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Delta Open-Loop Variable-Torque Standard Drive VP3000 Series User Manual

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(Original instructions)

READ PRIOR TO INSTALLATION FOR SAFETY.

DANGER

- ☑ Disconnect AC input power before connecting any wiring to the AC motor drive.
- ☑ When wiring, turn off the AC motor drive power first. It takes a certain time for the internal DC capacitor to discharge. A charge may still remain in the DC link capacitors with hazardous voltages before the POWER LED is OFF. Do NOT touch the internal circuits and components. To avoid damage, use a voltmeter for testing. Wiring only after the voltage is lower than the safety voltage value of 25 V_{DC}. If the AC motor drive does not fully discharge, there will be residual voltage inside. Any wiring at this time causes short-circuit and fire. It is strongly suggested to operate the wiring under no-voltage conditions to ensure personnel safety.
- ☑ There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. Take anti-static measure before touching these components or the circuit boards.
- ☑ Never modify the internal components or wiring.
- ☑ Ground the AC motor drive by using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed.
- ☑ Do NOT install the AC motor drive in a location with high temperature, direct sunlight or inflammable materials or gases.

CAUTION

- ☑ Never connect the AC motor drive output terminals U/T1, V/T2 and W/T3 directly to the AC mains circuit power supply.
- ☑ After finishing the wiring of the AC motor drive, check if R/L1, S/L2, and T/L3 are short-circuited to ground with a multimeter. Do NOT power the drive if short circuits occur. Eliminate the short circuits before the drive is powered.
- ☑ The rated voltage of power system to install motor drives is listed below. Ensure that the installation voltage is in the correct range when installing a motor drive.
  1. For 460V models, the range is between 323–528V.
- ☑ Refer to the table below for short circuit rating:

460V Model (Power)	0.75–37 kW	45–132 kW	160–280 kW	315–400 kW	450–630 kW
Short Circuit Rating	5 kA	10 kA	18 kA	30 kA	42 kA

- ☑ Only qualified persons are allowed to install, wire, and maintain the AC motor drives.
- ☑ Even if the three-phase AC motor is stopped, a charge with hazardous voltages may still remain in the main circuit terminals of the AC motor drive.
- ☑ The performance of electrolytic capacitor will degrade if it is not charged for a long time. It is recommended to charge the drive that is stored in no charge condition every 2 years for 3–4 hours to restore the performance of electrolytic capacitor in the motor drive. **NOTE:** When power up the motor drive, use adjustable AC power source (ex. AC autotransformer) to charge the drive at 70–80% of rated voltage for 30 minutes (do not run the motor drive). Then charge the drive at 100% of rated voltage for an hour (do not run the motor drive). By doing these, restore the performance of electrolytic capacitor before starting to run the motor drive. Do NOT run the motor drive at 100% rated voltage right away.
- ☑ Pay attention to the following precautions when transporting and installing this package (including wooden crate and wood stave)
  1. If you need to deworm the wooden crate, do NOT use fumigation or you will damage the drive. Any damage to the drive caused by using fumigation voids the warranty.
  2. Use other methods, such as heat treatment or any other non-fumigation treatment, to deworm the wood packaging material.

	3. If you use heat treatment to deworm, leave the packaging materials in an environment of over 56°C for a minimum of thirty minutes. ☑ Connect the drive to a three-phase three-wire or three-phase four-wire Wye system to comply with UL standards. ☑ If the motor drive generates leakage current over AC 3.5 mA or over DC 10 mA on a grounding conductor, compliance with local grounding regulations or IEC61800-5-1 standard is the minimum requirement for grounding. ☑ The VP3000 series drives are designed for Industrial application. The non-linear load generates harmonic current, when you use a VP3000 series drive in a public low-voltage distribution network (such as power supply in a residential building), install suppression devices (for example, one-to-one transformer or input AC reactor) to suppress the possible interferences caused by the harmonic current. Contact Delta for more information.

NOTE: The content of this manual may be revised without prior notice. Consult our distributors or download the latest version at http://www.deltaww.com/iadownload_acmotordrive

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Issued Edition: 00
Firmware Version: V1.10 (Refer to Pr.A0-03 on the product for the firmware version.)
Issued Date: 2025/05

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Chapter 1 An Overview before Use

1-1 Confirm the Model of AC Motor Drive to Use

1-2 Part Names of the AC Motor Drive

1-1 Confirm the Model of AC Motor Drive to Use

After receiving the AC motor drive, check the following to ensure safe use:

1. Inspect the unit after unpacking to ensure that it was not damaged during shipment. Make sure that the part number printed on the package matches the part number indicated on the nameplate.
2. Make sure that the mains voltage is within the range indicated on the nameplate. Install the AC motor drive according to the instructions in this manual.
3. Before applying power, make sure that all devices, including mains power, motor, control board and digital keypad, are connected correctly.
4. When wiring the AC motor drive, make sure that the wiring of input terminals “R/L1, S/L2, T/L3” and output terminals “U/T1, V/T2, W/T3” are correct to prevent damage to the drive.
5. When power is applied, use the digital keypad to set parameters. When executing a trial run, begin with a low speed and then gradually increases the speed to the desired speed.

1-1-1 Nameplate Information

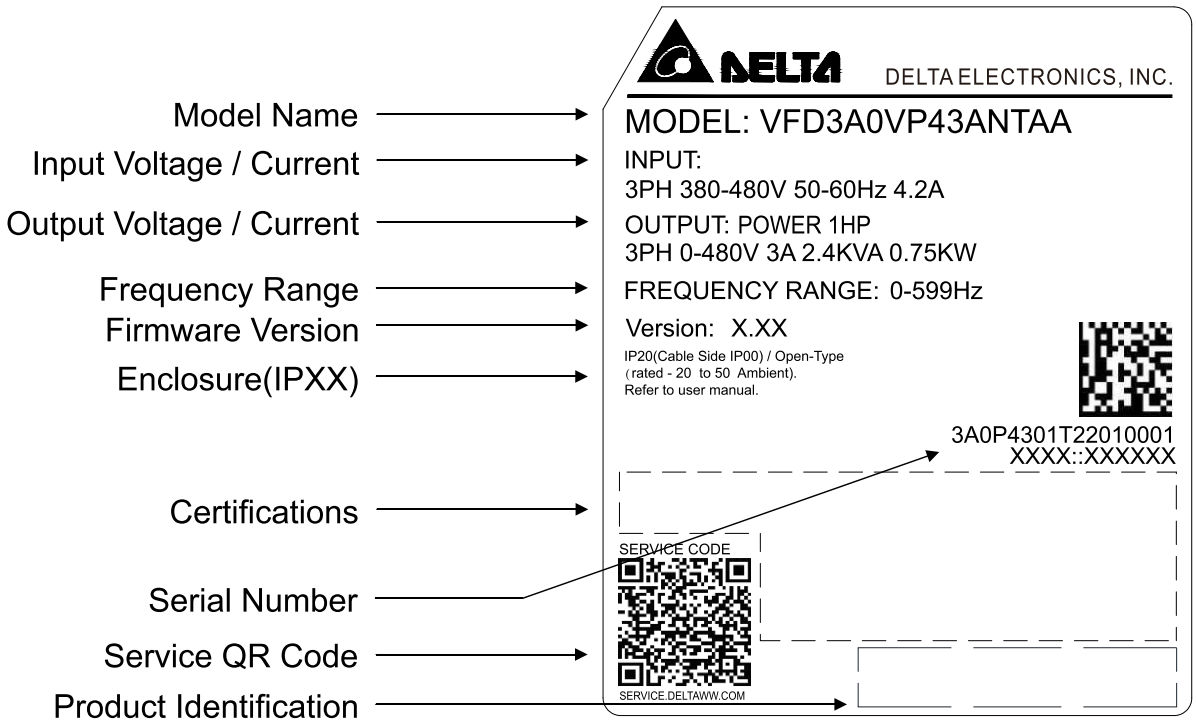


Figure 1-1

1-1-2 Model Name

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Example	VFD	3A0	VP	43	A	N	T	A	A

Definition		Description
[1]	Product name	VFD = Variable Frequency Device (AC Motor Drive)
[2]	Current specification	Continuous current (I_{CON}) **NOTE:** Refer to the Specifications in the user manual for more information.
[3]	Series	VP = VP3000
[4]	Input voltage	43 = 460V, three-phase
[5]	IP protection ratings	A = IP20 / UL Open Type / Wall-mount B = IP20 / Type 1 / Wall-mount S = IP00 / UL Open Type / Chassis
[6]	EMC filter	N = No built-in EMC filter F = EMC Category C3 S = EMC Category C2 H = EMC Category C3, Chassis
[7]	Safety function	T = Built-in STO (SIL3)
[8]	Special specification	A = No built-in DC choke C = Low harmonic (THDi 35%)
[9]	Version number	A = Version A **NOTE:** 1. For IP20 / UL Open Type models, accompanied with a LED digital keypad KPV-CE02 2. For IP20 / Type 1 models, accompanied with a LCD digital keypad KPV-CC01

Table 1-1

1-1-3 Serial Number

	[1]	[2]	[3]	[4]	[5]
Example	3A0P4301	T	22	01	0001

Definition		Description
[1]	Model name	VP3000 1HP (0.75 kW)
[2]	Production factory	T: Taoyuan W: Wujiang H: Hosur
[3]	Production year	2022
[4]	Production week	01
[5]	Production number	0001

Table 1-2

1-2 Part Names of the AC Motor Drive

Take frame A as an example.

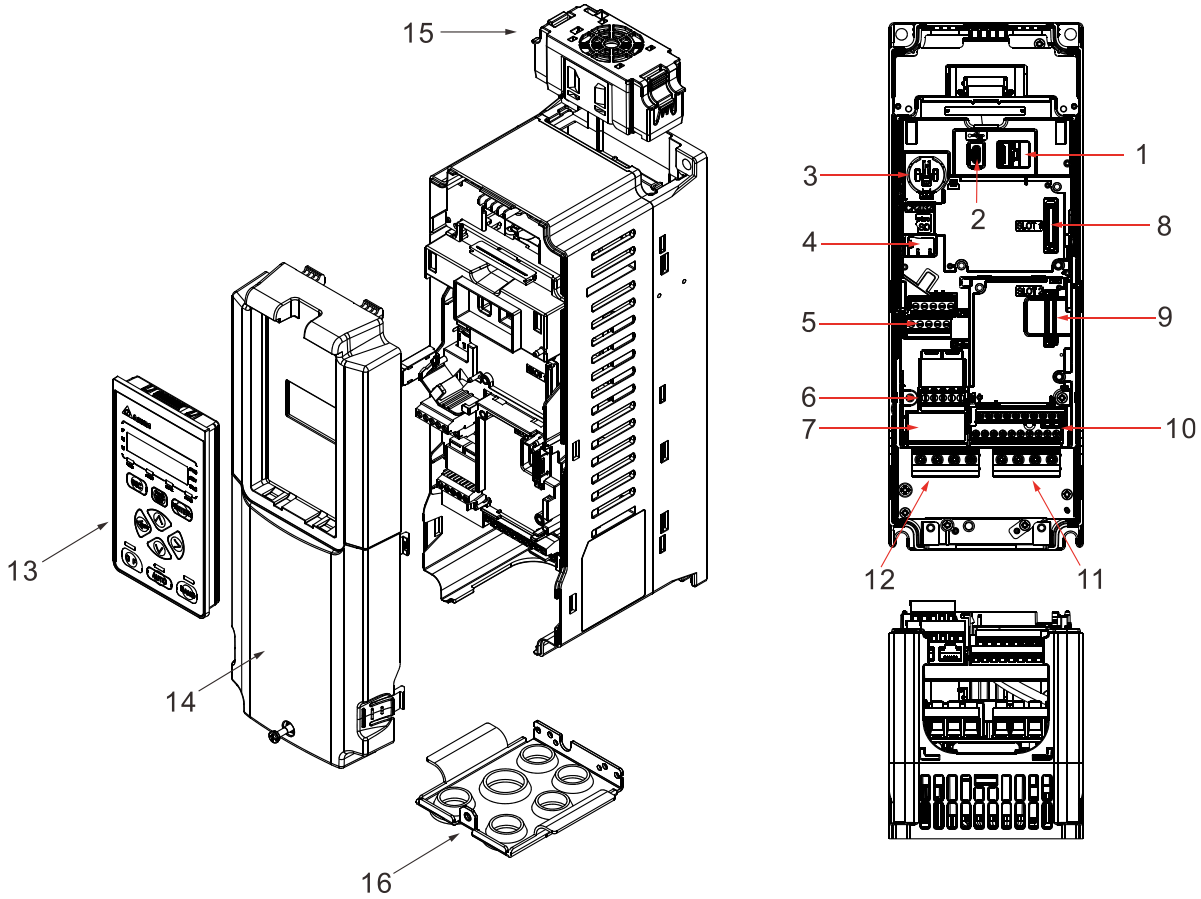


Figure 1-2

Number	Name	Description
1	Digital keypad connection port	To connect with digital keypad
2	USB-C port	To connect with operating software for monitoring the AC motor drive
3	CR2032 battery holder	Need to install the battery first for using RTC function
4	Micro SD slot	To install a memory card for storing historical records of the AC motor drive
5	Control circuit terminals A	Analog signal input / output terminals
6	Control circuit terminals B	Relay output terminals
7	RJ45 port	To connect with operating software for monitoring the AC motor drive
8	Extension card slot (SLOT 1)	A slot for digital input / digital output, analog input / analog output extension card
9	Extension card slot (SLOT 2)	A slot for communication extension card
10	Control circuit terminals C	Terminals of digital signals, communication and STO function
11	Motor output terminals	-
12	Main power input terminals	-
13	Digital keypad	To do the settings for the AC motor drive
14	Top cover	-
15	Cooling fan	-
16	Bottom cover	-

Table 1-3

Chapter 2 Mechanical Installation

2-1 Installation Environment

2-2 Mounting Clearance

2-3 Airflow and Power Dissipation

2-4 Transportation and Installation

2-5 Appearance and Dimensions

2-6 EMC Plate Installation

2-1 Installation Environment

The product installation environment affects the product performance, durability and other service life. Follow the specifications in Section 11-2 Environment for Operation, Storage and Transportation for product installation.

2-2 Mounting Clearance

- ☑ Prevent fiber particles, scraps of paper, shredded wood, sawdust, metal particles, etc. from adhering to the heat sink.
- ☑ Install the AC motor drive in a metal cabinet. When installing one drive below another one, use a metal separator between the AC motor drives to prevent mutual heating and to prevent the risk of fire accident.
- ☑ Install the AC motor drive in a Pollution Degree 2 environment with clean and circulating air. A clean and circulating environment means air without polluting substances and dust.

The appearances shown in the following figures are for reference only. The actual motor drives may look different.

Airflow direction: (Blue arrow) Inflow (Red arrow) Outflow (Black) Distance

Single drive installation

(Frame A–K)

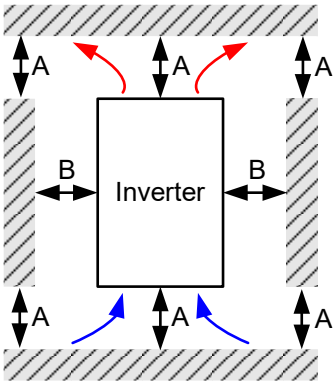


Figure 2-1

Multiple drives - Horizontal installation

(Frame A–K)

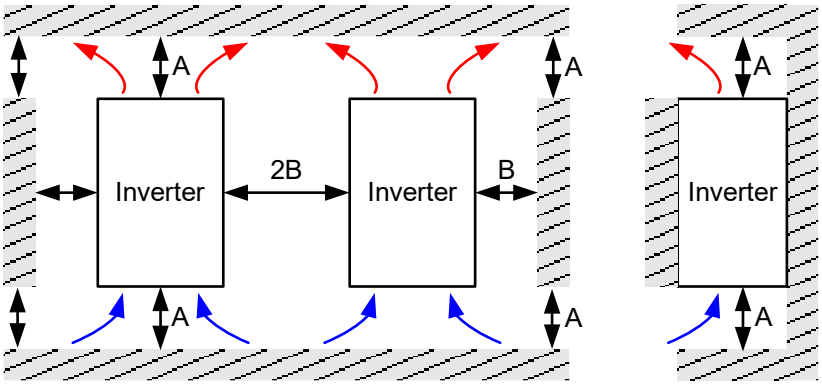


Figure 2-2

NOTE: The VFD3A0VP43BSTCA model cannot be horizontally installed on the ground. If you need to install the drive horizontally, select the model with a higher grade of power.

Single drive installation

(Frame L–M)

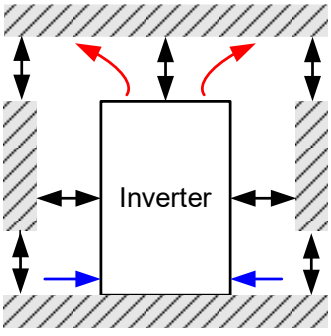


Figure 2-3

Multiple drives - Horizontal installation

(Frame L–M)

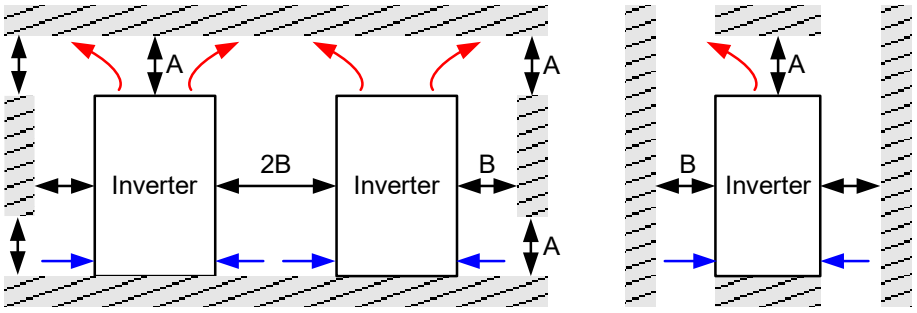


Figure 2-4

Multiple drives, side-by-side vertical installation

When installing one AC motor drive below another one (top-bottom installation), use a metal separator between the drives to prevent mutual heating. The temperature measured at the fan's inflow side must be lower than the temperature measured at the operation side. If the fan's inflow temperature is higher, use a thicker or larger size of metal separator. See diagram below. Operation temperature is the temperature measured at 50 mm away from the fan's inflow side.

(Frame A–K)

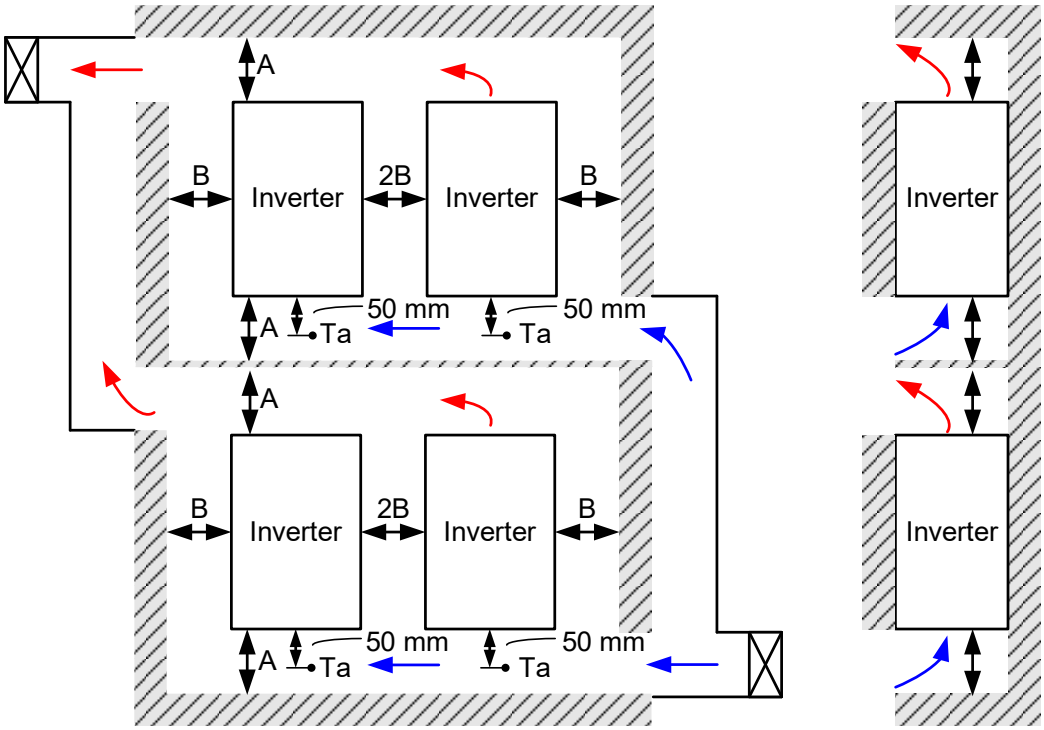


Diagram 2-5

Minimum mounting clearance

Frame	A (mm)	B (mm)
A–C	60	30
D–I	100	50
J	200	100
K	200	100
L	350	100
M	350	100

NOTE: The minimum mounting clearances A–B stated in the table above apply to AC motor drives installation. Failing to follow the minimum mounting clearances may cause the fan to malfunction and heat dissipation problems.

Table 2-1

Frame A	VFD3A0VP43ANTAA; VFD4A2VP43ANTAA; VFD5A6VP43ANTAA; VFD7A2VP43ANTAA; VFD011VP43ANTAA; VFD3A0VP43BFTAA; VFD4A2VP43BFTAA; VFD5A6VP43BFTAA; VFD7A2VP43BFTAA; VFD011VP43BFTAA
Frame B	VFD013VP43ANTAA; VFD018VP43ANTAA; VFD013VP43BFTAA; VFD018VP43BFTAA; VFD3A0VP43BSTCA; VFD4A2VP43BSTCA; VFD5A6VP43BSTCA; VFD7A2VP43BSTCA; VFD011VP43BSTCA; VFD013VP43BSTCA; VFD018VP43BSTCA
Frame C	VFD025VP43ANTAA; VFD032VP43ANTAA; VFD038VP43ANTAA; VFD025VP43BFTAA; VFD032VP43BFTAA; VFD038VP43BFTAA; VFD025VP43BSTCA; VFD032VP43BSTCA; VFD038VP43BSTCA
Frame D	VFD045VP43ANTCA; VFD062VP43ANTCA; VFD045VP43BFTCA; VFD062VP43BFTCA; VFD045VP43BSTCA; VFD062VP43BSTCA
Frame E	VFD073VP43ANTCA; VFD090VP43ANTCA; VFD073VP43BFTCA; VFD090VP43BFTCA; VFD073VP43BSTCA; VFD090VP43BSTCA
Frame F	VFD110VP43AFTCA; VFD110VP43BFTCA; VFD110VP43BSTCA
Frame G	VFD150CP43AFTCA; VFD150VP43BFTCA; VFD150VP43BSTCA
Frame H	VFD180VP43AFTCA; VFD220VP43AFTCA; VFD180VP43BFTCA; VFD220VP43BFTCA; VFD180VP43BSTCA; VFD220VP43BSTCA
Frame I	VFD260VP43AFTCA; VFD310VP43AFTCA; VFD260VP43BFTCA; VFD310VP43BFTCA; VFD260VP43BSTCA; VFD310VP43BSTCA
Frame J	VFD370VP43AFTCA; VFD395VP43AFTCA; VFD370VP43BFTCA; VFD395VP43BFTCA; VFD370VP43BSTCA; VFD395VP43BSTCA
Frame K	VFD460VP43AFTCA; VFD485VP43AFTCA; VFD460VP43BFTCA; VFD485VP43BFTCA; VFD460VP43BSTCA; VFD485VP43BSTCA
Frame L	VFD530VP43SHTCA; VFD616VP43SHTCA; VFD683VP43SHTCA; VFD770VP43SHTCA
Frame M	VFD866VP43SHTCA; VFD930VP43SHTCA; VFD1K1VP43SHTCA; VFD1K2VP43SHTCA

Table 2-2

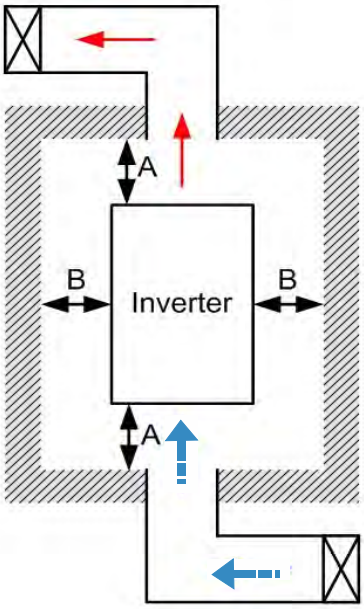


Figure 2-6

NOTE:

- The mounting clearances stated in the figure is for installing the drive in an open area (as shown in the figure on the left). To install the drive in a confined space (such as cabinet or electric box), follow the following rules: (1) Keep the minimum mounting clearances. (2) Install a ventilation equipment or an air conditioner to keep surrounding temperature lower than operation temperature. (3) Refer to parameter setting and set up Parameters A5-00 and H4-04.
- The table below lists the required air volume of each model for installing single drive in a confined space. When installing multiple drives, the required air volume shall be multiplied by the number of the drives.
- Refer to the chart (Airflow Rate for Cooling) for ventilation equipment design and selection.
- Refer to the chart (Power Dissipation for AC Motor Drive) for air conditioner design and selection.
- Different control mode affects the derating. See Pr.H4-04 for more information.
- Ambient temperature derating curve shows the derating status in different temperature in relation to different protection level.
- Refer to the ambient temperature derating curve and derating curves under different control modes in Chapter 11.
- If UL Type 1 models need side by side installation, remove the top cover for Frame A–C. Do NOT install the conduit box for Frame D and above.

2-3 Airflow and Power Dissipation

Airflow Rate for Cooling			Power Dissipation for AC Motor Drive		
Model	Flow Rate (cfm)	Flow Rate (m^3/hr)	Power Dissipation (watt)		
			Loss External (Heat sink)	Internal	Total
VFD3A0VP43ANTAA/-BFTAA	7.51	12.76	38	14	52
VFD4A2VP43ANTAA/-BFTAA	7.51	12.76	55	18	73
VFD5A6VP43ANTAA/-BFTAA	7.51	12.76	72	24	96
VFD7A2VP43ANTAA/-BFTAA	7.51	12.76	97	28	125
VFD011VP43ANTAA/-BFTAA	7.51	12.76	144	46	190
VFD013VP43ANTAA/-BFTAA	19.61	33.32	178	49	227
VFD018VP43ANTAA/-BFTAA	19.61	33.32	256	56	312
VFD025VP43ANTAA/-BFTAA	56.46	95.92	361	60	421
VFD032VP43ANTAA/-BFTAA	56.46	95.92	449	67	516
VFD038VP43ANTAA/-BFTAA	56.46	95.92	546	70	616
VFD3A0VP43BSTCA	-	-	42	11	53
VFD4A2VP43BSTCA	6.75	11.47	58	15	73
VFD5A6VP43BSTCA	6.75	11.47	79	20	99
VFD7A2VP43BSTCA	6.75	11.47	104	23	127
VFD011VP43BSTCA	21.5	36.57	161	30	191
VFD013VP43BSTCA	21.5	36.57	198	32	230
VFD018VP43BSTCA	21.5	36.57	265	42	307
VFD025VP43BSTCA	47.8	81.3	358	62	420
VFD032VP43BSTCA	47.8	81.3	464	73	537
VFD038VP43BSTCA	47.8	81.3	490	92	582
VFD045VP43ANTCA/-BFTCA/-BSTCA	95.56	162.36	458	120	578
VFD062VP43ANTCA/-BFTCA/-BSTCA	95.56	162.36	698	133	831
VFD073VP43ANTCA/-BFTCA/-BSTCA	93.23	158.4	786	137	923
VFD090VP43ANTCA/-BFTCA/-BSTCA	93.23	158.4	964	13	1101
VFD110VP43AFTCA/-BFTCA/-BSTCA	112.3	190.9	1287.9	157.9	1445.8
VFD150VP43AFTCA/-BFTCA/-BSTCA	150.6	255.8	1533.6	160.8	1694.4
VFD180VP43AFTCA/-BFTCA/-BSTCA	280.4	476.4	1876.1	203.2	2079.3
VFD220VP43AFTCA/-BFTCA/-BSTCA	280.4	476.4	2232.6	233.4	2466.0
VFD260VP43AFTCA/-BFTCA/-BSTCA	290.9	494.2	2422.9	248.6	2671.5
VFD310VP43AFTCA/-BFTCA/-BSTCA	290.9	494.2	2840.8	284.2	3125.1
VFD370VP43AFTCA/-BFTCA/-BSTCA	666.7	1132.7	3466.3	374.4	3840.7
VFD395VP43AFTCA/-BFTCA/-BSTCA	666.7	1132.7	3730.8	392.7	4123.5
VFD460VP43AFTCA/-BFTCA/-BSTCA	699.8	1189.0	1532.4	457.7	1990.2
VFD485VP43AFTCA/-BFTCA/-BSTCA	699.8	1189.0	4565.9	481.7	5047.6
VFD530VP43SHTCA	1105.3	1877.8	4722.5	946.4	5668.9
VFD616VP43SHTCA	1105.3	1877.8	5380.2	1016.7	6396.8
VFD683VP43SHTCA	1105.3	1877.8	5592.3	1134.0	6726.3
VFD770VP43SHTCA	1105.3	1877.8	6411.7	1249.4	7661.1
VFD866VP43SHTCA	1015.4	1725.1	8279.9	1268.5	9548.4
VFD930VP43SHTCA	1015.4	1725.1	9037.7	1363.2	10401.0
VFD1K1VP43SHTCA	1015.4	1725.1	10117.5	1647.8	11765.3
VFD1K2VP43SHTCA	1015.4	1725.1	11384.9	1861.3	13246.2

Airflow Rate for Cooling	Power Dissipation for AC Motor Drive
● The required airflow shown in the table is for installing single drive in a confined space. ● When installing multiple drives, the required air volume should be the required air volume for single drive × the number of the drives.	● The heat dissipation shown in the table is for installing single drive in a confined space. ● When installing multiple drives, volume of heat dissipation should be the heat dissipated for single drive × the number of the drives. ● Heat dissipation for each model is calculated by rated voltage, current and default carrier.

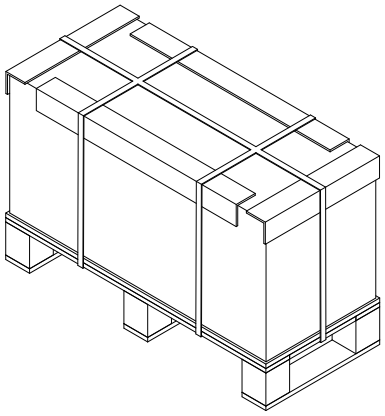
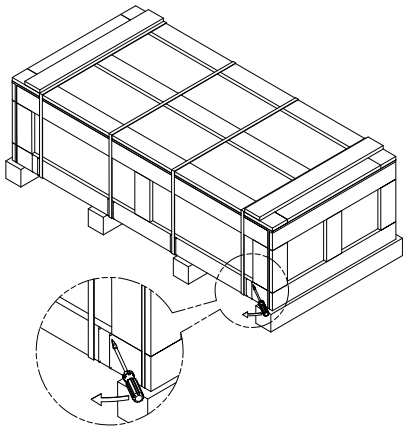
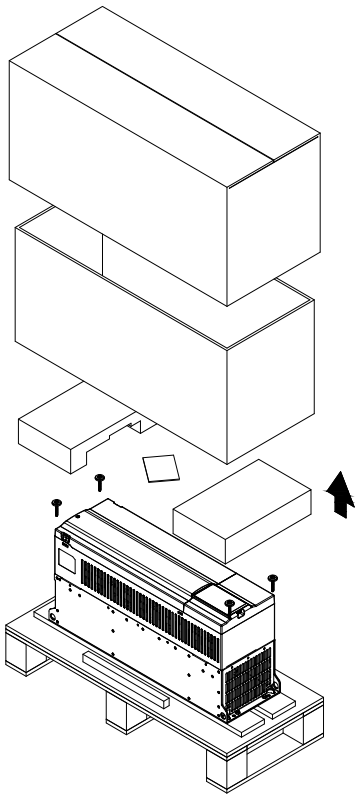
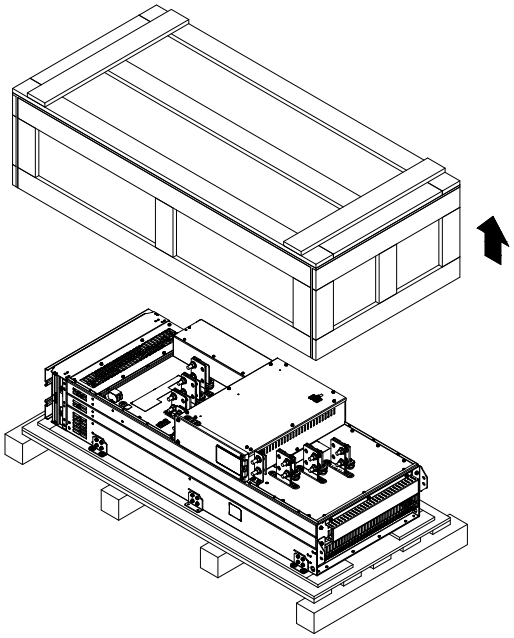
Table 2-3

2-4 Transportation and Installation

In order to ensure that the AC motor drive functions normally without risk of damage before installation, it should be kept in the original packaging during transportation or storage, and make sure the surrounding environmental conditions meet the specifications provided in this manual.

2-4-1 Unpacking

Follows the following steps for unpacking:

<table>
<tr><th>Frame G (Carton, applied for Frame A–G)</th><th>Frame L & M (Crate)</th></tr>
<tr><td>Step 1: Cut off all the packaging straps.
 
Figure 2-7</td><td>Step 1: Cut off all the packaging straps, and use a flathead screwdriver to pry open all fasteners on both sides of the crate.
 
Figure 2-8</td></tr>
<tr><td>Step 2: Remove the top cover, take out the EPEs and the manual, and then loosen the screws.
 
Figure 2-9</td><td>Step 2: Remove the top cover and take out the manual.
 
Figure 2-10</td></tr>
</table>

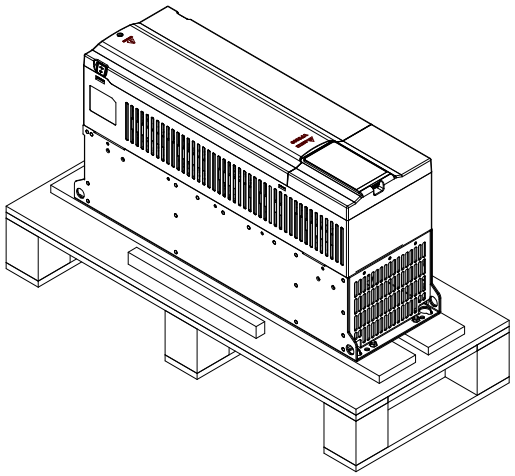
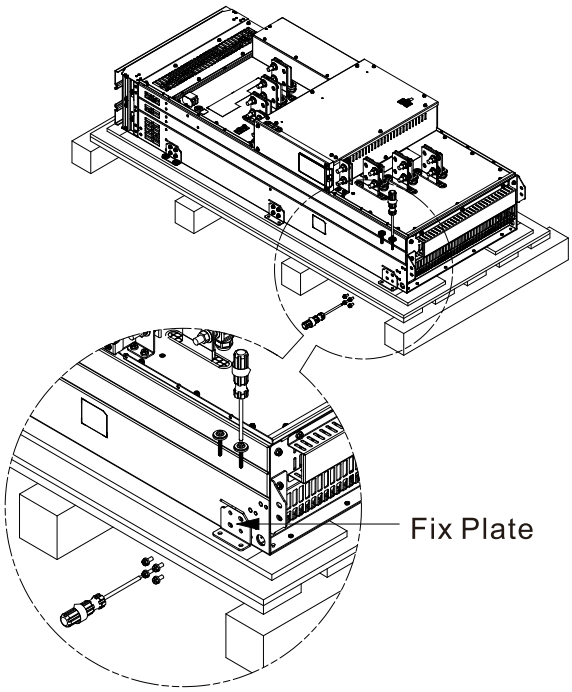
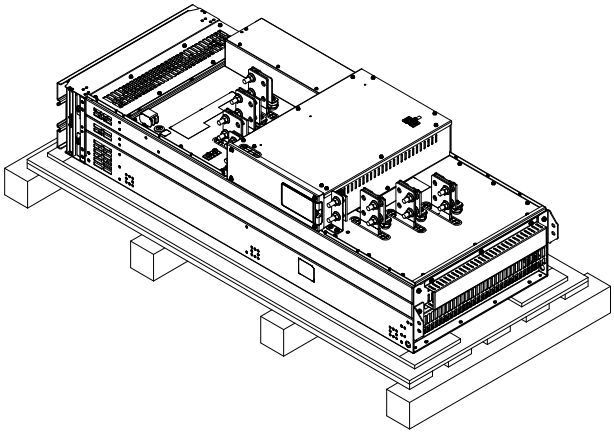
<table>
<tr><th>Frame G (Carton, applied for Frame A–G)</th><th>Frame L & M (Crate)</th></tr>
<tr><td rowspan="2">Step 3: Unpacking is completed.
 
Figure 2-11</td><td>Step 3: Loosen the screws and fix plates on both sides of the drive.
 

Figure 2-12</td></tr>
<tr><td>Step 4: Unpacking is completed.
 
Figure 2-13</td></tr>
</table>

2-4-2 The Lifting Hook

The arrows indicate the location of the lifting holes of Frame E–M, as shown in the figures below:

Frame E1

Applicable models:
VFD073VP43ANTCA; VFD090VP43ANTCA

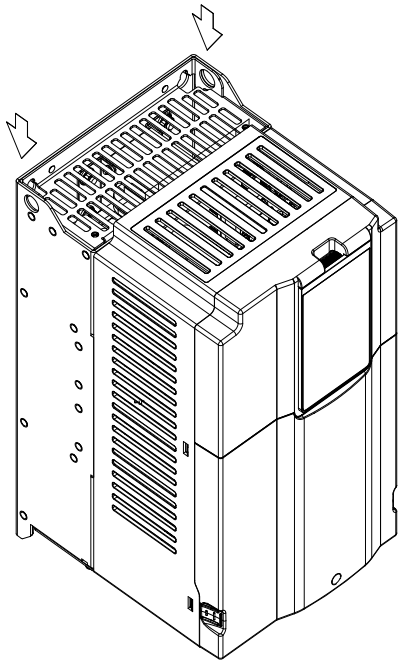


Figure 2-14

Frame E2

Applicable models:
VFD073VP43BFTCA; VFD090VP43BFTCA;
VFD073VP43BSTCA; VFD090VP43BSTCA

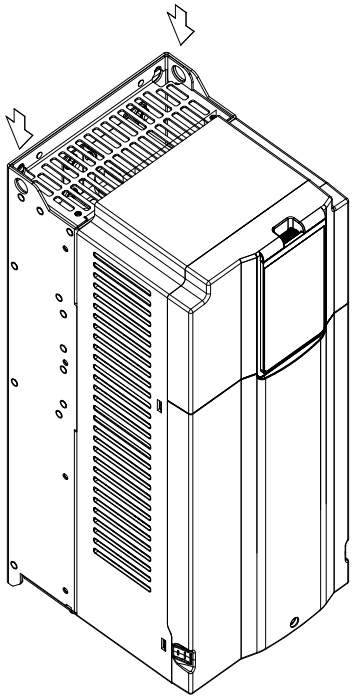


Figure 2-15

Frame F1

Applicable models:
VFD110VP43AFTCA

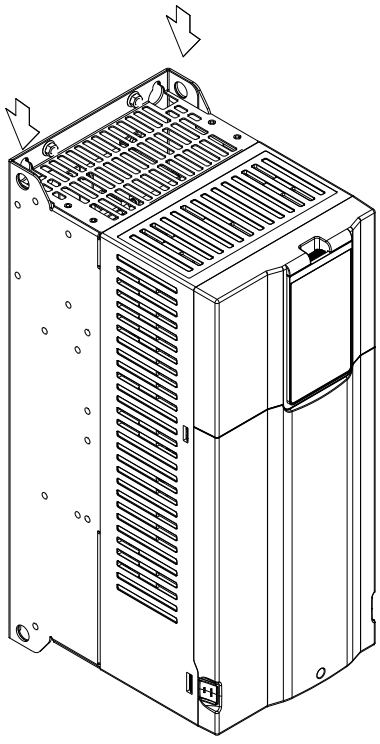


Figure 2-16

Frame F2

Applicable models:
VFD110VP43BFTCA; VFD110VP43BSTCA

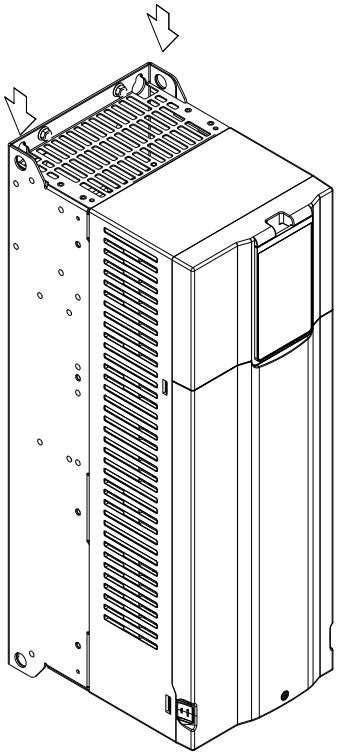


Figure 2-17

Frame G1

Applicable models:
VFD150VP43AFTCA

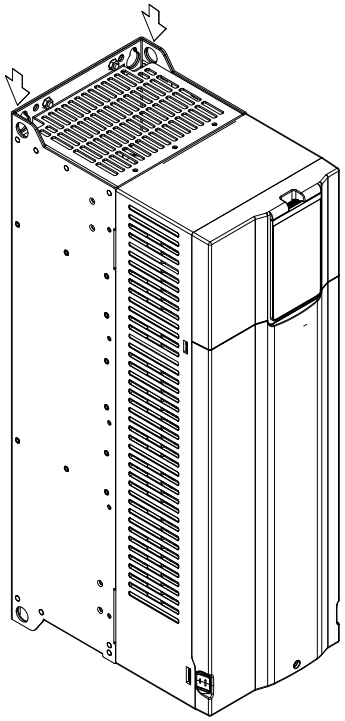


Figure 2-18

Frame G2

Applicable models:
VFD150VP43BSTCA; VFD150VP43BFTCA

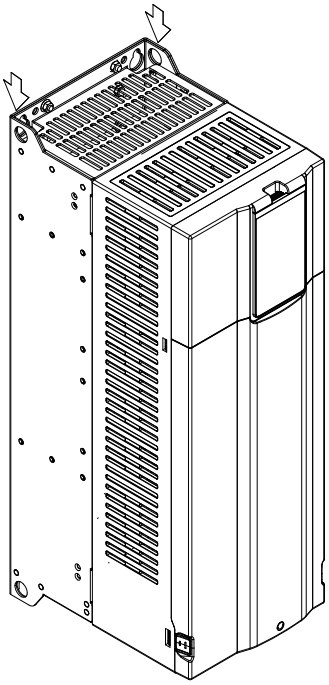


Figure 2-19

Frame H1

Applicable models:
VFD180VP43AFTCA; VFD220VP43AFTCA

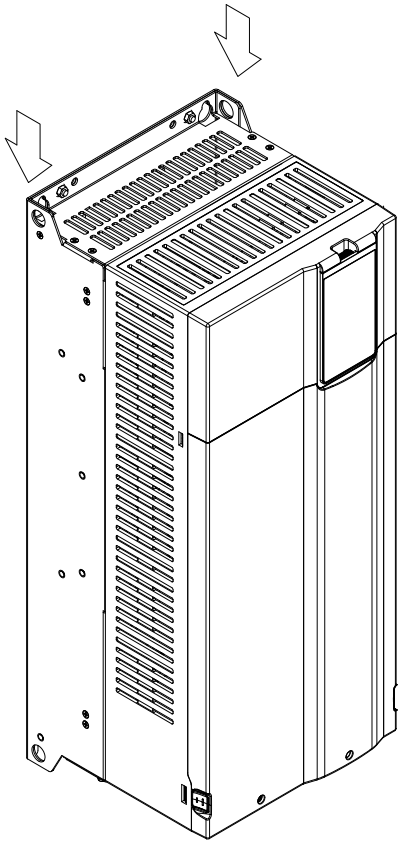


Figure 2-20

Frame H2

Applicable models:
VFD180VP43BFTCA; VFD180VP43BSTCA;
VFD220VP43BFTCA

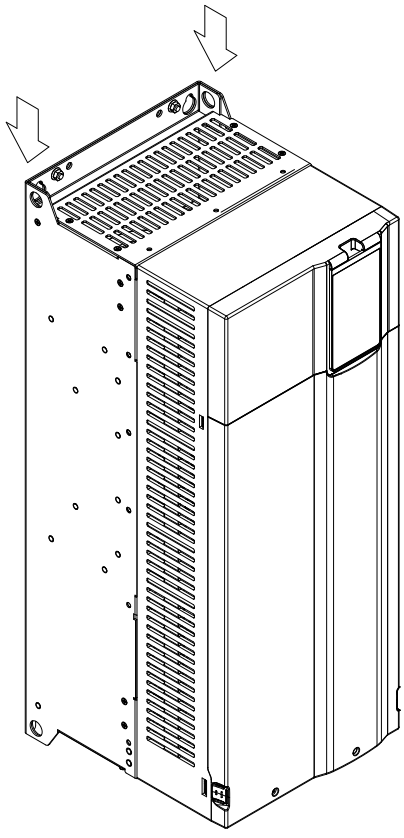


Figure 2-21

Frame I1

Applicable models:
VFD260VP43AFTCA; VFD310VP43AFTCA

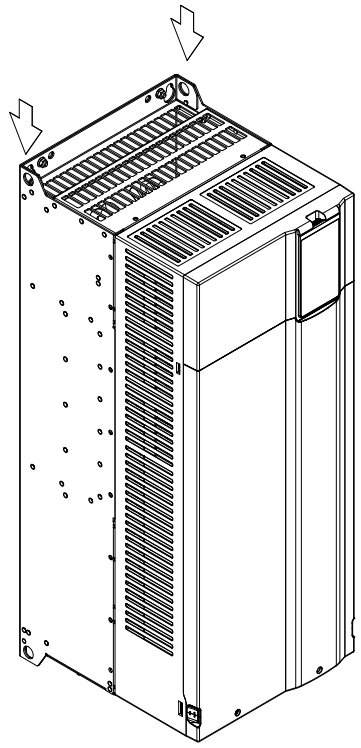


Figure 2-22

Frame I2

Applicable models:
VFD260VP43BFTCA; VFD260VP43BSTCA
VFD310VP43BFTCA; VFD310VP43BSTCA

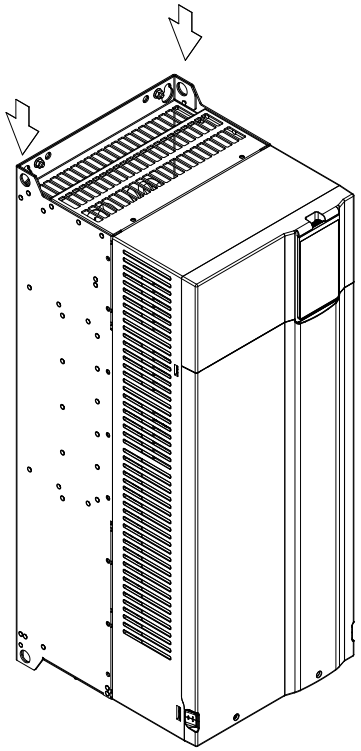


Figure 2-23

Frame J1

Applicable models:
VFD370VP43AFTCA; VFD395VP43AFTCA

Frame J2

Applicable models:
VFD370VP43BFTCA; VFD395VP43BFTCA;
VFD370VP43BSTCA; VFD395VP43BSTCA

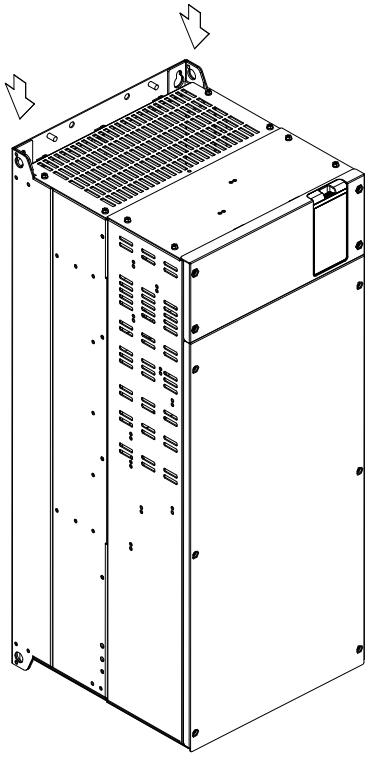


Figure 2-24

Frame K1

Applicable models:
VFD460VP43AFTCA; VFD485VP43AFTCA

Frame K2

Applicable models:
VFD460VP43BFTCA; VFD485VP43BFTCA;
VFD460VP43BSTCA; VFD485VP43BSTCA

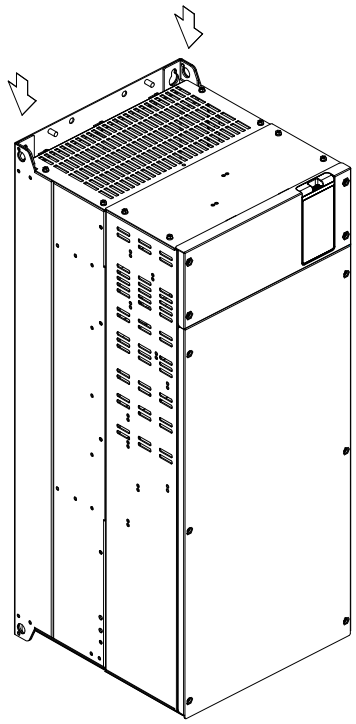


Figure 2-25

Frame L

Applicable models:
VFD530VP43SHTCA; VFD616VP43SHTCA;
VFD683VP43SHTCA; VFD770VP43SHTCA

Frame M

Applicable models:
VFD866VP43SHTCA; VFD930VP43SHTCA;
VFD1K1VP43SHTCA; VFD1K2VP43SHTCA

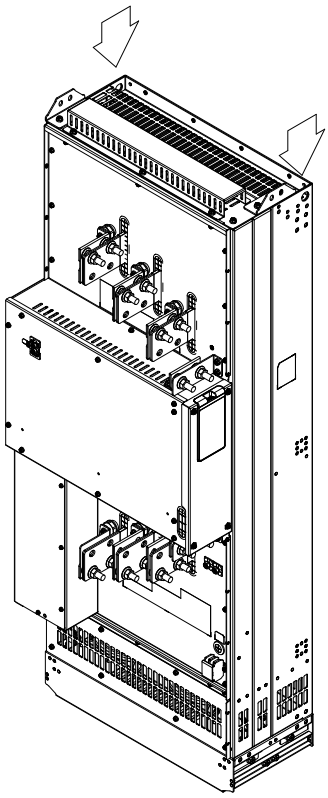


Figure 2-26

2-4-3 Weight

See Section 2-5 for the weight of each frame.

2-4-4 Lifting Indication

Frame E–K

1. Use the lifting hook to properly pass through the lifting hole, pay attention to the lifting method to prevent deformation of the drive lifting hole from improper installation.

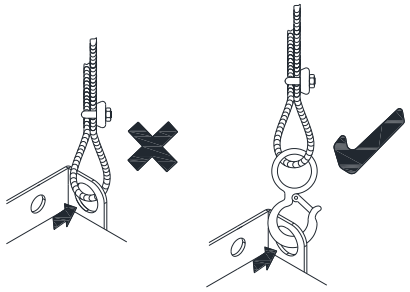


Figure 2-27

2. Make sure the two lifting hooks hook into the lifting holes, and then remove the screws and iron plates that fix the drive on the crate.

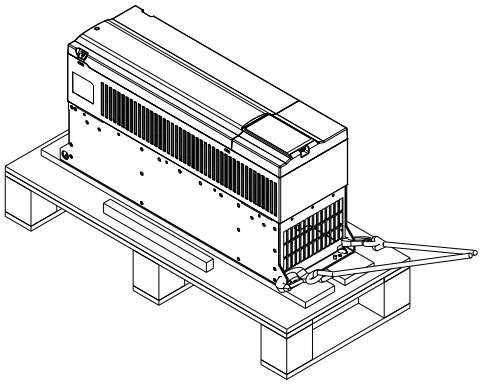


Figure 2-28

3. Note that the angle between the lifting hole of the drive and the hook device must be less than 30 degrees. The drive can be installed after being lifted.

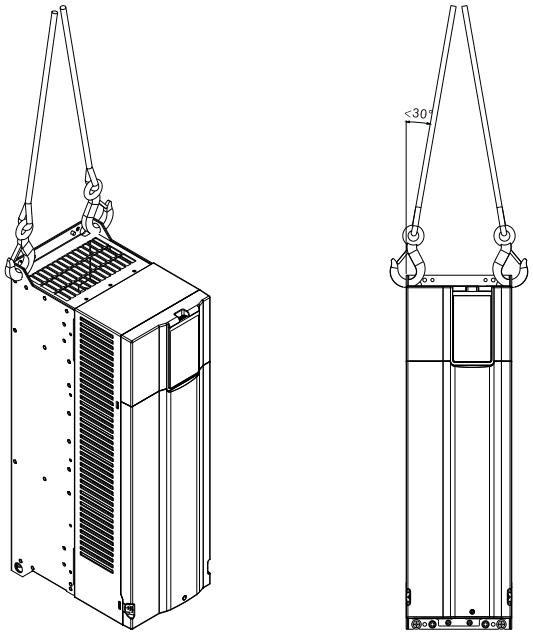


Figure 2-29

Frame L, M

Upright Lifting

1. Loosen the two screws and spare the track (refer to Section 2-4-5 Chassis Installation for track installation).

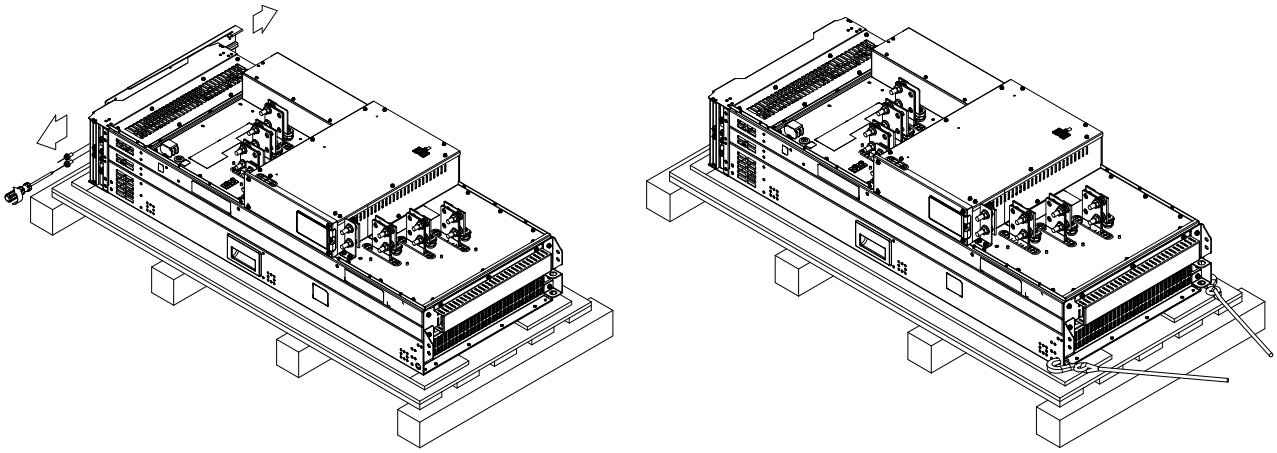


Figure 2-30

2. Note that the angle between the lifting hole of the drive and the hook device must be less than 30 degrees. The drive can be installed after being lifted.

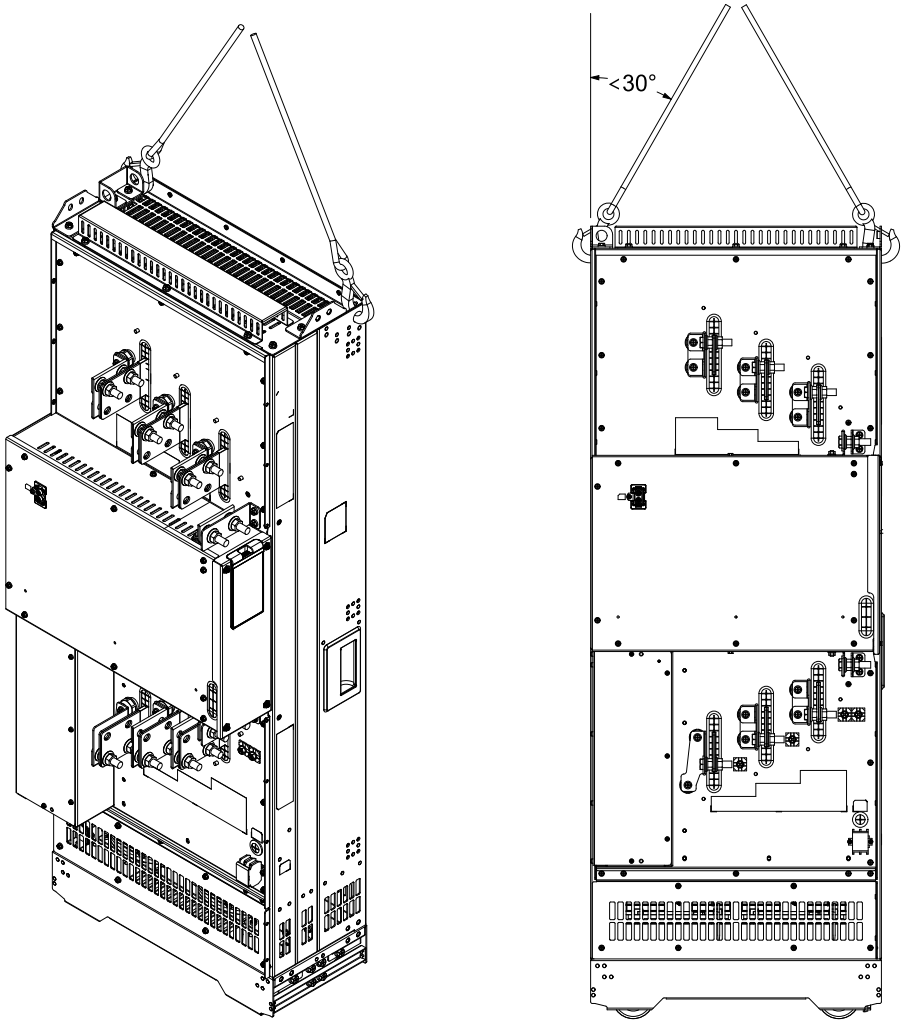


Figure 2-31

Horizontal Lifting

1. For the crate packaging, unscrew the fixed plate and the fixing two screws on the crate.

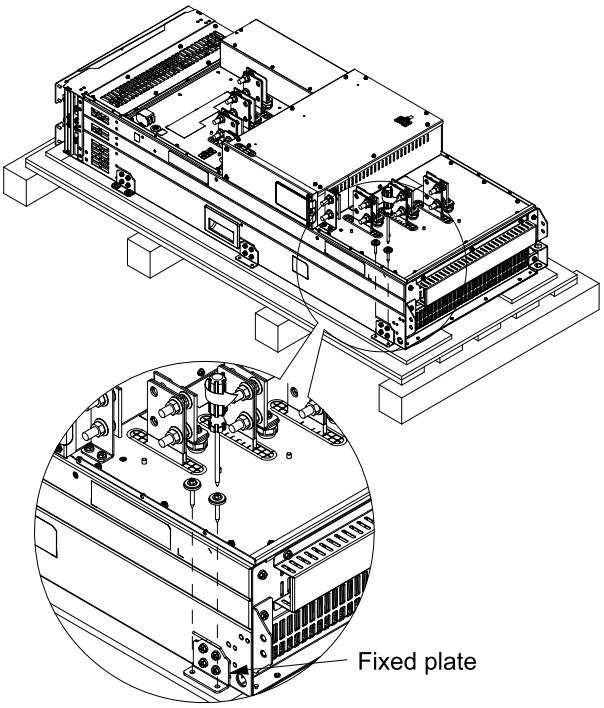


Figure 2-32

2. Lift the drive horizontally through the four fixed plate marking in the figure below. The angle between the lifting hole and the lifting hook is suggested to be 90 degrees.

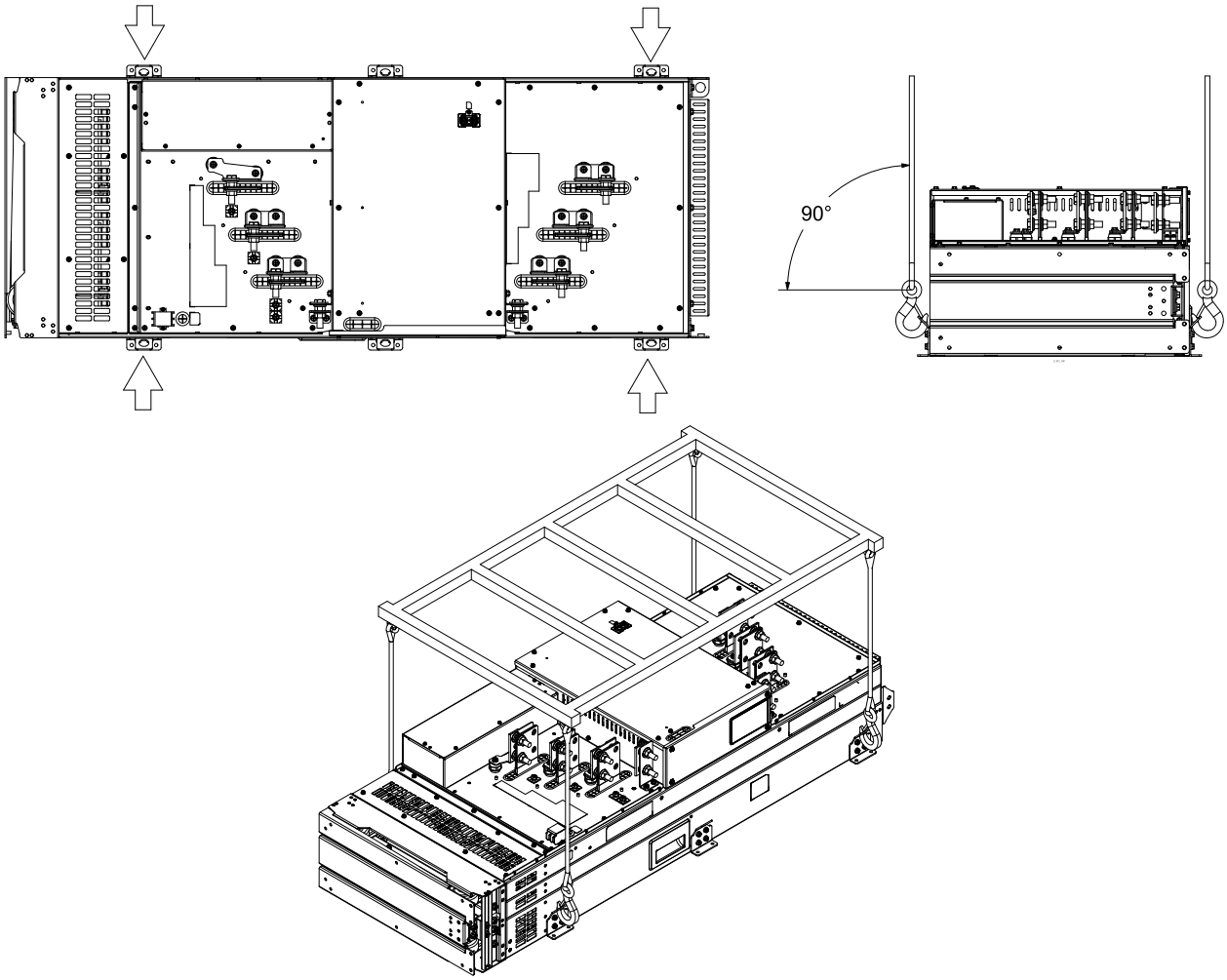


Figure 2-33

2-4-5 Chassis Installation

Follow the following steps for installation (applicable for Frame L & M):

1. Use 10 pcs of M6 and 2 pcs of M8 screws to lock the track to the cabinet.
   M6 Screw torque: 35–45 kg-cm / (30.4–39 lb-in.) / (3.43–4.41 Nm)
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

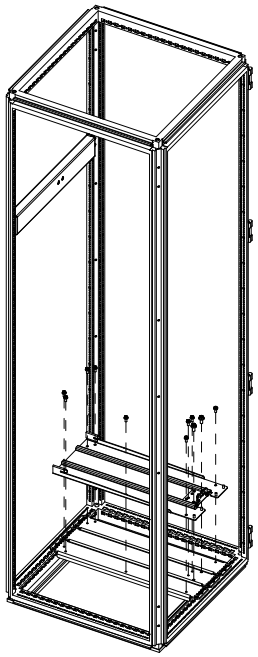


Figure 2-34

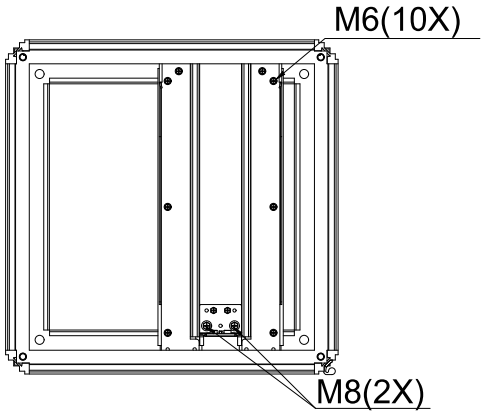


Figure 2-35

2. Lift the drive and place the front edge of the bottom against the end of the track, push the drive into the cabinet along the track and lean to the bottom. If you need auxiliary installation accessories, you can purchase the chassis rail (MKVP-CR01) as needed, refer to Section 10-3-7 for further information.
3. Use 4 pcs of M8 screws to lock the drive at the position indicated in the following figure.
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

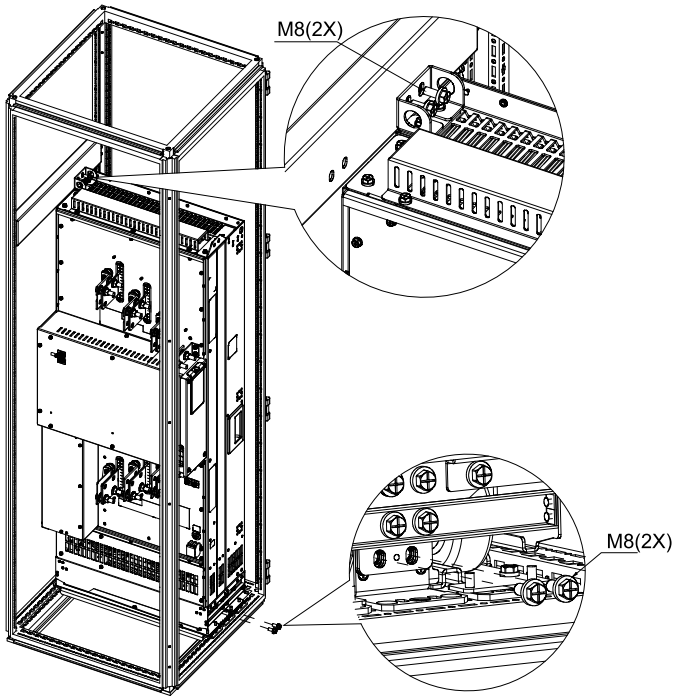


Figure 2-36

4. Install the front beam of the cabinet, and use 2 pcs of M8 screws to lock the drive at the position indicated in the following figure.
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

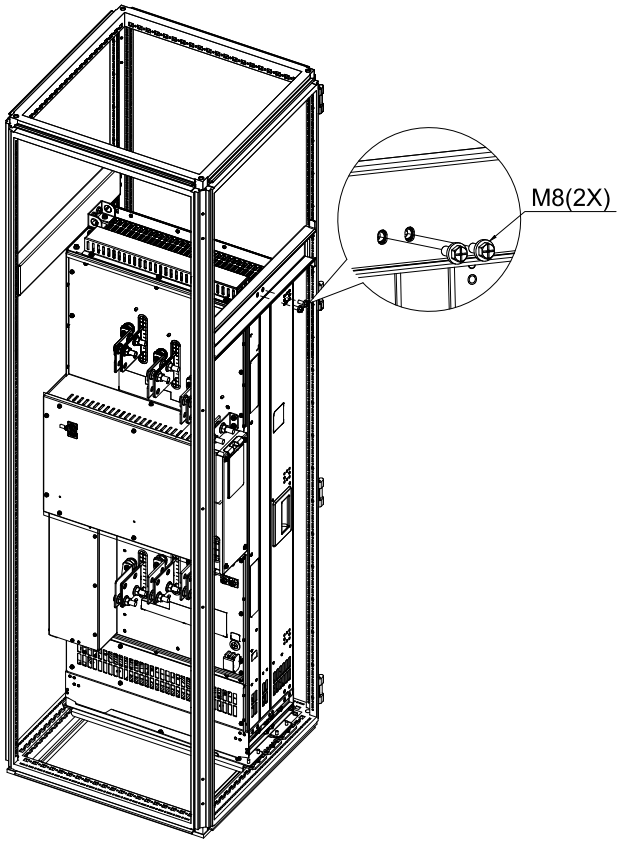


Figure 2-37

5. Loosen the 16 pcs of M12 screws and 4 pcs of M8 screws.

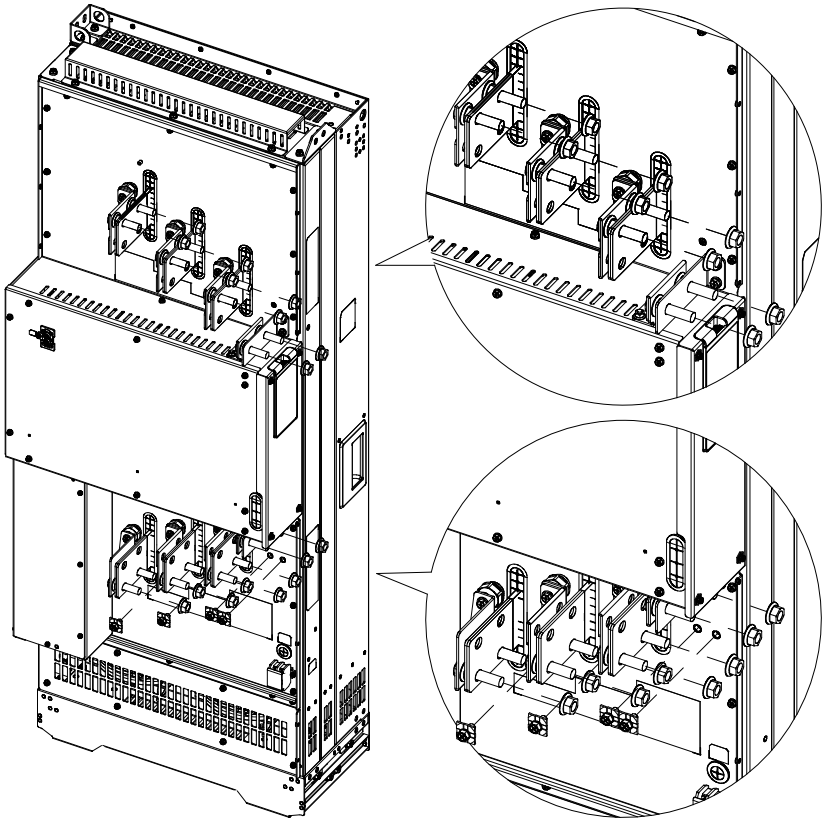


Figure 2-38

6. User the aforementioned 16 pcs of M12 nuts and 4pcs of M8 screws to secure the wire.
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)
   M12 Screw torque: 360 kg-cm / (312.5 lb-in.) / (35.28 Nm)

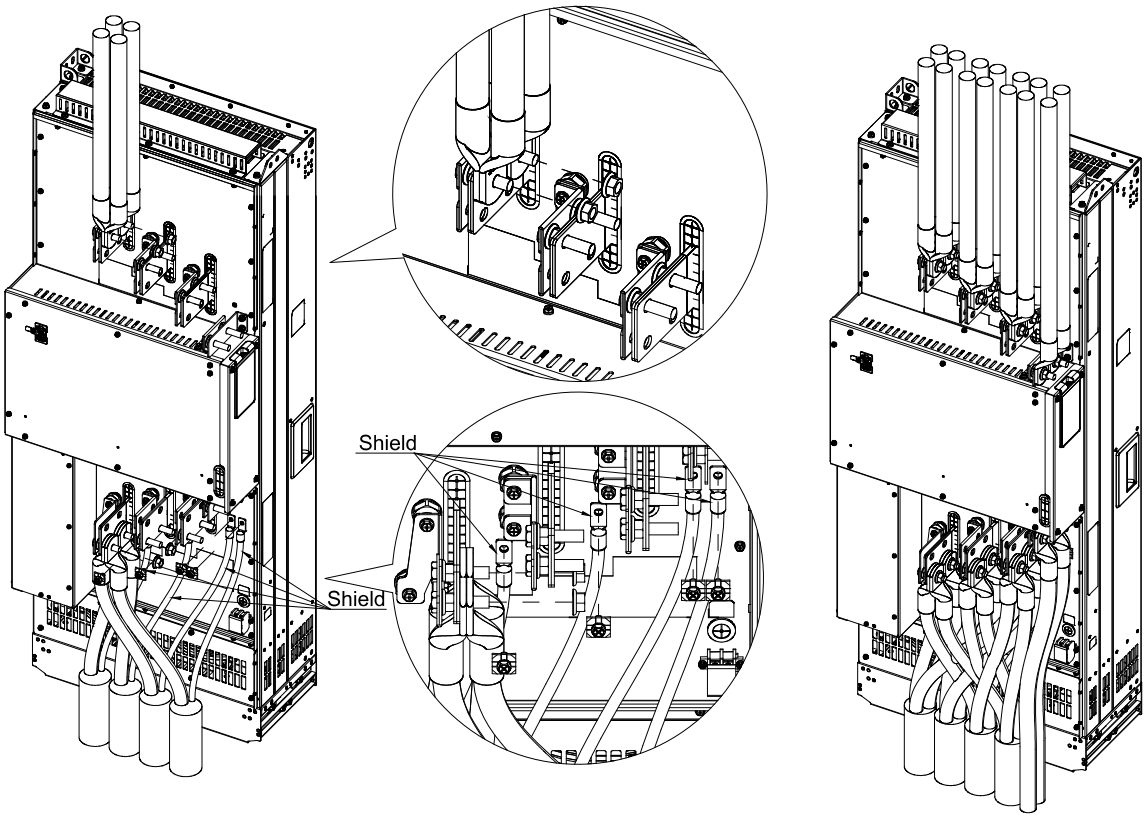


Figure 2-39

7. Installation completed.

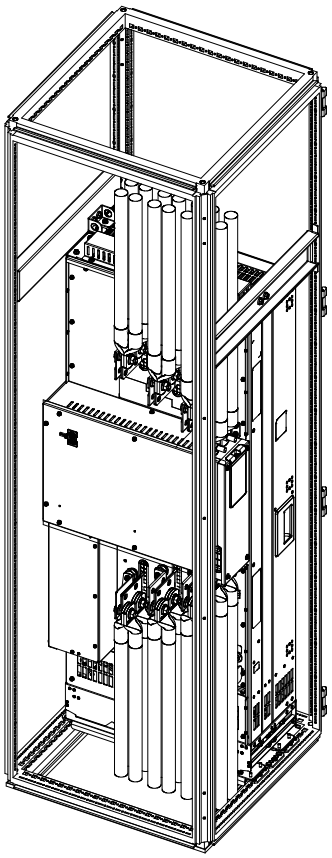


Figure 2-40

NOTE: The body of Frame L & M is relatively large. Pay attention to the placement of the drive and the safety of personnel during disassembly and assembly. Do not leave the drive randomly in the cabinet without being fully fixed and locked, or it may fall over.

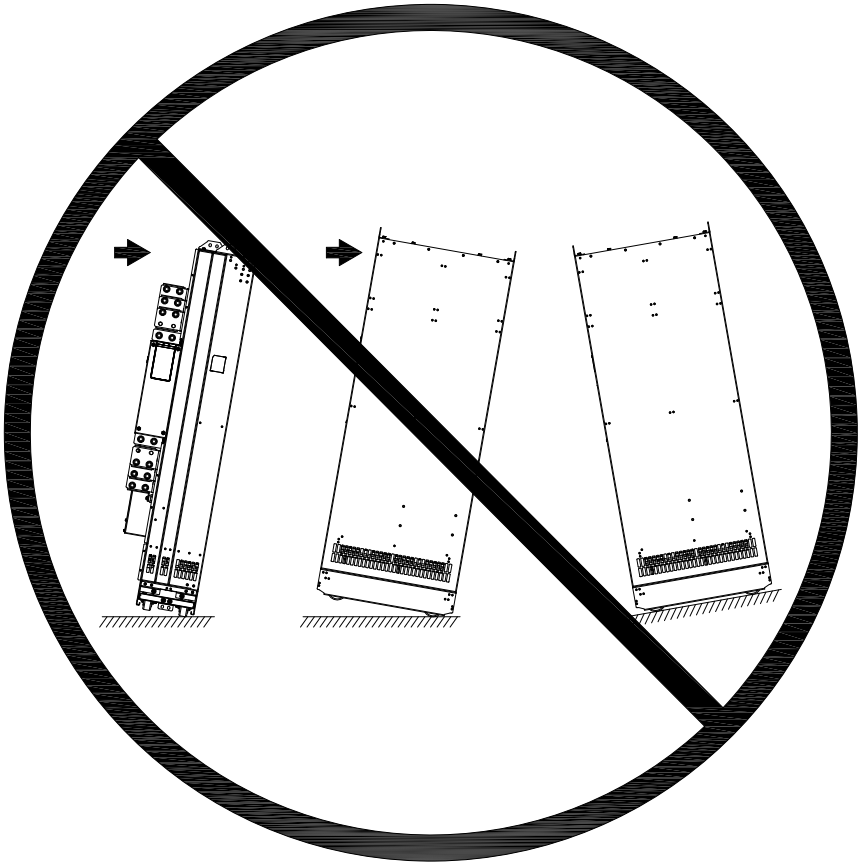


Figure 2-41

2-5 Appearance and Dimensions

Frame A1

Applicable models:

VFD3A0VP43ANTAA, VFD4A2VP43ANTAA, VFD5A6VP43ANTAA, VFD7A2VP43ANTAA, VFD011VP43ANTAA

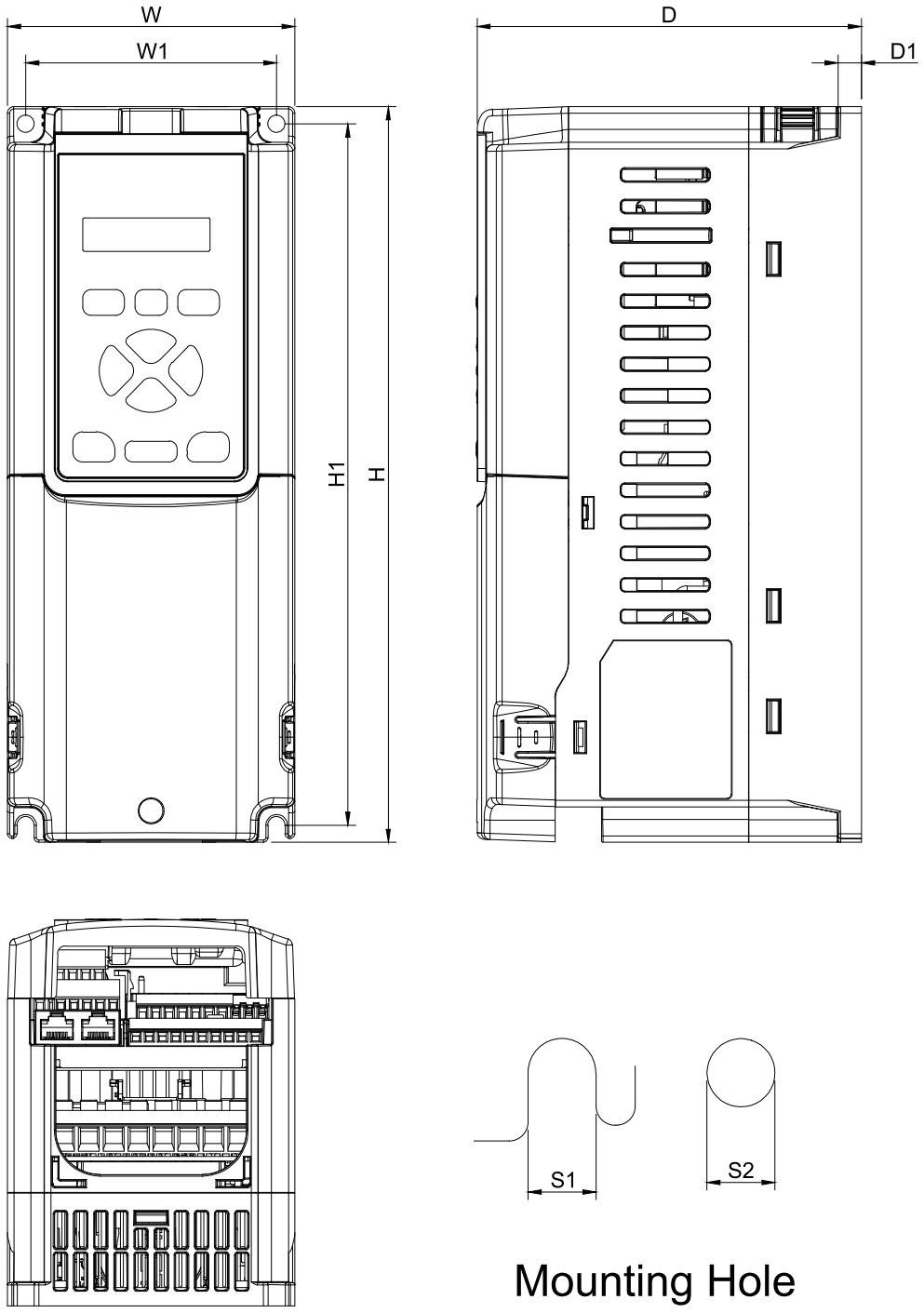


Figure 2-42

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2
A1	110 (4.33)	96 (3.78)	280 (11.02)	267 (10.51)	147 (5.79)	9 (0.35)	6.5 (0.26)	6.5 (0.26)

Weight: 1.71 kg

Table 2-4

Frame A2

Applicable models:

VFD3A0VP43BFTAA, VFD4A2VP43BFTAA, VFD5A6VP43BFTAA, VFD7A2VP43BFTAA, VFD011VP43BFTAA

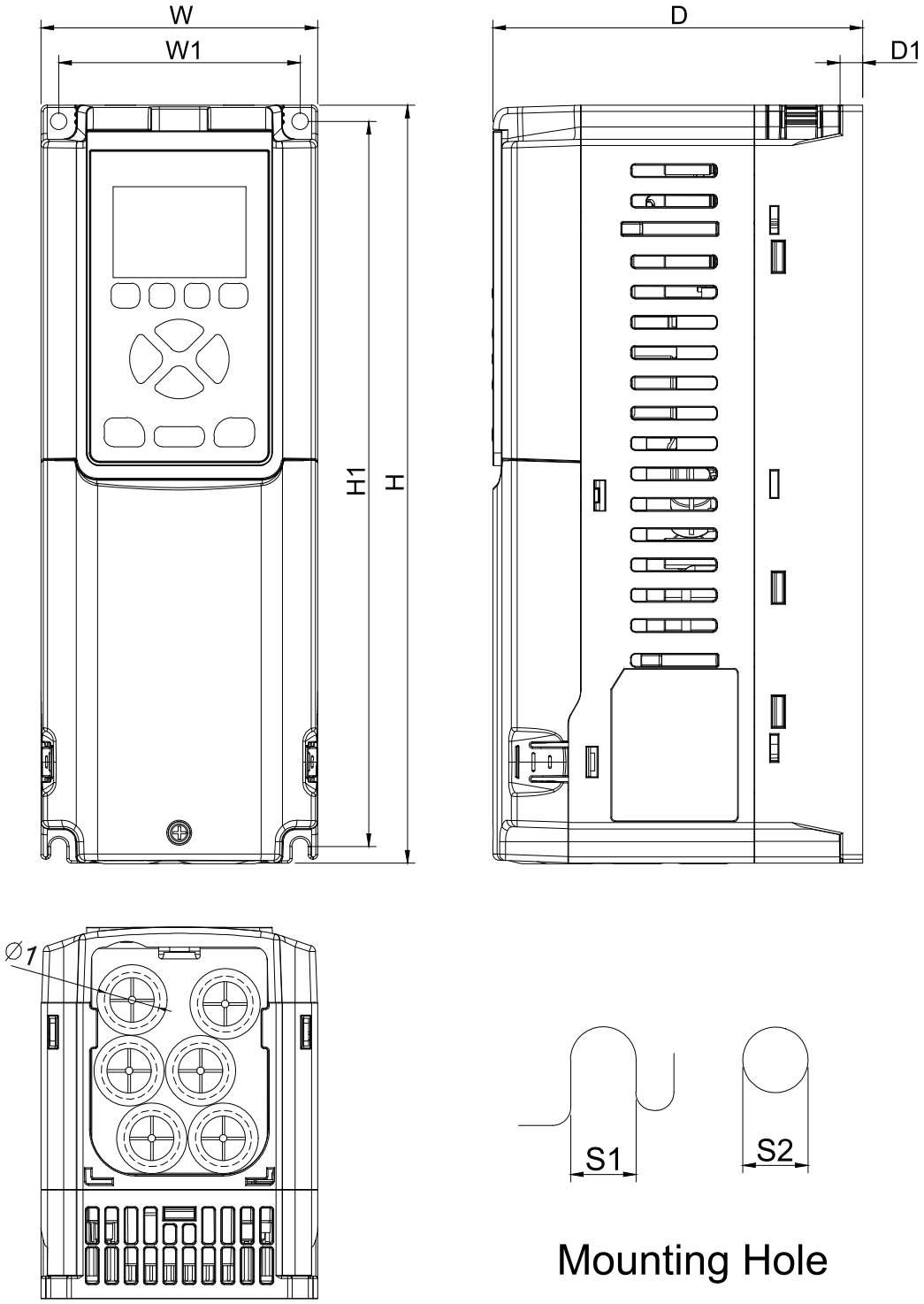


Figure 2-43

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	Ø1
A2	110 (4.33)	96 (3.78)	300 (11.81)	287 (11.3)	147 (5.79)	9 (0.35)	6.5 (0.26)	6.5 (0.26)	22.2 (0.87)

Weight: 1.95 kg

Table 2-5

Frame B1

Applicable models:

VFD013VP43ANTAA, VFD018VP43ANTAA

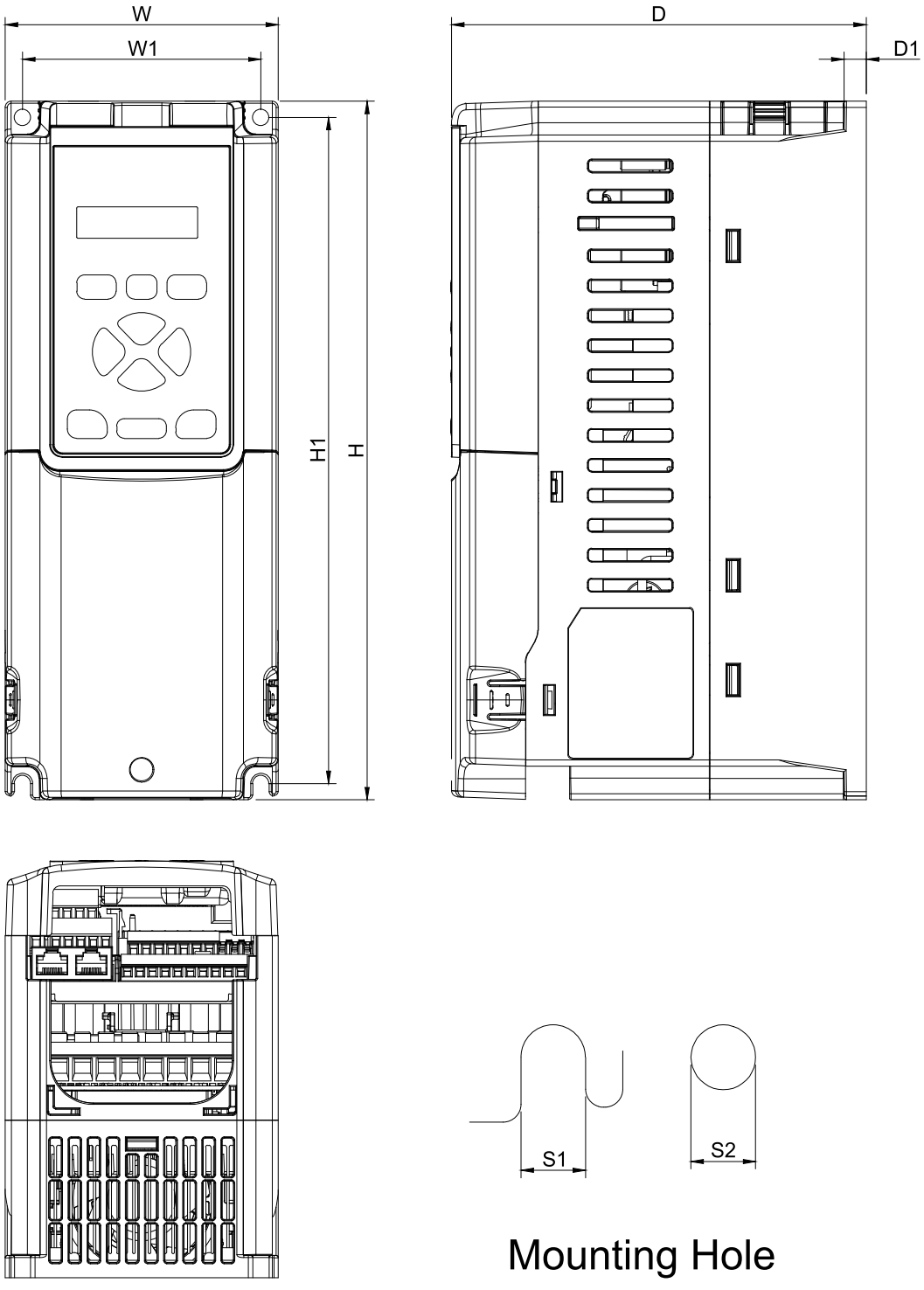


Figure 2-44

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2
B1	110 (4.33)	96 (3.78)	280 (11.02)	267 (10.51)	167 (6.57)	9 (0.35)	6.5 (0.26)	6.5 (0.26)

Weight: 1.97 kg

Table 2-6

Frame B2

Applicable models:

VFD013VP43BFTAA, VFD018VP43BFTAA

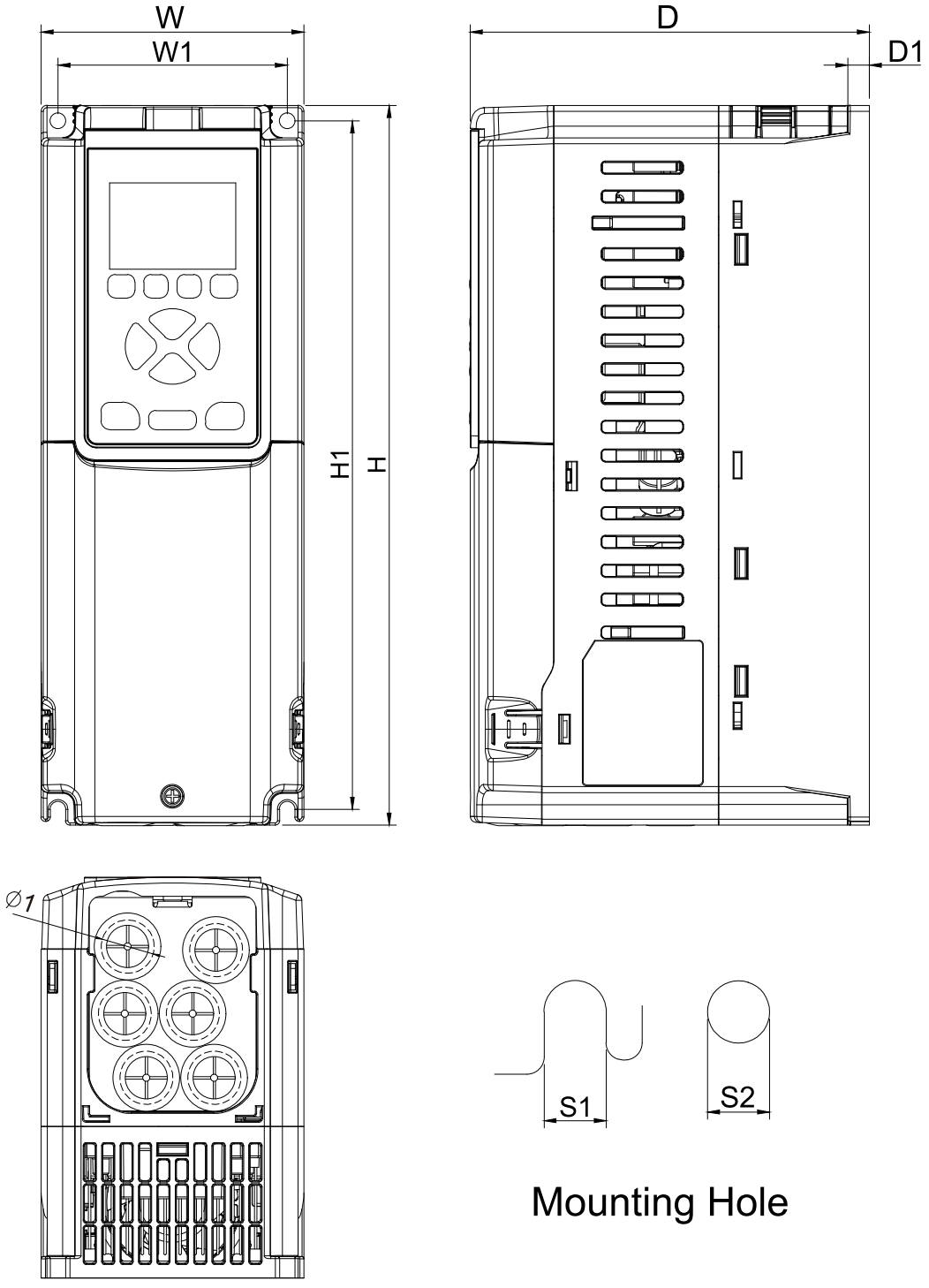


Figure 2-45

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	Ø1
B2	110 (4.33)	96 (3.78)	300 (11.81)	287 (11.3)	167 (6.57)	9 (0.35)	6.5 (0.26)	6.5 (0.26)	22.2 (0.87)

Weight: 2.47 kg

Table 2-7

Frame B3

Applicable models:

VFD3A0VP43BSTCA, VFD4A2VP43BSTCA, VFD5A6VP43BSTCA, VFD7A2VP43BSTCA, VFD011VP43BSTCA, VFD013VP43BSTCA, VFD018VP43BSTCA

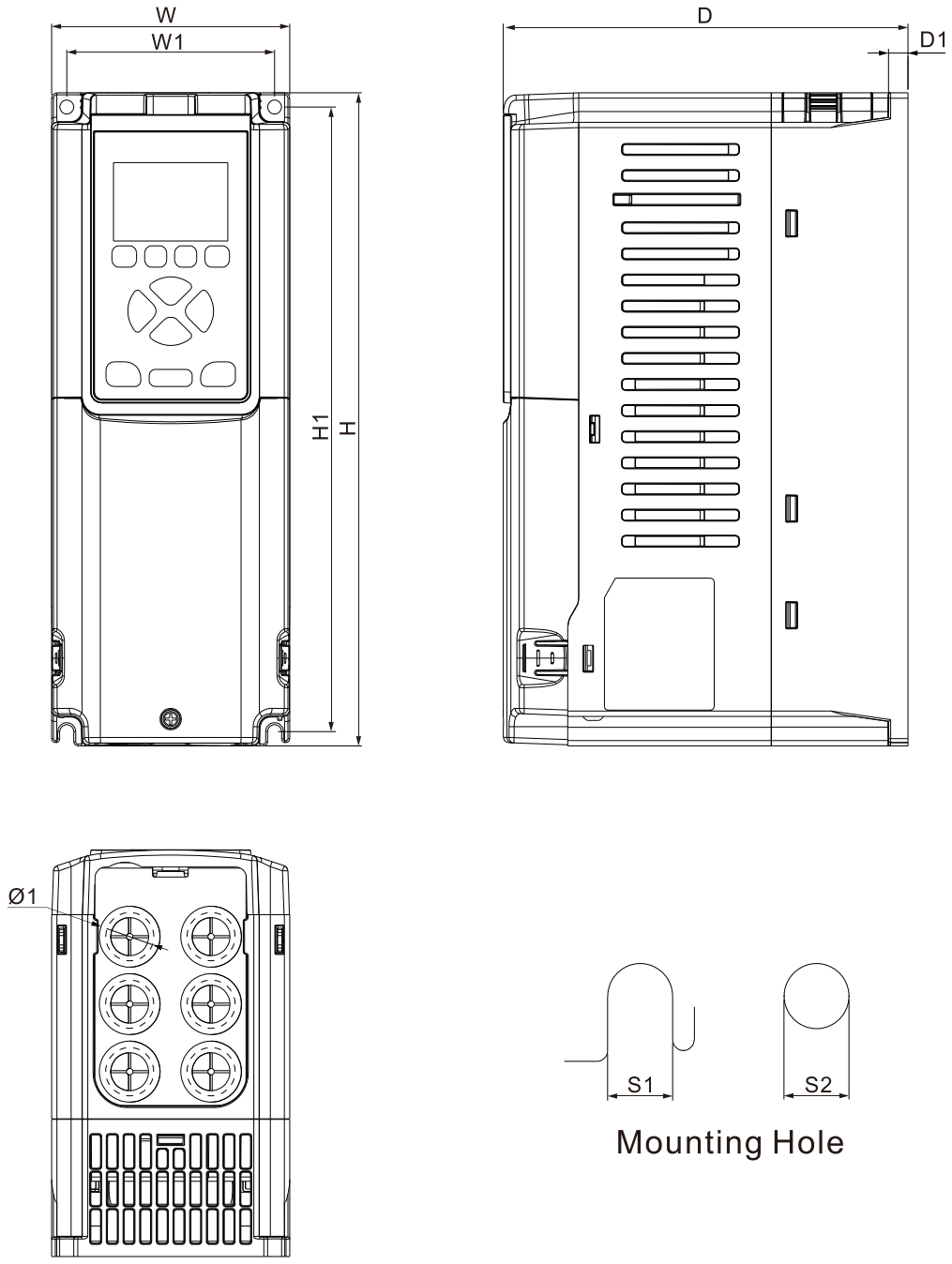


Figure 2-46

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	Ø1
B3	110 (4.33)	96 (3.78)	300 (11.81)	287 (11.3)	187 (7.36)	9 (0.35)	6.5 (0.26)	6.5 (0.26)	22.2 (0.87)

Weight: 3.3 kg

Table 2-8

Frame C1

Applicable models:

VFD025VP43ANTAA, VFD032VP43ANTAA, VFD038VP43ANTAA

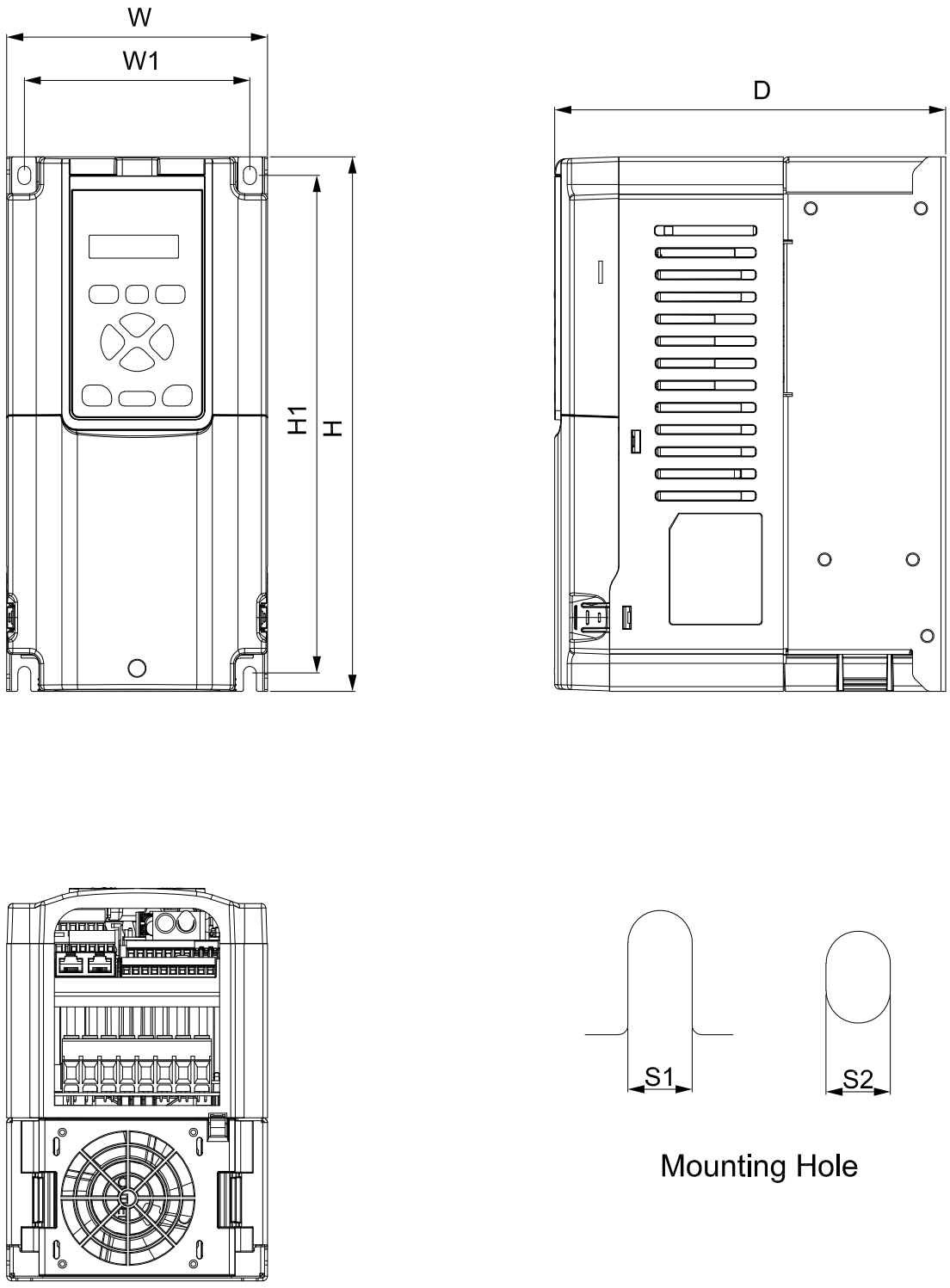


Figure 2-47

Unit: mm (inch)

Frame	W	W1	H	H1	D	S1	S2
C1	142 (5.59)	122.9 (4.84)	290 (11.42)	270 (10.63)	213 (8.39)	7 (0.28)	7 (0.28)

Weight: 5.6 kg

Table 2-9

Frame C2

Applicable models:

VFD025VP43BFTAA, VFD032VP43BFTAA, VFD038VP43BFTAA

VFD025VP43BSTCA, VFD032VP43BSTCA, VFD038VP43BSTCA

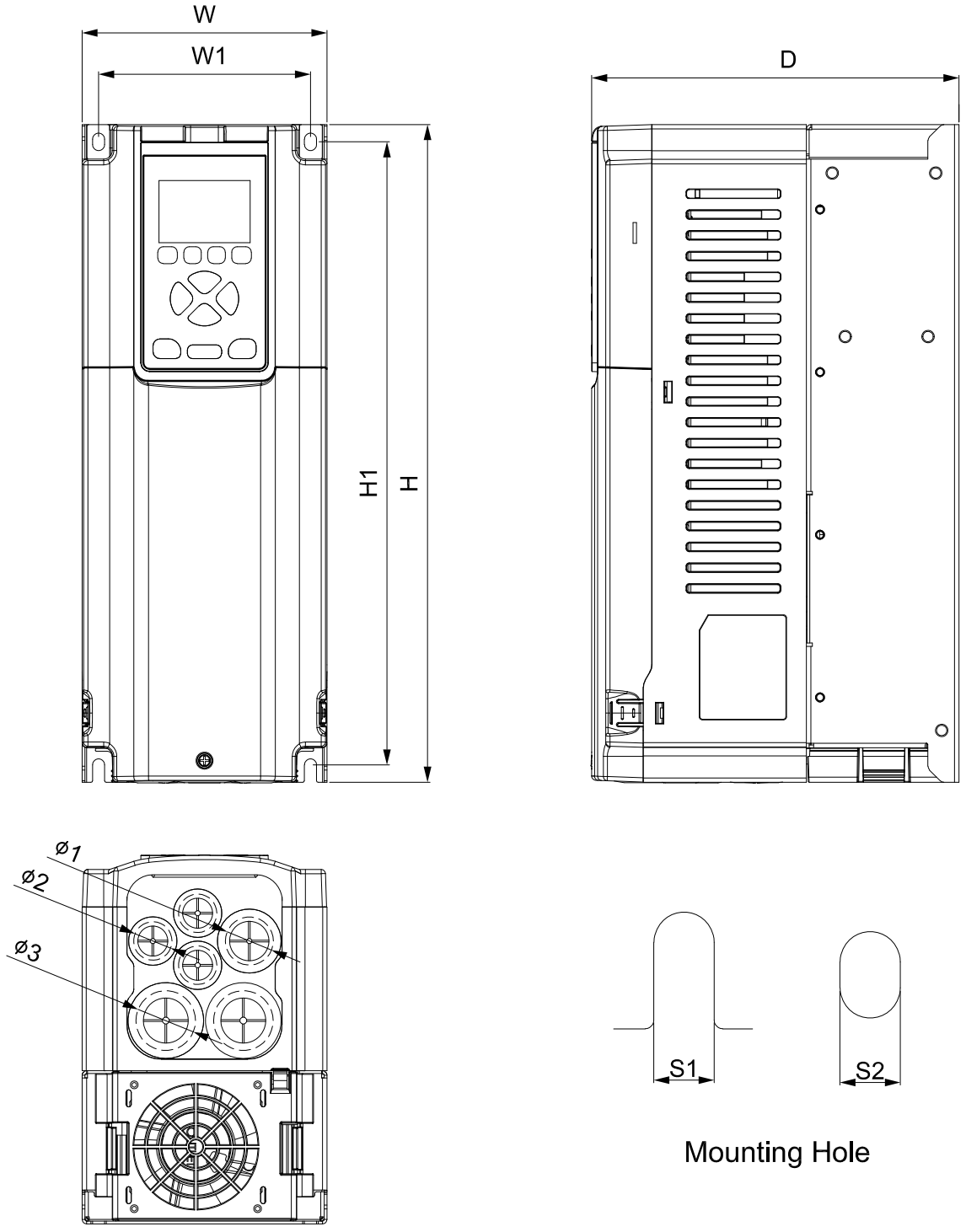


Figure 2-48

Unit: mm (inch)

Frame	W	W1	H	H1	D	S1	S2	Ø1	Ø2	Ø3
C2	142 (5.59)	122.9 (4.84)	380 (14.96)	360 (14.17)	213 (8.39)	7 (0.28)	7 (0.28)	27.8 (1.09)	22.2 (0.87)	34.5 (1.36)

Weight: 6 kg (model with last digit BFTAA) / 7 kg (model with last digit BSTCA) Table 2-10

Frame D1

Applicable models:

VFD045VP43ANTCA, VFD062VP43ANTCA

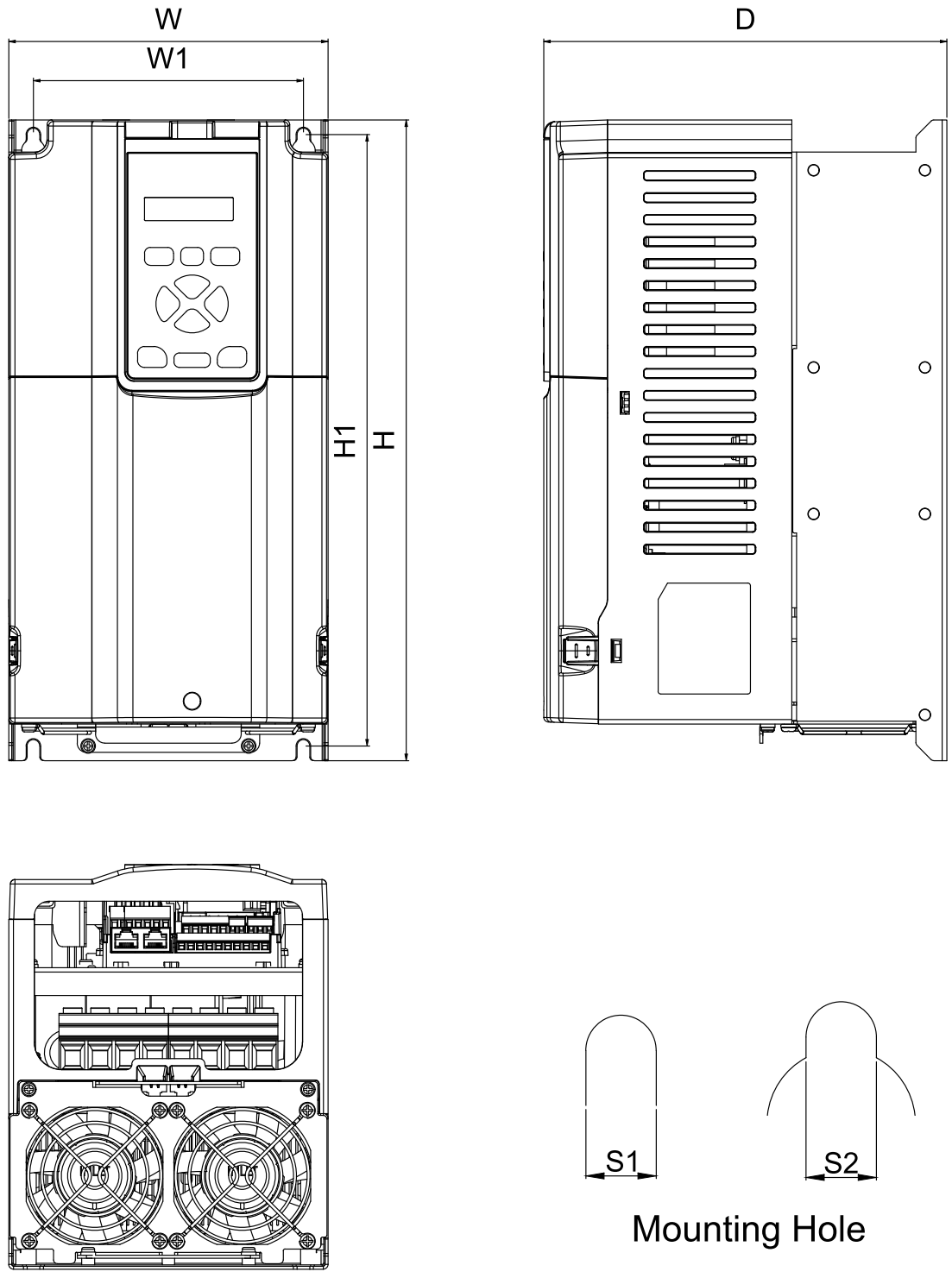


Figure 2-49

Unit: mm (inch)

Frame	W	W1	H	H1	D	S1	S2
D1	175 (6.89)	148 (5.83)	350 (13.78)	334 (13.15)	221 (8.7)	7 (0.28)	7 (0.28)

Weight: 8.5 kg

Table 2-11

Frame D2

Applicable models:

VFD045VP43BFTCA, VFD062VP43BFTCA, VFD045VP43BSTCA, VFD062VP43BSTCA

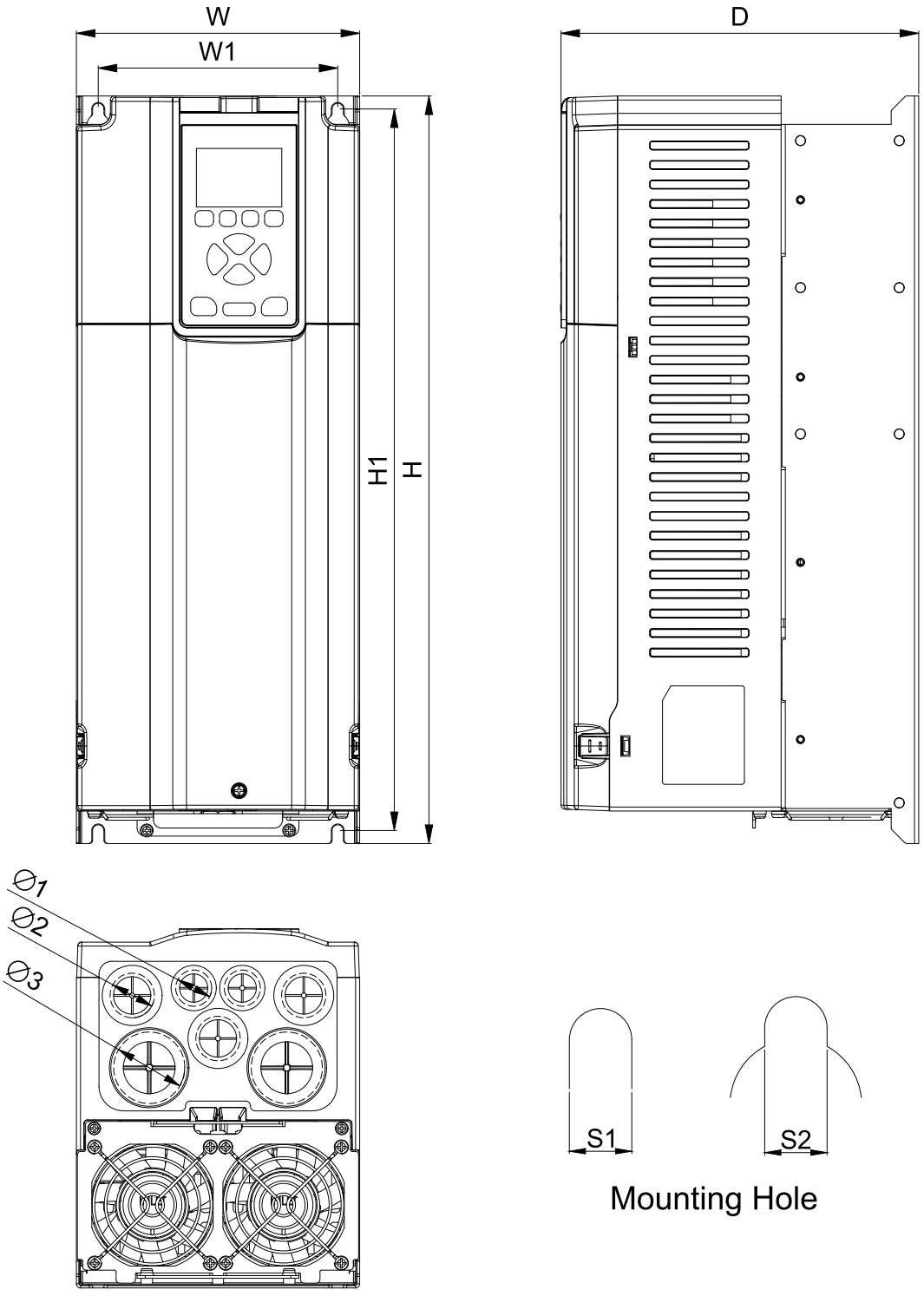


Figure 2-50

Unit: mm (inch)

Frame	W	W1	H	H1	D	S1	S2	Ø1	Ø2	Ø3
D2	175 (6.89)	148 (5.83)	460 (18.11)	444 (17.48)	221 (8.7)	7 (0.28)	7 (0.28)	22.3 (0.88)	27.4 (1.08)	44 (1.73)

Weight: 11 kg

Table 2-12

Frame E1

Applicable models:

VFD073VP43ANTCA, VFD090VP43ANTCA

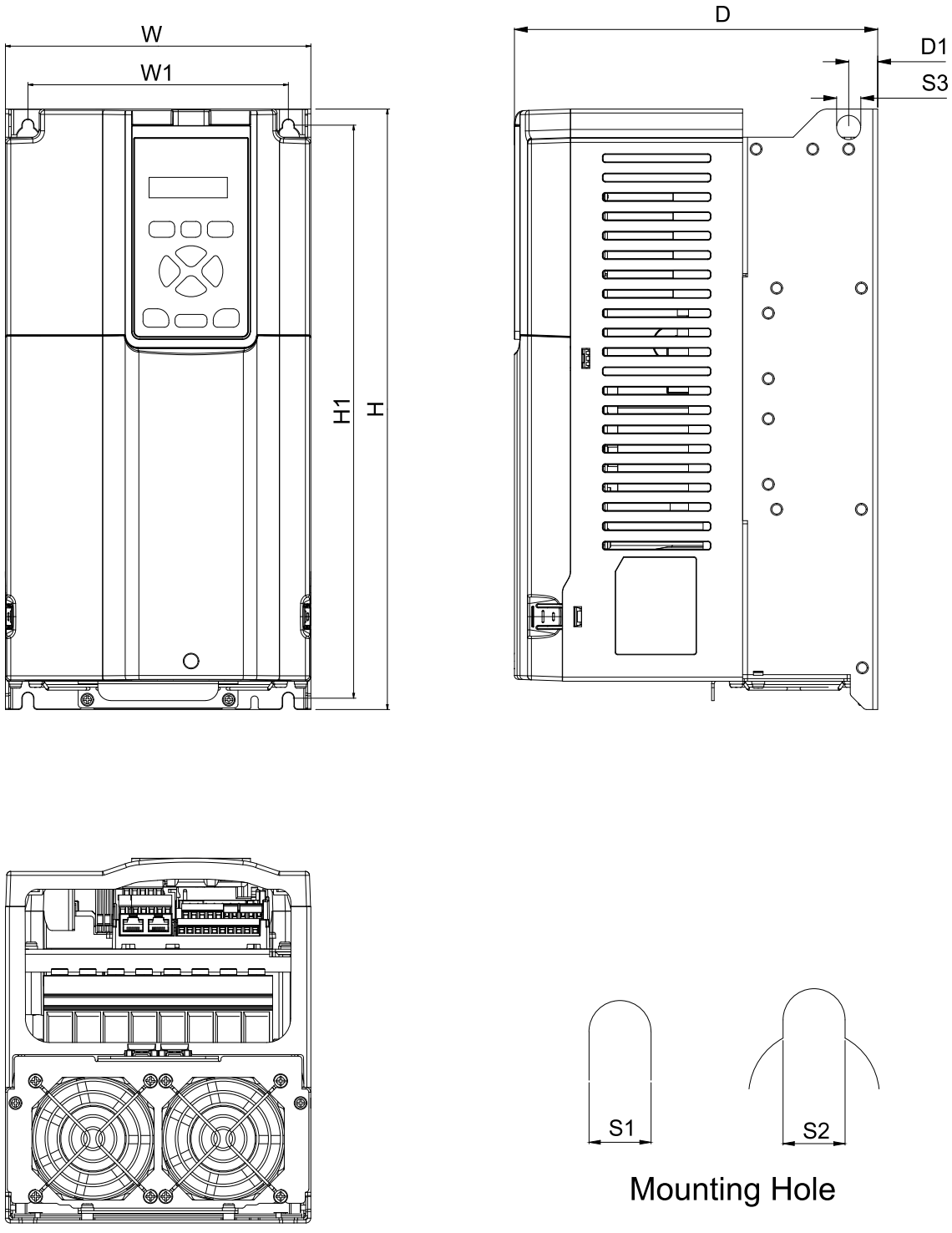


Figure 2-51

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
E1	190 (7.48)	162 (6.38)	372 (14.65)	355 (13.98)	226 (8.90)	18 (0.71)	7 (0.28)	7 (0.28)	15 (0.59)

Weight: 10.5 kg

Table 2-13

Frame E2

Applicable models:

VFD073VP43BFTCA, VFD090VP43BFTCA, VFD073VP43BSTCA, VFD090VP43BSTCA

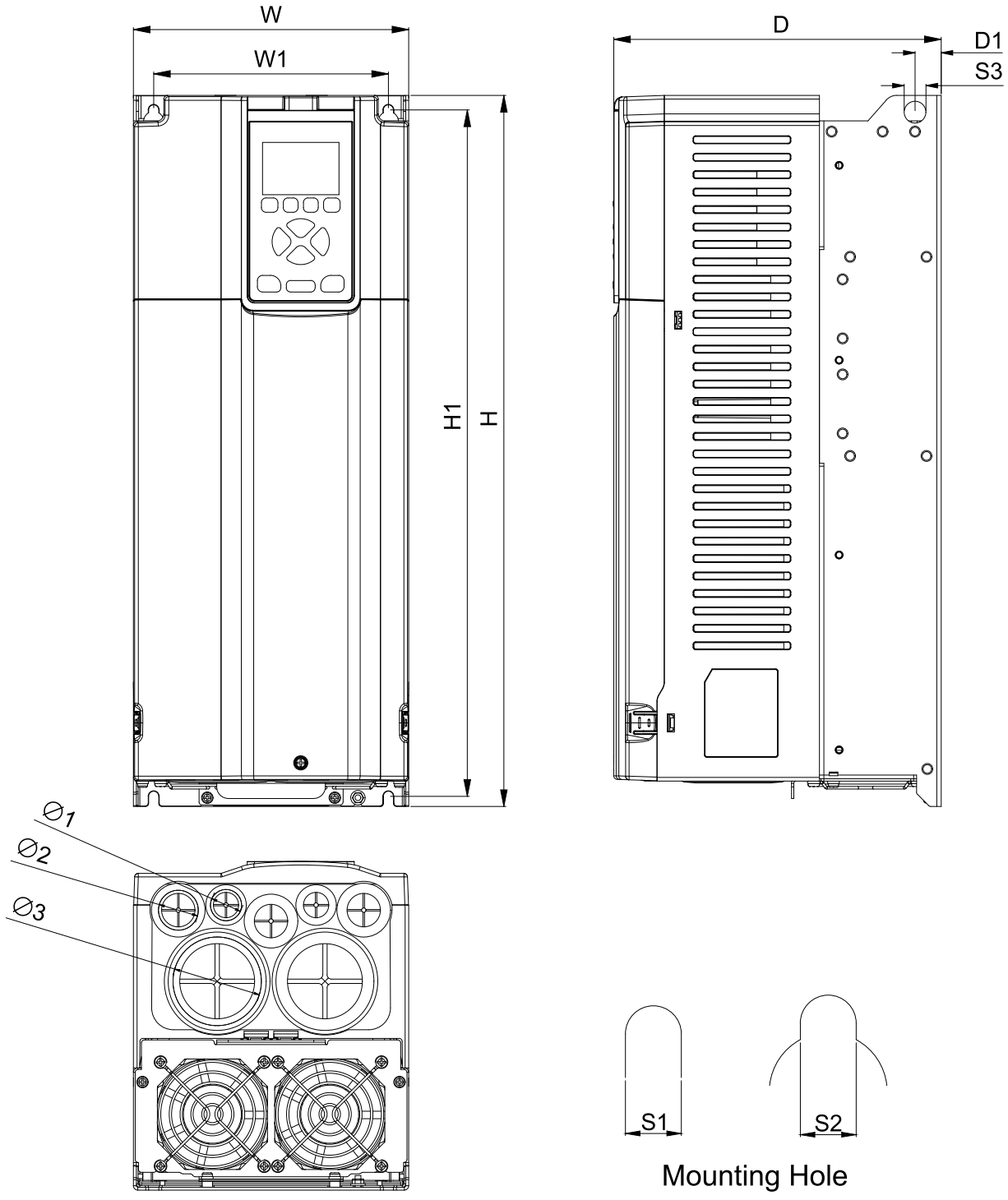


Figure 2-52

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3	Ø1	Ø2	Ø3
E2	190 (7.48)	162 (6.38)	489 (19.25)	472 (18.58)	226 (8.90)	18 (0.71)	7 (0.28)	7 (0.28)	15 (0.59)	21.5 (0.85)	27.5 (1.08)	61 (2.4)

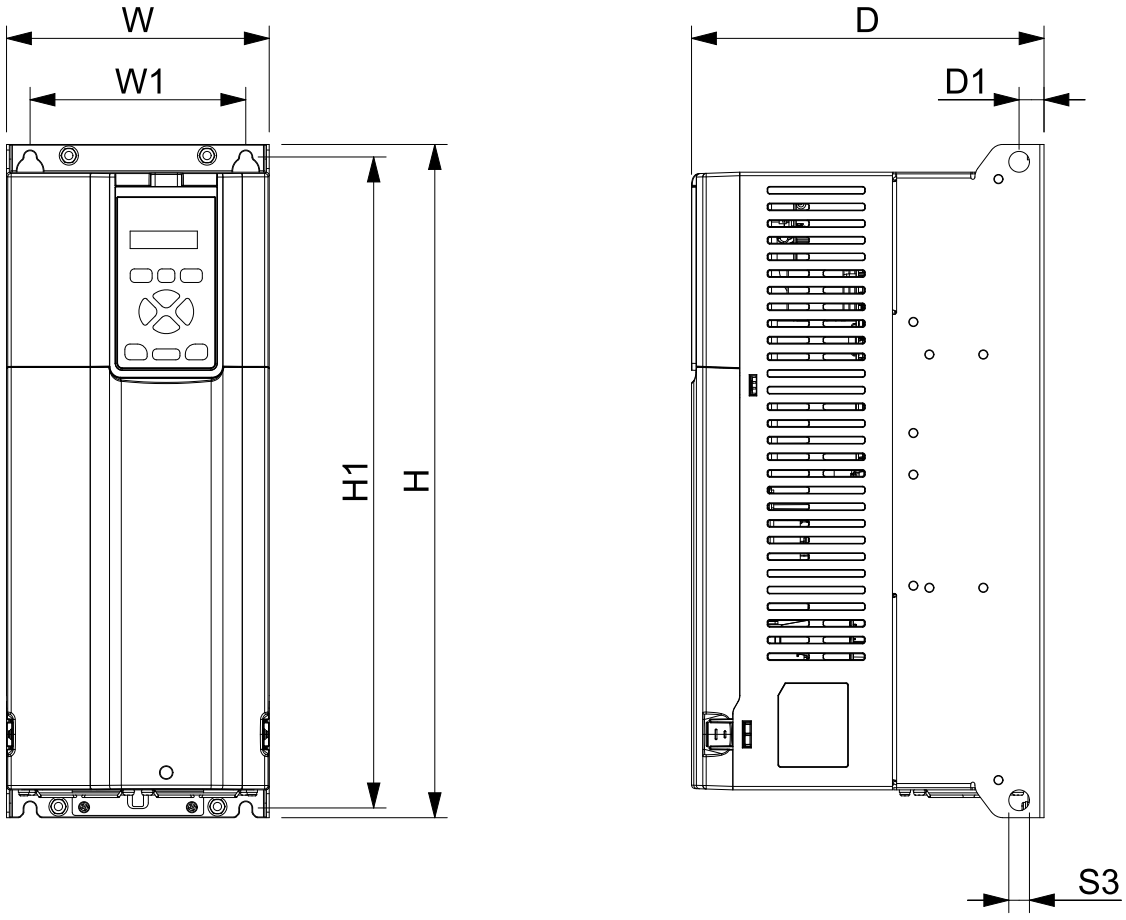
Weight: 13 kg

Table 2-14

Frame F1

Applicable models:

VFD110VP43AFTCA



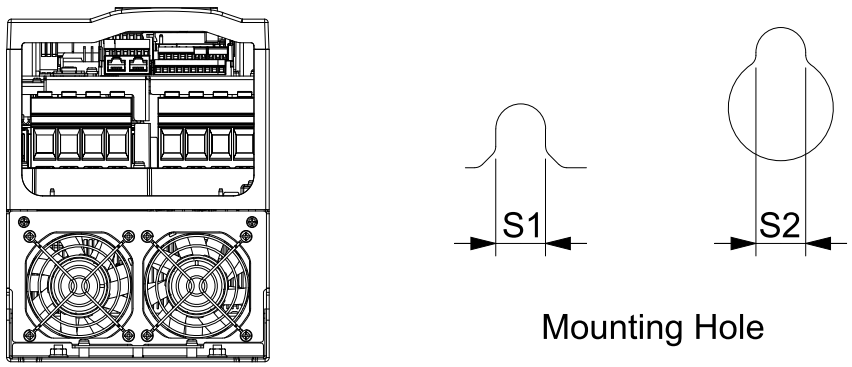


Figure 2-53

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
F1	190 (7.48)	156 (6.14)	485 (19.09)	469 (18.46)	255 (10.04)	18 (0.71)	9 (0.35)	9 (0.35)	15 (0.59)

Weight: 14.4 kg

Table 2-15

Frame F2

Applicable models:

VFD110VP43BFTCA, VFD110VP43BSTCA

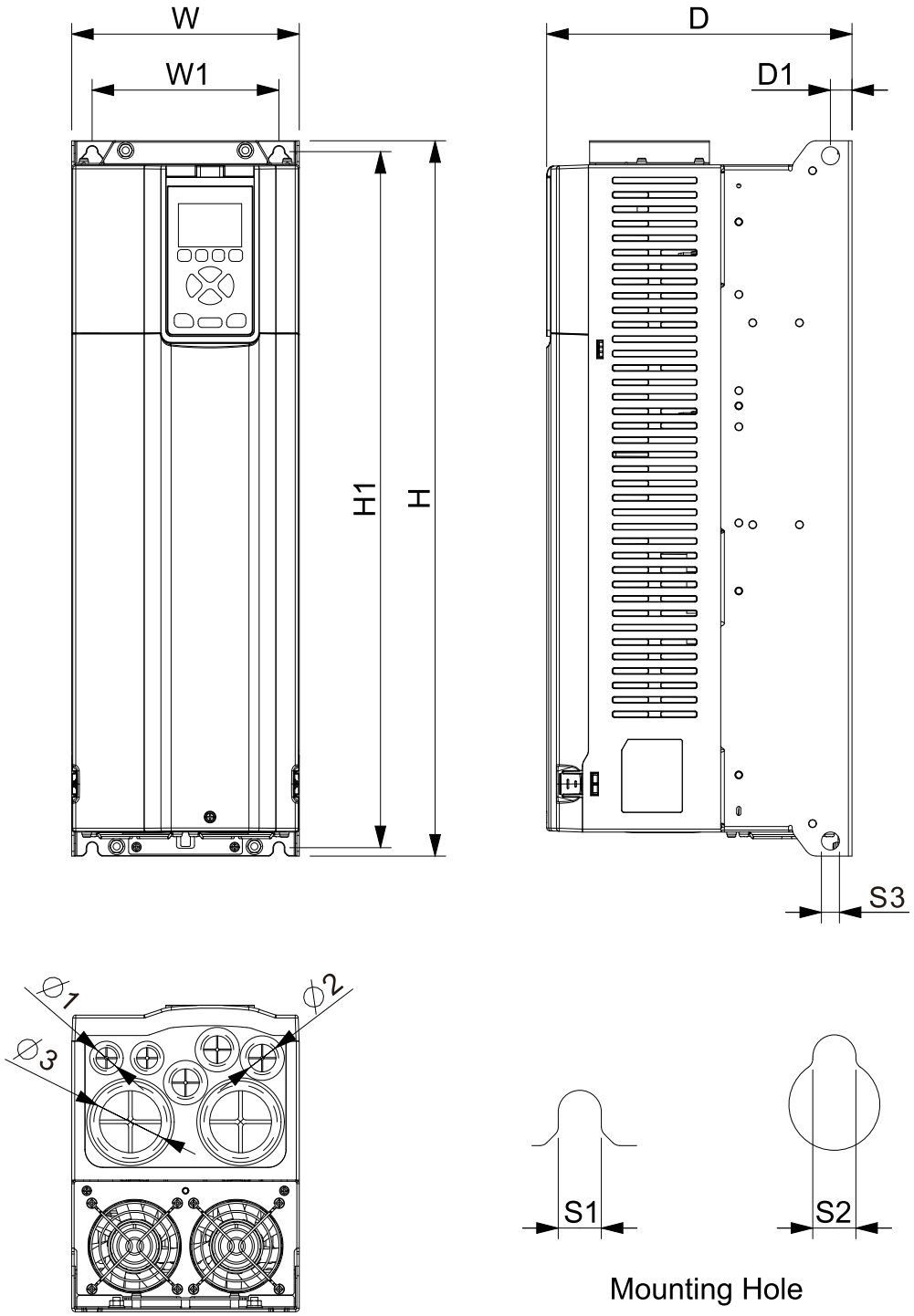


Figure 2-54

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3	Ø1	Ø2	Ø3
F2	190 (7.48)	156 (6.14)	595 (23.43)	579 (22.80)	255 (10.04)	18 (0.71)	9 (0.35)	9 (0.35)	15 (0.59)	21.5 (0.85)	27.5 (1.08)	61 (2.40)

Weight: 17.6 kg

Table 2-16

Frame G1

Applicable models:

VFD150VP43AFTCA

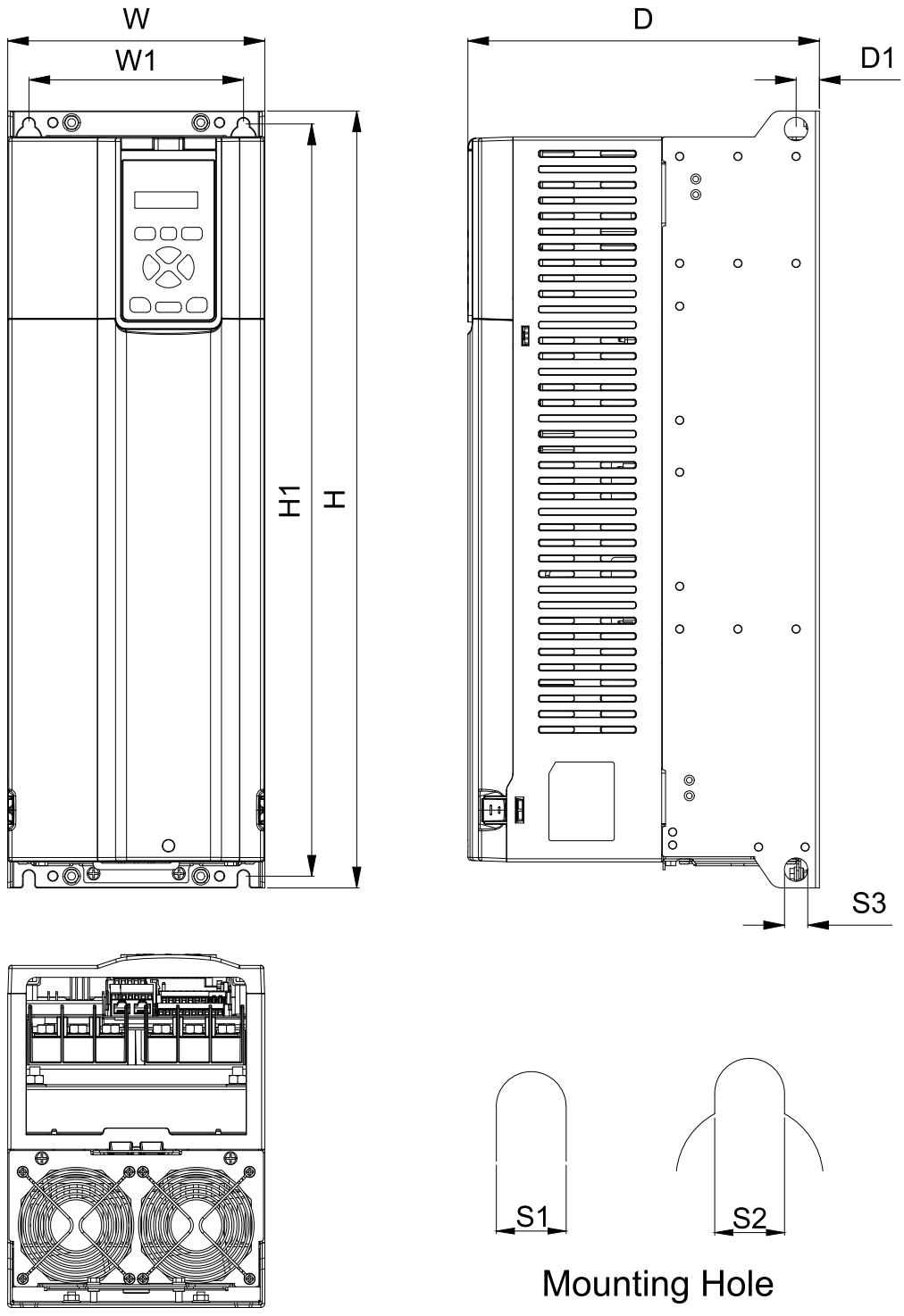


Figure 2-55

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
G1	199 (7.83)	166 (6.54)	599 (23.58)	580 (22.83)	272 (10.71)	18 (0.71)	9 (0.35)	9 (0.35)	18 (0.71)

Weight: 23.8 kg

Table 2-17

Frame G2

Applicable models:

VFD150VP43BFTCA, VFD150VP43BSTCA

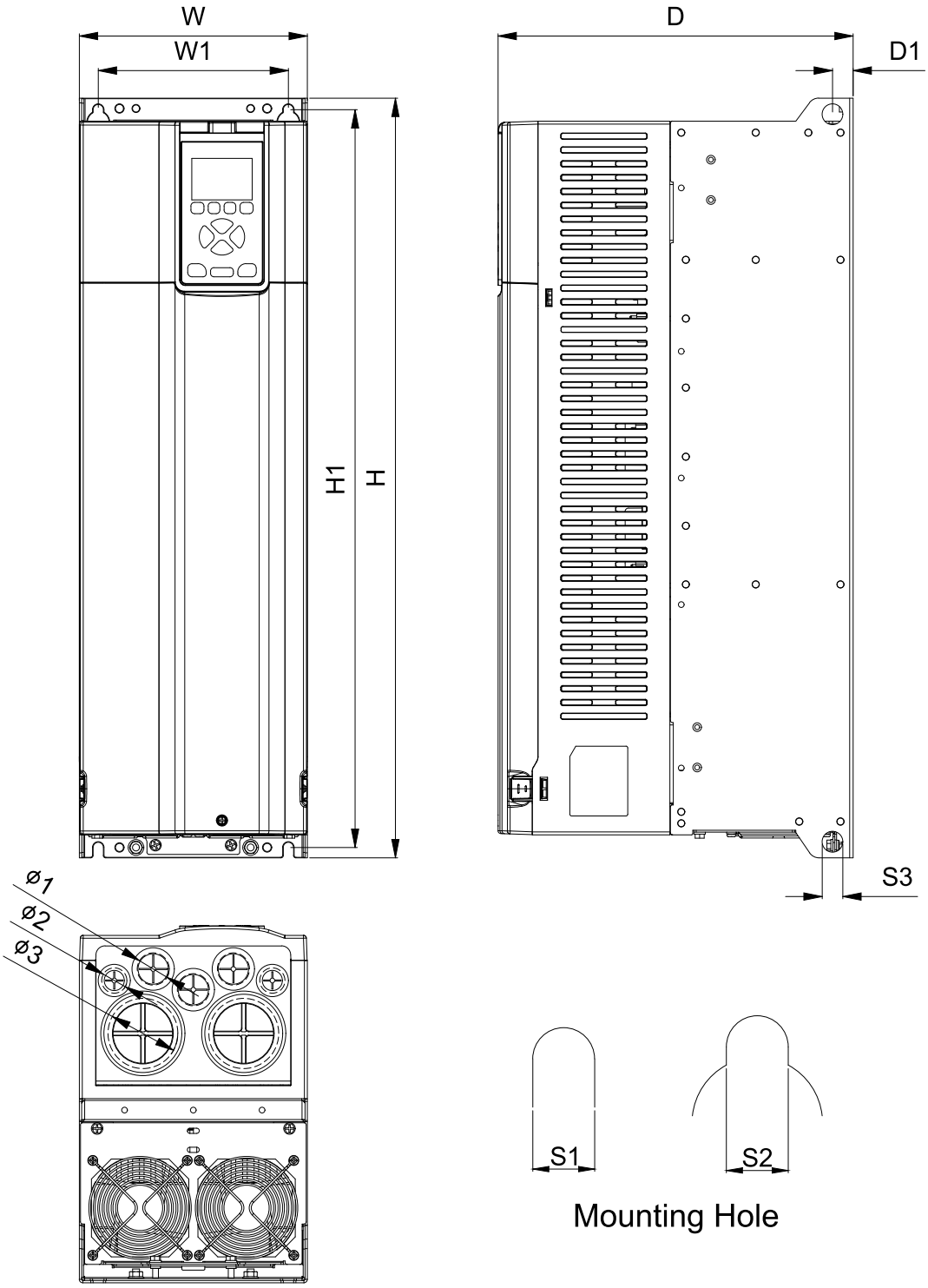


Figure 2-56

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	Ø1	Ø2	Ø3
G2	199 (7.83)	166 (6.54)	660 (25.98)	641 (25.24)	310 (12.2)	18 (0.71)	9 (0.35)	9 (0.35)	28 (1.1)	22 (0.87)	61 (2.4)

Weight: 28.7 kg

Table 2-18

Frame H1

Applicable models:

VFD180VP43AFTCA, VFD220VP43AFTCA

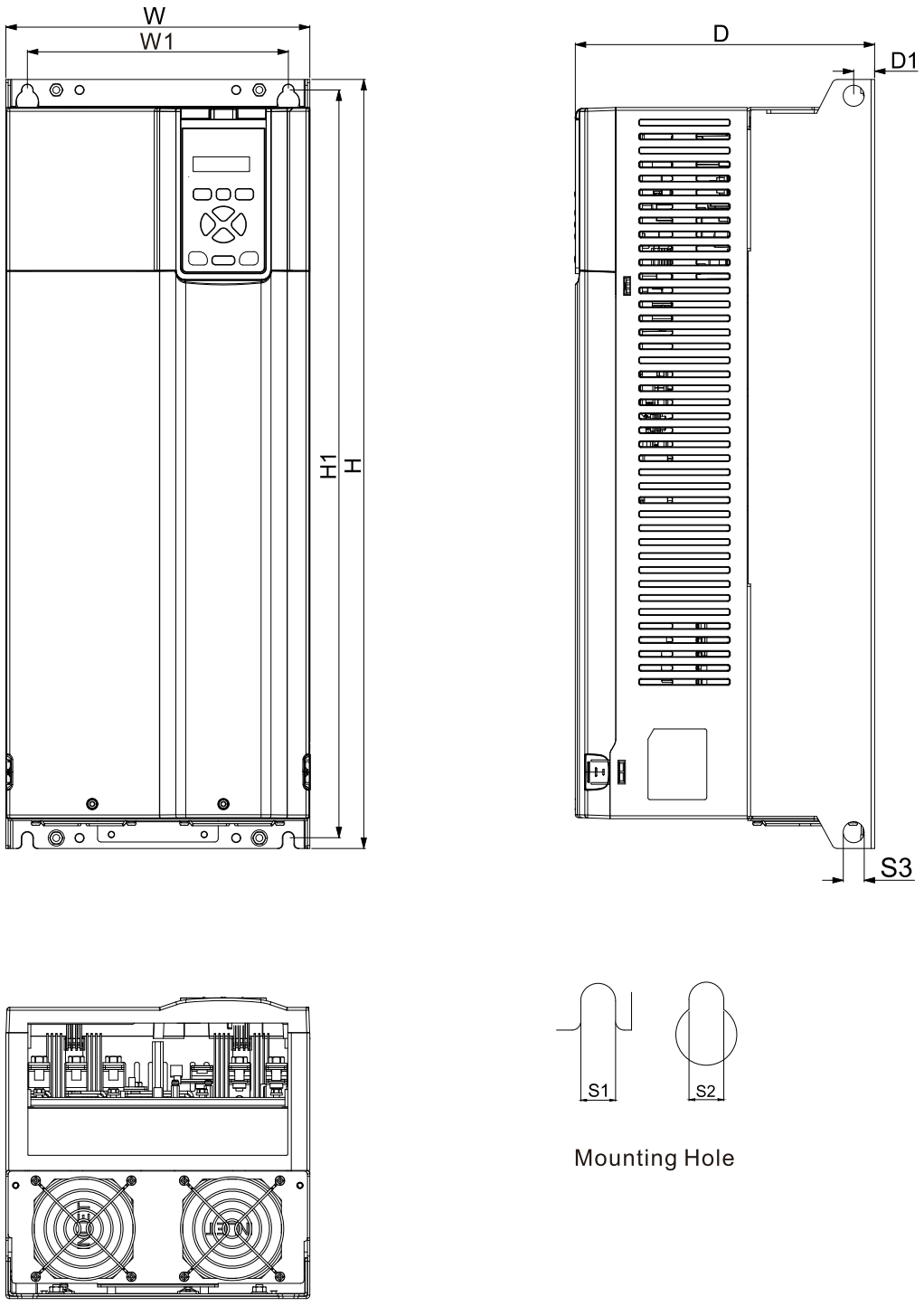


Figure 2-57

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
H1	262 (10.31)	225 (8.89)	660 (25.98)	641.8 (25.27)	258 (10.16)	18 (0.71)	9.5 (0.37)	9.5 (0.37)	18 (0.71)

Weight: 34.2 kg

Table 2-19

Frame H2

Applicable models:

VFD180VP43BFTCA, VFD220VP43BFTCA, VFD180VP43BSTCA, VFD220VP43BSTCA

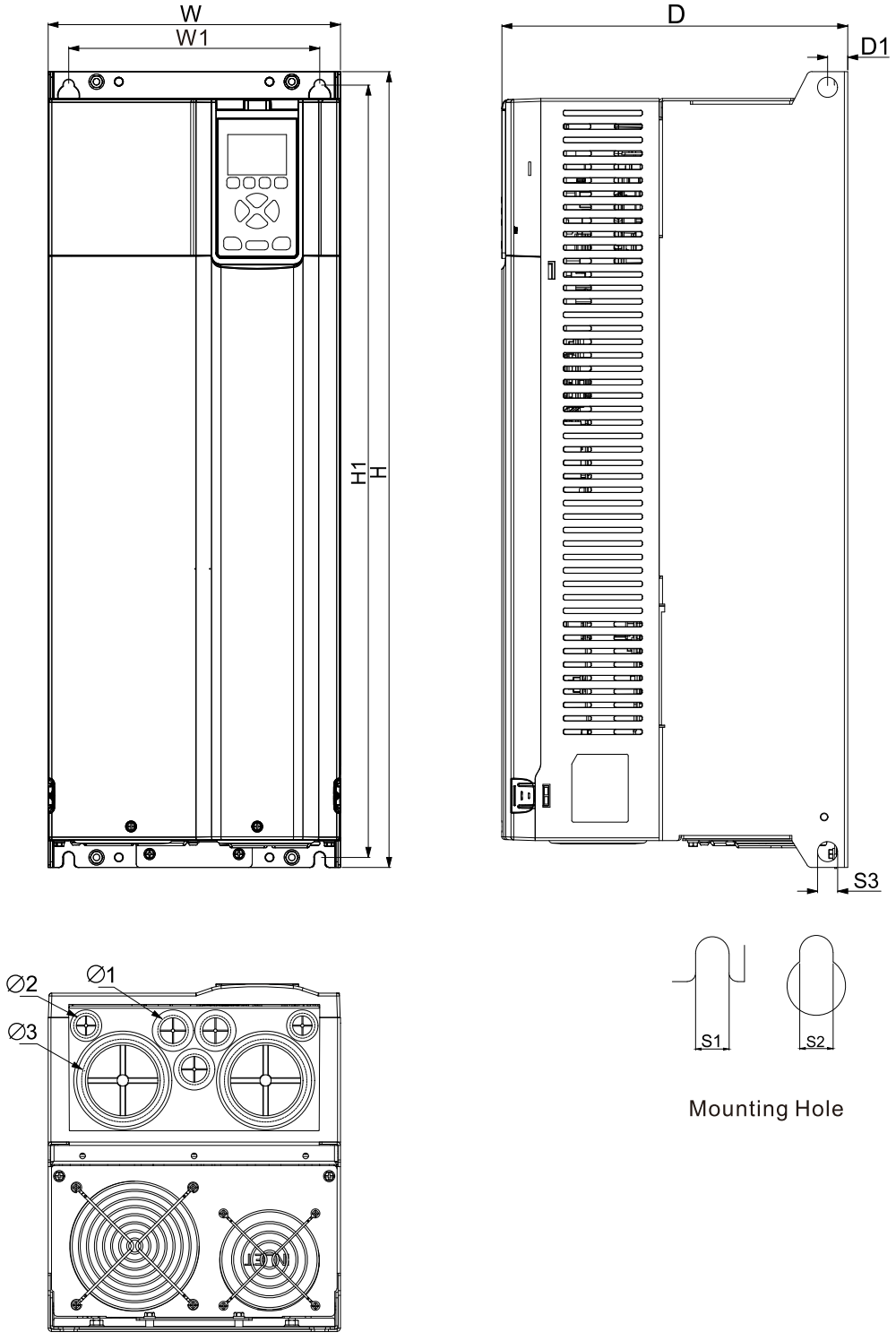


Figure 2-58

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3	Ø1	Ø2	Ø3
H2	262 (10.31)	225 (8.89)	710 (27.95)	689 (27.13)	310 (12.20)	18 (0.71)	9.5 (0.37)	9.5 (0.37)	18 (0.71)	27.5 (1.08)	22.3 (0.87)	74 (2.91)

Weight: 40.1 kg

Table 2-20

Frame I1

Applicable models:

VFD260VP43AFTCA, VFD310VP43AFTCA

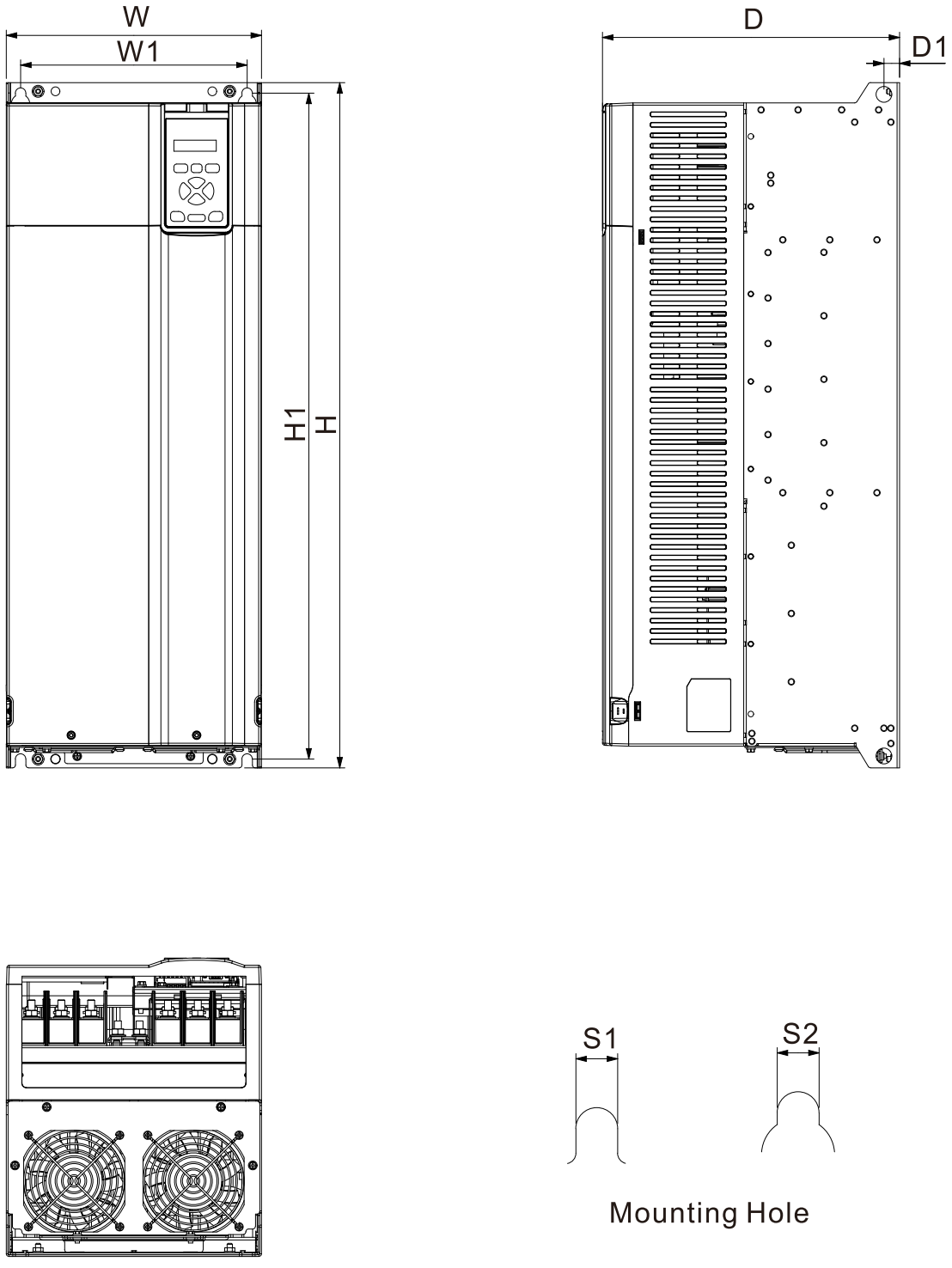


Figure 2-59

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2
I1	293 (11.54)	260 (10.24)	783 (30.83)	761 (29.96)	341 (13.43)	18 (0.71)	12 (0.47)	12 (0.47)

Weight: 46.1 kg

Table 2-21

Frame I2

Applicable models:

VFD260VP43BFTCA, VFD310VP43BFTCA, VFD260VP43BSTCA, VFD310VP43BSTCA

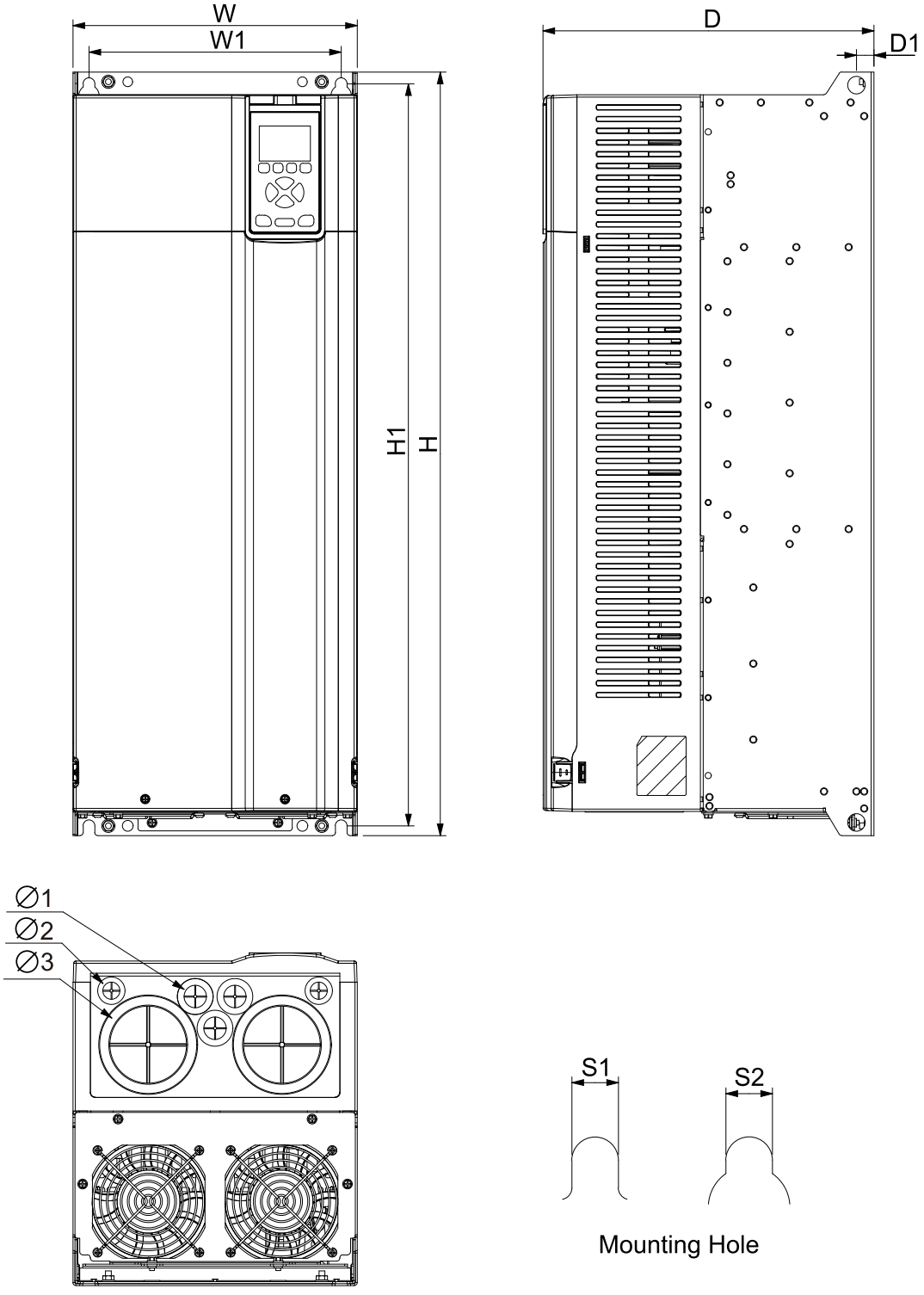


Figure 2-60

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	Ø1	Ø2	Ø3
I2	293 (11.54)	260 (10.24)	783 (30.83)	761 (29.96)	341 (13.43)	18 (0.71)	12 (0.47)	12 (0.47)	27.5 (1.08)	21.5 (0.85)	91 (3.58)

Weight: 48.6 kg

Table 2-22

Frame J1

Applicable models:

VFD370VP43AFTCA, VFD395VP43AFTCA

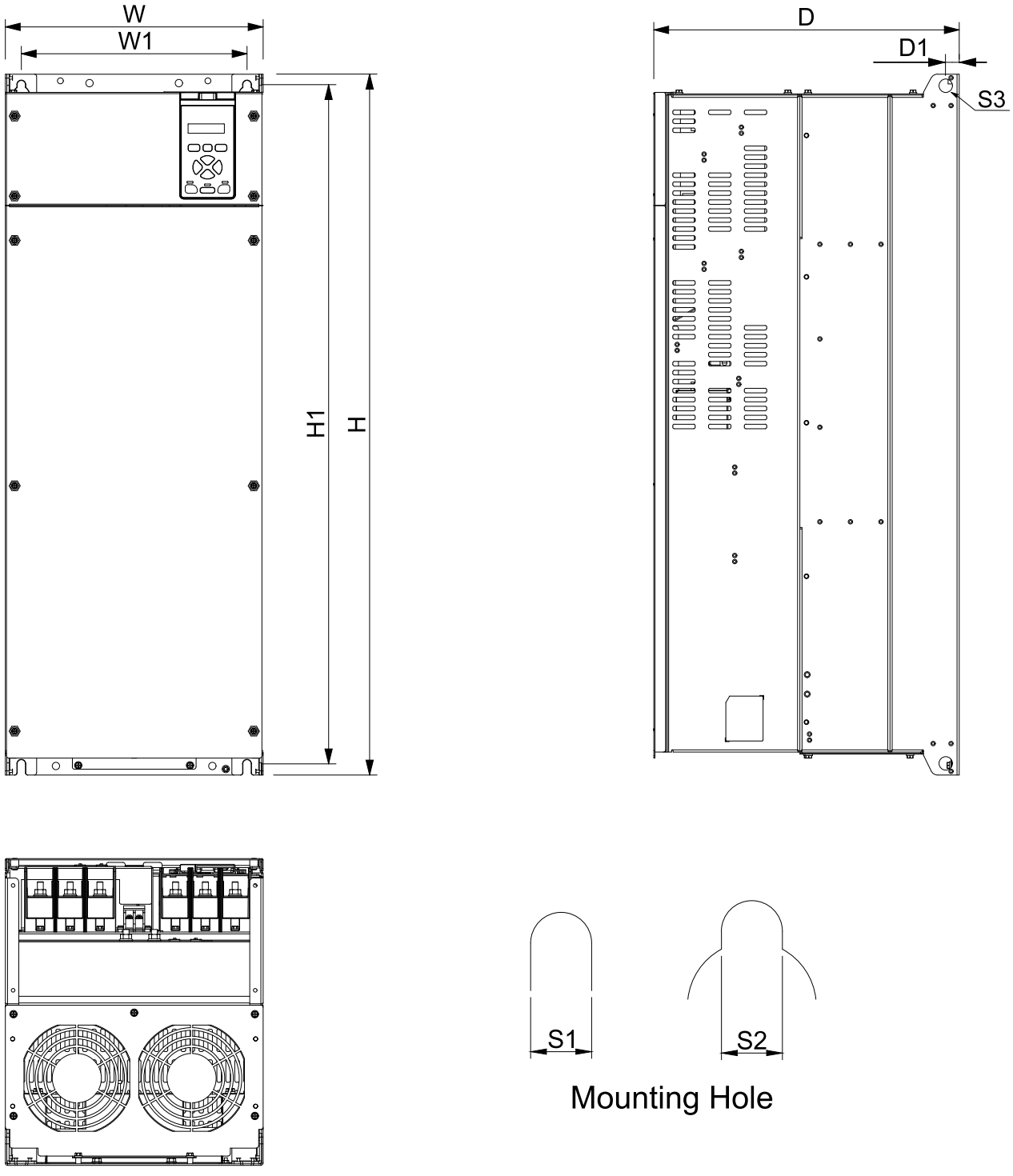


Figure 2-61

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
J1	346 (13.62)	303 (11.93)	937 (36.89)	908 (35.75)	410 (16.14)	18 (0.71)	11 (0.43)	11 (0.43)	18 (0.71)

Weight: 74.2 kg

Table 2-23

Frame J2

Applicable models:

VFD370VP43BFTCA, VFD395VP43BFTCA , VFD370VP43BSTCA, VFD395VP43BSTCA

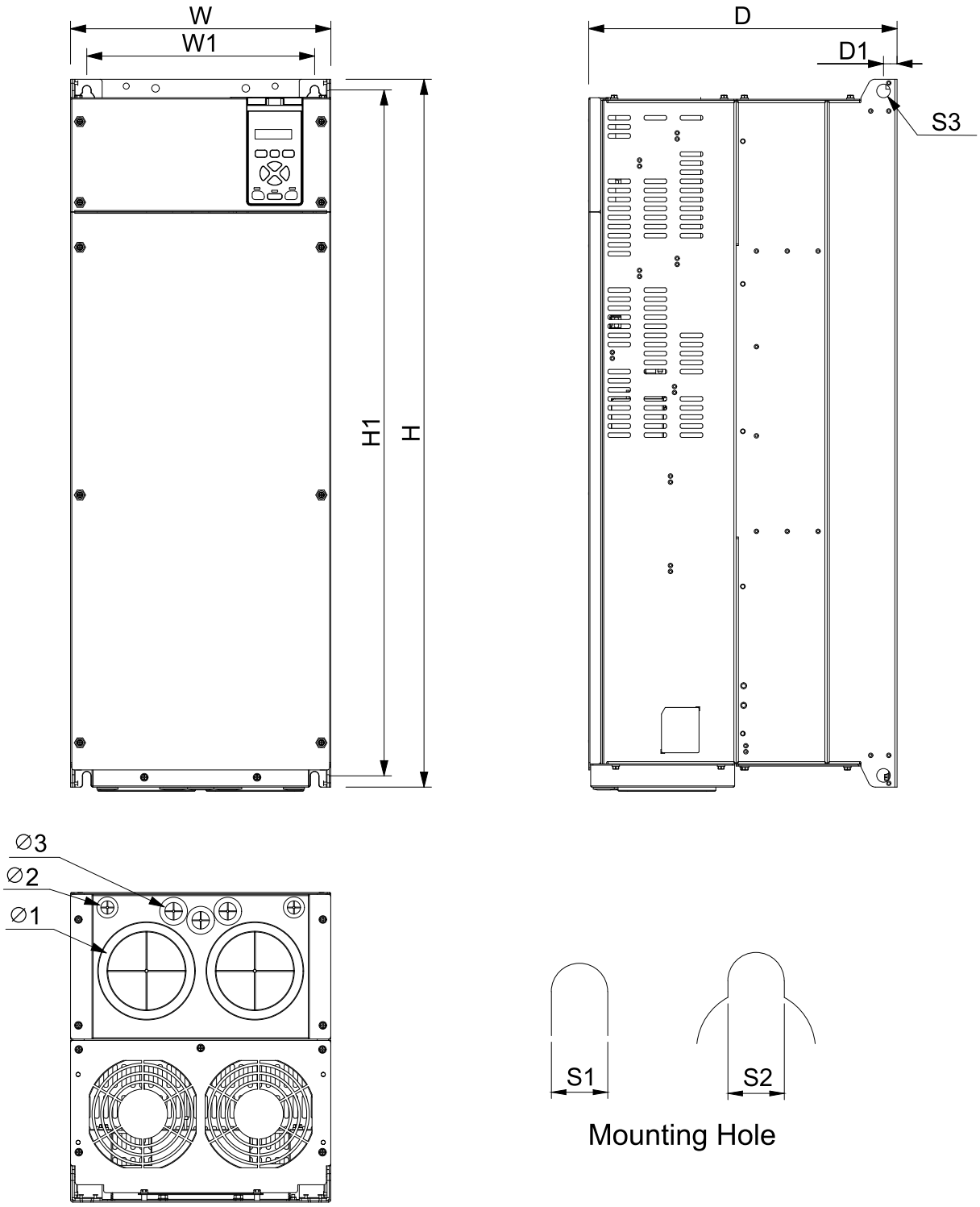


Figure 2-62

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3	Ø1	Ø2	Ø3
J2	346 (13.62)	303 (11.93)	937 (36.89)	908 (35.75)	410 (16.14)	18 (0.71)	11 (0.43)	11 (0.43)	18 (0.71)	117.3 (4.62)	21.5 (0.85)	27.5 (1.08)

Weight: 82.5 kg

Table 2-24

Frame K1

Applicable models:

VFD460VP43AFTCA, VFD485VP43AFTCA

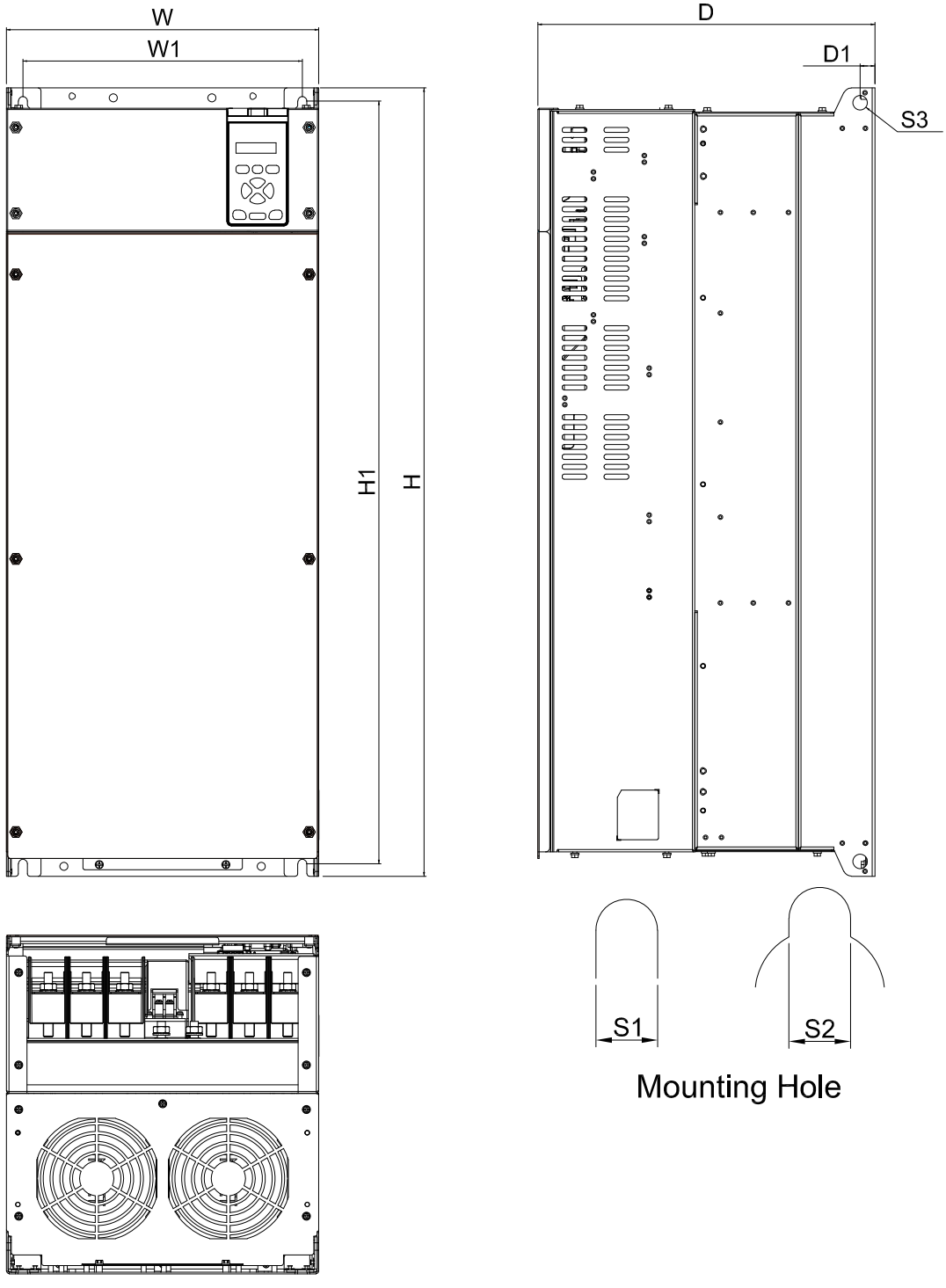


Figure 2-63

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3
K1	380 (14.96)	340 (13.39)	955 (37.60)	924 (36.38)	410 (16.14)	18 (0.71)	11 (0.43)	11 (0.43)	18 (0.71)

Weight: 90 kg

Table 2-25

Frame K2

Applicable models:

VFD460VP43BFTCA, VFD485VP43BFTCA, VFD460VP43BSTCA, VFD485VP43BSTCA

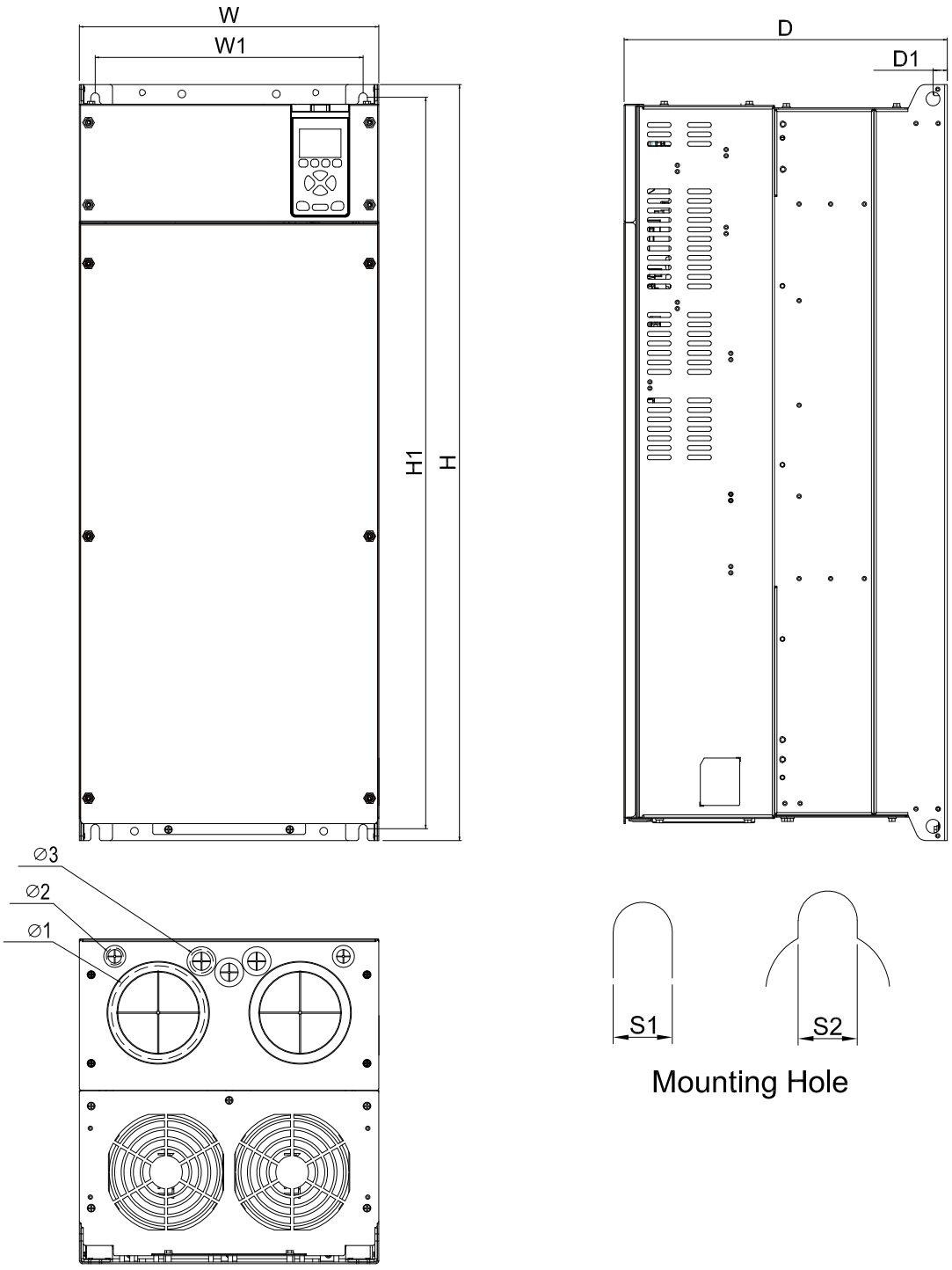


Figure 2-64

Unit: mm (inch)

Frame	W	W1	H	H1	D	D1	S1	S2	S3	Ø1	Ø2	Ø3
K2	380 (14.96)	340 (13.39)	955 (37.60)	924 (36.38)	410 (16.14)	18 (0.71)	11 (0.43)	11 (0.43)	18 (0.71)	117.3 (4.62)	21.5 (0.85)	27.5 (1.08)

Weight: 97 kg

Table 2-26

Frame L – Upright Installation

Applicable models:

VFD530VP43SHTCA, VFD616VP43SHTCA, VFD683VP43SHTCA, VFD770VP43SHTCA

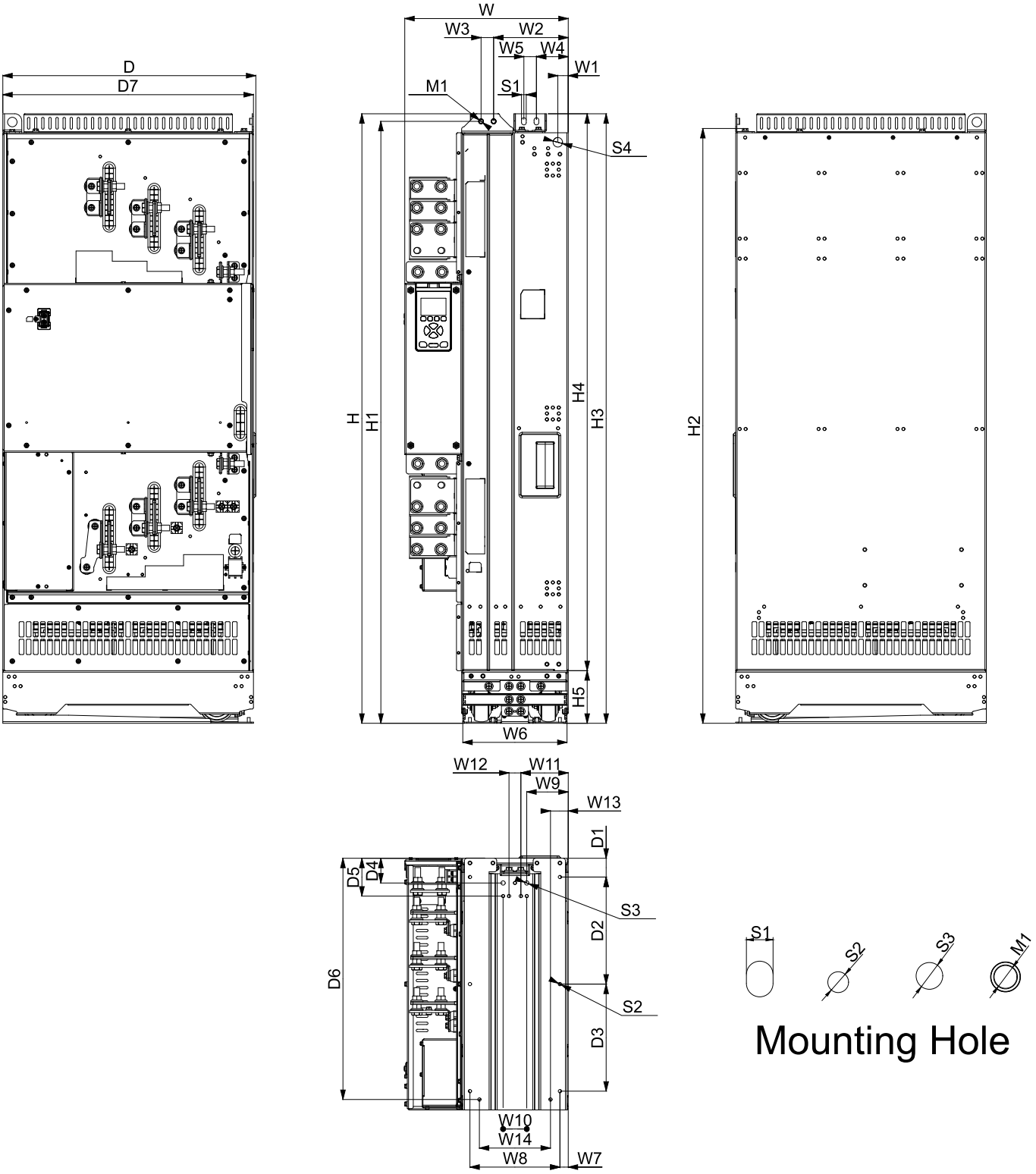


Figure 2-65

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
L	345 (13.58)	22 (0.87)	157.5 (6.2)	26.5 (1.04)	67.1 (2.6)	26.5 (1.04)	225 (8.86)	17.5 (0.69)	190 (7.48)	87.5 (3.44)	50 (1.97)	100 (3.94)
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
L	25 (0.98)	37.5 (1.48)	150 (5.91)	1281 (50.43)	1265 (49.8)	1250 (49.21)	1278.5 (50.33)	1170.5 (46.08)	110.5 (4.35)	-	-	-
Frame	H9	D	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
L	-	534 (21.03)	39.5 (1.56)	225 (8.86)	225 (8.86)	52 (2.05)	79.5 (3.13)	507 (19.96)	529 (20.83)	-	-	-

Frame	S1	S2	S3	S4	M1
L	9 (0.35)	7 (0.28)	9 (0.35)	20 (0.79)	M8 P1.25

Weight: 128.4 kg

Table 2-27

Frame L – Upright Installation with IP20 Shielded Cover

Applicable models:

VFD530VP43SHTCA, VFD616VP43SHTCA, VFD683VP43SHTCA, VFD770VP43SHTCA

The following figure is the dimension after installing the IP20 shielded cover, refer to Section 10-3-8 IP20 Shielded Cover for further installation description.

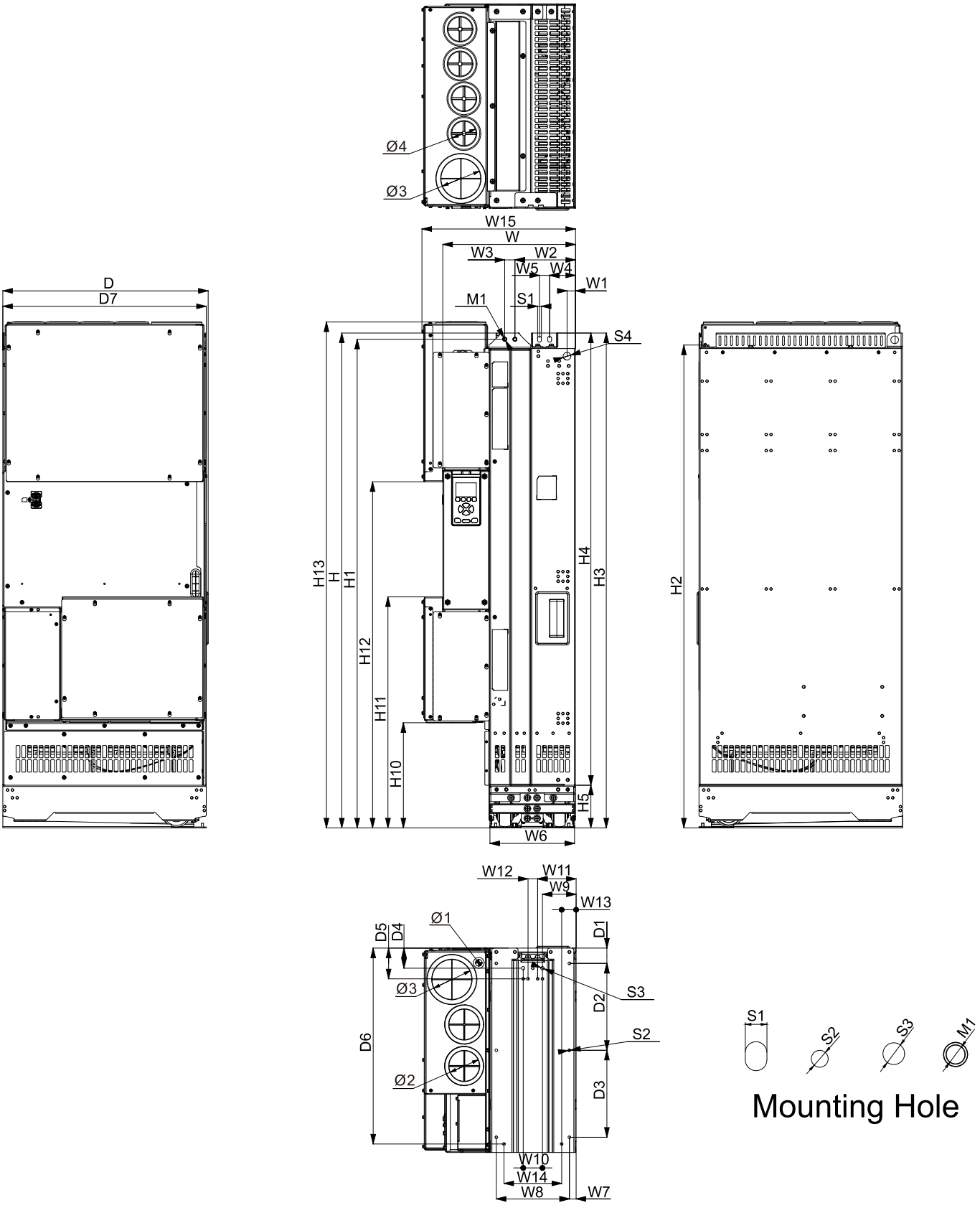


Figure 2-66

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
L	345 (13.58)	22 (0.87)	157.5 (6.2)	26.5 (1.04)	67.1 (2.6)	26.5 (1.04)	225 (8.86)	17.5 (0.69)	190 (7.48)	87.5 (3.44)	50 (1.97)	100 (3.94)
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
L	25 (0.98)	37.5 (1.48)	150 (5.91)	1281 (50.43)	1265 (49.8)	1250 (49.21)	1278.5 (50.33)	1170.5 (46.08)	110.5 (4.35)	-	-	-
Frame	H9	H10	H11	H12	H13	D	D1	D2	D3	D4	D5	D6
L	-	272.3 (10.72)	598 (23.54)	896 (35.28)	1310.3 (51.59)	534 (21.03)	39.5 (1.56)	225 (8.86)	225 (8.86)	52 (2.05)	79.5 (3.13)	507 (19.96)
Frame	D7	D8	D9	D10	S1	S2	S3	S4	Ø1	Ø2	Ø3	Ø4
L	529 (20.83)	-	-	-	9 (0.35)	7 (0.28)	9 (0.35)	20 (0.79)	17.5 (0.69)	79 (3.11)	103 (4.05)	63 (2.48)

Frame	M1
L	M8 P1.25

Weight: 139 kg

Table 2-28

Frame L – Horizontal Installation

Applicable models:

VFD530VP43SHTCA, VFD616VP43SHTCA, VFD683VP43SHTCA, VFD770VP43SHTCA

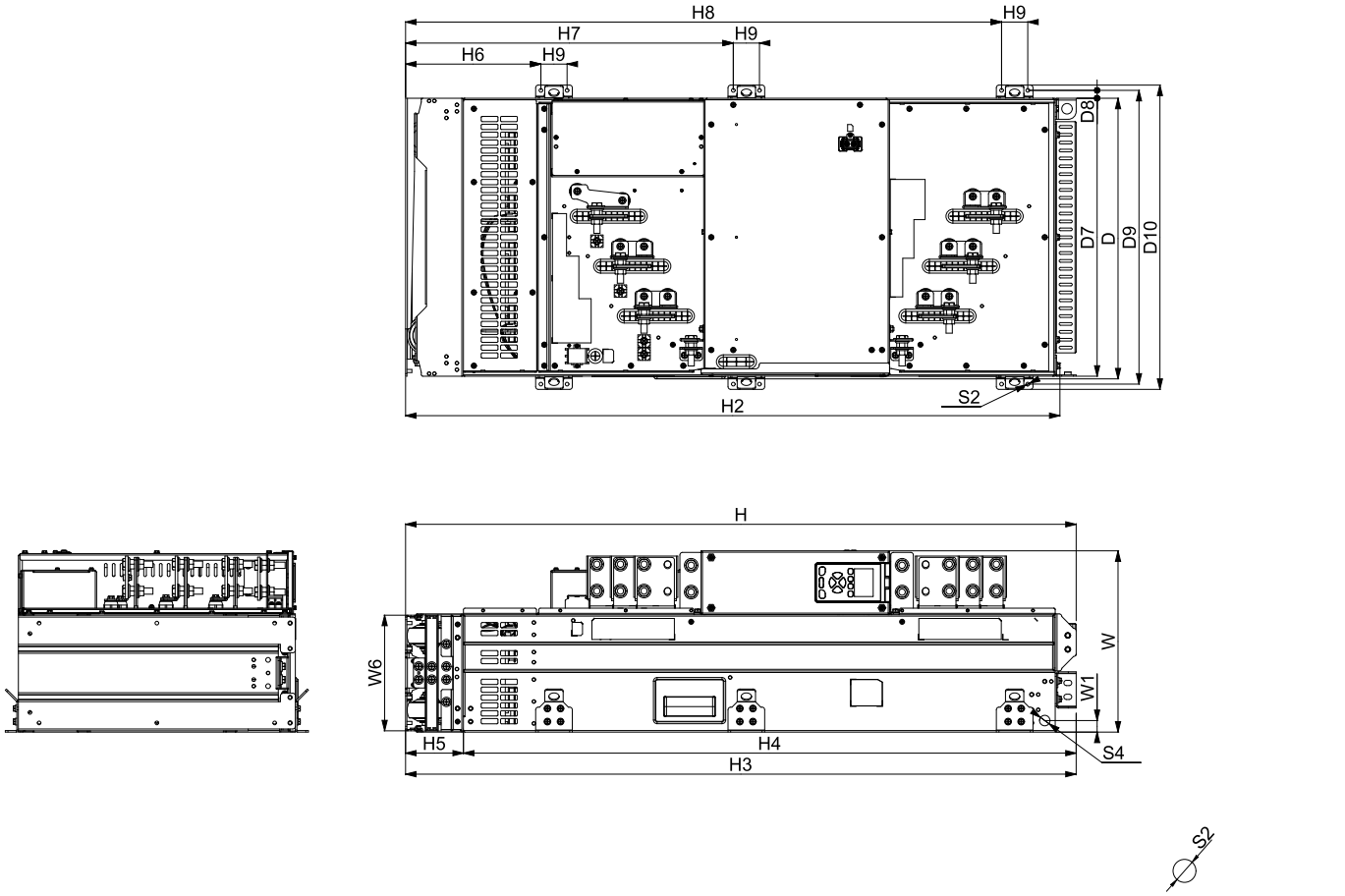


Figure 2-67

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
L	345 (13.58)	22 (0.87)	-	-	-	-	225 (8.86)	-	-	-	-	-
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
L	-	-	-	1281 (50.43)	-	1250 (49.21)	1278.5 (50.33)	1170.5 (46.08)	110.5 (4.35)	258.5 (10.18)	626 (24.65)	1138.5 (44.82)
Frame	H9	D	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
L	50 (1.97)	534 (21.03)	-	-	-	-	-	-	529 (20.83)	15 (0.60)	559 (22.01)	579 (22.80)
Frame	S1	S2	S3	S4	M1							
L	-	7 (0.28)	-	20 (0.79)	-							

Weight: 128.4 kg

Table 2-29

Frame L – Horizontal Installation with IP20 Shielded Cover

Applicable models:

VFD530VP43SHTCA, VFD616VP43SHTCA, VFD683VP43SHTCA, VFD770VP43SHTCA

The following figure is the dimension after installing the IP20 shielded cover, refer to Section 10-3-8 IP20 Shielded Cover for further installation description.

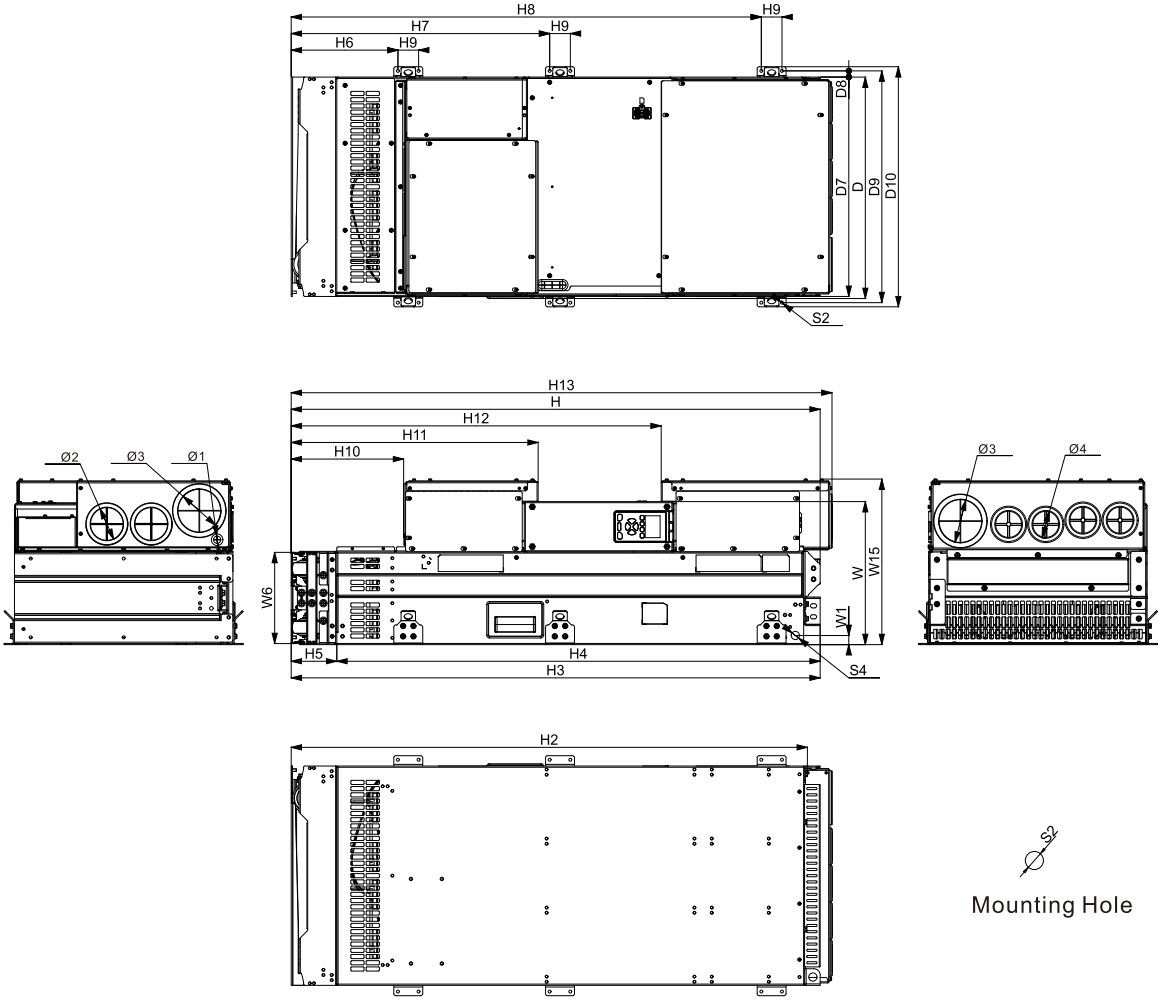


Figure 2-68

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
L	345 (13.58)	22 (0.87)	-	-	-	-	225 (8.86)	-	-	-	-	-
Frame	W12	W13	W14	W15	H	H1	H2	H3	H4	H5	H6	H7
L	-	-	-	399.3 (15.72)	1281 (50.43)	-	1250 (49.21)	1278.5 (50.33)	1170.5 (46.08)	110.5 (4.35)	258.5 (10.18)	626 (24.65)
Frame	H8	H9	H10	H11	H12	H13	D	D1	D2	D3	D4	D5
L	1138.5 (44.82)	50 (1.97)	272.3 (10.72)	598 (23.54)	896 (35.28)	1310.3 (51.59)	534 (21.03)	-	-	-	-	-
Frame	D6	D7	D8	D9	D10	S1	S2	S3	S4	Ø1	Ø2	Ø3
L	-	529 (20.83)	15 (0.60)	559 (22.01)	579 (22.80)	-	7 (0.28)	-	20 (0.79)	17.5 (0.69)	79 (3.11)	103 (4.05)
Frame	Ø4	M1										
L	63 (2.48)	-										

Weight: 139 kg

Table 2-30

Frame M – Upright Installation

Applicable models:

VFD866VP43SHTCA, VFD930VP43SHTCA, VFD1K1VP43SHTCA, VFD1K2VP43SHTCA

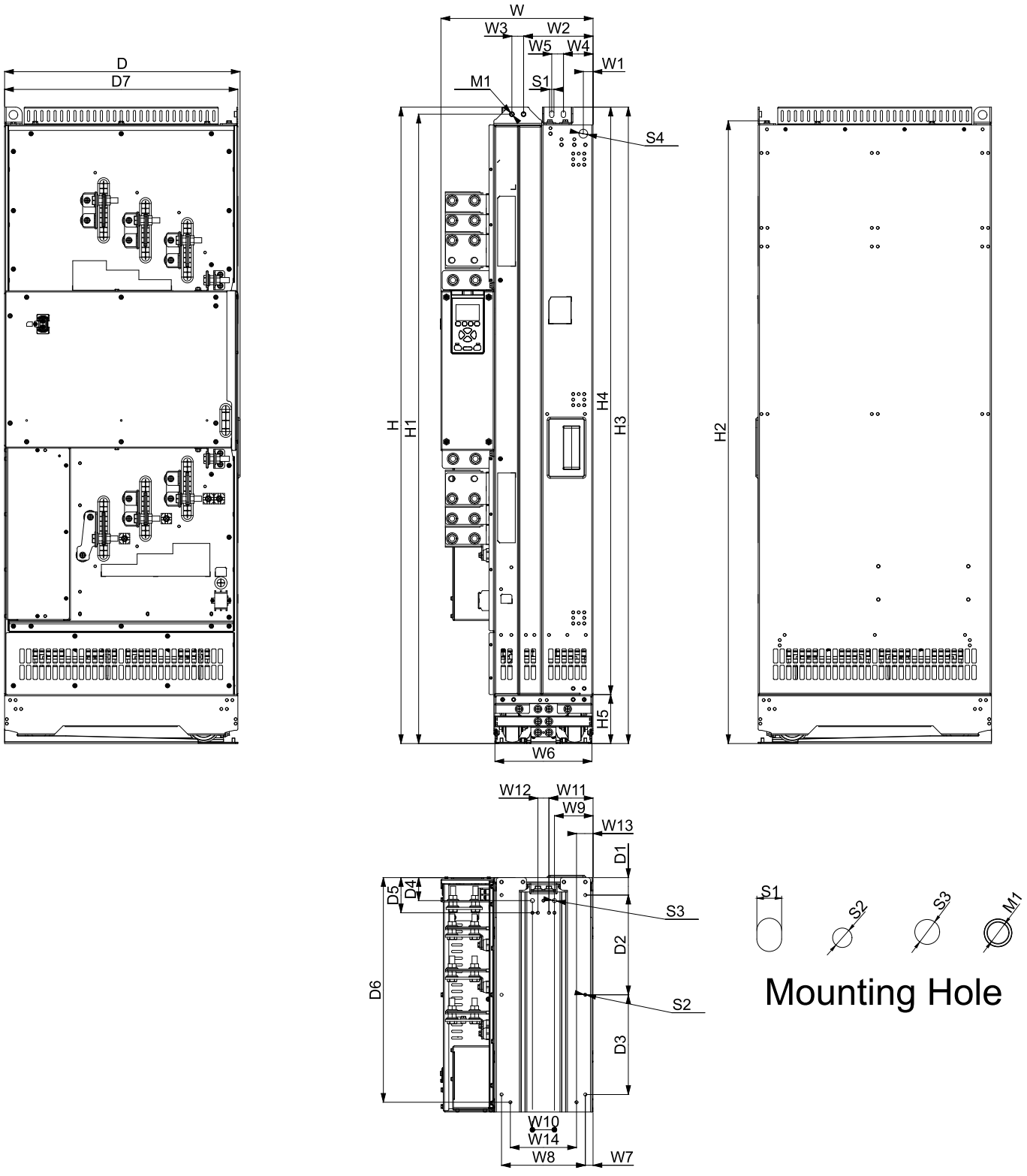


Figure 2-69

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
M	345 (13.58)	22 (0.87)	157.5 (6.2)	26.5 (1.04)	67.1 (2.6)	26.5 (1.04)	225 (8.86)	17.5 (0.69)	190 (7.48)	87.5 (3.44)	50 (1.97)	100 (3.94)
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
M	25 (0.98)	37.5 (1.48)	150 (5.91)	1436 (56.54)	1420 (55.91)	1405 (55.31)	1433.5 (56.44)	1325.5 (52.19)	110.5 (4.35)	-	-	-
Frame	H9	D	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
M	-	534 (21.03)	39.5 (1.56)	225 (8.86)	225 (8.86)	52 (2.05)	79.5 (3.13)	507 (19.96)	529 (20.83)	-	-	-
Frame	S1	S2	S3	S4	M1							
M	9 (0.35)	7 (0.28)	9 (0.35)	20 (0.79)	M8 P1.25							

Weight: 173.0 kg

Table 2-31

Frame M – Upright Installation with IP20 Shielded Cover

Applicable models:

VFD866VP43SHTCA, VFD930VP43SHTCA, VFD1K1VP43SHTCA, VFD1K2VP43SHTCA

The following figure is the dimension after installing the IP20 shielded cover, refer to Section 10-3-8 IP20 Shielded Cover for further installation description.

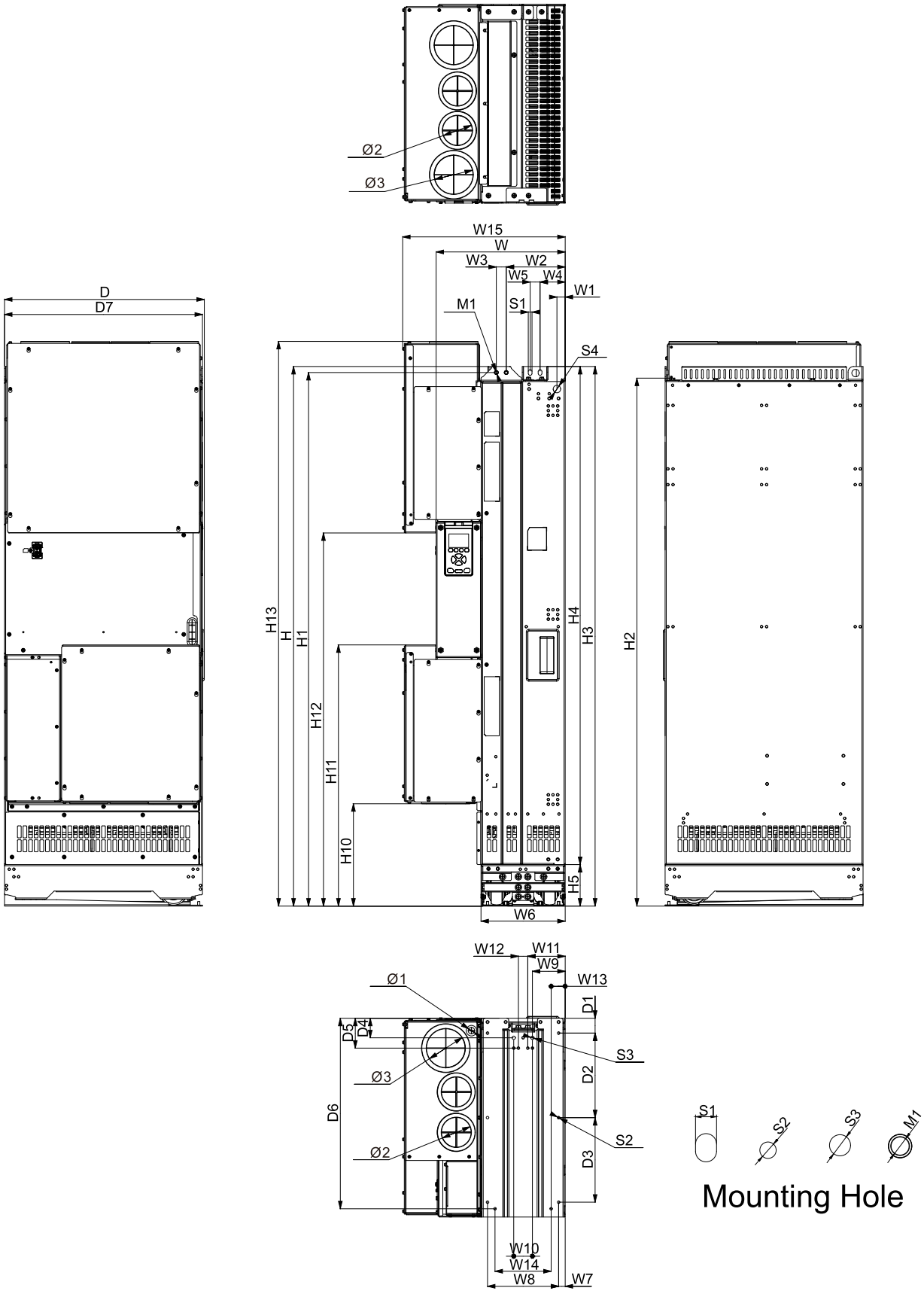


Figure 2-70

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
M	345 (13.58)	22 (0.87)	157.5 (6.2)	26.5 (1.04)	67.1 (2.6)	26.5 (1.04)	225 (8.86)	17.5 (0.69)	190 (7.48)	87.5 (3.44)	50 (1.97)	100 (3.94)
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
M	25 (0.98)	37.5 (1.48)	150 (5.91)	1436 (56.54)	1420 (55.91)	1405 (55.31)	1433.5 (56.44)	1325.5 (52.19)	110.5 (4.35)	-	-	-
Frame	H9	H10	H11	H12	H13	D	D1	D2	D3	D4	D5	D6
M	-	272.3 (10.72)	695 (27.36)	993 (39.09)	1502.7 (59.16)	534 (21.03)	39.5 (1.56)	225 (8.86)	225 (8.86)	52 (2.05)	79.5 (3.13)	507 (19.96)
Frame	D7	D8	D9	D10	S1	S2	S3	S4	Ø1	Ø2	Ø3	M1
M	529 (20.83)	-	-	-	9 (0.35)	7 (0.28)	9 (0.35)	20 (0.79)	17.5 (0.69)	79 (3.11)	103 (4.05)	M8 P1.25

Weight: 186.3 kg

Table 2-32

Frame M – Horizontal Installation

Applicable models:

VFD866VP43SHTCA, VFD930VP43SHTCA, VFD1K1VP43SHTCA, VFD1K2VP43SHTCA

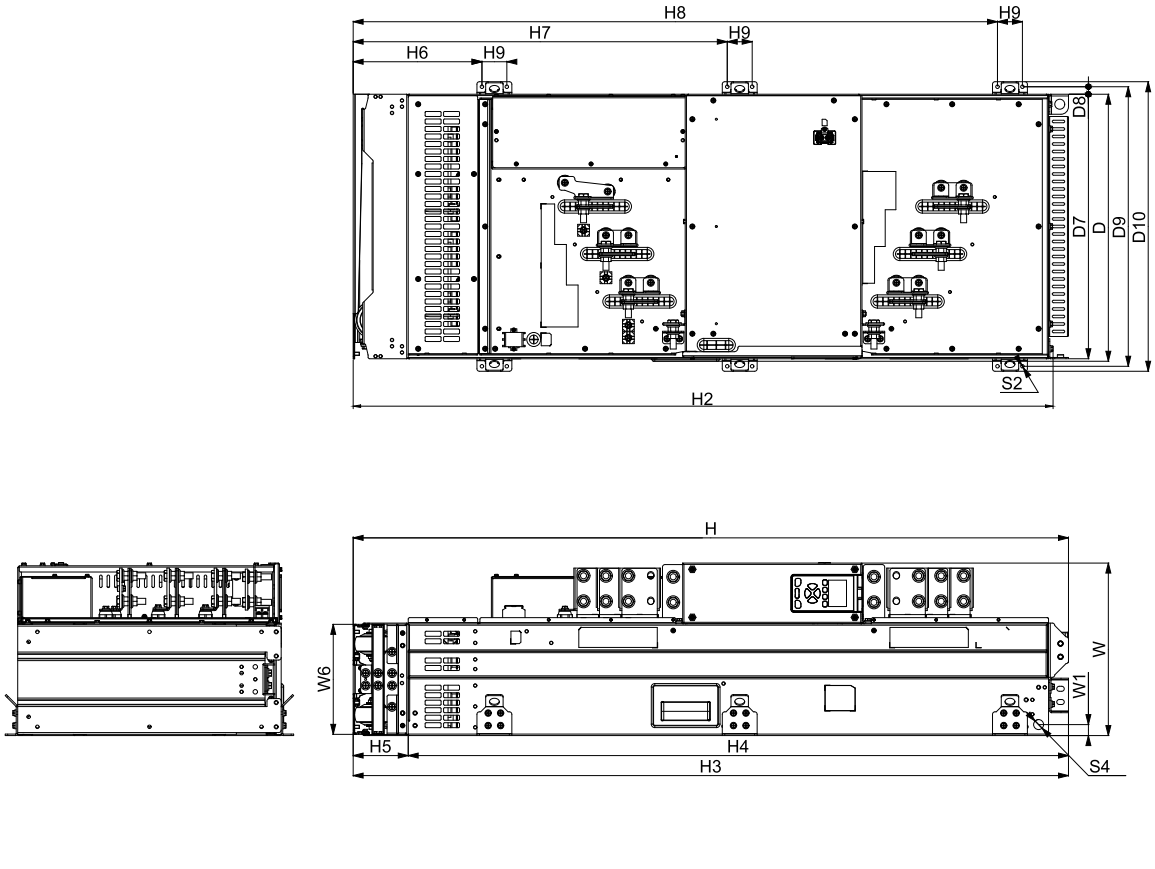


Figure 2-71

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
M	345 (13.58)	22 (0.87)	-	-	-	-	225 (8.86)	-	-	-	-	-
Frame	W12	W13	W14	H	H1	H2	H3	H4	H5	H6	H7	H8
M	-	-	-	1436 (56.54)	-	1405 (55.31)	1433.5 (56.44)	1325.5 (52.19)	110.5 (4.35)	258.5 (10.18)	751 (29.57)	1293.5 (50.93)
Frame	H9	D	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
M	50 (1.97)	-	-	-	-	-	-	-	529 (20.83)	15 (0.60)	559 (22.01)	579 (22.80)
Frame	S1	S2	S3	S4	M1							
M	-	7 (0.28)	-	20 (0.79)	-							

Weight: 173.0 kg

Table 2-33

Frame M – Horizontal Installation with IP20 Shielded Cover

Applicable models:

VFD866VP43SHTCA, VFD930VP43SHTCA, VFD1K1VP43SHTCA, VFD1K2VP43SHTCA

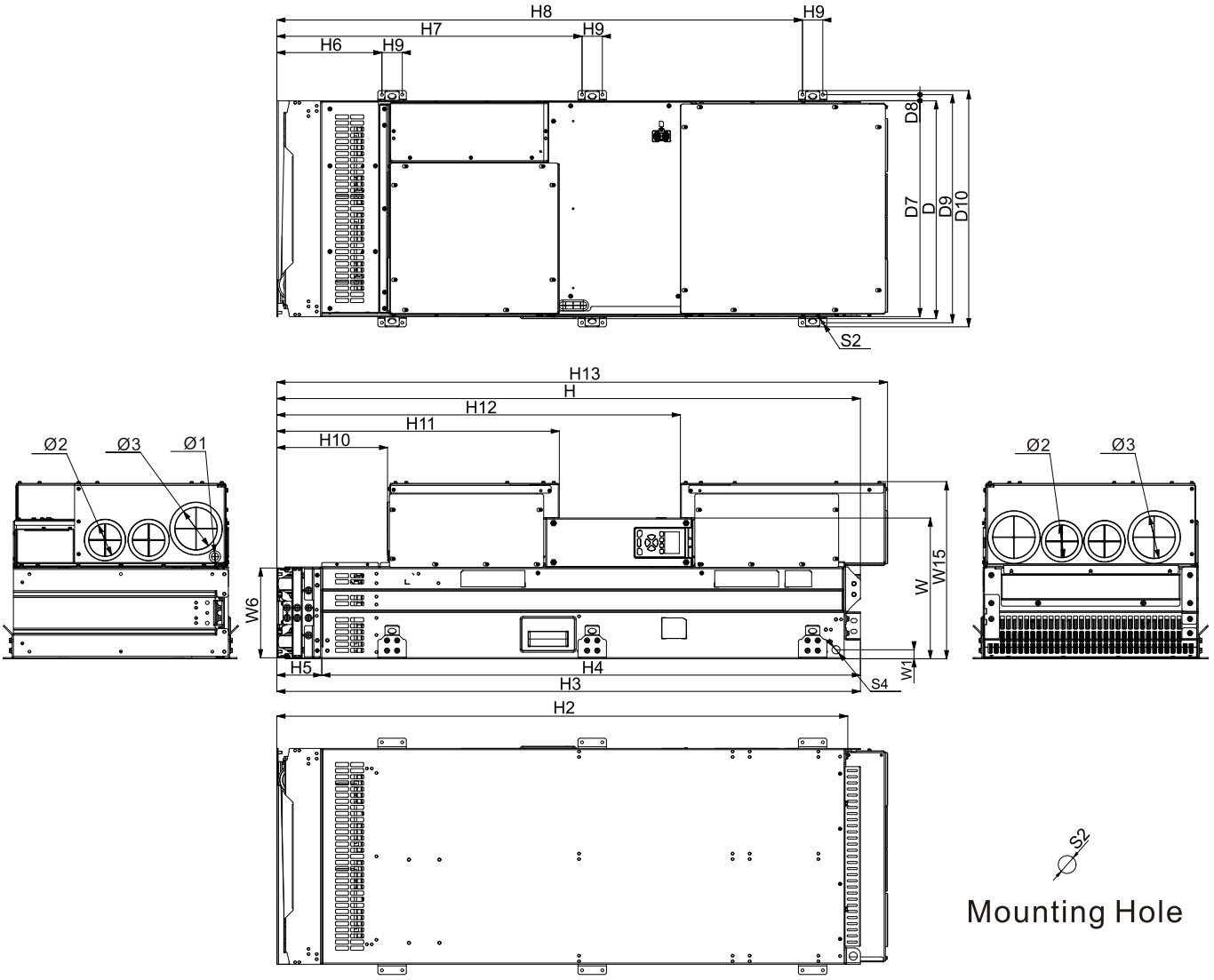


Figure 2-72

Unit: mm (inch)

Frame	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
M	345 (13.58)	22 (0.87)	-	-	-	-	225 (8.86)	-	-	-	-	-
Frame	W12	W13	W14	W15	H	H1	H2	H3	H4	H5	H6	H7
M	-	-	-	434.3 (17.1)	1436 (56.54)	-	1405 (55.31)	1433.5 (56.44)	1325.5 (52.19)	110.5 (4.35)	258.5 (10.18)	751 (29.57)
Frame	H8	H9	H10	H11	H12	H13	D	D1	D2	D3	D4	D5
M	1293.5 (50.93)	50 (1.97)	272.3 (10.72)	695 (27.36)	993 (39.09)	1502.7 (59.16)	534 (21.03)	-	-	-	-	-
Frame	D6	D7	D8	D9	D10	S1	S2	S3	S4	Ø1	Ø2	Ø3
M	-	529 (20.83)	15 (0.6)	559 (22.01)	579 (22.8)	-	7 (0.28)	-	20 (0.79)	17.5 (0.69)	79 (3.11)	103 (4.05)

Frame	M1
M	-

Weight: 186.3 kg

Table 2-34

2-6 EMC Plate Installation

2-6-1 Installation Method

NOTE: Refer to Section 10-3-4 for the EMC plate selection of each model.

Frame A–C

Applicable models: VFD3A0–038VP43ANTAA

1. Fasten the metal plate on the AC motor drive, as shown in the figure below.

Frame	Screw Spec. and Torque
A–C	M3 6–8 kg-cm / (5.2–6.9 lb-in.) / (0.59–0.78 Nm)

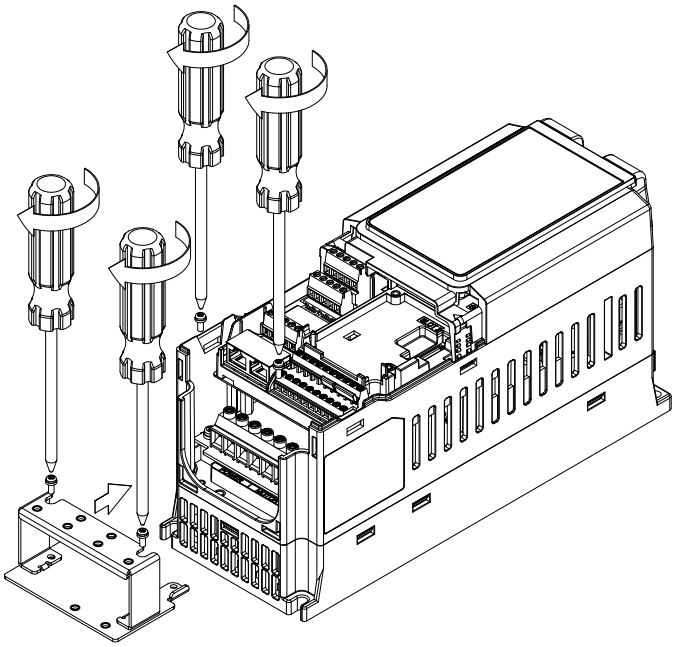


Figure 2-73

2. Choose the applicable Ohm clips according to the wire gauge and fasten it on the metal plate.

Frame	Screw Spec. and Torque
A–C	M4 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

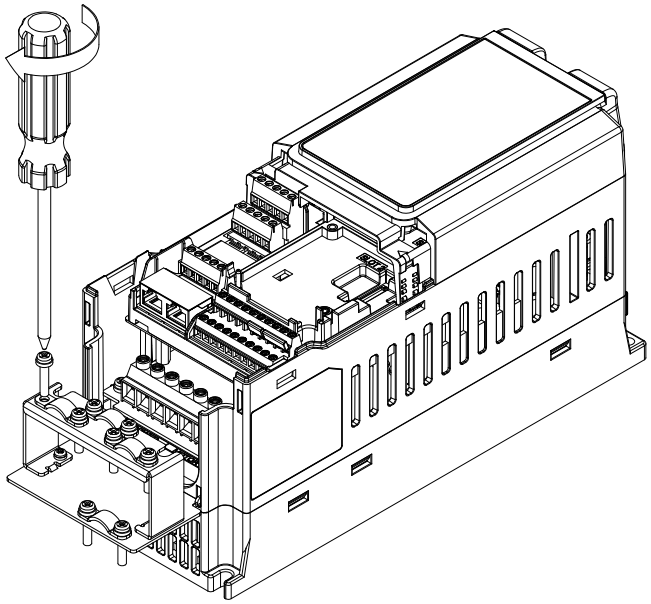


Figure 2-74

Frame D–E OPEN Type

Applicable models: VFD045–090VP43ANTCA

1. Fasten the metal plate on the AC motor drive, as shown in the figure below.

Frame	Screw Spec. and Torque
D–E	M4 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

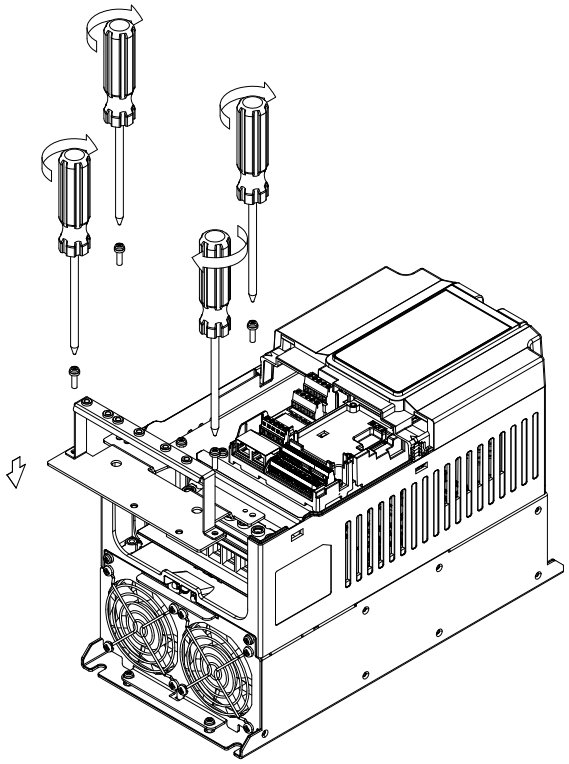


Figure 2-75

2. Choose the applicable Ohm clips according to the wire gauge and fasten it on the metal plate.

Frame	Screw Spec. and Torque
D–E	M4 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

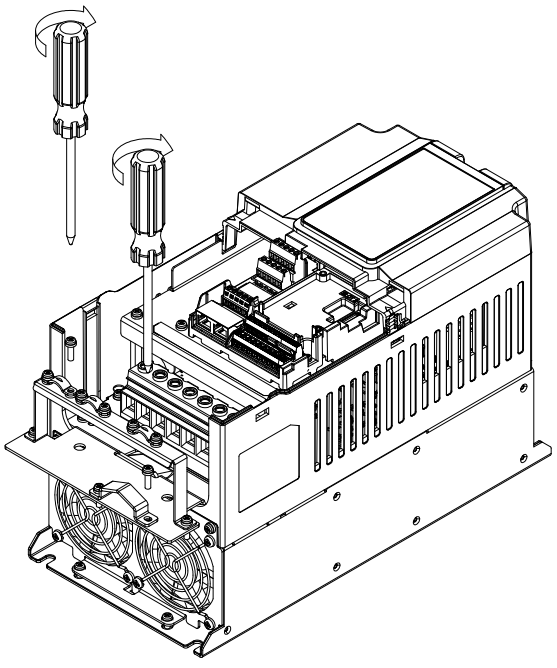


Figure 2-76

Frame D – Type 1

Applicable models: VFD045VP43BFTCA, VFD062VP43BFTCA, VFD045VP43BSTCA, VFD062VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	Output EMC clip	1
4	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	2

2. Fasten the accessories as shown in the figure below.

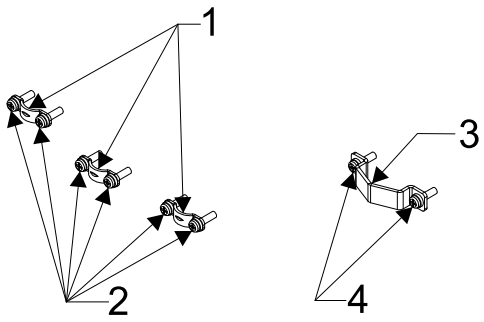


Figure 2-77

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

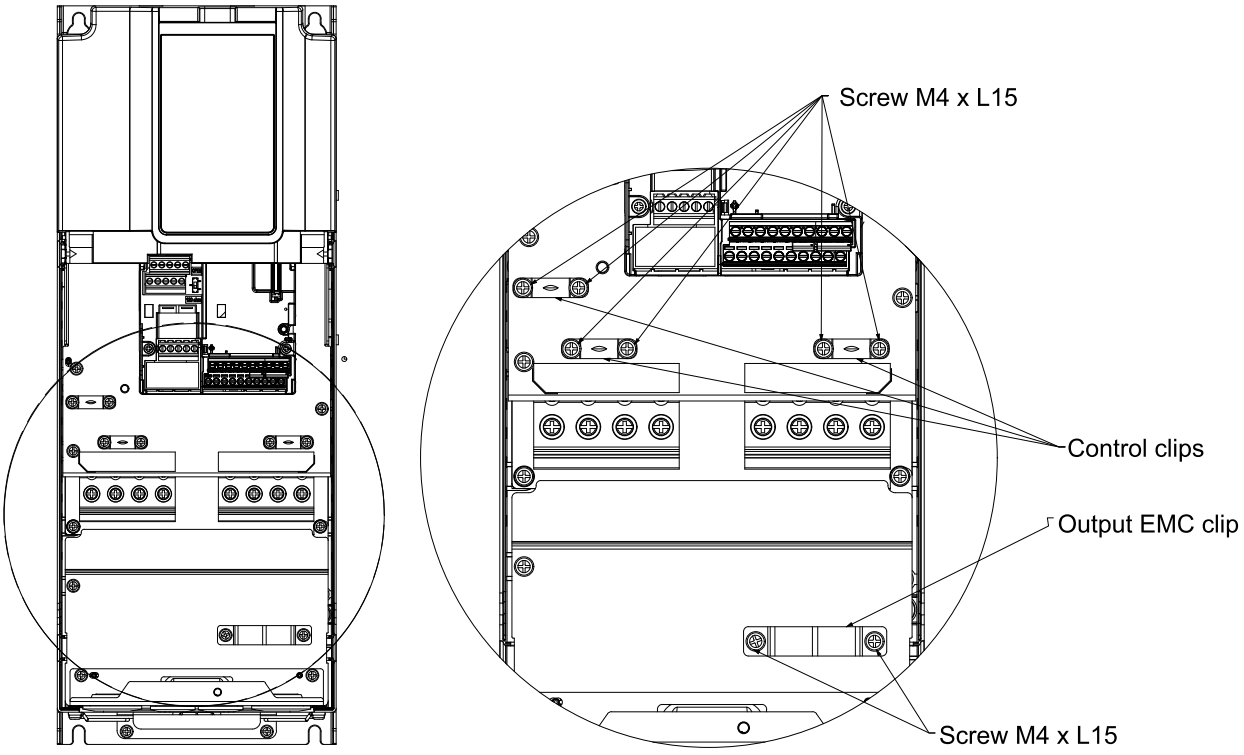


Figure 2-78

Frame E – Type 1

Applicable models: VFD073VP43BFTCA, VFD090VP43BFTCA, VFD073VP43BSTCA, VFD090VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	Output EMC clips	1
4	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	2

2. Fasten the accessories as shown in the figure below.

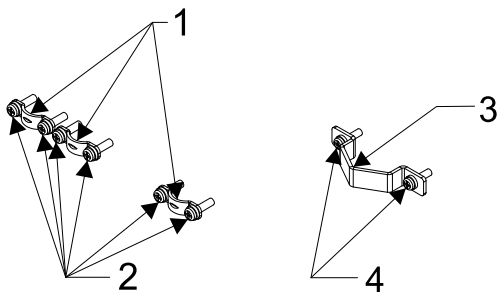


Figure 2-79

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

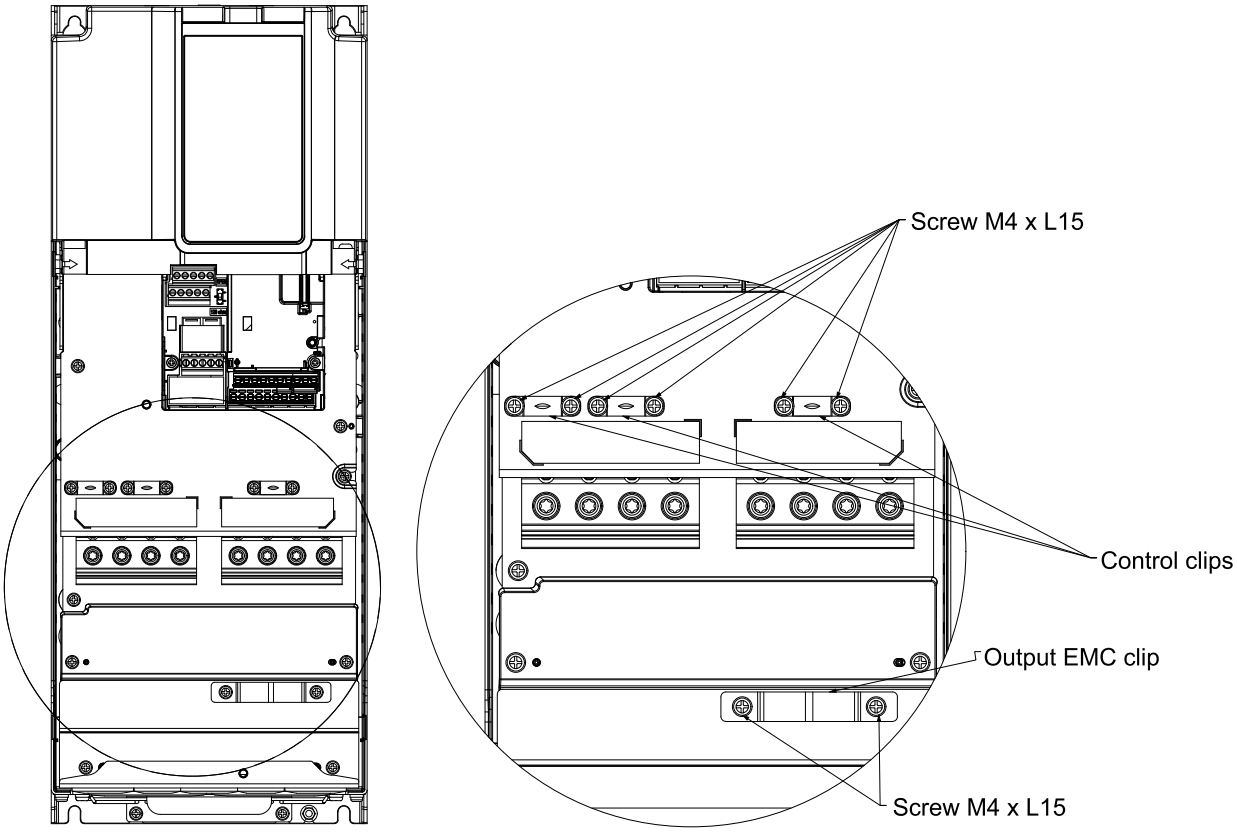


Figure 2-80

Frame F – Type 1

Applicable models: VFD110VP43AFTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Screw M4xL8 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	2
2	Control clips	3
3	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
4	Control EMC plate	1
5	Screw M5xL15 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
6	Output EMC plate	1
7	Output EMC clip	1
8	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	2

2. Fasten the accessories as shown in the figure below.

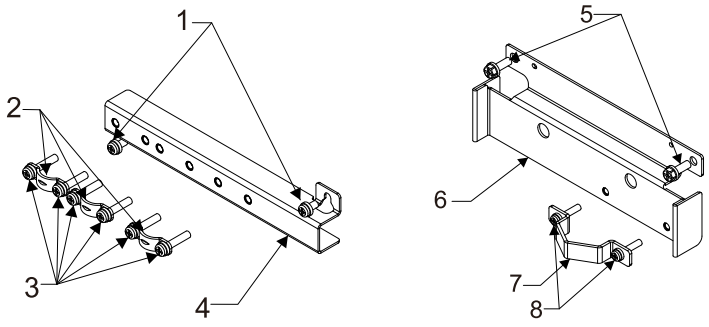


Figure 2-81

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

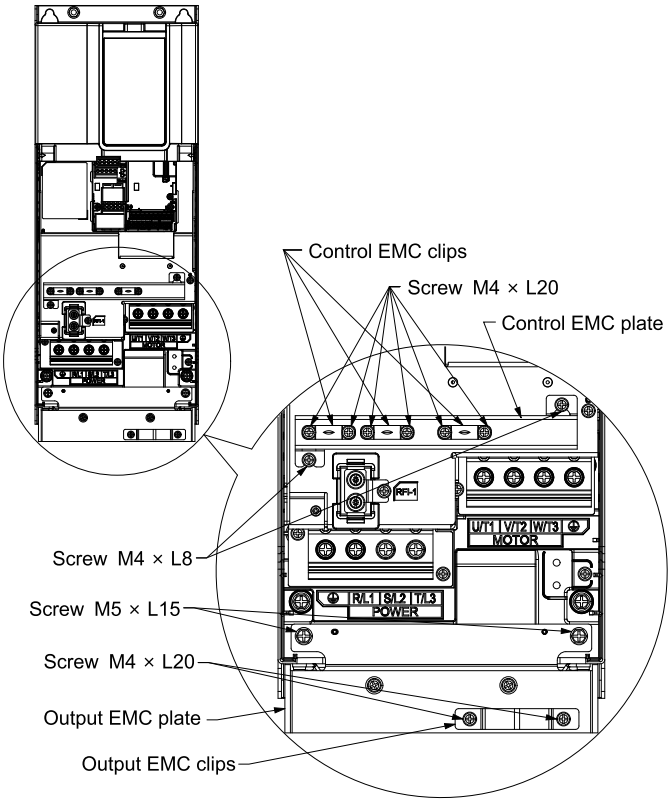


Figure 2-82

Frame G – Open Type

Applicable models: VFD150VP43AFTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M4xL25 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4
5	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
6	Output EMC clips	2

2. Fasten the accessories as shown in the figure below.

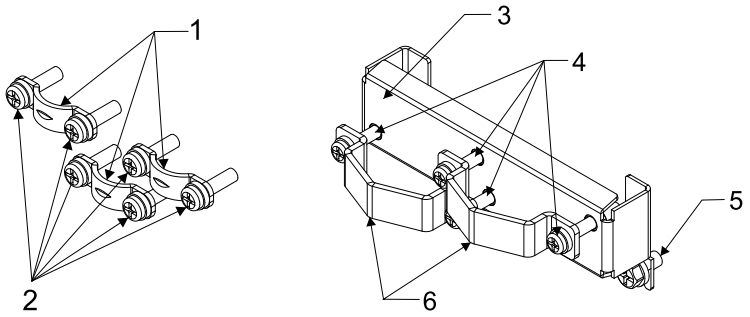


Figure 2-83

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

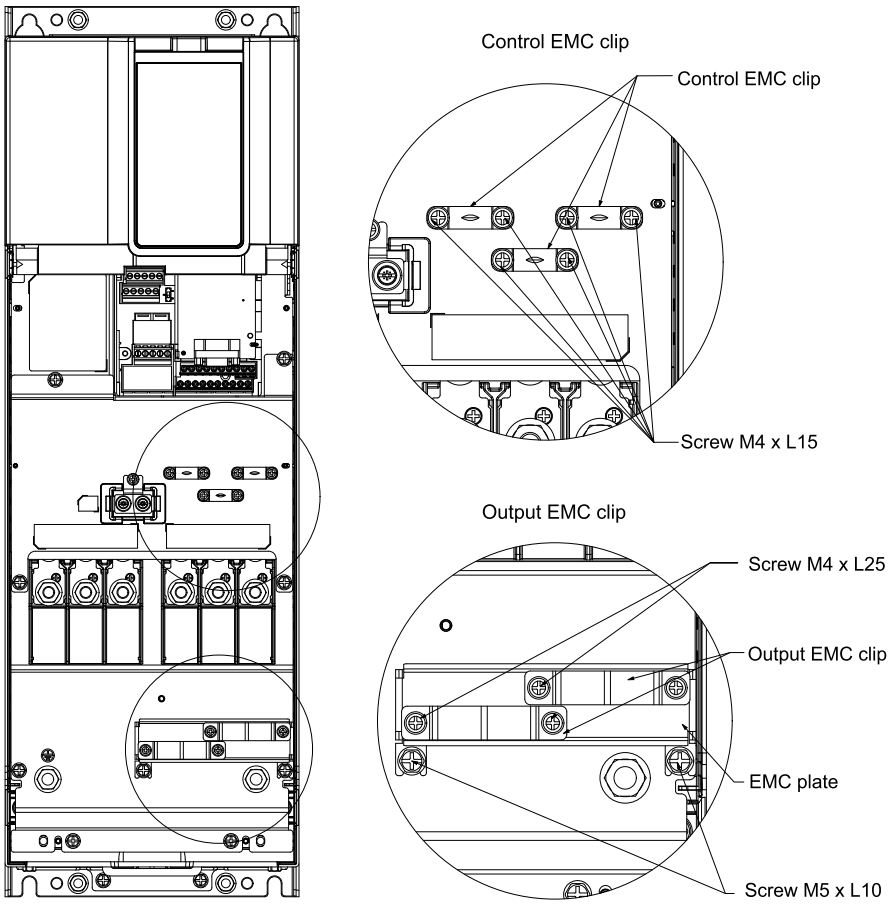


Figure 2-84

Frame G – Type1

Applicable models: VFD150VP43BFTCA, VFD150VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL15 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
5	Screw M4xL25 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4
6	Output EMC clips	2

2. Fasten the accessories as shown in the figure below.

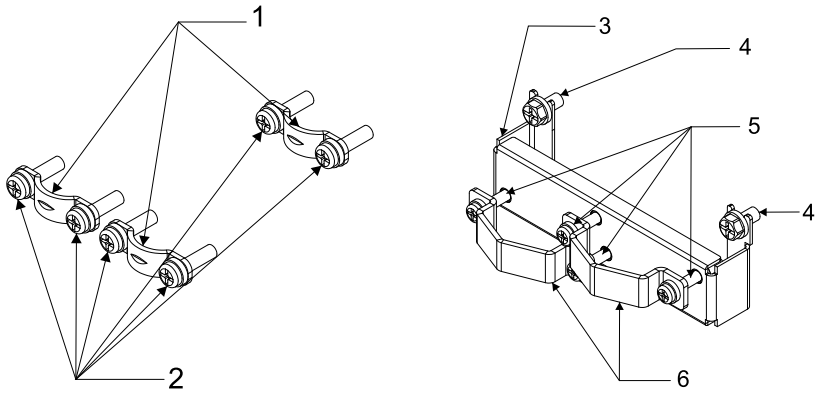


Figure 2-85

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

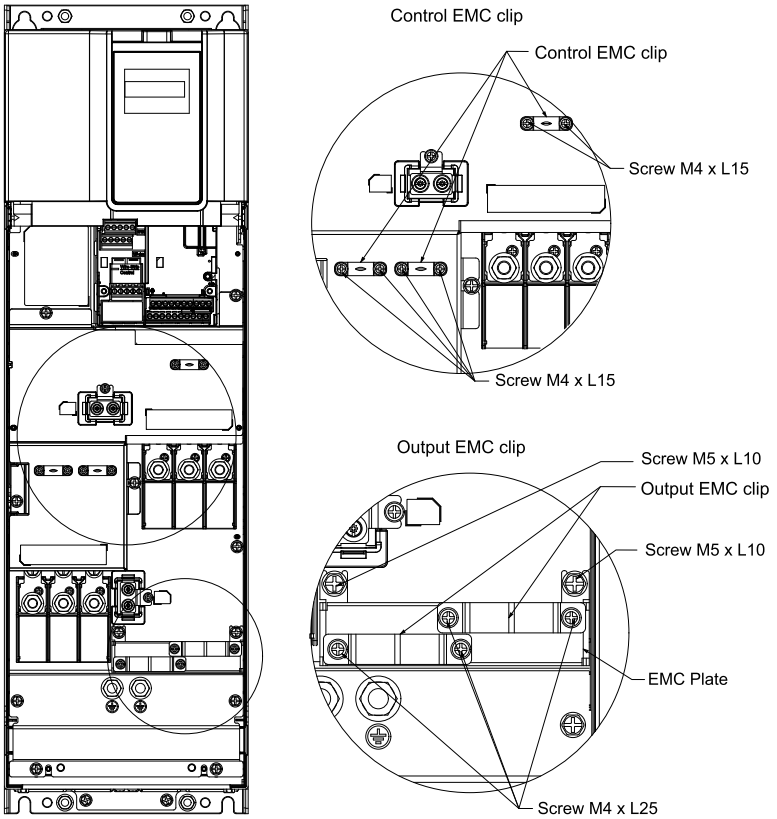


Figure 2-86

Frame H – Open Type

Applicable models: VFD180VP43AFTCA, VFD220VP43AFTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
5	Screw M4xL30 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4
6	Output EMC clips	2

2. Fasten the accessories as shown in the figure below.

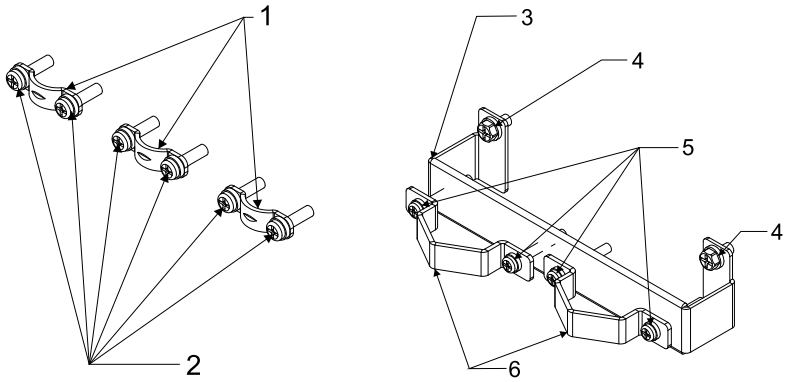


Figure 2-87

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

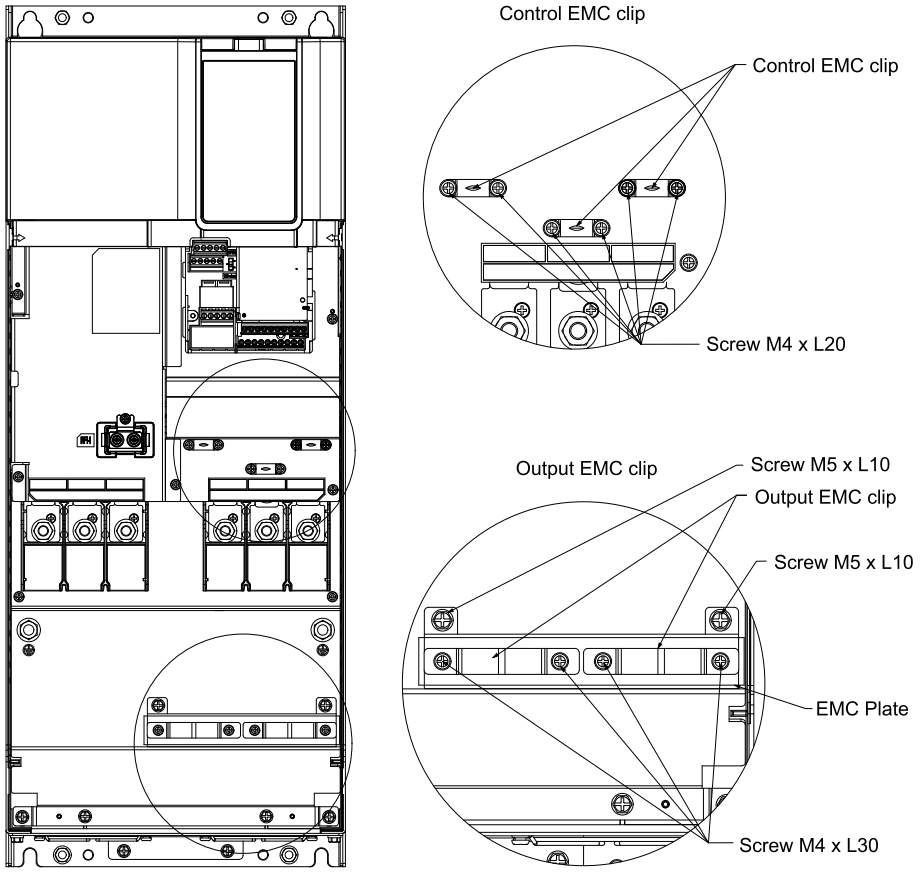


Figure 2-88

Frame I

Applicable models:

Open Type: VFD260VP43AFTCA, VFD310VP43AFTCA

Type 1: VFD260VP43BFTCA, VFD310VP43BFTCA, VFD260VP43BSTCA, VFD310VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
5	Screw M4xL33 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4
6	Output EMC clips	2

2. Fasten the accessories as shown in the figure below.

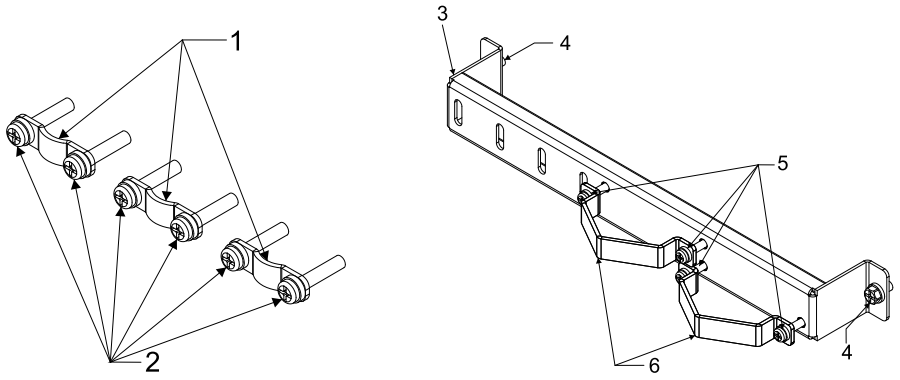


Figure 2-89

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

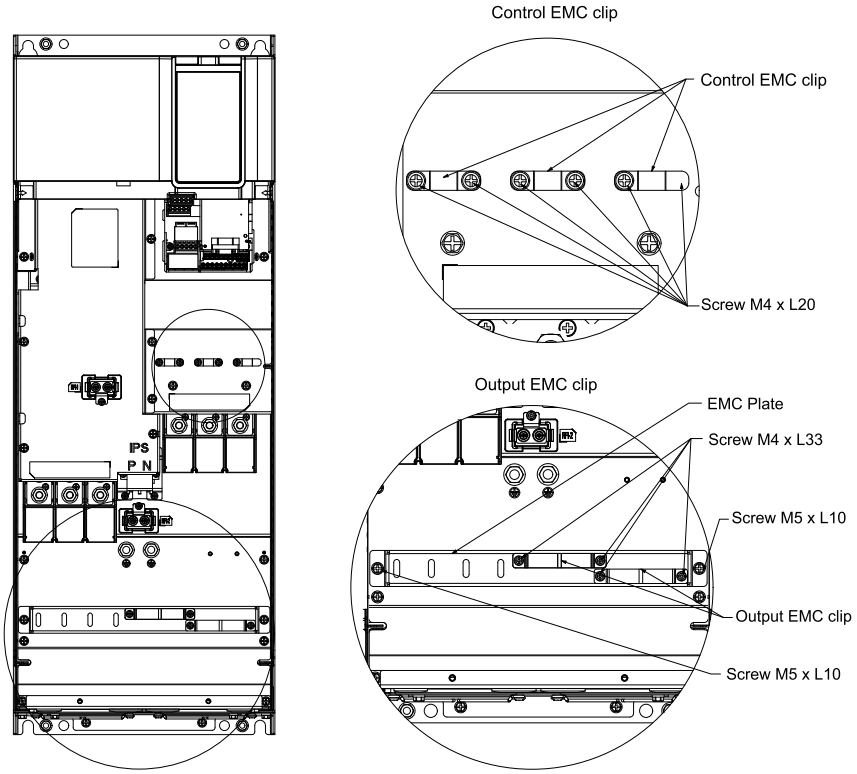


Figure 2-90

Frame J

Applicable models:

Open Type: VFD370VP43AFTCA, VFD395VP43AFTCA

Type 1: VFD370VP43BFTCA, VFD395VP43BFTCA, VFD370VP43BSTCA, VFD395VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
5	Output EMC clips	2
6	Screw M4xL33 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4

2. Fasten the accessories as shown in the figure below.

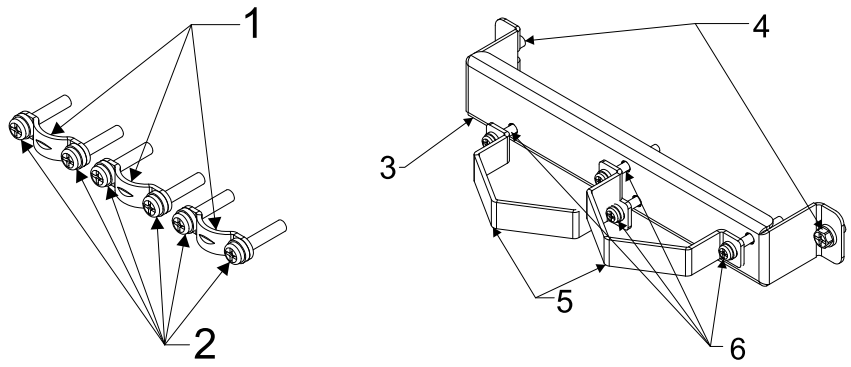


Figure 2-91

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

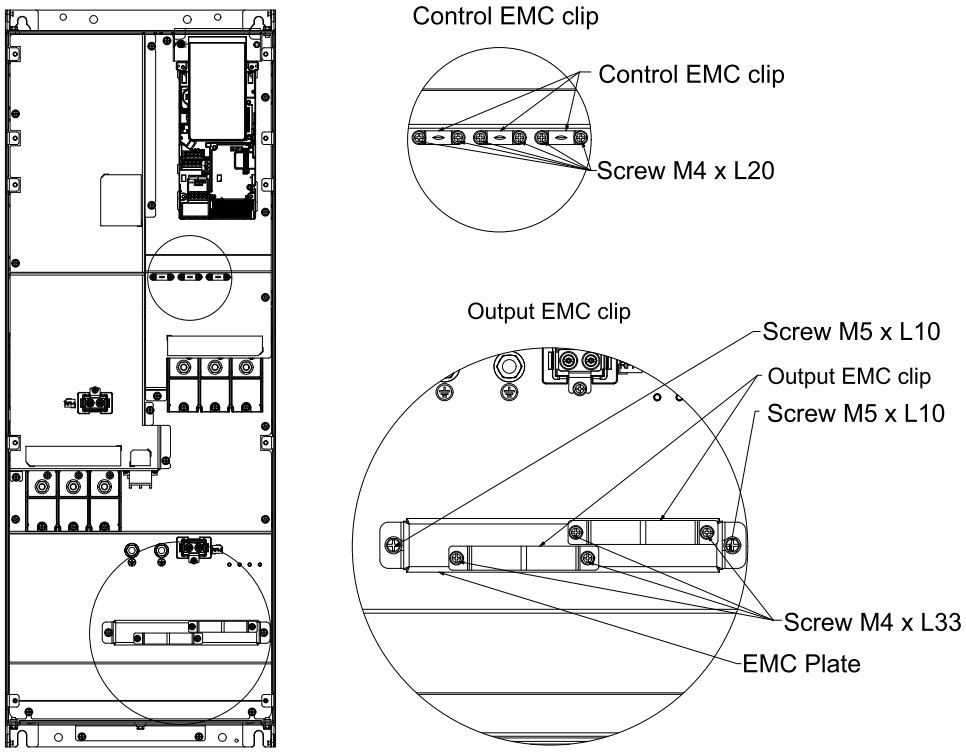


Figure 2-92

Frame K

Applicable models:

Open Type: VFD460VP43AFTCA, VFD485VP43AFTCA

Type 1: VFD460VP43BFTCA, VFD485VP43BFTCA, VFD460VP43BSTCA, VFD485VP43BSTCA

1. Refer to the following table for the assembling accessories, quantities and screw torque.

No.	Accessories	Qty (pcs)
1	Control clips	3
2	Screw M4xL20 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	6
3	EMC plate	1
4	Screw M5xL10 (Screw torque: 24–26 kg-cm / 20.8–22.6 lb-in. / 2.35–2.55 Nm)	2
5	Output EMC clips	2
6	Screw M4xL33 (Screw torque: 14–16 kg-cm / 12.2–13.9 lb-in. / 1.37–1.57 Nm)	4

2. Fasten the accessories as shown in the figure below.

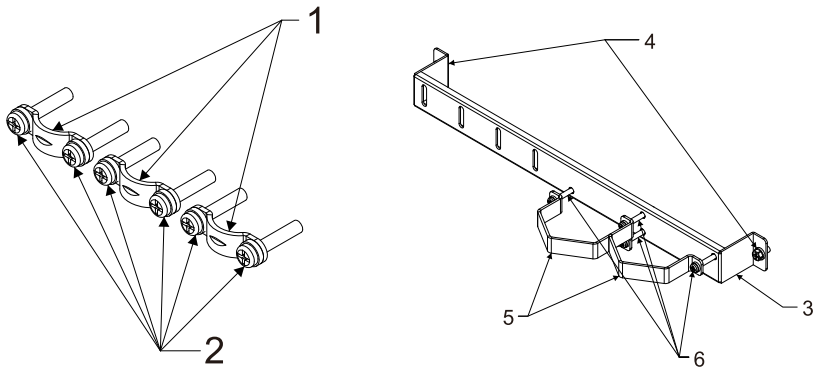


Figure 2-93

3. Install the above EMC plate and control clips onto the AC motor drive, refer to the installation location shown in the figure below.

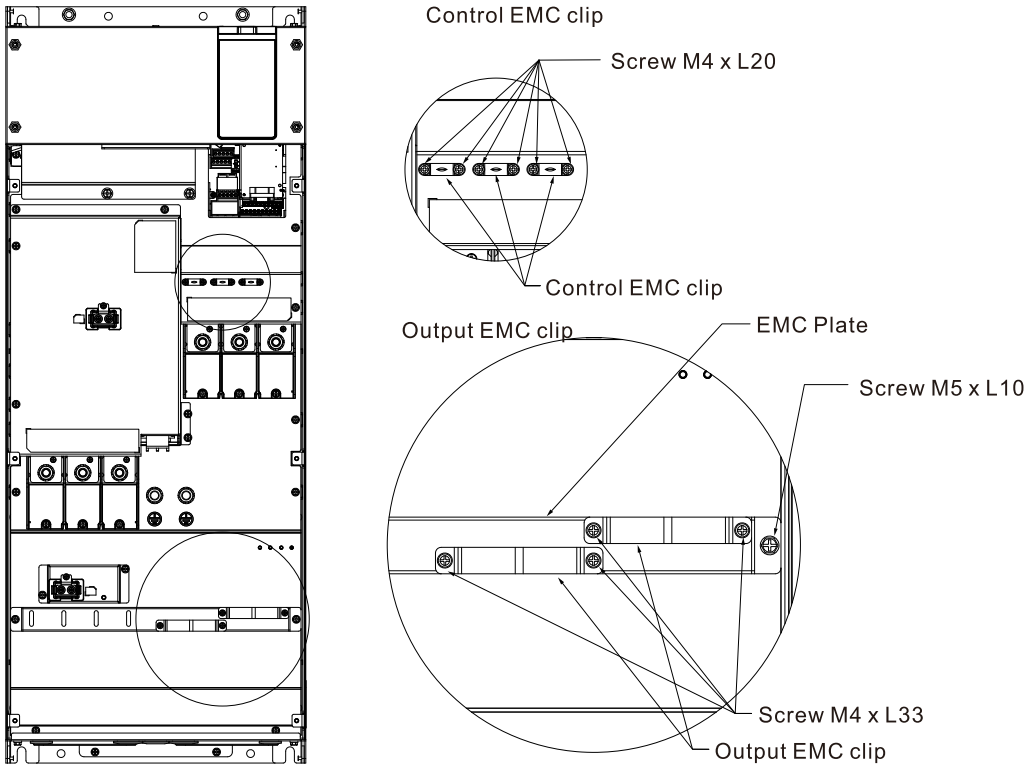
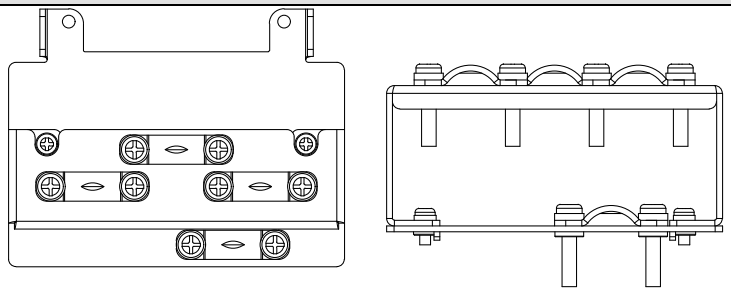
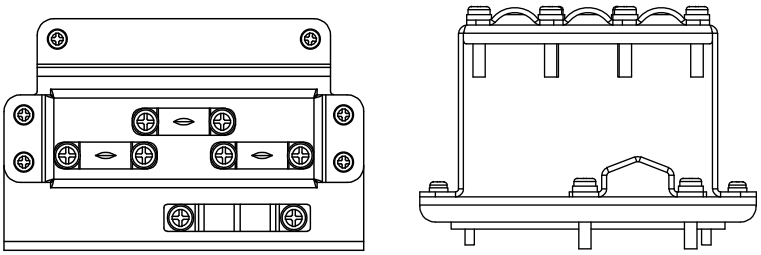
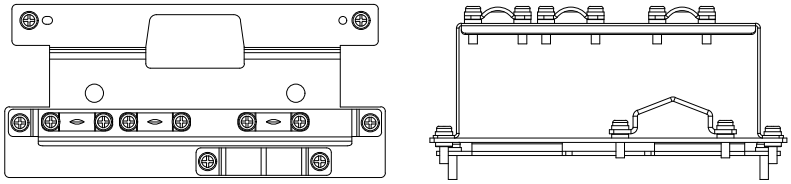
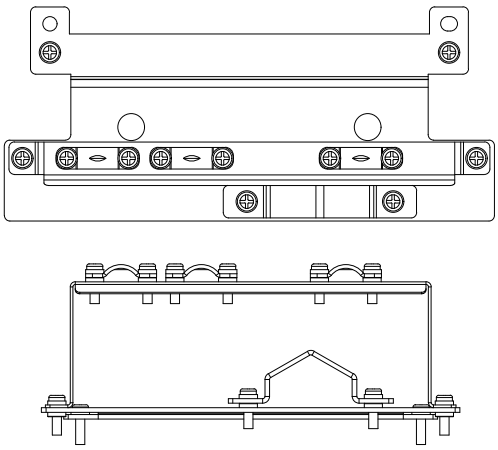


Figure 2-94

2-6-2 Suggested Wiring Method

NOTE: Refer to Section 10-3-4 for the EMC plate selection of each model.

Applicalbe Frame	EMC Plate Model	Diagram
A, B	MKVP-EPB	 Figure 2-95
C	MKVP-EPC	 Figure 2-96
D	MKVP-EPD	 Figure 2-97
E	MKVP-EPE	 Figure 2-98

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Chapter 3 Electrical Wiring

3-1 Safety Precautions

3-2 System Wiring Diagram

3-3 Main Circuit Terminals

3-4 Control Circuits

3-5 Safe Torque Off

3-6 RFI Jumper and Leakage Current

3-7 Harmonic Interference Prevention

3-8 Electromagnetic Interference Prevention

3-1 Safety Precautions

DANGER

- ☑ Fasten the screws in the main circuit terminal to prevent sparks caused by screws loosened due to vibration.
- ☑ If necessary, use an inductive filter only at the motor output terminals U/T1, V/T2, W/T3 of the AC motor drive. Do NOT use phase-compensation capacitors or L-C (Inductance-Capacitance) or R-C (Resistance-Capacitance), unless approved by Delta.
- ☑ DO NOT connect phase-compensation capacitors or surge absorbers at the output terminals of AC motor drives.
- ☑ Ensure proper insulation of the main circuit wiring in accordance with the relevant safety regulations.

CAUTION

Main Input Power Terminals

- ☑ Do not connect three-phase model to single-phase power. R/L1, S/L2 and T/L3 have no phase-sequence requirement, it can be connected in any sequence.
- ☑ The connection between the three-phase AC input power supply and the main circuit terminals (R/L1, S/L2, T/L3) must be connected with a non-fuse switch. Add a magnetic contactor (MC) to the power input wiring to cut off power quickly and reduce malfunction when the AC motor drive protection function activates. Both ends of the MC should have an R-C surge absorber.
- ☑ Use voltage and current within the specification in Chapter 11. Refer to Chapter 11 Specifications for details.
- ☑ When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of 200 mA or above and not less than 0.1-second operation time to avoid nuisance tripping.
- ☑ Use shielded wire or conduit for the power wiring and ground the two ends of the shield wire or conduit.
- ☑ Do NOT run and stop AC motor drives by turning the power ON and OFF. Run and stop AC motor drives by sending RUN and STOP command through the control MI terminals or the keypad. If you still need to run and stop AC motor drives by turning power ON and OFF, do so no more often than ONCE per hour.
- ☑ To comply with UL standards, connect the drive to a three-phase three-wire or three-phase four-wire Wye system of mains power system.

Output terminals for main circuit

- ☑ Use well-insulated motor, suitable for inverter operation.
- ☑ When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U/T1, V/T2, and W/T3 respectively, the motor will rotate counterclockwise (as viewed on the shaft end of the motor, refer to the pointed direction in the figure below) upon a forward operation command is received To permanently reverse the direction of motor rotation, change the setting of Pr.A1-28 (Forward Phase Selection) or switch over any of the two motor leads.

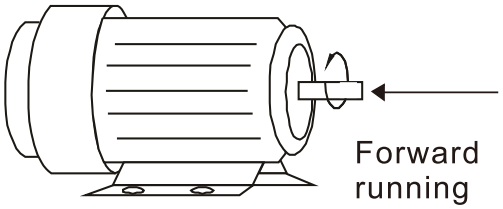


Figure 3-1

Analog Input Terminals (AI1, AI2, AI3 and ACM)

☑ Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (< 20 m) with proper grounding. If the noise is inductive, connecting the shield to the ACM terminal can reduce interference.

☑ Use twisted-pair wire for weak analog signals.

☑ If the analog input signals are affected by noise from the AC motor drive, connect a capacitor and a ferrite core as shown in the figure below.

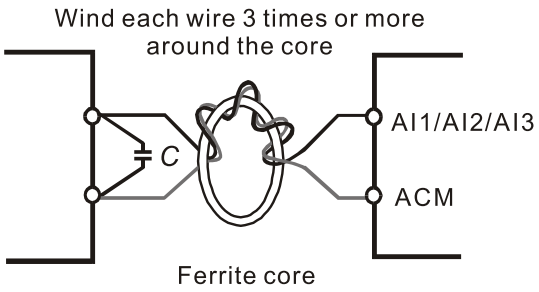


Figure 3-2

Digital Inputs (FWD, REV, MI1–MI6 and COM)

☑ The “COM” terminal is a common terminal of the photo-coupler in all the wiring methods.

☑ When the photo-coupler uses the internal power supply, the switch connection for Sink and Source modes are as below:
MI-DCM: Sink mode
MI-+24V: Source mode

☑ When the photo-coupler uses the external power supply, remove the short-circuit cable between +24V and COM terminals. Connect the +/- terminal of the external power supply to the MI or COM terminal to determine the Sink or Source mode.

AMBD POWER Terminal

☑ The AMBD POWER Terminal is not a traditional PN terminal. It can only be used with a magnetic bearing controller and only provides 2.5A (around 1.5W) for external use. Exceeding the power will cause damage to the internal components.

☑ When used with a magnetic bearing controller, Fuse connection must be connected in series to avoid damage to the drive causes by external faults or short-circuits. The Fuse specification withstand voltage should be larger than 600 V_{AC} and the Fuse current is 8 A; it is recommended to use Bussman Fuse model FWC-8A10F.

☑ AMBD power terminal wiring diagram

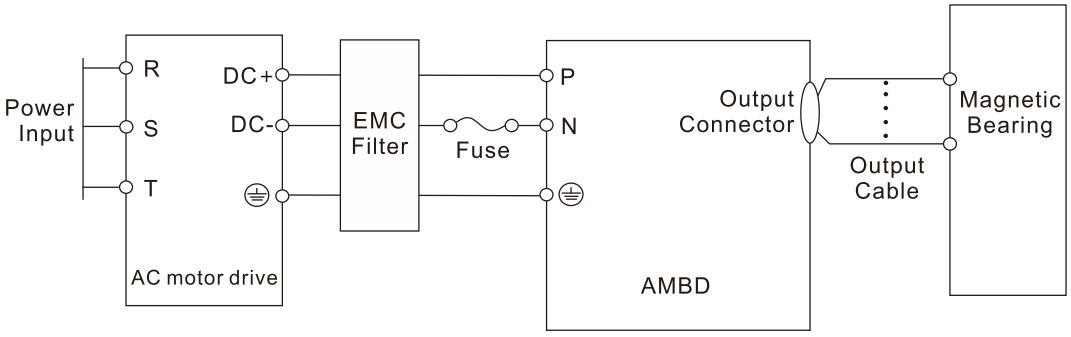


Figure 3-3

3-2 System Wiring Diagram

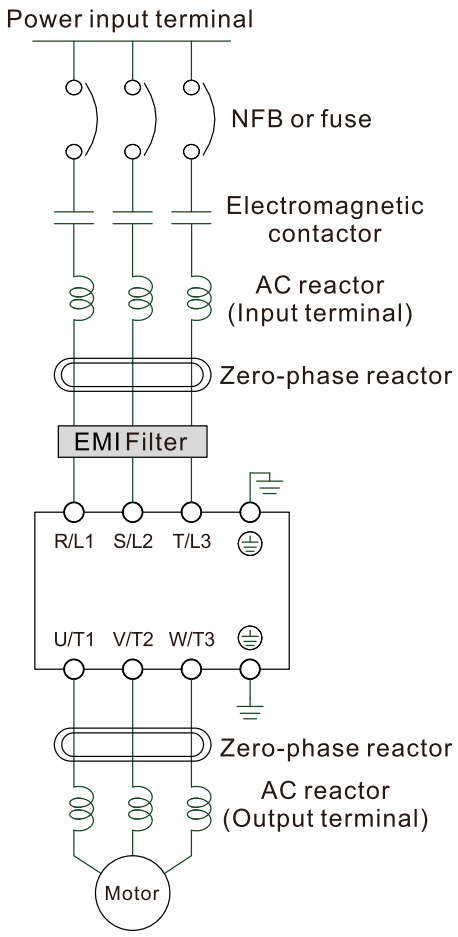


Figure 3-4

Power input terminal	Supply power according to the rated power specifications indicated in the manual
NFB or fuse	There may be a large inrush current during power on. Refer to Section 3-2-1 NFB to select a suitable NFB or Section 3-2-1 Fuse Specification Chart.
Magnetic contactor	Switching the power ON / OFF on the primary side of the magnetic contactor can turn the drive ON / OFF, but frequent switching may cause machine failure. Do not switch ON / OFF more than once an hour. Do not use the magnetic contactor as the power switch for the drive; doing so shortens the life of the drive.
AC reactor (Input terminal)	When the main power capacity is > 500 kVA, or when it switches into the phase capacitor, the instantaneous peak voltage and current generated may destroy the internal circuit of the drive. It is recommended that you install an input side AC reactor in the drive. This also improves the power factor and reduces power harmonics. The wiring distance should be within 10 m. Refer to Section 10-3-2 AC Reactor for details.
Zero phase reactor	Used to reduce radiated interference, especially in environments with audio devices, and reduce input and output side interference. The effective range is AM band to 10 MHz. Refer to Section 10-3-3 Zero Phase Reactor for details.
EMI filter	Can be used to reduce magnetic interference. Refer to Section 10-3-4 EMI Filter for details.
AC reactor (Output terminal)	The motor cable length affects the size of the reflected wave on the motor end. It is recommended that you install an AC output reactor when the motor wiring length exceeds 20m. Refer to Section 10-3-2 AC Reactor for details.

Table 3-1

3-2-1 Magnetic Contactor / Air Circuit Breaker and Non-fuse Circuit Breaker / Fuse Spec.

- Magnetic Contactor (MC) and Air Circuit Breaker (ACB)

  It is recommended the surrounding temperature for MC should be ≥ 60°C and that for ACB should be ≥ 50°C. In the meanwhile, consider temperature derating for components with ON / OFF switch in accordance with the ambient temperature of the on-site distribution panel.

- Fuse Specification

  ☑ Fuse specifications lower than the table below are allowed.

  ☑ For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code (NEC) and any applicable local codes. Use UL classified fuses to fulfill this requirement.

  ☑ For installation in Canada, branch circuit protection must be provided in accordance with Canadian Electrical Code and any applicable provincial codes. Use UL classified fuses to fulfill this requirement.

Frame	Model	Rated Output Current (A)	Rated Input Current (A)	MC/ACB Selection (A)	NFB (A)	Fuse Selection	Fuse Current (A)	UL61800-5-1 SCCR (kA)
A	VFD3A0VP43ANTAA/-BFTAA	3	4.2	9	9	JJS-10	10	5
	VFD4A2VP43ANTAA/-BFTAA	4.2	5.9	9	12	JJS-15	15	5
	VFD5A6VP43ANTAA/-BFTAA	5.6	7.8	12	12	JJS-15	15	5
	VFD7A2VP43ANTAA/-BFTAA	7.2	10.1	16	18	JJS-20	20	5
	VFD011VP43ANTAA/-BFTAA	11	15.4	22	32	JJS-30	30	5
B	VFD3A0VP43BSTCA	3	3	9	7	JJS-6	6	5
	VFD4A2VP43BSTCA	4.2	4.2	9	7	JJS-6	6	5
	VFD5A6VP43BSTCA	5.6	5.6	9	9	JJS-10	10	5
	VFD7A2VP43BSTCA	7.2	7.2	12	12	JJS-15	15	5
	VFD011VP43BSTCA	11	11	16	18	JJS-20	20	5
	VFD013VP43ANTAA/-BFTAA	13	18.2	32	32	JJS-35	35	5
	VFD013VP43BSTCA	13	13	22	22	JJS-25	25	5
	VFD018VP43ANTAA/-BFTAA	18	25	40	40	JJS-50	50	5
	VFD018VP43BSTCA	18	18	32	32	JJS-35	35	5
C	VFD025VP43ANTAA/-BFTAA	25	35	65	65	JJS-70	70	5
	VFD025VP43BSTCA	25	25	40	40	JJS-45	45	5
	VFD032VP43ANTAA/-BFTAA	32	45	80	85	JJS-90	90	5
	VFD032VP43BSTCA	32	32	50	50	JJS-60	60	5
	VFD038VP43ANTAA/-BFTAA	38	53	80	105	JJS-100	100	5
	VFD038VP43BSTCA	38	38	65	65	JJS-70	70	5
D	VFD045VP43ANTCA/-BFTCA/-BSTCA	45	45	80	85	JJS-80	80	5
	VFD062VP43ANTCA/-BFTCA/-BSTCA	62	62	105	105	JJS-110	110	5
E	VFD073VP43ANTCA/-BFTCA/-BSTCA	73	73	125	130	JJS-150	150	10
	VFD090VP43ANTCA/-BFTCA/-BSTCA	90	90	150	150	JJS-175	175	10
F	VFD110VP43AFTCA/-BFTCA/-BSTCA	110	110	185	200	JJS-200	200	10
G	VFD150VP43AFTCA/-BFTCA/-BSTCA	150	150	265	300	JJS-300	300	10

Frame	Model	Rated Output Current (A)	Rated Input Current (A)	MC/ACB Selection (A)	NFB (A)	Fuse Selection	Fuse Current (A)	UL61800-5-1 SCCR (kA)
H	VFD180VP43AFTCA/-BFTCA/-BSTCA	180	180	265	300	JJS-350	350	10
	VFD220VP43AFTCA/-BFTCA/-BSTCA	220	220	330	400	JJS-400	400	10
I	VFD260VP43AFTCA/-BFTCA/-BSTCA	260	260	400	500	JJS-500	500	10
	VFD310VP43AFTCA/-BFTCA/-BSTCA	310	310	500	600	JJS-600	600	18
J	VFD370VP43AFTCA/-BFTCA/-BSTCA	370	370	630	600	JJS-600	600	18
	VFD395VP43AFTCA/-BFTCA/-BSTCA	395	395	630	800	JJS-600	600	18
K	VFD460VP43AFTCA/-BFTCA/-BSTCA	460	460	800	800	KTU-800	800	18
	VFD485VP43AFTCA/-BFTCA/-BSTCA	481	481	800	1000	KTU-800	800	18
L	VFD530VP43SHTCA	530	530	800	1000	KTU-1100	1100	18
	VFD616VP43SHTCA	616	616	1000	1200	KTU-1200	1200	30
	VFD683VP43SHTCA	683	683	1000	1350	KTU-1400	1400	30
	VFD770VP43SHTCA	770	770	1250	1500	KTU-1600	1600	30
M	VFD866VP43SHTCA	866	866	1500	1500	KTU-1800	1800	42
	VFD930VP43SHTCA	930	930	1600	2000	KTU-1800	1800	42
	VFD1K1VP43SHTCA	1100	1100	2000	2000	KTU-2000	2000	42
	VFD1K2VP43SHTCA	1212	1212	2000	2000	KTU-2400	2400	42

Table 3-2

3-3 Main Circuit Terminals

3-3-1 Remove the Cover for Wiring

Remove the top cover before wiring the multi-function input and output terminals (except Frame L and M).

NOTE: The drive appearances shown in the figures are for reference only, a real drive may look different.

Frame A–G

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

Loosen the screws and press the tabs on both sides to remove the cover.

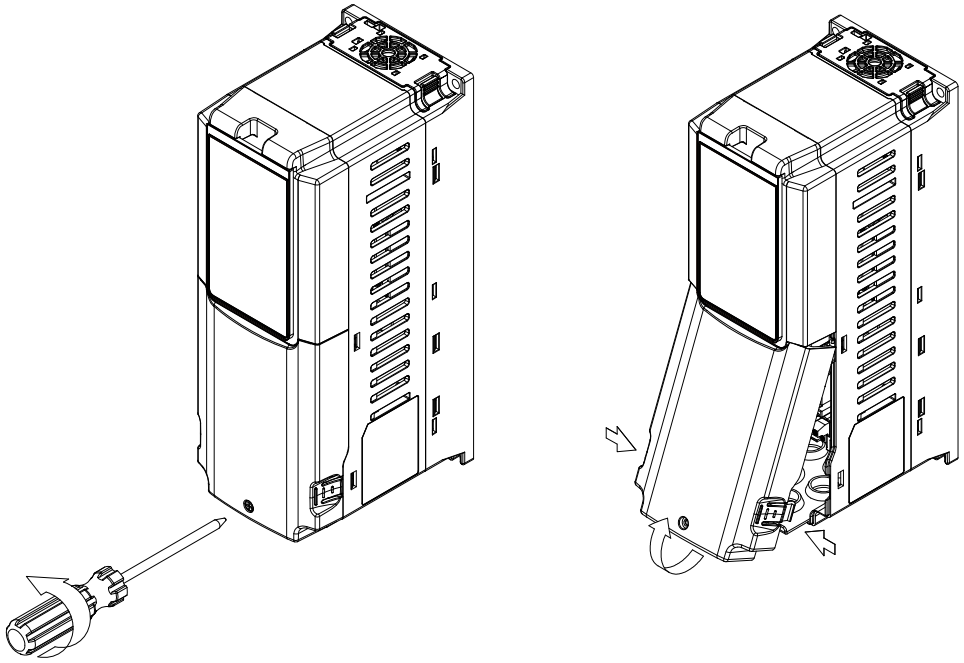


Figure 3-5

Frame H–I

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

Loosen the screws and press the tabs on both sides to remove the cover.

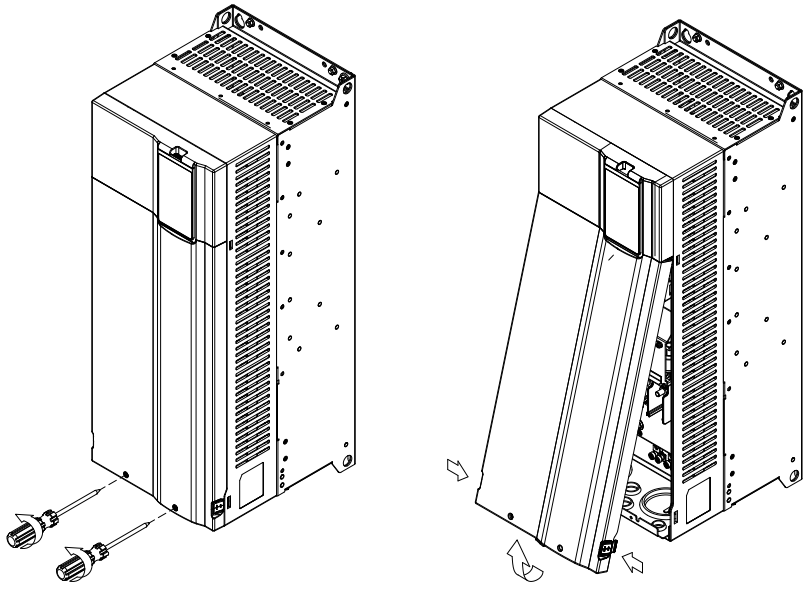


Figure 3-6

Frame J–K

Screw torque: 14–16 kg-cm / (12.15–13.89 lb-in.) / (1.4–1.6 Nm)

Loosen the screws and remove the top cover.

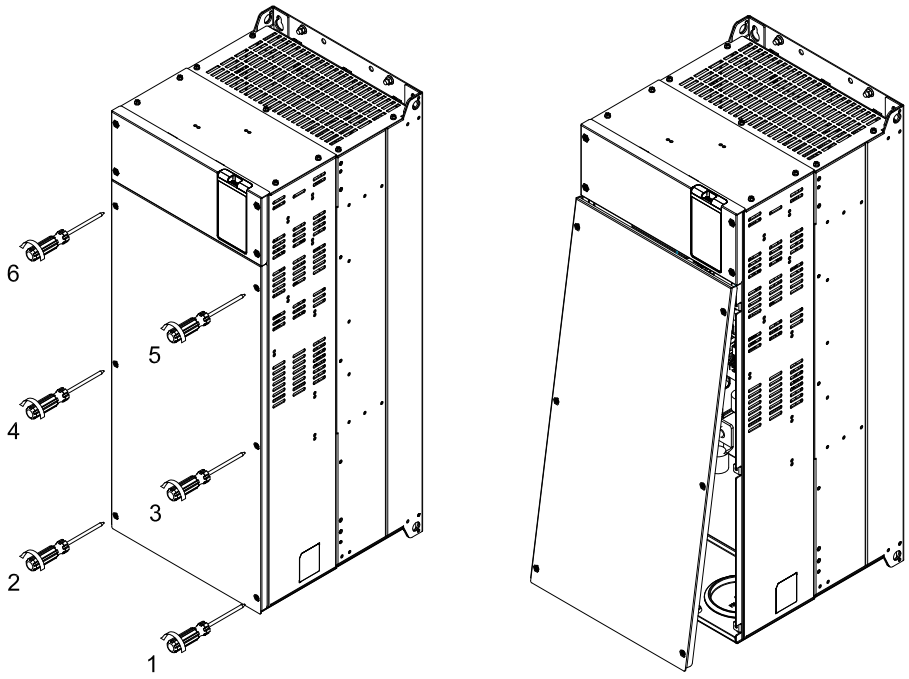


Figure 3-7

Frame L–M

You can wire the main circuit terminals without removing the top cover.

Screw torque: 14–16 kg-cm / (12.15–13.89 lb-in.) / (1.4–1.6 Nm)

Loosen the screws and remove the cover for wiring the control terminals.

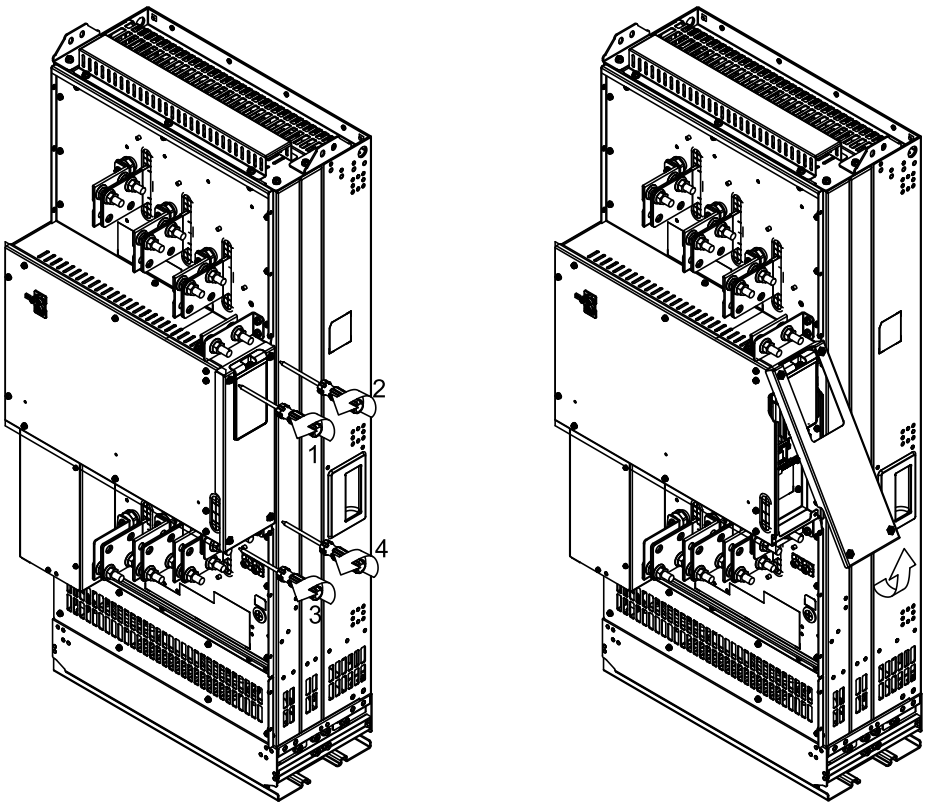


Figure 3-8

3-3-2 Wiring

Applicable for all frame models

Input: three-phase power

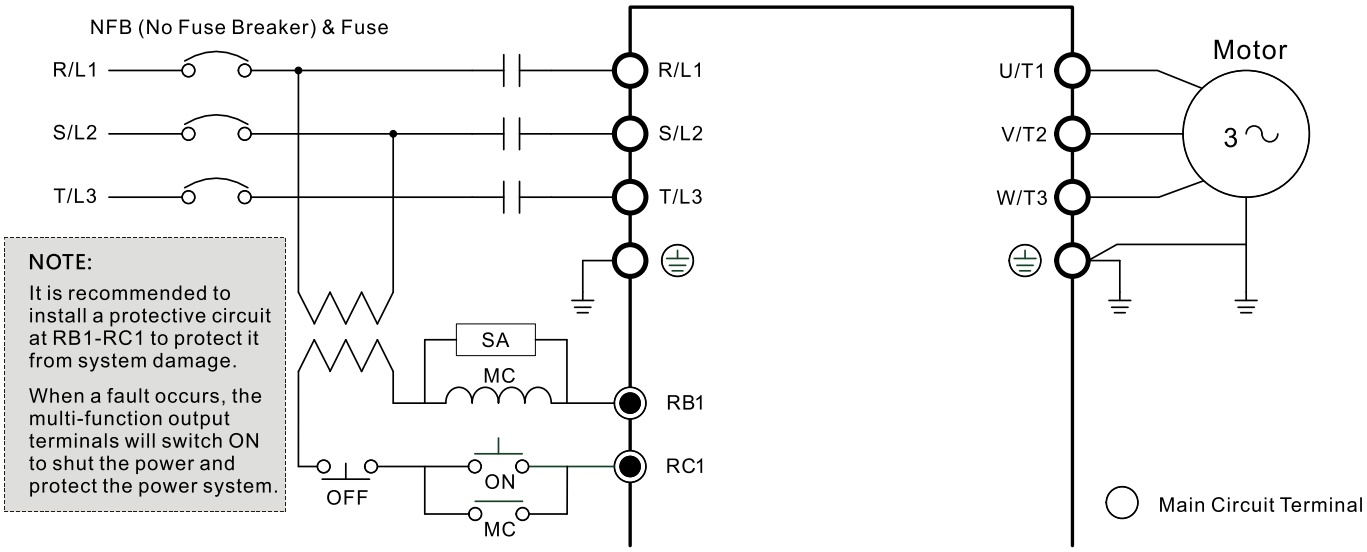


Figure 3-9

NOTE: When the wiring between the motor and the drive exceeds 75m, refer to Section 10-3-2 Motor Wiring Length for the cable length specification.

Terminal	Description
R/L1, S/L2, T/L3	Power input terminal (three-phase)
U/T1, V/T2, W/T3	AC motor drive output terminals for connecting three-phase induction motor
⏚	Ground connection, comply with local regulations.

Table 3-3

3-3-3 Terminal Specification

Pin Terminal / Tube Terminal

- Use the specified ring lug for main circuit terminal wiring. See Figure 3-10 for pin terminal and tube terminal specifications. For other types of wiring, use the wires that comply with the local regulations.

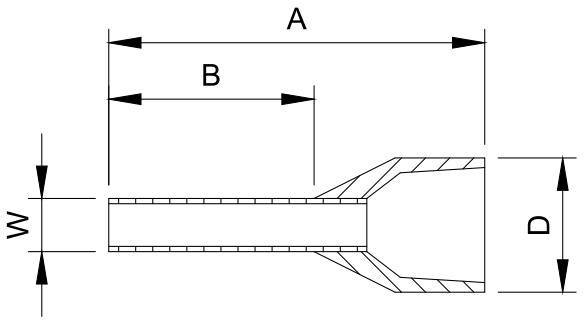


Figure 3-10

Pin Terminal / Tube Terminal Specification

The part number of the pin terminal / tube terminal (produced by K.S. Terminals Inc.) in the table below are for reference only. You can buy pin terminals/ tube terminals of your choice to match with different frame sizes. For Frame G–F, refer to the ring lug terminal specifications in the table below.

Unit: mm

Frame	AWG	Kit P/N		A (REF)	B (MAX)	D (MAX)	W (MAX)
		Pin Terminal	Tube Terminal				
A	10 AWG	PTNY5-13	-	23.8	14	7	3.2
	12 AWG	PTNY5-13	E4012				
	14 AWG	PTNY2-13	E2512				
	16 AWG	PTNY2-13	E1512				
	18 AWG	PTNY1-13	E1012				
B	10 AWG	PTNY5-13	-	23.8	14	7	3.2
	12 AWG	PTNY5-13	E4012				
	14 AWG	PTNY2-13	E2512				
	16 AWG	PTNY2-13	E1512				
	18 AWG	PTNY1-13	E1012				
C	8 AWG	PTNYB10-12	E10-12	34	14	7	4.9
D	4 AWG	PTNYB25-15	E25-18	40.4	19	12	7
	6 AWG	PTNYB16-13	E16-18				
E	1 AWG	PTNYB50-20	E50-20	40.4	21	15	11
	2 AWG	PTNYB35-20	E35-22				
	3 AWG	PTNYB35-20	E35-22				
	6 AWG	PTNYB16-13	E16-18				
F	1/0 AWG	PTNYB50-20	E50-20	52.5	21	15	11
	3 AWG	PTNYB35-20	E35-22				

Table 3-4

Ring Lug Terminal

- Use the specified ring lug for main circuit terminal wiring. See Figure 3-11 and Figure 3-12 for ring lug specifications. For other types of wiring, use the wires that comply with the local regulations.
- After crimping the wire to the ring lug (must be UL approved), UL and CSA approved recognized component (YDPU2/8), install heat shrink tube rated at a minimum of 600 V_{AC} insulation over the live part. Refer to Figure 3-12.

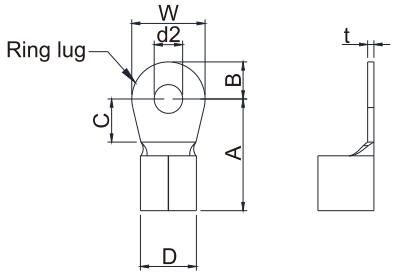


Figure 3-11

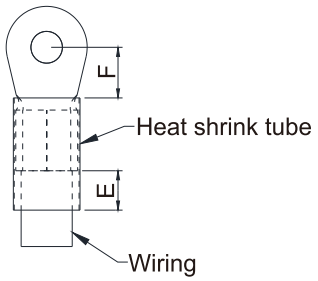


Figure 3-12

Ring Lug Terminal Specification

The part number of the ring lugs (produced by K.S. Terminals Inc.) in the table below are for reference only. You can buy the ring lugs of your choice to match with different frame sizes. Frame A–F are designed for European terminal blocks, and the specifications in the table below are not applicable.

Unit: mm

Frame	AWG/MCM	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
G	2 AWG	SQNBS38-8	39	11.5	12	22	8.4	15	12	22	1.3
H	1/0 AWG	SQNBS60-8	40	12	12.6	25.6	8.4	15	12.6	25.6	4
	2 AWG	SQNBS38-8									
I	3/0 AWG	SQNBS80-8	42	12	16	28	8.4	15	16	28	4.3
	4/0 AWG	SQNBS100-8									
	250 MCM	SQNBS125-8									
J	250 MCM	SQNBS125-8	53	12	16	36	8.4	15	16	36	4
	300 MCM	SQNBS150-8									
K	350 MCM	SQNBS180-10	70	19	16	39.6	10.5	15	16	44	4.8
	400 MCM	SQNBS250-10									
L	2/0 AWG	TLK70-12	58.5	30	13	31	13	15	13	31	5.5
	3/0 AWG	TLK95-12									
	4/0 AWG	TLK120-12									
	250 MCM	TLK150-12									
	300 MCM	TLK150-12									
M	300 MCM	TLK150-12	91.5	30	13	43	13	15	13	43	5.9
	350 MCM	TLK185-12									
	500 MCM	TLK300-12									

NOTE:

Table 3-5

*1. AWG: Refer to the tables below for wire specifications of each frame model.
*2. F(MAX.) = 16.5

AMBD POWER Terminal Specification

Frame	AWG/MCM	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
I~M	16~20 AWG	RNYBL1-4	18	3.8	7	6	4.3	11	7	8	0.75

Table 3-6

Frame A1

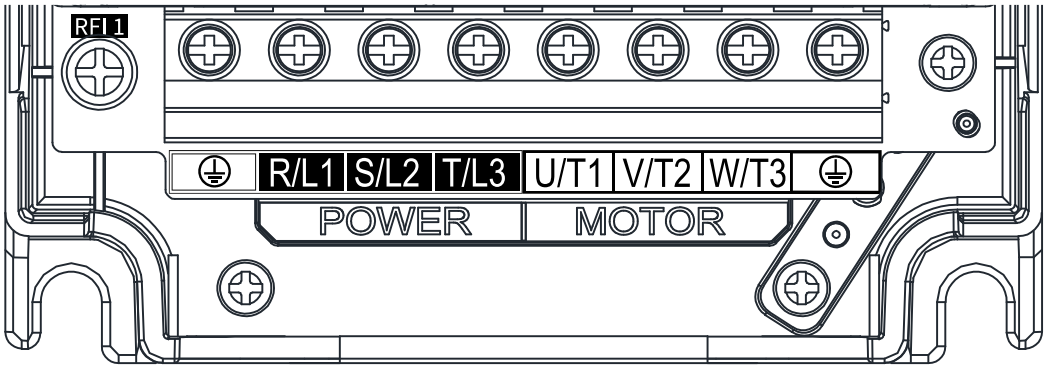


Figure 3-13

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 7–8 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD3A0VP43ANTAA	6 mm^2 (10 AWG)	0.75 mm^2 (18 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)	6 mm^2 (10 AWG)	2.5 mm^2 (14 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)
VFD4A2VP43ANTAA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD5A6VP43ANTAA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD7A2VP43ANTAA		2.5 mm^2 (14 AWG)			2.5 mm^2 (14 AWG)	
VFD011VP43ANTAA		4.0 mm^2 (12 AWG)			4.0 mm^2 (12 AWG)	

Table 3-7

Frame A2

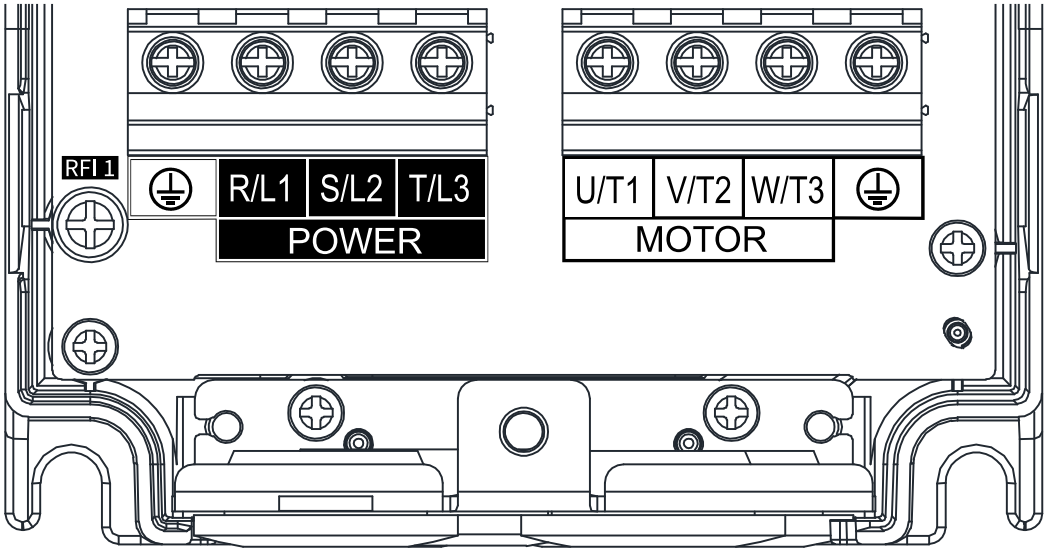


Figure 3-14

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 7–8 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD3A0VP43BFTAA	6 mm^2 (10 AWG)	0.75 mm^2 (18 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)	6 mm^2 (10 AWG)	2.5 mm^2 (14 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)
VFD4A2VP43BFTAA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD5A6VP43BFTAA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD7A2VP43BFTAA		2.5 mm^2 (14 AWG)			2.5 mm^2 (14 AWG)	
VFD011VP43BFTAA		4.0 mm^2 (12 AWG)			4.0 mm^2 (12 AWG)	

Table 3-8

Frame B1

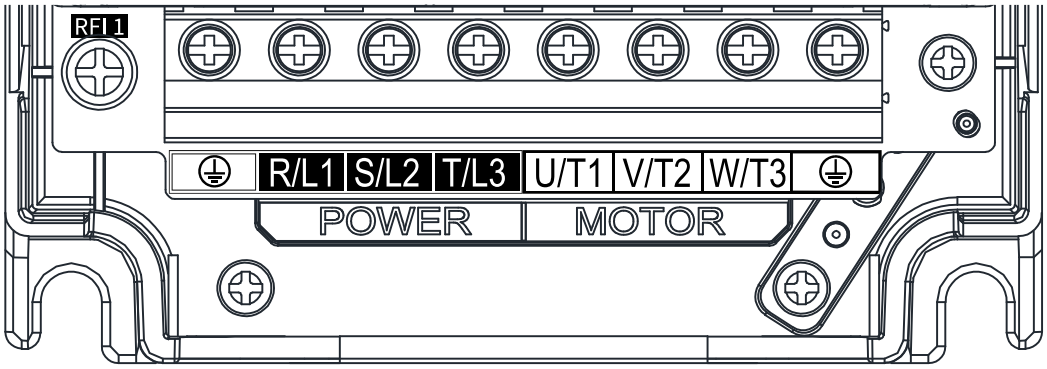


Figure 3-15

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- For VFD018VP43ANTAA models: if you install at Ta 40°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 7–8 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD013VP43ANTAA	6 mm^2 (10 AWG)	6 mm^2 (10 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)	6 mm^2 (10 AWG)	6 mm^2 (10 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)
VFD018VP43ANTAA		6 mm^2 (10 AWG)			6 mm^2 (10 AWG)	

Table 3-9

Frame B2

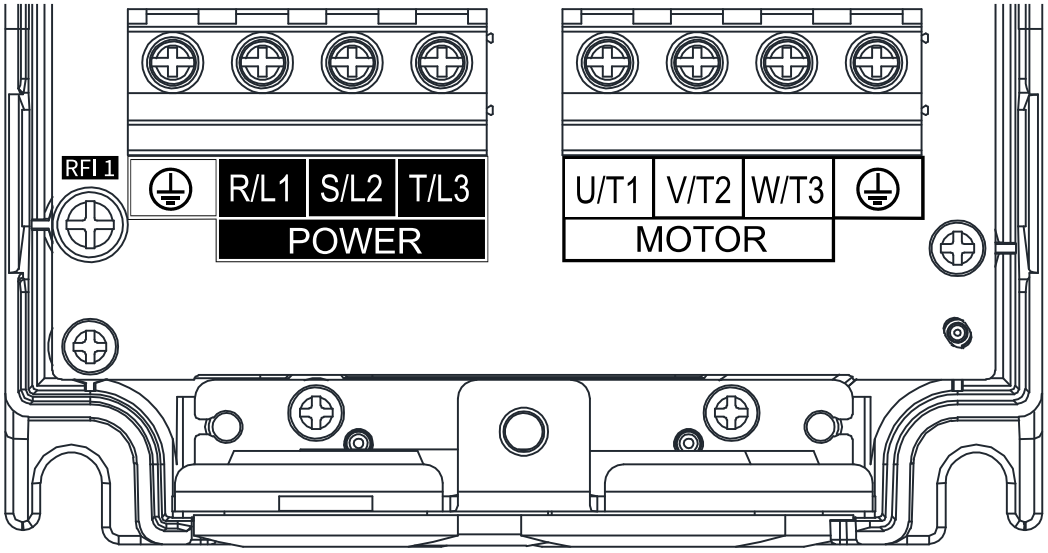


Figure 3-16

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- For VFD018VP43BFTAA models: if you install at Ta 40°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 7–8 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD013VP43BFTAA	6 mm^2 (10 AWG)	6 mm^2 (10 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)	6 mm^2 (10 AWG)	6 mm^2 (10 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)
VFD018VP43BFTAA		6 mm^2 (10 AWG)			6 mm^2 (10 AWG)	

Table 3-10

Frame B3

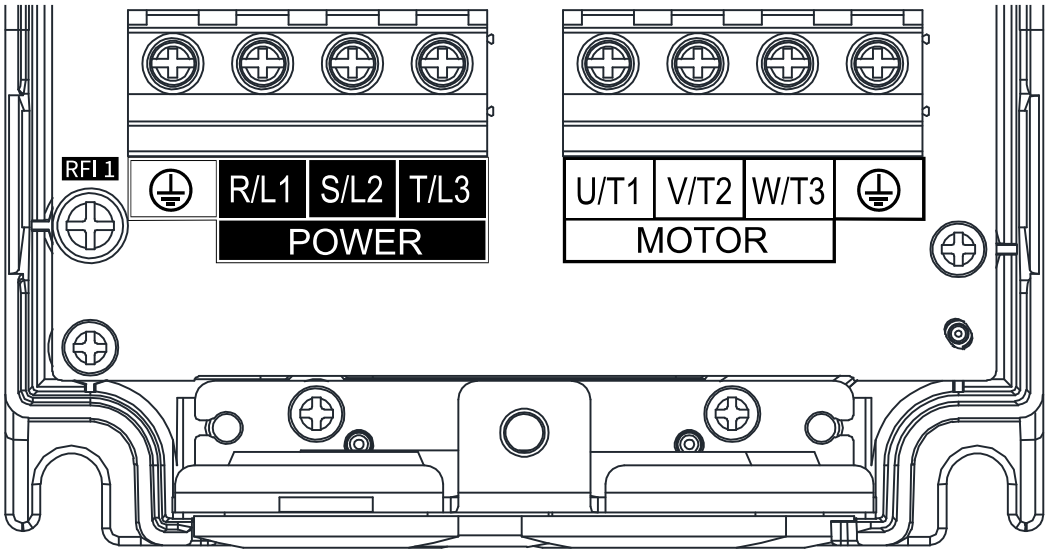


Figure 3-17

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- For VFD018VP43BSTCA models: if you install at Ta 40°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 7–8 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD3A0VP43BSTCA	6 mm^2 (10 AWG)	0.75 mm^2 (18 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)	6 mm^2 (10 AWG)	2.5 mm^2 (14 AWG)	6 kg-cm (5.2 lb-in.) (0.59 Nm)
VFD4A2VP43BSTCA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD5A6VP43BSTCA		1.5 mm^2 (16 AWG)			2.5 mm^2 (14 AWG)	
VFD7A2VP43BSTCA		2.5 mm^2 (14 AWG)			2.5 mm^2 (14 AWG)	
VFD011VP43BSTCA		4.0 mm^2 (12 AWG)			4.0 mm^2 (12 AWG)	
VFD013VP43BSTCA		6 mm^2 (10 AWG)			6 mm^2 (10 AWG)	
VFD018VP43BSTCA		6 mm^2 (10 AWG)			6 mm^2 (10 AWG)	

Table 3-11

Frame C1

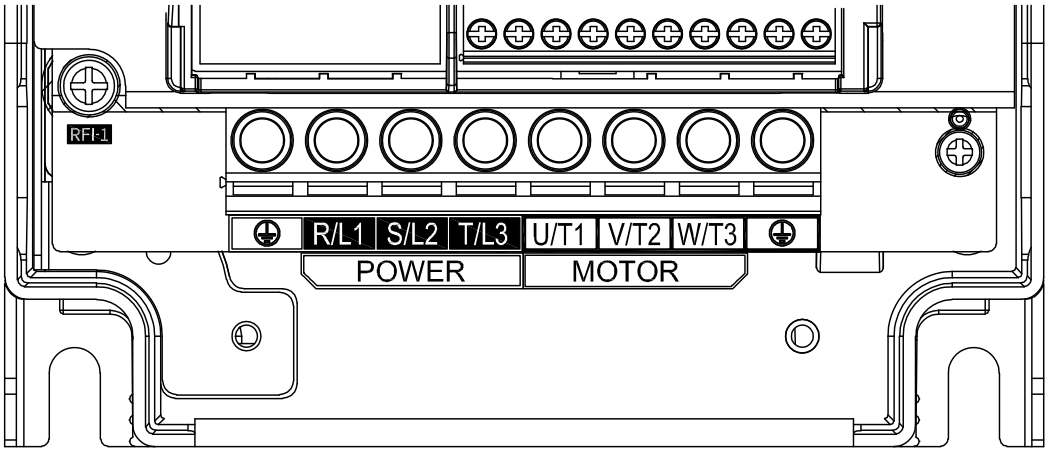


Figure 3-18

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 11–12 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD025VP43ANTAA	10 mm^2 (8 AWG)	10 mm^2 (8 AWG)	12 kg-cm (10.4 lb-in.) (1.18 Nm)	10 mm^2 (8 AWG)	10 mm^2 (8 AWG)	12 kg-cm (10.4 lb-in.) (1.18 Nm)
VFD032VP43ANTAA		10 mm^2 (8 AWG)			10 mm^2 (8 AWG)	
VFD038VP43ANTAA	16 mm^2* (6 AWG)	10 mm^2 (8 AWG)		16 mm^2 (6 AWG)	10 mm^2 (8 AWG)	

NOTE: * Only bare wire can be used for 6 AWG wire gauge. Table 3-12

Frame C2

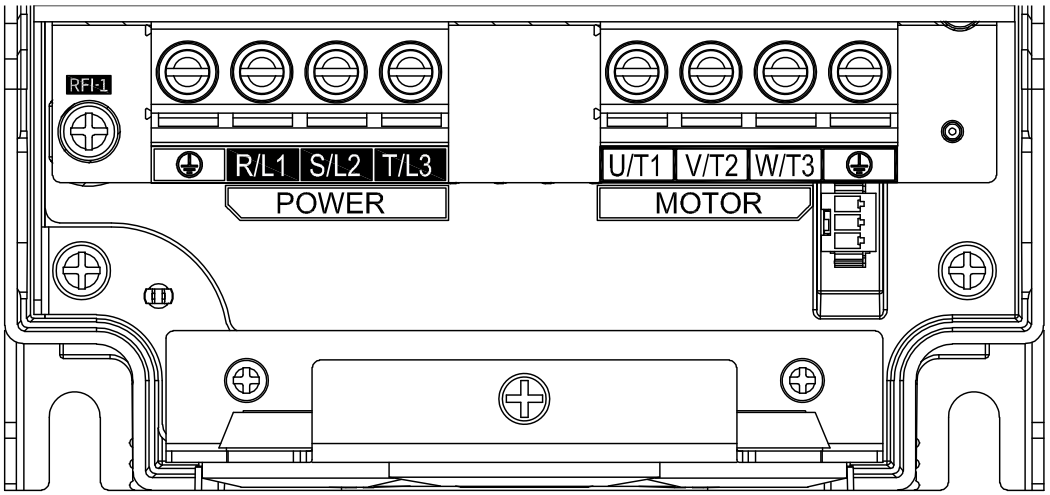


Figure 3-19

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 11–12 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD025VP43BFTAA	10 mm² (8 AWG)	10 mm² (8 AWG)	12 kg-cm (10.4 lb-in.) (1.18 Nm)	10 mm² (8 AWG)	10 mm² (8 AWG)	12 kg-cm (10.4 lb-in.) (1.18 Nm)
VFD032VP43BFTAA		10 mm² (8 AWG)			10 mm² (8 AWG)	
VFD025VP43BSTCA		10 mm² (8 AWG)			10 mm² (8 AWG)	
VFD032VP43BSTCA		10 mm² (8 AWG)			10 mm² (8 AWG)	
VFD038VP43BFTAA	16 mm²* (6 AWG)	10 mm² (8 AWG)		16 mm² (6 AWG)	10 mm² (8 AWG)	
VFD038VP43BSTCA		10 mm² (8 AWG)			10 mm² (8 AWG)	

NOTE: * Only bare wire can be used for 6 AWG wire gauge.

Table 3-13

Frame D1

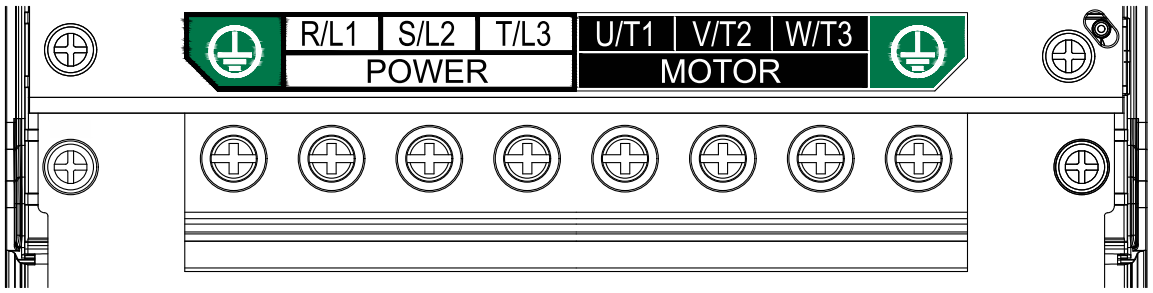


Figure 3-20

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 18–19 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD045VP43ANTCA	25 mm^2 (4 AWG)	16 mm^2 (6 AWG)	39 kg-cm (33.9 lb-in.) (3.82 Nm)	25 mm^2 (4 AWG)	16 mm^2 (6 AWG)	39 kg-cm (33.9 lb-in.) (3.82 Nm)
VFD062VP43ANTCA		25 mm^2 (4 AWG)			16 mm^2 (6 AWG)	

Table 3-14

Frame D2

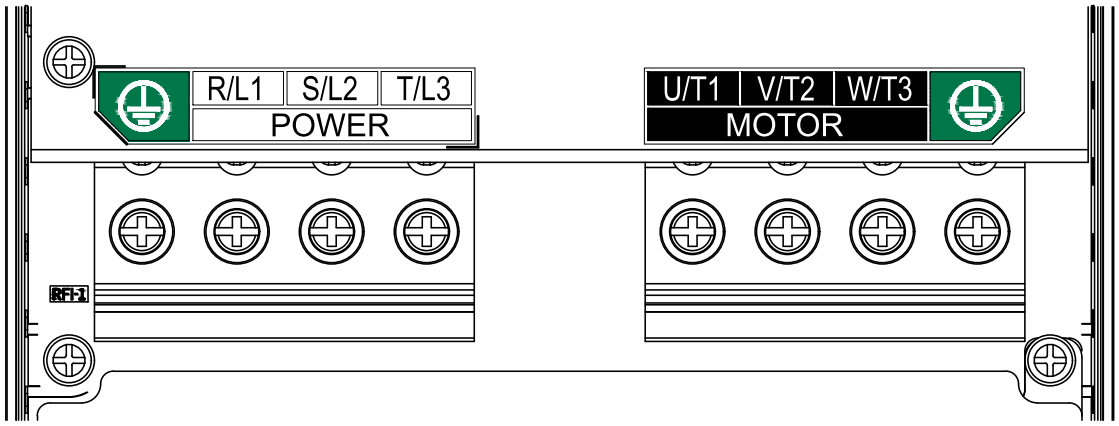


Figure 3-21

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 18–19 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD045VP43BFTCA	25 mm^2 (4 AWG)	16 mm^2 (6 AWG)	39 kg-cm (33.9 lb-in.) (3.82 Nm)	25 mm^2 (4 AWG)	16mm^2 (6 AWG)	39 kg-cm (33.9 lb-in.) (3.82 Nm)
VFD062VP43BFTCA		25 mm^2 (4 AWG)			16mm^2 (6 AWG)	
VFD045VP43BSTCA		16 mm^2 (6 AWG)			16mm^2 (6 AWG)	
VFD062VP43BSTCA		25 mm^2 (4 AWG)			16mm^2 (6 AWG)	

Table 3-15

Frame E1

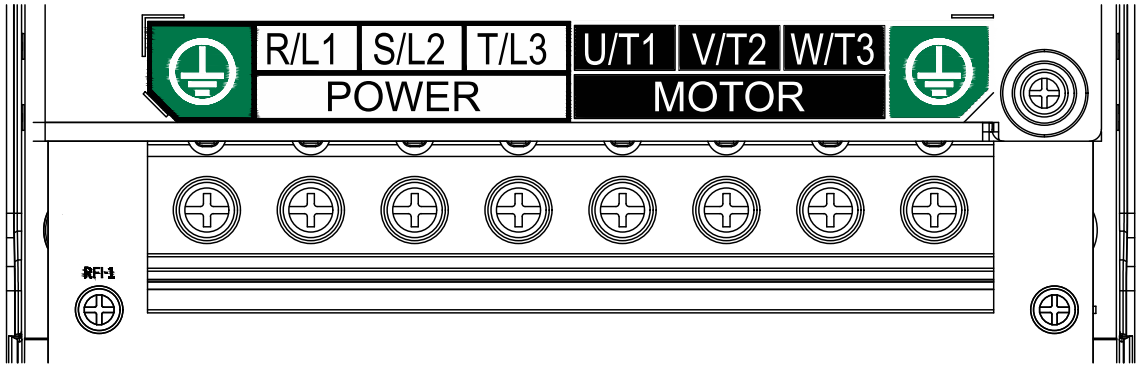


Figure 3-22

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 19–21 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD073VP43ANTCA	50 mm^2 (1 AWG)	35 mm^2 (3 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)	50 mm^2 (1 AWG)	16 mm^2 (6 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)
VFD090VP43ANTCA		35 mm^2 (2 AWG)			16 mm^2 (6 AWG)	

Table 3-16

Frame E2

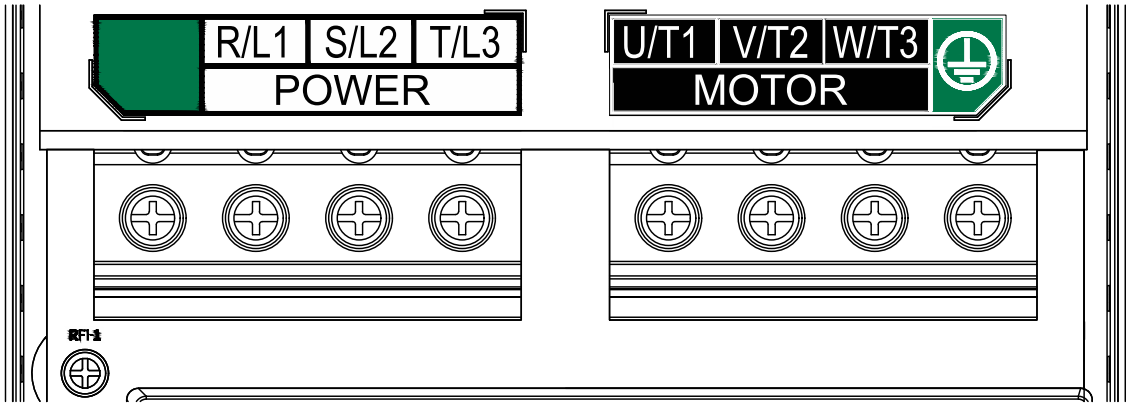


Figure 3-23

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 19–21 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD073VP43BSTCA	50 mm^2 (1 AWG)	35 mm^2 (3 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)	50 mm^2 (1 AWG)	16 mm^2 (6 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)
VFD090VP43BSTCA		35 mm^2 (2 AWG)			16 mm^2 (6 AWG)	
VFD073VP43BFTCA		35 mm^2 (3 AWG)			16 mm^2 (6 AWG)	
VFD090VP43BFTCA		35 mm^2 (2 AWG)			16 mm^2 (6 AWG)	

Table 3-17

Frame F1

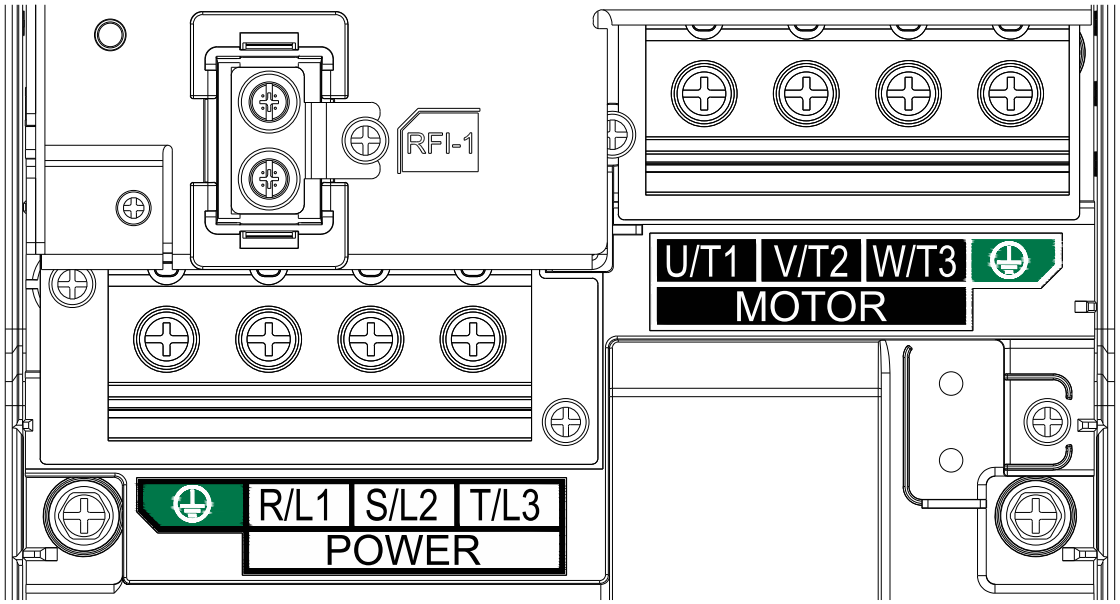


Figure 3-24

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 19–21 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD110VP43AFTCA	50 mm^2 (1/0 AWG)	50 mm^2 (1/0 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)	50 mm^2 (1/0 AWG)	25 mm^2 (3 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)

Table 3-18

Frame F2

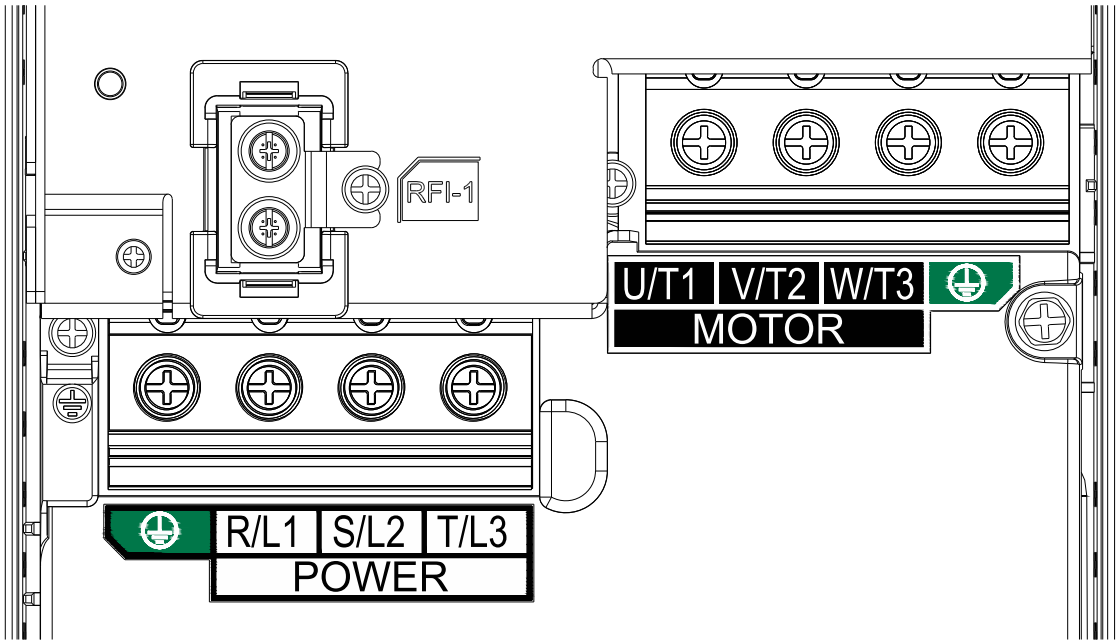


Figure 3-25

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- Stripping length: 19–21 mm

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD110VP43BFTCA	50 mm^2 (1/0 AWG)	50 mm^2 (1/0 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)	50 mm^2 (1/0 AWG)	25 mm^2 (3 AWG)	56 kg-cm (48.7 lb-in.) (5.50 Nm)
VFD110VP43BSTCA		50 mm^2 (1/0 AWG)			25 mm^2 (3 AWG)	

Table 3-19

Frame G1

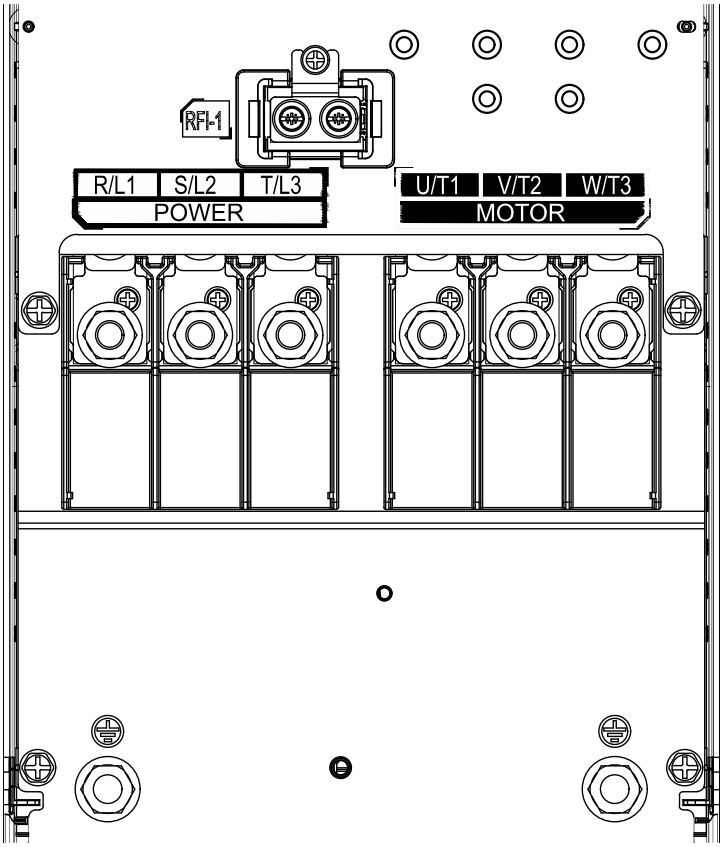


Figure 3-26

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD150VP43AFTCA	35 mm^2*2 (3 AWG*2)	35 mm^2*2 (3 AWG*2)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	35 mm^2 (3 AWG)	35 mm^2 (3 AWG)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)

Table 3-20

Frame G2

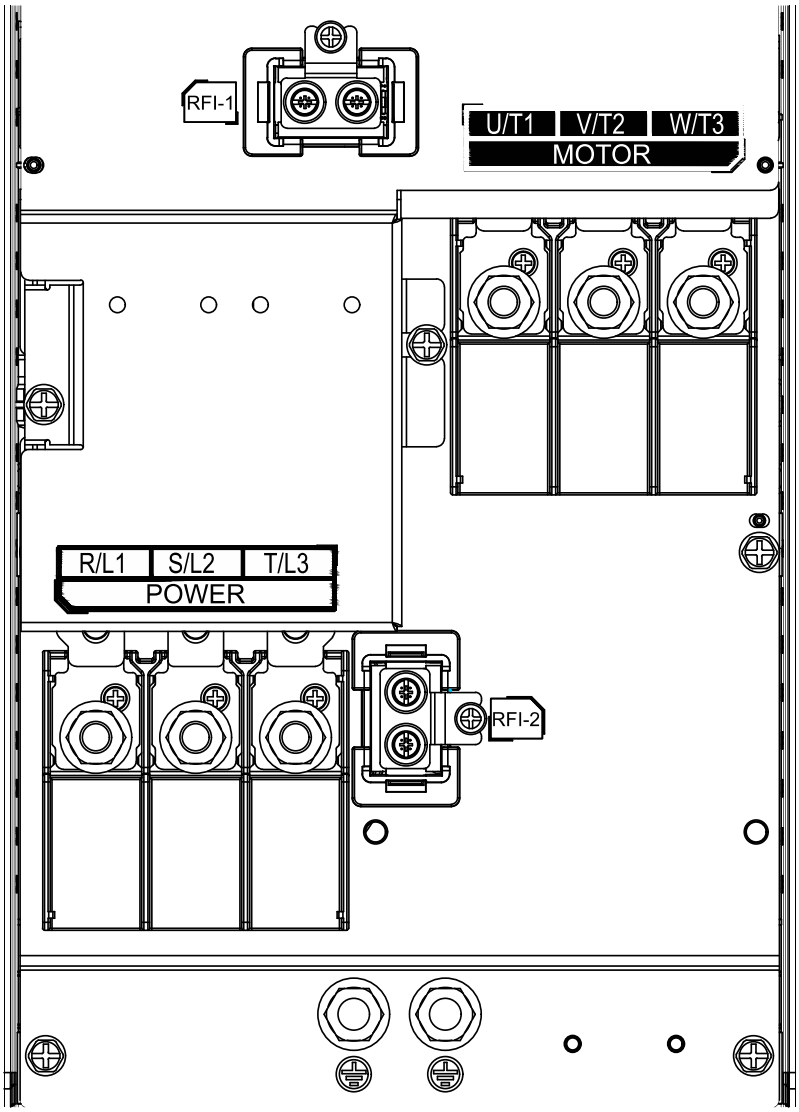


Figure 3-27

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD150VP43BFTCA	35 mm^2*2 (3 AWG*2)	35 mm^2*2 (3 AWG*2)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	35 mm^2 (3 AWG)	35 mm^2 (3 AWG)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)
VFD150VP43BSTCA		35 mm^2*2 (3 AWG*2)		35 mm^2 (3 AWG)	35 mm^2 (3 AWG)	

Table 3-21

Frame H1

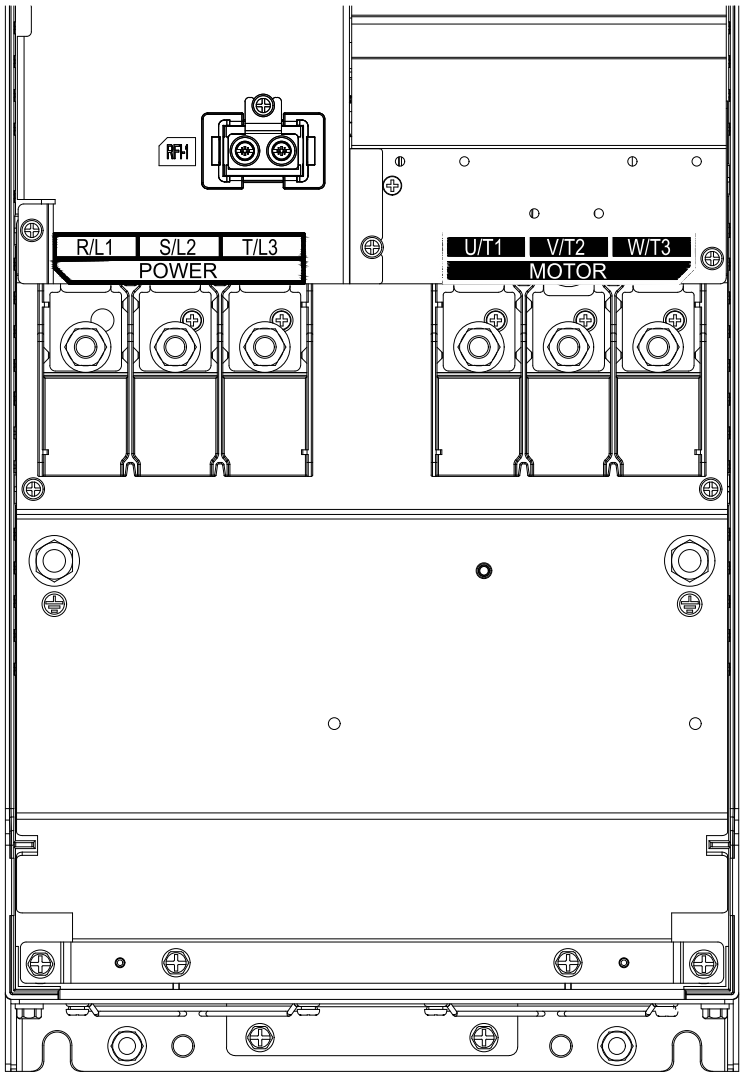


Figure 3-28

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD180VP43AFTCA	50 mm^2*2 (1/0 AWG*2)	35 mm^2*2 (2 AWG*2)	80 kg-cm (69.4 lb-in.) (7.84 Nm)	50 mm^2*2 (1/0 AWG*2)	35 mm^2*2 (2 AWG*2)	80 kg-cm (69.4 lb-in.) (7.84 Nm)
VFD220VP43AFTCA		50 mm^2*2 (1/0 AWG*2)			50 mm^2*2 (1/0 AWG*2)	

Table 3-22

Frame H2

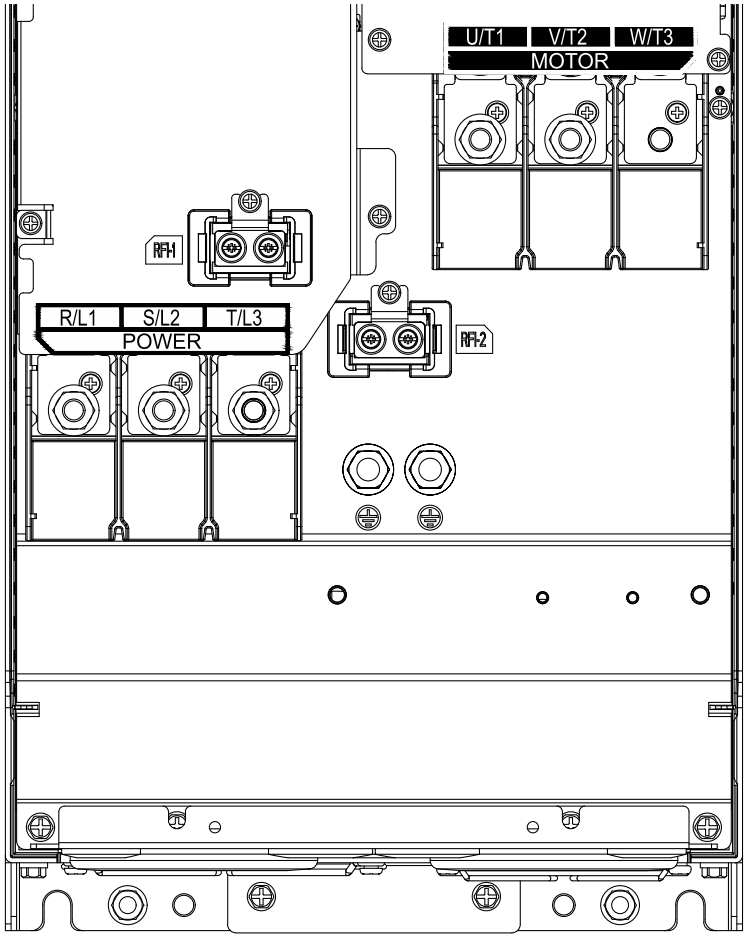


Figure 3-29

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))
VFD180VP43BSTCA	50 mm²*2 (1/0 AWG*2)	35 mm²*2 (2 AWG*2)	80 kg-cm (69.4 lb-in.) (7.84 Nm)	50 mm²*2 (1/0 AWG*2)	35 mm²*2 (2 AWG*2)	80 kg-cm (69.4 lb-in.) (7.84 Nm)
VFD220VP43BSTCA		50 mm²*2 (1/0 AWG*2)			50 mm²*2 (1/0 AWG*2)	
VFD180VP43BFTCA		35 mm²*2 (2 AWG*2)			35 mm²*2 (2 AWG*2)	
VFD220VP43BFTCA		50 mm²*2 (1/0 AWG*2)			50 mm²*2 (1/0 AWG*2)	

Table 3-23

Frame I

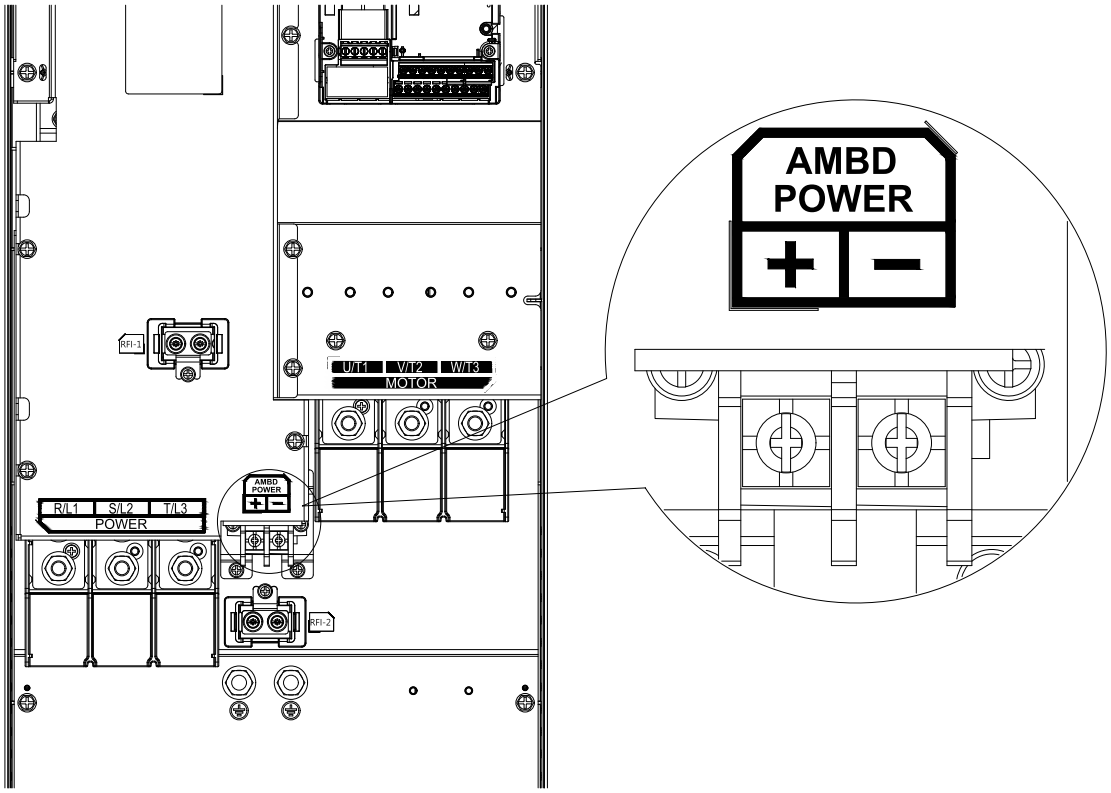


Figure 3-30

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- For AMBD Terminal, use wires that are recognized by UL or IEC with a voltage resistance of 600 V_{AC} or above, and are temperature resistance to 90°C or above.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚			AMBD Terminal		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD260VP43AFTCA	120 mm²*2 (4/0 AWG*2)	70 mm²*2 (2/0 AWG*2)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	120 mm² (4/0 AWG)	70 mm² (2/0 AWG)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	1.5 mm² (16 AWG*1)	0.5 mm² (20 AWG*1)	M4 15 kg-cm (13.1 lb-in.) (1.47 Nm)
VFD310VP43AFTCA		95 mm²*2 (3/0 AWG*2)			95 mm² (3/0 AWG)				
VFD260VP43BFTCA		70 mm²*2 (2/0 AWG*2)			70 mm² (2/0 AWG)				
VFD310VP43BFTCA		95 mm²*2 (3/0 AWG*2)			95 mm² (3/0 AWG)				
VFD260VP43BSTCA		70 mm²*2 (2/0 AWG*2)			70 mm² (2/0 AWG)				
VFD310VP43BSTCA		95 mm²*2 (3/0 AWG*2)			95 mm² (3/0 AWG)				

Table 3-24

Frame J

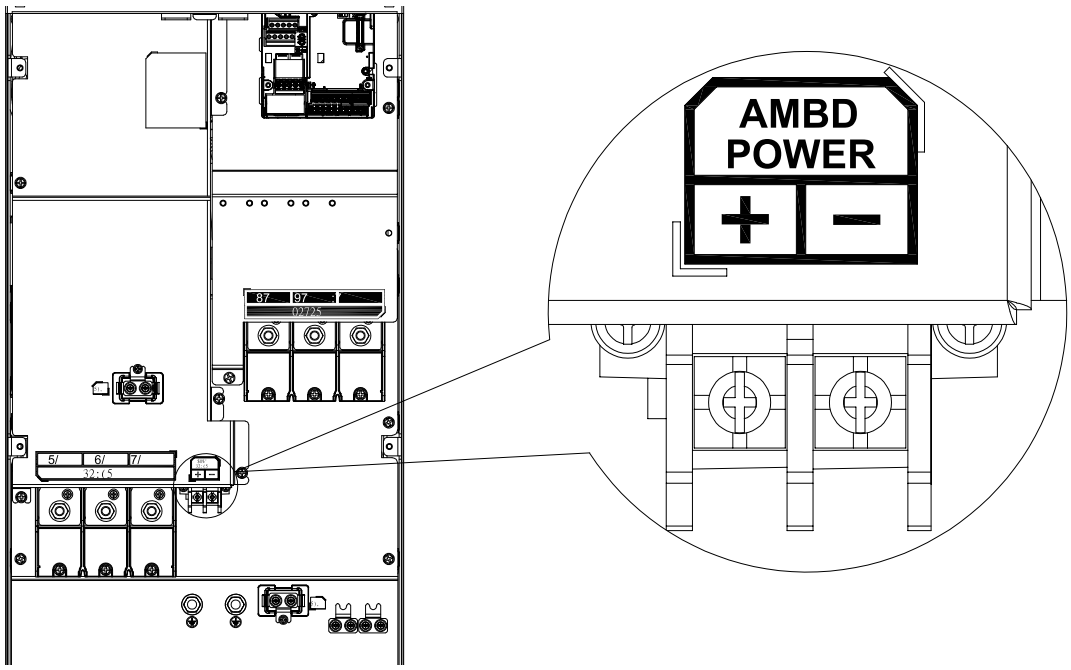


Figure 3-31

- If you install at Ta 45°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- For VFD395VP43xxTCA models: if you install at Ta 45°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- For AMBD Terminal, use wires that are recognized by UL or IEC with a voltage resistance of 600 V_{AC} or above, and are temperature resistance to 90°C or above.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚			AMBD Terminal		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD370VP43AFTCA	150 mm²*2 (300 MCM*2)	120 mm²*2 (250 MCM*2)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	150 mm² (300 MCM)	120 mm² (250 MCM)	M8 92 kg-cm (79.9 lb-in.) (9.02 Nm)	1.5 mm² (16 AWG*1)	0.5 mm² (20 AWG*1)	M4 15 kg-cm (13.1 lb-in.) (1.47 Nm)
VFD395VP43AFTCA		120 mm²*2 (250 MCM*2)		150 mm² (300 MCM)	120 mm² (250 MCM)				
VFD370VP43BFTCA		120 mm²*2 (250 MCM*2)		150 mm² (300 MCM)	120 mm² (250 MCM)				
VFD395VP43BFTCA		120 mm²*2 (250 MCM*2)		150 mm² (300 MCM)	120 mm² (250 MCM)				
VFD370VP43BSTCA		120 mm²*2 (250 MCM*2)		150 mm² (300 MCM)	120 mm² (250 MCM)				
VFD395VP43BSTCA		120 mm²*2 (250 MCM*2)		150 mm² (300 MCM)	120 mm² (250 MCM)				

Table 3-25

Frame K

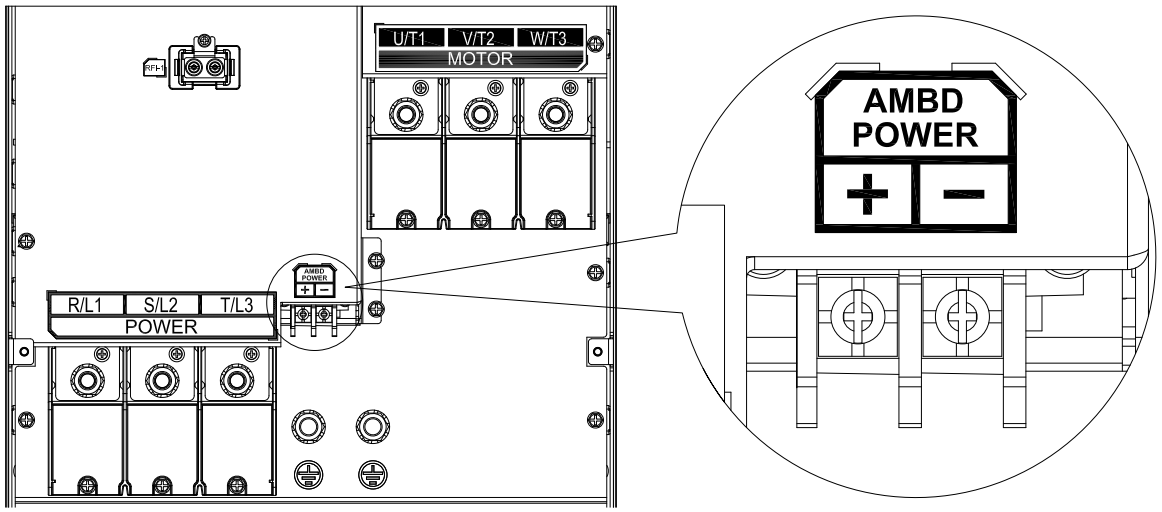


Figure 3-32

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- For AMBD Terminal, use wires that are recognized by UL or IEC with a voltage resistance of 600 V_{AC} or above, and are temperature resistance to 90°C or above.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚			AMBD Terminal		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD460VP43AFTCA	240 mm²*2 (400 MCM*2)	185 mm²*2 (350 MCM*2)	M10 153 kg-cm (132.8 lb-in.) (15.00 Nm)	240 mm² (400 MCM)	185 mm² (350 MCM)	M10 153 kg-cm (132.8 lb-in.) (15.00 Nm)	1.5 mm² (16 AWG*1)	0.5 mm² (20 AWG*1)	M4 15 kg-cm (13.1 lb-in.) (1.47 Nm)
VFD485VP43AFTCA		185 mm²*2 (350 MCM*2)		240 mm² (400 MCM)	185 mm² (350 MCM)				
VFD460VP43BFTCA		185 mm²*2 (350 MCM*2)		240 mm² (400 MCM)	185 mm² (350 MCM)				
VFD485VP43BFTCA		185 mm²*2 (350 MCM*2)		240 mm² (400 MCM)	185 mm² (350 MCM)				
VFD460VP43BSTCA		185 mm²*2 (350 MCM*2)		240 mm² (400 MCM)	185 mm² (350 MCM)				
VFD485VP43BSTCA		185 mm²*2 (350 MCM*2)		240 mm² (400 MCM)	185 mm² (350 MCM)				

Table 3-26

Frame L

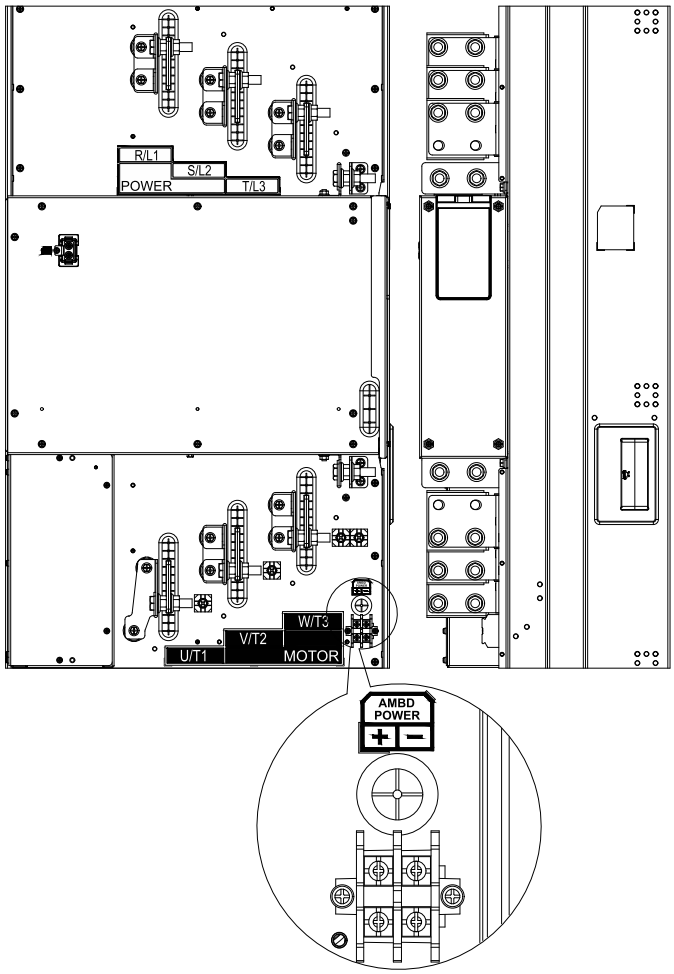


Figure 3-33

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- For AMBD Terminal, use wires that are recognized by UL or IEC with a voltage resistance of 600 V_{AC} or above, and are temperature resistance to 90°C or above.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚			AMBD Terminal		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD530VP43SHTCA	150 mm²*4 (300 MCM*4)	70 mm²*4 (2/0 AWG*4)	M12 360 kg-cm (312.5 lb-in.) (35.28 Nm)	150 mm²*2 (300 AWG*2)	70 mm²*2 (2/0 AWG*2)	M12 360 kg-cm (312.5 lb-in.) (35.28 Nm)	1.5 mm² (16 AWG*1)	0.5 mm² (20 AWG*1)	M4 15 kg-cm (13.1 lb-in.) (1.47 Nm)
VFD616VP43SHTCA		95 mm²*4 (3/0 AWG*4)			95 mm²*2 (3/0 AWG*2)				
VFD683VP43SHTCA		120 mm²*4 (4/0 AWG*4)			120 mm²*2 (4/0 AWG*2)				
VFD770VP43SHTCA		120 mm²*4 (250 MCM*4)			120 mm²*2 (250 MCM*2)				

Table 3-27

Frame M

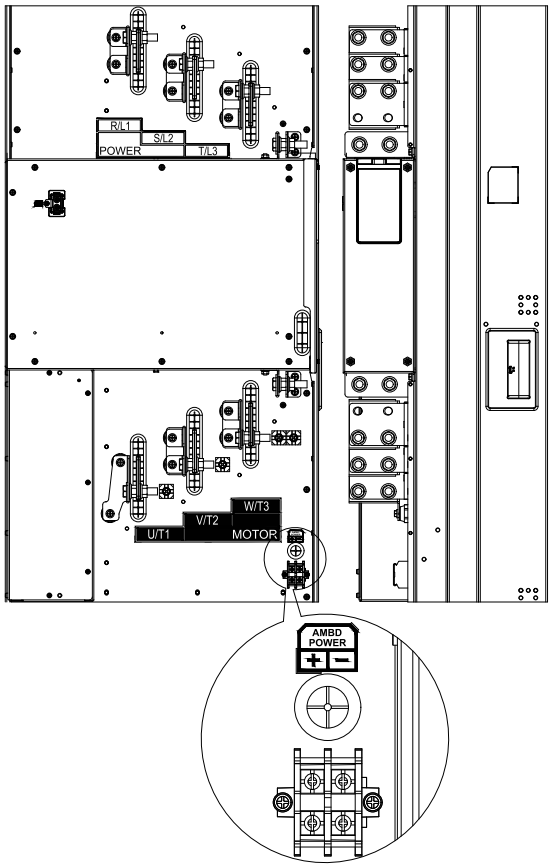


Figure 3-34

- If you install at Ta 50°C environment, use coper wires that have a voltage rating of 600V and are temperature resistance to 75°C or 90°C.
- If you install at Ta 50°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- For VFD1K1VP43SHTCA models: if you install at Ta 45°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- For VFD1K2VP43SHTCA models: if you install at Ta 35°C above environment, use copper wires that have a voltage rating of 600V and are temperature resistance to 90°C or above.
- To be UL installation resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wire.
- For AMBD Terminal, use wires that are recognized by UL or IEC with a voltage resistance of 600 V_{AC} or above, and are temperature resistance to 90°C or above.

Model	Main Circuit Terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3			Terminal ⏚			AMBD Terminal		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%))	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD866VP43SHTCA	240 mm²*4 (500 MCM*4)	150 mm²*4 (300 MCM*4)	M12 360 kg-cm (312.5 lb-in.) (35.28 Nm)	240 mm²*2 (500 MCM*2)	150 mm²*2 (300 MCM*2)	M12 360 kg-cm (312.5 lb-in.) (35.28 Nm)	1.5 mm² (16 AWG*1)	0.5 mm² (20 AWG*1)	M4 15 kg-cm (13.1 lb-in.) (1.47 Nm)
VFD930VP43SHTCA		185 mm²*4 (350 MCM*4)			185 mm²*2 (350 MCM*2)				
VFD1K1VP43SHTCA		240 mm²*4 (500 MCM*4)			240 mm²*2 (500 MCM*2)				
VFD1K2VP43SHTCA		240 mm²*4 (500 MCM*4)			240 mm²*2 (500 MCM*2)				

Table 3-28

3-4 Control Circuits

3-4-1 Wiring

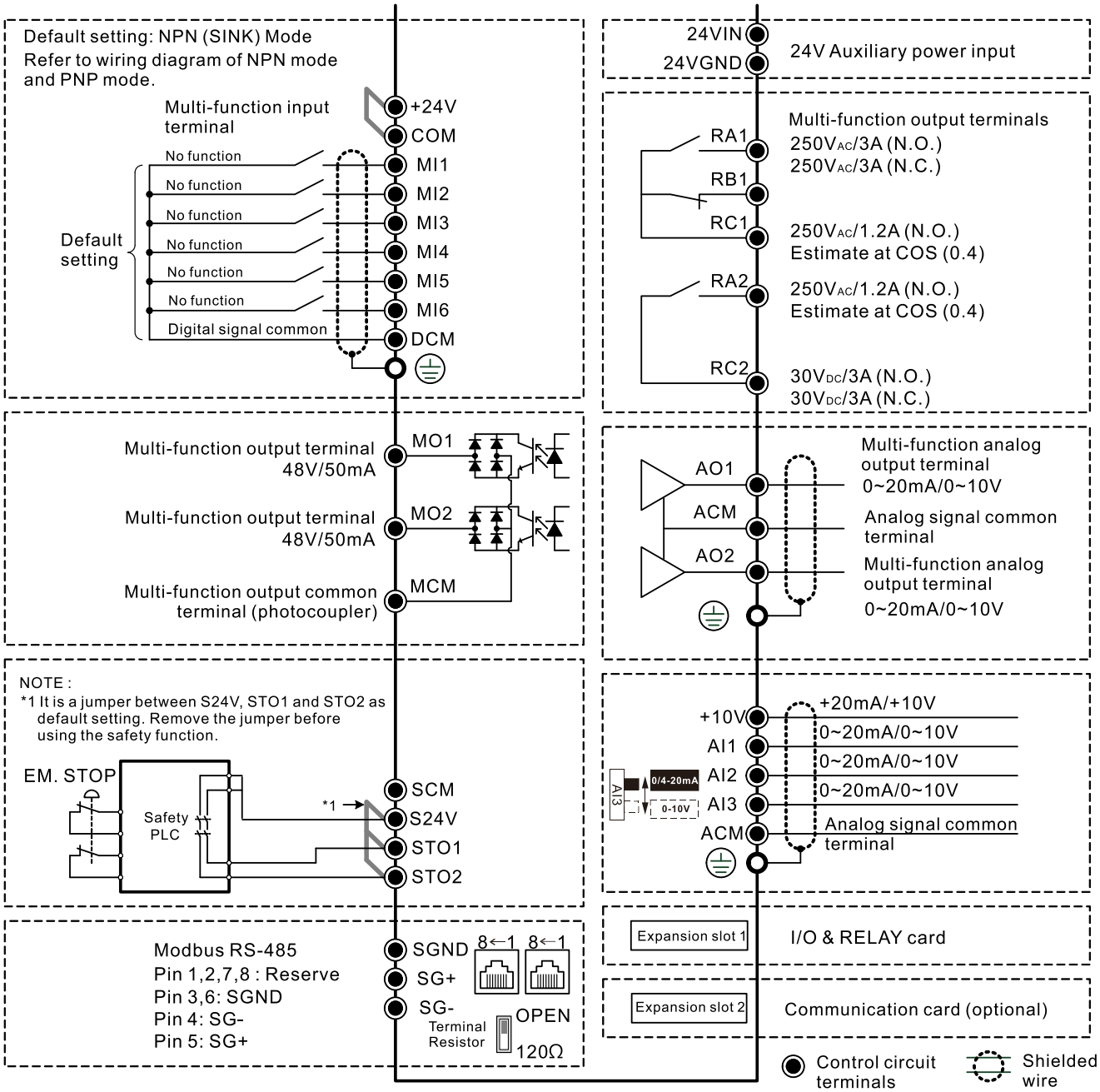


Figure 3-35

- SINK (NPN) / SOURCE (PNP) Mode

Sink Mode

With internal power (+24 V_{DC})

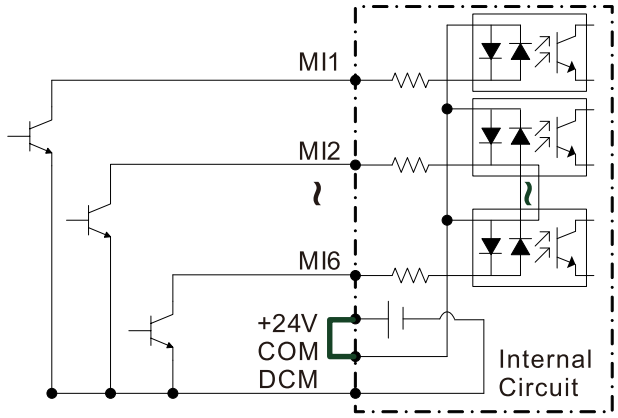


Figure 3-36

Source Mode

With internal power (+24 V_{DC})

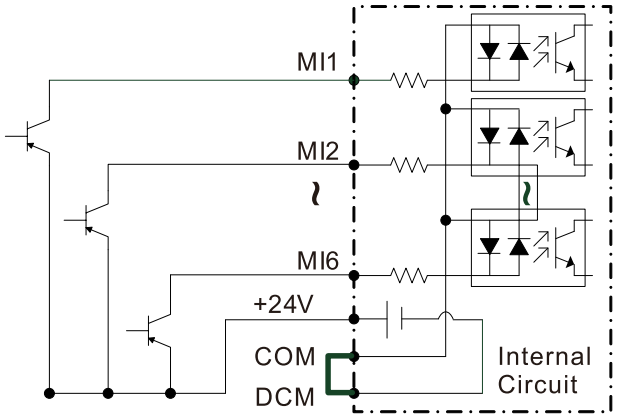


Figure 3-37

Sink Mode

With external power

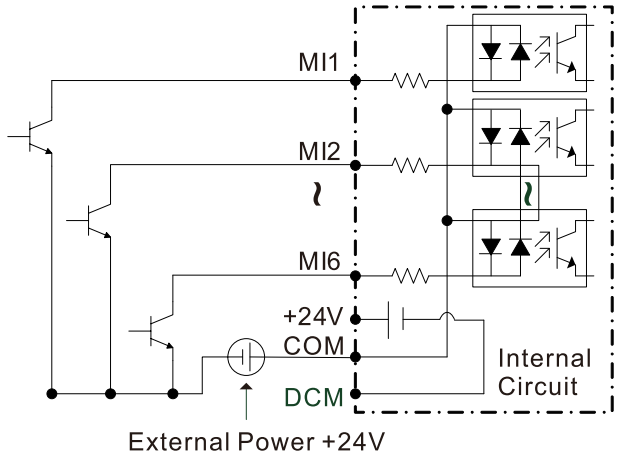


Figure 3-38

Source Mode

With external power

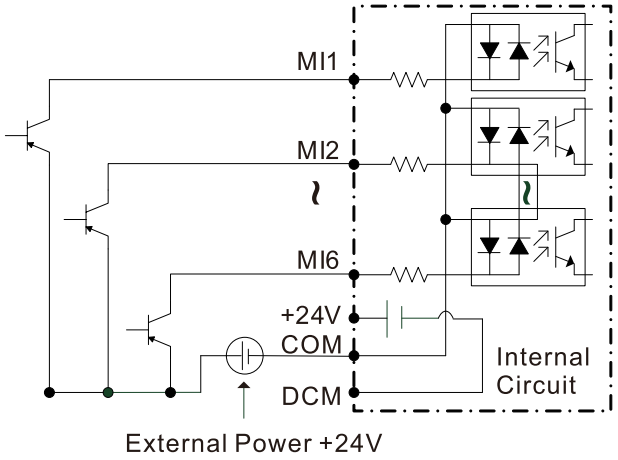


Figure 3-39

3-4-1-1 The Wiring of Multi-pump Controlled Communication Cable

To use multi-pump function, you have to connect the first RS-485 port of each station in parallel (SG+/ SG-) or use a network cable to plug into the RJ45 communication port of each station.

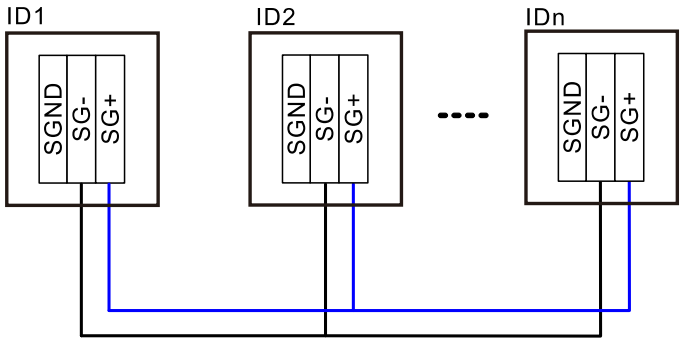


Figure 3-40

3-4-1-2 The Wiring of Pressure Sensor

Set multi-master for the auto-change pump system, if require using the pressure feedback sensor signals to control the constant pressure in system, both master station and backup master station must have pressure signals feedback*[1]. In the situation, you can set one more pressure sensor for transferring feedback signals to the backup master station, or master station and backup master station use the same one.

NOTE: *[1] If the feedback signal type is ACI, you must select AI3 for connection to ensure normal function. The AI3 signal type (Pr.G2-41) should be set as the same as the AI3 analog input switch, the default of these two are both 4–20 mA signal type.

Single pump: one pressure sensor to one drive

AI1–AI3 are optional terminals. The following demonstration takes AI1 as the example, the default 0–10 V can be set through Pr.G2-03.

- ACI

Sensor using internal power	Sensor using external power

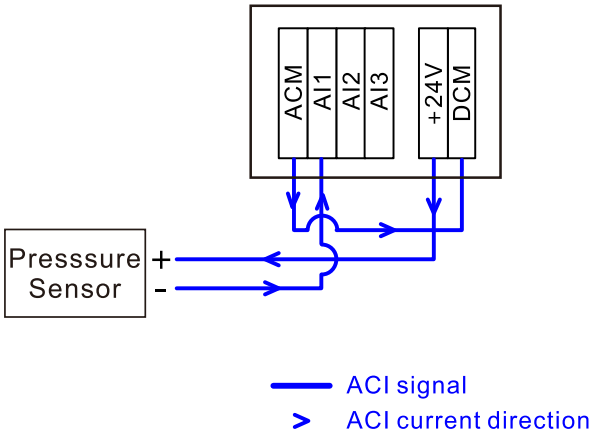
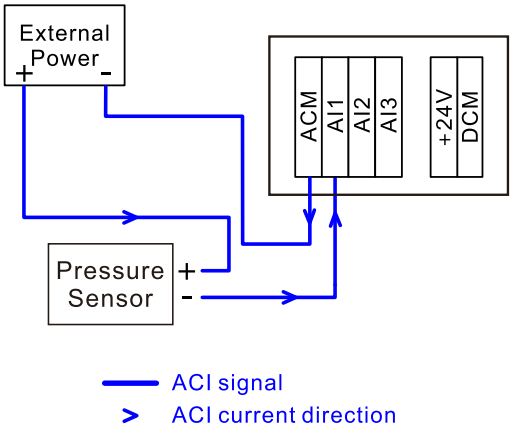

	

Figure 3-41	Figure 3-42

- AVI

Sensor using internal power

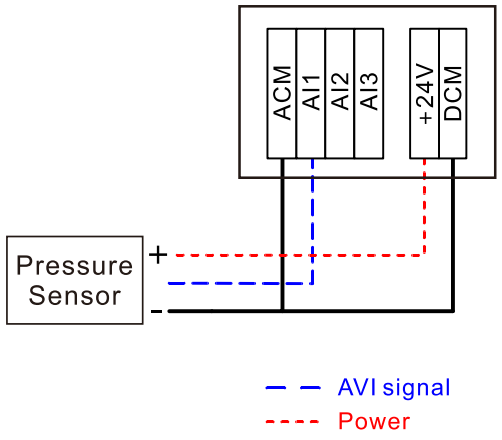


Figure 3-43

Sensor using external power

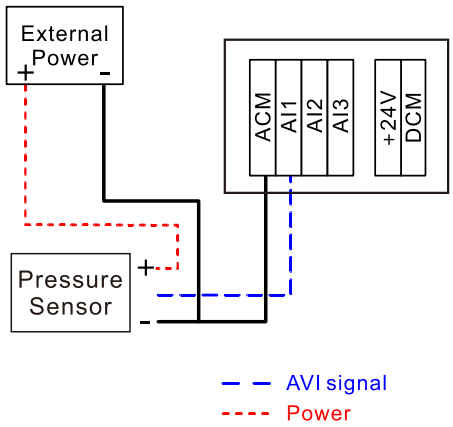


Figure 3-44

Multi-pump: one pressure sensor to more than one drive

It is limited to select AI3, refer to the above NOTE 1.

- ACI

Sensor using internal power

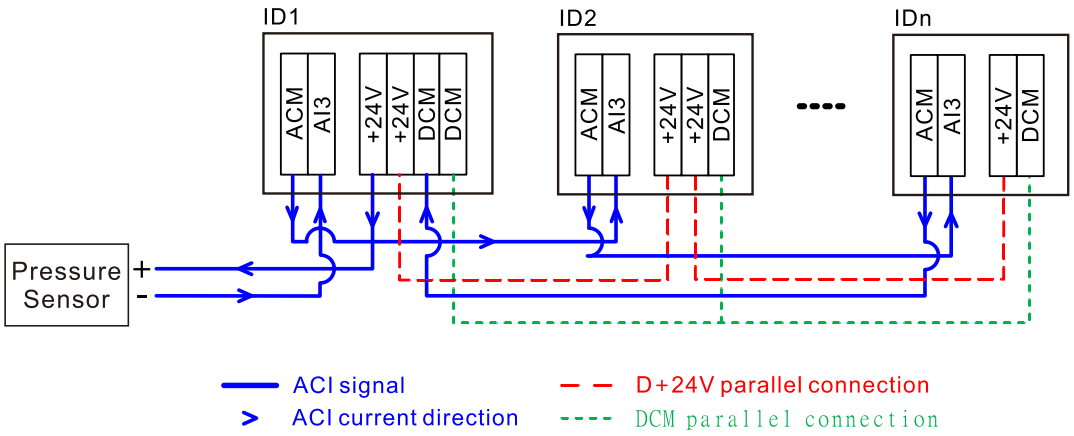


Figure 3-45

Sensor using external power

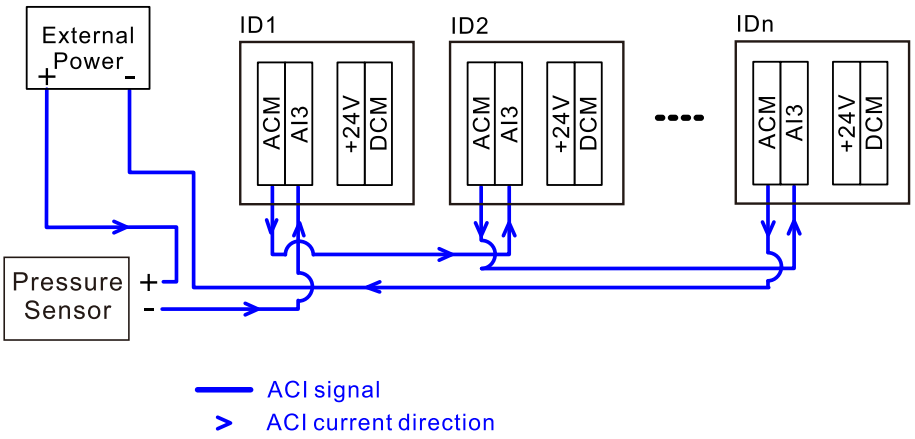


Figure 3-46

AI1–AI3 are optional terminals. The following demonstration takes AI1 as the example, the default 0–10 V can be set through Pr.G2-03.

- AVI

Sensor using internal power

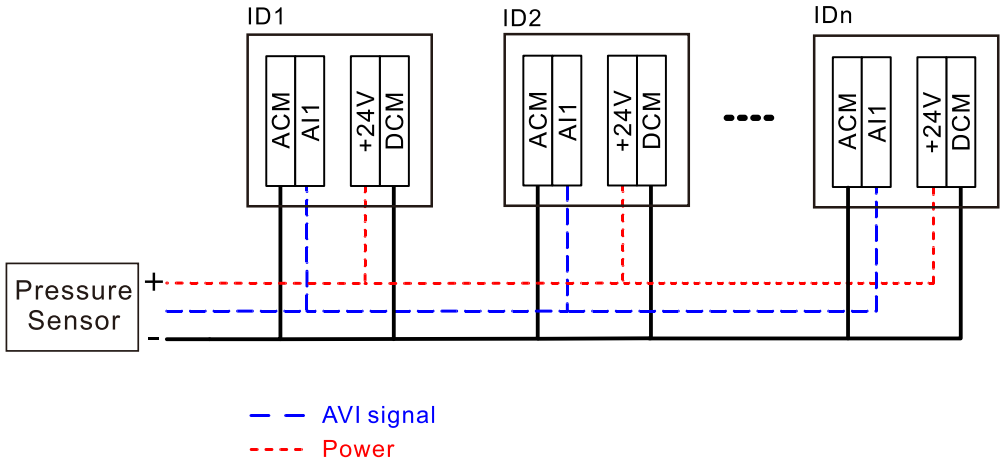


Figure 3-47

Sensor using external power

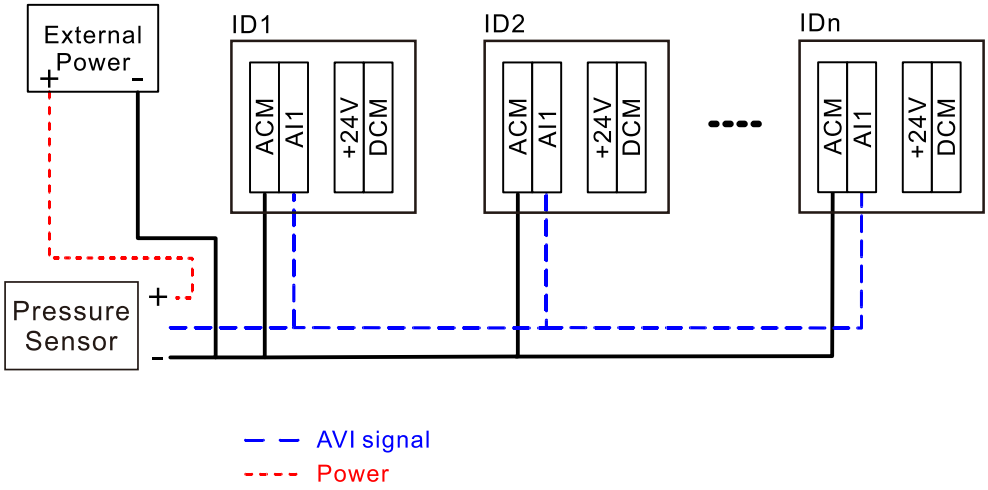


Figure 3-48

3-4-2 Terminal Specification

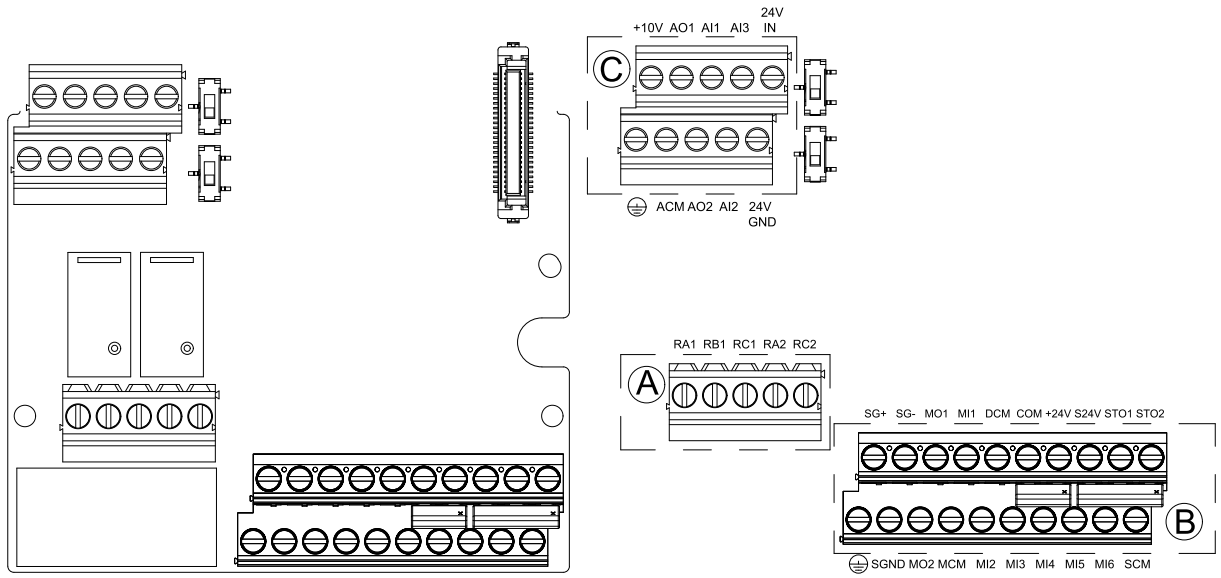


Figure 3-49

Terminal Name	Area	Conductor	Stripping Length (mm)	Max. Wire Gauge	Min. Wire Gauge	Tightening Torque (±10%))
Relay Terminals	Ⓐ	Solid wire Stranded wire	6–7	0.75 mm^2 (18 AWG)	0.2 mm^2 (24 AWG)	5 kg-cm (4.3 lb-in.) (0.49 Nm)
Control Terminals	Ⓑ	Solid wire Stranded wire				
Control Terminals	Ⓒ	Solid wire Stranded wire				

Table 3-29

Wiring Precautions:

- In the figure above, the default for STO1, STO2 and +24V are short-circuited. Use the +24V power supply of the safety function (as shown in section Ⓑ of above figure) for STO only. Do NOT use it for other purposes. The default setting for +24V-COM is short-circuited and SINK mode (NPN); refer to Chapter 3 Wiring for detail.
- Tighten the wiring with slotted screwdriver: 3.5 mm (wide) x 0.4 mm (thick)
- When wiring bare wires, ensure that they are perfectly arranged to go through the wiring holes.

Terminals Name	Terminal Function	Descriptions
+24V	+24V power supply	+24 V_{DC} ± 10% 200 mA For DI/O use
COM	Digital control signal common (Sink)	Multi-function input common terminal
MI1 | MI6	Multi-function Input Selection 1–6	MI1–MI6 support three-wire / two-wire control MI5 supports pulse input (basic input frequency 599 Hz) Refer to the MI setting in Parameter Group G0 for MI1–MI6 function selection. Source Mode: ON: activation voltage ≥ 15 V_{DC} OFF: cut-off voltage ≤ 5 V_{DC}

Terminals Name	Terminal Function	Descriptions
		Sink Mode: ON: activation voltage ≤ 9 V_{DC} OFF: cut-off voltage ≥ 19 V_{DC}
DCM	Digital frequency signal common	Digital frequency signal common
MO1 | MO2	Multi-function Output 1–2 (photo coupler)	MO2 supports single-pulse output (basic output frequency 599 Hz) As pulse output: max. current 48 V_{DC} / 50 mA Not as pulse output: max. current 48 V_{DC} / 25 mA
MCM	Multi-function Output Common (photo coupler)	Multi-function Output Common
RA1	Multi-function relay output 1 (N.O.) a	To output various kinds of monitoring signals such as motor drive in operation, frequency reached, and overload indication. Resistive Load 3 A (N.O.) / 3 A (N.C.) 250 V_{AC} 3 A (N.O.) / 3 A (N.C.) 30 V_{DC} Inductive Load (COS 0.4) 1.2 A (N.O.) / 1.2 A (N.C.) 250 V_{AC} 1.2 A (N.O.) / 1.2 A (N.C.) 30 V_{DC}
RB1	Multi-function relay output 1 (N.C.) b	
RC1	Multi-function relay common (Relay)	
RA2	Multi-function relay output 2 (N.O.) a	
RC2	Multi-function relay common (Relay)	
+10V	Potentiometer power supply	Power supply for analog frequency setting: +10–11 V_{DC} / 20 mA
AI1 – AI3	Analog voltage frequency command	● The three analog input formats all support 0–10 V (AI1 default) and 0–20 mA / 4–20 mA (AI2 / AI3 default) ● Voltage type input resistance: 164 kΩ; Current type input resistance: 250 Ω ● The three analog input formats all support KTY84-130, PTC, PT100 and PT1000. It is recommended to use current signal input. Temperature range -20–200°C
AO1	Multi-function analog voltage output	● The two analog inputs both support 0–+10V / 0–20 mA / 4–20 mA ● Under voltage mode (0–10 V), the max. output current is 2 mA ● Voltage type load limit: > 5 kΩ; Current type load limit: < 500 Ω
AO2		
ACM	Analog Signal Common	Analog signal common terminal
24VIN	24V auxiliary power input	When the drive uses AC power input to the RST terminal, all functions of the drive work normally. When the above power supply at the input side of the drive is forced to be cut off due to the supply end, the drive is powered off and shut down. Some functions can continue operate through the 24V auxiliary power input, as follows: 1. All communication cards work normally 2. Parameters and be read, written, and copied through keypad, RS-485, USB and communication cards. 3. Keypad is able to display and operate normally

Terminals Name	Terminal Function	Descriptions
		4. Analog input can be read and written normally 5. When Digital I/O uses external input, the 24 V_{DC} power supplies normally (refer to external power Sink / Source mode) ● Input voltage range: 24V ± 5% **NOTE:** the following functions cannot work Relay output, I/O extension card and PLC function
24V GND	24V auxiliary power input common	For 24 Vin use
STO1	Default short circuit of STO1-STO2-S24V (disable STO function). Only provide Source trigger mode.	
STO2	Built-in STO/SIL3 according to IEC61800-5-2, EN 61508 SIL3/ EN ISO 13849-1 PLe STO1–SCM; STO2–SCM ON: voltage ≥ 15 V_{DC}	
S24V	STO1–SCM; STO2–SCM OFF: voltage ≤ 5 V_{DC} S24V–SCM only use for STO1 and STO2 circuit	
SCM	STO1, STO2 and S24V common	
SG+	Modbus RS-485	
SG-		
SGND		
RJ45	PIN1, 2, 7, 8: Reserve PIN3, 6: SGND PIN4: SG- PIN5: SG+	

NOTE: When the drive input side is connected to USB (not connected to the RST main power supply), it mainly provides parameter reading, writing and software burning function, other functions (including control terminals) cannot be used.

Table 3-30

3-4-3 Calendar Battery Installation

To ensure the calendar function is normal, check and install the CR2032 battery and adjust the time before use. Follow the following steps to install the battery:

NOTE: The battery is not included when the drive leaves the factory, purchase one separately for use if necessary.

1. Press and hold the top tab of the keypad panel and pull forward (outward) to remove it.

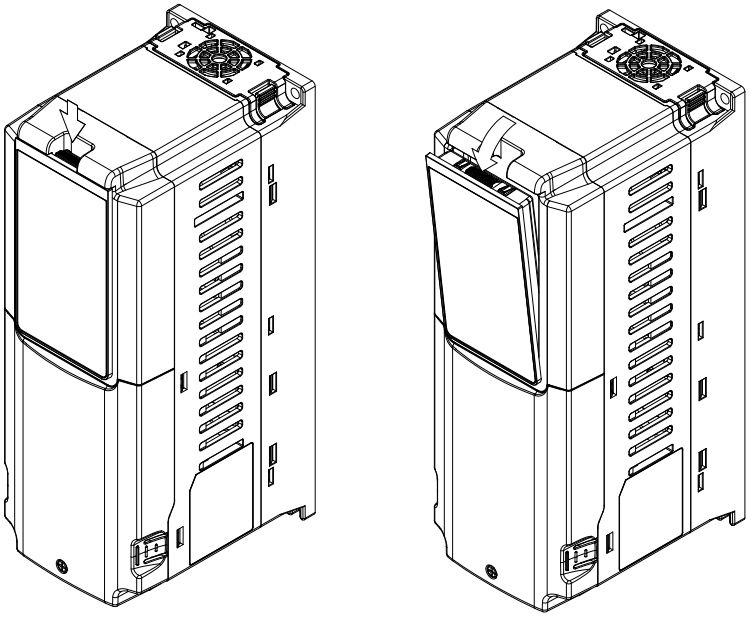


Figure 3-50

2. Press inward both sides of the bottom of the cover as the arrows indicated in the figure below and lift it up to remove the bottom cover.

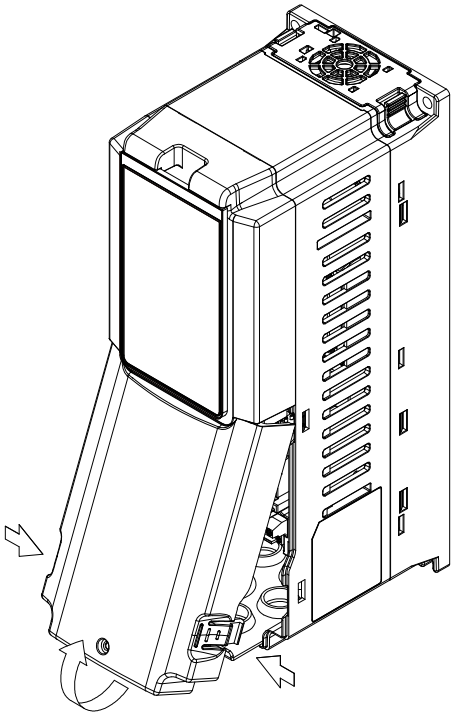


Figure 3-51

3. Press inward both sides at the middle of the drive as the arrows indicated in the figure below and lift it up to remove the top cover.

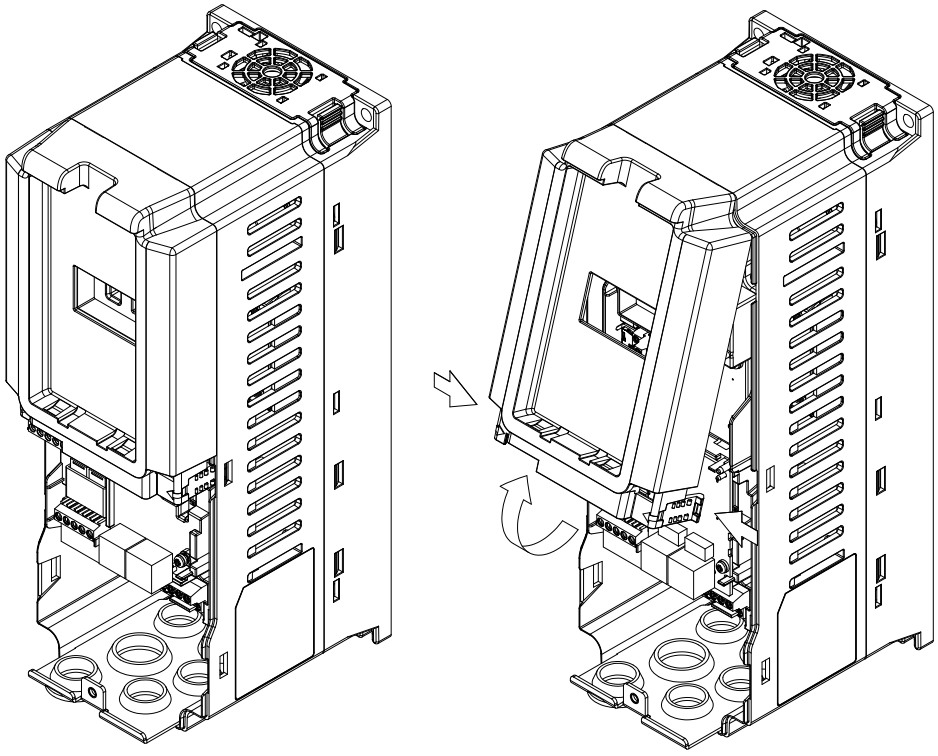


Figure 3-52

4. Install the battery. The battery holder locates on the upper left half of the drive. Put the CR2032 battery in and press it down so that it is flat on the battery holder and placed in the hook.

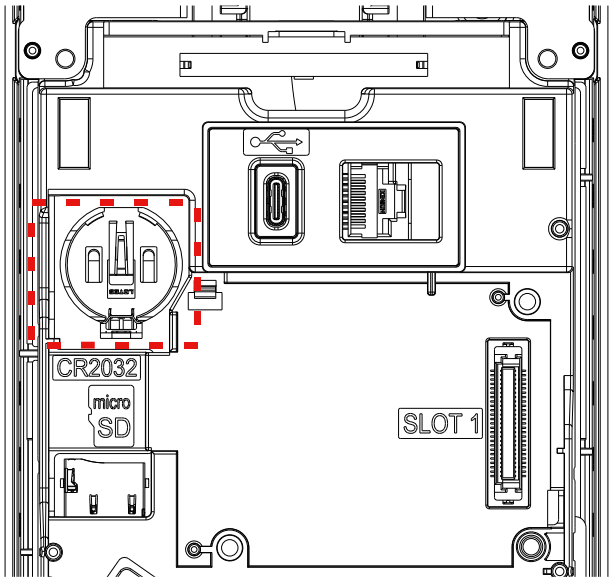


Figure 3-53

5. Install the top cover, put the buckle at the front end of the cover towards the top of the drive, press down the bottom edge of the cover so that the hooks on both sides stick in the middle of the drive.
6. Install the bottom cover, put the buckle at the front end of the cover into the bottom edge of the top cover, press down the bottom edge of the cover so that the hooks on both sides stick on the bottom of the drive.
7. Install the keypad panel, put the bottom edge of the panel against the bottom of the panel-shape groove of the drive, press the upper edge of the panel down to fit into the groove, and the battery installation is completed.

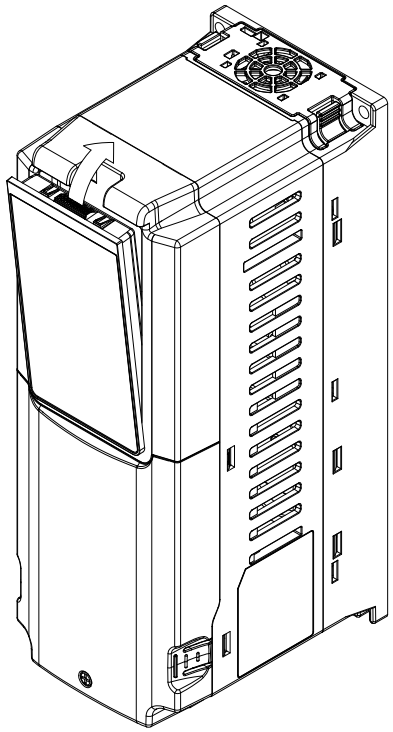


Figure 3-54

NOTE: When you need to replace the battery, after performing steps 1–3, press down the battery hook to pop up the battery and take it off, and then perform steps 4–7 in sequence.

3-5 Safe Torque Off

3-5-1 Basic Function

The VP3000 series provide a Safe Torque Off (STO) function, through the dual-channel STO_1 and STO_2 signal input to turn off the IGBT switching, prevent the motor from generating torque, so as to achieve the purpose of safe stop.

VP3000 STO function comply with the following regulations:

- ISO 13849-1:2015 Category 3 PL e
- IEC 61508 SIL3
- EN 62061 SIL CL 3
- EN 60204-1 Category 0

3-5-2 STO Specification

Refer to the table below for the safe parameters of STO function:

Item	Definition	Standard	Performance
S.F.F	Safe Failure Fraction	IEC61508	SPS(1oo1): 99.92% STO(1oo2): 98.86%
HFT	Hardware Fault Tolerance	IEC61508	SPS(1oo1): 0 STO(1oo2): 1
SIL	Safety Integrity Level	IEC61508	SIL 3
		IEC62061	SILCL 3
PFH	Average frequency of dangerous failure [h-1]	IEC61508	$8.22*10^{-10}$
PFD_{av}	Probability of Dangerous Failure on Demand	IEC61508	$3.94*10^{-4}$
Category	Category	ISO13849-1	Category 3
PL	Performance level	ISO13849-1	e
$MTTF_d$	Mean time to dangerous failure	ISO13849-1	High (44463)
DC	Diagnostic Coverage	ISO13849-1	Medium
PTI	Proof Test Interval	IEC61508	20 years
Phase deviation	The Max. acceptable phase deviation time between STO1 and STO2	N/A	550 ms
PST	Process Safety Time	IEC61508	6 ms
Demand Mode	Mode of operation	IEC61508	High demand mode
DTI	Diagnostic Test Interval	IEC61508	SPS(1oo1): 6 ms STO(1oo2): 30s
MT	Mission Time	ISO13849-1	> 20 years
MTTR	Mean Time to Restoration	ISO13849-1	30s
Tape A/B	Classification of subsystem	IEC61508	Type A

Table 3-31

NOTE:

1. Periodic test pulses with the pulse duration (low-level) less than 1 ms and the pulse interval (T) greater than 10 ms will be ignored.
2. If any of the SPS fault occurs during the operation, the drive shall stop output current and remain in safe state.

3-5-3 Terminal Function

Refer to Section 3-4 Control Circuit for description of STO function

The table below is the operation principle and display description after STO1 / STO2 signal input:

Signal	Status			
STO1–SCM	ON	OFF	ON	OFF
STO2–SCM	ON	ON	OFF	OFF
Drive Output Status	Ready to output	STO1 mode Torque output off	STO2 mode Torque output off	STO mode Torque output off
Fault Displays	No fault displays	STO1	STO2	STO
RESET	N.A	Directly reset	Directly reset	Directly reset

Table 3-32

- STO means that Channel 1 and Channel 2 enable Safe Torque Off at the same time.
- STO1 indicates that the difference between Channel 1 and Channel 2 is too large, and Channel 1 is active. Check the external wiring.
- STO2 indicates that the difference between Channel 1 and Channel 2 is too large, and Channel 2 is active. Check the external wiring.
- STL1 indicates Channel 1 internal circuit detected abnormal. The system executes fault corrective actions to ensure that the drive remains in a safe status.
- STL2 indicates Channel 2 internal circuit detected abnormal. The system executes fault corrective actions to ensure that the drive remains in a safe status.
- STO1–SCM / STO2–SCM ON: means STO1–SCM / STO2–SCM input voltage > 15 V_{DC} power
- STO1–SCM / STO2–SCM OFF: means STO1–SCM / STO2–SCM input voltage < 5 V_{DC} power

3-5-4 Wiring

Internal STO circuit is as the figure below:

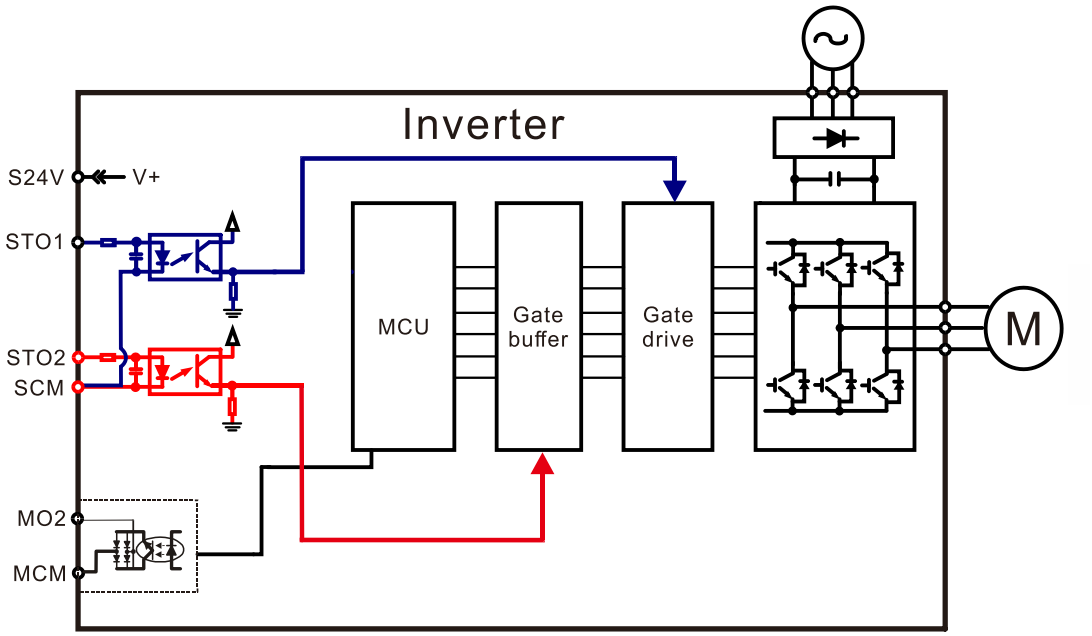


Figure 3-55

In the figure below, the default setting for S24V-STO1-STO2 is short-circuited:

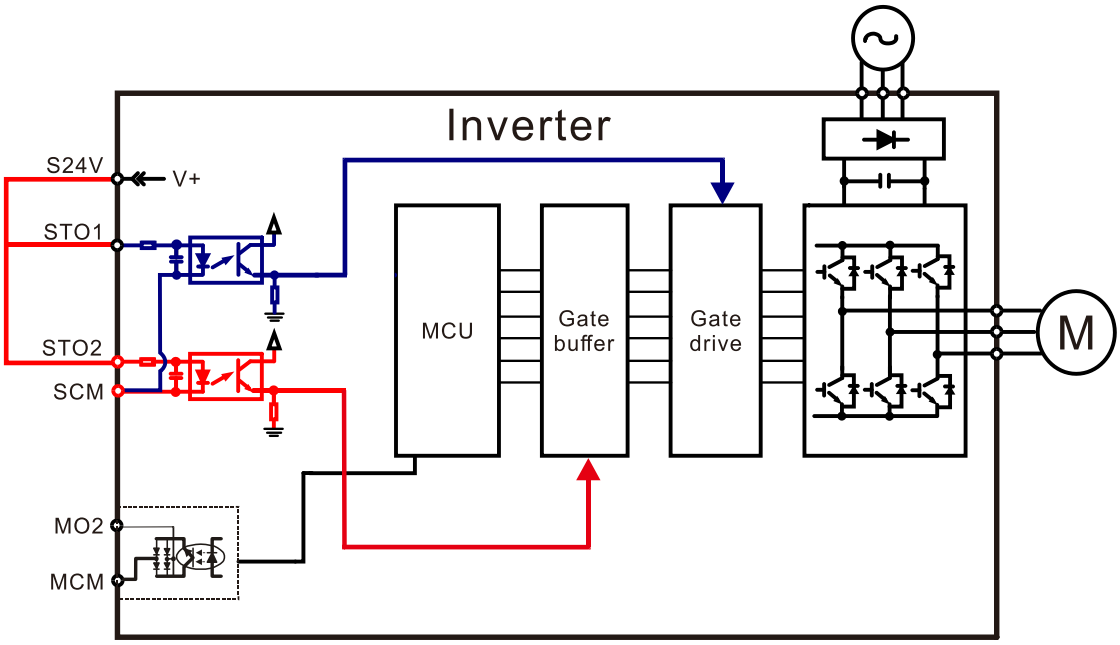


Figure 3-56

Control loop wiring

1. Default wiring

   The S24V-STO1-STO2 terminals are shorted together as default wiring. If you need to use the Safety function (refer to wiring method 2 & 3), remove the short-circuit.

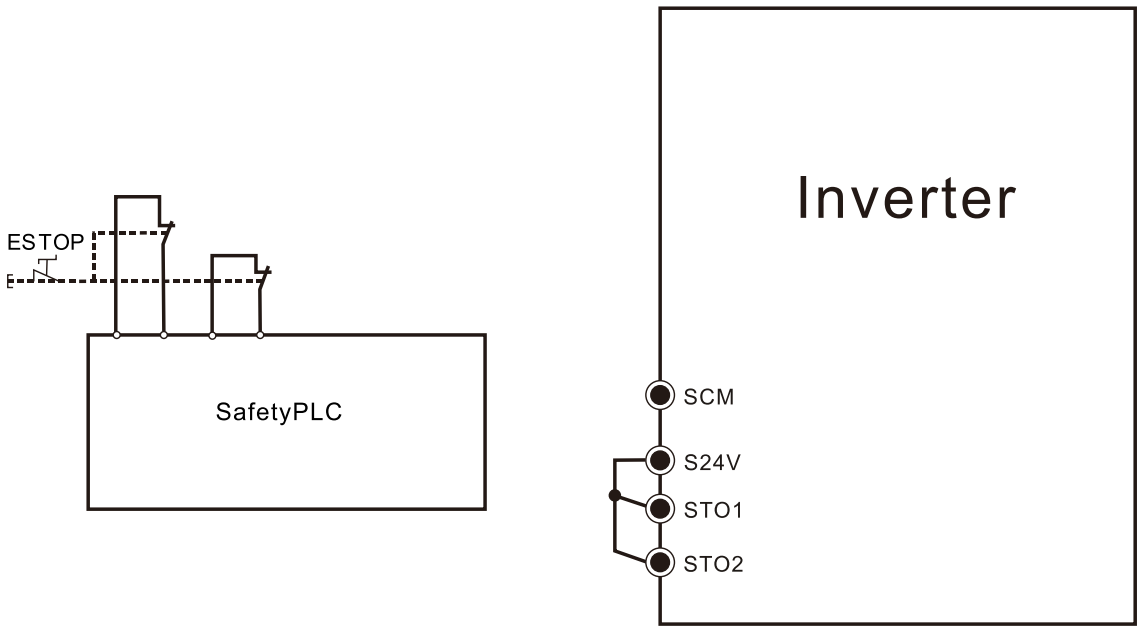


Figure 3-57

2. Built-in 24V power wiring

   - Remove the short-circuit of S24V-STO1-STO2.
   - As shown in the figure below, the ESTOP switch must be closed in normal situation so the drive can output normally.
   - In STO mode, the ESTOP switch is turned ON, the drive stops output, and the keypad displays STO.
   - With this connection, the SCM does not need to be wired (empty connection). Connect 24V Safety dedicated power terminal, do NOT use the general +24V terminal power supply.

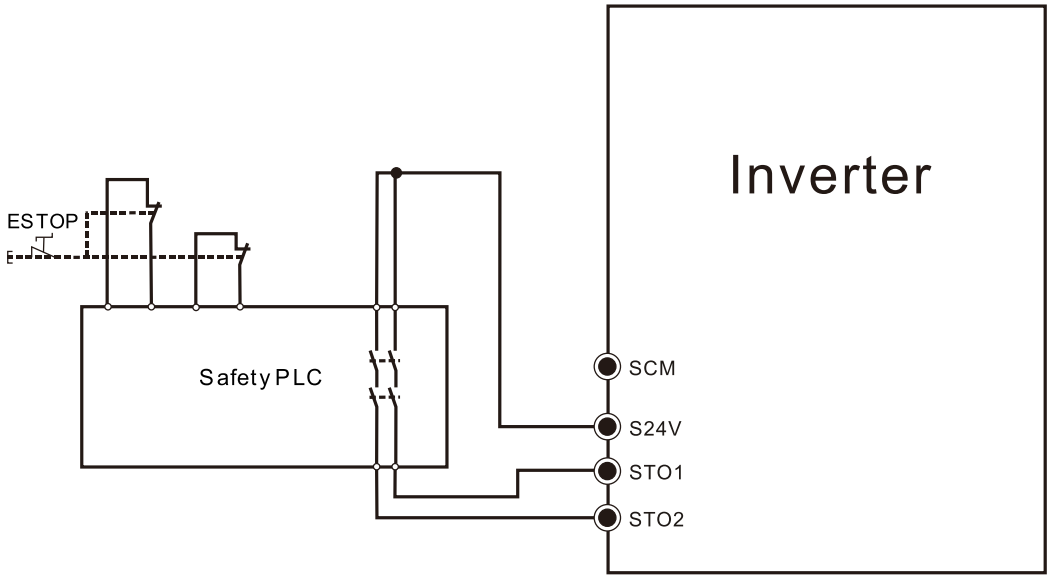


Figure 3-58

3. External 24V power wiring
   - Remove the short-circuit of S24V-STO1-STO2.
   - As shown in the figure below, the ESTOP switch must be closed in normal situation so the drive can output normally.
   - In STO mode, the ESTOP switch is turned ON, the drive stops output, and the keypad displays STO.
   - With this connection, the SCM must be connected to the negative terminal of the external power supply to form a power supply circuit.
   - External 24V is from external SELV/PELV.

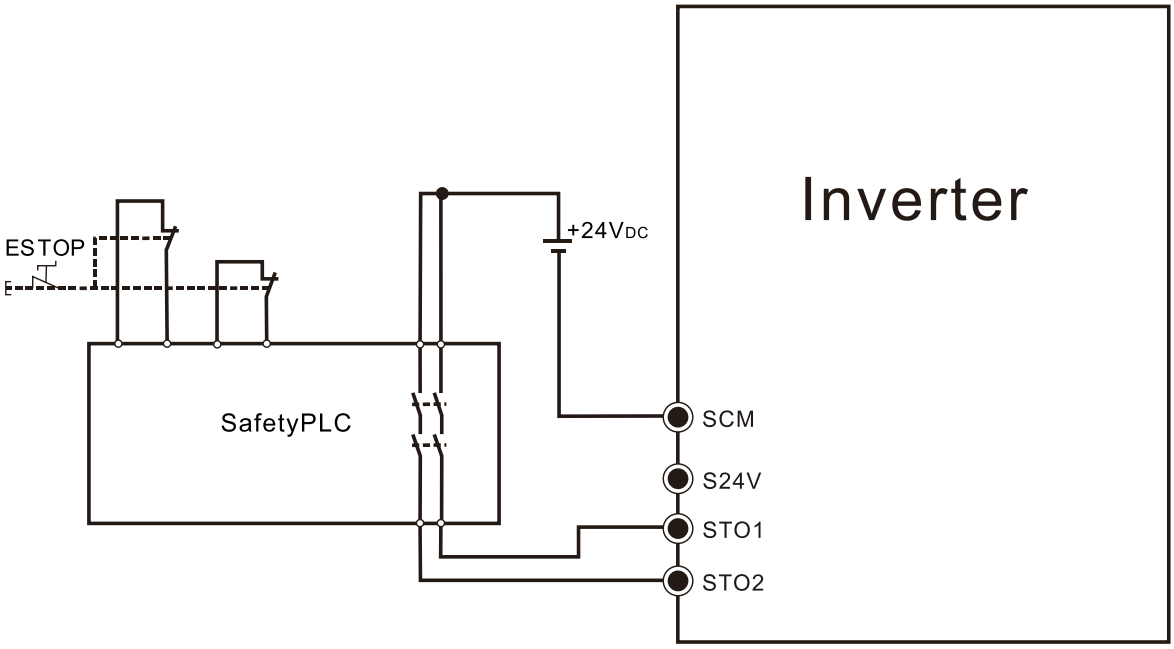


Figure 3-59

3-5-5 Parameters and Fault Codes

- Pr.H0-14 sets the reset method of STO fault, refer to Chapter 13 for detail.
- Refer to Parameter Group O for detail description of fault records, refer to Chapter 8 for fault treatment.

Pr.	Parameter Name
o4-00	Fault Code REC 1
o4-19	Fault Code REC 2
o5-00	Fault Code REC 3
o5-19	Fault Code REC 4
o6-00	Fault Code REC 5
o6-19	Fault Code REC 6

Table 3-33

3-5-6 Operating Sequential Diagram

The STO1 and STO2 circuits must be conducted (ON: default short-circuit of STO terminal) when the STO function is under general operation, and then the drive can operate normally. If any one of the STO circuit is disconnected (OFF), the drive is unable to run, or stop running. The following sequence diagrams describe the signal status under different conditions:

1. Pr.H0-14 STO Auto Reset = 0 Disable, manual-reset is valid

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time, and then the STO2 is OFF. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO fault message.

Since the STO fault message is invalid under the manual RESET command when the two STO channels are both OFF (non-conductive), the drive still cannot run after receiving the RUN command.

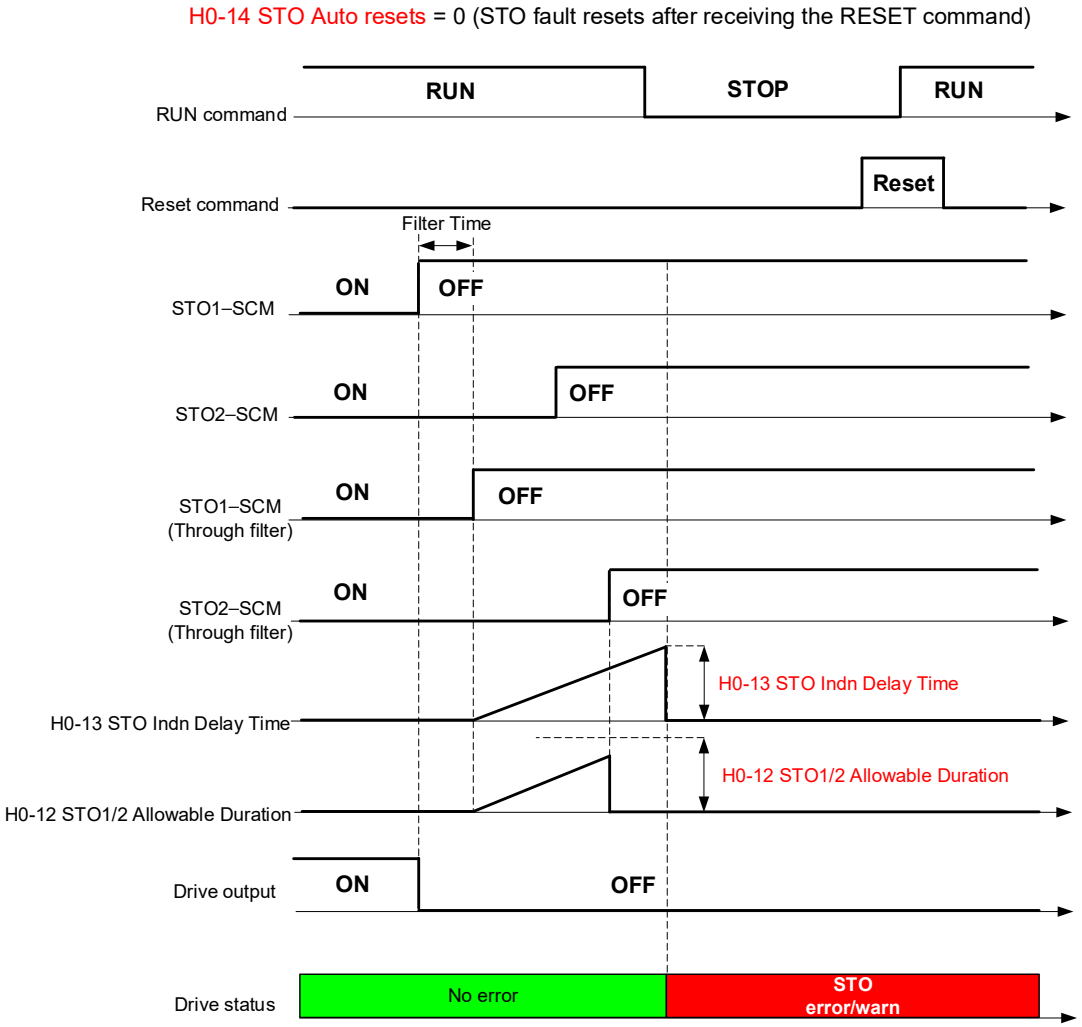


Figure 3-60

2. Pr.H0-14 STO Auto Reset = 1 Enable, auto-reset is valid)

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time, and then the STO2 is OFF. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO fault message.

Since the STO fault message is invalid under the manual RESET command when the two STO channels are both OFF (non-conductive), the drive still cannot run after receiving the RUN command.

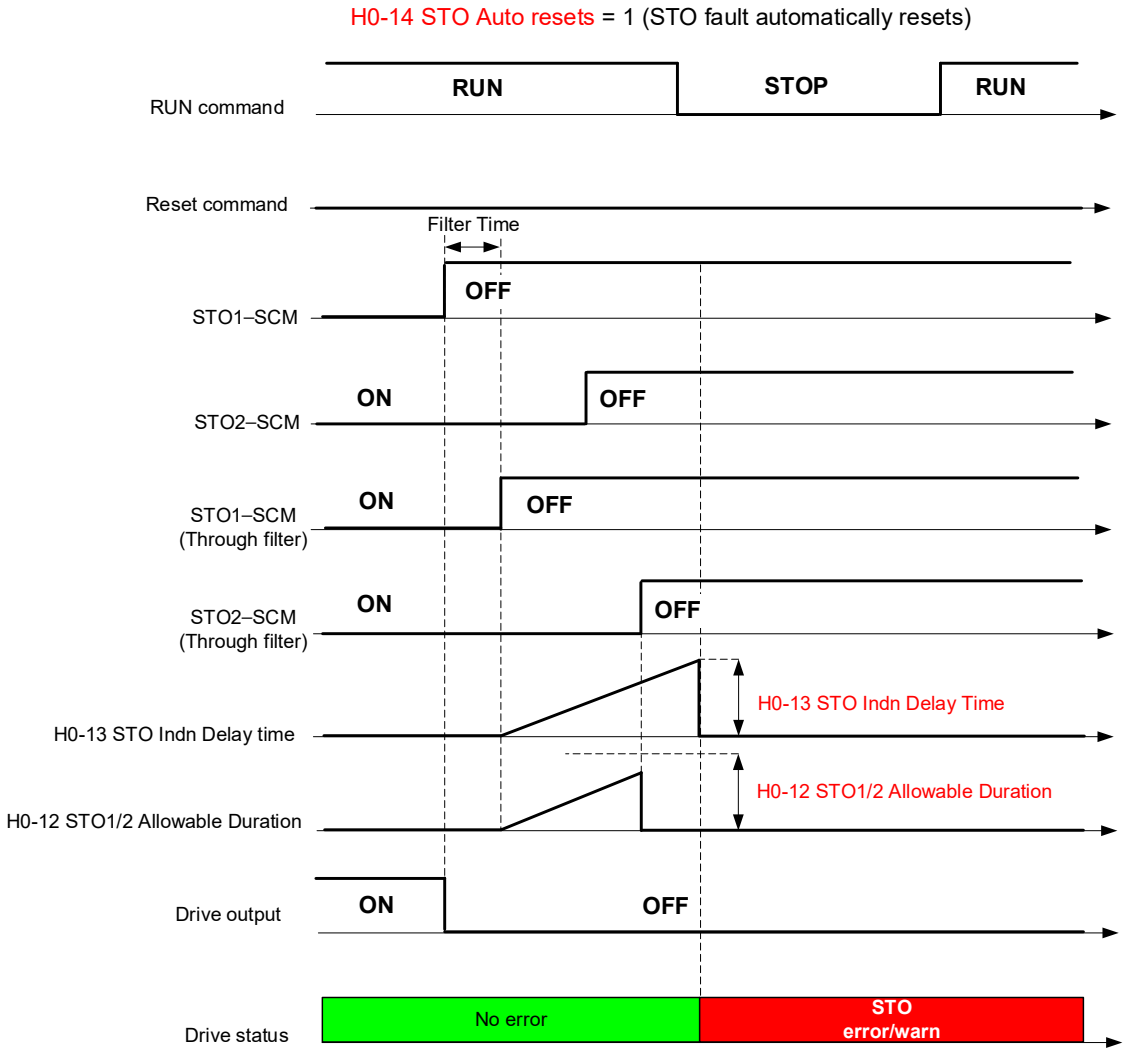


Figure 3-61

3. Pr.H0-14 STO Auto Reset = 0 Disable, manual-reset is valid

The STO function is triggered after the drive runs, the original STO1 is OFF (non-conductive) only for a brief time and then turns back to ON (conductive). When it is OFF, the drive stops outputting immediately. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO fault message.

Since the STO fault message is valid under the manual RESET command when the two STO channels are both ON (conductive), the drive clears the fault message, after the RESET command and the Fault Restart Delay Time (Pr.H0-10) is reached, the drive receives the RUN command and resumes to operate

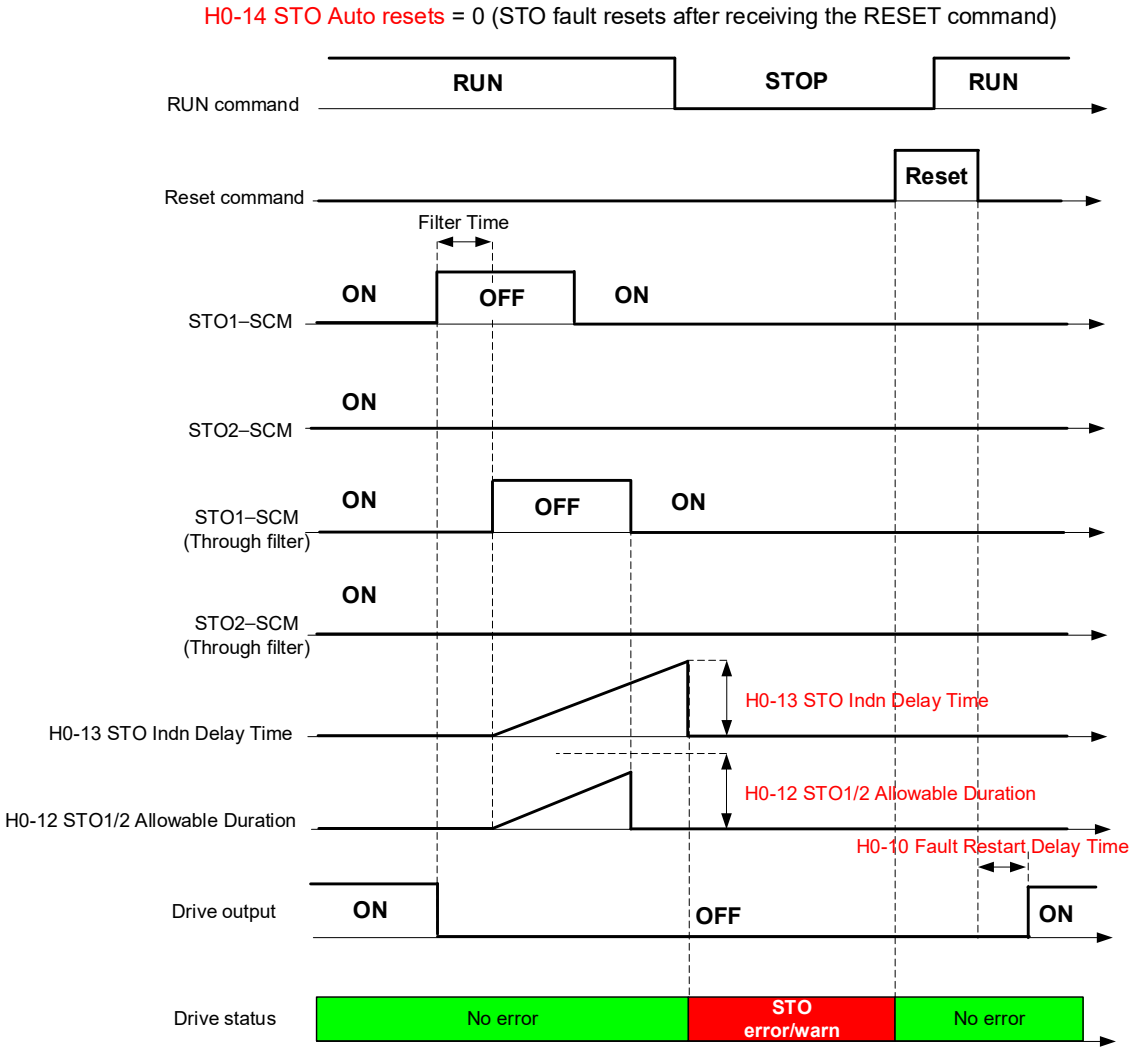


Figure 3-62

4. Pr.H0-14 STO Auto Reset = 1 Enable, auto-reset is valid

The STO function is triggered after the drive runs, the original STO1 is OFF (non-conductive) only for a brief time and then turns back to ON (conductive). When it is OFF, the drive stops outputting immediately. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO fault message.

Since the STO fault message is valid under the auto RESET command when the two STO channels are both ON (conductive), the drive clears the fault message when the Fault Auto Reset Delay Time (Pr.H0-09) is reached. And then the Fault Restart Delay Time (Pr.H0-10) is reached, the drive receives the RUN command and resumes to operate

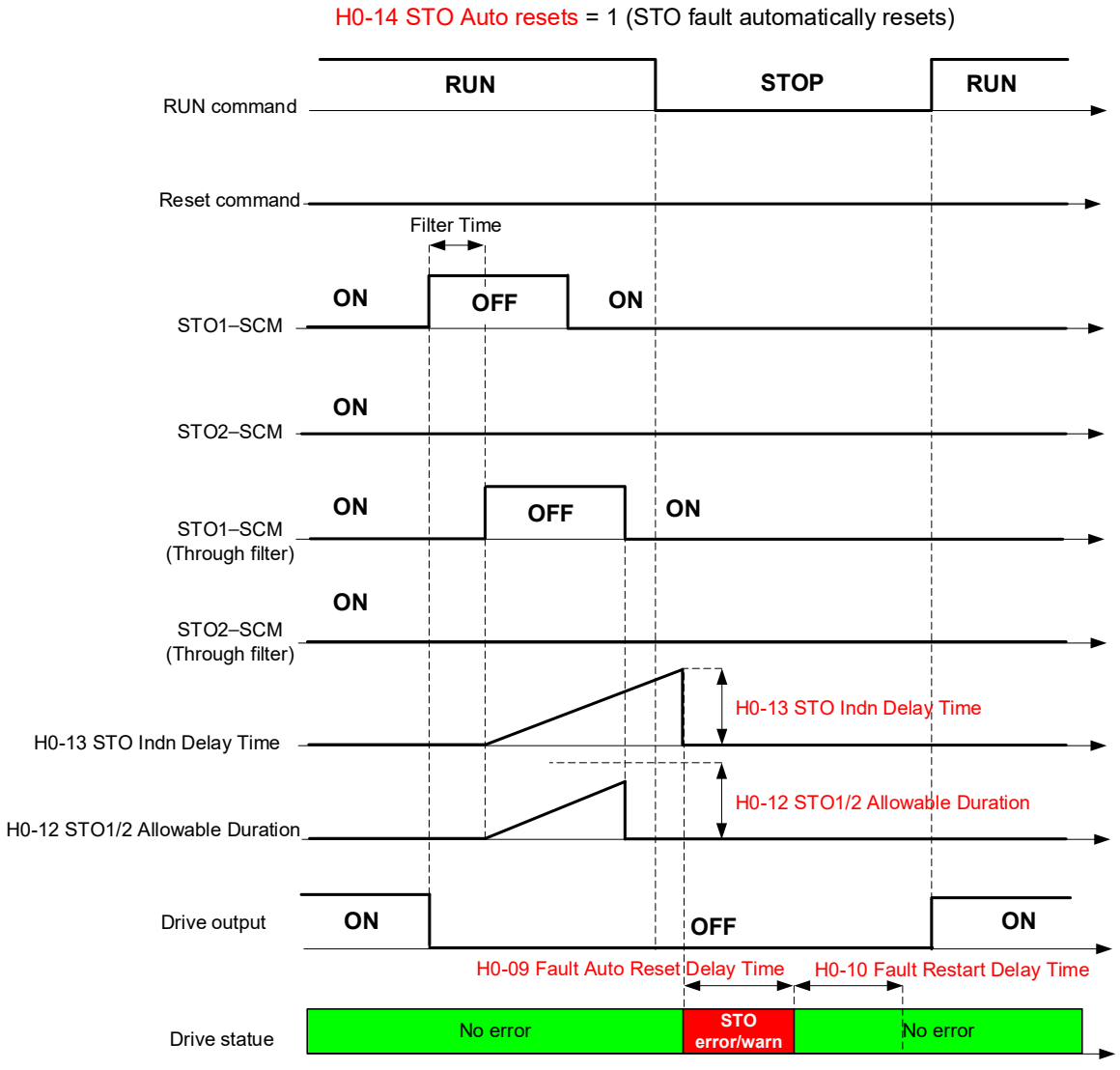


Figure 3-63

5. Pr.H0-14 STO Auto Reset = 0 Disable, manual-reset is valid

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO1 fault message.

Since the STO1 fault message is invalid under the manual RESET command when the STO1 is OFF (non-conductive), the drive still cannot run after receiving the RUN command.

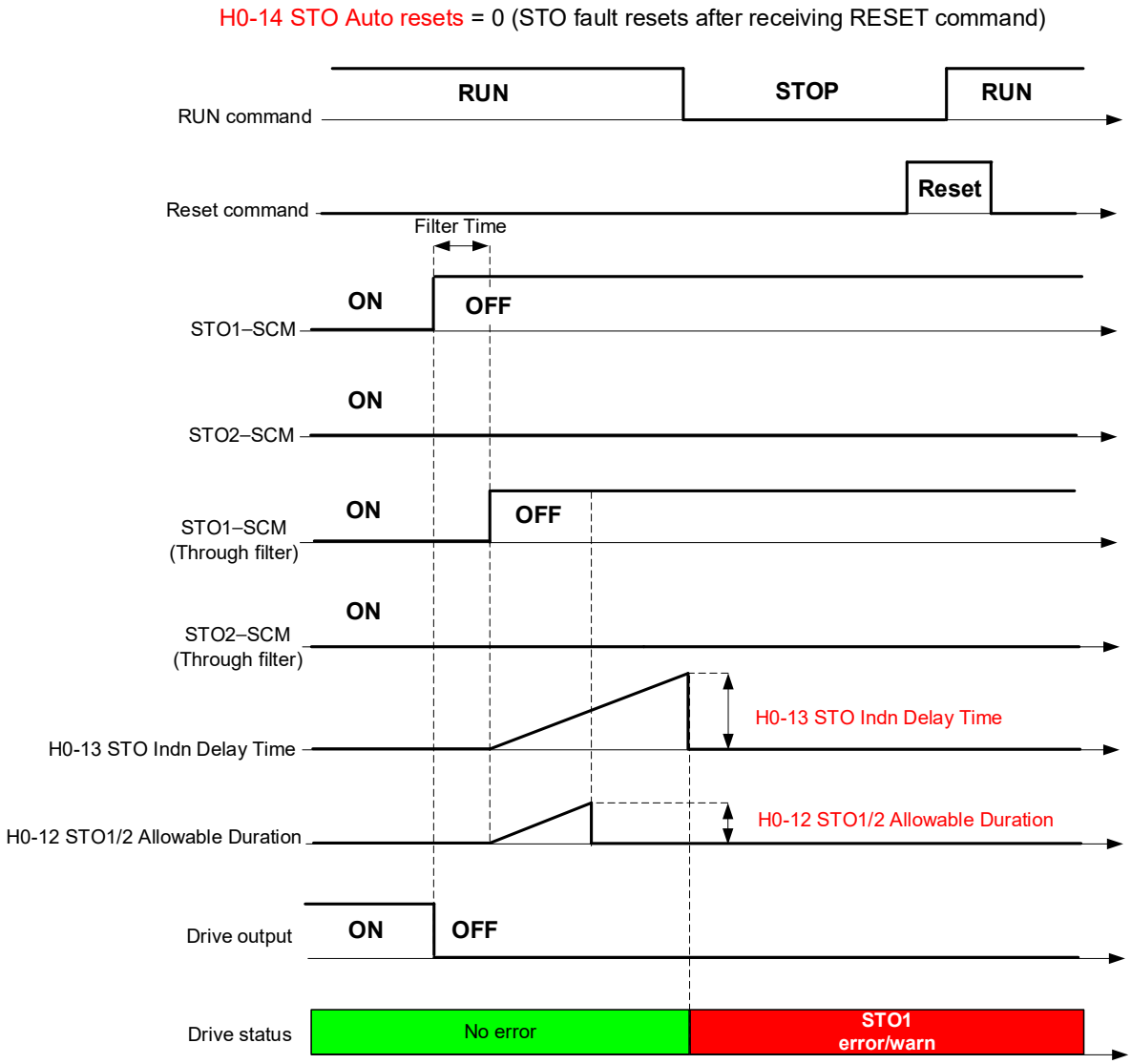


Figure 3-64

6. Pr.H0-14 STO Auto Reset = 1 Enable, auto-reset is valid

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO1 fault message.

Since the STO1 fault message is invalid under the auto RESET command when the STO1 is OFF (non-conductive), the drive still cannot run after receiving the RUN command.

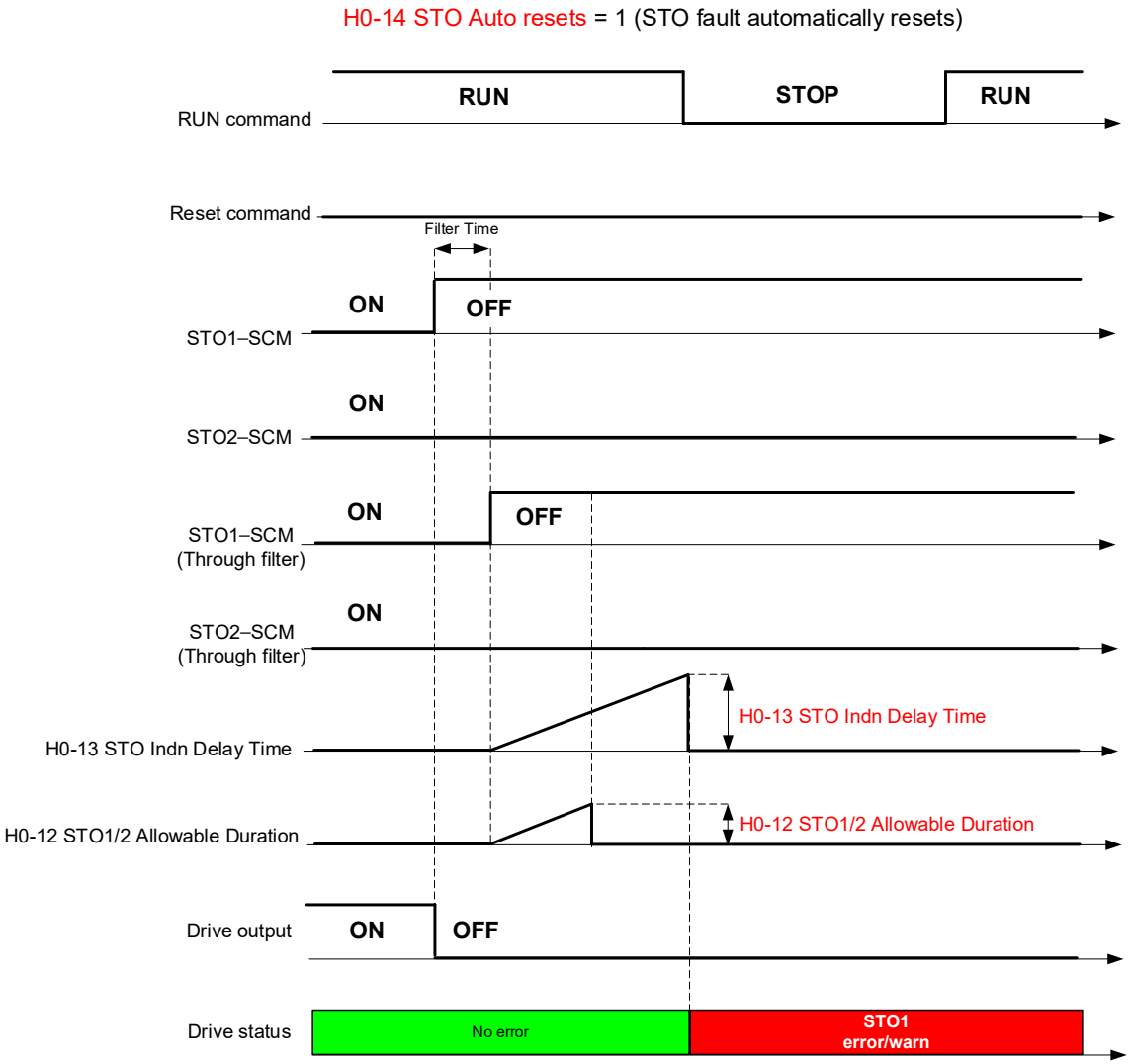


Figure 3-65

7. Pr.H0-14 STO Auto Reset = 0 Disable, manual-reset is valid

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO1 fault message.

Since the STO1 fault message is invalid under the manual RESET command when the two STO channels are both OFF (non-conductive), the drive still cannot run after receiving the RUN command.

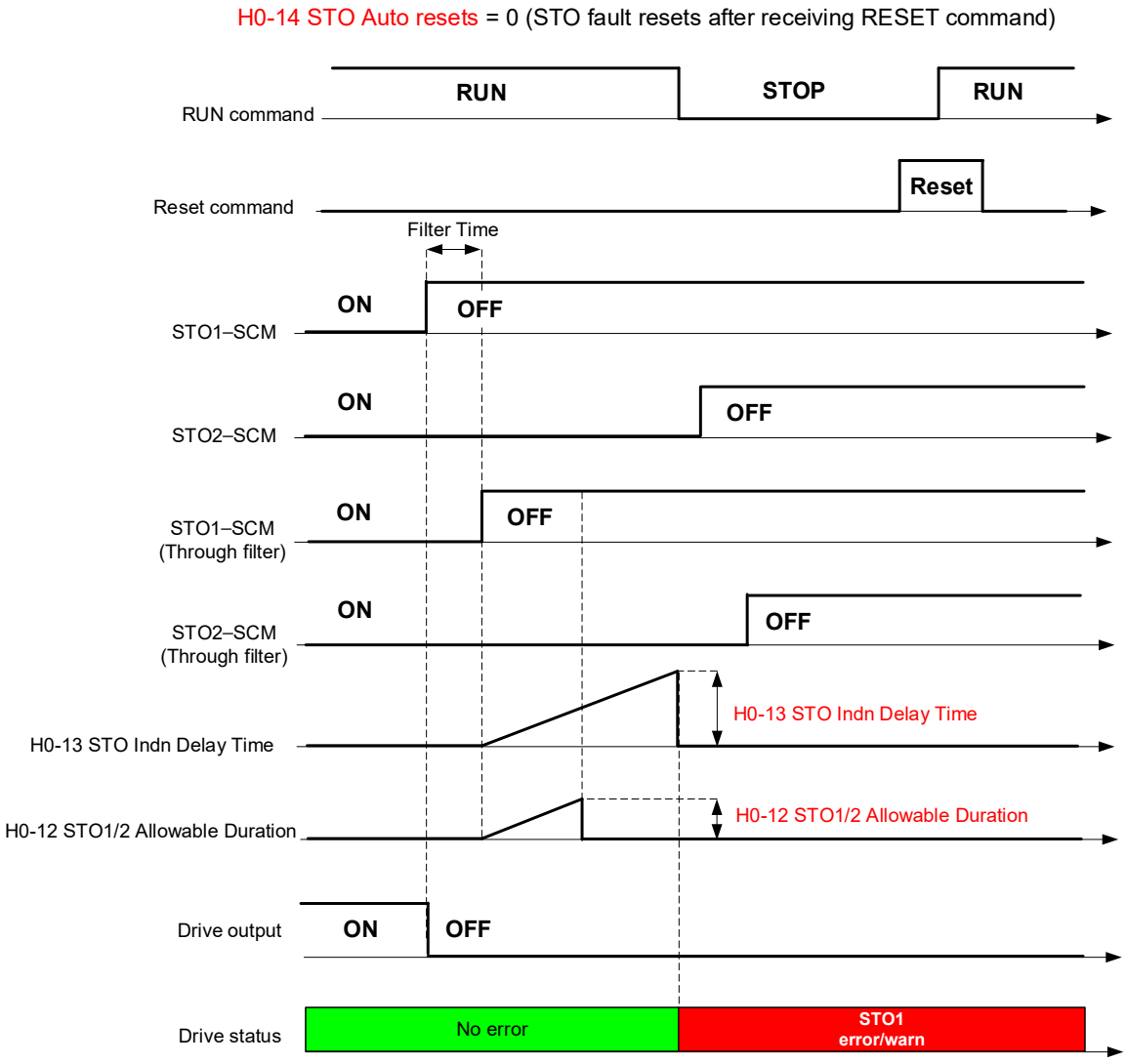


Figure 3-66

8. Pr.H0-14 STO Auto Reset = 1 Enable, auto-reset is valid

The STO function is triggered after the drive runs, STO1 changes from ON (conducting) to OFF (non-conducting), the drive stops output immediately, and starts counting after the filter time. When the counting time of two circuits of STO are less than then allowable difference time of STO1 / STO2 (Pr.H0-12), and the STO indication delay time (Pr.H0-13) is reached, the drive displays STO1 fault message.

Since the STO1 fault message is invalid under the auto RESET command when the two STO channels are both OFF (non-conductive), the drive still cannot run after receiving the RUN command.

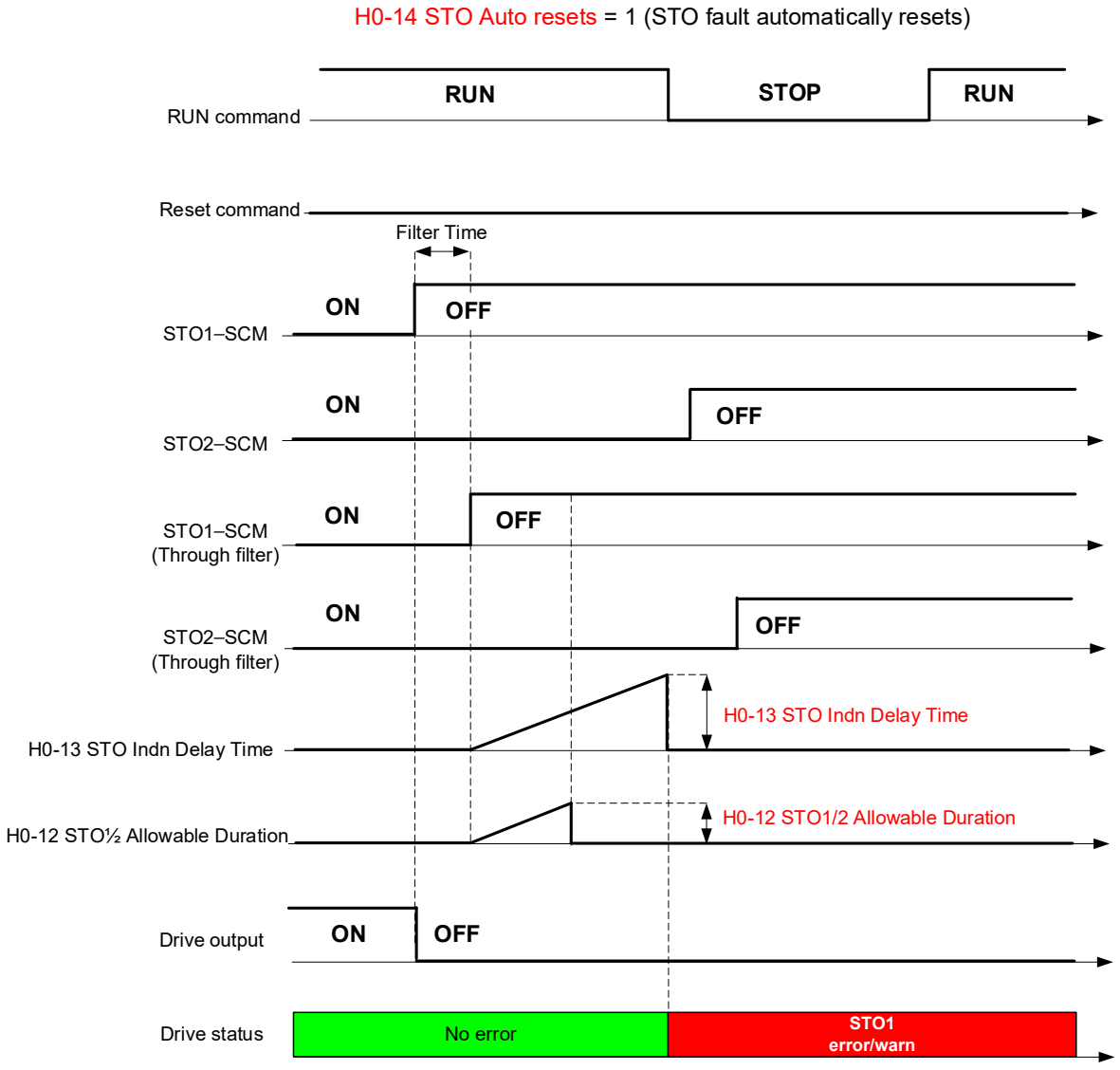


Figure 3-67

3-5-7 STO Offline Test

VP3000 is applicable for applications of long-term continuous operation. For safety concern and referring to EN IEC61800-5-2 Clause 6.2.2.1.4 Note 2, an offline test based on SIL3, PLe/Cat.3 level is required for every three months.

- Offline test: test once every 3 months
- Test method:
  Connect STO1 and STO2 to SCM[*1] simultaneously to check whether the STO function works normally (if the STO safety circuit is connected with an ESTOP switch, you can press the ESTOP switch to fulfill this required condition). If the drive shows STO fault, it means that the STO channels are normal; if anything else pops up, it means that the STO is abnormal and the drive needs to be returned to the factory for repair.
  NOTE: [*1] SCM: Safety Common Ground.

3-6 RFI Jumper and Leakage Current

RFI Jumper:

1. The drive contains Varistors / MOVs that are connected from phase to phase and from phase to ground to prevent the drive from unexpected stop or damage caused by mains surges or voltage spikes. Because the Varistors / MOVs from phase to ground are connected to ground with the RFI jumper, removing the RFI jumper disables the protection.
2. In models with a built-in EMC filter, the RFI jumper connects the filer capacitors to ground to form a return path for high frequency noise in order to isolate the noise from contaminating the mains power. Removing the RFI jumper strongly reduces the effect of the built-in EMC filter. Although a single drive complies with the international standards for leakage current, an installation with several drives with built-in EMC filters can trigger the RCD. Removing the RFI jumper helps, but the EMC performance of each drive is no longer guaranteed.

Frame A1–B1 (Take Frame A1 as example shown in the following figures)

Applicable models: VFD3A0VP43ANTAA, VFD4A2VP43ANTAA, VFD5A6VP43ANTAA, VFD7A2VP43ANTAA, VFD011VP43ANTAA, VFD013VP43ANTAA, VFD018VP43ANTAA

1. Loosen and remove the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

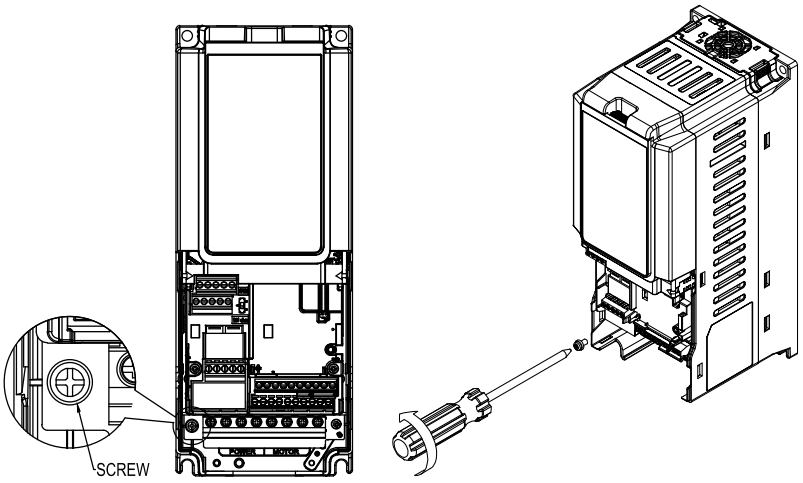


Figure 3-68

2. Fasten the screws to the RFI jumper storage placement.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

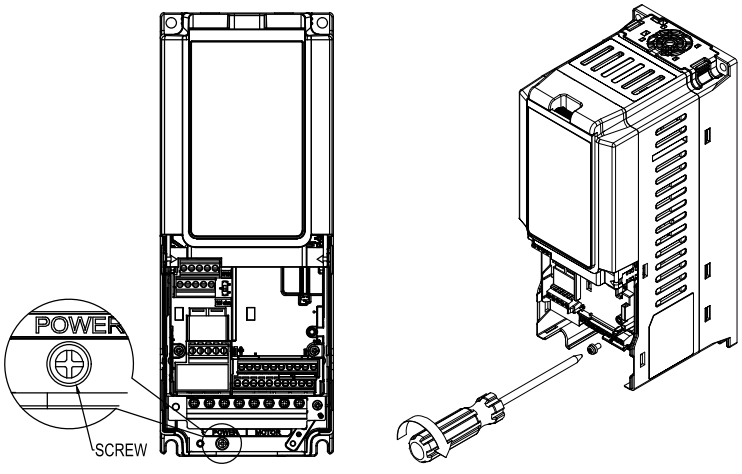


Figure 3-69

Frame A2–B2 (Take Frame A1 as example shown in the following figures)

Applicable models: VFD3A0VP43BFTAA, VFD4A2VP43BFTAA, VFD5A6VP43BFTAA, VFD7A2VP43BFTAA, VFD011VP43BFTAA, VFD013VP43BFTAA, VFD018VP43BFTAA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

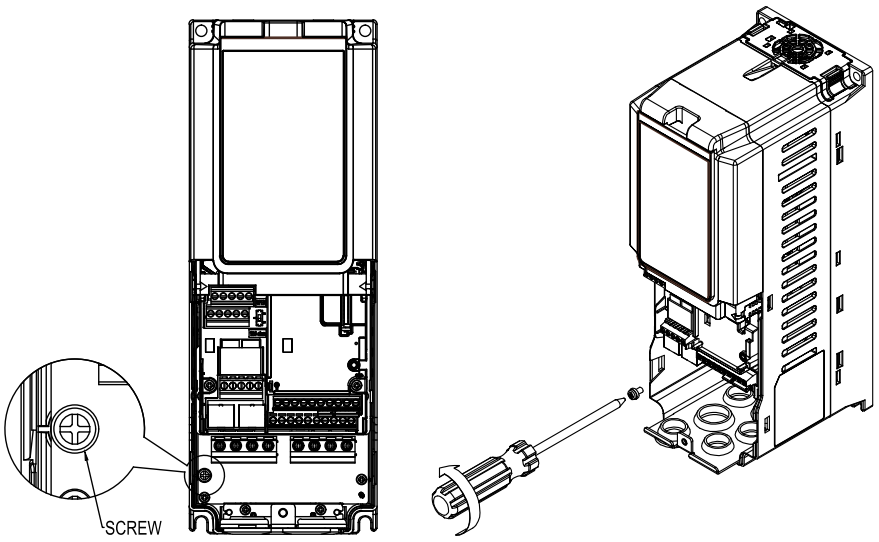


Figure 3-70

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

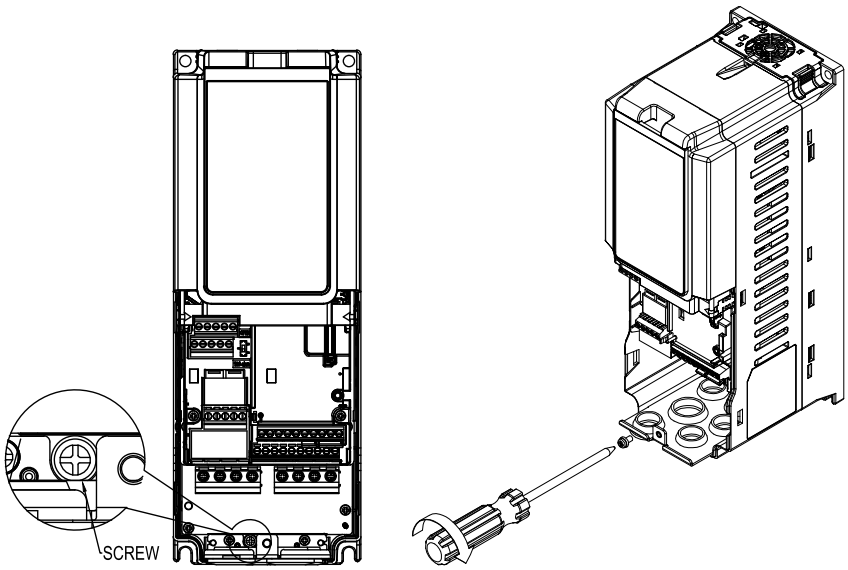


Figure 3-71

Frame C1

Applicable models: VFD025VP43ANTAA, VFD032VP43ANTAA, VFD038VP43ANTAA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

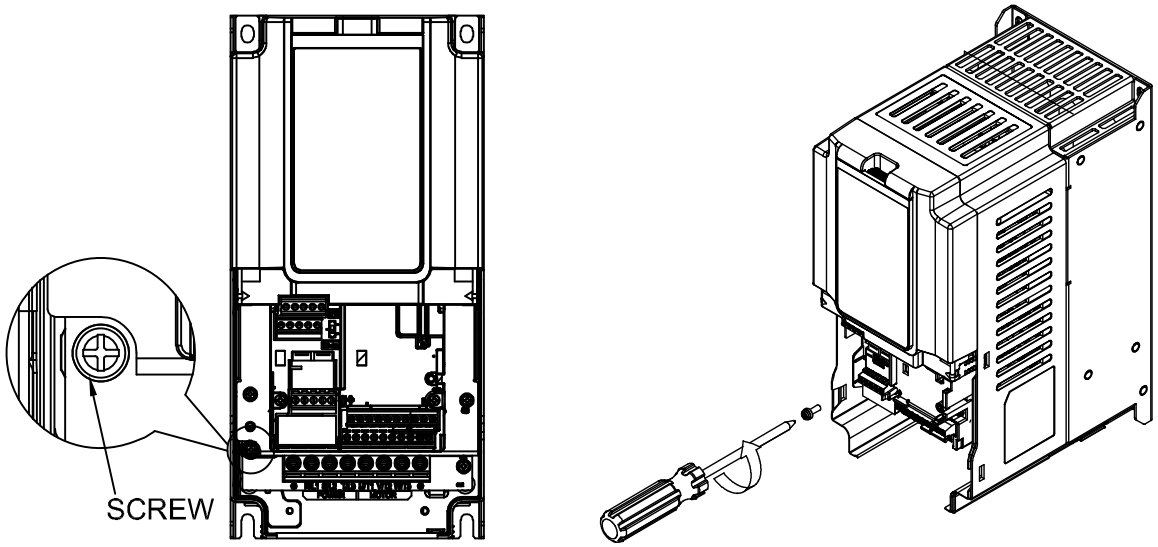


Figure 3-72

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

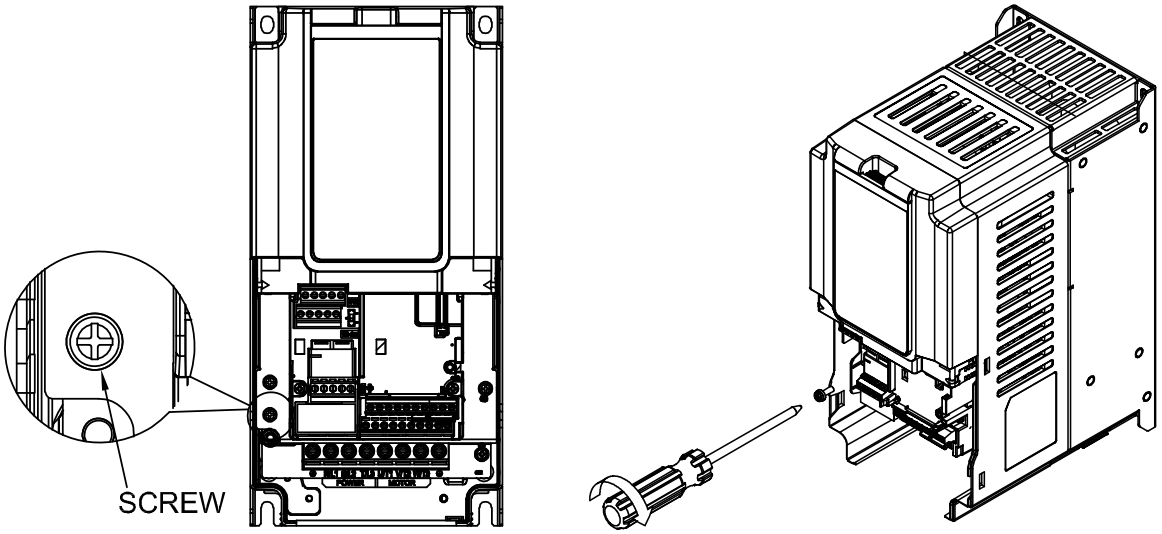


Figure 3-73

Frame C2

Applicable models: VFD025VP43BFTAA, VFD032VP43BFTAA, VFD038VP43BFTAA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

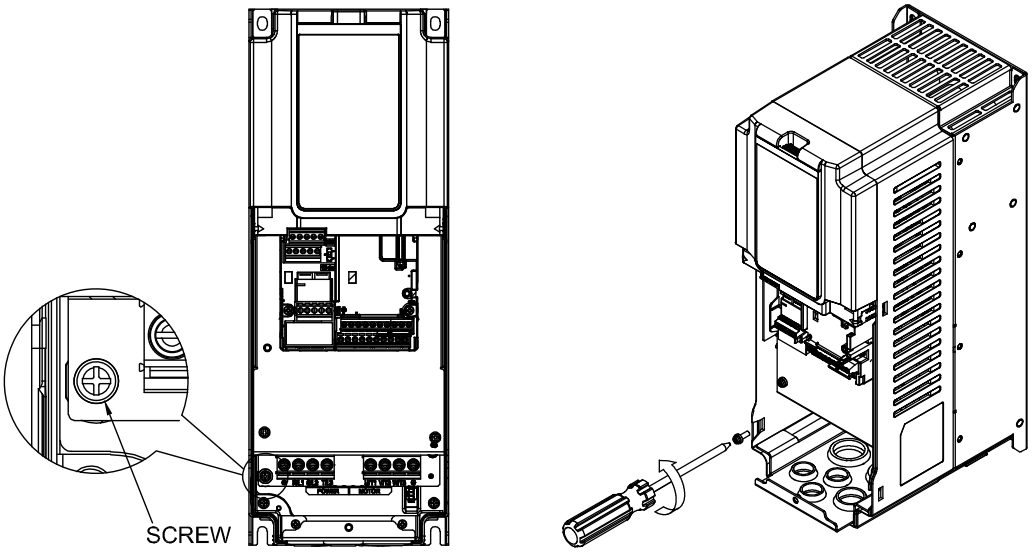


Figure 3-74

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

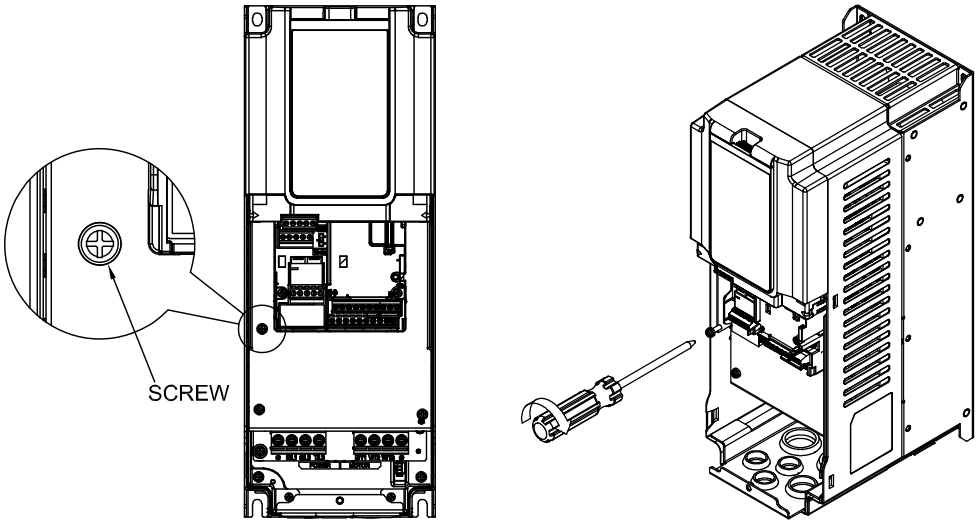


Figure 3-75

Frame D1

Applicable models: VFD045VP43ANTCA, VFD062VP43ANTCA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

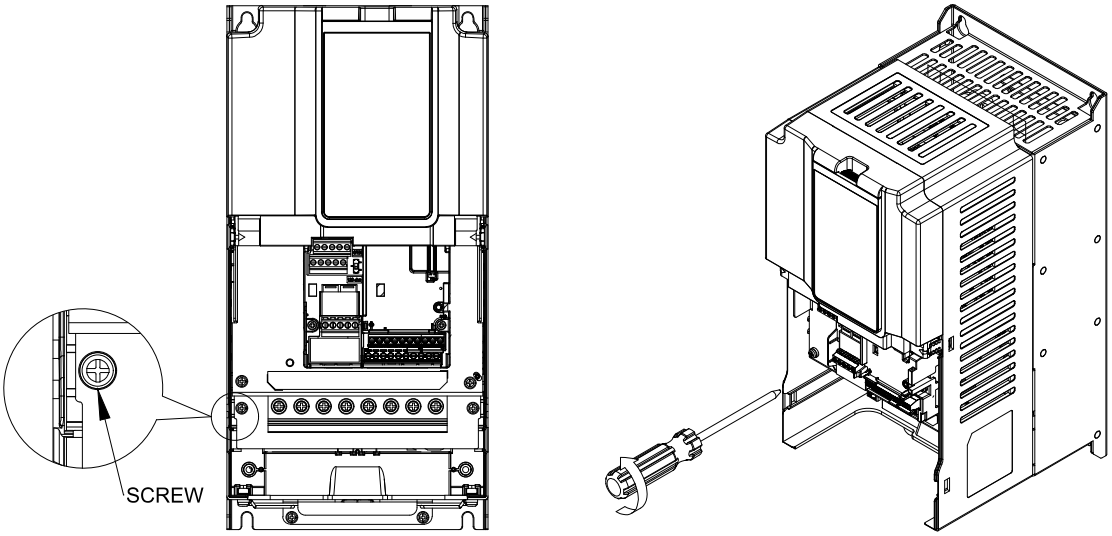


Figure 3-76

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

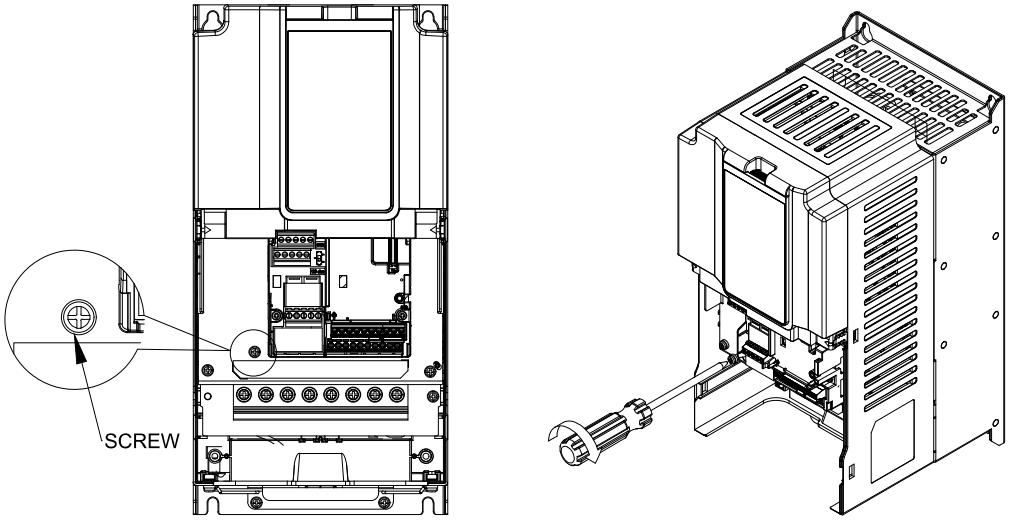


Figure 3-77

Frame D2

Applicable models: VFD045VP43BFTCA, VFD062VP43BFTCA, VFD045VP43BSTCA, VFD062VP43BSTCA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

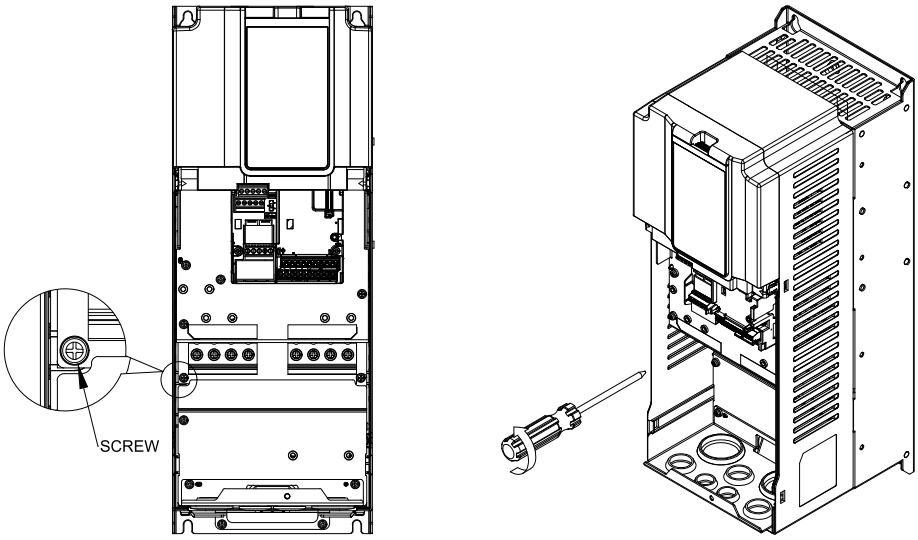


Figure 3-78

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

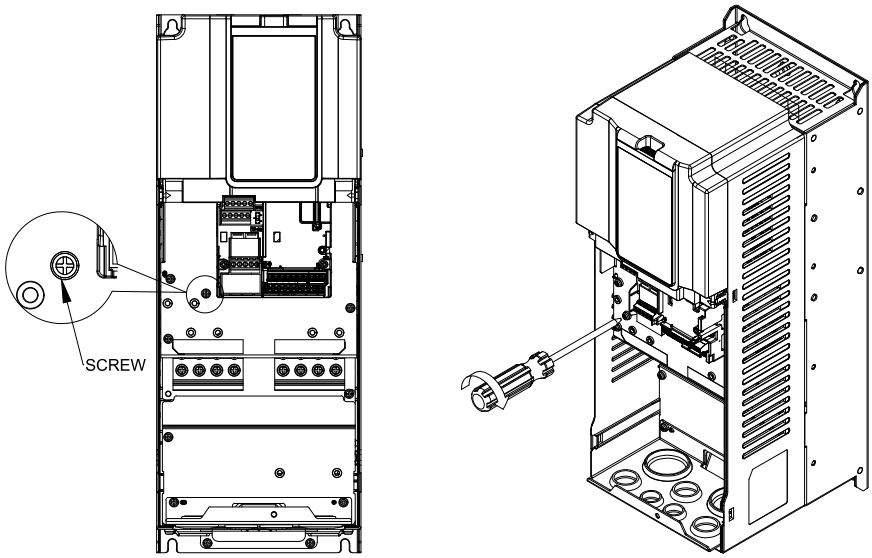


Figure 3-79

Frame E1

Applicable models: VFD073VP43ANTCA, VFD090VP43ANTCA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

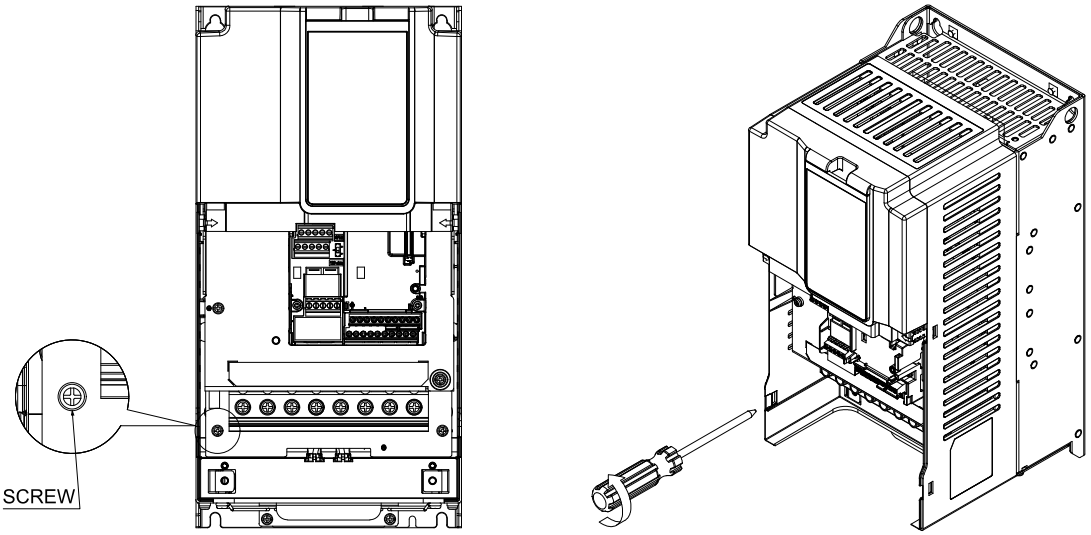


Figure 3-80

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

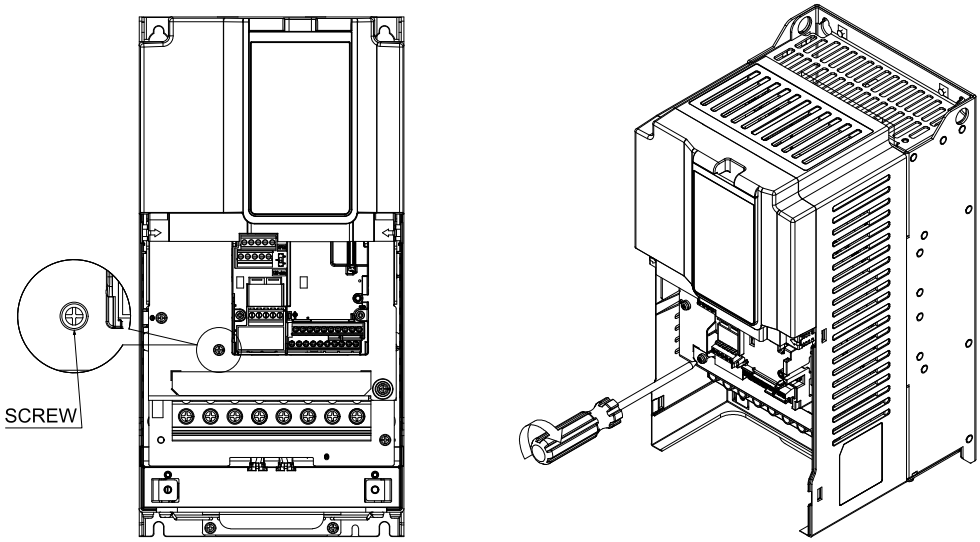


Figure 3-81

Frame E2

Applicable models: VFD073VP43BFTCA, VFD090VP43BFTCA, VFD073VP43BSTCA, VFD090VP43BSTCA

1. Loosen and remove the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

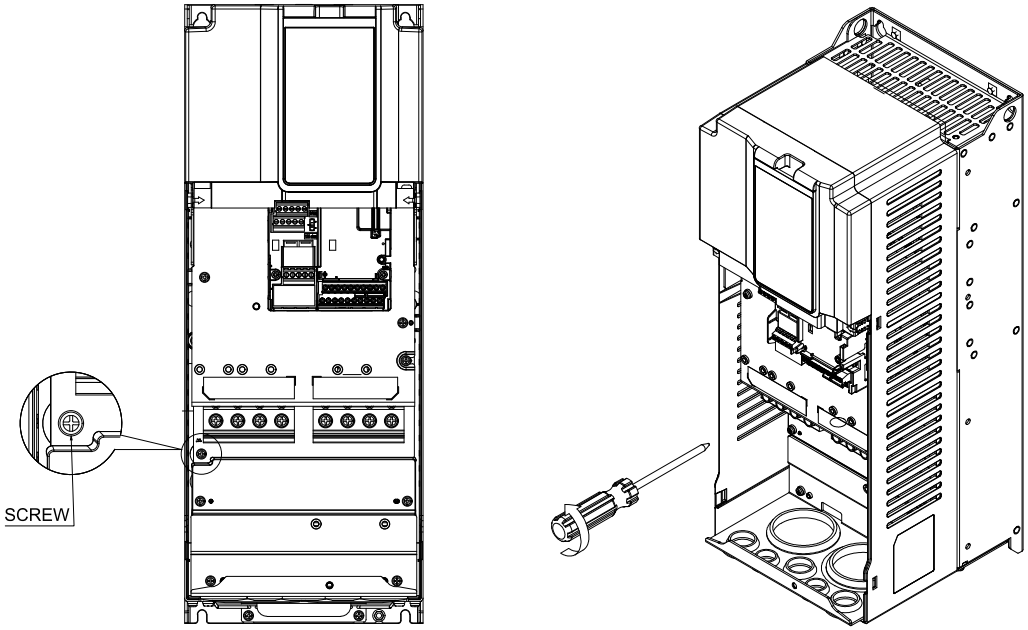


Figure 3-82

2. Fasten the screws to the RFI jumper storage placement.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

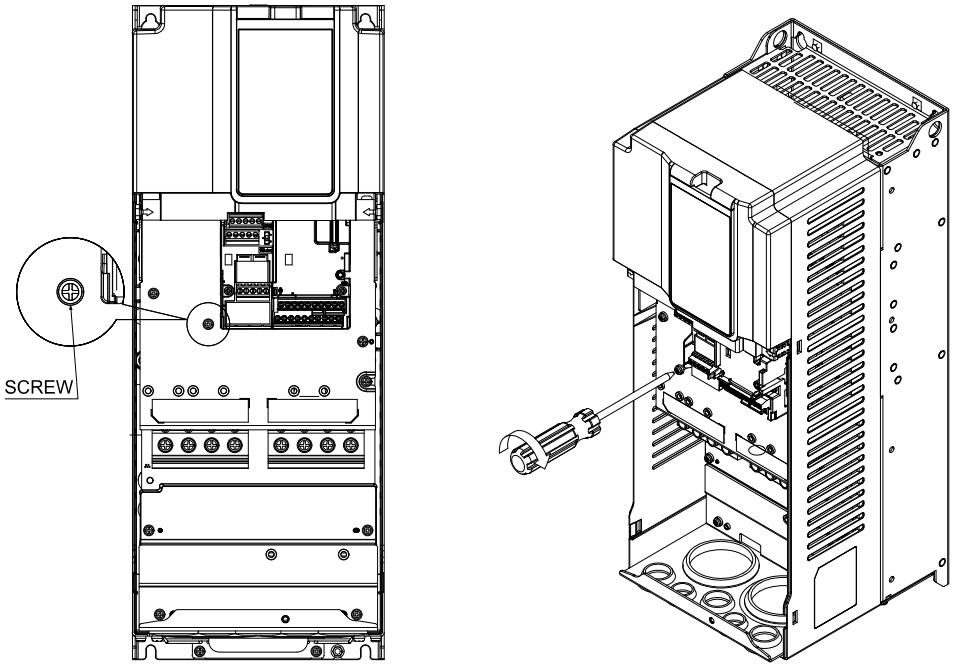


Figure 3-83

Frame F1

Applicable models: VFD110VP43AFTCA

1. Loosen the RFI jumper screw and the fix screw, remove the RFI jumper and keep the fix screw on the plate.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

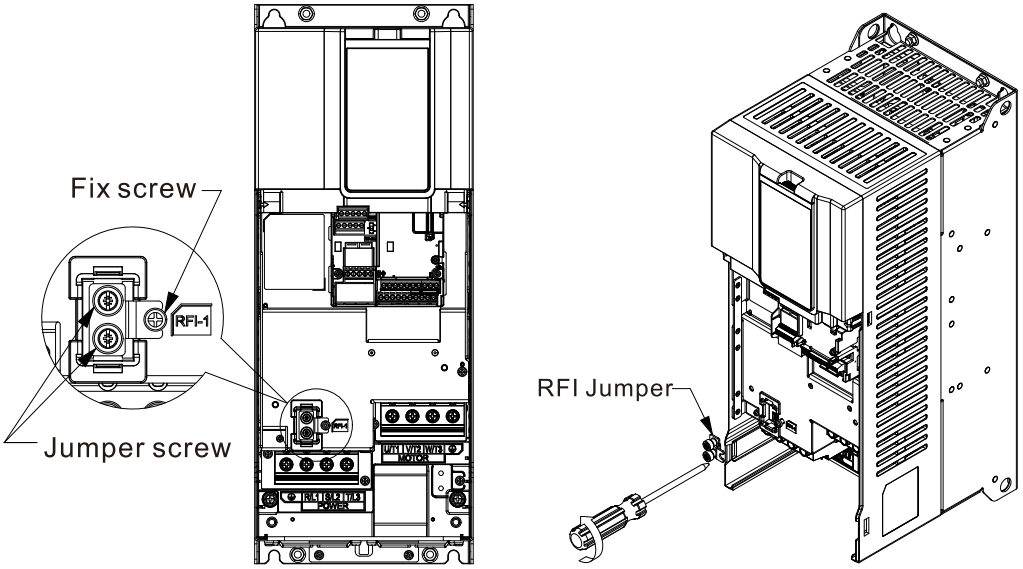


Figure 3-84

2. Loosen the screws on the jumper storage placement, after placing the RFI jumper, fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

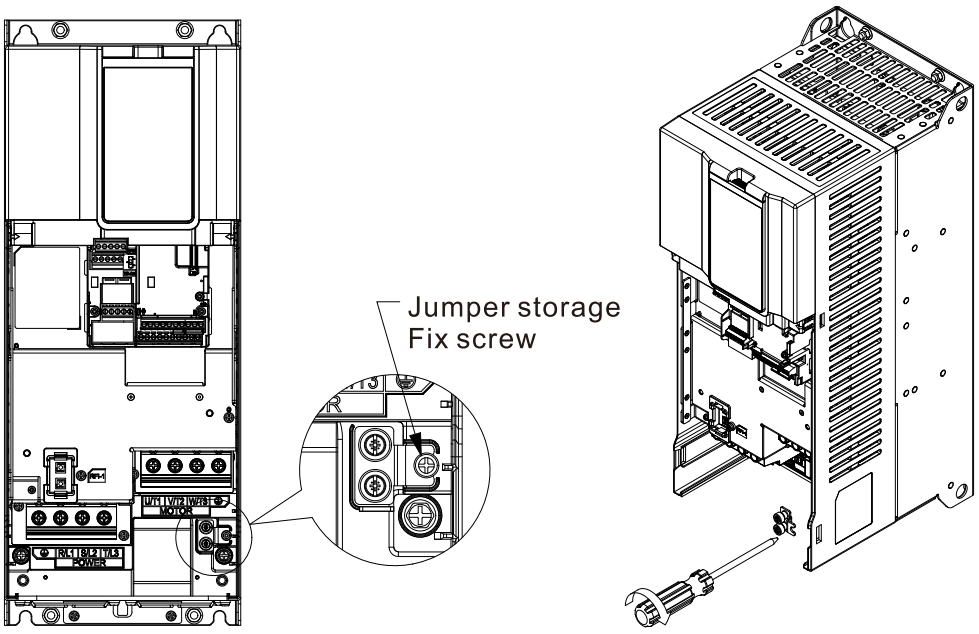


Figure 3-85

Frame F2

Applicable models: VFD110VP43BFTCA, VFD110VP43BSTCA

1. Loosen the RFI jumper screw and the fix screw, remove the RFI jumper and keep the fix screw on the plate.
   Screw torque: 6–8 kg-cm / (5.2–6.9 lb-in) / (0.59–0.78 Nm)

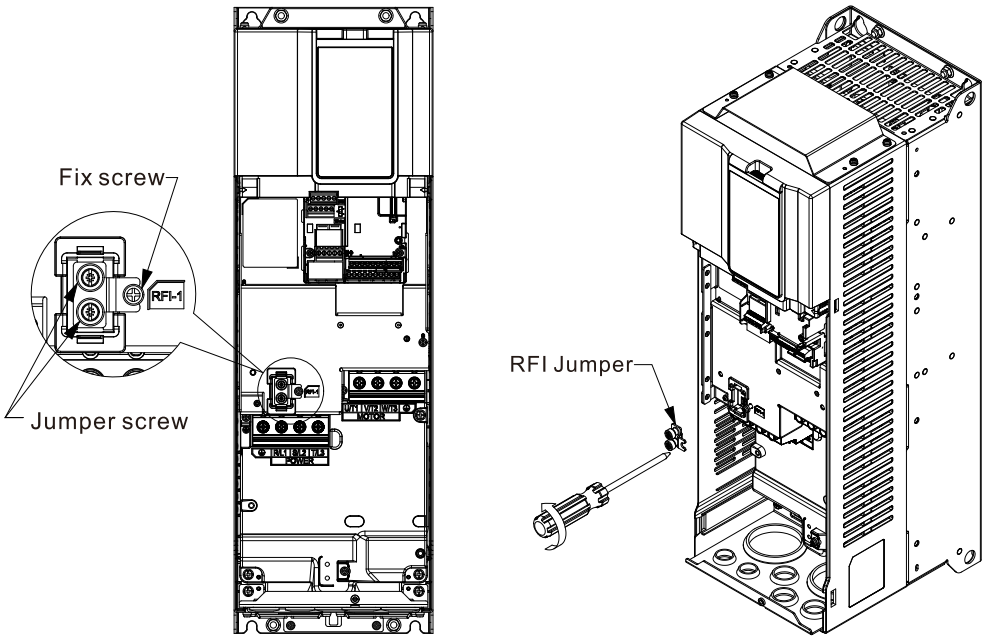


Figure 3-86

2. Loosen the screws on the jumper storage placement, after placing the RFI jumper, fasten back the screws.
   Screw torque: 6–8 kg-cm / (5.2–6.9 lb-in) / (0.59–0.78 Nm)

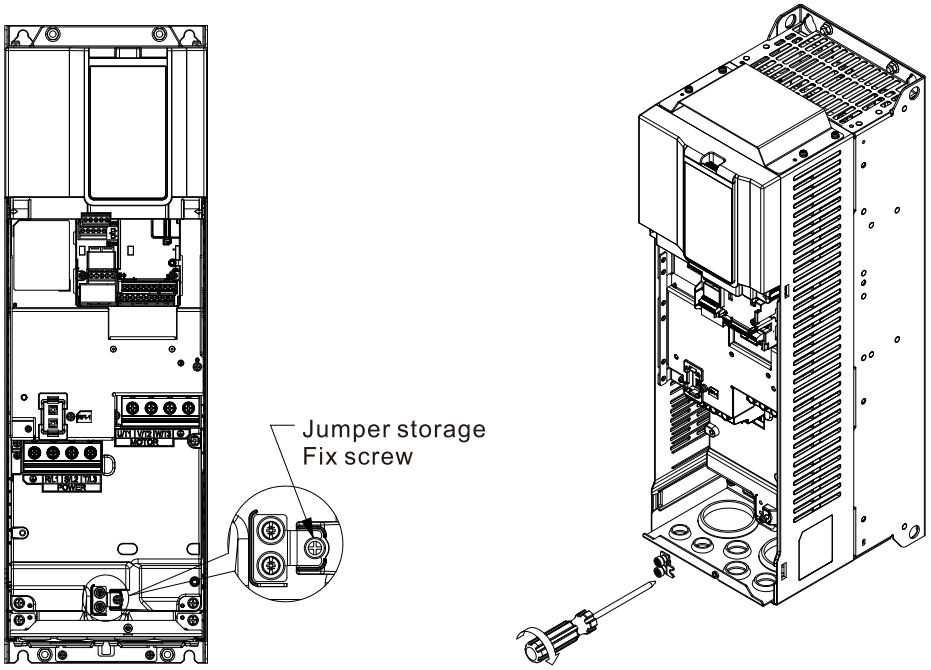


Figure 3-87

Frame G1

Applicable models: VFD150VP43AFTCA

1. Loosen the RFI jumper.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

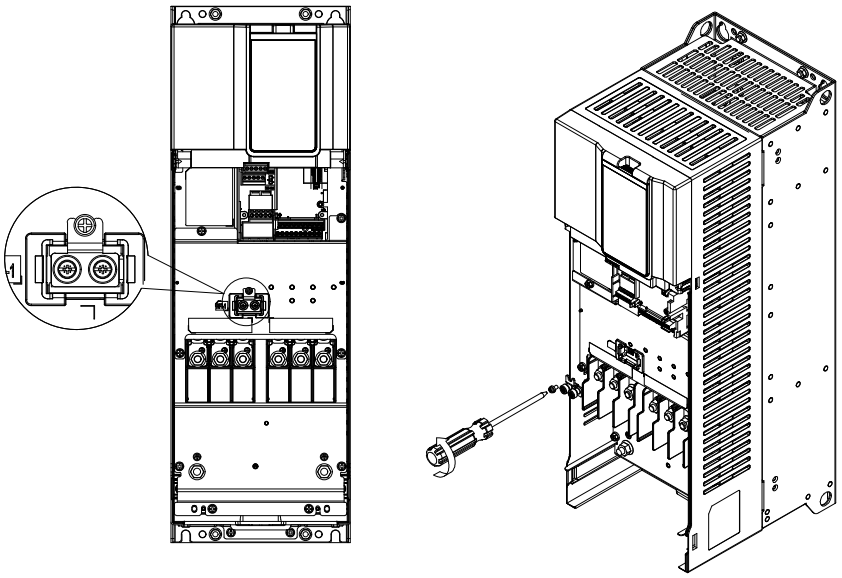


Figure 3-88

2. Place the RFI jumper and fasten back the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

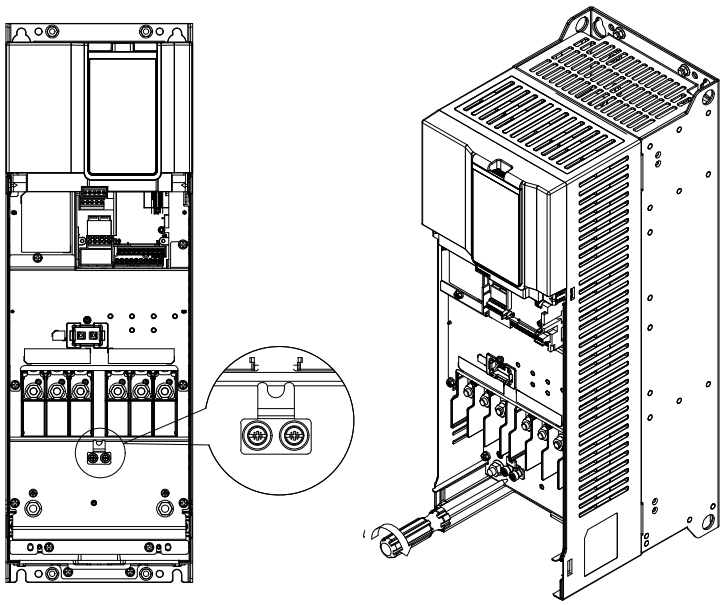


Figure 3-89

Frame G2

Applicable models: VFD150VP43BFTCA, VFD150VP43BSTCA

1. Loosen the RFI jumper.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

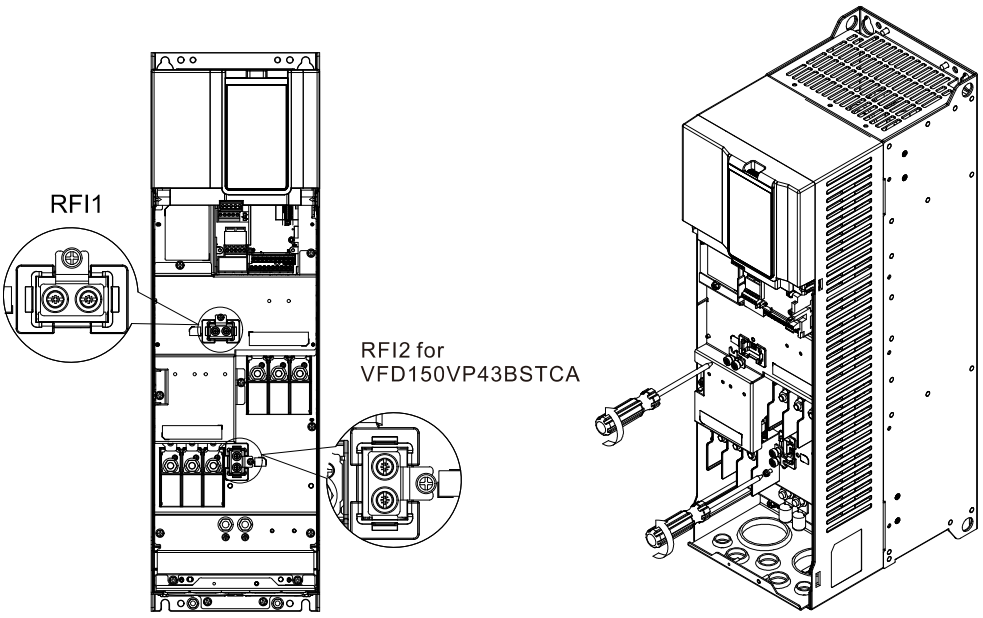


Figure 3-90

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

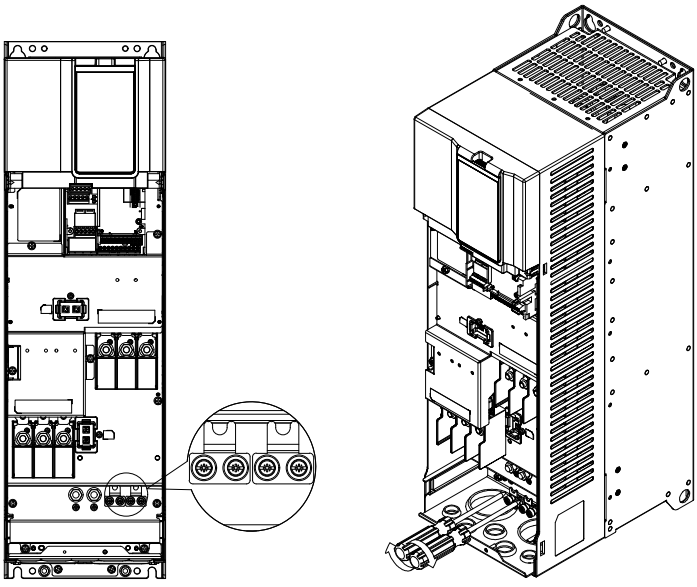


Figure 3-91

Frame H1

Applicable models: VFD180VP43AFTCA–VFD220VP43AFTCA

1. Loosen the RFI jumper.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

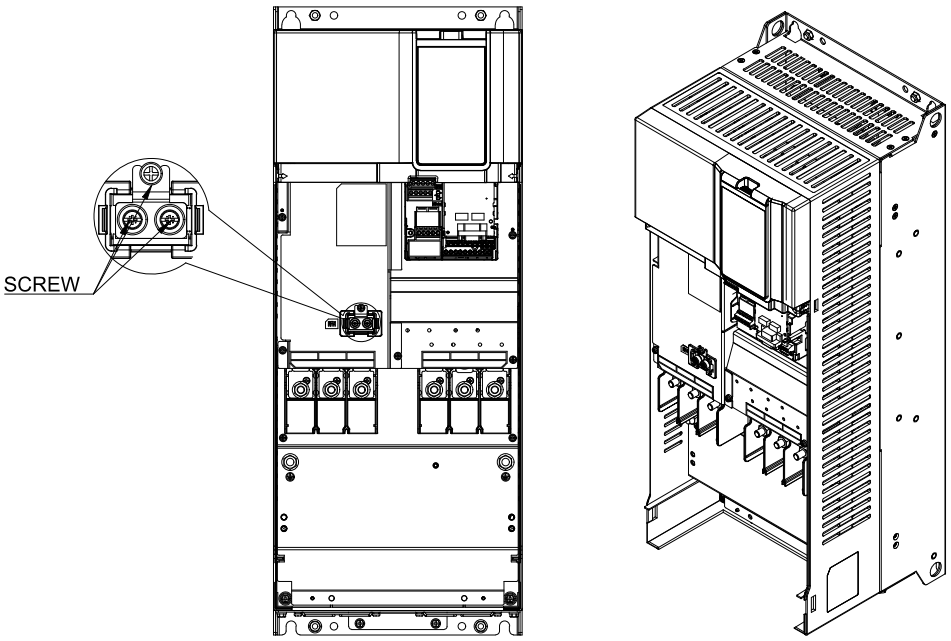


Figure 3-92

2. Place the RFI jumper and fasten back the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

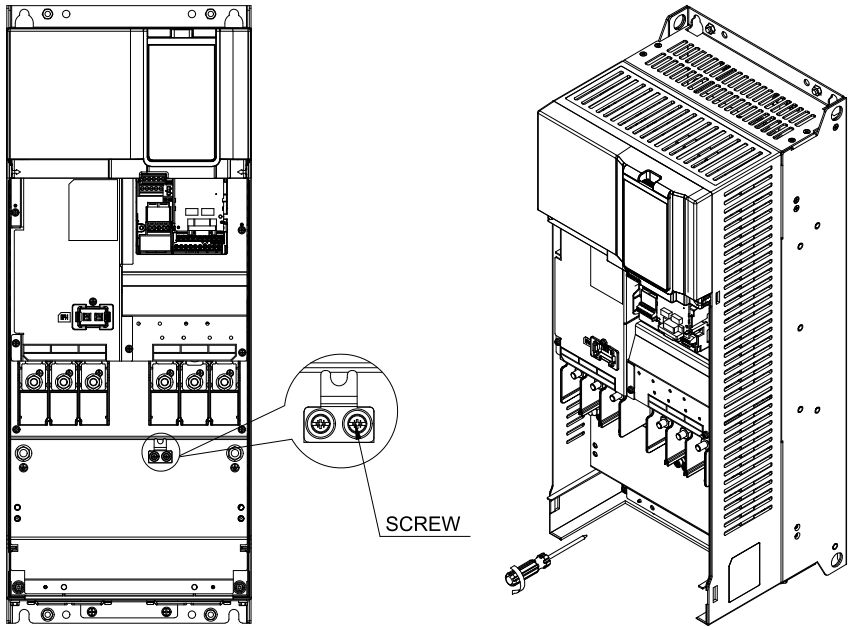


Figure 3-93

Frame H2

Applicable models: VFD180VP43BSTCA–VFD220VP43BSTCA

1. Loosen the RFI jumper.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

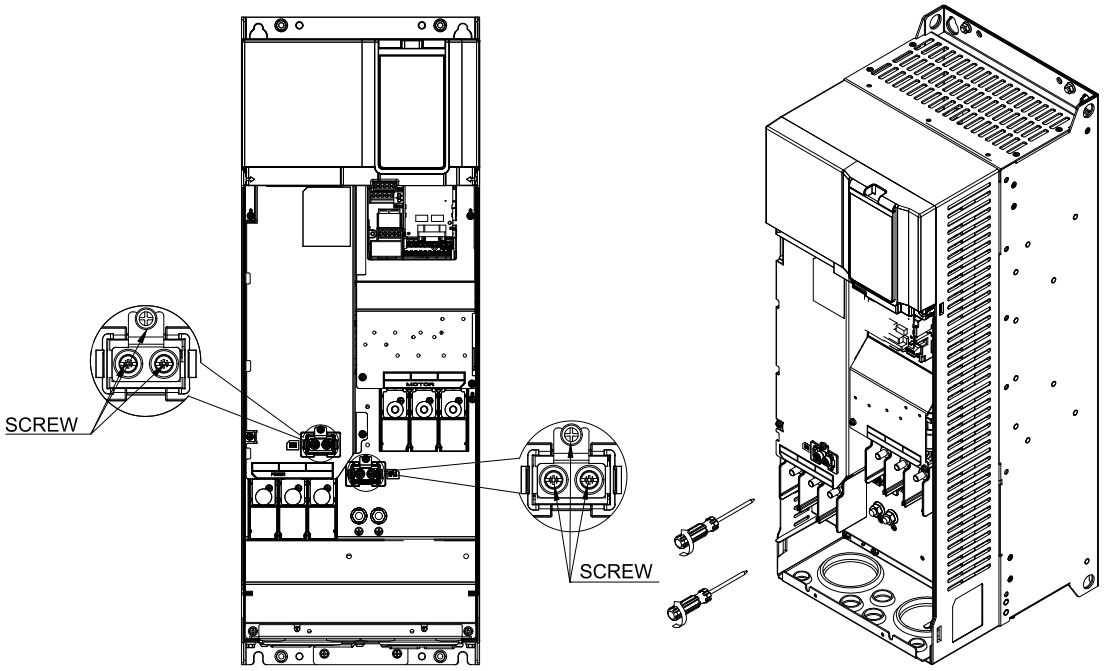


Figure 3-94

2. Place the RFI jumper and fasten back the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

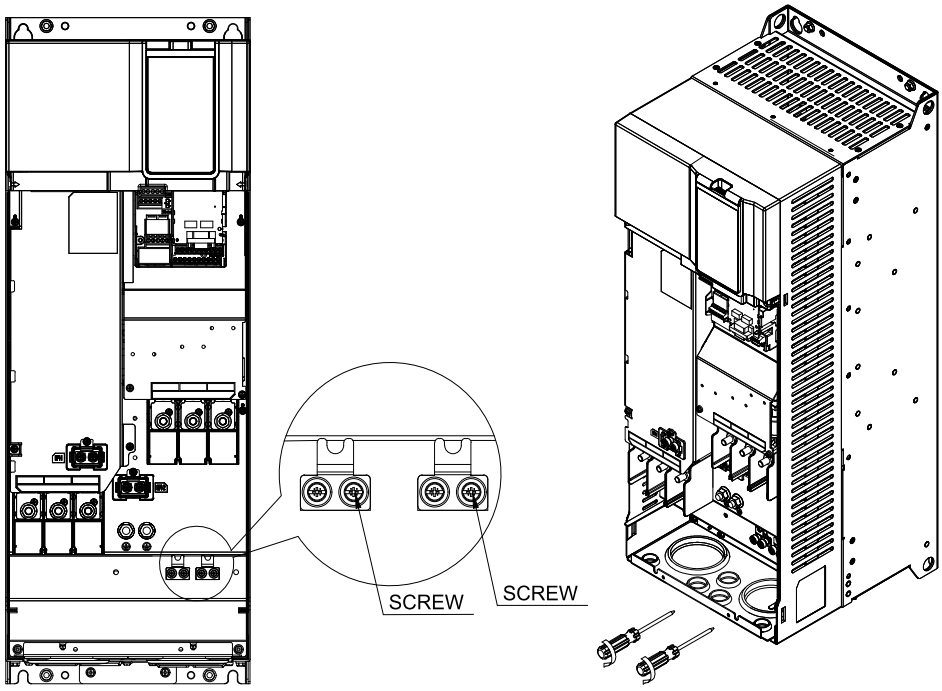


Figure 3-95

Frame H2

Applicable models: VFD180VP43BFTCA–VFD220VP43BFTCA

1. Loosen the RFI jumper.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

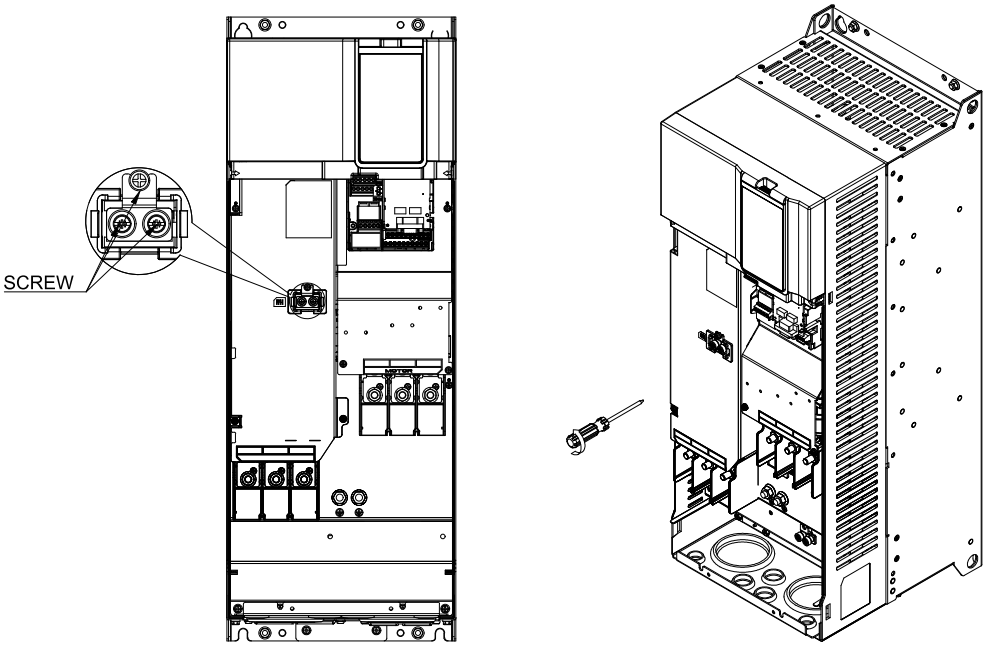


Figure 3-96

2. Place the RFI jumper and fasten back the screws.

   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

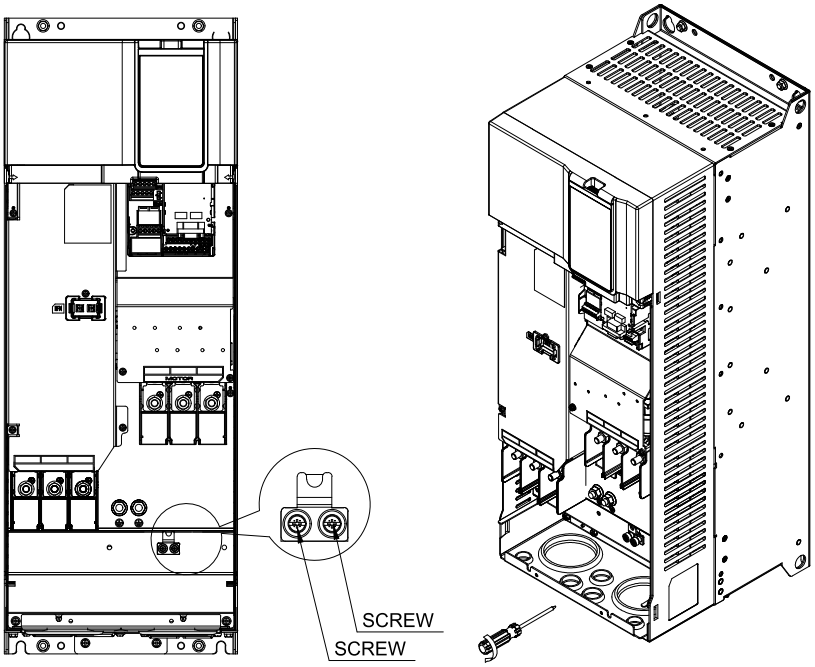


Figure 3-97

Frame I1

Applicable models: VFD260VP43AFTCA–VFD310VP43AFTCA

1. Loosen the RFI jumper and keep the screws on the plate.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

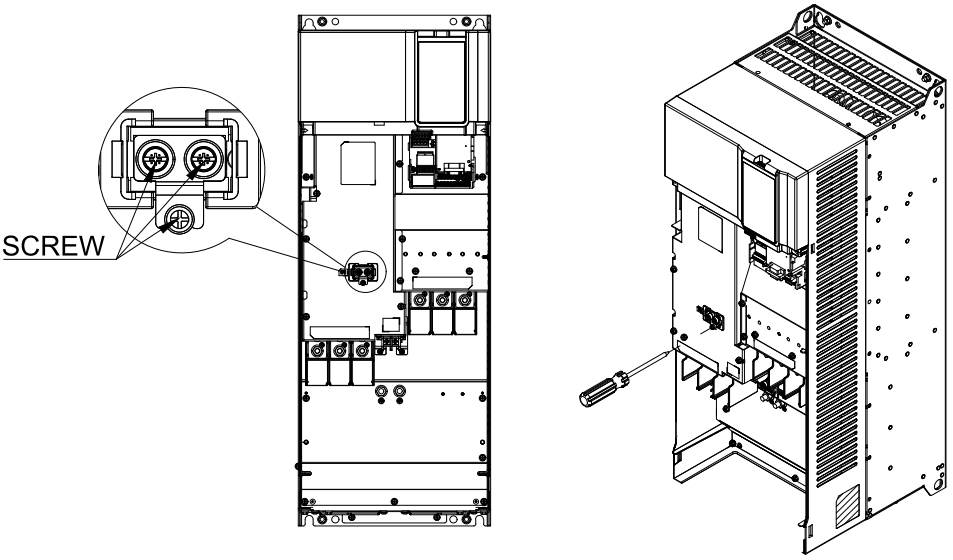


Figure 3-98

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

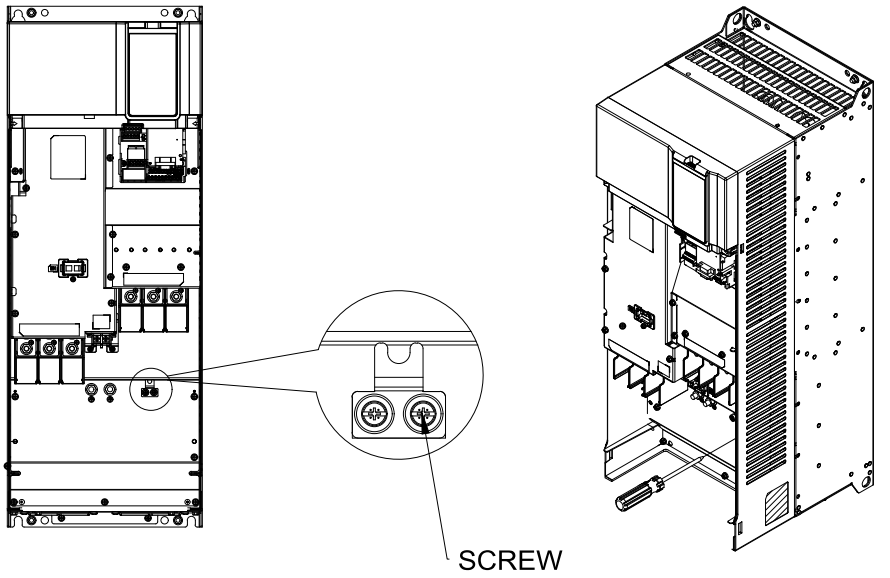


Figure 3-99

Frame I2

Applicable models: VFD260VP43BFTCA–VFD310VP43BFTCA, VFD260VP43BSTCA–VFD310VP43BSTCA

1. Loosen the RFI jumper and keep the screws on the plate.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

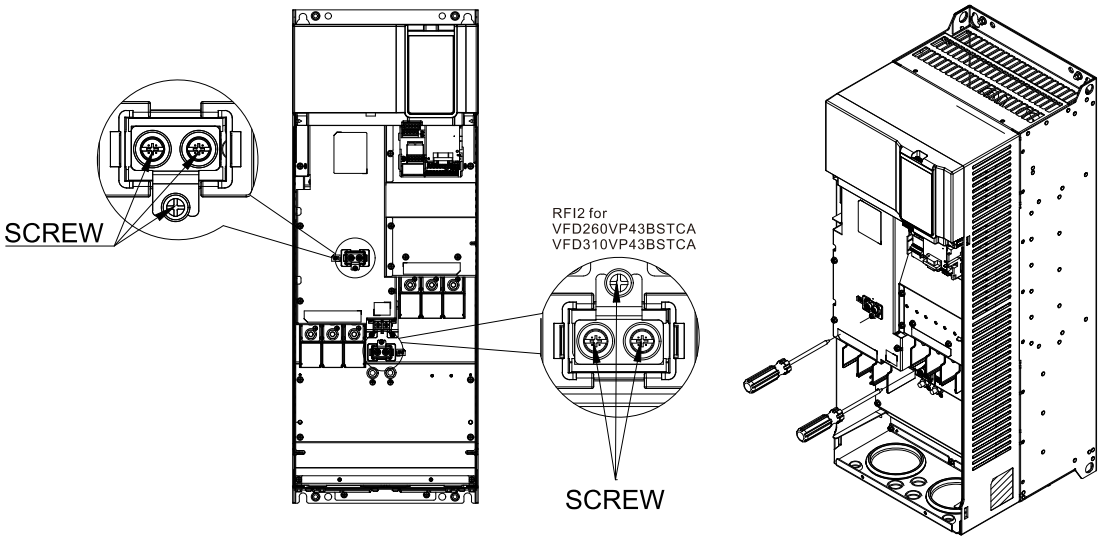


Figure 3-100

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

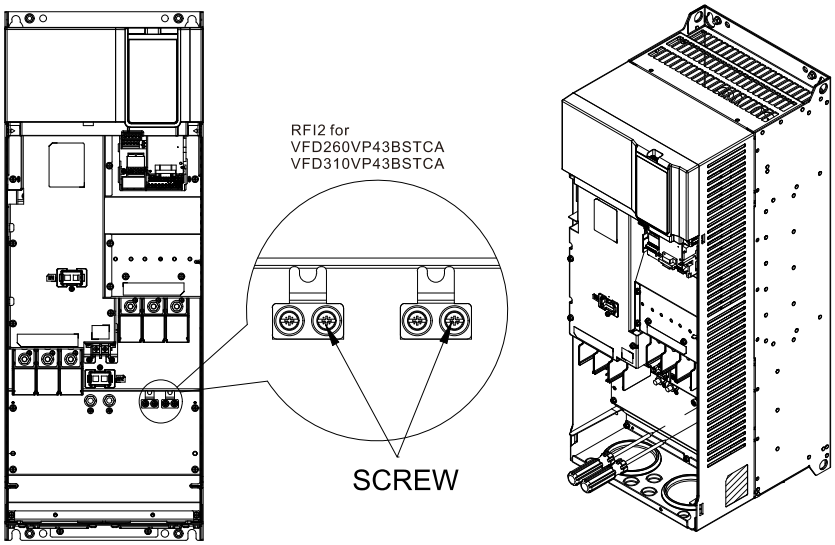


Figure 3-101

Frame J

Applicable models: VFD370VP43AFTCA–VFD395VP43AFTCA, VFD370VP43BSTCA–VFD395VP43BSTCA
VFD370VP43BFTCA–VFD395VP43BFTCA

1. Loosen the RFI jumper (fasten the M4 screws back to the original place).
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

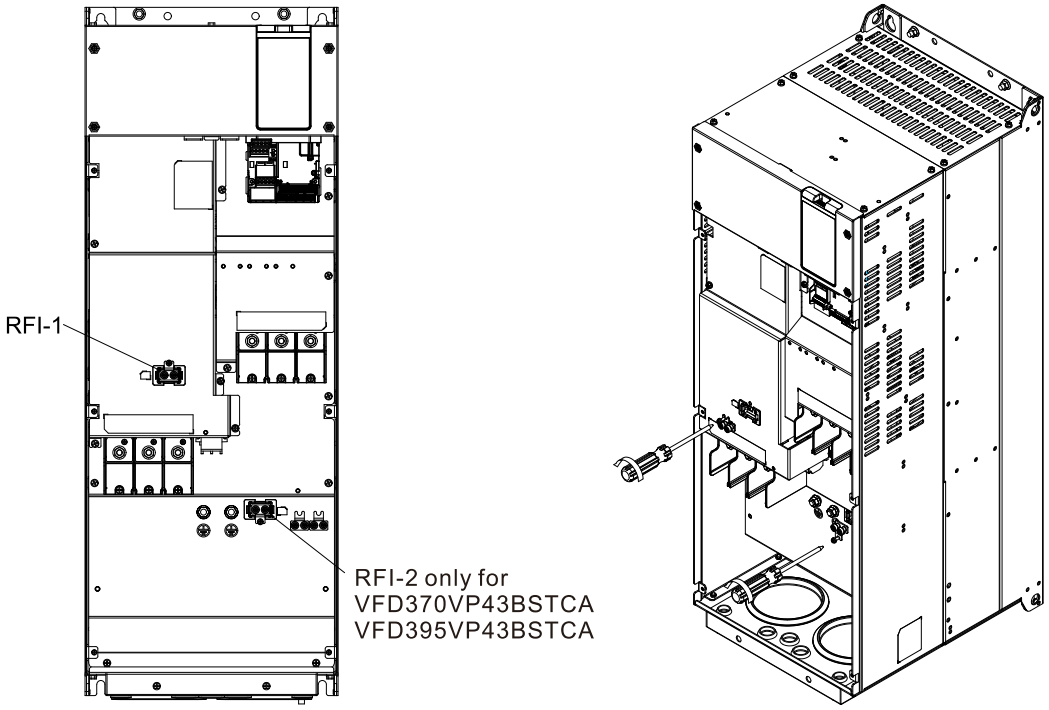


Figure 3-102

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

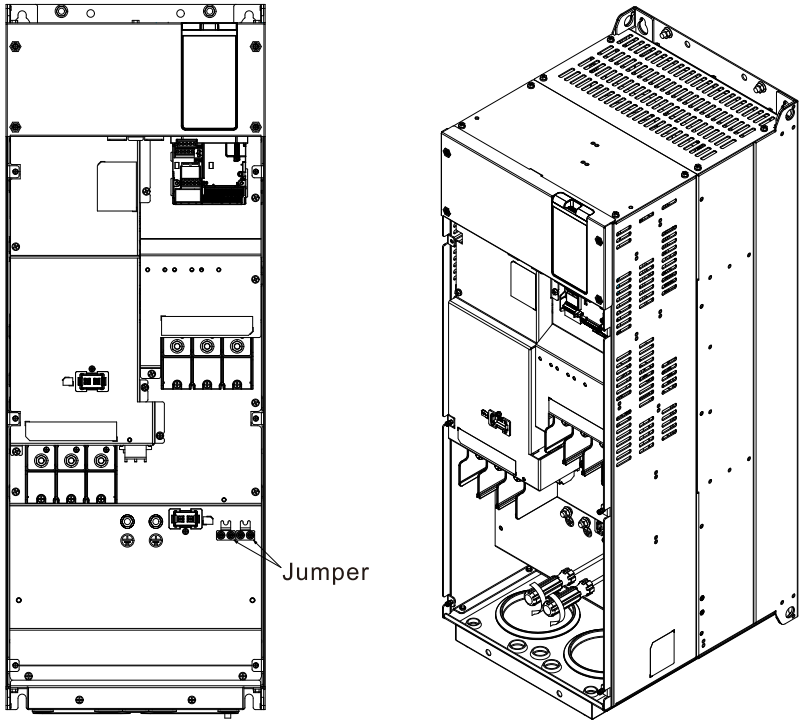


Figure 3-103

Frame K1

Applicable models: VFD460VP43AFTCA, VFD485VP43AFTCA

1. Loosen the RFI jumper (fasten the M4 screws back to the original place).
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

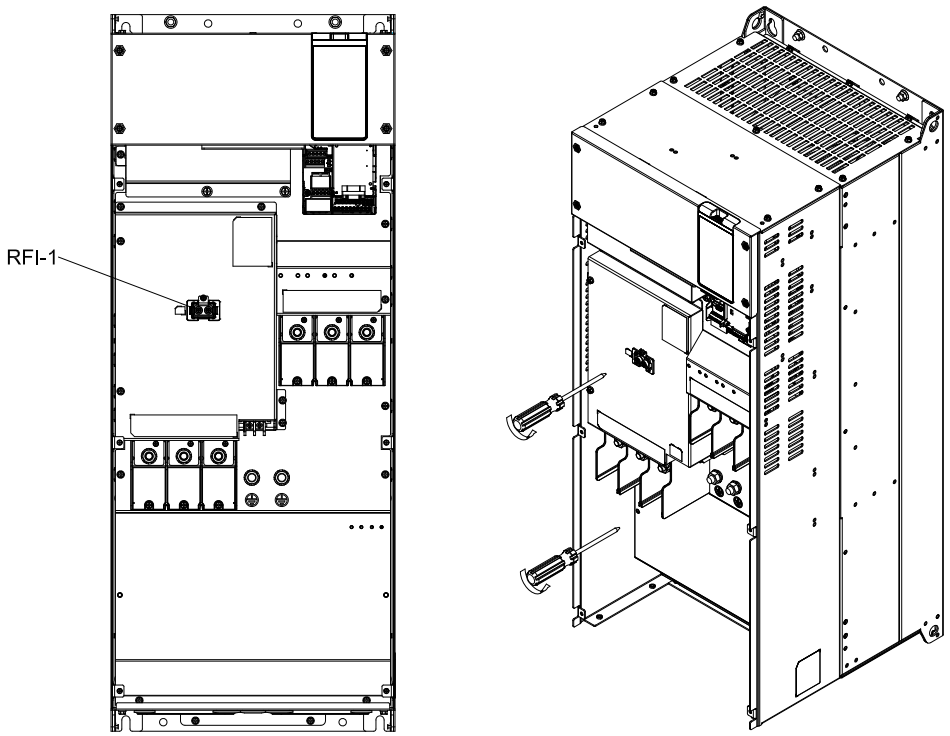


Figure 3-104

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

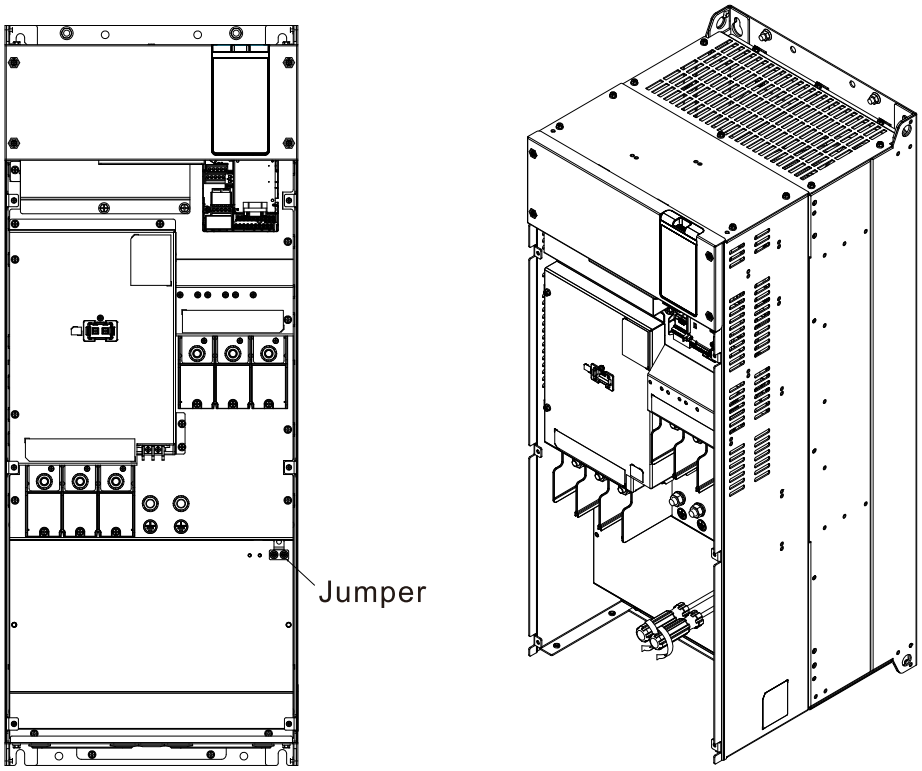


Figure 3-105

Frame K2

Applicable models: VFD460VP43BSTCA–VFD485VP43BSTCA, VFD460VP43BFTCA–VFD485VP43BFTCA

1. Loosen the RFI jumper (fasten the M4 screws back to the original place).
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

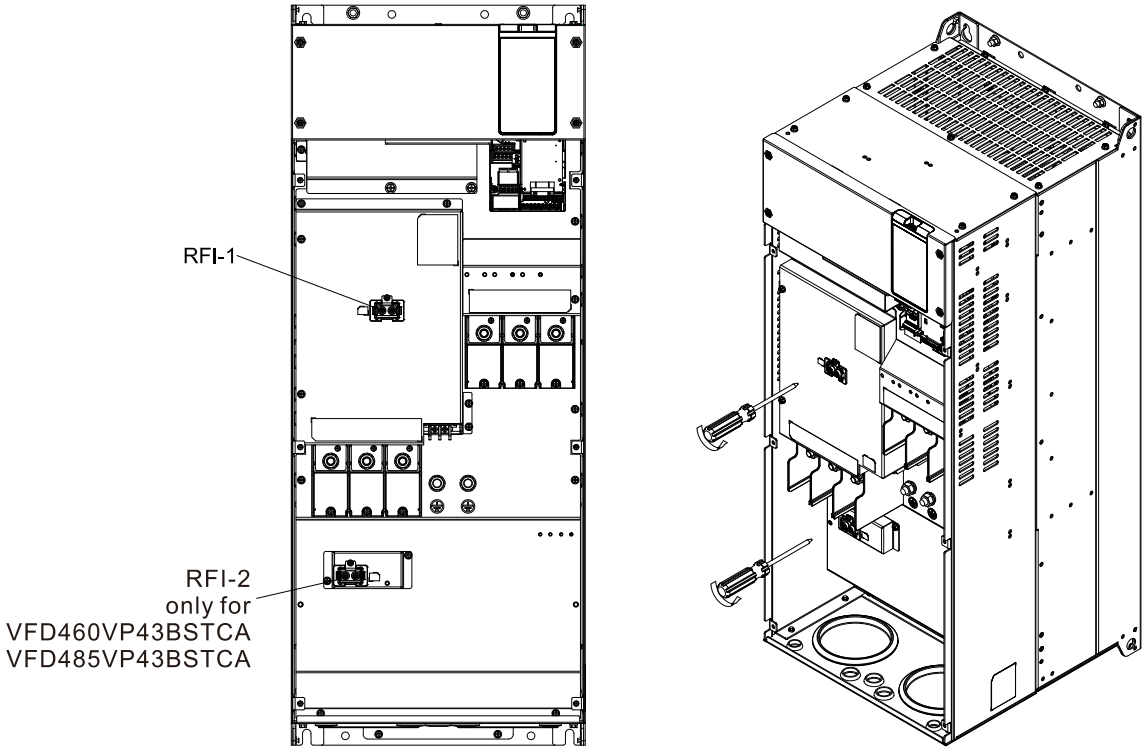


Figure 3-106

2. Place the RFI jumper and fasten back the screws.
   Screw torque: 8–10 kg-cm / (6.9–8.7 lb-in) / (0.78–0.98 Nm)

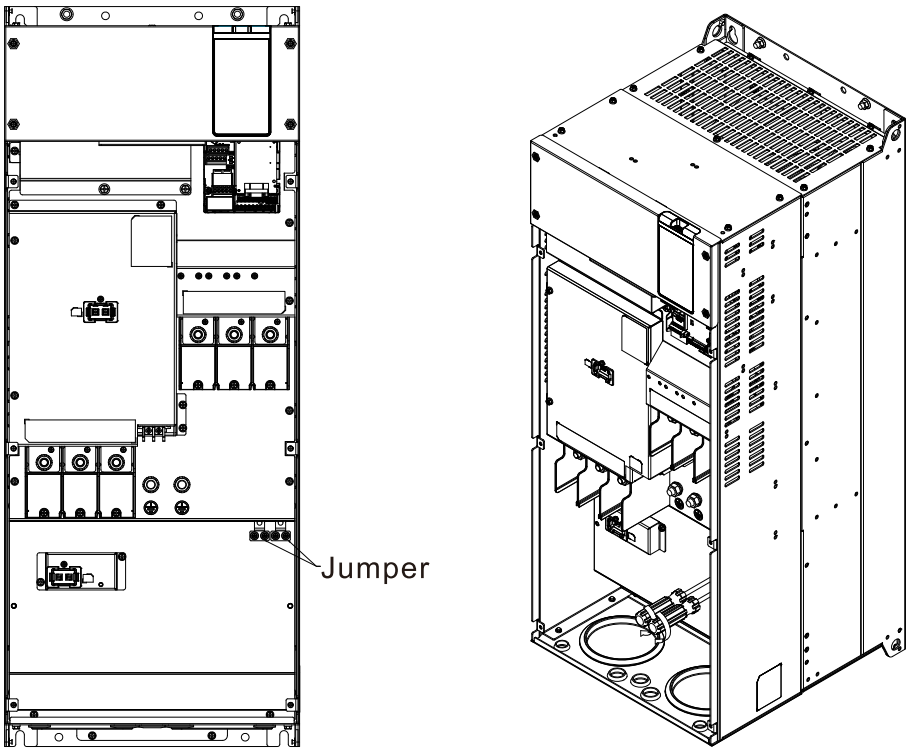


Figure 3-107

Frame L–M

Applicable models: VFD530VP43SHTCA–VFD1K2VP43SHTCA

1. Loosen the three screws on the RFI jumper and remove the jumper.
   M4 screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)
   RFI jumper screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

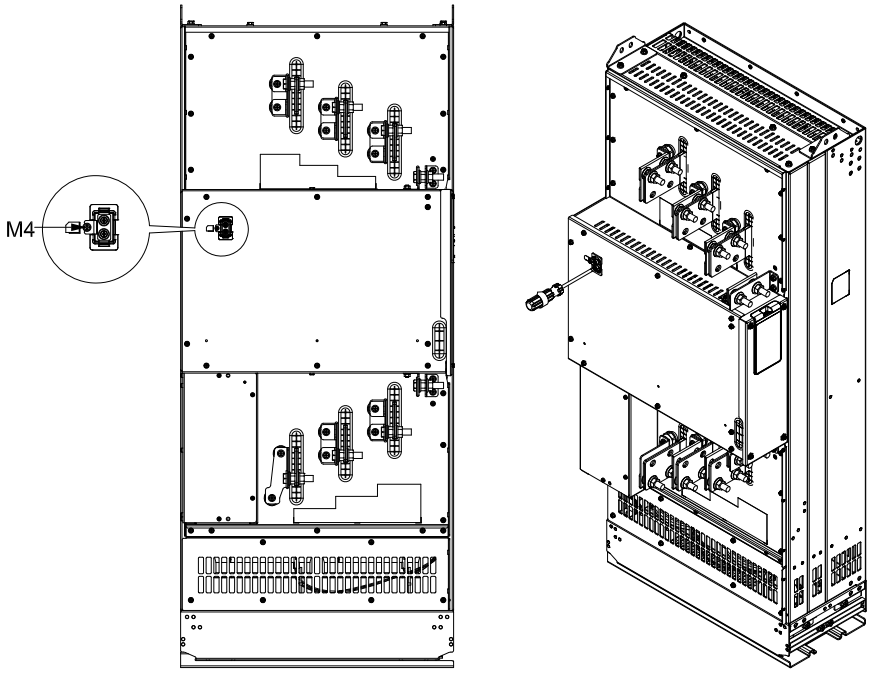


Figure 3-108

2. Fasten the M4 screws back to its original position and put the RFI jumper to the position indicated in the figure below and fasten it.
   M4 screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)
   RFI jumper screw torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.78–0.98 Nm)

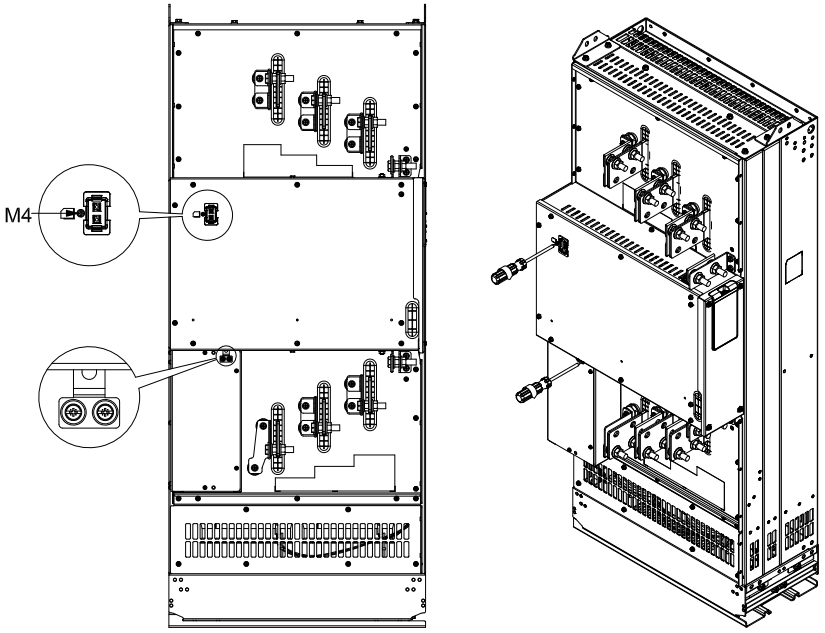


Figure 3-109

Isolating main power from ground:

When the power distribution system for the drive is a floating ground system (IT) or an asymmetric ground system (Corner Grounded TN Systems), you must remove the RFI jumper. Voltage of any phase to the ground for either system may be larger than the voltage specifications of the drive's built-in surge absorber and common-mode capacitance. In this case, connecting RFI jumper to the ground may cause damage to the drive.

Important points regarding ground connection:

- ☑ To ensure the safety of personnel, proper operation, and to reduce electromagnetic radiation, you must properly ground the motor and drive during installation.
- ☑ The diameter of the grounding cables must with the local safety regulations.
- ☑ You must connect the shielded cable to the motor drive's ground to meet safety regulations.
- ☑ Only use the shielded cable as the ground for equipment when the aforementioned points are met.
- ☑ When installing multiple drives, do not connect the grounds of the drives in series but connect each drive to ground. The following pictures show the correct and wrong ways to connect the grounds.

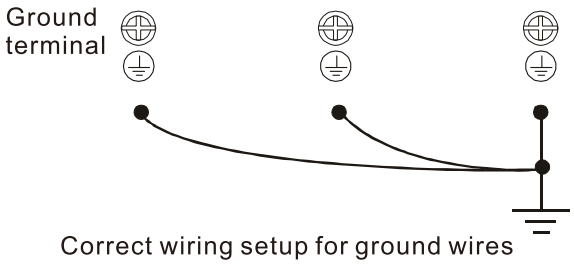


Figure 3-110

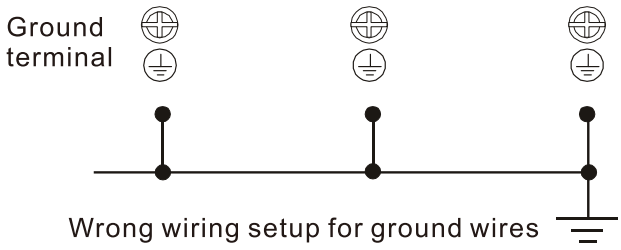


Figure 3-111

Pay particular attention to the following points:

- ☑ Do not remove the RFI jumper while the power is on.
- ☑ Make sure that the main power supply has been cut off before removing the RFI jumper.
- ☑ Removing the RFI jumper also cuts the capacitor conductivity of the surge absorber to ground and the built-in EMC filter capacitors. Compliance with the EMC specifications is no longer guaranteed.
- ☑ Do not remove the RFI jumper if the mains power is a symmetrical grounded power system in order to maintain the efficiency for EMC circuit.
- ☑ Remove the RFI jumper when conducting high voltage tests. When conducting a high voltage test to the entire facility, disconnect the mains power and the motor if the leakage current is too high.

Floating Ground System (IT Systems)

A floating ground system is also called an IT system, an ungrounded system, or a high impedance / resistance (greater than 30 Ω) grounded system.

1. Remove the RFI jumper to disconnect the ground cable from the internal filter capacitor and surge absorber.
2. In situations where EMC is required, check for excess electromagnetic radiation affecting nearby low voltage circuits. In some situations, the adapter and cable naturally provide enough suppression. If in doubt, install an extra electrostatic shielded cable on the power supply side between the main circuit and the control terminals to increase shielding.
3. Do not install an external RFI / EMC filter. The external EMC filter passes through a filter capacitor and connects power input to the ground. This is extremely dangerous and damages the motor drive.

Asymmetric Ground System (Corner Grounded TN Systems)

Caution: Do not remove the RFI jumper while power to the input terminal of the drive is ON.

In the following four situations, you must remove the RFI jumper. This is to prevent the system from grounding through the RFI and filter capacitors and damaging the drive.

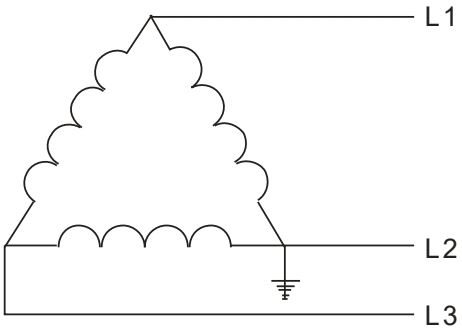
<table>
<tr><th colspan="2">You must remove the RFI jumper for an asymmetric ground system</th></tr>
<tr><td>1. Grounding at a corner in a triangle configuration
 

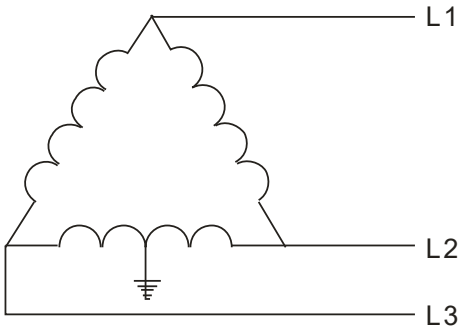
Figure 3-112</td><td>Grounding at a midpoint in a polygonal configuration
 

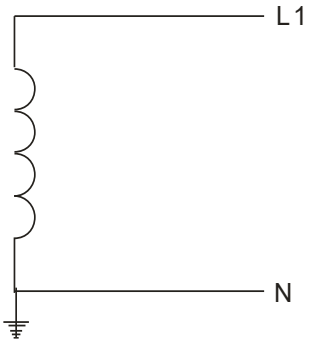
Figure 3-113</td></tr>
<tr><td>Grounding at one end in a single-phase configuration
 

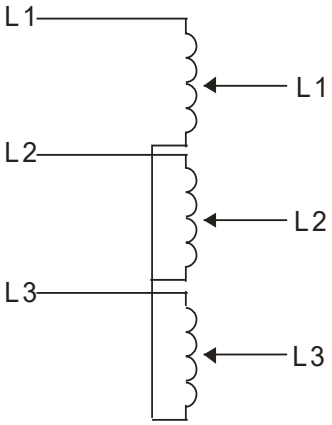
Figure 3-114</td><td>4. No stable neutral grounding in a three-phase autotransformer configuration
 

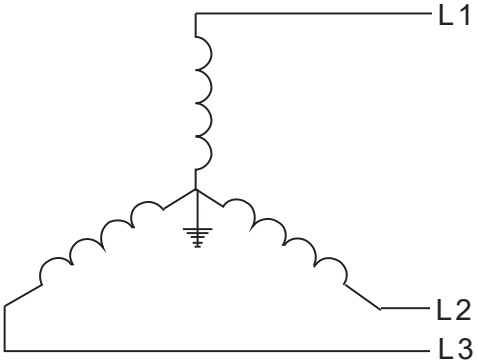
Figure 3-115</td></tr>
<tr><th colspan="2">You can use the RFI jumper for a symmetrical grounding power system</th></tr>
<tr><td>An internal ground is formed through a ground capacitor, which reduces electromagnetic radiation. The requirements for electromagnetic compatibility are more stringent. In the application of power system using symmetrical grounding, you can install an EMC filter. Refer to the figure on the right for the symmetrical grounding power system.</td><td> 

Figure 3-116</td></tr>
</table>

3-7 Harmonic Interference Prevention

Connection of AC Reactor

In order to suppress rapid changes in current and high-order harmonic current, AC reactors are required. While suppressing the high-order harmonic current, it also improves the power factor of the drive input side.

For the following situation, connect an AC reactor to the input side (primary side).

- When you need to suppress the high-order harmonic current or improve power factor at the power side.
- When you need to switch the phase advance capacitors.
- When you connect the drive to a larger capacity power transformer (600 kVA and above).

Wiring of AC Reactor

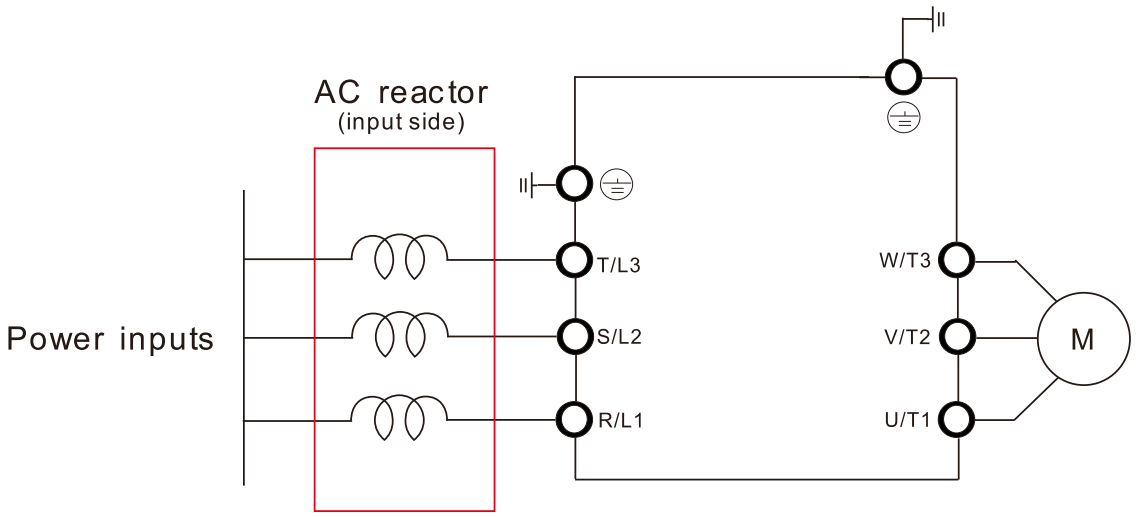


Figure 3-117

NOTE: Refer to Section 10-3-1 AC Reactor for selection.

3-8 Electromagnetic Interference Prevention

When using an AC motor drive to drive the equipment, the harmonic noise will be generated on the power input and output sides of the drive and generates EMC interference on the power supply network and the electrical equipment around the AC motor drive. The AC motor drive is usually installed in an industrial environment with high electromagnetic interference. Under these circumstances, the drive may not only be a noise generator, but more possibly a noise receiver.
Delta drives have been optimized for EMC during design and comply with the EMC power system product standard EN61800-3. Correctly install the drive can reduce the EMC interference. To ensure a long-term normal operation of the power system, the drive must be correct wiring and grounding.
The prevention methods are as follows.

3-8-1 Grounding

The grounding can be set with different forms of grounding terminals as grounding electrodes according to different equipment. Use a grounding wire on the electrical equipment that needs to be grounded to guide the leakage current to the ground. According to Ohm's law, there may be different potential difference between these electrodes and the earth due to different grounding resistance values.

The main purpose of EMC is to prevent noise, and the main consideration of this kind of signal grounding is frequency. When the frequency is lower than 10 kHz, single-point grounding is sufficient; but if the frequency is higher than 10 kHz, multi-point grounding is more effective.

- Single-point ground: Gather the signal grounding points of all IT equipment and connect them to one point. In terms of the grounding, it can be connected to the earth or to the grounding reference. You can also consider connecting the ground to a safety ground point that has been connected to the earth.
- Multi-point ground: Gather the signal grounding points of all IT equipment and ground them independently.

When the DC passes through a conductor, it passes through the entire conductor. If the AC passes through a conductor, and the current moves increasingly close to the surface of the conductor as the frequency increases, this is so-called the Skin effect. In this case, the effective cross-sectional area of the conductor will be smaller, and the resistance value will increase. In conclusion, in order to reduce the influence of the skin effect, you should enlarge the effective cross-sectional area of grounding to increase the current flow at high frequencies. For the above circumstances, you may consider changing the grounding wire from a single wire to a braided conductor or a strip conductor.

3-8-2 Shield

What is a shield?
Electrostatic Shielding: In order to avoid the influence of the external electric filed on the equipment, or to avoid the influence of the internal electric filed of the electrical equipment on other equipment, use a conductor to cover the external electrical filed, so that the internal circuit and the external equipment are not affected, that is called the electrostatic shielding.

In order to avoid interference, some electronic devices or measuring equipment must implement electrostatic shielding. For example, the grounded metal cover or denser metal mesh cover is used for indoor high-voltage equipment. Another example is a power transformer for full-wave rectification or bridge rectification. A metal sheet or a layer of enameled wire is wrapped between the primary winding and the secondary winding and grounded to achieve the shielding effect. In addition, in high-voltage live work, workers wear pressure equalizing suits woven with metal wires or conductive fibers, which can protect human body as a shield.

3-8-3 Wire and Cable

The Shielded Twisted Pair (often abbreviated as STP) is a copper wire. This type of wire is twisted with each other in two pairs and packed in an insulating sleeve. The metal mesh (usually copper) outside the twisted pair can shield the transmission line from external electromagnetic field interference and also serve as a ground.

The outermost layer of the ware and cable is generally rubber or rubber synthetic sleeve. The function of this layer is to insulate and to protect the cable from damage.

Cables are divided into high-voltage and low-voltage cables. If it is a high-voltage cable, there will be a layer of resin-like filler inside to achieve insulation. In high-voltage cables, this layer is the most important part of insulation. Low-voltage cables do not have this layer of filler but are wrapped with something like a ribbon inside. This is to fix each core of the cable and fill the gap in the middle.

The two functions for the shielding layer of the power cable are as follows:

1. The current passing through the power cable is relatively large, resulting in a magnetic field around the current. To avoid affecting other components, the shielding layer can shield this electromagnetic field in the cable.
2. To achieve a certain degree of ground protection. If the cable core is damaged, the leaked current flows into the grounding grid along the shielding layer to achieve safety protection.

3-8-4 Filter

Electromagnetic interference is divided into ration and conduction according to the energy transmitting methods. For radiated interference, shielding technology can generally achieve the best results; as for conducted interference, the most effective and economical methods is to use magnetic filter components to eliminate and suppress it.

In noise interference, the 150K–300 MHz frequency band is called high-frequency; and 120–3000 Hz frequency band is called low-frequency. The high-frequency noise current has a small amplitude but high frequency, and the low-frequency noise current has a large amplitude but low frequency. Both of them are transmitted to the power supply system through the power line.

The high-frequency interference conducted by the power supply needs to be effectively eliminated and suppressed by using a filter. The filter is composed of an inductance coil and a capacitor. Not all the drives have built-in filters, in which case an external filter must be purchased. Refer to Figure 3-95 for general standard filter wiring diagram.

3-8-4-1 External Filter

Install the drive and filter on a metal plate such as a grounded control cabinet. Use shielded wires for motor cables and keep the wiring distance as short as possible. Generally, the drive provides the corresponding type of filter, because only the filter that has been tested and certified can pass the EMC standard.

EMC Filter Installation

Foreword

All electrical equipment, including AC motor drives, generate high frequency / low frequency noise and interfere with peripheral equipment by radiation or conduction when in operation. You can eliminate most of the interference by install an EMC filter correctly. It is recommended to use DELTA EMC filter to have the best interference elimination performance.

We assure that it can comply with following rules when AC motor drive and EMC filter are installed and wired according to user manual:

1. EN61000-6-4
2. EN61800-3 1996
3. EN55011 (1991) Class A Group 1

General Precautions

To ensure EMC filter can maximize the effect of suppressing the interference of AC motor drive, the installation and wiring of AC motor drive should follow the user manual. In addition, be sure to observe the following precautions:

1. Install the EMC filter and AC motor drive on the same metal plate.
2. Install the AC motor drive on footprint EMC filter or install the EMC filter as close as possible to the AC motor drive.
3. Wire as short as possible.
4. Ground the metal plate.
5. The cover of EMC filter and AC motor drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

Choose suitable motor cable and precautions

Improper installation and choice of motor cable affect the performance of EMC filter. Be sure to follow the precautions below when selecting motor cable.

1. Use the cable with shielding (double shielding is the best). The shielding on both ends of the motor cable should be grounded with the minimum length and maximum contact area.
2. Remove any paint on metal saddle for good ground contact with the saddle and the metal plate, as shown in Figure 3-93.
3. The connection between the motor cable isolated copper mesh and the metal plate must be correct. The isolated copper mesh at both ends of the motor cable should be fixed to the metal plate with a saddle. Refer to Figure 3-94 for correct connecting method.

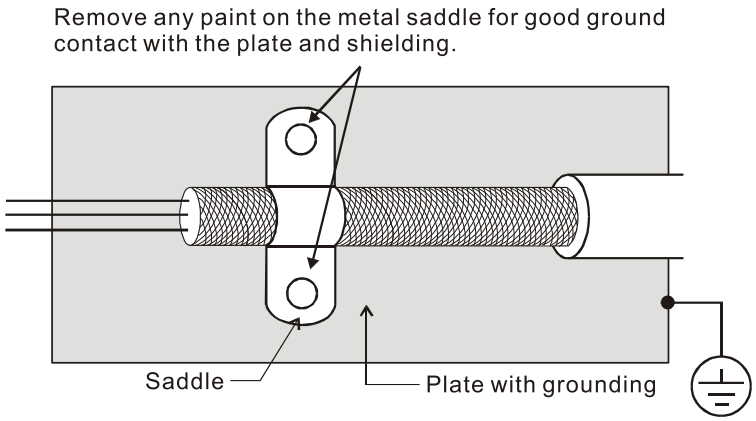


Figure 3-118

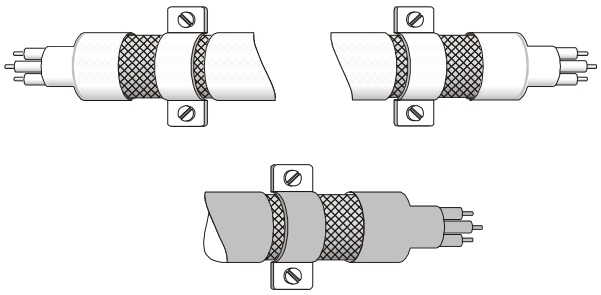


Figure 3-119

3-8-4-2 Connection of EMC Filter

Since the output of the drive switches at high speed, the noise is transmitted from the drive power line, which may cause interference to external equipment (radio, telephone, non-contact switch, pressure sensor or position detector). It is recommended to install an EMC filter on the input side to reduce the noise from the drive to the power line and the reverse noise as well.

NOTE:

1. Use an EMC filter dedicated to the drive.
2. Install the EMC filter as close to the drive as possible.

Connect an EMC filter to the input side of the drive to reduce the radio noise and induction noise. Filter wiring is shown as the figure below.

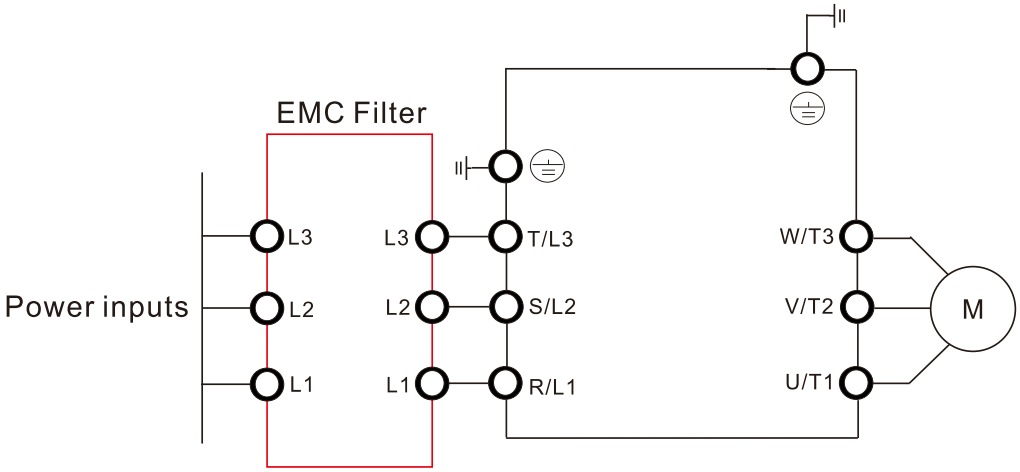


Figure 3-120

NOTE: Do NOT connect phase advanced capacitors and LC/RC filters to the output circuit of the drive. Otherwise, the drive, phase advanced capacitor, EMC filter and earth-leakage circuit-breaker may be damaged.

3-8-4-3 Induction Noise Prevention

In addition to install the EMC filter to suppress induction noise from the output side, you can also consolidate the wiring in a grounded metal pipe for the same purpose. If the signal cable is over 30 cm away from the drive, the influence of induction noise will be reduced. Be sure to ground the metal pipe.

3-8-5 Zero Phase Reactor (Choke)

Install a zero-phase reactor on the input or output side can also reduce the interference. Due to the large current passing through the power input/ output line, be more attention to the saturation of the magnetic core. Due to the large load current on the zero-phase reactor on the power input/ output line, the ideal material is the composite magnetic powder core. This material is highly anti-saturated, its resistivity is several times larger than pure metal magnetic material; therefore, it can be applied in a higher frequency band. You can also increase the number of turns to obtain high impedance capability.

Zero phase reactor installation position diagram:

1. Install at the cable between the power supply and the EMC filter.
2. Install at the cable between the EMC filter and the drive.
3. Install at the cable between the drive and the motor.

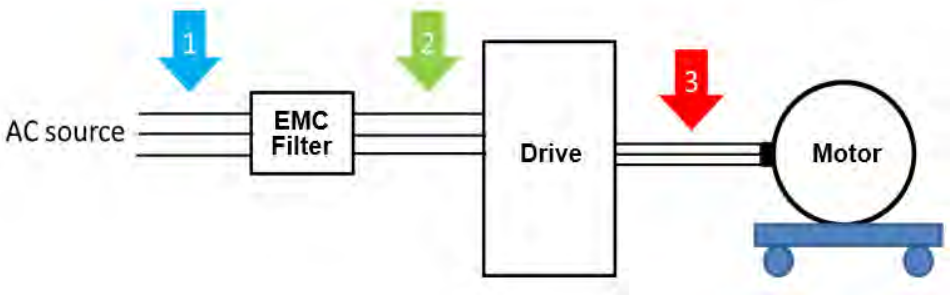


Figure 3-121

Harmonic Interference

The load of the AC motor drive is a non-linear load and generates different components of harmonic current according to the design of the input rectifier. The harmonic current generally needs to be limited within a certain range. This is to ensure that the harmonic voltage and current distortion of the power grid do not exceed the specified range, so as to avoid affecting other equipment. Generally speaking, the drive with built-in DC reactor can effectively suppress the harmonic current (Total Harmonic Current Distortion, THID) within a certain range, which can also reduce the distortion of harmonic voltage (Total Harmonic Voltage Distortion, THVD).

3-8-6 Reactors

In the input circuit of the drive, harmonic with lower frequency (5, 7, 9 and 11 times) has higher proportion. In addition to possibly interfering with the normal operation of other equipment, they also consume a large amount of reactive power and greatly reduce the power factor of the line. Connecting reactors in series in the input circuit is an effective way to suppress lower-order harmonic current.

AC reactor

Connected in series between the power supply and the input side of the drive, the main functions of AC reactors are as follows:

1. Lower the harmonic generated from the drive while increasing the impedance of the power supply side.
2. Absorb and weaken the impact of the surge voltage/ current generated from nearby equipment, and the surge voltage of the main power supply on the drive.
3. Improve power factors.

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Chapter 4 Operation Interface

4-1 Digital Keypad

4-2 SD Card

4-3 Tuning Software

4-1 Digital Keypad

Model Name	KPV-CE02	KPV-CC01	KPV-CC02
	Figure 4-1	Figure 4-2	Figure 4-3

- Communication Interface: RS-485 interface, RJ45 (socket)
- Communication protocol: 115200, 8, N, 2
- Installation method: The embedded type can be installed flat on the surface of the control box. The front cover is waterproof.
- Optional accessory: buy an MKV-KPPK model for wall mounting or embedded mounting. Its protection level is IP66.
- The maximum RJ45 extension lead is 5 m (16 ft)
- This keypad is applicable for Delta drives VP3000, VS3000 and VH3000.

Install and detach the digital keypad

Detach the keypad	Install the keypad

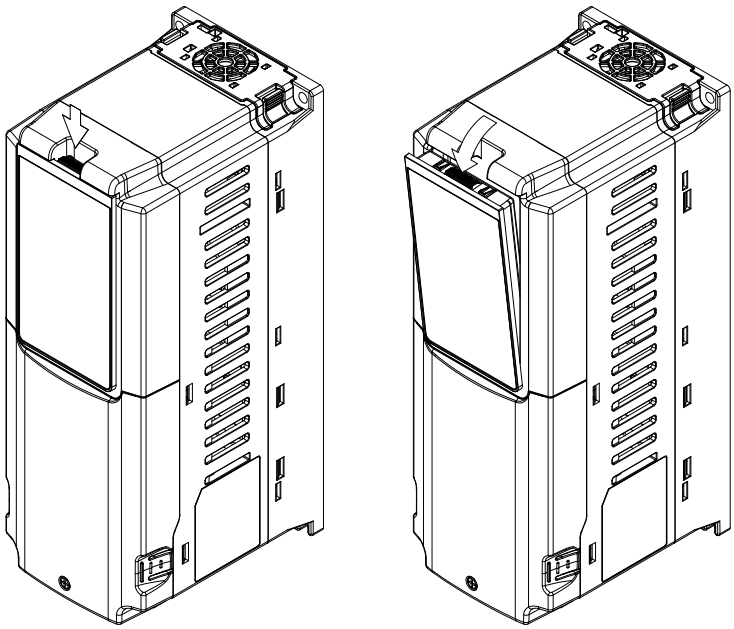
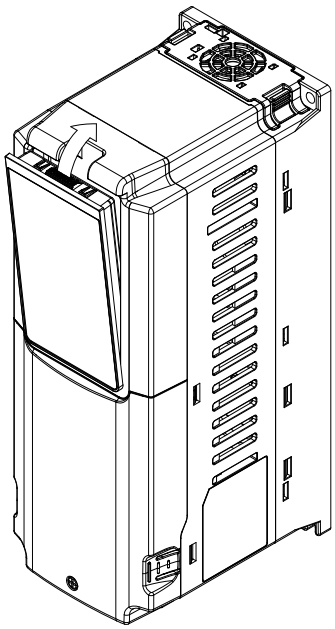

	

Figure 4-4	Figure 4-5

4-1-1 Dimensions

KPV-CE02

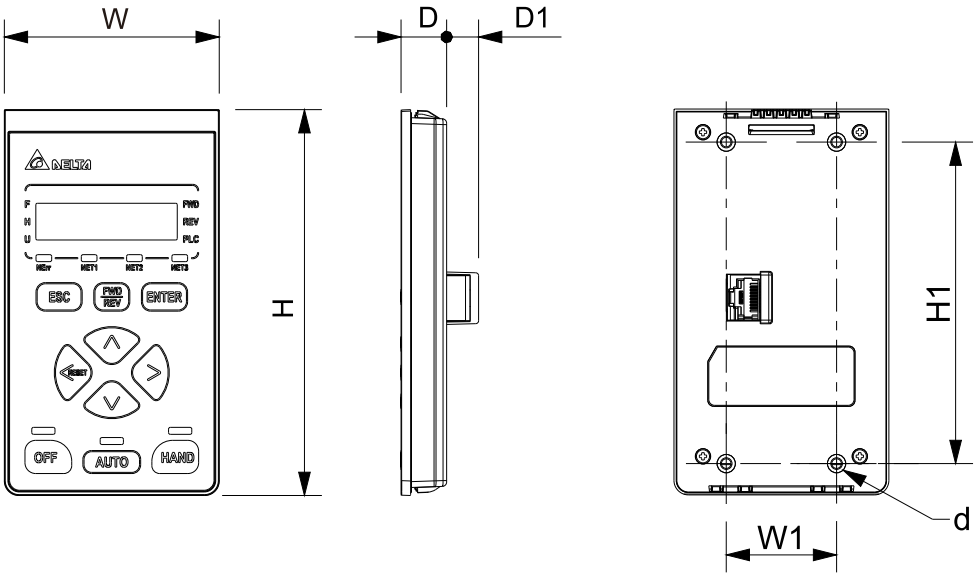


Figure 4-6

Unit: mm (inch)

	W	W1	H	H1	D	D1	d
KPV-CE02	74 (2.91)	38 (1.50)	132.5 (5.22)	110.4 (4.35)	15.7 (0.62)	11 (0.43)	M4xP0.7

Table 4-1

KPV-CC01/ KPV-CC02

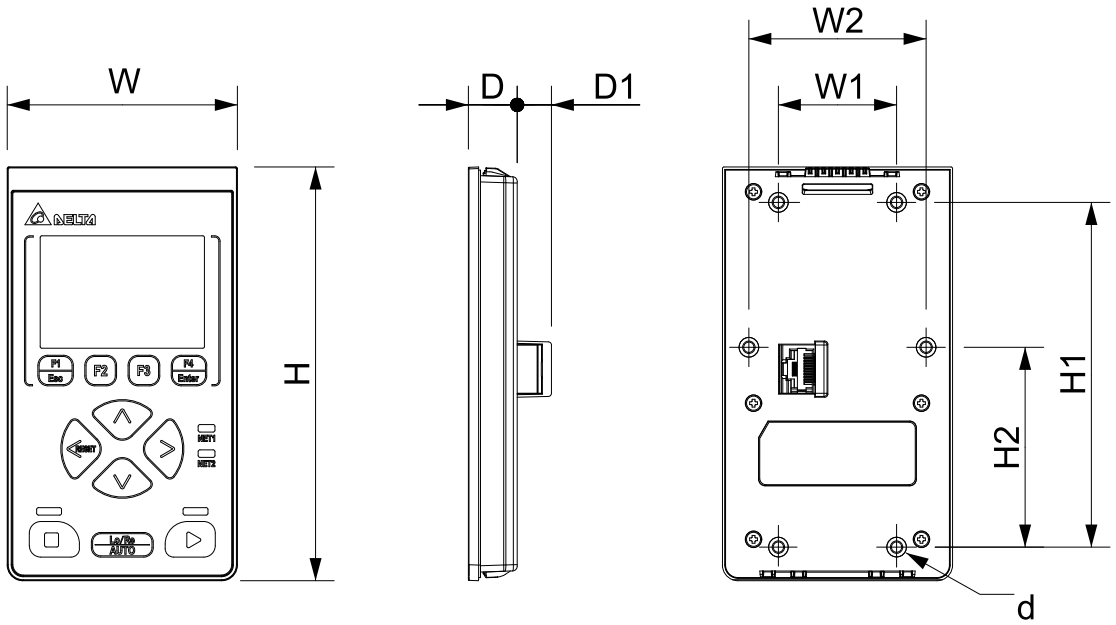


Figure 4-7

Unit: mm (inch)

	W	W1	W2	H	H1	H2	D	D1	d
KPV-CC01 KPV-CC02	74 (2.91)	38 (1.50)	57 (2.24)	132.5 (5.22)	110.4 (4.35)	64 (2.52)	15.7 (0.62)	11 (0.43)	M4xP0.7

Table 4-2

4-1-2 Descriptions of Digital Keypad

KPV-CE02

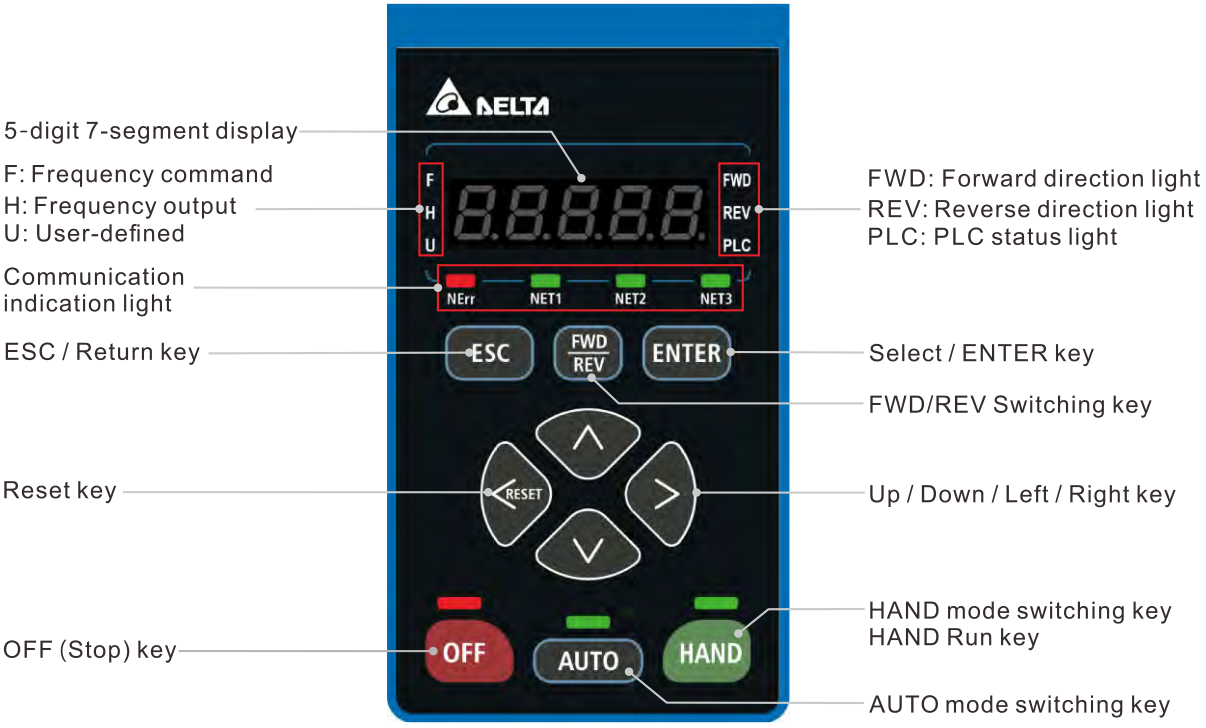


Figure 4-8

KPV-CC01

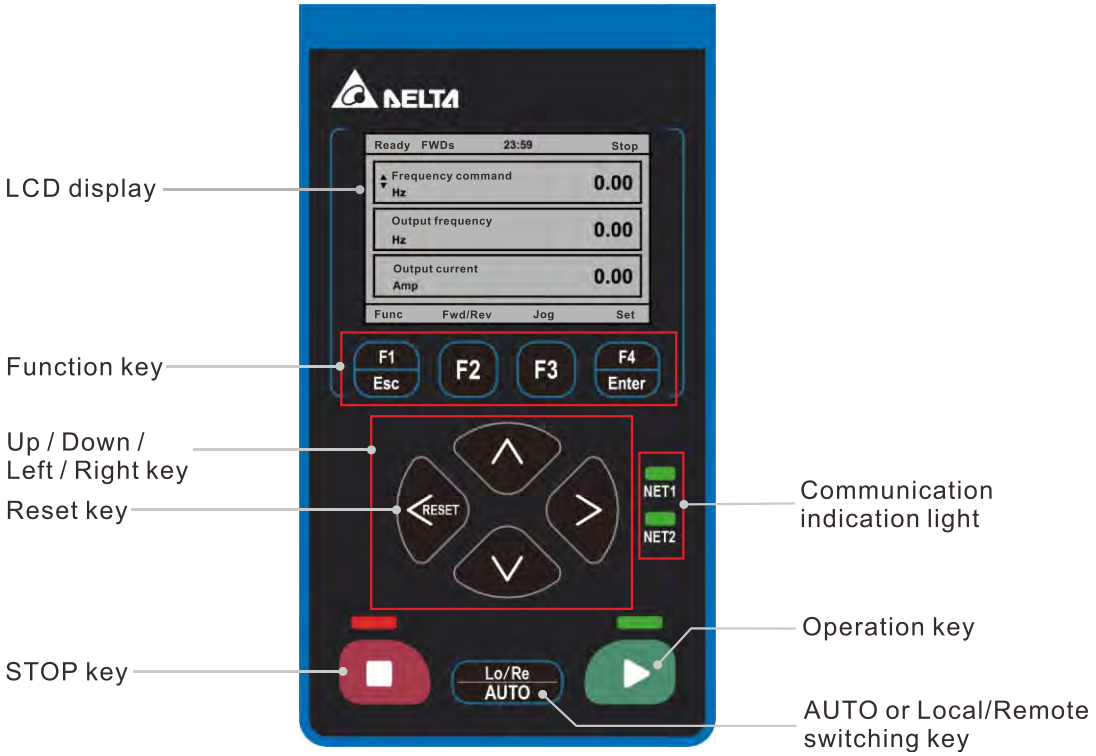


Figure 4-9

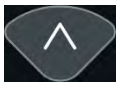
4-1-3 Keypad Function Descriptions

4-1-3-1 Keypad Function Descriptions of KPV-CE02

Key	Name	Function Description
	Operation key/ HAND key	**HAND / Operation key** 1. After pressing HAND key, it switches to HAND mode to control the drive and immediately starts to operate. 2. Press the HAND key in OFF mode, the drive operates according to the frequency command set by Pr.C1-08 (Keypad FREQ Cmd). 3. Press HAND key in AUTO mode, the drive operates according to the setting value of Pr.A4-04 (HAND Initial FREQ Cmd): ● Pr.A4-04 = 0 FREQ before switch: the drive operates with previous frequency command before switch. ● Pr.A4-04 = 1 HAND mode FREQ: the drive operates according to the setting value of Pr.C1-08 (Keypad FREQ Cmd) **NOTE:** The HAND key is for operation command, the drive remains operation or starts operation after pressing HAND key.
	OFF key	1. This key has the highest priority when the command is from the keypad. 2. When it receives the OFF command, regardless of whether the AC motor drive is in operation or stop status, the AC motor drive executes the “STOP” command.
	AUTO key	1. Operates the drive in AUTO mode. 2. Press the AUTO key at STOP, then the setting switches to AUTO frequency source and AUTO operation source.
	Up key	1. In the numeric value setting mode, use the UP/DOWN key to add and subtract the values. 2. Use the up key to change the number from 0 to 9, and the down key in reverse. 3. In the menu/text selection mode, selects an item.
	Down key	1. In the numeric value setting mode, use the UP/DOWN key to add and subtract the values. 2. In the menu/text selection mode, selects an item. 3. Use down key to enter next option; and the up key to return to previous option.
	Left key	1. In the numeric value setting mode, use the Left/ right key to: • Move the cursor • Switch between high bit and low bit

Key	Name	Function Description
		• Switch between bit00–32 and the status setting 0–1 2. When setting Calendar, use left/ right keys to switch month, day, hour, and minute. 3. Use left/ right keys to switch the Pr Group, for example, switch from Group A0 to Group b0. 4. When a fault occurs, use the Left key to reset the fault. 5. When setting the copied file name, use left/ right keys to move the cursor.
	Right key	1. In the numeric value setting mode, use the Left key to move the cursor. 2. When the keypad is locked, press ESC and the Right key for 3 seconds to unlock the keypad.
	ENTER Key	1. Goes to the next menu level. 2. If at the last level, press ENTER to execute the command.
	ESC key	1. Goes to the menu. 2. When in the menu, use ESC to go back to the previous page. Menu: 1. Pr Management 2. I/O monitor* 3. Keypad lock 4. App Macros and Quick Setting 5. Option cards 6. Fault record 7. PLC Function 8. Copy function 9. Keypad settings 10. Serial Number 11. SD Card Management **NOTE:** * The I/O monitor function will be available in firmware version 1.11.
	FWD/ REV Switch key	Operation direction key The Fwd/Rev function only controls the operation direction of the drive, NOT the drive activation. FWD is forward direction; REV is Reverse direction.

4-1-3-2 Keypad Function Descriptions of KPV-CC01

Key	Name	Function Description
	Operation key	**HAND / Operation Key** 1. After pressing HAND key, it switches to HAND mode to control the drive and immediately starts to operate. 2. Press the HAND key in OFF mode, the drive operates according to the frequency command set by Pr.C1-08 (Keypad FREQ Cmd). 3. Press HAND key in AUTO mode, the drive operates according to the setting value of Pr.A4-04 (HAND Initial FREQ Cmd): ● Pr.A4-04 = 0 FREQ before switch: the drive operates with previous frequency command before switch. ● Pr.A4-04 = 1 HAND mode FREQ: the drive operates according to the setting value of Pr.C1-08 (Keypad FREQ Cmd) 4. After switching modes, it displays “HAND” mode on the home screen of KPV-CC01. **NOTE:** The HAND key is for operation command, the drive remains operation or starts operation after pressing HAND key.
	OFF key	1. This key has the highest priority when the command is from the keypad. 2. When it receives the STOP command, regardless of whether the AC motor drive is in operation or stop status, the AC motor drive executes the “STOP” command.
	Lo/Re Switch and AUTO key	1. The default function of this key is Local / Remote switching function. 2. Use parameter to change this key to AUTO mode switching key. 3. Press the AUTO key at STOP, then the setting switches to AUTO frequency source and AUTO operation source. 4. Successful mode switching for the KPV-CC01 displays Local, Remote or AUTO mode on the screen.
	Up key	1. In the numeric value setting mode, use the UP/DOWN key to add and subtract the values. 2. In the menu/text selection mode, selects an item.
	Down key	1. In the numeric value setting mode, use the UP/DOWN key to add and subtract the values. 2. In the menu/text selection mode, selects an item.

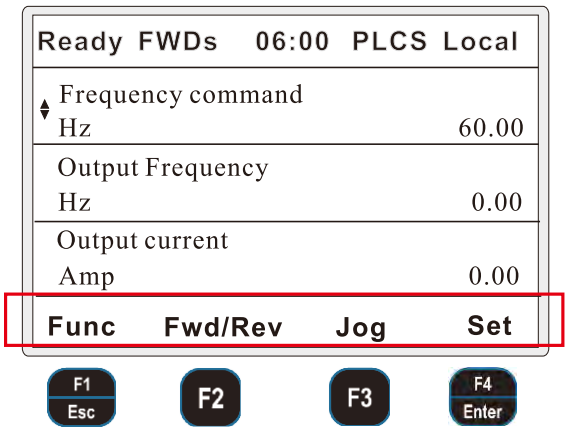
Key	Name	Function Description
	Left key	1. In the numeric value setting mode, use the Left key to move the cursor. 2. When a fault occurs, use the Left key to reset the fault.
	Right key	1. In the numeric value setting mode, use the Right key to move the cursor. 2. When the keypad is locked, press ESC and the Right key for 3 seconds to unlock the keypad.

Function Key

Function key display

The names and definitions of the 4 function keys are different according to the functional requirements of current display page and are fixedly displayed in the bottom column of the screen.

On the main page, the names and definitions are as below:



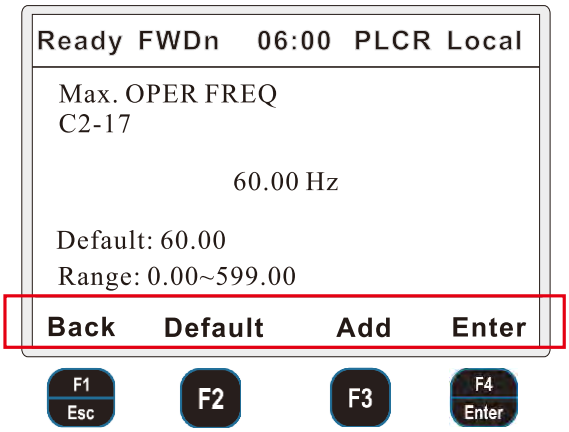
F1 / Esc: Func

F2 key: Fwd/ Rev

F3 key: Jog

F4 / Enter key: Set

On the parameter setting page, the names and definitions are as below:



F1 / Esc key: Back

F2 key: Default

F3 key: Add

F4 / Enter: Enter

The following functions of each key display in the bottom of the screen and vary with the displayed content.

Key	Functions	Descriptions
	ESC	**Delete Key** When the function list displays “ESC” on the screen, F1/Esc key is defined as “Delete and return to previous page”.
	Func	**Function selection key** When the function list displays “Func” on the screen, press F1/Esc key to go to the function selection page.

Key	Functions	Descriptions
		Menu: 1. Pr Management 2. I/O monitor* 3. Keypad lock 4. App Macros and Quick Setting 5. Option cards 6. Fault record 7. PLC Function 8. Copy function 9. Drive Information 10. Start Wizard 11. Keypad settings 12. SD card management **NOTE:** * The I/O monitor function will be available in Firmware V1.11.
	Back	When the function list displays “Back” on the screen, F1/Esc key is defined as “Return to previous page”.
	No	When the function list displays “No” on the screen, F1/ Esc key is defined as “No”.
F2	Fwd / Rev	**Forward / Reverse direction switching key** When the function list displays “Fwd / Rev” on the screen, the F2 key is defined as “Operation direction switching key”. 1. The Fwd/Rev function only controls the operation direction of the drive, NOT the drive activation. 2. Fwd is forward direction; Rev is Reverse direction.
	Home	**Home key** When the function list displays “Home” on the screen, press F2 key to go to the Home page.
	Default	**Return to default key** When the function list displays “Default” on the screen, press F2 key to go to parameter settings return to the default selection page.
F3	JOG	**JOG operation key** When the function list displays “JOG” on the screen, F3 key is defined as JOG operation.
	Add	**Add parameter into the user industry application list** When the function list displays “Add” on the screen, press F3 key to add the parameter displayed on the screen into the user industry application parameter list.
	Next	**Go to next page** When the function list displays “Next” on the screen, press F3 key to go to next page.
	Macro	**Go to Macro selection** When the function list displays “Macro” on the screen, press F3 key to go to Macro selection list.
	ErrDisp	**Error display page** When the function list displays “ErrDisp” on the screen, press F3 key to see detailed fault information.

Key	Functions	Descriptions
	WarnDisp	**Warn display page** When the function list displays “WarnDisp’ on the screen, press F3 key to see detailed warning information.
F4 Enter	ENTER	**Confirm function key** When the function list displays “ENTER” on the screen, F4/Enter key is defined as “Confirm”.
	Select	**Select function key** When the function list displays “Select” on the screen, press F4/Enter key to go to next level of the chosen function.
	Edit	**Edit function key** When the function list displays “Edit” on the screen, press F4/Enter key to edit the content on the displayed page.
	Set	**Frequency setting key** When the function list displays “Freq set” on the screen, press F4/Enter key on Home page to execute Frequency command setting.
	Yes	**Yes key** When the function list displays “Yes” on the screen, F4/Enter key is defined as “Yes”.
	Diffe	**Difference comparison function key** When the function list displays “Diffe” on the screen, press F4/Enter key to check the difference information of parameters comparison.
	Info	**Fault information key** When the function list displays “Info” on the screen, press F4/Enter key to see detailed information of the fault.
	Fix	**Fault treatment key** When the function list displays “Fix” on the screen, press F4/Enter key to display the QR code of the fault for further treatment.

4-1-4 LED Function Descriptions

4-1-4-1 LED Function Descriptions of KPV-CE02

LED	Descriptions	
	Operation LED	ON / Flash: 1. HAND light ON: HAND mode, the drive operates in HAND mode 2. HAND light flashes: HAND mode, the drive is in standby status (frequency command < minimum frequency setting)
	AUTO mode LED	ON / Flash: 1. AUTO light ON: AUTO mode, the drive operates in AUTO mode 2. AUTO light flash: AUTO mode, the drive stops/ in standby status (frequency command < minimum frequency setting)
	STOP / Error LED	ON / Flash: 1. ON: OFF mode, the drive stops 2. Press the OFF key in HAND or AUTO mode, the OFF light is ON. The HAND or AUTO indicator lights refer to the setting of Pr.A2-00 Stop method: ● Pr.A2-00 = 0 Ramp to stop: during the stopping process, the HAND or AUTO light flashes until the drive stops. The HAND or AUTO light is OFF after the drive stops, and the OFF light is ON. ● Pr.A2-00 = 1 Coast to stop: press the OFF key in HAND or AUTO mode, the HAND or AUTO light turns off immediately, and the OFF light is ON. 3. Flash: a warning or error occurs to the drive
	Communication indication light 1–3	
	Communication error indication light	

4-1-4-2 LED Function Descriptions of KPV-CC01

LED	Descriptions	
	Operation LED	ON: 1. AC motor drive is operating. 2. The drive operates in HAND mode
	STOP / Error LED	ON: 1. The drive is in STOP status 2. The drive is in OFF status Flashes The drive is in FAULT status

4-1-4-3 Description of Communication Lights

CMC-DN01

Lights	Definition	Description	
NET1 (MS)	Comm. Card status indication	OFF	no power
		Green light	ON: Comm. Card is working Flashes: stand by
		Red light	Flashes: a recoverable error has occurred to the Comm. card ON: an unrecoverable error has occurred to the Comm. Card, such as hardware error
		Orange light	Flashes: the Comm. card is self-testing
NET2 (NS)	Communication connection status indication	OFF	no working power or the IP address is not configured
		Green light	Flashes: Comm. card is online, but has not established a connection with the main station ON: Comm. card is online and connects normally with the main station, the I/O data is normal
		Red light	Flashed: connection timed out ON: use duplicate IP address
		Orange light	Flashes: the Comm. card is self-testing

CMC-EIP01

Lights	Definition	Description	
NET1 (MS)	Comm. Card status indication	OFF	No power
		Green light	ON: Comm. Card is working Flashes: stand by
		Red light	Flashes: a recoverable error has occurred to the Comm. card ON: an unrecoverable error has occurred to the Comm. Card
		Orange light	Flashes: the Comm. card is self-testing
NET2 (NS)	Communication connection status indication	OFF	No working power or the IP address is not configured
		Green light	Flashes: Comm. card is online, but has not established a connection with the main station ON: Comm. card is online and connects normally with the main station, the I/O data is normal
		Red light	Flashed: connection timed out ON: use duplicate IP address
		Orange light	Flashes: the Comm. card is self-testing

CMC-EIP02

Lights	Definition	Description	
NET1 (MS)	Comm. Card status indication	OFF	No power
		Green light	ON: Comm. Card is working Flashes: stand by
		Red light	Flashes: a recoverable error has occurred to the Comm. card ON: an unrecoverable error has occurred to the Comm. Card
		Orange light	Flashes: the Comm. card is self-testing
NET2 (NS)	Communication connection status indication light	OFF	No working power or the IP address is not configured
		Green light	Flashes: Comm. card is online, but has not established a connection with the main station ON: Comm. card is online and connects normally with the main station, the I/O data is normal

Lights	Definition	Description	
		Red light	Flashed: connection timed out ON: use duplicate IP address
		Orange light	Flashes: the Comm. card is self-testing

CMC-PN01

Lights	Definition	Description	
NET1 (SF)	Malfunction indication	Red light	OFF: no error ON: an error occurred to the system
NET2 (BF)	Bus error indication	Red light	OFF: no error ON: an error occurred to the communication bus
NET3 (Rx/Tx)	Data transmission/ reception status indication	Orange light	OFF: stop transmitting/ receiving data ON: data transmitting/ receiving

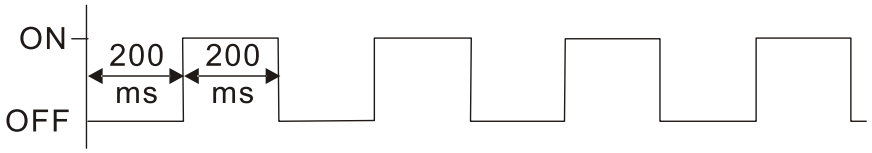
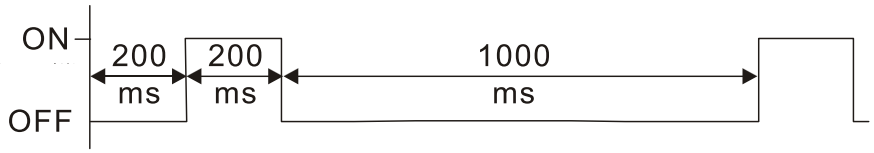
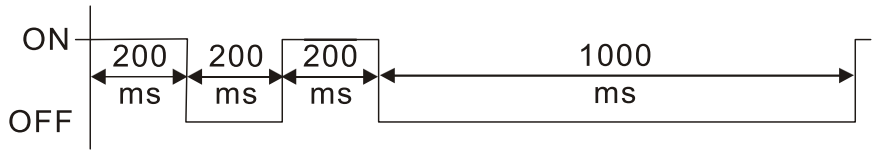
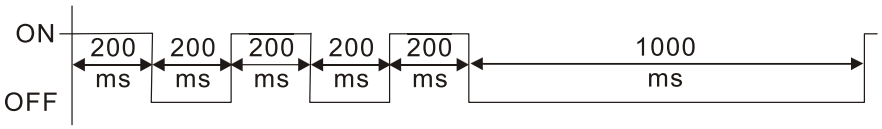
CMC-PD01

Lights	Definition	Description	
NET1 (SF)	Malfunction indication	Red light	ON: an error occurred to the system OFF: no error
NET2 (BF)	Bus error indication	Red light	OFF: no error ON: an error occurred to the communication bus
NET3 (Rx/Tx)	Data transmission/ reception status indication	Orange light	ON: data transmitting/ receiving OFF: stop transmitting/ receiving data

CMC-COP01

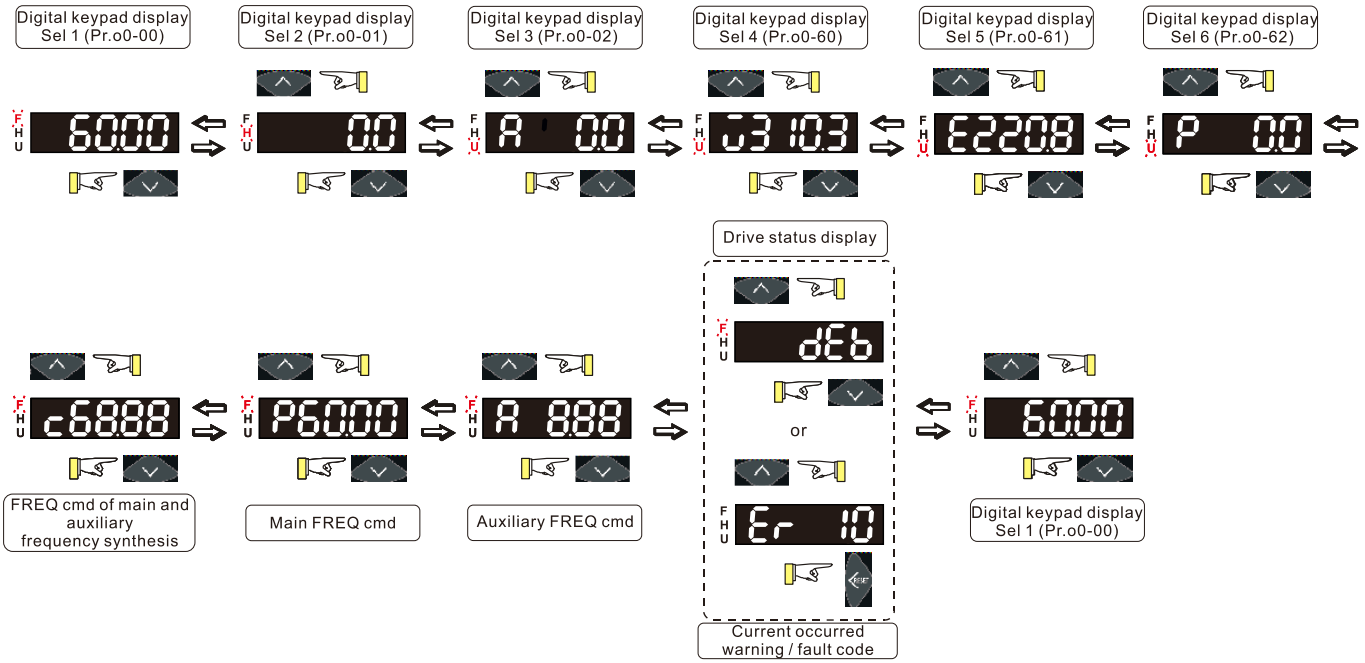
Lights	Definition	Description	
NET1 (ERR)	Fault Indication	Red light	ON: Bus OFF Single flash: at least one CANopen packet failure Double flash: Guarding fail or heartbeat fail Triple flash: SYNC failure
NET2 (RUN)	Communication connection status indication	Green light	ON: CANopen is in operation OFF: CANopen is in initial status Blinking: CANopen is in pre-operation status Single flash: CANopen is in stop status

4-1-4-4 Communication light flashing mode

Name	Definition
Blinking	
Single flash	
Double flash	
Triple flash	

4-1-5 KPV-CE02 Function Display Instructions and Operation Flow

4-1-5-1 Function Display



Function Display	Descriptions
	Status display 1 (set by Pr.o0-00) The example on the left is Pr.o0-00 = 9 (FREQ Cmd)
	Status display 2 (set by Pr.o0-01) The example on the left is Pr.o0-01 = 2 (motor actual output FREQ)
	Status display 3 (set by Pr.o0-02) The example on the left is Pr.o0-02 = 0 (output current)
	Status display 4 (set by Pr.o0-60) The example on the left is Pr.o0-60 = 3 (drive DC bus voltage)
	Status display 5 (set by Pr.o0-61) The example on the left is Pr.o0-61 = 4 (drive output voltage)
	Status display 6 (set by Pr.o0-62) The example on the left is Pr.o0-62 = 6 (drive output power)
	Frequency command of the main and auxiliary frequency synthesis
	Main frequency command
	Auxiliary frequency command
	Drive status display
	Current warning code
	Current error code

Drive status display

Drive Status	LED Display	Descriptions
dEb		Deceleration Energy Backup
DCIn		DC injection
AutoT		Auto tuning
B.B.		Base Block
Sleep		Sleep function
Stall		Stall function
PHeat		Pre-heat
FlySr		Flying start
Fire		FireMode
STO		Safe Torque Off function is activated.
NoRdy		The drive is not ready yet.
Qstop		The drive is executing quick stop.
Pd01		The IGBT life is lower than the setting level.
Pd02		The DC bus capacitor life is lower than the setting level.
Pd03		The board capacitor life is lower than the setting level.
Pd04		The fan life is lower than the setting level.
Pd05		The PB relay life is lower than the setting level.
Pd06		The control board relay 1 life is lower than the setting level.
Pd07		The control board relay 2 life is lower than the setting level.
Pd08		The fan 1 feedback is lower than the setting level.
Pd09		The fan 2 feedback is lower than the setting level.
Pd10		The fan 3 feedback is lower than the setting level.

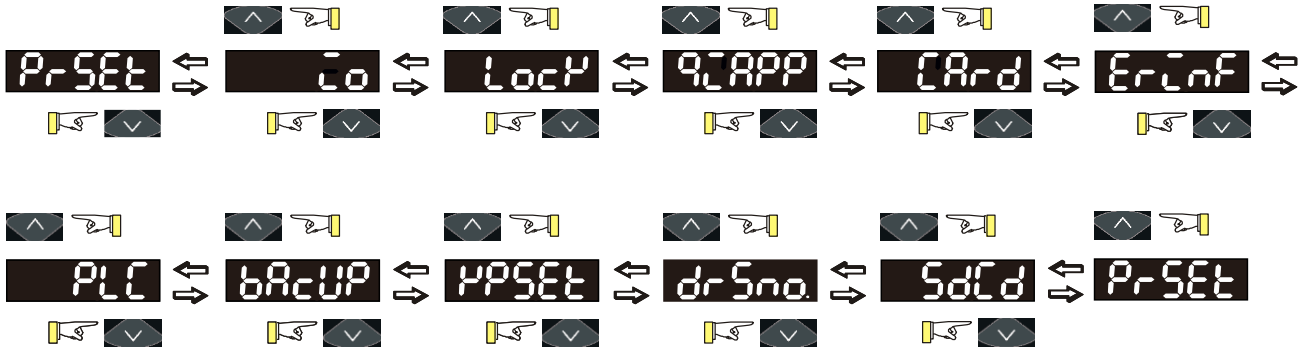
4-1-6 KPV-CE02 Function List and Operation Flow

KPV-CE02 Function List

No.	Display	Function Name	No.	Display	Function Name
1	PAr	Pr Management	7	PLC	PLC Function
2	io	I/O monitor*	8	bAcUP	Copy function
3	LocY	Keypad lock	9	HPSEt	Keypad settings
4	QLAPP	App Macros and Quick Setting	10	drSno	Serial Number
5	CArd	Option cards	11	SdCd	SD Card Management
6	ErLnF	Fault record information			

NOTE: * I/O monitor function will be available in Firmware V1.11.

KPV-CE02 Function List Operation Flow

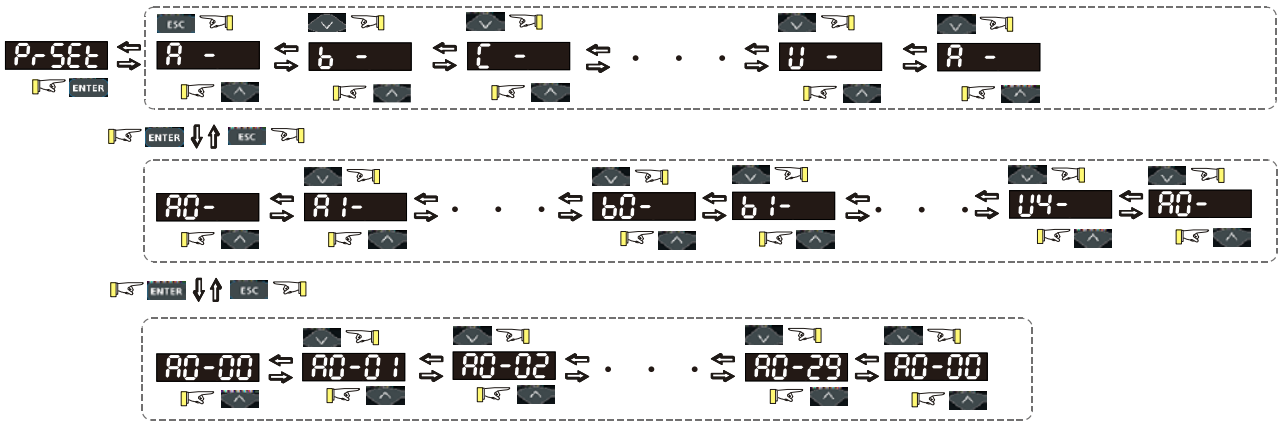


4-1-6-1 Pr Management

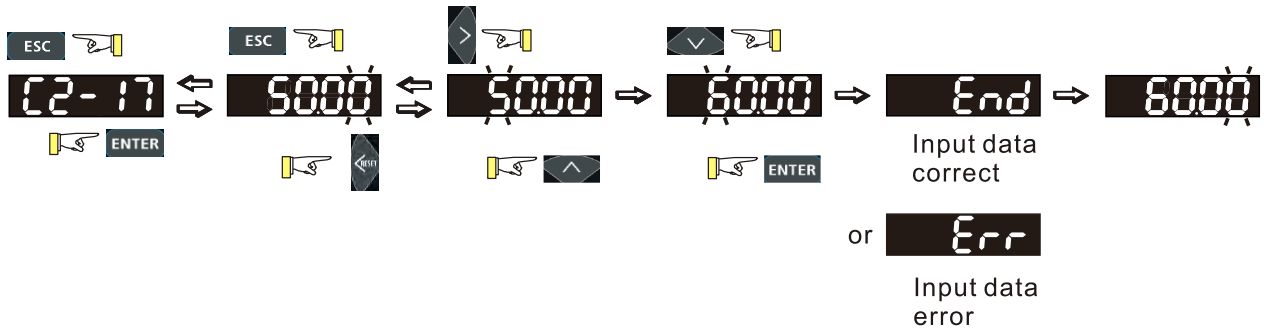
Pr management includes two functions: parameter setting and modified parameter.

Parameter Setting

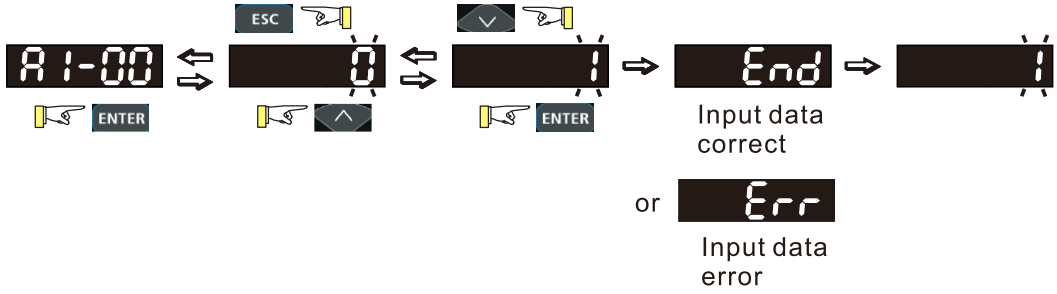
(1) Select parameters



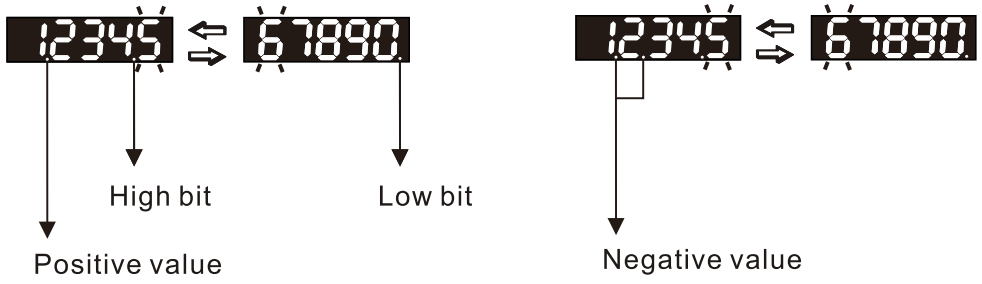
(2) Numeric value parameter setting



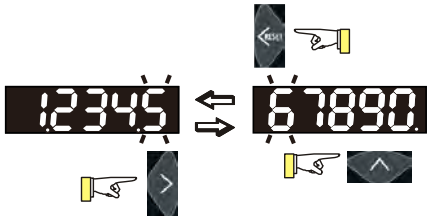
(3) Function option parameter setting



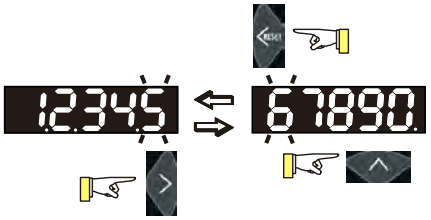
(4) Decimal value description



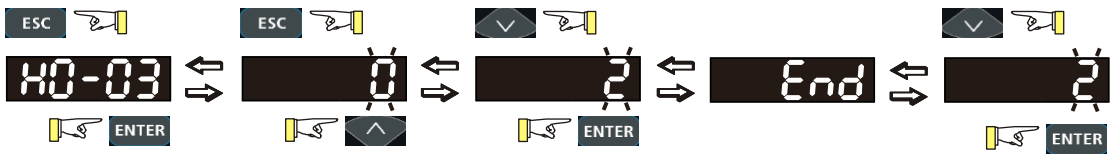
For example: value = 1234567890



For example: value = -1234567890



(5) Binary parameter setting



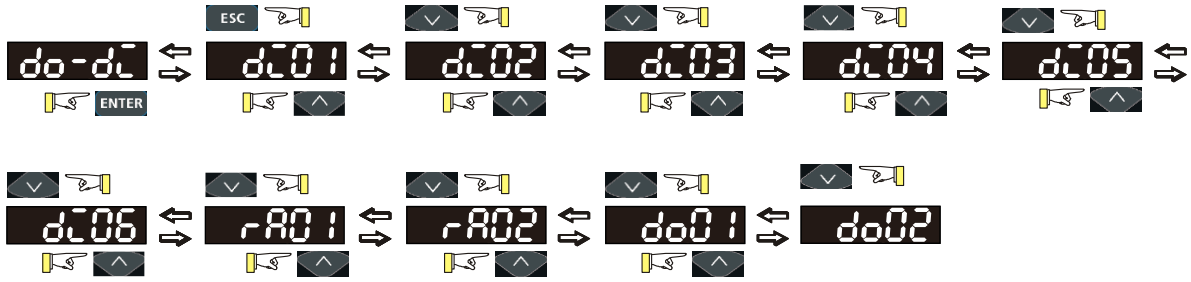
Transfer the binary setting to decimal setting first, input the decimal values into the keypad and then press Enter. For example, bit2 = 1, transfer to decimal as 0000 0000 0000 0100 = 4, input value 4 in the parameter setting and then press Enter.

4-1-6-2 I/O monitor (This function will be available in Firmware V1.11)

I/O monitor operation flow includes digital terminals (do-di) and analog terminals (Ao-Ai).

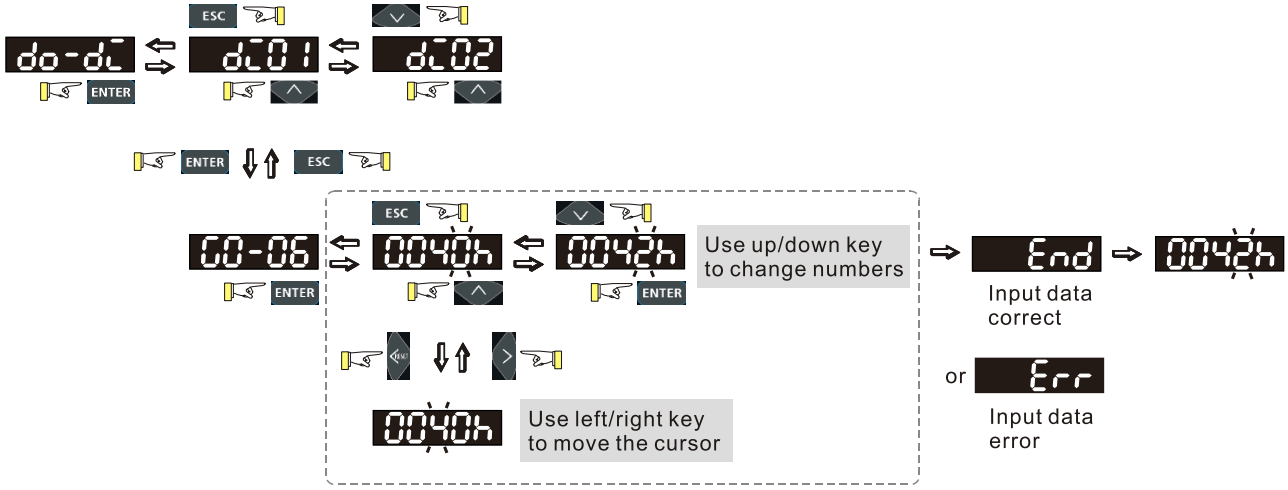
Digital terminal (do-di)

(1) Digital input/ output terminal operation



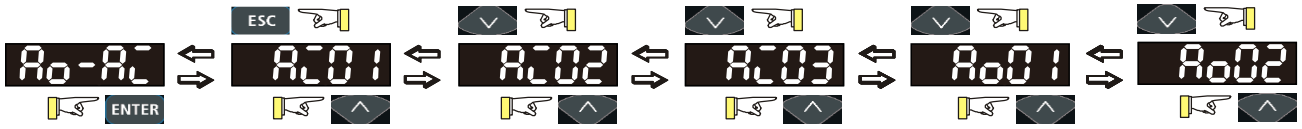
(2) Digital input/ output terminal - check current setting and change setting

For example: check the setting value of MI1 (di01) (Pr. G0-06: LED displays g0-06) and change the value from 40h to 42h.



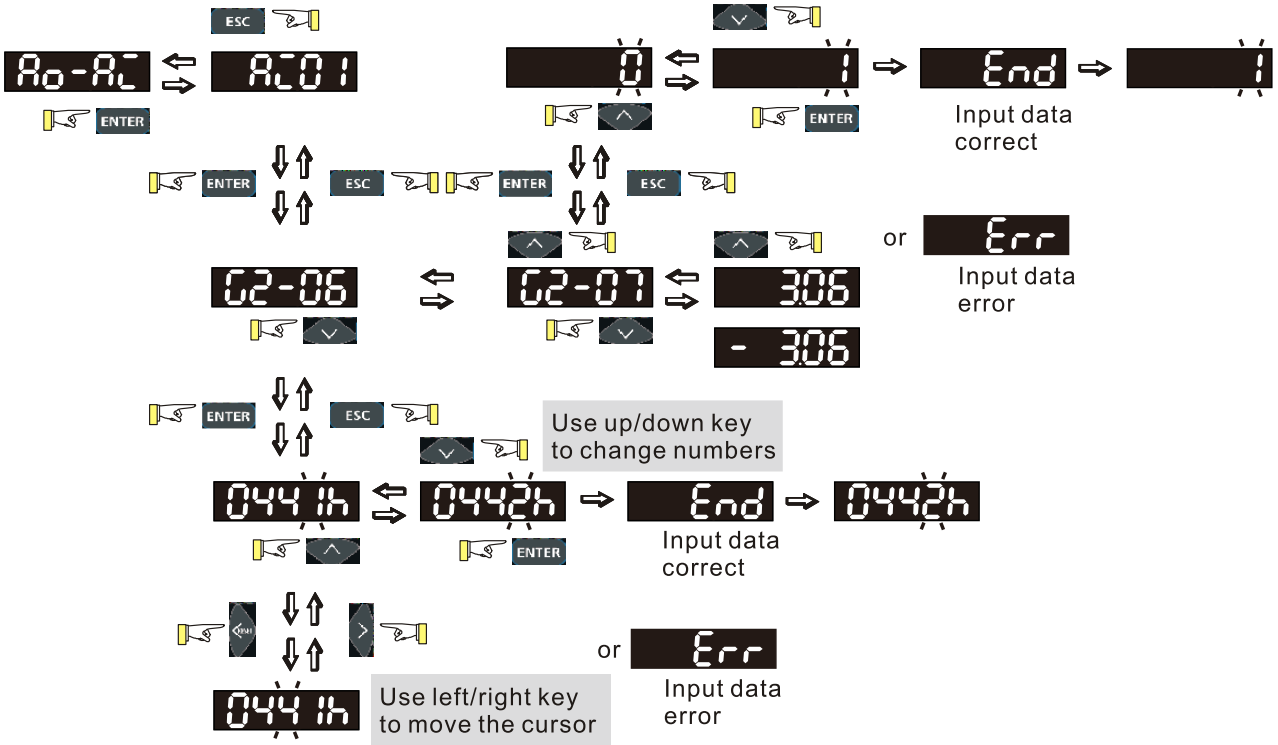
Analog terminal (Ao-Ai)

(1) Analog input/ output terminal operation



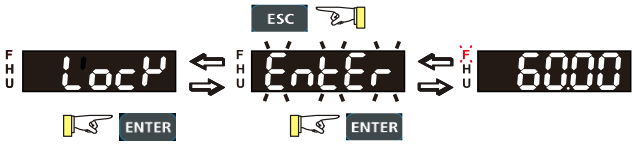
(2) Analog input/ output terminal - check current setting and change setting

For example: check the setting of AI1 (Ai01). When you enter Ai01, the keypad displays g2-06 (Ai01 function selection parameter) first, press [Down key] to display g2-07 (Ai01 input signal type), and then press [Down key] again to display the current Ai01 input value.



4-1-6-3 Keypad lock

When EntEr displays and flashes, press ENTER again to enable the keypad lock function.

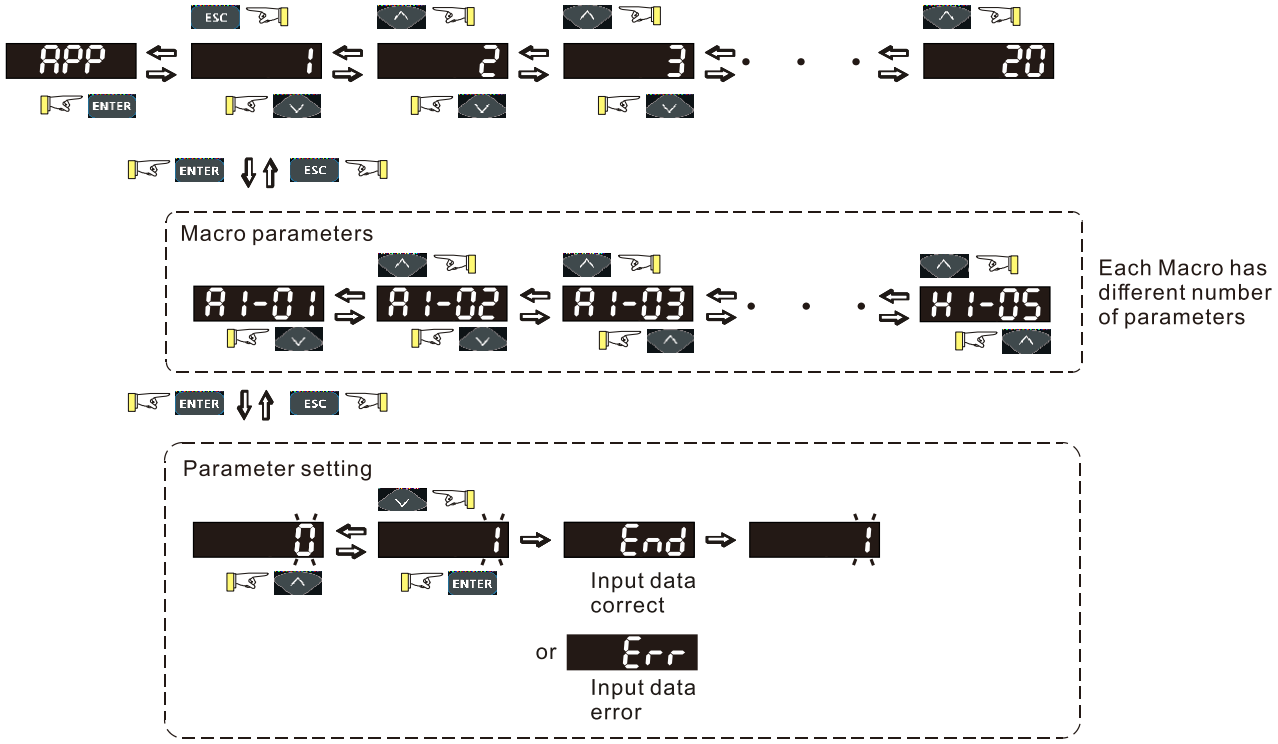


4-1-6-4 App Macros and Quick Setting

App Macros and Quick Setting function includes application macros and quick setting.

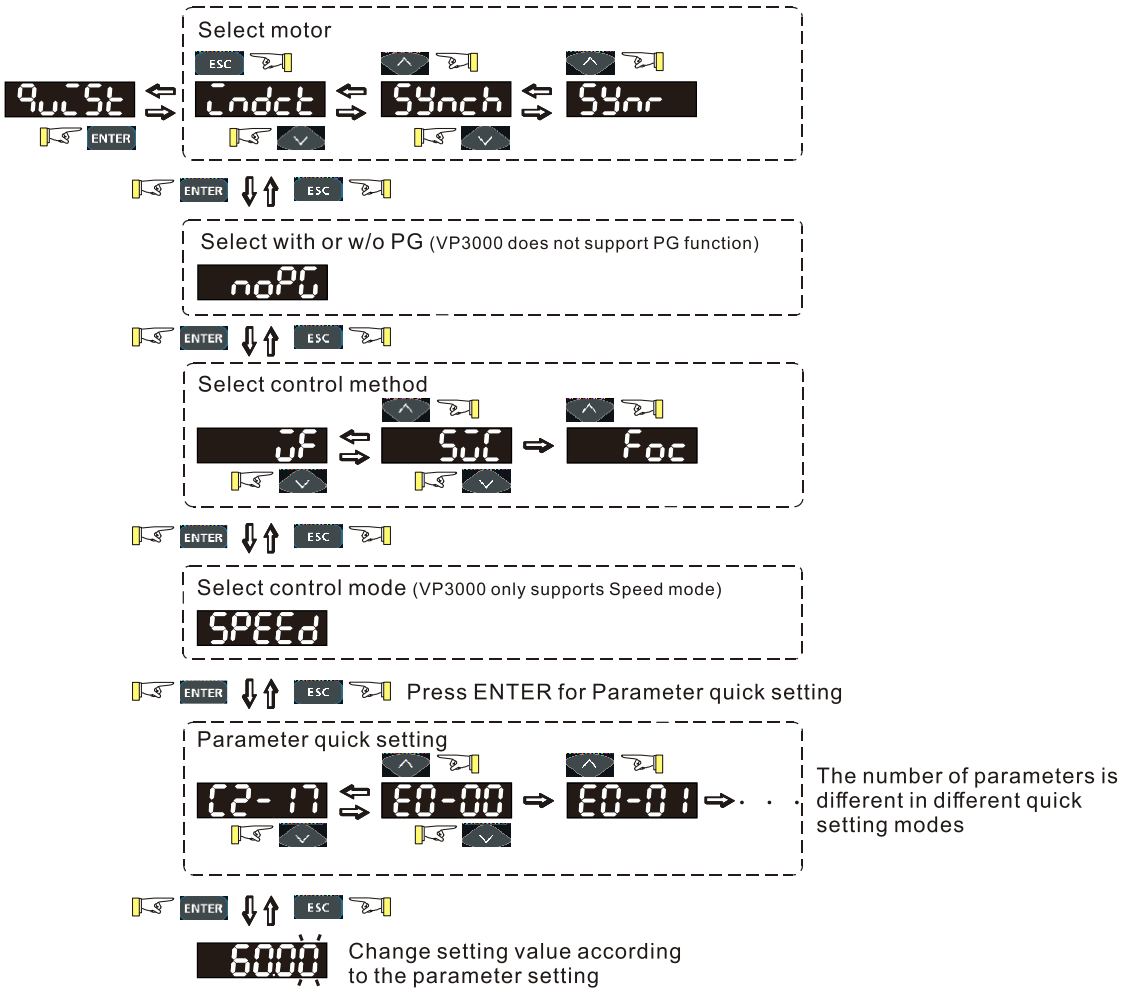
Application MACRO

0: Disable	4: Three wire-2	16: Compressor
1: User-defined	5: Manual switching macro	17: PM Compressor
2: Basic operation macro	6: Multi speed operation macro	18: Fan
3: Three wire-1	7: PID macro	19: Pump
		20: Air handling unit



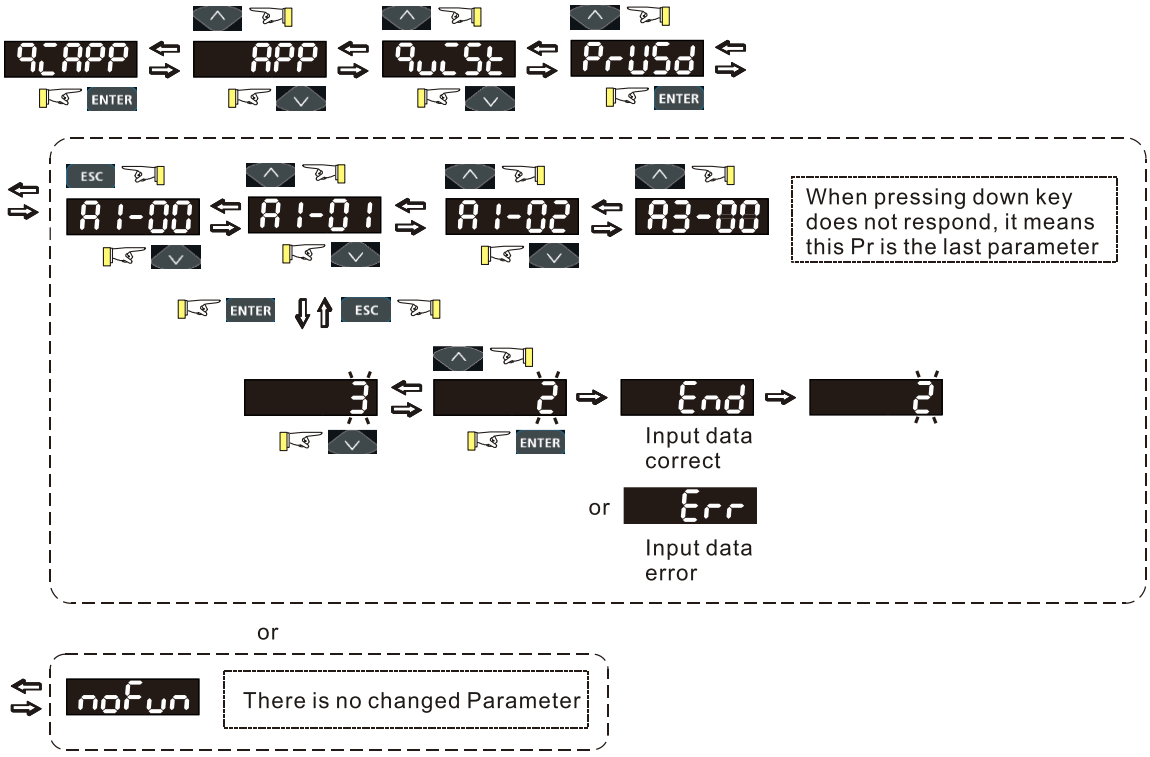
Quick Setting

IMVF, IMSVC, IMFOC, PMSVC, PMFOC, SycnRMFOC



Modified Parameter

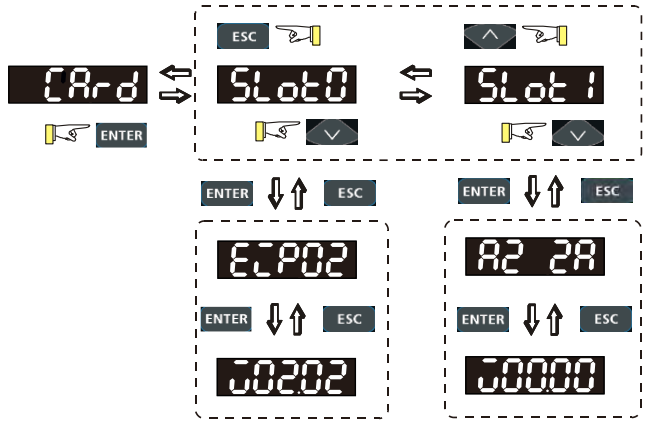
Display and change setting



4-1-6-5 Option cards

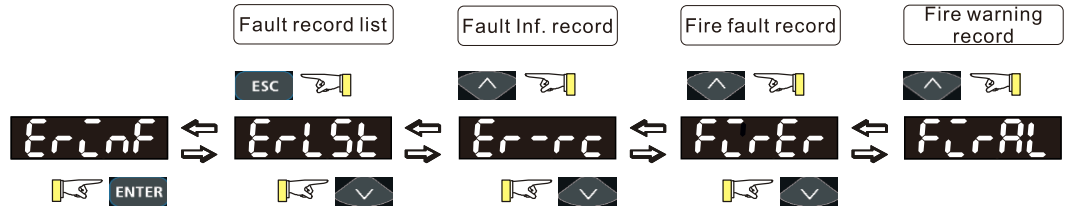
No option card: when noCrd displays, it means there is no option card installed.

Install communication card and IO card: press ENTER and use up/down keys to check current installed slot number, after select the slot, press ENTER to check the installed option cards. When you select the installed option card and press ENTER, you can check the firmware version of the card.



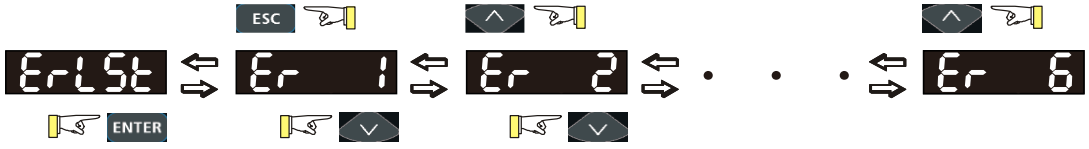
4-1-6-6 Fault record information

Fault record information includes fault record, fault information record, fault record at Fire and warning record at Fire.



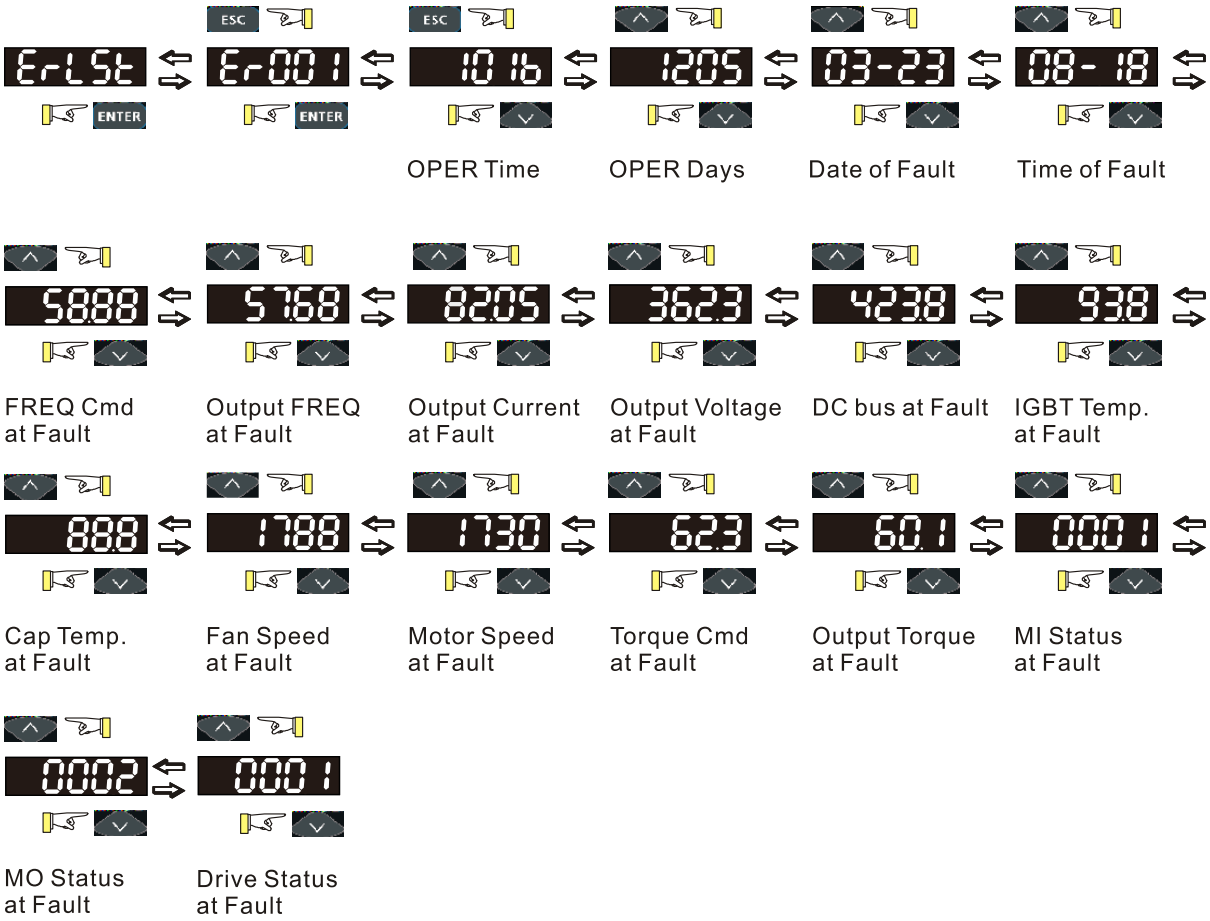
Fault record

Records 6 faults.



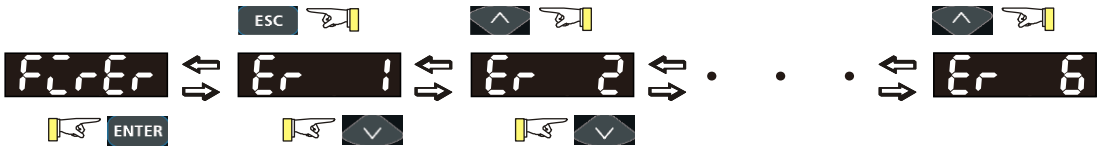
Fault information record

Records the following information when a fault occurs: operation time at fault, operation days at fault, date of fault_month/ day, time of fault_hour/ minute, frequency command at fault, output frequency at fault, output current at fault, output voltage at fault, DC bus at fault, IGBT temperature at fault, Cap temperature at fault, fan speed at fault, motor speed at fault, torque command at fault, output torque at fault, MI status at fault, MO status at fault and drive status at fault.



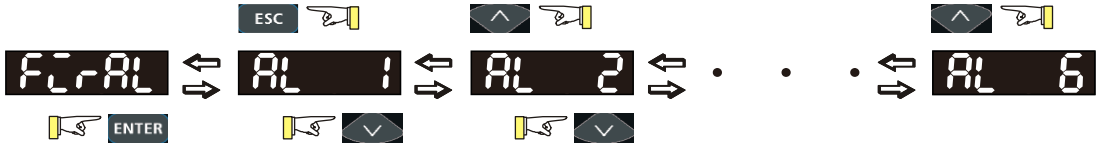
Fault record at Fire

Records 6 errors in FireMode



Warning record at Fire

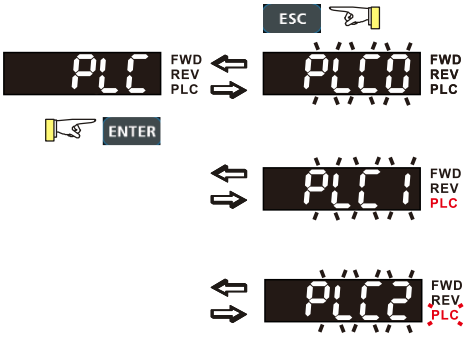
Records 6 warnings in FireMode



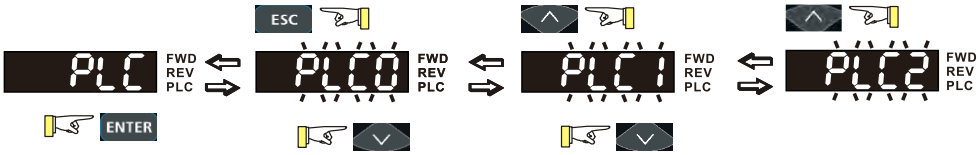
4-1-6-7 PLC Function

(1) After entering the PLC setting page, there will be three possible PLC status:

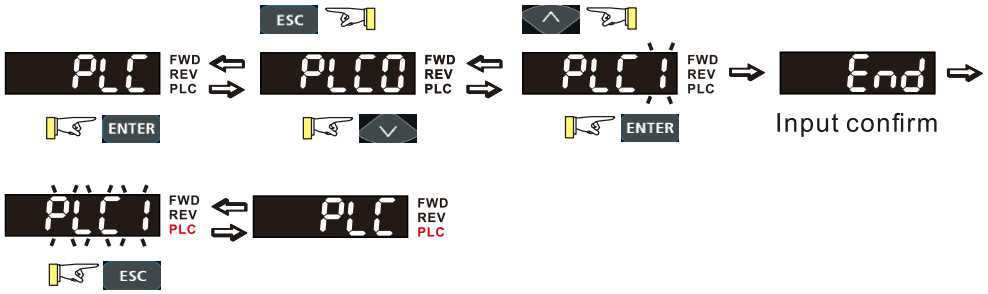
- PLC0 (no PLC function)
- PLC1 (PLC is running)
- PLC2 (PLC stops running).



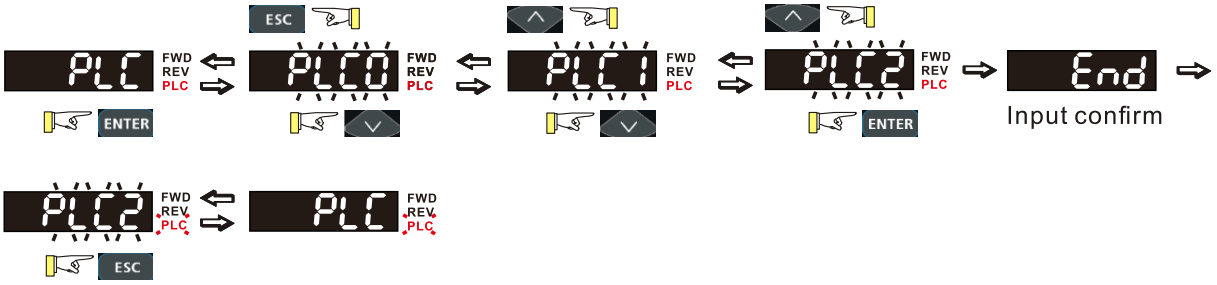
(2) Use the up/down key to switch PLC0, PLC1 and PLC2.



(3) Press ENTER at PLC1 setting page to start the PLC program, and the PLC light starts to stay on. After pressing ESC to return to the PLC function page, the PLC light remains on.



(4) Press ENTER at PLC2 setting page to stop the PLC program, and the PLC light starts to flash. After pressing ESC to return to the PLC function page, the PLC light remains flashing.

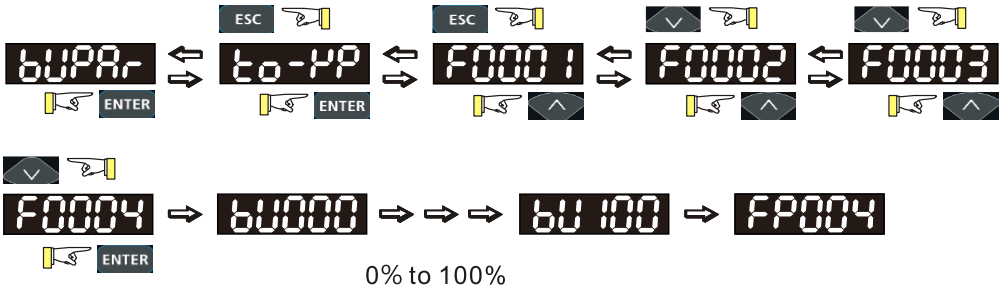


4-1-6-8 Copy function

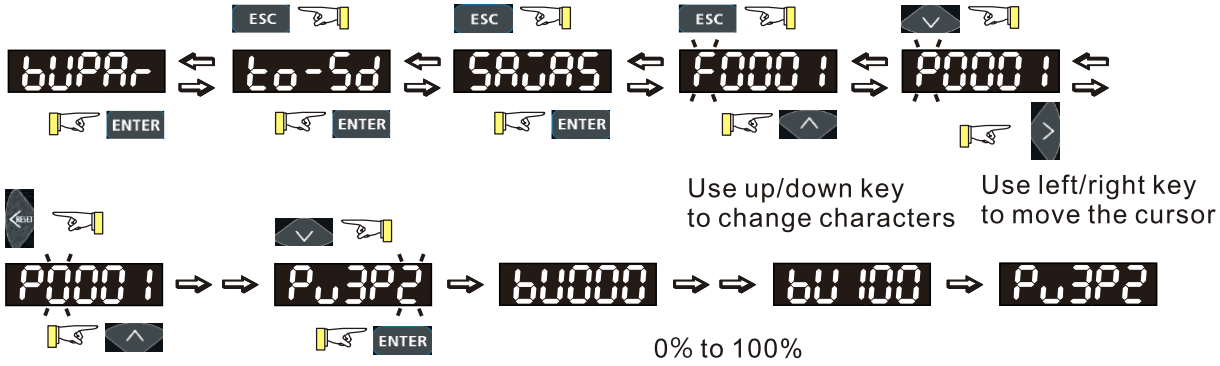
Copy function includes copy parameter, restore parameter backup, delete parameter backup, copy PLC program, restore PLC program backup, and delete PLC program backup.

Copy parameter

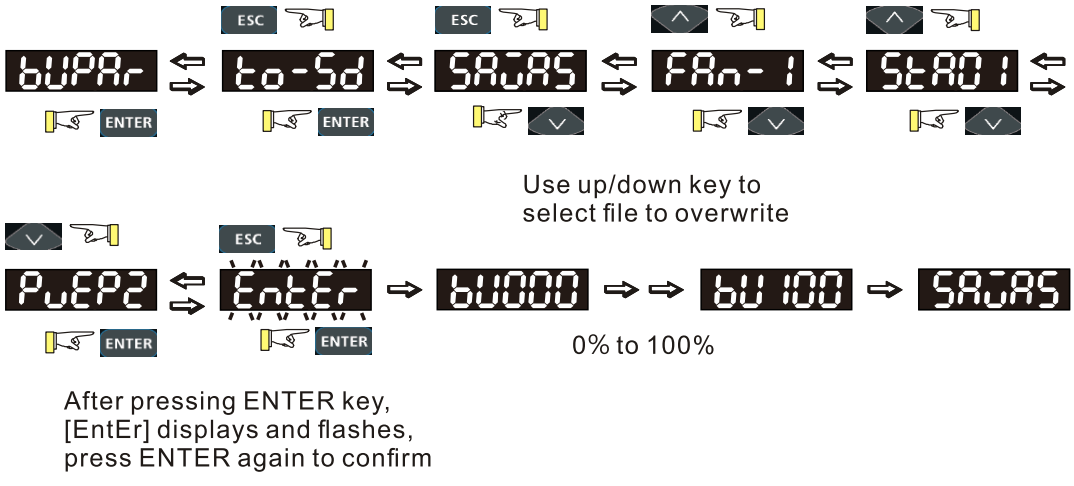
(1) Copy parameter to Keypad (up to 4 groups: F0001–F0004)



(2) Copy parameter to SD card - save as a new file

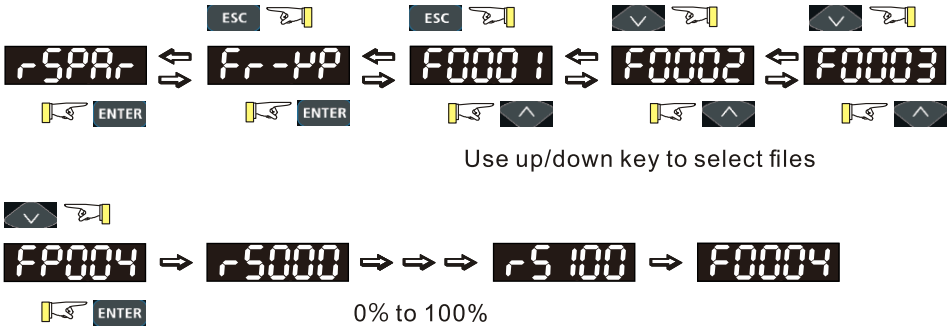


(3) Copy parameter to SD card - overwrite the original file

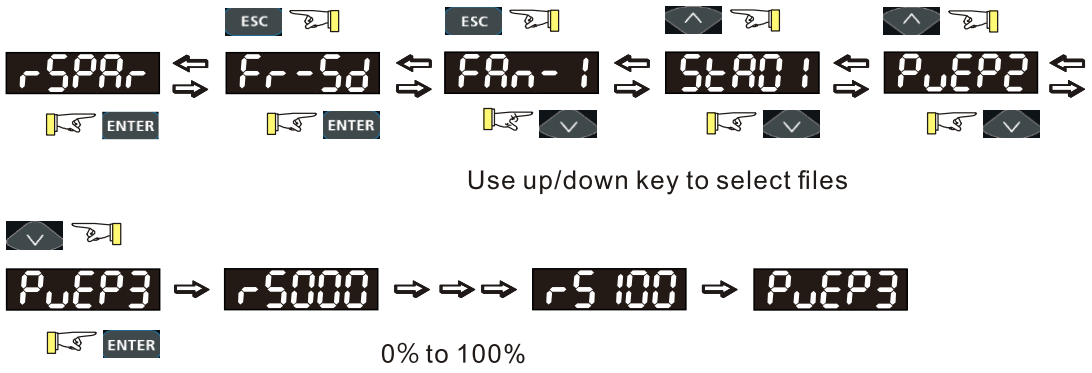


Restore parameter backup

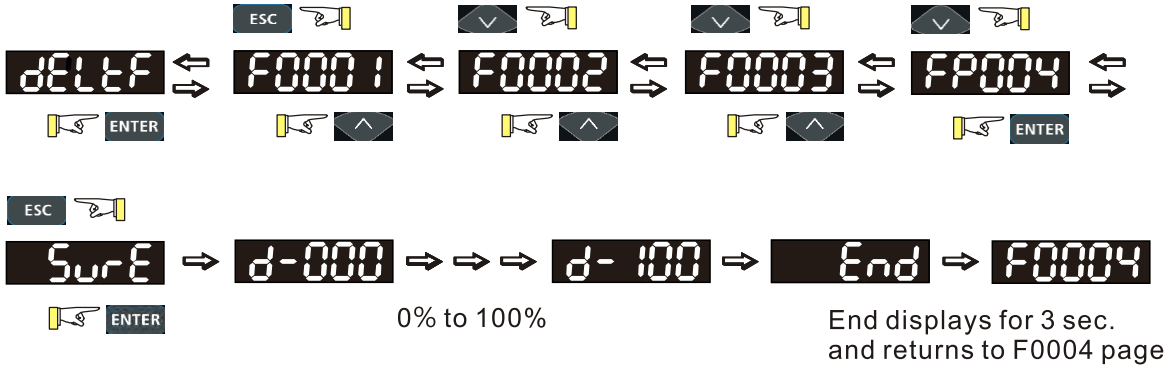
(1) Restore parameter backup source - Keypad



(2) Restore parameter backup source - SD card

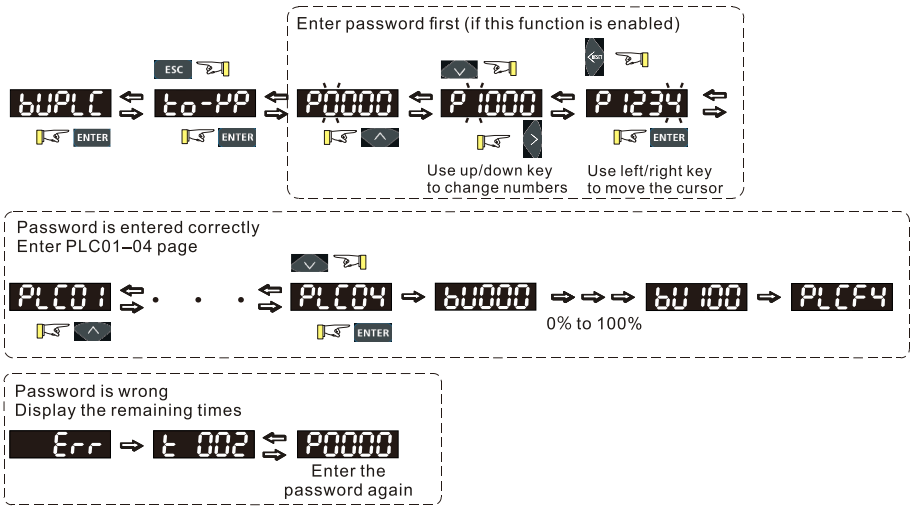


Delete parameter backup

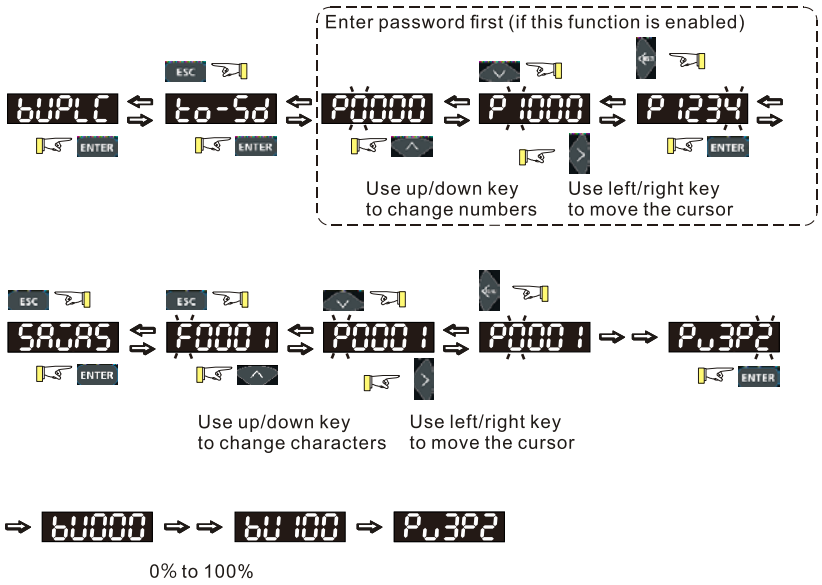


Copy PLC program

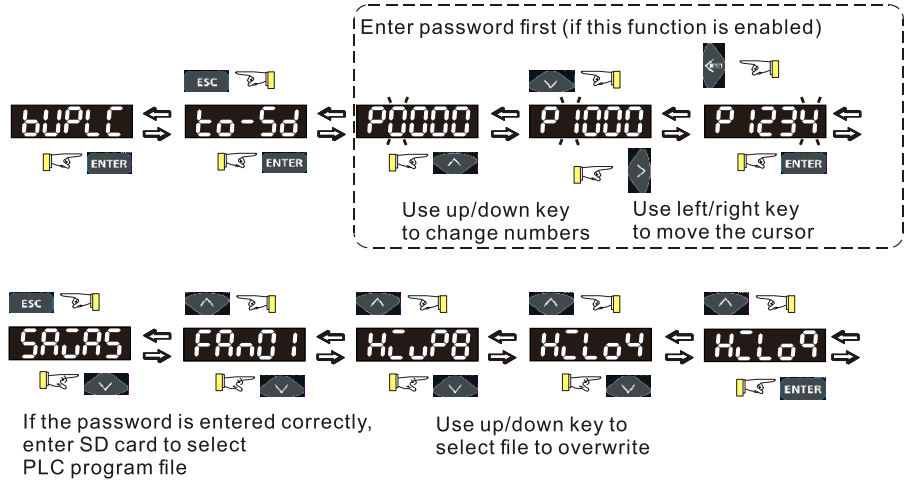
(1) Copy PLC program to Keypad (up to 4 groups: PLC01–PLC04)



(2) Copy PLC program to SD card - save as a new file

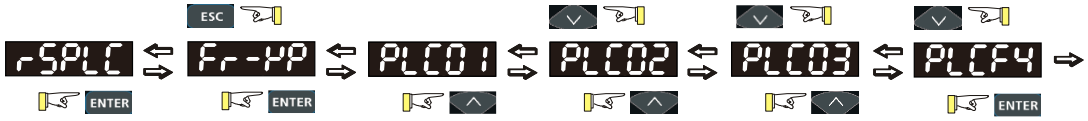


(3) Copy PLC program to SD card - overwrite the original file



Restore PLC program backup

(1) Restore PLC program backup source - Keypad

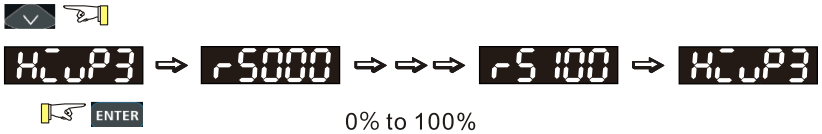


Use up/down key
to select files

0% to 100%

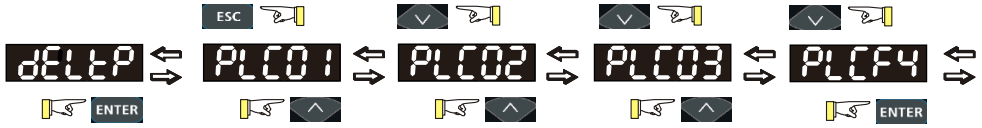
(2) Restore PLC program backup source - SD card

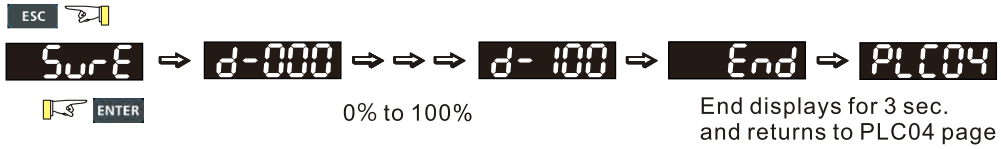
Use up/down key
to select files



0% to 100%

Delete PLC program backup





0% to 100%

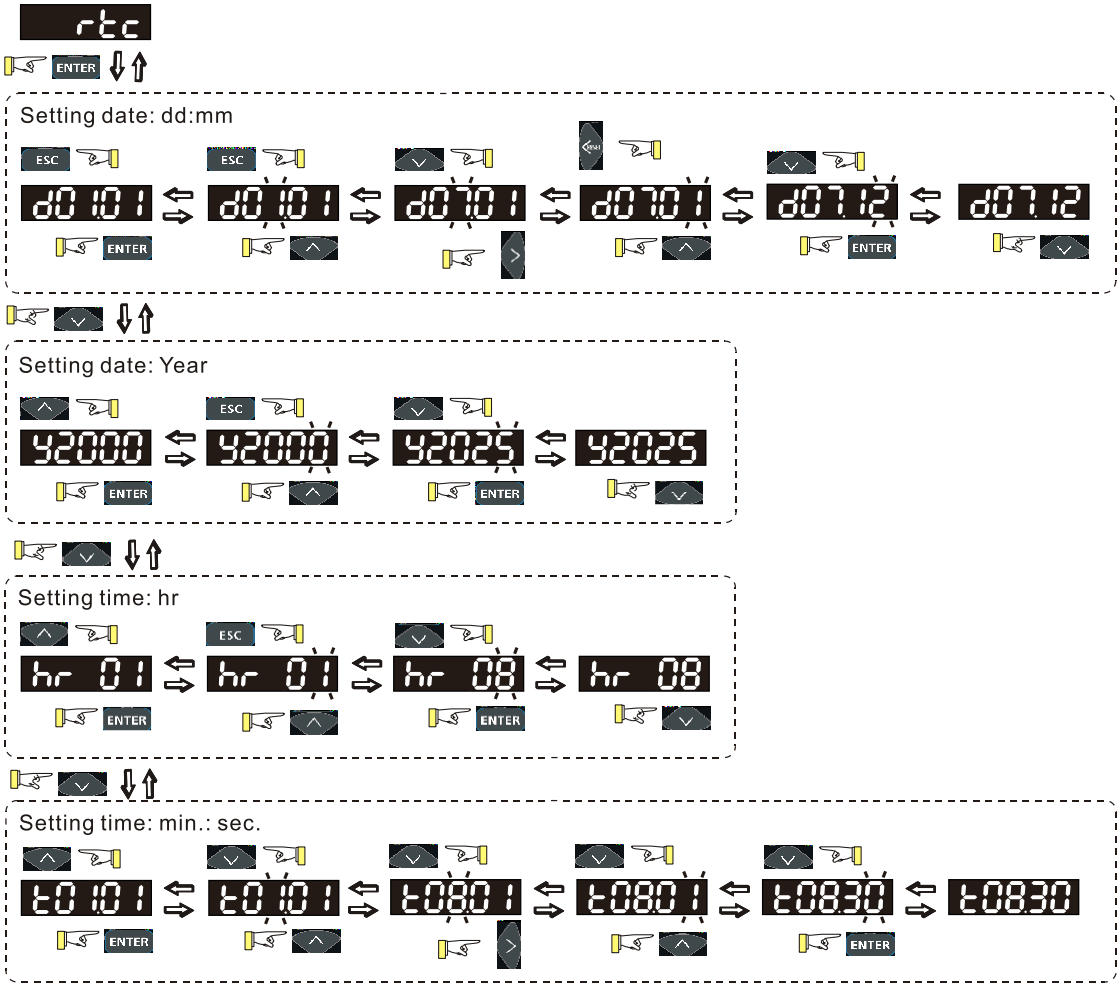
End displays for 3 sec.
and returns to PLC04 page

4-1-6-9 Keypad settings

Keypad setting includes Calendar, Keypad version and Firmware update.

Calendar setting

Sets day, month, year, hour, minute and second according to the following process.



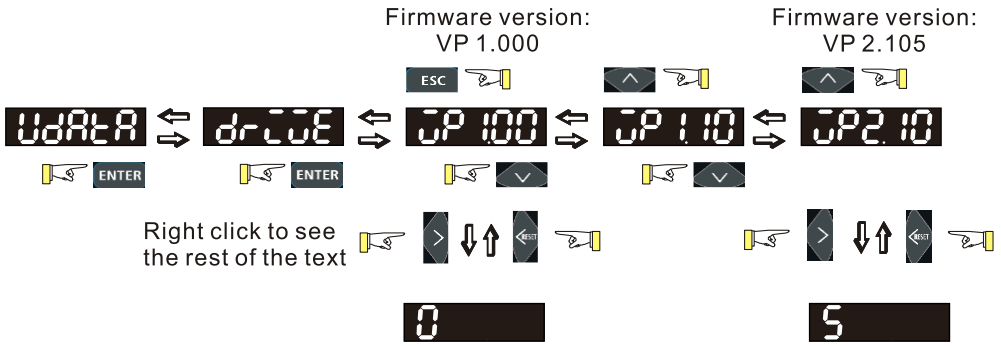
Keypad version

Display current keypad firmware version

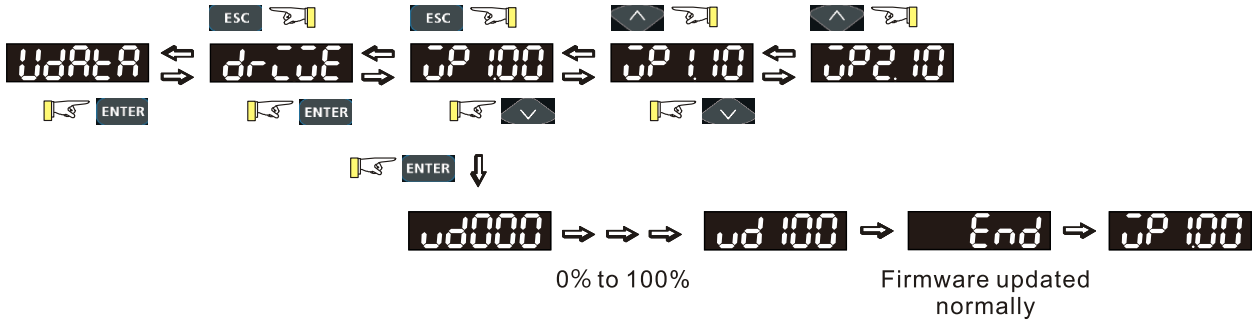
Firmware update

Update the drive firmware

(1) Check firmware version



(2) Select the firmware and start updating the firmware.



4-1-6-10 Serial Number

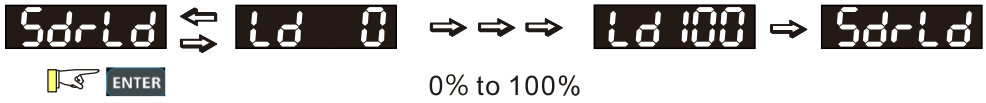
Serial Number: 1K2P4309W23010001	
1K2	Current specification 1200A
P	P: VP3000
43	43: 460V Models
09	Serial number
W	W: made in WJ factory, LED keypad display with J instead of W T: made in Taiwan
23	Year 2023
01	Week 1
0001	Product production sequence number for each week

4-1-6-11 SD Card Management

The SD card management function includes capacity status, reload SD card, release cache space and format SD card.

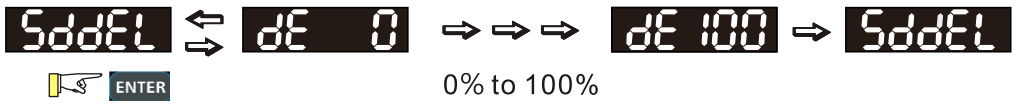
Capacity Status

Reload SD Card



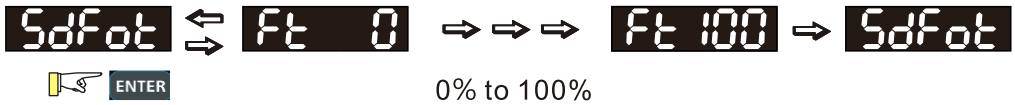
0% to 100%

Release Cache Space



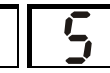
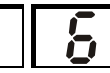
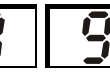
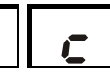
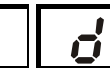
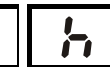
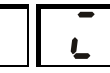
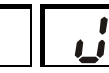
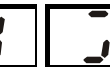
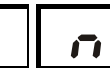
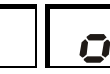
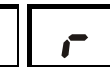
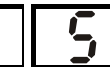
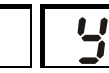
0% to 100%

Format SD Card

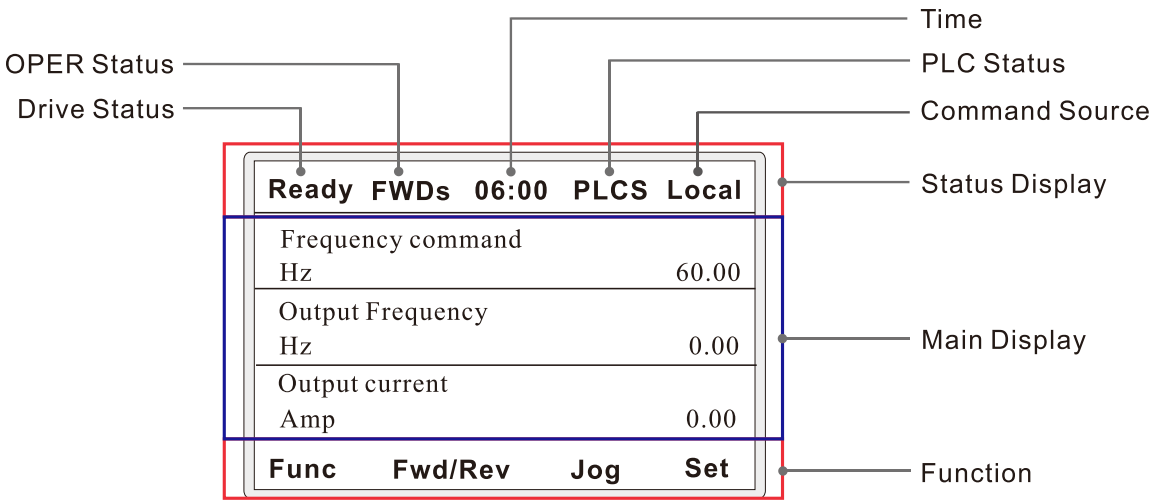


0% to 100%

Reference table for the seven-segment digital keypad LED display

Number	0	1	2	3	4	5	6	7	8	9
Display										
Character	A	a	B	b	C	c	D	d	E	e
Display		-	-				-			-
Character	F	f	G	g	H	h	I	i	J	j
Display		-		-			-			
Character	K	k	L	l	M	m	N	n	O	o
Display		-		-	-	-	-		-	
Character	P	p	Q	q	R	r	S	s	T	t
Display		-	-		-			-	-	
Character	U	u	V	v	W	w	X	x	Y	y
Display			-		-	-	-	-		-
Character	Z	z								
Display		-								

4-1-7 KPV-CC01 Display Description



4-1-7-1 KPV-CC01 Status Display

Keypad status information support list:

Status	Descriptions	KPV-CE02	KPV-CC01	KPV-CC02
Drive Status	Display current executing function, for example: Error, Ready, dEb, Sleep...etc.	X	✓	✓
Operation Status	Display the drive current operating status, for example: FWDs, FWDn, FWDa, FWDd, etc.	X	✓	✓
Bluetooth Status	Display the Bluetooth status A display indicates that the Bluetooth function is enabled.	X	X	✓
Time	Display current time (hour: minute)	X	✓	✓
PLC Status	PLCR: PLC program is running PLCS: PLC program is stop No display indicates no PLC function is used.	X	✓	✓
Command Source	Display current command source: HAND, OFF, AUTO, Local, Remote	X	✓	✓

Drive status instruction

Drive Status	Name	Descriptions
Error	Fault	When a fault occurs to the drive, the status column displays Error.
RUN	Operation	When the drive is in operation, the status column displays Run.
Ready	Ready	When the drive is ready, the status column displays Ready.
dEb	Deceleration Energy Backup	When the drive executes dEb function, the status column displays dEb.
DCIn	DC Injection	When the drive executes DC injection (DC brake at start and stop), the status column displays DCIn.

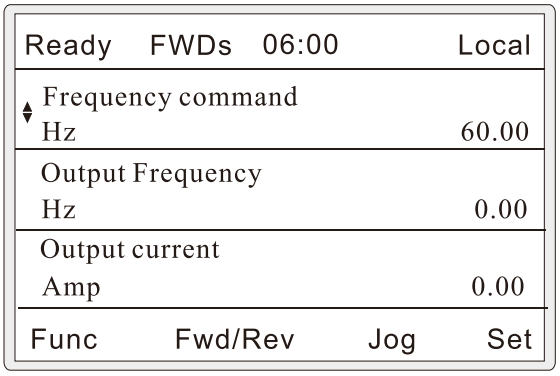
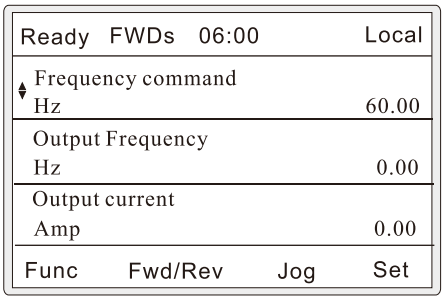
Drive Status	Name	Descriptions
AutoT	Motor parameter auto-tuning	When the drive executes motor parameter auto-tuning, the status column displays AutoT.
B.B.	Base Block	When the drive is in Base Block, the status column displays B.B.
Sleep	Sleep	When the drive is in sleep, the status column displays Sleep.
Stall	Stall function	When the drive is in stall, the status column displays Stall.
Pheat	Pre-heat	When the motor executes pre-heating, the status column displays PHeat.
FlySr	Flying start	When the drive is in flying start, the status column displays FlySr.
Fire	FireMode	When the drive is in FireMode, the status column displays Fire.
STO	Safe Torque Off	When the Safe Torque Off function is activated, the status column displays STO.
NoRdy	Not ready	When the drive is not ready yet, the status column displays NoRdy.
QStop	Quick stop	When the drive is executing quick stop, the status column displays QStop.
Pd01	Pd01	When the IGBT life is lower than the setting level , the status column displays Pd01.
Pd02	Pd02	When the DC bus capacitor life is lower than the setting level, the status column displays Pd02.
Pd03	Pd03	When the board capacitor life is lower than the setting level, the status column displays Pd03.
Pd04	Pd04	When the fan life is lower than the setting level, the status column displays Pd04.
Pd05	Pd05	When the PB relay life is lower than the setting level, the status column displays Pd05.
Pd06	Pd06	When the control board relay 1 life is lower than the setting level, the status column displays Pd06.
Pd07	Pd07	When the control board relay 2 life is lower than the setting level, the status column displays Pd07.
Pd08	Pd08	When the fan 1 feedback is lower than the setting level, the status column displays Pd08.
Pd09	Pd09	When the fan 2 feedback is lower than the setting level, the status column displays Pd09.
Pd10	Pd10	When the fan 3 feedback is lower than the setting level, the status column displays Pd10.

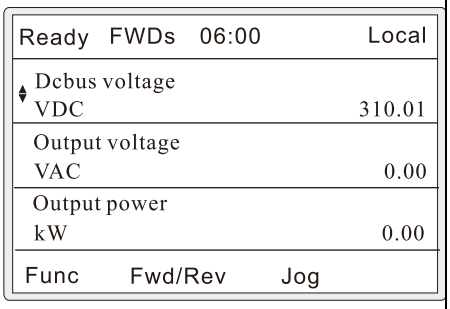
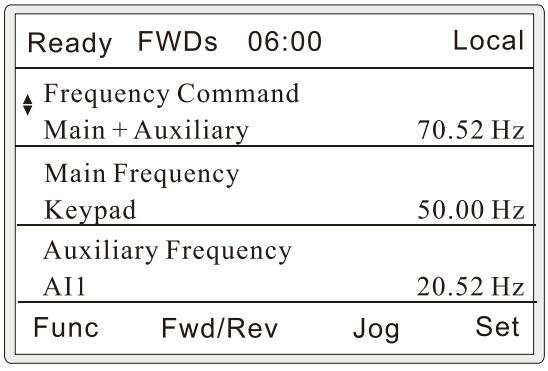
Operation Status:

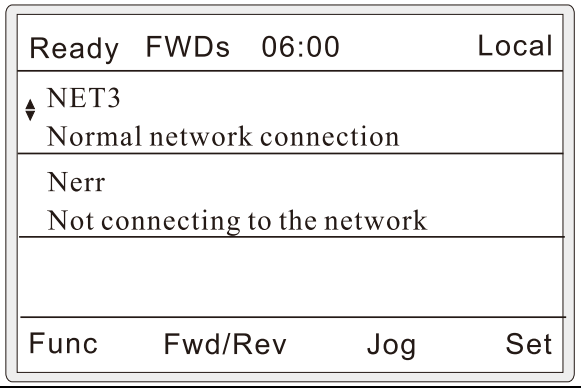
Drive Status	Name	Descriptions
FWDs	Stop status + forward operation	The drive is STOP and the operation direction is FWD, the operation status displays FWDs.
REVs	Stop status + reverse operation	The drive is STOP and the operation direction is REV, the operation status displays REVs.
FtoR	FWD switch to REV	Switching from forward to reverse deceleration (follows REVa to reverse)
RtoF	REV switch to FWD	Switching from reverse to forward deceleration (follows FWDa to forward)
FWDn	FWD normal speed	When the drive operates in FWD constant speed, the operation status displays FWDn.
FWDa	FWD acceleration	When the drive is in FWD acceleration, the operation status displays FWDa.
FWDd	FWD deceleration	When the drive is in FWD deceleration, the operation status displays FWDd.
REVn	REV normal speed	When the drive operates in REV constant speed, the operation status displays REVn.
REVa	REV acceleration	When the drive is in REV acceleration, the operation status displays REVa.
REVd	REV deceleration	When the drive is in REV deceleration, the operation status displays REVd.
JOGf	JOG forward	When the drive is in JOG forward, the operation status displays JOGf.
JOGr	JOG reverse	When the drive is in JOG reverse, the operation status displays JOGr.
PTQC	Positive torque control	When the drive operates with positive torque control, the operation status displays PTQC.
NTQC	Negative torque control	When the drive operates with negative torque control, the operation status displays NTQC.

4-1-7-2 KPV-CC01 Monitoring Screen

KPV-CC01 Monitoring Screen

<table>
<tr><th>Monitoring Screen</th><th>Descriptions</th></tr>
<tr><td>Main screen</td><td>The main screen displays frequency command, output frequency and output current. Use the up/ down keys to move the cursor or press ENTER to go to the frequency setting page.
 
</td></tr>
<tr><td rowspan="3">Digital keypad display selection 1–6</td><td>The defaults of digital keypad display 1–6 are:
● Pr.o0-00 = 9 Frequency command
● Pr.o0-01 = 2 Output frequency
● Pr.o0-02 = 0 Output current
● Pr.o0-60 = 3 DC bus voltage
● Pr.o0-61 = 4 Output voltage
● Pr.o0-62 = 6 Output power</td></tr>
<tr><td>The following display selections can be set by using the Set key:
● 9 (FREQ Cmd)
● 42 (P-PID1 reference)
● 43 (P-PID2 reference)
● 71 (B-PID1 reference)
● 74 (B-PID2 reference)
● 77 (B-PID3 reference)
● 80 (B-PID4 reference)</td></tr>
<tr><td> 


</td></tr>
<tr><td>Master and auxiliary frequency screen</td><td>This page provides monitoring Master and auxiliary frequency simultaneously.
 
</td></tr>
</table>

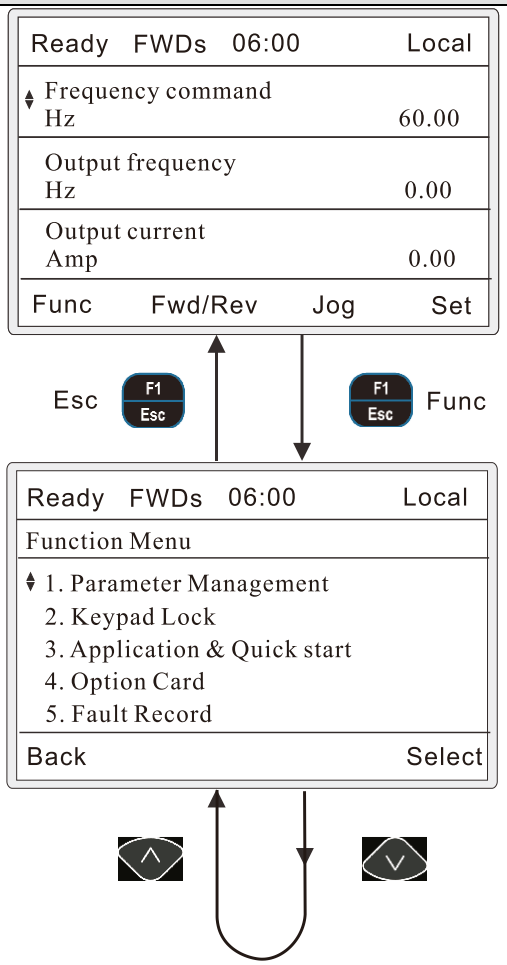
Monitoring Screen	Descriptions
Communication monitoring screen	The communication monitoring screen displays NET3 and Nerr status information. 

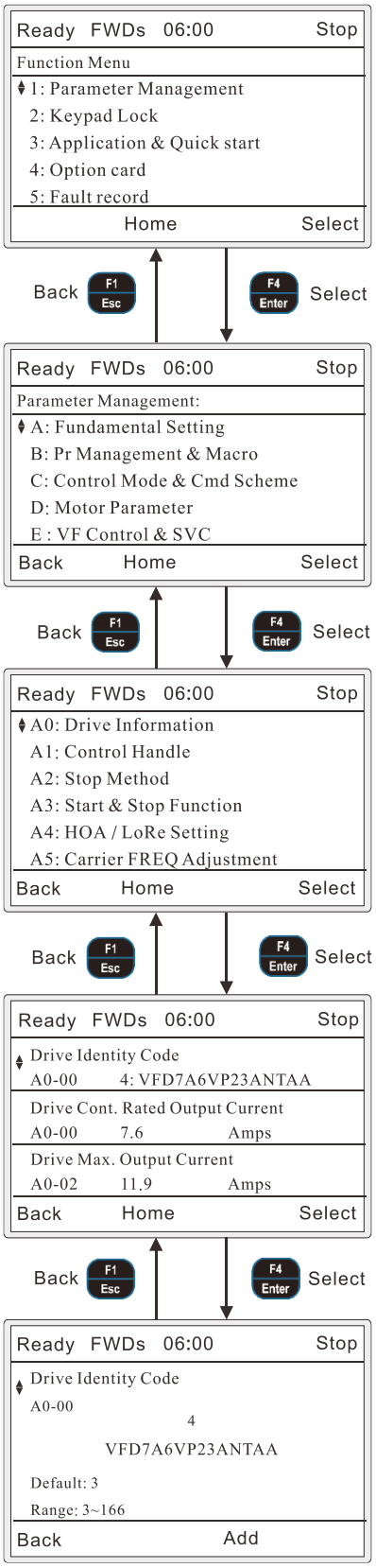
4-1-7-3 KPV-CC01 Function List

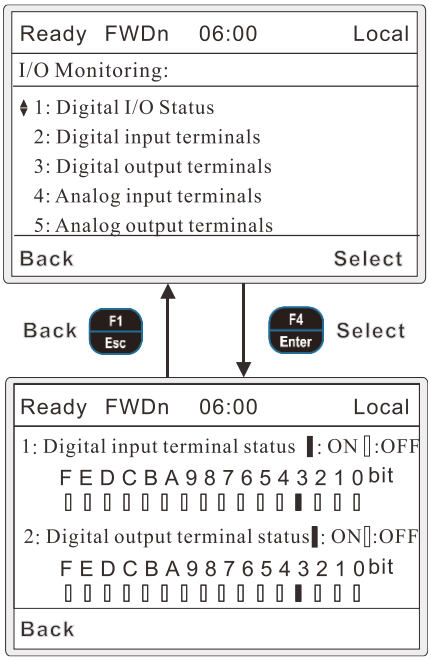
The KPV-CC01 and KPV-CC02 support the following characters:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7 8 9 _ - # & % @

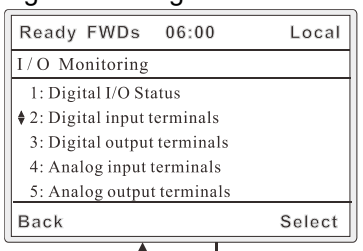
KPV-CC01 Function List

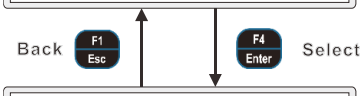
Function Name	Function Menu	Descriptions
KPC-CC01 Keypad function	1. Pr Management 2. I/O Monitoring* 3. Keypad Lock 4. Applications & Quick start 5. Option Card 6. Fault Record 7. PLC Function 8. Backup 9. Drive Information 10. Startup Wizard 11. Keypad Setting 12. SD Card Management **NOTE:** * I/O monitoring function will be available in Firmware V1.11.	

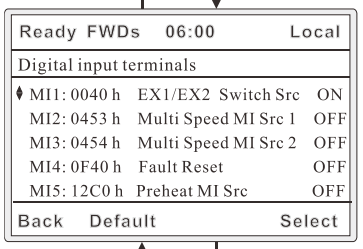
Function Name	Function Menu	Descriptions
Pr Management	Parameter Setting	1. This function displays and sets the drive parameter groups. 2. Use up/ down keys to select the parameter group, and press Select to enter the parameter sub-group and parameter list. 

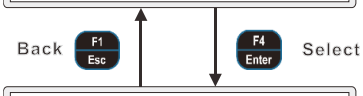
Function Name	Function Menu	Descriptions
I/O monitor* (This function will be available in Firmware V1.11)	Digital I/O status	Displays the status of digital input/ output terminals 

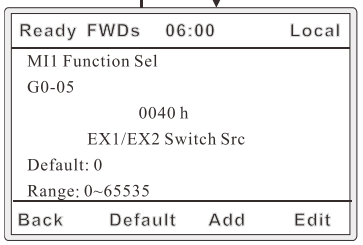
Function Name	Function Menu	Descriptions
	Digital input terminals	1. Displays the information of digital input terminal function setting, ON/ OFF status, respond time, N.O./ N.C. modes, and virtual input. 2. Press Select to enter the parameter setting page and change the setting value.

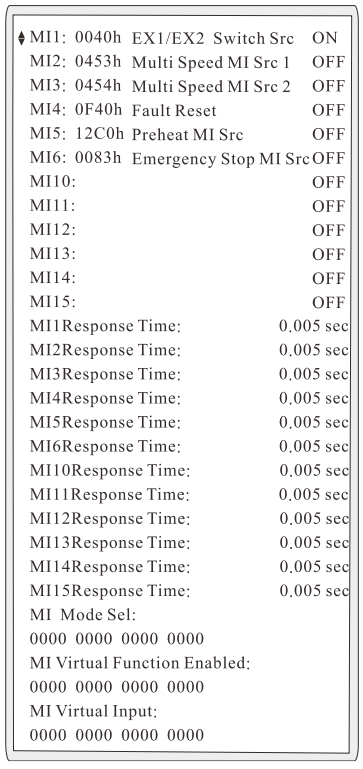


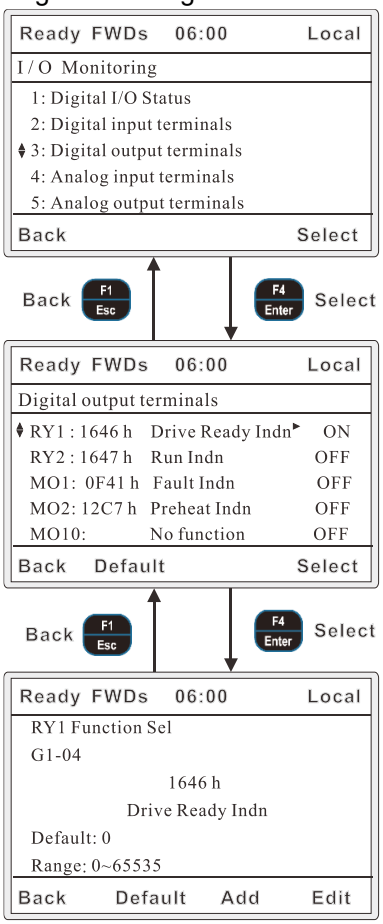
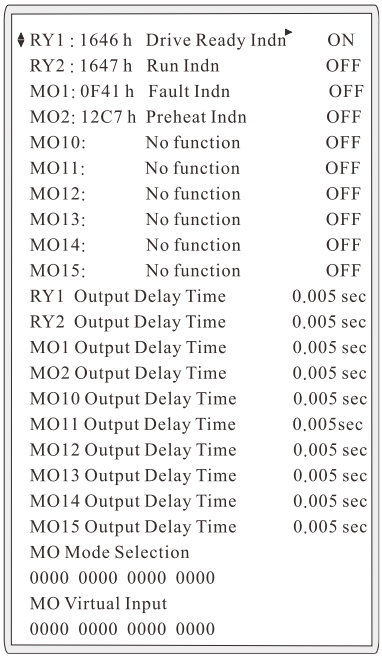


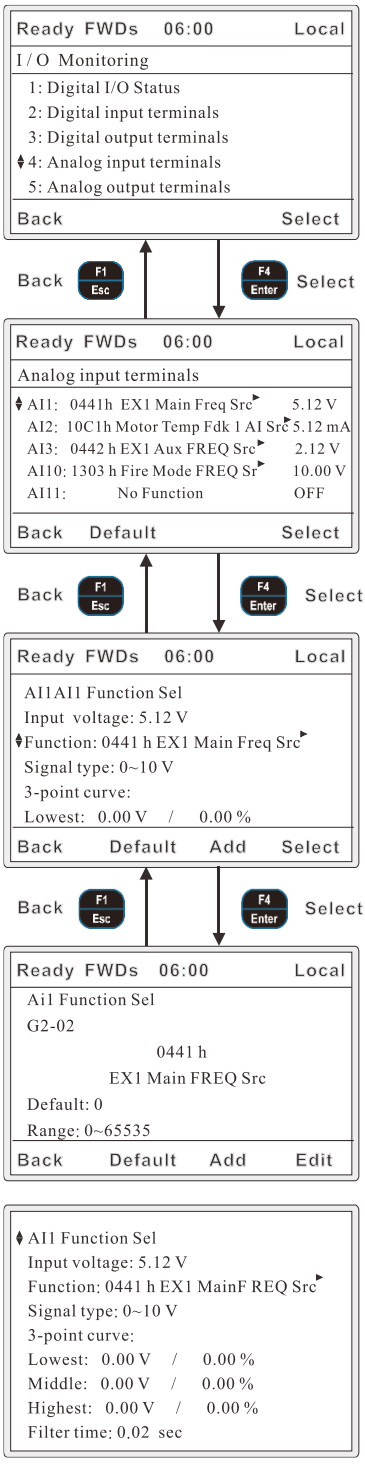


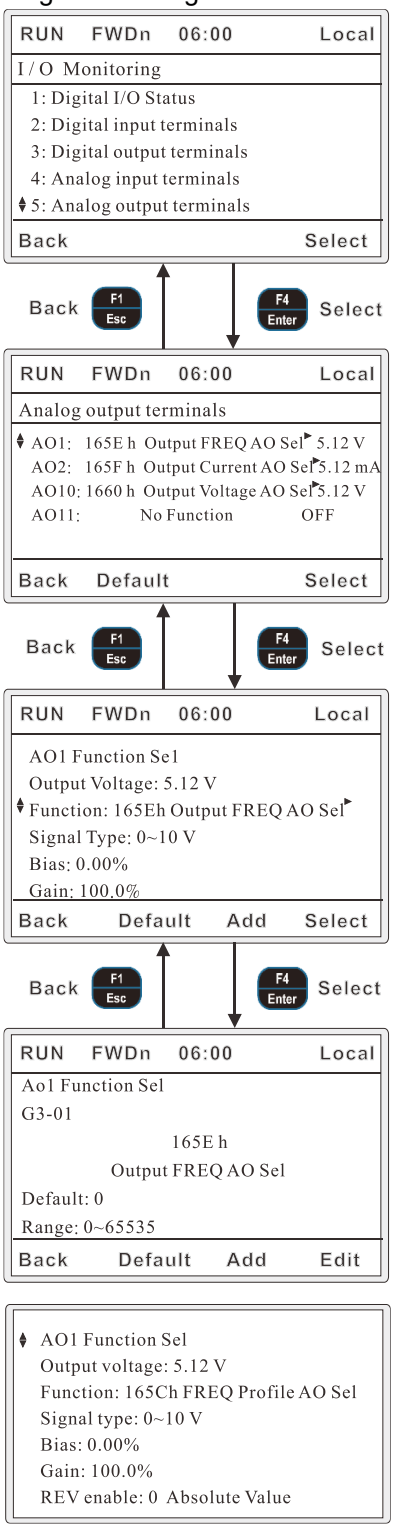


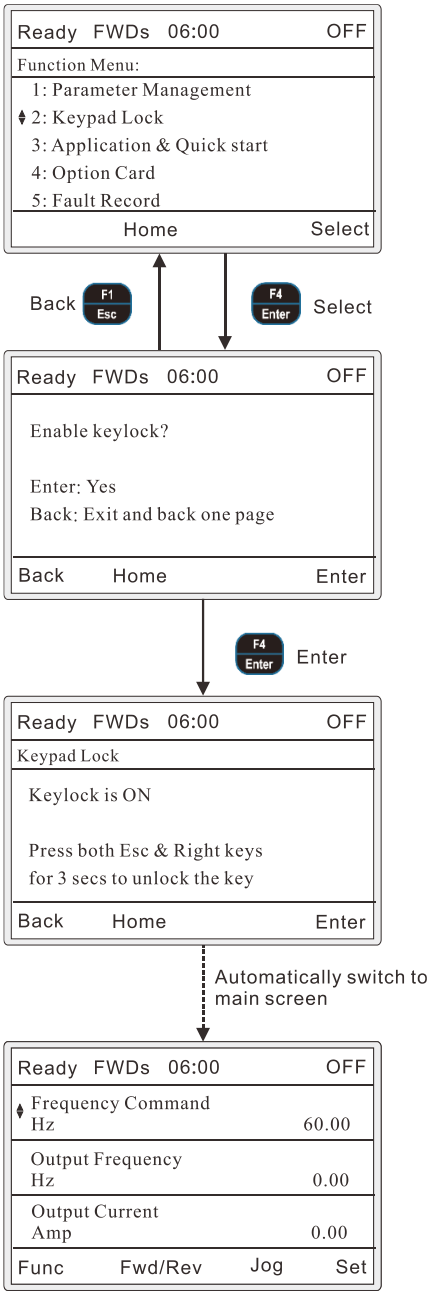


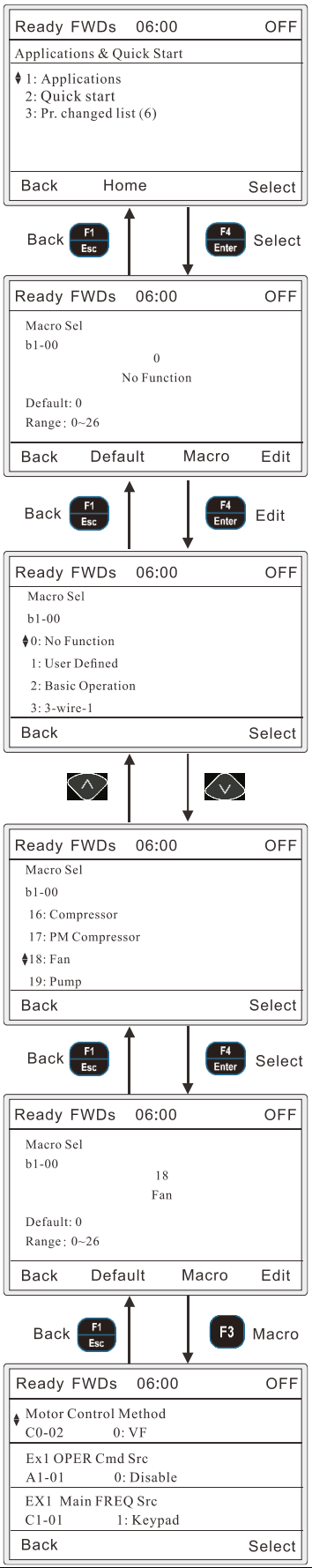


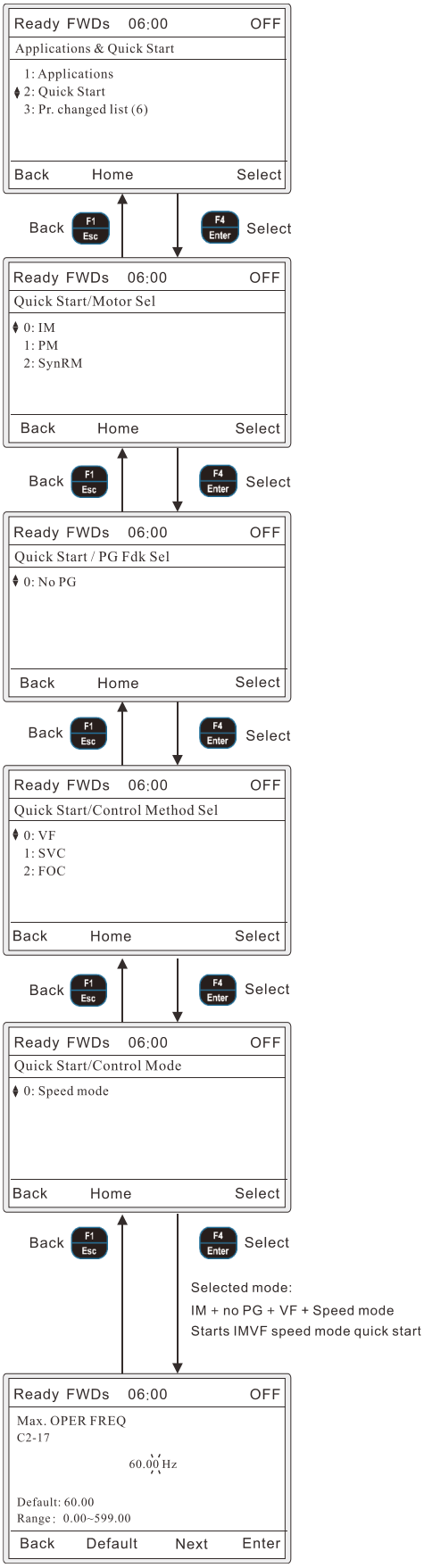
Function Name	Function Menu	Descriptions
	Digital output terminals	1. Displays the information of digital output terminal function setting, ON/ OFF status, output delay time, N.O./ N.C. modes, and virtual input. 2. Press Select to enter the parameter setting page and change the setting value.  

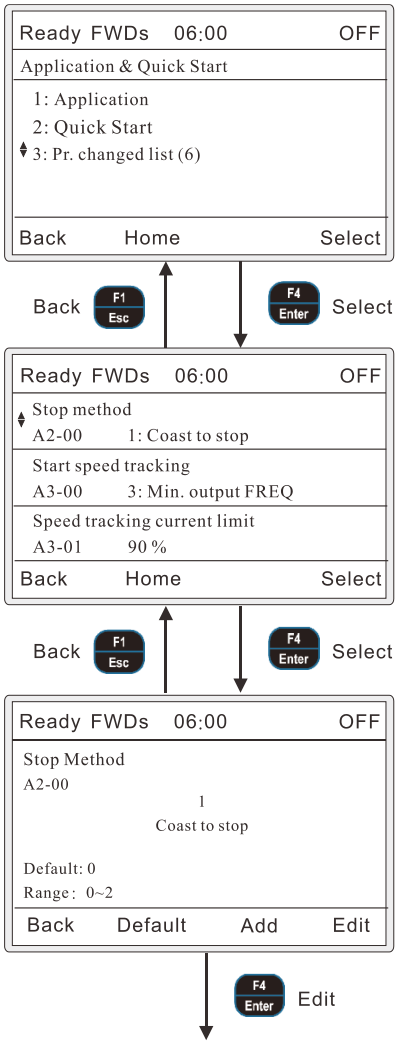
Function Name	Function Menu	Descriptions
	Analog input terminals	1. Displays the information of analog input terminal function setting, current input value, filter time, three-point setting and signal type. 2. Press Select to enter the parameter setting page and change the setting value. 

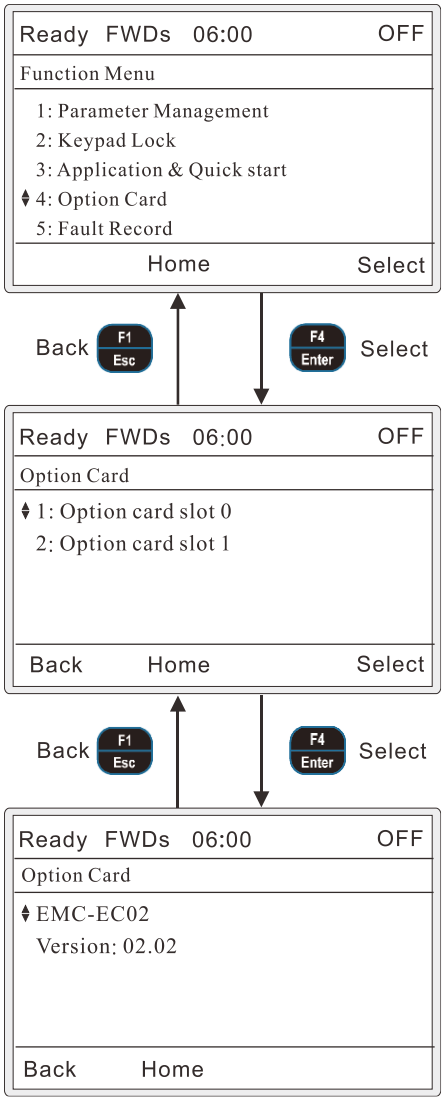
Function Name	Function Menu	Descriptions
	Analog output terminals	1. Displays the information of analog output terminal function setting, current output value, signal type, bias, gain, and reverse enable. 2. Press Select to enter the parameter setting page and change the setting value. 

Function Name	Function Menu	Descriptions
Keypad lock		1. This function locks the keys on the keypad. 2. The main screed does not display lock status after the keypad is locked but shows “Keypad lock is enabled” when you press any key under lock status. Press [ESC + right key] for three seconds to unlock the keypad. 

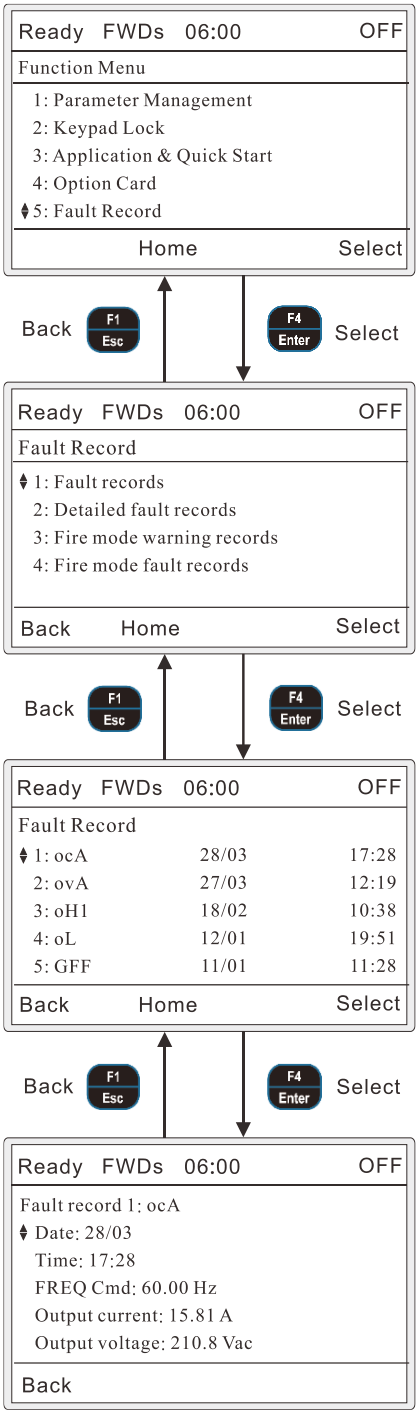
Function Name	Function Menu	Descriptions
Application & Quick Start	Application MACRO 0: Reserve 1: Use-defined 2: Basic Operation 3: 3-Wire–1 4: 3-Wire–2 5: HOA Switch 6: Multi-Speed 7: PID 8–15: Reserved 16: Compressor 17: PM Compressor 18: Fan 19: Pump 20: AHU 21–26: Reserved	1. This function displays the application macro and its parameter combination. 2. Press Select to enter the parameter setting page and change the setting value. 

Function Name	Function Menu	Descriptions
	Quick start 1. VF 2. IMSVC 3. IMFOC 4. PMSVC 5. PMFOC 6. SynSVC **NOTE:** Quick start option 2–6 will be available in Firmware V1.11.	1. This function displays the parameter combination of quick setting. 2. Press ENTER or Edit to enter the parameter setting page and change the setting value. 

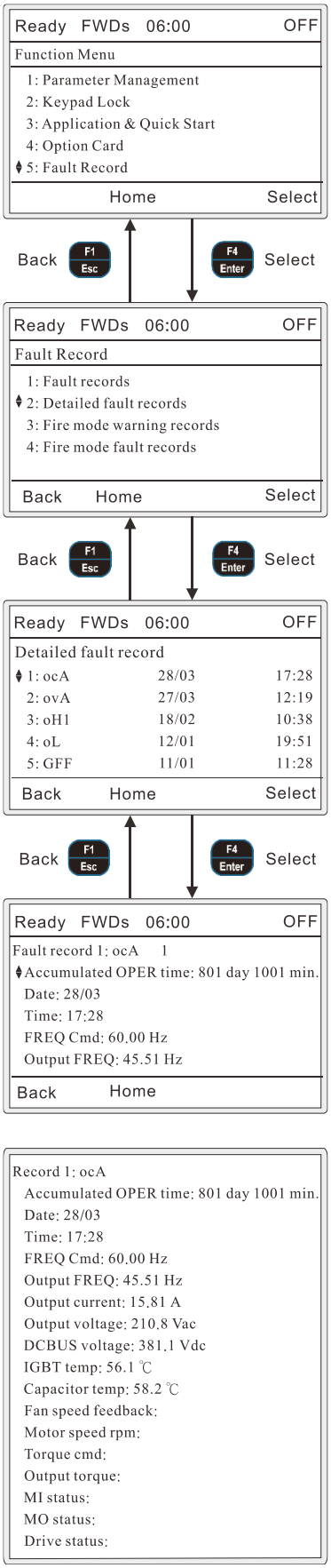
Function Name	Function Menu	Descriptions
	Pr. changed list (XX)	1. This function displays parameters that is modified, you can directly enter the parameter setting page and change setting value. 2. Modified parameter (06): it means there are 6 parameters that have been modified.  Press “Edit” key to enter the parameter setting screen and change the setting value

Function Name	Function Menu	Descriptions
Option cards		1. Displays current used option card. 2. Press Select to read further information. 

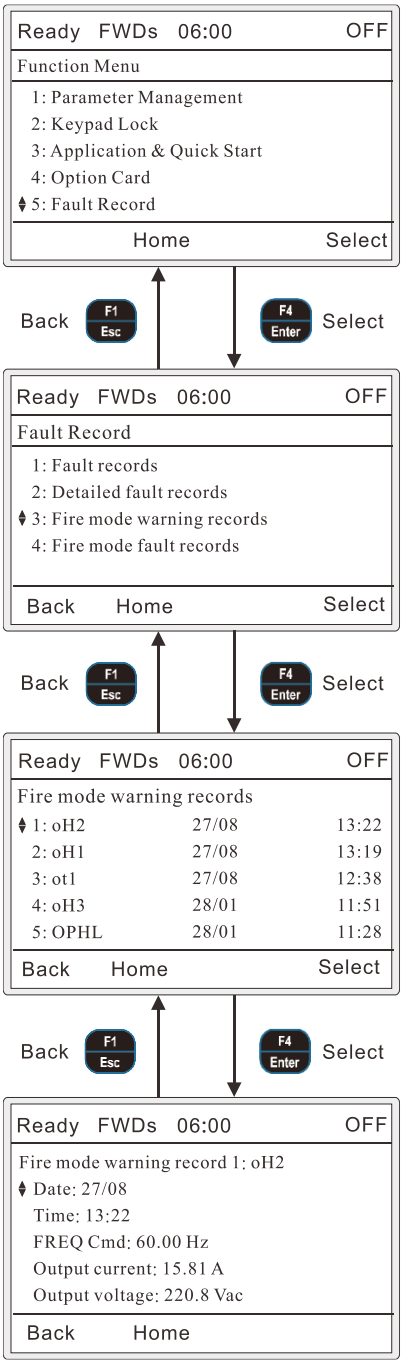
Function Name	Function Menu	Descriptions
Fault record	Fault record	1. Displays 30 fault records. 2. Press Select to read further information of the fault records.



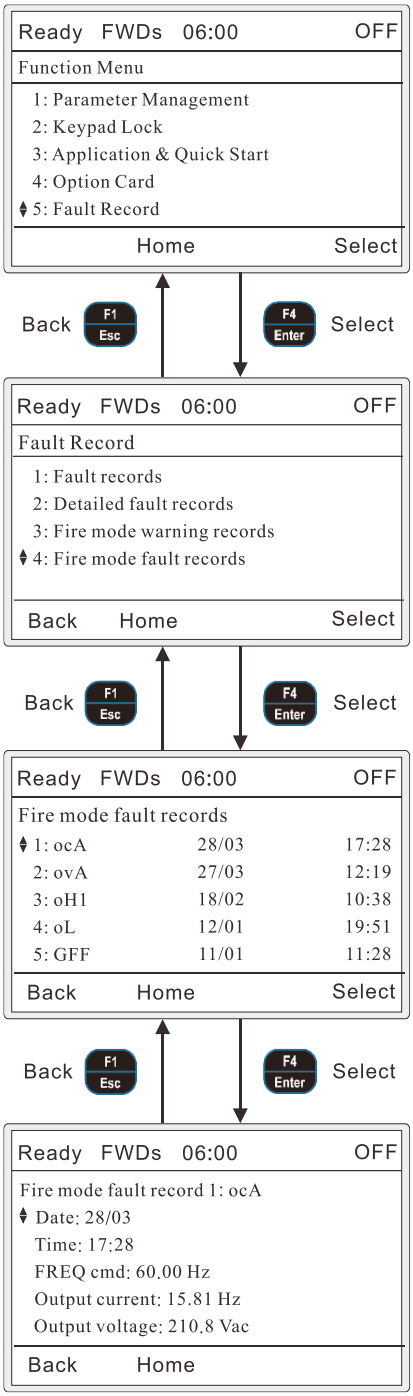
Function Name	Function Menu	Descriptions
	Detailed fault records	1. Displays 6 fault records. 2. Press Select to read further information of the fault records.

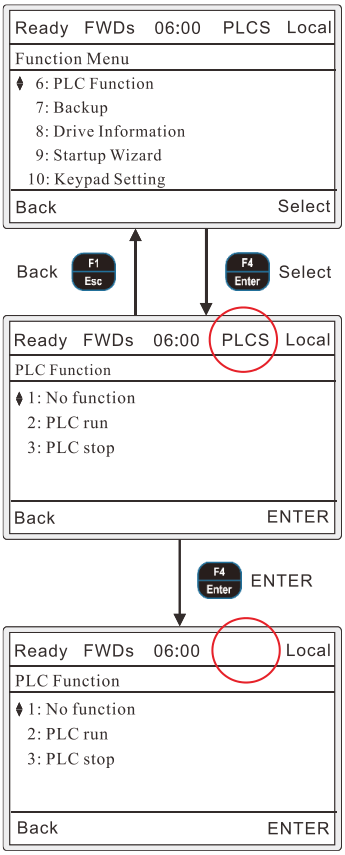
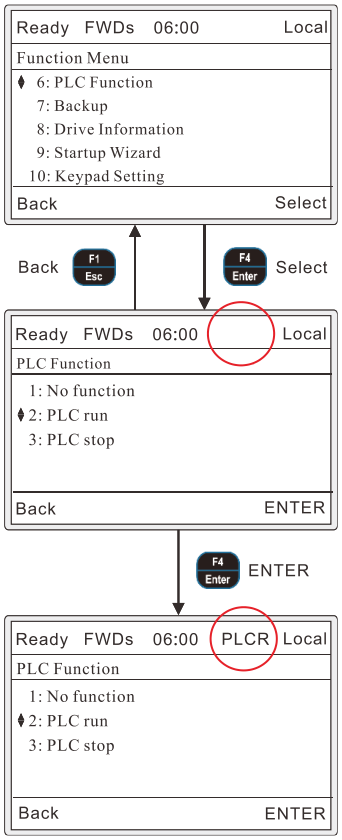


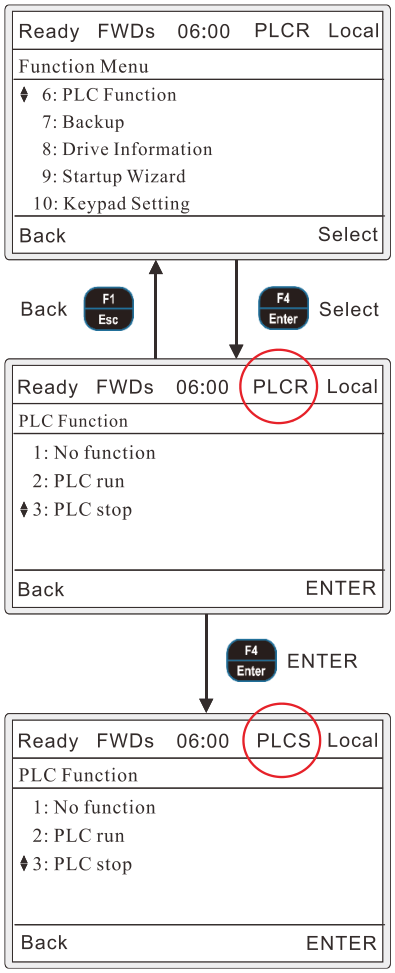
Function Name	Function Menu	Descriptions
	Fire mode warning records	1. Displays 6 warning records in FireMode. 2. Press Select to read further information of the fault records.

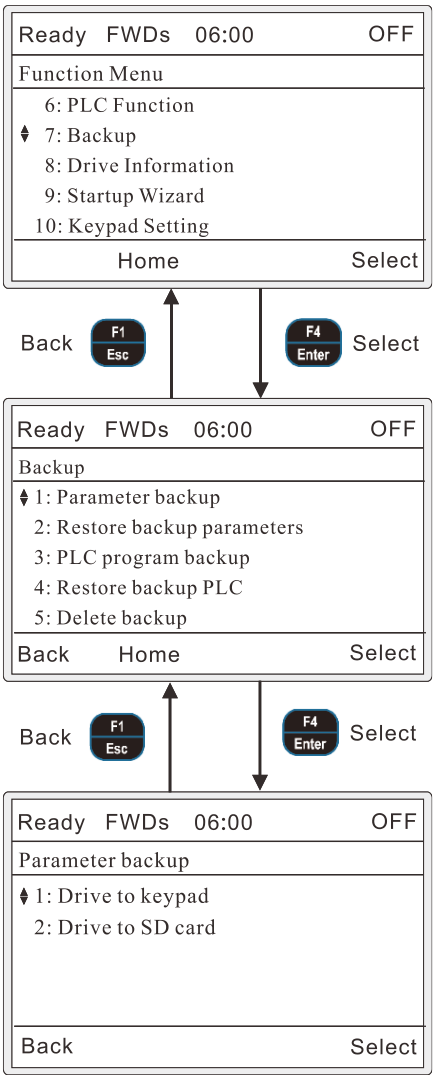


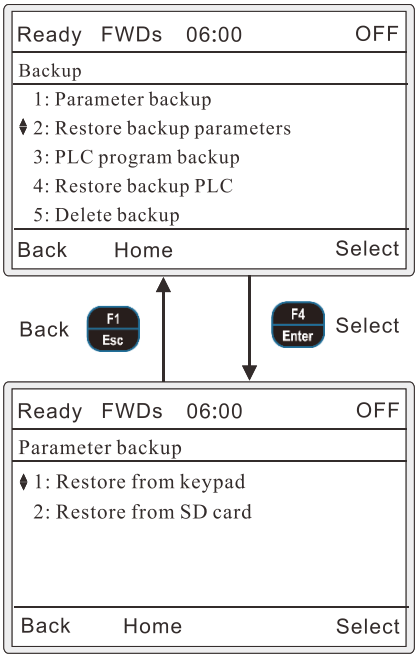
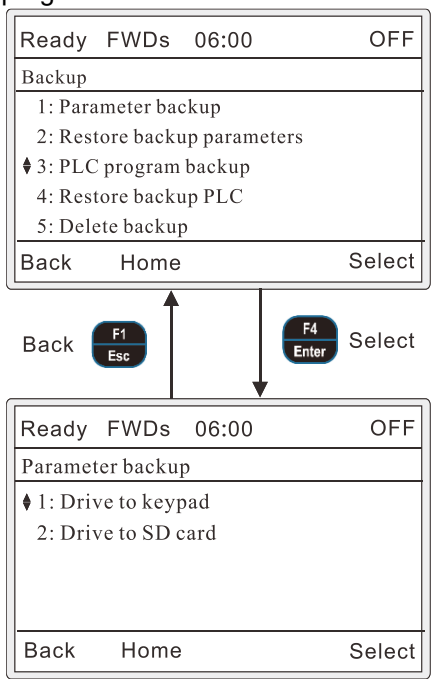
Function Name	Function Menu	Descriptions
	Fire mode fault records	1. Displays 6 fault records in FireMode. 2. Press Select to read further information of the fault records.

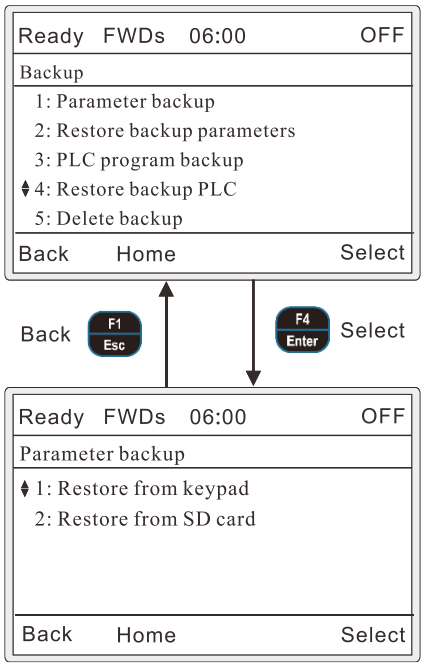
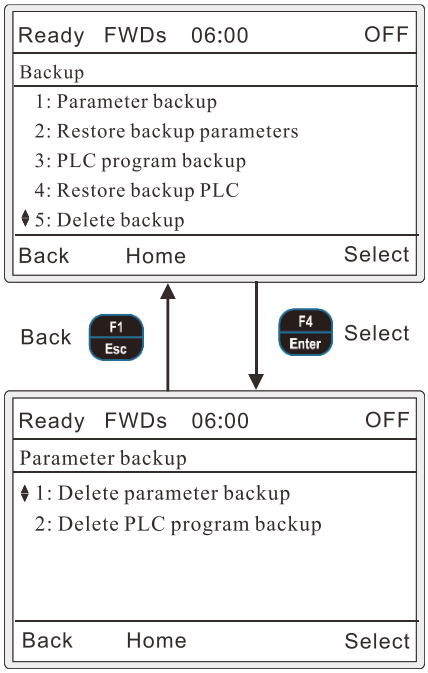


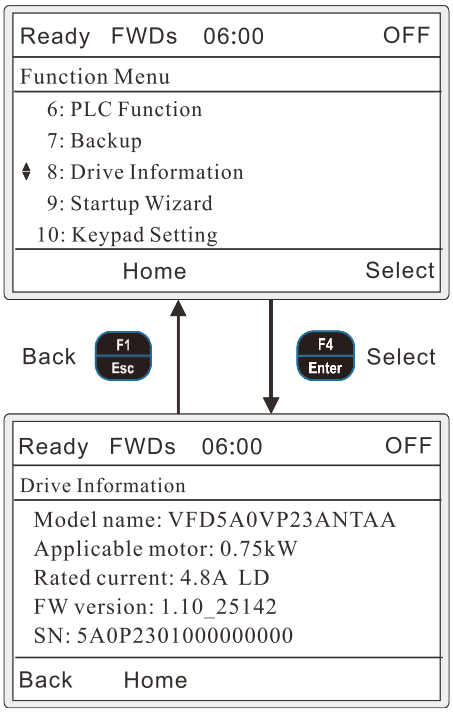
<table>
<tr><th>Function Name</th><th>Function Menu</th><th>Descriptions</th></tr>
<tr><td rowspan="2">PLC Function</td><td>No Function</td><td>1. Select PLC function.
2. When you select “No function”, it does not display the PLC status.
 
</td></tr>
<tr><td>PLC Run</td><td>1. Select PLC operation on this page to start the PLC program.
2. PLC status display: PLCR
 
</td></tr>
</table>

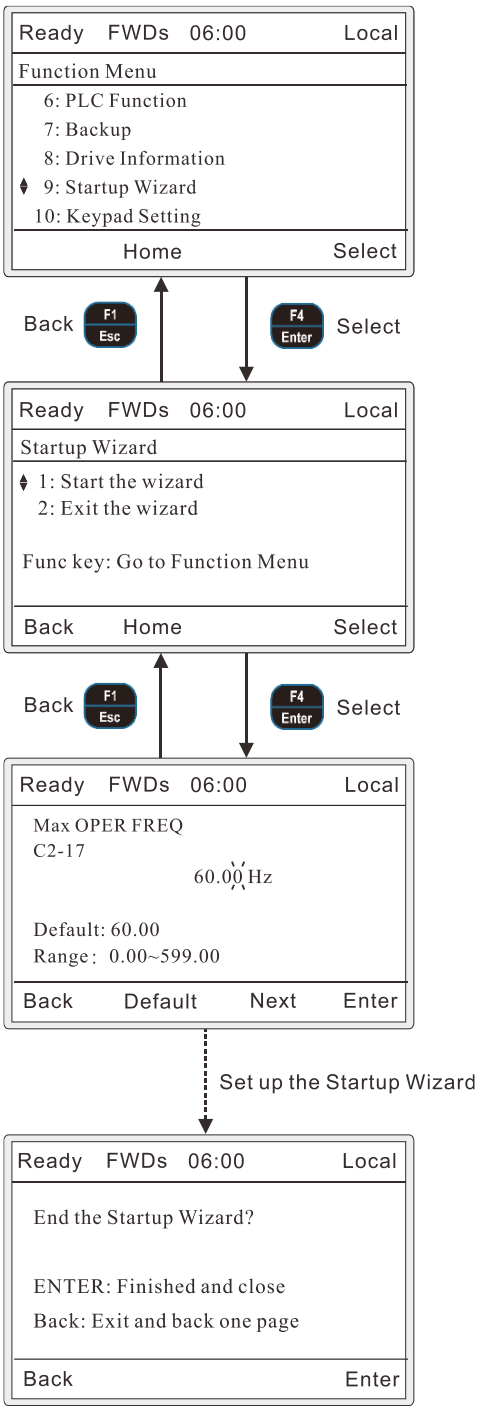
Function Name	Function Menu	Descriptions
	PLC Stop	1. Select PLC stop on this page to stop the PLC program. 2. PLC status display: PLCS 

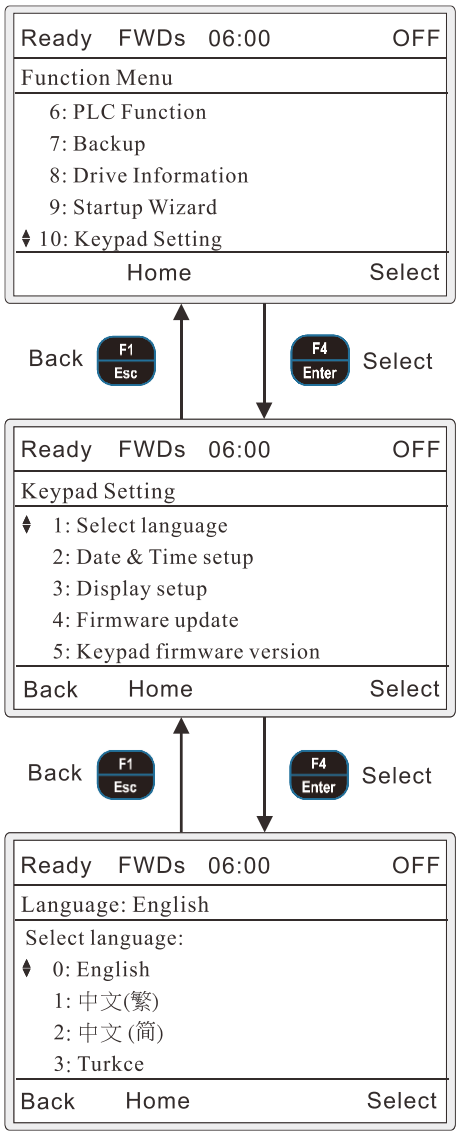
Function Name	Function Menu	Descriptions
Backup	Parameter backup	1. Displays the function combination of copy parameter: 1. Drive to Keypad. 2. Drive to SD card. ● Option 1: Drive to Keypad, saves 4 groups of parameters. ● Option 2: Drive to SD card, save the parameters in SD card. 

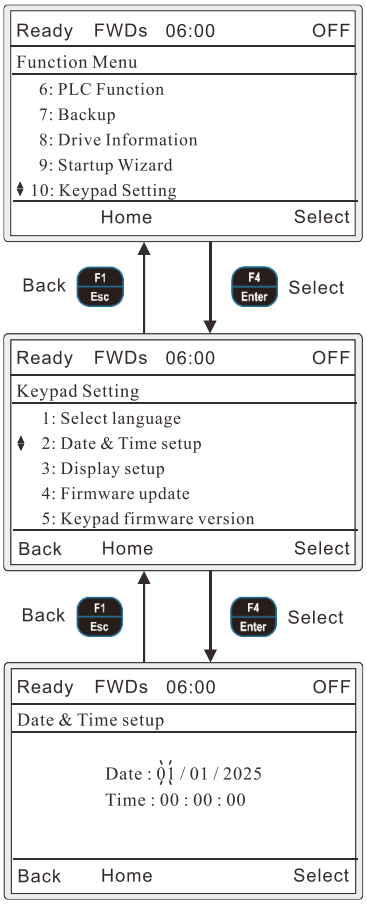
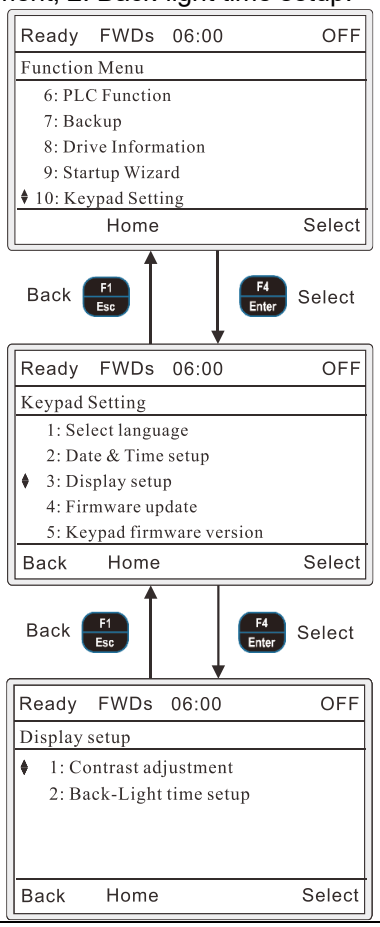
Function Name	Function Menu	Descriptions
	Restore backup parameters	1. Displays the function combination of restore parameter backup: 1. Restore from Keypad. 2. Restore from SD card. ● Option 1: Restore from Keypad, recover 4 groups of parameter settings that are stored in the Keypad. ● Option 2: Restore from SD card, recover all parameter settings that are stored in the SD card. 
	PLC program backup	1. Displays the function combination of copy PLC program: 1. Drive to Keypad. 2. Drive to SD card. ● Option 1: Drive to Keypad, saves 4 groups of PLC program. ● Option 2: Drive to SD card, save the PLC program in SD card. 

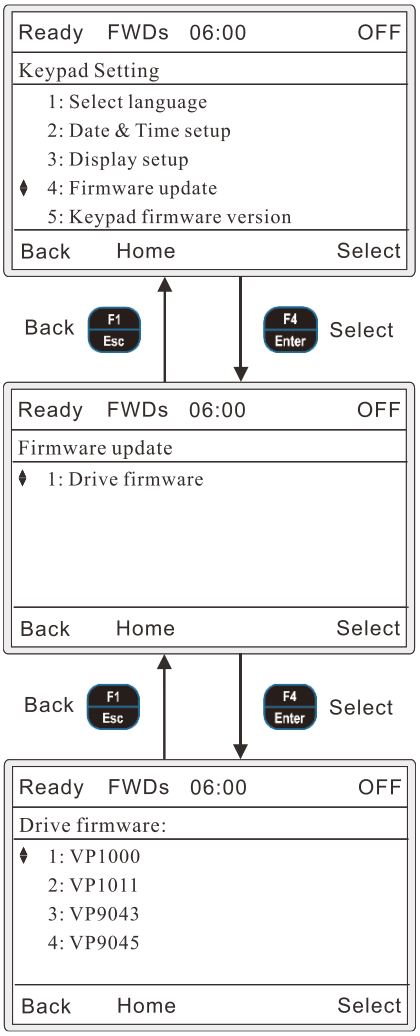
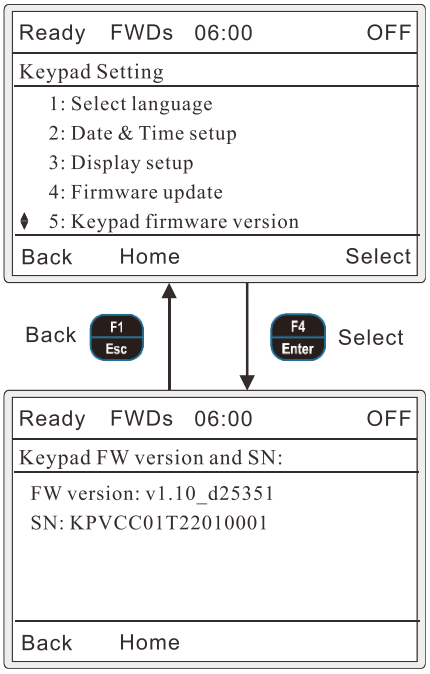
Function Name	Function Menu	Descriptions
	Restore backup PLC	1. Displays the function combination of restore PLC program backup: 1. Restore from Keypad. 2. Restore from SD card. ● Option 1: Restore from Keypad, recover 4 groups of PLC program that are stored in the Keypad. ● Option 2: Restore from SD card, recover PLC program that is stored in the SD card. 
	Delete backup	1. This function selects the parameter backup or PLC program backup to be deleted. 

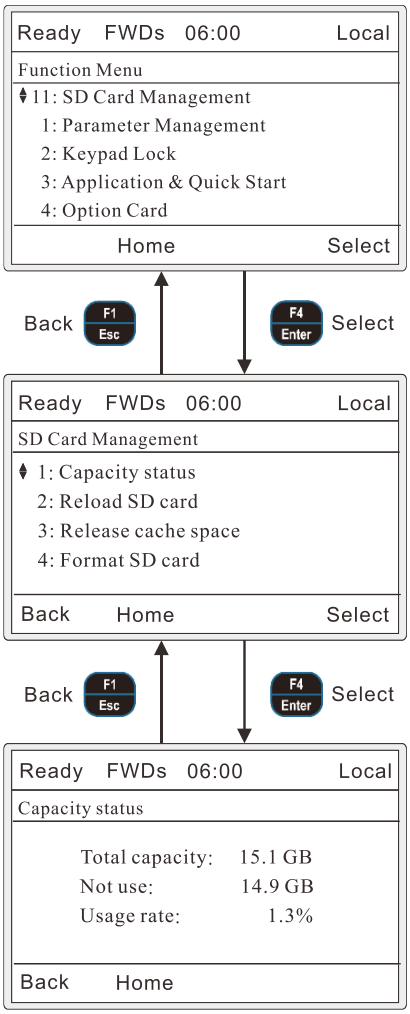
Function Name	Function Menu	Descriptions
Drive Information		1. This function displays the drive information. 

Function Name	Function Menu	Descriptions
Startup Wizard	Enter Startup Wizard	1. Select option 1 in this page: enter Startup Wizard for basic function setting. 2. Select option 2 in this page: exit Startup Wizard and return to the menu. 
	Exit Startup Wizard	

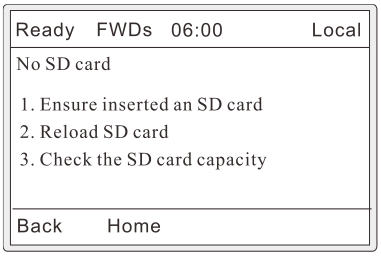
Function Name	Function Menu	Descriptions
Keypad settings	Language select	1. This function sets the keypad language. Language select: ● English ● 繁體中文 (Traditional Chinese) ● 简体中文 (Simplified Chinese) ● Turkish ● Russian ● Spanish ● Portuguese ● French ● Polish ● German ● Italian ● Swedish 

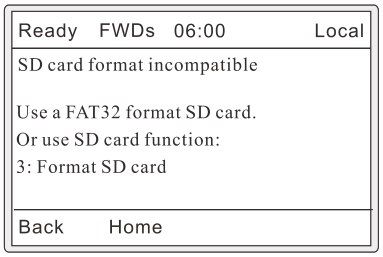
Function Name	Function Menu	Descriptions
	Date & Time setup	1. This function sets the keypad time. 
	Display setup	1. This function sets the keypad display: 1. Contrast adjustment, 2. Back-light time setup. 

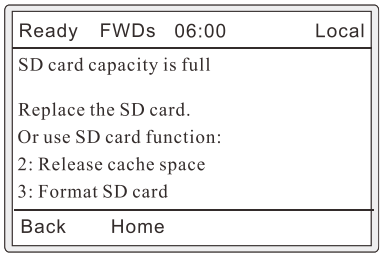
Function Name	Function Menu	Descriptions
	Firmware update	1. This function updates the drive firmware. 
	Firmware Version	1. This function displays the keypad firmware version and the product serial number. 

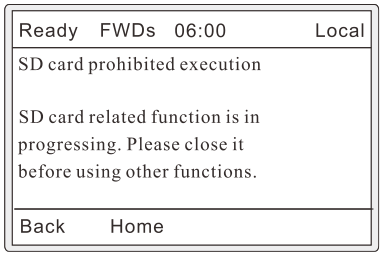
Function Name	Function Menu	Descriptions
SD Card Management	Capacity status	1. This function displays the capacity information of the current inserted SD card. 

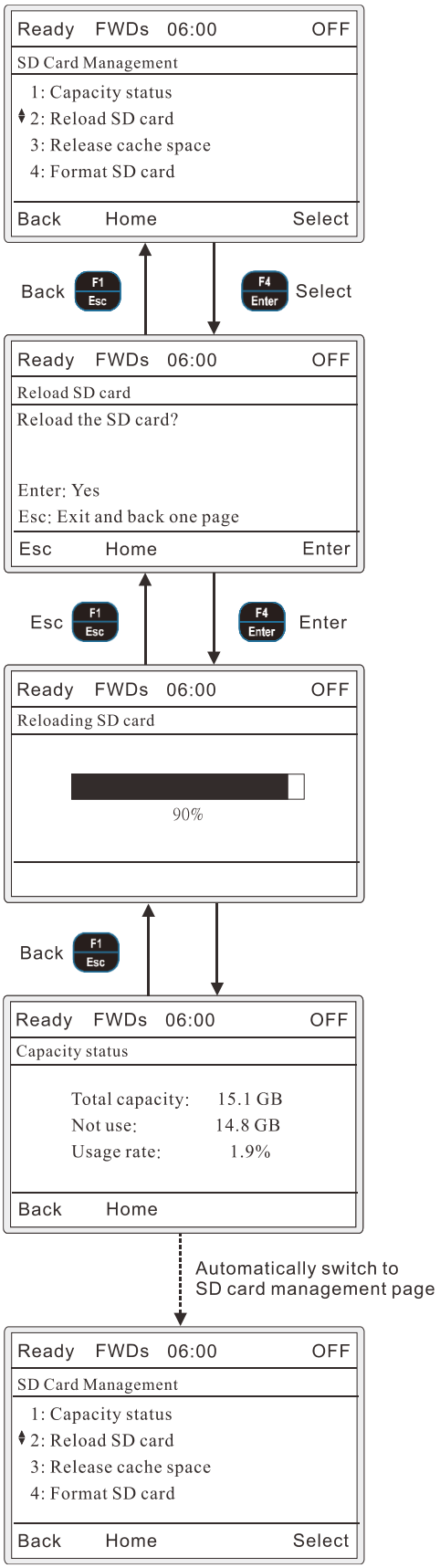
Function Name	Function Menu	Descriptions
		2. The followings are warning messages for SD card functions. Follows the indications shown on the display for further operation.

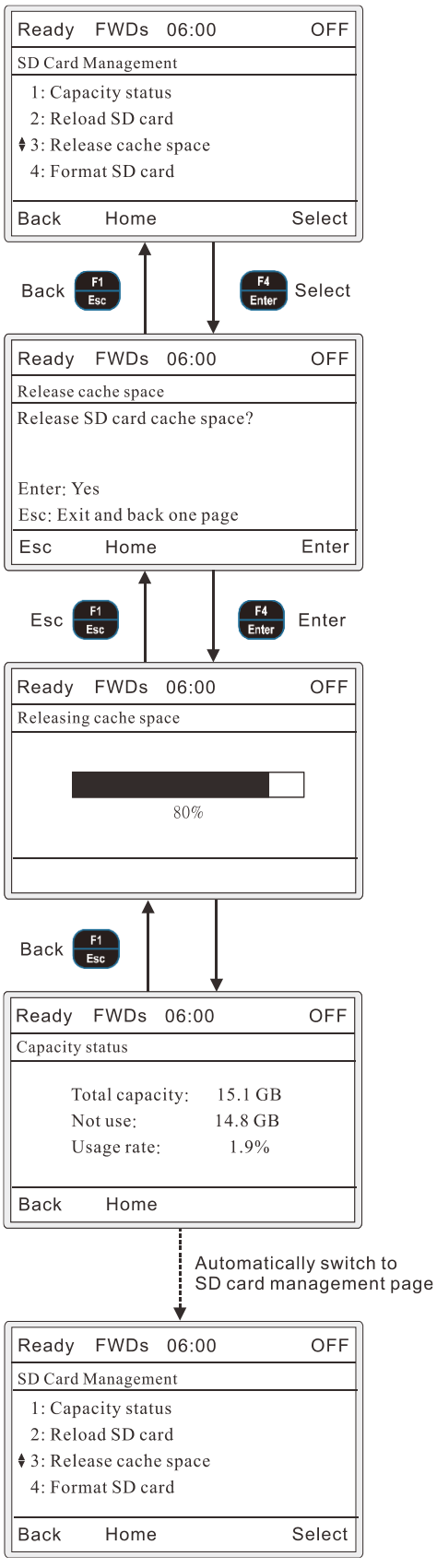


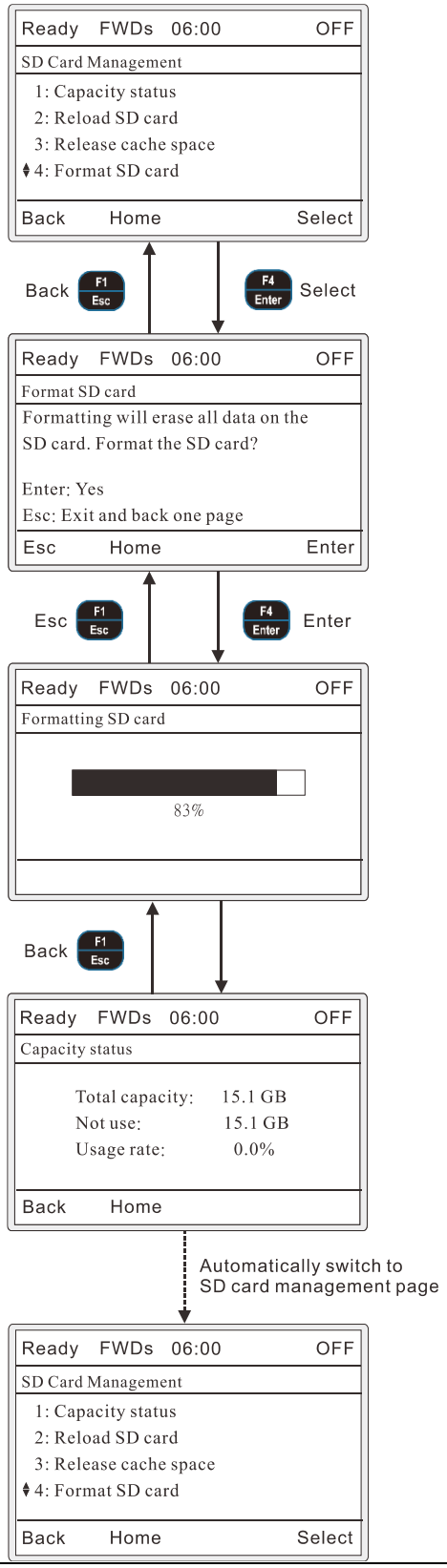






Function Name	Function Menu	Descriptions
	Reload SD card	1. Reloads the SD card information. When the SD card is inserted after the drive starts, execute the reload function first, then the SD card function can be operated. 

Function Name	Function Menu	Descriptions
	Release cache space	1. This function releases cache space, especially when the SD card is highly used. Releasing cache space could erase the cache file in the SD card and reduce ths usage rate of the SD card.
		

Function Name	Function Menu	Descriptions
	Format SD Card	1. The SD card function only supports SD card with FAT32 format, with suggested configuration of 64KB (refer to Section 4-2 SD card for Using Precautions). 2. This function foramts the SD card to FAT32 and the best configuration unit 64KB. 

4-1-7-4 Support function list for each Keypad:

Function Name	Function Menu	KPV-CE02	KPV-CC01	KPV-CC02
Pr Management	Parameter Setting	v	v	v
I/O monitor* (*Available in Firmware V1.11)	Digital input/ output terminal status	x	v	v
	Multi-function digital input terminals	x	v	v
	Multi-function digital output terminals	x	v	v
	Multi-function analog input terminals	x	v	v
	Multi-function analog output terminals	x	v	v
Keypad lock		v	v	v
Application & Quick Start	Application MACRO	v	v	v
	Quick Start	v	v	v
	Pr. changed list (XX)	v	v	v
Option cards		v	v	v
Fault record	Fault record	v	v	v
	Detailed fault information	x	v	v
	Fire mode fault records	v	v	v
	Fire mode warning records	v	v	v
PLC	No PLC	v	v	v
	PLC Run	v	v	v
	PLC Stop	v	v	v
Copy function	Parameter backup	v	v	v
	Restore backup parameters	v	v	v
	PLC program backup	v	v	v
	Restore backup PLC	v	v	v
	Delete backup	v	v	v
Drive Information		x	v	v
Start Wizard	Start the Wizard	x	v	v
	Exit the Wizard	x	v	v
Keypad settings	Select language	x	v	v
	Date & Time setup	v	v	v
	Display setup	x	v	v
	Firmware update	v	v	v
	Keypad firmware version	v	v	v
SD card management	Capacity status	v	v	v
	Reload SD card	v	v	v
	Release cache space	v	v	v
	Format SD card	v	v	v
Bluetooth setup	Bluetooth enable/ disable	x	x	v
	Bluetooth name	x	x	v
	Pairing setup	x	x	v

4-2 SD Card

4-2-1 Specification and Using Precautions:

Specification

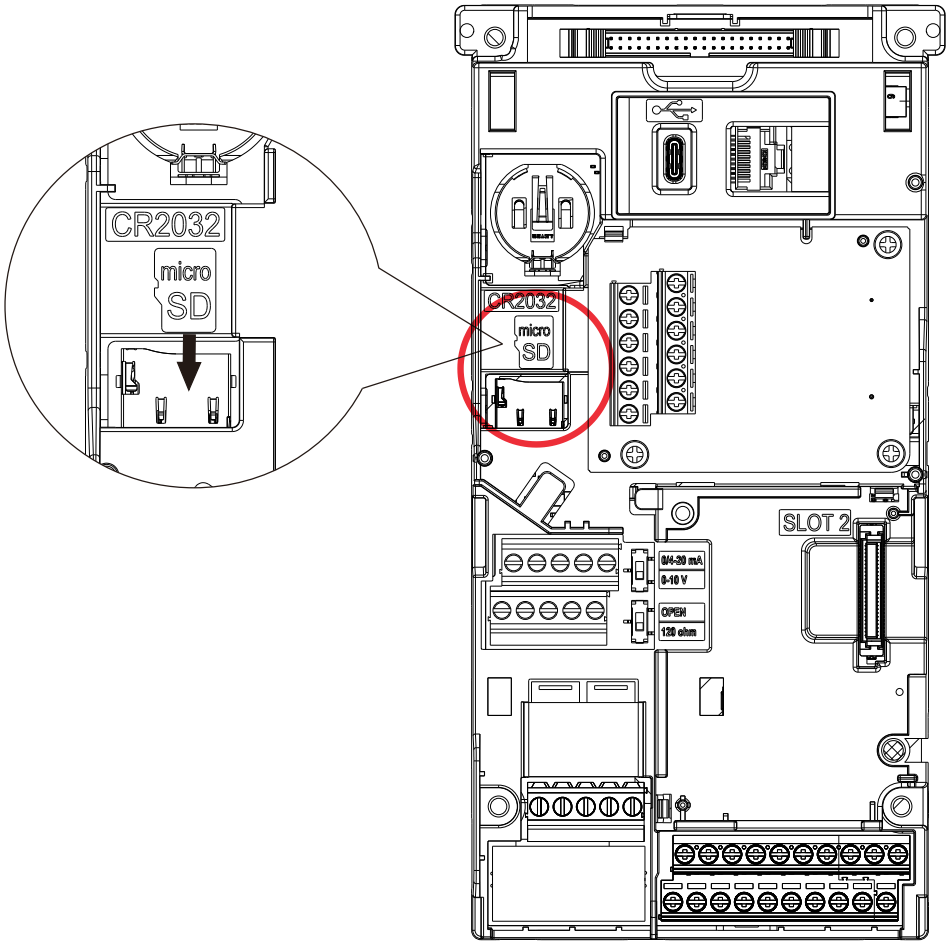
1. SD card type: microSD
2. Maximum capacity: 4–32 GB (SDHC)
3. Transmission speed: Speed Class 10 and above
4. Format restrictions: FAT32, configured unit 64KB

Using Precautions

1. When you first use the SD card function of the drive, it is recommended to format the SD card through the drive, so the SD card can be configured to meet the drive requested format restrictions (FAT32 and configured unit 64 KB).
2. If you format the SD card through the PC, pay attention to the format restrictions.
3. The AC motor drive detects whether the SD card exists when the drive is power ON (auto detection) or when using Reload SD card function (manual detection).
4. If the SD card is formatted and inserted into the drive before the drive is powered ON, the SD card related functions can be operated after the drive is ON, such as backup, upgrade firmware or the recorder function.
5. If the SD card is formatted but inserted into the drive after the drive is powered ON, the drive cannot identify the SD card. To identify the SD card and operate the related functions, it must be executed in one of the following two methods:
   (1) Restart the AC motor drive
   (2) Execute the reload SD card function in the SD Card Management function list
6. When the SD card capacity is full, it stops writing data into the SD card. Refer to Section 4-2-3 Saving data for detailed information.
7. The writing speed may be affected due to the different manufacturing processes of each brand, it is suggested to choose the SD card produced by a well-known brand.
8. When the format configuration unit is set incorrect, it may affect the write in speed of the SD card and causing communication time-out or abnormal data reading.
9. The SD card is not included when the drive leaves the factory, purchase one separately for use if necessary.

4-2-2 Installation

Install the SD card as shown in the figure below:



4-2-3 Saving Data

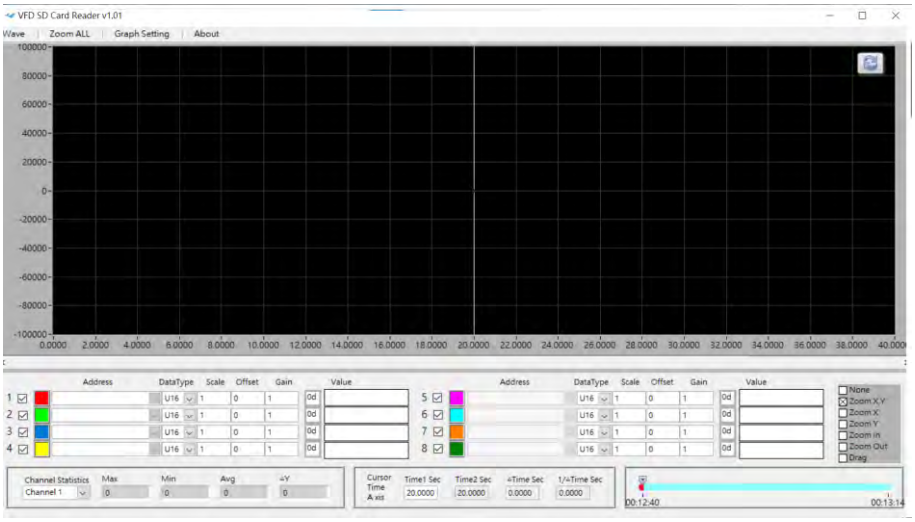
1. The folders in the SD card are defined according to different functions as listed in the following table. When you first use the SD card function and insert the card into the drive, it automatically generates a parent folder called VP3000 and its children folders when the drive identifies the SD card (refer to the using precautions in Section 4-2-1).

Parent Folder	Children Folder	Function	File Extension	Note
VP3000	FIRMWARE	Firmware file	.vp	
	LANGUAGE	Language pack	.lan	
	LOGFOLD	Recorder	.txt (wave file .bak (backup file) .tmp (temporary archieve)	'.bak' and '.tmp' files are automatically saved by the system. '.tmp' files can be erased through the Release Cache Space function in the SD Card Management function list
	PARM	Parameter files	.PR	
	PLC	Program	.PLC	

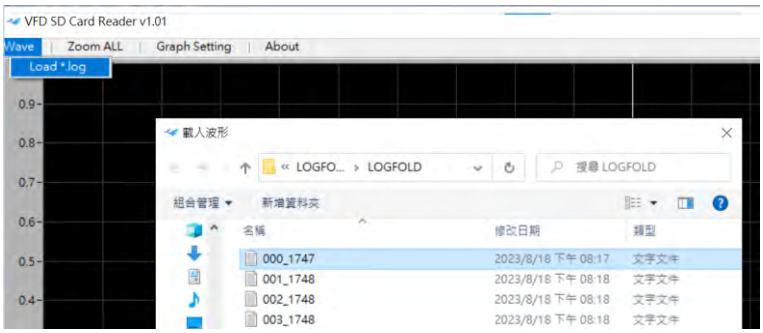
2. Each function corresponds to different children folders above, for example, if you need to upgrade the firmware, save the firmware file into the FIRMWARE folder, then the drive can execute the upgrade function. Other functions can be deducted in the same way.
3. The number of characters in folder name and backup file name is limited to 8 English letters or numbers.
4. When the SD card is used to save data that includes drive function files (files save in VP3000 Parent folder and children folders) and other external files, and the SD card use rate reaches 99%, the drive stops write in data and the SD card shows SDfu (the capacity is full), but the data inside the SD card can still be read.
5. When the SD card is used to save data that only includes the drive function files (files save in VP3000 Parent folder and children folder), it starts and uses the recorder function to continuously record the wave form data. When the SD card use rate reaches 80%, the temporary archive will be rewritten with new temporary archive, and the previous temporary archive will be deleted. If there are no temporary archives, the recorder function stops operating and the drive displays SDfu (the SD card is full). In this case, other functions except the recorder can still operate until the SD card capacity use rate reaches 99%, such as parameter backup function.
6. Refer to Chapter 8 Troubleshooting for the SD card related fault/ warning messages and corrective actions.

4-2-4 Recorder Data Review

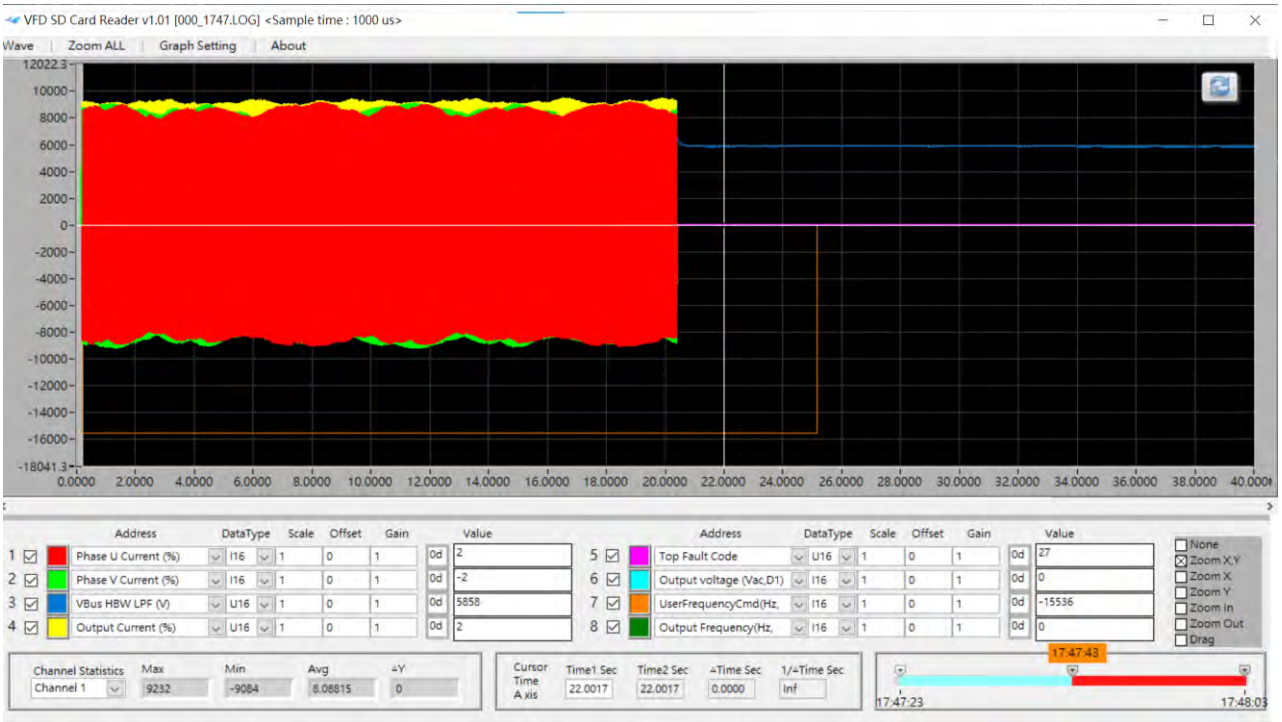
1. Start the recorder software VFD SD Card Reader.exe



2. Click Load *.log under the Wave menu and choose the Waveform file.

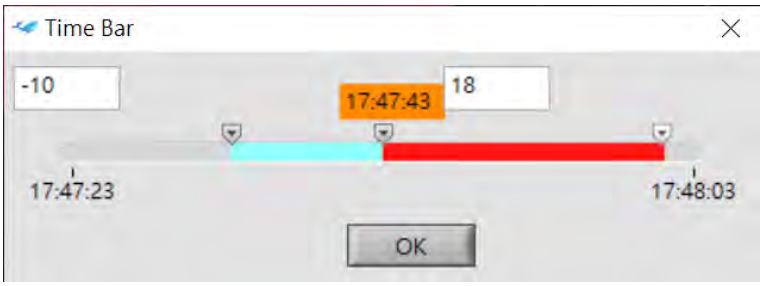


3. After you choose the file and load the waveform, the screen displays as below. From the demonstrated screen below, you can see information of Channel 1–8, by dragging the white line in the center of the screen, you can observe the information of recorded waveform. You can also click the left mouse button to select an area and zoom in. The screen will be partially enlarged according to the selected area. To return to the original wave form, click Zoon ALL menu.

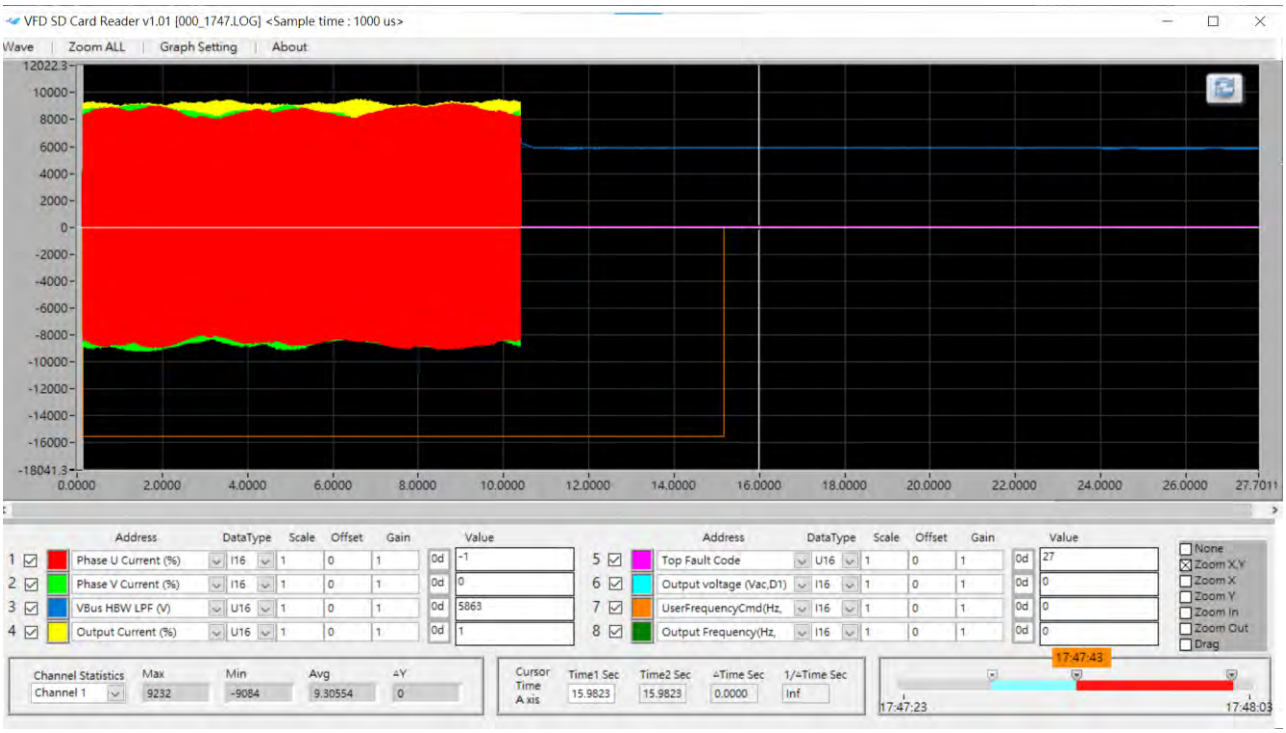


4. In addition, the waveform presentation interval can also be selected through the Time Bar function on the lower right, for example, the current presented waveform time interval is 40 seconds. Click the Time Bar icon and the screen displays as below.

Adjust the dragging timeline left and right, for example, drag left to -10 seconds and right to 18 seconds.



Click OK, then the waveform is presented as below, the total interval becomes 28 seconds.



4-3 Tuning Software

4-3-1 Foreword

DIADesigner is one of the software of DIAStudio integrated software package, which is the development software for Delta's new generation of automation products. DIADesigner provides users with functions such as program editing, network and hardware configuration and parameter setting, etc. for Delta's full range of industrial automation products, and completes various tasks in a consistent user interface and operating experience. It also provides plenty of auxiliary tools and multi-language pack, bringing users a convenient and highly efficient development environment.

4-3-2 Software Download Instruction

DIAInstaller is a resident program for managing Delta's industrial automation software. You can download, install, and update Delta's industrial automation software here, and all process are executed in the background without affecting other operations. Download DIAInstaller from the following path:

https: //diastudio.deltaww.com/

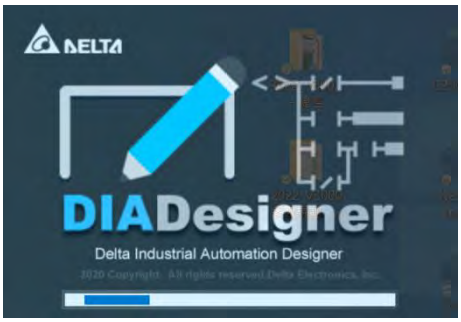
1. Refer to the Download and Installation manual to complete the software installation.

Figure: DIAInstaller

2. Start DIADesigner.
3. After completing the installation, double-click the DIADesigner desktop shortcut to start the program, as shown in the figure below.

Figure: DIADesigner desktop shortcut

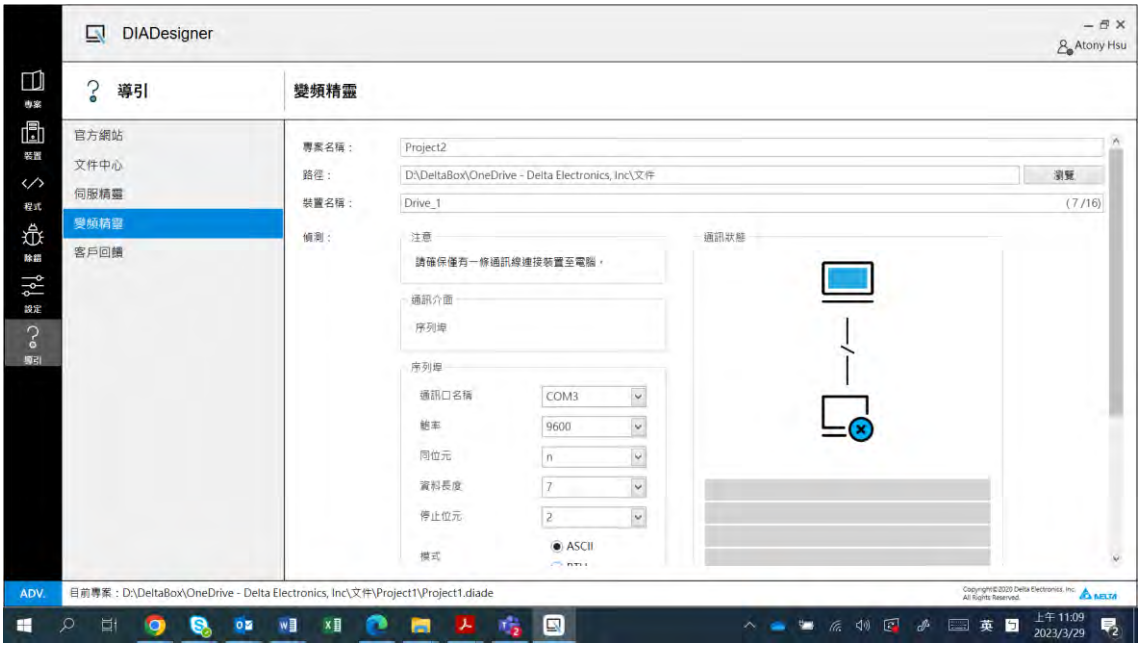
4. When you enter the DIADesigner, the screen in as follows:



5. The startup screen displays the initial welcome screen of the software, as shown in the figure below:

Figure: DIADesigner startup screen

6. Select Drive Wizard and enter the setting page, as shown in the figure below:



7. Refer to the DIADesigner manual for further information of connection methods, description of each part of the screen and operation method, etc.

Chapter 5 Initial Operation and Adjustment

5-1 Safety Precautions

5-2 Check Items before Start

5-3 Start Process

5-4 Control Mode and Adjustment

5-1 Safety Precautions

 DANGER	☑ Turn off the AC motor drive power before doing any wiring. A charge with hazardous voltages may remain in the DC bus capacitors even after the power has been turned off for a short time. Measure the remaining voltage with a DC voltmeter before doing any wiring. For your safety, do not start wiring before the voltage drops to a safe level (less than 25 V_{DC}). Installing wiring with a residual voltage may cause personal injury, sparks and a short circuit. ☑ Only qualified personnel familiar with AC motor drives are allowed to perform installation, wiring and commissioning Make sure the power is turned off before wiring to prevent electric shock. ☑ Make sure that power is only applied to the R/L1, S/L2, and T/L3 terminals. Failure to comply may result in damage to the equipment. The voltage and current must be in the range indicated on the nameplate (refer to Section 1-1-1 Nameplate Information for details). ☑ All units must be grounded directly to a common ground terminal to prevent damage from lightning strike or electric shock and reduce noise interference. ☑ Tighten the screws of the main circuit terminals to prevent sparks caused by screws loosened due to vibration.
 CAUTION	☑ For your safety, choose wires that comply with local regulations when wiring. ☑ Check the following items after finishing the wiring: 1. Are all connections correct? 2. Are there any loosen wires? 3. Are there any short circuits between the terminals or to ground?

5-2 Check Items before Start

Check Items before Power ON:

1. R, S and T are the input terminals of the drive, which are connected to the power supply and there is no voltage between the phase-to-phase or phase-to-ground.
2. U, V and W are the output terminals of the drive, which are connected to the motor and there is no voltage between the phase-to-phase or phase-to-ground.
3. Make sure the resistance of U-V, V-W and W-U are the same.
4. Check whether the input voltage matches the voltage of the drive and motor.
5. Check whether the screws on terminals are tighten well.
6. Check whether the control circuit terminal is short-circuited.
7. Make sure to close the top cover of the drive to avoid accidental touch.
8. Make sure all the power switches of the drive are OFF.

Check Items after Power ON:

1. Check whether the keypad on the drive displays the initial setting page or main page.
2. Check whether the status column of the keypad displays Ready.
3. If a fault code shows, refer to Chapter 8 Troubleshooting to clear the fault.

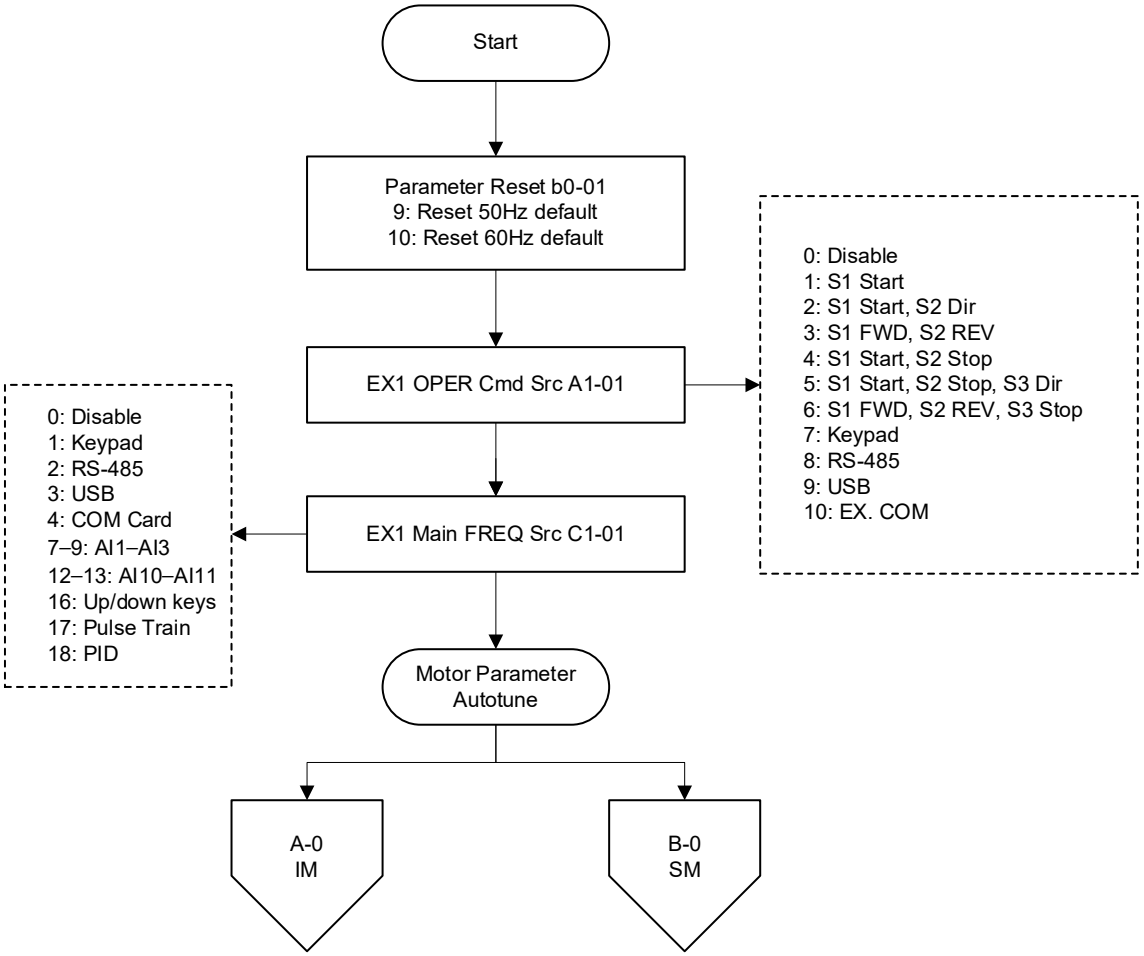
5-3 Start Process

The following are abbreviations for different types of motors:

- IM: Induction motor
- SM: Synchronous AC motor
- PM: Permanent magnet synchronous AC motor
- IPM: Interior permanent magnet synchronous AC motor
- SPM: Surface permanent magnet synchronous AC motor
- PMA: Permanent magnet assisted synchronous reluctance motor
- SynRM: Synchronous reluctance motor

5-3-1 Parameter Setting

5-3-1-1 Adjustment Flowchart



5-3-1-2 Adjustment Steps

1. Parameter Reset

   Pr. b0-01 = 9: Reset 50 Hz default or 10: Reset 60 Hz default.

2. Set the operation command source.

Pr.	Parameter Name	Settings
A1-01	EX1 OPER Cmd Src	0: Disable 1: S1 Start 2: S1 Start, S2 Dir 3: S1 FWD, S2 REV 4: S1 Start, S2 Stop 5: S1 Start, S2 Stop, S3 Dir 6: S1 FWD, S2 REV, S3 Stop 7: Keypad 8: RS-485 9: USB 10: EX. COM

3. Set the frequency command source.

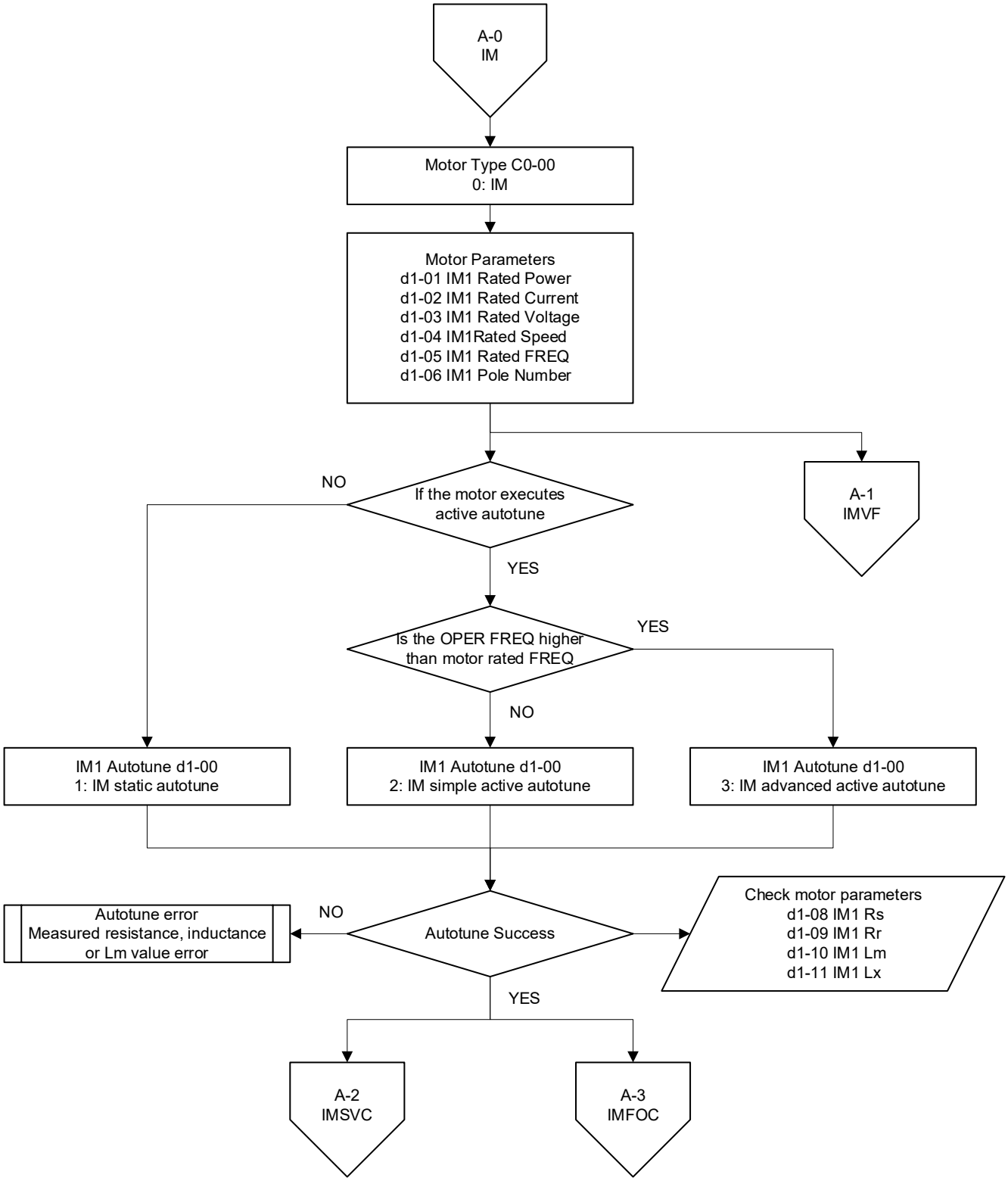
Pr.	Parameter Name	Settings
C1-01	EX1 Main FREQ Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: EX. COM 7–9: AI1–AI3 12–13: AI10–AI11 16: Up/down keys 17: Pulse Train 18: PID

4. Select motor autotune.

   Refer to Section 5-3-2 IM Autotune or Section 5-3-3 SM Autotune.

5-3-2 IM Autotune

5-3-2-1 Adjustment Flowchart



5-3-2-2 Adjustment Steps

1. Select motor type.

   Set Pr. C0-00 = 0: IM.

2. Set motor parameters.

Pr.	Parameter Name
d1-01	IM1 Rated Power
d1-02	IM1 Rated Current
d1-03	IM1 Rated Voltage
d1-04	IM1 Rated Speed
d1-05	IM1 Rated FREQ
d1-06	IM1 Pole Number

   NOTE: If you choose to operate the motor with VF control method, directly refer to Section 5-4-1 IMVF.

3. Select the type of motor autotune.
   (1) If the motor is connected to a load or cannot rotate, set Pr. d1-00 = 1: IM static autotune.
   (2) If the motor does not connect to a load and is able to rotate, when it operates lower than the rated frequency, set Pr. d1-00 = 2: IM simple active autotune.
   (3) If the motor does not connect to a load and is able to rotate, when it operates higher than the rated frequency, set Pr. d1-00 = 3: IM advanced active autotune.
   (4) If Pr. C0-00 is set as SynRM, set Pr. d5-00 = 2: SM blocked rotor autotune.

4. Execute autotune.
   (1) Autotune success, check the motor parameters.

Pr.	Parameter Name
d1-08	IM1 Rs
d1-09	IM1 Rr
d1-10	IM1 Lm
d1-11	IM1 Lx

   (2) Autotune error, refer to the Chapter 8 for fault code information of the drive and keypad.

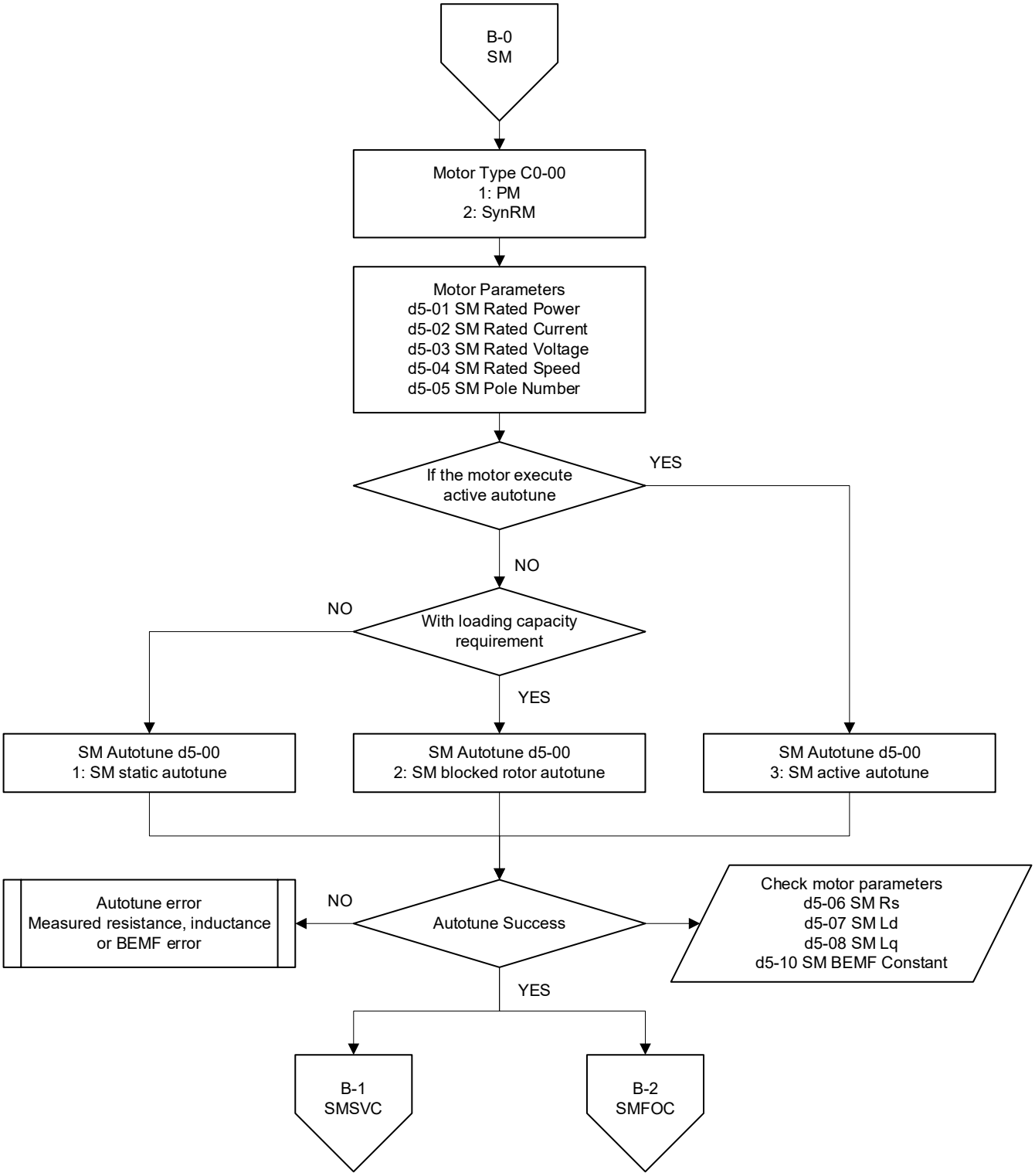
Error code	Description
AUE (40)	The motor autotune process does not complete.
AUE1 (142)	No-feedback current error during motor autotune.
AUE3 (145)	Rs measuring error during motor autotune.
AUE4 (148)	Rr measuring error during motor autotune.
AUE6 (150)	No-load current (I_0) error during motor autotune.
AUE8 (152)	High-frequency testing error during motor autotune.
AUE9 (153)	Lsigma measuring error during motor autotune.

5. Choose the motor control method.

   Refer to Section 5-4-2 IMSVC or Section 5-4-3 IMFOC.

5-3-3 SM Autotune

5-3-3-1 Adjustment Flowchart



5-3-3-2 Adjustment Steps

1. Select motor type.

   Set Pr. C0-00 = 1: PM or 2: SynRM.

2. Set motor parameters.

Pr.	Parameter Name
d5-01	SM Rated power
d5-02	SM Rated Current
d5-03	SM Rated Voltage
d5-04	SM Rated Speed
d5-05	SM Pole Number

3. Select the type of motor autotune.

   (1) If the motor is connected to a load or cannot rotate, and there is no loading capacity requirement, set Pr. d5-00 = 1: SM static autotune.

   (2) If the motor is connected to a load or cannot rotate, and there is loading capacity requirement, set Pr. d5-00 = 2: SM blocked rotor autotune.

   (3) If the motor does not connect to a load and is able to rotate, set Pr. d5-00 = 3: SM active autotune.

4. Execute autotune.

   (1) Autotune success, check the motor parameters.

Pr.	Parameter Name
d5-06	SM Rs
d5-07	SM Ld
d5-08	SM Lq
d5-10	SM BEMF Constant

   (2) Autotune error, refer to the Chapter 8 for fault code information of the drive and keypad.

Error code	Description
AUE (40)	The motor autotune process does not complete.
AUE1 (142)	No-feedback current error during motor autotune.
AUE3 (145)	Rs measuring error during motor autotune.
AUE7 (151)	Ld and Lq measuring error during motor autotune.

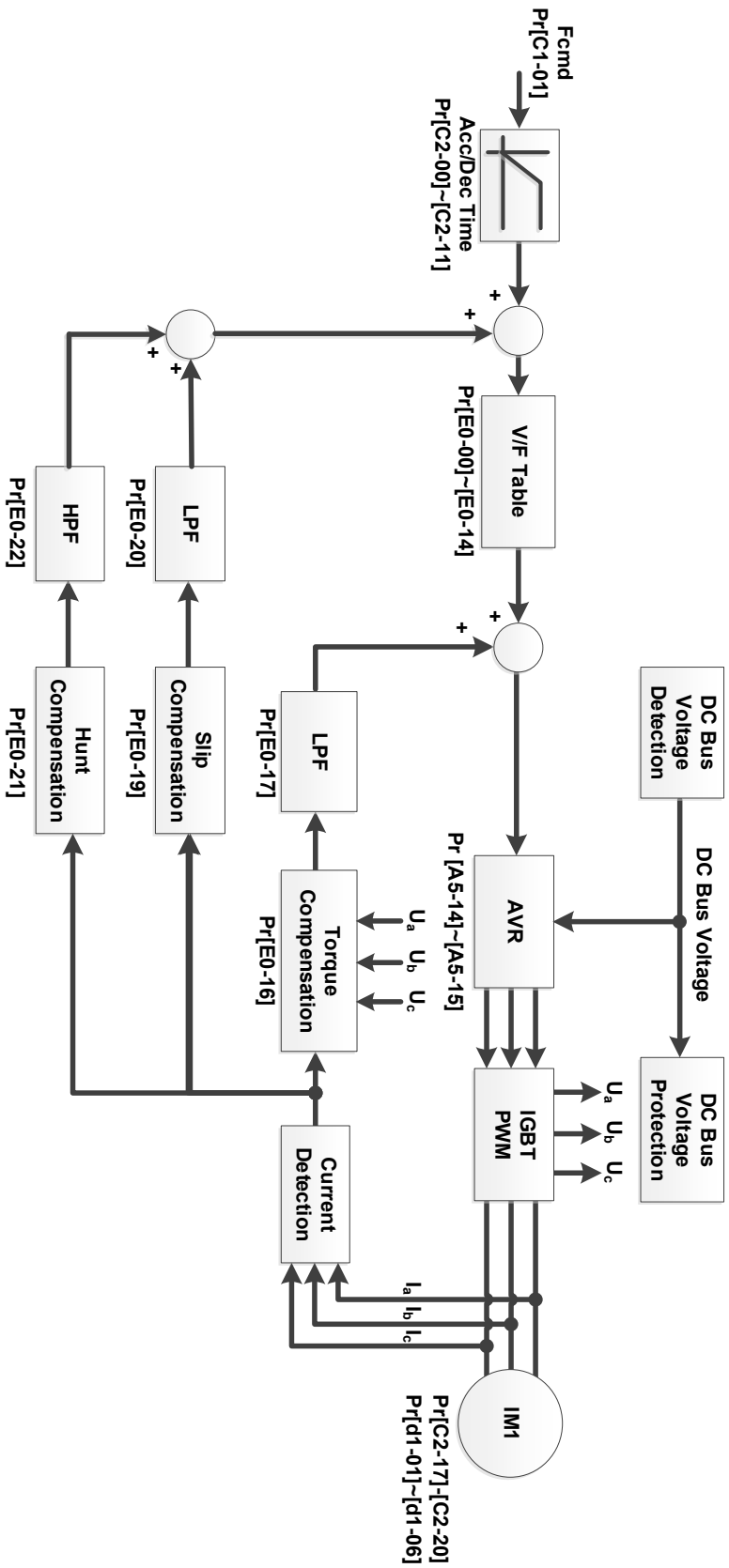
5. Choose the motor control method.

   Refer to Section 5-4-4 SMSVC or Section 5-4-5 SMFOC.

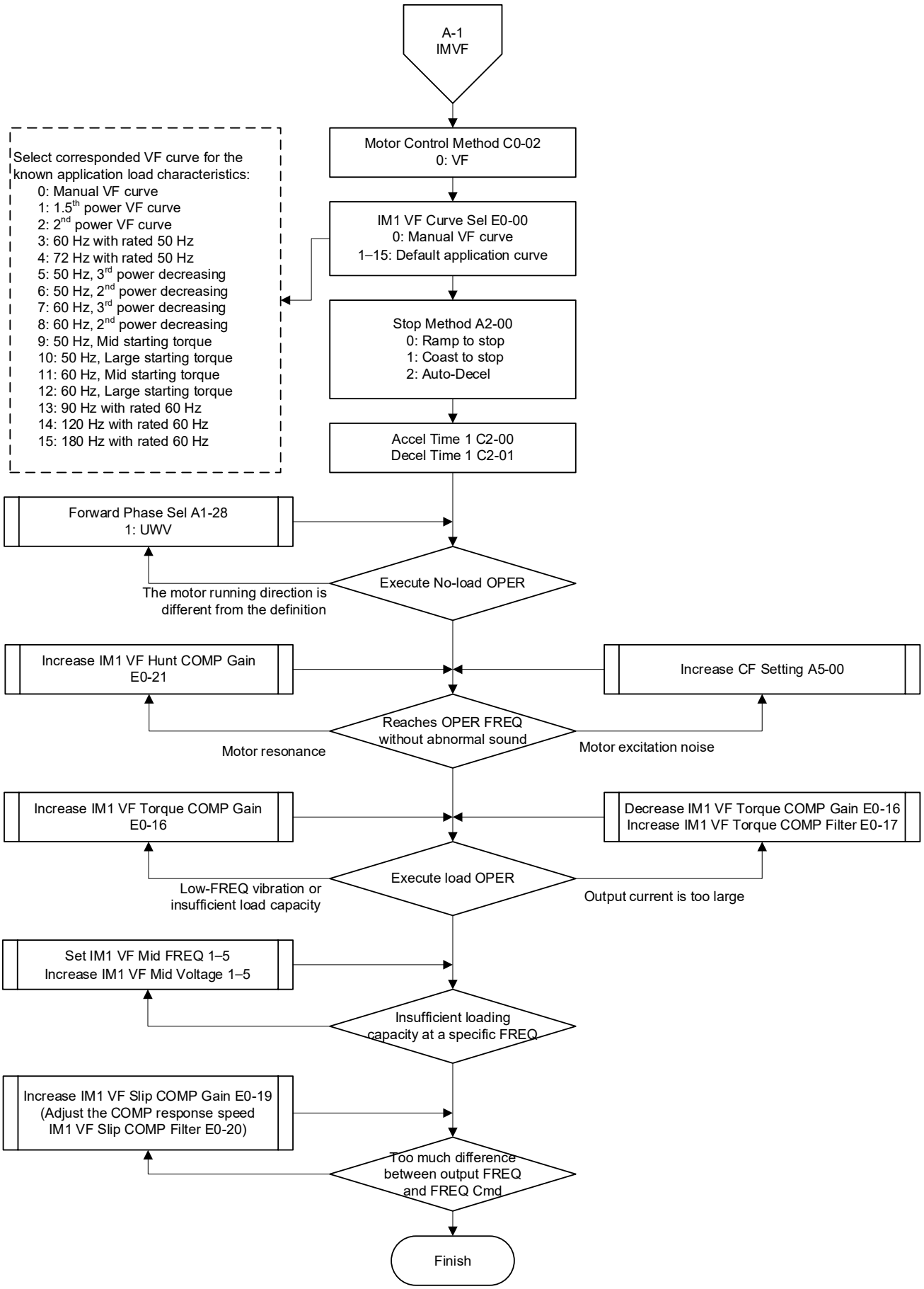
5-4 Control Mode and Adjustment

5-4-1 IMVF

5-4-1-1 Control Diagram



5-4-1-2 Adjustment Flowchart



5-4-1-3 Adjustment Steps

1. Choose the motor control method.
   Set Pr. C0-02 = 0: VF.
2. Set IM1 VF curve selection.

Pr.	Parameter Name	Settings
E0-00	IM1 VF Curve Sel	0: Manual VF curve 1: 1.5th power V/F curve 2: 2nd power V/F curve 3: 60Hz with rated 50Hz 4: 72Hz with rated 60Hz 5: 50 Hz, 3rd power decreasing 6: 50 Hz, 2nd power decreasing 7: 60 Hz, 3rd power decreasing 8: 60 Hz, 2nd power decreasing 9: 50 Hz, Mid starting torque 10: 50 Hz, Large starting torque 11: 60 Hz, Mid starting torque 12: 60 Hz, Large starting torque 13: 90 Hz with rated 60 Hz 14: 120Hz with rated 60 Hz 15: 180Hz with rated 60 Hz

3. Setup stop method.

Pr.	Parameter Name	Settings
A2-00	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel

4. Set the acceleration and deceleration time

Pr.	Parameter Name
C2-00	Accel Time 1
C2-01	Decel Time 1

5. Execute no-load operation.
   If the motor operating direction is different from the definition, adjust Pr. A1-28 Forward Phase Selection = 1: UWV.
6. Check if the motor can operate to the operation frequency without abnormal sound.
   (1) If the motor resonates, increase setting for Pr. E0-21 IM1 VF Hunt Compensation Gain.
   (2) If there is motor excitation noise, increase setting for Pr. A5-00 Carrier Frequency Setting.

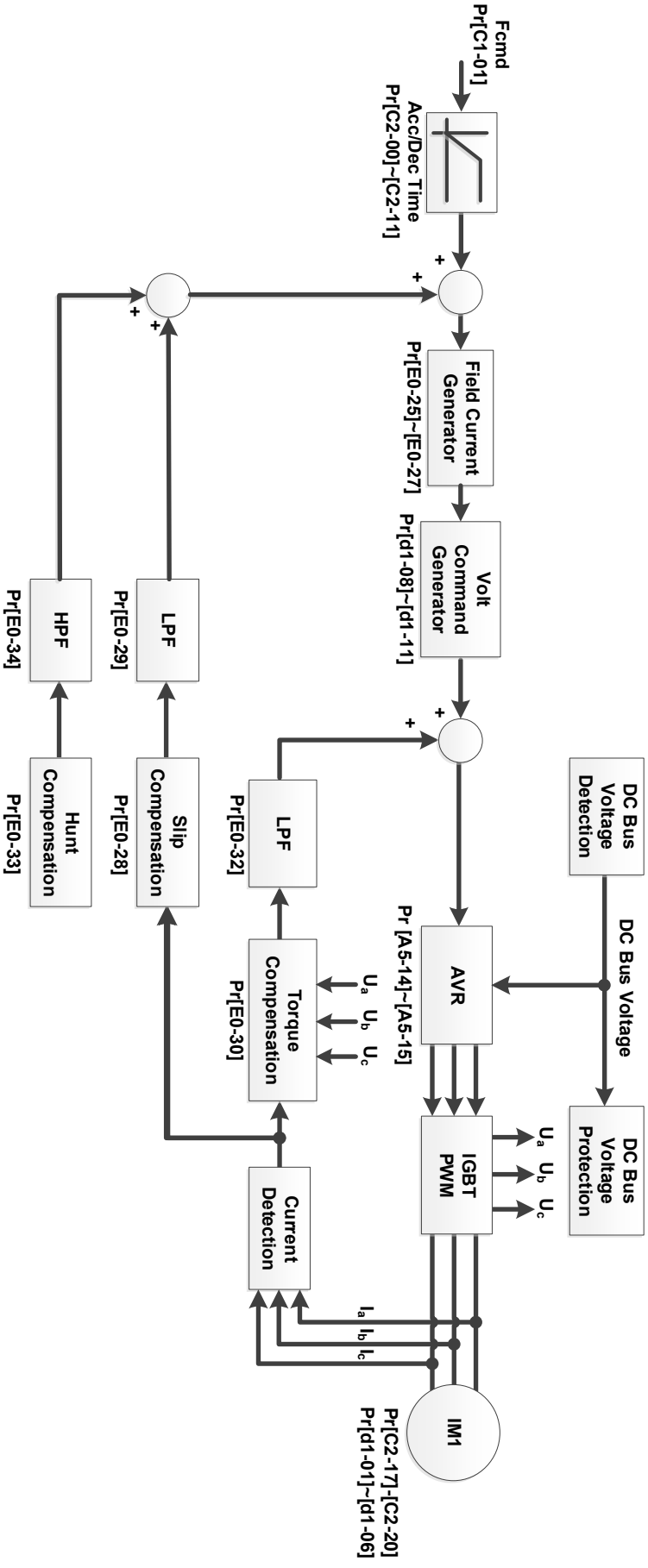
7. Execute load operation.
   (1) If the motor vibrates in low-frequency or has insufficient loading capacity, increase setting for Pr. E0-16 IM1 VF Torque Compensation Gain to enhance the loading capacity for full frequency range; however, it may cause over current if you set this parameter too large.
   (2) If the output current is too large, decrease setting for Pr. E0-16 IM1 VF Torque Compensation Gain or increase setting for Pr. E0-17 IM1 VF Torque Compensation Filter, you can also adjust the VF curve if the motor loading capacity at this time is insufficient.
8. If the loading capacity at specific frequency is insufficient, adjust the VF curve manually to increase the output voltage corresponding to the specific frequency.

Pr.	Parameter Name	Pr.	Parameter Name
E0-03	IM1 VF Mid FREQ 5	E0-04	IM1 VF Mid Voltage 5
E0-05	IM1 VF Mid FREQ 4	E0-06	IM1 VF Mid Voltage 4
E0-07	IM1 VF Mid FREQ 3	E0-08	IM1 VF Mid Voltage 3
E0-09	IM1 VF Mid FREQ 3	E0-10	IM1 VF Mid Voltage 3
E0-11	IM1 VF Mid FREQ 1	E0-12	IM1 VF Mid Voltage 1

9. If there is too much difference between the output frequency and the frequency command, increase setting for Pr. E0-19 IM1 VF Slip Compensation Gain, you can also adjust the compensation response speed through Pr. E0-20 IM1 VF Slip Compensation Filter.

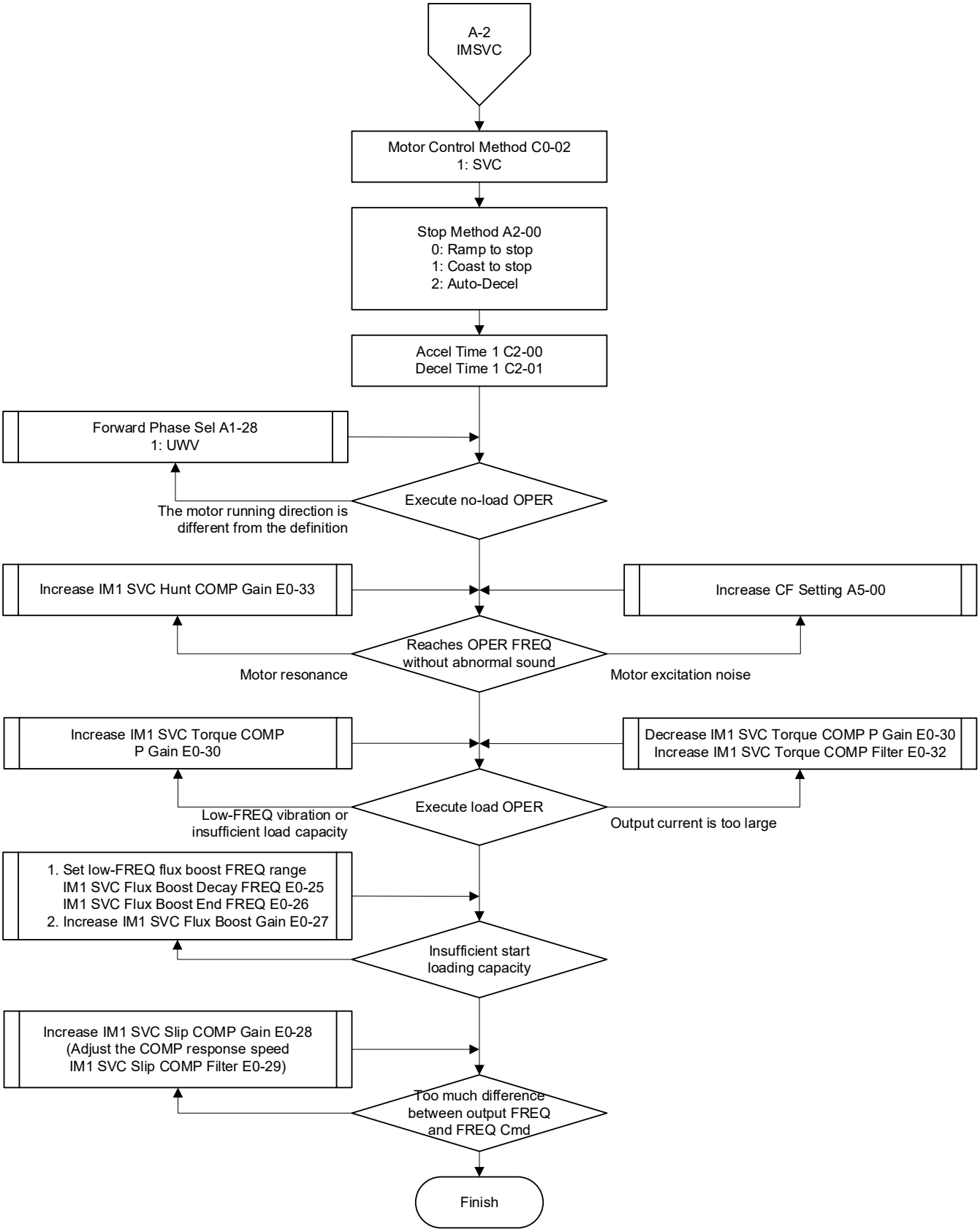
5-4-2 IMSVC

5-4-2-1 Control Diagram



5-4-2-2 Adjustment Flowchart

※ You need to complete A-0 IM Autotune first (refer to Section 5-3-2).



5-4-2-3 Adjustment Steps

※ You need to complete A-0 IM Autotune first (refer to Section 5-3-2).

1. Choose the motor control method.
   Set Pr. C0-02 = 1: SVC.
2. Setup stop method.

Pr.	Parameter Name	Settings
A2-00	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel

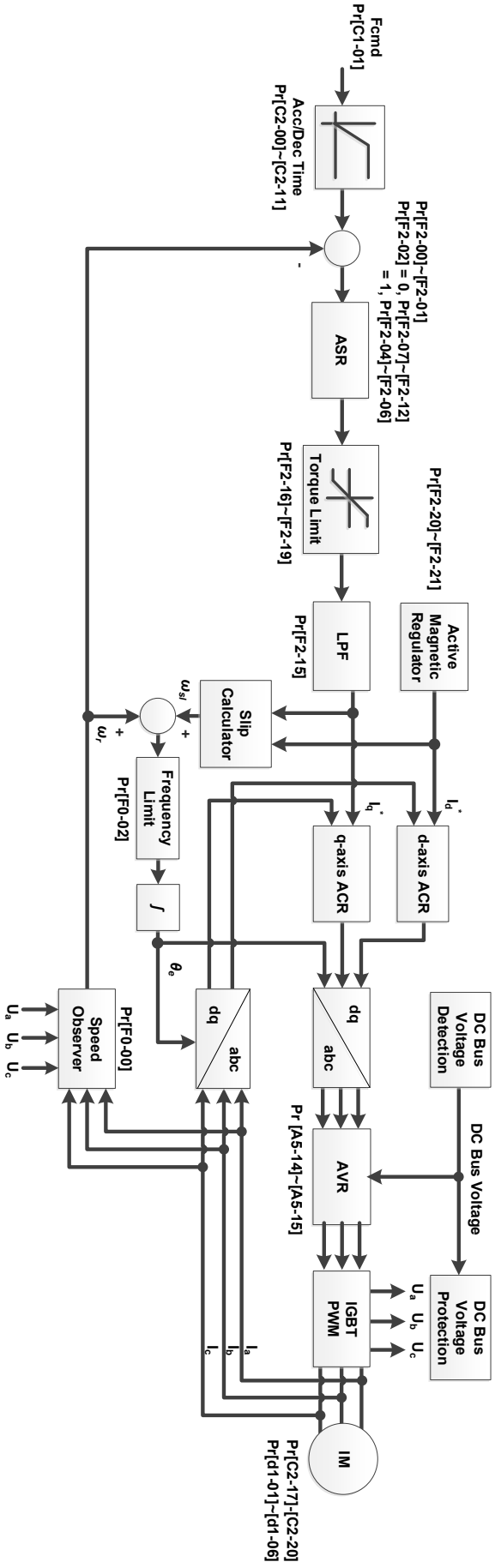
3. Set the acceleration and deceleration time

Pr.	Parameter Name
C2-00	Accel Time 1
C2-01	Decel Time 1

4. Execute no-load operation.
   If the motor operating direction is different from the definition, adjust Pr. A1-28 Forward Phase Selection = 1: UWV.
5. Check if the motor can operate to the operation frequency without abnormal sound.
   (1) If the motor resonates, increase setting for Pr. E0-33 IM1 SVC Hunt Compensation Gain.
   (2) If there is motor excitation noise, increase setting for Pr. A5-00 Carrier Frequency Setting.
6. Execute load operation.
   (1) If the motor vibrates in low-frequency or has insufficient loading capacity, increase setting for Pr. E0-30 IM1 SVC Torque Compensation P Gain to enhance the loading capacity for full frequency range; however, it may cause over current if you set this parameter too large.
   (2) If the output current is too large, decrease setting for Pr. E0-30 IM1 SVC Torque Compensation P Gain or increase setting for Pr. E0-32 IM1 SVC Torque Compensation Filter.
7. If the start loading capacity is insufficient, set the required low-frequency flux boost frequency range through Pr. E0-25 IM1 SVC Flux Boost Decay FREQ and Pr. E0-26 IM1 SVC Flux Boost End FREQ, and increase setting for Pr. E0-27 IM1 SVC Flux Boost Gain.
8. If there is too much difference between the output frequency and the frequency command, increase setting for Pr. E0-28 IM1 SVC Slip Compensation Gain, you can also adjust the compensation response speed through Pr. E0-29 IM1 SVC Slip Compensation Filter.

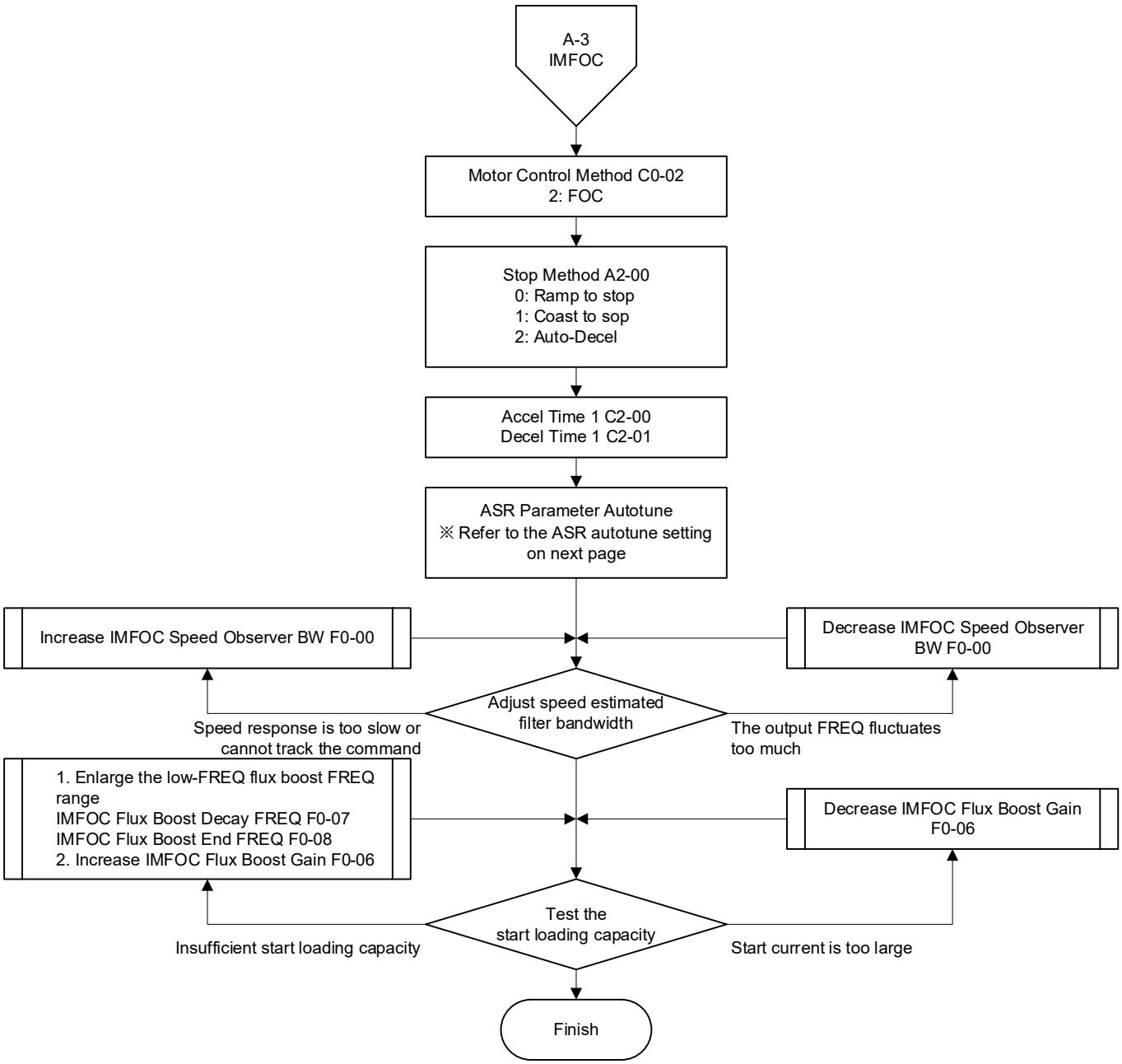
5-4-3 IMFOC

5-4-3-1 Control Diagram

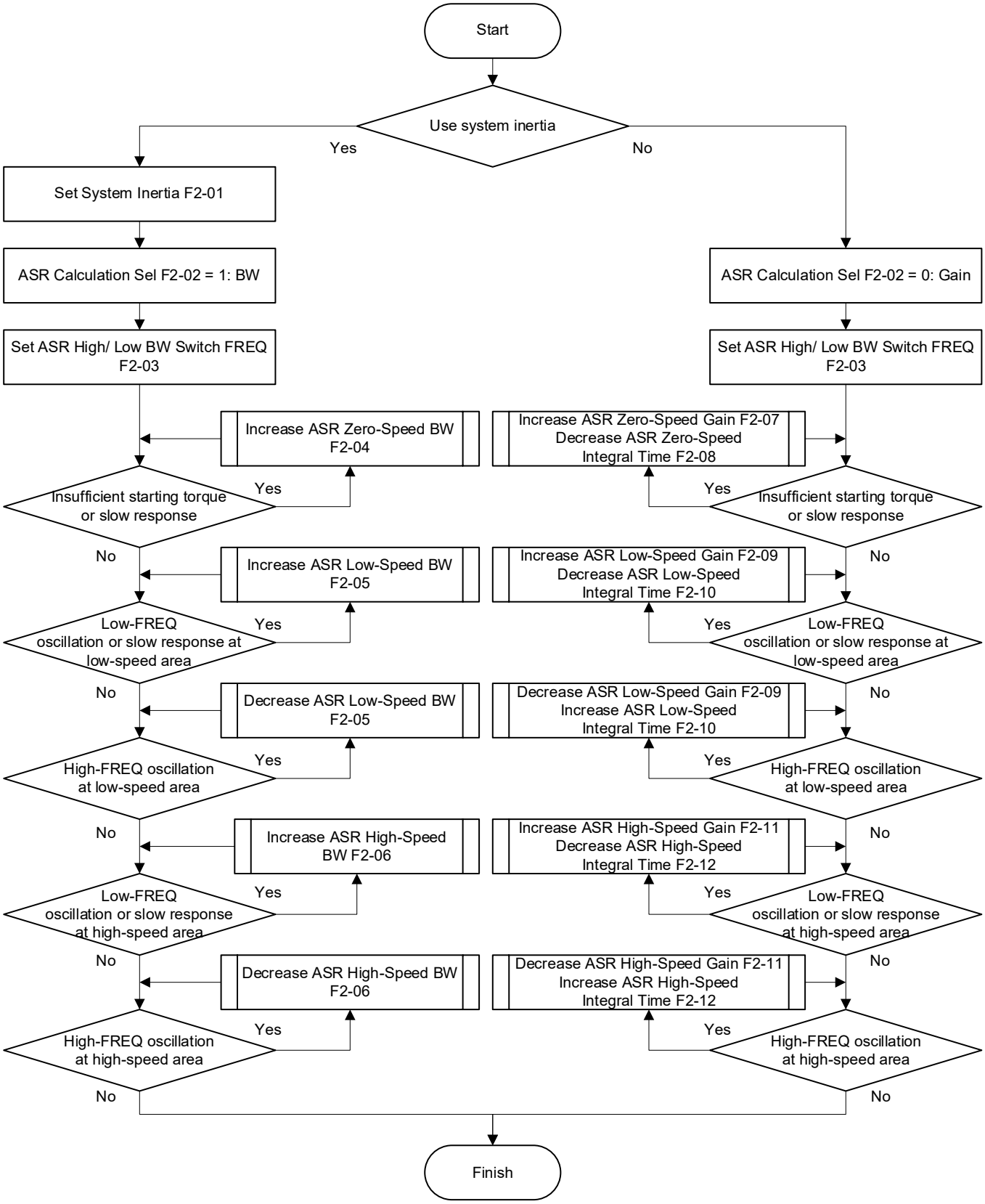


5-4-3-2 Adjustment Flowchart

※ You need to complete A-0 IM Autotune first (refer to Section 5-3-2).



- ASR Parameter Autotune



5-4-3-3 Adjustment Steps

※ You need to complete A-0 IM Autotune first (refer to Section 5-3-2).

1. Choose the motor control method.
   Set Pr. C0-02 = 2: FOC.
2. Setup stop method.

Pr.	Parameter Name	Settings
A2-00	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel

3. Set the acceleration and deceleration time

Pr.	Parameter Name
C2-00	Accel Time 1
C2-01	Decel Time 1

4. ASR Parameter Autotune
   A. Use system inertia and ASR bandwidth adjustment.
      (0) Set Pr. F2-01 System Inertia.
      (1) Set ASR Calculation Selection F2-02 = 1: Bandwidth.
      (2) Adjust the ASR high-speed and low-speed area through Pr. F2-03 ASR High/ Low BW Switch FREQ.
      (3) If the starting torque is insufficient or the speed response is slow, increase setting for Pr. F2-04 ASR Zero-Speed BW.
      (4) If the speed in the low-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-05 ASR Low-Speed BW.
      (5) If the speed in the low-speed area oscillates at high frequency, decrease setting for Pr. F2-05 ASR Low-Speed BW.
      (6) If the speed in the high-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-06 ASR High-Speed BW.
      (7) If the speed in the high-speed area oscillates at high frequency, decrease setting for Pr. F2-06 ASR High-Speed BW.
   B. Adjust ASR gain
      (1) Set ASR Calculation Selection F2-02 = 0: Gain.
      (2) Adjust the ASR high-speed and low-speed area through Pr. F2-03 ASR High/ Low BW Switch FREQ.
      (3) If the starting torque is insufficient or the speed response is slow, increase setting for Pr. F2-07 ASR Zero-Speed Gain or decrease setting for Pr. F2-08 ASR Zero-Speed Integral Time.
      (4) If the speed in the low-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-09 ASR Low-Speed Gain or decrease setting for Pr. F2-10 ASR Low-Speed Integral Time.
      (5) If the speed in the low-speed area oscillates at high frequency, decrease setting for Pr. F2-09 ASR Low-Speed Gain or increase setting for Pr. F2-10 ASR Low-Speed

Integral Time.

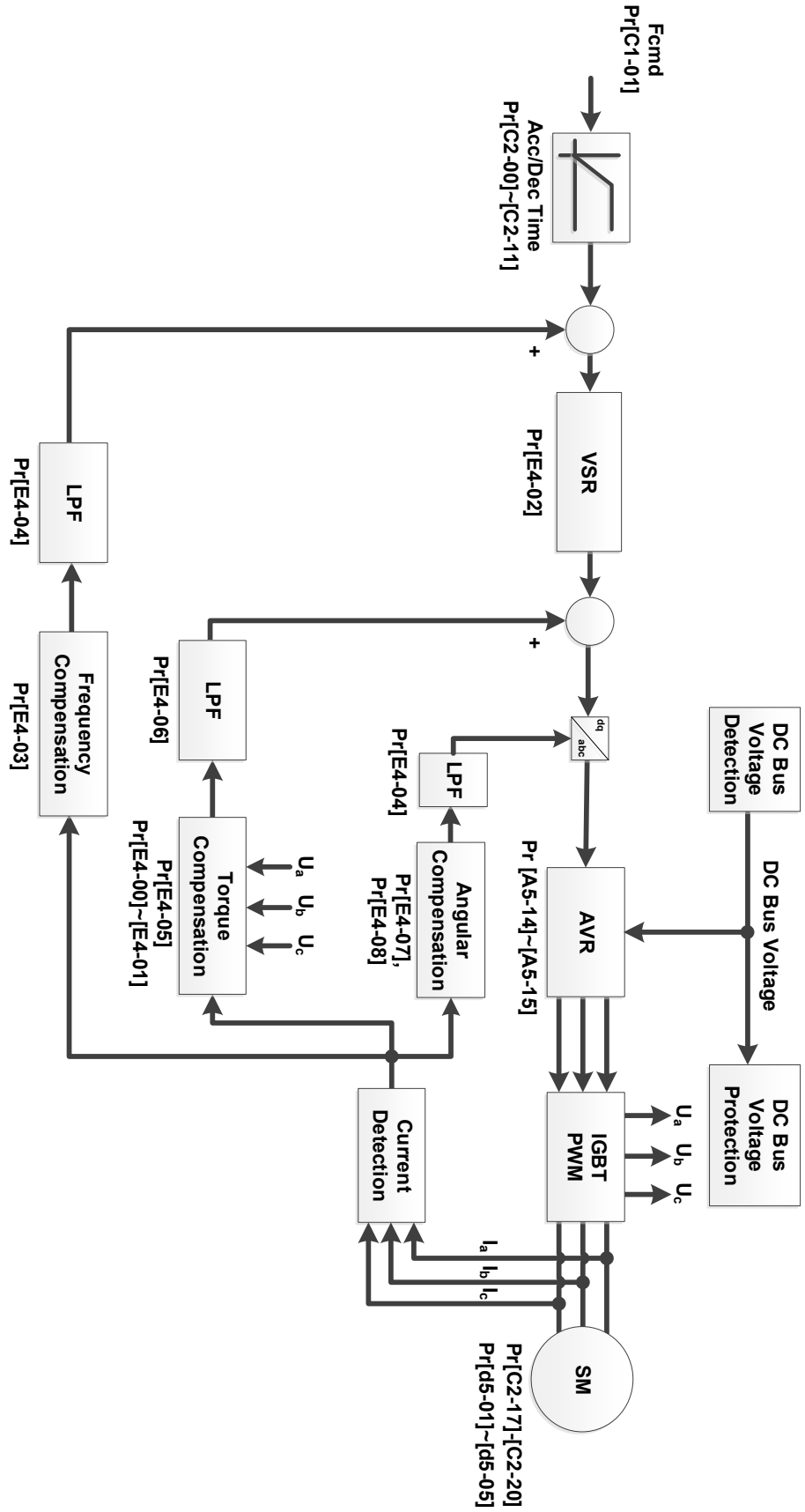
(6) If the speed in the high-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-11 ASR High-Speed Gain or decrease setting for Pr. F2-12 ASR High-Speed Integral Time.

(7) If the speed in the high-speed area oscillates at high frequency, decrease setting for Pr. F2-11 ASR High-Speed Gain or increase setting for Pr. F2-12 ASR High-Speed Integral Time.

5. Adjust speed observer filter bandwidth.
   (1) If the speed response is too slow or the frequency command cannot be tracked, increase setting for Pr. F0-00 IMFOC Speed Observer BW.
   (2) If the output frequency fluctuates too much, decrease setting for Pr. F0-00 IMFOC Speed Observer BW.
6. Test the start loading capacity.
   (1) If the motor start loading capacity is insufficient, enlarge low-frequency flux boost frequency range through Pr. F0-07 IMFOC Flux Boost Decay FREQ and Pr. F0-08 IMFOC Flux Boost End FREQ, and increase setting for Pr. F0-06 IMFOC Flux Boost Gain.
   (2) If the motor start current is too large, decrease setting for Pr. F0-06 IMFOC Flux Boost Gain.

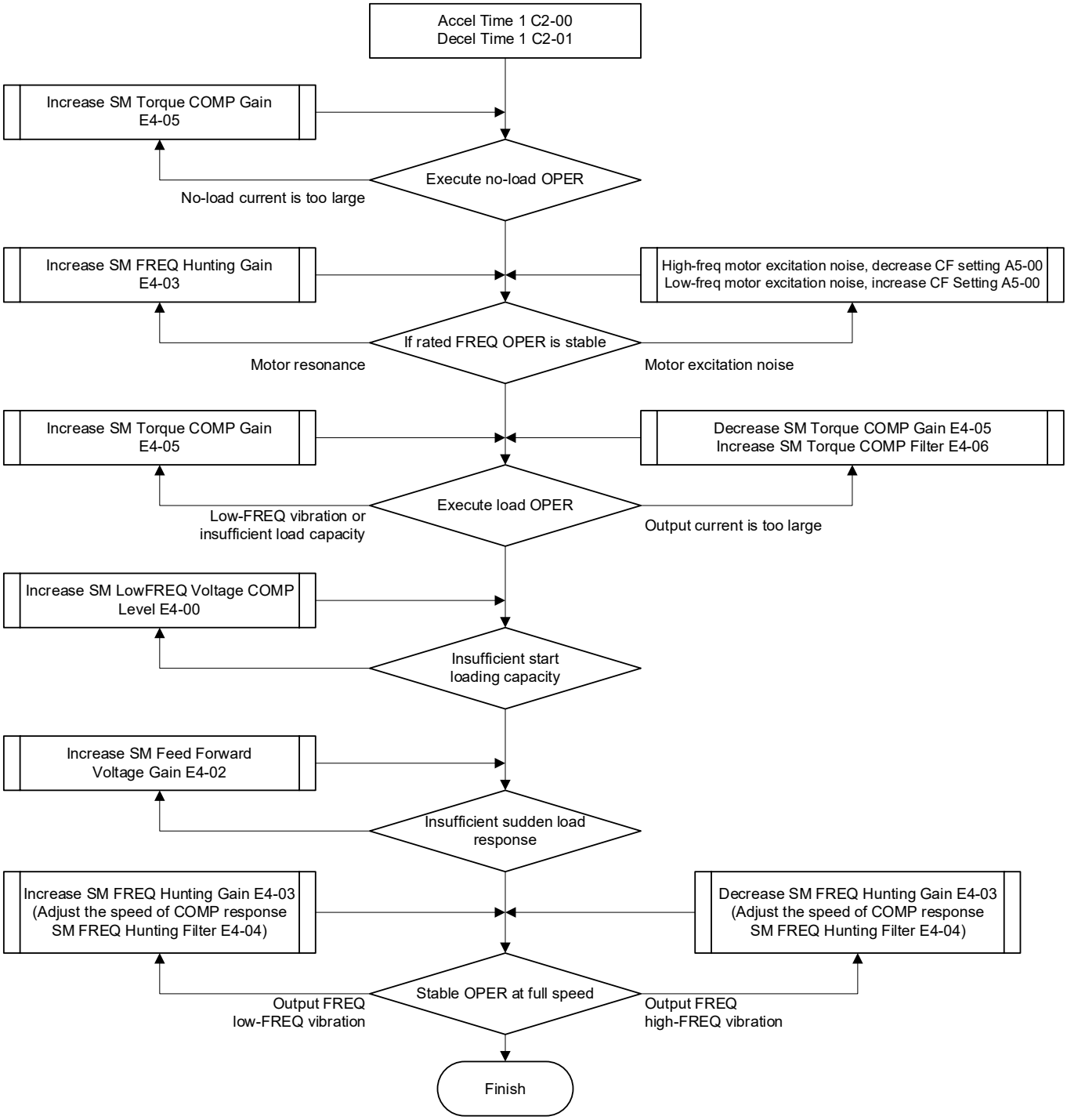
5-4-4 SMSVC

5-4-4-1 Control Diagram



5-4-4-2 Adjustment Flowchart

※ You need to complete B-0 SM Autotune first (refer to Section 5-3-3).


Accel Time 1 C2-00
Decel Time 1 C2-01
Increase SM Torque COMP Gain E4-05
Execute no-load OPER
No-load current is too large
Increase SM FREQ Hunting Gain E4-03
High-freq motor excitation noise, decrease CF setting A5-00
Low-freq motor excitation noise, increase CF Setting A5-00
If rated FREQ OPER is stable
Motor resonance
Motor excitation noise
Increase SM Torque COMP Gain E4-05
Decrease SM Torque COMP Gain E4-05
Increase SM Torque COMP Filter E4-06
Execute load OPER
Low-FREQ vibration or insufficient load capacity
Output current is too large
Increase SM LowFREQ Voltage COMP Level E4-00
Insufficient start loading capacity
Increase SM Feed Forward Voltage Gain E4-02
Insufficient sudden load response
Increase SM FREQ Hunting Gain E4-03 (Adjust the speed of COMP response SM FREQ Hunting Filter E4-04)
Decrease SM FREQ Hunting Gain E4-03 (Adjust the speed of COMP response SM FREQ Hunting Filter E4-04)
Stable OPER at full speed
Output FREQ low-FREQ vibration
Output FREQ high-FREQ vibration
Finish

5-4-4-3 Adjustment Steps

※ You need to complete B-0 SM Autotune first (refer to Section 5-3-3).

1. Choose the motor control method.
   Set Pr. C0-02 = 1: SVC.
2. Select the SM rotor initial detection method.
   (1) If the mechanism or process allows reversal, set Pr. A3-17 = 1: Force alignment.
   If the alignment force at start is insufficient, increase setting for Pr. A3-18 Force Alignment Current Value; if the alignment current is too large, decrease setting for Pr. A3-18 Force Alignment Current Value.
   (2) If the motor is SPM and the system does not allow reversal, set Pr. A3-17 = 2: Pulse inject.
   If the operation direction at start is incorrect, increase setting for Pr. A3-20 Pulse Inject Current Threshold; if the start current is too large or causes ocA, decrease setting for Pr. A3-20 Pulse Inject Current Threshold.
   (3) If the motor is IPM, PMA and SynRM and the system does not allow reversal, set Pr. A3-17 = 3: HFI.
   If the operation direction at start is incorrect, increase setting for Pr. A3-22 HFI Amplitude; if there is evidence of electromagnetic noise, decrease setting for Pr. A3-22 HFI Amplitude.
3. Setup stop method.

Pr.	Parameter Name	Settings
A2-00	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel

4. Set the acceleration and deceleration time

Pr.	Parameter Name
C2-00	Accel Time 1
C2-01	Decel Time 1

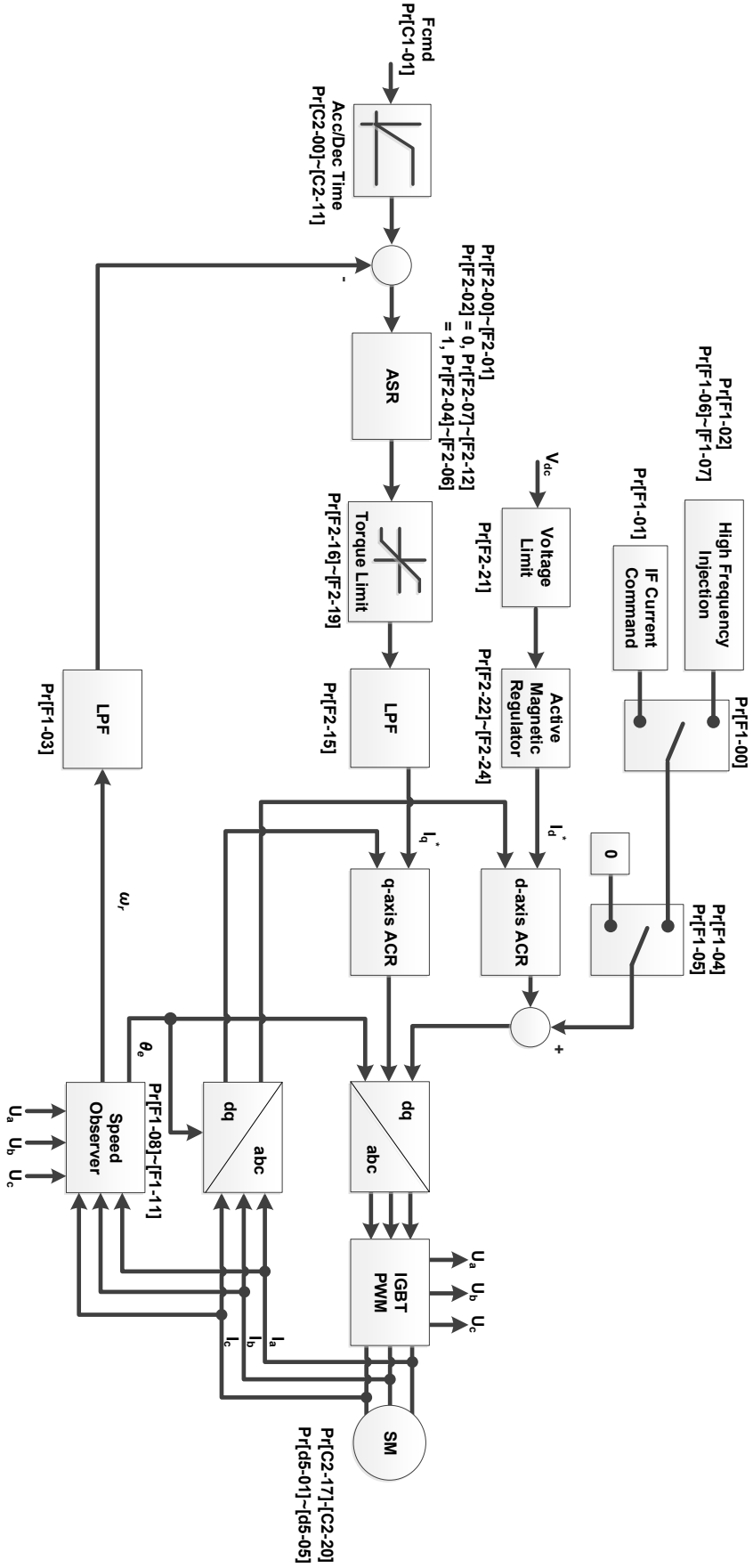
5. Execute no-load operation.
   If the no-load current is too large, increase setting for Pr. E4-05 SM Torque COMP Gain.
6. Check if the motor rated frequency operates stably.
   (1) If the motor resonates, increase setting for Pr. E4-03 SM FREQ Hunting Gain.
   (2) If there is high-frequency motor excitation noise, decrease setting for Pr. A5-00 Carrier Frequency Setting.
   If there is low-frequency motor excitation noise, increase setting for Pr. A5-00 Carrier Frequency Setting.
7. Execute load operation.
   (1) If the motor vibrates in low-frequency or has insufficient loading capacity, increase setting for Pr. E4-05 SM Torque COMP Gain to enhance the loading capacity for full frequency range; however, it may cause over current if you set this parameter too large.
   (2) If the output current is too large, decrease setting for Pr. E4-05 SM Torque COMP Gain

or increase setting for Pr. E4-06 SM Torque COMP Filter.

8. If the start loading capacity is insufficient, increase setting for Pr. E4-00 SM LowFREQ Voltage COMP Level.
9. If the response of sudden load is insufficient, increase setting for Pr. E4-02 SM Feed Forward Voltage Gain.
10. Check if the operation is stable at full speed.
    (1) If the motor output frequency oscillates at low-frequency, increase setting for Pr. E4-03 SM FREQ Hunting Gain, you can also adjust the compensation response speed through Pr. E4-04 SM FREQ Hunting Filter.
    (2) If the motor output frequency oscillates at high-frequency, decrease setting for Pr. E4-03 SM FREQ Hunting Gain, you can also adjust the compensation response speed through Pr. E4-04 SM FREQ Hunting Filter.

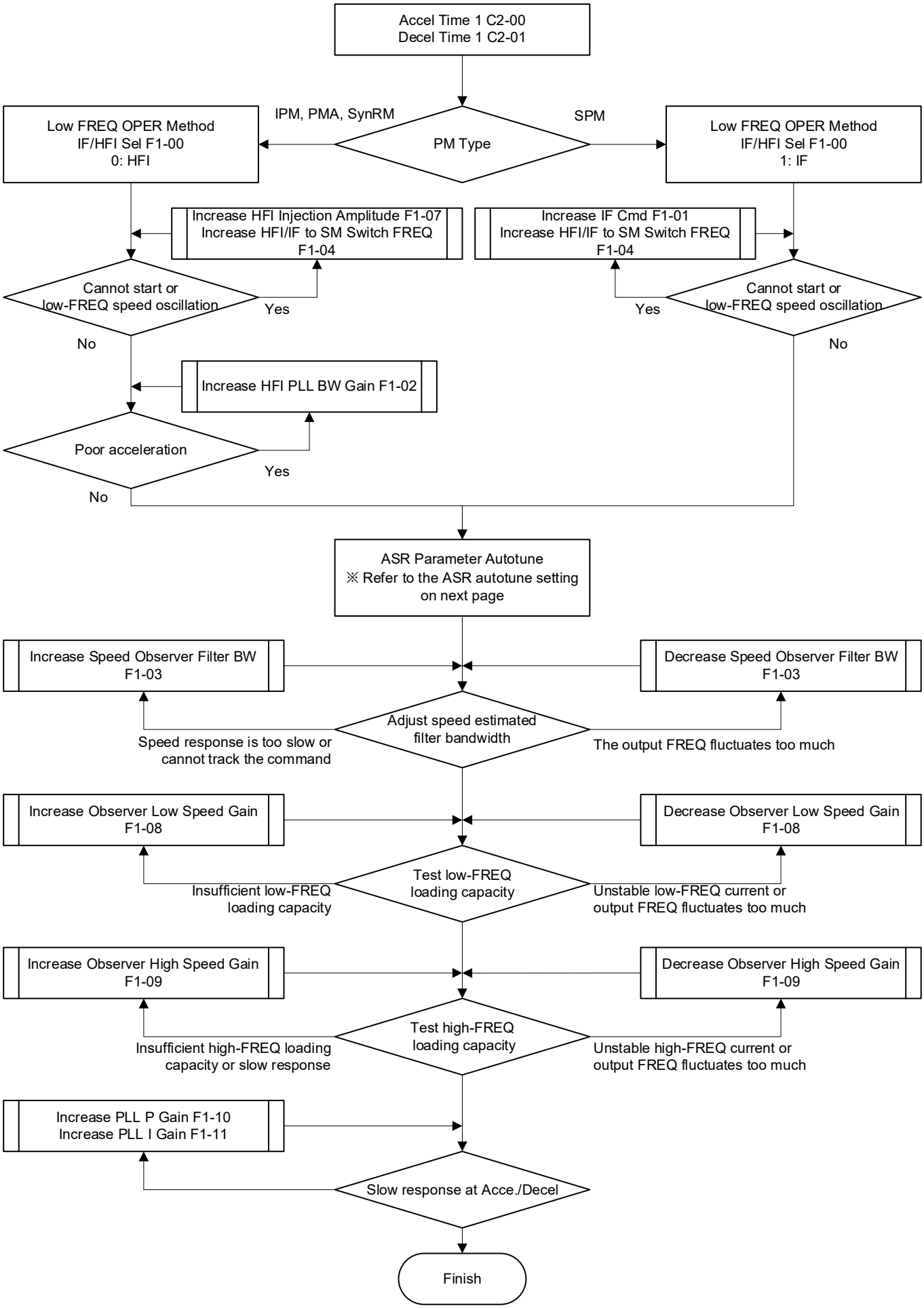
5-4-5 SMFOC

5-4-5-1 Control Diagram

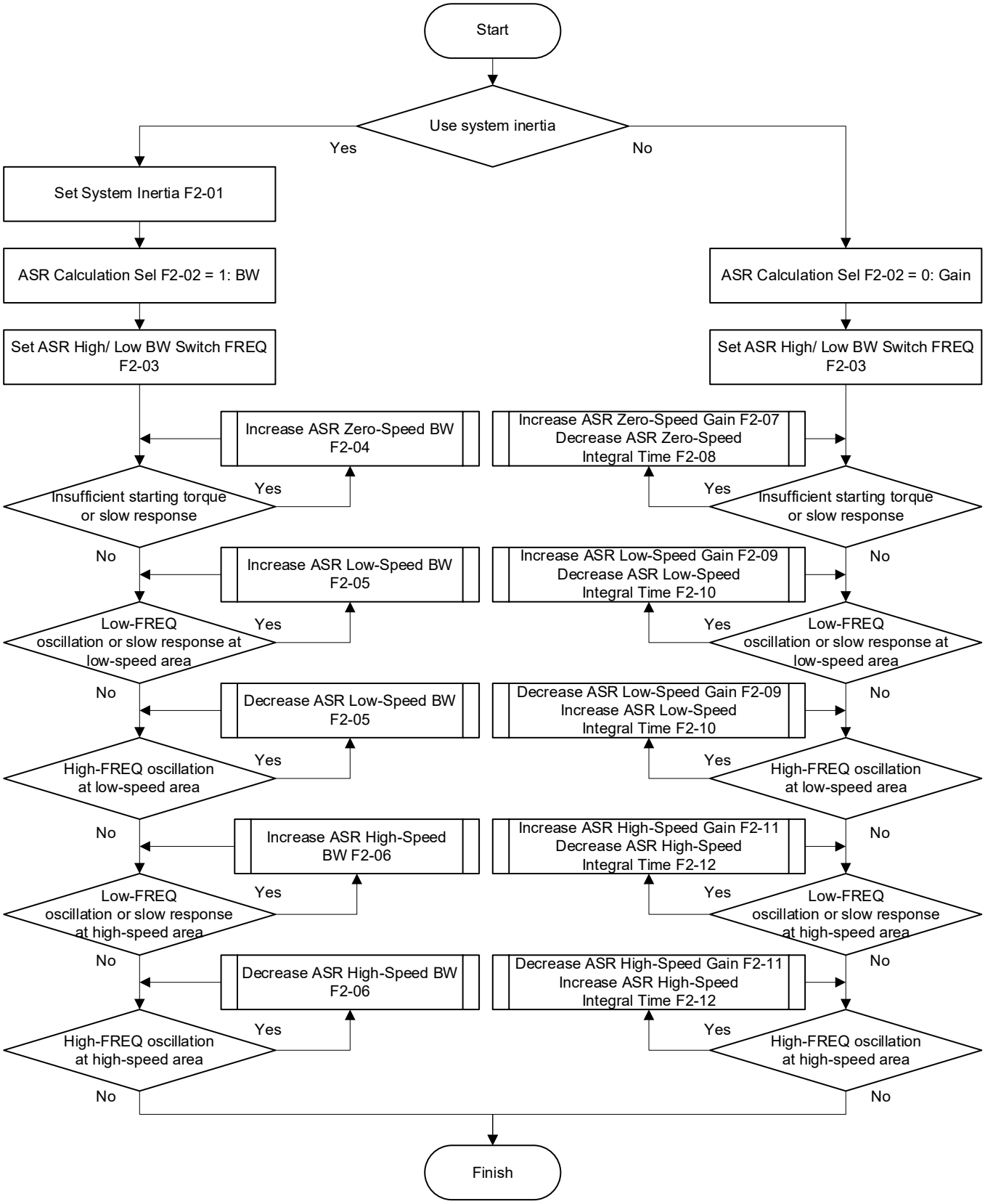


5-4-5-2 Adjustment Flowchart

※ You need to complete B-0 SM Autotune first (refer to Section 5-3-3).


Accel Time 1 C2-00
Decel Time 1 C2-01
PM Type
IPM, PMA, SynRM
SPM
Low FREQ OPER Method
IF/HFI Sel F1-00
0: HFI
Low FREQ OPER Method
IF/HFI Sel F1-00
1: IF
Increase HFI Injection Amplitude F1-07
Increase HFI/IF to SM Switch FREQ
F1-04
Increase IF Cmd F1-01
Increase HFI/IF to SM Switch FREQ
F1-04
Cannot start or
low-FREQ speed oscillation
Yes
No
Cannot start or
low-FREQ speed oscillation
Yes
No
Increase HFI PLL BW Gain F1-02
Poor acceleration
Yes
No
ASR Parameter Autotune
※ Refer to the ASR autotune setting
on next page
Increase Speed Observer Filter BW
F1-03
Decrease Speed Observer Filter BW
F1-03
Adjust speed estimated
filter bandwidth
Speed response is too slow or
cannot track the command
The output FREQ fluctuates too much
Increase Observer Low Speed Gain
F1-08
Decrease Observer Low Speed Gain
F1-08
Test low-FREQ
loading capacity
Insufficient low-FREQ
loading capacity
Unstable low-FREQ current or
output FREQ fluctuates too much
Increase Observer High Speed Gain
F1-09
Decrease Observer High Speed Gain
F1-09
Test high-FREQ
loading capacity
Insufficient high-FREQ loading
capacity or slow response
Unstable high-FREQ current or
output FREQ fluctuates too much
Increase PLL P Gain F1-10
Increase PLL I Gain F1-11
Slow response at Acce./Decel
Finish

- ASR Parameter Autotune



5-4-5-3 Adjustment Steps

※ You need to complete B-0 SM Autotune first (refer to Section 5-3-3).

1. Choose the motor control method.
   Set Pr. C0-02 = 2: FOC.
2. Select the SM rotor initial detection method.
   (1) If the mechanism or process allows reversal, set Pr. A3-17 = 1: Force alignment.
   If the alignment force at start is insufficient, increase setting for Pr. A3-18 Force Alignment Current Value; if the alignment current is too large, decrease setting for Pr. A3-18 Force Alignment Current Value.
   (2) If the motor is SPM and the system does not allow reversal, set Pr. A3-17 = 2: Pulse inject.
   If the operation direction at start is incorrect, increase setting for Pr. A3-20 Pulse Inject Current Threshold; if the start current is too large or causes ocA, decrease setting for Pr. A3-20 Pulse Inject Current Threshold.
   (3) If the motor is IPM, PMA and SynRM and the system does not allow reversal, set Pr. A3-17 = 3: HFI.
   If the operation direction at start is incorrect, increase setting for Pr. A3-22 HFI Amplitude; if there is evidence of electromagnetic noise, decrease setting for Pr. A3-22 HFI Amplitude.
3. Setup stop method.

Pr.	Parameter Name	Settings
A2-00	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel

4. Set the acceleration and deceleration time

Pr.	Parameter Name
C2-00	Accel Time 1
C2-01	Decel Time 1

5. Select operation method at low-frequency.
   (1) If the motor is IPM, PMA and SynRM, set Pr. F1-00 IF/ HFI Selection = 0: HFI.
      a. If the motor cannot be started or the speed oscillates at low-frequency, increase setting for Pr. F1-07 HFI Injection Amplitude or increase setting for Pr. F1-04 IF/HFI to SM Switch FREQ.
      b. If the acceleration is poor, increase setting for Pr. F1-02 HFI PLL BW Gain.
   (2) If the motor is SPM, set Pr. F1-00 IF/ HFI Selection = 1: IF.
      a. If the motor cannot be started or the speed oscillates at low-frequency, increase setting for Pr. F1-01 IF Command or increase setting for Pr. F1-04 IF/HFI to SM Switch FREQ.
6. ASR Parameter Autotune
   A. Use system inertia and ASR bandwidth adjustment.
      (0) Set Pr. F2-01 System Inertia.

(1) Set ASR Calculation Selection F2-02 = 1: Bandwidth.
(2) Adjust the ASR high-speed and low-speed area through Pr. F2-03 ASR High/ Low BW Switch FREQ.
(3) If the starting torque is insufficient or the speed response is slow, increase setting for Pr. F2-04 ASR Zero-Speed BW.
(4) If the speed in the low-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-05 ASR Low-Speed BW.
(5) If the speed in the low-speed area oscillates at high frequency, decrease setting for Pr. F2-05 ASR Low-Speed BW.
(6) If the speed in the high-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-06 ASR High-Speed BW.
(7) If the speed in the high-speed area oscillates at high frequency, decrease setting for Pr. F2-06 ASR High-Speed BW.

B. Adjust ASR gain
(1) Set ASR Calculation Selection F2-02 = 0: Gain.
(2) Adjust the ASR high-speed and low-speed area through Pr. F2-03 ASR High/ Low BW Switch FREQ.
(3) If the starting torque is insufficient or the speed response is slow, increase setting for Pr. F2-07 ASR Zero-Speed Gain or decrease setting for Pr. F2-08 ASR Zero-Speed Integral Time.
(4) If the speed in the low-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-09 ASR Low-Speed Gain or decrease setting for Pr. F2-10 ASR Low-Speed Integral Time.
(5) If the speed in the low-speed area oscillates at high frequency, decrease setting for Pr. F2-09 ASR Low-Speed Gain or increase setting for Pr. F2-10 ASR Low-Speed Integral Time.
(6) If the speed in the high-speed area oscillates at low frequency or responds slowly, increase setting for Pr. F2-11 ASR High-Speed Gain or decrease setting for Pr. F2-12 ASR High-Speed Integral Time.
(7) If the speed in the high-speed area oscillates at high frequency, decrease setting for Pr. F2-11 ASR High-Speed Gain or increase setting for Pr. F2-12 ASR High-Speed Integral Time.

7. Adjust speed observer filter bandwidth.
(1) If the speed response is too slow or the frequency command cannot be tracked, increase setting for Pr. F1-03 Speed Observer Filter BW.
(2) If the output frequency fluctuates too much, decrease setting for Pr. F1-03 Speed Observer Filter BW.

8. Test loading capacity at low-frequency.
(1) If the loading capacity at low-frequency is insufficient, increase setting for Pr. F1-08 Observer Low Speed Gain.
(2) If the low-frequency current is unstable or the output frequency fluctuates too much, decrease setting for Pr. F1-08 Observer Low Speed Gain.

9. Test loading capacity at high-frequency.
   (1) If the loading capacity at high-frequency is insufficient or the response is slow, increase setting for Pr. F1-09 Observer High Speed Gain.
   (2) If the high-frequency current is unstable or the output frequency fluctuates too much, decrease setting for Pr. F1-09 Observer High Speed Gain.
10. If the response is slow during acceleration and deceleration, increase setting for Pr. F1-10 PLL P Gain or Pr. F1-11 PLL I Gain.

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Chapter 6 Drive Communication Network

6-1 Modbus Communication

6-2 BACnet Communication

6-1 Modbus Communication

6-1-1 Specification

Item		Specifications
Interface		RS-485
Sync Method		Asynchronous
Communication Parameters	Transmission Speed	4.8, 9.6, 19.2, 38.4, 57.6, 78, 115.2 Kbps
	Data length	7-bit, 8-bit
	Calibration	Even number (E), Odd number (O), None (N)
	Stop bit	1-bit, 2-bit
Communication Protocol		Modbus RTU/ ASCII
Number of Connected Drives		Up to 31 drives

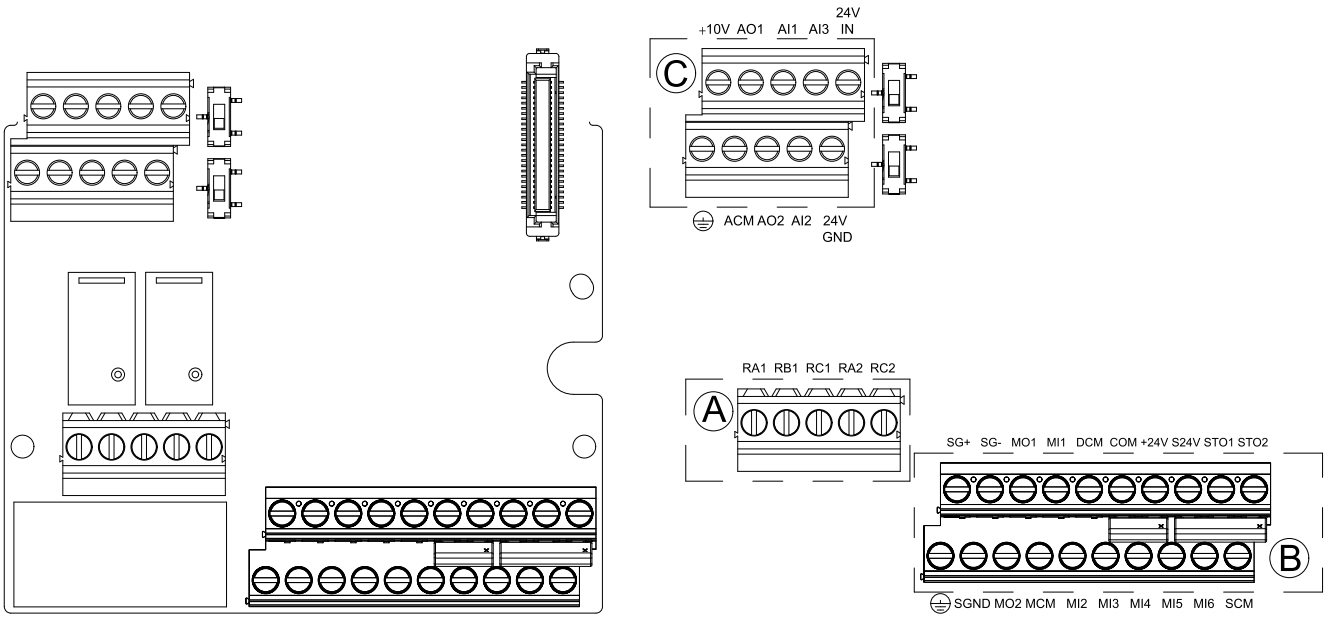
- When using the communication interface, the diagram on the right shows the communication port pin definitions. We recommend that you connect the AC motor drive to your PC by using Delta IFD6530 or IFD6500 as a communication converter. Refer to the RJ45 terminal on Section 3-4-1 Wiring for details of the communication port on the right.

Modbus RS-485
Pin 1–2,7,8: Reserved
Pin 3, 6: GND
Pin 4: SG-
Pin 5: SG+

- Default communication format of the port:
  1. Modbus ASCII mode
  2. 9600 bps transmission speed
  3. 7 data bits
  4. No calibration (NONE)
  5. 2 stop bits
- Modbus ASCII (American Standard Code for Information Interchange): Each byte of data is the combination of two ASCII characters. For example, one byte of data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

6-1-2 Wiring Configuration

Drive Communication Port

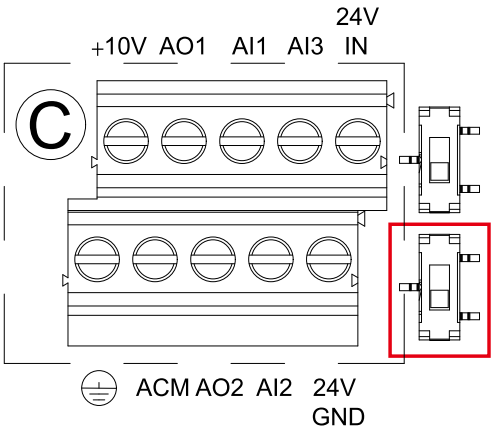


There are two ways of wiring:

1. Connect with RJ45 connector.
2. Use terminal SG+, SG- and SGND.

Terminal Resistor Setting

When using Modbus communication, the terminal equipment needs to be connected to a terminal resistor. You can use the built-in terminal resistor on the control board by switching the dip switch to the bottom (120).



Slave Mode	Master Mode

6-1-3 Related Parameters

Modbus

NOTE: means that you can set this parameter during operation.

	Pr.	Comm. Address	Parameter Name	Description	Default
	n0-00	0x1540	RS-485 COM Port Protocol Sel	Defines RS-485 communication port protocol selection 0: Modbus Slave 1: Modbus Master 2: BACnet MS/TP	0
↗	n1-01	0x1581	Modbus Address	Defines the Modbus communication address 1–254	1
↗	n1-02	0x1582	Modbus COM Baud Rate	Defines the Modbus transmission speed (Baud Rate). 0: 4.8 Kbps 1: 9.6 Kbps 2: 19.2 Kbps 3: 38.4 Kbps 4: 57.6 Kbps 5: 76.8 Kbps 6: 115.2 Kbps	1
↗	n1-03	0x1583	Modbus Package Format	Defines the Modbus communication format 0: 7, N, 2 (ASCII) 1: 7, E, 1 (ASCII) 2: 7, O, 1 (ASCII) 3: 7, E, 2 (ASCII) 4: 7, O, 2 (ASCII) 5: 8, N, 1 (ASCII) 6: 8, N, 2 (ASCII) 7: 8, E, 1 (ASCII) 8: 8, O, 1 (ASCII) 9: 8, E, 2 (ASCII) 10: 8, O, 2 (ASCII) 11: 8, N, 1 (RTU) 12: 8, N, 2 (RTU) 13: 8, E, 1 (RTU) 14: 8, O, 1 (RTU) 15: 8, E, 2 (RTU) 16: 8, O, 2 (RTU)	0

Pr.	Comm. Address	Parameter Name	Description	Default
n1-04	0x1584	Modbus Timeout Check Time	Defines communication timeout when the drive does not receive any signal in the setting time. Set the timeout check time as 0 sec. to disable the timeout detection. 0.0–100.0 sec.	0.0
n1-05	0x1585	Modbus Timeout Disposal	Defines the drive treatment after communication timeout when the control command source or the frequency command source is Modbus. 0: Continue OPER 1: Warning & continue OPER 2: Fault & ramp to stop 3: Fault & coast to stop	0
n1-06	0x1586	Modbus Response Delay Time	Defines the delay time of the drive responding to the upper Modbus package. 0.0–200.0 ms	2.0
n1-07	0x1587	Modbus MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
n1-08	0x1588	Modbus AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0
n1-09	0x1589	Modbus Master Target Selection	0: None 1: InnerPLC 2: D2D	0

Code Description

The communication protocol is in hexadecimal, ASCII: ”0”…“9”, “A”…“F”, every hexadecimal value represents an ASCII code. For example:

Character	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

1. Communication Data Frame

ASCII mode:

STX	Start character = ‘ : ’ (3AH)
Address High	Communication address: one 8-bit address consists of 2 ASCII codes
Address Low	
Function High	Command code: one 8-bit command consists of 2 ASCII codes
Function Low	
DATA (n-1)	Contents of data: n x 8-bit data consists of 2n ASCII codes n ≤ 16, maximum of 32 ASCII codes (20 sets of data)
…….	
DATA 0	
LRC Check High	LRC checksum: one 8-bit checksum consists of 2 ASCII codes
LRC Check Low	
END High	End characters: END High = CR (0DH), END Low = LF (0AH)
END Low	

RTU mode:

START	A silent interval of more than 3.5 char
Address	Communication address: 8-bit binary address
Function	Command code: 8-bit binary command
DATA (n-1)	Contents of data: n×8-bit data, n ≤ 16
…….	
DATA 0	
CRC Check Low	CRC checksum: one 16-bit CRC checksum consists of 2 8-bit binary characters
CRC Check High	
END	A silent interval of more than 3.5 char

2. Communication Address (Address)

00H: Broadcast to all AC motor drives

01H: AC motor drive at address 01

0FH: AC motor drive at address 15

10H: AC motor drive at address 16, and so on, up to address 254 (FEH)

Function code (Function)

Command code:	Functions
03H	Read data from register
06H	Write single register
10H	Write continuous multiple data (can write at most 20 sets of data simultaneously).

3. 03H: Read data from register

Example: Reading two continuous data from register address 2102H. AMD address is 01H.

ASCII mode:

Command Message		Response Message	
STX	':'	STX	':'
Address (station)	'0'	Address	'0'
	'1'		'1'
Function	'0'	Function	'0'
	'3'		'3'
Starting register (address)	'2'	Number of register (count by byte)	'0'
	'1'		'4'
	'0'	Content of starting register 2102H	'1'
	'2'		'7'
Number of register (count by word)	'0'		'7'
	'0'		'0'
	'0'	Content of register 2103H	'0'
	'2'		'0'
LRC Check	'D'		'0'
	'7'		'0'
END	CR	LRC Check	'7'
	LF		'1'
		END	CR
			LF

RTU mode:

Command Message		Response Message	
Address	01H	Address	01H
Function	03H	Function	03H
Starting data register	21H	Number of register (count by byte)	04H
	02H		
Number of register (count by word)	00H	Content of register address 2102H	17H
	02H		70H
CRC Check Low	6FH	Content of register address 2103H	00H
CRC Check High	F7H		00H
		CRC Check Low	FEH
		CRC Check High	5CH

4. Function code 06H: Write single register

   Example: Writing data 6000 (1770H) to register 0100H. AMD address is 01H.

   ASCII mode:

Command Message		Response Message	
STX	':'	STX	':'
Address	'0'	Address	'0'
	'1'		'1'
Function	'0'	Function	'0'
	'6'		'6'
Target register	'0'	Target register	'0'
	'1'		'1'
	'0'		'0'
	'0'		'0'
Register content	'1'	Register content	'1'
	'7'		'7'
	'7'		'7'
	'0'		'0'
LRC Check	'7'	LRC Check	'7'
	'1'		'1'
END	CR	END	CR
	LF		LF

   RTU mode:

Command Message		Response Message	
Address	01H	Address	01H
Function	06H	Function	06H
Target register	01H	Target register	01H
	00H		00H
Register content	17H	Register content	17H
	70H		70H
CRC Check Low	86H	CRC Check Low	86H
CRC Check High	22H	CRC Check High	22H

5. Command code: 10H, write continuous multiple data (can write at most 20 sets of data simultaneously).
   For example: change the drive (address 01H) multi-speed Pr. C1-23 = 50.00 (1388H), Pr. C1-24 = 40.00 (0FA0H).

   ASCII mode:

Command Message

STX	':'
ADR 1	'0'
ADR 0	'1'
CMD 1	'1'
CMD 0	'0'
Target register	'0'
	'4'
	'5'
	'7'
Number of register (count by word)	'0'
	'0'
	'0'
	'2'
Number of register (count by byte)	'0'
	'4'
The first data content	'1'
	'3'
	'8'
	'8'
The second data content	'0'
	'F'
	'A'
	'0'
LRC Check	'4'
	'4'
END	CR
	LF

Response Message

STX	':'
ADR 1	'0'
ADR 0	'1'
CMD 1	'1'
CMD 0	'0'
Target register	'0'
	'4'
	'5'
	'7'
Number of register (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'9'
	'2'
END	CR
	LF

RTU mode:

Command Message

ADR	01H
CMD	10H
Target register	04H
	57H
Number of register (count by word)	00H
	02H
Quantity of data (byte)	04H
The first data content	13H
	88H
The second data content	0FH
	A0H
CRC Check Low	04H
CRC Check High	93H

Response Message

ADR	01H
CMD	10H
Target register	04H
	57H
Number of register (count by word)	00H
	02H
CRC Check Low	F1H
CRC Check High	28H

6. ASCII mode (LRC Check):

LRC (Longitudinal Redundancy Check) is calculated by summing up the values of the bytes from ADR1 to the last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum. For example: 01H + 03H + 21H + 02H + 00H + 02H = 29H, take complementary number of 2 = D7H

RTU mode (CRC Check):

CRC check is from Address to Data content. It is calculated by the following steps:

Step 1: Load a 16-bit register (called CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register and put the result in the CRC register.

Step 3: Examine the LSB of CRC register.

Step 4: If the LSB of CRC register is 0, shift the CRC register one bit to the right, fill the value from Step 3 to CRC register, or the Exclusive OR the CRC register with the polynomial value A001H, then repeat step 3.

Step 5: Repeat step 3 and 4 until you perform eight shifts. This processes a complete 8-bit byte.

Step 6: Repeat step 2 through 5 for the next 8-bit byte of the command message. Continue doing this until all bytes are processed. The final contents of the CRC register are the CRC value. When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, that is, the lower order byte is transmitted first.

6-1-4 Address list

1. ASCII
   (1) Read one or multiple parameters: 3Ah (start word ':') + 30h 31h (station 01) + 30h 33h (function code 03h) + 30h 30h xxh xxh – 32h 36h xxh xxh (Modbus address 00xxh–26xxh) + xxh xxh xxh xxh (read data length 1) + LRC (checksum) + CR/LF
   (2) Write in one parameter: 3Ah (start word ':') + 30h 31h (station 01) + 30h 36h (function code 06h) + 30h 30h xxh xxh – 32h 36h xxh xxh (Modbus address 00xxh–26xxh) + xxh xxh xxh xxh (read data length 1) + LRC (checksum) + CR/LF
   (3) Write in 20 parameters: 3Ah (start word ':') + 30h 31h (station 01) + 31h 30h (function code 10h) + 30h 30h xxh xxh – 32h 36h xxh xxh (Modbus address 00xxh–26xxh) + 30h 30h 31h 34h (word data length) + 30h 30h 32h 38h (byte data length) + xxh xxh xxh xxh (the first write in value) + ... + xxh xxh xxh xxh (the 20th write in value) + LRC (checksum) + CR/LF

2. RTU
   (1) Read one or multiple parameters: 01h (station 01) + 03h (function code 03h) + 00xxh–26xxh (Modbus address) + xxxxh (read data length) + CRC (checksum)
   (2) Write in one parameter: 01h (station 01) + 06h (function code 06h) + 00xxh–26xxh (Modbus address) + xxxxh (write in value) + CRC (checksum)
   (3) Write in 20 parameters: 01h (station 01) + 10h (function code 10h) + 00xxh–26xxh (Modbus address) + 0014h (word data length) + 0028h (byte data length) + xxxxh (the first write in value) + xxxxh (the 20th writes in value) + CRC (checksum)

3. Control command (20xx):

Function Name	Modbus Address	Attribute	Size	Function Description		
Operation command	2000H	R/W	U16	bit1–0	00b: Disable	1: Once the drive receives one command, it remains in the operation status specified by the command and will not change the operation status until it receives another new command. 2: The function is only valid when the operation command source is set as communication (Pr. A1-01 or A1-08 = 8). 3: bit1–0 are recommended to return to 01b (Stop) after reset
					01b: Stop	
					10b: Run	
					11b: JOG Enable	
				bit3–2	Reserve	
				bit5–4	00b: Disable	
					01b: FWD	
					10b: REV	
					11b: Change direction	
				bit7–6	00b: 1st acceleration / deceleration	1: To enable this function, you need to set 2000h bit12 as 1 first. 2: By reading 2107h, you can get the currently executed step speed.
					01b: 2nd acceleration / deceleration	
					10b: 3rd acceleration / deceleration	
					11b: 4th acceleration / deceleration	

Function Name	Modbus Address	Attribute	Size	Function Description		
			U16	bit11–8	0000b: Main speed	
					0001b: 1st Step Speed	
					0010b: 2nd Step Speed	
					0011b: 3rd Step Speed	
					0100b: 4th Step Speed	
					0101b: 5th Step Speed	
					0110b: 6th Step Speed	
					0111b: 7th Step Speed	
					1000b: 8th Step Speed	
					1001b: 9th Step Speed	
					1010b: 10th Step Speed	
					1011b: 11th Step Speed	
					1100b: 12th Step Speed	
					1101b: 13th Step Speed	
					1110b: 14th Step Speed	
					1111b: 15th Step Speed	
				bit12	1: Enable function of bit6–11	
				bit15–13	Reserve	
Frequency command	2001H	R/W		Frequency command (xxx.xx Hz), two decimal points for standard drives; one decimal point for high-speed drive.		
Fault/ Control command source	2002H	R/W		bit0	External Fault enabled	Used to trigger external fault to stop the drive operation, the stop method can be set through the drive parameters
				bit1	1: Reset	Used to clear the fault status.
				bit2	1: B.B. enable	Used to trigger B.B to temporarily stop the drive operation. When bit2 = 0 B.B. is cleared, the drive immediately returns the previous operation status.
				bit15–3	Reserve	
PID1 setpoint	2020H	R/W		PID1 setpoint value		
PID1 feedback	2021H	R/W		PID1 feedback value		
PID1 track reference	2022H	R/W		PID1 track reference value		
PID2 setpoint	2024H	R/W		PID2 setpoint value		
PID2 feedback	2025H	R/W		PID2 feedback value		
PID2 track reference	2026H	R/W		PID2 track reference value		
PID3 setpoint	2028H	R/W		PID3 setpoint value		
PID3 feedback	2029H	R/W		PID3 feedback value		
PID4 setpoint	202CH	R/W		PID4 setpoint value		

Function Name	Modbus Address	Attribute	Size	Function Description
PID4 feedback	202DH	R/W	U16	PID4 feedback value
PID5 setpoint	2030H	R/W		PID5 setpoint value
PID5 feedback	2031H	R/W		PID5 feedback value
PID6 setpoint	2034H	R/W		PID6 setpoint value
PID6 feedback	2035H	R/W		PID6 feedback value

4. Error data (21XX):

Function Name	Modbus Address	Attribute	Size	Function Description		
Error state	2100H	R	U16	bit7–0	Fault code	1. Display the current error status. 2. Description of the displayed fault can be read through 32xx.
				bit15–8	Warning code	1. Display the current warning status. 2. Description of the displayed warning can be read through 33xx.
Operation status	2101H	R		bit1–0	Drive operation and stop status	Used to check the drive operation status and control the LED display of operation status
					00b: Stop	RUN light OFF / STOP light ON
					01b: Stopping	RUN light flashes / STOP light ON
					10b: Stand by	RUN light ON / STOP light flashes
					11b: Operation	RUN light ON / STOP light OFF
				bit2	JOG operation status	
				bit4–3	Drive operation direction	Used to check the drive operation direction to control the LED display of the operation direction status
					00b: FWD	REV light OFF / FWD light ON
					01b: REV → FWD	REV light flashes / FWD light ON
					10b: FWD → REV	REV light ON / FWD light flashes
					11b: REV	REV light ON / FWD light OFF
				bit6–5	Reserve	
				bit7	The drive is controlled by external terminals	
				bit8	The drive frequency command source is this communication channel	
				bit9	The drive frequency command source is the external terminals	
				bit10	The drive is controlled by this communication channel	
				bit11	Parameter lock status 1b: Parameter locked	To check whether the drive parameter is locked. If bit11 = 1b,

Function Name	Modbus Address	Attribute	Size	Function Description		
						the parameter is read as 0.
			U16	bit12	Reserve	
				bit15–13	HOA and LOC / REM action source status 000b: HOA mode OFF 001b: HOA mode HAND-ON 010b: HOA mode AUTO-ON 011b: LOC/REM mode LOC-ON 100b: LOC/REM mode REM-ON	1. The upper unit checks current frequency and control source through this bit. Use 2119H bit10 to check whether the command source is communication. 2. The upper unit can use 2002H bit4–3 to enable the active source of HAND/AUTO or LOC/REM.
Frequency command	2102H	R		1: Speed mode → Speed command, 2: Torque mode → speed limit (Unit: Hz)		
Output frequency	2103H	R		Filter depth is related to Pr.o0-05 (Unit: Hz)		
Output current	2104H	R		1. When output current (xx.xx) is larger than 655.35 Amp, it automatically changes to one decimal place (xxx.x). (Unit: A) 2. Decimal places can be referred by the high byte of 211FH.		
DC bus voltage	2105H	R		The drive DC bus voltage (Unit: V_{DC})		
Output voltage	2106H	R		The drive output voltage (Unit: %)		
Multi-step speed	2107H	R		Drive's current running speed step given by multi-step speed command (0 is main speed)		
Counter value	2109H	R		The present counter value of MI		
Output power factor angle	210AH	R		Drives' output power factor angle (0.0–180.0°)		
Output torque	210BH	R		Drive's output torque (percentage is based on the motor rated torque) (Unit: %)		
Actual speed	210CH	R		Motor actual speed (Unit: rpm)		
Output power	210FH	R		Drive output power (Unit kWh)		
Keypad output current display	211FH	R		bit7–0	Reserve	
				bit9–8	Decimal point of A page 01b: One decimal point 10b: Two decimal points	
				bit15–10	Reserve	

5. User Variable (22xx):

Function Name	Modbus Address	Attribute	Size	Function Description
Output current	2200H	R	U16	Display the current outputs from the drive to the motor (Unit: A)
Counter value	2201H	R		Display the counter value (Unit: CNT)
Actual output frequency	2202H	R		Display the drive's actual output frequency (Unit: Hz)
DC bus voltage	2203H	R		Display the drive's DC bus voltage (Unit: V_{DC})
Output voltage	2204H	R		Display the drive's output voltage of U, V, W (Unit: V_{AC})
Output power factor angle	2205H	R		Display the drive's output power factor angle (Unit: deg)
Output power	2206H	R		Display the drive's output power (Unit: kWh)
Actual speed	2207H	R		Display the motor's actual speed (Unit: rpm)
Output torque	2208H	R		Display the drive estimated output torque, the motor rated torque is 100.0% (Unit: %)
PID feedback	220AH	R		Display the PID feedback value (Unit: %)
AI1 percentage	220BH	R		Display signal of AI1 analog input terminal (Unit: %)
AI2 percentage	220CH	R		Display signal of AI2 analog input terminal (Unit: %)
AI3 percentage	220DH	R		Display signal of AI3 analog input terminal (Unit: %)
IGBT temperature	220EH	R		Display temperature of the drive IGBT module (Unit: °C)
Drive capacitance temperature	220FH	R		Display the temperature of capacitance (Unit: °C)
DI status	2210H	R		Display the digital input ON / OFF status
DO status	2211H	R		Display the digital output ON / OFF status
Multi-step speed	2212H	R		Display the multi-step speed that is executing
CPU DI pin status	2213H	R		Display the corresponding CPU pin status of digital input
CPU DO pin status	2214H	R		Display the corresponding CPU pin status of digital output
Overload counter	2219H	R		Display times of counter overload (0.00–100.00%)
GFF	221AH	R		GFF (Unit: %)
DC bus voltage ripples	221BH	R		DC bus voltage ripples (Unit: %)
PLC register	221CH	R		Display PLC register D1043 data

Function Name	Modbus Address	Attribute	Size	Function Description
User-defined	221EH	R	U16	User-defined output display (Unit: %)
Fan speed	2222H	R		Fan speed (Unit: %)
Speed / torque mode	2223H	R		Control mode of the drive 0: Speed mode (SPD) 1: Torque mode (TQR)
Current carrier frequency	2224H	R		Display current carrier frequency of the drive (Unit: Hz)
Drive status	2226H	R		Display the drive status
Output torque	2227H	R		Display the drive's estimated output torque (positive or negative direction) (Unit: Nt-m) (t0.0: Positive torque; -0.0: Negative torque)
Torque command	2228H	R		Torque command (Unit: %)
kWh	2229H	R		Display kWh value (Unit: kWh)
PID reference	222EH	R		PID reference (XXX.XX %)
PID output frequency	2230H	R		PID output frequency (XXX.XX Hz)
Hardware ID	2231H	R		Hardware ID
Auxiliary frequency	2232H	R		Display the auxiliary frequency (Unit: Hz)
Main frequency	2233H	R		Display the main frequency (Unit: Hz)
Addition and subtraction of main and auxiliary frequency	2234H	R		Display the frequency value after addition and subtraction of main and auxiliary frequency (Unit: Hz)
KTY84 / PTC	2235H	R		Display the motor temperature (only support KTY84-130) (Unit: °C)
A-phase current	223BH	R		A-phase current (Ia) (Unit: A)
B-phase current	223CH	R		B-phase current (Ib) (Unit: A)
C-phase current	223DH	R		C-phase current (Ic) (Unit: A)
PMFOC Ke estimated value	223FH	R		Ke estimated value Standard model: 1 decimal point; high-speed model: 2 decimal points

6. Status monitor read only (23xx)

Function Name	Modbus Address	Attribute	Size	Function Description	
AC Motor drive status (Low word)	2300H	R	U16	bit1–0	AC motor drive operation status 00b: Drive stops (keypad RUN light OFF/ STOP light ON) 01b: Drive stopping (keypad RUN light flashes / STOP light ON) 10b: Drive standby (keypad RUN light ON / STOP light flashes)

Function Name	Modbus Address	Attribute	Size	Function Description	
					11b: Drive operating (keypad RUN light ON / STOP light OFF) NOTE: this bit is used to detect the drive operating status, to control the LED display for the operation status.
				bit3–2	Operation Direction 00b: The drive is in FWD run status (Keypad REV light OFF / FWD light ON) 01b: The drive runs from current REV direction to target FWD direction (keypad REV light flashes / FWD light ON) 10b: The drive runs from current FWD direction to target REV direction (keypad REV light ON / FWD light flashes) 11b: The drive is in REV direction (keypad REV light ON / FWD light OFF) NOTE: this bit is used to detect the drive operating direction, to control the LED display for the running direction.
				bit4	JOG Operation Status 1b: JOG active
				bit7–5	Drive HOA and LOC/ REM operation source status 000b: HOA mode OFF 001b: HOA mode HAND-ON 010b: HOA mode AUTO-ON 011b: LOC/ REM mode LOC-ON 100b: LOC/ REM mode REM-ON
				bit8	Drive ready status 1b: Ready Active - The drive is ready to receive command
				bit9	Drive output status 1b: The drive is outputting
			U16	bit10	Command reach status (speed reach, position reach, torque reach, homing complete) 1b: Command reaches active
				bit11	Reserve
				bit12	Drive quick stop status 1b: Quick stop active
				bit13	Drive Halt status 1b: The drive pauses
				bit14	Drive fault status 1b: The drive fault is triggered
				bit15	Drive warning status 1b: The drive warning is triggered
AC Motor drive status (How word)	2301H	R		bit0	Drive status (High word) Acceleration/ deceleration status 0b: Dec - the drive output frequency is decelerating 1b: Acc - the drive output frequency is accelerating
				bit1	FireMode Status 1b: FireMode active

Function Name	Modbus Address	Attribute	Size	Function Description	
				bit2	Drive dEb status 1b: dEb active
				bit3	Preheat output status 1b: Preheat output active
				bit11–4	Reserve
				bit12	Parameter Lock Status 1b: Parameter is locked
				bit13	Parameters read-only status 1b: Parameters are read-only
				bit14	Enable parameter copy function 1b: The drive is copying or resuming parameters
				bit15	Reserve
Frequency command	2302H	R		Frequency command (Hz), one decimal point for high-speed models	
Current output frequency	2303H	R		Motor actual operating frequency (XXXXX Hz), one decimal point for high-speed models	
Fault code	2304H	R		Fault code that occurs to the drive	
Warning code	2305H	R		Warning code that occurs to the drive	
Error status	2306H	R		Error status (0b: does not trigger errors, 1b: error triggered)	
				bit0	Low voltage warning (Lv)
				bit1	Overheat warning
				bit2	PID feedback error
				bit3	Slip error (oSL)
				bit4	Over-voltage warning
				bit5	Over-current stall prevention
				bit6	Over-voltage stall prevention
			U16	bit7	Under current output
				bit15–8	Reserve
Current control mode	2308H	R		1: Speed mode, 2: Torque mode, 3: Position mode, 4: Auto-tune mode	
Motor actual speed rpm (low word)	230AH	R		The motor speed estimated by the drive or feedback by the encoder, the unit is rpm	
Motor actual speed rpm (high word)	230BH	R		The motor speed estimated by the drive or feedback by the encoder, the unit is rpm	
Motor actual speed Hz	230CH	R		The motor speed estimated by the drive or feedback by the encoder, the unit is Hz	
Output current (low word)	2310H	R		Unit: A	
Output current (high word)	2311H	R		Unit: A	
U-phase current	2312H	R		Unit: A	
V-phase current	2314H	R		Unit: A	
W-phase current	2316H	R		Unit: A	
Actual Id command (Low word)	2318H	R		Unit: A	

Function Name	Modbus Address	Attribute	Size	Function Description	
Actual Id command (High word)	2319H	R		Unit: A	
Actual Id feedback (Low word)	231AH	R		Unit: A	
Actual Id feedback (High word)	231BH	R		Unit: A	
Actual Iq command (Low word)	231CH	R		Unit: A	
Actual Iq command (High word)	231DH	R		Unit: A	
Actual Iq feedback (Low word)	231EH	R		Unit: A	
Actual Iq feedback (High word)	231FH	R		Unit: A	
DC bus voltage (XXX.X V)	2322H	R		Drive DC bus voltage (XXX.X V)	
DC bus voltage ripple	2323H	R		Drive DC bus ripple (XXX.X V)	
Output voltage	2324H	R		Drive output voltage (XXX.X V)	
Drive Output PF Angle	2327H	R		Drive Output PF Angle (XXX.X) (0.0–180.0 degree)	
Output power	2328H	R		Display the output power of U, V and W (XXXX kW)	
kWh	232AH	R		kWh display (XXXX.X)	
Drive frequency extension definition	232FH	R		bit1–0	Decimal points 00b: none 01b: one decimal point 10b: two decimal points 11b: three decimal points
				bit3–2	Reserve
				bit5–4	Unit 00b: Hz 01b: rpm 10b–11b: Reserve
				bit7–6	Reserve
				bit8	Sign definition 0b: signed 1b: unsigned
Fan speed	2330H	R		Drive fan speed (XXX%)	
Capacitor temperature	2331H	R		The drive capacitor temperature (XXX.X°C)	
IGBT temperature	2332H	R		The power model IGBT temperature (XXX.X°C)	
Actual torque command	2336H	R	U16	Actual torque command (XXX.X%)	

Function Name	Modbus Address	Attribute	Size	Function Description
Output torque	2337H	R		The output positive and negative torque calculated by the drive (XXX.X Nt-m).
Average output torque	2338H	R		The average output positive and negative torque calculated by the drive (XXX.X Nt-m).
Process PID1 Output frequency	2340H	R		Process PID output frequency, the unit is Hz External PID output frequency, the unit is %
Process PID1 target value	2341H	R		PID target value (XXX.XX %)
Process PID1 compensation	2342H	R		PID offset (XXX.XX%)
Process PID2 Output frequency	2344H	R		PID output frequency (XXX.XX Hz)
Process PID2 target value	2345H	R		PID target value (XXX.XX %)
Process PID2 compensation	2346H	R		PID offset (XXX.XX%)
External PID1 output frequency	2348H	R		PID output frequency (XXX.XX Hz)
External PID1 target value	2349H	R		PID target value (XXX.XX %)
External PID1 compensation	234AH	R		PID offset (XXX.XX%)
External PID2 output frequency	234CH	R		PID output frequency (XXX.XX Hz)
External PID2 target value	234DH	R		PID target value (XXX.XX %)
External PID2 compensation	234EH	R		PID offset (XXX.XX%)
External PID3 output frequency	2350H	R		PID output frequency (XXX.XX Hz)
External PID3 target value	2351H	R		PID target value (XXX.XX %)
External PID3 compensation	2352H	R		PID offset (XXX.XX%)
External PID4 output frequency	2354H	R		PID output frequency (XXX.XX Hz)
External PID4 target value	2355H	R		PID target value (XXX.XX %)
External PID4 compensation	2356H	R		PID offset (XXX.XX%)
PWM Carrier Frequency	2366H	R		Drive operation carrier frequency (X.X kHz)
Multi-step speed status	2367H	R		Drive currently executed step speed from the multi-step speed command (0 represents main speed)
Overload counter	2368H	R		

Function Name	Modbus Address	Attribute	Size	Function Description
GFF protection proportion	236AH	R		GFF (XX%) value
PLC buffer overflow	236BH	R		PLC register D1043 data
PMFOC Ke estimation	236CH	R		PMFOC Ke estimation (Standard model: 1 decimal point; high-speed model: 2 decimal points)

7. Remote IO (26xx):

Function Name	Modbus Address	Attribute	Size	Function Description
Digital input terminal MI6–MI1 status	2600H	R		Each bit corresponds to different terminal input contact
Digital input terminal MI6–MI1 CPU Pin status	2608H	R		Each bit corresponds to different terminal CPU Pin
Digital output terminal MO16–MO1 status	2640H	R/W		Each bit corresponds to different terminal output contact
Digital output terminal MO16–MO1 CPU Pin status	2648H	R		Each bit corresponds to different terminal CPU Pin
AI0 Proportional value	2660H	R		Analog input signal AI0 percentage
AI1 Proportional value	2661H	R		Analog input signal AI1 percentage
AI2 Proportional value	2662H	R	U16	Analog input signal AI2 percentage
Analog input signal AI10 percentage	266AH	R		Extension card AI10, 0.0–100.0% (EMV-A22A)
Analog input signal AI11 percentage	266BH	R		Extension card AI11, 0.0–100.0% (EMV-A22A)
AFM1 output value	2680H	R		AFM1 output percentage (%)
AFM2 output value	2681H	R		AFM2 output percentage (%)
AO10 output value	268AH	R		Extension card AO10 output percentage (%)
AO11 output value	268BH	R		Extension card AO11 output percentage (%)
AFM1 output percentage (%)	26A0H	R/W		AFM1 output percentage (%)
AFM2 output percentage (%)	26A1H	R/W	U16	AFM2 output percentage (%)

Function Name	Modbus Address	Attribute	Size	Function Description
Analog output signal AO10 percentage	26AAH	R/W		Extension card AO10, 0.0–100.0% (EMV-A22A)
Analog output signal AO11 percentage	26ABH	R/W		Extension card AO11, 0.0–100.0% (EMV-A22A)

8. 60xxh Output message (Upper unit → Drive)

Index	Attr.	Size	Description			Speed Mode
			bit	Def.	Auth.	
6000H	W	U16	0	Cmd_Ack	4	0: fcmd =0 1: fcmd = Fset (Fpid)
			1	Dir_Cmd	4	0: FWD command 1: REV command
			2	Reserve		
			3	Halt	3	0: Continue operating to the target speed 1: Temporarily stop according to the deceleration setting
			4	Lock	4	0: Continue operating to the target speed 1: Frequency stops at current frequency
			5	JOG	4	0: JOG OFF Edge 0 → 1: JOG RUN (Ack OFF valid)
			6	QStop	2	Quick Stop
			7	Servo_ON	1	0: Servo OFF 1: Servo ON
			8	Reserve		
			9	Ext Cmd2	4	Edge 0 → 1: Clear absolute position
			10	InrPOS	4	0: Disable internal positioning Edge 0 → 1: Performs internal positioning
			14–11	Reserve		
			15	RST	1	Edge 0 → 1: Clear fault codes
6001H	RW			Mode		0: Speed mode
6002H	RW			Speed		Speed command (Unsigned)
6003H	RW			Torque Limit		Torque limit (Signed)
6007H	RW			Speed Limit		Speed limit (Unsigned)

9. 61xxh Input message (Drive → Upper unit)

Index	Attr.	Size	Description		Speed Mode
			bit	Def.	
6100h	R	U16	0	Arrive	0: Frequency command is not reached 1: Frequency command reached
			1	Dir	0: FWD command 1: REV command
			2	Warn	0: No warning 1: Warning occurs
			3	Error	0: No fault 1: Fault occurs
			4	Reserve	
			5	JOG	0: JOG OFF 1: On JOG
			6	QStop	Quick Stop
			7	Servo_ON	0: PWM OFF 1: PWM ON
			8	POS_Match	0: Does not match mechanical origin 1: Match mechanical origin
			10–9	Reserve	
			11	OMS (Operation mode specific)	0: bit11 Internal limit no active 1: bit 11 Internal limit active
			13–12	Reserve	
			14	OMS (Operation mode specific)	0: bit14 does not touch the hardware limit 1: bit14 touches the hardware limit
			15	Synchronize detection	0: Not synchronized 1: Synchronized
6101h	R			Mode	Actual mode
6102h	R			Actual Velocity	Actual output command (Unit: 0.01 Hz / high-speed model is 0.1Hz)
6103h	R			Error code	Corresponds the drive fault codes to DS302 and DS402 for definition (only valid for EtherCAT and CANopen)
6104h	R			Actual Pos	Actual position (absolute) (Unit: Pulse)
6105h	R				
6106h	R			Actual Torq	Actual torque (signed) (Unit: 0.1%)

6-1-5 Exception response:

When the drive is using the communication connection, if an error occurs, the drive responds to the error code and sets the highest bit (bit 7) of the command code to 1 (function code AND 80H) then responds to the control system to signal that an error occurred. Refer to the table of error codes for communication error for reference. Example:

ASCII mode:

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Exception code	'0'
	'2'
LRC Check	'7'
	'7'
END	CR
	LF

RTU mode:

Address	01H
Function	86H
Exception code	02H
CRC Check Low	C3H
CRC Check High	A1H

The explanation of exception codes:

Fault code	Descriptions
1	Function code is not supported or unrecognized.
2	Address is not supported or unrecognized.
3	Data is incorrect or unrecognized.
4	Failure to execute this function code

6-2 BACnet Communication

6-2-1 Specification

Item		Specifications
Interface		RS-485
Sync Method		Asynchronous
Communication Parameters	Transmission Speed	9.6, 19.2, 38.4, 78 Kbps
	Data length	8-bit
	Calibration	None (N)
	Stop bit	1-bit
Communication Protocol		RTU

About BACnet:

BACnet is an ASHRAE communication protocol for building automation and control networks. (ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.).

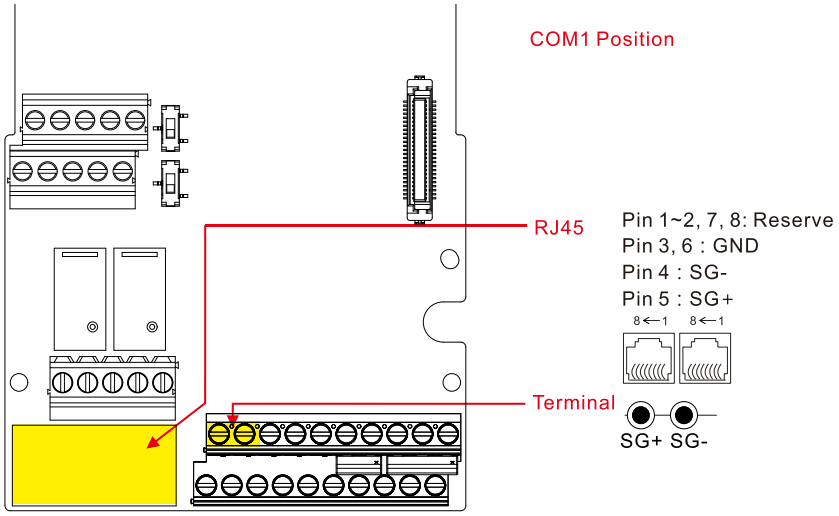
VP3000's BACnet is based on version 2004.

BACnet's regulations are related to several kinds of physical layers' interfaces. The physical layer built inside VP3000 is achieved via MS/TP interface.

The BACnet of VP3000 supports a device type called B-ASC. B-ASC supports six types of services such as DS-RP-B, DS-RPM-B, DS-WP-B, DM-DDB-B, DM-DOB-B and DM-DCC-B.

6-2-2 Wiring Configuration

- Connection of the communication cable is as shown in the diagram below:
  Pay extra attention that HW Pins of COM1_Port is shared by RJ45 and RS-485. That means you can use RJ45_cable or RS-485_lines to access the COM1_Port.
  When BACnet is enabled, COM1_Port will be dominated by BACnet function. Under this condition, you will not be able to use Modbus VFD Soft, VFD Explorer or PLC function on COM1_Port.



6-2-3 Parameter Setting

To use VP3000 BACnet function, there are two parts of parameter settings:

Part 1: Setup parameters related to Communication at Pr_Group n.

Part 2: Setup parameters related to Communication at Pr_Group A and C.

Part 1: Pr_Group n Communication

1-1.1. Set Pr. n0-00 = 2, BACnet is enabled, then the COM1_Port will be accessed by BACnet. (**Note:** The HW Pins of COM1_Port are shared by RJ45 and RS-485. When BACnet is enabled, BACnet will access the COM1_Port, that also means we can NOT use Modbus, PLC connections, VFDSoft and VFD Explorer by COM1_Port). When this is set, the COM1_Port communication format will be changed to RTU 8, N, 1, and will not refer to the setting of Pr. n1-03.

1-1.2. Set Pr. n3-01, default = 10, BACnet's MS/TP station number 0–127.

1-1.3. Set Pr. n3-03, default = 38400, BACnet communication baud rate, 9600, 19200, 38400 or 76800 bps.

1-1.4. Set Pr. n3-04, the default setting of Device Object_Identifier is = 0x000A. The setting range of Device Instance can be 0–4194303.

1-1.5. Set Pr. n3-02, default = 127, set the station search range.

1-1.6. Set Pr. n3-05, set up the BACnet password. If setup is successful, the keypad will display 8888.

Part 2: Pr_Group A and C, System parameter

2-1. Set Pr. C0-01 or C1-05 = 2, that means the frequency command source is RS-485 interface.

2-2. Set Pr. A1-01 or A1-08 = 8, that means the operation command source is RS-485 interface.

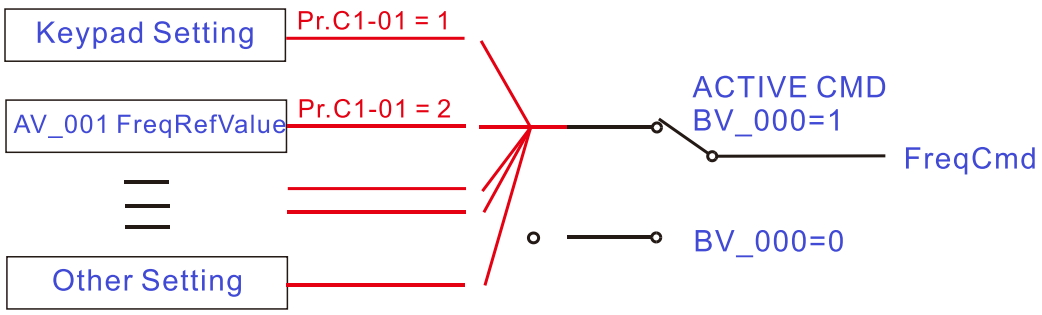
Example:

After setting the above 2 parts of parameters, we have enabled the BACnet function in VP3000. Thus, we can control the VP3000 RUN or STOP or gets the operation status through the BACnet objects.

Step 1. Write_Service on AV_000 (FreqRefValue), Present_Value = 60.0 (Hz)

Step 2. Write_Service on BV_000 (Active CMD), Present_Value = Active

Step 3. Read_Service on AV_050 (Output frequency), Present_Value retrieves.



NOTE:

In VP3000, we can set different reference source of FreqCmd by setting different parameter or IO settings. Refer to the description of Keypad, PR, and IO in the user manual for further details.

6-2-4 VP3000 BACnet Object and Property:

In VP3000, BACnet supports 3 types of object: Device, Analog Value (AV) and Binary Value (BV). In each object type, we have the following table to show the Properties list:

Property ID		Object Type		
		Device	Analog Value	Binary Value
#4	ACTIVE_TEXT			V
#11	APDU_TIMEOUT	V		
#12	APPLICATION_SOFTWARE_VERSION	V		
#28	DESCRIPTION	V	V	V
#30	DEVICE_ADDRESS_BINDING	V	V	
#36	EVENT_STATE		V	V
#44	FIRMWARE_REVISION	V		
#46	INACTIVE_TEXT			V
#62	MAX_APDU_LENGTH_ACCEPTED	V		
#63	MAX_INFO_FRAMES	V		
#64	MAX_MASTER	V		
#70	MODEL_NAME	V		
#73	NUMBER_OF_APDU_RETRIES	V		
#75	OBJECT_IDENTIFIER	V*1	V	V
#76	OBJECT_LIST	V		
#77	OBJECT_NAME	V*1	V	V
#79	OBJECT_TYPE	V	V	V
#81	OUT_OF_SERVICE		V	V
#85	PRESENT_VALUE		V*2	V*2
#87	PRIORITY_ARRAY		V*3	V*3
#96	PROTOCOL_OBJECT_TYPES_SUPPORTED	V		
#97	PROTOCOL_SERVICES_SUPPORTED	V		
#98	PROTOCOL_VERSION	V		
#104	RELINQUISH_DEFAULT		V*3	V*3
#107	SEGMENTATION_SUPPORTED	V		
#111	STATUS_FLAGS		V	V
#112	SYSTEM_STATUS	V		
#117	UNITS		V	
#120	VENDOR_IDENTIFIER	V		
#121	VENDOR_NAME	V		
#139	PROTOCOL_REVISION	V		
#155	DATABASE_REVISION	V		

NOTE:

*1. The Object_ID and Object_Name Properties of Device are writeable.

*2. The Present_Value Property of some AV and BV objects is commandable.

*3. Only Commandable objects support Priority_Array and Relinquish_Default.

The AV objects are divided into 'Commandable' and 'Read-only" cases.

- Commandable case: You can use Write_Serivce to access the Present_Value property of commandable AV objects. Therefore, the commandable AV objects are linking to the Control_Word and Pr_Word in VP3000.
- Read-only case: You can only use Read_Service to access the Present_Value property of read-only AV objects. Therefore, the read-only AV objects are linking to the Status_Word in VP3000.

The BV objects are divided into 'Commandable' and 'Read-only" cases.

- Commandable case: You can use Write_Serivce to access the Present_Value property of commandable BV objects. Therefore, the commandable BV objects are linking to the Control_Bit in VP3000.
- Read-only case: You can only use Read_Service to access the Present_Value property of read-only BV objects. Therefore, the read-only BV objects are linking to the Status_Bit in VP3000.

6-2-4-1 AnalogValue (AV) Object

- Commandable AnalogValue (AV) Object

  In VP3000, AV_000–AV_005 support the commandable Present_Value property. Meanwhile, these objects also support Priority_Arryay and Relinquish_Default properties. Therefore, we can use (multiple) Read_Serivce to access the data.

Object Number	R/W	Object Name	Object Description	Unit
AV 000	RW	AV 000	Frequency Reference Value	UNITS_HERTZ
AV 001	RW	AV 001	AO 0 Set Value	UNITS_PERCENT
AV 002	RW	AV 002	AO 1 Set Value	UNITS_PERCENT
AV 003	RW	AV 003	AO 10 Set Value	UNITS_PERCENT
AV 004	RW	AV 004	AO 11 Set Value	UNITS_PERCENT
AV 005	RW	AV 005	DO Set Value	UNITS_NO_UNITS

- Read-only AnalogValue (AV) Object

  In VP3000, AV_050–AV_073 support the read-only Present_Value property. Meanwhile, these objects do not support Priority_Array and Relinquish_Default properties.

Object Number	R/W	Object Name	Object Description	Unit
AV 050	R	AV 050	Display output frequency	UNITS_HERTZ
AV 051	R	AV 051	Display output torque	UNITS_PERCENT
AV 052	R	AV 052	Warn code	UNITS_NO_UNITS
AV 053	R	AV 053	Error code	UNITS_NO_UNITS
AV 054	R	AV 054	Display output current	UNITS_AMPERES
AV 055	R	AV 055	Display DC bus voltage	UNITS_VOLTS
AV 056	R	AV 056	Display output voltage of U, V, W	UNITS_VOLTS

Object Number	R/W	Object Name	Object Description	Unit
AV 057	R	AV 057	Display output power angle of U, V, W	UNITS_DEGREES_ANGULAR
AV 058	R	AV 058	Display actual output power of U, V, W	UNITS_KILOWATTS
AV 059	R	AV 059	Display the IGBT temperature	UNITS_DEGREES_CELSIUS
AV 060	R	AV 060	Display the temperature of capacitance	UNITS_DEGREES_CELSIUS
AV 061	R	AV 061	Display real carrier frequency of the drive	UNITS_KILOHERTZ
AV 062	R	AV 062	Display overload condition	UNITS_PERCENT
AV 063	R	AV 063	Display GND fail detect level	UNITS_PERCENT
AV 064	R	AV 064	Display DC bus voltage ripples	UNITS_VOLTS
AV 065	R	AV 065	Fan speed of the drive	UNITS_PERCENT
AV 066	R	AV 066	Output speed	UNITS_REVOLUTIONS_PER_MINUTE
AV 067	R	AV 067	KW per Hour	UNITS_KILOWATT_HOURS
AV 068	R	AV 068	Real multi-speed switch	UNITS_NO_UNITS
AV 069	R	AV 069	Digital input status	UNITS_NO_UNITS
AV 070	R	AV 070	Digital output status	UNITS_NO_UNITS
AV 071	R	AV 071	Corresponding CPU pin status of digital input	UNITS_NO_UNITS
AV 072	R	AV 072	Corresponding CPU pin status of digital output	UNITS_NO_UNITS
AV 073	R	AV 073	PLC D1043 value	UNITS_NO_UNITS

6-2-4-2 BinaryValue (BV) Object

- Commandable BinaryValue (BV) Object

  In VP3000, BV_000–BV_002 support the commandable Present_Value property. Meanwhile, these objects also support Priority_Array and Relinquish_Default properties. Therefore, we can use (multiple) Read_Serivce to access the data.

Object Number	R/W	Object Name	Object Description
BV 000	RW	BV 000	Run/Stop Cmd Inactive (0): FreqCmd = 0 Active (1): FreqCmd = FreqRefValue
BV 001	RW	BV 001	Fwd/Rev Cmd Inactive (0): Forward Active (1): Reverse
BV 002	RW	BV 002	Reset Cmd Inactive (0): Do nothing Active (1): Reset Fault

- Read-only BinaryValue (BV) Object

  In VP3000, BV_050–BV_053 support the read-only Present_Value property. Meanwhile, these objects do not support Priority_Array and Relinquish_Default properties.

Object Number	R/W	Object Name	Object Description
BV 050	R	BV 050	Run/Stop State Inactive (0): VFD Stop Active (1): VFD Running
BV 051	R	BV 051	Fwd/Rev State Inactive (0): Forward Active (1): Reverse
BV 052	R	BV 052	Warn state Inactive (0): No Warn Active (1): Occur Warn
BV 053	R	BV 053	Error State Inactive (0): No Error Active (1): Occur Error

Chapter 7 Second Development Platform

7-1 Specification of Second Development Platform

7-2 Introduction to the Functions of Instructions

7-3 The Setting of Initialization

7-4 The Examples for the External PID Function of PLC

7-1 Specification of Second Development Platform

Item	Specification	Remark
Algorithmic control method	Stored program, scanning back and forth	
Input / output control method	Batch processing method (when END instruction is executed), with input / output refresh instructions	
Algorithmic processing speed	Basic instructions (several μs)	Application instructions (1 to dozens of μs)
Programming language	Instruction list + Ladder diagram	
Program capacity	20000 steps	
Input / output contacts	Input (X): 6, output (Y): 4	These input / output contacts (on control board) are for VP3000, other series might be different.

Type	Device	Item		Range of use		Function
Relay (bit type)	X	External input relay		X0–X177, 128 points, octal number system	Total 256 points	Correspond to the external inputs
	Y	External output relay		Y0–Y177, 128 points, octal number system		Correspond to the external outputs
	M	Auxiliary relay	General use	M0–M999, 1000 points	Total 1360 points	The contacts can be switched ON / OFF withing the program
			Special purpose	M1000–M1359, 360 points		
	T	Timer	100 ms	T0–T159, 160 points	Total 160 points	For the timer specified by TMR instruction, the contacts correspond to T will be ON if the time reaches the setting.
	C	Counter	16-bit count up	C0–C79, 80 points	Total 80 points	For the counter specified by CNT instruction, the contacts correspond to C will be ON if the time reaches the setting.
Register (word)	T	Current value of timer		T0–T159, 160 points		The contacts of the timer are conducted when the time reaches the setting.
	C	Current value of counter		C0–T79, 16-bit counter, 80 points		The contacts of the counter are conducted when the count reaches the setting.
	D	Data register	Data retention	D0–D499, 500 points	Total 2920 points	As a memory area for data storage
			Special purpose	D1000–D1619, 620 points D2000–D2799, 800 points		
			General use	D3000–M3999, 1000 points		
Constant	K	Decimal	Single-byte	Setting range: K-32,768–K32,767		
			Double-byte	Setting range: K-2,147,483,648–K2,147,483,647		
	H	Hexadecimal	Single-byte	Setting range: H0000–HFFFF		
			Double-byte	Setting range: H00000000–HFFFFFFFF		

Type	Device	Item	Range of use	Function
Serial port (for writing / reading programs)			RS-485 / keypad port	
Analog input / output			Built-in three analog inputs and two analog outputs	
Function expansion module		Optional accessory	EMV-D42A; EMV-R6AA; EMV-A22A	

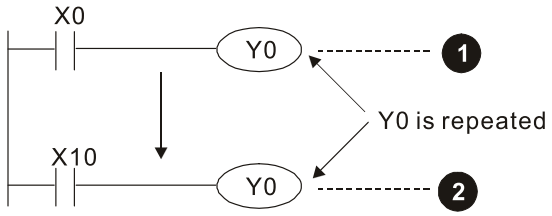
7-1-1 Introduction to Device Functions

Input / output contacts

Function of input contact X: the input contact X connects with an input device, and reads input signals entering the PLC. There is no limit to the number of times that contact A or B of each input contact X can be used in the program. The ON / OFF of input contact X only can change with the ON / OFF of input device; a peripheral device (WPLsoft) cannot be used to force input contact X to be ON / OFF.

Output contact Y

The task of output contact Y is to send an ON / OFF signal to drive the load connected with output contact Y. Output contacts are divided into two types: relay and transistor. There is no limit to the number of times that contact A or B of each output contact Y. It is recommended that the number of output coil Y is used only once in a program, otherwise the right to determine the output state when the PLC performs program scanning will be assigned to the program's final output Y circuit.



The output of Y0 will be decided by circuit ❷ ,
i.e. decided by ON/OFF of X10.

Numerical value, constant [K] / [H]

Constant	Single-byte	K	Decimal	K-32,768–K32,767
	Double-byte			K-2,147,483,648–K2,147,483,647
	Single-byte	H	Hexadecimal	H0000–HFFFF
	Double-byte			H00000000–HFFFFFFFF

PLC can use five types of numerical values to implement calculations based on its control tasks; the following content is explanations of the tasks and functions of different numerical values.

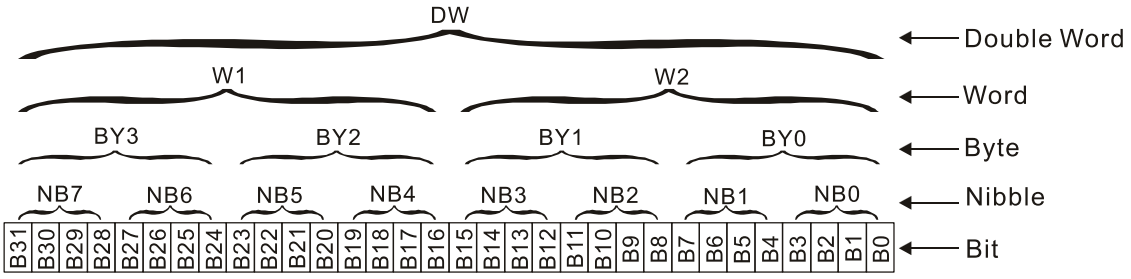
- Binary Number (BIN)

  PLC's numerical operations and memory use binary numbers. Binary values and related terms are as follows:

bit	Bit is the fundamental unit of binary system, and its state is either 1 or 0
Nibble	Consist of four consecutive bits, e.g., b3–b0. To indicate a value which range between 0–9 in decimal or a value which range between 0–F in hexadecimal .

Byte	Consist of two consecutive nibbles, that is, eight bits, b7–b0. To indicate a value which range between 00–FF in hexadecimal.
Word	Consist of two consecutive bytes, that is, 16 bits, b15–b0. To indicate a value which range between 0000–FFFF in hexadecimal.
Double Word	Consist of two consecutive words, that is, 32 bits, b31–b0. To indicate a value which range between 00000000–FFFFFFFF in hexadecimal.

The bit, nibble, byte, word, and double word in a binary system:



- Octal Number (OCT)

  The external input and output terminals of DVP-PLC are numbered in octal format.

  Example:

  External input: X0–X7, X10–X17, ... (No. of device)

  External output: Y0–Y7, Y10–Y17, ... (No. of device)

- Decimal Number (DEC)

  The timing of decimal applications in PLC system is as follows:

  - As setting values for timer (T), counter (C), e.g., TMR C0 K50. (constant K)
  - The numbers of M, T, C, D devices, e.g., M10, T30. (No. of device)
  - As operands in application instructions, e.g., MOV K123 D0. (constant K)

- Binary-Coded Decimal (BCD)

  Take one nibble or four bits to indicate a decimal value, so that data of consecutive 16 bits can indicate a four-nibble decimal value. Mainly used in reading the input values from DIP switches or outputting the data to a 7-segment display.

- Hexadecimal Number (HEX)

  The timing of hexadecimal applications in PLC system is to use it as operands in application instructions, e.g., MOV H1A2B D0. (H constant)

- Constant K

  A decimal number in PLC system is generally preceded by K, e.g., K100 indicates that it is decimal, and the value is 100.

  Exception: if K is used with a X / Y / M / S device, a data in nibble, byte, word, or double word format will be formed. Example: K2Y10, K4M100. K1 represents a 4-bit combination, and K2–K4 represents 8-bit, 12-bit and 16-bit combinations individually.

- H Constant

  A hexadecimal number in PLC system is generally preceded by H, e.g., H100 indicates that it is hexadecimal, and the value is 100.

Auxiliary Relay

Like an output relay Y, an auxiliary relay M has an output coil and contacts A and B, and the number of times they can be used in a program is unrestricted. Users can use an auxiliary relay M to configure the control circuit but cannot use it to directly drive an external load. Auxiliary relay is divided into two types according to its characteristics, see the following content:

- General type: for this type of auxiliary relay, the state returns to OFF if power outage occurs in PLC operation, it is still OFF even power ON again.
- Special type: each special-purpose auxiliary relay has its own specific use. Do not use any undefined special purpose auxiliary relays

Timer

The unit of the timer is 100 ms, and the counting method is counting up. When the current value in the timer equals the setting value, the associated output coil is conducted. The setting value should be a K value in decimal and can be specified by the content of data register D.

The actual setting time of the timer = the unit of timer x setting value

Counter

If the counting pulse input signals of the counter are OFF→ON, when the current value in the counter equals the setting value, the associated output coil is conducted. The setting value should be a K value in decimal and can be specified by the content of data register D.

16-Bit counter C0–C79:

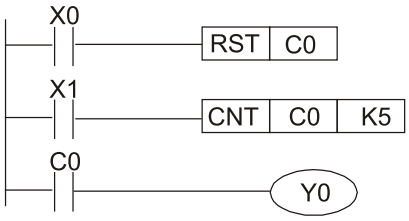
- The setting range of 16-bit counter: K0–K32,767. (K0 and K1 are identical, their output contacts are conducted immediately at the first counting)
- For general type counter, the current value is cleared when a power failure occurs in PLC.
- If a value greater than the setting value is transmitted to the register of C0 current value by using MOV instruction or WPLSoft, when X1 is OFF→ON in the next time, the contact of C0 counter becomes ON, and the current value becomes the same as the setting value.
- The setting value of counter can be set by using constant K directly, or by using the numeral value of register D (data register D1000–D1199 and D2000–D2799 are not included) indirectly.
- The setting value can only be positive if the constant K is used, and the setting value can be a positive or negative if the data register D is used. The current value changes from 32,767 to -32,768 as the counting continues to accumulate.

Features of Counter

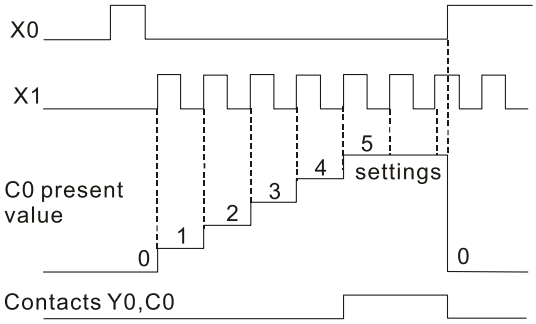
Item	16-bit counter
Type	General
Counting direction	Counting up
Setting value	0–32,767
Designation of setting value	Constant K or data register D
Change of the current value	The counting stops when it reaches the setting value.
Output contacts	The output contacts conduct and remain when the counting reaches the setting value.
Reset	The current value returns to zero when RST instruction is executed, and the contacts are also reset to OFF.
Action of contacts	Act at the end of the scanning.

Example:

LD	X0
RST	C0
LD	X1
CNT	C0, K5
LD	C0
OUT	Y0



1. When X0 = ON, RST instruction is executed, the current value of C0 returns to zero, and the output contacts are also reset to OFF.
2. When X1 is OFF→ON, the current value counts up (add 1).
3. When the counting of the counter C0 reaches the setting value K5, the contact of C0 is conducted, the current value of C0 = setting value = K5 C0 do not receive the trigger signal sent from X1 afterward, the current value of C0 remains at K5.



7-1-2 Device communication address of PLC

Device	Range of use	Type	Address (Hex)
X	00–37 (Octal)	bit	0400–041F
Y	00–37 (Octal)	bit	0500–051F
T	00–159	bit / word	0600–069F
M	000–999	bit	0800–0BE7
M	1000–1359	bit	0BE8–0D4F
C	0–79	bit / word	0E00–0E47
D	0–499	word	1000–11F3
D	1000–1619	word	13E8–1653
D	3000–3999	word	1BB8–1F9F

The available command codes

Command code	Function	Device
01	Read the status of Coil	Y, M, T, C
02	Read the status of input	X, Y, M, T, C
03	Read one piece of data	T, C, D
05	Force to change the status of one Coil	Y, M, T, C
06	Write one piece of data	T, C, D
0F	Force to change the status of multiple Coil	Y, M, T, C
10	Write multiple pieces of data	T, C, D

NOTE: When the built-in PLC function of VP3000 is activated, Modbus can visit the device information of built-in PLC and parameters of AC motor drive at the same time by the different addresses (default: AC motor drive is 1, built-in PLC is 2).

7-2 Introduction to the Functions of Instructions

7-2-1 Overview of basic instructions

Basic instructions

Instruction Code	Function	Operand	Execution Speed (μs)
LD	Load contact A	X, Y, M, T, C	0.8
LDI	Load contact B	X, Y, M, T, C	0.8
AND	Connect contact A in serial	X, Y, M, T, C	0.8
ANI	Connect contact B in serial	X, Y, M, T, C	0.8
OR	Connect contact A in parallel	X, Y, M, T, C	0.8
ORI	Connect contact B in parallel	X, Y, M, T, C	0.8
ANB	Connect a block in serial	N/A	0.3
ORB	Connect a block in parallel	N/A	0.3
MPS	PUSH operation to stack	N/A	0.3
MRD	POP operation to stack (the stack pointer stays intact)	N/A	0.3
MPP	POP operation to stack	N/A	0.3

Output instructions

Instruction Code	Function	Operand	Execution Speed (μs)
OUT	Drive coil	Y, M	1
SET	Maintain the action (ON)	Y, M	1
RST	Clear the contacts or register	Y, M, T, C, D	1.2

Timer, counter

Instruction Code	Function	Operand	Execution Speed (μs)
TMR	16-bit timer	T-K or T-D	1.1
CNT	16-bit counter	C-K or C-D (16-bit)	0.5

Master-Control Instructions

Instruction Code	Function	Operand	Execution Speed (μs)
MC	The connection between the contacts of common lists	N0–N7	0.4
MCR	Remove the connection between the contacts of common lists	N0–N7	0.4

Rising-Edge / Falling-Edge Contact Detection Instructions

Instruction Code	Function	Operand	Execution Speed (μs)
LDP	Rising edge detection	X, Y, M, T, C	1.1
LDF	Falling edge detection	X, Y, M, T, C	1.1
ANDP	Detect serial connection at rising edge	X, Y, M, T, C	1.1
ANDF	Detect serial connection at falling edge	X, Y, M, T, C	1.1
ORP	Detect parallel connection at rising edge	X, Y, M, T, C	1.1
ORF	Detect parallel connection at falling edge	X, Y, M, T, C	1.1

Differential Instructions

Instruction Code	Function	Operand	Execution Speed (μs)
PLS	Differential output at rising edge	Y, M	1.2
PLF	Differential output at falling edge	Y, M	1.2

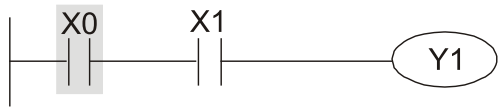
End Instruction

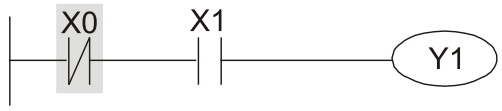
Instruction Code	Function	Operand	Execution Speed (μs)
END	Program end	N/A	0.2

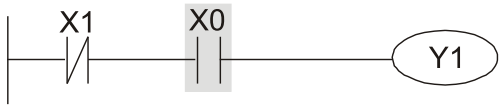
Other Instructions

Instruction Code	Function	Operand	Execution Speed (μs)
NOP	No operation	N/A	0.2
INV	Inverse operation result	N/A	0.2
P	Pointer	P	0.3

7-2-2 Instructions of basic instructions

Instruction	Function					
LD	Load contact A					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	LD instruction is used on the contact A that has its start from the left BUS bar or contact A that is the start of a contact circuit. The functions are to save the present contents and store the acquired contact status into the accumulative register.					
Example	Ladder diagram: 			Instruction code		Operation
				LD	**X0**	**Load X0 (the contact A)**
				AND	X1	Connect X1 (the contact A) in serial
				OUT	Y1	Drive Coil Y1

Instruction	Function					
LDI	Load contact B					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	LDI instruction is used on the contact B that has its start from the left BUS bar or contact B that is the start of a contact circuit. The functions are to save the present contents and store the acquired contact status into the accumulative register.					
Example	Ladder diagram: 			Instruction code		Operation
				LDI	**X0**	**Load X0 (the contact B)**
				AND	X1	Connect X1 (the contact A) in serial
				OUT	Y1	Drive Coil Y1

Instruction	Function					
AND	Connect contact A in serial					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	AND instruction is used in the serial connection of contact A. The functions are to read out the contacts' status of present serial connection and perform "AND" operation with the logical operation result obtained. The final result will be stored in the accumulative register.					
Example	Ladder diagram: 			Instruction code		Operation
				LDI	X1	Load X1 (the contact B)
				AND	**X0**	**Connect X0 (the contact A) in serial**
				OUT	Y1	Drive Coil Y1

Instruction	Function					
ANI	Connect contact B in serial					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ANI instruction is used in the serial connection of contact B. The functions are to read out the contacts' status of present serial connection and perform "AND" operation with the logical operation result obtained. The final result will be stored in the accumulative register.					

Example

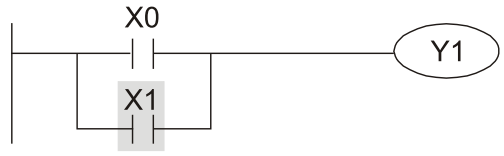
Ladder diagram:

Instruction code		Operation
LD	X1	Load X1 (the contact A)
ANI	**X0**	**Connect X0 (the contact B) in serial**
OUT	Y1	Drive Coil Y1

Instruction	Function					
OR	Connect contact A in parallel					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	OR instruction is used in the parallel connection of contact A. The functions are to read out the contacts' status of present serial connection and perform "OR" operation with the logical operation result obtained. The final result will be stored in the accumulative register.					

Example

Ladder diagram:

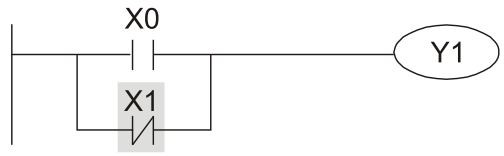


Instruction code		Operation
LD	X0	Load X0 (the contact A)
OR	**X1**	**Connect X1 (the contact A) in serial**
OUT	Y1	Drive Coil Y1

Instruction	Function					
ORI	Connect contact B in parallel					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ORI instruction is used in the parallel connection of contact B. The functions are to read out the contacts' status of present serial connection and perform "OR" operation with the logical operation result obtained. The final result will be stored in the accumulative register.					

Example

Ladder diagram:

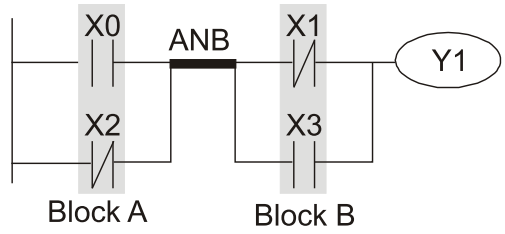


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ORI	**X1**	**Connect X1 (the contact B) in serial**
OUT	Y1	Drive Coil Y1

Instruction	Function
ANB	Connect a block in serial
Operand	N/A
Description	To perform “AND” operation of the previous saved logical result and the present content in the accumulative register.

Example

Ladder diagram:

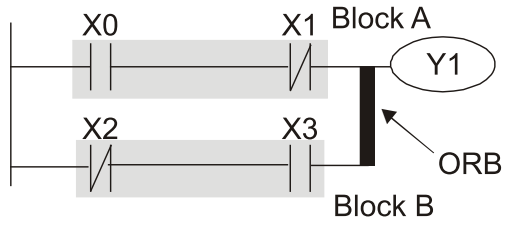


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ORI	X2	Connect X2 (the contact B) in parallel
LDI	X1	Load X1 (the contact B)
OR	X3	Connect X3 (the contact A) in parallel
ANB		**Connect a block in serial**
OUT	Y1	Drive Coil Y1

Instruction	Function
ORB	Connect a block in parallel
Operand	N/A
Description	To perform “OR” operation of the previous saved logical result and the present content in the accumulative register.

Example

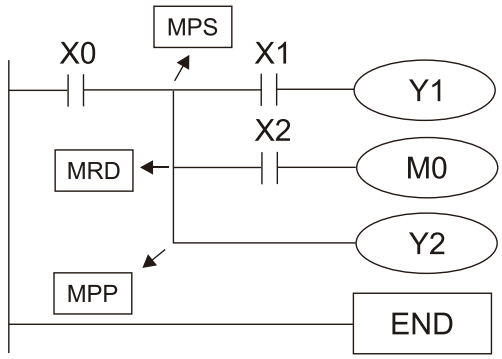
Ladder diagram:

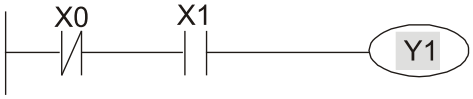


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ANI	X1	Connect X1 (the contact B) in parallel
LDI	X2	Load X2 (the contact B)
AND	X3	Connect X3 (the contact A) in parallel
ORB		**Connect a block in parallel**
OUT	Y1	Drive Coil Y1

Instruction	Function
MPS	PUSH operation to stack
Operand	N/A
Description	To save the content in the accumulative register into the stack. (the stack pointer plus 1)

Instruction	Function
MRD	POP operation to stack (the stack pointer stays intact)
Operand	N/A
Description	To read the stack and store it into the accumulative register. POP operation to stack (the stack pointer stays intact)

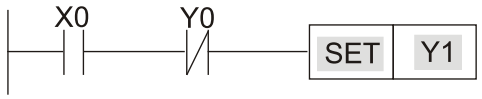
<table>
<tr><td>Instruction</td><td colspan="4">Function</td></tr>
<tr><td>MPP</td><td colspan="4">POP operation to stack</td></tr>
<tr><td>Operand</td><td colspan="4">N/A</td></tr>
<tr><td>Description</td><td colspan="4">To retrieve the previous saved logical result and store it into the accumulative register. (the stack pointer minus 1)</td></tr>
<tr><td>Example</td><td>Ladder diagram:
 
</td><td colspan="3"><table>
<tr><td>Instruction code</td><td></td><td>Operation</td></tr>
<tr><td>LD</td><td>X0</td><td>Load X0 (the contact A)</td></tr>
<tr><td>MPS</td><td></td><td>PUSH operation to stack</td></tr>
<tr><td>AND</td><td>X1</td><td>Connect X1 (the contact A) in serial</td></tr>
<tr><td>OUT</td><td>Y1</td><td>Drive Coil Y1</td></tr>
<tr><td>MRD</td><td></td><td>POP operation to stack (the stack pointer stays intact)</td></tr>
<tr><td>AND</td><td>X2</td><td>Connect X2 (the contact A) in serial</td></tr>
<tr><td>OUT</td><td>M0</td><td>Drive Coil M0</td></tr>
<tr><td>MPP</td><td></td><td>POP operation to stack</td></tr>
<tr><td>OUT</td><td>Y2</td><td>Drive Coil Y2</td></tr>
<tr><td>END</td><td></td><td>Program end</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Instruction</td><td colspan="6">Function</td></tr>
<tr><td>OUT</td><td colspan="6">Drive coil</td></tr>
<tr><td rowspan="2">Operand</td><td>X0–X17</td><td>Y0–Y17</td><td>M0–M799</td><td>T0–159</td><td>C0–C79</td><td>D0–D399</td></tr>
<tr><td>-</td><td>✓</td><td>✓</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Description</td><td colspan="6">To output the logical operation result before OUT instruction into a designated device.
Action of the Coil contact:
<table>
<tr><td rowspan="3">Operation result</td><td colspan="3">OUT instruction</td></tr>
<tr><td rowspan="2">Coil</td><td colspan="2">Contact</td></tr>
<tr><td>Contact A (Normally Open)</td><td>Contact B (Normally Close)</td></tr>
<tr><td>FALSE</td><td>OFF</td><td>Not conducting</td><td>Conducting</td></tr>
<tr><td>TRUE</td><td>ON</td><td>Conducting</td><td>Not conducting</td></tr>
</table></td></tr>
<tr><td>Example</td><td colspan="2">Ladder diagram:
 
</td><td colspan="3"><table>
<tr><td>Instruction code</td><td></td><td>Operation</td></tr>
<tr><td>LDI</td><td>X0</td><td>Load X0 (the contact B)</td></tr>
<tr><td>AND</td><td>X1</td><td>Connect X1 (the contact A) in parallel</td></tr>
<tr><td>OUT</td><td>Y1</td><td>Drive Coil Y1</td></tr>
</table></td></tr>
</table>

Instruction	Function					
SET	Maintain the action (ON)					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	-	✓	✓	-	-	-
Description	When the SET instruction is driven, its designated device will be “ON” and keep being ON both when SET instruction is still being driven or not driven. Use RST instruction to set the device to be OFF.					

Example

Ladder diagram:



Instruction code		Operation
LD	X0	Load X0 (the contact A)
ANI	Y0	Connect Y0 (the contact B) in parallel
SET	**Y1**	**Maintain the action (ON)**

Instruction	Function					
RST	Clear the contacts or register					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	-	✓	✓	✓	✓	✓

Description

When the RST instruction is driven, the actions of the designated devices are:

Device	Status
Y, M	Coil and contacts are set to “OFF”.
T, C	The current value of the timer or the counter are set to “0”, the coil and the contacts are set to “OFF”.
D	The value is set to “0”.

If RST instruction is not being executed, the status of the designated device stays intact.

Example

Ladder diagram:

Instruction code		Operation
LD	X0	Load X0 (the contact A)
RST	**Y5**	**Clear the contacts or register**

Instruction	Function	
TMR	16-bit timer	
Operand	T-K	T0–T159, K0–K32,767
	T-D	T0–T159, D0–D399

Description

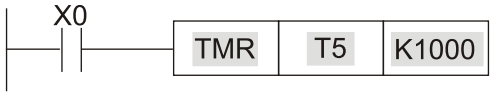
When TMR instruction is executed, the designated coil of the timer receives power, and the timer starts to count. When the counting reaches the setting value (current value ≥ setting value), the contact will be:

Normally Open (N.O.) contact	Closed
Normally Close (N.C.) contact	Open

If RST instruction is not being executed, the status of the designated device stays intact.

Example

Ladder diagram:



Instruction code		Operation
LD	X0	Load X0 (the contact A)
TMR	**T5 K1000**	**T5 Timer Setting value is K1000**

Instruction	Function	
CNT	16-bit counter	
Operand	C-K	C0–C79, K0–K32,767
	C-D	C0–C79, D0–D399

Description

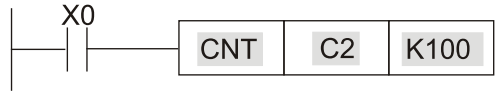
When CNT instruction goes from OFF→ON, the designated counter coil is from losing power→receiving power , and the current value in the counter plus 1. When the counting reaches the setting value (current value = setting value), the contact will be:

Normally Open (N.O.) contact	Closed
Normally Close (N.C.) contact	Open

If there are other counting pulses input after the counting reaches its target, the contact and current value stay intact. Use RST instruction to restart or reset the counting.

Example

Ladder diagram:



Instruction code		Operation
LD	X0	Load X0 (the contact A)
CNT	**C2 K100**	**C2 Counter Setting value is K100**

Instruction	Function
MC / MCR	The connection / disconnection between the contacts of common lists
Operand	N0–N7

Description

MC instruction is master-control start instruction. When MC instruction is executed, the execution of instructions between MC and MCR are not be interrupted. When MC instruction is OFF, the execution of instructions between MC and MCR are:

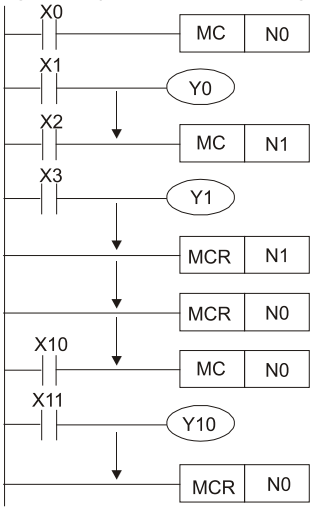
Instruction type	Description
General purpose timer	The value returns 0, the coil loses power, and no action for the contacts
Counter	The coil loses power, the value and the contacts stay intact
The coil driven by OUT instruction	None receives power
Devices driven by SET and RST instructions	Stay intact
Application instructions	All disabled

MCR is the master-control end instruction that is placed in the end of the master-control program. There should not be any contact instructions prior to MCR instruction.

MC-MCR master-control program instructions support the nested program structure (max. 8 layers) and use the instructions in the order N0–N7.

Example

Ladder diagram: (see the next page)



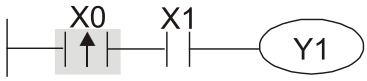
Instruction code		Operation
LD	X0	Load X0 (the contact A)
MC	**N0**	**The connection of the NO common serial contacts**
LD	X1	Load X1 (the contact A)
OUT	Y0	Drive Coil Y0
⋮		
LD	X2	Load X2 (the contact A)
MC	**N1**	**The connection of the N1 common serial contacts**
LD	X3	Load X3 (the contact A)

		OUT	Y1	Drive Coil Y1
		⋮		
		MCR	**N1**	**Remove the connection of the N1 common serial contacts**
		⋮		
		MCR	**N0**	**Remove the connection of the N0 common serial contacts**
		⋮		
		LD	X10	Load X10 (the contact A)
		MC	**N0**	**The connection of the NO common serial contacts**
		LD	X11	Load X11 (the contact A)
		OUT	Y10	Drive Coil Y10
		⋮		
		MCR	**N0**	**Remove the connection of the N0 common serial contacts**

Instruction	Function					
LDP	Rising edge detection					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	The method of using LDP is the same as using LD, but the actions of the two instructions differ. LDP saves the current content and store the detected status of rising-edge to the accumulative register.					

Example

Ladder diagram:



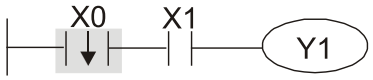
Instruction code		Operation
LDP	**X0**	**Rising edge of X0 detection starts**
AND	X1	Connect X1 (the contact A) in serial
OUT	Y1	Drive Coil Y1

Remark	See the specification of each model for the range of operands. If the status of a designated rising-edge is ON before the PLC is powered, the contact of the rising-edge is TRUE after PLC is powered.

Instruction	Function					
LDF	Falling edge detection					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	The method of using LDF is the same as using LD, but the actions of the two instructions differ. LDF saves the current content and store the detected status of falling-edge to the accumulative register.					

Example

Ladder diagram:

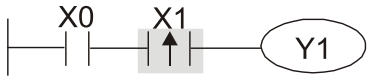


Instruction code		Operation
LDF	**X0**	**Falling edge of X0 detection starts**
AND	X1	Connect X1 (the contact A) in serial
OUT	Y1	Drive Coil Y1

Instruction	Function					
ANDP	Detect serial connection at rising edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ANDP instruction is used in the serial connection of the contacts' rising-edge detection					

Example

Ladder diagram:

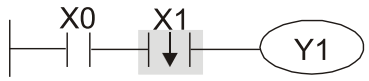


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ANDP	**X1**	**Detect serial connection at rising edge of X1**
OUT	Y1	Drive Coil Y1

Instruction	Function					
ANDF	Detect serial connection at falling edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ANDP instruction is used in the serial connection of the contacts' rising-edge detection					

Example

Ladder diagram:

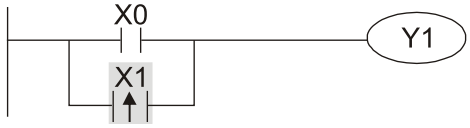


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ANDF	**X1**	**Detect serial connection at falling edge of X1**
OUT	Y1	Drive Coil Y1

Instruction	Function					
ORP	Detect parallel connection at rising edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ORP instruction is used in the parallel connection of the contacts' rising-edge detection					

Example

Ladder diagram:

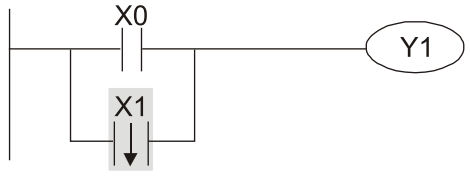


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ORP	**X1**	**Detect parallel connection at rising edge of X1**
OUT	Y1	Drive Coil Y1

Instruction	Function					
ORF	Detect parallel connection at falling edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	✓	✓	✓	✓	✓	-
Description	ORF instruction is used in the parallel connection of the contacts' falling-edge detection					

Example

Ladder diagram:

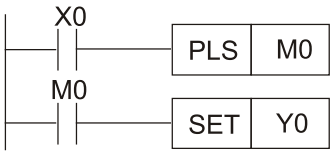


Instruction code		Operation
LD	X0	Load X0 (the contact A)
ORF	**X1**	**Detect parallel connection at falling edge of X1**
OUT	Y1	Drive Coil Y1

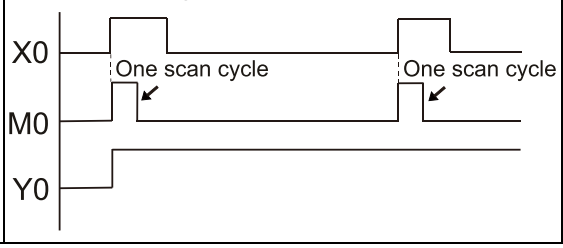
Instruction	Function					
PLS	Differential output at rising edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	-	✓	✓	-	-	-
Description	Differential output at rising edge instruction. When X0 goes from OFF→ON (the rising-edge is triggered), PLS instruction is executed, M0 sends pulses once and the pulse length is one scanning time.					

Example

Ladder diagram:



Sequence diagram:

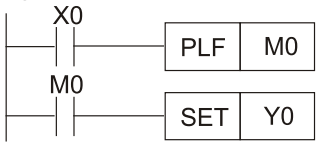


Instruction code		Operation
LD	X0	Load X0 (the contact A)
PLS	**M0**	**Differential output at rising edge of M0**
LD	M0	Load M0 (the contact A)
SET	Y0	Maintain the action of Y0 (ON)

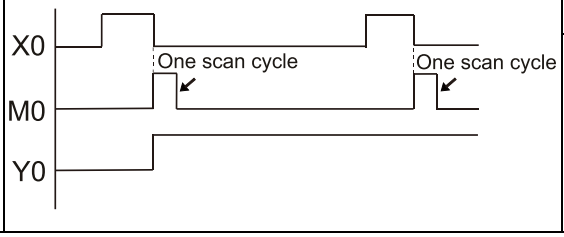
Instruction	Function					
PLF	Differential output at falling edge					
Operand	X0–X17	Y0–Y17	M0–M799	T0–159	C0–C79	D0–D399
	-	✓	✓	-	-	-
Description	Differential output at falling edge instruction. When X0 goes from ON→OFF (the falling-edge is triggered), PLF instruction is executed, M0 sends pulses once and the pulse length is one scanning time.					

Example

Ladder diagram:



Sequence diagram:



Instruction code		Operation
LD	X0	Load X0 (the contact A)
PLF	**M0**	**Differential output at falling edge of M0**
LD	M0	Load M0 (the contact A)
SET	Y0	Maintain the action of Y0 (ON)

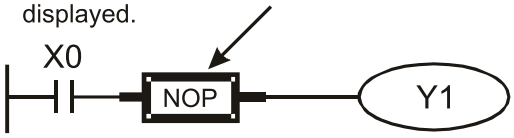
Instruction	Function
END	Program end
Operand	N/A
Description	END instruction has to be placed in the end of a ladder diagram or instruction program. PLC scans from address 0 to END instruction, and then return to address 0 to restart the scan.

Instruction	Function
NOP	No operation
Operand	N/A
Description	NOP instruction does not perform any operations in the program; therefore, after the execution of NOP, the existing logical operation result will be kept. If you want to delete a certain instruction without altering the length of the program, you can use NOP instruction.

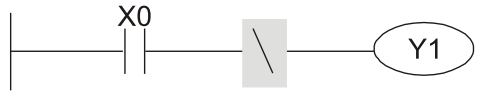
Example

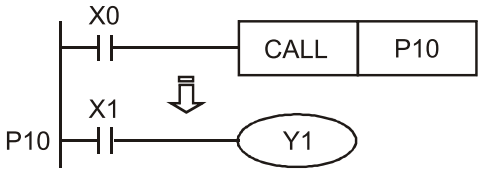
Ladder diagram:

NOP command will be simplified and not displayed when the ladder diagram is displayed.



Instruction code		Operation
LD	X0	Load X0 (the contact B)
NOP		**No operation**
OUT	Y1	Drive Coil Y1

<table>
<tr><td>Instruction</td><td colspan="3">Function</td></tr>
<tr><td>INV</td><td colspan="3">Inverse operation result</td></tr>
<tr><td>Operand</td><td colspan="3">N/A</td></tr>
<tr><td>Description</td><td colspan="3">Invert the logical operation result before INV instruction and store it in the accumulative register.</td></tr>
<tr><td rowspan="5">Example</td><td rowspan="5">Ladder diagram:
 
</td><td>Instruction code</td><td></td><td>Operation</td></tr>
<tr><td>LD</td><td>X0</td><td>Load X0 (the contact B)</td></tr>
<tr><td>INV</td><td></td><td>Inverse operation result</td></tr>
<tr><td>OUT</td><td>Y1</td><td>Drive Coil Y1</td></tr>
</table>

<table>
<tr><td>Instruction</td><td colspan="3">Function</td></tr>
<tr><td>P</td><td colspan="3">Pointer</td></tr>
<tr><td>Operand</td><td colspan="3">P0–P255</td></tr>
<tr><td>Description</td><td colspan="3">Pointer P is used for call instruction API 01 CALL of subprogram. The use of P does not need to start from number 0, and the number cannot be used repeatedly; otherwise, unexpected errors may occur.</td></tr>
<tr><td rowspan="8">Example</td><td rowspan="8">Ladder diagram:
 
</td><td>Instruction code</td><td></td><td>Operation</td></tr>
<tr><td>LD</td><td>X0</td><td>Load X0 (the contact A)</td></tr>
<tr><td>CALL</td><td>P10</td><td>CALL instruction reaches P10</td></tr>
<tr><td>⋮</td><td></td><td></td></tr>
<tr><td>P10</td><td></td><td>Pointer P10</td></tr>
<tr><td>LD</td><td>X1</td><td>Load X1 (the contact A)</td></tr>
<tr><td>OUT</td><td>Y1</td><td>Drive Coil Y1</td></tr>
</table>

7-2-3 Overview of application instructions

Category	API	Instruction Code		P Instruction	Function	Steps	
		16-bit	32-bit			16-bit	32-bit
Loop Control	01	CALL	-	✓	Call subprograms	3	-
	02	SRET	-	-	Subprograms end	1	-
	06	FEND	-	-	Main programs end	1	-
	08	FOR	-	-	Start of a FOR-NEXT loop	3	
	09	NEXT	-	-	End of a FOR-NEXT loop	1	
	317	BREAK	-	✓	Jump out of a FOR-NEXT loop	3	-
Transmission Comparison	10	CMP	DCMP	✓	Compare output value	7	13
	11	ZCP	DZCP	✓	Zone compares	9	17
	12	MOV	DMOV	✓	Move	5	9
	13	SMOV	-	✓	Shift move	11	-
	15	BMOV	-	✓	Block move	7	-
	18	BCD	DBCD	✓	Convert BIN to BCD	5	9
	19	BIN	DBIN	✓	Convert BCD to BIN	5	9
Arithmetic and Logical Operations	20	ADD	DADD	✓	BIN addition	7	13
	21	SUB	DSUB	✓	BIN subtraction	7	13
	22	MUL	DMUL	✓	BIN multiplication	7	13
	23	DIV	DDIV	✓	BIN division	7	13
	24	INC	DINC	✓	BIN increment (add one)	3	5
	25	DEC	DDEC	✓	BIN decrement (subtract one)	3	5
	26	WAND	DAND	✓	Logical operation with AND operator	7	13
	27	WOR	DOR	✓	Logical operation with OR operator	7	13
	28	WXOR	DXOR	✓	Logical operation with XOR operator	7	13
	29	NEG	DNEG	✓	2's complement (negative)	3	5
	114	MUL16	MUL32	✓	Multiplying binary numbers for 16-bit / 32-bit	7	13
	115	DIV16	DIV32	✓	Dividing binary numbers for 16-bit / 32-bit	7	13
Rotation & Displacement	30	ROR	DROR	✓	Rotate right	5	9
	31	ROL	DROL	✓	Rotate left	5	9
Data processing	40	ZRST	-	✓	Zone reset	5	-
	41	DECO	-	✓	Decode	7	-
	42	ENCO	-	✓	Encode	7	-
	43	SUM	DSUM	✓	Sum of active bits	5	9
	44	BON	DBON	✓	Check specified bit status	7	13
	45	MEAN	DMEAN	✓	Mean	7	13
	49	-	DFLT	✓	Convert BIN integer to binary floating-point number	-	9
Communication	150	MODRW	-	✓	Read / write Modbus data	7	-
Floating point operation	110	-	DECMP	✓	Binary floating-point number comparison	-	13
	111	-	DEZCP	✓	Binary floating-point number zone comparison	-	17
	116	-	DRAD	✓	Degree → Radian	-	9
	117	-	DDEG	✓	Radian → Degree	-	9
	120	-	DEADD	✓	Binary floating-point number addition	-	13
	121	-	DESUB	✓	Binary floating-point number subtraction	-	13

Category	API	Instruction Code		P Instruction	Function	Steps	
		16-bit	32-bit			16-bit	32-bit
	122	-	DEMUL	✓	Binary floating-point number multiplication	-	13
	123	-	DEDIV	✓	Binary floating-point number division	-	13
	124	-	DEXP	✓	Binary floating-point number exponentiation	-	9
	125	-	DLN	✓	Binary floating-point number natural logarithm operation	-	9
	127	-	DESQR	✓	Binary floating-point number square root	-	9
	129	-	DINT	✓	Binary floating-point number → BIN integer	-	9
	130	-	DSIN	✓	Binary floating-point number sine operation	-	9
	131	-	DCOS	✓	Binary floating-point number cosine operation	-	9
	132	-	DTAN	✓	Binary floating-point number tangent operation	-	9
	133	-	DASIN	✓	Binary floating-point number arcsine operation	-	9
	134	-	DACOS	✓	Binary floating-point number arccosine operation	-	9
	135	-	DATAN	✓	Binary floating-point number arctangent operation	-	9
	136	-	DSINH	✓	Binary floating-point number hyperbolic sine operation	-	9
	137	-	DCOSH	✓	Binary floating-point number hyperbolic cosine operation	-	9
	138	-	DTANH	✓	Binary floating-point number hyperbolic tangent operation	-	9
	172	-	DADDR	✓	Floating-point number addition	-	13
	173	-	DSUBR	✓	Floating-point number subtraction	-	13
	174	-	DMULR	✓	Floating-point number multiplication	-	13
	175	-	DDIVR	✓	Floating-point number division	-	13
Additional instruction	202	SCAL	-	✓	Proportional calculation	9	-
RTC (real-time clock)	160	TCMP	-	✓	Time comparison	11	-
	161	TZCP	-	✓	Time zone comparison	9	-
	162	TADD	-	✓	Time addition	7	-
	163	TSUB	-	✓	Time subtraction	7	-
	166	TRD	-	✓	Time read	3	-
Gray code	170	GRY	DGRY	✓	Binary code → Gray code	5	9
	171	GBIN	DGBIN	✓	Gray code → Binary code	5	9
Contact type logical operation	215	LD&	DLD&	-	Contact type logical operation LD#	5	9
	216	LD|	DLD|	-	Contact type logical operation LD#	5	9
	217	LD^	DLD^	-	Contact type logical operation LD#	5	9

Category	API	Instruction Code		P Instruction	Function	Steps	
		16-bit	32-bit			16-bit	32-bit
	218	AND&	DAND&	-	Contact type logical operation AND#	5	9
	219	ANDI	DANDI	-	Contact type logical operation AND#	5	9
	220	AND^	DAND^	-	Contact type logical operation AND#	5	9
	221	OR&	DOR&	-	Contact type logical operation OR#	5	9
	222	OR|	DOR|	-	Contact type logical operation OR#	5	9
	223	OR^	DOR^	-	Contact type logical operation OR#	5	9
Contact type comparison	224	LD =	DLD =	-	Contact type comparison LD※	5	9
	225	LD >	DLD >	-	Contact type comparison LD※	5	9
	226	LD <	DLD <	-	Contact type comparison LD※	5	9
	228	LD < >	DLD < >	-	Contact type comparison LD※	5	9
	229	LD < =	DLD < =	-	Contact type comparison LD※	5	9
	230	LD > =	DLD > =	-	Contact type comparison LD※	5	9
	232	AND =	DAND =	-	Contact type comparison AND※	5	9
	233	AND >	DAND >	-	Contact type comparison AND※	5	9
	234	AND <	DAND <	-	Contact type comparison AND※	5	9
	236	AND < >	DAND < >	-	Contact type comparison AND※	5	9
	237	AND < =	DAND < =	-	Contact type comparison AND※	5	9
	238	AND > =	DAND > =	-	Contact type comparison AND※	5	9
	240	OR =	DOR =	-	Contact type comparison OR※	5	9
	241	OR >	DOR >	-	Contact type comparison OR※	5	9
	242	OR <	DOR <	-	Contact type comparison OR※	5	9
	244	OR < >	DOR < >	-	Contact type comparison OR※	5	9
	245	OR < =	DOR < =	-	Contact type comparison OR※	5	9
	246	OR > =	DOR > =	-	Contact type comparison OR※	5	9
Floating-point contact type comparison	275	-	FLD =	-	Floating-point number contact type comparison LD※	-	9
	276	-	FLD >	-	Floating-point number contact type comparison LD※	-	9

Category	API	Instruction Code		P Instruction	Function	Steps	
		16-bit	32-bit			16-bit	32-bit
	277	-	FLD <	-	Floating-point number contact type comparison LD※	-	9
	278	-	FLD < >	-	Floating-point number contact type comparison LD※	-	9
	279	-	FLD < =	-	Floating-point number contact type comparison LD※	-	9
	280	-	FLD > =	-	Floating-point number contact type comparison LD※	-	9
	281	-	FAND =	-	Floating-point number contact type comparison AND※	-	9
	282	-	FAND >	-	Floating-point number contact type comparison AND※	-	9
	283	-	FAND <	-	Floating-point number contact type comparison AND※	-	9
	284	-	FAND < >	-	Floating-point number contact type comparison AND※	-	9
	285	-	FAND < =	-	Floating-point number contact type comparison AND※	-	9
	286	-	FAND > =	-	Floating-point number contact type comparison AND※	-	9
	287	-	FOR =	-	Floating-point number contact type comparison OR※	-	9
	288	-	FOR >	-	Floating-point number contact type comparison OR※	-	9
	289	-	FOR <	-	Floating-point number contact type comparison OR※	-	9
	290	-	FOR < >	-	Floating-point number contact type comparison OR※	-	9
	291	-	FOR < =	-	Floating-point number contact type comparison OR※	-	9
	292	-	FOR > =	-	Floating-point number contact type comparison OR※	-	9
Special instruction for drive	139	RPR	DRPR	✓	Read parameters of drive	5	9
	140	WPR	DWPR	✓	Write parameters of drive	5	9
	323	WPRA	DWPRA	✓	Write parameters of drive (in RAM only)	5	9
	142	FREQ	-	✓	Operation control for drive	7	-
	263	TORQ	-	✓	Set target torque	5	-

7-2-4 Instructions of application instructions

Instruction codes can be divided into 16-bit and 32-bit instructions. We prefix "D" to instruction code to indicate 32-bit instruction, and suffix “P” to instruction code to indicate a pulse executing instruction.

<table>
<tr><th>API</th><th colspan="3">Instruction Code</th><th colspan="10">Operand</th><th>Function</th></tr>
<tr><td>01</td><td></td><td>CALL</td><td>P</td><td colspan="10">S</td><td>Call subprograms</td></tr>
<tr><td colspan="4">Type / Operand</td><td colspan="3">Bit Devices</td><td colspan="7">Word Devices</td><td rowspan="2"></td></tr>
<tr><td colspan="4"></td><td>X</td><td>Y</td><td>M</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>T</td><td>C</td><td>D</td></tr>
<tr><td colspan="11">Caution for using operand
• Operand S can assign P
• Operand S of VP3000 can assign P0–P63</td><td>16-bit instruction (3 steps)
CALL | Continuous execution type | CALLP | Pulse execution type
32-bit instruction
- | - | - | -
Associated flag: none</td></tr>
<tr><td>Description</td><td colspan="14">● S: the pointer of the call subprogram
● Subprogram must be placed after FEND instruction.
● Subprogram must end with SRET instruction.
● Refer to the description and example of FEND instruction for more details.</td></tr>
</table>

API	Instruction Code	Operand	Function
02	**SRET**	-	Subprograms end

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D

Caution for using operand

- No operand
- No contact to drive the instruction is required.

16-bit instruction (1 step)

SRET	Continuous execution type	-	-

32-bit instruction

-	-	-	-

Associated flag: none

Description

- No contact to drive the instruction is required. Automatically returns program execution to the address after CALL instruction
- This instruction code indicates the end of subprogram. The subprogram returns to main program and begins the execution with the instruction after CALL instruction.
- Refer to the description and example of FEND instruction for more details.

API	Instruction Code	Operand	Function
06	**FEND**	-	Main programs end

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D

Caution for using operand

- No operand
- No contact to drive the instruction is required.

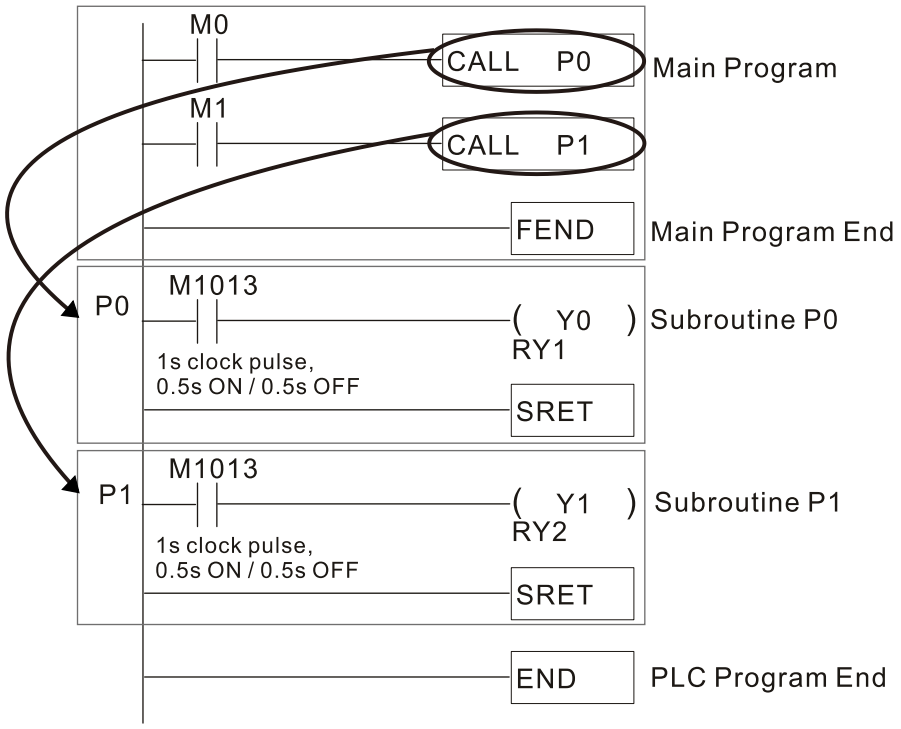
16-bit instruction (1 step)

FEND	Continuous execution type	-	-

32-bit instruction

-	-	-	-

Associated flag: none

Description	● This instruction code indicates the end of main program. It is the same as END instruction in PLC operation process. ● The subprogram of CALL instruction must be placed after FEND instruction, and each subprogram must end with SRET instruction. ● An END instruction is also required when using FEND instruction. But END instruction must be placed after main program and subprogram to the last.
CALL instruction program flow	

API	Instruction Code	Operand	Function
08	**FOR**	S	Start of a FOR-NEXT loop

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S							*	*	*	*	*

Caution for using operand

- No contact to drive the instruction is required.

16-bit instruction (3 steps)

FOR	Continuous execution type	-	-

32-bit instruction

-	-	-	-

Associated flag: none

Description	● S: the number of repeated nested loops ● The designated scope of FOR is K1–K32767 If N ≤ K1, then the programs in this FOR-NEXT loop will be ignored.

API	Instruction Code	Operand	Function
09	**NEXT**	-	End of a FOR-NEXT loop

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D

Caution for using operand

- No operand
- No contact to drive the instruction is required.

16-bit instruction (1 step)

NEXT	Continuous execution type	—	—

32-bit instruction

-	-	-	-

Associated flag: none

API	Instruction Code	Operand	Function
317	**BREAK** P	D	Jump out of a FOR-NEXT loop

Operand \ Type	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*	*	*	*

Caution for using operand

- Only escape the FOR-NEXT loop of the level
- After triggering, do not perform the operation from BREAK to NEXT of the level.

16-bit instruction (3 steps)

BREAK	Continuous execution type	BREAKP	Pulse execution type

32-bit instruction

-	-	-	-

Associated flag: none

Description

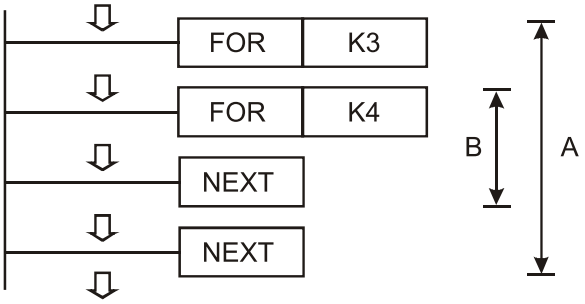
- D: the number of nested loops not completed (including the loop jumps out this time)
- An error occurs when:
  1. The number of instructions between FOR and NEXT differs.
  2. FOR and NEXT are not paring (the NEXT that appears first finds the closest FOR of it in front to pair, and the FOR and the NEXT have been paired cannot be paired for the following instruction).
  3. FEND or END is between the paired FOR-NEXT.
  4. BREAK is out of the paired FOR-NEXT.
- FOR-NEXT loops can be nested for maximum five levels. Be careful that if there are too many loops, the increased PLC scan time may cause timeout of watchdog timer and error. You can increase D1000 to change the time for watchdog
- The input variable of FOR must be positive (K1–K32767), otherwise FOR-NEXT program operation will be ignored.
- The number of FOR loop operation is mainly based on the input variable when the FOR operation is reached. The number will not be changed by changing the input value midway.
- When BREAK is triggered, the programs between this triggered BREAK and the NEXT of this level does not perform operation.

Example

Constants cannot be entered into FOR, the following examples are only for explanations.

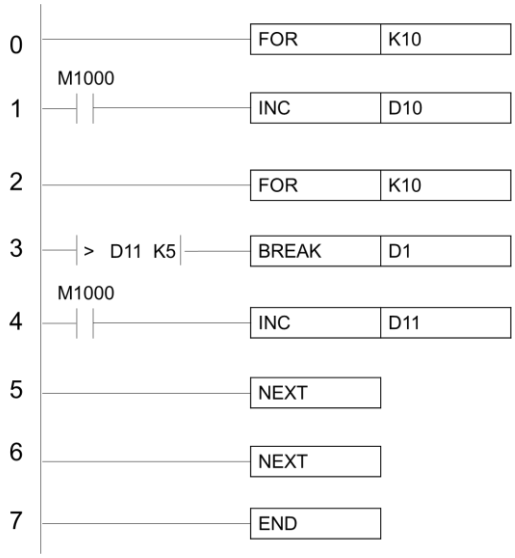
- Example 1

  After program A executes three times, the programs after NEXT continue to execute. Program B executes four times whenever program A executes once. Therefore, program B executes 3 x 4 = 12 times in total.



- Example 2

  When the programs between FOR-NEXT are not to be executed, you can use BREAK instruction to jump out. The following programs are two layers of loop (0–6, 2–5), when the program operation is finished: D10 = 10, D11 = 6, D1 = 10.



  D11 executes six times in the loop of second layer, D11 > 5, and then jumps out the loop of second layer to no.6, the rest of the number for D1 loop is five at the moment.

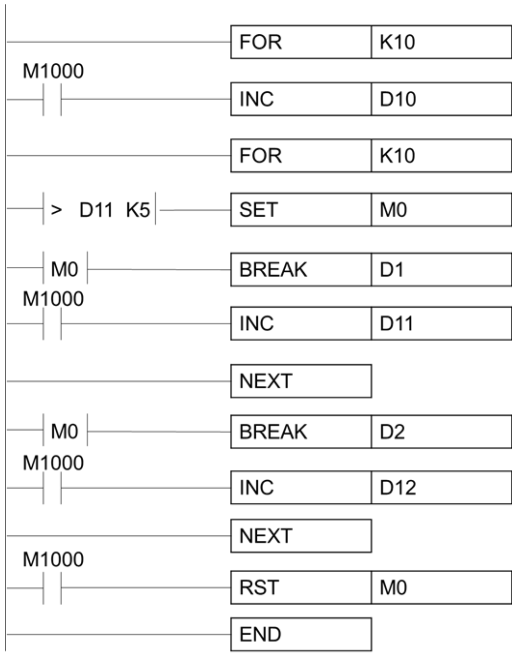
  Only jump out one layer of loop, so the operation will go back to no.1 and start.

  When enter the second layer of loop again, D11 > 5, so the loop jumps out directly. The rest of the number for D1 loop is 10.

  Repeat this until the end of the first layer of loop, D10 = 10.

- Example 3

  If you want the operation to jump out all layers of loops, it is recommended to set another flag and use BREAK after every NEXT. See the figure below, when the program operation is finished, D10 = 1, D11 = 6, D12 = 0, D1 = 5, D2 = 10.



API	Instruction Code	Operand	Function
10	D **CMP** P	S_1, S_2, D	Compare output value

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D		*	*								

Caution for using operand

- Operand D occupies 3 consecutive devices.

16-bit instruction (7 steps)

CMP	Continuous execution type	CMPP	Pulse execution type

32-bit instruction (13 steps)

DCMP	Continuous execution type	DCMPP	Pulse execution type

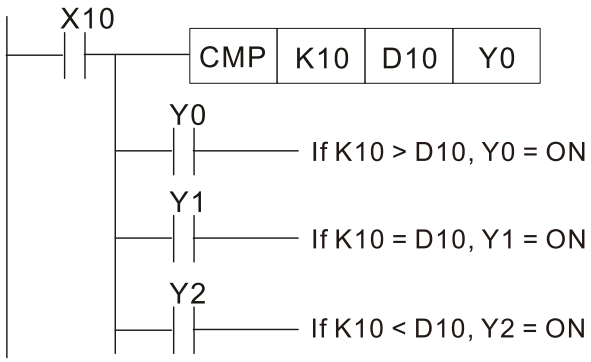
Associated flag: none

Description

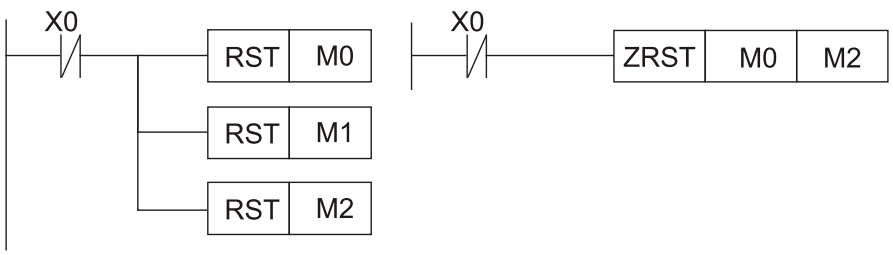
- S_1: comparison value 1
  S_2: comparison value 2
  D: comparison result
- Compare operand S_1 and S_2, and the comparison result is stored in D.
- The two comparison values are compared algebraically, and the two values are signed binary values. When b15 = 1 in 16-bit instruction, the comparison regards the value as negative binary values.

Example

- Designate device Y0, and operand D automatically occupies Y0, Y1, and Y2.
- When X10 = ON, CMP instruction is executed, and one of Y0, Y1, and Y2 will be ON. When X10 = OFF, CMP instruction is not executed, and Y0, Y1, and Y2 remain their status before X10 = OFF.
- If you need to obtain a comparison result with ≥, ≤, and ≠, make a serial-parallel connection between Y0–Y2.



- To clear the comparison result, use RST or ZRST instruction.



API	Instruction Code			Operand	Function
11	D	**ZCP**	P	S_1, S_2, S, D	Zone compares

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
S				*	*	*	*	*	*	*	*
D		*	*								

Caution for using operand

- The content in S_1 should be smaller than the content in S_2.
- Operand D occupies 3 consecutive devices.

16-bit instruction (9 steps)

ZCP	Continuous execution type	ZCPP	Pulse execution type

32-bit instruction (17 steps)

DZCP	Continuous execution type	DZCPP	Pulse execution type

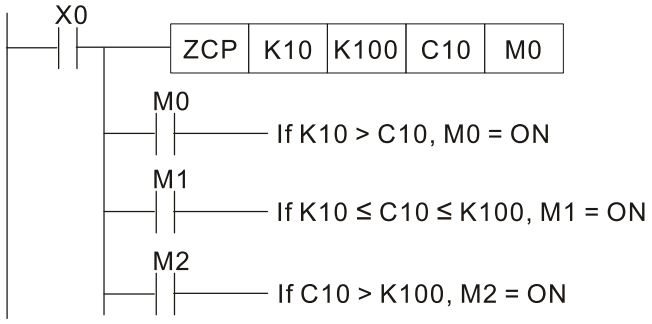
Associated flag: none

Description

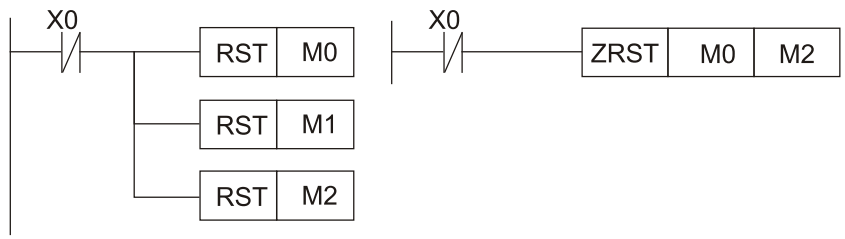
- S_1: lower bound of zone comparison
  S_2: upper bound of zone comparison
  S: comparison value
  D: comparison result
- S is compared with its S_1 and S_2, and the result is stored in D.
- When $S_1 > S_2$, the instruction performs comparison by using S_1 as the lower / upper bound.
- The two comparison values are compared algebraically, and the two values are signed binary values. When b15 = 1 in 16-bit instruction, the comparison regards the value as negative binary values.

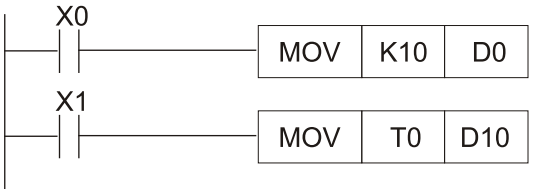
Example

- Designate device M0, and operand D automatically occupies M0, M1 and M2.
- When X0 = ON, ZCP instruction is executed, and one of M0, M1, and M2 will be ON. When X0 = OFF, ZCP instruction is not executed, and M0, M1, and M2 remain their status before X0 = OFF.
- If you need to obtain a comparison result with ≥, ≤, and ≠, make a serial-parallel connection between M0–M2.



- To clear the comparison result, use RST or ZRST instruction.



<table>
<tr><td>API</td><td colspan="3">Instruction Code</td><td colspan="11">Operand</td><td>Function</td></tr>
<tr><td>12</td><td>D</td><td colspan="2">MOV</td><td>P</td><td colspan="11">S, D</td><td>Move</td></tr>
<tr><td rowspan="2">Type / Operand</td><td colspan="4">Bit Devices</td><td colspan="7">Word Devices</td><td colspan="4" rowspan="2"></td></tr>
<tr><td>X</td><td>Y</td><td>M</td><td>K</td><td>H</td><td>KnX</td><td>KnY</td><td>KnM</td><td>T</td><td>C</td><td>D</td></tr>
<tr><td>S</td><td></td><td></td><td></td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td colspan="4" rowspan="3">16-bit instruction (5 steps)
MOV | Continuous execution type | MOVP | Pulse execution type</td></tr>
<tr><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td></tr>
<tr><td colspan="12" rowspan="2">Caution for using operand: none</td></tr>
<tr><td colspan="4">32-bit instruction (9 steps)
DMOV | Continuous execution type | DMOVP | Pulse execution type</td></tr>
<tr><td colspan="12"></td><td colspan="4">Associated flag: none</td></tr>
<tr><td>Description</td><td colspan="16">● S: source of data
D: destination of data
● When this instruction is executed, the content of S is moved directly to D. When this instruction is not executed, the content of D remains unchanged.</td></tr>
<tr><td>Example</td><td colspan="16">● When X0 = OFF, the content in D10 remains unchanged. If X0 = ON, the value K10 is moved to D10 data register.
● When X1 = OFF, the content in D10 remains unchanged. If X1 = ON, the current value T0 is moved to D10 data register.
 
</td></tr>
</table>

API	Instruction Code		Operand	Function
13	**SMOV**	P	S, m_1, m_2, D, n	Shift move

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S						*	*	*	*	*	*
m_1				*	*						
m_2				*	*						
D						*	*	*	*	*	*
n				*	*						

Caution for using operand

- M1168 can adjust BCD (OFF), BIN (ON) modes.

16-bit instruction (11 steps)

SMOV	Continuous execution type	SMOVP	Pulse execution type

32-bit instruction

-	-	-	-

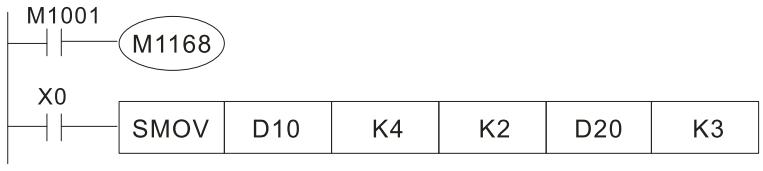
Associated flag: none

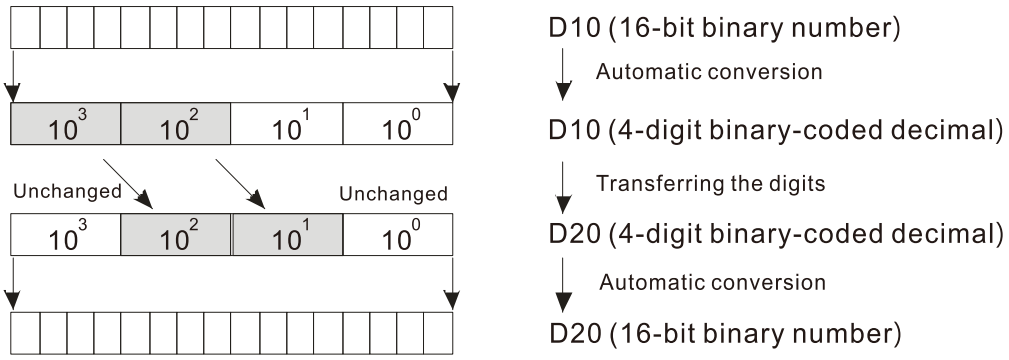
Description

- S: source of data
  m_1: start digit to be moved of the source data
  m_2: number of digits to be moved of the source data
  D: destination device
  n: start digit of the destination position for the moved digits
- BCD mode (M1168 = OFF): in this mode, SMOV enables to operate BCD number, the operation is similar to the way SMOV operates decimal numbers. That is to say, this instruction copies the designated digit of the operand S (a 4-digit BCD number) and send to the operand D (also a 4-digit BCD number).
- BIN mode (M1168 = ON): this instruction copies the designated digit of the operand S (a 4-digit decimal number) and send to the operand D (also a 4-digit decimal number). The current data on the target register will be covered.
- Scope of m_1: 1–4
- Scope of m_2: 1–m_1 (m_2 cannot be larger than m_1)
- Scope of n: m_2 –4 (n cannot be smaller than m_2)

Example

- Example 1
  1. When M1168 = OFF (BCD mode) and X0 = ON, transfer the two digit content that starts calculating from the 4th digit (means the thousands digit) of D10's decimal value to the two digit content that starts from the 3rd digit (means the hundreds digit) of D20's decimal number. 10^3 and 10^0 of D20 remain unchanged after this instruction is executed.
  2. When the BCD value exceeds the range of 0–9,999, PLC determines an operation error and will not execute the instruction. M1067, M1068 = ON, and D1067 records the error code OE18 (hex).

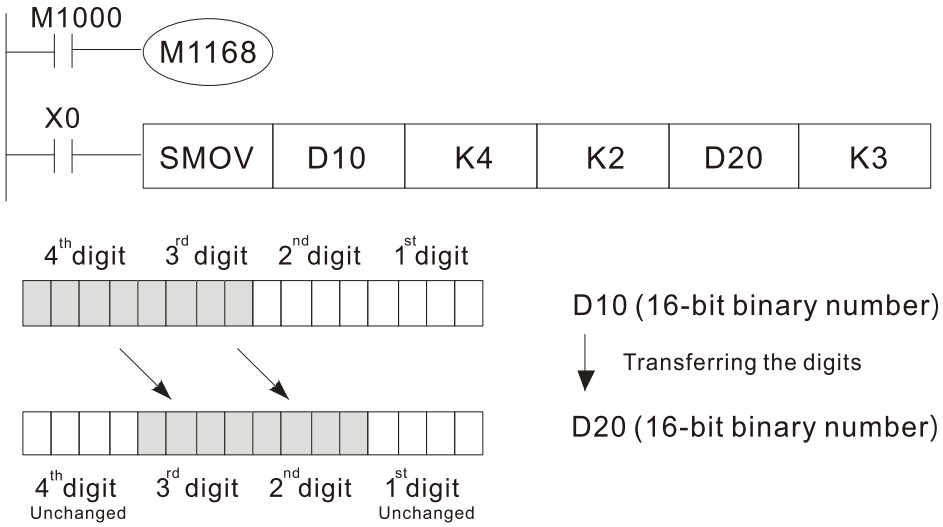




3. Before the execution, assume D10 = K1234 and D20 = K5678. After the execution, D10 remains unchanged and D20 becomes K5128.

- Example 2

When M1168 = ON (BIN mode) and use SMOV instruction, D10 and D20 does not be converted in BCD format but be moved in BIN format (4 digits as a unit).



API	Instruction Code	Operand	Function
15	**BMOV** P	S, D, n	Block move

Operand \ Type	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S						*	*	*	*	*	*
D							*	*	*	*	*
n				*	*				*	*	

16-bit instruction (7 steps)

BMOV	Continuous execution type	BMOVP	Pulse execution type

32-bit instruction

-	-	-	-

Caution for using operand

- Scope of n = 1–512

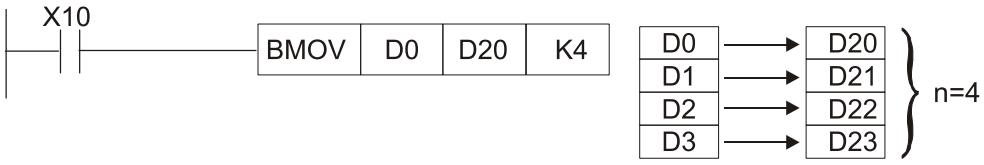
Associated flag: none

Description

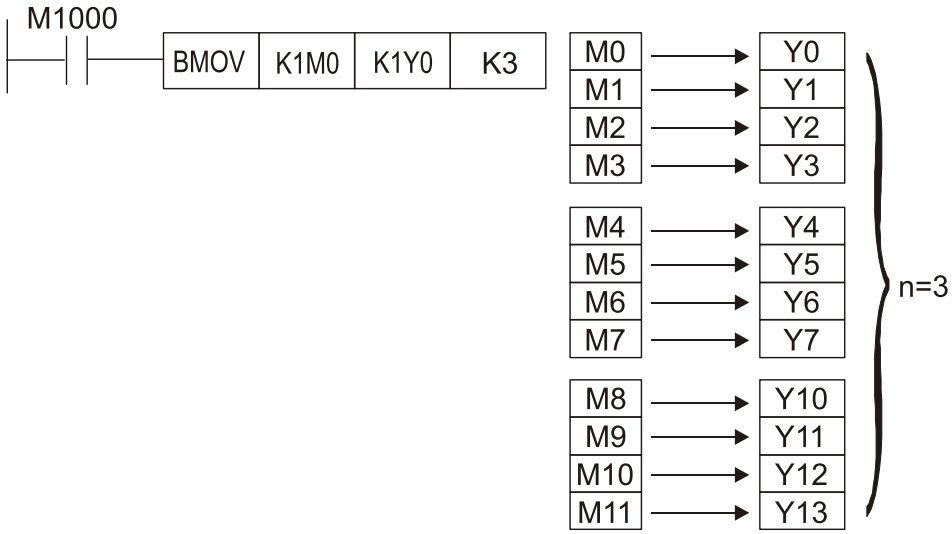
- S: start of source devices
  D: start of destination devices
  n: number of data to be moved
- The contents in n registers starting from the device designated by S is moved to n registers starting from the device designated by D. If n exceeds the actual number of available source devices, only the devices that fall within the valid range will be used.

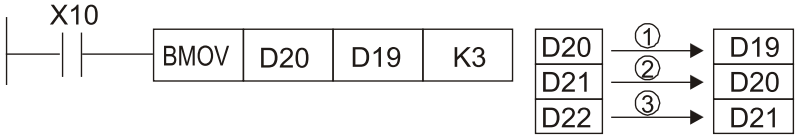
Example

- Example 1
  When X10 = ON, the contents of four registers of D1–D3 is moved to the four registers of D20–D23.



- Example 2
  Assume the bit devices KnX, KnY, and KnM are designated for moving, the number of digits of S and D has to be the same, that is, their n has to be the same.



	● Example 3 To avoid coincidence of the device numbers to be moved designated by the two operands and cause confusion, be aware of the arrangement on the designated device numbers, as shown below: When S > D, the instruction is processed following the order①→②→③.  When S < D, the instruction is processed following the order③→②→①.

API	Instruction Code			Operand	Function
18	D	**BCD**	P	S, D	Convert BIN to BCD

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S						*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- Scope of S is BIN: 0–9999

16-bit instruction (5 steps)

BCD	Continuous execution type	BCDP	Pulse execution type

32-bit instruction (9 steps)

DBCD	Continuous execution type	DBCDP	Pulse execution type

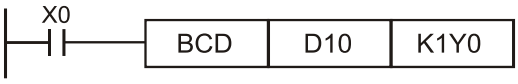
Associated flag: none

Description

- S: source of data
  D: destination of data
- The content in S (BIN value, 0–9999) is converted into BCD value and stored in D.
- Operand S, D use device F, and they can only use 16-bit instructions.

Example

- When X0 = ON, the binary value of D10 is converted into BCD value, and the unit digit of the conversion result is stored in K1Y0 (Y0–Y3, the 4 bit devices).



When D10 = 001E (Hex) = 0030 (decimal), the execution result is: Y0–Y3 = 0000 (BIN).

API	Instruction Code	Operand	Function
19	D **BIN** P	S, D	Convert BCD to BIN

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S						*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- Scope of S is BCD: 0–9,999, DBCD: 0–99,999,999

16-bit instruction (5 steps)

BIN	Continuous execution type	BINP	Pulse execution type

32-bit instruction (9 steps)

DBIN	Continuous execution type	DBINP	Pulse execution type

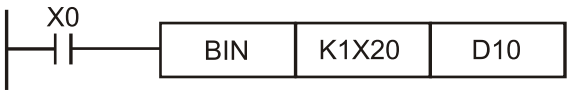
Associated flag: none

Description

- S: source of data
  D: conversion result
- The content in S (BCD value, 0–9999) is converted into BIN value and stored in D.
- The scope of valid value of S is BCD: 0–9,999, DBCD: 0–99,999,999
- Provided the content in S is not a BCD value, an operation error will occur.

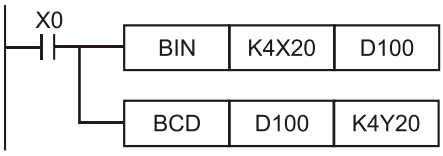
Example

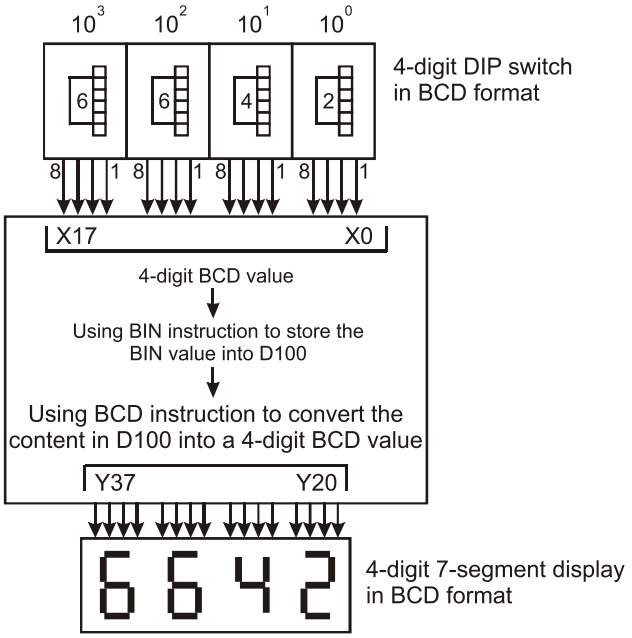
- When X0 = ON, the BCD value of K1X20 is converted to BIN value and stored in D10.



Remark

- When PLC needs to read an external DIP switch in BCD format, BIN instruction has to be first adopted to convert the read data into BIN value and store the data in PLC.
- When PLC needs to display its stored data by a 7-segment display in BCD format, BCD instruction has to be first adopted to convert the data into BCD value and send the data to the 7-segment display.
- When X0 = ON, the BCD value of K4X20 is converted into BIN value and sent it to D100. The BIN value of D100 will then be converted into BCD value and sent to K4Y20.





API	Instruction Code	Operand	Function
20	D **ADD** P	S_1, S_2, D	BIN addition

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (7 steps)

ADD	Continuous execution type	ADDP	Pulse execution type

32-bit instruction (13 steps)

DADD	Continuous execution type	DADDP	Pulse execution type

Associated flag:

M1020: Zero flag
M1021: Borrow flag
M1022: Carry flag
See the following descriptions.

Description

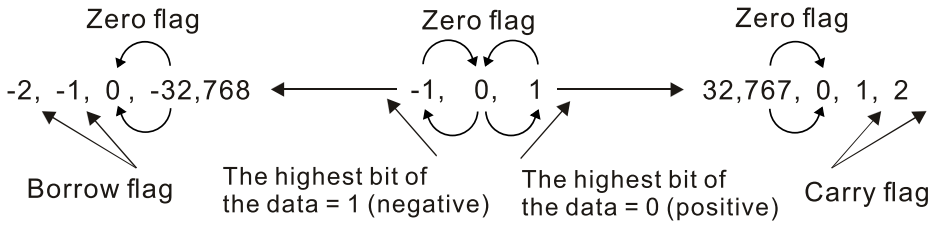
- S_1: summand
  S_2: addend
  D: sum
- This instruction adds S_1 and S_2 in BIN format and store the result in D.
- The highest bit is symbolic bit 0 (+) and 1 (-), which is suitable for algebraic addition, e.g., 3 + (-9) = -6.
- Flag changes in binary addition:
  1. If the operation result = 0, zero flag M1020 = ON.
  2. If the operation result < -32,768, borrow flag M1021 = ON.
  3. If the operation result > 32,767, carry flag M1022 = ON.

Example

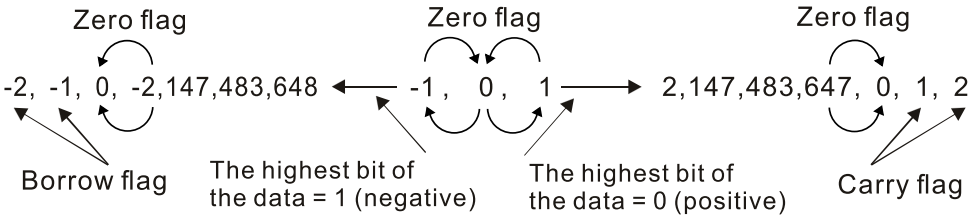
- In 16-bit BIN addition:
  When X0 = ON, the content in D0 plus the content in D10 and the sum is stored in D20.

Remark

- Flags and the positive / negative sign of the values:
  16-bit:



  32-bit:



API	Instruction Code			Operand	Function
21	D	**SUB**	P	S_1, S_2, D	BIN subtraction

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (7 steps)

SUB	Continuous execution type	SUBP	Pulse execution type

32-bit instruction (13 steps)

DSUB	Continuous execution type	DSUBP	Pulse execution type

Associated flag:

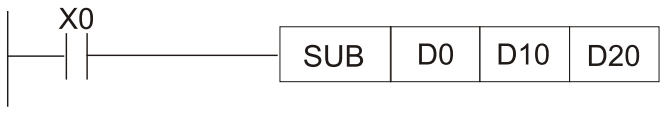
M1020: Zero flag
M1021: Borrow flag
M1022: Carry flag
See the following descriptions.

Description

- S_1: minuend
  S_2: subtrahend
  D: difference
- This instruction subtracts S_1 and S_2 in BIN format and stores the result in D.
- The highest bit is symbolic bit 0 (+) and 1 (-), which is suitable for algebraic subtraction.
- Flag changes in binary subtraction:
  1. If the operation result = 0, zero flag M1020 = ON.
  2. If the operation result < -32,768, borrow flag M1021 = ON.
  3. If the operation result > 32,767, carry flag M1022 = ON.

Example

- In 16-bit BIN subtraction:
  When X0 = ON, the content in D0 minus the content in D10 and the difference is stored in D20.



API	Instruction Code			Operand	Function
22	D	**MUL**	P	S_1, S_2, D	BIN multiplication

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- In 16-bit instruction, operand D occupies 2 consecutive devices.

16-bit instruction (7 steps)

MUL	Continuous execution type	MULP	Pulse execution type

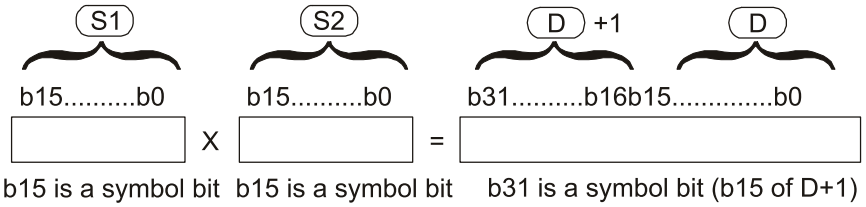
32-bit instruction (13 steps)

DMUL	Continuous execution type	DMULP	Pulse execution type

Associated flag: none

Description

- S_1: Multiplicand
  S_2: Multiplicator
  D: Product
- This instruction multiplies S_1 by S_2 in BIN format and stores the result in D.
- In 16-bit BIN multiplication,

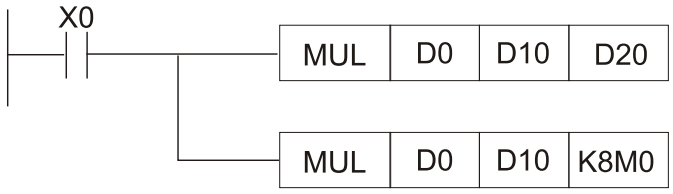


Symbol bit = 0 refers to a positive value
Symbol bit = 1 refers to a negative vlalue

When D serves as a bit device, it can designate K1–K4 and construct a 16-bit result, occupying consecutive 2 groups of 16-bit data.

Example

- The 16-bit D0 is multiplied by the 16-bit D10 and brings forth a 32-bit product. The higher 16 bits are stored in D21, and the lower 16-bit are stored in D20. ON / OFF of the most left bit indicates the positive / negative status of the result value.



API	Instruction Code			Operand	Function
23	D	**DIV**	P	S_1, S_2, D	BIN division

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- In 16-bit instruction, operand D occupies 2 consecutive devices.

16-bit instruction (7 steps)

DIV	Continuous execution type	DIVP	Pulse execution type

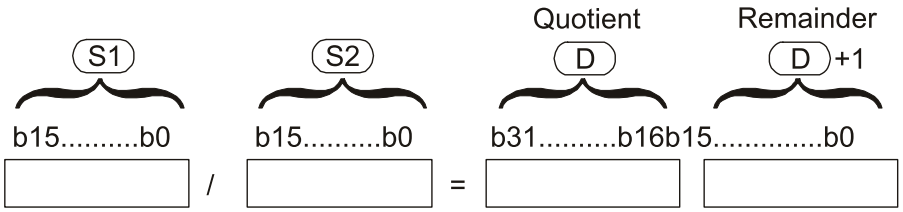
32-bit instruction (13 steps)

DDIV	Continuous execution type	DDIVP	Pulse execution type

Associated flag: none

Description

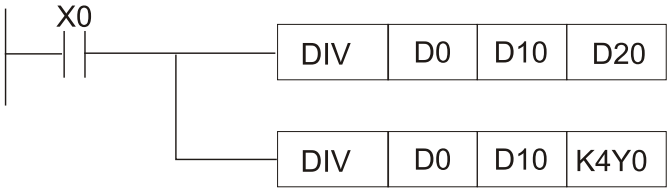
- S_1: Dividend
  S_2: Divisor
  D: Quotient and remainder
- This instruction divides S_1 and S_2 in BIN format and stores the result in D. Be careful with the positive / negative signs of S_1, S_2 and D when doing 16-bit operation.
- In 16-bit BIN division,



When D serves as a bit device, it can designate K1–K4 and construct a 16-bit result, occupying consecutive 2 groups of 16-bit data and bringing forth the quotient and remainder.

Example

- When X0 = ON, D0 is divided by D10, and the quotient will be stored in D20 and remainder in D21. ON / OFF of the highest bit indicates the positive / negative status of the result value.



API	Instruction Code			Operand	Function
24	D	**INC**	P	D	BIN increment (add one)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (3 steps)

INC	Continuous execution type	INCP	Pulse execution type

32-bit instruction (5 steps)

DINC	Continuous execution type	DINCP	Pulse execution type

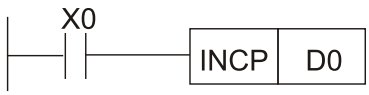
Associated flag: none

Description

- D: destination devices
- If the instruction is not a pulse execution one, the content in the designated device D will plus "1" in every scan period whenever the instruction is executed.
- This instruction adopts pulse execution instructions (INCP).
- In 16-bit operation, 32,767 plus 1 and obtains -32,768. In 32-bit operation, 2,147,483,647 plus 1 and obtains -2,147,483,648.

Example

- When X0 = OFF→ON, the content in D0 plus 1 automatically.



API	Instruction Code			Operand	Function
25	D	**DEC**	P	D	BIN decrement (subtract one)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*			

Caution for using operand: none

16-bit instruction (3 steps)

DEC	Continuous execution type	DECP	Pulse execution type

32-bit instruction (5 steps)

DECC	Continuous execution type	DDECP	Pulse execution type

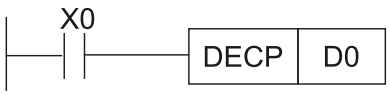
Associated flag: none

Description

- D: destination devices
- If the instruction is not a pulse execution one, the content in the designated device D will minus “1” in every scan period whenever the instruction is executed.
- This instruction adopts pulse execution instructions (DECP).
- In 16-bit operation, -32,768 minus 1 and obtains 32,767. In 32-bit operation, -2,147,483,648 minus 1 and obtains 2,147,483,647.

Example

- When X0 = OFF→ON, the content in D0 minus 1 automatically.



API	Instruction Code			Operand	Function
26	D	**WAND / DAND**	P	S_1, S_2, D	Logical operation with AND operator (16-bit) / logical operation with AND operator (32-bit)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (7 steps)

WAND	Continuous execution type	WANDP	Pulse execution type

32-bit instruction (13 steps)

DAND	Continuous execution type	DANDP	Pulse execution type

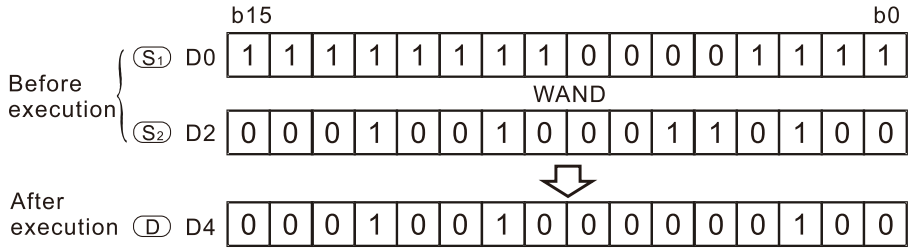
Associated flag: none

Description

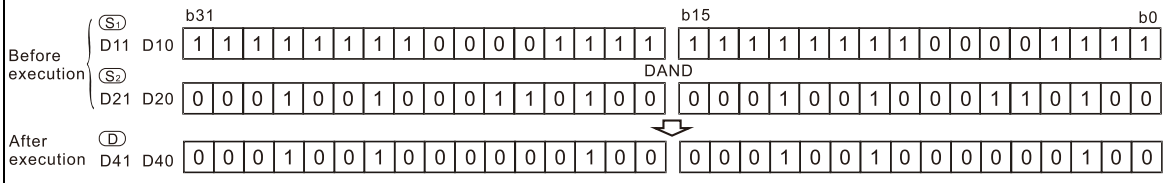
- S_1 source data device 1
  S_2 source data device 2
  D: operation result
- This instruction conducts logical AND operation of S_1 and S_2 and stores the result in D.
- The corresponding bit of the operation result in D will be “0” if any of the bits in S1 or S2 is “0”.

Example

- When X0 = ON,16-bit D0 and D2 perform WAND, logical AND operation, and the result will be stored in D4.



- When X1 = ON, 32-bit (D11, D10) and (D21, D20) perform DAND, logical AND operation, and the result will be stored in (D41, D40).



API	Instruction Code			Operand	Function
27		**WOR / DOR**	P	S_1, S_2, D	Logical operation with OR operator (16-bit) / logical operation with OR operator (32-bit)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (7 steps)

WOR	Continuous execution type	WORP	Pulse execution type

32-bit instruction (13 steps)

DOR	Continuous execution type	DORP	Pulse execution type

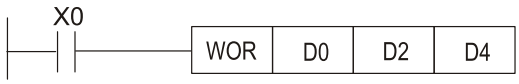
Associated flag: none

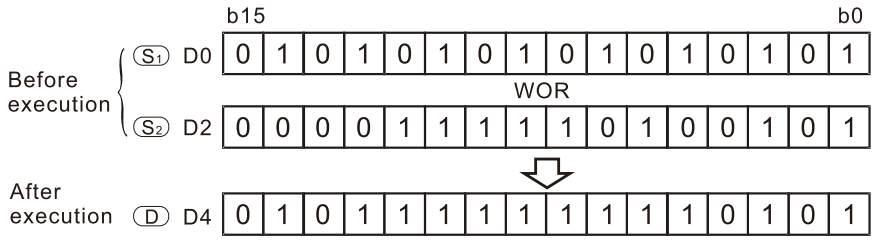
Description

- S_1 source data device 1
  S_2 source data device 2
  D: operation result
- This instruction conducts logical OR operation of S_1 and S_2 and stores the result in D.
- The corresponding bit of the operation result in D will be “0” if any of the bits in S1 or S2 is “0”.

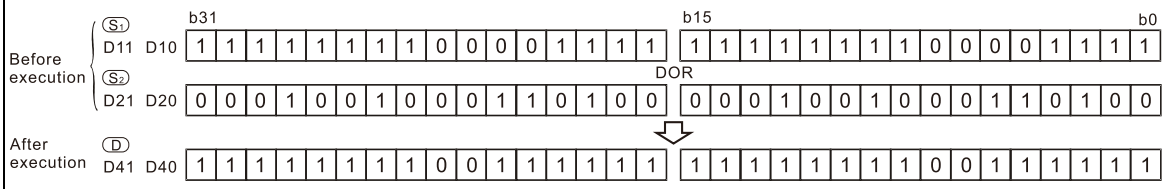
Example

- When X0 = ON,16-bit D0 and D2 perform WOR, logical OR operation, and the result will be stored in D4.





- When X1 = ON, 32-bit (D11, D10) and (D21, D20) perform DOR, logical OR operation, and the result will be stored in (D41, D40).



API	Instruction Code			Operand	Function
28	D	**WXOR / DXOR**	P	S_1, S_2, D	Logical operation with XOR operator (16-bit) / logical operation with XOR operator (32-bit)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (7 step)

WXOR	Continuous execution type	WXORP	Pulse execution type

32-bit instruction (13 steps)

DXOR	Continuous execution type	DXORP	Pulse execution type

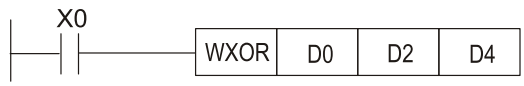
Associated flag: none

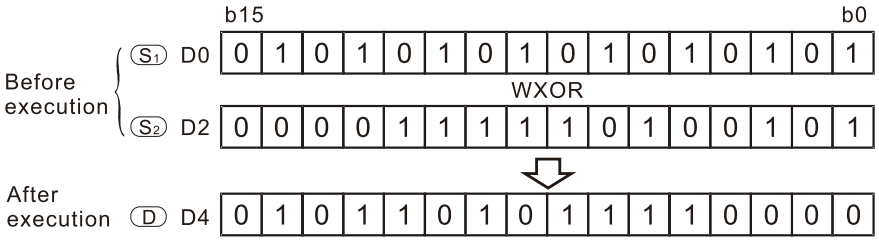
Description

- S_1 source data device 1
  S_2 source data device 2
  D: operation result
- This instruction conducts logical XOR operation of S_1 and S_2 and stores the result in D.
- If the bits in S_1 and S_2 are the same, the corresponding bit of the operation result in D will be "0";
  if the bits in S_1 and S_2 are different, the corresponding bit of the operation result in D will be "1".

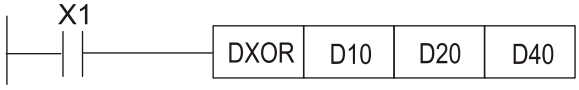
Example

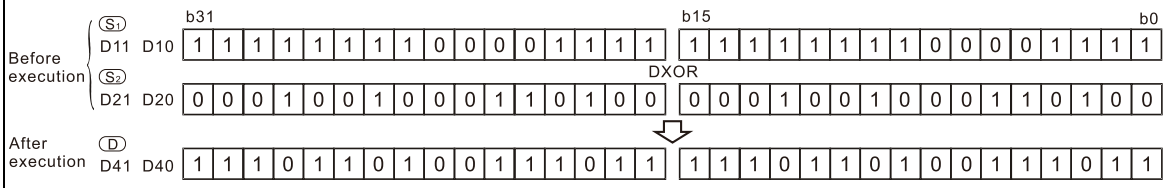
- When X0 = ON,16-bit D0 and D2 perform XWOR, logical XOR operation, and the result will be stored in D4.





- When X1 = ON, 32-bit (D11, D10) and (D21, D20) perform XDOR, logical XOR operation, and the result will be stored in (D41, D40).





API	Instruction Code			Operand	Function
29	D	**NEG**	P	D	2's complement (negative)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*	*	*	*

Caution for using operand: none

16-bit instruction (3 steps)

NEG	Continuous execution type	NEGP	Pulse execution type

32-bit instruction (5 steps)

DNEG	Continuous execution type	DNEGP	Pulse execution type

Associated flag: none

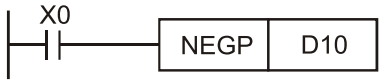
Description

- Device to store 2's complement
- Each bit in D is reverse (0 → 1, 1 → 0) at first, and then the least significant bit plus 1 and is stored in the original register. This instruction can be used for converting a negative BIN value into an absolute value.
- This instruction adopts pulse execution instructions (NEGP, DNEGP).
- Operand D uses device F, and they can only use 16-bit instructions.

Example

- Example 1

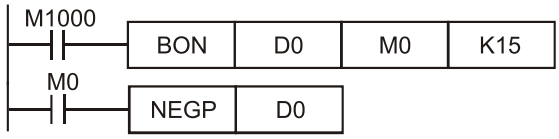
  When X0 goes from OFF → ON, each bit in D10 is reverse (0 → 1, 1 → 0) at first, and then the least significant bit plus 1 and is stored in D10.



- Example 2

  To obtain the absolute value of a negative value:

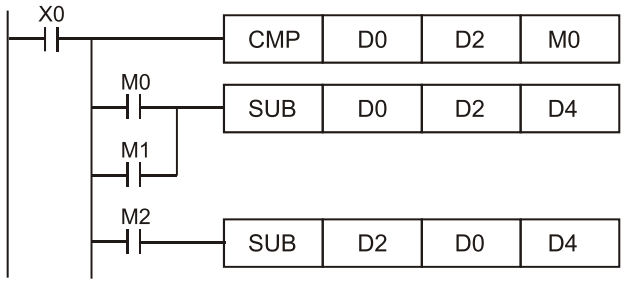
  1. When the 15th bit of D0 is "1", M0 = ON. (D0 is a negative value).
  2. When M0 = ON, the absolute value of D0 can be obtained by NEG instruction.



- Example 3

  Obtain the absolute value of the difference of the subtraction. When X0 = ON:

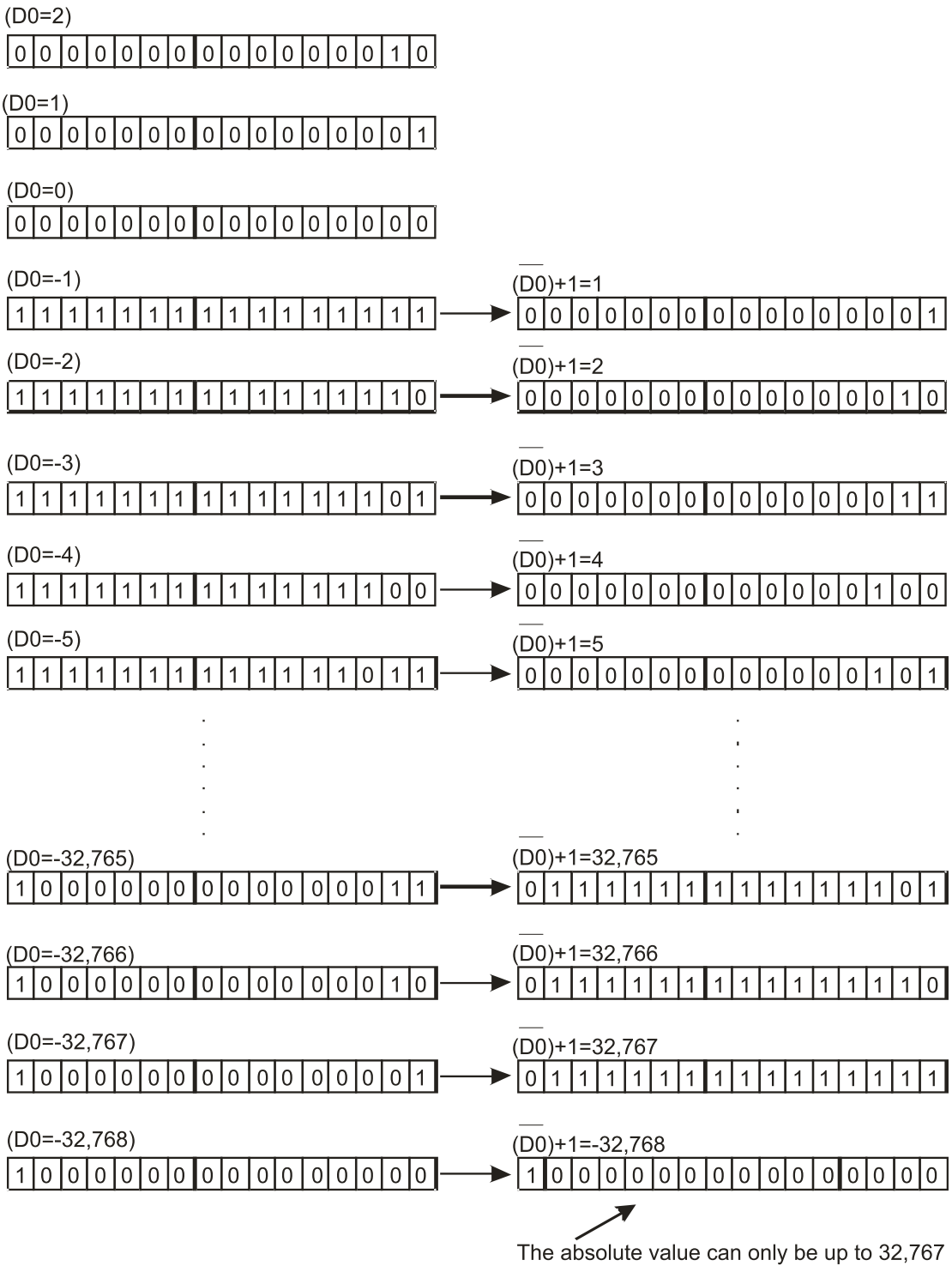
  1. If D0 > D2, M0 = ON.
  2. If D0 = D2, M1 = ON.
  3. If D0 < D2, M2 = ON.
  4. D4 is then able to remain positive.



Remark

- Negative value and its absolute value

1. The positive / negative numbers are represented by the leftmost bit of the register (MSB), MSB = 0 indicates the value is positive, and MSB = 1 indicates the value is negative.
2. NEG instruction is able to convert a negative value into its absolute value.



API	Instruction Code			Operand	Function
114		**MUL16 / MUL32**	P	S_1, S_2, D	Multiplying binary numbers for 16-bit / Multiplying binary numbers for 32-bit

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand: see the remark below

16-bit instruction (7 steps)

MUL	Continuous execution type	MULP	Pulse execution type

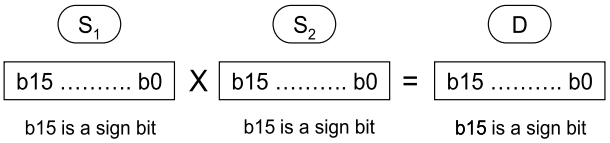
32-bit instruction (13 steps)

DMUL	Continuous execution type	DMULP	Pulse execution type

Associated flag: none

Description

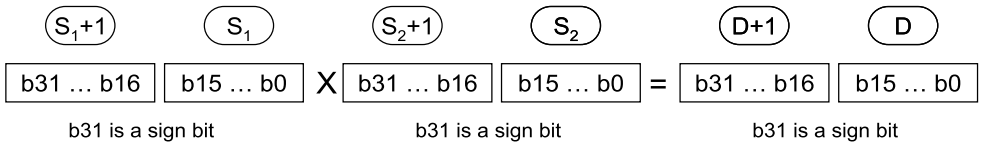
- S_1: Multiplicand
  S_2: Multiplicator
  D: Product
- MUL16 and MUL16P are 16-bit instructions. MUL32 and MUL32P are 32-bit instructions.
- The signed binary value in S_1 is multiplied by the signed binary value in S_2, and the product is stored in D. Notice that it is applicable to normal algebraic regulations.
- If the sign bit is 0, it represents a positive value. If the sign bit is 1, it represents a negative value.
- 16-bit BIN multiplication



16-bit value × 16-bit value = 16-bit value

When D serves as a bit device, it can designate K1–K4 and construct a 16-bit result, occupying one 16-bit data.

- 32-bit BIN multiplication

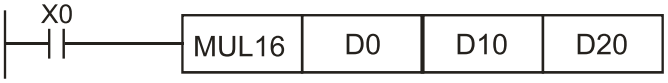


32-bit value × 32-bit value = 32-bit value

When D serves as a bit device, it can designate K1–K8 and construct a 32-bit result, occupying one 32-bit data.

Example

- The 16-bit value K100 in D0 is multiplied by the 16-bit value K200 in D10, and the product is stored in D20. Whether the value is positive or negative is indicated by OFF / ON of MSB. OFF indicates the positive value (0), and ON indicates the negative value (1).



16-bit value × 16-bit value = 16-bit value

⇨ D0 × D10 = D20

D0 = K100, D10 = K200, D20 = K20,000

Remark	● If the product of 16-bit multiplication exceeds the expressible range of 16-bit signed numbers, when the value is larger than the 16-bit maximum positive number (K32767) or when the value is smaller than the minimum negative number (K-32768), M1022 carry flag is ON, and only write the value of the lower 16 bits. ● If the multiplication result of the 16-bit instruction needs to obtain a complete value (recorded as 32-bit), use API22 MUL / MULP instruction instead. See this description for more details. ● If the product of 32-bit multiplication exceeds the expressible range of 32-bit signed numbers, when the value is larger than the 32-bit maximum positive number (K2147483647) or when the value is smaller than the minimum negative number (K-2147483648), M1022 carry flag is ON, and only write the value of the lower 32 bits. ● If the multiplication result of the 32-bit instruction needs to obtain a complete value (recorded as 64-bit), use API22 DMUL / DMULP instruction instead. See this description for more details.

API	Instruction Code			Operand	Function
115		**DIV16 / DIV32**	P	S_1, S_2, D	Dividing binary numbers for 16-bit / dividing binary numbers for 32-bit

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- If a remainder by 16-bit division should be recorded, use DIV / DIVP instruction instead.
- If a remainder by 32-bit division should be recorded, use DDIV / DDIVP instruction instead.

16-bit instruction (7 steps)

DIV16	Continuous execution type	DIV16P	Pulse execution type

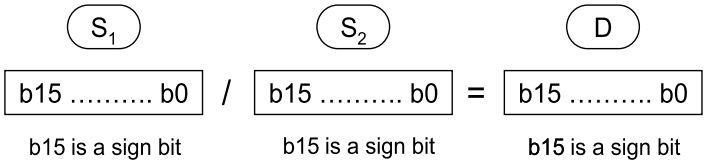
32-bit instruction (13 steps)

DDIV32	Continuous execution type	DDIV32P	Pulse execution type

Associated flag: none

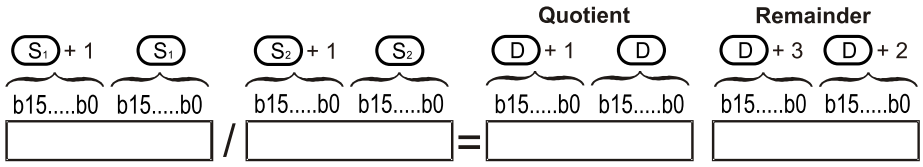
Description

- S_1: Dividend
  S_2: Divisor
  D: Quotient
- DIV16 and DIV16P are 16-bit instructions. DIV32 and DIV32P are 32-bit instructions.
- The singed binary value in S_1 is divided by the signed binary value in S_2, and the quotient is stored in D. It is not a normal algebraic regulation. Be careful with the positive / negative signs of S_1, S_2 and D when doing 16-bit and 32-bit operation.
- If the divisor is 0, the instruction will not be executed. M1067 and M1068 = ON, and the error code in D1067 is H0E19.
- In 16-bit BIN division,



When D serves as a bit device, it can designate K1–K4 and construct a 16-bit result, occupying a 16-bit quotient.

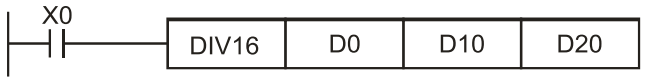
- In 32-bit BIN division,



When D serves as a bit device, it can designate K1–K8 and construct a 32-bit result, occupying a 32-bit quotient.

Example

- Example 1
  When X0 = ON, the dividend K103 in D0 is divided by the divisor K5 in D10, and the quotient is stored in D20. ON / OFF of the highest bit indicates the positive / negative status of the result value.

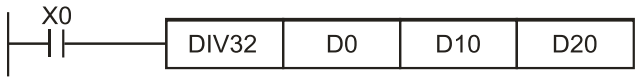


D0 / D10 = D20 ⇨ K103 / K5 = K20, the remainder is K3

D20 = K20 (the remainder is left out.)

- Example 2

  When X0 = ON, the dividend K81,000 in (D1, D0) is divided by the divisor K40,000 in (D11, D10), and the quotient is stored in (D21, D20). ON / OFF of the highest bit indicates the positive / negative status of the result value.



(D1, D0) / (D11, D10) = (D21, D20) ⇨ K81,000 / K40,000 = K2, the remainder is K1,000

(D21, D20) = K2 (the remainder is left out.)

API	Instruction Code	Operand	Function
30	D **ROR** P	D, n	Rotate right

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*	*	*	*
n				*	*						

Caution for using operand:

- If D is designated as KnY, KnM, only K4 (16-bit) is valid.
- Scope of n = K1–K16 (16-bit)

16-bit instruction (5 steps)

ROR	Continuous execution type	RORP	Pulse execution type

32-bit instruction (9 steps)

DROR	Continuous execution type	DRORP	Pulse execution type

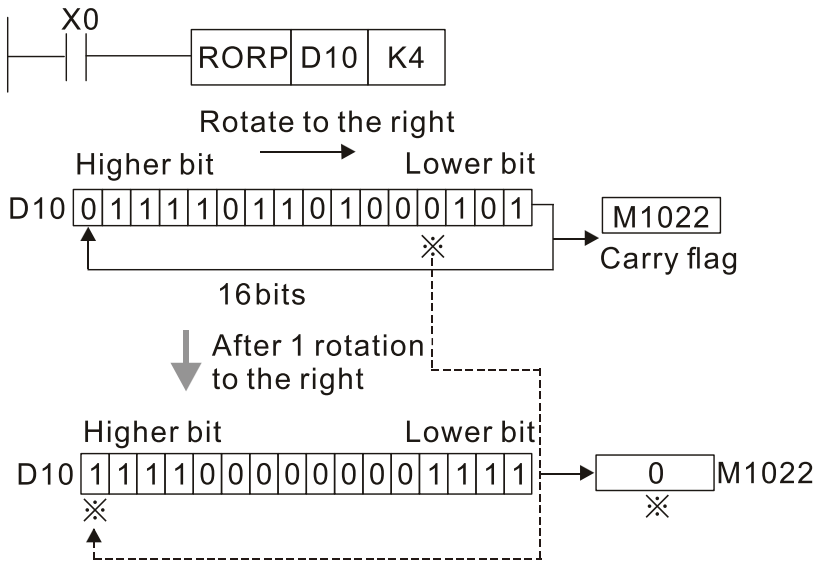
Associated flag: M1022, Carry flag

Description

- D: device to be rotated
  n: number of bits to be rotated in 1 rotation
- This instruction rotates the device content designated by D to the right for n bits.
- This instruction adopts pulse execution instructions (RORP).

Example

- When X0 = OFF→ON, the 16 bits (4 bits as a group) in D10 rotates to the right, as shown in the figure below. The bit marked with ※ is sent to carry flag M1022.



API	Instruction Code	Operand	Function
31	D **ROL** P	D, n	Rotate left

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D							*	*	*	*	*
n				*	*						

Caution for using operand

- If D is designated as KnY, KnM, only K4 (16-bit) is valid.
- Scope of n = K1–K16 (16-bit)

16-bit instruction (5 steps)

ROL	Continuous execution type	ROLP	Pulse execution type

32-bit instruction (9 steps)

DROL	Continuous execution type	DROLP	Pulse execution type

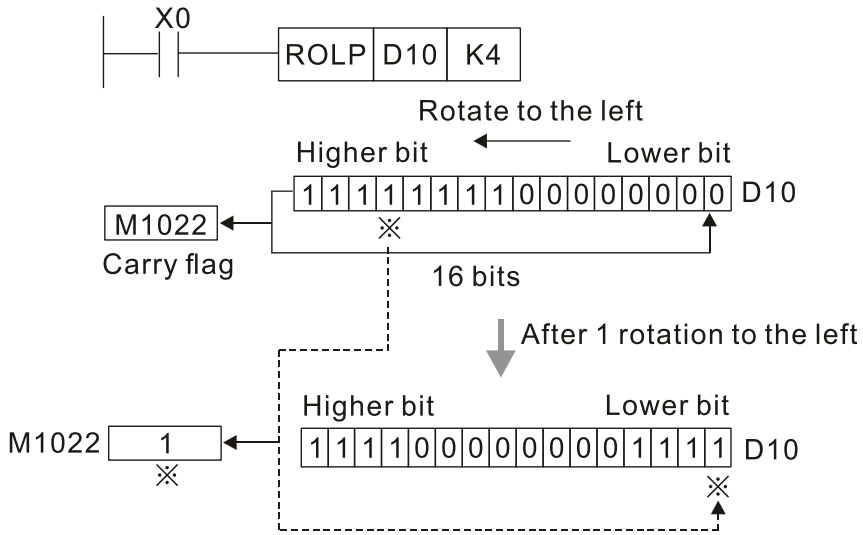
Associated flag: M1022, Carry flag

Description

- D: device to be rotated
  n: number of bits to be rotated in 1 rotation
- This instruction rotates the device content designated by D to the left for n bits.
- This instruction adopts pulse execution instructions (ROLP).

Example

- When X0 = OFF→ON, the 16 bits (4 bits as a group) in D10 rotates to the left, as shown in the figure below. The bit marked with ※ is sent to carry flag M1022.



API	Instruction Code	Operand	Function
40	**ZRST** P	D_1, D_2	Zone reset

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D_1		*	*						*	*	*
D_2		*	*						*	*	*

Caution for using operand

- Number of operand D_1 ≤ number of operand D_2
- Operand D_1 and D_2 have to designate devices of the same type.
- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

ZRST	Continuous execution type	ZRSTP	Pulse execution type

32-bit instruction

-	-	-	-

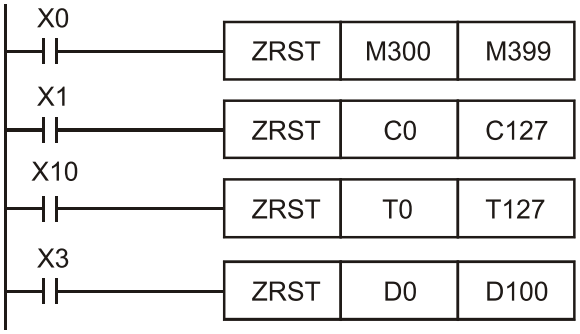
Associated flag: none

Description

- D_1: the start device of zone reset
  D_2: the end device of zone reset
- When number of operand D_1 > number of operand D_2, only operand designated by D_2 will be reset.

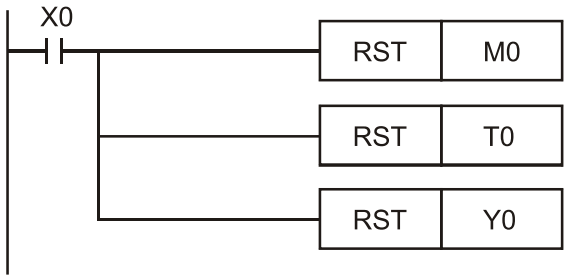
Example

- When X0 = ON, auxiliary relay M300 to M399 will be reset to OFF.
- When X1 = ON, 16-bit counter C0 to C127 will all be reset.
  (write in 0 and reset the contact and coil to OFF)
- When X10 = ON, timer T0 to T127 will be reset to OFF.
  (write in 0 and reset the contact and coil to OFF)
- When X3 = ON, data register D0 to D100 will be reset to 0



Remark

- Devices (i.e., bit device Y, M; and word device T, C, D) can be individually reset by RST instruction.



API	Instruction Code	Operand	Function
41	**DECO** P	S, D, n	Decode

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S	*	*	*	*	*				*	*	*
D		*	*				*	*	*	*	*
n				*	*						

16-bit instruction (7 steps)			
DECO	Continuous execution type	DECOP	Pulse execution type

32-bit instruction			
-	-	-	-

Caution for using operand

- When operand D is bit device, n = 1–8, and when operand D is word device, n = 1–4.

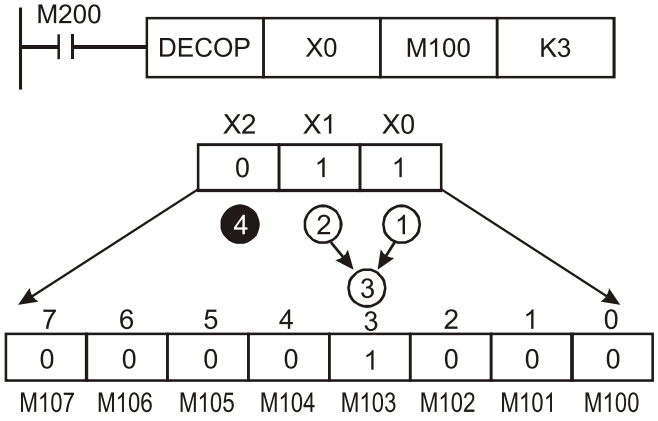
Associated flag: none

Description

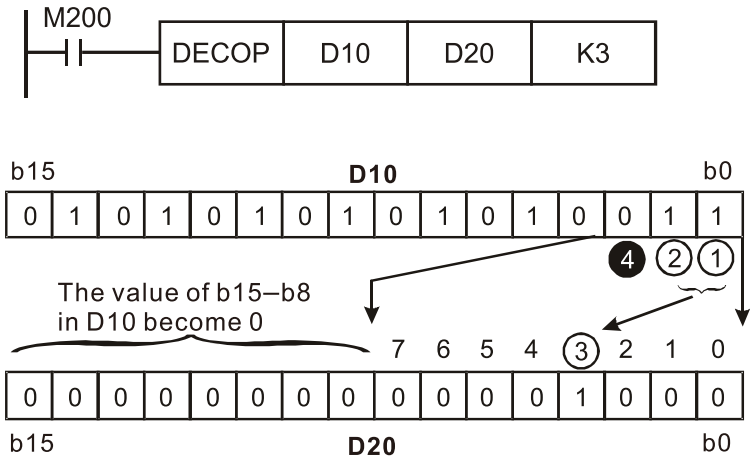
- S: source device to be decoded
  D: device for storing the decoded result
  n: length of decoded bits
- The instruction decodes the lower "n" bits of S and stores the result of "2^n" bits in D.

Example

- Example 1
  1. When D is used as a bit device, the valid range is $0 < n \leq 8$. Error occurs when n = 0 or n > 8.
  2. When n = 8, the maximum points to decode is 2^8 = 256 points.
  3. When M200 = OFF→ON, this instruction decodes the content in X0–X2 to M100–M107
  4. If S = 3, M103 (third bit from M100) = ON.
  5. After the execution is completed, M200 becomes OFF. The decoded results have been output retain their operation.



- Example 2
  1. When D is used as a word device, the valid range is $0 < n \leq 4$. Error occurs when n = 0 or n > 4.
  2. When n = 4, the maximum points to decode is 2^4 = 16 points.
  3. When M200 = OFF→ON, this instruction decodes the content in D10 (b2–b0) to D20 (b7–b0). The unused bits in D20 (b15–b8) become 0.
  4. The lower 3 bits of D10 are decoded and stored in the lower 8 bits of D20. The higher 8 bits of D20 are all 0.
  5. After the execution is completed, M200 becomes OFF. The decoded results have been output retain their operation.


M200
DECOP
D10
D20
K3
b15
D10
b0
0 1 0 1 0 1 0 1 0 1 0 1 0 0 1 1
4 2 1
The value of b15–b8
in D10 become 0
7 6 5 4 3 2 1 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
b15
D20
b0

API	Instruction Code	Operand	Function
42	**ENCO** P	S, D, n	Decode

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S	*	*	*						*	*	*
D		*	*						*	*	*
n				*	*						

16-bit instruction (7 steps)

ENCO	Continuous execution type	ENCOP	Pulse execution type

32-bit instruction

-	-	-	-

Caution for using operand

- When operand S is bit device, n = 1–8, and when operand S is word device, n = 1–4.

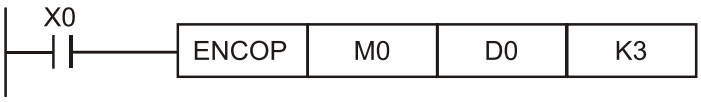
Associated flag: none

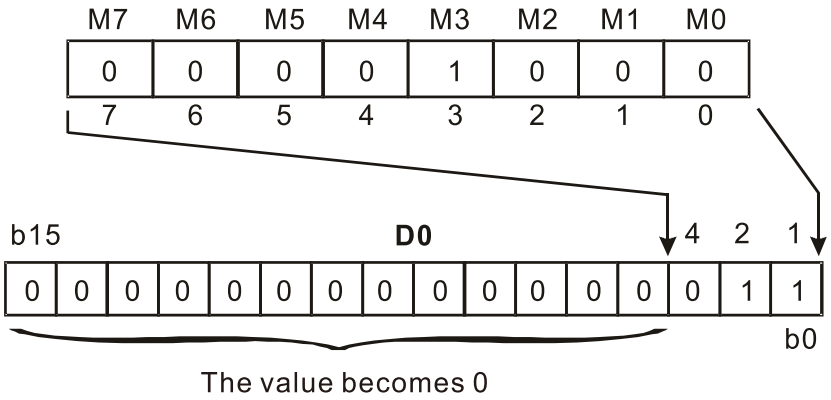
Description

- S: source device to be decoded
  D: device for storing the decoded result
  n: length of decoded bits
- The instruction decodes the lower “n” bits of S and stores the result in D.
- If several bits of S are 1, the first bit that is 1 will be processed orderly from high bit to low bit.

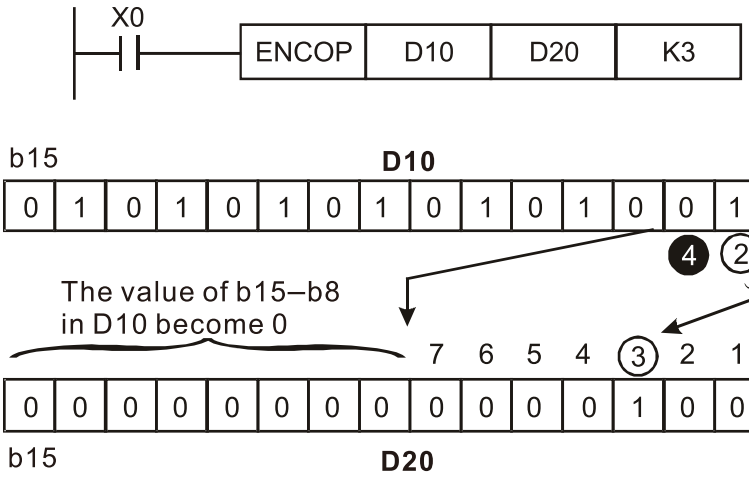
Example

- Example 1
  1. When S is used as a bit device, the valid range is $0 < n \leq 8$. Error occurs when n = 0 or n > 8.
  2. When n = 8, the maximum points to encode is $2^8 = 256$ points.
  3. When X0 = OFF→ON, this instruction encodes the content in 2^3 bits (M0–M7) and stores in the lower 3-bit (b2–b0) of D0. The unused bits in D0 (b15–b3) become 0.
  4. After the execution is completed, X0 becomes OFF, and the data in D remains unchanged.





- Example 2
  1. When S is used as a word device, the valid range is $0 < n \leq 4$. Error occurs when n = 0 or n > 4.
  2. When n = 4, the maximum points to encode is 2^4 = 16 points.
  3. When X0 = OFF→ON, this instruction encodes the content in 2^3 bits (b0–b7) of D10 and stores in the lower 3-bit (b2–b0) of D0. The unused bits in D20 (b15–b3) become 0. (b8–b15 in D10 are invalid data)
  4. After the execution is completed, X0 becomes OFF, and the data in D remains unchanged.



API	Instruction Code			Operand	Function
43	D	**SUM**	P	S, D	Sum of active bits

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*	*	*	*	*	*	*
D									*	*	*

16-bit instruction (5 steps)

SUM	Continuous execution type	SUMP	Pulse execution type

32-bit instruction (9 steps)

DSUM	Continuous execution type	DSUMP	Pulse execution type

Caution for using operand

- When using 32-bit instruction, D occupies two registers.

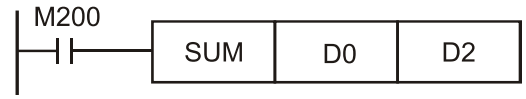
Associated flag: none

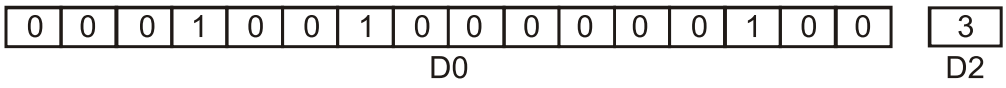
Description

- S: source device
  D: destination device for storing counted value
- The sum of all bits whose contents are "1" in S will be stored in D.

Example

- When X0 = OFF→ON, the 16 bits (4 bits as a group) in D10 rotates to the left, as shown in the figure below. The bit marked with ※ is sent to carry flag M1022.
- When M200 = ON, the sum of whose contents are “1” in 16 bits of D0 will be stored in D2.





API	Instruction Code	Operand	Function
44	D **BON** P	S, D, n	Check specified bit status

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*	*	*	*	*	*	*
D		*	*								
n				*	*				*	*	*

Caution for using operand

- Valid range of operand n : n = 0–15 (16-bit), n = 0–31 (32-bit)

16-bit instruction (7 steps)

BON	Continuous execution type	BONP	Pulse execution type

32-bit instruction (13 steps)

DBON	Continuous execution type	DBONP	Pulse execution type

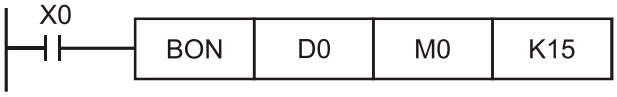
Associated flag: none

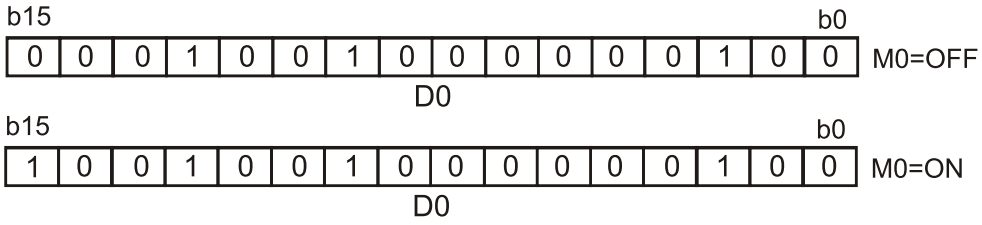
Description

- S: source device
  D: device for storing check result
  n: bit number to be checked (numbered from 0)
- The instruction checks the status of designated bit (specified by n) in S and stores the result in D.
- Operand S uses device F, and they can only use 16-bit instructions.

Example

- When X0 = ON, if the bit15 of D0 is “1”, then M0 = ON; if it is “0”, then M0 = OFF.
- X0 becomes OFF, M0 remains in its previous status.





API	Instruction Code	Operand	Function
45	D **MEAN** P	S, D, n	Mean

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S						*	*	*	*	*	*
D							*	*	*	*	*
n				*	*	*	*	*	*	*	*

Caution for using operand

- Valid range of operand n : n = 0–64

16-bit instruction (7 steps)

MEAN	Continuous execution type	MEANP	Pulse execution type

32-bit instruction (13 steps)

DMEAN	Continuous execution type	DMEANP	Pulse execution type

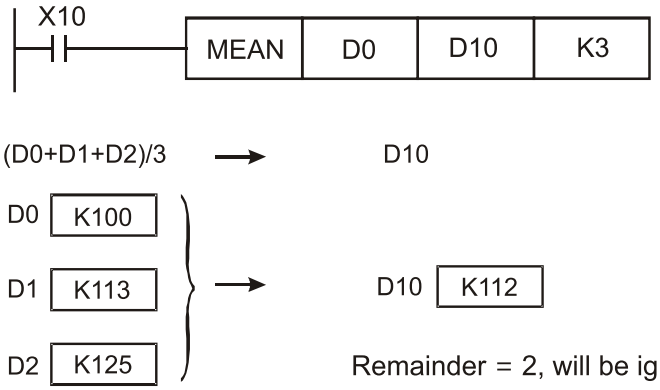
Associated flag: none

Description

- S: start device to obtain mean value
  D: destination device for storing mean value
  n: The number of consecutive source devices used
- Add the contents of n devices starting from S, obtain the mean value, and store in D. Remainders in the operation will be truncated.
- If n is out of the valid range, PLC will determine it as an “instruction operation error” and stop.

Example

- When X10 = ON, the contents in 3 (n = 3) registers starting from D0 will be summed and then divided by 3. The obtained mean value will be stored in D10, and the remainder will be truncated.



API	Instruction Code			Operand	Function
49	D	**FLT**	P	S, D	BIN integer → binary floating-point number

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S									*	*	*
D									*	*	*

Caution for using operand

- Operand D occupies 2 consecutive devices.
- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DFLT	Continuous execution type	DFLTP	Pulse execution type

Associated flag: none

Description

- S: source device for conversion
  D: device for storing the conversion result
- Convert BIN integer to binary floating-point number.

Example

- When X11 = ON, convert the BIN integers corresponding to D0 and D1 to floating-point numbers and put into D20 and D21.

API	Instruction Code	Operand	Function
150	**MODRW**	S_1, S_2, S_3, S, n	Read / write Modbus data

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
S_3				*	*						*
S											*
n				*	*						*

Caution for using operand

- Since the communication process goes through PLC scan for many times, it is recommended to use the pulse execution type of this function code.

16-bit instruction (11 steps)

MODRW	Continuous execution type	MODRWP	Pulse execution type

32-bit instruction

-	-	-	-

Associated flag: M1077, M1078, M1079, M1080, M1081

Description

- S_1: address of communication device
  S_2: function code
  S_3: device address of data to be read / written
  S: register for storing read / written data
  n: length of read / written data
- Before using this instruction, COM1 must be defined as being controlled by PLC (set Pr.N1-07 = 1). After that, set the corresponding communication speed and format (Pr.N1-02 and Pr.N1-03). For function code (S_2), only these function codes listed below are available currently, others are still not executable.

Function	Description
H02	Read multiple coil (bit)
H03	Read multiple word
H06	Write single word
H0F	Write multiple coil (bit)
H10	Write multiple word

- After the instruction is executed, M1077, M1078, M1079, M1080 and M1081 becomes 0 immediately.
- For example, if you want the PLC master of the drive to control another drive slave and PLC slave, assume the station number of drive slave is 10, and the one of PLC slave is 20. See explanation below:

  The drive to control slave devices

No.	Example	MODRW Instruction				
		S_1	S_2	S_3	S	n
		Station number	Command code	Address	Register	Length
1	Read the parameters Pr.A0-00–Pr.A0-03 of drive slave, 4 records in total. And store the data to D0–D3.	K10	H3	H0000	D0	K4

No.	Example	MODRW Instruction				
		S_1	S_2	S_3	S	n
		Station number	Command code	Address	Register	Length
2	Read the address H2100–H2102 of drive slave, 3 records in total. And store the data to D5–D7.	K10	H3	H2100	D5	K3
3	Write the parameters Pr.L1-00–Pr.L1-02 of drive slave, 3 records in total. And the written values are D10, D11, and D12.	K10	H10	H1440	D10	K3
4	Write the address H2000–H2001of drive slave, 2 records in total. And the written values are D15 and D16.	K10	H10	H2000	D15	K2

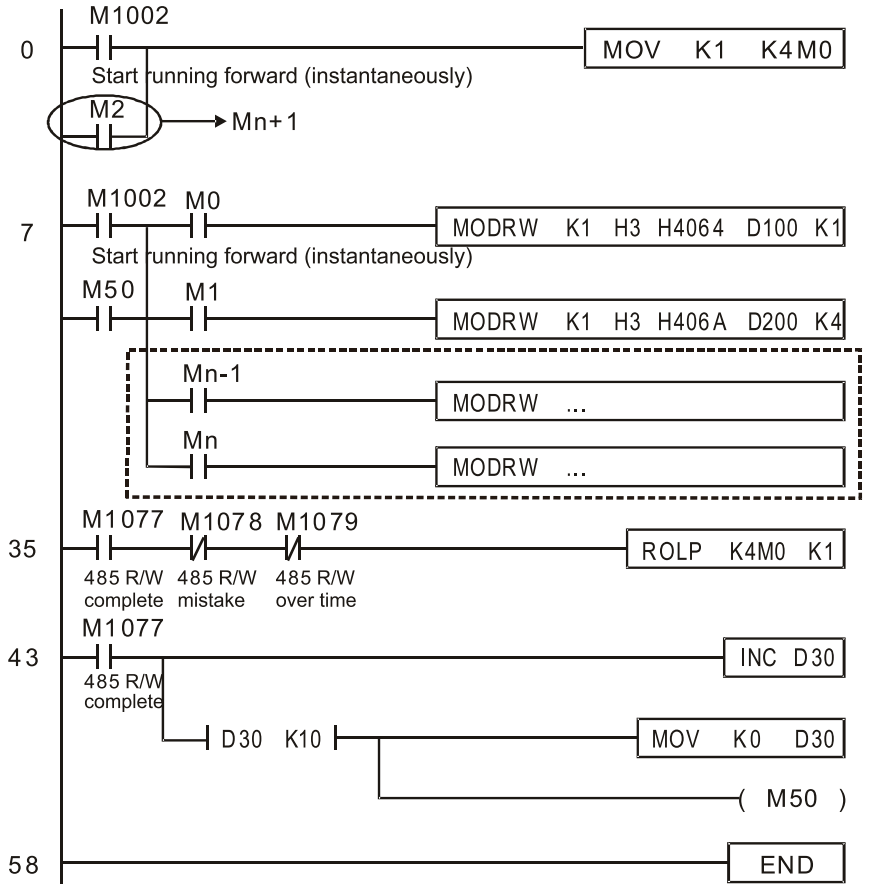
The PLC to control slave devices

No.	Example	MODRW instruction				
		S_1	S_2	S_3	S	n
		Station number	Command code	Address	Register	Length
1	Read X0–X3 status of PLC slave, 4 records in total. And store the read data in bit0–bit3 of D0.	K20	H2	H400	D0	K4
2	Read Y0–Y3 status of PLC slave, 4 records in total. And store the read data in bit0–bit3 of D1.	K20	H2	H500	D1	K4
3	Read M0–M3 status of PLC slave, 4 records in total. And store the read data in bit0–bit3 of D2.	K20	H2	H800	D2	K4
4	Read T0–T3 status of PLC slave, 4 records in total. And store the read data in bit0–bit3 of D3.	K20	H2	H600	D3	K4
5	Read C0–C3 status of PLC slave, 4 records in total. And store the read data in bit0–bit3 of D4.	K20	H2	HE00	D4	K4
6	Read T0–T3 count values of PLC slave, 4 records in total. And store the read data in D10–D13.	K20	H3	H600	D10	K4
7	Read C0–C3 count values of PLC slave, 4 records in total. And store the read data in D20–D23.	K20	H3	HE00	D20	K4
8	Read D0–D3 count values of PLC slave, 4 records in total. And store the read data in D30–D33.	K20	H3	H1000	D30	K4
9	Write Y0–Y3 status of PLC slave, 4 records in total. And the written values are bit0–bit3 of D1.	K20	HF	H500	D1	K4
10	Write M0–M3 status of PLC slave, 4 records in total. And the written data are bit0–bit3 of D2.	K20	HF	H800	D2	K4
11	Write T0–T3 status of PLC slave, 4 records in total. And the written data are bit0–bit3 of D3.	K20	HF	H600	D3	K4

No.	Example	MODRW instruction				
		S_1	S_2	S_3	S	n
		Station number	Command code	Address	Register	Length
12	Write C0–C3 status of PLC slave, 4 records in total. And the written data are bit0–bit3 of D4.	K20	HF	HE00	D4	K4
13	Write T0–T3 count values of PLC slave, 4 records in total. And the written data are D10–D13.	K20	H10	H600	D10	K4
14	Write C0–C3 count values of PLC slave, 4 records in total. And the written data are D20–D23.	K20	H10	HE00	D20	K4
15	Write D0–D3 count values of PLC slave, 4 records in total. And the written data are D30–D33.	K20	H10	H1000	D30	K4

Example

- PLC triggers M0 to be ON when it starts and sends the instruction to execute one MODRW.
- After receiving a response from the slave device, if the instruction is correct, then ROL is executed once, and M1 becomes ON.
- After receiving a response from the slave device, delays 10 PLC scan cycles, trigger M50 = 1, and then MODRW is executed once again.
- After receiving a response from the slave device again, if the instruction is correct, then ROL is executed once, and M2 becomes ON (M2 can be defined as repeat M), K4M0 becomes K1 again, that is, only M0 is 1, and the instructions can be sent cyclically. If you want to add instructions to be sent, you just have to add instructions in the dotted line box and replace the M of repeat M to be Mn+1.



API	Instruction Code			Operand	Function
110	D	**ECMP**	P	S_1, S_2, D	Binary floating-point number comparison

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
D											*

Caution for using operand

- Operand D occupies 3 consecutive devices.
- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DECMP	Continuous execution type	DECMPP	Pulse execution type

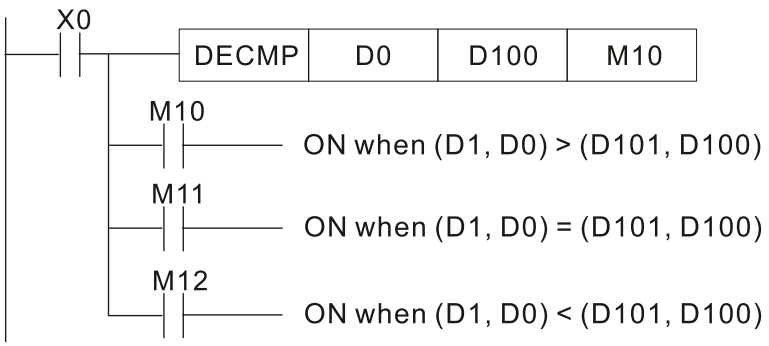
Associated flag: none

Description

- S_1: binary floating-point number comparison value 1
  S_2: binary floating-point number comparison value 2
  D: comparison result, occupies 3 consecutive devices
- The binary floating-point value 1 and 2 are compared with each other. The comparison result (>, =, <) is stored in D.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the comparison.

Example

- Designate the device to be M10, and this automatically occupies M10 to M12.
- When X0 = ON, DECMP instruction is executed, and one of M10, M11, and M12 will be ON. When X0 = OFF, DECMP instruction is not executed, and M10, M11, and M12 remain their status before X0 = OFF.
- If you need to obtain a comparison result with ≥,≤, and ≠, make a serial-parallel connection between M10 –M12.
- To clear the comparison result, use RST or ZRST instruction.



API	Instruction Code			Operand	Function
111	D	**EZCP**	P	S_1, S_2, S, D	Binary floating-point number zone comparison

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
S				*	*						*
D		*	*								

Caution for using operand

- Operand D occupies 3 consecutive devices.
- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (17 steps)

DEZCP	Continuous execution type	DEZCPP	Pulse execution type

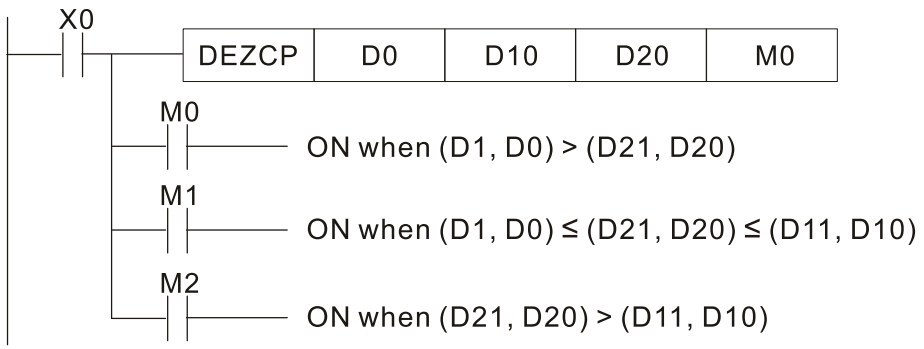
Associated flag: none

Description

- S_1: lower bound of binary floating-point in zone comparison
  S_2: upper bound of binary floating-point in zone comparison
  S: binary floating-point number comparison value
  D: comparison result, occupies 3 consecutive devices
- S is compared with S_1 and S_2, and the result is stored in D.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the comparison.
- When $S_1 > S_2$, the instruction uses S_1 as upper / lower bound for comparison.

Example

- Designate the device to be M0, and this automatically occupies M0 to M2.
- When X0 = ON, DEZCP instruction is executed, and one of M0, M1, and M2 will be ON. When X0 = OFF, EZCP instruction is not executed, and M0, M1, and M2 remain their status before X0 = OFF.
- To clear the comparison result, use RST or ZRST instruction.



API	Instruction Code			Operand	Function
116	D	**RAD**	P	S, D	Degree → Radian

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D		*	*								

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DRAD	Continuous execution type	DRADP	Pulse execution type

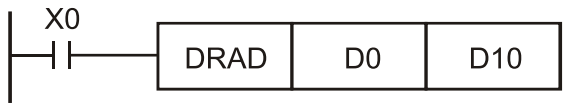
Associated flag: none

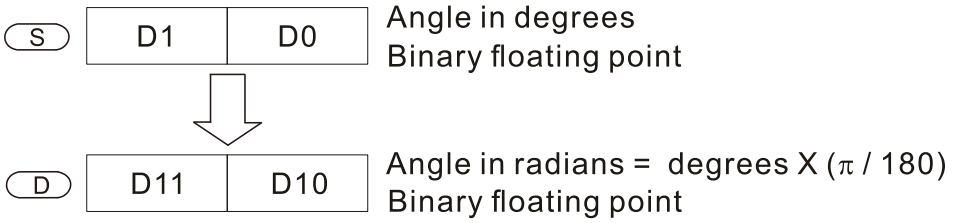
Description

- S: source of data (degree)
  D: result (radian)
- Use the following formula to convert degree to radian.
  Radian = Degree x (π / 180)

Example

- When X0 = ON, designate the degree of binary floating-point number (D1, D0). Convert the degree into radian and store the result in binary floating point in (D11, D10).





API	Instruction Code	Operand	Function
117	D **DEG** P	S, D	Radian → Degree

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DDEG	Continuous execution type	DDEGP	Pulse execution type

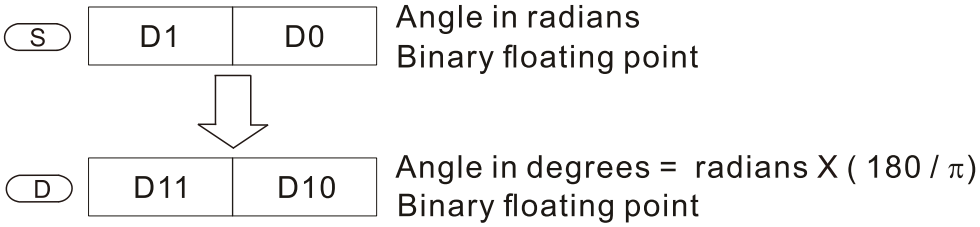
Associated flag: none

Description

- S: source of data (radian)
  D: result (degree)
- Use the following formula to convert radian to degree.
  Degree = Radian x (π / 180)

Example

- When X0 = ON, designate the degree of binary floating-point number (D1, D0). Convert the radian into degree and store the result in binary floating point in (D11, D10).



API	Instruction Code			Operand	Function
120	D	**EADD**	P	S_1, S_2, D	Binary floating-point number addition

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DEADD	Continuous execution type	DEADDP	Pulse execution type

Associated flag: none

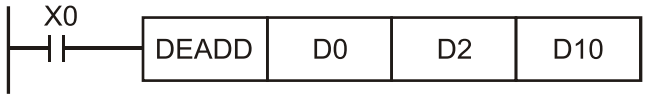
Description

- S_1: summand
  S_2: addend
  D: sum
- The content of the register that S_1 designates adds the content of the register that S_2 designates, and its sum is stored in the register that D designates. This addition is performed in the form of binary floating-point numbers.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the addition.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as "continuous execution type" instruction (pulse execution type DEADDP is generally used) and the drive contact is ON, the register will be added once in every scan.

Example

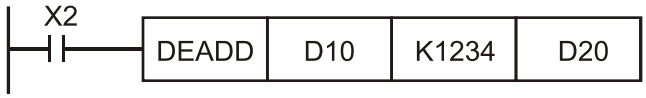
- Example 1

When X0 = ON, the binary floating-point numbers (D1, D0) add the binary floating-point numbers (D3, D2), and stores the result in (D11, D10).



- Example 2

When X2 = ON, the binary floating-point numbers (D11, D10) add K1234 (convert to binary floating-point number automatically), and stores the result in (D21, D20).



API	Instruction Code			Operand	Function
121	D	**ESUB**	P	S_1, S_2, D	Binary floating-point number subtraction

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DESUB	Continuous execution type	DESUBP	Pulse execution type

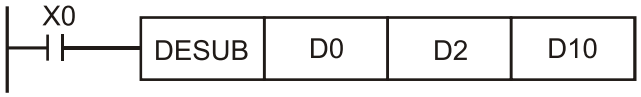
Associated flag: none

Description

- S_1: minuend
  S_2: subtrahend
  D: difference
- Subtract the content of the register that S_2 designates from the content of the register that S_1 designates , and its difference is stored in the register that D designates. This subtraction is performed in the form of binary floating-point numbers.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the subtraction.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as "continuous execution type" instruction (pulse execution type DESUBP is generally used) and the drive contact is ON, the register will be subtracted once in every scan.

Example

- Example 1
  When X0 = ON, the binary floating-point numbers (D1, D0) subtract the binary floating-point numbers (D3, D2), and stores the result in (D11, D10).



- Example 2
  When X2 = ON, subtract the binary floating-point numbers (D1, D0) from K1234 (convert to binary floating-point number automatically), and stores the result in (D11, D10).

API	Instruction Code			Operand	Function
122	D	**EMUL**	P	S_1, S_2, D	Binary floating-point number multiplication

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DEMUL	Continuous execution type	DEMULP	Pulse execution type

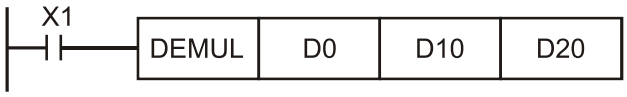
Associated flag: none

Description

- S_1: Multiplicand
  S_2: Multiplicator
  D: Product
- The content of the register that S_1 designates multiplies the content of the register that S_2 designates, and its product is stored in the register that D designates. This multiplication is performed in the form of binary floating-point numbers.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the multiplication.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as "continuous execution type" instruction (pulse execution type DEMULP is generally used) and the drive contact is ON, the register will be multiplied once in every scan.

Example

- Example 1
  When X1 = ON, multiply the binary floating-point number (D1, D0) and (D11, D11), and store the product to the register that (D21, D20) designate.



- Example 2
  When X2 = ON, multiply K1234 (convert to binary floating-point number automatically) and the binary floating-point numbers (D1, D0), and stores the result in (D11, D10).

API	Instruction Code			Operand	Function
123	D	**EDIV**	P	S_1, S_2, D	Binary floating-point number division

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DEDIV	Continuous execution type	DEDIVP	Pulse execution type

Associated flag: none

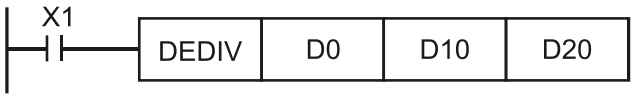
Description

- S_1: Dividend
  S_2: Divisor
  D: Quotient and remainder
- The content of the register that S_1 designates divides by the content of the register that S_2 designates, and its quotient is stored in the register that D designates. This division is performed in the form of binary floating-point numbers.
- If S_1 or S_2 is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the division.

Example

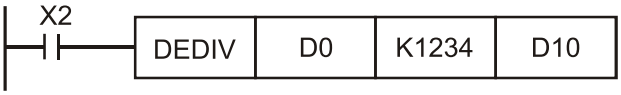
- Example 1

  When X1 = ON, the binary floating-point number (D1, D0) divides by the binary floating-point number (D11, D10), and store the quotient to the register that (D21, D20) designate.



- Example 2

  When X2 = ON, the binary floating-point numbers (D1, D0) divides by K1234 (convert to binary floating-point number automatically), and stores the result in (D11, D10).



API	Instruction Code			Operand	Function
124	D	**EXP**	P	S, D	Binary floating-point number exponentiation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DEXP	Continuous execution type	DEXPP	Pulse execution type

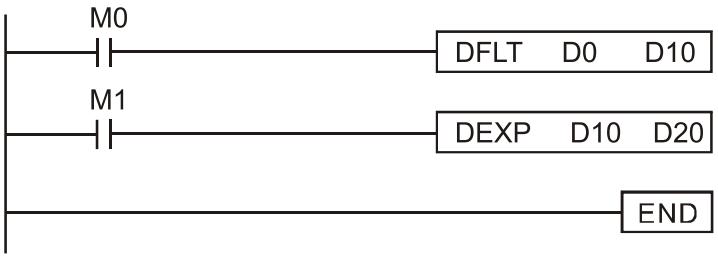
Associated flag: none

Description

- S: device of operation source
  D: device of operation result
- e = 2.71828 is as a base number, and S is the exponent to do EXP operation.
  $[D + 1, D] = e^{[S + 1, S]}$
- Both positive and negative values are valid for S. The 32-bit format must be used to designate register D. The operation is executed in floating-point numbers, so the value in S needs to be converted into floating-point number before exponent operation.
- The content of operand $D = e^S$, e =2.71828, and S is the designated source data.

Example

- When M0 = ON, convert (D0, D1) to be binary floating-point numbers and store in the register (D11, D10).
- When M1 = ON, (D11, D10) are the exponent to do EXP operation. Their value is binary floating-point numbers and store in the register (D21, D20).



API	Instruction Code			Operand	Function
125	D	**LN**	P	S, D	Binary floating-point number natural logarithm operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DLN	Continuous execution type	DLNP	Pulse execution type

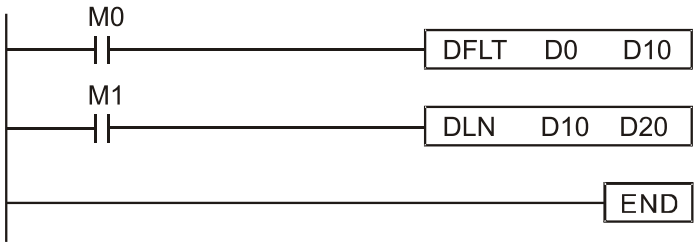
Associated flag: none

Description

- S: device of operation source
  D: device of operation result
- e = 2.71828 is as a base number, and S is the exponent to do LN operation.
  $[D + 1, D] = \ln [S + 1, S]$
- Both positive and negative values are valid for S. The 32-bit format must be used to designate register D. The operation is executed in floating-point numbers, so the value in S needs to be converted into floating-point number before exponent operation.
- The content of operand $D = \ln S = \log_e S$, e =2.71828, and S is the designated source data.

Example

- When M0 = ON, convert (D0, D1) to be binary floating-point numbers and store in the register (D11, D10).
- When M1 = ON, (D11, D10) are the exponent to do LN operation. Their value is binary floating-point numbers and store in the register (D21, D20).



API	Instruction Code			Operand	Function
127	D	**ESQR**	P	S, D	Binary floating-point number square root

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DESQR	Continuous execution type	DESQRP	Pulse execution type

Associated flag: none

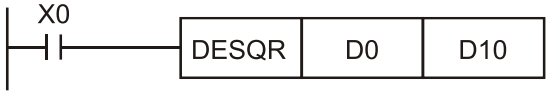
Description

- S: the source device for calculating square root
  D: operation result
- Calculate square root of the content in register that S designates, the result will be stored in the register that D designates. The square root operation is performed in the form of binary floating-point numbers.
- If S is a designated constant K or H, the instruction will convert the constant into a binary floating-point value before the square root operation.

Example

- Example 1

When X0 = ON, calculate the square root of the binary floating-point number (D1, D0), and store result to the register that (D11, D10) designate.

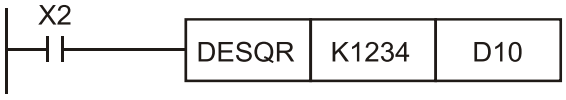


$$\sqrt{(D1 \cdot D0)} \longrightarrow (D11 \cdot D10)$$

Binary floating point　　Binary floating point

- Example 2

When X2 = ON, calculate the square root of K1234 (convert to binary floating-point number automatically), and stores the result in (D11, D10).



API	Instruction Code			Operand	Function
129	D	**INT**	P	S, D	Binary floating-point number → BIN integer

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S											*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

-	-	-	-

32-bit instruction (9 steps)

DINT	Continuous execution type	DINTP	Pulse execution type

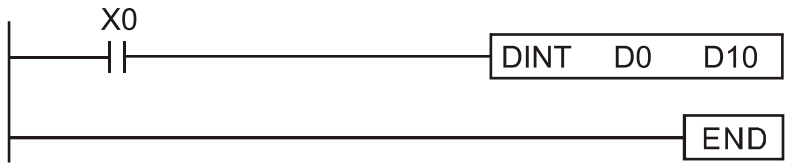
Associated flag: none

Description

- S: source device for conversion
  D: the conversion result
- The content in the register that S designates is converted from binary floating-point form to BIN integer and store them to the register that D designates. The decimal of the operation result will be left out.
- This instruction is the opposite of the API 49 (FLT) instruction.

Example

- When X0 = ON, convert the binary floating-point numbers (D1, D0) to BIN integer, and store the result to (D10). The decimal of the operation result will be left out.



API	Instruction Code			Operand	Function
130	D	**SIN**	P	S, D	Binary floating-point number sine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

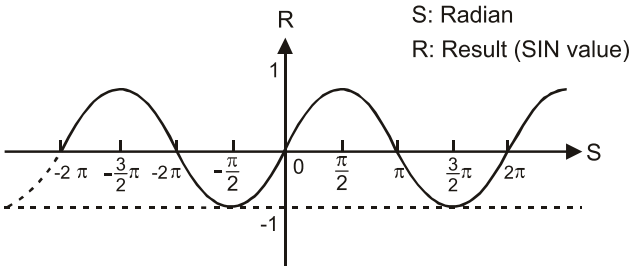
DSIN	Continuous execution type	DSINP	Pulse execution type

Associated flag: none

Description

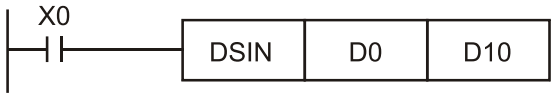
- S: source value
  D: operation result of sine
- The source designated by S is radian.
- RAD value = degree x π / 180
- Find sine value from the source value designated by S, and store in the register that D designates.

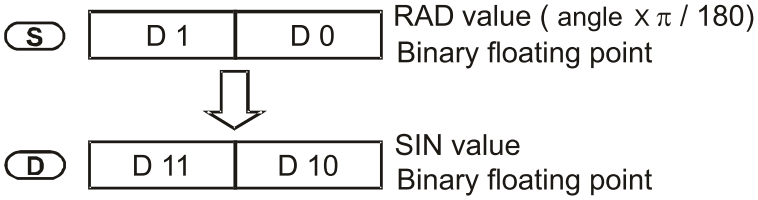
See the figure below for the relation between the radian and the operation result:



Example

- When X0 = ON, designate the RAD value of the binary floating-point number (D1, D0) to find the sine value and stores in (D11, D10). The content is binary floating-point number.





API	Instruction Code			Operand	Function
131	D	**COS**	P	S, D	Binary floating-point number cosine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

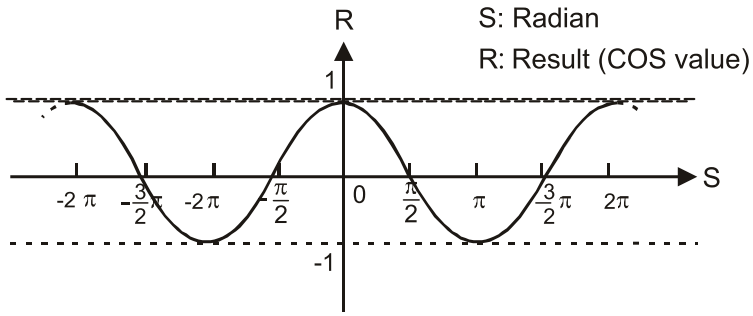
DCOS	Continuous execution type	DCOSP	Pulse execution type

Associated flag: none

Description

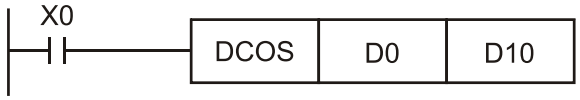
- S: source value
  D: operation result of cosine
- The source value designated by S can be set as radian or degree, and this is decided by flag M1018.
- M1018 = OFF, radian mode, RAD value = degree x π / 180
- M1018 = ON, degree mode, range: 0° ≤ degree < 360°
- If the operation result is 0, M1020 = ON
- Find cosine value from the source value designated by S, and store in the register that D designates.

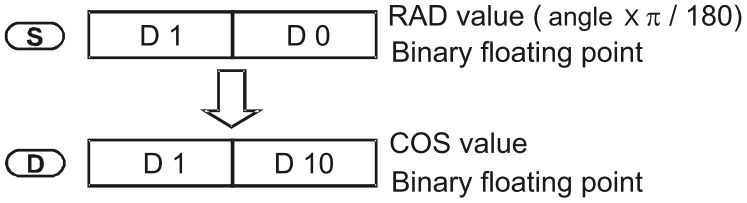
See the figure below for the relation between the radian and the operation result:



Example

- When X0 = ON, designate the RAD value of the binary floating-point number (D1, D0) to find the sine value and stores in (D11, D10). The content is binary floating-point number.





API	Instruction Code			Operand	Function
132	D	**TAN**	P	S, D	Binary floating-point number tangent operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

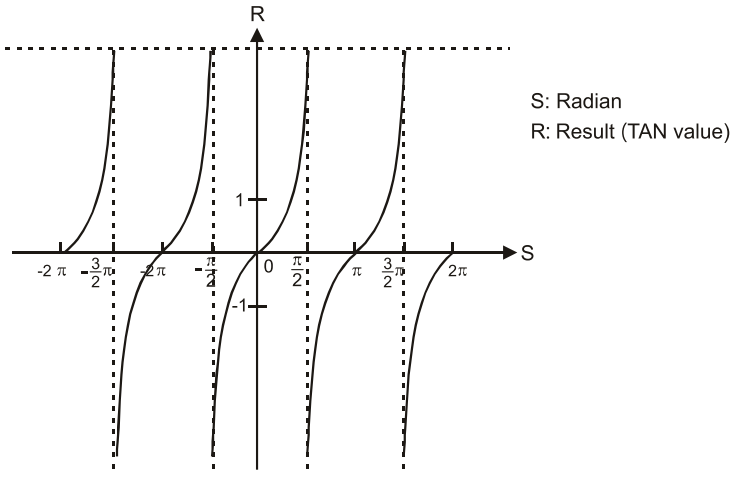
DTAN	Continuous execution type	DTANP	Pulse execution type

Associated flag: none

Description

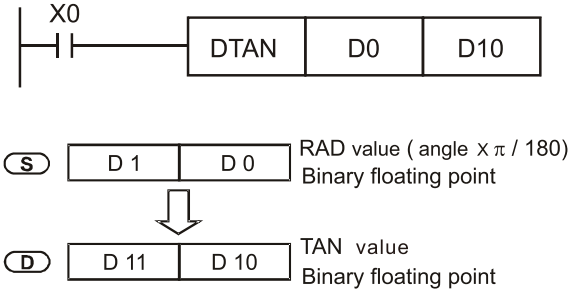
- S: source value
  D: operation result of tangent
- The source value designated by S can be set as radian or degree, and this is decided by flag M1018.
- M1018 = OFF, radian mode, RAD value = degree x π / 180
- M1018 = ON, degree mode, range: 0° ≤ degree < 360°
- If the operation result is 0, M1020 = ON
- Find tangent value from the source value designated by S, and store in the register that D designates.

See the figure below for the relation between the radian and the operation result:



Example

- When X0 = ON, designate the RAD value of the binary floating-point number (D1, D0) to find the tangent value and stores in (D11, D10). The content is binary floating-point number.



API	Instruction Code			Operand	Function
133	D	**ASIN**	P	S, D	Binary floating-point number arcsine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

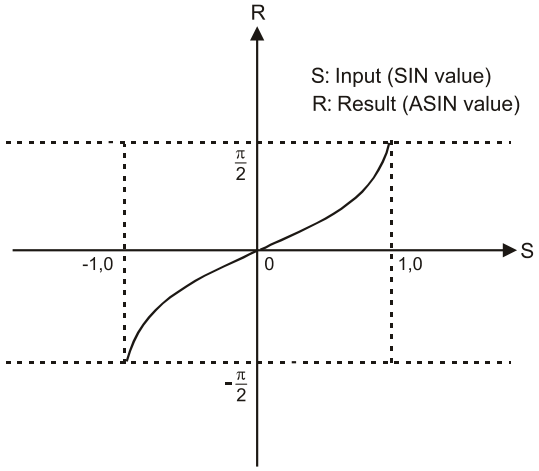
32-bit instruction (9 steps)

DASIN	Continuous execution type	DASINP	Pulse execution type

Associated flag: none

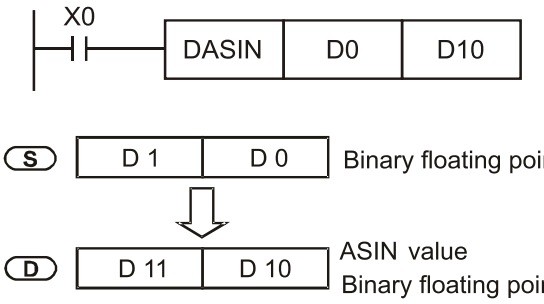
Description

- S: source value (binary floating-point number)
  D: operation result of arcsine
- ASIN value = $\sin^{-1}$
  See the figure below for the relation between the input value and the operation result:



Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the arcsine value and stores in (D11, D10). The content is binary floating-point number.



API	Instruction Code			Operand	Function
134	D	**ACOS**	P	S, D	Binary floating-point number arccosine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

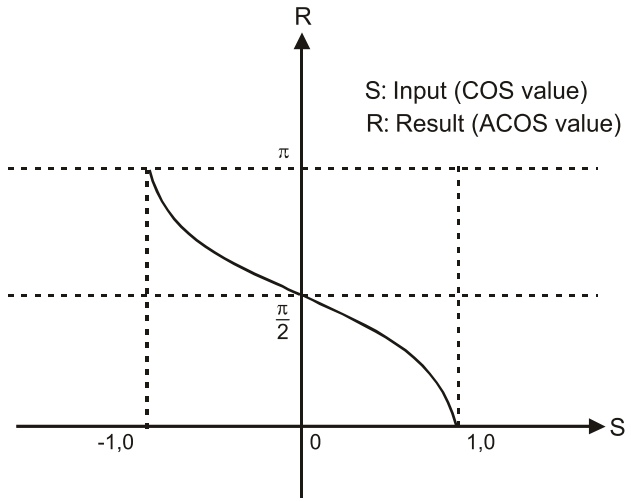
32-bit instruction (9 steps)

DACOS	Continuous execution type	DACOSP	Pulse execution type

Associated flag: none

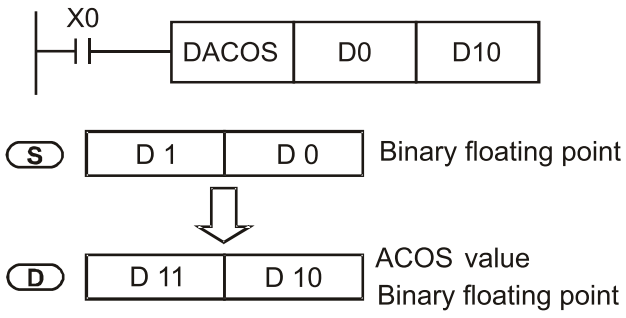
Description

- S: source value (binary floating-point number)
  D: operation result of arccosine
- ACOS value = $\cos^{-1}$
  See the figure below for the relation between the input value and the operation result:



Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the arccosine value and stores in (D11, D10). The content is binary floating-point number.



API	Instruction Code			Operand	Function
135	D	**ATAN**	P	S, D	Binary floating-point number arctangent operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

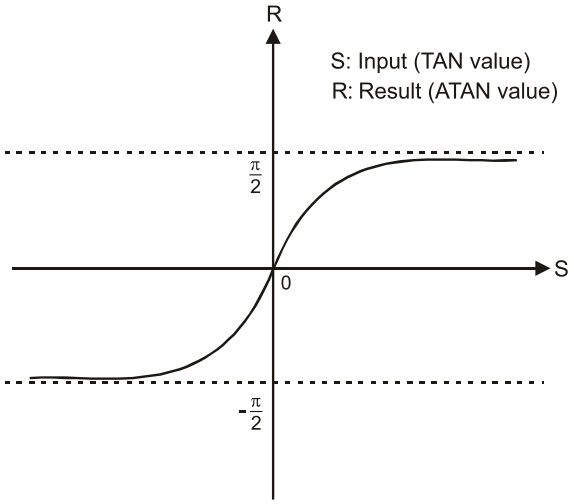
32-bit instruction (9 steps)

DATAN	Continuous execution type	DATANP	Pulse execution type

Associated flag: none

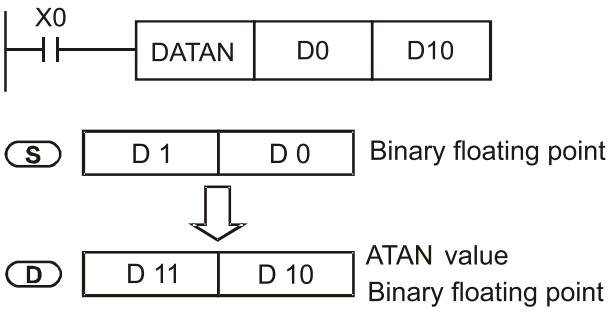
Description

- S: source value (binary floating-point number)
  D: operation result of arctangent
- ATAN value = $\tan^{-1}$
  See the figure below for the relation between the input value and the operation result:



Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the arctangent value and stores in (D11, D10). The content is binary floating-point number.



API	Instruction Code			Operand	Function
136	D	**SINH**	P	S, D	Binary floating-point number hyperbolic sine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DSINH	Continuous execution type	DSINHP	Pulse execution type

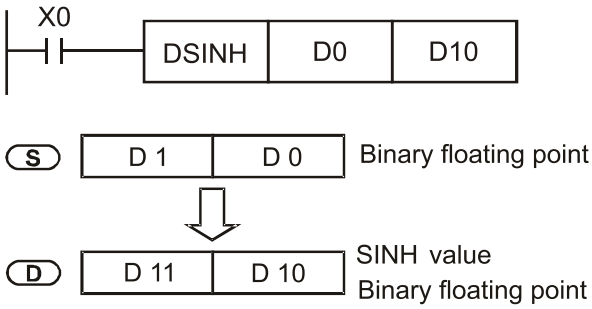
Associated flag: none

Description

- S: source value (binary floating-point number)
  D: operation result of hyperbolic sine
- sinh value = $(e^{s}-e^{-s}) / 2$

Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the hyperbolic sine value and stores in (D11, D10). The content is binary floating-point number.



API	Instruction Code			Operand	Function
137	D	**COSH**	P	S, D	Binary floating-point number hyperbolic cosine operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DCOSH	Continuous execution type	DCOSHP	Pulse execution type

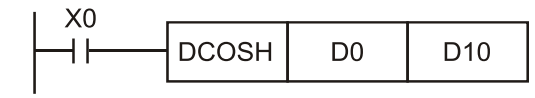
Associated flag: none

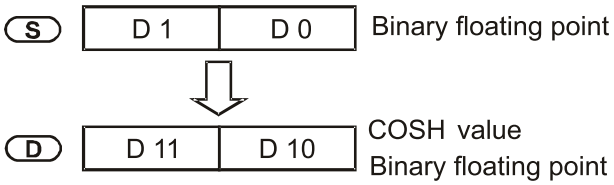
Description

- S: source value (binary floating-point number)
  D: operation result of hyperbolic cosine
- cosh value = $(e^{s} + e^{-s}) / 2$

Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the hyperbolic cosine value and stores in (D11, D10). The content is binary floating-point number.





API	Instruction Code			Operand	Function
138	D	**TANH**	P	S, D	Binary floating-point number hyperbolic tangent operation

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*						*
D											*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

DTANH	Continuous execution type	DTANHP	Pulse execution type

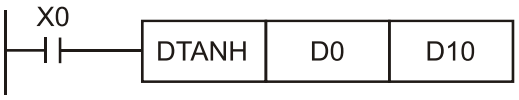
Associated flag: none

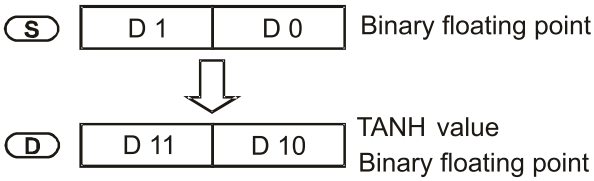
Description

- S: source value (binary floating-point number)
  D: operation result of hyperbolic tangent
- tanh value= $(e^{s} - e^{-s}) / (e^{s} + e^{-s})$

Example

- When X0 = ON, designate the binary floating-point number (D1, D0) to find the hyperbolic tangent value and stores in (D11, D10). The content is binary floating-point number.





API	Instruction Code			Operand	Function
172	D	**ADDR**	P	S_1, S_2, D	Floating-point number addition

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1											*
S_2											*
D											*

Caution for using operand

- The floating-point values (e.g., F1.2) can be entered directly into S_1 and S_2
- The floating-point value after the operation will be stored in operand D

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DADDR	Continuous execution type	DADDRP	Pulse execution type

Associated flag: none

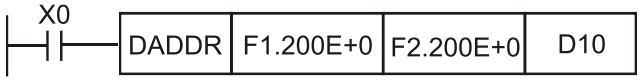
Description

- S_1: floating-point number summand
  S_2: floating-point number addend
  D: sum (floating-point)
- When the floating-point values of S_1 and S_2 are stored in the register D, its function is the same as API 120 DEADD.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as "continuous execution type" instruction (pulse execution type DADDRP is generally used) and the drive contact is ON, the register will be added once in every scan.
- If the absolute value of the operation result is larger than the maximum floating-point displayable, the carry flag M1022 = ON. If the absolute value of the operation result is smaller than the maximum floating-point displayable, the carry flag M1021 = ON. If the operation result = 0, zero flag M1020 = ON.

Example

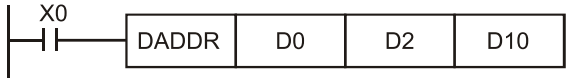
- Example 1

When X0 = ON, add the floating-point value F1.200E+0 (input the floating-point number F1.2, the ladder diagram shows a scientific notation F1.200E+0. You can set the floating-point digit by using WPLSoft) to the floating-point value F2.200E+0, the operation result is F3.400E+0 and is stored in the register (D10, D11).



- Example 2

When X0 = ON, the floating-point numbers (D1, D0) add the floating-point numbers (D3, D2), and stores the result in (D11, D10).



API	Instruction Code	Operand	Function
173	D **SUBR** P	S_1, S_2, D	Floating-point number subtraction

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1											*
S_2											*
D											*

Caution for using operand

- The floating-point values (e.g., F1.2) can be entered directly into S_1 and S_2
- The floating-point value after the operation will be stored in operand D

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DSUBR	Continuous execution type	DSUBRP	Pulse execution type

Associated flag: none

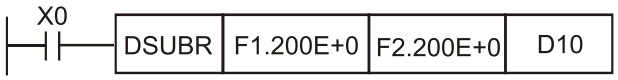
Description

- S_1: floating-point number minuend
  S_2: floating-point number subtrahend
  D: difference (floating-point)
- When the floating-point values of S_1 and S_2 are stored in the register D, its function is the same as API 121 DESUB.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as “continuous execution type” instruction (pulse execution type DSUBRP is generally used) and the drive contact is ON, the register will operate once in every scan.

Example

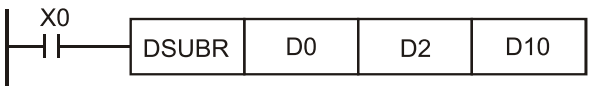
- Example 1

When X0 = ON, subtract the floating-point value F2.200E+0 from the floating-point value F1.200E+0 (input the floating-point number F1.2, the ladder diagram shows a scientific notation F1.200E+0. You can set the floating-point digit by using WPLSoft), the operation result is F-1.000E+0 and is stored in the register (D10, D11).



- Example 2

When X0 = ON, subtract the floating-point numbers (D3, D2) from the floating-point numbers (D1, D0), and stores the result in (D11, D10).



API	Instruction Code			Operand	Function
174	D	**MULR**	P	S_1, S_2, D	Floating-point number multiplication

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1											*
S_2											*
D											*

Caution for using operand

- The floating-point values (e.g., F1.2) can be entered directly into S_1 and S_2
- The floating-point value after the operation will be stored in operand D

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DMULR	Continuous execution type	DMULRP	Pulse execution type

Associated flag: none

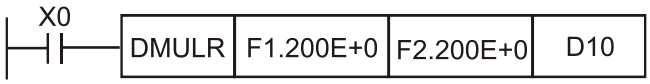
Description

- S_1: floating-point number multiplicand
  S_2: floating-point number multiplicator
  D: product (floating-point)
- When the floating-point values of S_1 and S_2 are stored in the register D, its function is the same as API 122 DEMUL.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as "continuous execution type" instruction (pulse execution type DMULRP is generally used) and the drive contact is ON, the register will operate once in every scan.

Example

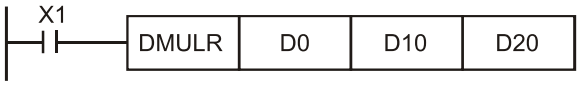
- Example 1

When X0 = ON, the floating-point value F1.200E+0 (input the floating-point number F1.2, the ladder diagram shows a scientific notation F1.200E+0. You can set the floating-point digit by using WPLSoft) multiplies the floating-point value F2.200E+0, the operation result is F2.640E+0 and is stored in the register (D10, D11).



- Example 2

When X1 = ON, multiply the floating-point number (D1, D0) and (D11, D11), and store the product to (D21, D20).



API	Instruction Code			Operand	Function
175	D	**DIVR**	P	S_1, S_2, D	Floating-point number division

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1											*
S_2											*
D											*

Caution for using operand

- The floating-point values (e.g., F1.2) can be entered directly into S_1 and S_2
- The floating-point value after the operation will be stored in operand D

16-bit instruction

-	-	-	-

32-bit instruction (13 steps)

DDIVR	Continuous execution type	DDIVRP	Pulse execution type

Associated flag: none

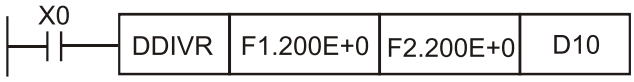
Description

- S_1: floating-point number dividend
  S_2: floating-point number divisor
  D: quotient (floating-point)
- When the floating-point values of S_1 and S_2 are stored in the register D, its function is the same as API 123 DEDIV.
- S_1 and S_2 can designate the same register. In this case, if the instruction is specified as “continuous execution type” instruction (pulse execution type DDIVRP is generally used) and the drive contact is ON, the register will operate once in every scan.

Example

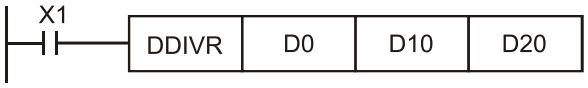
- Example 1

When X0 = ON, the floating-point value F1.200E+0 (input the floating-point number F1.2, the ladder diagram shows a scientific notation F1.200E+0. You can set the floating-point digit by using WPLSoft) divided by the floating-point value F2.200E+0, the operation result is F0.545E+0 and is stored in the register (D10, D11).



- Example 2

When X1 = ON, the floating-point number (D1, D0) divided by (D11, D11), and store the quotient to (D21, D20).



API	Instruction Code	Operand	Function
202	**SCAL** P	S_1, S_2, S_3, n	Proportional calculation

Operand \ Type	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
S_3				*	*						*
D											*

16-bit instruction (9 steps)

SCAL	Continuous execution type	SCALP	Pulse execution type

32-bit instruction

-	-	-	-

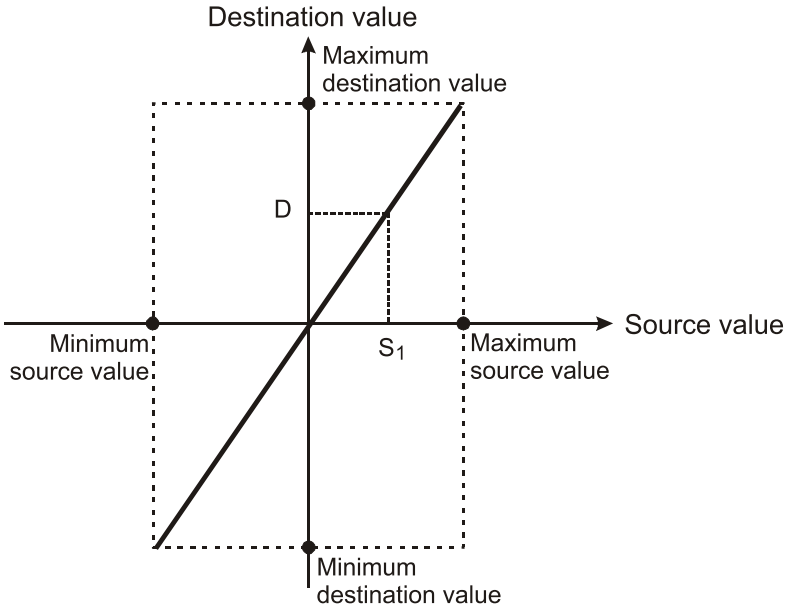
Caution for using operand

- The range of S_1, S_2, S_3 is -32768–32767
- If D > 32,767, then D = 32,767
  If D < -32,768, then D = -32,768

Associated flag: none

Description

- S_1: source value
  S_2: slope (unit: 0.001)
  S_3: offset
  D: destination devices
- Operation formula in the instruction: $D = (S_1 \times S_2) \div 1{,}000 + S_3$
- Users have to obtain S_2 and S_3 (decimals are rounded up into 16-bit integers) by using the slope and offset formulas below.
- Formula for slope: S_2 = [(max. destination value – min. destination value) ÷ (max. source value – min. source value)] × 1,000
- Formula for offset: S_3 = min. destination value – min. source value x S_2 ÷ 1,000
- Using the formula for slope must be noted that the max. source value has to be greater than the min. source value, and it is not limited that the max. destination value to be greater than the min. destination value.
- The output curve is shown as the figure:

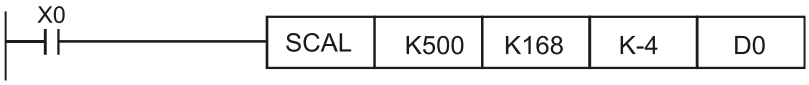


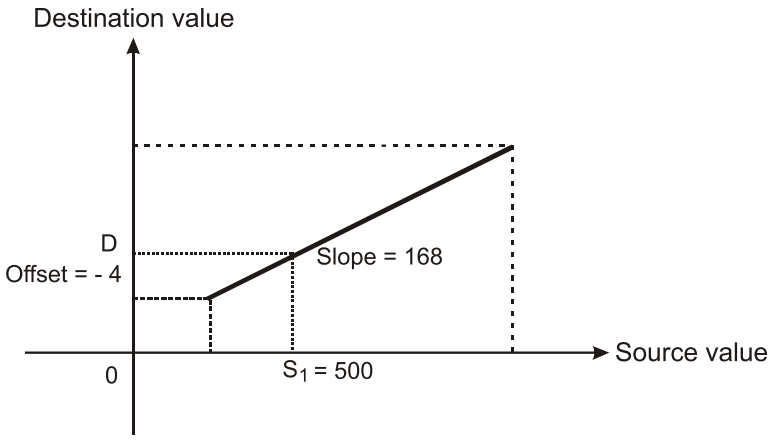
Example

- Example 1

Assume S_1 = 500, S_2 = 168, S_3 = -4 When X0 = ON, after executing SCAL instruction, you can obtain the required ratio in D0.

Calculation: D0 = (500 × 168) ÷ 1000 + (-4) = 80

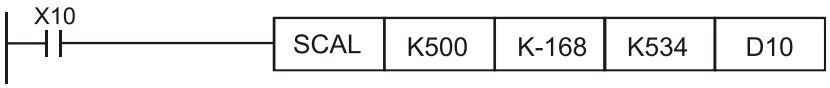


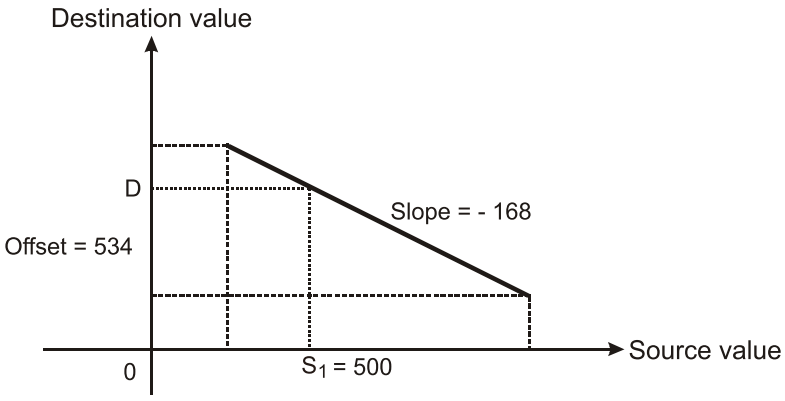


- Example 2

Assume S_1 = 500, S_2 = -168, S_3 = 534 When X0 = ON, after executing SCAL instruction, you can obtain the required ratio in D10.

Calculation: D10 = (500 × -168) ÷ 1000+ 534 = 450





API	Instruction Code		Operand	Function
160	**TCMP**	P	S_1, S_2, S_3, S, D	Time comparison

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*
S_3				*	*	*	*	*	*	*	*
S									*	*	*
D		*	*								

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (11 steps)

TCMP	Continuous execution type	TCMPP	Pulse execution type

32-bit instruction

-	-	-	-

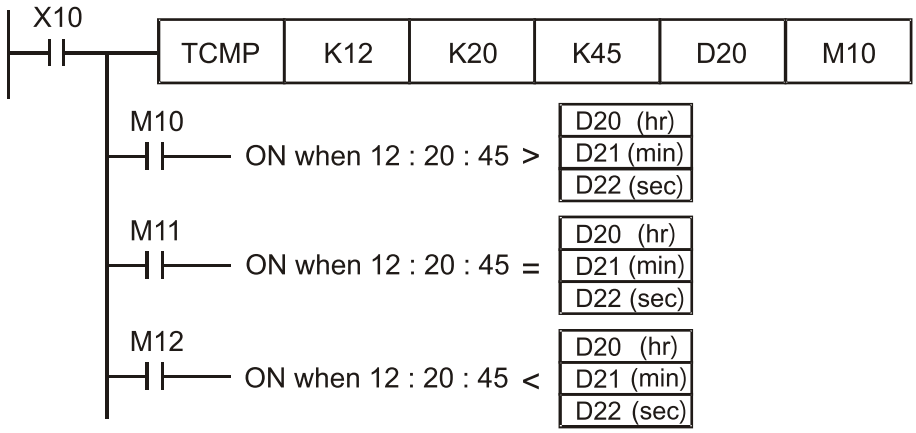
Associated flag: none

Description

- S_1: hour setting for time comparison, setting range: K0–K23
  S_2: minute setting for time comparison, setting range: K0–K59
  S_3: second setting for time comparison, setting range: K0–K59
  S: current time of RTC
  D: comparison result
- Compare the setting value of S_1, S_2, S_3 and the current value of start of S, and the comparison result is stored in D.
- S is the "hour" of the current time (K0–K23) in RTC. S+1 is the "minute" of the current time (K0–K59) in RTC. S+2 is the "second" of the current time (K0–K59) in RTC.
- Usually, the current time of RTC that S designates is read by using TRD instruction and then doing comparison by TCMP instruction. If S value exceeds the available range, it is operation error, so the instruction is not executed, M1068 = ON.

Example

- When X10 = ON, the instruction is executed to compare the current time of RTC D20–D22 and the setting value 12:20:45. The comparison result is stored in M10–M12. When X10 goes from ON→OFF, the instruction is not executed, but the previous ON / OFF statuses of M10–M12 remain.



API	Instruction Code		Operand	Function
161	**TZCP**	P	S_1, S_2, S, D	Time zone comparison

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*
S									*	*	*
D		*	*								

16-bit instruction (9 steps)

TZCP	Continuous execution type	TZCPP	Pulse execution type

32-bit instruction

-	-	-	-

Caution for using operand

- See the specification of each model for the scope of device's usage.

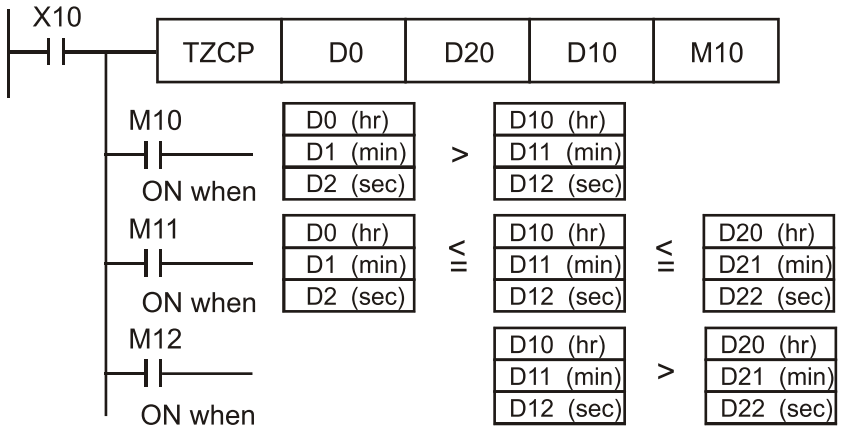
Associated flag: none

Description

- S_1: the lower bound setting value for time comparison
  S_2: the upper bound setting value for time comparison
  S: current time of RTC
  D: comparison result
- Compare the current time of RTC that S designates with S1–S2, the comparison result is stored in D.
- S_1, S_1 + 1, S_1 + 2: the hour, minute, second of the lower bound setting value for comparison.
- S_2, S_2 + 1, S_2 + 2: the hour, minute, second of the upper bound setting value for comparison.
- S, S + 1, S + 2: the hour, minute, second of the current time of RTC.
- D0 that S designates is usually read the current time of RTC by using TRD instruction and then doing comparison by TZCP instruction. If S_1, S_2 and S value exceed the available range, it is operation error, so the instruction is not executed, M1068 = ON.
- If S < S_1 and S < S_2, then D = ON; if S > S_1 and S < S_2, then D+2 = ON. For other conditions are D+1 = ON

Example

- When X10 = ON, TZCP instruction is executed, and one of M10, M11, and Y2 will be ON. When X10 = OFF, TZCP instruction is not executed, and M10, M11, and M12 remain their statuses before X10 = OFF.



API	Instruction Code		Operand	Function
162	TADD	P	S_1, S_2, D	Time addition

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*
D		*	*						*	*	*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (7 steps)

TADD	Continuous execution type	TADDP	Pulse execution type

32-bit instruction

-	-	-	-

Associated flag:

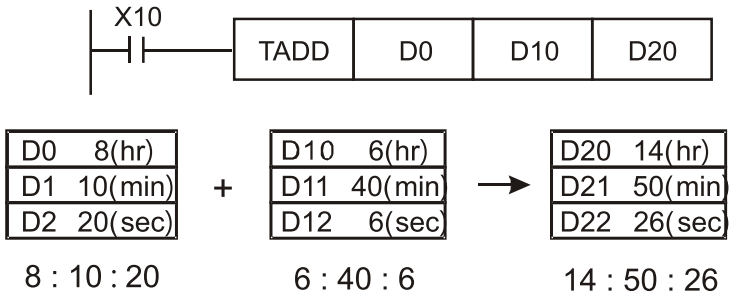
M1020: Zero flag
M1022: Carry flag
M1068 RTC error

Description

- S_1: time augend
  S_2: time addend
  D: time sum
- Add the hour, minute, second that S_1 designates and the hour, minute, second that S_2 designates, the result is stored in the hour, minuet, second of the register that D designates.
- If S_1, S_2 exceed the range, it's operation error, so the instruction is not executed. M1067, M1068 = ON, and record fault code 0E1A (HEX) in D1067.
- If the sum ≥ 24 hours, carry flag M1022 = ON, and the result in D is the value of the sum minus 24 hours.
- If the sum equals to 0 (00:00:00), zero flag M1020 = ON.

Example

- When X10 = ON, TADD instruction is executed. The hour, minute, second that D0–D2 designate plus the hour, minute, second that D10–D12 designates, the result is stored in the hour, minuet, second of the register that D20–D22 designates.



API	Instruction Code	Operand	Function
163	**TSUB** P	S_1, S_2, D	Time subtraction

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*
D									*	*	*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (7 steps)

TSUB	Continuous execution type	TSUBP	Pulse execution type

32-bit instruction

-	-	-	-

Associated flag:

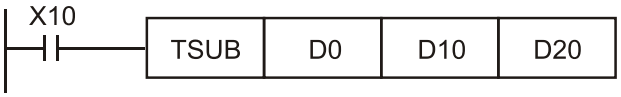
M1020: Zero flag
M1022: Carry flag
M1068 RTC error

Description

- S_1: time minuend
  S_2: time subtrahend
  D: time difference
- Add the hour, minute, second that S_1 designates and the hour, minute, second that S_2 designates, the result is stored in the hour, minuet, second of the register that D designates.
- If S_1, S_2 exceed the range, it's operation error, so the instruction is not executed. M1067, M1068 = ON, and record fault code 0E1A (HEX) in D1067.
- If the difference is a negative, borrow flag M1021 = ON, and the result of the negative number plus 24 hours will be displayed in the register D designates.
- If the difference equals to 0 (00:00:00), zero flag M1020 = ON.

Example

- When X10 = ON, TSUB instruction is executed. The hour, minute, second that D0–D2 designate minus the hour, minute, second that D10–D12 designates, the result is stored in the register that D20–D22 designates.



D0 20(hr)		D10 14(hr)		D20 5(hr)
D1 20(min)	–	D11 30(min)	→	D21 49(min)
D2 5(sec)		D12 8(sec)		D22 57(sec)
20 : 20 : 5		14 : 30 : 8		5 : 49 : 57

API	Instruction Code		Operand	Function
166	**TRD**	P	D	Time read

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
D									*	*	*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (3 steps)

TRD	Continuous execution type	TRDP	Pulse execution type

32-bit instruction

-	-	-	-

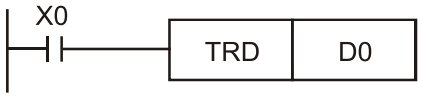
Associated flag: none

Description

- S: the device for storing the current time read in RTC
- The RTC offers year, week, month, day, hour, minute, second, a total of 7 sets of data to store in D1063–D1069. The function of TRD instruction allows programmers to read the current time of RTC and store in the designated 7 registers.
- D1063 only stores the last 2 digits of the A.D. year.

Example

- When X0 = ON, read the current time of RTC and store in D0–D6 registers.
- The content of D1064, 1 = Monday, 2 = Tuesday ... 7 = Sunday



Special D	Item	Content		General D	Item
D1063	Year (A.D.)	00–99	→	D0	Year (A.D.)
D1064	Week	1–7	→	D1	Week
D1065	Month	1–12	→	D2	Month
D1066	Day	1–31	→	D3	Day
D1067	Hour	0–23	→	D4	Hour
D1068	Minute	0–59	→	D5	Minute
D1069	Second	0–59	→	D6	Second

API	Instruction Code			Operand	Function
170	D	**GRY**	P	S, D	Binary code → Gray code

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

GRY	Continuous execution type	GRYP	Pulse execution type

32-bit instruction (9 steps)

DGRY	Continuous execution type	DGRYP	Pulse execution type

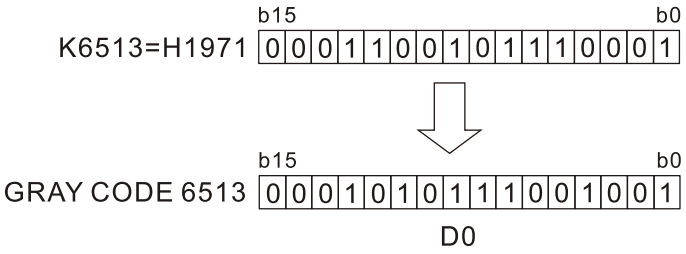
Associated flag: none

Description

- S: source device
  D: device for storing Gray code
- Convert the binary value of the device designated by S to Gray code, and store in the device that D designates.
- The available range of S is as below. If the value exceeds the range, it is operation error, and the instruction is not executed.
  16-bit instruction: 0–32,767
  32-bit instruction: 0–2,147,483,647

Example

- When X0 = ON, convert the constant K6513 to Gray code, and store in D0.



API	Instruction Code			Operand	Function
171	D	**GBIN**	P	S, D	Gray code → Binary code

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S				*	*	*	*	*	*	*	*
D							*	*	*	*	*

Caution for using operand

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

GBIN	Continuous execution type	GBINP	Pulse execution type

32-bit instruction (9 steps)

DGBIN	Continuous execution type	DGBINP	Pulse execution type

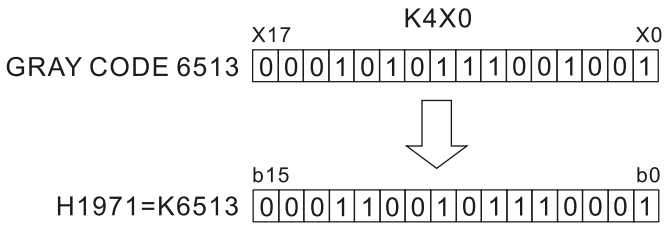
Associated flag: none

Description

- S: source device for storing Gray code
  D: device for storing the binary value
- Convert the content (Gray code) of the device designated by S to binary value, and store in the device that D designates.
- This instruction is to convert the content of the absolute position type encoder (the output value is generally Gray code) which connects with input side of PLC to be binary value, and store in the designated register.
- The available range of S is as below. If the value exceeds the range, it is operation error, and the instruction is not executed.
  16-bit instruction: 0–32,767
  32-bit instruction: 0–2,147,483,647

Example

- When X20 = ON, convert the Gray code from the absolute position encoder which connects with X0–X17 input side to be binary value, and store in D10.



API	Instruction Code	Operand	Function
215–217	D **LD#**	S_1, S_2	Contact type logical operation LD#

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

LD#	Continuous execution type	-	-

32-bit instruction (9 steps)

DLD#	Continuous execution type	-	-

Associated flag: none

Description

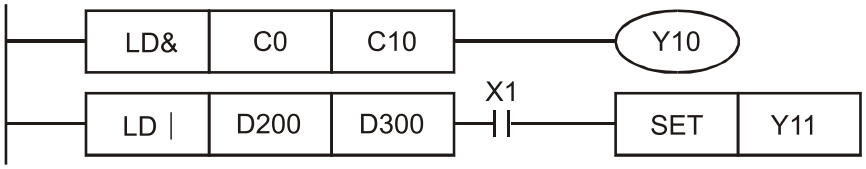
- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, if the result ≠ 0, the continuity of the instruction is enabled; if the result = 0, the continuity of the instruction is disabled.
- LD# (#: &, |, ^) instruction is used for direct connection with busbar

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
215	LD&	**D**LD&	S_1 & S_2 ≠ 0	S_1 & S_2 = 0
216	LD|	**D**LD|	S_1 | S_2 ≠ 0	S_1 | S_2 = 0
217	LD^	**D**LD^	S_1 ^ S_2 ≠ 0	S_1 ^ S_2 = 0

- &: logical operation with AND operator
- |: Logical operation with OR operator
- ^: Logical operation with XOR operator

Example

- C1 and C10 perform "AND" logical operation, if the result is not 0, Y10 = ON
- D200 and D300 perform "OR" logical operation, if the result is not 0 and X1 = ON, then Y11 = ON and hold.



API	Instruction Code	Operand	Function
218–220	D **AND#**	S_1, S_2	Contact type logical operation AND#

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

AND#	Continuous execution type	-	-

32-bit instruction (9 steps)

DAND#	Continuous execution type	-	-

Associated flag: none

Description

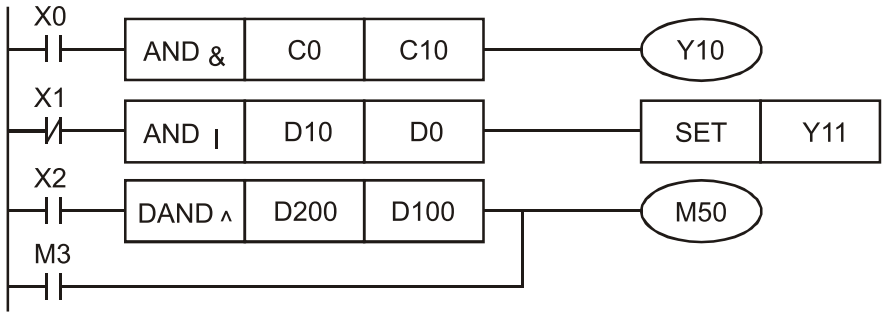
- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, if the result ≠ 0, the continuity of the instruction is enabled; if the result = 0, the continuity of the instruction is disabled.
- AND# (#: &, |, ^) instruction is used for serial connection with contacts

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
218	AND&	**D**AND&	S_1 & S_2 ≠ 0	S_1 & S_2 = 0
219	AND|	**D**AND|	S_1 | S_2 ≠ 0	S_1 | S_2 = 0
220	AND^	**D**AND^	S_1 ^ S_2 ≠ 0	S_1 ^ S_2 = 0

- &: logical operation with AND operator
- |: Logical operation with OR operator
- ^: Logical operation with XOR operator

Example

- When X0 =ON, and C1 and C10 perform "AND" logical operation with the result is not 0, then Y10 = ON
- When X1 = OFF, and D10 and D0 perform "OR" logical operation with the result is not 0, then Y11 = ON and hold.
- When X2 = ON, and 32-bit registers D200 (D201) and D100 (D101) perform "XOR" logical operation with the result is not 0 or M3 = ON, then M50 = ON.



API	Instruction Code	Operand	Function
221–223	D **OR#**	S_1, S_2	Contact type logical operation OR#

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

OR#	Continuous execution type	-	-

32-bit instruction (9 steps)

DOR#	Continuous execution type	-	-

Associated flag: none

Description

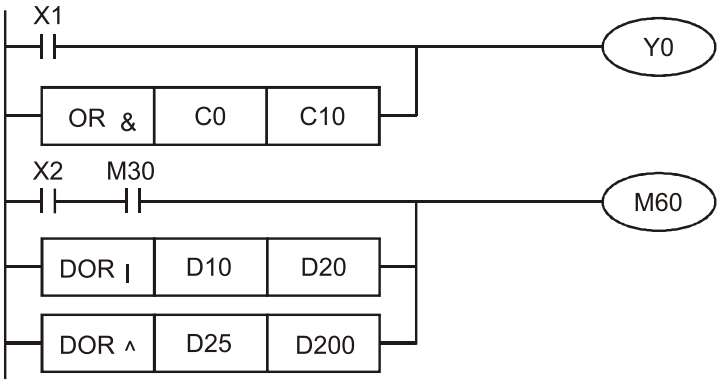
- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, if the result ≠ 0, the continuity of the instruction is enabled; if the result = 0, the continuity of the instruction is disabled.
- OR# (#: &, |, ^) instruction is used for parallel connection with contacts

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
221	OR&	**D**OR&	S_1 & S_2 ≠ 0	S_1 & S_2 = 0
222	OR|	**D**OR|	S_1 | S_2 ≠ 0	S_1 | S_2 = 0
223	OR^	**D**OR^	S_1 ^ S_2 ≠ 0	S_1 ^ S_2 = 0

- &: logical operation with AND operator
- |: Logical operation with OR operator
- ^: Logical operation with XOR operator

Example

- When X0 =ON, or C0 and C10 perform "AND" logical operation with the result is not 0, then Y0 = ON
- When both X2 and M30 are ON, or 32-bit registers D10 (D11) and D20 (D21) perform "OR" logical operation with the result is not 0, or 32-bit counter C235 and 32-bit register D200 (D201) perform "XOR" logical operation with the result is not 0, then M60 = ON.



API	Instruction Code	Operand	Function
224–230	D **LD※**	S_1, S_2	Contact type comparison LD※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand ※: =, >, <, <>, ≦, ≧

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

LD※	Continuous execution type	-	-

32-bit instruction (9 steps)

DLD※	Continuous execution type	-	-

Associated flag: none

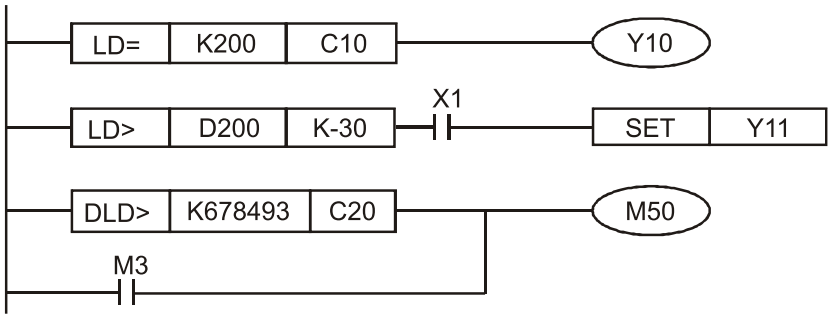
Description

- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, take API 224 (LD=) as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- LD※ (※: =, >, <, <>, ≦, ≧) instruction is used for direct connection with busbar

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
224	LD=	**D**LD=	$S_1 = S_2$	$S_1 \neq S_2$
225	LD>	**D**LD>	$S_1 > S_2$	$S_1 \leq S_2$
226	LD<	**D**LD<	$S_1 < S_2$	$S_1 \geq S_2$
228	LD<>	**D**LD<>	$S_1 \neq S_2$	$S_1 = S_2$
229	LD<=	**D**LD<=	$S_1 \leq S_2$	$S_1 > S_2$
230	LD>=	**D**LD>=	$S_1 \geq S_2$	$S_1 < S_2$

Example

- When C10 = K200, Y10 = ON.
- When D200 > K-30 and X1 = ON, Y11 = ON and hold.



API	Instruction Code	Operand	Function
232–238	D **AND※**	S_1, S_2	Contact type comparison AND※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand ※: =, >, <, <>, ≦, ≧

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

AND※	Continuous execution type	-	-

32-bit instruction (9 steps)

DAND※	Continuous execution type	-	-

Associated flag: none

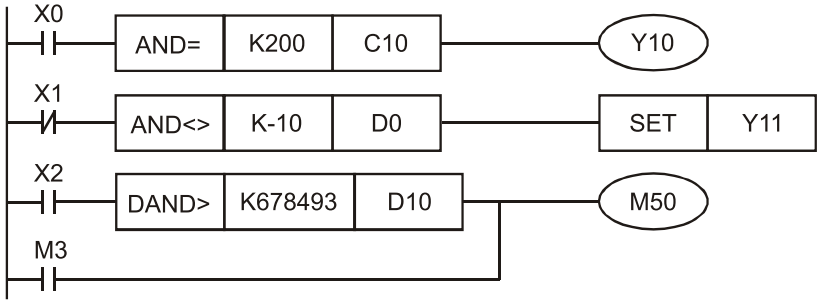
Description

- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, take API 232 (AND=) as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- AND※ (※: =, >, <, <>, ≦, ≧) instruction is used for serial connection with contacts

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
232	AND=	**D**AND=	$S_1 = S_2$	$S_1 \neq S_2$
233	AND>	**D**AND>	$S_1 > S_2$	$S_1 \leq S_2$
234	AND<	**D**AND<	$S_1 < S_2$	$S_1 \geq S_2$
236	AND<>	**D**AND<>	$S_1 \neq S_2$	$S_1 = S_2$
237	AND<=	**D**AND<=	$S_1 \leq S_2$	$S_1 > S_2$
238	AND>=	**D**AND>=	$S_1 \geq S_2$	$S_1 < S_2$

Example

- When X0 = ON, and the current value of C10 = K200, then Y10 = ON
- When X1 =OFF, and D0 ≠ K-10, then Y11 = ON and hold.
- When X2 = ON, the 32-bit register D0 (D11) is less than 678,493 or M3 = ON, then M50 = ON.



API	Instruction Code	Operand	Function
240–246	D **OR※**	S_1, S_2	Contact type comparison OR※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*	*	*	*	*	*	*
S_2				*	*	*	*	*	*	*	*

Caution for using operand ※: =, >, <, <>, ≦, ≧

- See the specification of each model for the scope of device's usage.

16-bit instruction (5 steps)

OR※	Continuous execution type	-	-

32-bit instruction (9 steps)

DOR※	Continuous execution type	-	-

Associated flag: none

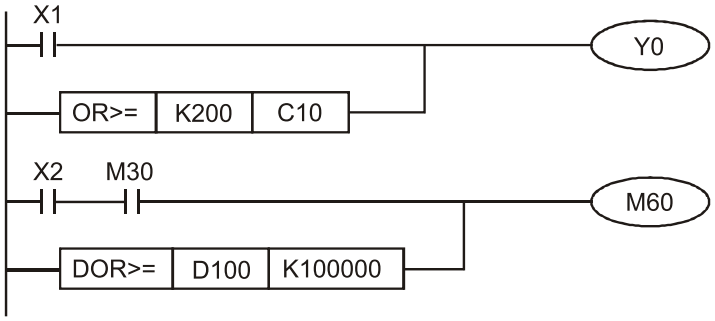
Description

- S_1: source device 1
  S_2: source device 2
- This instruction is to compare S_1 and S_2, take API 240 (OR=) as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- OR※ (※: =, >, <, <>, ≦, ≧) instruction is used for parallel connection with contacts

API No.	16-bit Instruction	32-bit Instruction	Continuity Condition	Discontinuity Condition
240	OR=	**D**OR=	$\mathbf{S_1 = S_2}$	$\mathbf{S_1 \neq S_2}$
241	OR>	**D**OR>	$\mathbf{S_1 > S_2}$	$\mathbf{S_1 \leq S_2}$
242	OR<	**D**OR<	$\mathbf{S_1 < S_2}$	$\mathbf{S_1 \geq S_2}$
244	OR<>	**D**OR<>	$\mathbf{S_1 \neq S_2}$	$\mathbf{S_1 = S_2}$
245	OR<=	**D**OR<=	$\mathbf{S_1 \leq S_2}$	$\mathbf{S_1 > S_2}$
246	OR>=	**D**OR>=	$\mathbf{S_1 \geq S_2}$	$\mathbf{S_1 < S_2}$

Example

- When X0 = ON, and the current value of C10 = K200, then Y10 = ON
- When X1 =OFF, and D0 ≠ K-10, then Y11 = ON and hold.
- When X2 = ON, the 32-bit register D0 (D11) is less than 678,493 or M3 = ON, then M50 = ON.



API	Instruction Code			Operand	Function
275–280	D	**FLD※**		S_1, S_2	Floating-point number contact type comparison LD※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

FLD※	Continuous execution type	-	-

Associated flag: none

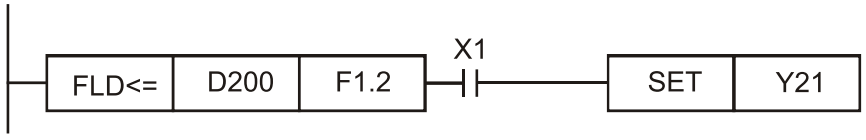
Description

- S_1: source device 1
  S_2: source device 2
- This instruction compares the content in S_1 and S_2. Take "FLD=" as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- Use FLD※ instruction, users can execute operation directly by inputting floating-point value (e.g., F1.2) in S_1, S_2 or storing floating-point value in the register D.
- The instruction is used for direct connection with busbar

API No.	32-bit Instruction	Continuity Condition	Discontinuity Condition
275	FLD=	$\mathbf{S_1 = S_2}$	$\mathbf{S_1 \neq S_2}$
276	FLD>	$\mathbf{S_1 > S_2}$	$\mathbf{S_1 \leq S_2}$
277	FLD<	$\mathbf{S_1 < S_2}$	$\mathbf{S_1 \geq S_2}$
278	FLD<>	$\mathbf{S_1 \neq S_2}$	$\mathbf{S_1 = S_2}$
279	FLD<=	$\mathbf{S_1 \leq S_2}$	$\mathbf{S_1 > S_2}$
280	FLD>=	$\mathbf{S_1 \geq S_2}$	$\mathbf{S_1 < S_2}$

Example

- When the floating-point value in D200 (D201) ≤ F1.2 and X1 is ON, then Y21 is being triggered and hold.



API	Instruction Code			Operand	Function
281–286	D	**FAND※**		S_1, S_2	Floating-point number contact type comparison AND※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

FAND※	Continuous execution type	-	-

Associated flag: none

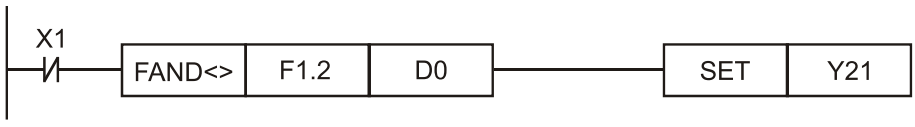
Description

- S_1: source device 1
  S_2: source device 2
- This instruction compares the content in S_1 and S_2. Take "FAND=" as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- Use FAND※ instruction, users can execute operation directly by inputting floating-point value (e.g., F1.2) in S_1, S_2 or storing floating-point value in the register D.
- The instruction is used for direct connection with busbar

API No.	32-bit Instruction	Continuity Condition	Discontinuity Condition
281	FAND=	$\mathbf{S_1 = S_2}$	$\mathbf{S_1 \neq S_2}$
282	FAND>	$\mathbf{S_1 > S_2}$	$\mathbf{S_1 \leq S_2}$
283	FAND<	$\mathbf{S_1 < S_2}$	$\mathbf{S_1 \geq S_2}$
284	FAND<>	$\mathbf{S_1 \neq S_2}$	$\mathbf{S_1 = S_2}$
285	FAND<=	$\mathbf{S_1 \leq S_2}$	$\mathbf{S_1 > S_2}$
286	FAND>=	$\mathbf{S_1 \geq S_2}$	$\mathbf{S_1 < S_2}$

Example

- When X1 = OFF, and D100 (D101) ≠ F1.2, then Y21 = ON and hold.



API	Instruction Code	Operand	Function
287–292	**FOR※**	S_1, S_2	Floating-point number contact type comparison OR※

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1									*	*	*
S_2									*	*	*

Caution for using operand: # : & | ^

- See the specification of each model for the scope of device's usage.

16-bit instruction

-	-	-	-

32-bit instruction (9 steps)

FOR※	Continuous execution type	-	-

Associated flag: none

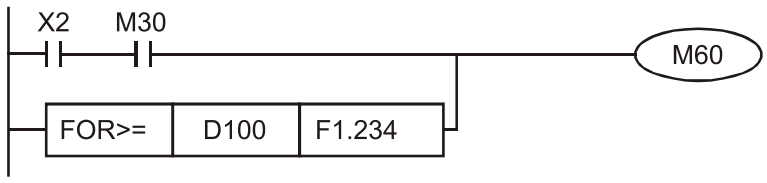
Description

- S_1: source device 1
  S_2: source device 2
- This instruction compares the content in S_1 and S_2. Take "FOR=" as an example, if the result is "equal to", the continuity of the instruction is enabled; if the result is "not equal to", the continuity of the instruction is disabled.
- Use FOR※ instruction, users can execute operation directly by inputting floating-point value (e.g., F1.2) in S_1, S_2 or storing floating-point value in the register D.
- The instruction is used for direct connection with busbar

API No.	32-bit Instruction	Continuity Condition	Discontinuity Condition
287	FOR=	$\mathbf{S_1 = S_2}$	$\mathbf{S_1 \neq S_2}$
288	FOR>	$\mathbf{S_1 > S_2}$	$\mathbf{S_1 \leq S_2}$
289	FOR<	$\mathbf{S_1 < S_2}$	$\mathbf{S_1 \geq S_2}$
290	FOR<>	$\mathbf{S_1 \neq S_2}$	$\mathbf{S_1 = S_2}$
291	FOR<=	$\mathbf{S_1 \leq S_2}$	$\mathbf{S_1 > S_2}$
292	FOR>=	$\mathbf{S_1 \geq S_2}$	$\mathbf{S_1 < S_2}$

Example

- When both X2 and M30 are ON, or the content in D100 (D101) ≥ F1.234, then M60 = ON.



7-2-5 Instructions of special application instructions for AC motor drives

API	Instruction Code	Operand	Function
139	D **RPR** P	S_1, S_2	Read parameters of drive

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2											*

Caution for using operand: none

16-bit instruction (5 steps)

RPR	Continuous execution type	RPRP	Pulse execution type

32-bit instruction (9 steps)

DRPR	Continuous execution type	DRPRP	Pulse execution type

Associated flag:

M1016 parameters written error
M1017 parameters written successfully

Description

- S_1: the parameter address for reading data
  S_2: the register for storing the read data

API	Instruction Code			Operand	Function
140	D	**WPR**	P	S_1, S_2	Write parameters of drive

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*

Caution for using operand: none

16-bit instruction (5 steps)

WPR	Continuous execution type	WPRP	Pulse execution type

32-bit instruction (9 steps)

DWPR	Continuous execution type	DWPRP	Pulse execution type

Associated flag:

M1016 parameters written error
M1017 parameters written successfully

Description

- S_1: the data to be written
  S_2: the parameter address for writing data

Suggestion

- Note that when you use WPR instruction and write in parameters, most parameters are recorded at the same time of writing, and these parameters allows 10^9 times for change. A memory write error may occur if parameters are written more than 10^9 times.
- The following commonly used parameters have been specially processed, so there is no limit to the number of write times.
  1. PLC application parameters: L1-00–L1-49, L2-00–L2-49
  2. The source selection of PLC mode control digital terminal, bit0–bit1: L0-07–L0-08
  3. Acceleration time 1: Pr.C2-00
  4. Deceleration time 1: Pr.C2-01
  5. Acceleration time 2: Pr.C2-02
  6. Deceleration time 2: Pr.C2-03
  7. Acceleration time 3: Pr.C2-04
  8. Deceleration time 3: Pr.C2-05
  9. Acceleration time 4: Pr.C2-06
  10. Deceleration time 4: Pr.C2-07
  11. JOG acceleration time 4: Pr.C3-01
  12. JOG deceleration time 4: Pr.C3-02
- The calculation of write times is based on the written value whether is being changed or not. For example, write the same value 100 times at the same time counts as once only.
- If you are not sure that the use of WPR instruction in PLC writing, we recommend you use WPRA instruction.

API	Instruction Code			Operand	Function
323	D	**WPRA**	P	S_1, S_2	Write parameters of drive (in RAM only)

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*

Caution for using operand: none

16-bit instruction (5 steps)

WPRA	Continuous execution type	WPRAP	Pulse execution type

32-bit instruction (9 steps)

DWPRA	Continuous execution type	DWPRAP	Pulse execution type

Associated flag:

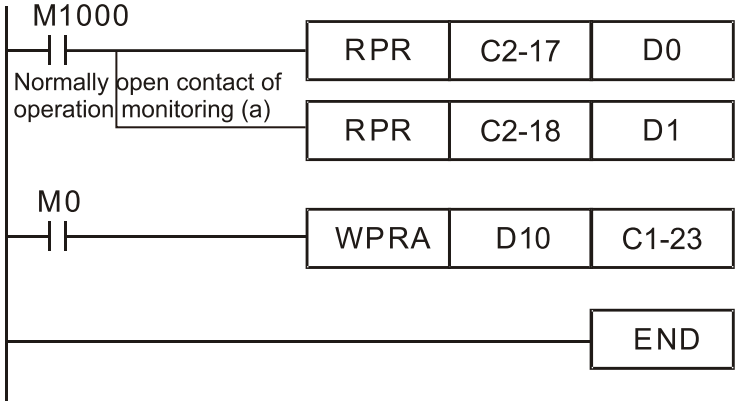
M1016 parameters written error
M1017 parameters written successfully

Description

- S_1: the data to be written
  S_2: the parameter address for writing data

Example

- Read Pr.C2-17 data of VP3000 and write into D0, read Pr.C2-18 data and write into D1.
- When M0 = ON, write the content of D10 into VP3000's Pr.C1-23 (multi-speed 1).
- If parameters are written successfully, M1017 = ON.



API	Instruction Code	Operand	Function
142	**FREQ** P	S_1, S_2, S_3	AC motor drive speed control

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
S_3				*	*						*

Caution for using operand: none

16-bit instruction (7 steps)

FREQ	Continuous execution type	FREQP	Pulse execution type

32-bit instruction

-	-	-	-

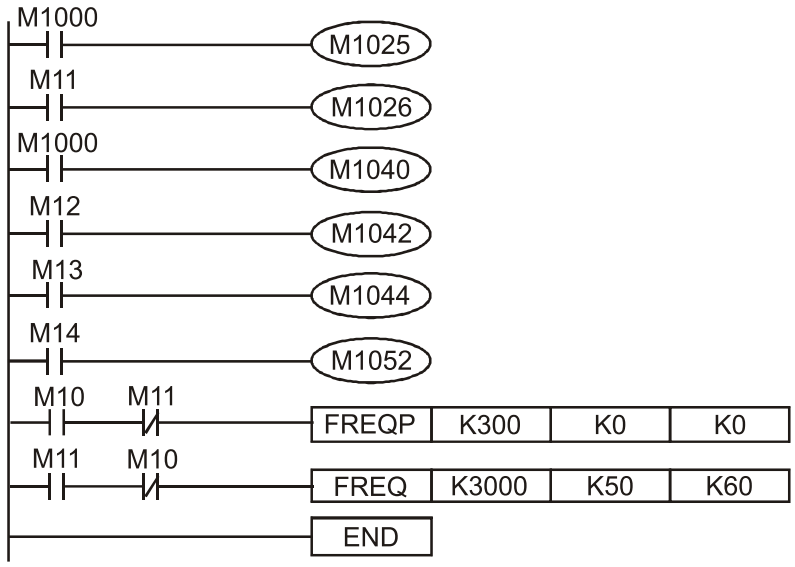
Associated flag: M1015

Description

- S_1: frequency command
  S_2: acceleration time
  S_3: deceleration time
- S_2, S_3: for the setting of acceleration time / deceleration time, the number of decimal places is determined by Pr.C2-13.
  For example, when Pr.C2-13 = 0 (unit: 0.01 second)
  See the ladder diagram below, if set S_2 as 50, it means 0.5 seconds; if set S_3 as 60, it means 0.6 seconds.
- The FREQ instruction can control AC motor drive's frequency command, acceleration time and deceleration time.; and it also can control operation by using special register.
  Such as:
  1. M1025: control RUN (ON) / STOP (OFF) of AC motor drive
     [Note: RUN is valid when servo ON (M1040 = ON).]
  2. M1026: control the direction of operation FWD (OFF) / REV (ON) of AC motor drive
  3. M1040: control servo ON (ON) / servo OFF (OFF)
  4. M1042: trigger quick stop (ON) / do not trigger quick stop (OFF)
  5. M1044: pause (ON) / release pause (OFF)
  6. M1052: lock frequency (ON) / release lock frequency (OFF)

Example

- M1025: control RUN (ON) / STOP (OFF) of AC motor drive
  M1026: control the direction of operation FWD (OFF) / REV (ON) of AC motor drive
  M1015: frequency reached
- When M10 = ON, set AC motor drive's frequency command K300 (3.00 Hz) with acceleration time and deceleration time of 0.
  When M11 = ON, set AC motor drive's frequency command K3000 (30.00 Hz) with acceleration time of 50 (0.5 sec.) and deceleration time of 60 (0.6 sec.). (When Pr.C2-13 = 0)
- When M11 = OFF, AC motor drive's frequency command becomes 0.

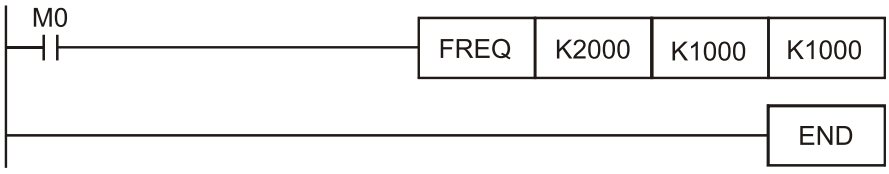


- Pr. L0-01 is defined as whether the reference command before PLC execution is cleared.

  bit 0: before the PLC scan, whether the target frequency is cleared to be 0.

  (PLC is ON, and FREQ instruction is in the program)

  For example: when a user is writing a program,



  we force M0 to be 1, then the frequency command is 20.00 Hz. If M0 = 0, it has different situations:

  Case1: when Pr.L0-01 bit0 is 0, and M0 = 0, then the frequency command remains at 20.00 Hz.

  Case2: when Pr.L0-01 bit0 is 1, and M0 = 0, then the frequency command becomes 0.00 Hz.

  This is because that before the PLC scans the programs, when Pr.L0-01 bit0 = 1, the frequency will be cleared to be 0 first; when Pr.L0-01 bit0 = 0, the action to clear the frequency to be 0 is not performed.

API	Instruction Code	Operand	Function
322	**CATCH** P	S_1, S_2, S_3, n	Word read of internal control

Type / Operand	Bit Devices			Word Devices							
	X	Y	M	K	H	KnX	KnY	KnM	T	C	D
S_1				*	*						*
S_2				*	*						*
S_3				*	*						*
D				*	*						*

Caution for using operand: stored in D and D+1

16-bit instruction (9 steps)

CATCH	Continuous execution type	CATCHP	Pulse execution type

32-bit instruction

-	-	-	-

Associated flag: none

Description

- S_1: channel selection

  S_2: the address to read

  S_3: the address to read (SUB)

  D: destination for storing (D and D+1)
- The definition of channels:

  0: Reserved

  1: RS485

  2: Reserved

  3: COM Card

  4: CANopen
- The definition of S_2:

  20XXH: refer to the communication related chapter for details

  26XXH: refer to the communication related chapter for details

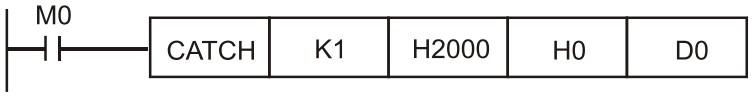
  60XXH: refer to the communication related chapter for details
- The definition of S_3:

  Only supported by 60XXH, refer to the communication related chapter for details

Example

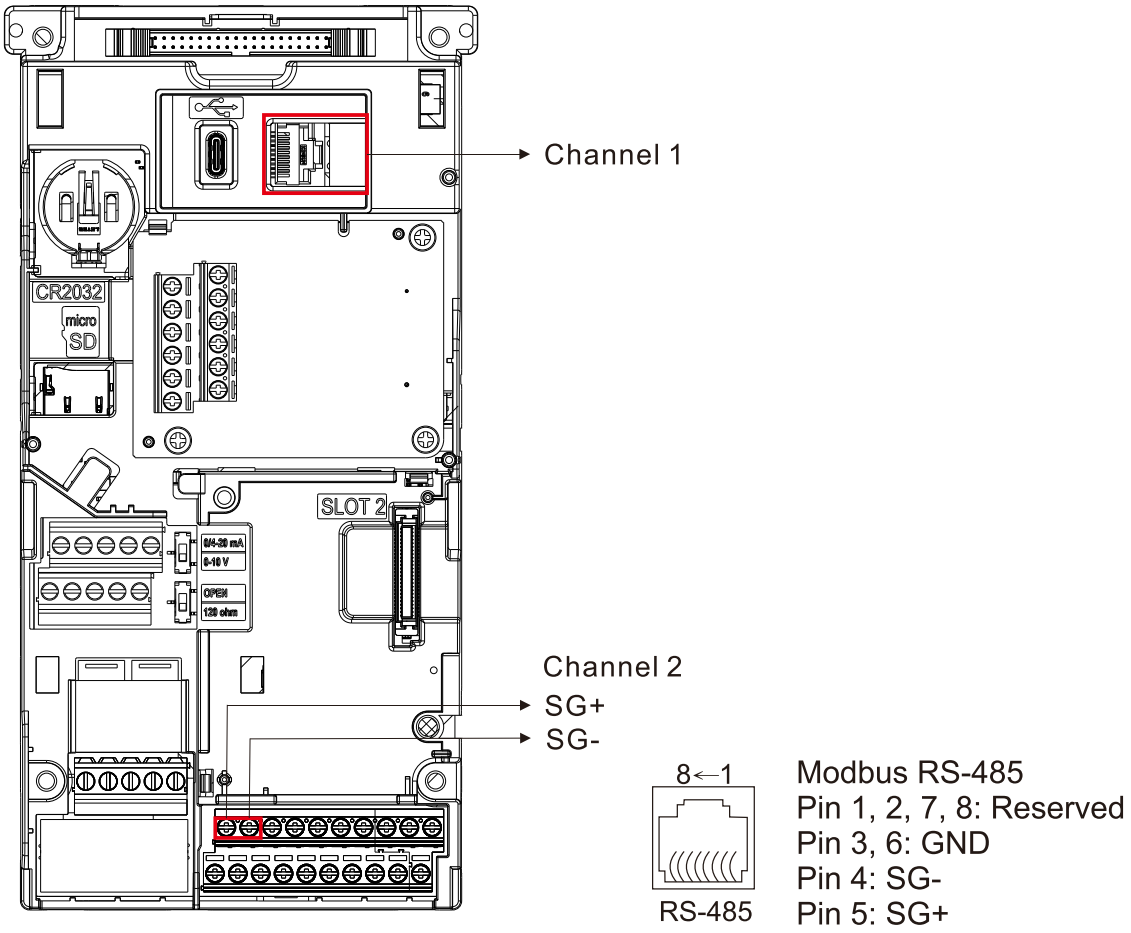
See the example below:

If M0 = ON, then CATCH instruction read RS485 communication address 2000H (H0 is invalid), and store the result in [D1, D0].



7-3 The Setting of Initialization

1. The default communication format of PLC is 7, N, 2, 9600, and station number is 2. You can change this station number in Pr.L0-00, but the address cannot be the same as Pr.N1-01 of AC motor drive.
2. VP3000 provides two communication ports for upload / download PLC programs, see the figure below. The communication format of Channel 1 is fixed in 19200, 8, N, and 2 RTU.



3. A master device can store data in AC motor drive and inner PLC at the same time. The method of execution is by the recognitions the station numbers, for example, if the station number of the AC motor drive is 1, and the station number of inner PLC is 2, then the commands from the master device are:
   01 (station no.)　03 (read)　0001 (address)　0001 (one data item), this is to read the data of Pr.A0-01 in AC motor drive.
   02 (station no.)　03 (read)　1000 (address)　0001 (one data item), this is to read the data of D0 in inner PLC.
4. When uploading / downloading programs, the PLC programs stop working.
5. Noted that using WPR instruction to write parameters, the value can be changed less than 10^9 times, or a memory write error will occur. The calculation of write times is based on the written value whether is being changed or not. If the written value left unchanged, the changed times would not increase in the next parameter operation; if the written value differs from the last time, then the changed times increase by one.

6. When Pr.o0-00 = 29, the display is the value of PLC register D1043, see the figures below:

Digital Keypad: KPV-CC01	Digital Keypad: KPV-CE02	
Allowable display range: 0–65535	0–9999	Exceed 9999

7. In RUN mode of PLC or STOP mode of PLC, the setting value 9 and 10 of Pr.b0-01 cannot be set, which means that cannot return to the default.
8. When Pr.b0-01 = 6, PLC can return to the default.
9. When PLC controls the operation of AC motor drive, the control command depends on whether the associated flag of Pr.L0-02 allows the operation command to be from PLC.
10. When PLC controls the frequency of AC motor drive (FREQ instruction), the frequency command depends on whether the associated flag of Pr.L0-02 allows the frequency command to be from PLC.
11. When PLC controls the specific digital output terminals of AC motor drive, the command of the specific digital output terminals depends on whether the associated flag of Pr.L0-04 allows their command to be from PLC.
12. When PLC controls the specific analog output terminals of AC motor drive, the command of the specific analog output terminals depends on whether the associated flag of Pr.L0-06 allows their command to be from PLC.
13. When PLC controls the operation of AC motor drive, if set Pr.A4-12 (the STOP is valid for keypad) at this moment, the stop is triggered when keypad gives order.

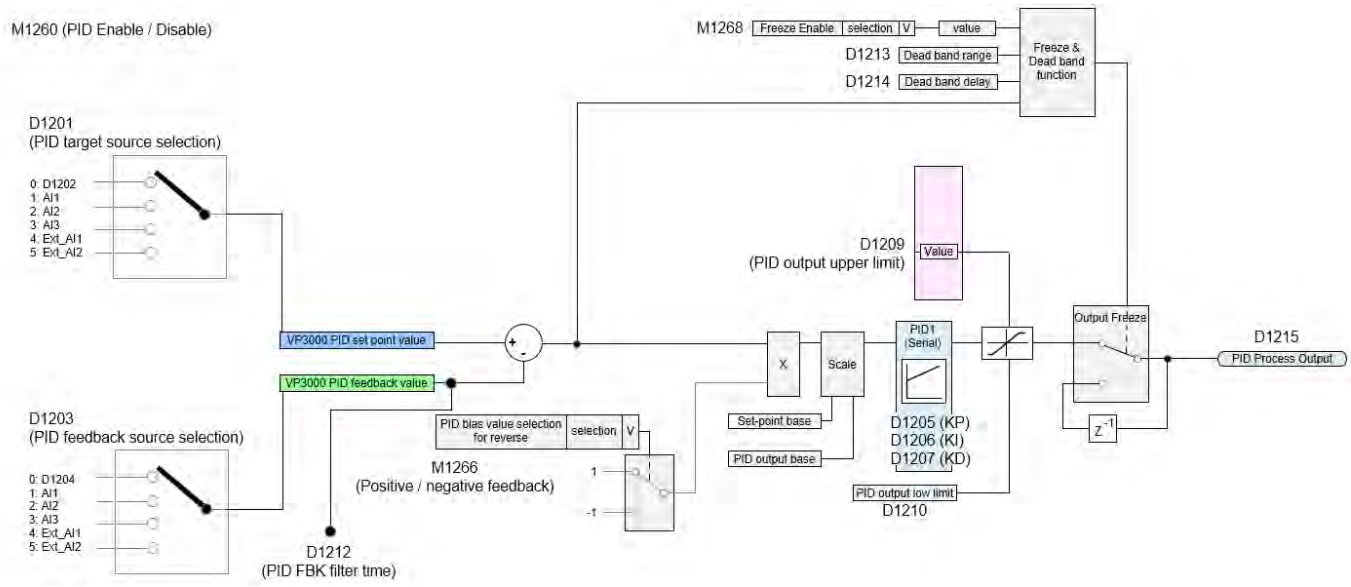
7-4 The Examples for the External PID Function of PLC

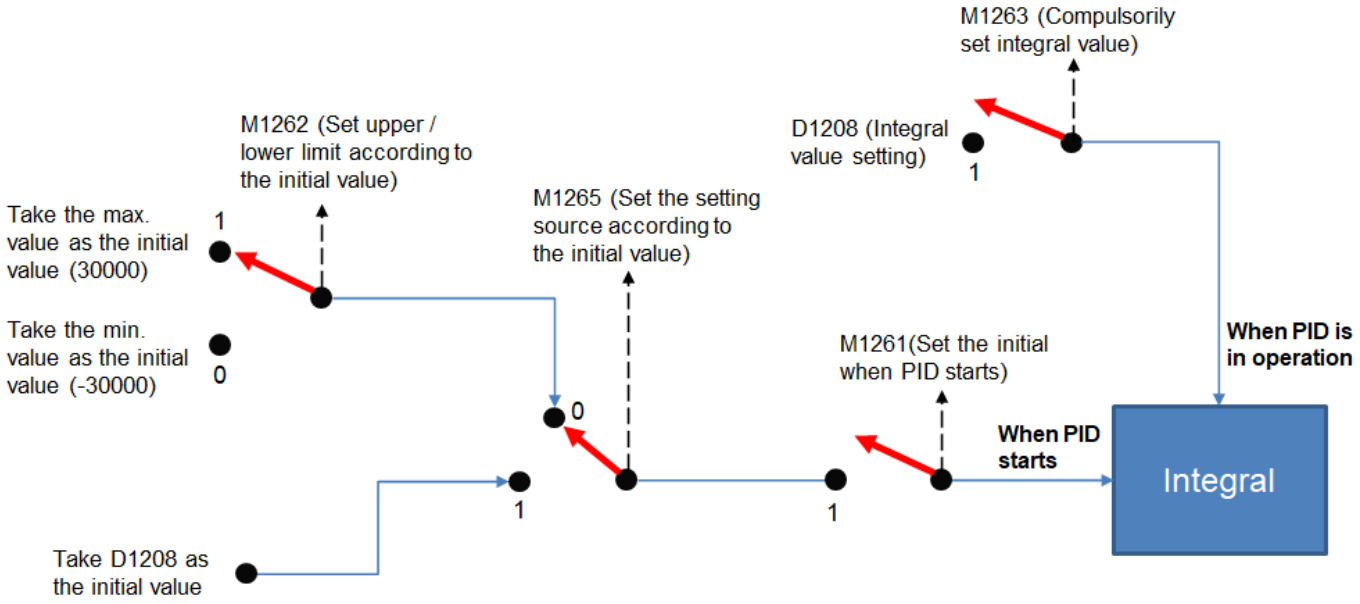
Use external PID function of PLC and freely designate reference input, the control of gain, positive / negative feedback, upper / lower bound of output to affect the output result. And it can also connect with any target in the ladder diagram. In addition, there are eight groups of PID control functions to achieve special application scenarios by setting integral value.

The description below lists the special D number of the first group, the special D numbers of the following groups 2–N can be got by the first group's special D number + 20 x (N-1), the maximum of N is eight.

If the setting value of the special D which relates with PID1 module exceeds the setting range or transgress the setting principles, then M1264 becomes ON and PID output returns zero. And the corresponding value of errors will be displayed in D1216 with bit format. Refer to the definition of bit below:

- bit0: the command value exceeds the limiting value
- bit1: the feedback value exceeds the limiting value
- bit2: the gain value (ratio, integral time, differential time) of the controller exceeds the limiting value
- bit3: the upper / lower bound setting value of output exceeds the limiting value
- bit4: the upper / lower bound setting error (the upper bound must always be greater than the lower bound)
- bit5: the integration setting value of the controller exceed the limiting value
- bit6: differential controller, feedback filter time exceed the limiting value
- bit7: the deadband exceeds the limiting value
- bit8: the deadband delay time exceeds the limiting value
- bIt9–bit15：Reserve





For the external PID function of PLC, see D1201–1366 for special D, M1260–M1338 for special M.

The relevant registers in speed mode are listed below:

Control special M

Special M	Function	Attribute
M1025	Frequency of AC motor drive = frequency setting (ON) / frequency of AC motor drive = 0 (OFF)	RW
M1026	The operating direction of AC motor drive, FWD (OFF) / REV (ON)	RW
M1027	Drive reset	RW
M1036	Ignore calendar errors	RW
M1038	MI5 counting starts	RW
M1039	Reset MI5 counting value	RW
M1040	Power supply by hardware (Servo ON)	RW
M1042	Quick stop	RW
M1044	Halt	RW
M1052	Lock, the frequency is locked at the current operating frequency	RW
M1230	Trigger warning codes defined by PLC	RW
M1260	PLC PID1 enable	RW
M1261	The given initial value of integral when PLC PID1 starts	RW
M1262	PLC PID1 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1263	PLC PID1 integral value is forced to be equal to D1208	RW
M1264	PLC PID1 error status	RW
M1265	PLC PID1 integral initial value setting 0: According to M1262 1: Set initial value as D1208	RW
M1266	PID1 difference in forward and reverse setting	RW

Special M	Function	Attribute
M1268	PID1 output freeze enable	RW
M1270	PLC PID2 enable	RW
M1271	The given initial value of integral when PLC PID2 starts	RW
M1272	PLC PID2 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1273	PLC PID2 integral value is forced to be equal to D1228	RW
M1274	PLC PID2 error status	RW
M1275	PLC PID2 integral initial value setting 0: According to M1272 1: Set initial value as D1228	RW
M1276	PID2 difference in forward and reverse setting	RW
M1278	PID2 output freeze enable	RW
M1280	PLC PID3 enable	RW
M1281	The given initial value of integral when PLC PID3 starts	RW
M1282	PLC PID3 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1283	PLC PID3 integral value is forced to be equal to D1248	RW
M1284	PLC PID3 error status	RW
M1285	PLC PID3 integral initial value setting 0: According to M1282 1: Set initial value as D1248	RW
M1286	PID3 difference in forward and reverse setting	RW
M1288	PID3 output freeze enable	RW
M1290	PLC PID4 enable	RW
M1291	The given initial value of integral when PLC PID4 starts	RW
M1292	PLC PID4 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1293	PLC PID4 integral value is forced to be equal to D1268	RW
M1294	PLC PID4 error status	RW
M1295	PLC PID4 integral initial value setting 0: According to M1292 1: Set initial value as D1268	RW
M1296	PID4 difference in forward and reverse setting	RW
M1298	PID4 output freeze enable	RW
M1300	PLC PID5 enable	RW
M1301	The given initial value of integral when PLC PID5 starts	RW
M1302	PLC PID5 integral initial value setting:	RW

Special M	Function	Attribute
	0: Set by the minimum value 1: Set by the maximum value	
M1303	PLC PID5 integral value is forced to be equal to D1288	RW
M1304	PLC PID5 error status	RW
M1305	PLC PID5 integral initial value setting 0: According to M1302 1: Set initial value as D1288	RW
M1306	PID5 difference in forward and reverse setting	RW
M1308	PID5 output freeze enable	RW
M1310	PLC PID6 enable	RW
M1311	The given initial value of integral when PLC PID6 starts	RW
M1312	PLC PID6 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1313	PLC PID6 integral value is forced to be equal to D1308	RW
M1314	PLC PID6 error status	RW
M1315	PLC PID6 integral initial value setting 0: According to M1312 1: Set initial value as D1308	RW
M1316	PID6 difference in forward and reverse setting	RW
M1318	PID6 output freeze enable	RW
M1320	PLC PID7 enable	RW
M1321	The given initial value of integral when PLC PID7 starts	RW
M1322	PLC PID7 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1323	PLC PID7 integral value is forced to be equal to D1328	RW
M1324	PLC PID7 error status	RW
M1325	PLC PID7 integral initial value setting 0: According to M1322 1: Set initial value as D1328	RW
M1326	PID7 difference in forward and reverse setting	RW
M1328	PID7 output freeze enable	RW
M1330	PLC PID8 enable	RW
M1331	The given initial value of integral when PLC PID8 starts	RW
M1332	PLC PID8 integral initial value setting: 0: Set by the minimum value 1: Set by the maximum value	RW
M1333	PLC PID8 integral value is forced to be equal to D1348	RW
M1334	PLC PID8 error status	RW

Special M	Function	Attribute
M1335	PLC PID8 integral initial value setting 0: According to M1332 1: Set initial value as D1348	RW
M1336	PID8 difference in forward and reverse setting	RW
M1338	PID8 output freeze enable	RW

Status special M

Special M	Function	Attribute
M1000	Operation always ON	RO
M1001	Operation always OFF	RO
M1002	Start in a forward direction	RO
M1003	Start in a reverse direction	RO
M1005	Drive fault occurs	RO
M1006	Drive operating	RO
M1007	Motor operating direction (0: FWD, 1: REV)	RO
M1011	10ms clock pulse	RO
M1012	100ms clock pulse	RO
M1013	1s clock pulse	RO
M1014	1 min. clock pulse	RO
M1015	Frequency reached (use with M1025)	RO
M1016	Parameter read / write error	RO
M1017	Parameter successfully write in	RO
M1019	Drive warning indication (0: No warning; 1: Warning)	RO
M1020	Zero flag	RO
M1021	Borrow flag	RO
M1022	Carry flag	RO
M1023	Divisor is 0 (for DIV command)	RO
M1056	Already power supply by hardware (Servo ON ready)	RO
M1058	On quick stopping	RO
M1063	Torque reached	RO
M1068	Calendar calculation error	RO
M1074	Output enabling status (0: Disabled, 1: Enabled)	RO
M1075	Operation enabling status (0: Disabled, 1: Enabled)	RO
M1076	Calendar time error or update time-out	RO
M1077	485 read/ write completed	RO
M1078	485 read/ write error	RO
M1079	485 communication time-out	RO
M1080	485 exception error	RO
M1081	485 Check sum or data format error	RO
M1090	AUTO enabling status (0: Disabled, 1: Enabled)	RO

Special M	Function	Attribute
M1091	OFF enabling status (0: Disabled, 1: Enabled)	RO
M1092	HAND enabling status (0: Disabled, 1: Enabled)	RO
M1110	LOCAL enabling status (0: Disabled, 1: Enabled)	RO
M1111	REMOTE enabling status (0: Disabled, 1: Enabled)	RO
M1168	SMOV BCD BIN mode switching	RO

Control special D

Special D	Function	Attribute
D1040	AO1 output value (0.00–100.00%)	RW
D1041	AO10 output value (0.00–100.00%)	RW
D1042	AO11 output value (0.00–100.00%)	RW
D1043	Drive displayed value	RW
D1045	AO2 output value (0.00–100.00%)	RW
D1057	Speed ratio of the high-speed counter	RW
D1058	The corresponding frequency of high-speed counter (Unit: 0.01 Hz)	RW
D1059	Decimal points of the corresponding physical quantity of high-speed counter 1: No decimal point 2: One decimal point 3: Two decimal points 4: Three decimal points 5: Four decimal points (follow the above logic to set the decimal point, if the decimal points is set incorrectly, the physical quantity may not be displayed with complete value.)	RW
D1060	Mode setting (speed mode = 0)	RW
D1061	485 COM1 communication time-out time (Unit: ms)	RW
D1062	Torque limit under speed mode	RW
D1201	PID1 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1202	PID1 reference (0–30000)	RW
D1203	PID1 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4	RW

Special D	Function	Attribute
	5: Ext_AI5	
D1204	PID1 feedback value (0–30000)	RW
D1205	P value of PID1 (0.00–100.00)	RW
D1206	I value of PID1 (0.0–6000.0)	RW
D1207	D value of PID1 (0.000–10.000)	RW
D1208	Force given value of PID1 integral value (0–30000)	RW
D1209	PID1 maximum limitation (0–30000)	RW
D1210	PID1 feedback filter time (0.000–30.000 sec.)	RW
D1211	PID1 derivative controller filter time (0.000–10.000 sec.)	RW
D1212	PID1 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1213	PID1 deadband range (0–10000)	RW
D1214	PID1 deadband delay time (0.0–3600.0 sec.)	RW
D1221	PID2 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1222	PID2 reference (0–30000)	RW
D1223	PID2 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1224	PID2 feedback value (0–30000)	RW
D1225	P value of PID2 (0.00–100.00)	RW
D1226	I value of PID2 (0.0–6000.0)	RW
D1227	D value of PID2 (0.000–10.000)	RW
D1228	Force given value of PID2 integral value (0–30000)	RW
D1229	PID2 maximum limitation (0–30000)	RW
D1230	PID2 feedback filter time (0.000–30.000 sec.)	RW
D1231	PID2 derivative controller filter time (0.000–10.000 sec.)	RW
D1232	PID2 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1233	PID2 deadband range (0–10000)	RW
D1234	PID2 deadband delay time (0.0–3600.0 sec.)	RW
D1241	PID3 reference selection 0: Refer to D1202	RW

Special D	Function	Attribute
	1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	
D1242	PID3 reference (0–30000)	RW
D1243	PID3 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1244	PID3 feedback value (0–30000)	RW
D1245	P value of PID3 (0.00–100.00)	RW
D1246	I value of PID3 (0.0–6000.0)	RW
D1247	D value of PID3 (0.000–10.000)	RW
D1248	Force given value of PID3 integral value (0–30000)	RW
D1249	PID3 maximum limitation (0–30000)	RW
D1250	PID3 feedback filter time (0.000–30.000 sec.)	RW
D1251	PID3 derivative controller filter time (0.000–10.000 sec.)	RW
D1252	PID3 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1253	PID3 deadband range (0–10000)	RW
D1254	PID3 deadband delay time (0.0–3600.0 sec.)	RW
D1261	PID4 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1262	PID4 reference (0–30000)	RW
D1263	PID4 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1264	PID4 feedback value (0–30000)	RW

Special D	Function	Attribute
D1265	P value of PID4 (0.00–100.00)	RW
D1266	I value of PID4 (0.0–6000.0)	RW
D1267	D value of PID4 (0.000–10.000)	RW
D1268	Force given value of PID4 integral value (0–30000)	RW
D1269	PID4 maximum limitation (0–30000)	RW
D1270	PID4 feedback filter time (0.000–30.000 sec.)	RW
D1271	PID4 derivative controller filter time (0.000–10.000 sec.)	RW
D1272	PID4 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1273	PID4 deadband range (0–10000)	RW
D1274	PID4 deadband delay time (0.0–3600.0 sec.)	RW
D1281	PID5 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1282	PID5 reference (0–30000)	RW
D1283	PID5 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1284	PID5 feedback value (0–30000)	RW
D1285	P value of PID5 (0.00–100.00)	RW
D1286	I value of PID5 (0.0–6000.0)	RW
D1287	D value of PID5 (0.000–10.000)	RW
D1288	Force given value of PID5 integral value (0–30000)	RW
D1289	PID5 maximum limitation (0–30000)	RW
D1290	PID5 feedback filter time (0.000–30.000 sec.)	RW
D1291	PID5 derivative controller filter time (0.000–10.000 sec.)	RW
D1292	PID5 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1293	PID5 deadband range (0–10000)	RW
D1294	PID5 deadband delay time (0.0–3600.0 sec.)	RW
D1301	PID6 reference selection 0: Refer to D1202 1: AI1 2: AI2	RW

Special D	Function	Attribute
	3: AI3 4: Ext_AI4 5: Ext_AI5	
D1302	PID6 reference (0–30000)	RW
D1303	PID6 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1304	PID6 feedback value (0–30000)	RW
D1305	P value of PID6 (0.00–100.00)	RW
D1306	I value of PID6 (0.0–6000.0)	RW
D1307	D value of PID6 (0.000–10.000)	RW
D1308	Force given value of PID6 integral value (0–30000)	RW
D1309	PID6 maximum limitation (0–30000)	RW
D1310	PID6 feedback filter time (0.000–30.000 sec.)	RW
D1311	PID6 derivative controller filter time (0.000–10.000 sec.)	RW
D1312	PID6 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1313	PID6 deadband range (0–10000)	RW
D1314	PID6 deadband delay time (0.0–3600.0 sec.)	RW
D1321	PID7 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1322	PID7 reference (0–30000)	RW
D1323	PID7 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1324	PID7 feedback value (0–30000)	RW
D1325	P value of PID7 (0.00–100.00)	RW
D1326	I value of PID7 (0.0–6000.0)	RW

Special D	Function	Attribute
D1327	D value of PID7 (0.000–10.000)	RW
D1328	Force given value of PID7 integral value (0–30000)	RW
D1329	PID7 maximum limitation (0–30000)	RW
D1330	PID7 feedback filter time (0.000–30.000 sec.)	RW
D1331	PID7 derivative controller filter time (0.000–10.000 sec.)	RW
D1332	PID7 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1333	PID7 deadband range (0–10000)	RW
D1334	PID7 deadband delay time (0.0–3600.0 sec.)	RW
D1341	PID8 reference selection 0: Refer to D1202 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1342	PID8 reference (0–30000)	RW
D1343	PID8 feedback selection 0: Refer to D1204 1: AI1 2: AI2 3: AI3 4: Ext_AI4 5: Ext_AI5	RW
D1344	PID8 feedback value (0–30000)	RW
D1345	P value of PID8 (0.00–100.00)	RW
D1346	I value of PID8 (0.0–6000.0)	RW
D1347	D value of PID8 (0.000–10.000)	RW
D1348	Force given value of PID8 integral value (0–30000)	RW
D1349	PID8 maximum limitation (0–30000)	RW
D1350	PID8 feedback filter time (0.000–30.000 sec.)	RW
D1351	PID8 derivative controller filter time (0.000–10.000 sec.)	RW
D1352	PID8 integral value backfills the main frequency filter time (0.00–655.35 sec.)	RW
D1353	PID8 deadband range (0–10000)	RW
D1354	PID8 deadband delay time (0.0–3600.0 sec.)	RW

Status special D

Special D	Function	Attribute
D1001	Version	RO
D1002	Program capacity	RO
D1003	Check sum	RO
D1010	Current scan time (Unit: 0.1 ms)	RO
D1011	Minimum scan time (Unit: 0.1 ms)	RO
D1012	Maximum scan time (Unit: 0.1 ms)	RO
D1014	The number of error steps of PLC calculation	RO
D1020	Drive output frequency (0.00–600.00)	RO
D1021	Motor current (XXXX.X)	RO
D1022	AI / AO / DI / DO extension card number 0: No extension card 1: Relay card (6 out) (EMV-R6AA) 2: Digital I/O card (4 in 2 out) (EMV-D42A) 10: Analog I/O card (2 in 2 out) (EMV-A22A)	RO
D1023	Communication extension card number 0: No extension card 1: DeviceNet Slave (CMC-DN01) 2: Profibus-DP Slave (CMC-PD01) 3: CANopen Slave (EMC-COP01) 5: EtherNet/IP Slave (CMC-EIP01 / CMC-EIP02) 8: BACNet 12: PROFINET Slave (CMC-PN01)	RO
D1028	AI1 corresponding value (0.00–100.00%)	RO
D1029	AI2 corresponding value (0.00–100.00%)	RO
D1030	AI3 corresponding value (-100.00–100.00%)	RO
D1031	Extension card AI10 (0.0–100.0%)	RO
D1032	Extension card AI11 (0.0–100.0%)	RO
D1036	Drive fault code	RO
D1037	The output frequency of AC motor drive (0.00–600.00) (Standard model: two decimal points; high-speed model: one decimal point)	RO
D1038	DC bus voltage (XXXX.X)	RO
D1039	Output voltage (XXXX.X)	RO
D1050	Actual operating mode (speed mode = 0)	RO
D1053	Actual torque	RO
D1054	MI5 current calculated counter value (L Word)	RO
D1055	MI5 current calculated counter value (H Word)	RO
D1056	The corresponding physical quantity of high-speed counter	RO
D1063	Year	RO
D1064	Week	RO

Special D	Function	Attribute
D1065	Month	RO
D1066	Day	RO
D1067	Hour	RO
D1068	Minute	RO
D1069	Second	RO
D1100	Target frequency (Standard model: two decimal points, high-speed model: one decimal point)	RO
D1101	Target frequency (under operation) (Standard model: two decimal points, high-speed model: one decimal point)	RO
D1102	Reference frequency (Standard model: two decimal points, high-speed model: one decimal point)	RO
D1105	Target torque	RO
D1107	Pi low word	RO
D1108	Pi high word	RO
D1109	Random value	RO
D1114	Current controlled IM number 1: Motor 1 2: Motor 2 N: Motor N	RO
D1215	PID1 calculated result (0–30000)	RO
D1216	PID1 module fault information	RO
D1235	PID2 calculated result (0–30000)	RO
D1236	PID2 module fault information	RO
D1255	PID3 calculated result (0–30000)	RO
D1256	PID3 module fault information	RO
D1275	PID4 calculated result (0–30000)	RO
D1276	PID4 module fault information	RO
D1295	PID5 calculated result (0–30000)	RO
D1296	PID5 module fault information	RO
D1315	PID6 calculated result (0–30000)	RO
D1316	PID6 module fault information	RO
D1335	PID7 calculated result (0–30000)	RO
D1336	PID7 module fault information	RO
D1355	PID8 calculated result (0–30000)	RO
D1356	PID8 module fault information	RO
D1560	Warning code	RO

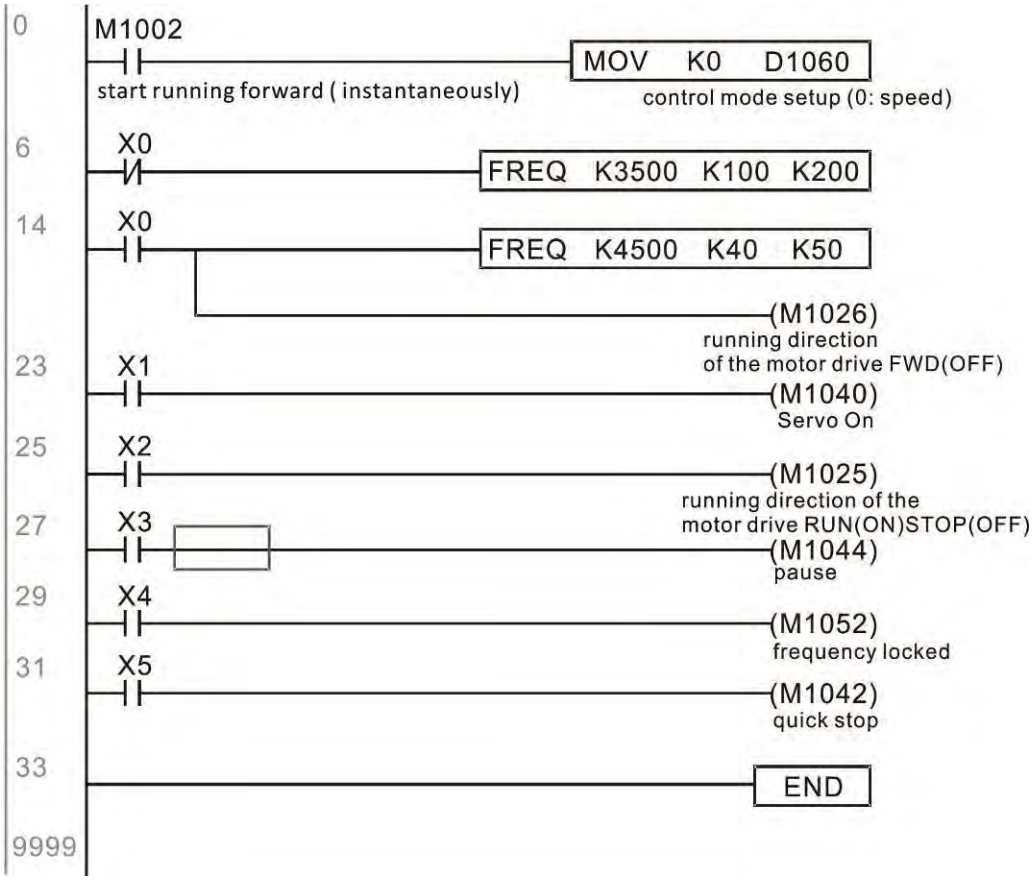
Speed mode control command:

FREQ(P)	S1	S2	S3
	Target speed	1st acceleration time	1st deceleration time

The example for speed mode control:

Before executing speed control, if the control method is FOC (magnetic field orientation), you have to set up the motor parameters to be used first.

1. Set D1060 = 0, to make the AC motor drive be speed mode (default).
2. Control frequency, acceleration time and deceleration time by FREQ instruction.
3. Set M1040 =1, AC motor drive is being magnetized, but the frequency is zero.
4. Set M1025 = 1, the frequency command of AC motor drive becomes the frequency that FREQ instruction designates. The acceleration and deceleration also operate according to the acceleration time and deceleration time that FREQ instruction designates.
5. Available to lock the current operating frequency by controlling M1052.
6. Available to execute temporarily stop (halt) by controlling M1044, the deceleration method is according to the deceleration setting.
7. Available to execute quick stop by controlling M1042, the deceleration method will decelerate as soon as possible on the premise that no error occurs. (An error may occur if the load is too large)
8. The authority to control is M1040 (Servo ON) > M1042 (Quick stop) > M1044 (Halt) > M1052 (LOCK)



Chapter 8 Troubleshooting

8-1 Alarm List

8-2 Warning Codes and Troubleshooting

8-3 Fault Codes and Troubleshooting

8-1 Alarm List

8-1-1 AC Motor Drive Warning Codes

ID No.	Warning Name	ID No.	Warning Name
0	No record	70	ExCom ID fail (ECid)
5	Communication error 10 (CE10)	71	ExCom power loss (ECLv)
7	Save error 1 (SE1)	72	ExCom test mode (ECtt)
8	Save error 1 (SE2)	73	ExCom BUS off (ECbF)
9	IGBT overheating warning (oH1)	74	ExCom no power (ECnP)
10	Capacitor overheating warning (oH2)	75	ExCom factory defect (ECFF)
12	AI1 analog signal loss (AnL)	76	ExCom inner error (ECiF)
13	Under current (uC)	77	ExCom IO Net break (ECio)
15	Run disable (RuDs)	78	ExCom IO net break (ECPP)
16	Safe torque off (STO)	79	ExCom configuration data error (ECPi)
17	Over speed warning (oSPd)	80	Ethernet link fail (ECEF)
18	Deviation warning (dAvE)	81	Communication time-out (ECto)
20	Over-torque 1 (ot1)	82	Checksum error (ECCS)
21	Over-torque 1 (ot2)	83	Return defect (ECrF)
22_1	Motor overheating PTC (oH3)	84	Modbus TCP over (Eco0)
22_2	Motor overheating KTY84 (oH3)	85	EtherNet/IP over (Eco1)
22_3	Motor overheating PT100 (oH3)	86	IP fail (ECiP)
22_4	Motor overheating PT1000 (oH3)	87	Mail fail (EC3F)
24	Over slip error (oSL)	88	ExCom busy (ECbY)
26	Output U phase loss (OPHL)	89	ExCom card break (ECCb)
27	Output V phase loss (OPHL)	123	Deceleration energy backup error (dEb)
28	Output W phase loss (OPHL)	140	SD memory error (SDiv)
30	Copy model error 3 (SE3)	142	AI2 analog signal loss (AnL)
31	Under load (ULD)	143	AI3 analog signal loss (AnL)
32	Overload (OLD)	144	AI10 analog signal loss (AnL)
33	Phase loss protection (ORP)	145	AI11 analog signal loss (AnL)
34	Low voltage (LV)	146	Monitor signal 1 trigger (BX1n)
50	PLC opposite defect (PLod)	147	Monitor signal 2 trigger (BX2n)
51	PLC save memory error (PLSv)	148	Monitor signal 3 trigger (BX3n)
52	Data defect (PLdA)	149	Monitor signal 4 trigger (BX4n)
53	Function defect (PLFn)	150	Monitor signal 5 trigger (BX5n)
54	PLC buffer overflow (PLor)	151	Monitor signal 6 trigger (BX6n)
55	Function defect (PLFF)	152	Monitor signal 7 trigger (BX7n)
56	Checksum error (PLSn)	153	Monitor signal 8 trigger (BX8n)
57	No end command (PLEd)	154	Battery low voltage (RtLv)
59	PLC download fail (PLdF)	155	Electronic thermal relay 1 protection (EoL1)
60	PLC scan time fail (PLSF)		

ID No.	Warning Name	ID No.	Warning Name
156	Electronic thermal relay 2 protection (EoL2)	163	SD card capacity is full (SDfu)
		164	No SD card (SDno)
157	Electronic thermal relay 3 protection (EoL3)	165	SD card format error (SDfe)
		166	SD card prohibited execution (SDih)
158	Electronic thermal relay 4 protection (EoL4)	167	SD card time out (SDto)
		300	Leakage warning (LEKn)
159	Safe torque off 1 (STO1)	301	Low pressure warning (LPSn)
160	Safe torque off 2 (STO2)	302	Dry pump warning (dryn)
161	SPS models low voltage (SPLV)	303	Cleaning process warning (CLE)
162	Controller overload (MCOL)	304	Cavitation warning (Cavi)

8-1-2 AC Motor Drive Fault Codes

ID No.	Fault Name	ID No.	Fault Name
0	No record	35	W-phase error (cd3)
1	Over-current during acceleration (ocA)	37	oc hardware error (HD1)
2	Over-current during deceleration (ocd)	39	occ hardware error (Hd3)
3	Over-current during steady operation (ocn)	40	Auto-tuning error (AUE)
4	Ground fault (GFF)	48	AI1 loss (ACE)
5	IGBT short circuit between upper bridge and lower bridge (occ)	49	External Fault (EF)
		50	Emergency stop (EF1)
6	Over-current at stop (ocS)	52	Password is locked (Pcod)
7	Over-voltage during acceleration (ovA)	58	Modbus transmission time-out (CE10)
8	Over-voltage during deceleration (ovd)	61	Y-connection / D-connection switch error (ydc)
9	Over-voltage at constant speed (ovn)		
10	Over-voltage at stop (ovS)	63	Over slip error (oSL)
11	Low-voltage during acceleration (LvA)	68	Reverse direction of the speed feedback (SdRv)
12	Low-voltage during deceleration (Lvd)		
13	Low-voltage at constant speed (Lvn)	69	Over speed rotation feedback (SdOr)
15	Phase loss protection (OrP)	70	Large deviation of speed feedback (SdDe)
16	IGBT overheating (oH1)	71	Watchdog (WDTT)
17	Capacitor overheating (oH2)	72	STO Loss 1 (STL1)
18	IGBT temperature detection failure (tH1o)	76	Safe torque off (STO)
19	Capacitor hardware error (tH2o)	77	STO Loss 2 (STL2)
21	Overload (oL)	79	Safe torque off 1 (STO1)
22	Electronic thermal relay 1 protection (EoL1)	80	Safe torque off 2 (STO2)
		82	Output phase loss U phase (OPHL)
23	Electronic thermal relay 2 protection (EoL2)	83	Output phase loss V phase (OPHL)
		84	Output phase loss W phase (OPHL)
24_1	Motor overheating PTC (oH3)	87	Overload protection at low frequency (oL3)
24_2	Motor overheating KTY84 (oH3)	88	Model ID change (IDCH)
24_3	Motor overheating PT100 (oH3)	89	Rotor position detection error (RoPd)
24_4	Motor overheating PT1000 (oH3)	94	Initializing power board communication error when power ON (POCF)
25	Interrupt error (INTR)		
26	Over-torque 1 (ot1)	95	Board identification error during power-on initialization (IDDE)
27	Over-torque 2 (ot2)		
28	Under current (uC)	96	Power board communication error (PMCF)
30	EEPROM write error (cF1)	97	AI2 loss (ACE)
31	EEPROM read error (cF2)	98	AI3 loss (ACE)
33	U-phase error (cd1)	99	AI10 loss (ACE)
34	V-phase error (cd2)	100	AI11 loss (ACE)

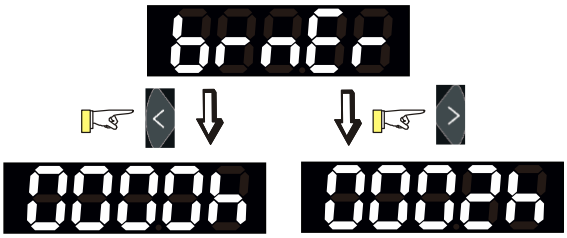
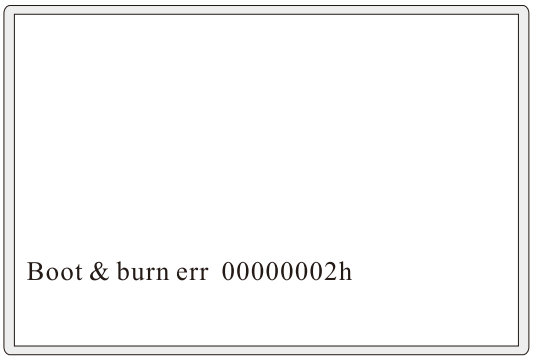
ID No.	Fault Name	ID No.	Fault Name
101	CANopen guarding error (CGdE)	213	Protection initialization error (ThIF)
102	CANopen heartbeat error (CHbE)	214	Power-on process initialization time-out (POTO)
104	CANopen bus off error (CbFE)	220	Parameter copy write-in unfinished (CWF)
114	SPS models over voltage (SPOV)	224	STO execution time-out (STOT)
115	SPS models low voltage (SPLV)	225	STO ROM verification failure (STOR)
118	Monitor signal 1 trigger (BX1e)	226	STO loss (STOL)
119	Monitor signal 2 trigger (BX2e)	227	STO Channel 1 error (STC1)
120	Monitor signal 3 trigger (BX3e)	228	STO Channel 2 error (STC2)
121	Monitor signal 4 trigger (BX4e)	229	STO Channel 1 time-out (SPC1)
122	Monitor signal 5 trigger (BX5e)	230	STO Channel 2 time-out (SPC2)
123	Monitor signal 6 trigger (BX6e)	231	STO Gate check error (SGBE)
124	Monitor signal 7 trigger (BX7e)	232	STO power 24V over voltage (S24O)
125	Monitor signal 8 trigger (BX8e)	233	STO power 24V under voltage (S24U)
132	Under load protection (ULD)	234	STO power 6V over voltage (S6OV)
133	Overload protection (OLD)	235	STO power 6V under voltage (S6UV)
134	Electronic thermal relay 3 protection (EoL3)	236	STO power 5V over voltage (S5OV)
		237	STO power 5V under voltage (S5UV)
135	Electronic thermal relay 4 protection (EoL4)	238	STO watchdog (SWDG)
		239	STO sampling failure (SADE)
142	Auto-tune error (AUE1)	240	STO execution time too short (SEBL)
143	Auto-tune error (AUE2)	241	STO execution time too high (SEAB)
144	Auto-tune error (AUE3)	260	Control board identification error (CBER)
148	Auto-tune error (AUE4)	300	Large amount leakage error (LEKE)
149	Auto-tune error (AUE5)	301	High pressure error (HPS)
150	Auto-tune error (AUE6)	302	Low pressure error (LPSE)
151	Auto-tune error (AUE7)	303	Dry pump error (dryE)
152	Auto-tune error (AUE8)	304	Dry pump auto-tune error (dAUE)
153	Auto-tune error (AUE9)	305	Pipe blockage (JAME)
154	Auto-tuning error (AUEa)	306	ExCom card break (ECCb)
155	Auto-tuning error (AUEb)	307	Communication time-out (ECto)
156	Auto-tuning error (AUEc)		

8-1-3 PLC Fault Codes

Code	ID	Descriptions	Corrective Actions
PLod	50	The device number in the downloaded program has exceeded the defined range	Check if the device number used by the program has exceeded the model definition 1 and re-download the program
PLSv	51	Device number write error during program execution	Check the PLC program with D1014 and re-download the program
PLdA	52	The read/ write device number or the uploaded command error during Modbus communication	Check if the used communication address is correct and retransmit the communication packet
PLFn	53	Command error while downloading program	Check whether the used API model supports the command and re-download the program
PLor	54	Program exceeds memory capacity during program execution	Check if the PLC program is correct and re-download the program
PLFF	55	Command error during program execution	Check the PLC program with D1014 and re-download the program 1. If the FOR/NEXT command is written correctly 2. Is MC/ MCR paired 3. If the break command is written correctly 4. If the FOR/NEXT command is written correctly 5. If the break command is written correctly 6. Ensure the used model supports all API codes
PLSn	56	Checksum error during program execution	Clear the current PLC program and re-download the program
PLEd	57	Program has no END stop command	Check if the PLC program is correct and re-download the program
PLdF	59	Communication loss or the drive power off while downloading the program	Check if the connection and the power supply is normal and re-download the program
PLSF	60	PLC scan time-out during program execution	Check if the PLC program uses excessive FOR and CALL commands, reduce the usage and re-download the program.

8-1-4 Digital Keypad Fault Codes

Fault code	Causes
Erk1	The read or write data flash does not respond in one second
Erk3	Fail to write data to Flash (read error after write in)
Erk4	Flash has not been written; the keypad parameter value has been set exceeding the defined range
Erk8	The structure of the received communication packet is wrong, the retransmission is still wrong, and the fault jumps three times in a row
Erk9	Communication time-out at start (the digital keypad cannot connect with the drive in 9 seconds after power-on)
Erk10	Communication time-out (the digital keypad cannot connect with the drive in 6 seconds during normal communication)
Erk11	The drive does not support the communication of backup and restore function
Erk12	Parameters are not unlocked while restoring backup
Erk13	The drive modes (normal mode, restore mode and backup mode) error while restoring backup
Erk14	1. When restoring the backup, switch the modes of the drive. If the switching command fails, the keypad retransmits up to 3 times, each time at an interval of 1 second; if it still fails, the Erk14 fault shows. 2. When switching the drive modes while restoring the backup, the drive replies “In progress” during the switching process and the digital keypad waits for up to 20 seconds. If the drive is still in progress, the Erk14 fault shows.
Erk15	Failed to verify the file compatibility with the drive while restoring the backup
Erk16	Failed to verify the file size with the drive while restoring the backup
Erk17	Failed to write data while restoring the backup
Erk18	Check the file size is empty while restoring the backup
Erk19	SD card is loss in the SD card displaying screen.
Erk20	The drive does not support the SD card function in the SD card displaying screen
Erk21	The drive does not support the communication in the download function (ex. Language packet)
Erk22	The drive mode (boot/ user mode) error in the download function (ex. Language packet)
Erk23	The file size exceeds the upper limit (24440 bytes) during parameter backup; and exceeds upper limit (65400 bytes) during PLC backup
Erk24	The Erk24 fault shows when firmware CC01 is burned into hardware CE02 or firmware CE02 is burned into hardware CC01, and the keypad cannot work normally.

Fault code	Causes
brnEr/ Boot & burn err	AC motor drive boot failure and burn in error 1. When a communication error occurs to the control board and the internal components, or the drive burn in error occurs, the digital keypad displays the following fault information: ● LED keypad (KPV-CE02) displays brnEr. ● LCD keypad (KPC-CC01) displays Boot & burn err 2. When the above fault information shows on the keypad, you can try the following treatments: ● Re-burn in the drive firmware ● Turn off the drive and check whether the communication cable between the control board and the internal components is well connected 3. If the fault still exists after the above treatments, follow the example instructions below to obtain the fault information and contact Delta for further details ● When the LED keypad (KPV-CE02) shows “brnEr”, press the left key for High-word “0000h” and press the right key for Low-word “0002h” (as shown in the figure below)  ● When the LCD keypad (KPV-CC01) shows “Boot & burn err”, the screen displays “00000002h” (as shown in the figure below) 

8-2 Warning Codes and Troubleshooting

ID No.	Warning Name	Descriptions
5	Communication error 10 (CE10)	RS-485 Modbus transmission time-out
Action and Reset		
Action Condition		When the communication time exceeds the detection time of Pr. n1-04 (Modbus timeout check time)
Action Time		Setting for Pr. n1-04.
Warning Setting Parameter		N/A
Reset Method		"Warning" occurs when Pr. n1-05 = 0 and the motor drive keeps running. The drive resets automatically when receiving the next communication packet. 0: Continue OPER 1: Warning & continue OPER 2: Fault & ramp to stop 3: Fault & coast to stop
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The upper unit does not transmit the communication command within Pr. n1-04 setting time		Check if the upper unit transmits the communication command within the setting time for Pr. n1-04.
Malfunction caused by interference		Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance.
Different communication setting from upper unit		Check if the setting for Pr. n1-03 is the same as the setting for the upper unit.
Disconnection or bad connection of the cable		Check the cable and replace it if necessary.

Warning Name	Descriptions
Keypad communication time out (CK10)	Keypad communication data, transmission time-out (Keypad auto-detect this error and display it.)
Action and Reset	
Action Condition	When the communication time exceeds the detection time of Pr. n1-04 (Modbus timeout check time)
Action Time	Setting for Pr. n1-04.
Warning Setting Parameter	N/A
Reset Method	Remove the keypad and then reconnect it to the motor drive
Reset Condition	Immediately reset
Record	No

Cause	Corrective Actions
Incorrect communication command from keypad	Keypad and the motor drive do not communicate properly. It is recommended to remove the keypad and then reconnect it to the motor drive.
Malfunction caused by interference	Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance.
Different communication setting from keypad	Check if the Baud rate = 115200 bps. Format = RTU8, N, 2.
Disconnection or bad connection of the cable	Check the cable and replace it if necessary.

ID No.	Warning Name	Descriptions
7	Save error 1 (SE1)	Keypad COPY error 1: Keypad copy time-out
Action and Reset		
Action Condition		"SE1" warning occurs when the keypad does not transmit the COPY command to the drive and does not transmit any data to the drive again in 10 sec. at the time you copy the parameters to the drive.
Action Time		10 sec.
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Communication connection error		SE1: The causes of error are mostly communication problems between the keypad and control board. Potential causes include communication signal interference and the unacceptable communication command to the Slave. It is recommended to rule out communication quality factors first. Check if the error occurs randomly, or only occurs when copying certain parameters (the error displays on the upper right corner of the copy page). If you cannot clear the error, please contact Delta.
Keypad error		
Control board error		

ID No.	Warning Name	Descriptions
8	Save error 2 (SE2)	Keypad COPY error 2: parameter writing error
Action and Reset		
Action Condition		If the copied parameter is incorrect when coping parameters to the drive, SE2 warning occurs.
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Copy parameters using upload files with large version differences		When the Slave compares the parameter copy data and find that the data is wrong (wrong status such as exceeding the parameter upper and lower limit, etc.), the SE2 warning occurs. If the SE2 warning occurs, it is recommended to use the same version of firmware for upload and download parameters. If the warning still exists, contact Delta.
Malfunction caused by interference		Verify the wiring and grounding of the main circuit, control circuit and the encoder for effective anti-interference performance.

ID No.	Warning Name	Descriptions
9	IGBT over-heating warning (oH1)	The AC motor drive detects over-heating of IGBT which exceeds the protection level of oH1 warning. (When Pr. H4-00 is higher than the IGBT overheating level, the drive shows oH1 error without displaying oH1 warning.)
Action and Reset		
Action Condition		Pr. H4-00
Action Time		Immediately acts when IGBT voltage is higher than Pr. H4-00
Warning Setting Parameter		N/A
Reset Method		Auto-reset
Reset Condition		The drive auto-resets when IGBT temperature is lower than oH1 warning level minus (–) 5°C
Record		No
Cause		Corrective Actions
Check if the ambient temperature or temperature inside the cabinet is too high, or if there is obstruction in the ventilation hole of the control cabinet.		1. Check the ambient temperature. 2. Regularly inspect the ventilation hole of the control cabinet. 3. Change the installed place if there are heating objects, such as braking resistors, in the surroundings. 4. Install / add cooling fan or air conditioner to lower the temperature inside the cabinet.
Check if there is any obstruction on the heat sink or if the fan is running		Remove the obstruction or replace the cooling fan.
Insufficient ventilation space		Increase ventilation space of the drive.
Check if the drive matches the corresponded loading.		1. Decrease loading. 2. Decrease the carrier. 3. Replace with a drive with larger capacity.
The drive has run 100% or more of the rated output for a long time		Replace with a drive with larger capacity.

ID No.	Warning Name	Descriptions
10	Capacitor overheating warning (oH2)	The drive has detected the capacitors are overheat and the temperature exceeds the warning protection level
Action and Reset		
Action Condition		oH2 error level minus (–) 5°C
Action Time		The oH2 warning occurs when the temperature sensor of capacitor detects the temperature is higher than oH2 warning level
Warning Setting Parameter		N/A
Reset Method		Auto-reset
Reset Condition		The drive auto-resets when the capacitor temperature is lower than oH2 warning level minus (–) 10°C
Record		No
Cause		Corrective Actions
Check if the ambient temperature or temperature inside the cabinet is too high, or if there is obstruction in the ventilation hole of the control cabinet.		1. Check the ambient temperature. 2. Regularly inspect the ventilation hole of the control cabinet. 3. Change the installed place if there are heating objects, such as braking resistors, in the surroundings. 4. Install / add cooling fan or air conditioner to lower the temperature inside the cabinet.
Check if there is any obstruction on the heat sink or if the fan is running		Remove the obstruction or replace the cooling fan.
Insufficient ventilation space		Increase ventilation space of the drive.
Check if the drive matches the corresponded loading.		1. Decrease loading. 2. Decrease the carrier. 3. Replace with a drive with larger capacity.
The drive has run 100% or more of the rated output for a long time		Replace with a drive with larger capacity.
Unstable power		Install reactor(s).
The load changes frequently		Reduce the changes of the load.

ID No.	Warning Name	Descriptions	
12	AI1 analog signal loss (AnL)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-03 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Warning Setting Parameter		G2-11 AI1 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-11 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is “Fault” when Pr. G2-11 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-11 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI1 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the AnL error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Warning Name	Descriptions	
13	Under current (uC)	Low current	
Action and Reset			
Action Condition		H2-12	
Action Time		H2-13	
Warning Setting Parameter		H2-14 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time	
Reset Method		Auto	“Warning” occurs when Pr. H2-14 = 0. The “Warning” automatically clears when the output current is > (Pr. H2-12 × 105%).
		Manual	“Error” occurs when Pr. H2-14 = 1–4. You must reset manually.
Reset Condition		Immediately reset	
Record		Does not record when Pr. H2-14 = 0 and uC displays “Warning”	
Cause		Corrective Actions	
Motor cable disconnection		Exclude the connection issue of the motor and its load.	
Improper setting for the low current protection		Set the proper settings for Pr. H2-12, Pr. H2-13 and Pr. H2-14.	
Low load		Check the load status. Make sure the motor capacity matches the load.	

ID No.	Warning Name	Descriptions
15	Run disable (RuDs)	When enabling Pr. A1-21, the corresponded MI terminal is OFF and receiving a RUN command
Action and Reset		
Action Condition		The corresponded MI terminal of Pr. A1-21 is OFF and receiving a RUN command
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Auto resets when the MI terminal is ON
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Incorrect wiring or the function signal has not input		Check whether the wiring and upper unit function output is correct.

ID No.	Warning Name	Descriptions
16	Safe torque off (STO)	Safety Torque Off function activates
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Warning Setting Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		It is “Warning”, which will be automatically reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		No
Cause		Corrective Actions
The switch action of STO1/SCM1 and STO2/SCM2 (OPEN)		Check whether the wiring and upper unit function output is correct.

ID No.	Warning Name	Descriptions
17	Over speed warning (oSPd)	Over speed warning
Action and Reset		
Action Condition		When the operation mode is FOC, and the estimated speed and command exceeds the setting level of Pr.H8-03
Action Time		Pr.H8-04
Warning Setting Parameter		Pr.H8-05
Reset Method		The warning is automatically cleared when the drive stops
Reset Condition		The warning is automatically cleared when the drive stops
Record		No
Cause		Corrective Actions
The IMFOC speed estimator bandwidth is set improperly		Decrease setting of Pr.F0-00.
SMFOC estimation gain is set improperly		Adjust settings for Pr.F1-08 and F1-09.
ASR speed controller bandwidth is set improperly		Increase ASR speed controller bandwidth.
Motor parameters are set incorrectly		Set the motor parameters again and execute parameter tuning.
Malfunction caused by interference		Verify the wiring and grounding of the main circuit and control circuit comply with anti-interference solutions.

ID No.	Warning Name	Descriptions
18	Deviation warning (dAvE)	Over speed deviation warning
Action and Reset		
Action Condition		Pr.H8-00
Action Time		Pr.H8-01
Warning Setting Parameter		Pr.H8-02 (Speed deviation action) = 0 0: Warning & continue OPER
Reset Method		“Warning” automatically clears when the drive stops
Reset Condition		After the drive stops
Record		No
Cause		Corrective Actions
Improper parameter setting for the slip error		Reset proper value for Pr.H8-00 and Pr.H8-01.
Improper setting for ASR parameters and acceleration/ deceleration		Reset ASR parameters. Set proper acceleration/ deceleration time.
Accel./ Decel. time is too short		Reset proper acceleration/ deceleration time.
Motor locked		Remove the causes of motor locked.
Mechanical brake is not released		Check the active timing of the system.
Incorrect parameter setting of torque limit (Pr.F2-16–F2-19)		Adjust to proper setting value.
Malfunction caused by interference		Verify wiring of the control circuit, and wiring/ grounding of the main circuit to prevent interference.

ID No.	Warning Name	Descriptions
20	Over-torque (ot1)	Over-torque 1 warning
Action and Reset		
Action Condition		Pr. H5-04
Action Time		Pr. H5-05
Warning Setting Parameter		Pr. H5-00 (ot Action) = 0 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		The ot1 warning automatically clears when the output current is < (Pr. H5-04 × 95%)
Reset Condition		The ot1 warning automatically clears when the output current is < (Pr. H5-04 × 95%)
Record		No
Cause		Corrective Actions
Incorrect parameter setting		Reset Pr. H5-04 and Pr. H5-05.
Mechanical failure (E.g., over-torque, mechanical lock)		Rule out the causes of malfunction.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-04, E0-06, E0-08, E1-04, E1-06, E1-08 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
The motor capacity is too small		Replace the motor with a larger capacity model.
Overload during low-speed operation		Decrease low-speed operation time. Enlarge the motor capacity.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Improper parameter settings for speed tracking function (Including restart after momentary power loss and restart after fault)		Correct the parameter settings for speed tracking. Start the speed tracking function. Adjust the maximum current for Pr. A3-01 speed tracking.

ID No.	Warning Name	Descriptions
21	Over-torque (ot2)	Over-torque 2 warning
Action and Reset		
Action Condition		Pr. H5-06
Action Time		Pr. H5-07
Warning Setting Parameter		Pr. H5-02 (Normal speed ot action) = 0 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		The ot2 warning automatically clears when the output current is < (Pr. H5-06 × 95%)
Reset Condition		The ot2 warning automatically clears when the output current is < (Pr. H5-06 × 95%)
Record		No
Cause		Corrective Actions
Incorrect parameter setting		Reset Pr. H5-06 and Pr. H5-07.
Mechanical failure (E.g., over-torque, mechanical lock)		Rule out the causes of malfunction.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-04, E0-06, E0-08, E1-04, E1-06, E1-08 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
The motor capacity is too small		Replace the motor with a larger capacity model.
Overload during low-speed operation		Decrease low-speed operation time. Enlarge the motor capacity.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Improper parameter settings for speed tracking function (Including restart after momentary power loss and restart after fault)		Correct the parameter settings for speed tracking. Start the speed tracking function. Adjust the maximum current for Pr. A3-01 speed tracking.

ID No.	Warning Name	Descriptions
22_1	Motor overheating (oH3) PTC	Motor overheating warning. The AC motor drive detects the temperature inside the motor is too high
Action and Reset		
Action Condition		Pr. H6-03 = 1 (PTC), PTC input level > Pr. H6-07 (default = 50%)
Action Time		Immediately act
Warning Setting Parameter		Fault treatment: Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time When Pr. H6-09 = 0 and when the temperature is ≤ Pr. H6-07 level, the oH3 warning is automatically cleared. It is “Warning” when Pr. H6-09 = 0, which will be automatically reset
Reset Method		The oH3 is “Warning” when Pr. H6-09 = 0. When the temperature is ≤ Pr. H6-07 level, the oH3 warning is automatically cleared.
Reset Condition		When the temperature is ≤ Pr. H6-07 level, the oH3 warning is automatically cleared.
Record		No
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches the motor nameplate		Configure the correct rated current value of the motor again.
Check if the PTC is properly set and wired		Check the connection between PTC thermistor resistor and the heat protection.

Cause	Corrective Actions
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Warning Name	Descriptions
22_2	Motor overheating (oH3) KTY84	Motor overheating warning. The AC motor drive detects the temperature inside the motor is too high
Action and Reset		
Action Condition		Pr. H6-03 = 2 (KTY84), and the KTY84 temperature is > Pr. H6-07
Action Time		Immediately act
Warning Setting Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time The oH3 is automatically cleared when Pr. H6-09 = 0 and the temperature is < Pr. H6-07 level
Reset Method		The oH3 is “Warning” when Pr. H6-09 = 0. When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Reset Condition		When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Record		No
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches the motor nameplate		Configure the correct rated current value of the motor again.
Check if the KTY84 is properly set and wired		Check the connection between PTC thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Warning Name	Descriptions
22_3	Motor overheating (oH3) PT100	Motor overheating warning. The AC motor drive detects the temperature inside the motor is too high
Action and Reset		
Action Condition		Pr. H6-03 = 3 (PT100), and the PT100 temperature is > Pr. H6-07
Action Time		Immediately act
Warning Setting Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time The oH3 is automatically cleared when Pr. H6-09 = 0 and the temperature is < Pr. H6-07 level
Reset Method		The oH3 is “Warning” when Pr. H6-09 = 0. When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Reset Condition		When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Record		No
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr. E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches the motor nameplate		Configure the correct rated current value of the motor again.
Check if the PT100 is properly set and wired		Check the connection between PT100 thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Warning Name	Descriptions
22_4	Motor overheating (oH3) PT1000	Motor overheating warning. The AC motor drive detects the temperature inside the motor is too high
Action and Reset		
Action Condition		Pr. H6-03 = 4 (PT1000), and the PT1000 temperature is > Pr. H6-07
Action Time		Immediately act
Warning Setting Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time The oH3 is automatically cleared when Pr. H6-09 = 0 and the temperature is < Pr. H6-07 level
Reset Method		The oH3 is “Warning” when Pr. H6-09 = 0. When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Reset Condition		When the temperature is < Pr. H6-07 level, the oH3 warning is automatically cleared.
Record		No
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr. E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches the motor nameplate		Configure the correct rated current value of the motor again.
Check if the PT1000 is properly set and wired		Check the connection between PT1000 thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Warning Name	Descriptions
24	Over slip (oSL)	Over slip warning On the basis of the maximum slip (Pr. H5-50). When the motor drive outputs at constant speed, F > H or F < H exceeds the level set via Pr. H5-54, and it exceeds the time set via Pr. H5-55, oSL shows. oSL occurs in induction motors only.
Action and Reset		
Action Condition		When the drive outputs at constant speed, and F > H or F < H exceeds the Pr. H5-54 level
Action Time		H5-55
Warning Setting Parameter		H5-48 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		The oSL warning is automatically cleared when Pr. H5-48 = 0, the drive outputs at constant speed, and F > H or F < H does not exceed the Pr. H5-54 level anymore.
Reset Condition		No
Record		No
Cause		Corrective Actions
Any of the motor parameters in parameter group 5 may be incorrect		Check the motor parameter.
The load is too large		Reduce the loading.
Check if Pr. H5-54, Pr. H5-55, and Pr. H5-48 are properly set.		Check the parameter settings for oSL protection.

ID No.	Warning Name	Descriptions
26	Output U phase loss warning (OPHL)	The drive output U phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03
Warning Setting Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		If Pr. H3-05 is set to 0, the OPHL warning automatically clears after the drive stops.
Reset Condition		No
Record		No
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Warning Name	Descriptions
27	Output V phase loss warning (OPHL)	The drive output V phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03
Warning Setting Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		If Pr. H3-05 is set to 0, the OPHL warning automatically clears after the drive stops.
Reset Condition		No
Record		No
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Warning Name	Descriptions
28	Output W phase loss warning (OPHL)	Output phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03
Warning Setting Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		If Pr. H3-05 is set to 0, the OPHL warning automatically clears after the drive stops.
Reset Condition		No
Record		No
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Warning Name	Descriptions
30	Copy model error 3 (SE3) (SE3)	Keypad COPY error 3: copy model error
Action and Reset		
Action Condition		“SE3” warning occurs when different drive identity codes are found during copying parameters.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		No
Record		No
Cause		Corrective Actions
Keypad copy between different power range drives		It is mainly to prevent parameter copies between different HP/models. Use the same model ID to upload and download parameter copying.

ID No.	Warning Name	Descriptions
31	Under load (ULD)	The load does not reach the user defined loading curve and triggers under load protection.
Action and Reset		
Action Condition		H7-19–H7-28
Action Time		Pr. H7-18
Warning Setting Parameter		H7-16 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		The warning is automatically cleared when the load is higher than the setting loading curve.
Reset Condition		The warning is automatically cleared when the load is higher than the setting loading curve.
Record		No
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. H7-19–H7-28 corresponds to the exact loading.

ID No.	Warning Name	Descriptions
32	Overload (OLD)	The load is higher than the user defined loading curve and triggers overload protection.
Action and Reset		
Action Condition		The loading condition is higher than Pr. H7-05–H7-14 loading curve
Action Time		Pr. H7-04
Warning Setting Parameter		H7-02 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		The warning is automatically cleared when the load is lower than the setting loading curve.
Reset Condition		The warning is automatically cleared when the load is lower than the setting loading curve.
Record		Yes
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for H7-05–H7-14 is correct.

ID No.	Warning Name	Descriptions
33	Phase loss protection (ORP)	Power input phase loss protection
Action and Reset		
Action Condition		DC bus ripple is higher than 60 V_{DC}
Action Time		N/A
Warning Setting Parameter		Pr.H3-00
Reset Method		Manual reset
Reset Condition		DC bus ripple < 60 V_{DC}
Record		Yes
Cause		Corrective Actions
Phase loss of input power		Correctly install the wiring of the main circuit power.
Single phase power input to three-phase model		Choose the model whose power matches the voltage.
Power voltage changes		If the main circuit power works normally, verify the main circuit. Cycle the power after checking the power, if OrP error still exists, return to the factory for repair.
Loose wiring terminal of input power		Make sure the wiring is correct. Tighten the terminal screws according to the torque described in the user manual.
Unbalanced three-phase of input power		Check the power three-phase status.

ID No.	Warning Name	Descriptions
34	Low voltage (LV)	Before the AC motor drive operates, it detects that the DC bus voltage is lower than Pr. H1-02 setting value
Action and Reset		
Action Condition		DC bus voltage is lower than Pr. H1-02 setting value
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-02
Warning Setting Parameter		N/A
Reset Method		Auto-reset
Reset Condition		It can be reset after the DC bus voltage exceeds the following voltage. 460V models: Pr. H1-02 + 60 V_{DC}
Record		No
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
The load is too large		Reduce the load. Enlarge the drive capacity.

ID No.	Warning Name	Descriptions
50	PLC download fail (PLod)	The device number in the downloaded program has exceeded the defined range
Action and Reset		
Action Condition		During PLC download process, the program source code detects incorrect address (e.g., the address exceeds the range), the PLod warning shows.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
Incorrect component number is found when downloading the PLC program		Check if the device number used by the program has exceeded the model definition and re-download the program.

ID No.	Warning Name	Descriptions
51	PLC save memory error (PLSv)	Device number write error during program execution
Action and Reset		
Action Condition		The program detects incorrect written address (e.g., the address has exceeded the range) during PLC operation, then the PLSv warning shows.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
An incorrect written address is detected during PLC operation		Check the PLC program with D1014 and re-download the program.

ID No.	Warning Name	Descriptions
52	Data defect (PLdA)	The read/ write device number or the uploaded command exceed the range, or other data error occurs during Modbus communication
Action and Reset		
Action Condition		When the program detects incorrect read address (for example, the address is out of the range) during PLC program uploading, the PLdA warning occurs.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-upload the program. If the program does not detect any problem, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
During PLC operation, the external Modbus has written/read incorrect data to internal PLC program		Check if the used communication address has exceeded the model defined range and retransmit the communication packet again.

ID No.	Warning Name	Descriptions
53	Function defect (PLFn)	Command error while downloading program
Action and Reset		
Action Condition		The program detects incorrect command (unsupported command) during PLC downloading, then PLFn warning acts.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
Unsupported command has used while downloading the program		Check whether the used API model supports the command and re-download the program.

ID No.	Warning Name	Descriptions
54	PLC buffer overflow (PLor)	Program exceeds memory capacity during program execution
Action and Reset		
Action Condition		When PLC runs the last command and the command exceeds the maximum capacity of the program, the PLor warning shows.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
The total size of the program code exceeds the model capacity.		Check if the PLC program is correct and re-download the program.

ID No.	Warning Name	Descriptions
55	Function defect (PLFF)	Command error during program execution
Action and Reset		
Action Condition		PLFF warning occurs when an unresolved command is found during the program operation
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
The PLC runs an incorrect command during operation		Check the PLC program with D1014 and re-download the program 1. If the FOR/NEXT command is written correctly 2. Is MC/ MCR paired 3. If the break command is written correctly 4. If the FOR/NEXT command is written correctly 5. If the break command is written correctly 6. Ensure the used model supports all API codes

ID No.	Warning Name	Descriptions
56	Checksum error (PLSn)	PLC checksum error
Action and Reset		
Action Condition		PLC checksum error is detected after power on, then PLSn warning shows
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
The program detects checksum error during PLC operation		1. Disable PLC 2. Delete PLC program (Pr. b0-01 = 6) 3. Enable PLC 4. Re-download PLC program

ID No.	Warning Name	Descriptions
57	No end commands (PLEd)	Program has no END stop command
Action and Reset		
Action Condition		The “End” command is missing until the last command is executed, the PLEd warning shows
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
There is no “END” command during PLC operation		Check if the PLC program is correct and re-download the program.

ID No.	Warning Name	Descriptions
59	PLC download fail (PLdF)	Communication loss or the drive power off while downloading the program
Action and Reset		
Action Condition		The communication package is loss while downloading the program
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		The communication package is loss while downloading the program
Reset Condition		No
Record		No
Cause		Corrective Actions
PLC download is forced to stop, so the program write-in is uncompleted		Check if the connection and the power supply is normal and re-download the program.

ID No.	Warning Name	Descriptions
60	PLC scan time fail (PLSF)	PLC scan time-out during program execution
Action and Reset		
Action Condition		When the PLC scan time exceeds the maximum allowable time (200 ms), PLSF warning shows.
Action Time		Immediately act when the error is detected
Warning Setting Parameter		N/A
Reset Method		Check if the program is correct and re-download the program. If the fault does not exist after re-download the program, the warning automatically clears.
Reset Condition		No
Record		No
Cause		Corrective Actions
The PLC scan time exceeds the maximum allowable time (200 ms)		Check if the PLC program uses excessive FOR and CALL commands, reduce the usage and re-download the program.

ID No.	Warning Name	Descriptions
70	ExCom ID fail (ECid)	Duplicate MAC ID error Node address setting error
Action and Reset		
Action Condition		Duplicate setting of MAC ID Node address setting error
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Correct the setting and cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
The setting address exceeds the range (0–63)		Check the address setting of the communication card (Pr. n4-01, n4-06).
The speed setting exceeds the range		Standard: 0–2, non-standard: 0–7
The address is duplicated with other nodes on the BUS		Reset the address

ID No.	Warning Name	Descriptions
71	ExCom power loss (ECLv)	Low voltage of communication card
Action and Reset		
Action Condition		The 5V power that drive provides to communication card is too low
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
The 5V power that drive provides to communication card is too low		1. Switch the communication card to other AC motor drives and observe if there is ECLv warning shown. If yes, replace with a new communication card; if not, replace the drive. 2. Use another communication card to test if the ECLv warning has shown as well. If not, replace the card; if yes, replace the drive.
Communication cards break off		Make sure the communication card is well inserted.

ID No.	Warning Name	Descriptions
72	ExCom test mode (ECtt)	Communication card is in the test mode
Action and Reset		
Action Condition		Communication card is in the test mode
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power and enter the normal mode
Reset Condition		No
Record		No
Cause		Corrective Actions
Communication command error		Cycle the power

ID No.	Warning Name	Descriptions
73	ExCom BUS off (ECbF)	The communication card detects too many errors in the BUS, then enters the BUS-OFF status and stop communicating
Action and Reset		
Action Condition		When the drive detects BUS-off (for DeviceNet)
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
Poor connection of the cable		Re-connect the cable
Bad quality of the cable		Replace the cable

ID No.	Warning Name	Descriptions
74	ExCom no power (ECnP)	There is no power supply on the DeviceNet
Action and Reset		
Action Condition		There is no power supply on the DeviceNet
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
The drive detects that DeviceNet has no power		Check if the cable and power is normal. If yes, return to the factory for repair.

ID No.	Warning Name	Descriptions
75	ExCom factory defect (ECFF)	Factory default setting error
Action and Reset		
Action Condition		Factory default setting error
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
Factory default setting error		Use DCISoft to reset to the default value.

ID No.	Warning Name	Descriptions
76	ExCom inner error (ECiF)	Serious internal error
Action and Reset		
Action Condition		Internal memory saving error
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Cycle the power
Reset Condition		No
Record		No
Cause		Corrective Actions
Noise interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference. Cycle the power
The memory is broken		Reset to the default value and check if the error still exists. If yes, replace the communication card.

ID No.	Warning Name	Descriptions
77	ExCom IO Net break (ECio)	IO connection breaks off
Action and Reset		
Action Condition		IO connection between the communication card and the master is broken off
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The cable is loose		Re-install the cable.
Incorrect parameter setting for master communication		Check the setting for master communication parameter.

ID No.	Warning Name	Descriptions
78	ExCom IO net break (ECPP)	Profibus data error
Action and Reset		
Action Condition		No
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The used GSD file is incorrect		Use the correct GSD file for the software.

ID No.	Warning Name	Descriptions
79	ExCom configuration data error (ECPi)	Profibus configuration data error
Action and Reset		
Action Condition		No
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The used GSD file is incorrect		Use the correct GSD file for the software.

ID No.	Warning Name	Descriptions
80	Ethernet link fail (ECEF)	Ethernet cable is not connected
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		No
Record		No
Cause		Corrective Actions
The cable is loose		Re-connect the network cable.
Bad quality of the cable		Replace the cable.

ID No.	Warning Name	Descriptions
81	Communication time-out (ECto)	Communication time-out for communication card and the upper unit
Action and Reset		
Action Condition		No
Action Time		No
Warning Setting Parameter		N/A
Reset Method		No
Reset Condition		Auto resets when the communication with the upper unit is back to normal
Record		No
Cause		Corrective Actions
Communication card is not connected with the upper unit		Check if the connection of the communication cable is correct.
Communication error of the upper unit		Check if the communication of the upper unit is normal.

ID No.	Warning Name	Descriptions
82	Checksum error (ECCS)	A fault occurs to the communication checksum between communication card and the drive
Action and Reset		
Action Condition		Software detection
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Noise interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Warning Name	Descriptions
83	Return defect (ECrF)	The communication card has returned to the default
Action and Reset		
Action Condition		The communication card has returned to the default
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The communication card is returning to the default.		No need to handle the warning.

ID No.	Warning Name	Descriptions
84	Modbus TCP over (ECo0)	The connection of Modbus TCP has exceeded the limit
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The number of master station connection is larger than the number of the communication card that can be connected		Reduce the connected number of the master station.
Though there is no communication after the upper unit is connected, the Modbus TCP is still on-line, which caused the connection being occupied.		Modify the upper unit program. It must be disconnected when it is not used for a long time.
Every time the upper unit connects with the communication card, it opens a new Modbus TCP connection, which causes the connection to be occupied		Modify the upper unit program. Uses the same Modbus TCP connection when connecting to the same communication card.

ID No.	Warning Name	Descriptions
85	EtherNet/IP over (ECo1)	The connection of Ethernet/IP has exceeded the limit
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
The number of master station connection is larger than the number of the communication card that can be connected		Reduce the connected number of the master station.
Though there is no communication after the upper unit is connected, the Ethernet/IP is still on-line, which caused the connection being occupied.		Modify the upper unit program. It must be disconnected when it is not used for a long time.
Every time the upper unit connects with the communication card, it opens a new Ethernet/IP connection, which causes the connection to be occupied		Modify the upper unit program. Uses the same Ethernet/IP connection when connecting to the same communication card.

ID No.	Warning Name	Descriptions
86	IP fail (ECiP)	IP setting failure
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
IP conflicts		Reset IP
DHCP IP configuration is incorrect		Contact your MIS member to check if the DHCP server works normally.

ID No.	Warning Name	Descriptions
87	Mail fail (EC3F)	Mail warning: When the communication card setting Alarm condition is met, an Alarm mail is sent.
Action and Reset		
Action Condition		When the communication card setting Alarm condition is met
Action Time		Immediately act
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Alarm setting condition is met		No need to handle the warning.

ID No.	Warning Name	Descriptions
88	ExCom busy (ECbF)	ExCom busy: receiving too many packets, the communication card is busy
Action and Reset		
Action Condition		Software detection
Action Time		No
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		No
Record		No
Cause		Corrective Actions
There are too many communication packages for the communication card to process		Reduce the communication packages.

ID No.	Warning Name	Descriptions
89	ExCom card break (ECCb)	Communication cards break off warning
Action and Reset		
Action Condition		Communication cards break off
Action Time		The time between communication card break off and ECCb displays: 1. EtherNet/IP: 5 sec. 2. Modbus TCP: 5 sec. 3. DeviceNet: 1 sec. 4. PROFIBUS: 1 sec. 5. EtherCAT: 0.1 sec.
Warning Setting Parameter		N/A
Reset Method		Auto resets after communication card is re-installed
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Communication cards break off		Re-install communication card

ID No.	Warning Name	Descriptions
123	Deceleration energy backup error (dEb)	Deceleration energy backup error
Action and Reset		
Action Condition		Software detection
Action Time		No
Warning Setting Parameter		Pr. J2-00 0: Disable 1: Auto-decel, stop after restore 2: Auto-decel, run after restore 3: Low speed high voltage control 4: All high voltage control 5: dEb Decel, stop after restore 6: FOC Decel, stop after restore 7: FOC Decel, run after restore
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Momentary power loss, or too low and unstable power voltage, or power supply sliding down because of sudden heavy load.		Check the field electricity consumption.
Unexpected power shut down or power loss		Check the field electricity consumption.

ID No.	Warning Name	Descriptions
140	SD card function error (SDiv)	The SD card is not inserted, or the disk format does not match when using the SD card memory function
Action and Reset		
Action Condition		Auto-detect
Action Time		Immediately act
Warning Setting Parameter		No
Reset Method		Press RESET key
Reset Condition		No
Record		Yes
Cause		Corrective Actions
The SD card does not use FAT32 format		Format the SD card to FAT32 by a PC.
Use the SD card memory function		Check if the SD card memory function is used and if the SD card is correctly inserted.

ID No.	Warning Name	Descriptions	
142	AI2 analog signal loss (AnL)	Analog input current loss (including all analog 4–20 mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-22 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Warning Setting Parameter		Pr. G2-30 AI2 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-30 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is “Fault” when Pr. G2-30 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-30 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI2 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the AnL error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Warning Name	Descriptions	
143	AI3 analog signal loss (AnL)	Analog input current loss (including all analog 4–20 mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-41 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Warning Setting Parameter		Pr. G2-49 AI3 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-49 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is “Fault” when Pr. G2-49 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-49 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI3 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the AnL error still occurs after checking all the wiring, return to the factory for repair.	

<table>
<tr><th>ID No.</th><th>Warning Name</th><th colspan="2">Descriptions</th></tr>
<tr><td>144</td><td>AI10 analog signal loss (AnL)</td><td colspan="2">Analog input current loss (including all analog 4–20mA signals)</td></tr>
<tr><td colspan="4">Action and Reset</td></tr>
<tr><td colspan="2">Action Condition</td><td colspan="2">When the analog input (Pr. G6-02 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)</td></tr>
<tr><td colspan="2">Action Time</td><td colspan="2">The action condition is attained for 0.1s</td></tr>
<tr><td colspan="2">Warning Setting Parameter</td><td colspan="2">Pr. G6-10
AI10 signal loss action:
0: Disable
1: Warning & continue OPER
2: Fault & Ramp to Stop
3: Fault & Auto-Decel
4: Fault & Coast to Stop
5: Fault & by Quick Stop Time
6: Warning & FREQ Lower Limit OPER</td></tr>
<tr><td colspan="2" rowspan="2">Reset Method</td><td>Auto</td><td>It is “Warning” when Pr. G6-10 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.</td></tr>
<tr><td>Manual</td><td>It is "Fault” when Pr. G6-10 = 2–5, which must be reset manually.</td></tr>
<tr><td colspan="2">Reset Condition</td><td colspan="2">Immediately reset</td></tr>
<tr><td colspan="2">Record</td><td colspan="2">It is “Fault” when Pr. G6-10 = 2–5 and will be recorded.</td></tr>
<tr><td colspan="2">Cause</td><td colspan="2">Corrective Actions</td></tr>
<tr><td colspan="2">Loose or broken AI10 wiring</td><td colspan="2">Tighten the terminals again.
Replace with a new cable.</td></tr>
<tr><td colspan="2">External device error</td><td colspan="2">Replace new device.</td></tr>
<tr><td colspan="2">Hardware failure</td><td colspan="2">If the AnL error still occurs after checking all the wiring, return to the factory for repair.</td></tr>
</table>

ID No.	Warning Name	Descriptions	
145	AI11 analog signal loss (AnL)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G6-14 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Warning Setting Parameter		Pr. G6-22 AI11 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G6-22 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is "Fault” when Pr. G6-22 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G6-22 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI11 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the AnL error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Warning Name	Descriptions
146	Monitor signal 1 trigger (BX1n)	Sets the monitor signal source o2-01 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-02 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-03 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-02 trigger condition
Record		Records when Pr. o2-03 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-01, o2-02 and o2-03 is correct.

ID No.	Warning Name	Descriptions
147	Monitor signal 2 trigger (BX2n)	Sets the monitor signal source o2-08 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-09 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-10 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-09 trigger condition
Record		Records when Pr. o2-10 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-08, o2-09 and o2-10 is correct.

ID No.	Warning Name	Descriptions
148	Monitor signal 3 trigger (BX3n)	Sets the monitor signal source o2-15 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-16 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-17 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-16 trigger condition
Record		Records when Pr. o2-17 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-15, o2-16 and o2-17 is correct.

ID No.	Warning Name	Descriptions
149	Monitor signal 4 trigger (BX4n)	Sets the monitor signal source o2-22 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-23 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-24 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-23 trigger condition
Record		Records when Pr. o2-24 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-22, o2-23 and o2-24 is correct.

ID No.	Warning Name	Descriptions
150	Monitor signal 5 trigger (BX5n)	Sets the monitor signal source o2-29 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-30 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-31 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-30 trigger condition
Record		Records when Pr. o2-31 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-29, o2-30 and o2-31 is correct.

ID No.	Warning Name	Descriptions
151	Monitor signal 6 trigger (BX6n)	Sets the monitor signal source o2-36 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-37 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-38 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-37 trigger condition
Record		Records when Pr. o2-38 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-36, o2-37 and o2-38 is correct.

ID No.	Warning Name	Descriptions
152	Monitor signal 7 trigger (BX7n)	Sets the monitor signal source o2-43 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-44 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-45 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-44 trigger condition
Record		Records when Pr. o2-45 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-43, o2-44 and o2-45 is correct.

ID No.	Warning Name	Descriptions
153	Monitor signal 8 trigger (BX8n)	Sets the monitor signal source o2-50 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-51 trigger condition
Action Time		Immediately act
Warning Setting Parameter		Pr. o2-52 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-51 trigger condition
Record		Records when Pr. o2-52 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for o2-50, o2-51 and o2-52 is correct.

ID No.	Warning Name	Descriptions
154	Battery low voltage (RtLv)	Insufficient voltage of the external battery
Action and Reset		
Action Condition		The battery voltage is lower than 2.4 V
Action Time		1 second
Warning Setting Parameter		Pr. J6-00 0: No warning 1: Warning after power on 2: Warning each hour 3: Warning each day
Reset Method		Immediately resets or automatically clears when the level returns to 2.4V
Reset Condition		Immediately resets or automatically clears when the level returns to 2.4V
Record		Yes
Cause		Corrective Actions
Insufficient battery voltage		Replace with a new battery.
Battery detection abnormal		If the warning cannot be cleared after replacing the battery and the warning still exists after restarting the drive, return to the factory for repair.

ID No.	Warning Name	Descriptions
155	Electronic thermal relay 1 protection (EoL1)	Electronic thermal relay 1 protection.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 1 rated current
Action Time		Pr. H5-09 (if the output current is larger than 100% of motor 1 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-09 setting value)
Warning Setting Parameter		Pr. H5-10 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		“Error” occurs when Pr. H5-10 = 1–4. You must reset manually.
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Records when Pr. H5-10 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-08 = 2 (Constant torque mode)		Pr. H5-08 = 1 electronic thermal relay selection motor 1 = standard motor (motor with fan on the shaft).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-08 = 0 (electronic thermal relay selection motor 1= disable) and install thermal relay on each motor.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Warning Name	Descriptions
156	Electronic thermal relay 2 protection (EoL2)	Electronic thermal relay 2 protection.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 2 rated current
Action Time		Pr. H5-20 (if the output current is larger than 100% of motor 2 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-20 setting value)
Warning Setting Parameter		Pr. H5-21 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		“Error” occurs when Pr. H5-21 = 1–4. You must reset manually.
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Records when Pr. H5-21 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-19 = 2 (IM2 EoL1 Mode = 2 Constant Torque mode)		Pr. H5-19 = 1 (IM2 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-19 = 0 (IM2 EoL1 mode= disable) and install thermal relay on each motor.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Warning Name	Descriptions
157	Electronic thermal relay 3 protection (EoL3)	Electronic thermal relay 3 protection.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 3 rated current
Action Time		Pr. H5-31 (if the output current is larger than 100% of motor 3 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-31 setting value)
Warning Setting Parameter		Pr. H5-32 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		"Error" occurs when Pr. H5-32 = 1–4. You must reset manually.
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Records when Pr. H5-32 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-30 = 2 (Constant torque mode)		Pr. H5-30 = 1 (IM3 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-30 = 0 (IM3 EoL1 mode= disable) and install thermal relay on each motor.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Warning Name	Descriptions
158	Electronic thermal relay 4 protection (EoL4)	Electronic thermal relay 4 protection. The drive coasts to stop once it activates.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 4 rated current
Action Time		Pr. H5-42 (if the output current is larger than 100% of motor 4 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-42 setting value)
Warning Setting Parameter		Pr. H5-43 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		"Error" occurs when Pr. H5-43 = 1–4. You must reset manually.
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Records when Pr. H5-43 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-43 = 2 (Constant torque mode)		Pr. H5-43 = 1 (IM4 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-43 = 0 (IM4 EoL1 mode= disable) and install thermal relay on each motor.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Warning Name	Descriptions
159	Safe torque off 1 (STO1)	The action time difference between Channel 1 and Channel 2 are too large and Channel 1 activates.
Action and Reset		
Action Condition		There is action time difference between two channels
Action Time		Pr. H0-12
Warning Setting Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		It is “Warning”, which will be automatically reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		No
Cause		Corrective Actions
Channel external appliance problems		1. Check whether Channel 1 and Channel 2 use appliance as input, and whether there is time difference in the appliance action time; replace the appliance with the same action time. 2. Check whether the appliance is broken.

ID No.	Warning Name	Descriptions
160	Safe torque off 2 (STO2)	The action time difference between Channel 1 and Channel 2 are too large and Channel 2 activates.
Action and Reset		
Action Condition		There is action time difference between two channels
Action Time		Pr. H0-12
Warning Setting Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		It is “Warning”, which will be automatically reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		No
Cause		Corrective Actions
Channel external appliance problems		1. Check whether Channel 1 and Channel 2 use appliance as input, and whether there is time difference in the appliance action time; replace the appliance with the same action time. 2. Check whether the appliance is broken.

ID No.	Warning Name	Descriptions
161	SPS models low voltage (SPLV)	SPS models detect that the internal DC bus voltage is lower than Pr. H1-04
Action and Reset		
Action Condition		H1-04
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-04
Warning Setting Parameter		N/A
Reset Method		Manual reset
Reset Condition		DC bus voltage is larger than Pr. H1-04
Record		Yes
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
The load is too large		Reduce the load. Enlarge the drive capacity. Increase the acceleration time.

ID No.	Warning Name	Descriptions
162	Controller calculation overload (MCOL)	Controller calculation is overload
Action and Reset		
Action Condition		Warning occurs when the controller calculation is more than 85%
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Auto-reset
Reset Condition		Controller calculation is lower than 80%
Record		No
Cause		Corrective Actions
Controller calculation is overload		Decrease the carrier frequency of Pr. A5-00.

ID No.	Warning Name	Descriptions
163	SD card capacity is full (SDfu)	SD card capacity is full, the recorder function will be disabled
Action and Reset		
Action Condition		Auto detection
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Press the Reset key
Reset Condition		N/A
Record		Yes
Cause		Corrective Actions
The usage rate of the SD card is 99%		1. Release the cache space or format the SD card. 2. Replace the SD card. 3. Clean the Log files if there are too many of it.
The recorder function is filled up with Log files, and there is no Temp files to overwrite automatically		

ID No.	Warning Name	Descriptions
164	No SD card (SDno)	SD card is not inserted
Action and Reset		
Action Condition		Auto detection
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Press the Reset key
Reset Condition		N/A
Record		Yes
Cause		Corrective Actions
The SD card is not correctly inserted while executing the SD card related functions (ex. Backup, recorder, etc.)		1. Check if the SD card is inserted. 2. Replace the SD card.
SD card does not reload after hot swapping		
Unsupported SD card type (ex. SDXC, SDUC…)		

ID No.	Warning Name	Descriptions
165	SD card format error (SDfe)	SD card format is incorrect
Action and Reset		
Action Condition		Auto detection
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Press the Reset key
Reset Condition		N/A
Record		Yes
Cause		Corrective Actions
The SD card format is detected error (ex. FAT16 or exFAT, etc.) when powering ON or reloading SD card		1. Format SD card to FAT32 (via AC motor drive or PC). 2. Replace the SD card.

ID No.	Warning Name	Descriptions
166	SD card prohibited execution (SDih)	SD card function is prohibited execution
Action and Reset		
Action Condition		Auto detection
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Press the Reset key
Reset Condition		N/A
Record		Yes
Cause		Corrective Actions
Enable the recorder function and restore the backup file to the SD card		The recorder function cannot be executed with some functions (read, write SD card or PLC) at the same time. Verify the recorder function (Pr.o1-33 Recorder Function) status: Pr.o1-33 = 0, Disabled Pr.o1-33 ≥ 1, Enabled
Enable the recorder function and reload		
Enable PLC function and execute the recorder function		

ID No.	Warning Name	Descriptions
167	SD card time-out (SDto)	The data write-in time is too long because the disk of the SD card is too fragmented or due to other reasons.
Action and Reset		
Action Condition		Auto detection
Action Time		Immediately displayed
Warning Setting Parameter		N/A
Reset Method		Press the Reset key
Reset Condition		N/A
Record		Yes
Cause		Corrective Actions
Enable the recorder function and restore the backup file to the SD card		The recorder function cannot be executed with some functions (read, write SD card or PLC) at the same time. Verify the recorder function (Pr.o1-33 Recorder Function) status: Pr.o1-33 = 0, Disabled Pr.o1-33 ≥ 1, Enabled
Enable the recorder function and reload		
Enable PLC function and execute the recorder function		

ID No.	Warning Name	Descriptions
300	Leakage warning (LEKn)	Triggers when detecting large amount water leakage
Action and Reset		
Action Condition		The feedback pressure is lower than Plow and the load current is larger than Pr. U3-03 setting Plow = [Target pressure × (1 – Pr. U3-01%)]
Action Time		Pr. U3-02
Warning Setting Parameter		Pr. U3-04 0: Warning & continue OPER
Reset Method		Automatically resets after the triggered condition is cleared
Reset Condition		When the drive output rated current percentage is < Pr. U3-03 level × 0.9
Record		No
Cause		Corrective Actions
The pipe outlet is broken		Check if the pipes are damaged.
Pressure sensor error		Maintain pressure sensor.

ID No.	Warning Name	Descriptions
301	Low pressure warning (LPSn)	The warning occurs when the pressure is lower than the set pressure.
Action and Reset		
Action Condition		The feedback pressure is lower than Plow Plow = [Target pressure × (1 – Pr. U3-08%)]
Action Time		Pr. U3-09
Warning Setting Parameter		Pr. U3-10 0: Warning & continue OPER
Reset Method		Automatically resets after the triggered condition is cleared
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Unable to establish water pressure		Check if the pipe has leakage, or if there is no water from the source.
Pressure sensor broken		Replace the pressure sensor.

ID No.	Warning Name	Descriptions
302	Dry pump warning (dryn)	Warning occurs when the drive detects dry pump.
Action and Reset		
Action Condition		The corresponded power of the target frequency is below the dry pump curve
Action Time		Pr. U3-16
Warning Setting Parameter		Pr. U3-19 1: Warn and coast to stop 2: Warn and ramp to stop
Reset Method		Automatically resets after the triggered condition is cleared
Reset Condition		Auto-reset
Record		No
Cause		Corrective Actions
Pipe has leakage or has no water		Check if the pipe is damaged, or if there is no water from the source.

ID No.	Warning Name	Descriptions
303	Cleaning process warning (CLE)	Warning occurs when the drive is in cleaning process
Action and Reset		
Action Condition		Pr. U3-20 (Pump clean function) is enabled
Action Time		Immediately acts
Warning Setting Parameter		N/A
Reset Method		Automatically resets when the cleaning process completes
Reset Condition		Auto-reset
Record		No
Cause		Corrective Actions
Cleaning function is enabled		Waits for the cleaning process complete or stop the cleaning process.

ID No.	Warning Name	Descriptions
304	Cavitation warning (Cavi)	Warning occurs when the drive is in cavitation status
Action and Reset		
Action Condition		Pr. U2-01 bit0 is enabled
Action Time		Immediately acts
Warning Setting Parameter		N/A
Reset Method		Automatically resets after the triggered condition is cleared
Reset Condition		Auto-reset
Record		No
Cause		Corrective Actions
There is cavitation inside the pump		Check if the pipe outlet is jammed.

8-3 Fault Codes and Troubleshooting

ID No.	Fault Name	Descriptions
1	Over-current during acceleration (ocA)	Output current exceeds 1.9 times of rated current during acceleration. When ocA occurs, the drive closes the gate of the output immediately, the motor runs freely, and the display shows an ocA error.
Action and Reset		
Action Condition		190% of the rated current
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
Acceleration time is too short		1. Increase the acceleration time. 2. Increase the acceleration time of S-curve (Pr. C2-08–C2-11) 3. Adjust the accel/decel time (Pr.C2-00–C2-07) 4. Set over-current stall prevention function (Pr. H2-05–H2-07) 5. Replace the drive with a larger capacity model
Short circuit at motor output due to poor insulation wiring		Check the motor cable and remove causes of the short circuits or replace the cable before turning on the power.
Check for possible burnout or aging insulation of the motor		Check the motor insulation value with megger. Replace the motor if the insulation is poor.
The load is too large		Check if the output current during the whole working process exceeds the AC motor drive's rated current. If yes, replace the AC motor drive with a larger capacity model.
Impulsive change of the load		Reduce the load or increase the capacity of AC motor drive.
Use special motor or motor with larger capacity than the drive		Check the motor capacity (the rated current on the motor's nameplate should ≤ the rated current of the drive)
Use ON/OFF controller of an electromagnetic contactor at the output (U/V/W) of the drive		Check the action timing of the contactor and make sure it is not turned ON / OFF when the drive outputs the voltage.
V/F curve setting error		Adjust V/F curve setting and frequency/voltage. When the fault occurs, and the frequency voltage is too high, reduce the voltage.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
The motor starts when in free run		Enable the speed tracking during start-up of Pr. A3-00.

Cause	Corrective Actions
Improper parameter settings for the speed tracking function (including restart after momentary power loss and restart after fault)	Correct the parameter settings for speed tracking. 1. Start the speed tracking function. 2. Adjust the maximum current for Pr. A3-01 speed tracking.
Incorrect combination of control mode and used motor	Check the settings for Pr. C0-02 control mode: 1. For IM, Pr. C0-02 =0 2. For PM, Pr. C0-02 =1 3. For SynRM, Pr. C0-02 =2
The length of motor cable is too long	Increase AC motor drive's capacity. Install AC reactor(s) on the output side (U/V/W).
Hardware failure	The ocA occurs due to short circuit or ground fault at the output side of the drive. Check for possible short circuits between terminals with the electric meter corresponds to U, V and W. If short circuit occurs, return to the factory for repair.
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.

ID No.	Fault Name	Descriptions
2	Over-current during deceleration (ocd)	Output current exceeds 1.9 times of rated current during deceleration. When ocd occurs, the drive closes the gate of the output immediately, the motor runs freely, and the display shows an ocd error.
Action and Reset		
Action Condition		190% of the rated current
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
Deceleration time is too short		1. Increase the deceleration time 2. Increase the deceleration time of S-curve (Pr. C2-08–C2-11) 3. Adjust the accel/decel time (Pr.C2-00–C2-07) 4. Set over-current stall prevention function (Pr. H2-05–H2-07) 5. Replace the drive with a larger capacity model
Check if the mechanical brake of the motor activates too early		Check the action timing of the mechanical brake.
Short circuit at motor output due to poor insulation wiring		Check the motor cable and remove causes of the short circuits or replace the cable before turning on the power.
Check for possible burnout or aging insulation of the motor		Check the motor insulation value with megger. Replace the motor if the insulation is poor.
The load is too large		Check if the output current during the whole working process exceeds the AC motor drive's rated current. If yes, replace the AC motor drive with a larger capacity model.
Impulsive change of the load		Reduce the load or increase the capacity of AC motor drive.
Use special motor or motor with larger capacity than the drive		Check the motor capacity (the rated current on the motor's nameplate should ≤ the rated current of the drive)
Use ON/OFF controller of an electromagnetic contactor at the output (U/V/W) of the drive		Check the action timing of the contactor and make sure it is not turned ON / OFF when the drive outputs the voltage.
V/F curve setting error		Adjust V/F curve setting and frequency/voltage. When the fault occurs, and the frequency voltage is too high, reduce the voltage.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
The length of motor cable is too long		Enlarge the AC motor drive's capacity. Install AC reactor(s) on the output side (U/V/W).

Cause	Corrective Actions
Hardware failure	The ocA occurs due to short circuit or ground fault at the output side of the drive. Check for possible short circuits between terminals with the electric meter corresponds to U, V and W. If short circuit occurs, return to the factory for repair.
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.

ID No.	Fault Name	Descriptions
3	Over-current during steady operation (ocn)	Output current exceeds 1.9 times of rated current at constant speed. When ocn occurs, the drive closes the gate of the output immediately, the motor runs freely, and the display shows an ocn error.
Action and Reset		
Action Condition		190% of the rated current
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
Short circuit at motor output due to poor insulation wiring		Check the motor cable and remove causes of the short circuits or replace the cable before turning on the power.
Check for possible shaft lock, burnout, or aging insulation of the motor		Troubleshoot the motor shaft lock. Check the motor insulation value with megger. Replace the motor if the insulation is poor.
Impulsive change of the load		Reduce the load or increase the capacity of AC motor drive.
Use special motor or motor with larger capacity than the drive		Check the motor capacity (the rated current on the motor's nameplate should ≤ the rated current of the drive)
Use ON/OFF controller of an electromagnetic contactor at the output (U/V/W) of the drive		Check the action timing of the contactor and make sure it is not turned ON / OFF when the drive outputs the voltage.
V/F curve setting error		Adjust V/F curve setting and frequency/voltage. When the fault occurs, and the frequency voltage is too high, reduce the voltage.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
The length of motor cable is too long		Enlarge the AC motor drive's capacity. Install AC reactor(s) on the output side (U/V/W).
Hardware failure		The ocA occurs due to short circuit or ground fault at the output side of the drive. Check for possible short circuits between terminals with the electric meter corresponds to U, V and W. If short circuit occurs, return to the factory for repair.

ID No.	Fault Name	Descriptions
4	Ground fault (GFF)	When the AC motor drive detects that (one of) the output terminal(s) is grounded and the grounding current is higher than Pr. H2-00 setting value, GFF occurs. **NOTE:** the short circuit protection is provided for AC motor drive protection, not to protect the user.
Action and Reset		
Action Condition		Pr. H2-00 (Default = 60%)
Action Time		No
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
Motor burnout or aging insulation occurred		Check the motor insulation value with megger. Replace the motor if the insulation is poor.
Short circuit due to broken cable		Troubleshoot the short circuit. Replace the cable.
Larger stray capacitance of the cable and terminal		If the motor cable length exceeds 100 m, decrease the setting value for carrier frequency. Take remedies to reduce stray capacitance.
Malfunction caused by interference		Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance.
Hardware failure		Cycle the power after checking the status of motor, cable, and cable length. If GFF still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
5	IGBT short circuit between upper bridge and lower bridge (occ)	Short-circuit is detected between upper bridge and lower bridge of the IGBT module
Action and Reset		
Action Condition		Hardware protection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset after the fault is cleared for 5 sec.
Record		Yes
Cause		Corrective Actions
IGBT error		Check the motor wiring. Cycle the power, if occ still exists, return to the factory for repair.
Short-circuit detecting circuit error		

ID No.	Fault Name	Descriptions
6	Over-current at stop (ocS)	Over-current or hardware failure in current detection at stop. Cycle the power after ocS occurs. If the hardware failure occurs, the display shows cd1, cd2 or cd3.
Action and Reset		
Action Condition		190% of the rated current
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
Hardware failure		Check if other error code such as cd1–cd3 occur after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
7	Over-voltage during acceleration (ovA)	DC bus over-voltage during acceleration. When ovA occurs, the drive closes the gate of the output, the motor runs freely, and the display shows an ovA error.
Action and Reset		
Action Condition		460V models: 820 V_{DC}
Action Time		Immediately acts when DC bus voltage is higher than the condition
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset only when DC bus voltage is lower than 90% of the over-voltage condition
Record		Yes
Cause		Corrective Actions
Acceleration is too slow (e.g., lifting load decreases acceleration time)		Decrease the acceleration time. Replace the drive with a larger capacity model.
The setting for stall prevention condition is smaller than no-load current		The setting for stall prevention condition should be larger than no-load current
Power voltage is too high		Check if the input voltage is within the rated AC motor drive input voltage range and check for possible voltage spikes.
ON/OFF switch action of phase-in capacitor in the same power system		If the phase-in capacitor or active power supply unit acts in the same power system, the input voltage may surge abnormally in a brief time. In this case, install an AC reactor.
Regenerative voltage of motor inertia		Use over-voltage stall prevention (Pr. H1-08). Use a brake unit or DC bus.
Acceleration time is too short		Check if the over-voltage warning occurs after acceleration stops. When the warning occurs, do the following: 1. Increase the acceleration time. 2. Set Pr. H1-08 over-voltage stall prevention. 3. Increase setting value for Pr. C2-09 S-curve acceleration arrival time 2
Motor ground fault		The ground short circuit current charges the capacitor in the main circuit through the power. Check if there is ground fault on the motor cable, wiring box and its internal terminals. Troubleshoot the ground fault.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
8	Over-voltage during deceleration (ovd)	DC bus over-voltage during deceleration. When ovd occurs, the drive closes the gate of the output immediately, the motor runs freely, and the display shows an ovd error.
Action and Reset		
Action Condition		460V models: 820 V_{DC}
Action Time		Immediately acts when DC bus voltage is higher than the condition
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset only when DC bus voltage is lower than 90% of the over-voltage condition
Record		Yes
Cause		Corrective Actions
Deceleration time is too short, causing too large regenerative energy of the load		1. Increase the setting values for Pr. C2-01 C2-03, C2-05 and C2-07 (decel. time) 2. Reduce the brake frequency. 3. Replace with a drive with larger capacity. 4. Use S-curve acceleration/deceleration. 5. Use over-voltage stall prevention (Pr. H1-08).
The setting for stall prevention condition is smaller than no-load current		The setting for stall prevention condition should be larger than no-load current
Power voltage is too high		Check if the input voltage is within the rated AC motor drive input voltage range and check for possible voltage spikes.
ON/OFF switch action of phase-in capacitor in the same power system		If the phase-in capacitor or active power supply unit acts in the same power system, the input voltage may surge abnormally in a brief time. In this case, install an AC reactor.
Motor ground fault		The ground short circuit current charges the capacitor in the main circuit through the power. Check if there is ground fault on the motor cable, wiring box and its internal terminals. Troubleshoot the ground fault.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
9	Over-voltage at constant speed (ovn)	DC bus over-voltage at constant speed. When ovn occurs, the drive closes the gate of the output immediately, the motor runs freely, and the display shows an ovn error.
Action and Reset		
Action Condition		460V models: 820 V_{DC}
Action Time		Immediately acts when DC bus voltage is higher than the condition
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset only when DC bus voltage is lower than 90% of the over-voltage condition
Record		Yes
Cause		Corrective Actions
Impulsive change of the load		1. Reduce the load. 2. Replace with a drive with larger capacity.
The setting for stall prevention condition is smaller than no-load current		The setting for stall prevention condition should be larger than no-load current
Regenerative voltage of motor inertia		Use over-voltage stall prevention (Pr. H1-08).
Power voltage is too high		Check if the input voltage is within the rated AC motor drive input voltage range and check for possible voltage spikes.
ON/OFF switch action of phase-in capacitor in the same power system		If the phase-in capacitor or active power supply unit acts in the same power system, the input voltage may surge abnormally in a brief time. In this case, install an AC reactor.
Motor ground fault		The ground short circuit current charges the capacitor in the main circuit through the power. Check if there is ground fault on the motor cable, wiring box and its internal terminals. Troubleshoot the ground fault.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
10	Over-voltage at stop (ovS)	Over-voltage at stop
Action and Reset		
Action Condition		460V models: 820 V_{DC}
Action Time		Immediately acts when DC bus voltage is higher than the condition
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset only when DC bus voltage is lower than 90% of the over-voltage condition
Record		Yes
Cause		Corrective Actions
Power voltage is too high		Check if the input voltage is within the rated AC motor drive input voltage range and check for possible voltage spikes.
ON/OFF switch action of phase-in capacitor in the same power system		If the phase-in capacitor or active power supply unit acts in the same power system, the input voltage may surge abnormally in a brief time. In this case, install an AC reactor.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
Hardware failure in voltage detection		Check if other error code such as cd1–cd3 occur after cycling the power. If yes, return to the factory for repair.
Motor ground fault		The ground short circuit current charges the capacitor in the main circuit through the power. Check if there is ground fault on the motor cable, wiring box and its internal terminals. Troubleshoot the ground fault.

ID No.	Fault Name	Descriptions
11	Low voltage during acceleration (LvA)	DC bus voltage is lower than Pr. H1-02 setting value during acceleration
Action and Reset		
Action Condition		Pr. H1-02 (Default = depending on the models)
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-02
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		It can be reset after the DC bus voltage exceeds the following voltage. 460V models: Pr. H1-02 + 60 V_{DC}
Record		Yes
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
The load is too large		Reduce the load. Enlarge the drive capacity. Increase the acceleration time.

ID No.	Fault Name	Descriptions
12	Low voltage during deceleration (Lvd)	DC bus voltage is lower than Pr. H1-02 setting value during deceleration
Action and Reset		
Action Condition		Pr. H1-02 (Default = depending on the models)
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-02
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		It can be reset after the DC bus voltage exceeds the following voltage. 460V models: Pr. H1-02 + 60 V_{DC}
Record		Yes
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
Sudden load		Reduce the load. Enlarge the drive capacity.

ID No.	Fault Name	Descriptions
13	Low voltage at constant speed (Lvn)	DC bus voltage is lower than Pr. H1-02 setting value at constant speed
Action and Reset		
Action Condition		Pr. H1-02 (Default = depending on the models)
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-02
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		It can be reset after the DC bus voltage exceeds the following voltage. 460V models: Pr. H1-02 + 60 V_{DC}
Record		Yes
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
Sudden load		Reduce the load. Enlarge the drive capacity.

ID No.	Fault Name	Descriptions
15	Phase Loss Protection (OrP)	Phase loss of power input
Action and Reset		
Action Condition		The DC bus ripple is higher than the system allowed range
Action Time		No
Fault Treatment Parameter		Pr. H3-00 (OrP Action) 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Automatically resets when Pr. H3-00 = 0 as “Warning” It is “Fault” when Pr. H3-00 = 1–4, which must be reset manually.
Reset Condition		Immediately resets when the DC bus ripple is within the system allowed range.
Record		Records when Pr. H3-00 = 1–4 and OrP displays “Fault”
Cause		Corrective Actions
Phase loss of input power		Correctly install the wiring of the main circuit power.
Single phase power input to three-phase model		Choose the model whose power matches the voltage.
Power voltage changes		If the main circuit power works normally, verify the main circuit. Cycle the power after checking the power, if OrP error still exists, return to the factory for repair.
Loose wiring terminal of input power		Tighten the terminal screws according to the torque described in the user manual.
The input cable of three-phase power is cut off		Wire correctly. Replace the cut off cable.
Input power voltage changes too much		Check if the input power voltage signal fluctuates.
Unbalanced three-phase of input power		Check the power three-phase status.

ID No.	Fault Name	Descriptions
16	IGBT overheating (oH1)	IGBT temperature exceeds the protection level
Action and Reset		
Action Condition		When Pr.H4-00 is higher than the IGBT overheating protection level, oH1 error occurs instead of oH1 warning.
Action Time		IGBT temperature exceeds the protection level for more than 1 second, oH1 error occurs.
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Resets only when IGBT temperature is lower than the oH1 error level
Record		Yes
Cause		Corrective Actions
Check if the ambient temperature or temperature inside the cabinet is too high, or if there is obstruction in the ventilation hole of the control cabinet.		Check the ambient temperature. Regularly inspect the ventilation hole of the control cabinet. Change the installed place if there are heating objects, such as braking resistors, in the surroundings. Install / add cooling fan or air conditioner to lower the temperature inside the cabinet.
Check if there is any obstruction on the heat sink or if the fan is running		Remove the obstruction or replace the cooling fan.
Insufficient ventilation space		Increase ventilation space of the drive.
Check if the drive matches the corresponded loading.		1. Reduce the load. 2. Decrease the carrier. 3. Replace the drive with a larger capacity model.
The drive has run 100% or more of the rated output for a long time		Replace the drive with a larger capacity model.

ID No.	Fault Name	Descriptions
17	Capacitor overheating (oH2)	The drive has detected the capacitors are overheat and the temperature exceeds Pr. H4-01 warning protection level
Action and Reset		
Action Condition		When Pr.H4-01 is higher than the IGBT overheating protection level, oH2 error occurs instead of oH2 warning.
Action Time		Capacitor temperature exceeds the protection level for more than 1 second, oH2 error occurs.
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Resets when the capacitor temperature is lower than the oH2 warning
Record		Yes
Cause		Corrective Actions
Check if the ambient temperature or temperature inside the cabinet is too high, or if there is obstruction in the ventilation hole of the control cabinet.		Check the ambient temperature. Regularly inspect the ventilation hole of the control cabinet. Change the installed place if there are heating objects, such as braking resistors, in the surroundings. Install / add cooling fan or air conditioner to lower the temperature inside the cabinet.
Check if there is any obstruction on the heat sink or if the fan is running		Remove the obstruction or replace the cooling fan.
Insufficient ventilation space		Increase ventilation space of the drive.
Check if the drive matches the corresponded loading.		1. Reduce the load. 2. Decrease the carrier. 3. Replace the drive with a larger capacity model.
The drive has run 100% or more of the rated output for a long time		Replace the drive with a larger capacity model.
Unstable power		Install reactor(s).
The load changes frequently		Reduce the changes of the load.

ID No.	Fault Name	Descriptions
18	IGBT temperature detection failure (tH1o)	IGBT hardware failure in temperature detection
Action and Reset		
Action Condition		NTC broken or wiring failure
Action Time		When the IGBT temperature is higher than the protection condition, and detection time exceeds 100 ms, the tH1o protection activates.
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Hardware failure		Wait for 10 minutes, and then cycle the power. Check if tH1o protection still exists. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
19	Capacitor hardware error (tH2o)	Hardware failure in capacitor temperature detection
Action and Reset		
Action Condition		NTC broken or wiring failure
Action Time		When the IGBT temperature is higher than the protection condition, and detection time exceeds 100 ms, the tH2o protection activates.
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Hardware failure		Wait for 10 minutes, and then cycle the power. Check if tH2o protection still exists. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
21	Overload (oL)	The AC motor drive detects excessive drive output current. The overload capacity sustains for 1 minute when the drive outputs 110% of the drive's rated output current.
Action and Reset		
Action Condition		Based on overload curve and derating curve
Action Time		When the load is higher than the protection level and exceeds allowable time, the oL protection activates
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset in 5 sec. after the fault is cleared
Record		Yes
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed). Refer to the V/F curve selection of Pr. E0-00.
The capacity of the drive is too small		Replace the motor with a larger capacity model.
Overload during low-speed operation		Decrease low-speed operation time. Enlarge the AC motor drive's capacity. Decrease the carrier frequency of Pr. A5-00.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.
Output phase loss		Check the status of three-phase motor. Check if the cable is broken or the screws are loose.
Improper parameter settings for speed tracking function (Including restart after momentary power loss and restart after fault)		Correct the parameter settings for speed tracking. Start the speed tracking function. Adjust the maximum current for Pr. A3-01 speed tracking.

ID No.	Fault Name	Descriptions
22	Electronic thermal relay 1 protection (EoL1)	Electronic thermal relay 1 protection. The drive coasts to stop once it activates.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 1 rated current
Action Time		Pr. H5-09 (if the output current is larger than 100% of motor 1 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-09 setting value)
Fault Treatment Parameter		Pr. H5-10 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		“Error” occurs when Pr. H5-10 = 1–4. You must reset manually.
Reset Condition		Reset after the fault is cleared
Record		Records when Pr. H5-10 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-08 = 2 (Constant torque mode)		Pr. H5-08 = 1 (IM1 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-08 = 0 (electronic thermal relay selection motor 1= disable) and install thermal relay on each motor.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Fault Name	Descriptions
23	Electronic thermal relay 2 protection (EoL2)	Electronic thermal relay 2 protection. The drive coasts to stop once it activates.
Action and Reset		
Action Condition		Start counting when the output current is > 100% of motor 2 rated current
Action Time		Pr. H5-20 (if the output current is larger than 100% of motor 1 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-20 setting value)
Fault Treatment Parameter		Pr. H5-21 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		It is “Fault” when Pr. H5-21 = 1–4, which must be reset manually.
Reset Condition		Reset after the fault is cleared
Record		Records when Pr. H5-21 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-19 = 2 (Constant torque mode)		Pr. H5-19 = 1 (IM2 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-19 = 0 (IM2 EoL1 mode= disable) and install thermal relay on each motor.

Cause	Corrective Actions
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Fault Name	Descriptions
24_1	Motor overheating (oH3) PTC	Motor overheating (PTC) (Pr. H6-03 = 1 PTC), when PTC input > Pr. H6-07 setting value, the fault treatment acts according to Pr. H6-09.
Action and Reset		
Action Condition		PTC input value > Pr.H6-09 setting (Default = 50%)
Action Time		Immediately act
Fault Treatment Parameter		Fault treatment: Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		It is “Warning” when Pr. H6-09 = 0, which will be automatically reset It is “Fault” when Pr. H6-09 = 1–4, which must be reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H6-09 = 1–4 and oH3 displays “Fault”
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Enlarge the motor capacity.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches that on the motor nameplate		Reset to the correct motor rated current.
Check if the PTC is properly set and wired		Check the connection between PTC thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.
Unbalance three-phase impedance of the motor		Replace the motor.
Harmonics is too high		Use remedies to reduce harmonics.

ID No.	Fault Name	Descriptions
24_2	Motor overheating (oH3) KTY84	Motor overheating (KTY84) (Pr. H6-03 = 2 KTY84), when KTY84 temperature is > Pr. H6-07 setting value, the fault treatment acts according to Pr. H6-09.
Action and Reset		
Action Condition		KTY84 temperature > Pr.06-07 setting
Action Time		Immediately act
Fault Treatment Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		When Pr. H6-09 = 0 and when the temperature is < Pr. H6-07 level, the oH3 is automatically cleared. It is “Fault” when Pr. H6-09 = 1–4, which must be reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H6-09 = 1–4 and oH3 displays “Fault”
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Enlarge the motor capacity.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches that on the motor nameplate		Reset to the correct motor rated current.
Check if the KTY84 is properly set and wired		Check the connection between PTC thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Fault Name	Descriptions
24_3	Motor overheating (oH3) PT100	Motor overheating (PT100) (Pr. H6-03 = 3 PT100), when PT100 temperature is > Pr. H6-07 setting value, the fault treatment acts according to Pr. H6-09.
Action and Reset		
Action Condition		PT100 temperature > Pr.06-07 setting
Action Time		Immediately act
Fault Treatment Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		When Pr. H6-09 = 0 and when the temperature is < Pr. H6-07 level, the oH3 is automatically cleared. It is “Fault” when Pr. H6-09 = 1–4, which must be reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H6-09 = 1–4 and oH3 displays “Fault”
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Enlarge the motor capacity.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches that on the motor nameplate		Reset to the correct motor rated current.
Check if the PT100 is properly set and wired		Check the connection between PT100 thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Fault Name	Descriptions
24_4	Motor overheating (oH3) PT1000	Motor overheating (PT1000) (Pr. H6-03 = 4 PT1000), when PT1000 temperature is > Pr. H6-07 setting value, the fault treatment acts according to Pr. H6-09.
Action and Reset		
Action Condition		PT1000 temperature > Pr.06-07 setting
Action Time		Immediately act
Fault Treatment Parameter		Pr. H6-09 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		When Pr. H6-09 = 0 and when the temperature is < Pr. H6-07 level, the oH3 is automatically cleared. It is “Fault” when Pr. H6-09 = 1–4, which must be reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H6-09 = 1–4 and oH3 displays “Fault”
Cause		Corrective Actions
Motor locked		Clear the motor lock status.
The load is too large		Reduce the load. Enlarge the motor capacity.
Ambient temperature is too high		Change the installed place if there are heating devices in the surroundings. Install / add cooling fan or air conditioner to lower the ambient temperature.
Motor cooling system error		Check the cooling system to make it work normally.
Motor fan error		Replace the fan.
Operates at low speed too long		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Check if the motor rated current matches that on the motor nameplate		Reset to the correct motor rated current.
Check if the PT1000 is properly set and wired		Check the connection between PT1000 thermistor resistor and the heat protection.
Check if the setting for stall prevention is correct		Set the stall prevention to the proper value.

Cause	Corrective Actions
Unbalance three-phase impedance of the motor	Replace the motor.
Harmonics is too high	Use remedies to reduce harmonics.

ID No.	Fault Name	Descriptions
25	Interrupt error (INTR)	MCU firmware error
Action and Reset		
Action Condition		Firmware detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Automatically reset after cycling the power
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Firmware error		Cycle the power, if the fault still exists, contact Delta.

ID No.	Fault Name	Descriptions
26	Over-torque 1 (ot1)	When output current exceeds the over-torque detection level (Pr. H5-04) and exceeds over-torque detection time (Pr. H5-05), and when Pr.H5-00 is set to 1–4, the ot1 error displays.
Action and Reset		
Action Condition		Pr. H5-04
Action Time		Pr. H5-05
Fault Treatment Parameter		Pr. H5-00 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Auto: When Pr. H5-00 = 0, ot1 is “Warning”. The ot1 warning automatically clears when the output current is < (Pr. H5-04 × 95%) Manual: “Error” occurs when Pr. H5-00 = 1–4. You must reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H5-00 = 1–4, ot1 is “Fault”
Cause		Corrective Actions
Incorrect parameter setting		Reset Pr. H5-04 and Pr. H5-05.
Mechanical failure (e.g., over-torque, mechanical lock)		Remove the causes of malfunction.
The load is too large		Reduce the load. Replace the motor with a larger capacity model.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
The motor capacity is too small		Replace the motor with a larger capacity model.
Overload during low-speed operation		Decrease low-speed operation time. Enlarge the motor capacity.
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Improper parameter settings for speed tracking function (Including restart after momentary power loss and restart after fault)		Correct the parameter settings for speed tracking. Start the speed tracking function. Adjust the maximum current for Pr. A3-01 speed tracking.

ID No.	Fault Name	Descriptions	
27	Over-torque 2 (ot2)	When in the constant speed, the output current exceeds the over-torque detection level (Pr. H5-06) and exceeds over-torque detection time (Pr. H5-07), and when Pr.H5-02 is set to 1–4, the ot2 error displays.	
Action and Reset			
Action Condition		Pr. H5-06	
Action Time		Pr. H5-07	
Fault Treatment Parameter		Pr. H5-02 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time	
Reset Method		Auto	When Pr. H5-00 = 0, ot2 is “Warning”. The ot2 warning automatically clears when the output current is < (Pr. H5-06 × 95%)
		Manual	It is “Fault” when Pr. H5-02 = 1–4, which must be reset manually.
Reset Condition		Immediately reset	
Record		Records when Pr. H5-00 = 1–4, ot2 is “Fault”	
Cause		Corrective Actions	
Incorrect parameter setting		Reset Pr. H5-15 and Pr. H5-16.	
Mechanical failure (e.g., over-torque, mechanical lock)		Remove the causes of malfunction.	
The load is too large		Reduce the load. Replace the motor with a larger capacity model.	
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)	
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).	
The motor capacity is too small		Replace the motor with a larger capacity model.	
Overload during low-speed operation		Decrease low-speed operation time. Enlarge the motor capacity.	
Torque compensation is too large		Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.	
Improper parameter settings for speed tracking function (Including restart after momentary power loss and restart after fault)		Correct the parameter settings for speed tracking. Start the speed tracking function. Adjust the maximum current for Pr. A3-01 speed tracking.	

ID No.	Fault Name	Descriptions	
28	Under current (uC)	Low current	
Action and Reset			
Action Condition		H2-12	
Action Time		H2-13	
Fault Treatment Parameter		H2-14 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time	
Reset Method		Auto	"Warning" occurs when Pr. H2-14 = 0. The "Warning" is automatically cleared when the output current is > (Pr. H2-12 × 105%).
		Manual	"Error" occurs when Pr. H2-14 = 1–4. You must reset manually.
Reset Condition		Immediately reset	
Record		Records when Pr. H2-14 = 1–4 and uC displays "Fault"	
Cause		Corrective Actions	
Motor cable disconnection		Troubleshoot the connection between the motor and the load.	
Improper setting of low-current protection		Reset Pr. H2-12, Pr. H2-13, and Pr. H2-14 to proper settings.	
The load is too low		Check the load status. Make sure the motor capacity matches the load.	

ID No.	Fault Name	Descriptions
30	EEPROM write error (cF1)	Internal EEPROM cannot be programmed
Action and Reset		
Action Condition		When the firmware detects failure of parameter EEPROM write in, the cF1 fault occurs.
Action Time		cF1 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Internal EEPROM write in error		Press RESET key or reset the parameter to the default setting, if cF1 still exists, return to the factory for repair. Reset parameters to default. If cF1 still exists, return to the factory for repair. Cycle the power, if cF1 still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
31	EEPROM read error (cF2)	Internal EEPROM cannot be read
Action and Reset		
Action Condition		When the firmware detects parameter data error, the cF2 fault occurs.
Action Time		cF2 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Parameter EEPROM cannot be read		Press RESET key or reset the parameter to the default setting, if cF1 still exists, return to the factory for repair. Reset parameters to default. If cF2 still exists, return to the factory for repair. Cycle the power, if cF2 still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
33	U-phase error (cd1)	U-phase current detection error when power is ON
Action and Reset		
Action Condition		Hardware detection
Action Time		cd1 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Power-off
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Cycle the power If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
34	V-phase error (cd2)	V-phase current detection error when power is ON
Action and Reset		
Action Condition		Hardware detection
Action Time		cd2 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Power-off
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Cycle the power If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
35	W-phase error (cd3)	W-phase current detection error when power is ON
Action and Reset		
Action Condition		Hardware detection
Action Time		cd3 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Power-off
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Cycle the power If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
37	occ hardware error (Hd1)	Protection error of oc hardware protection circuit when power is ON
Action and Reset		
Action Condition		Hardware detection
Action Time		Hd1 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Power-off
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Cycle the power If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
39	occ hardware error (Hd3)	Protection error of occ IGBT short-circuit detection when power is ON
Action and Reset		
Action Condition		Hardware detection
Action Time		Hd3 acts immediately when the drive detects the fault
Fault Treatment Parameter		No
Reset Method		Power-off
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Cycle the power If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
40	Auto-tuning error (AUE)	The motor autotune process does not complete.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The motor auto-tune process does not complete.		Execute the auto-tune process again to ensure the process is complete.
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions	
48	AI1 Loss (ACE)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-03 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Fault Treatment Parameter		Pr. G2-11 AI1 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-11 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is “Fault” when Pr. G2-11 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-11 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI1 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the ACE error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Fault Name	Descriptions
49	External Fault (EF) (EF)	External fault. When the drive decelerates based on the setting of Pr. A1-33, the EF fault displays on the keypad.
Action and Reset		
Action Condition		Pr. A1-32 = 2–7, 10–15 and the MI terminal is ON
Action Time		Immediately act
Fault Treatment Parameter		Pr. A1-33 0: Coast to stop 1: Ramp to stop 2: By EF decel Time 3: Auto-Decel
Reset Method		Manual reset
Reset Condition		Manual reset only after the external fault is cleared (terminal status is recovered)
Record		Yes
Cause		Corrective Actions
External fault		Press RESET key after the fault is cleared.

ID No.	Fault Name	Descriptions
50	Emergency stop (EF1)	When the contact of MIx = EF1 is ON, the output stops immediately and displays EF1 on the keypad. The motor is in free running.
Action and Reset		
Action Condition		Pr. A2-03 = 2–7, 10–15 and the MI terminal is ON
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Manual reset only after the external fault is cleared (terminal status is recovered)
Record		Yes
Cause		Corrective Actions
Emergency stop		Verify if the system is back to normal condition, and then press RESET key to go back to the default.

ID No.	Fault Name	Descriptions
52	Password is locked (Pcod)	Entering the wrong password three consecutive times
Action and Reset		
Action Condition		Entering the wrong password three consecutive times
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Power-off
Record		Yes
Cause		Corrective Actions
Incorrect password input through Pr. b0-02		1. Input the correct password after rebooting the motor drive. 2. If you forget the password, input 9999 and press ENTER, and repeat it again. (You need to finish the above process within 10 seconds. If you do not finish it within 10 seconds, try again.) 3. The parameter settings return to the default when the “Input 9999” process is finished.

ID No.	Fault Name	Descriptions
58	Modbus transmission time-out occurs (CE10)	Modbus transmission time-out occurs
Action and Reset		
Action Condition		When the communication time exceeds the detection time for Pr. n1-04 time-out
Action Time		Setting for Pr. n1-04.
Fault Treatment Parameter		Setting for Pr. n1-05. 0: Continue OPER 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & coast to stop
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The upper unit does not transmit the communication command within Pr. n1-04 setting time		Check if the upper unit transmits the communication command within the setting time for Pr. n1-04.
Malfunction caused by interference		Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance.
Different communication setting from upper unit		Check if the setting for Pr. n1-03 is the same as the setting for the upper unit.
Disconnection or bad connection of the cable		Check the cable and replace it if necessary.

ID No.	Fault Name	Descriptions
61	Y-connection / D-connection switch error (ydc)	An error occurs when Y-D switches
Action and Reset		
Action Condition		1. ydc occurs when the confirmation signals of Y-connection and D-connection are conducted at the same time 2. If any of confirmation signals is not conducted within the setting time for Pr. d0-04, ydc occurs.
Action Time		Pr. d0-04
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Can be reset only when the confirmation signal of Y-connection is conducted if it is Y-connection, or when the confirmation signal of D-connection is conducted if it is D-connection.
Record		Yes
Cause		Corrective Actions
The electromagnetic valve operates incorrectly during Y-D switch		Check if the electromagnetic valve works normally. If not, replace it.
Incorrect parameter setting		Check if related parameters are all set up and set correctly.
The wiring of Y-D switch function is incorrect		Check the wiring.

ID No.	Fault Name	Descriptions
63	Over slip (oSL)	On the basis of the maximum slip limit set via Pr. H5-50, the speed deviation is abnormal. When the motor drive outputs at constant speed, F > H or F < H exceeds the level set via Pr. H5-54, and it exceeds the time set via Pr. H5-55, oSL shows. oSL occurs in induction motors only.
Action and Reset		
Action Condition		When the drive outputs at constant speed, and F > H or F < H exceeds the Pr. H5-54 level
Action Time		Pr. H5-55
Fault Treatment Parameter		Pr. H5-48 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method	Auto	When Pr. H5-48 = 0, oSL is “Warning”. When the drive outputs at constant speed, and F > H or F < H exceeds the Pr. H5-54 level, oSL warning will be cleared automatically.
	Manual	“Error” occurs when Pr. H5-48 = 1–4, oSL is “Fault”. You must reset manually.
Reset Condition		Immediately reset
Record		Records when Pr. H5-48 = 1–4, oSL is “Fault”
Cause		Corrective Actions
Any of the motor parameters in parameter group 5 may be incorrect		Check the motor parameter.
The load is too large		Reduce the loading.
Check if Pr. H5-54, Pr. H5-55, and Pr. H5-48 are properly set.		Check the parameter settings for oSL protection.

ID No.	Fault Name	Descriptions
68	Reverse direction of the speed feedback (SdRv)	Rotating direction is different from the commanding direction detected by the sensorless
Action and Reset		
Action Condition		Software detection
Action Time		Pr. H8-06
Fault Treatment Parameter		Pr. H8-07 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H8-07 = 1–4, SdRv is “Fault”
Cause		Corrective Actions
Improper setting of the FOC speed observer bandwidth		Decrease setting value for Pr. H0-00.
The setting of motor parameter is incorrect		Reset the motor parameter and execute parameter tuning
The motor cable is abnormal or broken		Check if the cable is well functioned or replace the cable
A reverse force is exerted, or the motor runs in a reverse direction at start		Start speed tracking function (Pr. A3-00)
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
69	Over speed rotation feedback (SdOr)	Over speed rotation detected by sensorless
Action and Reset		
Action Condition		Pr. H8-03
Action Time		Pr. H8-04
Fault Treatment Parameter		Pr. H8-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H8-05 = 1–4, SdOr is “Fault”
Cause		Corrective Actions
Improper setting of the IMFOC speed observer bandwidth		Decrease setting value for Pr. F0-00.
The setting of ASR bandwidth of speed controller is improper		Increase the bandwidth of ASR speed controller
The setting of motor parameter is incorrect		Reset the motor parameter and execute parameter tuning
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
70	Large deviation of speed feedback (SdDe)	A large deviation between the rotating speed and the command detected by the sensorless
Action and Reset		
Action Condition		Pr. H8-00
Action Time		Pr. H8-01
Fault Treatment Parameter		Pr. H8-02 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H8-02 = 1–4, SdDe is “Fault”
Cause		Corrective Actions
Improper parameter setting for abnormal rotating slip function		Reset proper setting for Pr. H8-00 and Pr. H8-01.
Improper parameter setting for ASR and acceleration/deceleration		Reset ASR parameters. Set proper acceleration/deceleration time.
The acceleration/deceleration time is too short		Reset proper acceleration / deceleration time.
Motor shaft locked		Remove causes of the motor shaft lock.
The mechanical brake is not released		Verify the system action timeline.
Incorrect parameter setting for torque limit (Pr. C4-10–C4-14, F2-16–F2-19)		Adjust the setting to proper value
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
71	Watchdog (WDTT)	Controller Watchdog calculation time-out detection error
Action and Reset		
Action Condition		Hardware detection
Action Time		No
Fault Treatment Parameter		No
Reset Method		Hardware failure and cannot be reset. Cycle the power.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Controller calculation time-out		Cycle the power. If the fault still exists, contact Delta.

ID No.	Fault Name	Descriptions
72	STO Loss 1 (STL1)	STO1–SCM1 internal loop detection error
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware failure and cannot be reset. Cycle the power.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
STO1 and SCM1 short circuit lines are not connected		Connect the short circuit line.
Hardware failure		Make sure all the wiring is correct and cycle the power. If the STL1 still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
76	Safe torque off (STO)	Safety Torque Off function activates
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Fault Treatment Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		Pr. H0-14 = 0, manually reset. Pr. H0-14 = 1, auto reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		Yes
Cause		Corrective Actions
The switch action of STO1/SCM1 and STO2/SCM2 (OPEN)		Check whether the wiring and upper unit function output is correct.

zID No.	Fault Name	Descriptions
77	STO Loss 2 (STL2)	STO2–SCM2 internal loop detection error
Action and Reset		
Action Condition		Hardware detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware failure and cannot be reset. Cycle the power.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
STO2 and SCM2 short circuit lines are not connected		Connect the short circuit line.
Hardware failure		Make sure all the wiring is correct and cycle the power. If the STL2 still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
79	Safe torque off 1 (STO1)	The action time difference between Channel 1 and Channel 2 are too large and Channel 1 activates.
Action and Reset		
Action Condition		There is action time difference between two channels
Action Time		Pr. H0-12
Fault Treatment Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		Pr. H0-14 = 0, manually reset. Pr. H0-14 = 1, auto reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		Yes
Cause		Corrective Actions
Channel external appliance problems		1. Check whether Channel 1 and Channel 2 use appliance as input, and whether there is time difference in the appliance action time; replace the appliance with the same action time. 2. Check whether the appliance is broken.

ID No.	Fault Name	Descriptions
80	Safe torque off 2 (STO2)	The action time difference between Channel 1 and Channel 2 are too large and Channel 2 activates.
Action and Reset		
Action Condition		There is action time difference between two channels
Action Time		Pr. H0-12
Fault Treatment Parameter		Pr. H0-11 0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop
Reset Method		Pr. H0-14 = 0, manually reset. Pr. H0-14 = 1, auto reset
Reset Condition		Channel 1 and Channel 2 return to no action level
Record		Yes
Cause		Corrective Actions
Channel external appliance problems		1. Check whether Channel 1 and Channel 2 use appliance as input, and whether there is time difference in the appliance action time; replace the appliance with the same action time. 2. Check whether the appliance is broken.

ID No.	Fault Name	Descriptions
82	Output phase loss U phase (OPHL)	U phase output phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03 Pr. H3-04: When enabling the output phase loss detection function before starting, the confirmation time is half of this time, and the parameter H3-03 is only used in normal operation
Fault Treatment Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H3-05 ≠ 0, H3-05 is “Fault”
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Fault Name	Descriptions
83	Output phase loss V phase (OPHL)	V phase output phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03 Pr. H3-04: When enabling the output phase loss detection function before starting, the confirmation time is half of this time, and the parameter H3-03 is only used in normal operation
Fault Treatment Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H3-05 ≠ 0, H3-05 is “Fault”
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Fault Name	Descriptions
84	Output phase loss W phase (OPHL)	W phase output phase loss
Action and Reset		
Action Condition		Pr. H3-02
Action Time		Pr. H3-03 Pr. H3-04: When enabling the output phase loss detection function before starting, the confirmation time is half of this time, and the parameter H3-03 is only used in normal operation
Fault Treatment Parameter		Pr. H3-05 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Records when Pr. H3-05 ≠ 0, H3-05 is “Fault”
Cause		Corrective Actions
Unbalance three-phase impedance of the motor		Replace the motor.
Check if the wiring is incorrect		Check the cable. Replace the cable.
Check if the motor is a single-phase motor		Choose a three-phase motor.
Check if the current sensor is broken		Check if the control board cable is loose. If yes, reconnect the cable and run the drive to test. If the error still occurs, return to the factory for repair. Check if the three-phase current is balanced with a current clamp meter. If the current is balanced and the OPHL error still shows on the display, return to the factory for repair.
If capacity of the drive is larger than the motor		Choose the matches capacity of the drive and motor.

ID No.	Fault Name	Descriptions
87	Overload protection at low frequency (oL3)	Low frequency and high current protection
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset after the fault is cleared for 5 sec.
Record		Yes
Cause		Corrective Actions
Power module overload		1. Reduce the motor drive's load. 2. Decrease the carrier frequency (Pr. A5-00). 3. Decrease the ambient temperature of the drive's operation. 4. Decrease the current limit. 5. Choose motor drives with lager power. 6. Increase the acceleration time. 7. If the drive is in V/F mode, decrease the output voltage for low-frequency operation.

ID No.	Fault Name	Descriptions
88	Model ID change (IDCH)	A fault occurs due to power board ID change
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Hardware ID circuit error		Cycle the power after manually reset, If the fault still exists, return to the factory for repair.
Model ID error		Check if the model name matches with Pr. A0-00 (refer to description in Section 1-1) and cycle the power after manually reset. If the fault still exists, return to the factory for repair.

ID No.	Fault Name	Descriptions
89	Rotor position detection error (RoPd)	Rotor position detection error protection
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The motor cable is abnormal or broken		Check if the cable is well functioned or replace the cable
Motor coil error		Replace the motor.
Hardware failure		IGBT broken. Return to the factory for repair.
Drive’s current feedback line error		Cycle the power. If RoPd still occurs during operation, return to the factory for repair.

ID No.	Fault Name	Descriptions
94	Initializing power board communication error when power ON (POCF)	Initializing power board communication error when power ON
Action and Reset		
Action Condition		The initializing process cannot complete the communication detection when power ON
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Auto-reset
Reset Condition		Communication recovers
Record		Yes
Cause		Corrective Actions
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
Hardware failure		Check if other error code occurs after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
95	Board identification error during power-on initialization (IDDE)	Board identification error during power-on initialization
Action and Reset		
Action Condition		Internal identification error
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		No
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Check if other error code occurs after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
96	Power board communication error (PMCF)	Power board communication error
Action and Reset		
Action Condition		Internal communication time-out
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Auto-reset
Reset Condition		Communication recovers
Record		Yes
Cause		Corrective Actions
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
Hardware failure		Check if other error code occurs after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions	
97	AI2 Loss (ACE)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-22 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Fault Treatment Parameter		Pr. G2-30 AI2 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-30 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is "Fault” when Pr. G6-30 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-30 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI2 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the ACE error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Fault Name	Descriptions	
98	AI3 loss (ACE)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G2-41 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Fault Treatment Parameter		Pr. G2-49 AI3 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G2-49 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is "Fault” when Pr. G6-49 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G2-49 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI3 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the ACE error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Fault Name	Descriptions	
99	AI10 loss (ACE)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G6-02 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Fault Treatment Parameter		Pr. G6-10 AI10 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G6-10 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is "Fault” when Pr. G6-10 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G6-10 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI10 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the ACE error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Fault Name	Descriptions	
100	AI11 Loss (ACE)	Analog input current loss (including all analog 4–20mA signals)	
Action and Reset			
Action Condition		When the analog input (Pr. G6-16 = 2) is lower than 3.6 mA (only detects analog input 4–20 mA)	
Action Time		The action condition is attained for 0.1s	
Fault Treatment Parameter		Pr. G6-22 AI11 signal loss action: 0: Disable 1: Warning & continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	
Reset Method		Auto	It is “Warning” when Pr. G6-22 = 1, and the warning will be automatically cleared when the analog input signal is ≥ 4 mA.
		Manual	It is "Fault” when Pr. G6-22 = 2–5, which must be reset manually.
Reset Condition		Immediately reset	
Record		It is “Fault” when Pr. G6-22 = 2–5 and will be recorded.	
Cause		Corrective Actions	
Loose or broken AI11 wiring		Tighten the terminals again. Replace with a new cable.	
External device error		Replace new device.	
Hardware failure		If the ACE error still occurs after checking all the wiring, return to the factory for repair.	

ID No.	Fault Name	Descriptions
101	CANopen guarding error (CGdE)	CANopen guarding error
Action and Reset		
Action Condition		When CANopen Node Guarding detects that one of the slaves does not response, the CGdE fault will activate. The upper unit sets factor and time during configuration.
Action Time		The time that upper unit sets during configuration
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		The upper unit sends a reset package to clear this fault.
Record		Yes
Cause		Corrective Actions
The guarding time is too short, or less detection times		Increase the guarding time (Index 100C) and detection times.
Malfunction caused by interference		1. Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance. 2. Make sure the communication circuit is wired in series. 3. Use CANopen cable or add terminating resistance.
Disconnection or bad connection of the cable		Check the cable and replace it if necessary.

ID No.	Fault Name	Descriptions
102	CANopen heartbeat error (CHbE)	CANopen heartbeat error
Action and Reset		
Action Condition		When CANopen Heartbeat detects that one of the slaves does not response, the CHbE fault activates. The upper unit sets the confirming time of producer and consumer during configuration.
Action Time		The upper unit sets the confirming time of producer and consumer during configuration.
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		The upper unit sends a reset package to clear this fault.
Record		Yes
Cause		Corrective Actions
The heartbeat time is too short		Increase heartbeat time (Index 100C).
Malfunction caused by interference		1. Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance. 2. Make sure the communication circuit is wired in series. 3. Use CANopen cable or add terminating resistance.
Disconnection or bad connection of the cable		Check the cable and replace it if necessary.

<table>
<tr><th>ID No.</th><th>Fault Name</th><th colspan="2">Descriptions</th></tr>
<tr><td>104</td><td>CANopen bus off error (CbFE)</td><td colspan="2">CANopen bus off error</td></tr>
<tr><td colspan="4">Action and Reset</td></tr>
<tr><td colspan="2" rowspan="2">Action Condition</td><td>Hardware</td><td>When CANopen card is not installed, CbFE fault will occur</td></tr>
<tr><td>Software</td><td>When the master received wrong communication package, CbFE fault occurs.
Too much interference on BUS.
When the CAN_H and CAN_L communication cable is short, the master will receive wrong package, and CbFE fault occurs.</td></tr>
<tr><td colspan="2">Action Time</td><td colspan="2">Immediately act</td></tr>
<tr><td colspan="2">Fault Treatment Parameter</td><td colspan="2">No</td></tr>
<tr><td colspan="2">Reset Method</td><td colspan="2">Manual reset</td></tr>
<tr><td colspan="2">Reset Condition</td><td colspan="2">Cycle the power</td></tr>
<tr><td colspan="2">Record</td><td colspan="2">Yes</td></tr>
<tr><td colspan="2">Cause</td><td colspan="2">Corrective Actions</td></tr>
<tr><td colspan="2">Check if the CANopen card is installed</td><td colspan="2">Make sure the CANopen card is installed.</td></tr>
<tr><td colspan="2">Check if the CANopen speed is correct</td><td colspan="2">Reset CANopen speed (Pr. n2-02).</td></tr>
<tr><td colspan="2">Malfunction caused by interference</td><td colspan="2">1. Verify the wiring and grounding of the communication circuit. It is recommended to separate the communication circuit from the main circuit, or wire in 90 degrees for effective anti-interference performance.
2. Make sure the communication circuit is wired in series.
3. Use CANopen cable or add terminating resistance.</td></tr>
<tr><td colspan="2">Disconnection or bad connection of the cable</td><td colspan="2">4. Check the cable and replace it if necessary.</td></tr>
</table>

ID No.	Fault Name	Descriptions
114	SPS models over voltage (SPOV)	SPS models detect that the internal DC bus over-voltage
Action and Reset		
Action Condition		820 V_{DC}
Action Time		Immediately acts when DC bus voltage is higher than the condition
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Reset only when DC bus voltage is lower than 90% of the over-voltage condition
Record		Yes
Cause		Corrective Actions
Impulsive change of the load		1. Reduce the load. 2. Replace with a drive with larger capacity.
The setting for stall prevention condition is smaller than no-load current		The setting for stall prevention condition should be larger than no-load current
Regenerative voltage of motor inertia		Use over-voltage stall prevention (Pr. H1-08).
Power voltage is too high		Check if the input voltage is within the rated AC motor drive input voltage range, and check for possible voltage spikes.
ON/OFF switch action of phase-in capacitor in the same power system		If the phase-in capacitor or active power supply unit acts in the same power system, the input voltage may surge abnormally in a brief time. In this case, install an AC reactor.
Motor ground fault		The ground short circuit current charges the capacitor in the main circuit through the power. Check if there is ground fault on the motor cable, wiring box and its internal terminals. Troubleshoot the ground fault.
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.

ID No.	Fault Name	Descriptions
115	SPS models low voltage (SPLV)	SPS models detect that the internal DC bus voltage is lower than Pr. H1-04
Action and Reset		
Action Condition		H1-04
Action Time		Immediately act when DC bus voltage is lower than Pr. H1-04
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		DC bus voltage is larger than Pr. H1-04
Record		Yes
Cause		Corrective Actions
Power-off		Improve power supply condition.
Power voltage changes		Adjust voltage to the power range of the drive.
Start up the motor with large capacity		Check the power system. Enlarge the capacity of power equipment.
The load is too large		Reduce the load. Enlarge the drive capacity. Increase the acceleration time.

ID No.	Fault Name	Descriptions
118	Monitor signal 1 trigger (BX1e)	Sets the monitor signal source o2-01 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-02 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-03 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-02 trigger condition
Record		Records when Pr. o2-03 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-01, o2-02 and o2-03 is correct.

ID No.	Fault Name	Descriptions
119	Monitor signal 2 trigger (BX2e)	Sets the monitor signal source o2-08 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-09 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-10 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-09 trigger condition
Record		Records when Pr. o2-10 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-08, o2-09 and o2-10 is correct.

ID No.	Fault Name	Descriptions
120	Monitor signal 3 trigger (BX3e)	Sets the monitor signal source o2-15 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-16 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-17 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-16 trigger condition
Record		Records when Pr. o2-17 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-15, o2-16 and o2-17 is correct.

ID No.	Fault Name	Descriptions
121	Monitor signal 4 trigger (BX4e)	Sets the monitor signal source o2-22 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-23 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-24 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-23 trigger condition
Record		Records when Pr. o2-24 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-22, o2-23 and o2-24 is correct.

ID No.	Fault Name	Descriptions
122	Monitor signal 5 trigger (BX5e)	Sets the monitor signal source o2-29 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-30 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-31 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-30 trigger condition
Record		Records when Pr. o2-31 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-29, o2-30 and o2-31 is correct.

ID No.	Fault Name	Descriptions
123	Monitor signal 6 trigger (BX6e)	Sets the monitor signal source o2-36 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-37 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-38 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-37 trigger condition
Record		Records when Pr. o2-38 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-36, o2-37 and o2-38 is correct.

ID No.	Fault Name	Descriptions
124	Monitor signal 7 trigger (BX7e)	Sets the monitor signal source o2-43 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-44 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-45 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-44 trigger condition
Record		Records when Pr. o2-45 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-43, o2-44 and o2-45 is correct.

ID No.	Fault Name	Descriptions
125	Monitor signal 8 trigger (BX8e)	Sets the monitor signal source o2-50 according to the trigger condition, and the monitoring signal meets the trigger condition.
Action and Reset		
Action Condition		Meet Pr. o2-51 trigger condition
Action Time		Immediately act
Fault Treatment Parameter		Pr. o2-52 0: Disable 1: Warning 2: Fault and ramp stop 3: Fault and coast stop
Reset Method		Manual reset
Reset Condition		Does not meet Pr. o2-51 trigger condition
Record		Records when Pr. o2-52 = 2 or 3
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if the setting for Pr. o2-50, o2-51 and o2-52 is correct.

ID No.	Fault Name	Descriptions
132	Under load protection (ULD)	The load does not operate according to the user defined loading curve and triggers under load protection.
Action and Reset		
Action Condition		The loading condition is lower than Pr. H7-15 L/F underload curve or Pr. H7-19–H7-28 Underload L/F Frequency Set
Action Time		Pr. H7-18
Fault Treatment Parameter		Pr. H7-16 0: Warning & continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & coast to stop 4: Fault & by Quick Stop Time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if Pr. H7-15 or H7-19–H7-28 is set properly.

ID No.	Fault Name	Descriptions
133	Overload protection (OLD)	The load is higher than the user defined loading curve and triggers overload protection.
Action and Reset		
Action Condition		The loading condition is higher than Pr. H7-01 L/F overload curve or Pr. H7-05–H7-14 Overload L/F Frequency Set
Action Time		Pr. H7-04
Fault Treatment Parameter		Pr. H7-02 0: Warning & continue OPER 1: Fault & ramp to stop 2: Fault & auto-decel 3: Fault & Coast to stop 4: Fault & by Quick stop time
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings that trigger the protection		Check if Pr. H7-01 or H7-05–H7-14 is set properly.

ID No.	Fault Name	Descriptions
134	Electronic thermal relay 3 protection (EoL3)	Electronic thermal relay 3 protection. The drive coasts to stop once it activates.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 3 rated current
Action Time		Pr. H5-31 (if the output current is larger than 100% of motor 3 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-31 setting value)
Fault Treatment Parameter		Pr. H5-32 0: Warning & continue OPER 1: Fault & ramp to stop 2: Fault & auto-decel 3: Fault & Coast to stop 4: Fault & by Quick stop time
Reset Method		“Error” occurs when Pr. H5-32 = 1–4. You must reset manually.
Reset Condition		Reset after the fault is cleared
Record		Records when Pr. H5-32 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-30 = 2 (Constant torque mode)		Pr. H5-30 = 1 (IM3 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-30 = 0 (IM3 EoL1 mode= disable) and install thermal relay on each motor.

Cause	Corrective Actions
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Fault Name	Descriptions
135	Electronic thermal relay 4 protection (EoL4)	Electronic thermal relay 4 protection. The drive coasts to stop once it activates.
Action and Reset		
Action Condition		Start counting when output current > 100% of motor 1 rated current
Action Time		Pr. H5-42 (if the output current is larger than 100% of motor 1 rated current again within 60 sec., the counting time reduces and is less than Pr. H5-42 setting value)
Fault Treatment Parameter		Pr. H5-43 0: Warning & continue OPER 1: Fault & ramp to stop 2: Fault & auto-decel 3: Fault & Coast to stop 4: Fault & by Quick stop time
Reset Method		“Error” occurs when Pr. H5-43 = 1–4. You must reset manually.
Reset Condition		Reset after the fault is cleared
Record		Records when Pr. H5-43 = 1–4
Cause		Corrective Actions
The load is too large		Reduce the load.
Accel./Decel. time and working cycle are too short		Increase the setting values for Pr. C2-00–Pr. C2-07 (accel./decel. time)
V/F voltage is too high		Adjust settings for Pr.E0-03–E0-14 (V/F curve). Adjust the setting value for the mid-point voltage (if the mid-point voltage is set too small, the load capacity decreases at low speed).
Overload during low-speed operation When using a general motor, even it operates below rated current, an overload may still occur during low-speed operation.		Decrease low-speed operation time. Change to dedicated motor for the drive. Enlarge the motor capacity.
When using motor drive dedicated motors, Pr. H5-43 = 2 (Constant torque mode)		Pr. H5-43 = 1 (IM4 EoL1 mode = Variable Torque mode).
Incorrect value of electronic thermal relay		Reset to the correct motor rated current.
The maximum motor frequency is set too low		Reset to the correct motor rated frequency.
One drive to multiple motors		Set Pr. H5-43 = 0 (IM4 EoL1 mode= disable) and install thermal relay on each motor.

Cause	Corrective Actions
Check if the setting for stall prevention is correct	Set the stall prevention to the proper value.
Torque compensation is too large	Adjust the torque compensation (refer to Pr. E0-16 torque compensation gain) until the current reduces and the motor does not stall.
Motor fan error	Check the status of the fan or replace the fan.
Unbalance three-phase impedance of the motor	Replace the motor.

ID No.	Fault Name	Descriptions
142	Auto-tune error (AUE1)	DC test error while motor parameter auto-tuning
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
143	Auto-tune error (AUE2)	Rotating state measuring error while motor parameter auto-tuning
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.
Motor does not operate correctly		Check whether the measurement of the motor rotation state cannot be performed correctly due to the coupled load.

ID No.	Fault Name	Descriptions
144	Auto-tune error (AUE3)	Rs measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
148	Auto-tune error (AUE4)	Rr measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
149	Auto-tune error (AUE5)	IM Lx measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
150	Auto-tune error (AUE6)	IM no-load current (I_0) measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
151	Auto-tune error (AUE7)	IM Lm measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
152	Auto-tune error (AUE8)	High-frequency testing error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
153	Auto-tune error (AUE9)	PM Ld measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
154	Auto-tuning error (AUEa)	PM Lq measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
155	Auto-tuning error (AUEb)	PM inductance measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
156	Auto-tuning error (AUEc)	PM inductance meter measuring error during motor auto-tune.
Action and Reset		
Action Condition		Software detection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
Incorrect settings for the motor parameter		Verify the settings of parameter group d are correct.
Motor wiring is incorrect		Check if the motor wiring is correct.
Motor error		Check if the motor works normally.
The motor U/V/W wire is abnormal		Check if the wire is broken.
The electromagnetic contactor is ON at output side (U/V/W) of the drive		Make sure the electromagnetic valve is OFF.

ID No.	Fault Name	Descriptions
213	Protection initialization error (ThIF)	Protection initialization error
Action and Reset		
Action Condition		Initialization detection error
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		No
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Hardware failure		Check if other error code occurs after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
214	Power-on process initialization time-out (POTO)	Power-on process initialization time-out
Action and Reset		
Action Condition		Initialization detection time-out
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		No
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Malfunction caused by interference		Verify the wiring of the control circuit and wiring/grounding of the main circuit to prevent interference.
Hardware failure		Check if other error code occurs after cycling the power. If yes, return to the factory for repair.

ID No.	Fault Name	Descriptions
220	Parameter copy write-in unfinished (CWF)	The backup parameter data written into the drive is incomplete.
Action and Reset		
Action Condition		The backup parameter data written into the drive is incomplete
Action Time		N/A
Fault Treatment Parameter		No
Reset Method		Direct reset
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Power off during parameter copy write-in process		Make sure the power is ON during the parameter copy write-in process.

ID No.	Fault Name	Descriptions
224	STO execution time-out (STOT)	The execution time of STO module exceeds the internal counter time.
Action and Reset		
Action Condition		The STO module execution time exceeds the internal counter time
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
225	STO ROM verifying failure (STOT)	The STO module ROM read-out error
Action and Reset		
Action Condition		The STO module ROM verifying failure
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
226	STO loss (STOL)	The STO module communication failure
Action and Reset		
Action Condition		The STO module communication failure
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
227	STO Channel 1 error (STC1)	The STO Channel 1 circuit failure
Action and Reset		
Action Condition		The STO Channel 1 circuit failure
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
228	STO Channel 2 error (STC2)	The STO Channel 2 circuit failure
Action and Reset		
Action Condition		The STO Channel 2 circuit failure
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
229	STO Channel 1 time-out (SPC1)	There is an activation time difference (> 500 ms) between STO Channel 1 and Channel 2, and Channel 1 is activated
Action and Reset		
Action Condition		The time difference between two channels are > 500 ms
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Channel external PLC equipment error		1. Check if Channel 1 and Channel 2 input with external PLC equipment, and if there is time difference between the equipment. Replace the PLC equipment to the ones with the same activation time. 2. Check if the PLC equipment is damaged.
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
230	STO Channel 2 time-out (SPC2)	There is an activation time difference (> 500 ms) between STO Channel 1 and Channel 2, and Channel 2 is activated
Action and Reset		
Action Condition		The time difference between two channels are > 500 ms
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Channel external PLC equipment error		1. Check if Channel 1 and Channel 2 input with external PLC equipment, and if there is time difference between the equipment. Replace the PLC equipment to the ones with the same activation time. 2. Check if the PLC equipment is damaged.
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
231	STO Gate check error (SGBE)	STO Gate circuit error
Action and Reset		
Action Condition		STO Gate check incorrect
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
232	STO power 24V over voltage (S24O)	STO power 24V over voltage
Action and Reset		
Action Condition		STO power 24V over voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
233	STO power 24V under voltage (S24U)	STO power 24V under voltage
Action and Reset		
Action Condition		STO power 24V under voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
234	STO power 6V over voltage (S6OV)	STO power 6V over voltage
Action and Reset		
Action Condition		STO power 6V over voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
235	STO power 6V under voltage (S6UV)	STO power 6V under voltage
Action and Reset		
Action Condition		STO power 6V under voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
236	STO power 5V over voltage (S5OV)	STO power 5V over voltage
Action and Reset		
Action Condition		STO power 5V over voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
237	STO power 5V under voltage (S5UV)	STO power 5V under voltage
Action and Reset		
Action Condition		STO power 5V under voltage
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
238	STO Watchdog (SWDG)	STO Watchdog occurs
Action and Reset		
Action Condition		STO module execution has a serious time-out
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
239	STO Sampling failure (SADE)	STO module sampling checking value is abnormal
Action and Reset		
Action Condition		STO module sampling checking value is abnormal
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
The power is ON when the USB is connected		Remove the USB and cycle the power.
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
240	STO execution time is too short (SEBL)	STO execution time is lower than the internal limit
Action and Reset		
Action Condition		STO execution time is lower than the internal limit
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
241	STO execution time is too high (SEAB)	STO execution time is higher than the internal limit
Action and Reset		
Action Condition		STO execution time is higher than the internal limit
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		Hardware error cannot be reset. Cycle the power after power off.
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Control board error		Replace the control board.

ID No.	Fault Name	Descriptions
260	Control board identification error (CBER)	A mismatch information occurs when using a control board (without physical AI3 analog switch) to upgrade the firmware to V1.10 and above.
Action and Reset		
Action Condition		Software protection
Action Time		Immediately act
Fault Treatment Parameter		No
Reset Method		No
Reset Condition		No
Record		Yes
Cause		Corrective Actions
Using a control board (without physical AI3 analog switch) to upgrade the firmware to V1.10 and above		1. Use a control board without physical AI3 analog switch with firmware below (including) V1.02. 2. Replace to the new control board (with physical AI3 analog switch) and use it with firmware of V1.10 and above.

ID No.	Fault Name	Descriptions
300	Large amount leakage error (LEKE)	Triggers when detecting large amount water leakage
Action and Reset		
Action Condition		The feedback pressure is lower than Plow and the load current is larger than Pr. U3-03 setting Plow = [Target pressure × (1 – Pr. U3-01%)]
Action Time		Pr. U3-02
Fault Treatment Parameter		Pr. U3-04 1: Fault and coast to stop 2: Fault & ramp to stop
Reset Method		Manual reset
Reset Condition		When the drive output rated current percentage is < Pr. U3-03 level × 0.9
Record		Yes
Cause		Corrective Actions
The pipe outlet is broken		Check if the pipes are damaged.
Pressure sensor error		Maintain pressure sensor.

ID No.	Fault Name	Descriptions
301	High pressure error (HPS)	The pressure feedback is higher than the set water pressure warning level
Action and Reset		
Action Condition		The feedback pressure is higher than Phigh Phigh = [Target pressure × (1 + Pr. U3-05%)]
Action Time		Pr. U3-06
Fault Treatment Parameter		Pr. U3-07 1: Fault and coast to stop 2: Fault & ramp to stop
Reset Method		Manual reset
Reset Condition		The feedback pressure is lower than Phigh × 0.9
Record		Yes
Cause		Corrective Actions
The water pressure cannot be reduced		Check if the water outlet valve of the pipeline is open.
Pressure sensor broken		Replace the pressure sensor.

ID No.	Fault Name	Descriptions
302	Low pressure error (LPSE)	The pressure feedback is lower than the set water pressure warning level
Action and Reset		
Action Condition		The feedback pressure is lower than Plow Plow = [Target pressure × (1 – Pr. U3-08%)]
Action Time		Pr. U3-09
Fault Treatment Parameter		Pr. U3-10 1: Fault and coast to stop 2: Fault & ramp to stop
Reset Method		Manual reset
Reset Condition		The feedback pressure is higher than Plow × 1.1
Record		Yes
Cause		Corrective Actions
Unable to establish water pressure		Check if the pipe has leakage, or if there is no water from the source.
Pressure sensor broken		Replace the pressure sensor.

ID No.	Fault Name	Descriptions
303	Dry pump error (dryE)	Warning occurs when the drive detects dry pump.
Action and Reset		
Action Condition		The corresponded power of the target frequency is below the dry pump curve
Action Time		Pr. U3-16
Fault Treatment Parameter		Pr. U3-19 1: Warn and coast to stop 2: Warn and ramp to stop
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The pump inlet pipeline is broken or has no water		Check if the pipe is damaged, or if there is no water from the source.

ID No.	Fault Name	Descriptions
304	Dry pump auto-tune error (dAUE)	1. The high-speed power tuning value is lower than the low-speed power tuning value. 2. Any of the high speed or low speed tuning value exceeds the drive rated power If any of the above condition is met, the drive stops with STOP command and displays dAUE
Action and Reset		
Action Condition		Power tuning value does not meet the dry pump detection curve routine
Action Time		Immediately act
Fault Treatment Parameter		Fault and coast to stop
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The value measured automatically by the dry pump curve is abnormal		Measure the load auto-tuning curve again, set Pr. U3-11 = 1 to execute dry pump curve autotune.
There is water in the pump system.		Close the pump outlet and inlet.

ID No.	Fault Name	Descriptions
305	Pipe blockage (JAME)	The output current still exceeds Pr. U3-22 setting value after the locked rotor cleaning is complete
Action and Reset		
Action Condition		In the single cleaning cycle, when the cleaning times reaches Pr. U3-26, and the current is still larger than Pr. U3-22
Action Time		Pr. U3-23 time
Fault Treatment Parameter		Immediately coast to stop
Reset Method		Manual reset
Reset Condition		Immediately reset
Record		Yes
Cause		Corrective Actions
The pump blade is blocked by objects		The cleaning function cannot clear the objects that block the pump blade, remove the object manually.

ID No.	Fault Name	Descriptions
306	ExCom card break (ECCb)	Communication cards break off warning
Action and Reset		
Action Condition		Communication cards break off
Action Time		The time between communication card break off and ECCb displays: 1. EtherNet/IP: 5 sec. 2. Modbus TCP: 5 sec. 3. DeviceNet: 1 sec. 4. PROFIBUS: 1 sec. 5. EtherCAT: 0.1 sec.
Warning Setting Parameter		N/A
Reset Method		Auto resets after communication card is re-installed
Reset Condition		Immediately reset
Record		No
Cause		Corrective Actions
Communication cards break off		Re-install communication card

ID No.	Fault Name	Descriptions
307	Communication time-out (ECto)	Communication time-out for communication card and the upper unit
Action and Reset		
Action Condition		No
Action Time		No
Warning Setting Parameter		N/A
Reset Method		No
Reset Condition		Auto resets when the communication with the upper unit is back to normal
Record		No
Cause		Corrective Actions
Communication card is not connected with the upper unit		Check if the connection of the communication cable is correct
Communication error of the upper unit		Check if the communication of the upper unit is normal

Chapter 9 Maintenance and Inspections

9-1 Maintenance and Inspections

9-2 Fan Kit

CAUTION	☑ When a fault occurs, wait for five seconds after the fault is cleared before pressing RESET with the input terminal keypad. ☑ Before opening the cover for the maintenance, the drive must first be switched off for at least three minutes until the charging indicator turns off. ☑ Only qualified personnel can work on maintenance or replace parts. (Remove metal items such as watch, rings, and other metal items before operation, and use only insulated tools.) ☑ Never modify the internal components or wiring. ☑ The performance and the surrounding environment should meet the standard specifications. There should be no abnormal noise, vibration, or odor.

The AC motor drive has various warnings and protections against errors such as over-voltage, low voltage, or over-current. Once an error occurs, the protections activate, the AC motor drive stops output and activates the error contacts, and the motor coasts to stop. Refer to the error display from the AC motor drive and look up the corresponding causes and solutions. The fault record is stored in the AC motor drive internal memory. You can read it from the digital keypad or through the communications by accessing the parameters.

The AC motor drive contains a large number of electronic components including ICs, resistors, capacitors, transistors, and cooling fans. These components do not last forever. Even under normal circumstances, they will eventually become error-prone if used exceed their lifespan. Therefore, you must perform periodic preventive maintenance to identify defective and worn out parts and eliminate the causes of malfunctions in the AC motor drive at an early stage. At the same time, parts that have exceeded their product life should be replaced to ensure safe operation.

Visual checks should be done regularly to monitor the AC motor drive's operation, and to make sure nothing unusual happens. Check the situations listed in this Chapter.

9-1 Maintenance and Inspections

Stop the drive operation, turn off the power and remove the cover before the maintenance. Even if the power has been turned off, a charge may still remain in the filter capacitors with hazardous voltages which takes a certain time to discharge. To avoid danger, strictly follow the waiting time mentioned in the precautions after the drive is powered off before performing the inspection.

- **Ambient Environment**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check the ambient temperature, humidity, vibration and if there is any dust, gas, oil or water drops.	Visual inspection and measurement with equipment with standard specifications	○		
Check for any dangerous objects in the surroundings	Visual inspection	○		

- **Voltage**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If the voltage of the main circuit and control circuit are correct	Measure with multi-meter with standard specifications	○		

- **Digital Keypad Display**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If the display is clear for reading	Visual inspection	○		
If there is any missing characters on the display	Visual inspection	○		

- **Mechanical Parts**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any abnormal sounds or vibrations	Visual and auditory inspection		○	
Check for any loose screws	Tighten the screws		○	
Check for deformed or damaged parts	Visual inspection		○	
Check for any color changed due to overheating	Visual inspection		○	
Check for any dust or dirt	Visual inspection		○	

- **Main Circuit - Terminal and wiring**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any loose or missing screws	Tighten the screws	○		
If there is any deformed, cracked, or damaged machinery / insulation, or any color changed due to overheating and aging.	Visual inspection		○	
Check for any dust or dirt	Visual inspection		○	
Check for wiring insulation damage or color changed	Visual inspection		○	

- **Main Circuit - Filter Capacity**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any leakage of liquid, color changed, cracking or deformation	Visual inspection		○	
Check if the safety valve is not removed or is obviously expanded	Visual inspection		○	
Measure the static capacity when required	Measure with equipment with standard specifications		○	

- **Main Circuit - Transformer and Reactor**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any abnormal vibrations or peculiar odors	Visual and auditory inspection	○		

- **Main Circuit - Electromagnetic Contactor and Relay**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any vibration sounds	Auditory inspection	○		
If the contact works correctly	Visual inspection	○		

- **Control Circuit - PCB and Connector**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any loose screws and connectors	Tighten the screws		○	
Check for any peculiar odors or color changed	Visual inspection and smell		○	
Check for any cracking, damage, deformation or corrosion	Visual inspection		○	
Check for any leakage of liquid or deformation in the capacitors	Visual inspection		○	

- **Cooling System - Cooling Fan**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any abnormal sounds or vibrations	Visual, auditory inspection and turn the fan by hand to check for smooth rotation (turn off the power before the inspection)		○	
Check for any loose screws	Tighten the screws		○	
Check for any color changed due to overheating	Visual inspection		○	

- **Cooling System - Ventilation Channel**

Check Item	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check for any obstruction around the heat sink, air intake or air outlet	Visual and auditory inspection	○		

NOTE: Use chemically neutral cloth to clean and use a dust cleaner to remove dust when necessary.

9-2 Fan Kit

NOTE: Refer to Section 10-3-6 for Fan selection of each model.

Frame A & B

Heat Sink Fan Model: MKVP-AFKM / MKVP-BFKM / MKVP-BFKM1

The VFD3A0VP43BSTCA model is not equipped with a fan, therefore, the following instructions do not apply.

1. Use a flathead screwdriver to insert into the groove of the middle cover, and then press the tab on both sides of the fan to remove it.

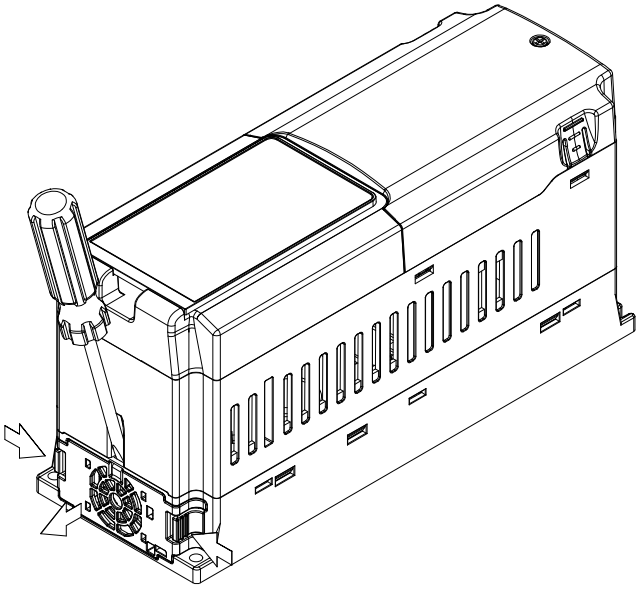


Figure 9-1

2. Disconnect the power terminal before removing the fan (as shown below).

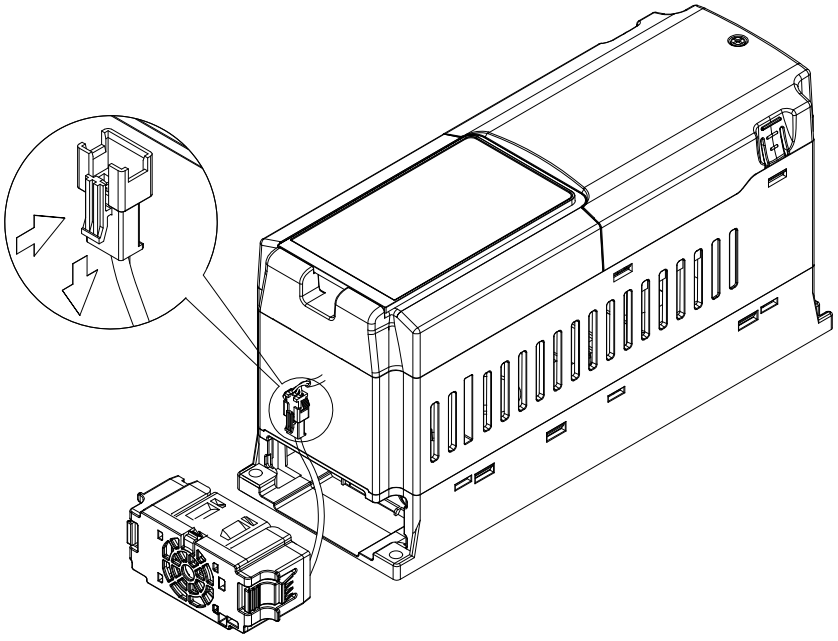


Figure 9-2

Frame C

Heat Sink Fan Model: MKVP-CFKM

1. Use a flathead screwdriver to insert to the groove of the middle cover, and open the fan hook (only for VFD025VP43BFTAA, VFD032VP43BFTAA , VFD038VP43BFTAA, VFD025VP43BSTCA, VFD032VP43BSTCA and VFD038VP43BSTCA).

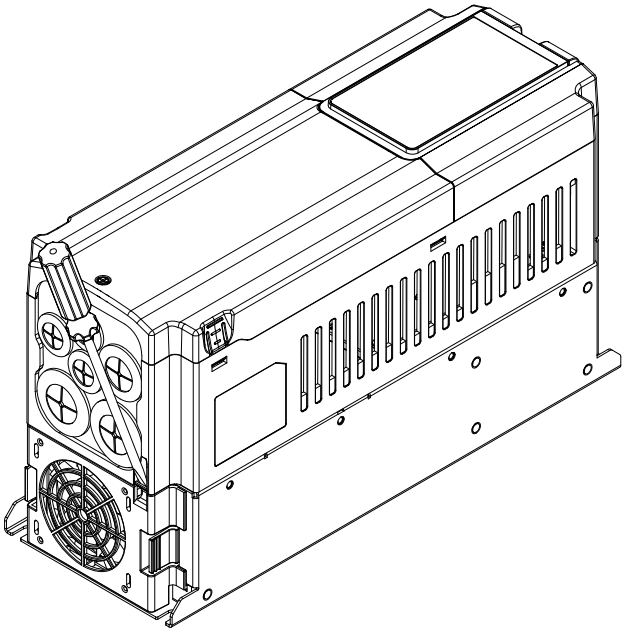


Figure 9-3

2. As shown in the figure below, press the tab on both sides of the fan to remove it.

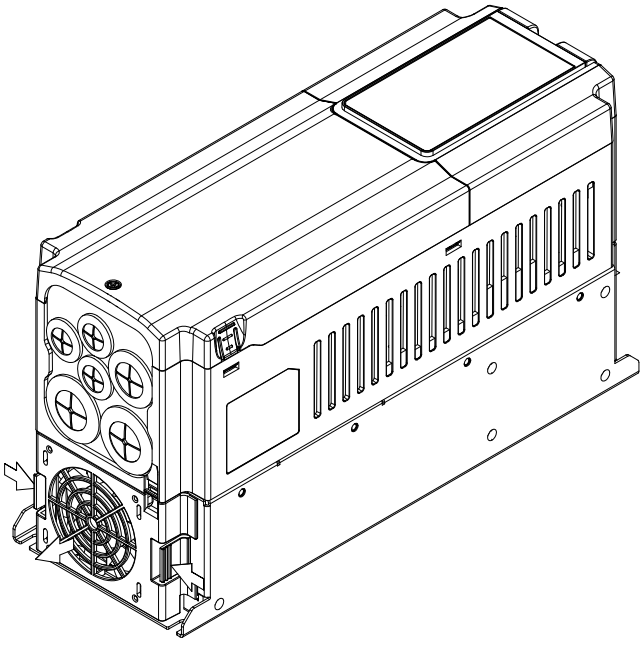


Figure 9-4

3. Disconnect the power terminal before removing the fan (as shown below).

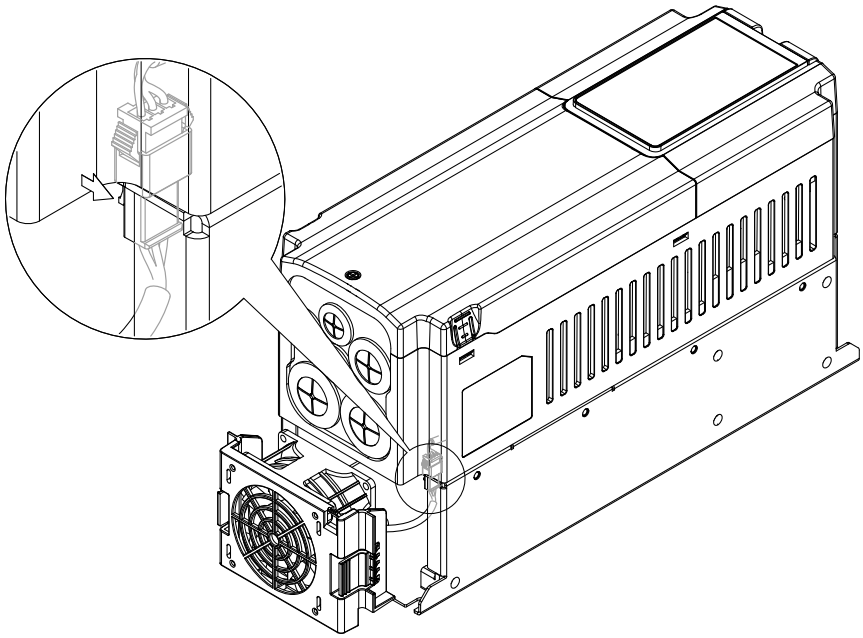


Figure 9-5

Frame D

Heat Sink Fan Model: MKVP-DFKM (OPEN TYPE)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

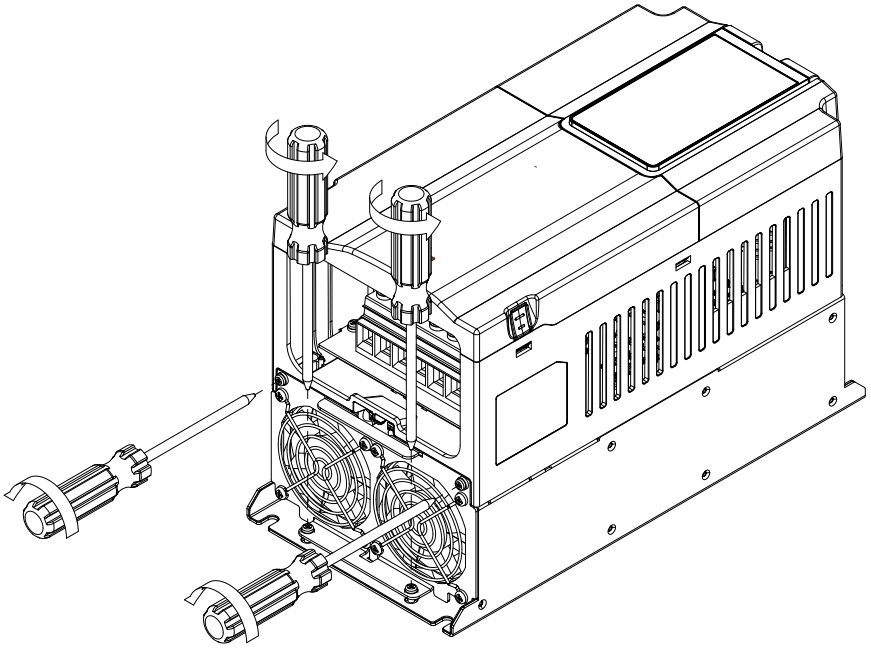


Figure 9-6

2. Disconnect the power terminal before removing the fan (as shown below).

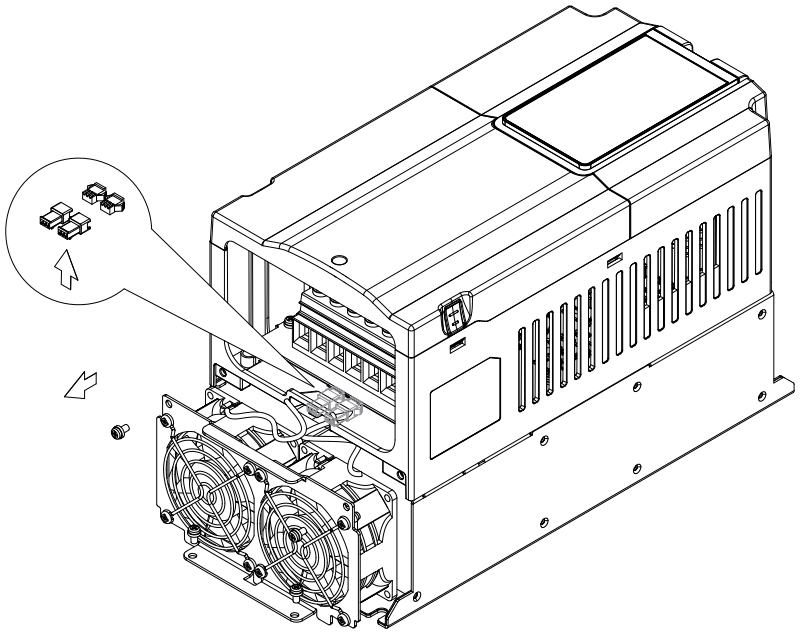


Figure 9-7

Frame D

Heat Sink Fan Model: MKVP-DFKM (TYPE1)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

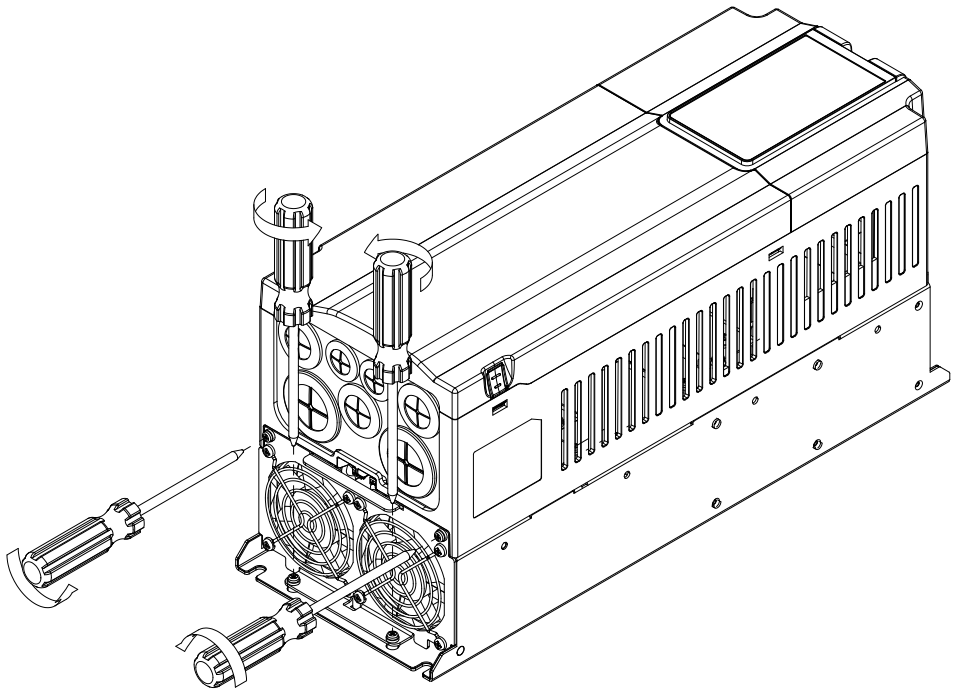


Figure 9-8

2. Disconnect the power terminal before removing the fan (as shown below).

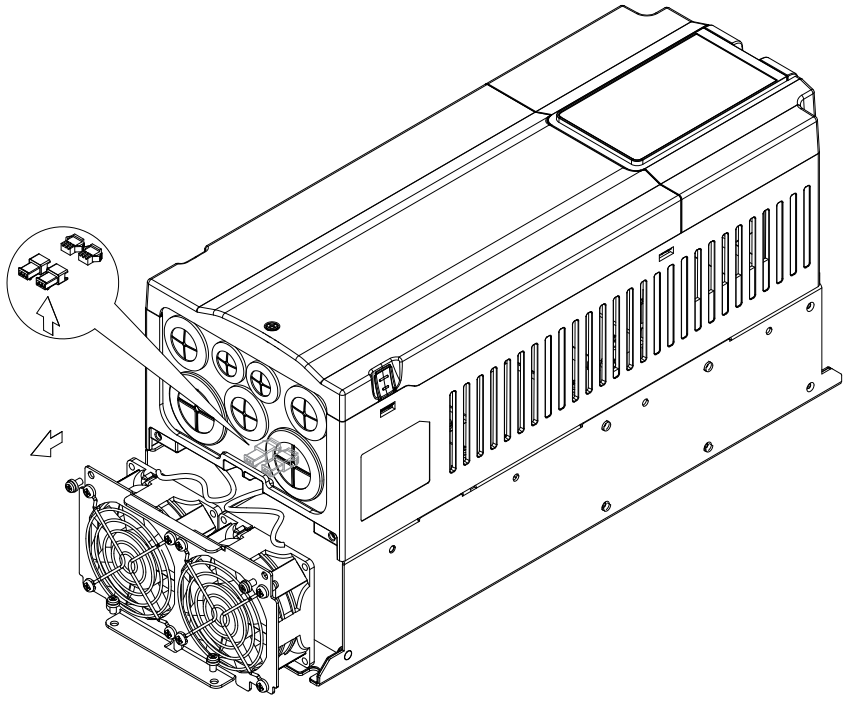


Figure 9-9

Frame E

Heat Sink Fan Model: MKVP-EFKM (OPEN TYPE)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

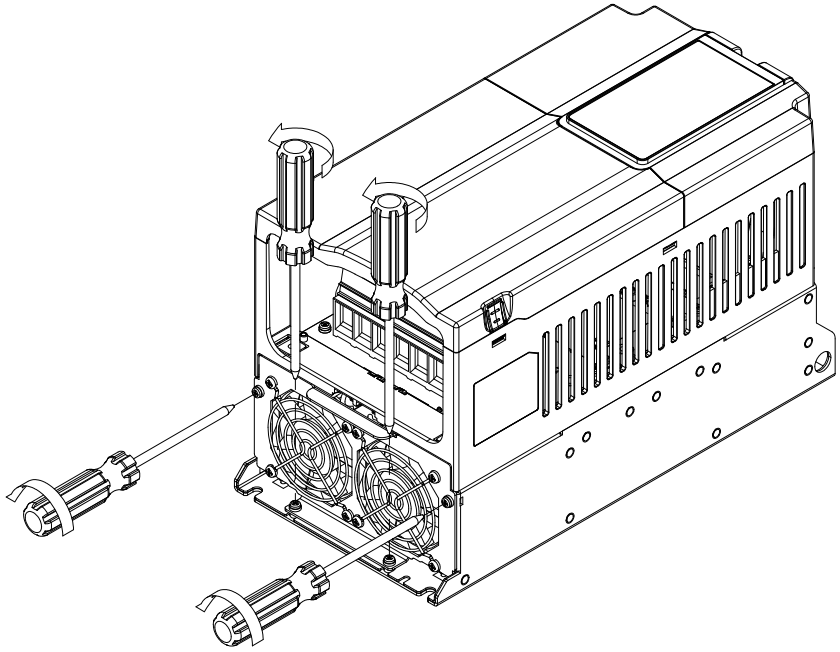


Figure 9-10

2. Disconnect the power terminal before removing the fan (as shown below).

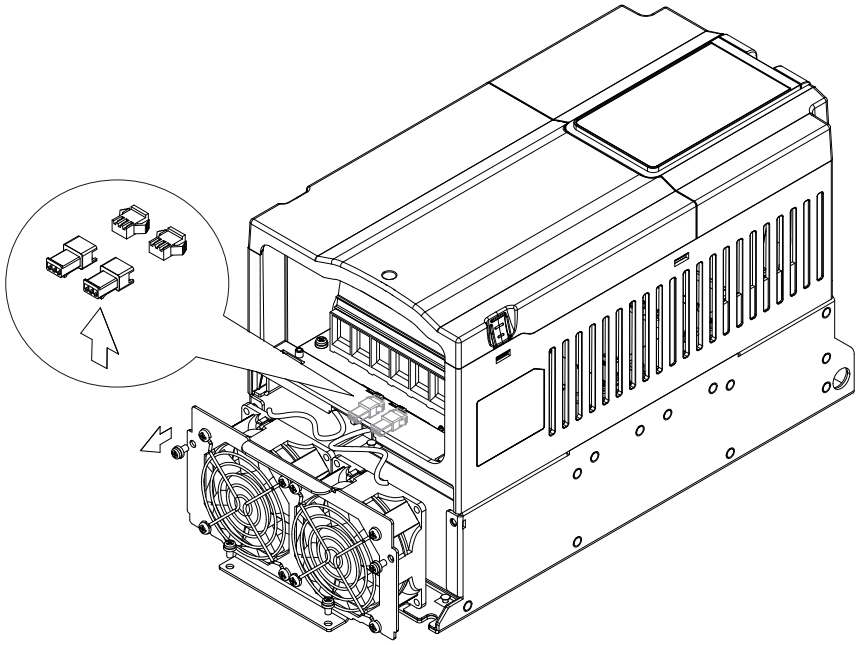


Figure 9-11

Frame E

Heat Sink Fan Model: MKVP-EFKM (TYPE1)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

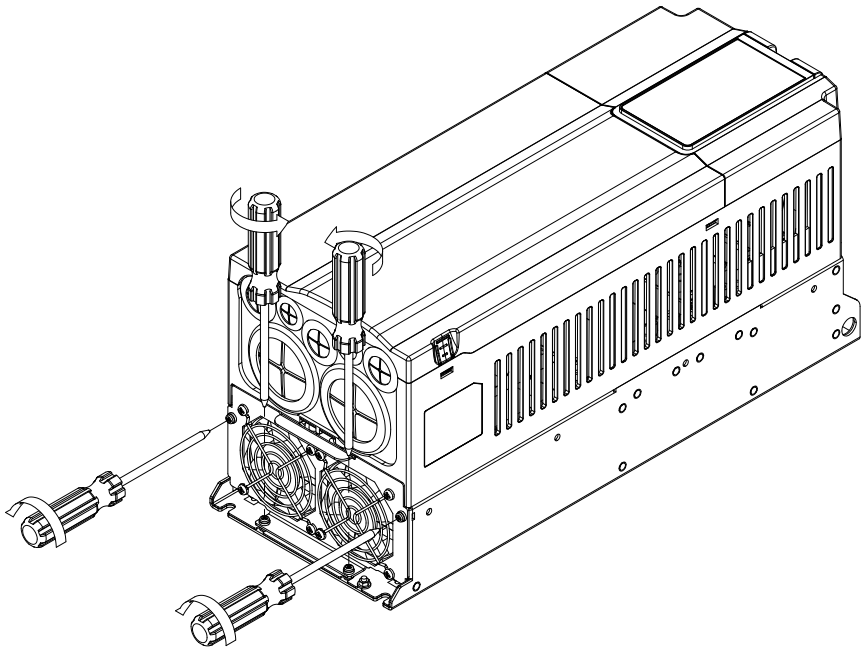


Figure 9-12

2. Disconnect the power terminal before removing the fan (as shown below).

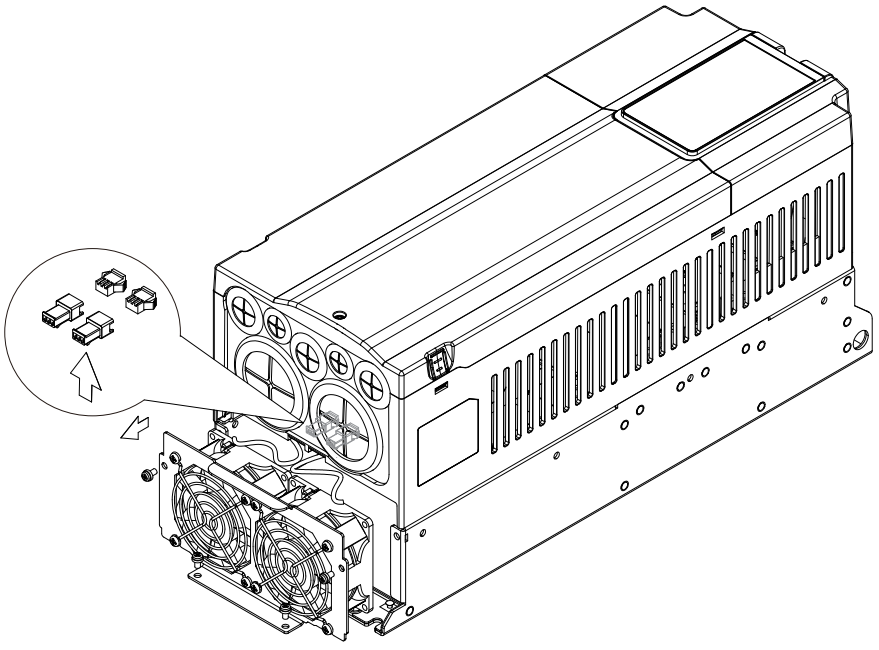


Figure 9-13

Frame F

Heat Sink Fan Model: MKVP-FFKM1 (OPEN TYPE)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

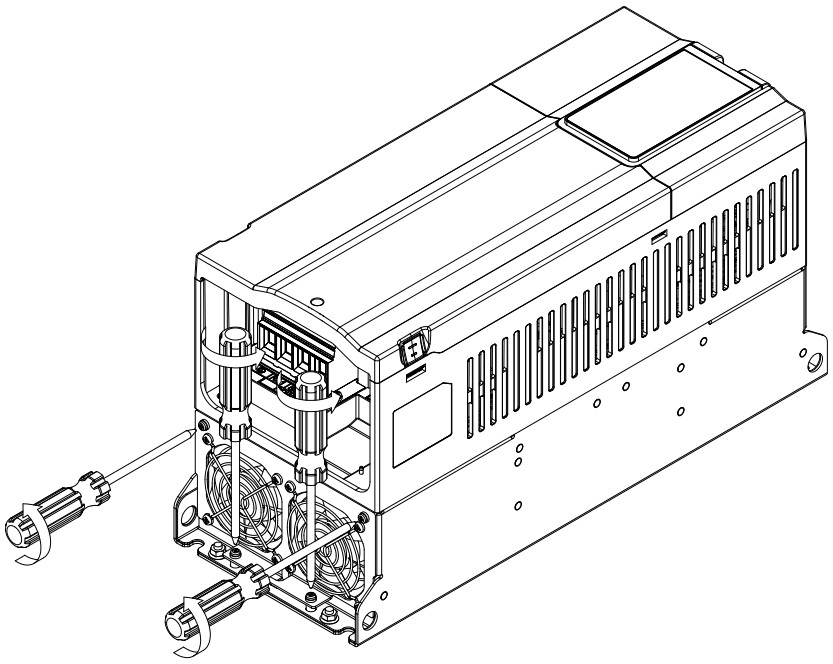


Figure 9-14

2. Disconnect the power terminal before removing the fan (as shown below).

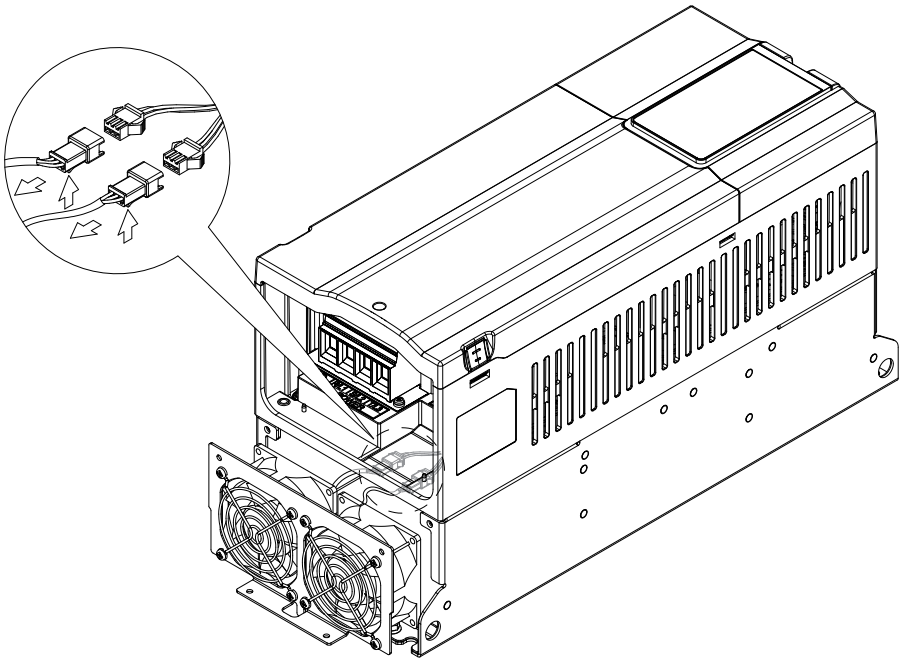


Figure 9-15

Frame F

Heat Sink Fan Model: MKVP-FFKM2 (TYPE1)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

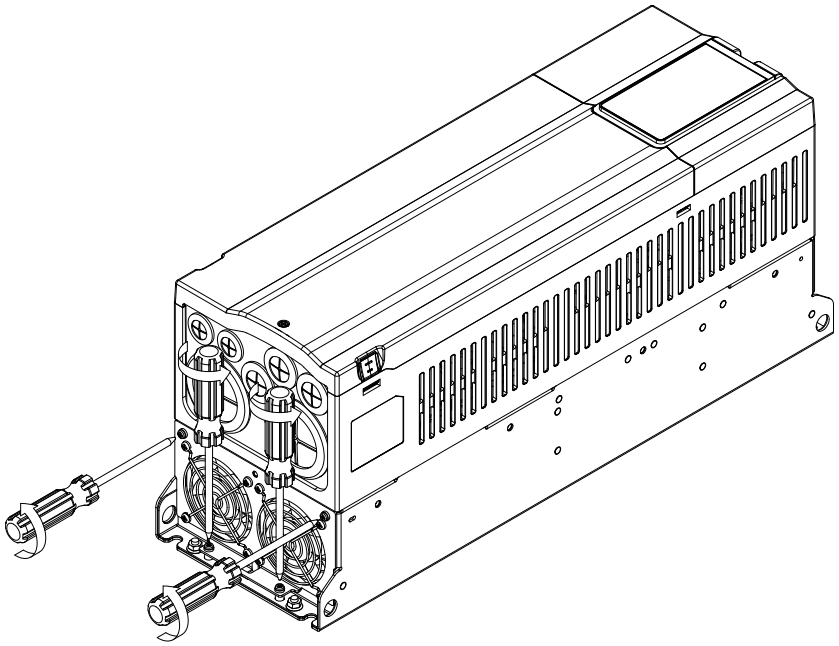


Figure 9-16

2. Disconnect the power terminal before removing the fan (as shown below).

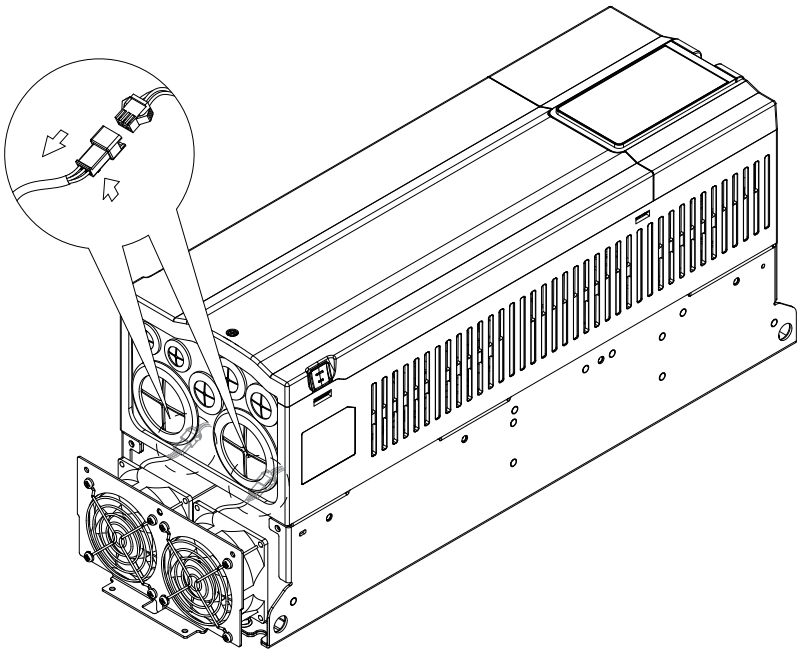


Figure 9-17

Frame G

Heat Sink Fan Model: MKVP-GFKM1 (OPEN TYPE)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

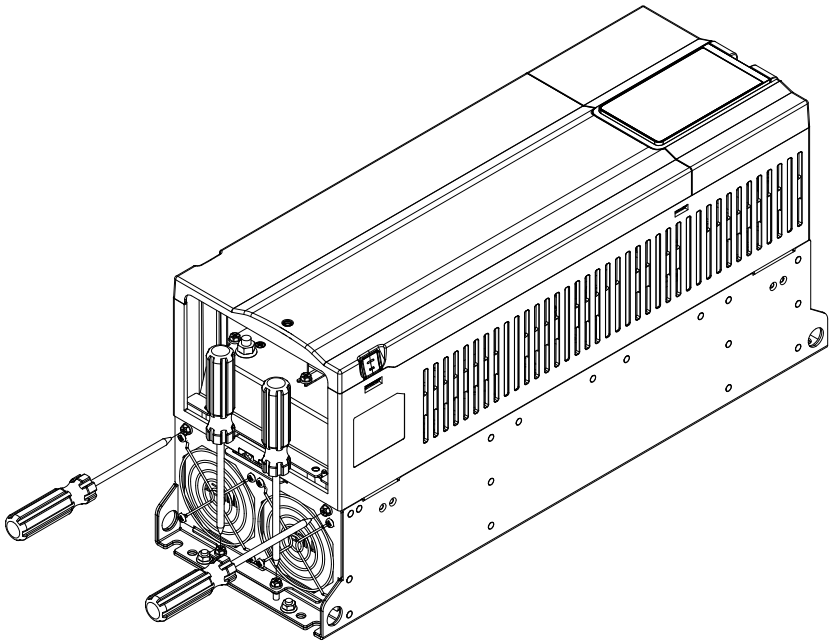


Figure 9-18

2. Disconnect the power terminal before removing the fan (as shown below).

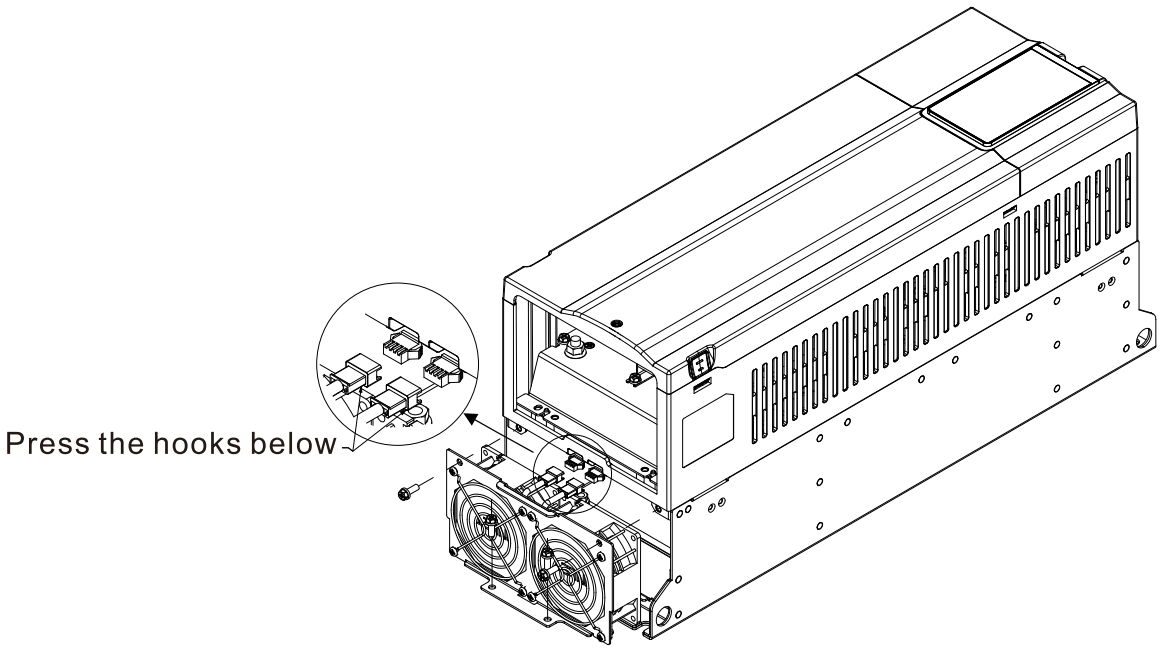


Figure 9-19

Frame G

Heat Sink Fan Model: MKVP-GFKM2 (TYPE1)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

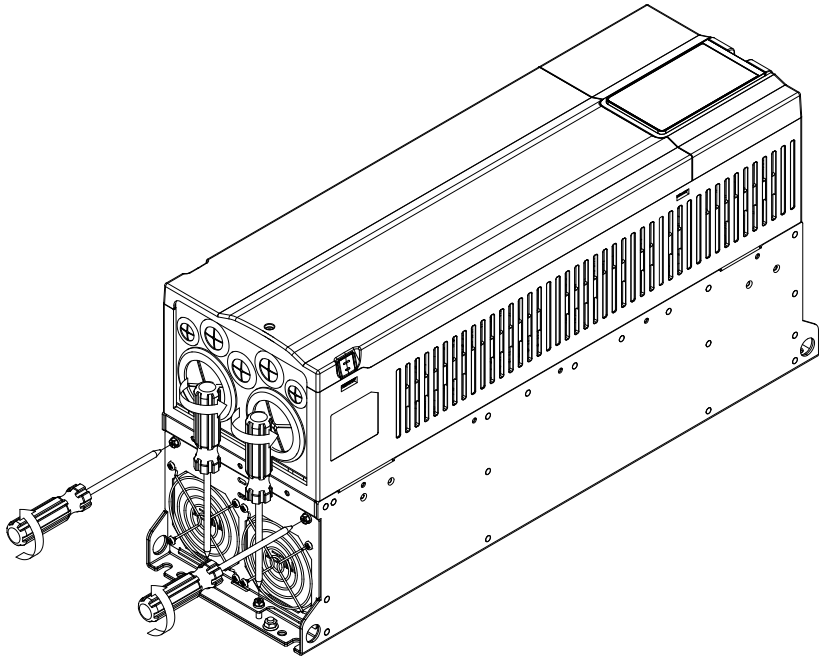


Figure 9-20

2. Disconnect the power terminal before removing the fan (as shown below).

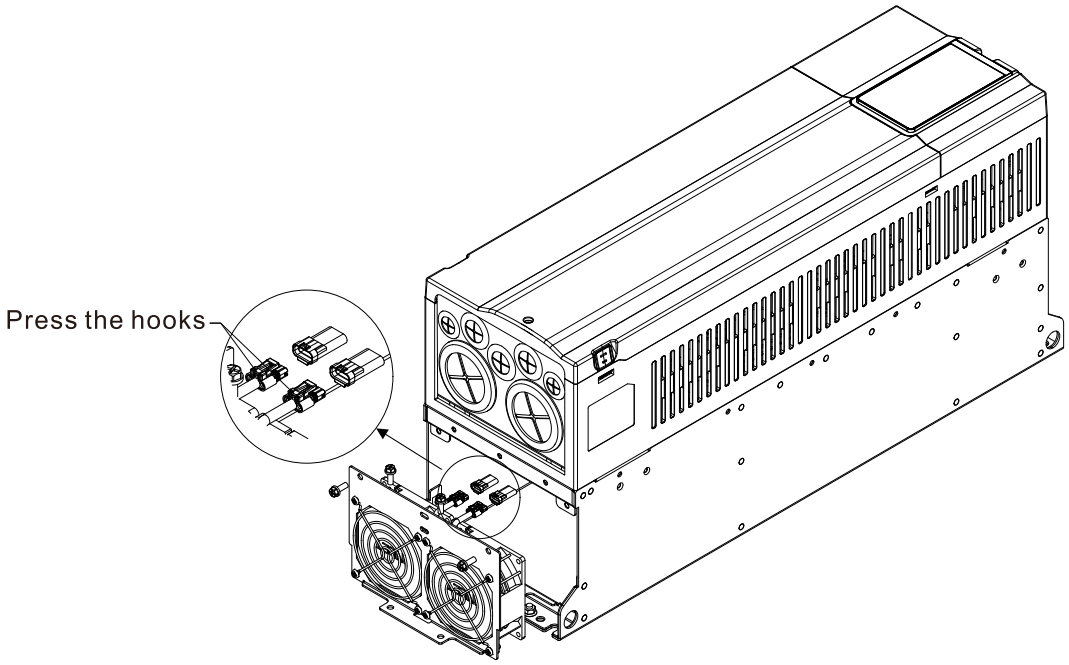


Figure 9-21

Frame H

Heat Sink Fan Model: MKVP-HFKM1 (OPEN TYPE)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

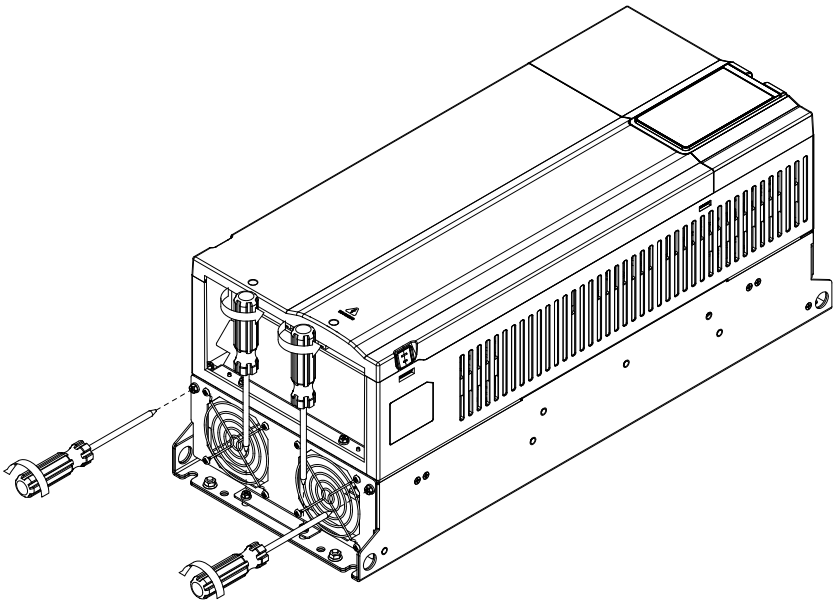


Figure 9-22

2. Disconnect the power terminal before removing the fan (as shown below).

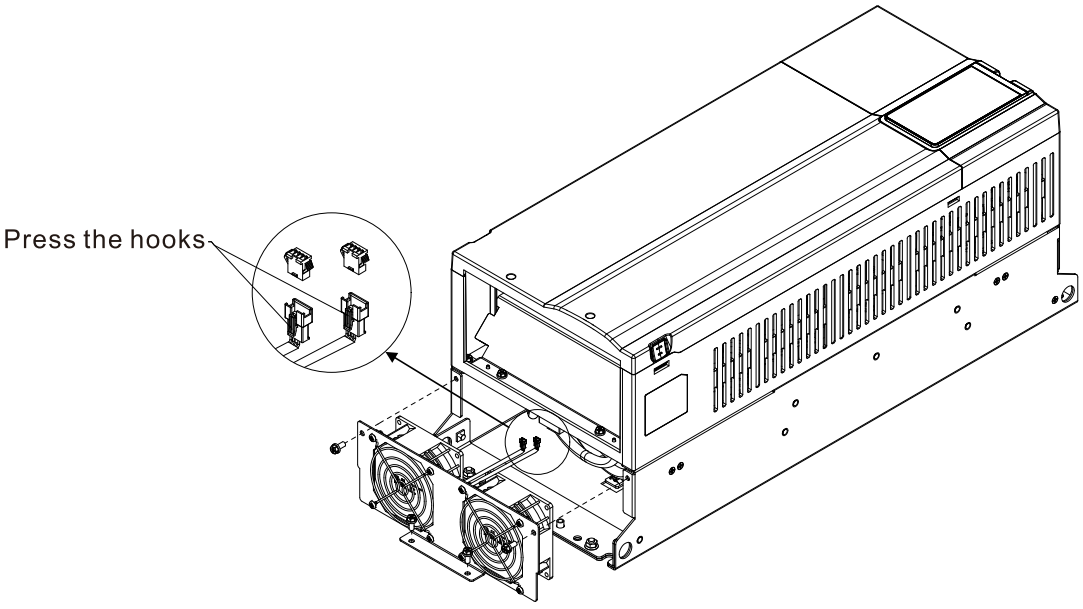


Figure 9-23

Frame H

Heat Sink Fan Model: MKVP-HFKM2 (TYPE1)

1. Loosen the four screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

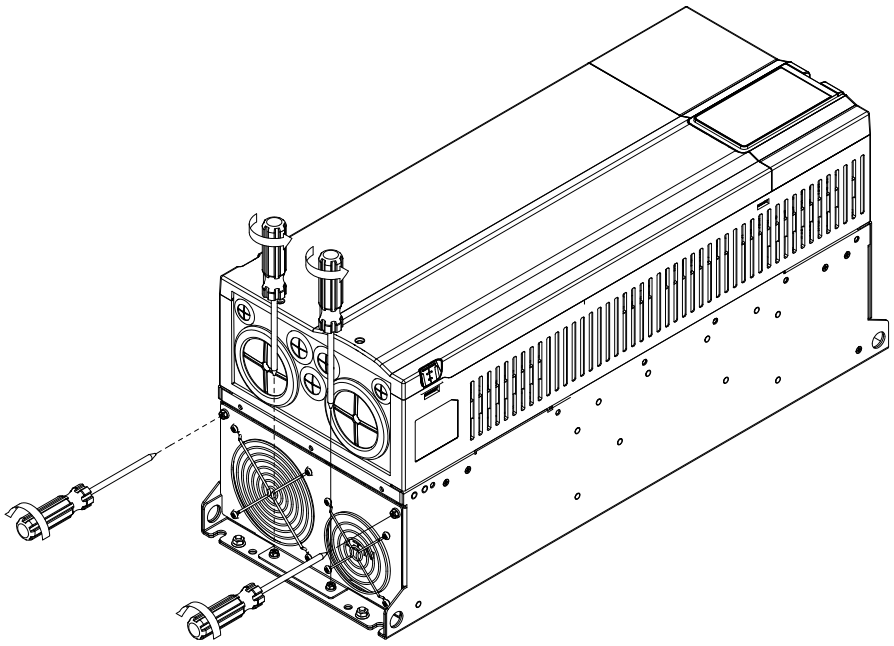


Figure 9-24

2. Disconnect the power terminal before removing the fan (as shown below).

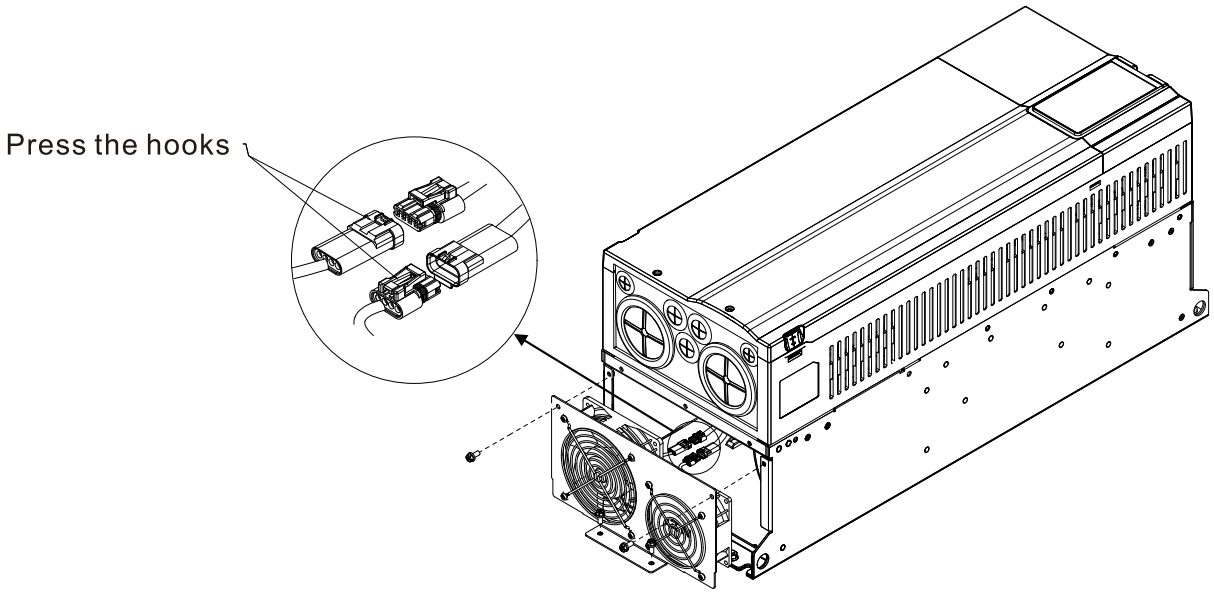


Figure 9-25

Frame I

Heat Sink Fan Model: MKVP-IFKM (OPEN TYPE)

1. Loosen the six screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

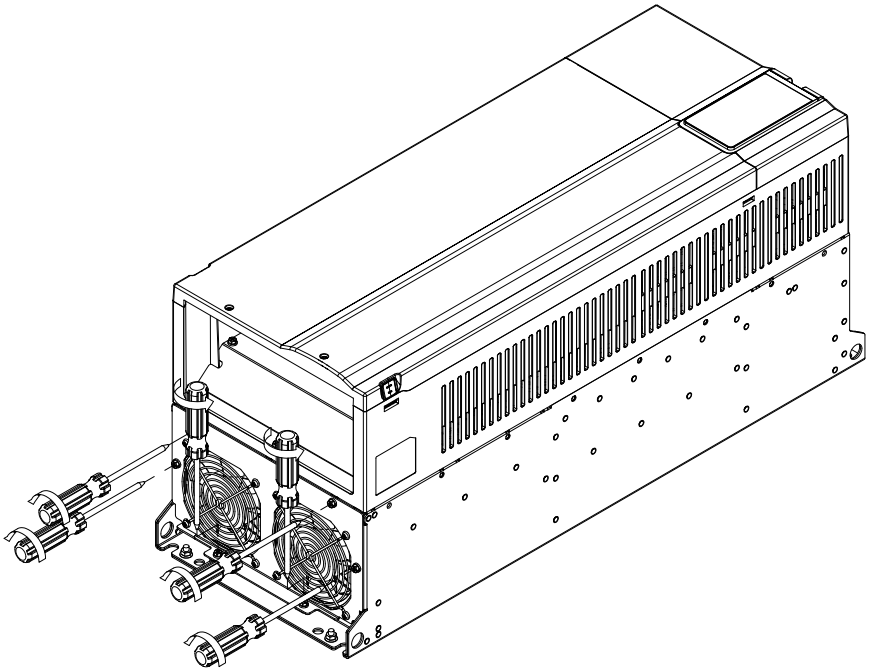


Figure 9-26

2. Disconnect the power terminal before removing the fan (as shown below).

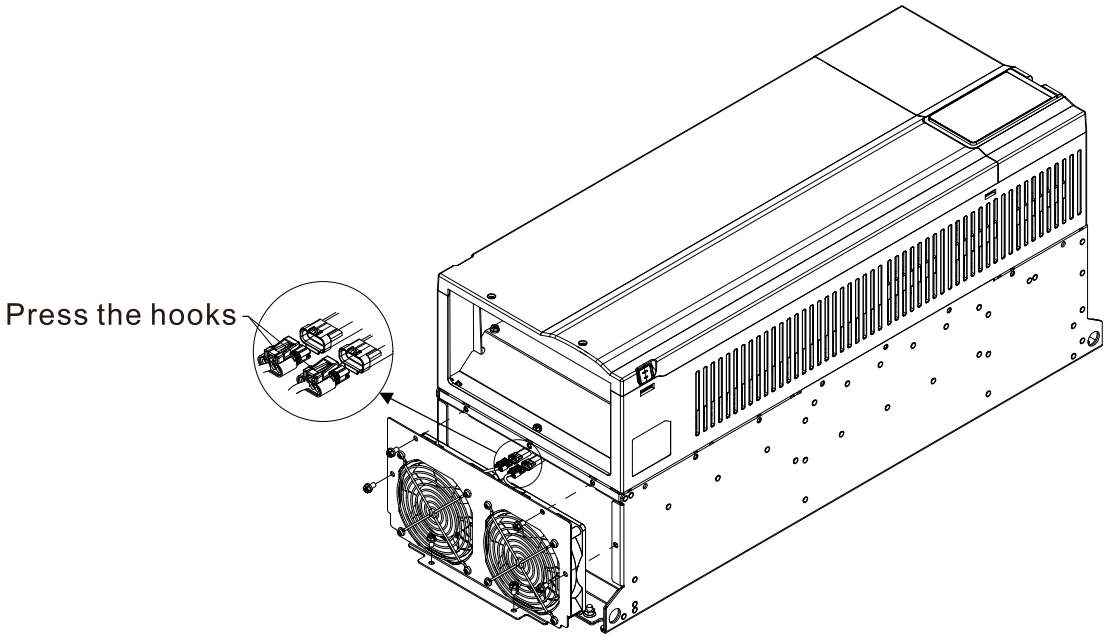


Figure 9-27

Frame I

Heat Sink Fan Model: MKVP-IFKM (TYPE1)

1. Loosen the six screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

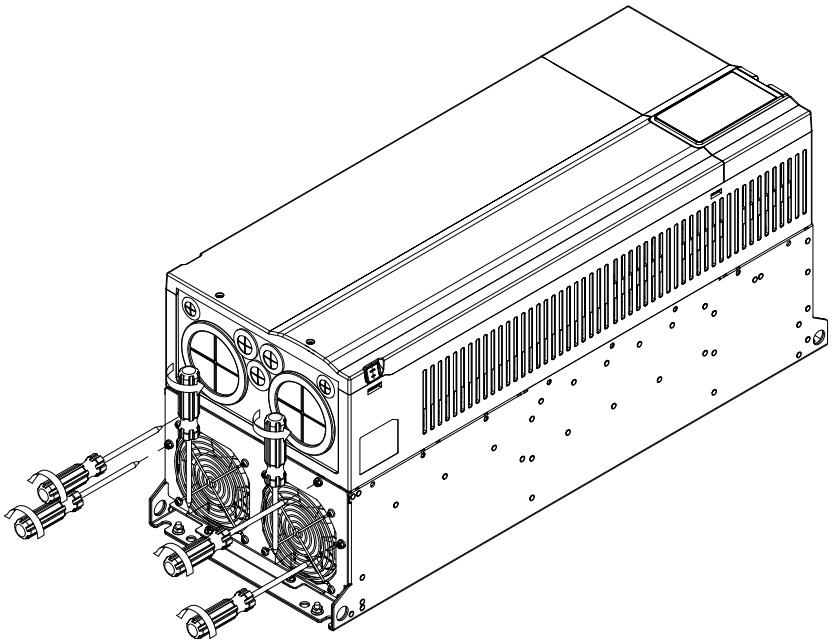


Figure 9-28

2. Disconnect the power terminal before removing the fan (as shown below).

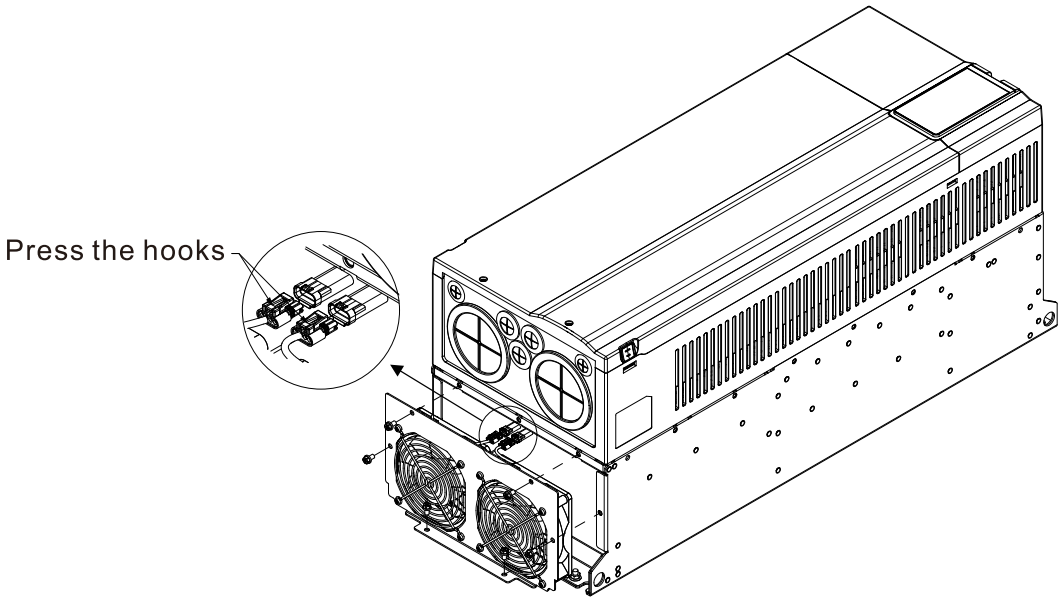


Figure 9-29

Frame J–K

Heat Sink Fan Model: MKVP-JFKM / MKVP-KFKM

1. Loosen the seven screws to remove the fan, as shown in the figure below.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

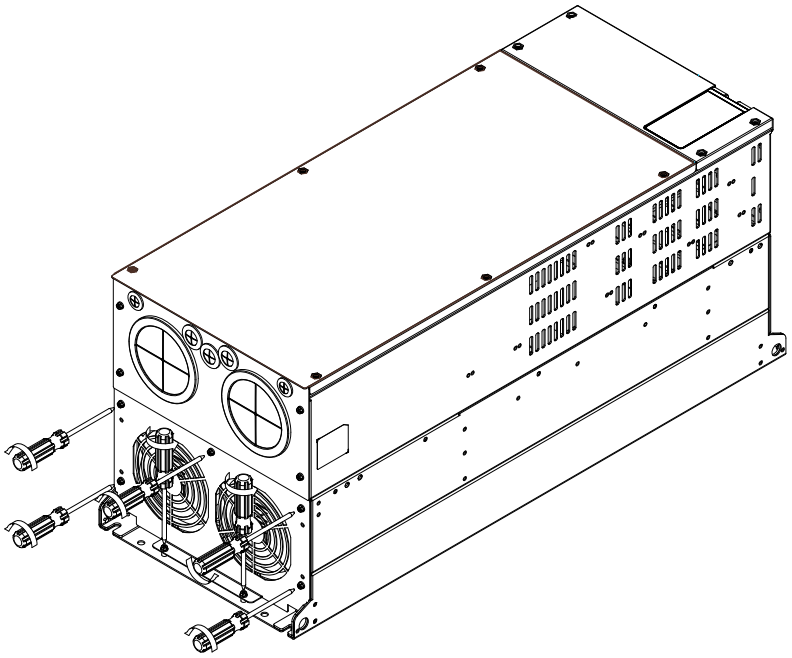


Figure 9-30

2. Disconnect the power terminal before removing the fan (as shown below).

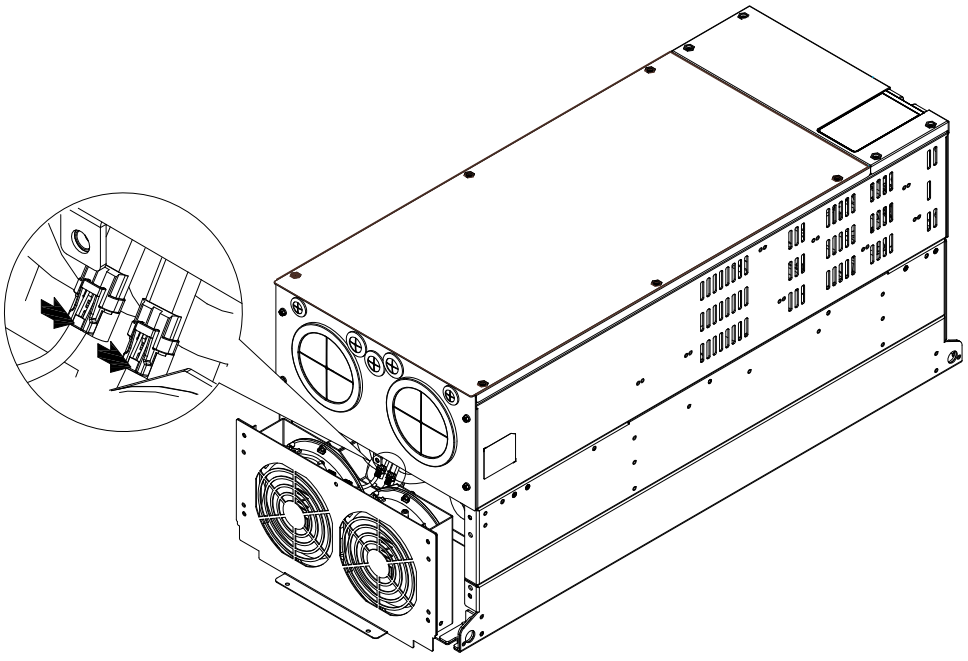


Figure 9-31

Frame L–M

Heat Sink Fan Model: MKVP-MFKM

1. Loosen the eleven screws (as shown in the figure below) and remove the cover.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

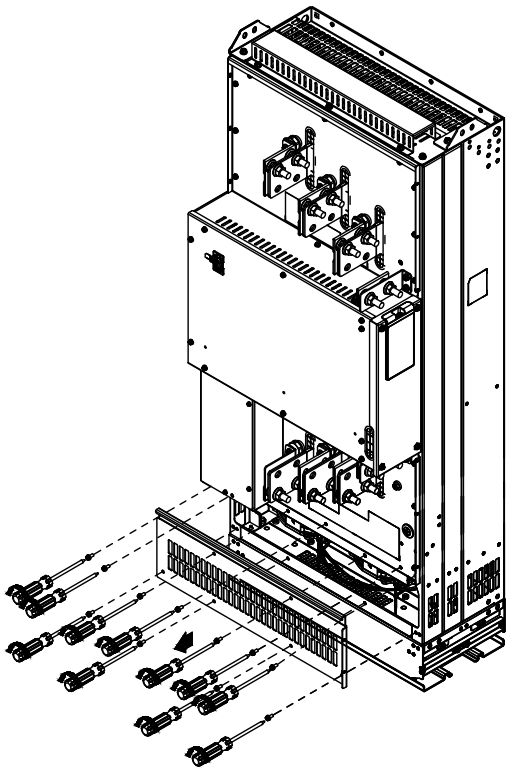


Figure 9-32

2. Cut off the two cable ties, press the latch to disconnect the power connectors (2pcs), as shown in Fig. 2 below. (When installing, buckle back the hooks of the power connector, and use the cable tie to fix the fan cable at the place marked in Fig.1.)

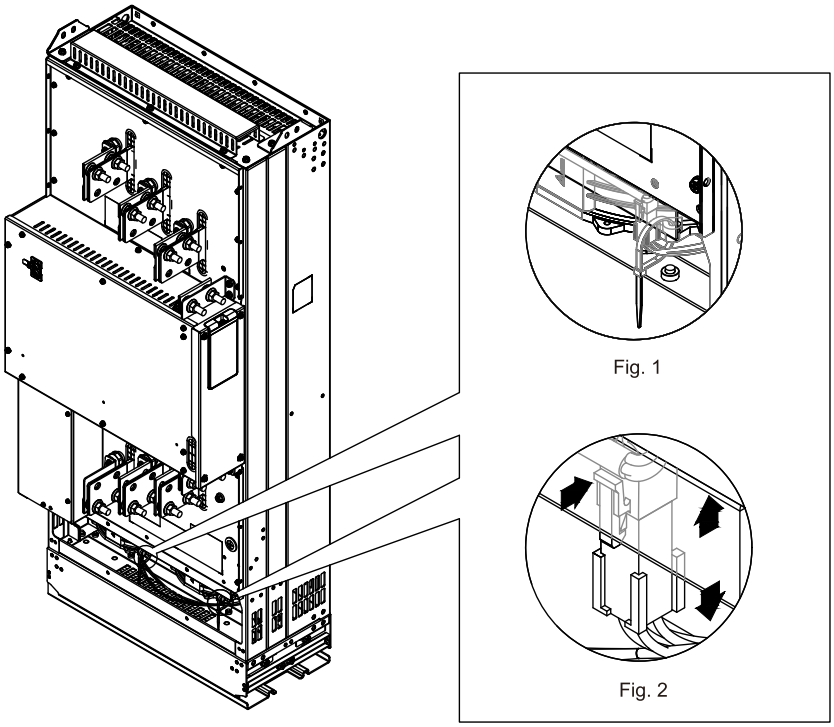


Figure 9-33

3. Remove the fan. (Make sure the fan power is properly disconnected before removal.)

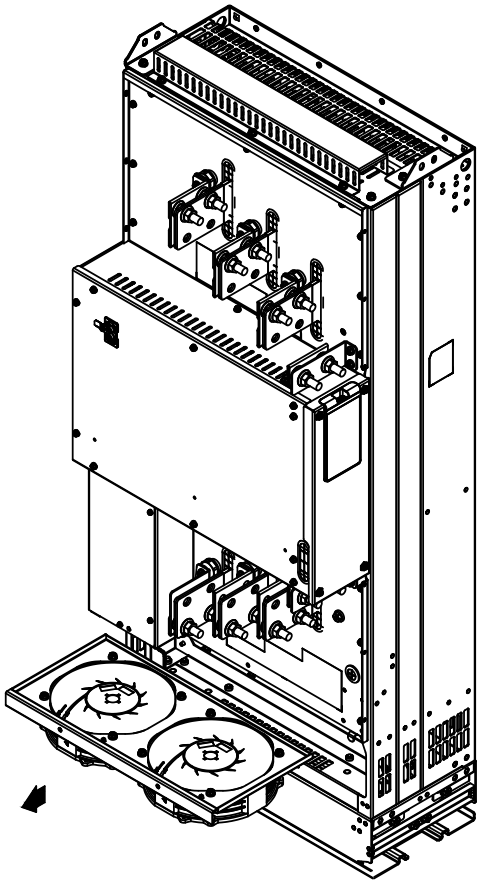


Figure 9-34

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Chapter 10 Accessories

10-1 Option Card

10-2 Delta Standard Fieldbus Cables

10-3 Other Optional Accessories

10-1 Option Card

10-1-1 Option Card Installation

10-1-1-1 Detach Keypad Support Seat

Frame A–G

Press the hooks on both sides of the support seat and take out the keypad support seat.

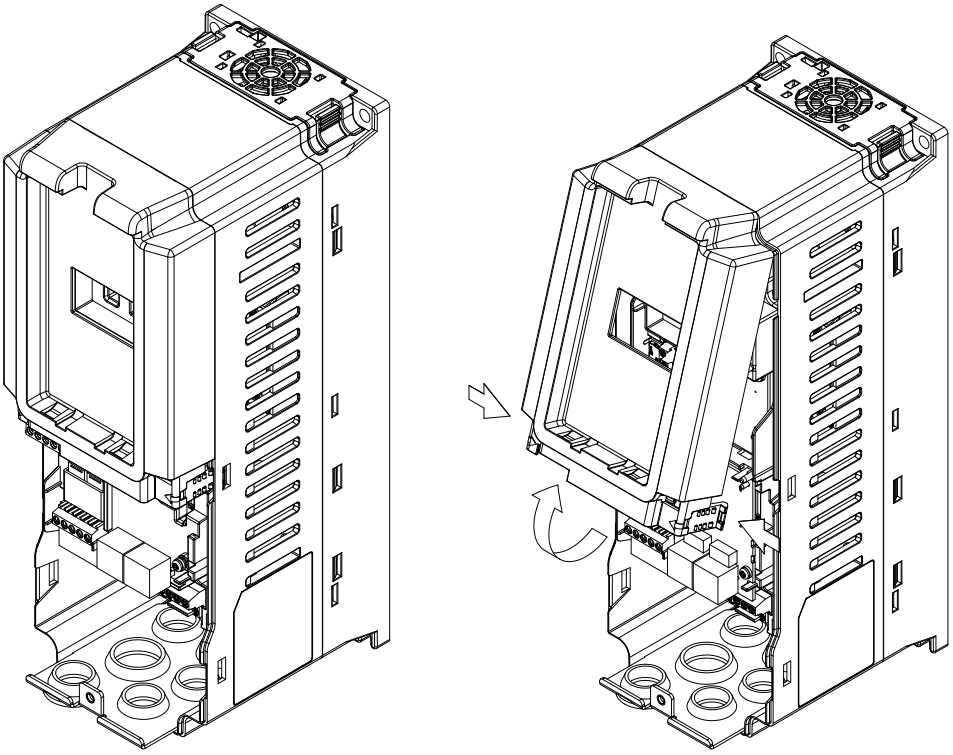


Figure 10-1

Frame H–I

Press the hooks on both sides of the support seat and take out the keypad support seat.

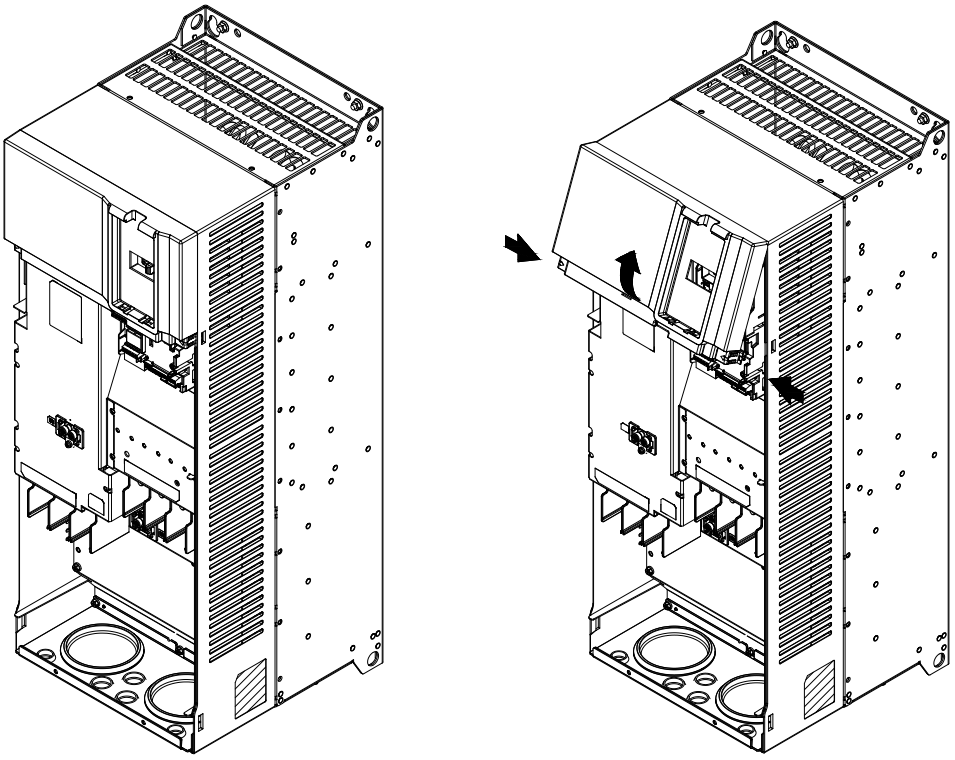


Figure 10-2

Frame J–K

Press the hooks on both sides of the support seat and take out the keypad support seat.

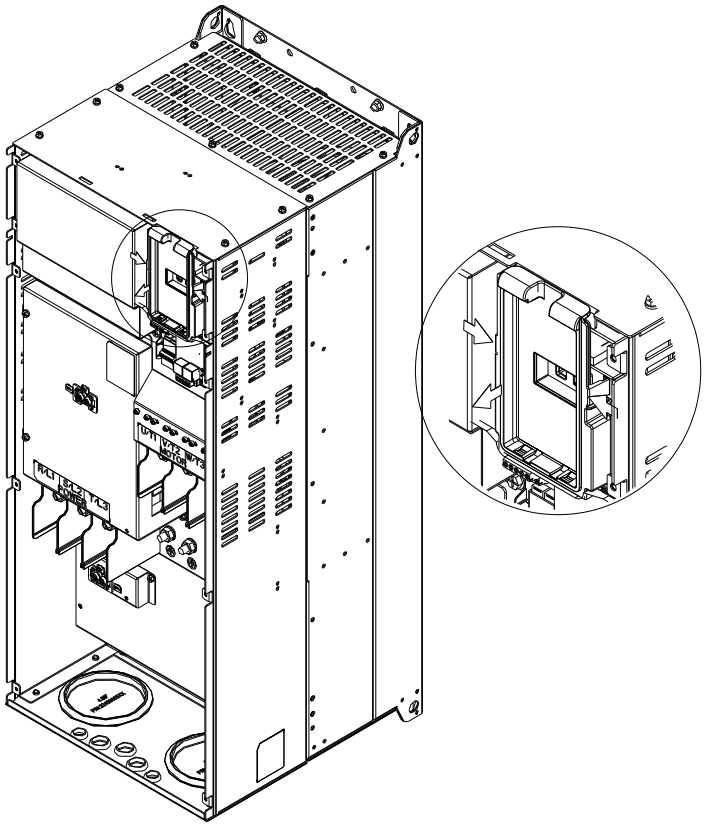


Figure 10-3

Frame L–M

Press the hooks on both sides of the support seat and take out the keypad support seat.

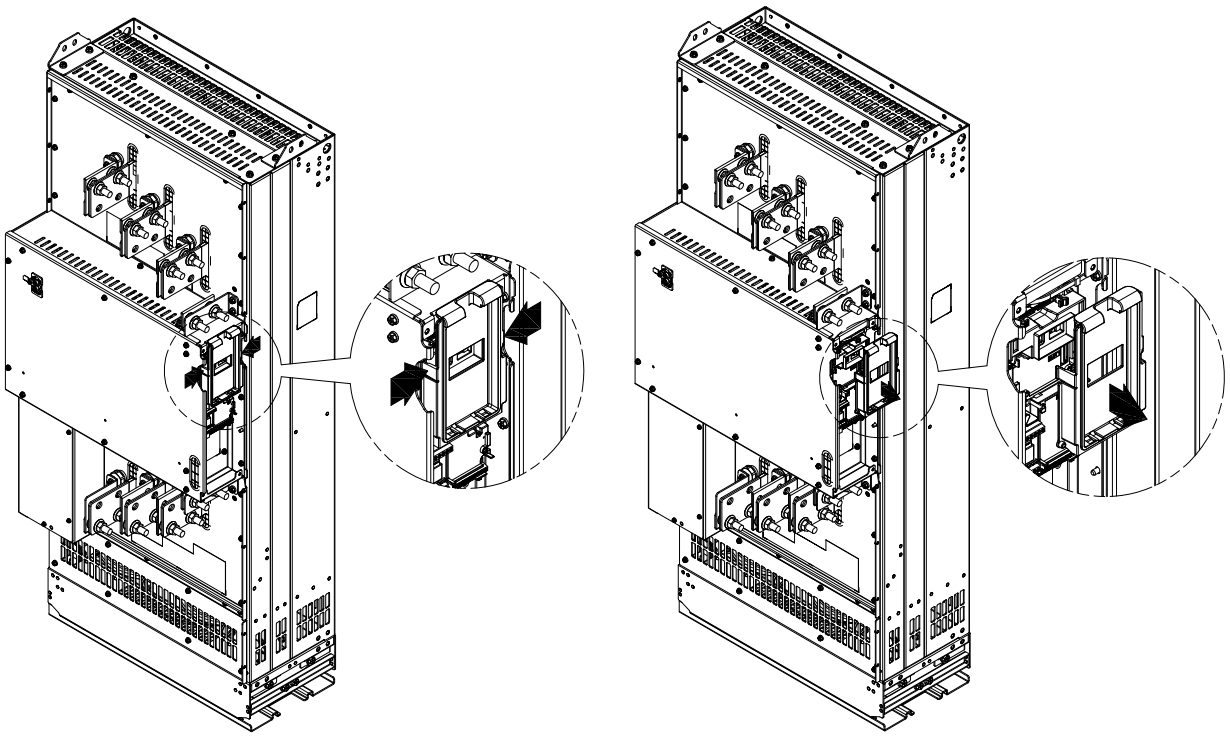


Figure 10-4

10-1-1-2 Option Card Installation Position

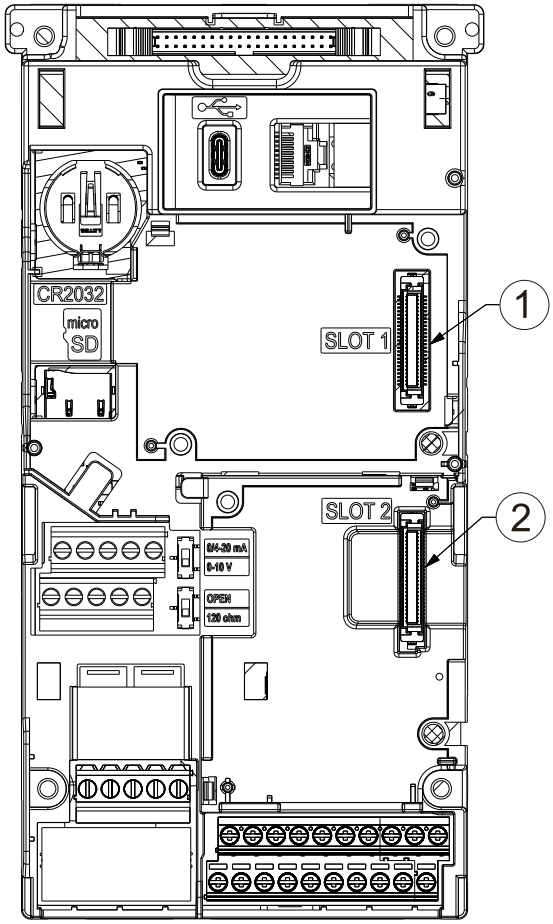


Figure 10-5

No.	Option Card Installation Position
1	I/O card (Slot 1) EMV-D42A; EMV-R6AA; EMV-A22A
2	Communication card (Slot 2) CMC-PD01; CMC-DN01; CMC-EIP01; CMC-EIP02; CMC-COP01; CMC-PN01

Table 10-1

Screw specification for option card terminals

EMV-D42A	Wire Gauge	0.2–0.5 mm^2 (26–20 AWG)
	Torque	5 kg-cm / (4.4 lb-in.) / (0.5 Nm)
EMV-R6AA	Wire Gauge	0.2–0.5 mm^2 (26–20 AWG)
	Torque	8 kg-cm / (7 lb-in.) / (0.8 Nm)
EMV-A22A	Wire Gauge	0.2–4 mm^2 (24–12 AWG)
	Torque	5 kg-cm / (4.4 lb-in.) / (0.5 Nm)

Table 10-2

I/O card (Slot 1)

EMV-D42A

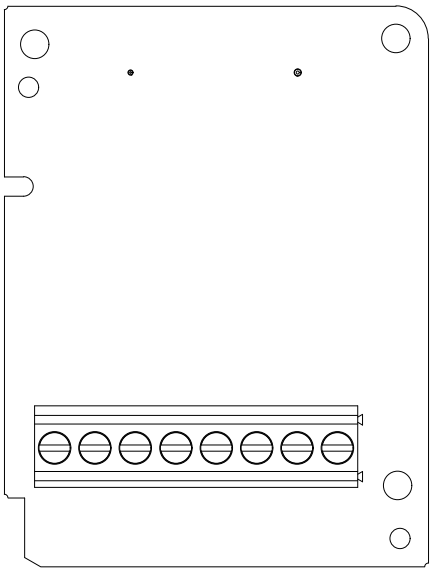


Figure 10-6

EMV-R6AA

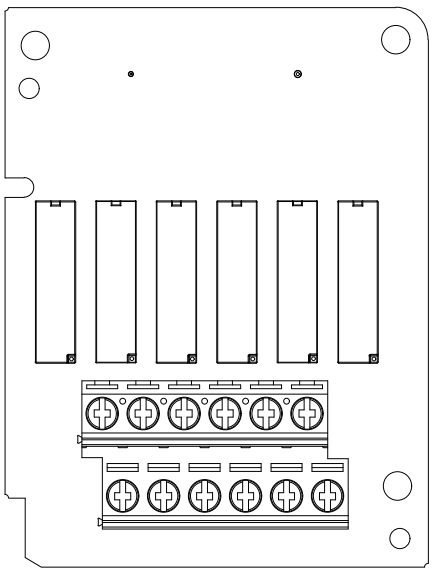


Figure 10-7

EMV-A22A

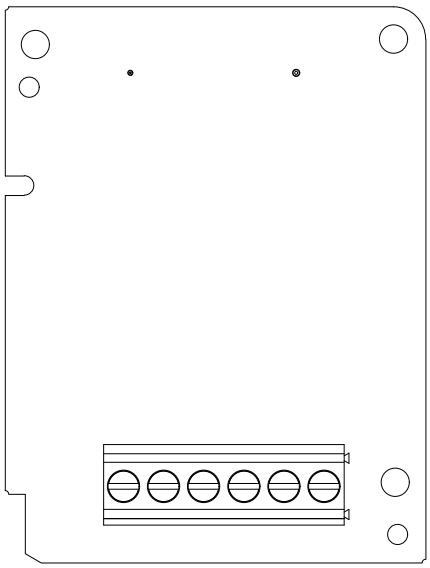


Figure 10-8

Communication card (Slot 2)

CMC-PD01

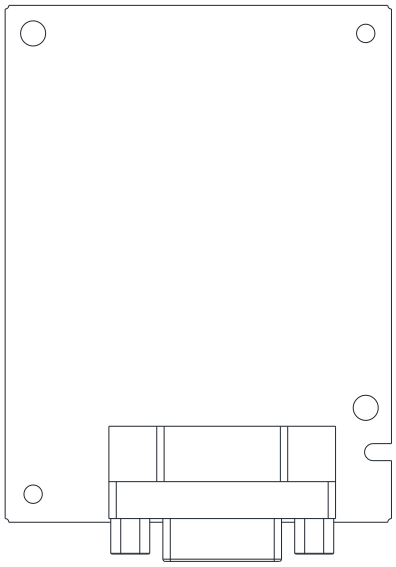


Figure 10-9

CMC-DN01

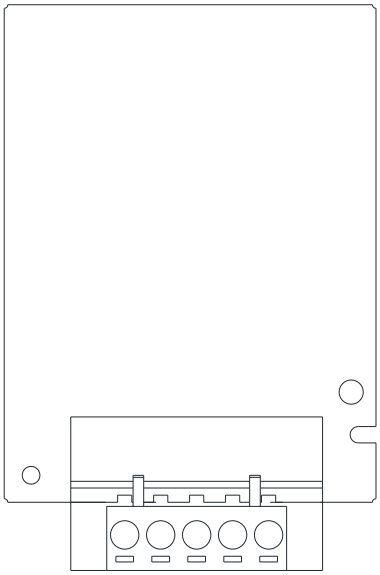


Figure 10-10

CMC-EIP01

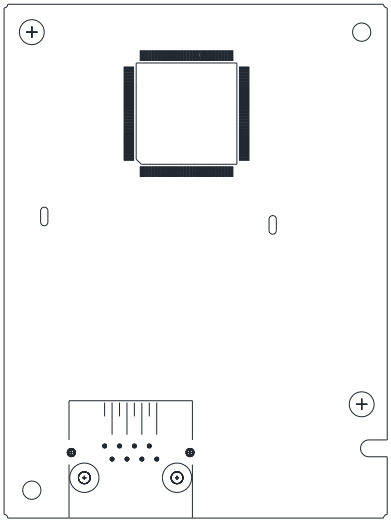


Figure 10-11

CMC-EIP02

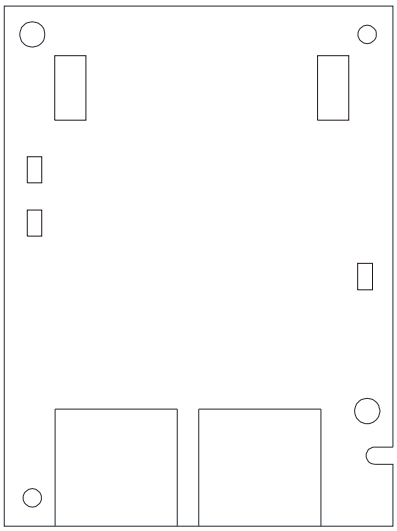


Table 10-12

CMC-PN01

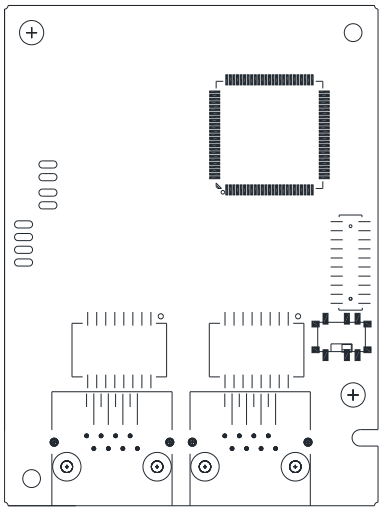


Table 10-13

EMC-COP01

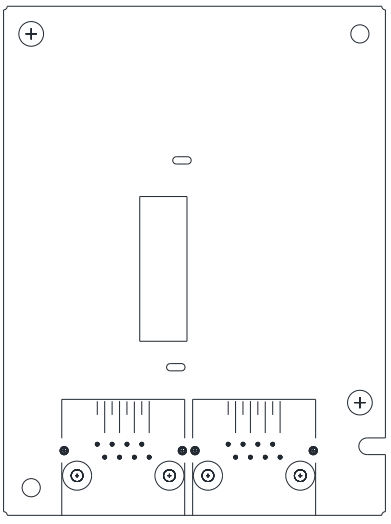


Table 10-14

10-1-1-3 Option Card Installation

- I/O Card: EMV-D42A, EMV-R6AA, EMV-A22A

1. Put the terminals of the I/C card facing up, aim the two holes on the I/O card at the positioning pins and press down to make the clips catch the option card.

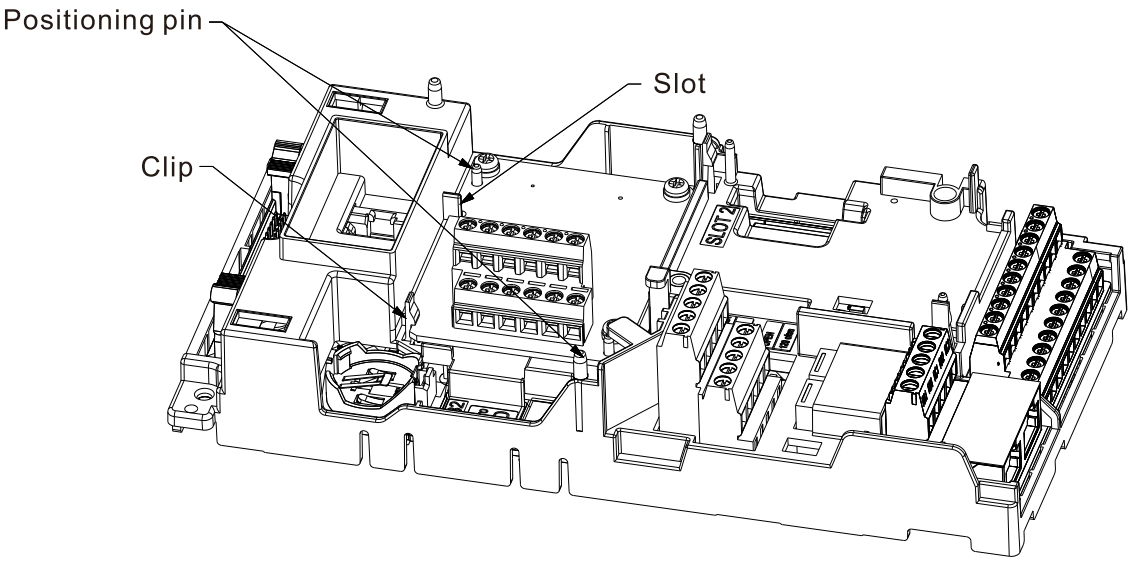


Figure 10-15

2. Fasten the screws after the I/O card is clipped with the hooks.
   Screw torque: 4–6 kg-cm / (3.5–5.2 lb-in.) / (0.39–0.59 Nm)

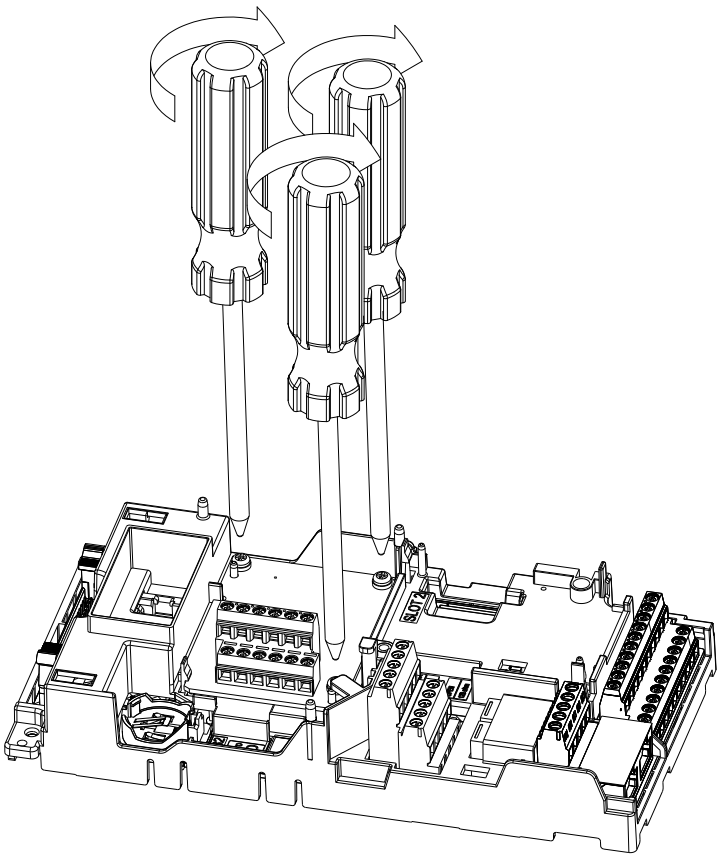


Figure 10-16

3. Installation is completed as shown in the figure below.

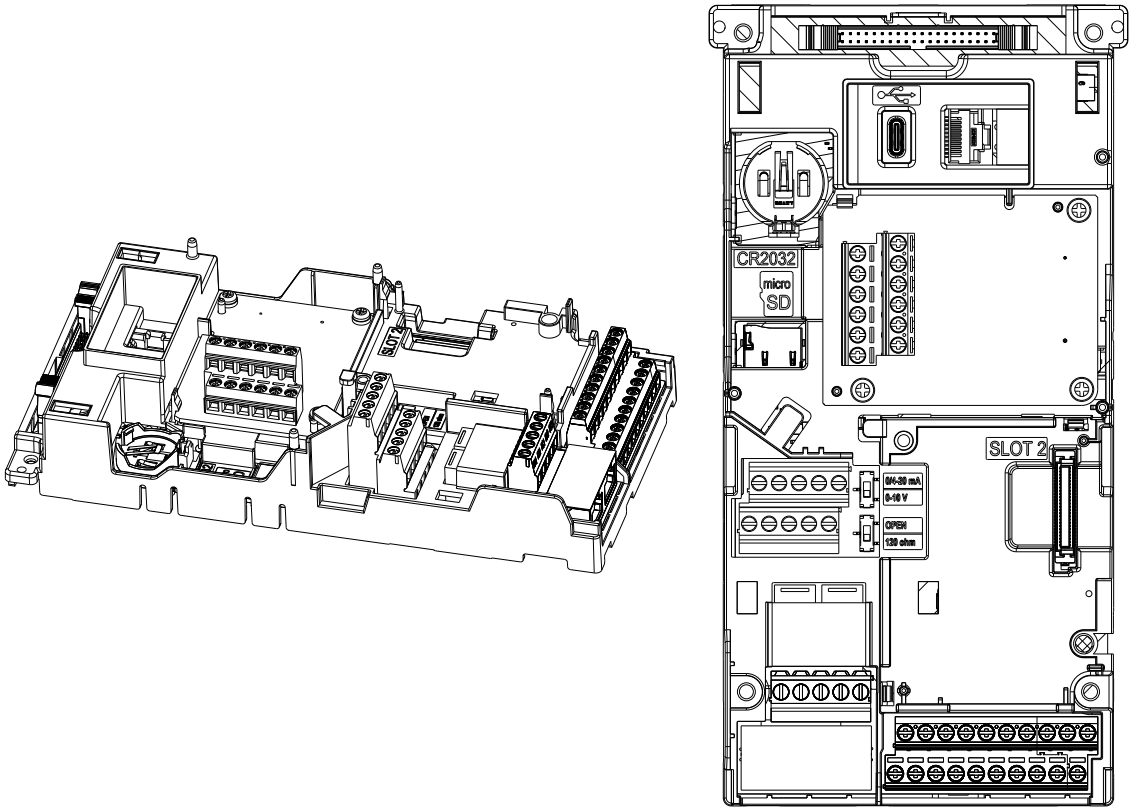


Figure 10-17

- Communication Card: EMC-COP01, CMC-EIP01, CMC-EIP02, CMC-DN01, CMC-PD01, CMC-PN01

  1. Aim the connection card at the connector on the control board and insert the card.

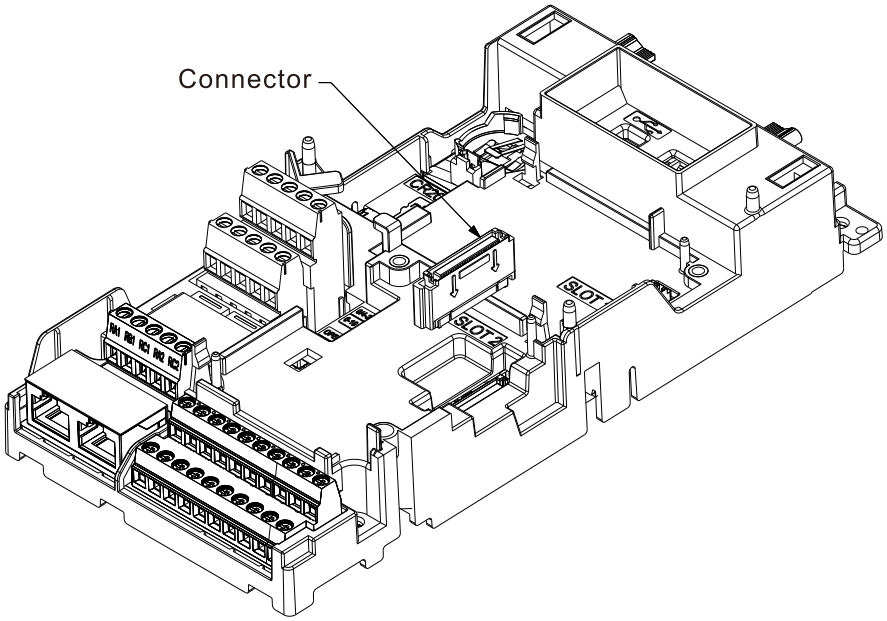


Figure 10-18

  2. Put the terminals of the communication card facing up, aim the two holes on the card at the positioning pins and press down to make the clips catch the option card.

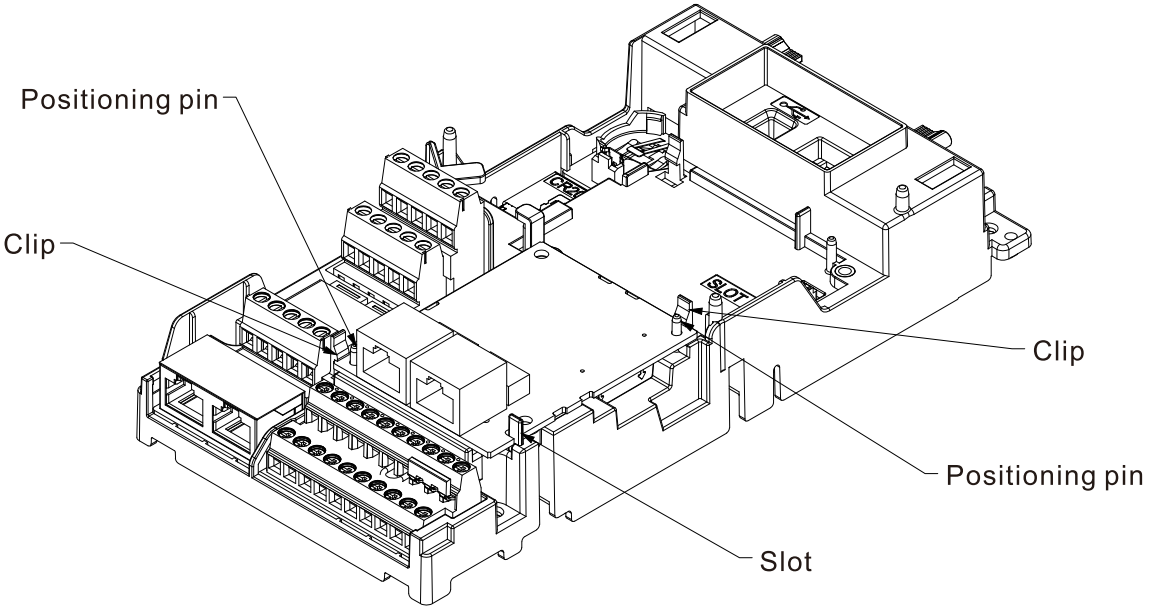


Figure 10-19

3. Fasten the screws after the communication card is clipped with the hooks.

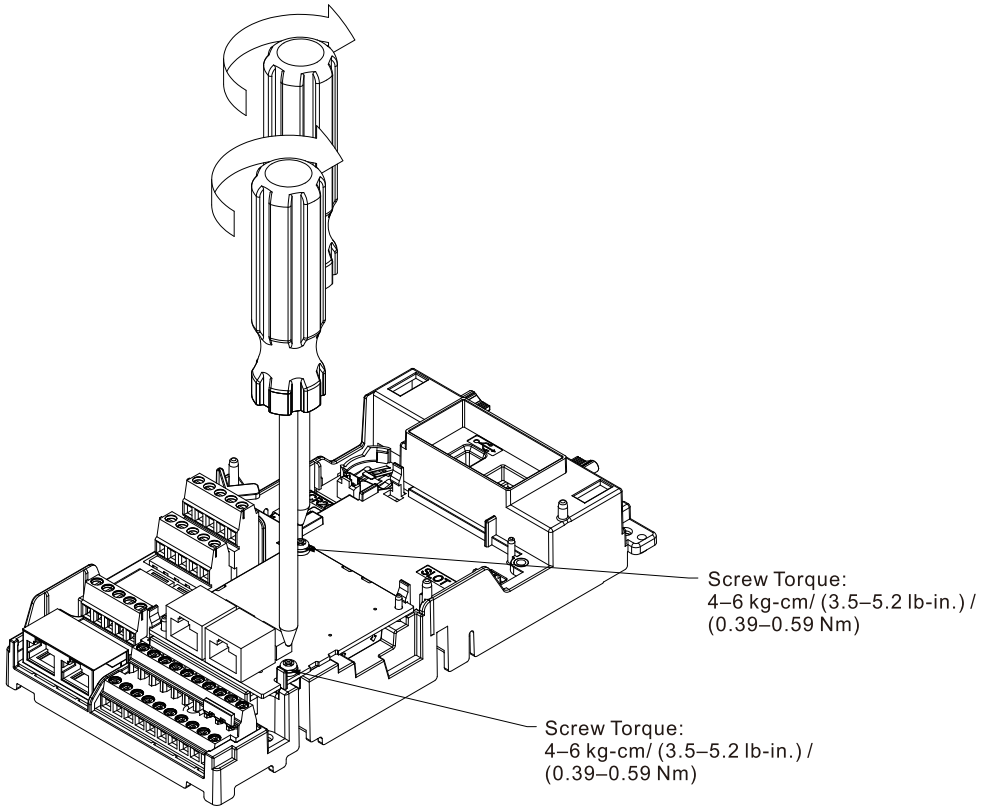


Figure 10-20

4. Installation is completed as shown in the figure below.

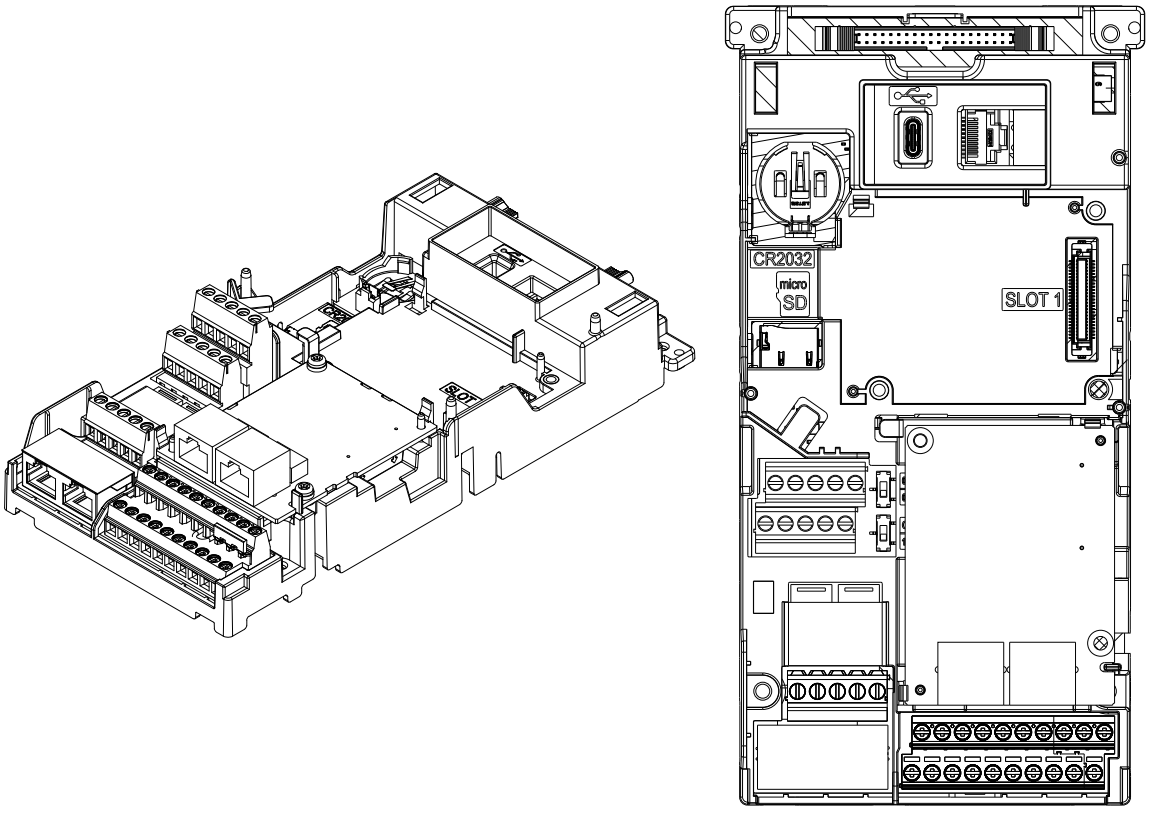
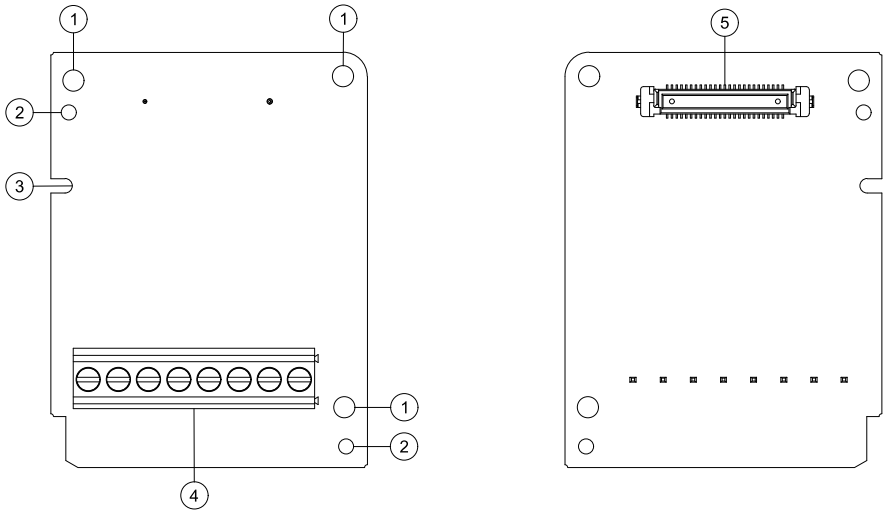


Figure 10-21

10-1-2 Extension Card for Digital Input/ Output

10-1-2-1 EMV-D42A -- Extension card for 4-point digital input/ 2-point digital input

- Product File



1.	Screw fixing hole
2.	Positioning hole
3.	Fool-proof groove
4.	Terminal block
5.	AC motor drive connection port

Figure 10-22

- Terminal Specification

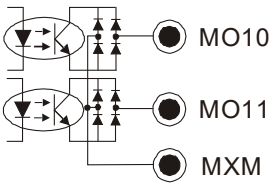
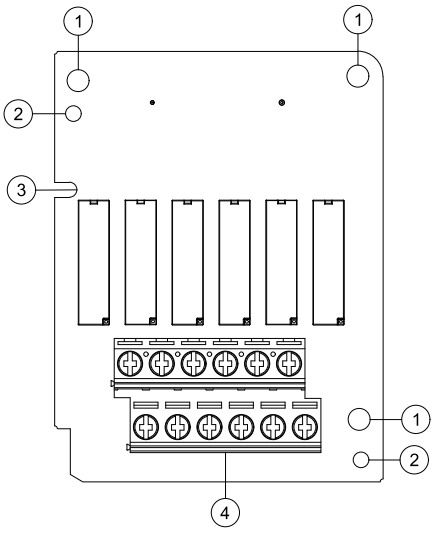
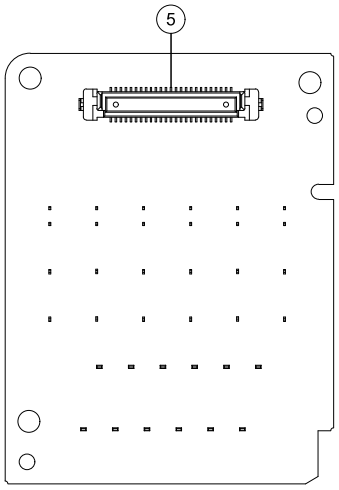
	Terminal	Descriptions
I/O Card	COM	Common for Multi-function input terminals Select SINK (NPN)/ SOURCE (PNP) in SJ1 jumper/ external power supply
	MI10–MI13	Refer to Parameter group G4 for multi-function input terminals selection. Internal power is applied from terminal E24: +24 V_{DC} ± 5% 200 mA, 5 W External power +24 V_{DC}: max. voltage 30 V_{DC}, min. voltage 19 V_{DC} ON: the activation current is 6.0 mA OFF: leakage current tolerance is 10μA
	MO10–MO11	Multi-function output terminals (photo coupler) Refer to Parameter group G5 for multi-function output terminals selection The AC motor drive releases various monitor signals, such as drive in operation, frequency attained and overload indication through a transistor.  Figure 10-23
	MXM	Common for multi-function output terminals MO10, MO11 (photo coupler) Max 48 V_{DC} 50 mA

Table 10-3

10-1-2-2 EMV-R6AA -- Relay output extension card (6-point N.O. output contact)

- Product File





1.	Screw fixing hole
2.	Positioning hole
3.	Fool-proof groove
4.	Terminal block
5.	AC motor drive connection port

Figure 10-24

- Terminal Specification

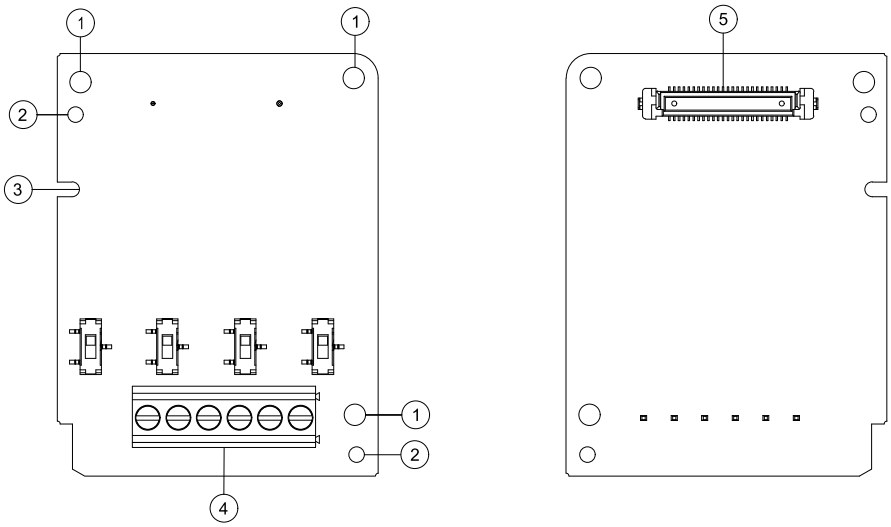
	Terminal	Descriptions
Relay Extension Card	RA10–RA15 RC10–RC15	Refer to Parameter group G5 for multi-function output terminals selection. Resistive Load 3 A (N.O.) / 250 V_{AC} 5 A (N.O.) / 30 V_{DC} Inductive Load (COS 0.4) 1.2 A (N.O.) / 250 V_{AC} 2.0 A (N.O.) / 30 V_{DC} To output various kinds of monitoring signals such as motor drive in operation, frequency reached, and overload indication.

Table 10-4

10-1-3 Extension Card for Analog Input/ Output

10-1-3-1 EMV-A22A -- Extension card for 2-point analog input/ 2-point analog output

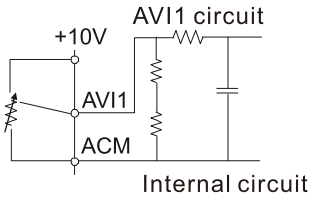
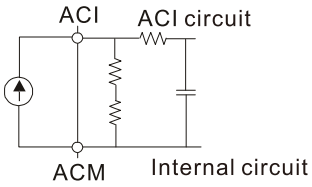
- Product File



1.	Screw fixing hole
2.	Positioning hole
3.	Fool-proof groove
4.	Terminal block
5.	AC motor drive connection port

Figure 10-25

- Terminal Specification

	Terminal	Descriptions	
Analog I/O Card	AI10, AI11	Refer to Parameter group G6 for analog input terminal and input mode selection. There are two sets of AI port, SSW3 (AI10) and SSW4 (AI11), which can be switched to Voltage or Current mode. Voltage mode: Input 0–10 V Current mode: Input 0–20 mA / 4–20 mA	
		Analog voltage frequency command  Figure 10-26	Impedance: 20 kΩ Range: 0–10 V = 0 AI10, AI11 Switch, default is 0–10 V
		Analog current frequency command  Figure 10-27	Impedance: 250 Ω Range: 0–20 mA / 4–20 mA = 0 AI10, AI11 Switch, default is 0–10 V

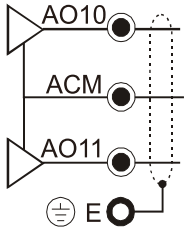
<table>
<tr><td rowspan="4"></td><td rowspan="4">AO10, AO11</td><td colspan="2">Refer to Parameter group G7 for analog output terminal and output mode selection.
There are two sets of AO port, SSW1 (AO10) and SSW2 (AO11), which can be switched to Voltage or Current mode.
Voltage mode: Output 0–10 V
Current mode: Output 0–20 mA / 4–20 mA</td></tr>
<tr><td rowspan="3">Multi-function analog voltage output
 

Figure 10-28</td><td>AVO:
0–10 V Max. output current 2 mA, Max. load 5 kΩ
Output current: 2mA max
Resolution: 10 mV (10V/1000)
Switch: AI10 / AI11 Switch, default is 0–10 V</td></tr>
<tr><td>ACO:
0–20 mA, Max. load 500 kΩ
Output current: 20 mA max
Resolution: 20 uA (20 mA/1000)
Switch: AI10 / AI11 Switch, default is 0–10 V</td></tr>
<tr><td></td></tr>
<tr><td>ACM</td><td>Analog Signal Common</td><td>Analog signal common terminal</td></tr>
</table>

Table 10-5

10-1-4 Extension Card for RS-485

10-1-4-1 CMC-PD01 -- Communication card, PROFIBUS DP

- Features
  1. Supports PZD control data exchange.
  2. Supports PKW access AC motor drive parameters.
  3. Supports user diagnosis function.
  4. Auto-detects baud rates; supports a Max. 12 Mbps.

- Product File

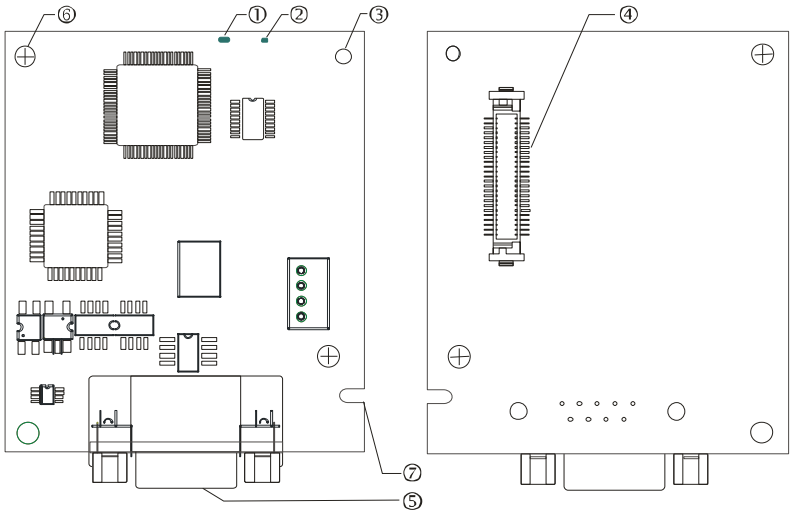


Figure 10-29

1.	NET indicator
2.	POWER indicator
3.	Positioning hole
4.	AC motor drive connection port
5.	PROFIBUS DP connection port
6.	Screw fixing hole
7.	Fool-proof groove

- Specifications

PROFIBUS DP Connector

Connector	DB9 connector
Transmission Method	High-speed RS-485
Transmission Cable	Shielded twisted pair cable
Electrical Isolation	500 V_{DC}

Table 10-6

Communication

Message Type	Cyclic data exchange
Module Name	CMC-PD01
GSD Document	DELA08DB.GSD
Company ID	08DB (HEX)
Serial Transmission Speed Supported (Auto-detection)	9.6 Kbps; 19.2 Kbps; 93.75 Kbps; 187.5 Kbps; 500 Kbps; 1.5 Mbps; 3 Mbps; 6 Mbps; 12 Mbps (bit per second)

Table 10-7

Electrical Specification

Power Supply Voltage	5 V_{DC} (supplied by the AC motor drive)
Insulation Voltage	500 V_{DC}
Power Consumption	1 W
Weight	28 g

Table 10-8

Environment

Noise Immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation / Storage	Operation: -10–50ºC (temperature), 90% (humidity) Storage: -25–70ºC (temperature), 95% (humidity)
Shock / Vibration Resistance	International standards: IEC61131-2, IEC60068-2-6 (TEST Fc) / IEC61131-2 & IEC60068-2-27 (TEST Ea)

Table 10-9

- Installation

PROFIBUS DP Connector

PIN	PIN Name	Definition
1	-	Not defined
2	-	Not defined
3	Rxd/Txd-P	Sending/ receiving data P (B)
4	-	Not defined
5	DGND	Data reference ground
6	VP	Power voltage – positive
7	-	Not defined
8	Rxd/Txd-N	Sending/ receiving data N (A)
9	-	Not defined

Table 10-10

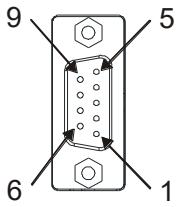


Figure 10-30

- LED Indicator & Troubleshooting

There are 2 LED indicators on CMC-PD01: POWER LED and NET LED. POWER LED displays the status of the working power. NET LED displays the connection status of the communication.

POWER LED

LED Status	Indication	Corrective Action
Green light ON	Power supply is in normal status	--
OFF	No power	Check if the connection between CMC-PD01 and AC motor drive is normal.

Table 10-11

NET LED

LED Status	Indication	Corrective Action
Green light ON	Normal status	--
Red light ON	CMC-PD01 is not connected to PROFIBUS DP bus	Connect CMC-PD01 to PROFIBUS DP bus.
Red light flashes	Invalid PROFIBUS communication address	Set the PROFIBUS address of CMC-PD01 between 1–125 (decimal)
Orange light flashes	CMC-PD01 fails to communicate with AC motor drive	Switch off the power and check whether CMC-PD01 is correctly and normally connected to AC motor drive

Table 10-12

10-1-4-2 CMC-DN01 -- Communication card, DeviceNet

- Features
  1. Based on the high-speed communication interface of Delta HSSP protocol, able to conduct immediate control to AC motor drive.
  2. Supports Group 2 only slave device connection and polling I/O data exchange.
  3. For I/O mapping, supports Max. 32 words of input and 32 words of output.
  4. Supports EDS file configuration in DeviceNet configuration software.
  5. Supports all baud rates on DeviceNet bus: 125 Kbps, 250 Kbps, 500 Kbps and extendable serial transmission speed mode.
  6. Node address and serial transmission speed can be set up on AC motor drive.
  7. Power supplied from AC motor drive.

- Product File

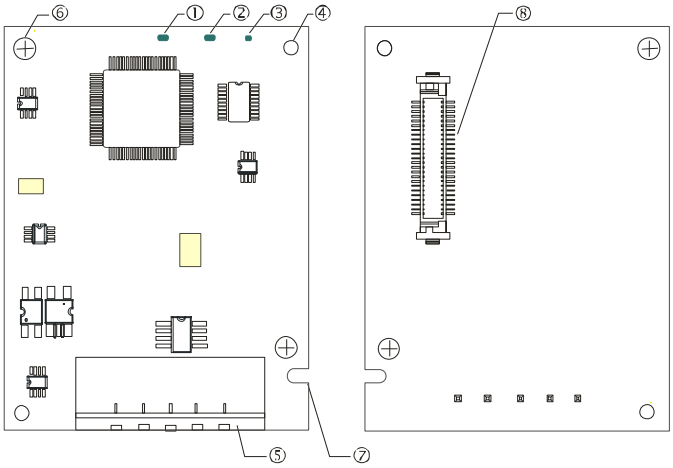


Figure 10-31

1.	NS indicator
2.	MS indicator
3.	POWER indicator
4.	Positioning hole
5.	DeviceNet Connection port
6.	Screw fixing hole
7.	Fool-proof groove
8.	AC motor drive connection port

- Specifications

DeviceNet Connector

Connector	5-PIN open removable connector of 5.08 mm PIN interval
Transmission Method	CAN
Transmission Cable	Shielded twisted pair cable (with 2 power cables)
Transmission Speed	125 Kbps, 250 Kbps, 500 Kbps and extendable serial transmission speed
Network Protocol	DeviceNet Protocol

Table 10-13

AC Motor Drive Connection Port

Connector	50 PIN communication terminal
Transmission Method	SPI communication
Terminal Function	1. Communicating with AC motor drive 2. Transmitting power supply from AC motor drive
Communication	Delta HSSP protocol

Table 10-14

Electrical Specification

Power Supply Voltage	5 V_{DC} (supplied by the AC motor drive)
Insulation Voltage	500 V_{DC}
Communication Cable	0.85 W
Power Consumption	1 W
Weight	23 g

Table 10-15

Environment

Noise Immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation/ Storage	Operation: -10–50ºC (temperature), 90% (humidity) Storage: -25–70ºC (temperature), 95% (humidity)
Shock / Vibration Resistance	International standards: IEC61800-5-1, IEC60068-2-6 / IEC61800-5-1, IEC60068-2-27

Table 10-16

- Installation

DeviceNet Connector

PIN	Signal	Color	Definition
1	V+	Red	DC24V
2	H	White	Signal+
3	S	-	Earth
4	L	Blue	Signal-
5	V-	Black	0V

Table 10-17

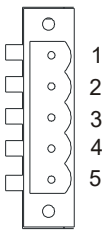


Figure 10-32

- LED Indicator & Troubleshooting

There are 3 LED indicators on CMC-DN01: POWER LED, MS LED, and NS LED. POWER LED displays the status of power supply. MS LED and NS LED are dual-color LED, displaying the connection status of the communication and error messages.

POWER LED

LED Status	Indication	Corrective Action
OFF	Power supply is in abnormal status	Check the power supply of CMC-DN01.
Green light ON	Power supply is in normal status.	--

Table 10-18

NS LED

LED Status	Indication	Corrective Action
OFF	No power supply or CMC-DN01 does not pass the MAC ID test	1. Check the power of CMC-DN01 and see if the connection is normal. 2. Make sure at least one or more nodes are on the bus. 3. Check if the serial transmission speed of CMCDN01 is the same as that of other nodes.
Green light flashes	CMC-DN01 is on-line but does not connect to the master	1. Configure CMC-DN01 to the scan list of the master. 2. Re-download the configured data to the master.
Green light ON	CMC-DN01 is on-line and normally connects to the master	--
Red light flashes	CMC-DN01 is on-line, but I/O connection is timed-out	1. Check if the network connection is normal. 2. Check if the master operates normally.
Red light ON	The communication is down MAC ID test failure No network power supply CMC-DN01 is off-line	1. Make sure all the MAC IDs on the network are not repeated 2. Check if the network installation is normal 3. Check if the baud rate of CMC-DN01 is consistent with that of other nodes 4. Check if the node address of CMC-DN01 is illegal 5. Check if the network power supply is normal

Table 10-19

MS LED

LED Status	Indication	Corrective Action
OFF	No power supply or being off-line	Check the power supply of CMC-DN01 and see if the connection is normal
Green light flashes	Waiting for I/O data	Switch the master PLC to RUN status
Green light ON	I/O data are normal	--
Red light flashes	Mapping error	1. Reconfigure CMC-DN01 2. Re-power AC motor drive
Red light ON	Hardware error	1. See the fault code displayed on the AC motor drive 2. Send back to the factory for repair if necessary
Orange light flashes	CMC-DN01 is establishing connection with AC motor drive	If the flashing lasts for a long time, turn off the power and check if CMC-DN01 and AC motor drive are correctly installed and normally connected to each other.

Table 10-20

10-1-4-3 EMC-COP01 -- Communication card, CANopen

- Terminating Resistor Position

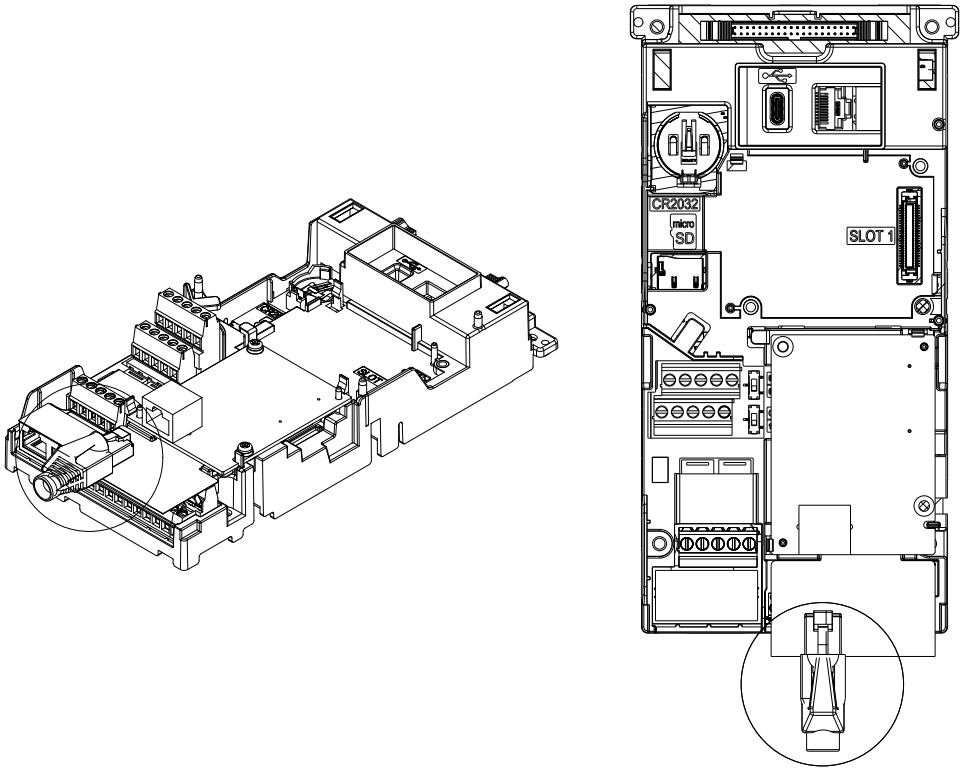


Figure 10-33

- RJ45 Pin Definition

RS-485 socket

Figure 10-34

PIN	Signal	Descriptions
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground/0V/V-
7	CAN_GND	Ground/0V/V-

Table 10-21

- Specifications

Connector	RJ45
Number of Ports	2 Ports
Transmission Method	CAN
Transmission Cable	CAN standard cable
Transmission Speed	1 Mbps; 500 Kbps; 250 Kbps; 125 Kbps; 100 Kbps; 50 Kbps
Network Protocol	CANopen protocol

Table 10-22

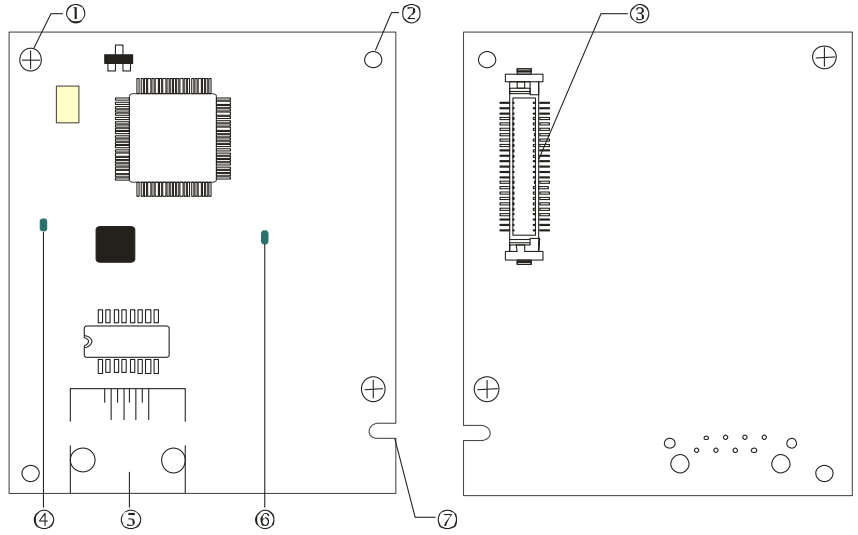
10-1-5 Extension Card for EtherNet

10-1-5-1 CMC-EIP01 / CMC-EIP02 -- Communication card, EtherNet/IP

- Features
  1. Supports Modbus TCP and Ethernet/IP protocol
  2. User-defined corresponding parameters (use with EIP V1.06 and above)
  3. IP filter simple firewall function
  4. MDI / MDI-X auto-detect
  5. Baud rate: 10 / 100 Mbps auto-detect

- Product File

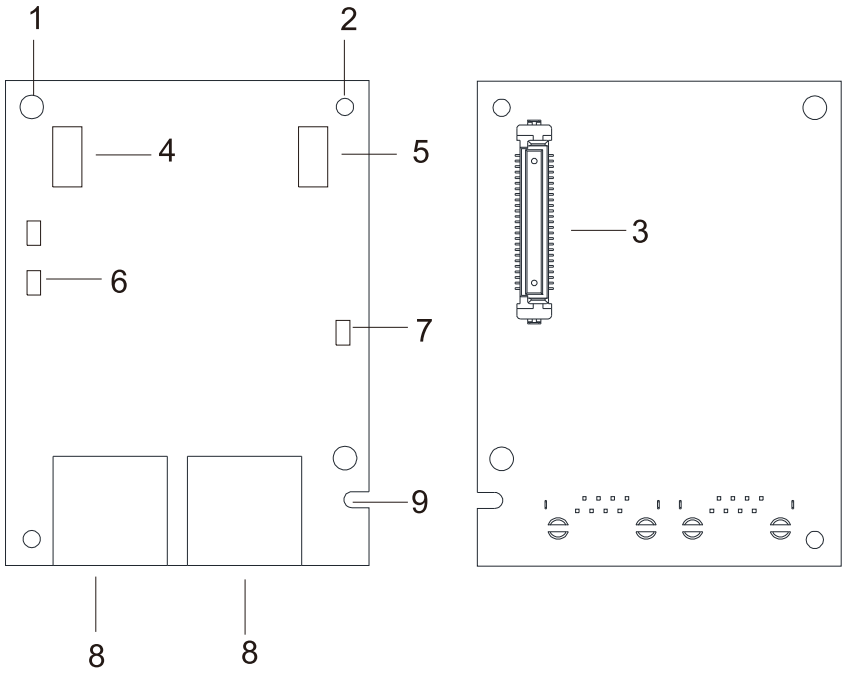
CMC-EIP01



1.	Screw fixing hole
2.	Positioning hole
3.	AC motor drive connection port
4.	LINK indicator
5.	RJ45 connection port
6.	POWER indicator
7.	Fool-proof groove

Figure 10-35

CMC-EIP02



1.	Screw fixing hole
2.	Positioning hole
3.	AC motor drive connection port
4.	NS indicator
5.	MS indicator
6.	LINK indicator
7.	POWER indicator
8.	Ethernet communication port (RJ45)
9.	Fool-proof groove

Figure10-36

- Specifications

Network Interface

Connector	RJ45 with auto MDI/MDIX
Number of Ports	CMC-EIP01: 1 Port CMC-EIP02: 2 Ports (switch)
Transmission Method	IEEE 802.3, IEEE 802.3u
Transmission Cable	Category 5e shielding 100M
Transmission Speed	10/100 Mbps Auto-Detect
Network Protocol	ICMP, IP, TCP, UDP, DHCP, BOOTP, SMTP, EhterNet/IP, Modbus TCP

Table 10-23

Electrical Specification

Weight	25 g (CMC-EIP01) / 30 g (CMC-EIP02)
Insulation Voltage	500 V_{DC}
Power Consumption	0.8 W (CMC-EIP01) / 1.4 W (CMC-EIP02)
Power Supply Voltage	5 V_{DC}

Table 10-24

Environment

Noise Immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation/ Storage	Operation: -10–50ºC (temperature), 90% (humidity) Storage: -25–70ºC (temperature), 95% (humidity)
Shock / Vibration Resistance	International standards: IEC61800-5-1, IEC60068-2-6 / IEC61800-5-1, IEC60068-2-27

Table 10-25

- Installation

  Connecting CMC-EIP01 to Network

  1. Turn off the power of the drive
  2. Open the cover of the AC motor drive
  3. Connect a CAT-5e network cable to the RJ45 port on the CMC-EIP01, as shown in the figure on the right.

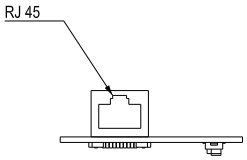


Figure 10-37

RJ45 Pin Definition

PIN	Signal	Definition
1	Tx+	Positive pole for data transmission
2	Tx-	Negative pole for data transmission
3	Rx+	Positive pole for data receiving
4	--	N/C

Table 10-26

PIN	Signal	Definition
5	--	N/C
6	Rx-	Negative pole for data receiving
7	--	N/C
8	--	N/C

Table 10-27

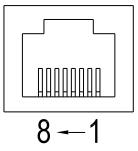


Figure 10-38

- VP3000 Communication Parameters Settings for Connecting to Ethernet

  When the VP3000 is connected to an Ethernet network, set up the communication parameters for it according to the table below. The Ethernet master is only able to read and write the frequency words and control word of VP3000 after the communication parameters are set.

Parameter	Description	Set Value (Dec)	Definition
A1-00	EX1/EX2 Switch Src	0	EX1 selection
A1-01	EX1 OPER Cmd Src	10	COM Card
C1-00	EX1 Main & Aux FREQ Math	0	0: Main FREQ
C1-01	EX1 Main FREQ Src	4	COM Card
n5-00	EtherNET Decoding Method	0 or 1	Delta drive decoding method
n5-01	EtherNET IP Configuration	0	Static IP (0)
n5-02	EtherNET IP Address 1	192	IP address 192.168.1.5
n5-03	EtherNET IP Address 2	168	IP address 192.168.1.5
n5-04	EtherNET IP Address 3	1	IP address 192.168.1.5
n5-05	EtherNET IP Address 4	5	IP address 192.168.1.5
n5-06	EtherNET Mask Address 1	255	Netmask 255.255.255.0
n5-07	EtherNET Mask Address 2	255	Netmask 255.255.255.0
n5-08	EtherNET Mask Address 3	255	Netmask 255.255.255.0
n5-09	EtherNET Mask Address 4	0	Netmask 255.255.255.0
n5-10	EtherNET Gateway Address 1	192	Default gateway 192.168.1.1
n5-11	EtherNET Gateway Address 2	168	Default gateway 192.168.1.1
n5-12	EtherNET Gateway Address 3	1	Default gateway 192.168.1.1
n5-13	EtherNET Gateway Address 4	1	Default gateway 192.168.1.1

Table 10-28

- LED Indicator & Troubleshooting

  There are 2 LED indicators on CMC-EIP01: POWER LED and LINK LED. The POWER LED displays the status of power supply, and the LINK LED displays the connection status of the communication.

  LED Indicators

LED	Status		Indication	Corrective Action
POWER	Green	ON	Power supply in normal status	--
		OFF	No power supply	Check the power supply
LINK	Green	ON	Network connection is in normal status	--
		Flashes	Network is in operation	--
		OFF	Network is not connected	Check if the network cable is connected

Table 10-29

Troubleshooting

Abnormality	Cause	Corrective Action
POWER LED OFF	AC motor drive is not powered	Check the power of the AC motor drive, and see if the power supply is normal
	The CMC-EIP01 is not connected to the AC motor drive	Ensure that CMC-EIP01 is connected to the AC motor drive
LINK LED OFF	The CMC-EIP01 is not connected to network	Ensure that the network cable is correctly connected to network
	Poor contact to RJ45 connector	Ensure that RJ45 connector is connected to Ethernet port
Cannot find communication card	The CMC-EIP01 is not connected to network	Ensure that CMC-EIP01 is connected to network
	The PC and CMC-EIP01 are in different network and blocked by network firewall	Search by IP or set up relevant settings by the AC motor drive keypad
Cannot open CMC-EIP01 setup page	The CMC-EIP01 is not connected to network	Ensure that CMC-EIP01 is connected to network
	Incorrect communication setting in DCISoft	Ensure that the communication setting in DCISoft is set to Ethernet
Cannot open CMC-EIP01 setup page	The PC and CMC-EIP01 are in different network and blocked by network firewall	Set up with the AC motor drive keypad
The CMC-EIP01 setup page opens successfully but webpage monitoring is unavailable	Incorrect network setting in CMC-EIP01	Check if the network setting for CMC-EIP01 is correct. For the Intranet setting in your company, consult your IT staff. For the Internet setting in your home, refer to the network setting instruction provided by your ISP.

Abnormality	Cause	Corrective Action
Cannot send e-mail	Incorrect network setting in CMC-EIP01	Check if the network setting for CMC-EIP01 is correct
	Incorrect mail server setting	Confirm the IP address for SMTP-Server

Table 10-30

10-1-5-2 CMC-PN01 -- Communication card, PROFINET

- Features

CMC-PN01 connects VP3000 drive to PROFINET to exchange data with the host controller easily. This simple network solution saves cost and time for connection and installation of factory automation. Moreover, its components are compatible with suppliers.'

By installing CMC-PN01 in VP3000 through the main PROFINET device, you can:

1. Control the drive through PROFINET
2. Modify the drive's parameters through PROFINET
3. Monitor the drive's status through PROFINET

- Product File

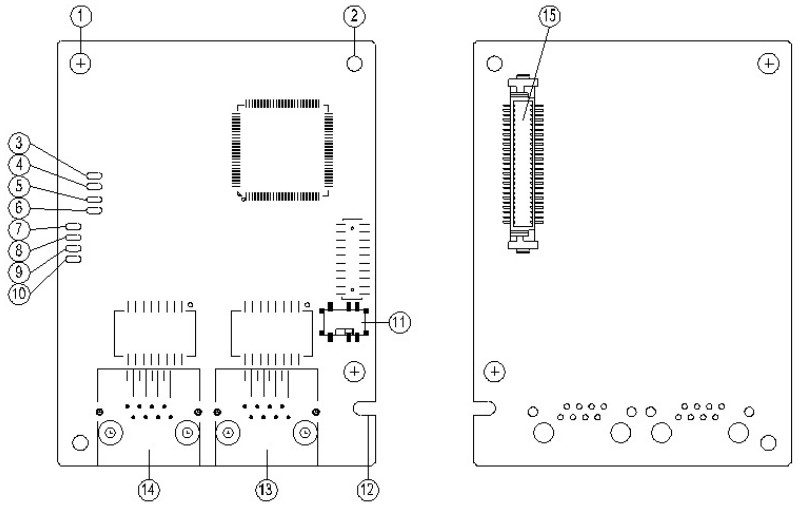


Figure 10-39

1.	Screw fixing hole
2.	Positioning hole
3.	Ready out indicator
4.	MT out indicator
5.	SD indicator
6.	BF out indicator
7.	ACT PHY2 indicator
8.	Link PHY2 indicator
9.	ACT PHY1 indicator
10.	Link PHY1 indicator
11.	ON/ OFF switch
12.	Fool-proof groove
13.	RJ45 port (Port 2)
14.	RJ45 port (Port 1)
15.	A port to connect with control board

Label with MAC address

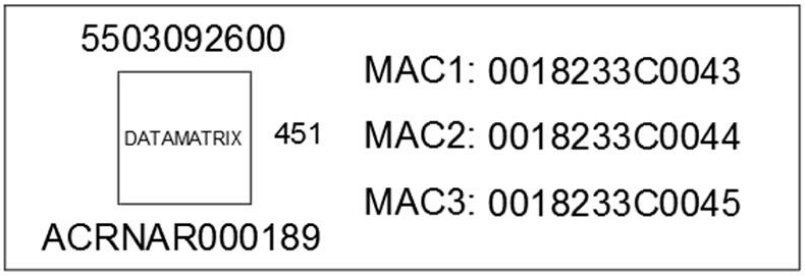


Figure 10-40

Definition	Descriptions
MAC1	Port 1 MAC Address
MAC2	Port 2 MAC Address
MAC3	Interface MAC Address

Table 10-31

- Specifications

Network Interface

Connector	RJ45
Number of Ports	2 Ports
Transmission Method	IEEE 802.3
Transmission Cable	Category 5e shielding 100 M
Transmission Speed	10/100 Mbps auto-negotiate
Network Protocol	PROFINET

Table 10-32

Electrical Specification

Power Supply Voltage	5 V_{DC}
Power Consumption	0.8 W
Insulation Voltage	500 V_{DC}
Weight (g)	27

Table 10-33

Environment

Noise Immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation Temperature	-10–50ºC (temperature), 90% (humidity)
Storage Temperature	-25–50ºC (temperature), 95% (humidity)
Shock / Vibration Resistance	International standards: IEC61800-5-1, IEC60068-2-6 / IEC61800-5-1, IEC60068-2-27

Table 10-34

- Installation

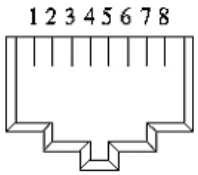
RJ45	PIN	Definition	Descriptions
 Figure 10-41	1	Tx+	Positive pole for data transmission
	2	Tx-	Negative pole for data transmission
	3	Rx+	Positive pole for data receiving
	4	--	N/C
	5	--	N/C
	6	Rx-	Negative pole for data receiving
	7	--	N/C
	8	--	N/C

Table 10-35

- VP3000 Communication Parameters Settings for Connecting to PROFINET

When you operate VP3000 through CMC-PN01, set up the communication card as the source of VP3000 controls and settings. You need to use the keypad to configure the following parameter addresses to the corresponding values:

Parameters	Setting Value	Description
A1-00	0	EX1/EX2 Switch Src
A1-01	10	EX1 OPER Cmd Src
C1-00	0	EX1 Main & Aux FREQ Math
C1-01	4	EX1 Main FREQ Src
n5-00	1 or 2	EtherNET Decoding Method
n0-03	12	COM Card ID: when connecting with CMC-PN01, the parameter shows 12.

Table 10-36

- LED Indicator Instruction

Name	Status		Indication
Ready out indicator	Yellow LED	Always ON	PN Stack starts normally
		Flashes	PN Stack starts normally, and waiting for synchronizing with MCU
		OFF	PN Stack failed to start
MT out indicator	Green	-	-
SD indicator	Red LED	-	-
BF out indicator	Red LED	Always ON	Connection with PROFINET Controller is interrupted
		Flashes	Connection is in normal state, but the communication with PROFINET Controller is abnormally
		OFF	Connection with PROFINET Controller is in normal state
ACT PHY1 indicator	Orange LED	Always ON	It is online, and exchanging the data with Master normally
		Flashes	It is offline, but hand shaking the data with Master
		OFF	Initial state
LINK PHY1 indicator	Green	Always ON	Network connection is in normal status
		OFF	Network is not connected
ACT PHY2 indicator	Orange LED	Always ON	It is online, and exchanging the data with Master normally
		Flashes	It is offline, but hand shaking the data with Master
		OFF	Initial state
LINK PHY2 indicator	Green	Always ON	Network connection is in normal status
		OFF	Network is not connected

Table 10-37

- Network Connection

  The wiring of CMC-PN01 shows as follows:

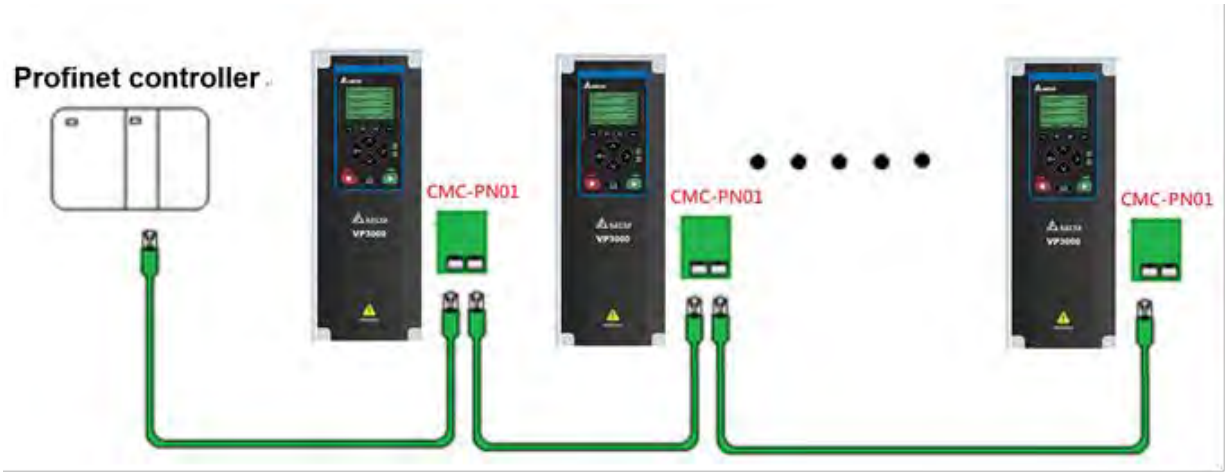


Figure 10-42

When the installation is finished, supply electricity to the drive. The Pr. n0-03 of the drive should be able to display “PROFINET” with a current value of 12. If not, make sure your version of the drive is correct and the communication card is correctly connected.

10-2 Delta Standard Fieldbus Cables

Type	Delta Standard Fieldbus Cables	Model	Description	Length
RS-485	CANopen Cable / RJ45 Extension Cable for Keypad	UC-CMC003-01A	CANopen cable, RJ45 connector	0.3 m
		UC-CMC005-01A	CANopen cable, RJ45 connector	0.5 m
		UC-CMC010-01A	CANopen cable, RJ45 connector	1 m
		UC-CMC015-01A	CANopen cable, RJ45 connector	1.5 m
		UC-CMC020-01A	CANopen cable, RJ45 connector	2 m
		UC-CMC030-01A	CANopen cable, RJ45 connector	3 m
		UC-CMC050-01A	CANopen cable, RJ45 connector	5 m
		UC-CMC100-01A	CANopen cable, RJ45 connector	10 m
		UC-CMC200-01A	CANopen cable, RJ45 connector	20 m
	DeviceNet Cable	UC-DN01Z-01A	DeviceNET cable	305 m
		UC-DN01Z-02A	DeviceNET cable	305 m
	PROFIBUS Cable	UC-PF01Z-01A	PROFIBUS DP cable	305 m
EtherNet	EtherNet/ EtherCAT Cable	UC-EMC003-02C	Ethernet / EtherCAT cable, Shielding	0.3 m
		UC-EMC005-02C	Ethernet / EtherCAT cable, Shielding	0.5 m
		UC-EMC010-02C	Ethernet / EtherCAT cable, Shielding	1 m
		UC-EMC020-02C	Ethernet / EtherCAT cable, Shielding	2 m
		UC-EMC050-02C	Ethernet / EtherCAT cable, Shielding	5 m
		UC-EMC100-02C	Ethernet / EtherCAT cable, Shielding	10 m
		UC-EMC200-02C	Ethernet / EtherCAT cable, Shielding	20 m

Table 10-38

Delta Fieldbus Cable TAP

Type	Delta Fieldbus Cable TAP	Model	Description	Length
RS-485	CANopen/ DeviceNet TAP	TAP-CN01	1 in 2 out, built-in 121 Ω terminal resistor	1 in 2 out
		TAP-CN02	1 in 4 out, built-in 121 Ω terminal resistor	1 in 4 out
		TAP-CN03	1 in 4 out, RJ45 connector, built-in 121 Ω terminal resistor	1 in 4 out

Table 10-39

10-3 Other Optional Accessories

10-3-1 AC Reactors

10-3-1-1 AC Input Reactor

Installing an AC reactor on the input side of an AC motor drive can increase line impedance, improve the power factor, reduce input current, increase system capacity, and reduce interference generated from the motor drive. It also reduces momentary voltage surges or abnormal current spikes from the mains power, further protecting the drive. For example, when the main power capacity is higher than 500 kVA, or when using a phase-compensation capacitor, momentary voltage and current spikes may damage the AC motor drive's internal circuit. An AC reactor on the input side of the AC motor drive protects it by suppressing surges.

NOTE:

1. When the power voltage exceeds the drive specification 380–480 V_{AC} with lower limit of ±20V, which is lower than 360 V_{AC} or higher than 500 V_{AC}, it is not recommended to install an AC reactor. If you need to install an AC reactor under this input voltage level, ensure that the output equivalent inductance of the transformer in the factory is less than the following recommended value:

   $$L = \frac{\text{Rated secondary voltage } V_{rms} \times \text{Short circuit impedance \%}}{\text{Rated secondary current } I_{rms} \times 2\pi \times \text{mains frequency } Hz \times 2} < 200uH$$

   For example:

   $L = \frac{480V \times 8\%}{250A \times 2\pi \times 60Hz \times 2} = 203.72uH$, then it is not recommended to install an AC input reactor.

2. If a three-phase generator is used to supply power to the drive, the generator output voltage should be set within the input voltage specification range marked on the drive, that is 380 V_{AC} ≤ V_{in} ≤ 480 V_{AC}.

Installation

Install an AC input reactor in series between the main power and the three input phases R S T, as shown in the figure below:

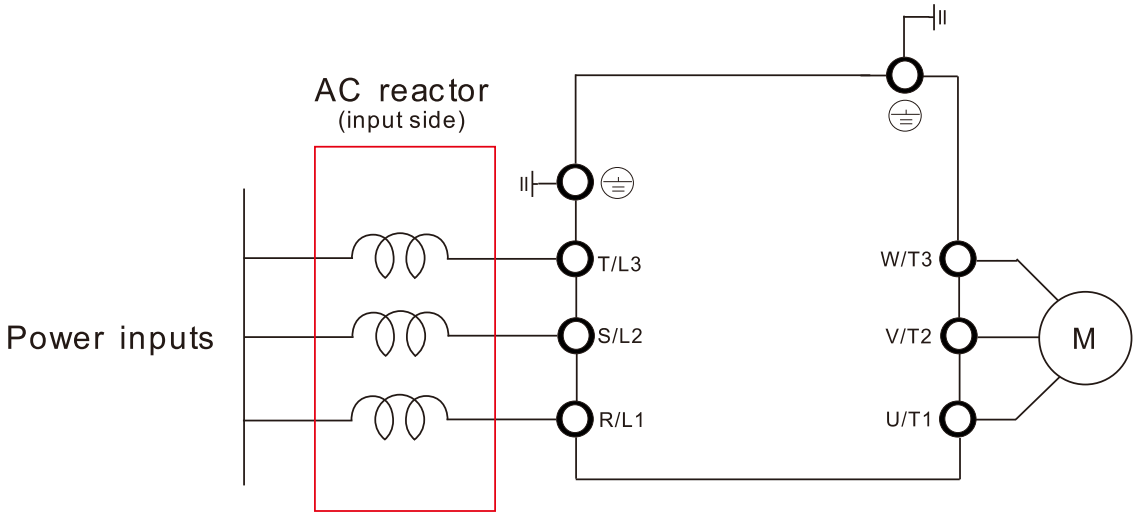


Figure 10-43

VP3000 AC Input Reactor Specifications

The following table is the recommended specifications for the Delta VP3000 AC input reactors:

380–460V, 50/ 60 Hz Normal Duty

Model	kW	HP	Rated Current (Arms)	Saturation Current (Arms)	3% Impedance (mH)	5% Impedance (mH)	Built-in DC Reactor	Input AC Reactor Delta Part #	Heat Dissipation (W)
VFD3A0VP43ANTAA	0.75	1	3	3.6	8.45	14.09	No	DR003A0810	20
VFD4A2VP43ANTAA	1.5	2	4.2	5.04	6.04	10.06	No	DR004A0607	21
VFD5A6VP43ANTAA	2.2	3	5.6	6.72	4.53	7.55	No	DR006A0405	31
VFD7A2VP43ANTAA	3	4	7.2	8.64	3.52	5.87	No	DR009A0270	40
VFD011VP43ANTAA	4	5.3	11	13.2	2.31	3.84	No	DR010A0231	50
VFD013VP43ANTAA	5.5	7.5	13	15.6	1.95	3.25	No	DR012A0202	50
VFD018VP43ANTAA	7.5	10	18	21.6	1.41	2.35	No	DR018A0117	54
VFD025VP43ANTAA	11	15	25	30	1.01	1.69	No	DR024AP881	60
VFD032VP43ANTAA	15	20	32	38.4	0.79	1.32	No	DR032AP660	80
VFD038VP43ANTAA	18.5	25	38	45.6	0.67	1.11	No	DR038AP639	85

NOTE: Table 10-40

1. The above heat dissipation is calculated based on AC reactor’s rated current; the actual dissipation varies with the operation current.

AC Input Reactor Dimension and Specification:

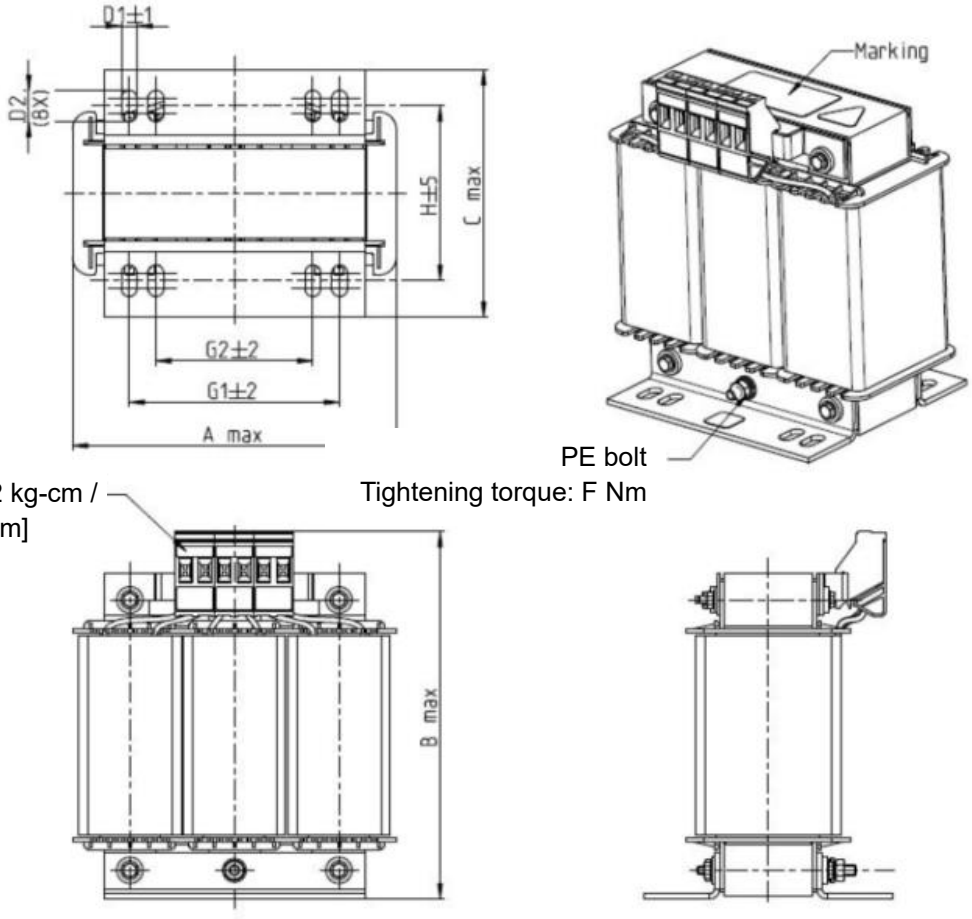


Figure 10-44

Unit: mm

Input AC Reactor Delta Part #	A	B	C	D1*D2	H	G1	G2	PE D
DR003A0810	100	125	65	6*9	43	60	40	M4
DR004A0607	100	125	65	6*9	43	60	40	M4
DR006A0405	130	15	95	6*12	60	80.5	60	M4
DR009A0270	160	160	105	6*12	75	107	75	M4
DR010A0231	160	160	115	6*12	90	107	75	M4
DR012A0202	160	160	115	6*12	90	107	75	M4
DR018A0117	160	160	115	6*12	90	107	75	M4

Table 10-41

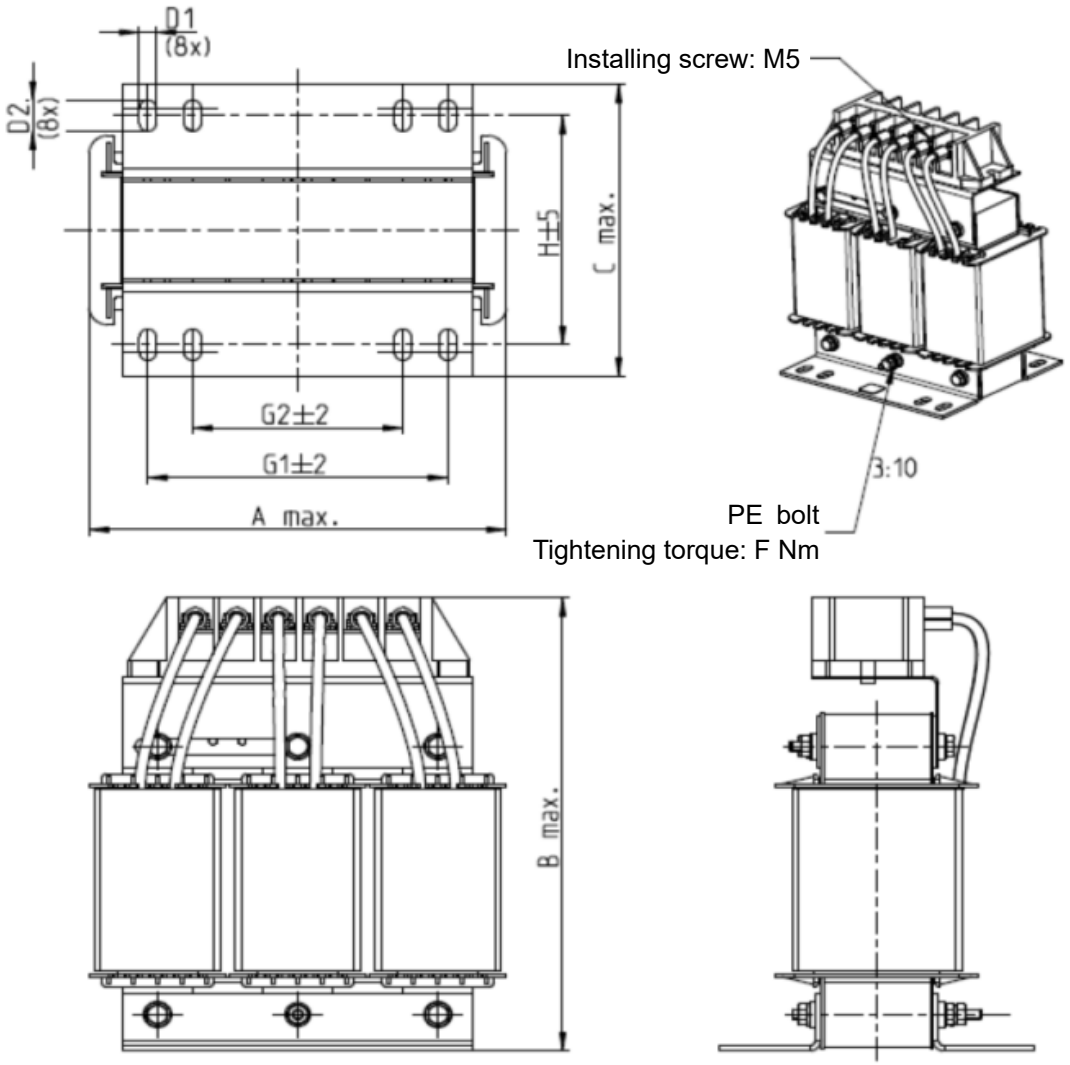


Figure 10-45

Unit: mm

Input AC Reactor Delta Part #	A	B	C	D1*D2	H	G1	G2	PE D
DR024AP881	160	175	115	6*12	90	107	75	M4
DR032AP660	195	200	145	6*12	115	122	85	M6
DR038AP639	190	200	145	6*12	115	122	85	M6

Table 10-42

The table below shows the THDi specification when using Delta drive to work with AC reactors:

Current Harmonics	Models without built-in reactors			Low Harmonic Models
	No AC Reactor	3% AC Reactor	5% AC Reactor	No AC Reactor
5th	46.85%	36.68%	29.87%	19.65%
7th	44.11%	14.51%	8.80%	14.58%
11th	36.39%	6.93%	6.03%	8.70%
13th	32.03%	3.43%	3.19%	9.96%
THDi	86.57%	40.44%	32.07%	35.83%

Table 10-43

NOTE: Low harmonic models can meet the 48% THDi required by the regulation without adding a reactor. These models cannot use with AC reactors to suppress the current harmonic; therefore, it is not recommended to add AC reactors for the low hormonic models.

10-3-1-2 AC Output Reactor

When using drives in long wiring output application, ground fault (GFF), over-current (OC) and motor over-voltage (OV) often occur. GFF and OC cause errors due to the drive's self-protective mechanism; over-voltage damages motor insulation.

The excessive length of the output wires makes the grounded stray capacitance too large, increase the three-phase output common mode current, and the reflected wave of the long wires makes the motor dv / dt and the motor terminal voltage too high. Thus, installing a reactor on the drive's output side can increase the high-frequency impedance to reduce the dv / dt and terminal voltage to protect the motor.

Installation

Installing an AC output reactor in series between the three output phases U V W and the motor, as shown in the figure below:

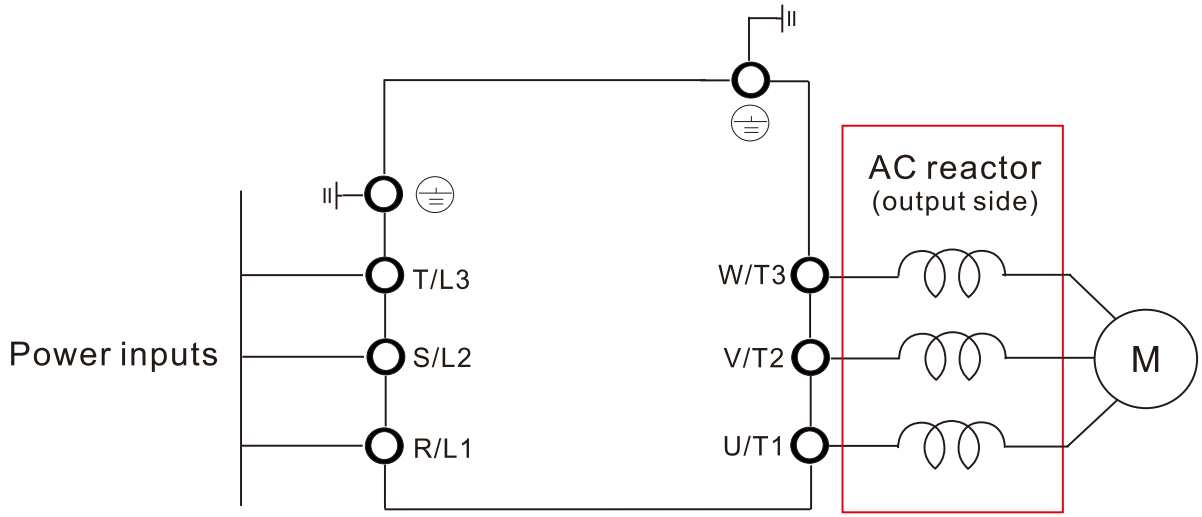


Figure 10-46

VP3000 AC Output Reactor Specifications

The following table is the specification of VP3000 AC output reactor:

380–460V, 50/ 60 Hz Normal Duty

HP	kW	HP	Rated Current (Arms)	Saturation Current (Arms)	3% Impedance (mH)	5% Impedance (mH)	Built-in DC Reactor	3% Output AC Reactor Delta Part #	Heat Dissipation (W)
VFD3A0VP43A	0.75	1	3	3.6	8.454	14.090	No	DR003L0810	13
VFD4A2VP43A	1.5	2	4.2	5.04	6.038	10.064	No	DR004L0607	18
VFD5A6VP43A	2.2	3	5.6	6.72	4.529	7.548	No	DR006L0405	22
VFD7A2VP43A	3	4	7.2	8.64	3.522	5.871	No	DR009L0270	35
VFD011VP43A	4	5.3	11	13.2	2.306	3.843	No	DR010L0231	40
VFD013VP43A	5.5	7.5	13	15.6	1.951	3.251	No	DR012L0202	45
VFD018VP43A	7.5	10	18	21.6	1.409	2.348	No	DR018L0117	48
VFD025VP43A	11	15	25	30	1.014	1.691	No	DR024LP881	52
VFD032VP43A	15	20	32	38.4	0.793	1.321	No	DR032LP660	66
VFD038VP43A	18.5	25	38	45.6	0.667	1.112	No	DR038LP639	70
VFD045VP43A	22	30	45	54	0.564	0.939	Yes	DR045LP541	85
VFD062VP43A	30	40	62	74.4	0.409	0.682	Yes	DR060LP405	85
VFD073VP43A	37	50	73	87.6	0.347	0.579	Yes	DR073LP334	110
VFD091VP43A	45	60	91	109.2	0.279	0.464	Yes	DR091LP267	130
VFD110VP43A	55	75	110	132	0.231	0.384	Yes	DR110LP221	150
VFD150VP43A	75	100	150	180	0.169	0.282	Yes	DR150LP162	175
VFD180VP43A	90	125	180	216	0.141	0.235	Yes	DR180LP135	195
VFD220VP43A	110	150	220	264	0.115	0.192	Yes	DR220LP110	235
VFD260VP43A	132	175	260	312	0.098	0.163	Yes	DR260LP098	285
VFD310VP43A	160	215	310	372	0.082	0.136	Yes	DR310LP078	300
VFD370VP43A	185	250	370	444	0.069	0.114	Yes	DR370LP066	345
VFD395VP43A	200	270	395	474	0.064	0.107	Yes	DR370LP066*1	410
VFD460VP43A	220	300	460	552	0.055	0.092	Yes	DR460LP054	410
VFD485VP43A	250	340	485	582	0.052	0.087	Yes	DR460LP054*1	440
VFD530VP43A	280	375	530	636	0.048	0.080	Yes	DR550LP044	440
VFD616VP43A	315	425	616	739.2	0.041	0.069	Yes	DR616LP039	465
VFD683VP43A	355	475	683	819.6	0.037	0.062	Yes	DR683LP036	495
VFD770VP43A	400	530	770	924	0.033	0.055	Yes	DR866LP028	600
VFD866VP43A	450	600	866	1039.2	0.029	0.049	Yes	DR866LP028	600
VFD930VP43A	500	665	930	1116	0.027	0.045	Yes	DR866LP028	600
VFD1K1VP43A	560	745	1100	1320	0.023	0.038	Yes	Contact Delta	
VFD1K2VP43A	630	840	1212	1454.4	0.021	0.035	Yes		

Table 10-44

NOTE:

*1: The inductance value for the above applications of Delta's reactors will be closed to, but less than 3%.

2: The above heat dissipation is calculated based on AC reactor's rated current; the actual dissipation varies with the operation current.

AC Output Reactor Dimension and Specification:

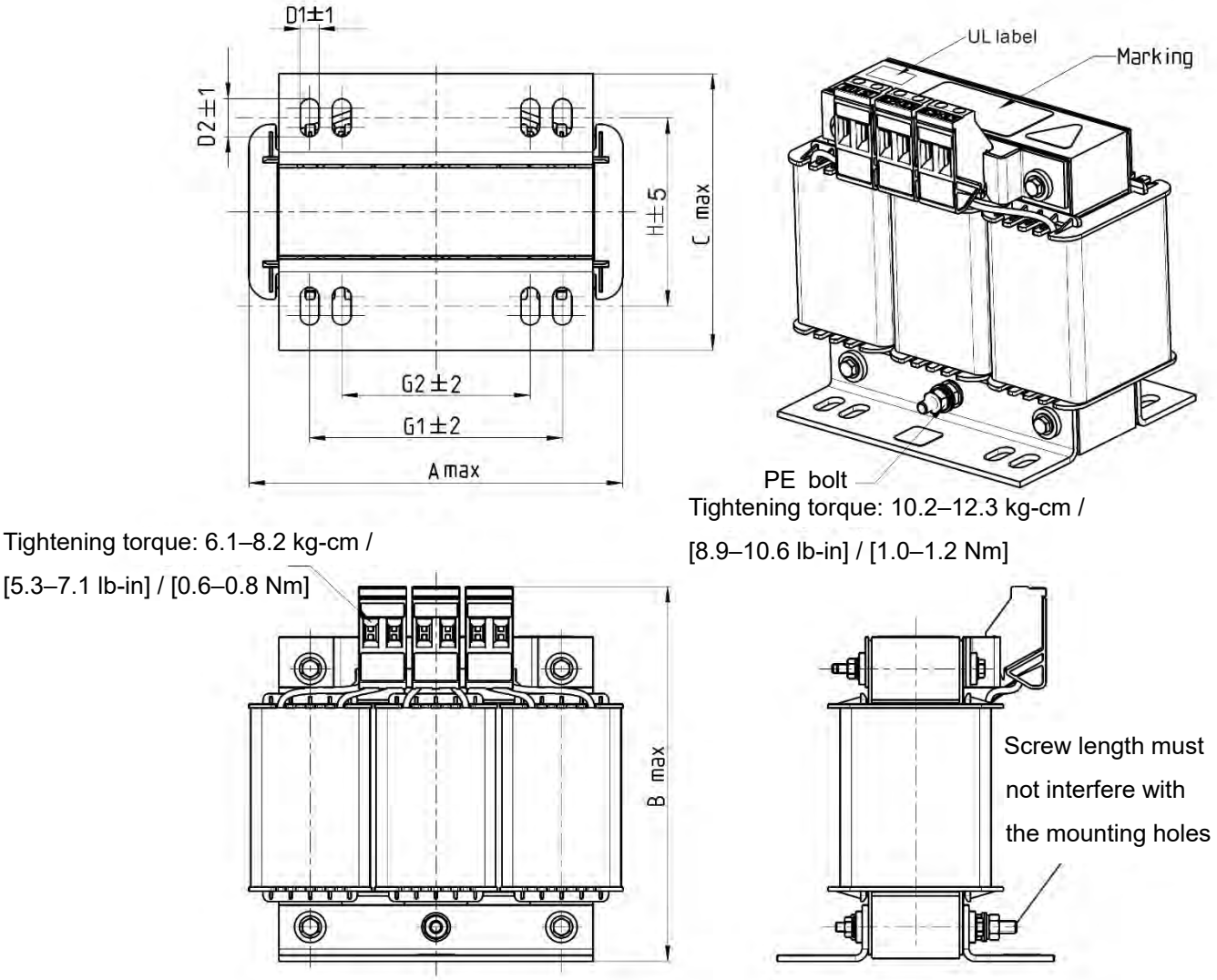


Figure 10-47

Unit: mm

Output AC Reactor Delta #	A	B	C	D1*D2	H	G1	G2	PE D
DR003L0810	96	115	65	6*9	42	60	40	M4
DR004L0607	120	135	95	6*12	60	80.5	60	M4
DR006L0405	120	135	95	6*12	60	80.5	60	M4
DR009L0270	150	160	100	6*12	74	107	75	M4
DR010L0231	150	160	115	6*12	88	107	75	M4
DR012L0202	150	160	115	6*12	88	107	75	M4
DR018L0117	150	160	115	6*12	88	107	75	M4
DR024LP881	150	160	115	6*12	88	107	75	M4
DR032LP660	180	190	145	6*12	114	122	85	M6

Table 10-45

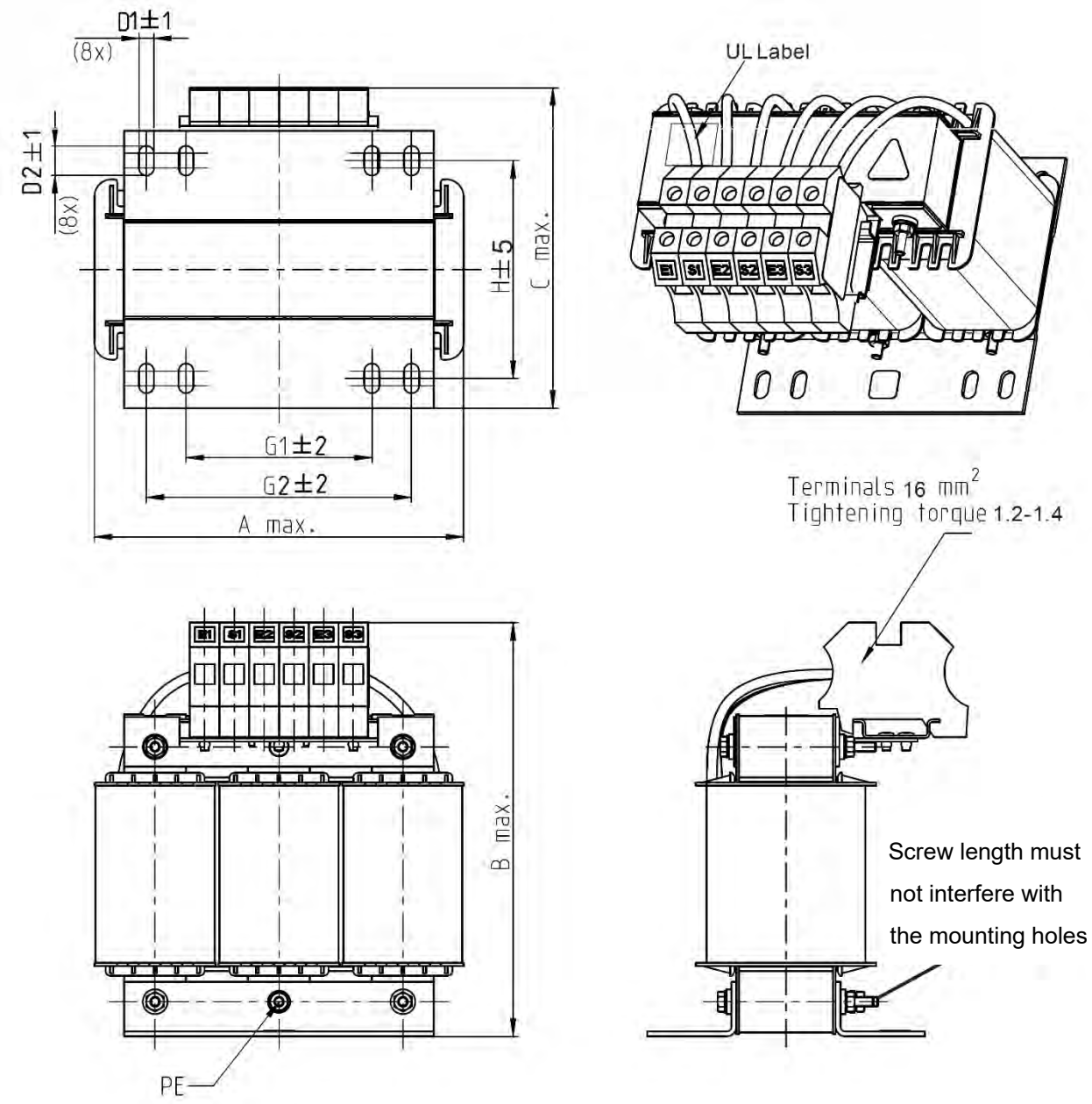


Figure 10-48

Unit: mm

Output AC Reactor Delta #	A	B	C	D1*D2	H	G1	G2	PE D
DR038LP639	180	205	170	6*12	115	85	122	M4
DR045LP541	235	245	155	7*13	85	/	176	M6

Table 10-46

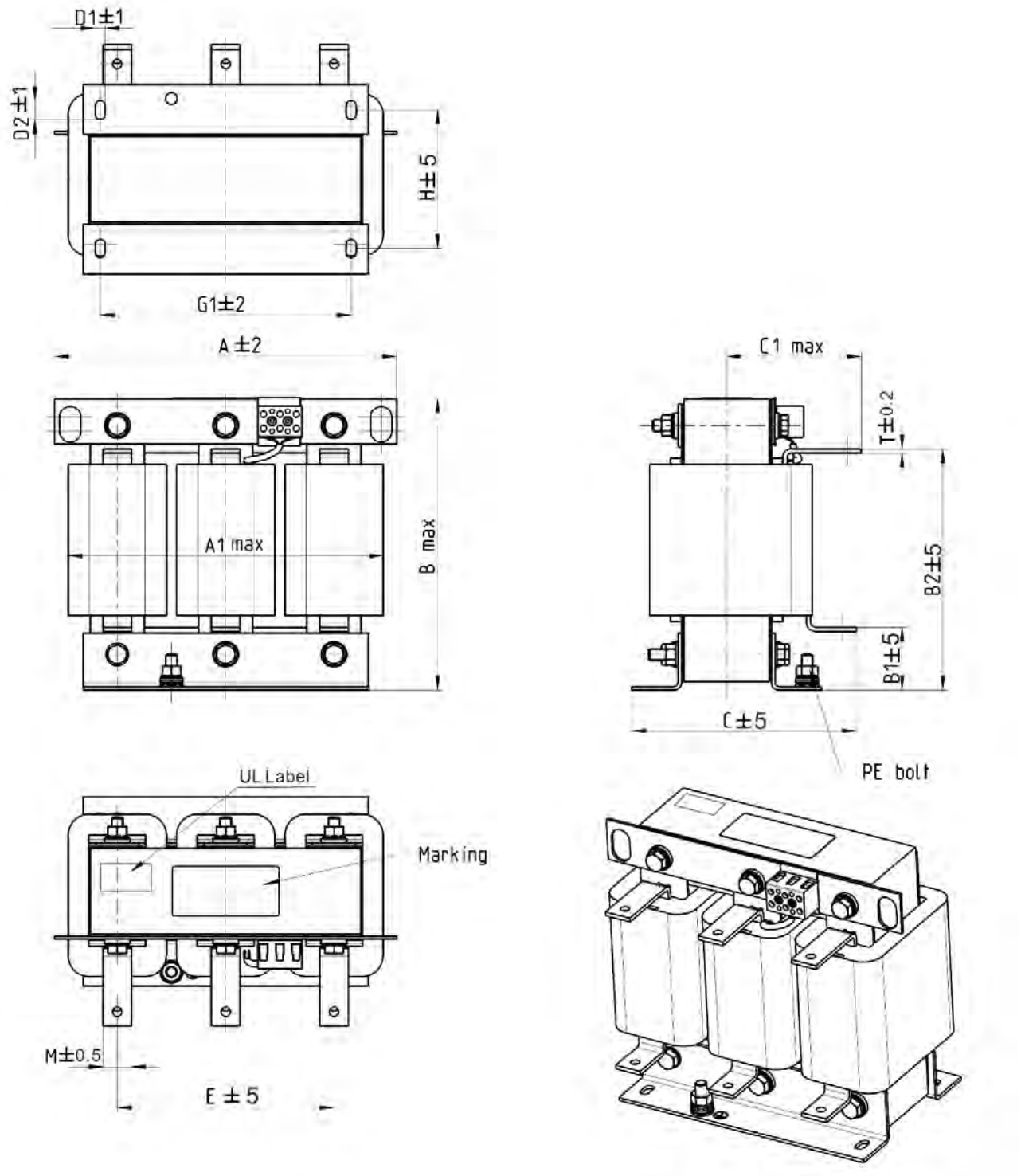


Figure 10-49

Unit: mm

Output AC Reactor Delta #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	H	M*T
DR060LP405	240	228	215	44	170	163	110	7*13	152	176	97	20*3
DR073LP334	250	235	235	44	186	174	115	11*18	160	190	124	20*3
DR091LP267	250	240	235	44	186	174	115	11*18	160	190	124	20*3
DR110LP221	270	260	245	50	192	175	115	10*18	176	200	106	20*3

Table 10-47

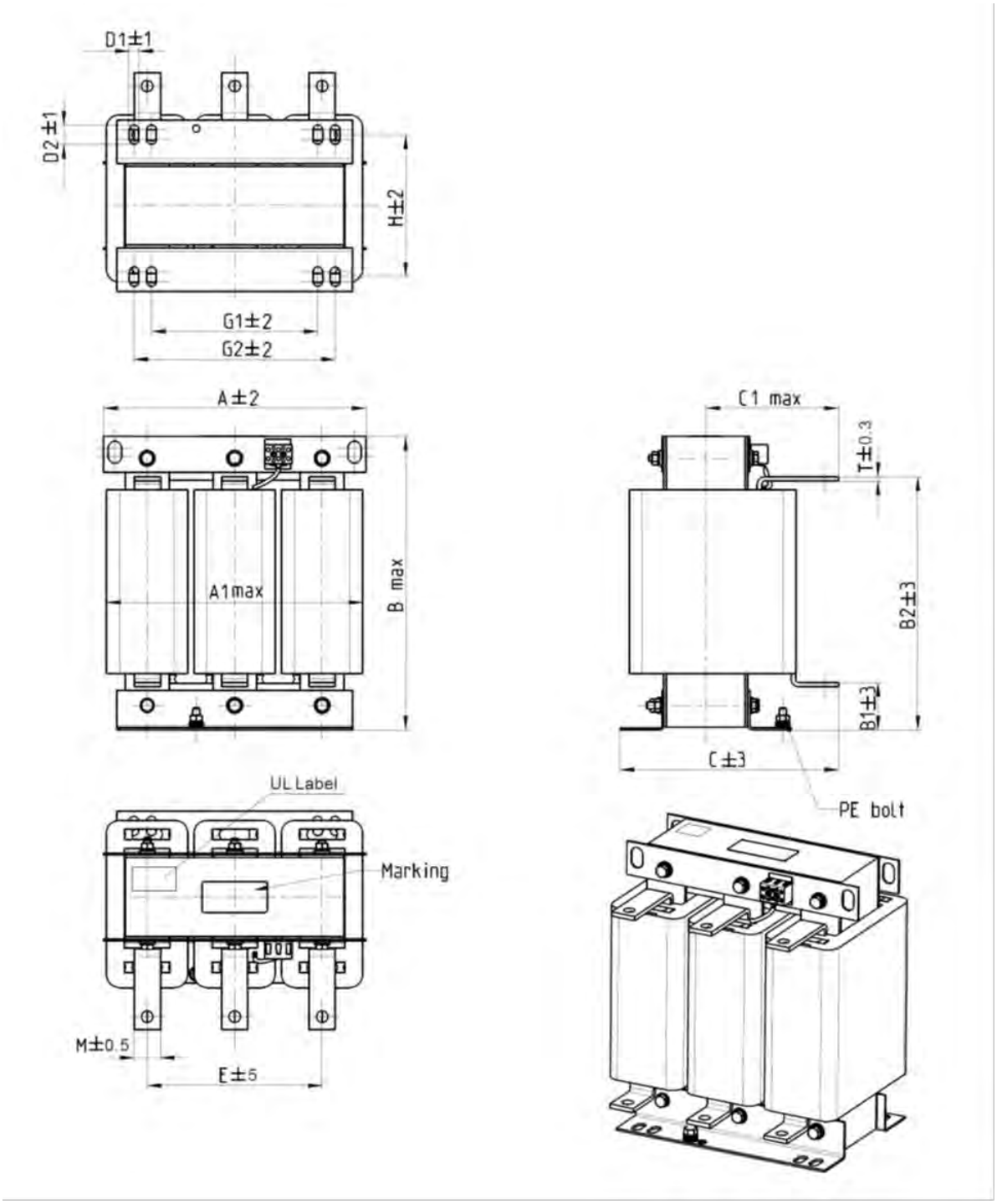


Figure 10-50

Unit: mm

Output AC Reactor Delta #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	G2	H	M*T
DR150LP162	270	264	265	51	208	192	125	10*18	176	200	/	118	30*3
DR180LP135	300	295	310	55	246	195	125	11*22	200	230	190	142	30*3
DR220LP110	300	298	310	57	248	210	140	11*22	200	230	190	142	30*5
DR260LP098	300	295	330	56	270	227	140	11*22	200	230	190	160	30*5
DR310LP078	300	298	350	54	288	233	145	11*22	200	230	190	160	30*5
DR370LP066	300	298	350	54	289	268	170	11*22	200	230	190	185	40*5

Table 10-48

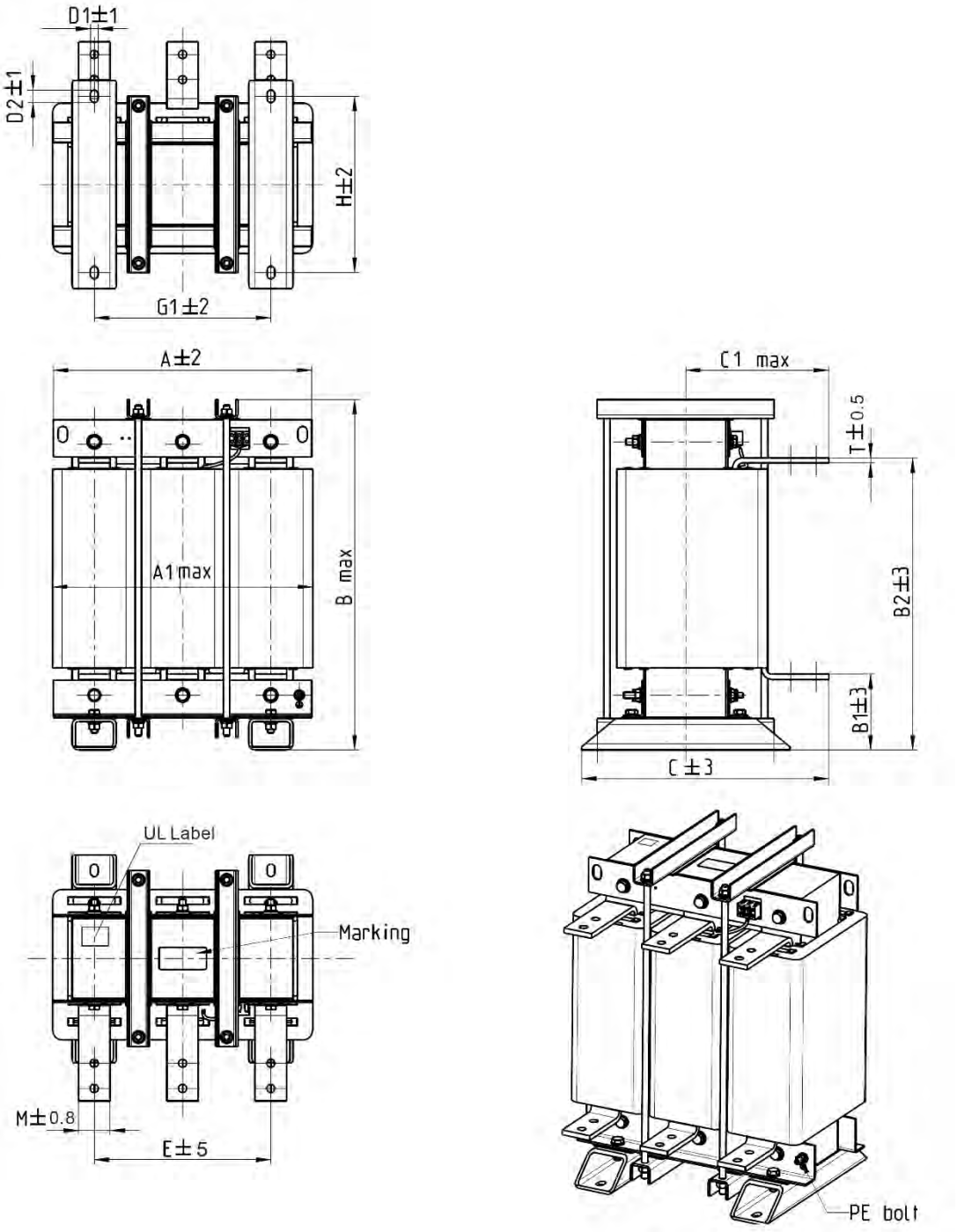


Figure 10-51

Unit: mm

Output AC Reactor Delta #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	H	M*T
DR460LP054	360	355	510	106	401	346	215	12*20	240	240	240	50*5
DR550LP044	360	355	510	106	401	358	220	12*20	240	240	250	50*5
DR616LP039	360	355	510	110	401	376	230	12*20	240	240	270	50*8
DR683LP036	360	355	510	110	401	396	240	12*20	240	240	290	50*8
DR866LP028	410	418	570	120	464	402	245	12*20	280	280	290	50*8

Table 10-49

10-3-1-3 Long Wiring Application

Motor Cable Length

1. Consequence of leakage current on the motor

   If the cable length is too long, the stray capacitance between cables increases and may cause leakage current. In this case, It activates the over-current protection, increases leakage current, or may affect the current display. The worst case is that it may damage the AC motor drive. If more than one motor is connected to one AC motor drive, the total wiring length should be the sum of the wiring length from AC motor drive to each motor. For the 460V series AC motor drive, when you install an overload thermal relay between the drive and the motor to protect the motor from overheating, the connecting cable must be shorter than 50 m; however, an overload thermal relay malfunction may still occur. To prevent the malfunction, install an output reactor (optional) to the drive or lower the carrier frequency setting.

2. Consequence of the surge voltage on the motor

   When a motor is driven by a PWM-type AC motor drive, the motor terminals experience surge voltages (dv/dt) due to power transistor conversion of AC motor drive. When the motor cable is exceptionally long (especially for the 460V series), surge voltages (dv/dt) may damage the motor insulation and bearing. To prevent this, follow these rules:

   a. Use a motor with enhanced insulation (refer to the table below).
   b. Reduce the cable length between the AC motor drive and motor to suggested values.
   c. Connect an output reactor (optional) to the output terminals of the AC motor drive.

Refer to the following tables for the suggested motor shielded cable length. Use a motor with a rated voltage ≤ 500 V_{AC} and insulation level ≥ 1.35 kV in accordance with IEC 60034-17.

460V Model	kW	HP	Rated Current (Arms)	Without an AC output reactor		With an AC output reactor	
			Normal Duty	Shielded Cable (meter)	Non-shielded Cable (meter)	Shielded Cable (meter)	Non-shielded Cable (meter)
VFD3A0VP43A	0.75	1	3	40	75	75	115
VFD4A2VP43A	1.5	2	4.2	50	75	75	115
VFD5A6VP43A	2.2	3	5.6	50	75	75	115
VFD7A2VP43A	3	4	7.2	50	75	75	115
VFD011VP43A	4	5.3	11	50	75	75	115
VFD013VP43A	5.5	7.5	13	50	75	75	115
VFD018VP43A	7.5	10	18	100	150	150	225
VFD025VP43A	11	15	25	100	150	150	225
VFD032VP43A	15	20	32	100	150	150	225
VFD038VP43A	18.5	25	38	100	150	150	225
VFD045VP43A	22	30	45	100	150	150	225
VFD062VP43A	30	40	62	100	150	150	225
VFD073VP43A	37	50	73	100	150	150	225
VFD091VP43A	45	60	91	150	225	225	325
VFD110VP43A	55	75	110	150	225	225	325
VFD150VP43A	75	100	150	150	225	225	325

460V Model	kW	HP	Rated Current (Arms)	Without an AC output reactor		With an AC output reactor	
			Normal Duty	Shielded Cable (meter)	Non-shielded Cable (meter)	Shielded Cable (meter)	Non-shielded Cable (meter)
VFD180VP43A	90	125	180	150	225	225	325
VFD220VP43A	110	150	220	150	225	225	325
VFD260VP43A	132	175	260	150	225	225	325
VFD310VP43A	160	215	310	150	225	225	325
VFD370VP43A	185	250	370	150	225	225	325
VFD395VP43A	200	270	395	150	225	225	325
VFD460VP43A	220	300	460	150	225	225	325
VFD485VP43A	250	340	485	150	225	225	325
VFD530VP43A	280	375	530	150	225	225	325
VFD616VP43A	315	425	616	150	225	225	325
VFD683VP43A	355	475	683	150	225	225	325
VFD770VP43A	400	530	770	150	225	225	325
VFD866VP43A	450	600	866	150	225	225	325
VFD930VP43A	500	665	930	150	225	225	325
VFD1K1VP43A	560	745	1100	150	225	225	325
VFD1K2VP43A	630	840	1212	150	225	225	325

Table 10-50

10-3-1-4 Sine-Wave Filter

When there is longer cable length connected between the motor drive and the motor, the damping leads to high frequency resonator, and makes impedance matching poor to enlarge the voltage reflection. This phenomenon will generate twice-input voltage in the motor side, which will easily make motor voltage overshoot to damage insulation.

To prevent this, installing sine-wave filter can transform PWM output voltage to smooth and low-ripple sin wave, and motor cable length can be longer than 1000 meters.

Installation

Sine-wave filter is serially connected between motor drive UVW output side and motor, which is shown as below:

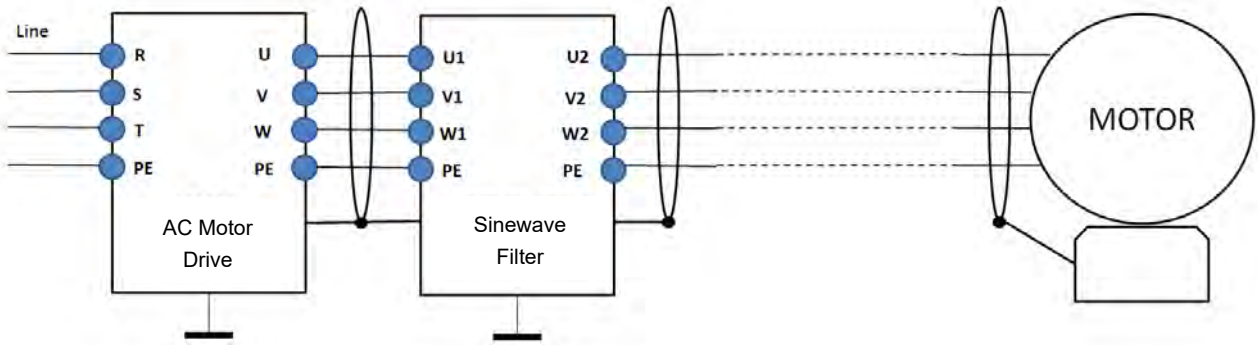


Figure 10-52 Wiring of non-shielded cable

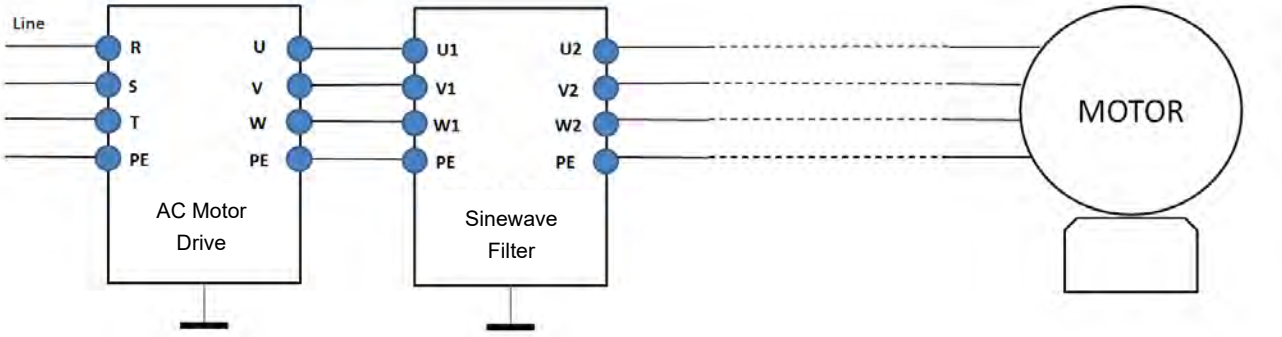


Figure 10-53 Wiring of shielded cable

NOTE:

1. Sinusoidal filters must only be used in V/F operation mode (Pr.C0-02 = 0). If the application requires FOC control, then Sinusoidal filters cannot be installed on the output.
2. Sinusoidal filters have strict limits on the output frequency (Pr.C2-17), carrier frequency (Pr.A5-00) and sometimes also on modulation type. Check the datasheet of the sine-wave filter and contact Delta for more information on how to set the drive to make sure that those limits never get exceeded.

Following table shows the sine-wave filter specification of Delta VP3000

380V–460V, 50 / 60 Hz

460V Model	kW	HP	Rated Current (Arms) Normal Duty	Suggested Sine-Wave Filter Part #	Output Cable Length (m) (Shielded or Non-Shielded)
VFD3A0VP43A	0.75	1	3	OSF-0015-EISA-E4M0	500
VFD4A2VP43A	1.5	2	4.2	OSF-0015-EISA-E4M0	500
VFD5A6VP43A	2.2	3	5.6	OSF-0015-EISA-E4M0	500
VFD7A2VP43A	3	4	7.2	OSF-0015-EISA-E4M0	500
VFD011VP43A	4	5.3	11	OSF-0015-EISA-E4M0	500
VFD013VP43A	5.5	7.5	13	OSF-0015-EISA-E4M0	500
VFD018VP43A	7.5	10	18	OSF-0020-EISA-E3M0	500
VFD025VP43A	11	15	25	OSF-0030-EISA-E2M0	500
VFD032VP43A	15	20	32	OSF-0040-EISA-E1M4	500
VFD038VP43A	18.5	25	38	OSF-0040-EISA-E1M4	500
VFD045VP43A	22	30	45	OSF-0050-EISA-E1M2	500
VFD062VP43A	30	40	62	OSF-0080-EISA-EM80	500
VFD073VP43A	37	50	73	OSF-0080-EISA-EM80	500
VFD091VP43A	45	60	91	OSF-0090-EISA-EM65	500
VFD110VP43A	55	75	110	OSF-0120-EISA-EM52	500
VFD150VP43A	75	100	150	OSF-0150-EISA-EM45	500
VFD180VP43A	90	125	180	OSF-0200-EISA-EM35	500
VFD220VP43A	110	150	220	OSF-0250-EISA-EM30	500
VFD260VP43A	132	175	260	OSF-0300-EISA-EM24	500
VFD310VP43A	160	215	310	OSF-0360-EISA-EM20	500
VFD370VP43A	185	250	370	OSF-0450-EISA-EM15	500
VFD395VP43A	200	270	395	OSF-0450-EISA-EM15	500
VFD460VP43A	220	300	460	OSF-0500-EISA-EM15	500
VFD485VP43A	250	340	485	OSF-0500-EISA-EM15	500
VFD530VP43A	280	375	530	OSF-0600-EISA-EM12	500
VFD616VP43A	315	425	616	OSF-0660-EISA-EM10	500
VFD683VP43A	355	475	683	OSF-0750-EISA-EM09	500
VFD770VP43A	400	530	770	OSF-0900-EISA-E75U	500
VFD866VP43A	450	600	866	OSF-0900-EISA-E75U	500
VFD930VP43A	500	665	930	OSF-1000-EISA-E60U	500
VFD1K1VP43A	560	745	1100	OSF-1200-EISA-E65U	500
VFD1K2VP43A	630	840	1212	OSF-1200-EISA-E65U	500

NOTE: Refer to the following URL for more information of sine-wave filter

https://www.eagtop.com/page99?_l=en&product_id=440

Table 10-51

10-3-2 Zero Phase Reactor

You can also suppress interference by installing a zero-phase reactor at the main input or the motor output of the drive, depending on the location of the interference. Delta provides two types of zero-phase reactors to solve interference problems.

A. Casing with mechanical fixed part

This solution is for the main input / motor output side and can withstand higher loading and be used at higher frequencies. You can get higher impedance by increasing the number of turns.

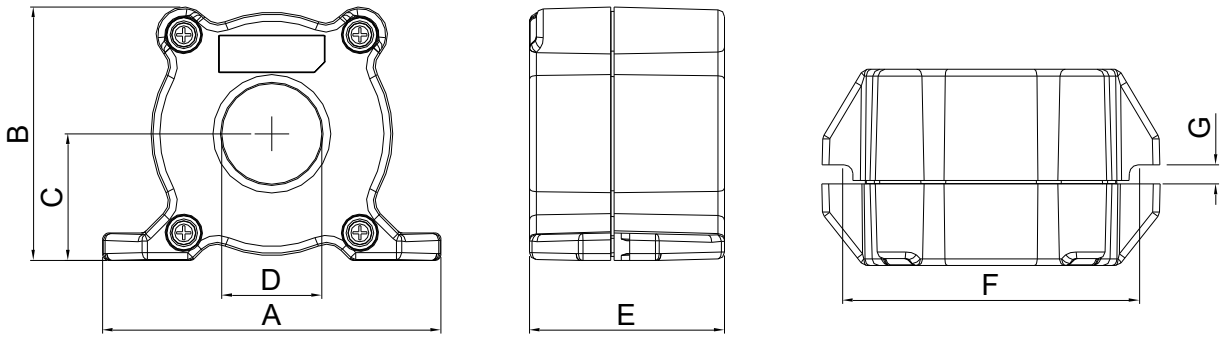


Figure 10-54

Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	Torque
RF008X00A	98 (3.858)	73 (2.874)	36.5 (1.437)	29 (1.142)	56.5 (2.224)	86 (3.386)	5.5 (0.217)	< 10 kgf/cm^2
RF004X00A	110 (4.331)	87.5 (3.445)	43.5 (1.713)	36 (1.417)	53 (2.087)	96 (3.780)	5.5 (0.217)	< 10 kgf/cm^2

Table 10-52

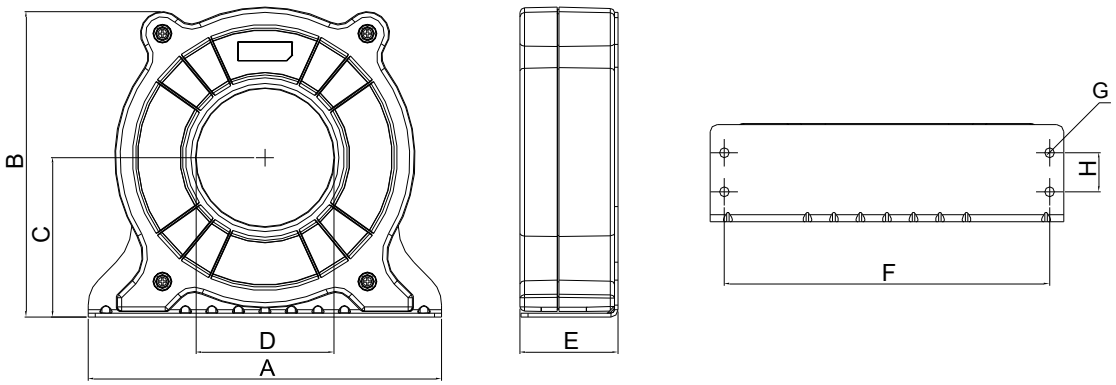


Figure 10-55

Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	H	Torque
RF002X00A	200 (7.874)	172.5 (6.791)	90 (3.543)	78 (3.071)	55.5 (2.185)	184 (7.244)	5.5 (0.217)	22 (0.866)	< 45 kgf/cm^2

Table 10-53

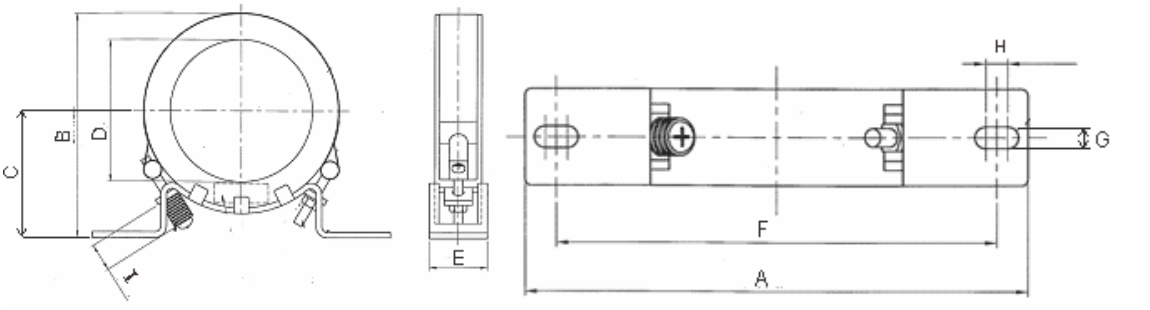


Figure 10-56

Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	H	I
RF300X00A	241 (9.488)	217 (8.543)	114 (4.488)	155 (6.102)	42 (1.654)	220 (8.661)	6.5 (0.256)	7.0 (0.276)	20 (0.787)

Table 10-54

B. Casing without mechanical fixed part

This solution has higher performance: high initial magnetic permeability, high saturation induction density, low iron loss and perfect temperature characteristic. If the zero-phase reactor does not need to be fixed mechanically, use this solution.

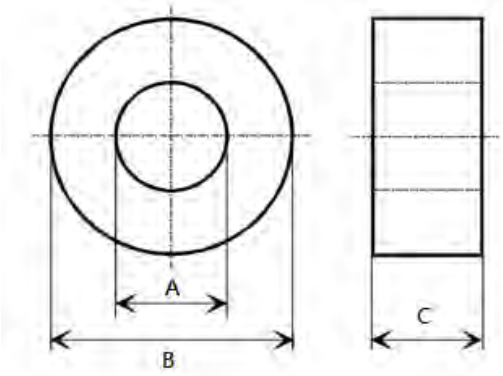


Figure 10-57

Model	A	B	C	Usage
RF008X00N	22.5	43.1	18.5	Motor cable
RF004X00N	36.3	53.5	23.4	Motor cable
RF410X00N	108.1	70	30.3	Motor cable
RF300X00N	166.9	123.9	30.5	Motor cable

Table 10-55

10-3-2-1 Installation

During installation, pass the cable through at least one zero-phase reactor. Use a suitable cable type (insulation class and wire section) so that the cable passes easily through the zero-phase reactor. Do not pass the grounding cable through the zero-phase reactor; only pass the motor wire through the zero-phase reactor.

With longer motor cables the zero-phase reactor can effectively reduce interference at the motor output. Install the zero-phase reactor as close to the output of the drive as possible. Figure A shows the installation diagram for a single turn zero-phase reactor. If the wire diameter allows several turns, Figure B shows the installation of a multi-turn zero-phase reactor. The more turns, the better the noise suppression effect.

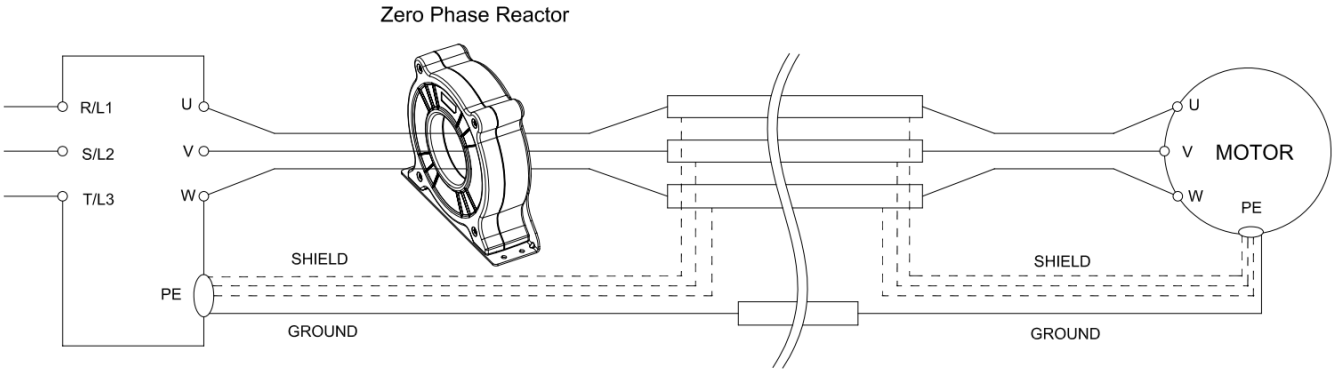


Figure A: Single turn wiring diagram for a shielding wire with a zero-phase reactor

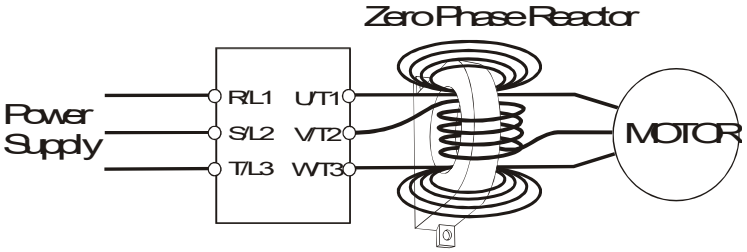


Figure B: Multi-turn zero-phase reactor

10-3-2-2 Installation Notes

Install the zero-phase reactor at the output terminal of the frequency converter (U, V, W). After the zero-phase reactor is installed, it reduces the electromagnetic radiation and load stress emitted by the wiring of the frequency converter. The number of zero-phase reactors required for the drive depends on the wiring length and the drive voltage.

The normal operating temperature of the zero-phase reactor should be lower than 85°C (176°F). However, when the zero-phase reactor is saturated, its temperature may exceed 85°C (176°F). In this case, increase the number of zero-phase reactors to avoid saturation. The following are reasons that might cause saturation of the zero-phase reactors: the drive wiring is too long, the drive has several sets of loads, the wiring is in parallel, or the drive uses high capacitance wiring. If the temperature of the zero-phase reactor exceeds 85°C (176°F) during the operation of the drive, increase the number of zero-phase reactors.

Recommended maximum wiring gauge when installing zero-phase reactor

Model	Recommended wiring gauge	
RF008X00A or RF008X00N	≤ 8 AWG	≤ 8.37 mm^2
RF004X00A or RF004X00N	≤ 4 AWG	≤ 21.15 mm^2
RF002X00A or RF410X00N	≤ 2 AWG	≤ 33.62 mm^2

Table 10-56

10-3-2-3 Zero-phase Reactor for Signal Cable

To solve interference problems between signal cables and electric devices, install a zero-phase reactor on the signal cable. Install it on the signal cable which is the source of the interference to suppress the noise for a better signal. The model names and dimensions are listed in the table below.

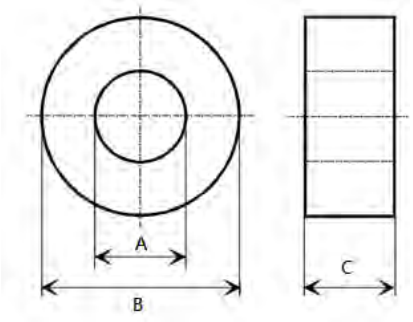


Figure 10-58

Unit: mm

Model	A	B	C	Purpose
RF026X00N	10.7	17.8	8.0	To use with signal cable
RF020X00N	17.5	27.3	12.3	To use with signal cable

Table 10-57

10-3-3 EMC Filter

Following table is the external EMC filter of VP3000 series, user can choose corresponding zero phase reactor and suitable shielded cable length in accord to required noise emission and electromagnetic interference level to have the best configuration to suppress the electromagnetic interference. When the application does not consider RE and only needs CE to comply with C2 or C1, there is no need to install zero phase reactor on the input side.

460V Models

<table>
<tr><th colspan="2">AC Motor Drive</th><th rowspan="3">EMC Filter Model</th><th>Y-Capacitor Accessory</th><th colspan="2">Zero Phase Reactor</th><th rowspan="3">Fc</th><th colspan="2">Conducted Emission</th><th>Radiation Emission</th></tr>
<tr><th rowspan="2">Frame</th><th rowspan="2">Model Name</th><th>Input</th><th>Input</th><th>Output</th><th colspan="2">Output Shielded Cable Length</th><th rowspan="2">EN61800-3*</th></tr>
<tr><th>(R/S/T)</th><th>(R/S/T)</th><th>(U/V/W)</th><th>C1</th><th>C2*</th></tr>
<tr><td rowspan="4">A</td><td>VFD4A2VP43ANTAA</td><td rowspan="4">EMF018A43A</td><td rowspan="12">N/A</td><td rowspan="5">RF008X00N</td><td rowspan="5">RF008X00N</td><td rowspan="5">9 kHz</td><td rowspan="15">50m</td><td rowspan="15">100m</td><td rowspan="15">C2</td></tr>
<tr><td>VFD5A6VP43ANTAA</td></tr>
<tr><td>VFD7A2VP43ANTAA</td></tr>
<tr><td>VFD011VP43ANTAA</td></tr>
<tr><td rowspan="2">B</td><td>VFD013VP43ANTAA</td><td rowspan="2">EMF23AM43B</td></tr>
<tr><td>VFD018VP43ANTAA</td></tr>
<tr><td rowspan="3">C</td><td>VFD025VP43ANTAA</td><td rowspan="3">B84143D0050R127</td><td rowspan="3">RF004X00N</td><td rowspan="3">RF004X00N</td></tr>
<tr><td>VFD032VP43ANTAA</td></tr>
<tr><td>VFD038VP43ANTAA</td></tr>
<tr><td rowspan="2">D</td><td>VFD045VP43ANTCA</td><td rowspan="2">B84143D075R127</td><td rowspan="2">6 kHz</td></tr>
<tr><td>VFD062VP43ANTCA</td><td rowspan="6">RF300X00N</td><td rowspan="6">RF300X00N</td></tr>
<tr><td rowspan="2">E</td><td>VFD073VP43ANTCA</td><td rowspan="2">B84143D0090R127</td></tr>
<tr><td>VFD090VP43ANTCA</td></tr>
<tr><td>F</td><td>VFD110VP43AFTCA</td><td rowspan="2">B84143D0200R127</td><td rowspan="8">CXY101-43A</td></tr>
<tr><td>G</td><td>VFD150VP43AFTCA</td></tr>
<tr><td rowspan="2">H</td><td>VFD180VP43AFTCA</td><td rowspan="4">MIF3400B</td></tr>
<tr><td>VFD220VP43AFTCA</td></tr>
<tr><td>I</td><td>VFD310VP43AFTCA</td><td rowspan="3">3 kHz</td></tr>
<tr><td rowspan="2">J</td><td>VFD370VP43AFTCA</td></tr>
<tr><td>VFD395VP43AFTCA</td></tr>
<tr><td rowspan="2">K</td><td>VFD460VP43AFTCA</td><td rowspan="2">MIF3800</td></tr>
<tr><td>VFD485VP43AFTCA</td></tr>
</table>

Table 10-58

NOTE: * means no need to add Y-capacitor accessory.

Y-capacitor accessory diagram

Model: CXY101-43A

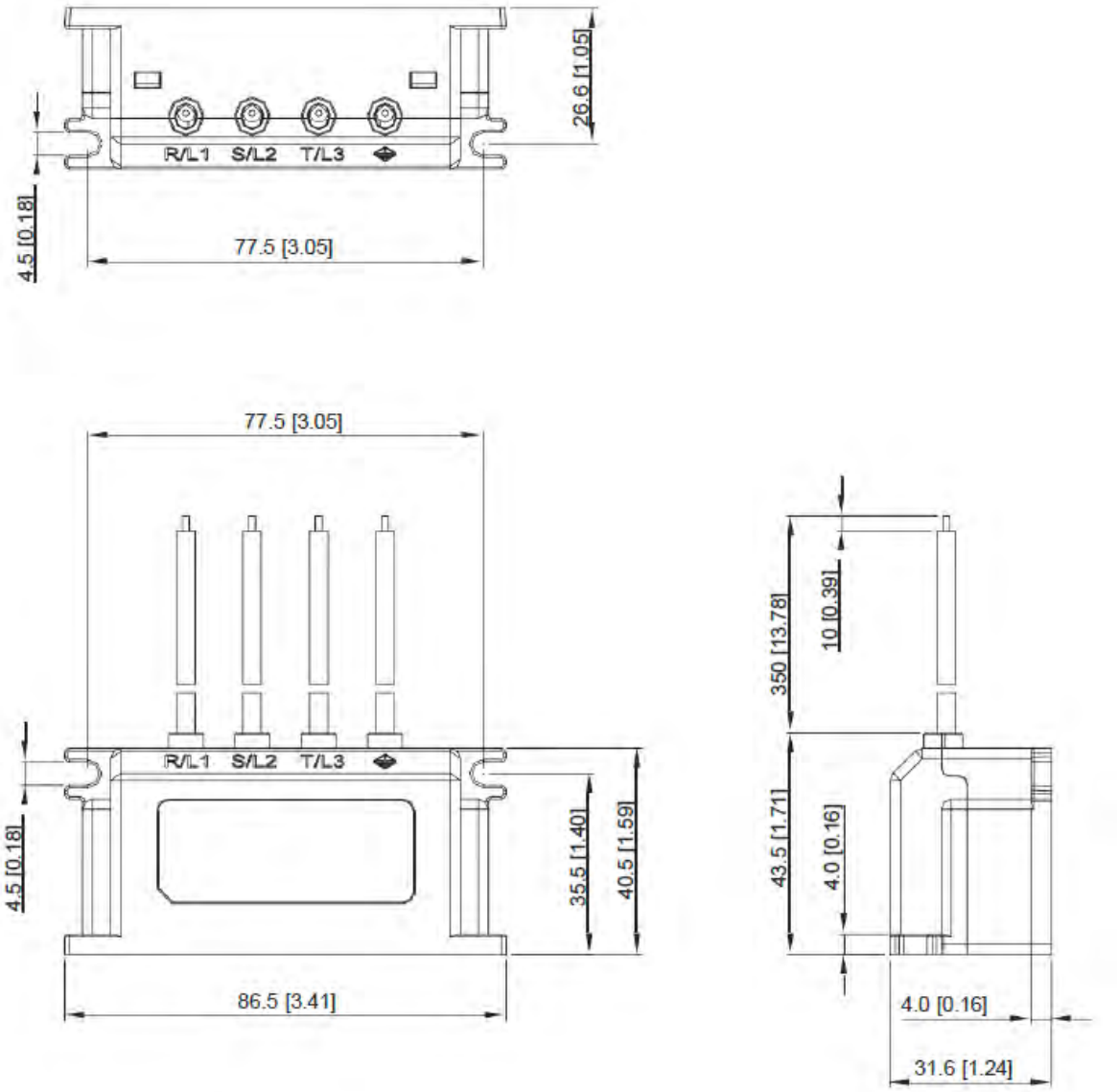


Figure 10-59

Model Name: EMF018A43A

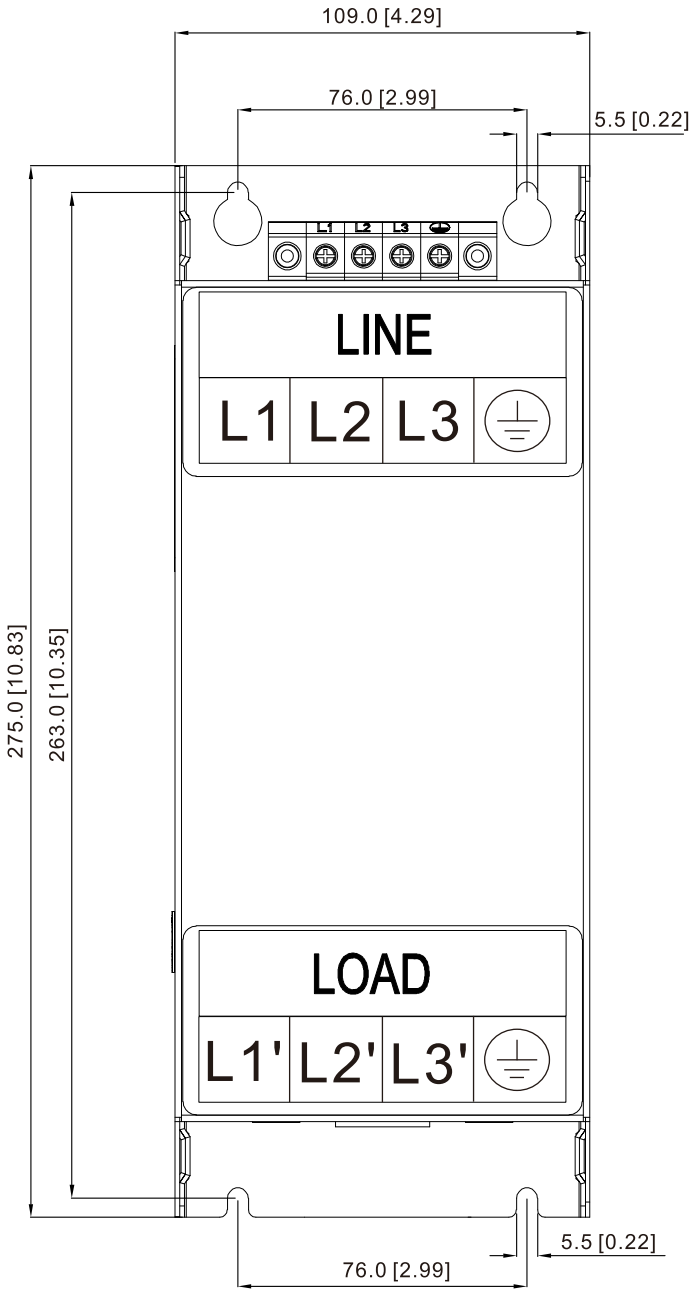


Figure 10-60

Model Name: EMF23AM43B

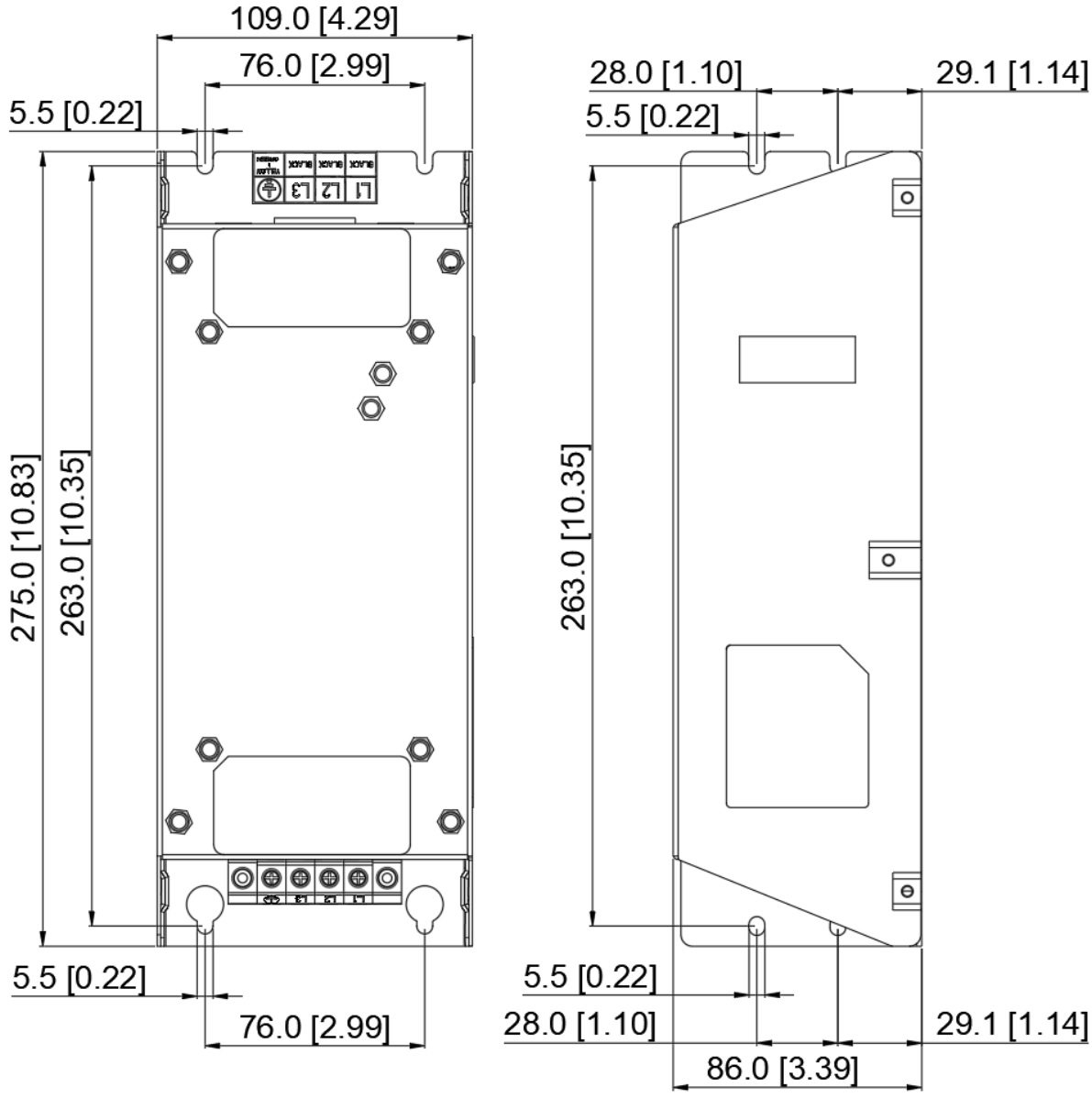


Figure 10-61

Model Name: B84143D0050R127

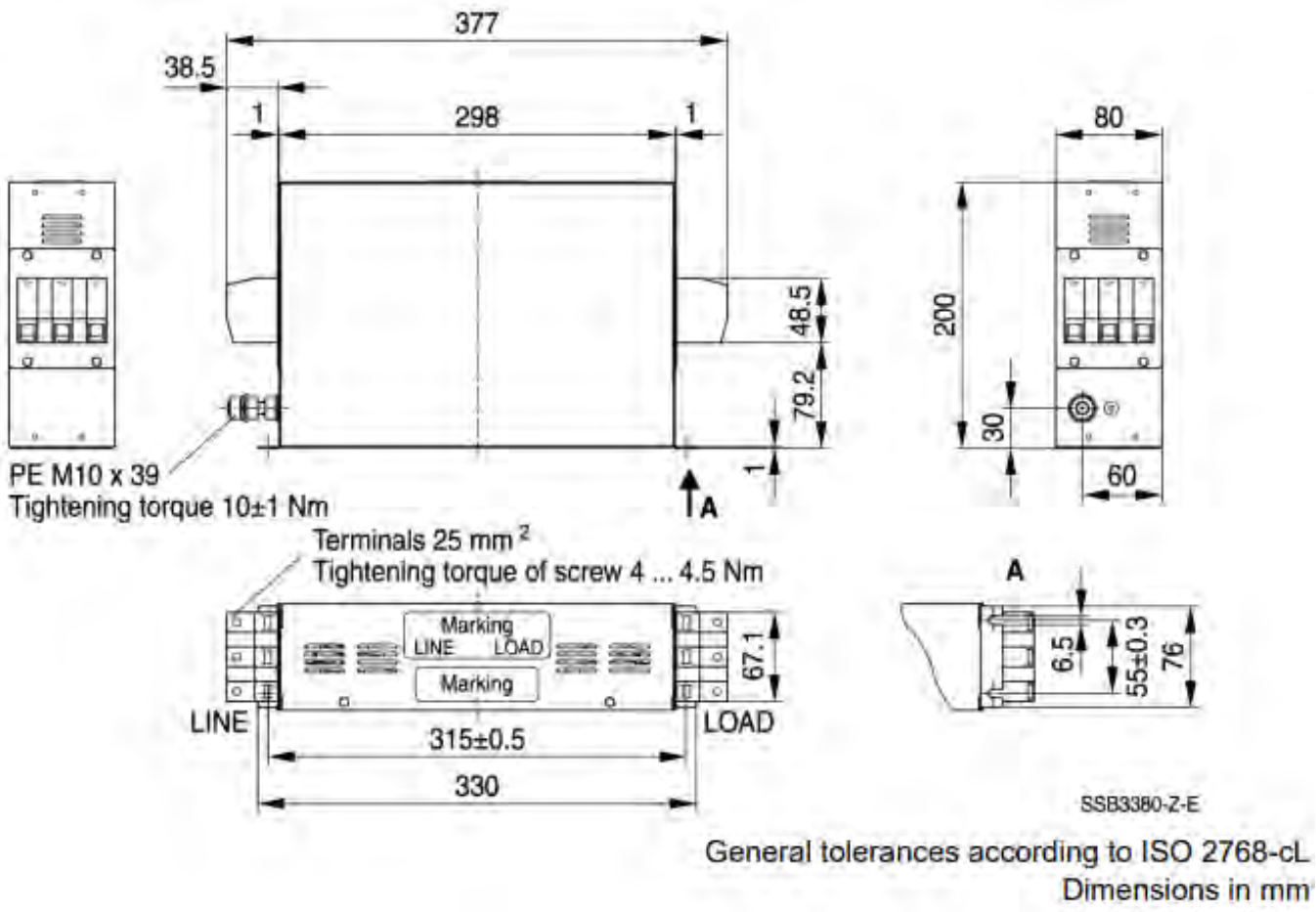


Figure 10-62

Model Name: B84143D0075R127

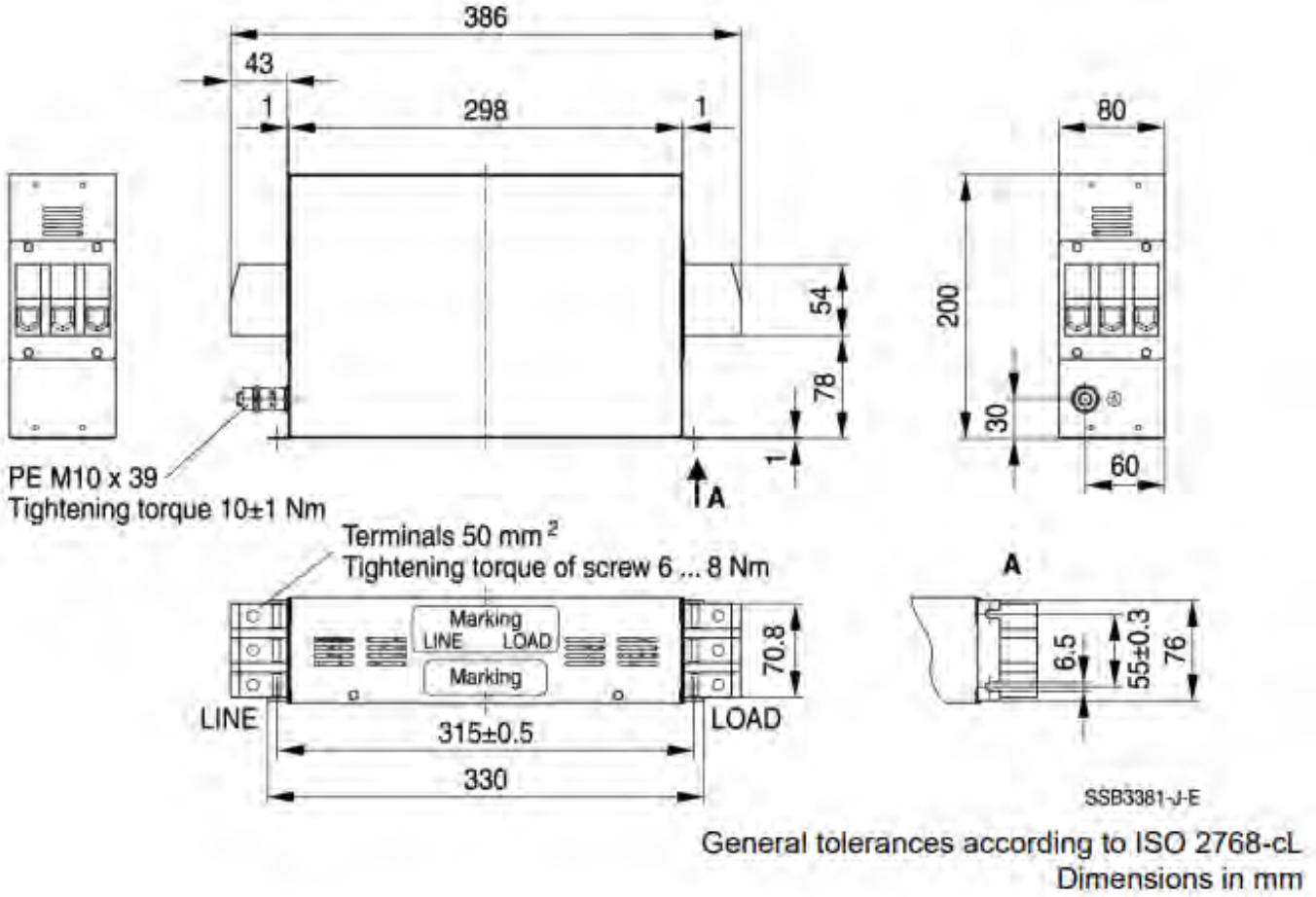


Figure 10-63

Model Name: B84143D0090R127

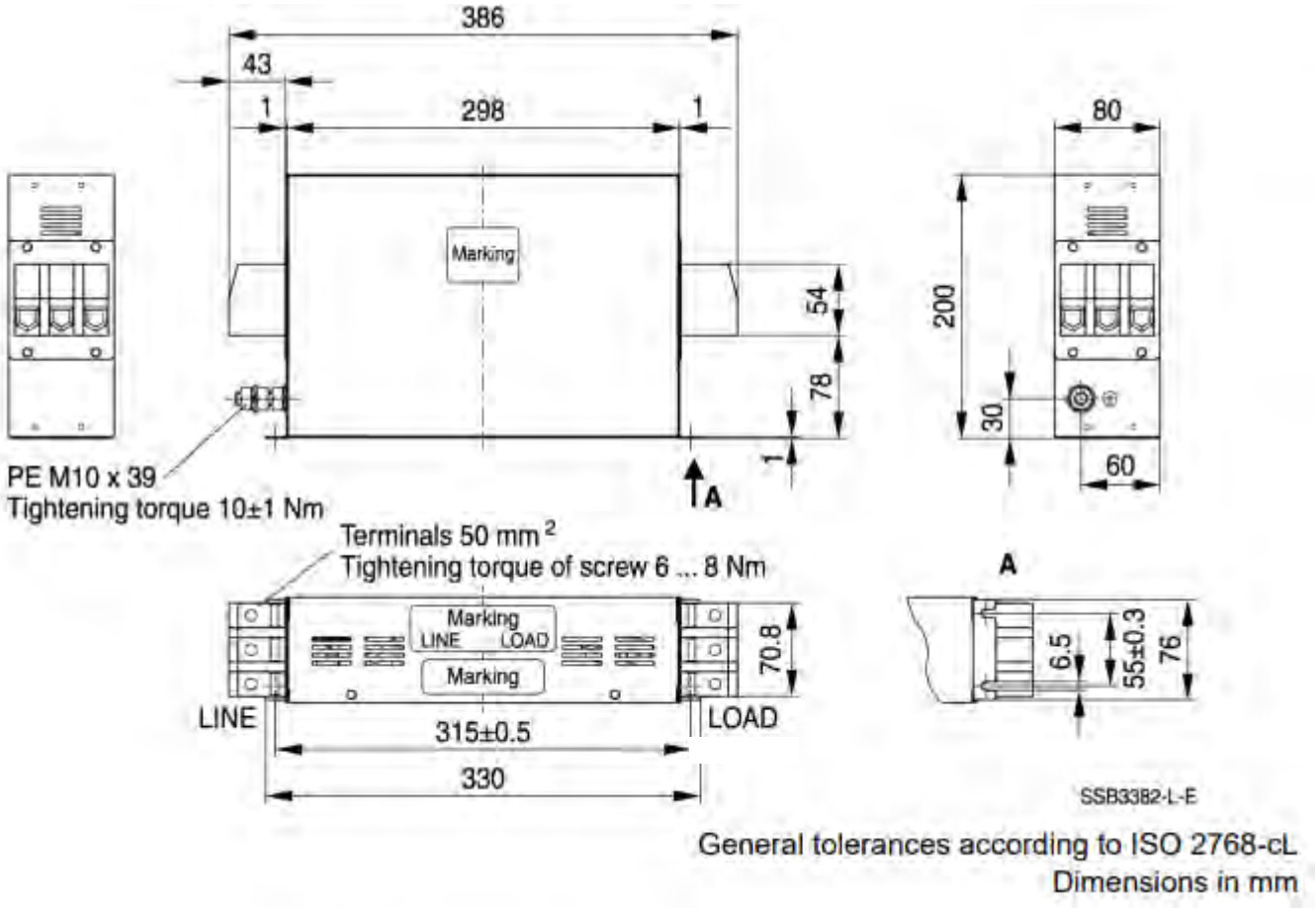


Figure 10-64

Model Name: B84143D0200R127

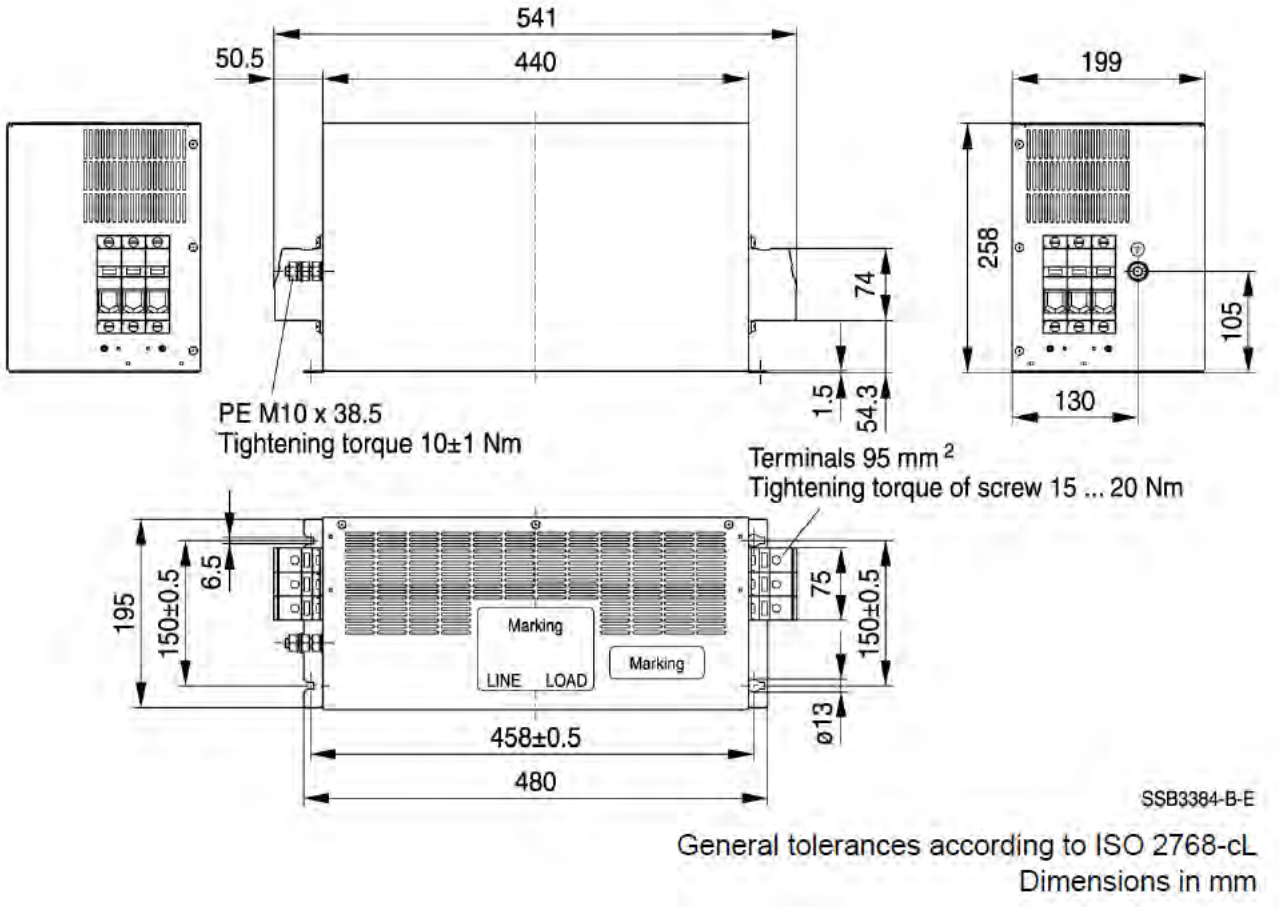


Figure 10-65

Model Name: MIF3400B

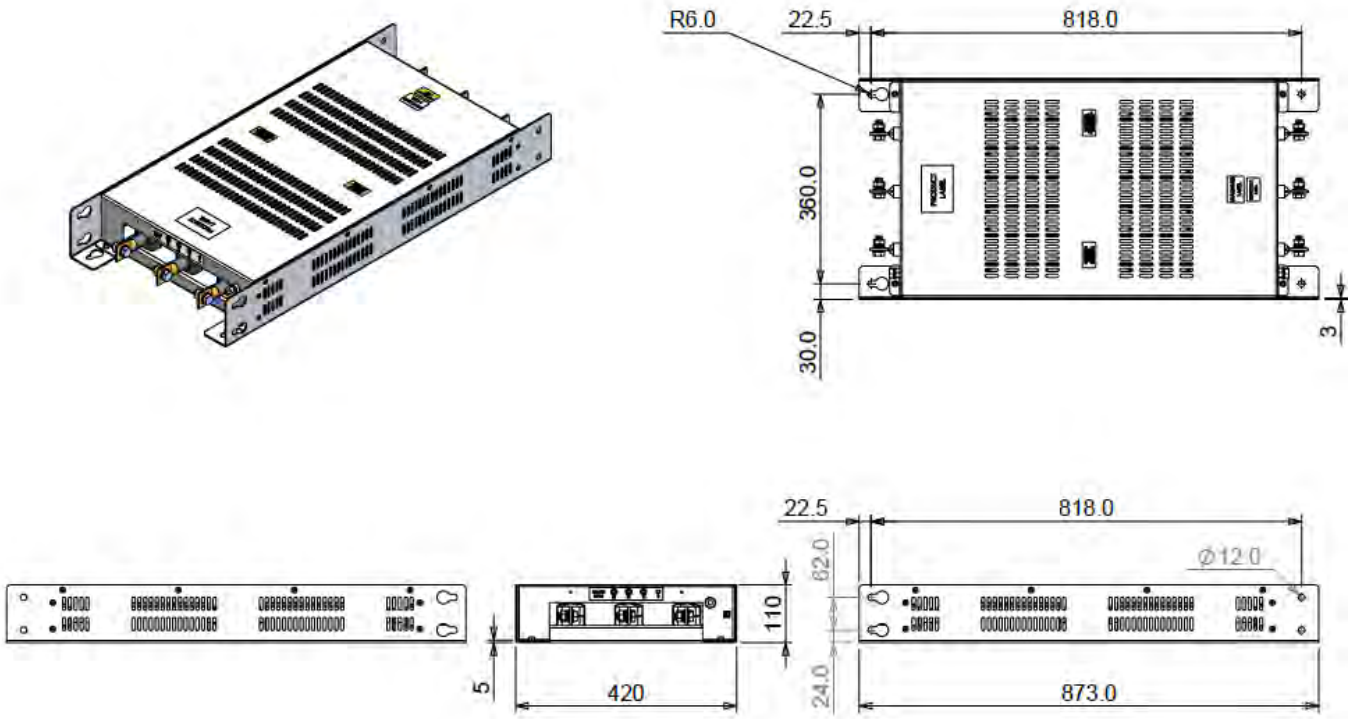


Figure 10-66

Model Name: MIF3800

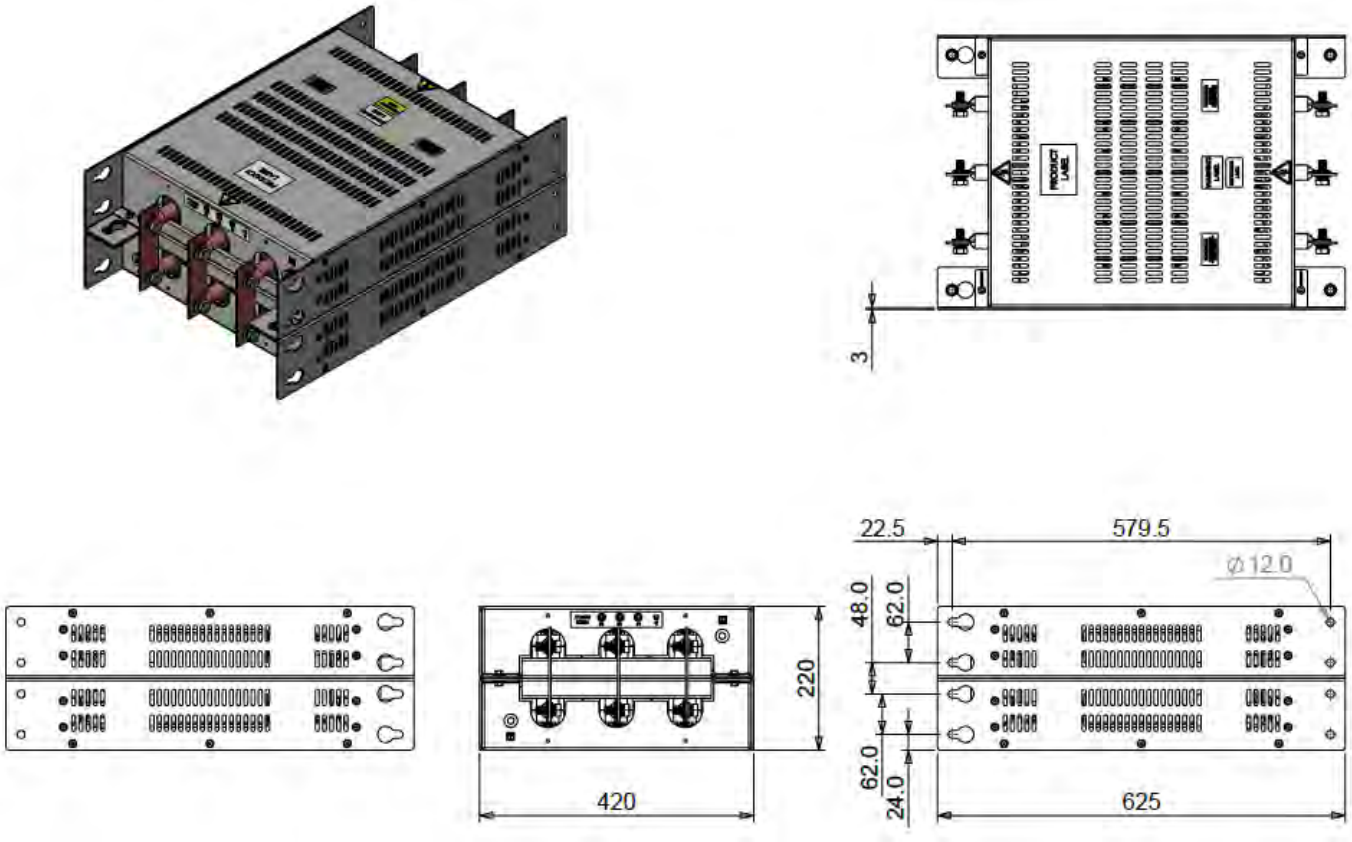


Figure 10-67

VP3000 built-in EMC Filter Overview:

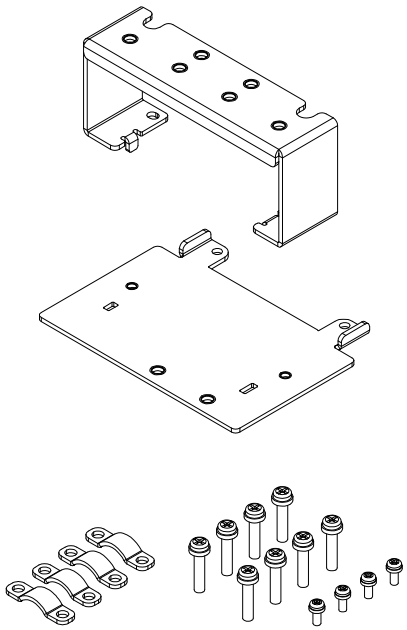
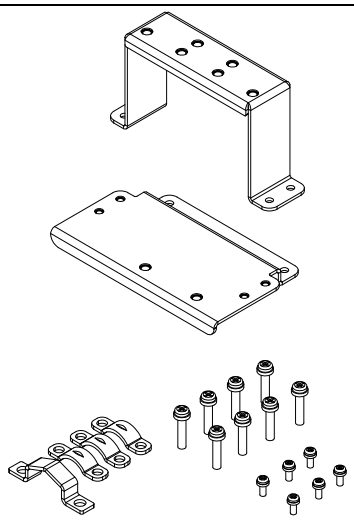
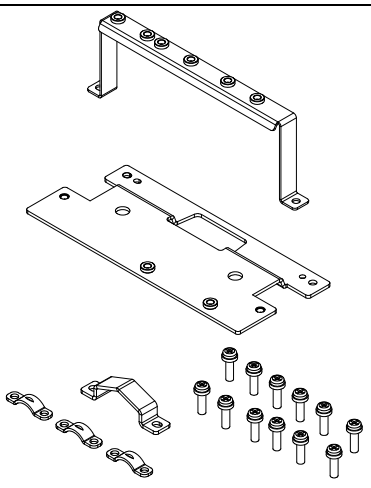
460V (kW)	Model - UL Open Type LED Keypad	Frame	EMC	Model EMC C3 UL Type 1 LCD Keypad	Frame	EMC	Model EMC C2 UL Type 1 LCD Keypad	Frame	EMC
0.75	VFD3A0VP43ANTAA*1	A1	-	VFD3A0VP43BFTAA*1	A2	C3 20m	VFD3A0VP43BSTCA	A2	C2 50m
1.5	VFD4A2VP43ANTAA*1	A1	-	VFD4A2VP43BFTAA*1	A2	C3 20m	VFD4A2VP43BSTCA	A2	C2 50m
2.2	VFD5A6VP43ANTAA*1	A1	-	VFD5A6VP43BFTAA*1	A2	C3 20m	VFD5A6VP43BSTCA	A2	C2 50m
3.7	VFD7A2VP43ANTAA*1	A1	-	VFD7A2VP43BFTAA*1	A2	C3 20m	VFD7A2VP43BSTCA	A2	C2 50m
4	VFD011VP43ANTAA*1	A1	-	VFD011VP43BFTAA*1	A2	C3 20m	VFD011VP43BSTCA	A2	C2 50m
5.5	VFD013VP43ANTAA*1	B1	-	VFD013VP43BFTAA*1	B2	C3 20m	VFD013VP43BSTCA	B2	C2 50m
7.5	VFD018VP43ANTAA*1	B1	-	VFD018VP43BFTAA*1	B2	C3 20m	VFD018VP43BSTCA	B2	C2 50m
11	VFD025VP43ANTAA*1	C1	-	VFD025VP43BFTAA*1	C2	C3 20m	VFD025VP43BSTCA	C2	C2 50m
15	VFD032VP43ANTAA*1	C1	-	VFD032VP43BFTAA*1	C2	C3 20m	VFD032VP43BSTCA	C2	C2 50m
18.5	VFD038VP43ANTAA*1	C1	-	VFD038VP43BFTAA*1	C2	C3 20m	VFD038VP43BSTCA	C2	C2 50m
22	VFD045VP43ANTCA	D1	-	VFD045VP43BFTCA	D2	C3 20m	VFD045VP43BSTCA	D2	C2 50m
30	VFD062VP43ANTCA	D1	-	VFD062VP43BFTCA	D2	C3 20m	VFD062VP43BSTCA	D2	C2 50m
37	VFD073VP43ANTCA	E1	-	VFD073VP43BFTCA	E2	C3 20m	VFD073VP43BSTCA	E2	C2 50m
45	VFD090VP43ANTCA	E1	-	VFD090VP43BFTCA	E2	C3 20m	VFD090VP43BSTCA	E2	C2 50m
55	VFD110VP43AFTCA	F1	C3 50m	VFD110VP43BFTCA	F2	C3 50m	VFD110VP43BSTCA	F2	C2 50m
75	VFD150VP43AFTCA	G1	C3 50m	VFD150VP43BFTCA	G2	C3 50m	VFD150VP43BSTCA	G2	C2 50m
90	VFD180VP43AFTCA	H1	C3 50m	VFD180VP43BFTCA	H2	C3 50m	VFD180VP43BSTCA	H2	C2 50m
110	VFD220VP43AFTCA	H1	C3 50m	VFD220VP43BFTCA	H2	C3 50m	VFD220VP43BSTCA	H2	C2 50m
132	VFD260VP43AFTCA	I1	C3 50m	VFD260VP43BFTCA	I2	C3 50m	VFD260VP43BSTCA	I2	C2 50m
160	VFD310VP43AFTCA	I1	C3 50m	VFD310VP43BFTCA	I2	C3 50m	VFD310VP43BSTCA	I2	C2 50m
185	VFD370VP43AFTCA	J1	C3 50m	VFD370VP43BFTCA	J2	C3 50m	VFD370VP43BSTCA	J2	C2 50m
200	VFD395VP43AFTCA	J1	C3 50m	VFD395VP43BFTCA	J2	C3 50m	VFD395VP43BSTCA	J2	C2 50m
220	VFD460VP43AFTCA	K1	C3 50m	VFD460VP43BFTCA	K2	C3 50m	VFD460VP43BSTCA	K2	C2 50m
250	VFD485VP43AFTCA	K1	C3 50m	VFD485VP43BFTCA	K2	C3 50m	VFD485VP43BSTCA	K2	C2 50m
280	-	-	-	VFD530VP43SHTCA*2	L	C3 150m	-	-	-
315	-	-	-	VFD616VP43SHTCA*2	L	C3 150m	-	-	-
350	-	-	-	VFD683VP43SHTCA*2	L	C3 150m	-	-	-
400	-	-	-	VFD770VP43SHTCA*2	L	C3 150m	-	-	-
450	-	-	-	VFD866VP43SHTCA*2	M	C3 150m	-	-	-
500	-	-	-	VFD930VP43SHTCA*2	M	C3 150m	-	-	-
560	-	-	-	VFD1K1VP43SHTCA*2	M	C3 150m	-	-	-
630	-	-	-	VFD1K2VP43SHTCA*2	M	C3 150m	-	-	-

* **NOTE:** Table 10-59

1. *1 E-CAP models.
2. *2 Chassis open type models (Frame L & M).

10-3-4 EMC Plate

10-3-4-1 EMC Plate (use shielded cable)

Frame	Applicable Models	EMC Plate Model	Diagram
A	**Type 1** VFD3A0VP43BFTAA VFD4A2VP43BFTAA VFD5A6VP43BFTAA VFD7A2VP43BFTAA VFD011VP43BFTAA	MKVP-EPB	 Figure 10-68
	Open Type VFD011VP43ANTAA VFD3A0VP43ANTAA VFD4A2VP43ANTAA VFD5A6VP43ANTAA VFD7A2VP43ANTAA		
B	**Type 1** VFD013VP43BFTAA VFD018VP43BFTAA		
	Open Type VFD013VP43ANTAA VFD018VP43ANTAA		
C	**Open Type** VFD025VP43ANTAA VFD032VP43ANTAA VFD038VP43ANTAA	MKVP-EPC	 Figure 10-69
D	**TYPE1** VFD045VP43BFTCA VFD062VP43BFTCA VFD045VP43BSTCA VFD062VP43BSTCA	MKVP-EPD	 Figure 10-70
	Open Type VFD045VP43ANTCA VFD062VP43ANTCA		

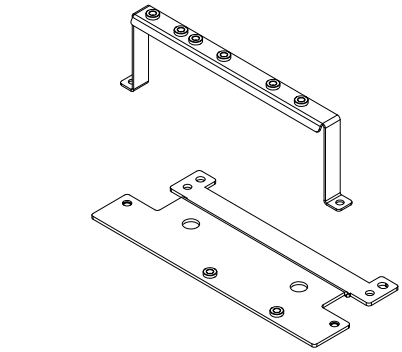
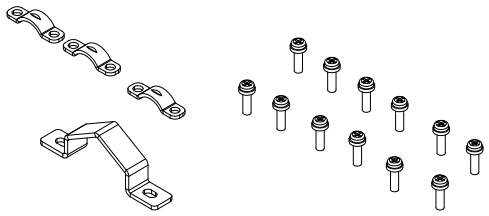
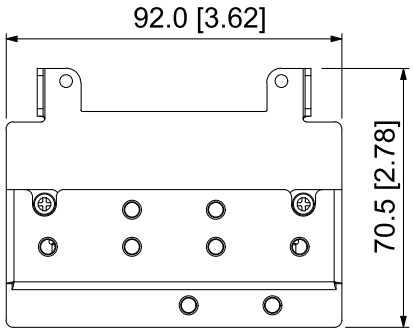
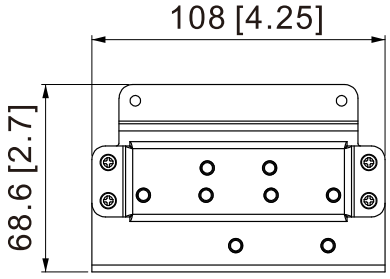
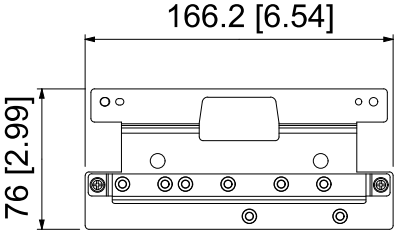
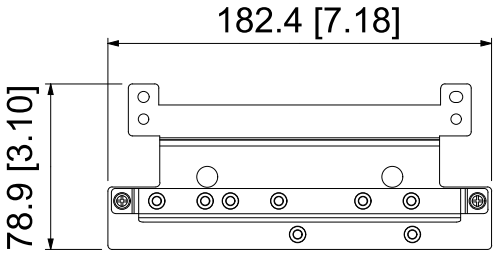
Frame	Applicable Models	EMC Plate Model	Diagram
E	**TYPE1** VFD073VP43BFTCA VFD090VP43BFTCA VFD073VP43BSTCA VFD090VP43BSTCA	MKVP-EPE	
	Open Type VFD073VP43ANTCA VFD090VP43ANTCA		

Figure 10-71

10-3-4-2 Dimension

Frame	EMC Plate Model	Dimension - Unit: mm (inch)
A–B	MKVP-EPB	 Figure 10-72
C	MKVP-EPC	 Figure 10-73
D	MKVP-EPD	 Figure 10-74

Frame	EMC Plate Model	Dimension - Unit: mm (inch)
E	MKVP-EPE	 Figure 10-75

NOTE:

1. For EMC plate installation instruction, refer to Section 2-6 EMC Plate Installation.
2. The EMC plate for Frame F–H are shipped with the AC motor drive, which is not an optional accessory. Refer to Section 2-6 EMC Plate Installation for further instructions.

10-3-5 Panel Mounting (MKV-KPPK)

For MKV-KPPK model, user can choose wall mounting or embedded mounting, protection level is IP56.

Applicable to the digital keypad KPV-CC01 & KPV-CE02.

Wall Mounting

Accessory*1

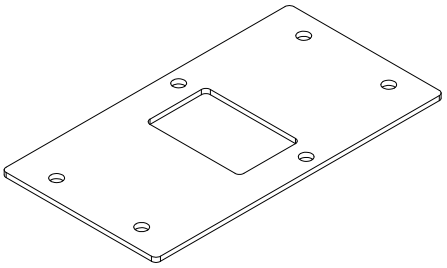


Figure 10-76

Screw*6 - M4*p0.7*L8mm*6

Screw torque: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

Panel cutout dimension Unit: mm (inch)

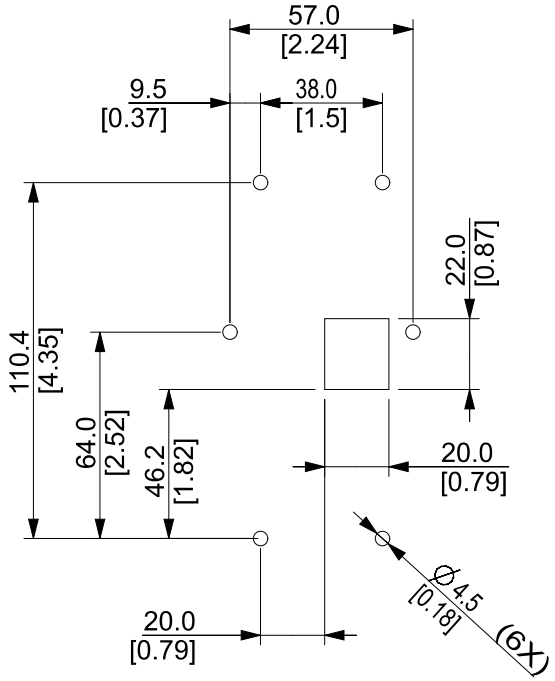


Figure 10-78

Embedded Mounting

Accessory*2

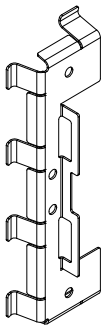


Figure 10-77

Screw*6 - M4*p0.7*L8mm*6

Screw torque: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

Panel cutout dimension Unit: mm (inch)

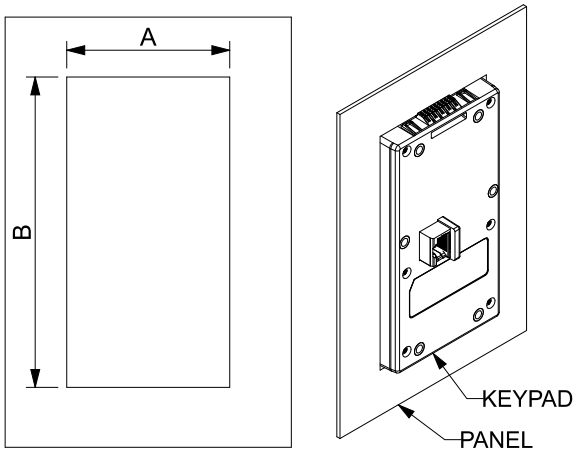


Figure 10-79

Normal cutout dimension

Unit: mm (inch)

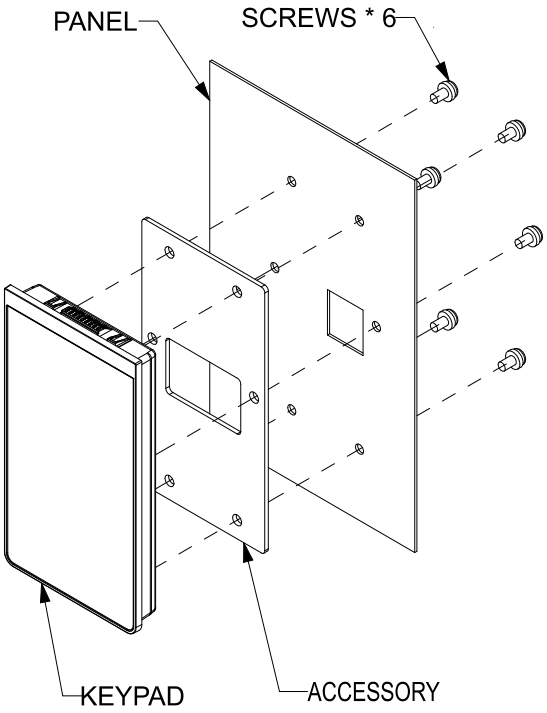
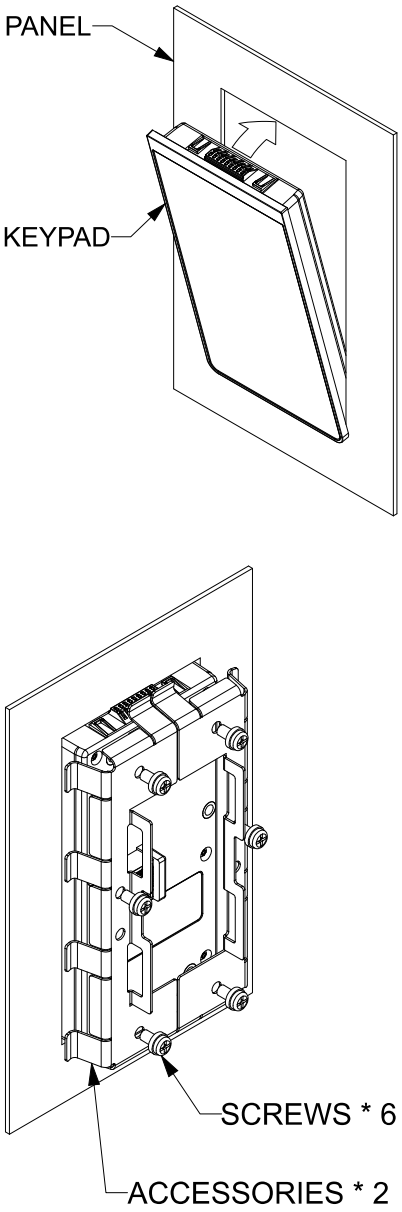
Panel Thickness	1.2 mm	1.6 mm	2.0 mm
A	68.3 (2.69)		
B	127.3 (5.01)	128.5 (5.06)	129.9 (5.11)

Deviation: ±0.15 mm / ±0.0059 inch Table 10-60

Cutout dimension (Waterproof level: IP56)

Panel Thickness	1.2 mm	1.6 mm	2.0 mm
A	68.3 (2.69)		
B	127.9 (5.07)		

Deviation: ±0.15 mm / ±0.0059 inch Table 10-61

Wall Mounting	Embedded Mounting
 Figure 10-80	 Figure 10-81

10-3-6 Fan Kit

- Appearance

NOTE:

1. The fan does not support hot swap function. For replacement, turn the power off before replacing the fan.
2. Refer to Chapter 9 Maintenance and Inspections for the description of Fan kit installation.

Frame A

Heat Sink Fan Model “MKVP-AFKM”

Applicable Models

Open Type

VFD011VP43ANTAA; VFD3A0VP43ANTAA; VFD4A2VP43ANTAA; VFD5A6VP43ANTAA; VFD7A2VP43ANTAA

Type 1

VFD3A0VP43BFTAA; VFD4A2VP43BFTAA; VFD5A6VP43BFTAA; VFD7A2VP43BFTAA; VFD011VP43BFTAA

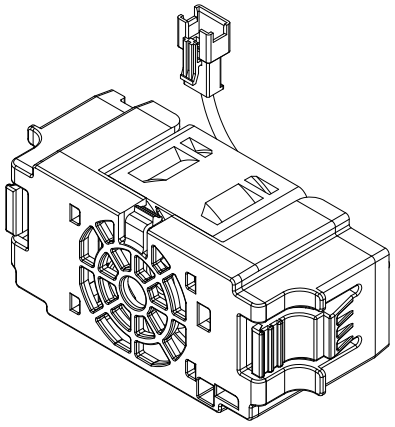


Figure 10-82

Frame B

Heat Sink Fan Model “MKVP-BFKM”

Applicable Models

Open Type

VFD013VP43ANTAA; VFD018VP43ANTAA

Type 1

VFD013VP43BFTAA; VFD018VP43BFTAA

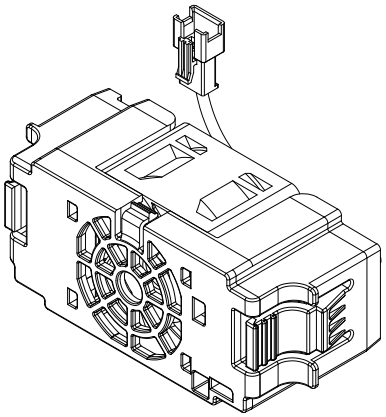


Figure 10-83

Frame B3

Heat Sink Fan Model “MKVP-BFKM1”

Applicable Models

VFD4A2VP43BSTCA; VFD5A6VP43BSTCA; VFD7A2VP43BSTCA; VFD011VP43BSTCA; VFD013VP43BSTCA; VFD018VP43BSTCA

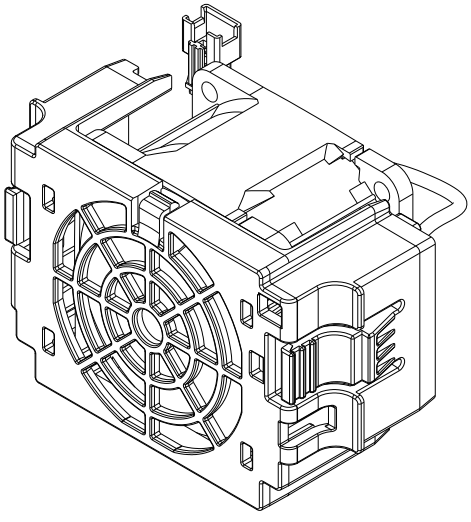


Figure 10-84

Frame C

Heat Sink Fan Model “MKVP-CFKM”

Applicable Models

VFD025VP43BFTAA; VFD032VP43BFTAA;
VFD038VP43BFTAA; VFD025VP43ANTAA;
VFD032VP43ANTAA; VFD038VP43ANTAA
VFD025VP43BSTCA; VFD032VP43BSTCA;
VFD038VP43BSTCA

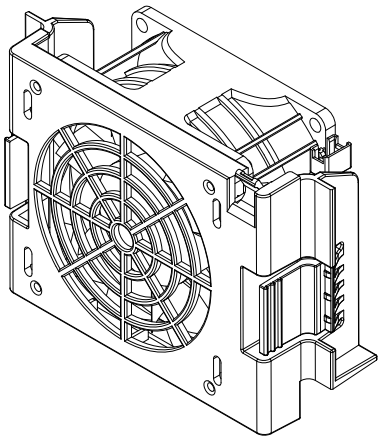


Figure 10-85

Frame D

Heat Sink Fan Model “MKVP-DFKM”

Applicable Models

Open Type

VFD045VP43ANTCA; VFD062VP43ANTCA

Type 1

VFD045VP43BFTCA; VFD062VP43BFTCA;
VFD045VP43BSTCA; VFD062VP43BSTCA

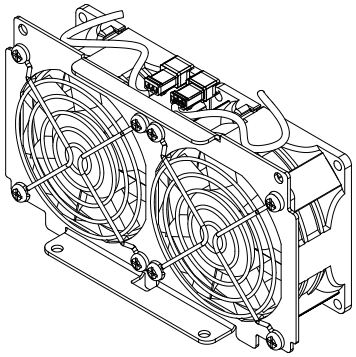


Figure 10-86

Frame E

Heat Sink Fan Model “MKVP-EFKM”

Applicable Models

Open Type

VFD073VP43ANTCA; VFD090VP43ANTCA

Type 1

VFD073VP43BFTCA; VFD090VP43BFTCA;
VFD073VP43BSTCA; VFD090VP43BSTCA

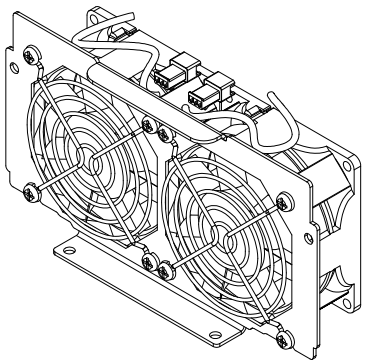


Figure 10-87

Frame F

Heat Sink Fan Model “MKVP-FFKM1”

Applicable Models

Open Type

VFD110VP43AFTCA

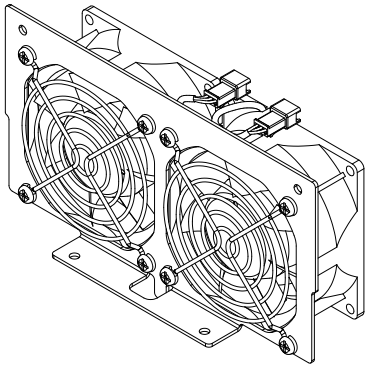


Figure 10-88

Frame F

Heat Sink Fan Model “MKVP-FFKM2”

Applicable Models

Type 1

VFD110VP43BFTCA; VFD110VP43BSTCA

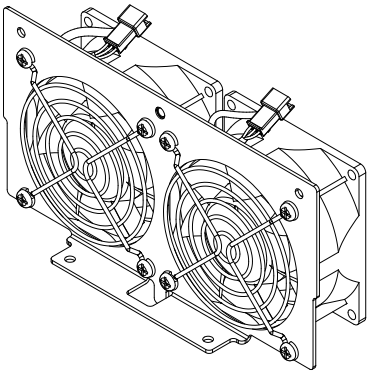


Figure 10-89

Frame G

Heat Sink Fan Model “MKVP-GFKM1”

Applicable Models

Open Type

VFD150VP43AFTCA

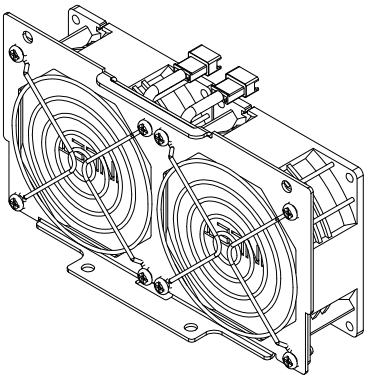


Figure 10-90

Frame G

Heat Sink Fan Model “MKVP-GFKM2”

Applicable Models

Type 1

VFD150VP43BSTCA; VFD150VP43BFTCA

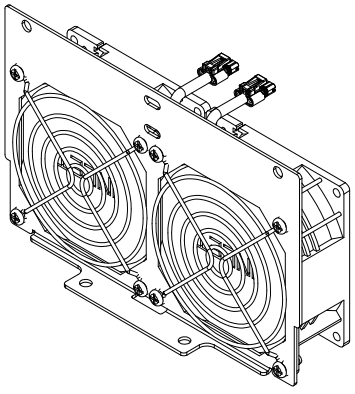


Figure 10-91

Frame H

Heat Sink Fan Model “MKVP-HFKM1”

Applicable Models

Open Type

VFD180VP43AFTCA; VFD220VP43AFTCA

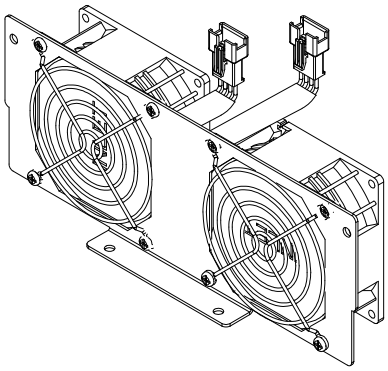


Figure 10-92

Frame H

Heat Sink Fan Model “MKVP-HFKM2”

Applicable Models

Type 1

VFD180VP43BFTCA; VFD220VP43BFTCA;
VFD180VP43BSTCA; VFD220VP43BSTCA

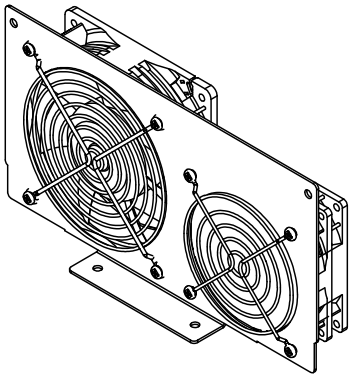


Figure 10-93

Frame I

Heat Sink Fan Model “MKVP-IFKM”

Applicable Models

Open Type

VFD260VP43AFTCA; VFD310VP43AFTCA

Type 1

VFD260VP43BFTCA; VFD310VP43BFTCA;
VFD260VP43BSTCA; VFD310VP43BSTCA

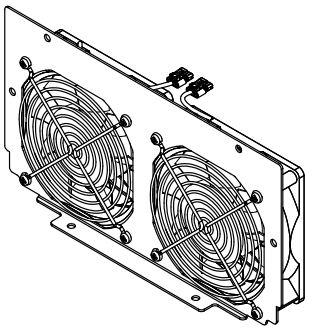


Figure 10-94

Frame J

Heat Sink Fan Model “MKVP-JFKM”

Applicable Models

VFD370VP43AFTCA; VFD395VP43AFTCA;
VFD370VP43BFTCA; VFD395VP43BFTCA;
VFD370VP43BSTCA; VFD395VP43BSTCA

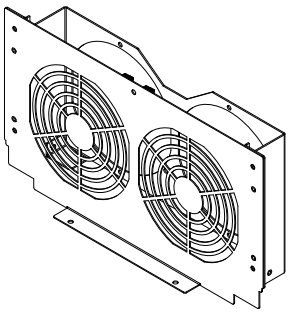


Figure 10-95

Frame K

Heat Sink Fan Model “MKVP-KFKM”

Applicable Models

VFD460VP43AFTCA; VFD485VP43AFTCA;
VFD460VP43BFTCA; VFD485VP43BFTCA;
VFD460VP43BSTCA; VFD485VP43BSTCA

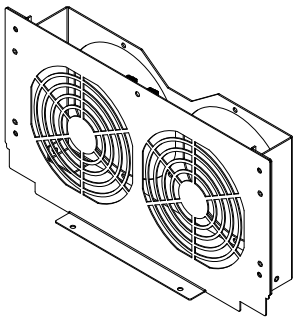


Figure 10-96

Frame L

Heat Sink Fan Model “MKVP-MFKM”

Applicable Models

VFD530VP43SHTCA; VFD616VP43SHTCA;
VFD683VP43SHTCA; VFD770VP43SHTCA

Frame M

VFD866VP43SHTCA; VFD930VP43SHTCA;
VFD1K1VP43SHTCA; VFD1K2VP43SHTCA

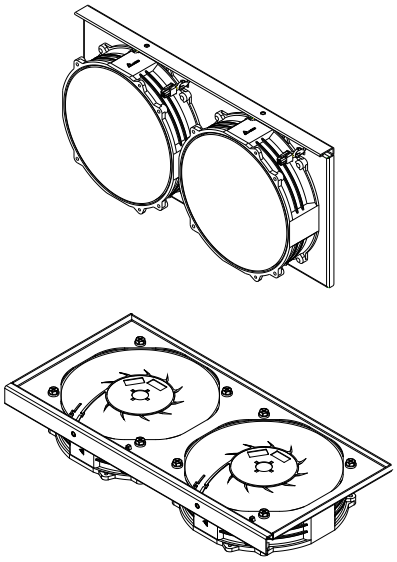


Figure 10-97

10-3-7 Chassis Rail (MKVP-CR01)

Frame L

Applicable models:

VFD530VP43SHTCA; VFD616VP43SHTCA;
VFD683VP43SHTCA; VFD770VP43SHTCA

Frame M

Applicable models:

VFD866VP43SHTCA; VFD930VP43SHTCA;
VFD1K1VP43SHTCA; VFD1K2VP43SHTCA

Model『MKVP-CR01』

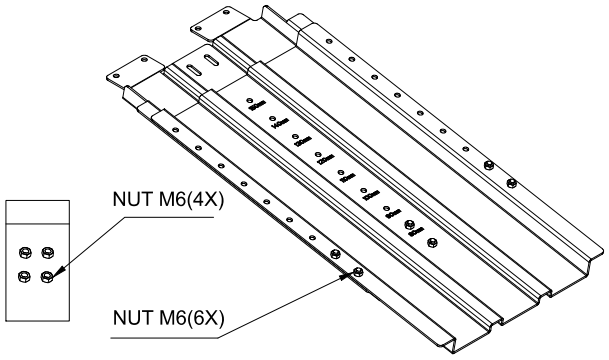


Figure 10-98

Recommended applicable range

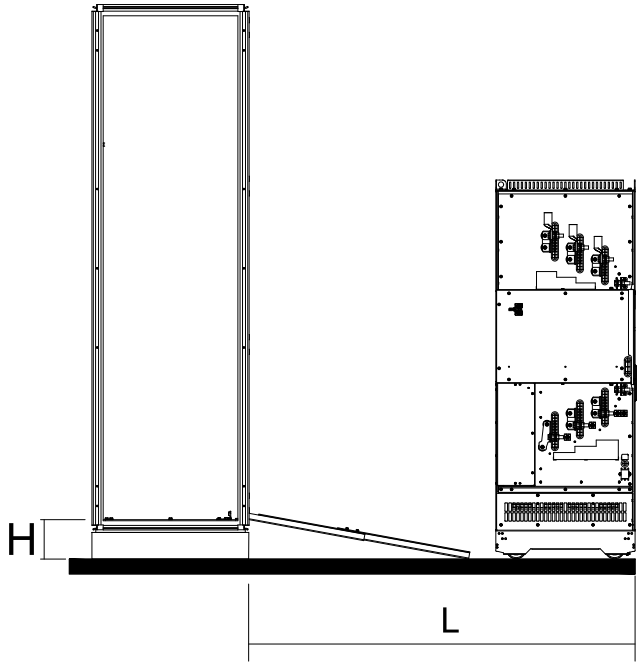


Figure 10-99

Cabinet Height Difference H (mm)	Recommended Installing Distance L (mm)
50	980
60	978
70	976
80	1103
90	1142
100	1181
110	1220
120	1259
130	1298
140	1337
150	1375

Table 10-62

NOTE:

1. For the AC motor drive dimensions, refer to Section 2-5 Appearance and Dimensions.
2. For unpacking the AC motor drive, refer to Section 2-4-1 Unpacking.
3. For lifting the AC motor drive, refer to Section 2-4-2 The Lifting Hook.
4. For installing the Chassis, refer to Section 2-4-5 Chassis Installation.

Installation

1. Use 10 pcs of M6 screws and 2 pcs of M8 screws to lock the chassis rail to the cabinet.
   M6 Screw torque: 35–45 kg-cm / (30.4–39.1 lb-in.) / (3.43–4.41 Nm)
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

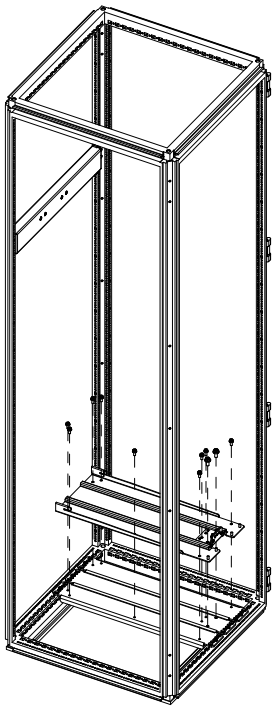


Figure 10-100

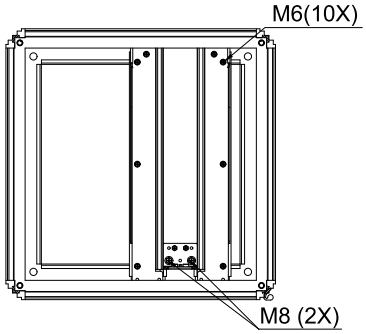


Figure 10-101

2. Use 4 pcs of M6 screws to lock the slide rail to the cabinet. Adjust the length according to the marking on the slide rail, and then fix it with the 6 pcs screws on the rail.
   M6 Screw torque: 35–45 kg-cm / (30.4–39.1 lb-in.) / (3.43–4.41 Nm)

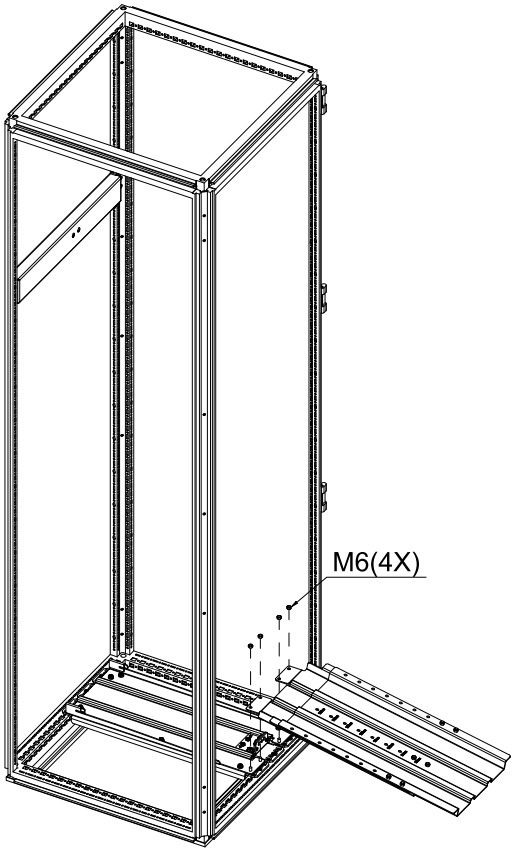


Figure 10-102

The cabinet height difference (H) is between 50–70 mm

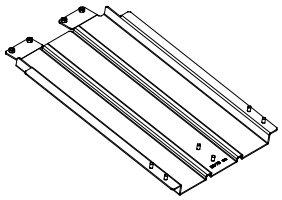


Figure 10-103

The cabinet height difference (H) is between 80–150 mm

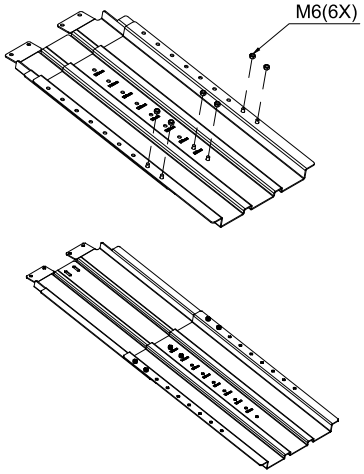


Figure 10-104

3. Install the safety buckle and push the drive into the cabinet along the slide rail. Make sure the cabinet is well fixed before pushing the drive.

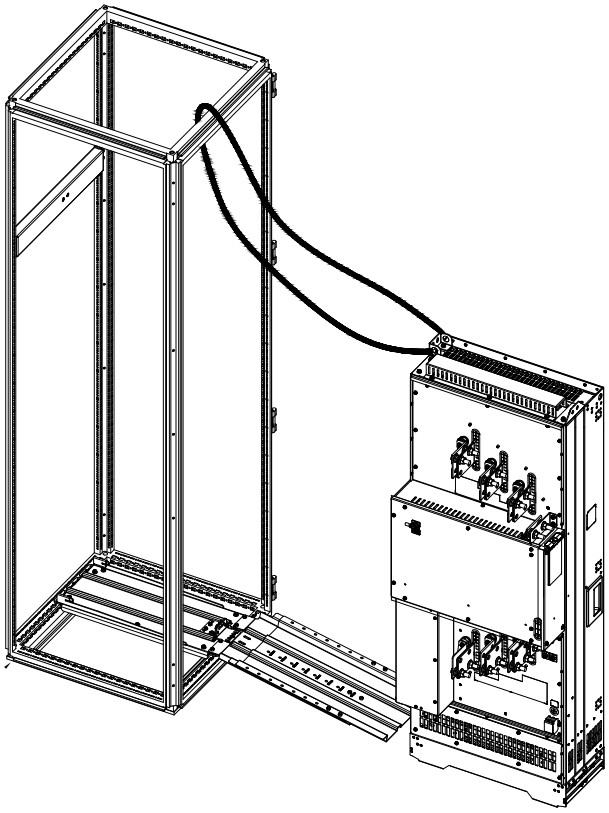


Figure 10-105

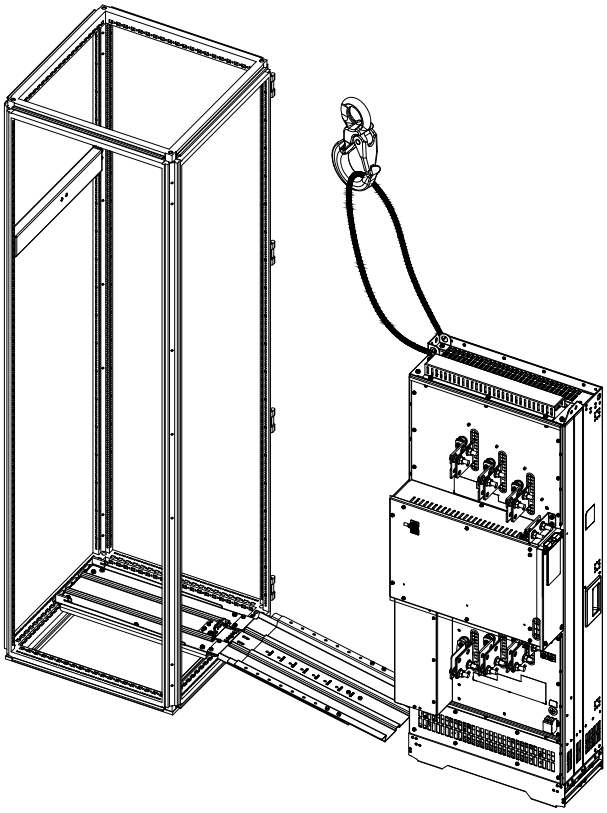


Figure 10-106

4. Use 4 pcs of M8 screws to lock the drive at the locations indicated in the following figures.
M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

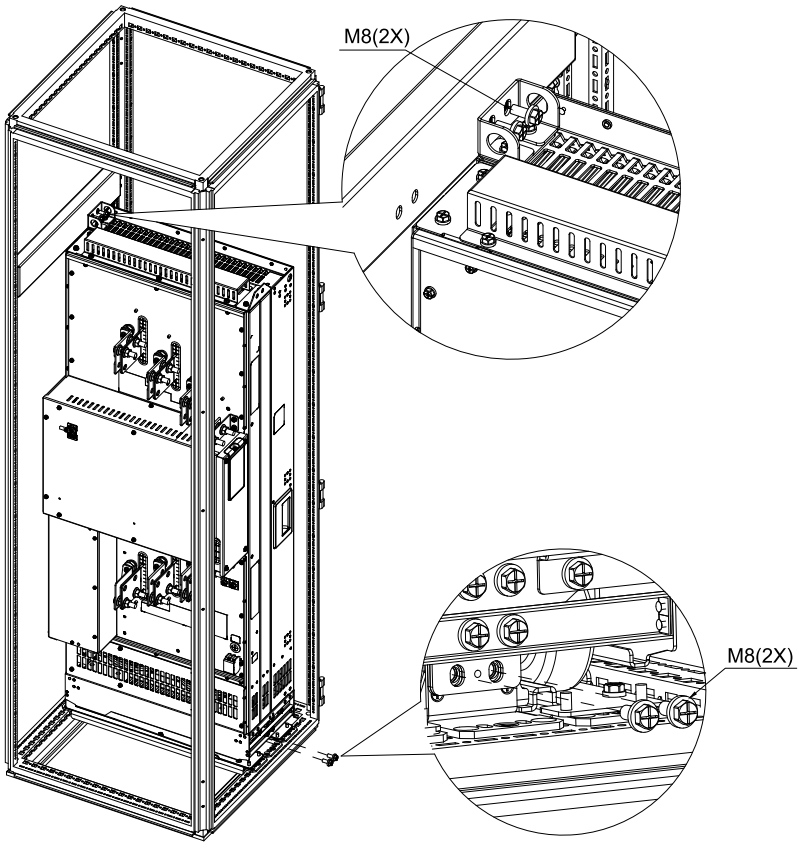


Figure 10-107

5. Install the front beam of the cabinet and use 2 pcs of M8 screws to lock the drive at the position indicated in the following figure.
   M8 Screw torque: 100–110 kg-cm / (86.8–95.5 lb-in.) / (9.80–10.78 Nm)

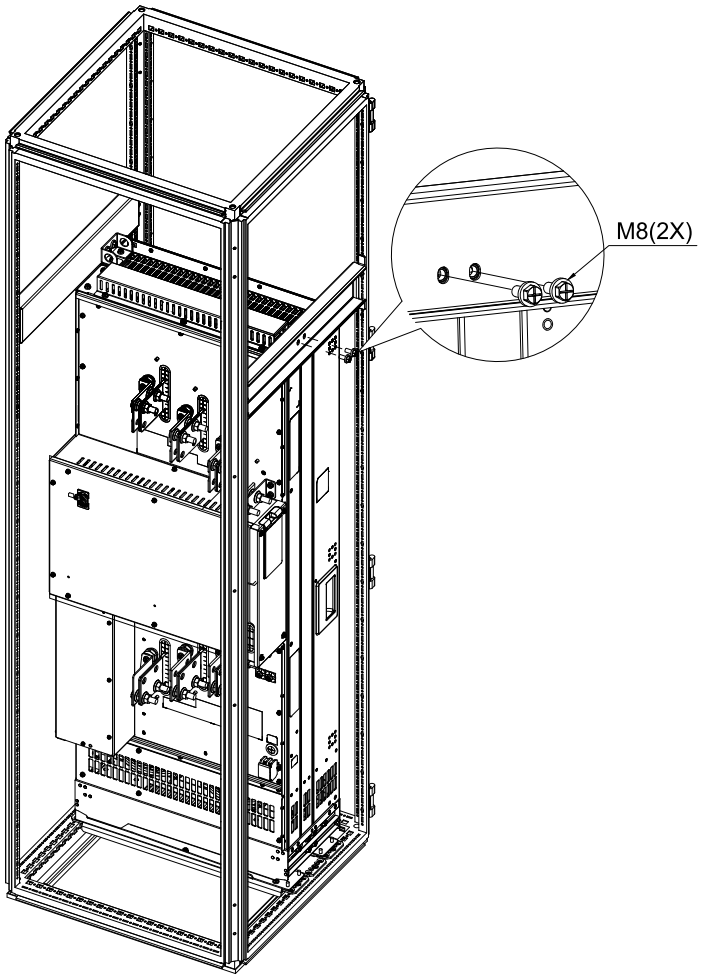


Figure 10-108

10-3-8 IP20 Shielded Cover

Assembly Component

Frame L

Model: MKVP-IP20L

Applicable models:

VFD530VP43SHTCA; VFD616VP43SHTCA; VFD683VP43SHTCA; VFD770VP43SHTCA

Item	Description	Q'ty
1	ACRY-COVER1	1
2	ACRY-COVER2	1
3	ACRY-COVER3	1
4	ACRY-COVER4	1
5	RST-COVER-1	1
5-1	Bushing Rubber D63	4
5-2	Bushing Rubber D103	1
6	RST-COVER-2	1
7	RST-COVER-3	1
8	RST-COVER-4	1
9	UVW-COVER-1	1
9-1	Bushing Rubber D17.5	1
9-2	Bushing Rubber D79	2
9-3	Bushing Rubber D103	1
10	UVW-COVER-2	1
11	UVW-COVER-3	1
12	UVW-COVER-4	1
13	SCREW M4x0.8x10L	44
14	RST-BUSBAR	5
15	UVW-BUSBAR	3
16	RST-PE1	1
17	UVW-PE2	1

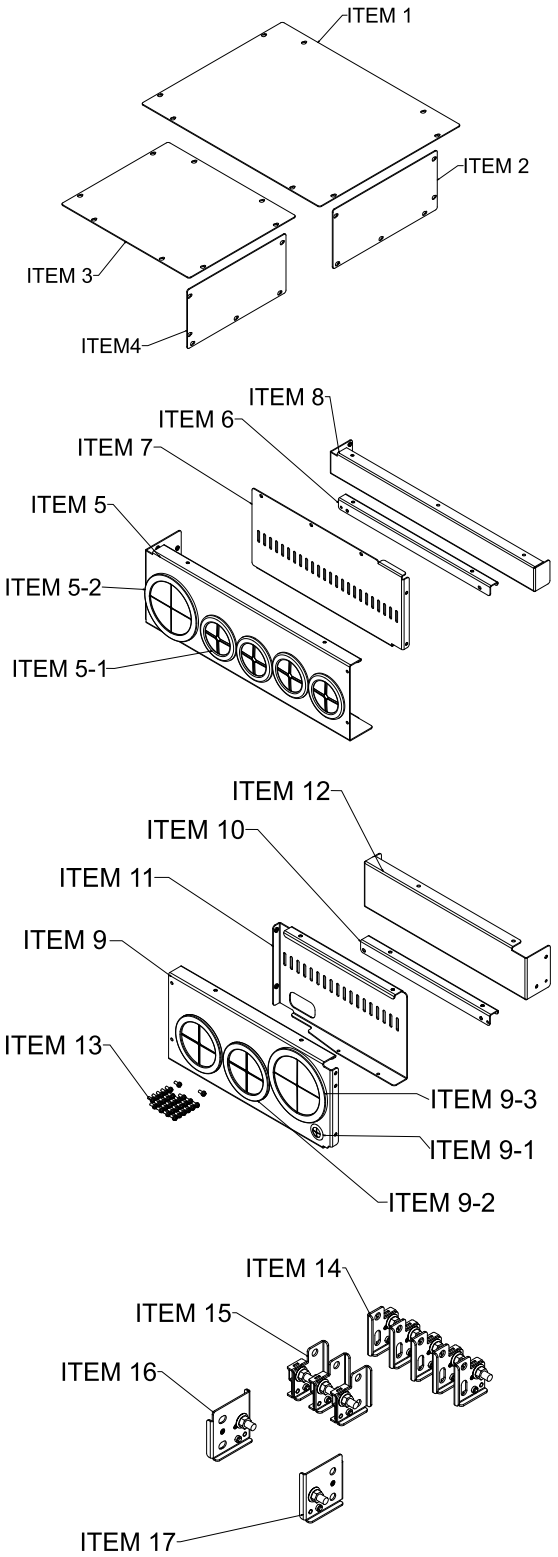


Figure 10-109

Frame M

Model: MKVP-IP20M

Applicable models:

VFD866VP43SHTCA; VFD930VP43SHTCA; VFD1K1VP43SHTCA; VFD1K2VP43SHTCA

Item	Description	Q'ty
1	ACRY-COVER1	1
2	ACRY-COVER2	1
3	ACRY-COVER3	1
4	ACRY-COVER4	1
5	RST-COVER-1	1
5-1	Bushing Rubber D79	2
5-2	Bushing Rubber D103	2
6	RST-COVER-2	1
7	RST-COVER-3	1
8	RST-COVER-4	1
9	UVW-COVER-1	1
9-1	Bushing Rubber D17.5	1
9-2	Bushing Rubber D79	2
9-3	Bushing Rubber D103	1
10	UVW-COVER-2	1
11	UVW-COVER-3	1
12	UVW-COVER-4	1
13	SCREW M4x0.8x10L	41
14	RST-BUSBAR	5
15	UVW-BUSBAR	3
16	RST-PE1	1
17	UVW-PE2	1
18	Voltage Insulator	8
19	SCREW M6x1.0x15L	8
20	SCREW M5x0.8x12L	6

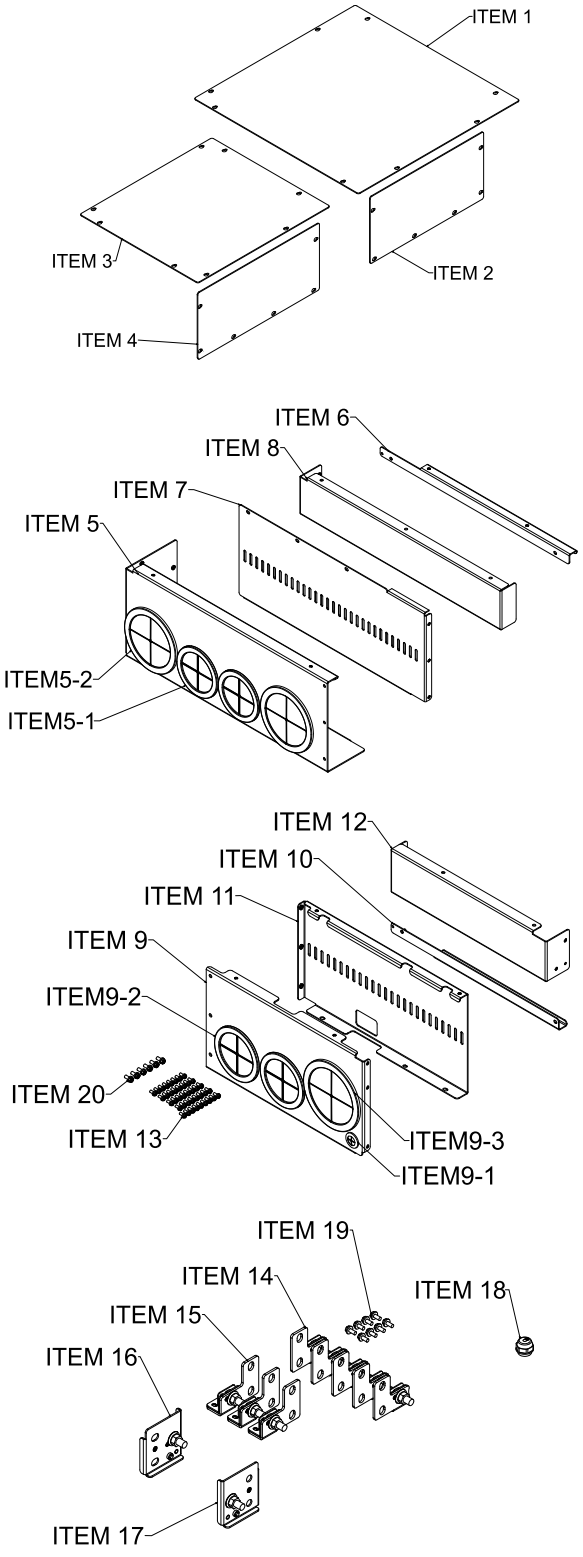


Figure 10-110

Installation

The IP20 shielded cover is applicable for Frame L and Frame M of VP3000, VP3000-E and VP3000-EHS, as shown in the figure below. The following installation description takes VP3000-E as demonstration.

VP3000

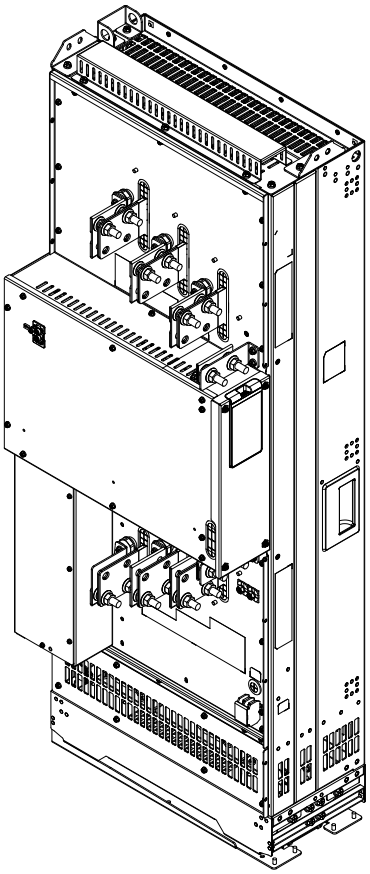


Figure 10-111

VP3000-E, VP3000-EHS

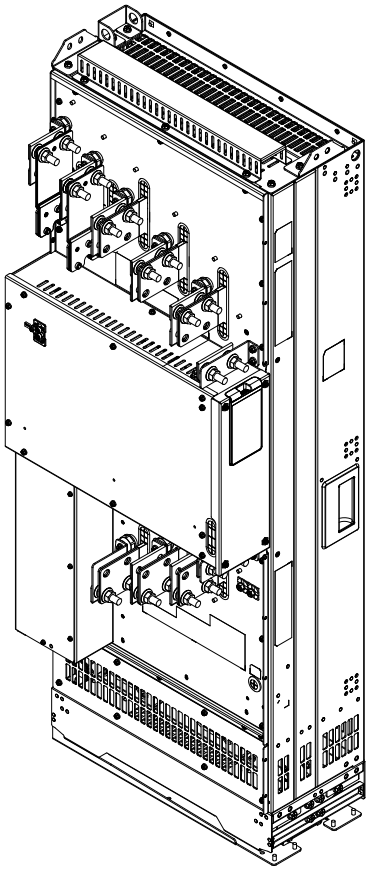


Figure 10-112

NOTE: In order to facilitate the disassembly of the acrylic board, place the fixed locking points of the cabinet and the drive referring to the dimension in the following figure.

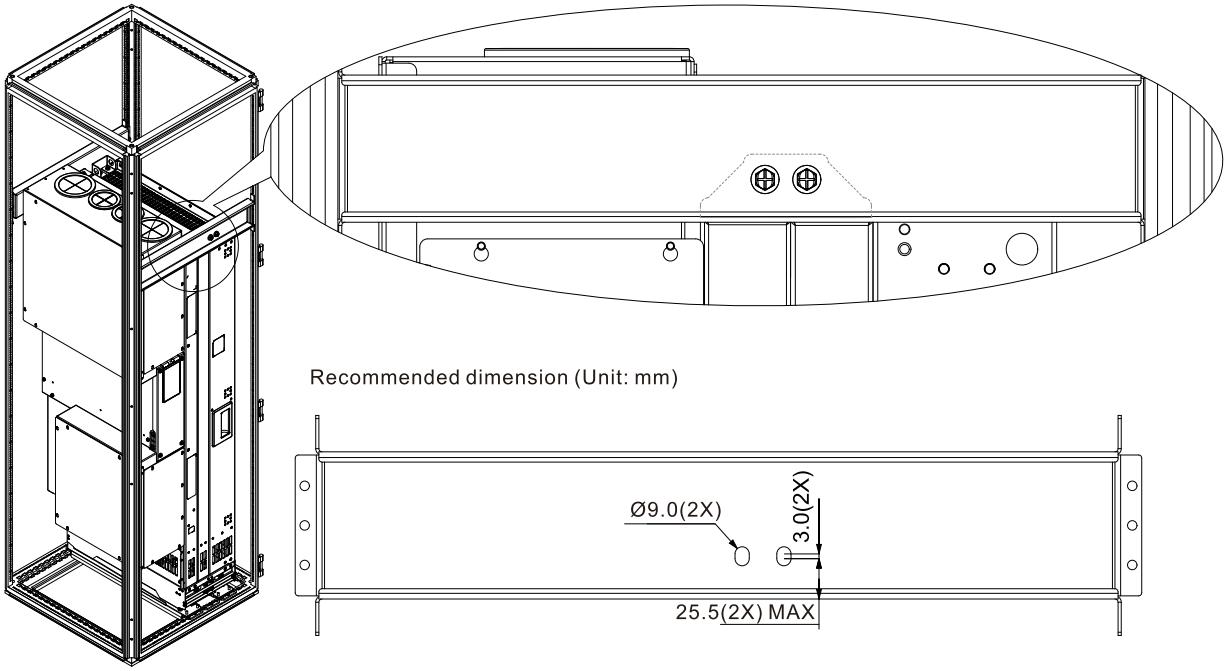


Figure 10-113

Step 1–3 are instructions for the side outlet direction (as shown in the figure below) that needs to be installed with ITEM 14–20 and continues with Step 4 for further assembly.

For the up/ down outlet direction, start the installation from Step 4.

(For Frame L installation, start with Step 2, and jumps to Step 4 for further assembly.)

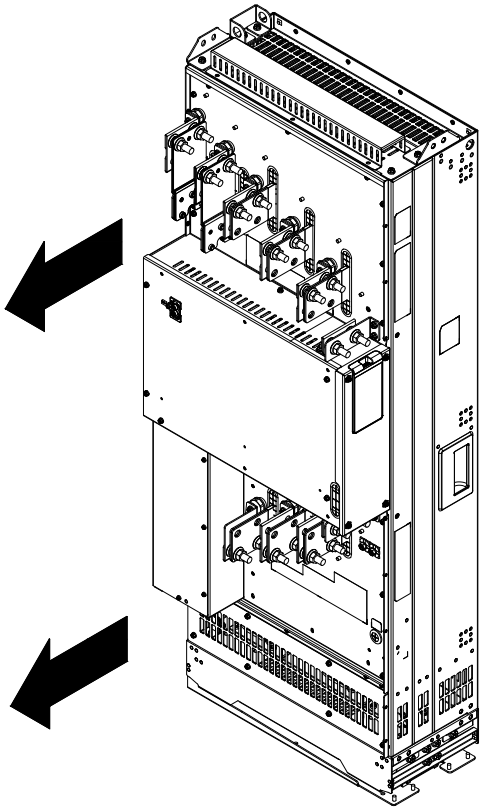


Figure 10-114

1. Fasten ITEM 18 Voltage Insulator, 8 pcs in total.
   Screw torque: 55–60 kg-cm / (47.7–52.1 lb-in.) / (5.39–5.88 Nm)

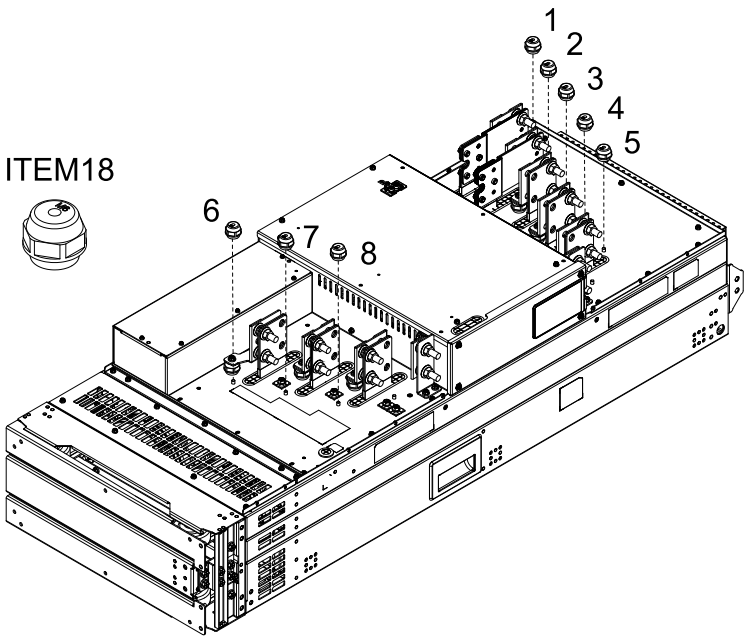


Figure 10-115

2. Unscrew 20 pcs of M12 nuts as shown in the the following figure, and attach ITEM 14–17 metal parts. Pre-lock Nut 1–10 in the figure below with the pre-lock torque first, and the adjust to the fixed torque after connecting the terminals. Nuts 11–20 can be directly locked with the fixed torque value.
   Pre-lock torque: 45–50 kg-cm / (39.1–43.4 lb-in.) / (4.41–4.90 Nm)
   Screw torque: 320–360 kg-cm / (277.8–312.5 lb-in.) / (31.36–35.28 Nm)

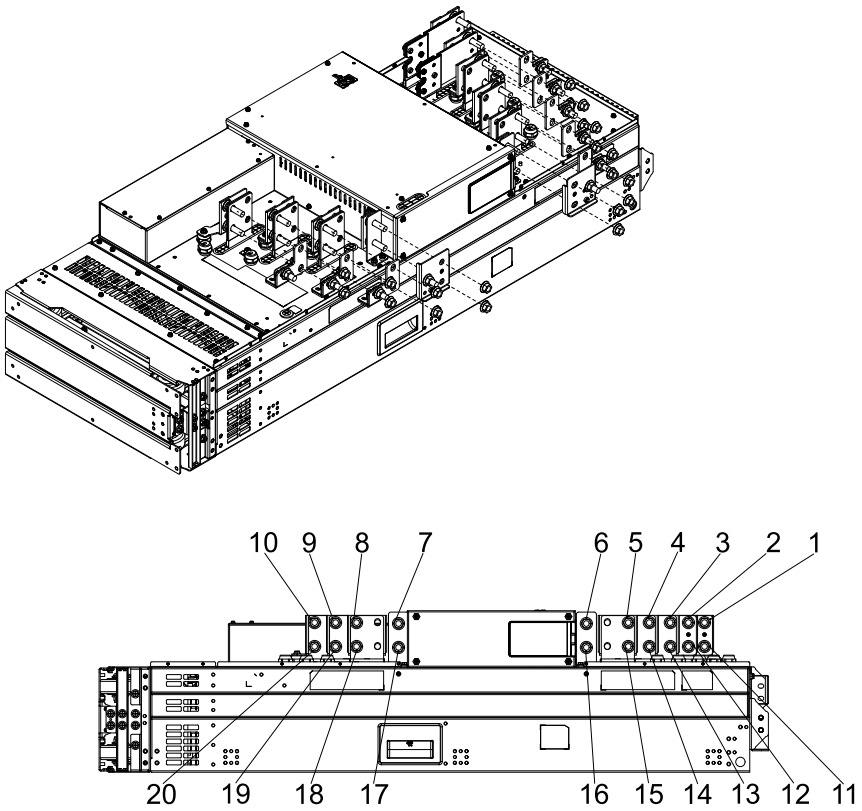


Figure 10-116

3. Fasten the M6x15L screws at the positions indicated in the following figure, 8 pcs in total.
   Screw torque: 35–45 kg-cm / (30.4–39.1 lb-in.) / (3.43–4.41 Nm)

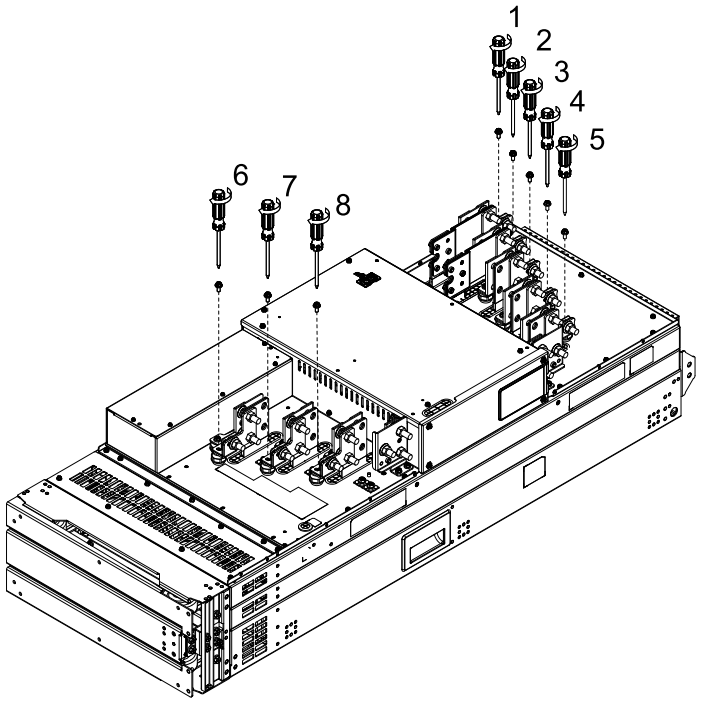


Figure 10-117

4. Unscrew the 5 pcs of M5 screws from the positions indicated in the following figure, and attach ITEM 8 and ITEM 12.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

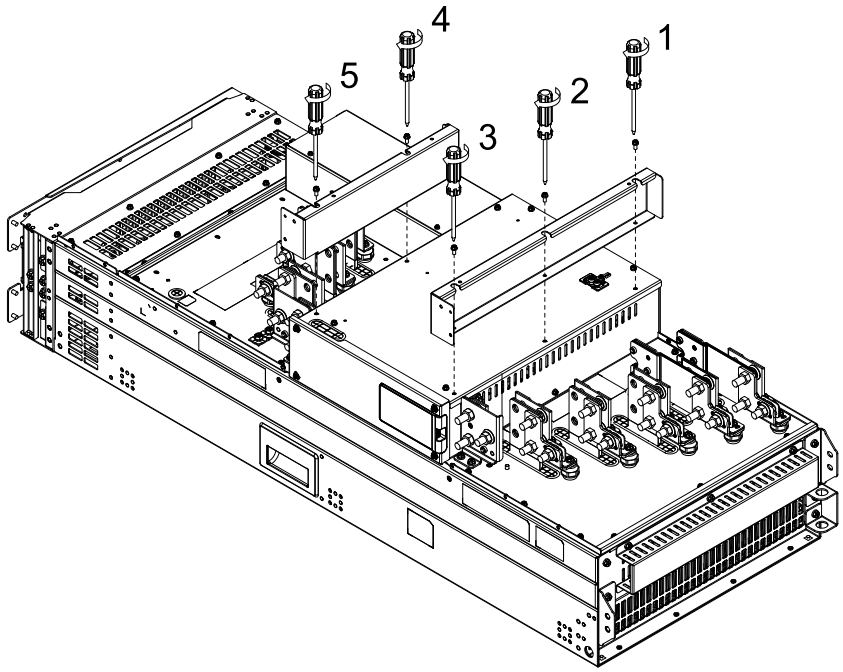


Figure 10-118

5. Attach ITEM 9 and ITEM11.
   Frame L: Use 5 pcs of M4x10L screws and attach ITEM 9 and ITEM 11 as shown in the following figure.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

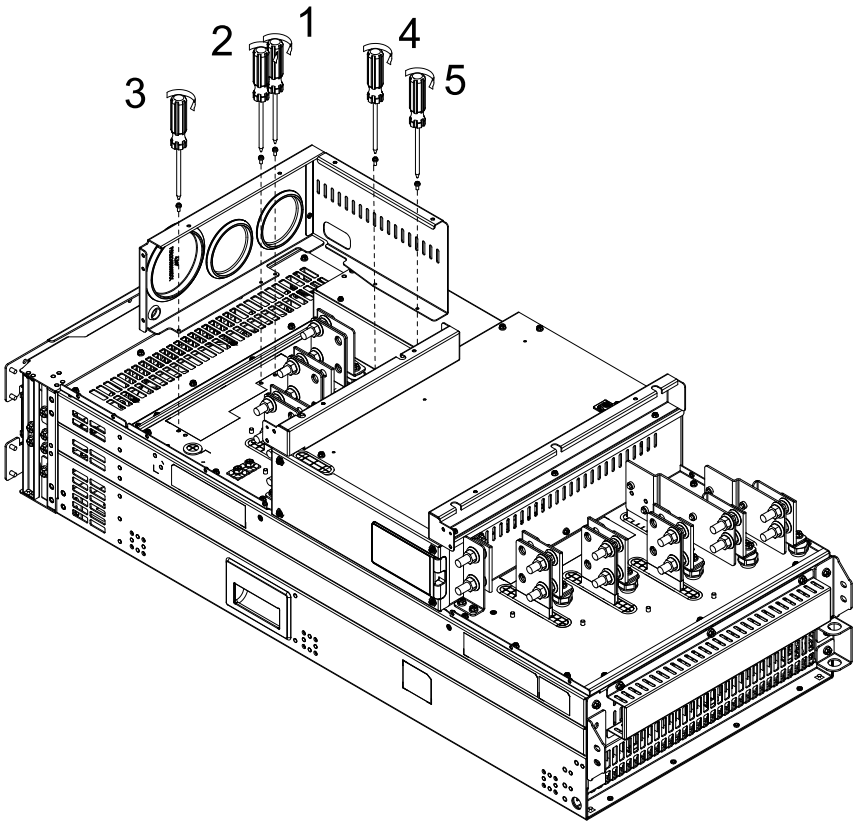


Figure 10-119

Frame M: Use 6 pcs of M5x12L screws and attach ITEM 9 and ITEM 11 as shown in the following figure.

Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.35–2.55 Nm)

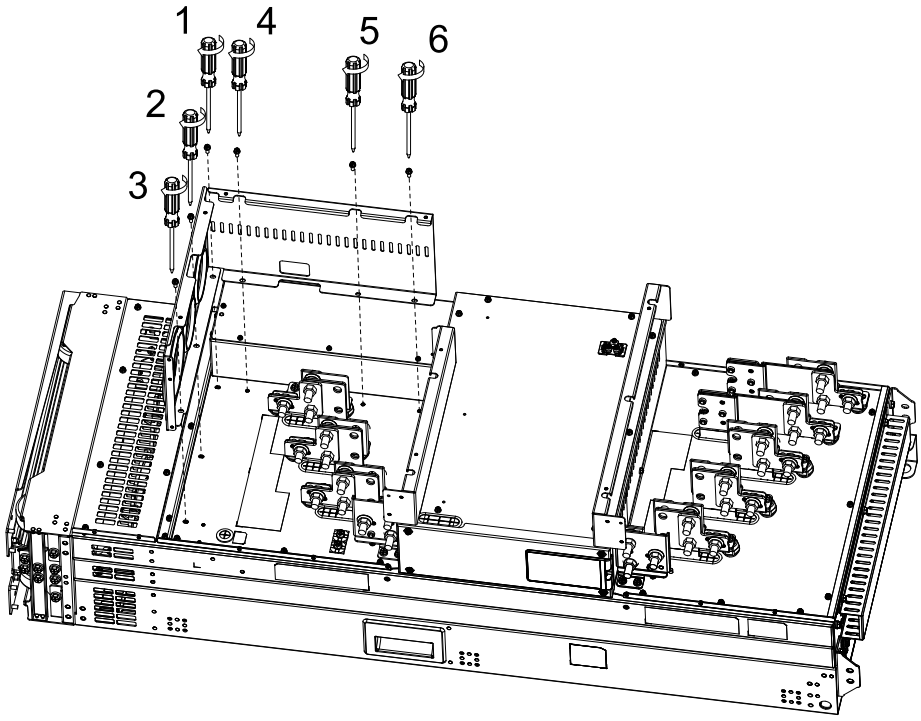


Figure 10-120

6. Use M4x10L screws (2 pcs for Frame L, 3 pcs for Frame M), and attach ITEM 9 and ITEM 11 as shown in the following figure.

   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

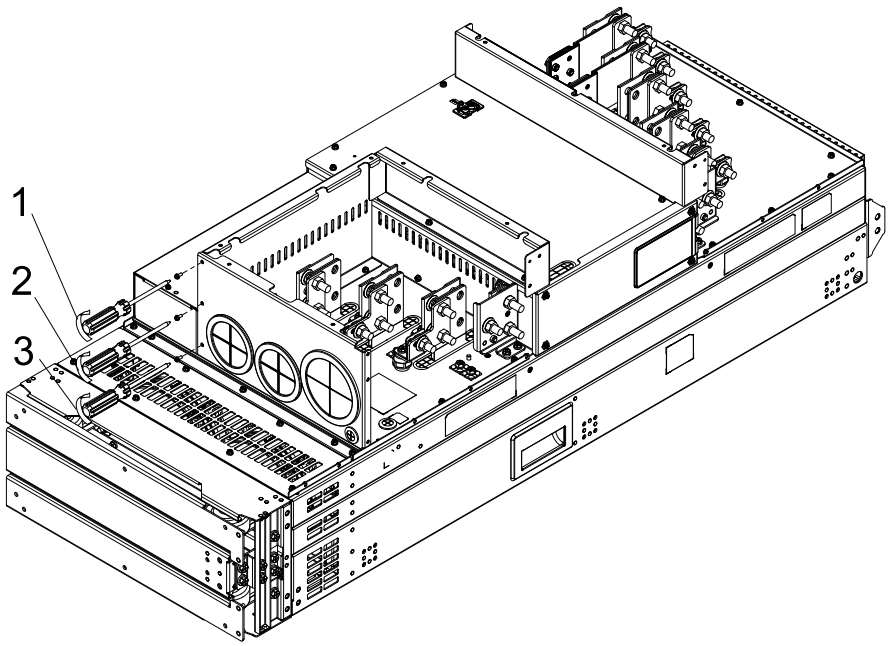


Figure 10-121

7. Use 6 pcs of M4x10L screws to attach ITEM 5 and ITEM 7.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

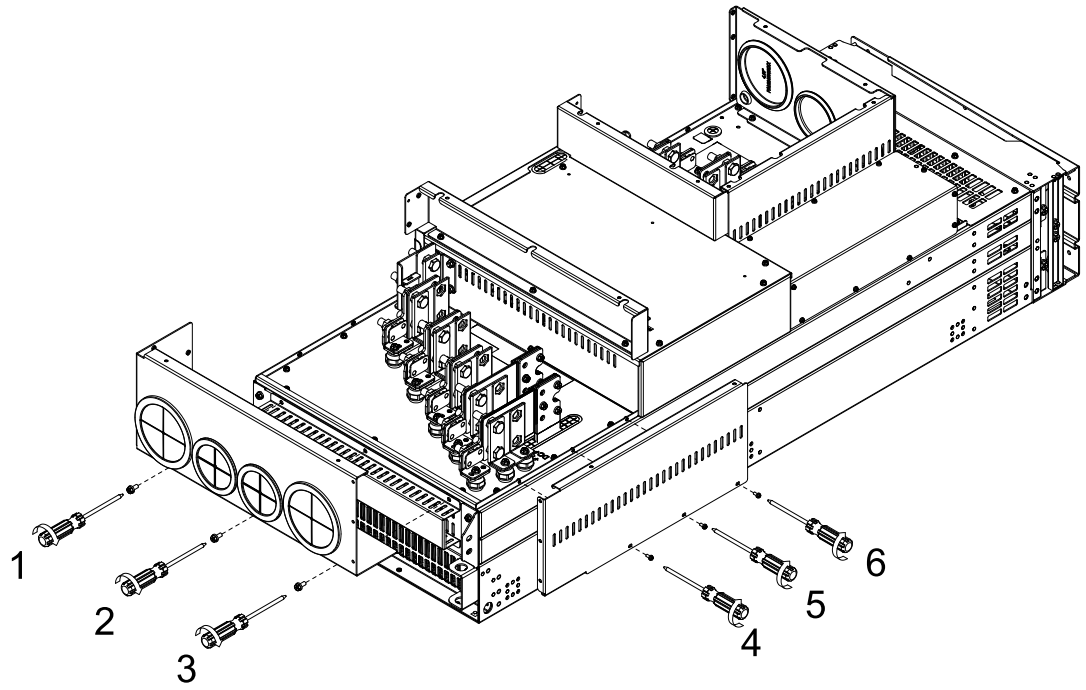


Figure 10-122

8. Use M4x10L screws (2 pcs for Frame L, 3 pcs for Frame M), and attach ITEM 5 and ITEM 7 as shown in the following figure.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

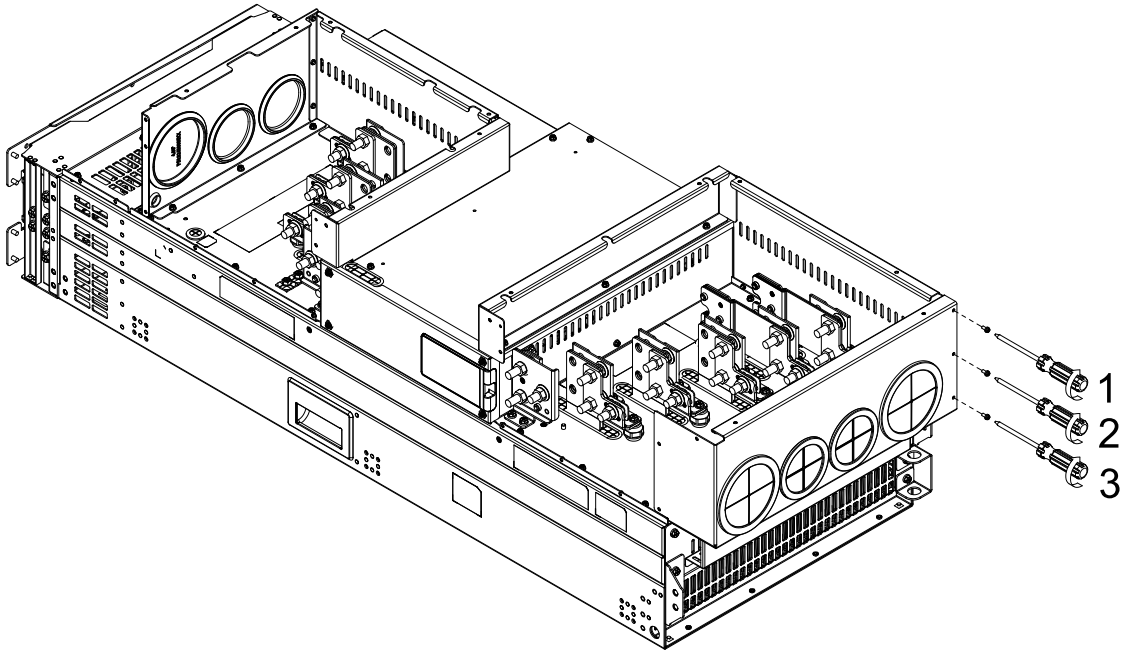


Figure 10-123

9. Use 4 pcs of M4x10L screws and attach ITEM 6 and ITEM 10 as shown in the following figure.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

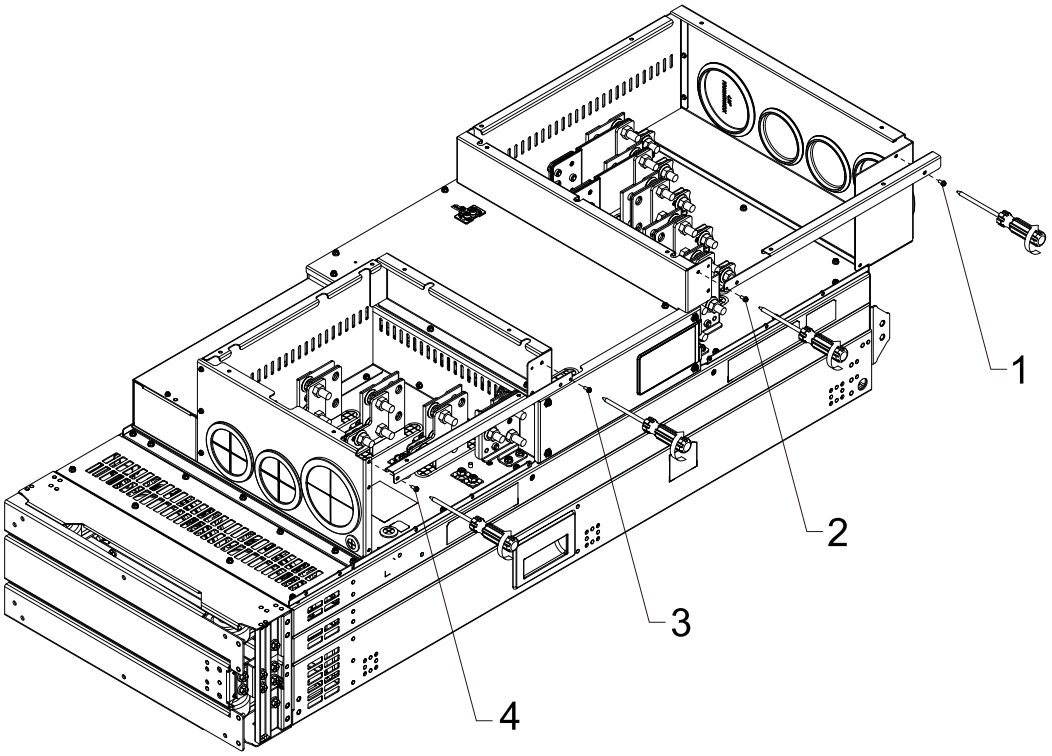


Figure 10-124

10. Use 28 pcs of M4x10L screws and attach ITEM 1–4 as shown in the following figure.
    Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.37–1.57 Nm)

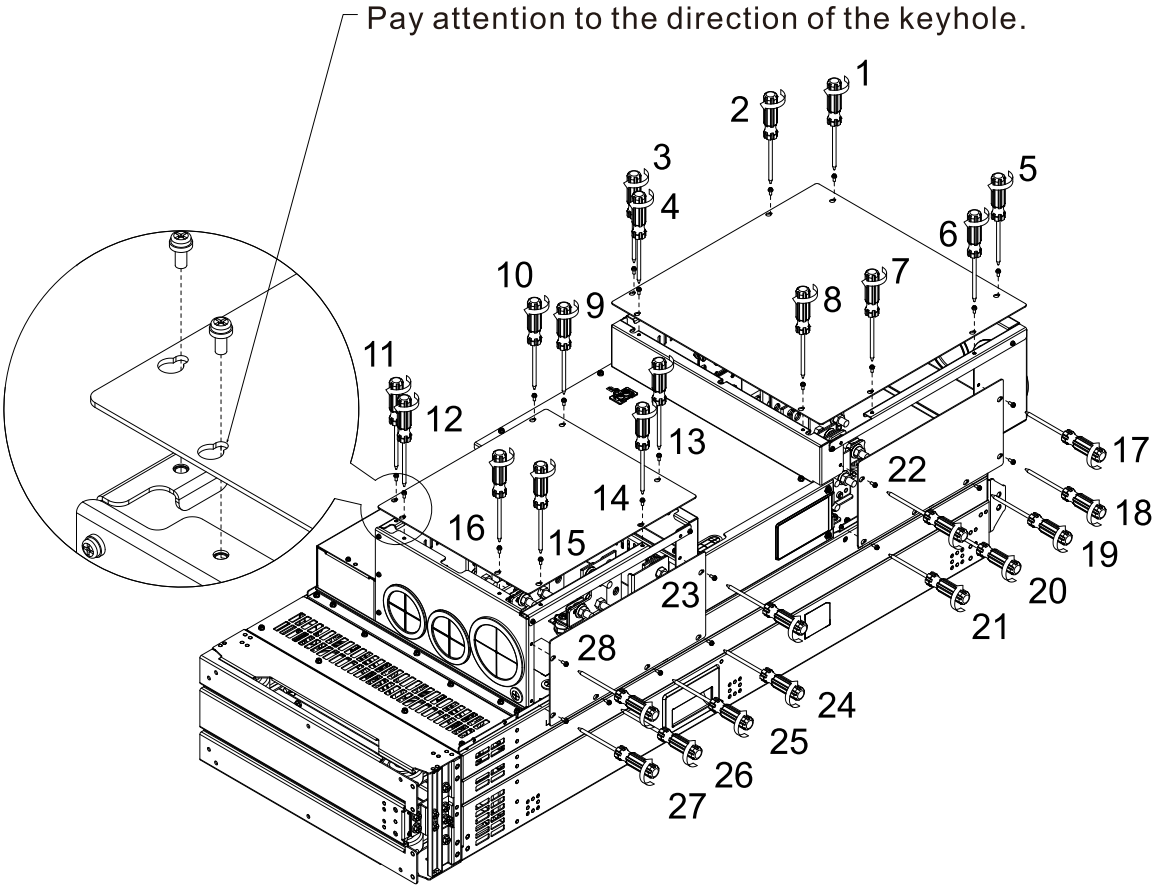


Figure 10-125

11. Installation completed.

Frame L

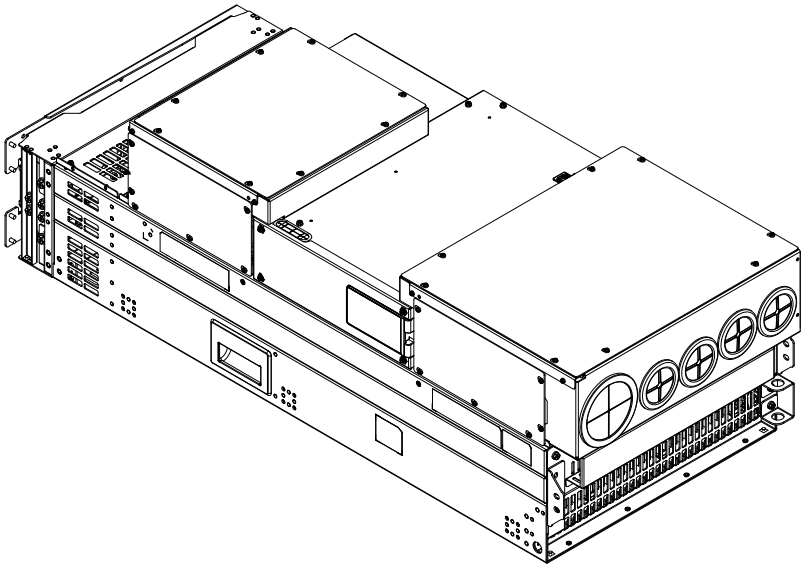


Figure 10-126

Frame M

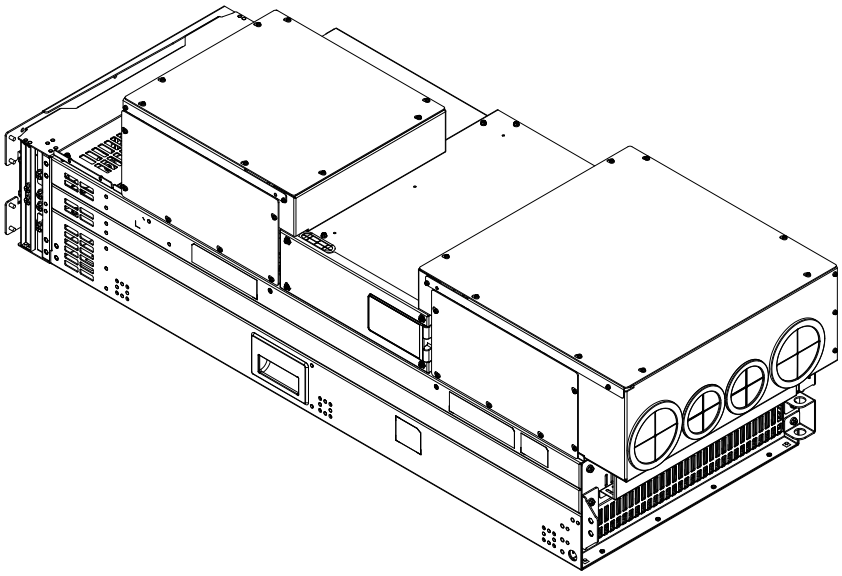


Figure 10-127

10-3-9 USB / RS-485 Communication Interface IFD6530

⚠ Warning

✓ Thoroughly read this instruction sheet before installation and putting it into use.

✓ The content of this instruction sheet and the driver file may be revised without prior notice. Consult our distributors or download the most updated instruction/driver version at Delta website.

Introduction

IFD6530 is a convenient RS-485-to-USB converter, which does not require external power-supply and complex setting process. It supports baud rate from 75 to 115.2 Kbps and auto switching direction of data transmission. In addition, it adopts RJ45 in RS-485 connector for users to wire conveniently. And its tiny dimension, handy use of plug-and-play and hot-swap provide more conveniences for connecting all DELTA IABG products to your PC.

Applicable Models: All DELTA IABG products.

■ Application & Dimension

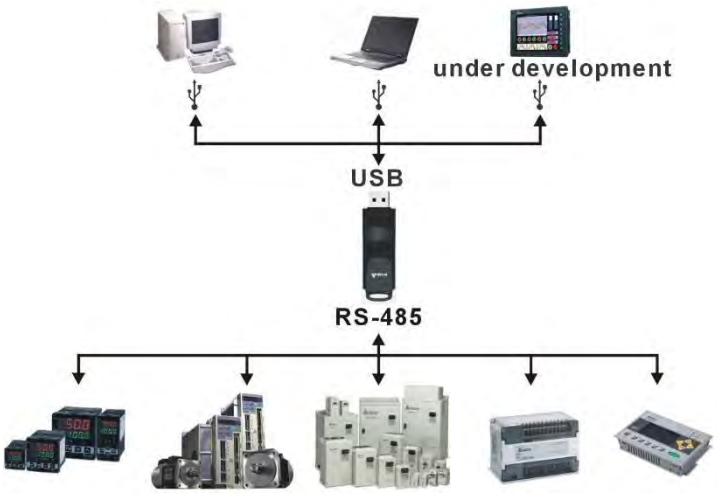


Figure 10-128

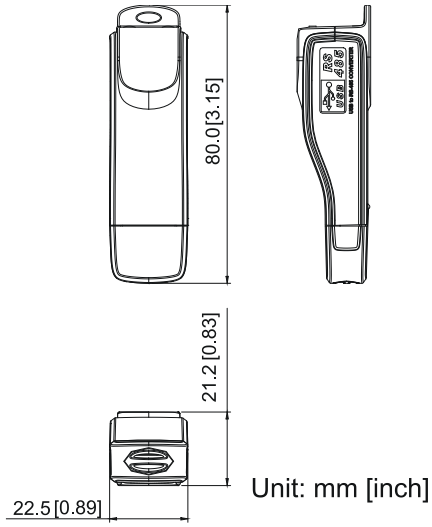


Figure 10-129

Specifications

Power supply	No external power is needed
Power Consumption	1.5 W
Isolated Voltage	2,500 V_{DC}
Baud Rate	75 Kbps, 150 Kbps, 300 Kbps, 600 Kbps, 1,200 Kbps, 2,400 Kbps, 4,800 Kbps, 9,600 Kbps, 19,200 Kbps, 38,400 Kbps, 57,600 Kbps, 115,200 Kbps
RS-485 Connector	RJ45
USB Connector	A type (plug)
Compatibility	Full compliance with USB V2.0 specification
Max. Cable Length	RS-485 Communication Port: 100 m
Support RS-485 half-duplex transmission	

Table 10-63

RJ45

⇒

Figure 10-130

PIN	Descriptions
1	Reserved
2	Reserved
3	GND
4	SG-

PIN	Descriptions
5	SG+
6	GND
7	Reserved
8	+9V

Table 10-64

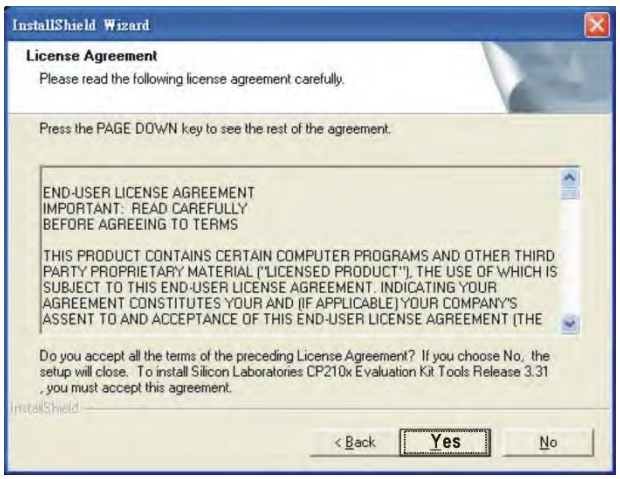
Preparations before Driver Installation

Download the USB Driver file (IFD6530_Drivers.exe) at Delta website (www.deltaww.com/iadownload_acmotordrive_TW/IFD6530_Drivers) and extract the driver file by the following steps.

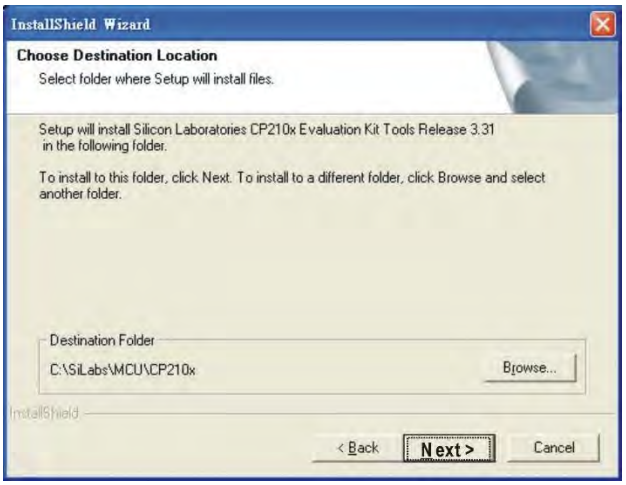
NOTE: DO NOT connect IFD6530 to PC before extracting the driver file.

STEP 1

STEP 2



STEP 3



STEP 4

STEP 5

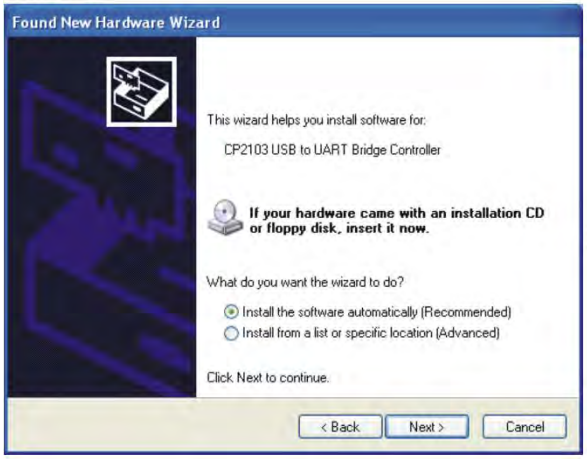
You should have a folder marked SiLabs under drive C. c:\ SiLabs

Driver Installation

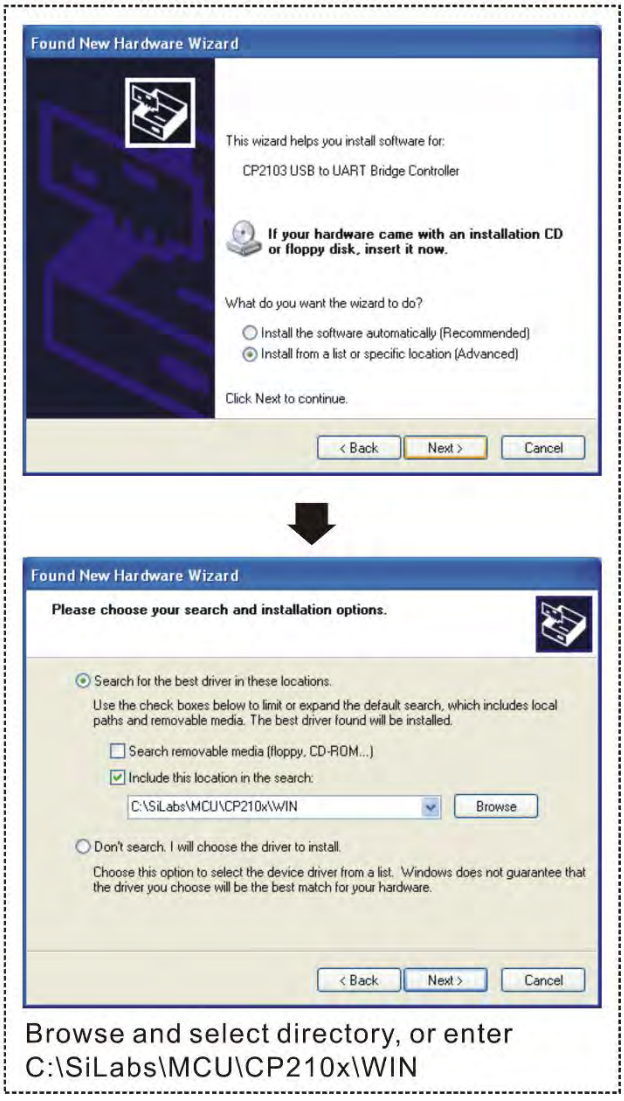
After connecting IFD6530 to PC, install the driver by following steps.

STEP 1

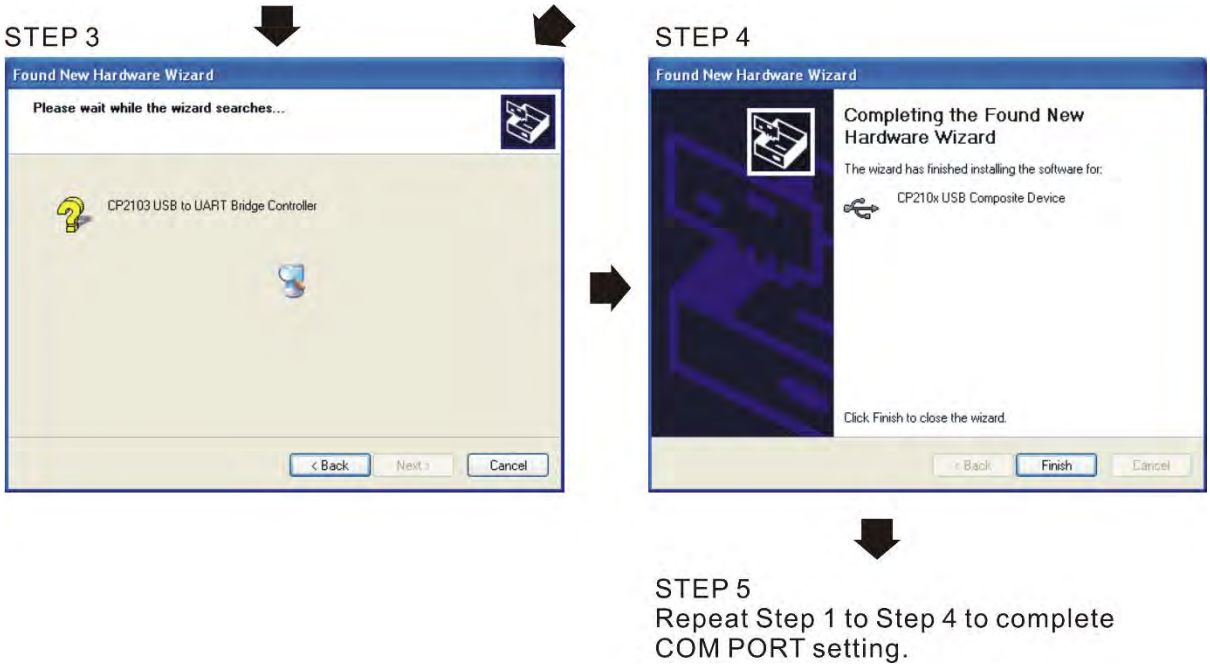
STEP 2



OR



Browse and select directory, or enter C:\SiLabs\MCU\CP210x\WIN



LED Display

1. Steady Green LED ON: power is ON.
2. Blinking orange LED: data is transmitting.

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Chapter 11 Specification

11-1 Specifications

11-2 General Specifications

11-3 Specification for Operation Temperature and Protection Level

11-4 Derating Curve

11-5 Efficiency Curve

11-1 Specifications

11-1-1 460V Models

Model	Frame			Output					Input	Power
VFD_ _ _VP43	IP20 UL Open Type[*1]	IP20 UL Type 1 with C3 Filter	IP20 UL Type 1 with C2 Filter	Applicable Motor Power		Continuous Rated Output Current	Light Load Output Current	Max. Output Current	Rated Input Current	Power Supply Capacity
				(kW)	(HP)	I_{CON}	$I_{ld,}$	I_{max}	(A)[*2]	(kVA)[*3]
3A0	A1	A2	B3	0.75	1	3	2.9	3.7	4.2	2.4
4A2	A1	A2	B3	1.5	2	4.2	4	5.9	5.9	3.3
5A6	A1	A2	B3	2.2	3	5.6	5.3	7.2	7.8	4.5
7A2	A1	A2	B3	3	4	7.2	6.9	10.1	10.1	5.7
011	A1	A2	B3	4	5	11	10	13	15.4	8.8
013	B1	B2	B3	5.5	7.5	13	12	16	18.2	10.4
018	B1	B2	B3	7.5	10	18	17	22.7	25	14
025	C1	C2	C2	11	15	25	24	30.8	35	20
032	C1	C2	C2	15	20	32	30.4	44.3	45	25
038	C1	C2	C2	18.5	25	38	36.1	56.9	53	30
045	D1	D2	D2	22	30	45	43	67.9	45	36
062	D1	D2	D2	30	40	62	59	76.3	62	49
073	E1	E2	E2	37	50	73	70	104	73	58
090	E1	E2	E2	45	60	90	87	122	90	72
110	F1	F2	F2	55	75	110	105	148	110	88
150	G1	G2	G2	75	100	150	143	185	150	120
180	H1	H2	H2	90	125	180	171	247	180	143
220	H1	H2	H2	110	150	220	210	287	220	175
260	I1	I2	I2	132	175	260	248	350	260	207
310	I1	I2	I2	160	215	310	295	418	310	247
370	J1	J2	J2	185	250	370	352	455	370	295
395	J1	J2	J2	200	270	395	376	498	395	315
460	K1	K2	K2	220	300	460	438	566	460	366
485	K1	K2	K2	250	340	485	461	597	485	386
530	-	L	-	280	375	530	505	652	530	422
616	-	L	-	315	425	616	587	757	616	491
683	-	L	-	355	475	683	650	840	683	544
770	-	L	-	400	530	770	733	1020	770	613
866	-	M	-	450	600	866	825	1065	866	690
930	-	M	-	500	665	930	886	1143	930	741
1K1	-	M	-	560	745	1100	1042	1345	1100	876
1K2	-	M	-	630	840	1212	1154	1490	1212	966

I_{CON}	Continuous output current without overload
$I_{ld,}$	110% of rated output current in light load: 1 minute for every 5 minutes
I_{max}	Maximum output current: 2 sec. at start-up
Rated Input Voltage	Three-phase, 380–480 V_{AC} (-15– +10%)
Rated Input Frequency	50 / 60 Hz
Allowable Power Frequency Change	+15% (47–63 Hz)
Displacement Power Factor (cosϕ)	0.98
Efficiency (%)	Frame A–C: 97; Frame D–M: 98
Braking Chopper	Not apply
DC Choke	Model names with suffix CA are built-in[*4]

Table 11-1

NOTE:

1. Frame L and M models are IP00 Chassis models.
2. The rated input current may fluctuate with the power supply impedance, power transformer, input reactors, DC chokes and the loads.
3. The power supply capacity is calculated based on the rated input power and 480 V_{AC}, which is used as a reference for selecting the power transformer capacity.
4. Refer to Model Name Explanation.
5. For high altitude, high ambient temperature, high carrier frequency, and advanced motor vector control, refer to Section 11-4 Derating in the user manual.
6. Refer to Section 11-4 for the default value of carrier frequency, adjustable range, and derating curve.

11-2 General Specifications

11-2-1 General Features

Control Characteristics	Control Mode	PWM control
	Control Method	1: V/F, 2: SVC, 3: PM Sensorless, 4: SynRM Sensorless
	Starting Torque	Reach up to 150% or above at 0.5 Hz
	V/F Curve	4-point adjustable V/F curve and square curve
	Speed Response Ability	IMVF, IMSVC: 1:50 IMFOC Sensorless: 1:100 PMSVC: 1:20 PMFOC Sensorless: 1:50
	Torque Limit	In FOC mode, torque quadrants can be set separately via parameters
	Torque Accuracy	±5%
	Max. Output Frequency (Hz)	599.00 Hz
	Frequency Output Accuracy	Digital command: ±0.01%, -10°C – +40°C Analog command: ±0.1%, 25 ±10°C
	Output Frequency Resolution	Digital command: 0.01 Hz Analog command: 0.03 × max. output frequency / 60 Hz (±11-bit)
	Overload Tolerance	Rated output current is 110%: 1 minute for every 5 minutes
	Frequency Setting Signal	0–10 V, 4–20 mA, 0–20 mA
	Accel. / Decel. Time	0.00–600.00/ 0.0–6000.0 sec.
	Main Control Function	Momentary power loss ride thru, Speed search, Over-torque detection, Torque limit, 16-step speed (Max.), Accel. / Decel. time switch, S-curve accel. / decel., Three-wire sequence, Auto-Tuning, Dwell, Slip compensation, Torque compensation, JOG frequency, Frequency upper/ lower limit settings, DC injection braking at start/ stop, High slip braking, Energy saving control, Modbus communication (RS-485 RJ45, max. 115.2 Kbps)
	Fan Control	Frame A–F: ON/ OFF switch control Frame G and above: PWM control
Protection Characteristics	Motor Protection	Electronic thermal relay protection
	Over-Current Protection	Over-current protection for 190% rated current
	Over-Voltage Protection	460V models: drive stops running when DC bus voltage exceeds 820 V
	Over-Temperature Protection	Built-in temperature sensor
	Stall Prevention	Stall prevention during acceleration, deceleration, and running independently
	Restart after Instantaneous Power Failure	Parameter setting up to 20 seconds
	Grounding Leakage Current Protection	Leakage current is higher than 50% of rated current of the AC motor drive
Certifications		CE Low Voltage Directive (LVD) 2014/35/EU, EN61800-5-1 EMC Directive 2014/30/EU, EN61800-3 UL61800-5-1/ CSA C22.2 No.274 RCM, KC, WEEE 2012/19/EU, RoHs 2011/65/EU, 2015/863/EC Quality assurance system ISO9001 and Environmental system ISO 14001
STO		Safe Torque Off (STO per EN/ IEC61800-5-2) TUV Rheinland certification IEC62061/ IEC61508, SIL CL3 EN ISO13849-1, Cat.3/PL e

Table 11-2

NOTE:

1. The maximum output frequency setting range varies with different carrier and control modes.
2. According to the motor protection requirements, you can use the drive internal parameters to adjust the protection level.
3. For information on Certifications and Declaration of Conformity (DoC), visit Delta | Download Center (deltaww.com)

11-2-2 Environment for Operation, Storage and Transportation

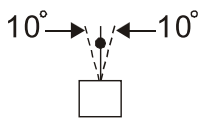
<table>
<tr><td colspan="5">Do NOT expose the AC motor drive in the bad environment, such as dust, direct sunlight, corrosive/ inflammable gasses, humidity, liquid, and vibration environment. The salt in the air must be less than 0.01 mg/ cm^2 every year.</td></tr>
<tr><td rowspan="14">Environment</td><td>Installation Location</td><td colspan="3">IEC60364-1/ IEC60664-1 Pollution degree 2, Indoor use only</td></tr>
<tr><td rowspan="3">Surrounding Temperature (oC)</td><td>Storage</td><td colspan="2">-25– +70</td></tr>
<tr><td>Transportation</td><td colspan="2">-25– +70</td></tr>
<tr><td colspan="3">Non-condensation, non-conductive pollution</td></tr>
<tr><td rowspan="3">Rated Humidity (%)</td><td>Operation</td><td colspan="2">5–95</td></tr>
<tr><td>Storage/ Transportation</td><td colspan="2">Max. 95</td></tr>
<tr><td colspan="3">No condense water</td></tr>
<tr><td rowspan="2">Air Pressure (kPa)</td><td>Operation/ Storage</td><td colspan="2">86–106</td></tr>
<tr><td>Transportation</td><td colspan="2">70–106</td></tr>
<tr><td rowspan="4">Pollution Level</td><td>Operation</td><td colspan="2">IEC60721-3-3 Class 3C3; Class 3S2</td></tr>
<tr><td>Storage</td><td colspan="2">IEC60721-3-1 Class 1C2; Class 1S2</td></tr>
<tr><td>Transportation</td><td colspan="2">IEC60721-3-2 Class 2C2; Class 2S2</td></tr>
<tr><td colspan="3">If you use the AC motor drive under harsh environment with high level of contamination (e.g., dew, water, dust), make sure it is installed in an environment qualified for IP54 such as in a cabinet.</td></tr>
<tr><td>Altitude</td><td>Operation</td><td colspan="2">If the AC motor drive is installed at an altitude 0–1000 m, follow normal operation restriction. For it is installed at altitude over 1,000 m, decrease 1% of rated current or lower 0.5°C of temperature for every 100 m increase in altitude. Maximum altitude for Corner Grounded TN system is 2,000 m.
Maximum altitude for 480 V_{AC} input voltage is 2,000 m.
Maximum altitude for 380 V_{AC} input voltage is 4,000 m.</td></tr>
<tr><td>Package Drop</td><td>Storage/ Transportation</td><td colspan="3">ISTA procedure 1A (according to weight) IEC60068-2-31</td></tr>
<tr><td>Vibration</td><td colspan="4">● IEC 61800-5-1 requirement (Frame A–B,D–E):
10 Hz ≤ f ≤ 57 Hz/ Amplitude 0.075 mm, 57 Hz < f ≤ 150 Hz/ 1.0g
● Delta's Internal Condition (Frame C):
2 Hz ≤ f ≤ 13.2 Hz/ Amplitude 1 mm, 13.2 Hz < f ≤ 55 Hz/ 0.7g to 2g, 55 Hz < f ≤ 512 Hz/ 2g
● Delta's Internal Condition (Frame F):
2 Hz ≤ f ≤ 13.2 Hz/ Amplitude 1 mm, 13.2 Hz < f ≤ 55 Hz/ 0.7g, 55 Hz < f ≤ 512 Hz/ 1.5g
● Delta's Internal Condition (Frame G–K):
2 Hz ≤ f ≤ 13.2 Hz/ Amplitude 1 mm, 13.2 Hz < f ≤ 55 Hz/ 0.7g to 1g, 55 Hz < f ≤ 512 Hz/ 1g
● Delta's Internal Condition (Frame L–M):
2 Hz ≤ f ≤ 13.2 Hz/ Amplitude 0.075 mm, 13.2 Hz < f ≤ 100 Hz/ 0.7g
Duration: 10 cycle per axis on each of three mutually perpendicular axes.
NOTE: Delta's internal test conditions are more stringent than the Standard IEC 61800-5-1 requirements.</td></tr>
<tr><td>Impact</td><td colspan="4">IEC 60068-2-27</td></tr>
<tr><td>OVC</td><td colspan="4">Over voltage category III</td></tr>
<tr><td>Operation Position</td><td colspan="2">Max. allowed offset angle ±10% (under normal installation position)</td><td colspan="2"> 
</td></tr>
</table>

Table 11-3

11-2-3 Operation Noise Level

According to IEC61800-5-1: 2022, operators working in an environment above 70dB must take appropriate hearing protection.

Frame	Noise Level dB(A)	Frame	Noise Level dB(A)
A	51	H	67.2
B	58.1	I	70.3
C	64	J	80.3
D	68.5	K	70.2
E	66.8	L	80.6
F	68.2	M	84.5
G	69.4		

Table 11-4

11-3 Specification for Operation Temperature and Protection Level

Frame	Top Cover	Conduit Box	Protection Level	Operation Temperature
A1–K1	Yes	N/A	IP20/ UL Open Type	-20–50°C
A2–K2	Yes	Yes	IP20/ UL Type 1	-20–45°C
L, M	N/A	N/A	IP00 Chassis	-20–50°C

Table 11-5

11-4 Derating Curve

Protection Level	Operating Environment
UL Type 1/ IP20	If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10– +40°C. If the temperature is above 40°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.
UL Open Type/ IP20	If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10– +50°C. If the temperature is above 50°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.

Table 11-6

Ambient Temperature Derating Curve

460V

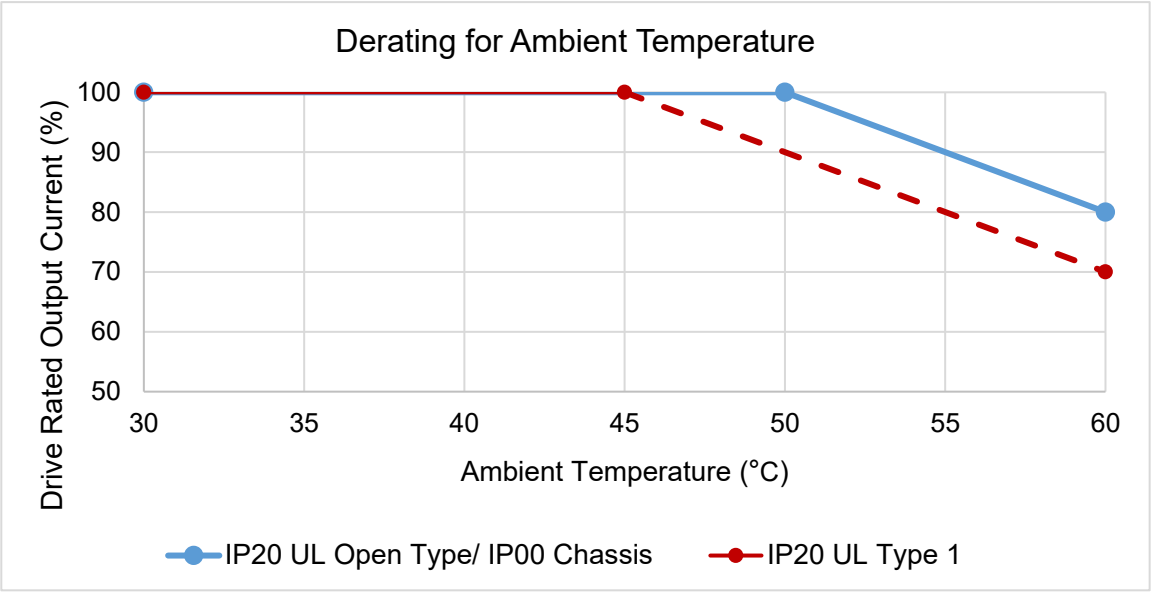


Figure 11-1

IP20 UL Open Type or IP00 Chassis:

The rated output current derating (%) when carrier frequency is the default value:

Ambient Temp. (Ta)/ 100% Load / Carrier Frequency (kHz)	30°C	50°C	60°C
Default	100	100	80

Table 11-7

IP20 UL Type 1:

The rated output current derating (%) when carrier frequency is the default value:

Ambient Temp. (Ta)/ 100% Load / Carrier Frequency (kHz)	30°C	45°C	60°C
Default	100	100	70

Table 11-8

Altitude Derating Curve

Condition	Operating Environment
High Altitude	If the AC motor drive is installed at an altitude 0–1000 m, follow normal operation restriction. For altitudes of 1000–2000 m, decrease 1% of the drive rated current or lower 0.5°C of temperature for every 100 m increase in altitude. The maximum altitude for Corner Grounded is 2,000 m. If installing at an altitude higher than 2000 m is required, contact Delta for more information.

Table 11-9

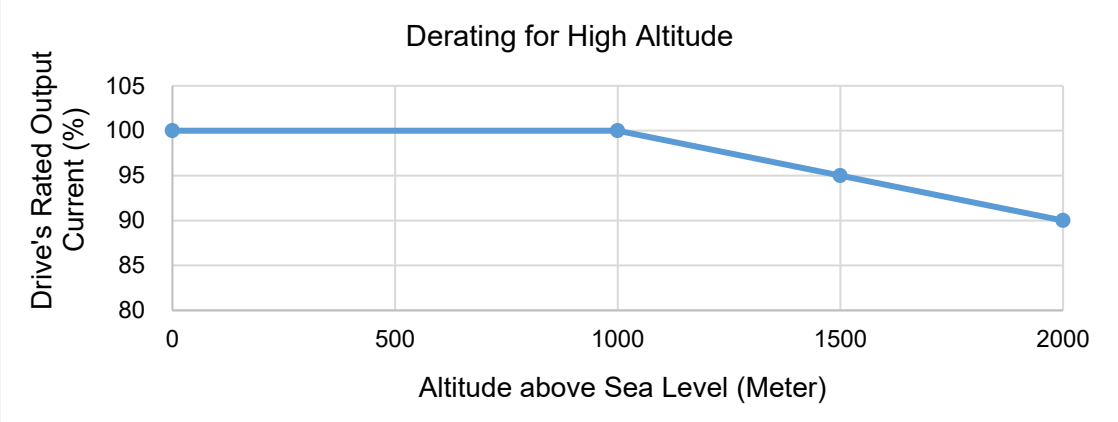


Figure 11-2

The rated output current derating (%) for different altitudes above sea level:

Altitude above Sea Level (meter)	0	1000	1500	2000
Output Current / Rated Current (%)	100	100	95	90

Table 11-10

Carrier Frequency Derating Curve

Frame A–D

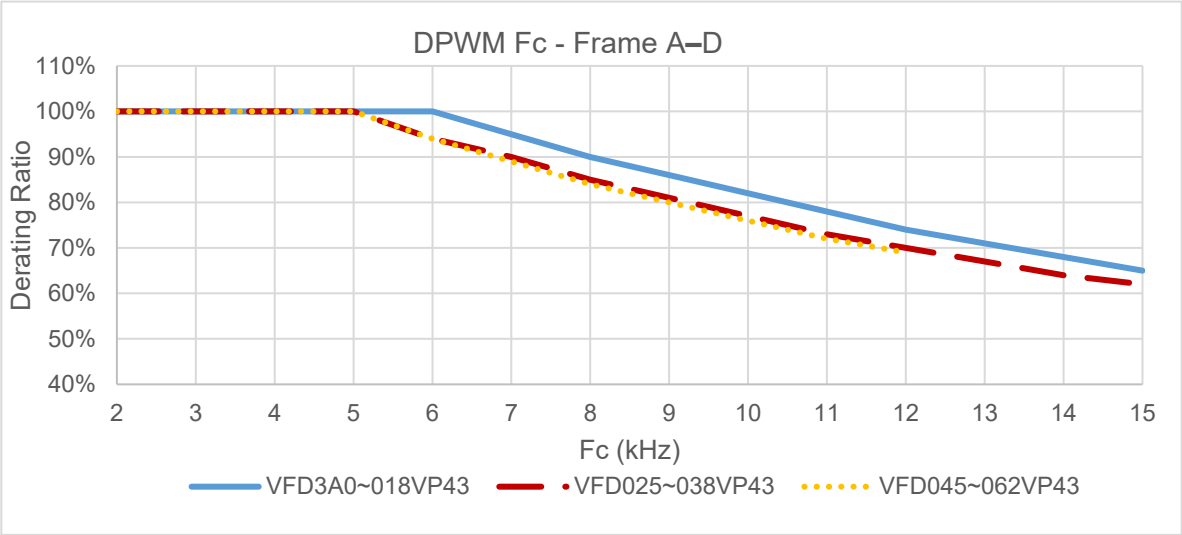


Figure 11-3

The rated output current derating for different carrier frequencies (unit: %):

Frame	Model	DPWM Fc (kHz)													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
A–B	VFD3A0–018VP43_ _ _ _ _	100	100	100	100	100	95	90	86	82	78	74	71	68	65
C	VFD025–038VP43_ _ _ _ _	100	100	100	100	94	90	85	81	77	73	70	67	64	62
D	VFD045–062VP43_ _ _ _ _	100	100	100	100	94	89	84	80	76	72	69	-	-	-

Table 11-11

Frame B3, C3 (built-in EMC C2)

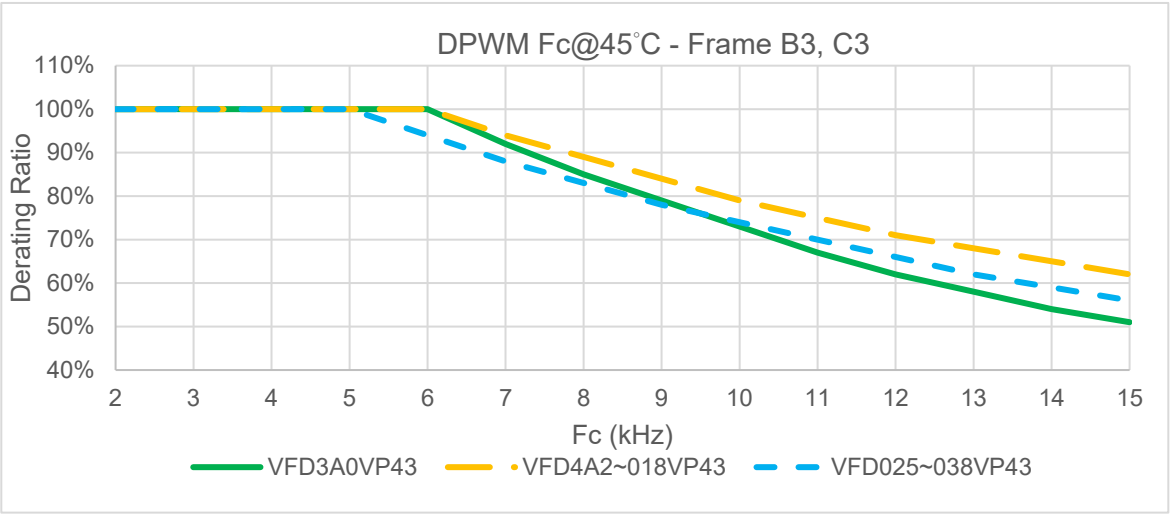


Figure 11-4

The rated output current derating for different carrier frequencies (unit: %):

Frame	Model	DPWM Fc (kHz)													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
B3	VFD3A0VP43_ _ _ _ _	100	100	100	100	100	92	85	79	73	67	62	58	54	51
B3	VFD4A2~018VP43_ _ _ _ _	100	100	100	100	100	94	89	84	79	75	71	68	65	62
C3	VFD025~038VP43_ _ _ _ _	100	100	100	100	94	88	83	78	74	70	66	62	59	56

Table 11-12

Frame E–K

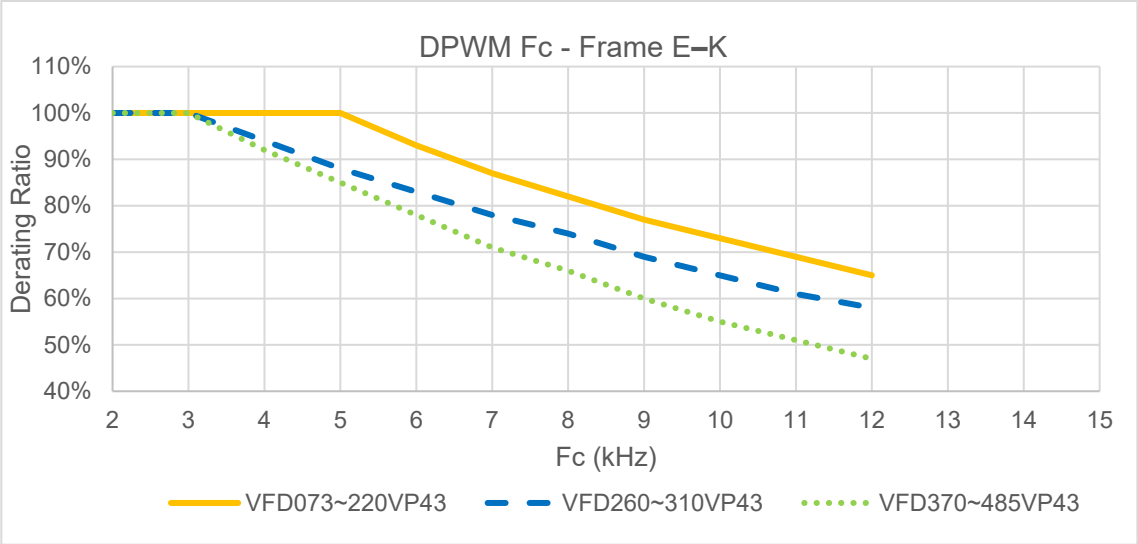


Figure 11-5

The rated output current derating for different carrier frequencies (unit: %):

Frame	Model	DPWM Fc (kHz)													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
E–H	VFD073–220VP43_ _ _ _ _	100	100	100	100	93	87	82	77	73	69	65	-	-	-
I	VFD260–310VP43_ _ _ _ _	100	100	94	88	83	78	74	69	65	61	58	-	-	-
J–K	VFD370–485VP43_ _ _ _ _	100	100	92	85	78	71	66	60	55	51	47	-	-	-

Table 11-13

Frame L–M

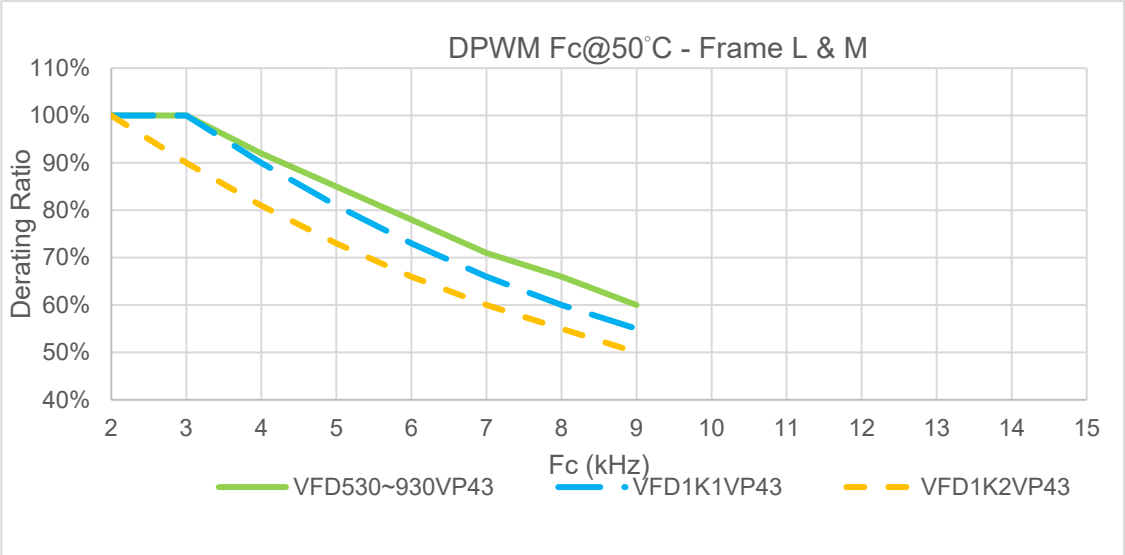


Figure 11-6

The rated output current derating for different carrier frequencies (unit: %):

Frame	Model	DPWM Fc (kHz)													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
L	VFD530–770VP43_ _ _ _ _	100	100	92	85	78	71	66	60	-	-	-	-	-	-
M	VFD866–930VP43_ _ _ _ _	100	100	92	85	78	71	66	60	-	-	-	-	-	-
M	VFD1K1VP43_ _ _ _ _	100	100	90	81	73	66	60	55	-	-	-	-	-	-
M	VFD1K2VP43_ _ _ _ _	100	90	81	73	66	60	55	50	-	-	-	-	-	-

Table 11-14

11-5 Efficiency Curve

- Models:
  VFD3A0VP43A–VFD011VP43A

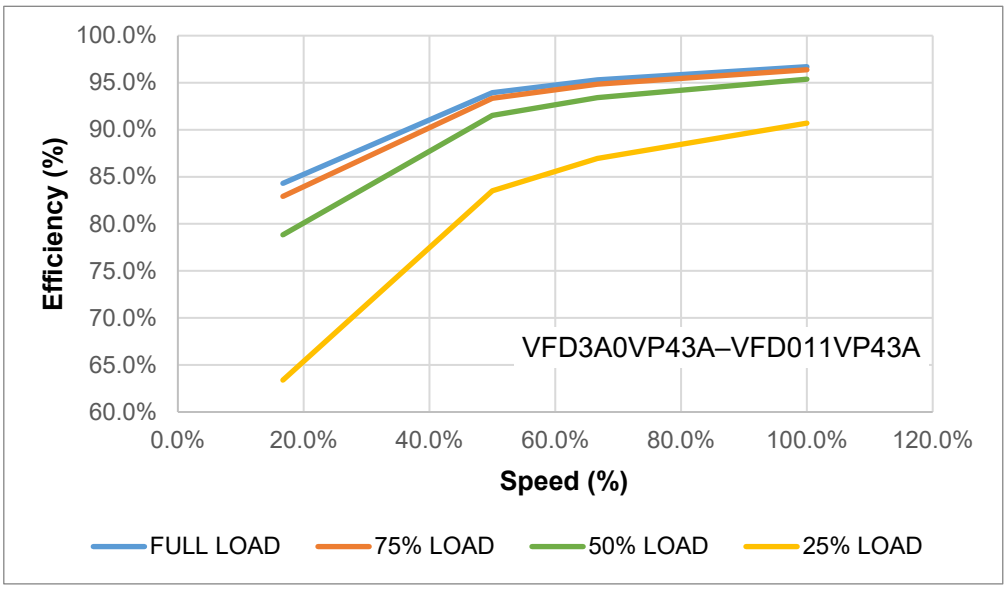


Figure 11-7

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50.0	66.7	100.0
100% Load	84.3	93.9	95.3	96.7
75% Load	82.9	93.3	94.8	96.4
50% Load	78.8	91.5	93.4	95.4
25% Load	63.4	83.5	87.0	90.7

Table 11-15

- Models:
  VFD013VP43A–VFD220VP43A

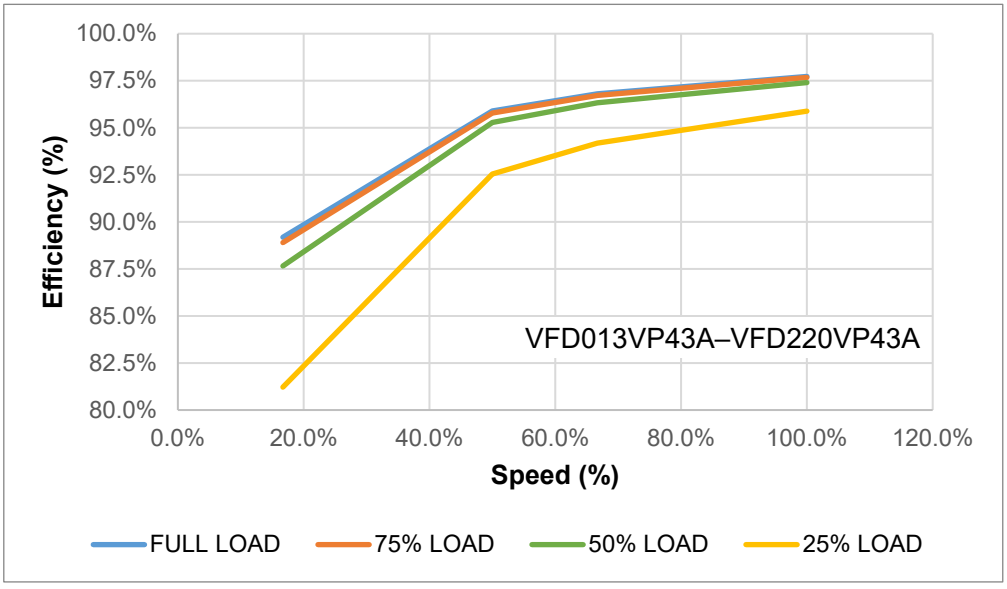


Figure 11-8

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50.0	66.7	100.0
100% Load	89.2	95.9	96.8	97.7
75% Load	88.9	95.8	96.7	97.7
50% Load	87.7	95.3	96.3	97.4
25% Load	81.2	92.5	94.2	95.9

Table 11-16

- Models:
  VFD260VP43A–VFD1K2VP43A

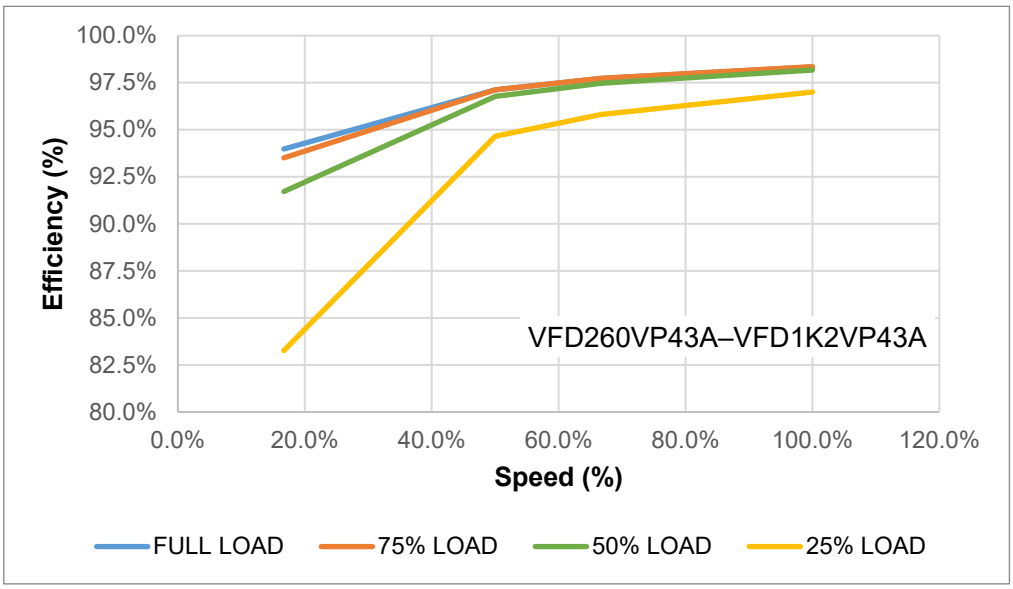


Figure 11-9

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50.0	66.7	100.0
100% Load	94.0	97.1	97.7	98.3
75% Load	93.5	97.1	97.7	98.3
50% Load	91.7	96.8	97.5	98.2
25% Load	83.3	94.7	95.8	97.0

Table 11-17

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Chapter 12 Summary of Parameter Settings

A. Fundamental Setting

b. Pr Management & Macro

C. Control Mode & Cmd Scheme

d. Motor Parameter

E. VF Control & SVC

F. FOC

G. IO Setting

H. Fault & Protection

J. Application Function

L. PLC Function

n. Communication

o. Monitor & Recorder

P. PID Function

U. Industry

Before Use

1. The AC motor drive functions are positively correlated with the number of parameters. For easy use and quick adjustment, the product is preset to display common parameters (for example, Parameter group A0–A4) before leaving the factory, those non-common parameters (for example, Parameter group A5) are not displayed, which can be adjusted through parameters, refer to description of Pr. b0-00 for further information.
2. The AC motor drive supports parameter backup for different firmware version, model powers or voltage, refer to description of Pr.b0-00 for further information.
3. Quick and easy use through the Macro selection, refer to description of Pr.b1-00.
4. The drive adopts one-way setting of function-specified MI / AI, refer to description of Pr.A1-00 and C1-01.
5. The drive adopts bidirectional setting of function-specified MO / AO and MO / AO-specified function, refer to description of Pr.A1-00 and G1-04.
6. Refer to Chapter 4 'Operation Interface' for information of intuitive digital keypad operation interface.
7. For AC motor drive with firmware version 1.10 and above, use it with digital keypad with firmware KPV-CC01 V1.10 and above to operate normally.

This chapter provides summary of parameter settings for user to gather the parameter setting ranges, default settings and set parameters. The parameters can be set, changed and reset by the digital keypad.

NOTE:

(1) ✓: the parameter can be set during operation

(2) ✻: Advanced parameters, set Pr.b0-00 to unlock this parameter.

(3) For more detail on parameters, refer to Ch13 Description of Parameter Settings.

(4) The following are abbreviations for different types of motors:

- IM: Induction motor
- PM: Permanent magnet synchronous AC motor
- IPM: Interior permanent magnet synchronous AC motor
- SPM: Surface permanent magnet synchronous AC motor
- SynRM: Synchronous reluctance motor

A. Fundamental Setting

A0. Drive Information

Pr.	Parameter Name	Setting Range	Default
A0-00 (0x00)	Drive Identity Code	3–165	Read only
A0-01 (0x01)	Drive Cont. Rated Current	0–6000.0 A	Read only
A0-02 (0x02)	Drive Max. Output Current	0–6000.0 A	Read only
A0-03 (0x03)	Control Board FW Version	0.00–655.35	Read only

Pr.	Parameter Name	Setting Range	Default
A0-05 (0x05)	Control Board FW Date Code	0–65535	Read only
A0-06 (0x06)	Power Board FW Version	0.00–655.35	Read only
A0-08 (0x08)	Power Board FW Date Code	0–65535	Read only
A0-29 (0x1D)	Drive Light Load Output Current	Read only	Read only

A1. Control Handle

Pr.	Parameter Name	Setting Range	Default
A1-00 (0x40)	EX1/EX2 Switch Src	0: External 1 1: External 2 2–7: MI1–MI6 8–10: Reserve 10–15: MI10–MI15	0
A1-01 (0x41)	EX1 OPER Cmd Src	0: Disable 1: S1 Start 2: S1 Start, S2 Dir 3: S1 FWD, S2 REV 4: S1 Start, S2 Stop 5: S1 Start, S2 Stop, S3 Dir 6: S1 FWD, S2 REV, S3 Stop 7: Keypad 8: RS-485 9: USB 10: EX. COM	0
A1-02 (0x42)	EX1 S1 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
A1-03 (0x43)	EX1 S2 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0

	Pr.	Parameter Name	Setting Range	Default
	A1-04 (0x44)	EX1 S3 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A1-05 (0x45)	EX1 S1 Trigger Method	0: Edge Triggered 1: Level Triggered	0
↗	A1-06 (0x46)	EX1 S2 Trigger Method	0: Edge Triggered 1: Level Triggered	0
↗	A1-07 (0x47)	EX1 S3 Trigger Method	0: Edge Triggered 1: Level Triggered	0
	A1-08 (0x48)	EX2 OPER Cmd Src	0: Disable 1: S1 Start 2: S1 Start, S2 Dir 3: S1 FWD, S2 REV 4: S1 Start, S2 Stop 5: S1 Start, S2 Stop, S3 Dir 6: S1 FWD, S2 REV, S3 Stop 7: Keypad 8: RS-485 9: USB 10: EX. COM	0
	A1-09 (0x49)	EX2 S1 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	A1-10 (0x4A)	EX2 S2 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	A1-11 (0x4B)	EX2 S3 Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A1-12 (0x4C)	EX2 S1 Trigger Method	0: Edge Triggered 1: Level Triggered	0

	Pr.	Parameter Name	Setting Range	Default
↗	A1-13 (0x4D)	EX2 S2 Trigger Method	0: Edge Triggered 1: Level Triggered	0
↗	A1-14 (0x4E)	EX2 S3 Trigger Method	0: Edge Triggered 1: Level Triggered	0
↗	A1-15 (0x4F)	Halt Decel Method	0: Ramp to stop 1: By Quick Stop Time 2: Auto-Decel	0
	A1-16 (0x50)	Halt MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	A1-17 (0x51)	Lock MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	A1-21 (0x55)	Run Enable MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A1-22 (0x56)	Run Disable Stop Method	0: Coast to stop 1: Ramp to stop 2: By Quick Stop Time 3: Auto-Decel	0
↗	A1-23 (0x57)	Run Enable Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	A1-24 (0x58)	OPER Cmd by Kpd Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

	Pr.	Parameter Name	Setting Range	Default
↗	A1-25 (0x59)	Forward Cmd Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	A1-26 (0x5A)	Reverse Cmd Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	A1-27 (0x5B)	FWD / REV Direction Setting	0: Enable FWD/ REV 1: FWD only 2: REV only	0
	A1-28 (0x5C)	Forward Phase Sel	0: UVW 1: UWV	0
	A1-29 (0x5D)	Base Block MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A1-30 (0x5E)	Base Block Time	Demagnitization time setting–5.0 sec.	Demagni-tization time set
↗	A1-31 (0x5F)	Base Block Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
	A1-32 (0x60)	External Fault MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	A1-33 (0x61)	External Fault Stop Method	0: Coast to stop 1: Ramp to stop 2: By EF decel Time 3: Auto-Decel	0
↗	A1-34 (0x62)	External Fault Decel Time	0.0–6000.0 sec. 0.00–600.00 sec.	10.00 or 60.00

A2. Stop Method

	Pr.	Parameter Name	Setting Range	Default
↗	A2-00 (0x80)	Stop Method	0: Ramp to stop 1: Coast to stop 2: Auto-Decel	0
	A2-01 (0x81)	Quick Stop MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A2-02 (0x82)	Quick Stop Method	0: By Quick Stop Time 1: Coast to stop 2: Auto-Decel 3: Ramp to stop	0
	A2-03 (0x83)	Emergency Stop MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A2-05 (0x85)	Decel Voltage Limit	Depending on the models	Depending on the models
↗	A2-06 (0x86)	Zero Speed Delay Level	0.00–599.00 Hz	1.00
↗	A2-07 (0x87)	Zero Speed Delay Time	0.0–6553.5 sec.	0.0
↗	A2-08 (0x88)	Zero Speed Delay Timeout	0.0–6553.5 sec.	0.0

A3. Start & Stop Function

	Pr.	Parameter Name	Setting Range	Default
↗	A3-00 (0xC0)	Start Speed Tracking	0: Disable 1: Max. output FREQ 2: FREQ Cmd at Start 3: Min. output FREQ 4: Rotor FREQ	0
↗	A3-01 (0xC1)	Speed Tracking Current Limit	20–200%	100
↗	A3-02 (0xC2)	Speed Tracking Voltage Gain	1–200%	100
↗	A3-03 (0xC3)	Speed Tracking Time	0.100–10.000 sec.	1.000
↗	A3-04 (0xC4)	Speed Tracking FREQ Filter	0.001–10.000 sec.	0.050

	Pr.	Parameter Name	Setting Range	Default
↗	A3-05 (0xC5)	Speed Tracking Transient Time	0.100–10.000 sec.	0.500
↗	A3-06 (0xC6)	DC Brake Current Level	0–150%	100
↗	A3-07 (0xC7)	DC Brake Time at Start	0.0–60.0 sec.	0.0
↗	A3-08 (0xC8)	DC Brake Time at Stop	0.0–60.0 sec.	0.0
↗	A3-09 (0xC9)	DC Brake Frequency at Stop	0.00–599.00 Hz	0.00
↗	A3-10 (0xCA)	DC Brake Kp Gain	0.000–60.000 pu	0.020
↗	A3-11 (0xCB)	DC Brake Ki Gain	0.000–60.000 pu	0.500
↗	A3-12 (0xCC)	PM Zero Voltage Time at Start	0.0–60.0 sec.	0.0
↗	A3-13 (0xCD)	PM Zero Voltage Time at Stop	0.0–60.0 sec.	0.0
↗	A3-14 (0xCE)	IM Magnetize Time at Start	0.0–60.0 sec.	0.0
↗	A3-15 (0xCF)	IM Magnetize Current at Start	0–100%	0
↗	A3-16 (0xD0)	IM Demagnetize Time	0.0–5.0 sec.	Depending on the models
	A3-17 (0xD1)	SM Rotor Initial Detection	0: Disable 1: Force Alignment 2: Pulse inject 3: HFI	0
	A3-18 (0xD2)	Force Alignment Current Value	0–150%	50
	A3-19 (0xD3)	Force Alignment Time	0.0–10.0 sec.	2.0
	A3-20 (0xD4)	Pulse Inject Curr Threshold	0–300%	100
↗	A3-21 (0xD5)	HFI Frequency	200–2400 Hz	1000
↗	A3-22 (0xD6)	HFI Amplitude	0–100%	30

A4. HOA / LoRe Setting

	Pr.	Parameter Name	Setting Range	Default
	A4-00 (0x100)	HOA/ LoRe Sel.	0: HOA 1: LoRe	0
↗	A4-01 (0x101)	AUTO Lock MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A4-02 (0x102)	AUTO Lock Mode	0: AUTO to OFF Disable 1: AUTO to HAND Disable 2: AUTO to HAND & OFF Disable	0
↗	A4-03 (0x103)	AUTO Initial FREQ Cmd	0: FREQ before switch 1: AUTO mode FREQ	0
↗	A4-04 (0x104)	HAND Initial FREQ Cmd	0: FREQ before switch 1: HAND mode FREQ	0
	A4-05 (0x105)	LoRe Switch Src	0: Remote 1: Local 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–19: Reserve 20: Keypad	20
↗	A4-06 (0x106)	Remote Lock MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	A4-07 (0x107)	Remote Keypad STOP Enable	0: Disable 1: Enable	0
↗	A4-08 (0x108)	Remote Initial FREQ Cmd	0: FREQ before switch 1: Remote mode FREQ	0
↗	A4-09 (0x109)	Local Initial FREQ Cmd	0: FREQ before switch 1: Local mode FREQ	0
	A4-10 (0x10A)	LoRe Switch Action	0: Always stop 1: Remote Start Cmd 2: Local Start Cmd 3: Start Cmd before Switch	2

＊A5. Carrier FREQ Adjustment

	Pr.	Parameter Name	Setting Range	Default
↗	A5-00 (0x140)	CF Setting	Depending on the models–15.0 kHz	Depending on the models
↗	A5-01 (0x141)	Over-Modulation Gain	80–110%	100
	A5-12 (0x14C)	RPWM Sel	0: Disable 1: RPWM Mode 1 2: RPWM Mode 2 3: RPWM Mode 3	0
↗	A5-13 (0x14D)	RPWM Range	0.0–Carrier frequency setting kHz	0.0
↗	A5-14 (0x14E)	AVR Function	0: Enable 1: Disable during decel 2: Disable	0
↗	A5-15 (0x14F)	AVR DC bus Filter Time	0.000–10.000 sec.	0.010
↗	A5-16 (0x150)	DC bus Filter Time	0.000–10.000 sec.	0.010
	A5-17 (0x151)	DC bus Ripple Suppression	0: Disable 1: Manual COMP	Depending on the models
↗	A5-18 (0x152)	DC bus Ripple Suppress Gain	0.00–50.00	0
	A5-19 (0x153)	DC bus Ripple Suppress Limit	5–30%	10

b. Pr Management & Macro

b0. Pr Management

	Pr.	Parameter Name	Setting Range	Default
↗	b0-00 (0x200)	Access Permission	0: Normal 1: Advanced	0
	b0-01 (0x201)	Parameter Reset	0: Reserved 5: Reset kWh 6: Reset PLC 7: Reset CANopen Slave index 9: Reset 50 Hz default 10: Reset 60 Hz default 11–12: Reserved 13: Reset parameters and setting	0
↗	b0-02 (0x202)	Password Setting	0–65535	0
↗	b0-03 (0x203)	Password	0–65535	0
↗	b0-04 (0x204)	Read-Only Password Setting	0–65535	0
↗	b0-05 (0x205)	Read-Only Password	0–65535	0
	b0-06 (0x206)	Failed password attempts	0–3	Read only
	b0-07 (0x207)	Parameter Lock Status	bit0: Parameter hidden bit1: Parameter read-only bit2: Reserve bit3: Over PW attempts limit bit4: FireMode parameter lock	Read only
✻	b0-12 (0x20D)	Parameter Control Bit	bit0: Disable the ‘force unlock’ function bit0 = 0: OFF (allow forced unlock) bit0 = 1: ON (not allow forced unlock)	0

b1. Application Macro

	Pr.	Parameter Name	Setting Range	Default
↗	b1-00 (0x240)	MACRO Sel	0: Reserve 1: User Defined 2: Basic operation 3: 3-Wire-1 4: 3-Wire-2 5: HOA Switch 6: Multi-Speed 7: PID	0

	Pr.	Parameter Name	Setting Range	Default
			8–15: Reserved 16: Compressor 17: PM Compressor 18: Fan 19: Pump 20: AHU	
↗	b1-01 (0x241)	MACRO Parameter 1	0–65535	0
↗	b1-02 (0x242)	MACRO Parameter 2	0–65535	0
↗	b1-03 (0x243)	MACRO Parameter 3	0–65535	0
↗	b1-04 (0x244)	MACRO Parameter 4	0–65535	0
↗	b1-05 (0x245)	MACRO Parameter 5	0–65535	0
↗	b1-06 (0x246)	MACRO Parameter 6	0–65535	0
↗	b1-07 (0x247)	MACRO Parameter 7	0–65535	0
↗	b1-08 (0x248)	MACRO Parameter 8	0–65535	0
↗	b1-09 (0x249)	MACRO Parameter 9	0–65535	0
↗	b1-10 (0x24A)	MACRO Parameter 10	0–65535	0
↗	b1-11 (0x24B)	MACRO Parameter 11	0–65535	0
↗	b1-12 (0x24C)	MACRO Parameter 12	0–65535	0
↗	b1-13 (0x24D)	MACRO Parameter 13	0–65535	0
↗	b1-14 (0x24E)	MACRO Parameter 14	0–65535	0
↗	b1-15 (0x24F)	MACRO Parameter 15	0–65535	0
↗	b1-16 (0x250)	MACRO Parameter 16	0–65535	0
↗	b1-17 (0x251)	MACRO Parameter 17	0–65535	0
↗	b1-18 (0x252)	MACRO Parameter 18	0–65535	0
↗	b1-19 (0x253)	MACRO Parameter 19	0–65535	0
↗	b1-20 (0x254)	MACRO Parameter 20	0–65535	0
↗	b1-21 (0x255)	MACRO Parameter 21	0–65535	0
↗	b1-22 (0x256)	MACRO Parameter 22	0–65535	0

	Pr.	Parameter Name	Setting Range	Default
↗	b1-23 (0x257)	MACRO Parameter 23	0–65535	0
↗	b1-24 (0x258)	MACRO Parameter 24	0–65535	0
↗	b1-25 (0x259)	MACRO Parameter 25	0–65535	0
↗	b1-26 (0x25A)	MACRO Parameter 26	0–65535	0
↗	b1-27 (0x25B)	MACRO Parameter 27	0–65535	0
↗	b1-28 (0x25C)	MACRO Parameter 28	0–65535	0
↗	b1-29 (0x25D)	MACRO Parameter 29	0–65535	0
↗	b1-30 (0x25E)	MACRO Parameter 30	0–65535	0
↗	b1-31 (0x25F)	MACRO Parameter 31	0–65535	0
↗	b1-32 (0x260)	MACRO Parameter 32	0–65535	0
↗	b1-33 (0x261)	MACRO Parameter 33	0–65535	0
↗	b1-34 (0x262)	MACRO Parameter 34	0–65535	0
↗	b1-35 (0x263)	MACRO Parameter 35	0–65535	0
↗	b1-36 (0x264)	MACRO Parameter 36	0–65535	0
↗	b1-37 (0x265)	MACRO Parameter 37	0–65535	0
↗	b1-38 (0x266)	MACRO Parameter 38	0–65535	0
↗	b1-39 (0x267)	MACRO Parameter 39	0–65535	0
↗	b1-40 (0x268)	MACRO Parameter 40	0–65535	0
↗	b1-41 (0x269)	MACRO Parameter 41	0–65535	0
↗	b1-42 (0x26A)	MACRO Parameter 42	0–65535	0
↗	b1-43 (0x26B)	MACRO Parameter 43	0–65535	0
↗	b1-44 (0x26C)	MACRO Parameter 44	0–65535	0
↗	b1-45 (0x26D)	MACRO Parameter 45	0–65535	0
↗	b1-46 (0x26E)	MACRO Parameter 46	0–65535	0
↗	b1-47 (0x26F)	MACRO Parameter 47	0–65535	0

Pr.	Parameter Name	Setting Range	Default
b1-48 (0x270)	MACRO Parameter 48	0–65535	0
b1-49 (0x271)	MACRO Parameter 49	0–65535	0
b1-50 (0x272)	MACRO Parameter 50	0–65535	0
b1-51 (0x273)	MACRO Parameter 51	0–65535	0
b1-52 (0x274)	MACRO Parameter 52	0–65535	0
b1-53 (0x275)	MACRO Parameter 53	0–65535	0
b1-54 (0x276)	MACRO Parameter 54	0–65535	0
b1-55 (0x277)	MACRO Parameter 55	0–65535	0
b1-56 (0x278)	MACRO Parameter 56	0–65535	0
b1-57 (0x279)	MACRO Parameter 57	0–65535	0
b1-58 (0x27A)	MACRO Parameter 58	0–65535	0
b1-59 (0x27B)	MACRO Parameter 59	0–65535	0
b1-60 (0x27C)	MACRO Parameter 60	0–65535	0

∗b2. Pr Modified REC 1–10

Pr.	Parameter Name	Setting Range	Default
b2-00 (0x280)	REC 1 Pr Address	0–65535	Read only
b2-01 (0x281)	REC 1 Original Setting	0–65535	Read only
b2-02 (0x282)	REC 1 New Setting	0–65535	Read only
b2-03 (0x283)	REC 1 Year	0–65535	Read only
b2-04 (0x284)	REC 1 Date	0–1231	Read only
b2-05 (0x285)	REC 1 Time	0–2359	Read only
b2-06 (0x286)	REC 2 Pr Address	0–65535	Read only
b2-07 (0x287)	REC 2 Original Setting	0–65535	Read only
b2-08 (0x288)	REC 2 New Setting	0–65535	Read only
b2-09 (0x289)	REC 2 Year	0–65535	Read only

Pr.	Parameter Name	Setting Range	Default
b2-10 (0x28A)	REC 2 Date	0–1231	Read only
b2-11 (0x28B)	REC 2 Time	0–2359	Read only
b2-12 (0x28C)	REC 3 Pr Address	0–65535	Read only
b2-13 (0x28D)	REC 3 Original Setting	0–65535	Read only
b2-14 (0x28E)	REC 3 New Setting	0–65535	Read only
b2-15 (0x28F)	REC 3 Year	0–65535	Read only
b2-16 (0x290)	REC 3 Date	0–1231	Read only
b2-17 (0x291)	REC 3 Time	0–2359	Read only
b2-18 (0x292)	REC 4 Pr Address	0–65535	Read only
b2-19 (0x293)	REC 4 Original Setting	0–65535	Read only
b2-20 (0x294)	REC 4 New Setting	0–65535	Read only
b2-21 (0x295)	REC 4 Year	0–65535	Read only
b2-22 (0x296)	REC 4 Date	0–1231	Read only
b2-23 (0x297)	REC 4 Time	0–2359	Read only
b2-24 (0x298)	REC 5 Pr Address	0–65535	Read only
b2-25 (0x299)	REC 5 Original Setting	0–65535	Read only
b2-26 (0x29A)	REC 5 New Setting	0–65535	Read only
b2-27 (0x29B)	REC 5 Year	0–65535	Read only
b2-28 (0x29C)	REC 5 Date	0–1231	Read only
b2-29 (0x29D)	REC 5 Time	0–2359	Read only
b2-30 (0x29E)	REC 6 Pr Address	0–65535	Read only
b2-31 (0x29F)	REC 6 Original Setting	0–65535	Read only
b2-32 (0x2A0)	REC 6 New Setting	0–65535	Read only
b2-33 (0x2A1)	REC 6 Year	0–65535	Read only
b2-34 (0x2A2)	REC 6 Date	0–1231	Read only

Pr.	Parameter Name	Setting Range	Default
b2-35 (0x2A3)	REC 6 Time	0–2359	Read only
b2-36 (0x2A4)	REC 7 Pr Address	0–65535	Read only
b2-37 (0x2A5)	REC 7 Original Setting	0–65535	Read only
b2-38 (0x2A6)	REC 7 New Setting	0–65535	Read only
b2-39 (0x2A7)	REC 7 Year	0–65535	Read only
b2-40 (0x2A8)	REC 7 Date	0–1231	Read only
b2-41 (0x2A9)	REC 7 Time	0–2359	Read only
b2-42 (0x2AA)	REC 8 Pr Address	0–65535	Read only
b2-43 (0x2AB)	REC 8 Original Setting	0–65535	Read only
b2-44 (0x2AC)	REC 8 New Setting	0–65535	Read only
b2-45 (0x2AD)	REC 8 Year	0–65535	Read only
b2-46 (0x2AE)	REC 8 Date	0–1231	Read only
b2-47 (0x2AF)	REC 8 Time	0–2359	Read only
b2-48 (0x2B0)	REC 9 Pr Address	0–65535	Read only
b2-49 (0x2B1)	REC 9 Original Setting	0–65535	Read only
b2-50 (0x2B2)	REC 9 New Setting	0–65535	Read only
b2-51 (0x2B3)	REC 9 Year	0–65535	Read only
b2-52 (0x2B4)	REC 9 Date	0–1231	Read only
b2-53 (0x2B5)	REC 9 Time	0–2359	Read only
b2-54 (0x2B6)	REC 10 Pr Address	0–65535	Read only
b2-55 (0x2B7)	REC 10 Original Setting	0–65535	Read only
b2-56 (0x2B8)	REC 10 New Setting	0–65535	Read only
b2-57 (0x2B9)	REC 10 Year	0–65535	Read only
b2-58 (0x2BA)	REC 10 Date	0–1231	Read only
b2-59 (0x2BB)	REC 10 Time	0–2359	Read only

∗b3. Pr Modified REC 11–20

Pr.	Parameter Name	Setting Range	Default
b3-00 (0x2C0)	REC 11 Pr Address	0–65535	Read only
b3-01 (0x2C1)	REC 11 Original Setting	0–65535	Read only
b3-02 (0x2C2)	REC 11 New Setting	0–65535	Read only
b3-03 (0x2C3)	REC 11 Year	0–65535	Read only
b3-04 (0x2C4)	REC 11 Date	0–1231	Read only
b3-05 (0x2C5)	REC 11 Time	0–2359	Read only
b3-06 (0x2C6)	REC 12 Pr Address	0–65535	Read only
b3-07 (0x2C7)	REC 12 Original Setting	0–65535	Read only
b3-08 (0x2C8)	REC 12 New Setting	0–65535	Read only
b3-09 (0x2C9)	REC 12 Year	0–65535	Read only
b3-10 (0x2CA)	REC 12 Date	0–1231	Read only
b3-11 (0x2CB)	REC 12 Time	0–2359	Read only
b3-12 (0x2CC)	REC 13 Pr Address	0–65535	Read only
b3-13 (0x2CD)	REC 13 Original Setting	0–65535	Read only
b3-14 (0x2CE)	REC 13 New Setting	0–65535	Read only
b3-15 (0x2CF)	REC 13 Year	0–65535	Read only
b3-16 (0x2D0)	REC 13 Date	0–1231	Read only
b3-17 (0x2D1)	REC 13 Time	0–2359	Read only
b3-18 (0x2D2)	REC 14 Pr Address	0–65535	Read only
b3-19 (0x2D3)	REC 14 Original Setting	0–65535	Read only
b3-20 (0x2D4)	REC 14 New Setting	0–65535	Read only
b3-21 (0x2D5)	REC 14 Year	0–65535	Read only
b3-22 (0x2D6)	REC 14 Date	0–1231	Read only
b3-23 (0x2D7)	REC 14 Time	0–2359	Read only
b3-24 (0x2D8)	REC 15 Pr Address	0–65535	Read only

Pr.	Parameter Name	Setting Range	Default
b3-25 (0x2D9)	REC 15 Original Setting	0–65535	Read only
b3-26 (0x2DA)	REC 15 New Setting	0–65535	Read only
b3-27 (0x2DB)	REC 15 Year	0–65535	Read only
b3-28 (0x2DC)	REC 15 Date	0–1231	Read only
b3-29 (0x2DD)	REC 15 Time	0–2359	Read only
b3-30 (0x2DE)	REC 16 Pr Address	0–65535	Read only
b3-31 (0x2DF)	REC 16 Original Setting	0–65535	Read only
b3-32 (0x2E0)	REC 16 New Setting	0–65535	Read only
b3-33 (0x2E1)	REC 16 Year	0–65535	Read only
b3-34 (0x2E2)	REC 16 Date	0–1231	Read only
b3-35 (0x2E3)	REC 16 Time	0–2359	Read only
b3-36 (0x2E4)	REC 17 Pr Address	0–65535	Read only
b3-37 (0x2E5)	REC 17 Original Setting	0–65535	Read only
b3-38 (0x2E6)	REC 17 New Setting	0–65535	Read only
b3-39 (0x2E7)	REC 17 Year	0–65535	Read only
b3-40 (0x2E8)	REC 17 Date	0–1231	Read only
b3-41 (0x2E9)	REC 17 Time	0–2359	Read only
b3-42 (0x2EA)	REC 18 Pr Address	0–65535	Read only
b3-43 (0x2EB)	REC 18 Original Setting	0–65535	Read only
b3-44 (0x2EC)	REC 18 New Setting	0–65535	Read only
b3-45 (0x2ED)	REC 18 Year	0–65535	Read only
b3-46 (0x2EE)	REC 18 Date	0–1231	Read only
b3-47 (0x2EF)	REC 18 Time	0–2359	Read only
b3-48 (0x2F0)	REC 19 Pr Address	0–65535	Read only
b3-49 (0x2F1)	REC 19 Original Setting	0–65535	Read only

Pr.	Parameter Name	Setting Range	Default
b3-50 (0x2F2)	REC 19 New Setting	0–65535	Read only
b3-51 (0x2F3)	REC 19 Year	0–65535	Read only
b3-52 (0x2F4)	REC 19 Date	0–1231	Read only
b3-53 (0x2F5)	REC 19 Time	0–2359	Read only
b3-54 (0x2F6)	REC 20 Pr Address	0–65535	Read only
b3-55 (0x2F7)	REC 20 Original Setting	0–65535	Read only
b3-56 (0x2F8)	REC 20 New Setting	0–65535	Read only
b3-57 (0x2F9)	REC 20 Year	0–65535	Read only
b3-58 (0x2FA)	REC 20 Date	0–1231	Read only
b3-59 (0x2FB)	REC 20 Time	0–2359	Read only

C. Control Mode & Cmd Scheme

C0. Motor Control Mode

Pr.	Parameter Name	Setting Range	Default
C0-00 (0x400)	Motor Type	0: IM 1: PM 2: SynRM	0
C0-02 (0x402)	Motor Control Method	0: VF 1: SVC 2: FOC	0

C1. FREQ Cmd Handle

Pr.	Parameter Name	Setting Range	Default
C1-00 (0x440)	EX1 Main and Aux FREQ Math	0: Main FREQ 1: Aux FREQ 2: ADD 3: SUB 4: MULTI 5: DIV 6: MAX 7: MIN	0
C1-01 (0x441)	EX1 Main FREQ Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Up/down keys 17: Pulse Train 18: PID	1
C1-02 (0x442)	EX1 Aux FREQ Src	0: Ddisable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3	0

Pr.	Parameter Name	Setting Range	Default
		10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Up/down keys 17: Pulse Train 18: PID	
↗ C1-03 (0x443)	EX1 Aux FREQ Gain	-200.0–200.0%	100.0
↗ C1-04 (0x444)	EX2 Main & Aux FREQ Math	0: Main FREQ 1: Aux FREQ 2: ADD 3: SUB 4: MULTI 5: DIV 6: MAX 7: MIN	0
C1-05 (0x445)	EX2 Main FREQ Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Up/down keys 17: Pulse Train 18: PID	1
C1-06 (0x446)	EX2 Aux FREQ Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Up/down keys	0

	Pr.	Parameter Name	Setting Range	Default
			17: Pulse Train 18: PID	
✓	C1-07 (0x447)	EX2 Aux FREQ Gain	-200.0–200.0%	100.0
✓	C1-08 (0x448)	Keypad FREQ Cmd	0.00–599.00 Hz	60.00
	C1-09 (0x449)	FREQ Cmd REC	0.00–599.00 Hz	60.00
	C1-10 (0x44A)	Zero-speed Behavior	0: Output ready 1: Zero-speed run 2: Min output FREQ	0
✓	C1-11 (0x44B)	Pulse Train MI Src	0: Disable 1–5: Reserve 6: MI5	0
✓	C1-12 (0x44C)	Pulse Train Filter Time	0.000–65.535 sec.	0.100
✓	C1-13 (0x44D)	FREQ Cmd Up Key MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
✓	C1-14 (0x44E)	FREQ Cmd Down Key MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	C1-15 (0x44F)	Up/Down Accel/ Decel Method	0: Accel/ Decel time 1: Up/Down Accel/Decel rate	0
✓	C1-16 (0x450)	Up/Down Accel/ Decel Rate	0.001–1.000 Hz / ms	0.001
✓	C1-17 (0x451)	Up/Down Accel/ Decel Rate Unit	0: Hz/ms 1: Hz/100ms	0
	C1-18 (0x452)	Multi Speed Mode	0: 16 Speed 1: 4 Speed	0
	C1-19 (0x453)	Multi Speed MI Src 1	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0

	Pr.	Parameter Name	Setting Range	Default
	C1-20 (0x454)	Multi Speed MI Src 2	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	C1-21 (0x455)	Multi Speed MI Src 3	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	C1-22 (0x456)	Multi Speed MI Src 4	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
✓	C1-23 (0x457)	Multi Speed 1	0.00–599.00 Hz	0.00
✓	C1-24 (0x458)	Multi Speed 2	0.00–599.00 Hz	0.00
✓	C1-25 (0x459)	Multi Speed 3	0.00–599.00 Hz	0.00
✓	C1-26 (0x45A)	Multi Speed 4	0.00–599.00 Hz	0.00
✓	C1-27 (0x45B)	Multi Speed 5	0.00–599.00 Hz	0.00
✓	C1-28 (0x45C)	Multi Speed 6	0.00–599.00 Hz	0.00
✓	C1-29 (0x45D)	Multi Speed 7	0.00–599.00 Hz	0.00
✓	C1-30 (0x45E)	Multi Speed 8	0.00–599.00 Hz	0.00
✓	C1-31 (0x45F)	Multi Speed 9	0.00–599.00 Hz	0.00
✓	C1-32 (0x460)	Multi Speed 10	0.00–599.00 Hz	0.00
✓	C1-33 (0x461)	Multi Speed 11	0.00–599.00 Hz	0.00
✓	C1-34 (0x462)	Multi Speed 12	0.00–599.00 Hz	0.00
✓	C1-35 (0x463)	Multi Speed 13	0.00–599.00 Hz	0.00
✓	C1-36 (0x464)	Multi Speed 14	0.00–599.00 Hz	0.00
✓	C1-37 (0x465)	Multi Speed 15	0.00–599.00 Hz	0.00
✓	C1-38 (0x466)	Negative FREQ Cmd Define	0: Always 0 Hz 1: Negative is reverse	0

	Pr.	Parameter Name	Setting Range	Default
	C1-39 (0x467)	AI Res Switch MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
✓	C1-40 (0x468)	AI Res Switch Max FREQ	0.00–599.00 Hz	60.00
✓	C1-41 (0x469)	AI Res Switch Delay	0.000–65.000 sec.	0.000
	C1-42 (0x46A)	User-Defined FREQ Cmd Unit	0: Hz 1: %	0
✓	C1-43 (0x46B)	User-Defined FREQ Cmd Upper Limit	0.00–655.35%	100.00
	C1-44 (0x46C)	User-Defined FREQ Cmd Decimal Point	1: One decimal point 2: Two decimal points	2

C2. Accel / Decel & Speed Limit

	Pr.	Parameter Name	Setting Range	Default
✓	C2-00 (0x480)	Accel Time 1	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-01 (0x481)	Decel Time 1	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-02 (0x482)	Accel Time 2	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-03 (0x483)	Decel Time 2	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-04 (0x484)	Accel Time 3	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-05 (0x485)	Decel Time 3	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-06 (0x486)	Accel Time 4	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
✓	C2-07 (0x487)	Decel Time 4	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)

	Pr.	Parameter Name	Setting Range	Default
✓	C2-08 (0x488)	Start of Accel S-curve Time	0.00–25.00 sec./ 0.0–250.0 sec.	0.20 / 0.2
✓	C2-09 (0x489)	End of Accel S-curve Time	0.00–25.00 sec./ 0.0–250.0 sec.	0.20 / 0.2
✓	C2-10 (0x48A)	Start of Decel S-curve Time	0.00–25.00 sec./ 0.0–250.0 sec.	0.20 / 0.2
✓	C2-11 (0x48B)	End of Decel S-curve Time	0.00–25.00 sec./ 0.0–250.0 sec.	0.20 / 0.2
✓	C2-12 (0x48C)	Accel/ Decel 1/4 Switch FREQ	0.00–599.00 Hz	0.00
	C2-13 (0x48D)	Accel/ Decel Time unit	0: 0.01 second 1: 0.1 second	0
✓	C2-14 (0x48E)	Quick Stop Time	0.0–6000.0 sec./ 0.00–600.00 sec.	10.00 or 60.00 (30 HP above models)
	C2-15 (0x48F)	Accel/ Decel Switch MI Src 1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	C2-16 (0x490)	Accel/ Decel Swtich MI Src 2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
✓	C2-17 (0x491)	Max. OPER FREQ	0.00–599.00 Hz	60.00
✓	C2-18 (0x492)	FREQ Upper Limit	Lower limit frequency–599.00 (Hz)	599.00
✓	C2-19 (0x493)	FREQ Lower Limit	0.00–Upper limit frequency (Hz)	0.00
	C2-20 (0x494)	Start FREQ	0.00–motor's max. operation frequency (Hz)	0.50
✓	C2-21 (0x495)	Skip FREQ 1 Upper Limit	Skip frequency 1 lower limit–motor's max. operation frequency (Hz)	0
✓	C2-22 (0x496)	Skip FREQ 1 Lower Limit	0–Skip frequency 1 upper limit (Hz)	0
✓	C2-23 (0x497)	Skip FREQ 2 Upper Limit	Skip frequency 2 lower limit–motor's max. operation frequency (Hz)	0
✓	C2-24 (0x498)	Skip FREQ 2 Lower Limit	0–Skip frequency 2 upper limit (Hz)	0
✓	C2-25 (0x499)	Skip FREQ 3 Upper Limit	Skip frequency 3 lower limit–motor's max. operation frequency (Hz)	0
✓	C2-26 (0x49A)	Skip FREQ 3 Lower Limit	0–Skip frequency 3 upper limit (Hz)	0

Pr.	Parameter Name	Setting Range	Default
C2-27 (0x49B)	Min Output FREQ	0.00–motor's max. operation frequency (Hz)	0.50

C3. JOG Setting

Pr.	Parameter Name	Setting Range	Default
C3-00 (0x4C0)	JOG FREQ	0.00–Max. OPER FREQ (Hz)	6.00
C3-01 (0x4C1)	JOG Accel Time	0.0–6000.0 sec./ 0.00–600.00 sec.	10.0/ 10.00
C3-02 (0x4C2)	JOG Decel Time	0.0–6000.0 sec./ 0.00–600.00 sec.	10.0/ 10.00
C3-03 (0x4C3)	JOG MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 5–9: Reserve 10–15: MI10–MI15	0
C3-04 (0x4C4)	JOG Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

d. Motor Parameter

＊d0. IM Switching

	Pr.	Parameter Name	Setting Range	Default
	d0-00 (0x640)	IM 1–4 Sel	1: IM1 2: IM2 3: IM3 4: IM4 5: IM1/ IM2 switch 6: IM1–IM4 switch 7: IM Y-D switch enable	1
↗	d0-01 (0x641)	IM Switch MI Src 1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	d0-02 (0x642)	IM Switch MI Src 2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	d0-03 (0x643)	Y-D Switch FREQ	0.00–599.00 Hz	60.00
↗	d0-04 (0x644)	Y-D Switch Delay Time	0.000–60.000 sec.	0.200
↗	d0-05 (0x645)	Y-con Confirm MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	d0-06 (0x646)	D-con Confirm MI Src	0: Disable 1: Dnable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	d0-07 (0x647)	Y-con Cmd Output	0: Disable 1–2: Relay1–Relay2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

Pr.	Parameter Name	Setting Range	Default
d0-08 (0x648)	D-con Cmd Output	0: Disable 1–2: Relay1–Relay2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

d1. IM1 Parameter & Autotune

Pr.	Parameter Name	Setting Range	Default
d1-00 (0x680)	IM Autotune	0: Disable 1: IM static autotune 2: IM simple active autotune 3: IM advanced active autotune 4: Reserve	0
d1-01 (0x681)	IM1 Rated Power	0.0–6553.5 kW	Depending on the models
d1-02 (0x682)	IM1 Rated Current	Depending on the models (A)	Depending on the models
d1-03 (0x683)	IM1 Rated Voltage	Depending on the models (V)	Depending on the models
d1-04 (0x684)	IM1 Rated Speed	Depending on the number of poles (rpm)	Depending on the number of poles
d1-05 (0x685)	IM1 Rated FREQ	0.00–599.00 Hz	60.00
d1-06 (0x686)	IM1 Pole Number	2–64 Pole	4
d1-07 (0x687)	IM1 No-Load Current	0.0–6553.5 A	Depending on the models
d1-08 (0x688)	IM1 Rs	0.000–65.535 Ω	Depending on the models
d1-09 (0x689)	IM1 Rr	0.000–65.535 Ω	Depending on the models
d1-10 (0x68A)	IM1 Lm	0.0–6553.5 mH	Depending on the models
d1-11 (0x68B)	IM1 Lx	0.0–6553.5 mH	Depending on the models

∗d2. IM2 Parameter & Autotune

Pr.	Parameter Name	Setting Range	Default
d2-00 (0x6C0)	IM2 Rated Power	0.0–6553.5 kW	Depending on the models
d2-01 (0x6C1)	IM2 Rated Current	Depending on the models (A)	Depending on the models
d2-02 (0x6C2)	IM2 Rated Voltage	Depending on the models (V)	Depending on the models
d2-03 (0x6C3)	IM2 Rated Speed	Depending on the number of poles (rpm)	Depending on the number of poles
d2-04 (0x6C4)	IM2 Rated FREQ	0.00–599.00 Hz	60.00
d2-05 (0x6C5)	IM2 Pole Number	2–64 Pole	4
d2-06 (0x6C6)	IM2 No-Load Current	0–Rated current (A)	Depending on the models
d2-07 (0x6C7)	IM2 Rs	0.000–65.535 Ω	Depending on the models
d2-08 (0x6C8)	IM2 Rr	0.000–65.535 Ω	Depending on the models
d2-09 (0x6C9)	IM2 Lm	0.0–6553.5 mH	0.0
d2-10 (0x6CA)	IM2 Lx	0.0–6553.5 mH	0.0

∗d3. IM3 Parameter & Autotune

Pr.	Parameter Name	Setting Range	Default
d3-00 (0x700)	IM3 Rated Power	0.0–6553.5 kW	Depending on the models
d3-01 (0x701)	IM3 Rated Current	Depending on the models (A)	Depending on the models
d3-02 (0x702)	IM3 Rated Voltage	Depending on the models (V)	Depending on the models
d3-03 (0x703)	IM3 Rated Speed	Depending on the number of poles (rpm)	Depending on the number of poles
d3-04 (0x704)	IM3 Rated FREQ	0.00–599.00 Hz	60.00
d3-05 (0x705)	IM3 Pole Number	2–64 Pole	4

Pr.	Parameter Name	Setting Range	Default
d3-06 (0x706)	IM3 No-Load Current	0–Rated current (A)	Depending on the models
d3-07 (0x707)	IM3 Rs	0.000–65.535 Ω	Depending on the models
d3-08 (0x708)	IM3 Rr	0.000–65.535 Ω	Depending on the models
d3-09 (0x709)	IM3 Lm	0.0–6553.5 mH	0.0
d3-10 (0x70A)	IM3 Lx	0.0–6553.5 mH	0.0

∗d4. IM4 Parameter & Autotune

Pr.	Parameter Name	Setting Range	Default
d4-00 (0x740)	IM4 Rated power	0.0–6553.5 kW	Depending on the models
d4-01 (0x741)	IM4 Rated Current	Depending on the models (A)	Depending on the models
d4-02 (0x742)	IM4 Rated Voltage	Depending on the models (V)	Depending on the models
d4-03 (0x743)	IM4 Rated Speed	Depending on the number of poles (rpm)	Depending on the number of poles
d4-04 (0x744)	IM4 Rated Frequency	0.00–599.00 Hz	60.00
d4-05 (0x745)	IM4 Pole Number	2–64 Pole	4
d4-06 (0x746)	IM4 No-Load Current	0–Rated current (A)	Depending on the models
d4-07 (0x747)	IM4 Rs	0.000–65.535 Ω	Depending on the models
d4-08 (0x748)	IM4 Rr	0.000–65.535 Ω	Depending on the models
d4-09 (0x749)	IM4 Lm	0.0–6553.5 mH	0.0
d4-10 (0x74A)	IM4 Lx	0.0–6553.5 mH	0.0

d5. SM Parameter & Autotune

Pr.	Parameter Name	Setting Range	Default
d5-00 (0x780)	SM Autotune	0: Disable 1: SM static autotune 2: SM blocked rotor autotune 3: SM active autotune 4: Reserve	0
d5-01 (0x781)	SM Rated power	0.1–6553.5 kW	Depending on the models
d5-02 (0x782)	SM Rated Current	Depending on the models (A)	Depending on the models
d5-03 (0x783)	SM Rated Voltage	Depending on the models (V)	Depending on the models
d5-04 (0x784)	SM Rated Speed	PM: 0–65535 rpm SynRM: 0–65535 rpm	1800 1500
d5-05 (0x785)	SM Pole Number	PM: 2–65535 Pole SynRM: 2–65535 Pole	8 4
d5-06 (0x786)	SM Rs	0–65.535 Ω (Digit of the decimal points varies with the motor's power)	1.000
d5-07 (0x787)	SM Ld	0.00–655.35 mH	10.00
d5-08 (0x788)	SM Lq	0.00–655.35 mH	10.00
d5-10 (0x78A)	SM BEMF Constant	0–6553.5 V/krpm	0

E. VF Control & SVC

E0. IM1 VF Control & SVC

	Pr.	Parameter Name	Setting Range	Default
	E0-00 (0x840)	IM1 VF Curve Sel	0: Manual VF curve 1: 1.5th power V/F curve 2: 2nd power V/F curve 3: 60 Hz with rated 50 Hz 4: 72 Hz with rated 60 Hz 5: 50 Hz, 3rd power decreasing 6: 50 Hz, 2nd power decreasing 7: 60 Hz, 3rd power decreasing 8: 60 Hz, 2nd power decreasing 9: 50 Hz, Mid starting torque 10: 50 Hz, Large starting torque 11: 60 Hz, Mid starting torque 12: 60 Hz, Large starting torque 13: 90 Hz with rated 60 Hz 14: 120 Hz with rated 60 Hz 15: 180 Hz with rated 60 Hz	0
↗	E0-01 (0x841)	IM1 VF Max FREQ	3.00–599.00 Hz	60.00
↗	E0-02 (0x842)	IM1 VF Max Voltage	Depending on the models (V)	Depending on the models
↗	E0-03 (0x843)	IM1 VF Mid FREQ 5	0.00–599.00 Hz	3.00
↗	E0-04 (0x844)	IM1 VF Mid Voltage 5	Depending on the models (V)	Depending on the models
↗	E0-05 (0x845)	IM1 VF Mid FREQ 4	0.00–599.00 Hz	3.00
↗	E0-06 (0x846)	IM1 VF Mid Voltage 4	Depending on the models (V)	Depending on the models
↗	E0-07 (0x847)	IM1 VF Mid FREQ 3	0.00–599.00 Hz	3.00
↗	E0-08 (0x848)	IM1 VF Mid Voltage 3	Depending on the models (V)	Depending on the models
↗	E0-09 (0x849)	IM1 VF Mid FREQ 2	0.00–599.00 Hz	3.00
↗	E0-10 (0x84A)	IM1 VF Mid Voltage 2	Depending on the models (V)	Depending on the models
↗	E0-11 (0x84B)	IM1 VF Mid FREQ 1	0.00–599.00 Hz	1.50

	Pr.	Parameter Name	Setting Range	Default
✓	E0-12 (0x84C)	IM1 VF Mid Voltage 1	Depending on the models (V)	Depending on the models
✓	E0-13 (0x84D)	IM1 VF Min FREQ	0.00–599.00 Hz	0.50
✓	E0-14 (0x84E)	IM1 VF Min Voltage	Depending on the models (V)	Depending on the models
✓	E0-16 (0x850)	IM1 VF Torque COMP Gain	0.000–60.000 pu	0.000
✓	E0-17 (0x851)	IM1 VF Torque COMP Filter	0.000–60.000 sec.	0.300
✓	E0-19 (0x853)	IM1 VF Slip COMP Gain	0.000–60.000 pu	0.000
✓	E0-20 (0x854)	IM1 VF Slip COMP Filter	0.000–60.000 sec.	0.100
✓	E0-21 (0x855)	IM1 VF Hunt COMP Gain	0.000–60.000 pu	1.000
✓	E0-22 (0x856)	IM1 VF Hunt COMP Filter	0.0–6000.0 sec.	1.0
✓	E0-25 (0x859)	IM1 SVC Flux Boost Decay FREQ	0–100%	5
✓	E0-26 (0x85A)	IM1 SVC Flux Boost End FREQ	0–100%	10
✓	E0-27 (0x85B)	IM1 SVC Flux Boost Gain	0–100%	20
✓	E0-28 (0x85C)	IM1 SVC Slip COMP Gain	0.000–2.000	1.000
✓	E0-29 (0x85D)	IM1 SVC Slip COMP Filter	0.000–60.000 sec.	0.500
✓	E0-30 (0x85E)	IM1 SVC Torque COMP P Gain	0.000–60.000	0.050
✓	E0-31 (0x85F)	IM1 SVC Torque COMP I Gain	0.000–60.000	0.010
✓	E0-32 (0x860)	IM1 SVC Torque COMP Filter	0.000–60.000 sec.	0.500
✓	E0-33 (0x861)	IM1 SVC Hunt COMP Gain	0.000–60.000	0.500
✓	E0-34 (0x862)	IM1 SVC Hunt COMP Filter	0.0–6000.0 sec.	1.0

∗E1. IM2 VF Control & SVC

	Pr.	Parameter Name	Setting Range	Default
	E1-00 (0x880)	IM2 VF Curve Sel	0: Manual VF curve 1: 1.5th power V/F curve 2: 2nd power V/F curve 3: 60 Hz with rated 50 Hz 4: 72 Hz with rated 60 Hz 5: 50 Hz, 3rd power decreasing 6: 50 Hz, 2nd power decreasing 7: 60 Hz, 3rd power decreasing 8: 60 Hz, 2nd power decreasing 9: 50 Hz, Mid starting torque 10: 50 Hz, Large starting torque 11: 60 Hz, Mid starting torque 12: 60 Hz, Large starting torque 13: 90 Hz with rated 60 Hz 14: 120 Hz with rated 60 Hz 15: 180 Hz with rated 60 Hz	0
↗	E1-01 (0x881)	IM2 VF Max FREQ	3.00–599.00 Hz	60.00
↗	E1-02 (0x882)	IM2 VF Max Voltage	Depending on the models (V)	Depending on the models
↗	E1-03 (0x883)	IM2 VF Mid FREQ 5	0.00–599.00 Hz	3.00
↗	E1-04 (0x884)	IM2 VF Mid Voltage 5	Depending on the models (V)	Depending on the models
↗	E1-05 (0x885)	IM2 VF Mid FREQ 4	0.00–599.00 Hz	3.00
↗	E1-06 (0x886)	IM2 VF Mid Voltage 4	Depending on the models (V)	Depending on the models
↗	E1-07 (0x887)	IM2 VF Mid FREQ 3	0.00–599.00 Hz	3.00
↗	E1-08 (0x888)	IM2 VF Mid Voltage 3	Depending on the models (V)	Depending on the models
↗	E1-09 (0x889)	IM2 VF Mid FREQ 2	0.00–599.00 Hz	3.00
↗	E1-10 (0x88A)	IM2 VF Mid Voltage 2	Depending on the models (V)	Depending on the models
↗	E1-11 (0x88B)	IM2 VF Mid FREQ 1	0.00–599.00 Hz	1.50
↗	E1-12 (0x88C)	IM2 VF Mid Voltage 1	Depending on the models (V)	Depending on the models

Pr.	Parameter Name	Setting Range	Default
E1-13 (0x88D)	IM2 VF Min FREQ	0.00–599.00 Hz	0.50
E1-14 (0x88E)	IM2 VF Min Voltage	Depending on the models (V)	Depending on the models
E1-16 (0x890)	IM2 VF Torque COMP Gain	0.000–60.000 pu	0.000
E1-17 (0x891)	IM2 VF Torque COMP Filter	0.000–60.000 sec.	0.300
E1-19 (0x893)	IM2 VF Slip COMP Gain	0.000–60.000 pu	0.000
E1-20 (0x894)	IM2 VF Slip COMP Filter	0.000–60.000 sec.	0.100
E1-21 (0x895)	IM2 VF Hunt COMP Gain	0.000–60.000 pu	1.000
E1-22 (0x896)	IM2 VF Hunt COMP Filter	0.0–6000.0 sec.	1.0
E1-25 (0x899)	IM2 SVC Flux Boost Decay FREQ	0–100%	5
E1-26 (0x89A)	IM2 SVC Flux Boost End FREQ	0–100%	10
E1-27 (0x89B)	IM2 SVC Flux Boost Gain	0–100%	20
E1-28 (0x89C)	IM2 SVC Slip COMP Gain	0.000–2.000	1.000
E1-29 (0x89D)	IM2 SVC Slip COMP Filter	0.000–60.000 sec.	0.500
E1-30 (0x89E)	IM2 SVC Torque COMP P Gain	0.000–60.000	0.050
E1-31 (0x89F)	IM2 SVC Torque COMP I Gain	0.000–60.000	0.010
E1-32 (0x8A0)	IM2 SVC Torque COMP Filter	0.000–60.000 sec.	0.500
E1-33 (0x8A1)	IM2 SVC Hunt COMP Gain	0.000–60.000	0.500
E1-34 (0x8A2)	IM2 SVC Hunt COMP Filter	0.0–6000.0 sec.	1.0

∗E2. IM3 VF Control & SVC

Pr.	Parameter Name	Setting Range	Default
E2-00 (0x8C0)	IM3 VF Curve Sel	0: Manual VF curve 1: 1.5th power V/F curve 2: 2nd power V/F curve 3: 60 Hz with rated 50 Hz 4: 72 Hz with rated 60 Hz 5: 50 Hz, 3rd power decreasing	0

Pr.	Parameter Name	Setting Range	Default
		6: 50 Hz, 2nd power decreasing 7: 60 Hz, 3rd power decreasing 8: 60 Hz, 2nd power decreasing 9: 50 Hz, Mid starting torque 10: 50 Hz, Large starting torque 11: 60 Hz, Mid starting torque 12: 60 Hz, Large starting torque 13: 90 Hz with rated 60 Hz 14: 120 Hz with rated 60 Hz 15: 180 Hz with rated 60 Hz	
E2-01 (0x8C1)	IM3 VF Max FREQ	3.00–599.00 Hz	60.00
E2-02 (0x8C2)	IM3 VF Max Voltage	Depending on the models (V)	Depending on the models
E2-03 (0x8C3)	IM3 VF Mid FREQ 5	0.00–599.00 Hz	3.00
E2-04 (0x8C4)	IM3 VF Mid Voltage 5	Depending on the models (V)	Depending on the models
E2-05 (0x8C5)	IM3 VF Mid FREQ 4	0.00–599.00 Hz	3.00
E2-06 (0x8C6)	IM3 VF Mid Voltage 4	Depending on the models (V)	Depending on the models
E2-07 (0x8C7)	IM3 VF Mid FREQ 3	0.00–599.00 Hz	3.00
E2-08 (0x8C8)	IM3 VF Mid Voltage 3	Depending on the models (V)	Depending on the models
E2-09 (0x8C9)	IM3 VF Mid FREQ 2	0.00–599.00 Hz	3.00
E2-10 (0x8CA)	IM3 VF Mid Voltage 2	Depending on the models (V)	Depending on the models
E2-11 (0x8CB)	IM3 VF Mid FREQ 1	0.00–599.00 Hz	1.50
E2-12 (0x8CC)	IM3 VF Mid Voltage 1	Depending on the models (V)	Depending on the models
E2-13 (0x8CD)	IM3 VF Min FREQ	0.00–599.00 Hz	0.50
E2-14 (0x8CE)	IM3 VF Min Voltage	Depending on the models (V)	Depending on the models
E2-16 (0x8D0)	IM3 VF Torque COMP Gain	0.000–60.000 pu	0.000
E2-17 (0x8D1)	IM3 VF Torque COMP Filter	0.000–60.000 sec.	0.300

Pr.	Parameter Name	Setting Range	Default
E2-19 (0x8D3)	IM3 VF Slip COMP Gain	0.000–60.000 pu	0.000
E2-20 (0x8D4)	IM3 VF Slip COMP Filter	0.000–60.000 sec.	0.100
E2-21 (0x8D5)	IM3 VF Hunt COMP Gain	0.000–60.000 pu	1.000
E2-22 (0x8D6)	IM3 VF Hunt COMP Filter	0.0–6000.0 sec.	1.0
E2-25 (0x8D9)	IM3 SVC Flux Boost Decay FREQ	0–100%	5
E2-26 (0x8DA)	IM3 SVC Flux Boost End FREQ	0–100%	10
E2-27 (0x8DB)	IM3 SVC Flux Boost Gain	0–100%	20
E2-28 (0x8DC)	IM3 SVC Slip COMP Gain	0.000–2.000	1.000
E2-29 (0x8DD)	IM3 SVC Slip COMP Filter	0.000–60.000 sec.	0.500
E2-30 (0x8DE)	IM3 SVC Torque COMP P Gain	0.000–60.000	0.050
E2-31 (0x8DF)	IM3 SVC Torque COMP I Gain	0.000–60.000	0.010
E2-32 (0x8E0)	IM3 SVC Torque COMP Filter	0.000–60.000 sec.	0.500
E2-33 (0x8E1)	IM3 SVC Hunt COMP Gain	0.000–60.000	0.500
E2-34 (0x8E2)	IM3 SVC Hunt COMP Filter	0.0–6000.0 sec.	1.0

∗E3. IM4 VF Control & SVC

Pr.	Parameter Name	Setting Range	Default
E3-00 (0x900)	IM4 VF Curve Sel	0: Manual VF curve 1: 1.5th power V/F curve 2: 2nd power V/F curve 3: 60 Hz with rated 50 Hz 4: 72 Hz with rated 60 Hz 5: 50 Hz, 3rd power decreasing 6: 50 Hz, 2nd power decreasing 7: 60 Hz, 3rd power decreasing 8: 60 Hz, 2nd power decreasing 9: 50 Hz, Mid starting torque 10: 50 Hz, Large starting torque 11: 60 Hz, Mid starting torque 12: 60 Hz, Large starting torque	0

	Pr.	Parameter Name	Setting Range	Default
			13: 90 Hz with rated 60 Hz 14: 120 Hz with rated 60 Hz 15: 180 Hz with rated 60 Hz	
✓	E3-01 (0x901)	IM4 VF Max FREQ	3.00–599.00 Hz	60.00
✓	E3-02 (0x902)	IM4 VF Max Voltage	Depending on the models (V)	Depending on the models
✓	E3-03 (0x903)	IM4 VF Mid FREQ 5	0.00–599.00 Hz	3.00
✓	E3-04 (0x904)	IM4 VF Mid Voltage 5	Depending on the models (V)	Depending on the models
✓	E3-05 (0x905)	IM4 VF Mid FREQ 4	0.00–599.00 Hz	3.00
✓	E3-06 (0x906)	IM4 VF Mid Voltage 4	Depending on the models (V)	Depending on the models
✓	E3-07 (0x907)	IM4 VF Mid FREQ 3	0.00–599.00 Hz	3.00
✓	E3-08 (0x908)	IM4 VF Mid Voltage 3	Depending on the models (V)	Depending on the models
✓	E3-09 (0x909)	IM4 VF Mid FREQ 2	0.00–599.00 Hz	3.00
✓	E3-10 (0x90A)	IM4 VF Mid Voltage 2	Depending on the models (V)	Depending on the models
✓	E3-11 (0x90B)	IM4 VF Mid FREQ 1	0.00–599.00 Hz	1.50
✓	E3-12 (0x90C)	IM4 VF Mid Voltage 1	Depending on the models (V)	Depending on the models
✓	E3-13 (0x90D)	IM4 VF Min FREQ	0.00–599.00 Hz	0.50
✓	E3-14 (0x90E)	IM4 VF Min Voltage	Depending on the models (V)	Depending on the models
✓	E3-16 (0x910)	IM4 VF Torque COMP Gain	0.000–60.000 pu	0.000
✓	E3-17 (0x911)	IM4 VF Torque COMP Filter	0.000–60.000 sec.	0.300
✓	E3-19 (0x913)	IM4 VF Slip COMP Gain	0.000–60.000 pu	0.000
✓	E3-20 (0x914)	IM4 VF Slip COMP Filter	0.000–60.000 sec.	0.100
✓	E3-21 (0x915)	IM4 VF Hunt COMP Gain	0.000–60.000 pu	1.000
✓	E3-22 (0x916)	IM4 VF Hunt COMP Filter	0.0–6000.0 sec.	1.0

Pr.	Parameter Name	Setting Range	Default
E3-25 (0x919)	IM4 SVC Flux Boost Decay FREQ	0–100%	5
E3-26 (0x91A)	IM4 SVC Flux Boost End FREQ	0–100%	10
E3-27 (0x91B)	IM4 SVC Flux Boost Gain	0–100%	20
E3-28 (0x91C)	IM4 SVC Slip COMP Gain	0.000–2.000	1.000
E3-29 (0x91D)	IM4 SVC Slip COMP Filter	0.000–60.000 sec.	0.500
E3-30 (0x91E)	IM4 SVC Torque COMP P Gain	0.000–60.000	0.050
E3-31 (0x91F)	IM4 SVC Torque COMP I Gain	0.000–60.000	0.010
E3-32 (0x920)	IM4 SVC Torque COMP Filter	0.000–60.000 sec.	0.500
E3-33 (0x921)	IM4 SVC Hunt COMP Gain	0.000–60.000	0.500
E3-34 (0x922)	IM4 SVC Hunt COMP Filter	0.0–6000.0 sec.	1.0

E4. SM SVC

Pr.	Parameter Name	Setting Range	Default
E4-00 (0x940)	SM LowFREQ Voltage COMP Level	0–150%	40
E4-01 (0x941)	SM LowFREQ COMP Stop FREQ	0.00–599.00 Hz	20.00
E4-02 (0x942)	SM Feed Forward Voltage Gain	0.00–2.00	1.00
E4-03 (0x943)	SM FREQ Hunting Gain	0.000–60.000	0.100
E4-04 (0x944)	SM FREQ Hunting Filter	0.000–60.000 sec.	0.100
E4-05 (0x945)	SM Torque COMP Gain	0–5000	20
E4-06 (0x946)	SM Torque COMP Filter	0.000–60.000 sec.	0.100
E4-07 (0x947)	SM Angle Hunting Gain	0.0–6000.0	8.0
E4-08 (0x948)	SM Angle Hunting Decay FREQ	0.0–6000.0	0.4

F. FOC

F0. IM FOC

	Pr.	Parameter Name	Setting Range	Default
↗	F0-00 (0xAC0)	IMFOC Speed Observer BW	1–1000 Hz	40
↗	F0-01 (0xAC1)	IMFOC Speed Observer Filter	0.000–3.000 sec.	0.005
↗	F0-02 (0xAC2)	IMFOC Min Stator FREQ Level	0.0–10.0%	2.0
↗	F0-06 (0xAC6)	IMFOC Flux Boost Gain	0–100%	50
↗	F0-07 (0xAC7)	IMFOC Flux Boost Decay FREQ	0–6%	4
↗	F0-08 (0xAC8)	IMFOC Flux Boost End FREQ	0–30%	20

F1. SM FOC

	Pr.	Parameter Name	Setting Range	Default
	F1-00 (0xB00)	IF/HFI Sel	0: HFI 1: IF	1
↗	F1-01 (0xB01)	IF Cmd	0–150%	40
↗	F1-02 (0xB02)	HFI PLL BW Gain	10–500%	100
↗	F1-03 (0xB03)	Speed Observer Filter BW	0–100 Hz	10
↗	F1-04 (0xB04)	IF/HFI to SM Switch FREQ	0.00–599.00 Hz	20.00
↗	F1-05 (0xB05)	SM to IF/HFI Switch FREQ	0.00–599.00 Hz	20.00
↗	F1-06 (0xB06)	HFI Injection FREQ	200–1200 Hz	500
↗	F1-07 (0xB07)	HFI Injection Amplitude	0–100%	15
↗	F1-08 (0xB08)	Observer Low Speed Gain	10–1000%	100
↗	F1-09 (0xB09)	Observer High Speed Gain	10–1000%	100
↗	F1-10 (0xB0A)	PLL P Gain	10–1000%	100
↗	F1-11 (0xB0B)	PLL I Gain	10–1000%	100

F2. ASR Setting

	Pr.	Parameter Name	Setting Range	Default
	F2-00 (0xB40)	Motor Inertia	0.1–1000000.0 kg-cm^2	330.0 (Depending on the models)
	F2-01 (0xB42)	System Inertia	0.01–600.00	1.00
	F2-02 (0xB43)	ASR Calculation Sel	0: Gain 1: Bandwidth	1
	F2-03 (0xB44)	ASR High/ Low BW Switch FREQ	0.00–Max. operation frequency (Hz)	7.00
↗	F2-04 (0xB45)	ASR Zero-Speed BW	0.1–750.0 Hz	3.0
↗	F2-05 (0xB46)	ASR Low-Speed BW	0.1–750.0 Hz	3.0
↗	F2-06 (0xB47)	ASR High-Speed BW	0.1–750.0 Hz	3.0
↗	F2-07 (0xB48)	ASR Zero-Speed Gain	0.1–750.0 Hz	3.0
↗	F2-08 (0xB49)	ASR Zero-Speed Integral Time	0.001–10.000 sec.	0.100
↗	F2-09 (0xB4A)	ASR Low-Speed Gain	0.1–750.0 Hz	3.0
↗	F2-10 (0xB4B)	ASR Low-Speed Integral Time	0.001–10.000 sec.	0.100
↗	F2-11 (0xB4C)	ASR High-Speed Gain	0.1–750.0 Hz	3.0
↗	F2-12 (0xB4D)	ASR High-Speed Integral Time	0.001–10.000 sec.	0.100
↗	F2-13 (0xB4E)	PDFF Gain	0.00–1.00 pu	0.30
↗	F2-14 (0xB4F)	ASR Speed Feedforward Gain	0.00–100.00 pu	0.00
↗	F2-15 (0xB50)	Torque Cmd Filter Time	0.0–6000.0 ms	5.0
↗	F2-16 (0xB51)	FWD Motoring Torque Limit	0.00–300.00%	250.00
↗	F2-17 (0xB52)	FWD Regenerating Torque Limit	0.00–300.00%	250.00
↗	F2-18 (0xB53)	REV Motoring Torque Limit	0.00–300.00%	250.00
↗	F2-19 (0xB54)	REV Regenerating Torque Limit	0.00–300.00%	250.00
✻ ↗	F2-20 (0xB55)	IMFOC AMR BW	0.1–750.0 Hz	10.0

	Pr.	Parameter Name	Setting Range	Default
✻ ↗	F2-21 (0xB56)	IMFOC AMR Voltage Limit	0–110%	100
✻ ↗	F2-22 (0xB57)	SMFOC AMR Kp Gain	0.00–3.00	1.00
✻ ↗	F2-23 (0xB58)	SMFOC AMR Ki Gain	0.00–3.00	0.20
✻ ↗	F2-24 (0xB59)	SMFOC AMR Id Filter Coefficient	0–1000	10

✻F3. ACR Setting

	Pr.	Parameter Name	Setting Range	Default
↗	F3-00 (0xB80)	ACR Gain Calculation Sel	0: ACR BW 1: BW Calculated by CF	1
↗	F3-01 (0xB81)	ACR BW	10–3000 Hz	300
↗	F3-02 (0xB82)	ACR d-Axis Kp Gain	0.01–100.00 pu	1.00
↗	F3-03 (0xB83)	ACR d-Axis Ki Gain	0.01–100.00 pu	1.00
↗	F3-04 (0xB84)	ACR q-Axis Kp Gain	0.01–100.00 pu	1.00
↗	F3-05 (0xB85)	ACR q-Axis Ki Gain	0.01–100.00 pu	1.00

G. IO Setting

G0. MI Setting

	Pr.	Parameter Name	Setting Range	Default
↗	G0-00 (0xCC0)	MI Mode Sel	0: Low Active 1: High Active	0
	G0-01 (0xCC1)	MI Status	0: Inactive 1: Active	Read only
↗	G0-02 (0xCC2)	Virtual MI Function	0: Disable 1: Enable	0
↗	G0-03 (0xCC3)	Virtual MI Level Setting	0: Low 1: High	0
↗	G0-06 (0xCC6)	MI1 Response Time	0.000–30.000 sec.	0.001
↗	G0-08 (0xCC8)	MI2 Response Time	0.000–30.000 sec.	0.001
↗	G0-10 (0xCCA)	MI3 Response Time	0.000–30.000 sec.	0.001
↗	G0-12 (0xCCC)	MI4 Response Time	0.000–30.000 sec.	0.001
↗	G0-14 (0xCCE)	MI5 Response Time	0.000–30.000 sec.	0.001
↗	G0-16 (0xCD0)	MI6 Response Time	0.000–30.000 sec.	0.001
↗	G0-17 (0xCD1)	MI Count Src	0: Disable 1–5: Reserve 6: MI5	0
↗	G0-18 (0xCD2)	MI Count Clear Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	G0-19 (0xCD3)	MI Count Reached Level	0–60000 0: Disable	0
↗	G0-20 (0xCD4)	MI Count Reset Level	0–60000 0: Disable	0
↗	G0-21 (0xCD5)	MI Count Reached MO Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15	0

Pr.	Parameter Name	Setting Range	Default
G0-22 (0xCD6)	MI Count Reset MO Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15	0

G1. MO Setting

Pr.	Parameter Name	Setting Range	Default
G1-00 (0xD00)	MO Mode Sel	0: MO-MCM or RA-RC Close at Active 1: MO-MCM or RA-RC Open at Active	0
G1-01 (0xD01)	Virtual MO Function	0: Disable 1: Enable	0
G1-02 (0xD02)	Virtual MO Level Setting	0: Inactive 1: Active	0
G1-03 (0xD03)	MO Status	0: Inactive 1: Active	Read only
G1-04 (0xD04)	RY1 Function Sel	0: No function 1: Indication during RUN 2: Operation speed reached 3: Output frequency reached 1 4: Output frequency reached 2 5: Zero speed during RUN (Frequency command) 6: Zero speed (Frequency command) 7: Over-torque indication 8: Over torque at constant speed 9: Drive is ready 10: Low voltage fault (Lv) 11: Malfunction indication 12: P-PID2 feedback error indication 13: Overheat warning 14: JOG indication 15: P-PID1 feedback error indication 16: Over-slip error indication 17: MI count value reaches MO indication 18: MI count value resets MO indication 19: Base Block 20: Warning indication 21: Over-voltage warning 22: Over-voltage stall prevention 23: Over-current stall prevention	11
G1-06 (0xD06)	RY2 Function Sel		1
G1-08 (0xD08)	MO1 Function Sel		66
G1-10 (0xD0A)	MO2 Function Sel		67

Pr.	Parameter Name	Setting Range	Default
		24: Operation source is digital keypad 25: Forward command 26: Reverse command 27: Output current > Pr.o0-08 (Pr.o0-09) 28: Output current < Pr.o0-08 (Pr.o0-10) 29: Output frequency > Pr.o0-13 (Pr.o0-14) 30: Output frequency < Pr.o0-13 (Pr.o0-15) 31: Y-connection switching command 32: D-connection switching command 33: Zero speed during RUN (output frequency) 34: Zero speed (output frequency) 35: Error output selection 1 36: Error output selection 2 37: Error output selection 3 38: Error output selection 4 39: Motor 1 overheating 40: Motor 2 overheating 41: L/F overload 42: L/F underload 43: UVW magnetic contactor action indication 44: Low current 45: Run enable 46: dEb output 47: Preheat active 48: Fire mode 49: Modbus MO output mask 50: CANopen MO output mask 51: BACnet MO output mask 52: DeviceNet MO output mask 53: Profibus MO output mask 54: Ethernet MO output mask 55: Pump 1 ouptut enable selection 56: Pump 2ouptut enable selection 57: Pump 3 ouptut enable selection 58: Pump 4ouptut enable selection 59: Pump 5 ouptut enable selection 60: Pump 6 ouptut enable selection 61: Pump 7 ouptut enable selection 62: Pump 8 ouptut enable selection 63: U-phase Phase loss	

	Pr.	Parameter Name	Setting Range	Default
			64: V-phase Phase loss 65: W-phase Phase loss 66: STO output logic A 67: STO output logic B 68: Over-ripple voltage protection 69: Monitor 1 trigger indication 70: Monitor 2 trigger indication 71: Monitor 3 trigger indication 72: Monitor 4 trigger indication 73: Monitor 5 trigger indication 74: Monitor 6 trigger indication 75: Monitor 7 trigger indication 76: Monitor 8 trigger indication 77: Virtual MO function 78: Indication within AI level range 79: Component life lower than level indication	
	G1-12 (0xD0C)	DFM MO Indn	0: Disable 1–3: Reserve 4: MO2	0
✓	G1-13 (0xD0D)	DFM Function Sel	0: Disable 1: FREQ Cmd 2: FREQ Profile 3: Output FREQ	0
✓	G1-14 (0xD0E)	DFM Output Gain	1–100	1
✓	G1-15 (0xD0F)	RY1 ON Response Time	0.00–655.35 sec.	0.01
✓	G1-16 (0xD10)	RY1 OFF Response Time	0.00–655.35 sec.	0.01
✓	G1-17 (0xD11)	RY2 ON Response Time	0.00–655.35 sec.	0.01
✓	G1-18 (0xD12)	RY2 OFF Response Time	0.00–655.35 sec.	0.01
✓	G1-19 (0xD13)	MO1 ON Response Time	0.00–655.35 sec.	0.01
✓	G1-20 (0xD14)	MO1 OFF Response Time	0.00–655.35 sec.	0.01
✓	G1-21 (0xD15)	MO2 ON Response Time	0.00–655.35 sec.	0.01
✓	G1-21 (0xD16)	MO2 OFF Response Time	0.00–655.35 sec.	0.01

G2. AI Setting

	Pr.	Parameter Name	Setting Range	Default
↗	G2-00 (0xD40)	Virtual AI Function	0: Disable 1: Enable	0
↗	G2-03 (0xD43)	AI1 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
↗	G2-04 (0xD44)	AI1 Filter Time	0.00–20.00 sec.	0.02
↗	G2-05 (0xD45)	AI1 Low Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	0.00 0.00 4.00
↗	G2-06 (0xD46)	AI1 Low %	-100.00–100.00%	0.00
↗	G2-07 (0xD47)	AI1 Mid Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	5.00 10.00 12.00
↗	G2-08 (0xD48)	AI1 Mid %	-100.00–100.00%	50.00
↗	G2-09 (0xD49)	AI1 High Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	10.00 20.00 20.00
↗	G2-10 (0xD4A)	AI1 High %	-100.00–100.00%	100.00
	G2-11 (0xD4B)	AI1 Signal Loss Action	0–6 0: Disable 1: Warn & Continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	0
↗	G2-12 (0xD4C)	Virtual AI1 Input	0.00–100.00%	0.00
	G2-13 (0xD4D)	AI1 Display	0.00–100.00%	Read only
↗	G2-22 (0xD56)	AI2 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	2
↗	G2-23 (0xD57)	AI2 Filter Time	0.00–20.00 sec.	0.02

	Pr.	Parameter Name	Setting Range	Default
↗	G2-24 (0xD58)	AI2 Low Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	0.00 0.00 4.00
↗	G2-25 (0xD59)	AI2 Low %	-100.00–100.00%	0.00
↗	G2-26 (0xD5A)	AI2 Mid Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	5.00 10.00 12.00
↗	G2-27 (0xD5B)	AI2 Mid %	-100.00–100.00%	50.00
↗	G2-28 (0xD5C)	AI2 High Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	10.00 20.00 20.00
↗	G2-29 (0xD5D)	AI2 High %	-100.00–100.00%	100.00
	G2-30 (0xD5E)	AI2 Signal Loss Action	0: Disable 1: Warn & Continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	0
↗	G2-31 (0xD5F)	Virtual AI2 Input	0.00–100.00%	0.00
	G2-32 (0xD60)	AI2 Display	-100.00–100.00%	Read only
↗	G2-41 (0xD69)	AI3 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	2
↗	G2-42 (0xD6A)	AI3 Filter Time	0.00–20.00 sec.	0.02
↗	G2-43 (0xD6B)	AI3 Low Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	0.00 0.00 4.00
↗	G2-44 (0xD6C)	AI3 Low %	-100.00–100.00%	0.00
↗	G2-45 (0xD6D)	AI3 Mid Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	5.00 10.00 12.00
↗	G2-46 (0xD6E)	AI3 Mid %	-100.00–100.00%	50.00

	Pr.	Parameter Name	Setting Range	Default
↗	G2-47 (0xD6F)	AI3 High Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	10.00 20.00 20.00
↗	G2-48 (0xD70)	AI3 High %	-100.00–100.00%	100.00
	G2-49 (0xD71)	AI3 Signal Loss Action	0: Disable 1: Warn & Continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	0
↗	G2-50 (0xD72)	Virtual AI3 Input	0.00–100.00%	0.00
	G2-51 (0xD73)	AI3 Display	-100.00–100.00%	Read only
↗	G2-59 (0xD7B)	AI Comparator Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
↗	G2-60 (0xD7C)	AI Comparator High Level	-100.0–100.0%	50.0
↗	G2-61 (0xD7D)	AI Comparator Low Level	-100.0–100.0%	10.0
↗	G2-62 (0xD7E)	AI Level in Range Indn	0: Disable 1–2: Relay 1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15	0

G3. AO Setting

	Pr.	Parameter Name	Setting Range	Default
↗	G3-00 (0xD80)	Virtual AO Function	0: Disable 1: Enable	0
↗	G3-01 (0xD81)	AO1 Function Sel	0: No function 1: FREQ Cmd AO selection 2: Motor speed AO selection 3: Output current AO selection 4: Output voltage AO selection 5: DC bus voltage AO selection 6: Power factor AO selection	1
↗	G3-15 (0xD8F)	AO2 Function Sel		3

	Pr.	Parameter Name	Setting Range	Default
			7: Output power AO selection 8: Output frequency AO selection 9: FREQ profile AO selection 10: Output torque AO selection 11: Motor Temp 1 AO selection 12: Motor Temp 2 AO selection 13: Virtual AO selection 14: Modbus AO mask 15: CANopen AO mask 16: BACnet AO mask 17: DeviceNet AO mask 18: Profibus AO mask 19: Ethernet AO mask 20: B-PID1 output AO selection 21: B-PID2 output AO selection 22: B-PID3 output AO selection 23: B-PID4 output AO selection	
✓	G3-02 (0xD82)	AO1 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	2
✓	G3-03 (0xD83)	AO1 Filter Time	0.00–20.00 sec.	0.02
✓	G3-04 (0xD84)	AO1 Bias	-100.00–100.00%	0.00
✓	G3-05 (0xD85)	AO1 Gain	-500.0–500.0%	100.0
✓	G3-06 (0xD86)	AO1 Output Method	0: Absolute Value 1: 0% Negative; 0–100% Positive 2: 0–50% Negative; 50–100% Positive	0
✓	G3-07 (0xD87)	Virtual AO1 Output	0.00–100.00 PCT	0.00
✓	G3-16 (0xD90)	AO2 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	2
✓	G3-17 (0xD91)	AO2 Filter Time	0.00–20.00 sec.	0.02
✓	G3-18 (0xD92)	AO2 Bias	-100.00–100.00%	0.00
✓	G3-19 (0xD93)	AO2 Gain	-500.0–500.0%	100.0
✓	G3-20 (0xD94)	AO2 Output Method	0: Absolute Value 1: 0% Negative; 0–100% Positive 2: 0–50% Negative; 50–100% Positive	0

	Pr.	Parameter Name	Setting Range	Default
✓	G3-21 (0xD95)	Virtual AO2 Output	0.00–100.00 PCT	0.00

∗G4. Extension MI Setting

	Pr.	Parameter Name	Setting Range	Default
	G4-00 (0xDC0)	Extension Card ID	0: None 1: EMV-A22A 5: EMV-D42A 6: EMV-R6AA	Read only
✓	G4-02 (0xDC2)	MI10 Response Time	0.000–30.000 sec.	0.001
✓	G4-04 (0xDC4)	MI11 Response Time	0.000–30.000 sec.	0.001
✓	G4-06 (0xDC6)	MI12 Response Time	0.000–30.000 sec.	0.001
✓	G4-08 (0xDC8)	MI13 Response Time	0.000–30.000 sec.	0.001
✓	G4-10 (0xDCA)	MI14 Response Time	0.000–30.000 sec.	0.001
✓	G4-12 (0xDCC)	MI15 Response Time	0.000–30.000 sec.	0.001

∗G5. Extension MO Setting

	Pr.	Parameter Name	Setting Range	Default
	G5-00 (0xE00)	Extension Card ID	0: None 1: EMV-A22A 5: EMV-D42A 6: EMV-R6AA	Read only
✓	G5-01 (0xE01)	MO10(RY10) Function Sel	0–65535	0
✓	G5-03 (0xE03)	MO11(RY11) Function Sel	0–65535	0
✓	G5-05 (0xE05)	RY12 Function Sel	0–65535	0
✓	G5-07 (0xE07)	RY13 Function Sel	0–65535	0
✓	G5-09 (0xE09)	RY14 Function Sel	0–65535	0
✓	G5-11 (0xE0B)	RY15 Function Sel	0–65535	0
✓	G5-13 (0xE0D)	MO10 (RY10) ON Response Time	0.00–655.35 sec.	0.01
✓	G5-14 (0xE0E)	MO10 (RY10) OFF Response Time	0.00–655.35 sec.	0.01
✓	G5-15 (0xE0F)	MO11 (RY11) ON Response Time	0.00–655.35 sec.	0.01

	Pr.	Parameter Name	Setting Range	Default
✓	G5-16 (0xE10)	MO11 (RY11) OFF Response Time	0.00–655.35 sec.	0.01
✓	G5-17 (0xE11)	RY12 ON Response Time	0.00–655.35 sec.	0.01
✓	G5-18 (0xE12)	RY12 OFF Response Time	0.00–655.35 sec.	0.01
✓	G5-19 (0xE13)	RY13 ON Response Time	0.00–655.35 sec.	0.01
✓	G5-20 (0xE14)	RY13 OFF Response Time	0.00–655.35 sec.	0.01
✓	G5-21 (0xE15)	RY14 ON Response Time	0.00–655.35 sec.	0.01
✓	G5-22 (0xE16)	RY14 OFF Response Time	0.00–655.35 sec.	0.01
✓	G5-23 (0xE17)	RY15 ON Response Time	0.00–655.35 sec.	0.01
✓	G5-24 (0xE18)	RY15 OFF Response Time	0.00–655.35 sec.	0.01

＊G6. Extension AI Setting

Pr.	Parameter Name	Setting Range	Default
G6-00 (0xE40)	Extension Card ID	0: None 1: EMV-A22A 5: EMV-D42A 6: EMV-R6AA	Read only
✓ G6-02 (0xE42)	AI10 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓ G6-03 (0xE43)	AI10 Filter Time	0.00–20.00 sec.	0.02
✓ G6-04 (0xE44)	AI10 Low Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	0.00 0.00 4.00
✓ G6-05 (0xE45)	AI10 Low %	-100.00–100.00%	0.00
✓ G6-06 (0xE46)	AI10 Mid Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	5.00 10.00 12.00
✓ G6-07 (0xE47)	AI10 Mid %	-100.00–100.00%	50.00
✓ G6-08 (0xE48)	AI10 High Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	10.00 20.00 20.00
✓ G6-09 (0xE49)	AI10 High %	-100.00–100.00%	100.00

	Pr.	Parameter Name	Setting Range	Default
	G6-10 (0xE4A)	AI10 Signal Loss Action	0: Disable 1: Warn & Continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	0
✓	G6-11 (0xE4B)	Virtual AI10 Input	0.00–100.00%	0.00
	G6-12 (0xE4C)	AI10 Display	-100.00–100.00%	Read only
✓	G6-14 (0xE4E)	AI11 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓	G6-15 (0xE4F)	AI11 Filter Time	0.00–20.00 sec	0.02
✓	G6-16 (0xE50)	AI11 Low Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	0.00 0.00 4.00
✓	G6-17 (0xE51)	AI11 Low %	-100.00–100.00%	0.00
✓	G6-18 (0xE52)	AI11 Mid Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	5.00 10.00 12.00
✓	G6-19 (0xE53)	AI11 Mid %	-100.00–100.00%	50.00
✓	G6-20 (0xE54)	AI11 High Value	0–10 V: 0.00–10.00 V 0–20 mA: 0.00–20.00 mA 4–20 mA: 4.00–20.00 mA	10.00 20.00 20.00
✓	G6-21 (0xE55)	AI11 High %	-100.00–100.00%	100.00
	G6-22 (0xE56)	AI11 Signal Loss Action	0: Disable 1: Warn & Continue OPER 2: Fault & Ramp to Stop 3: Fault & Auto-Decel 4: Fault & Coast to Stop 5: Fault & by Quick Stop Time 6: Warning & FREQ Lower Limit OPER	0
✓	G6-23 (0xE57)	Virtual AI11 Input	0.0–100.0%	0.0
	G6-24 (0xE58)	AI11 Display	-100.0–100.0%	Read only

＊G7. Extension AO Setting

	Pr.	Parameter Name	Setting Range	Default
	G7-00 (0xE80)	Extension Card ID	0: None 1: EMV-A22A 5: EMV-D42A 6: EMV-R6AA	Read only
✓	G7-01 (0xE81)	AO10 Function Sel	0–65535	0
✓	G7-02 (0xE82)	AO10 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓	G7-03 (0xE83)	AO10 Filter Time	0.00–20.00 sec.	0.02
✓	G7-04 (0xE84)	AO10 Bias	-100.00–100.00%	0.00
✓	G7-05 (0xE85)	AO10 Gain	-500.0–500.0%	100.0
✓	G7-06 (0xE86)	AO10 Output Method	0: Absolute Value 1: 0% Negative; 0–100% Positive 2: 0–50% Negative; 50–100% Positive	0
✓	G7-07 (0xE87)	Virtual AO10 Output	0.00–100.00 PCT	0.00
✓	G7-08 (0xE88)	AO11 Function Sel	0–65535	0
✓	G7-09 (0xE89)	AO11 Signal Type	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓	G7-10 (0xE8A)	AO11 Filter Time	0.00–20.00 sec.	0.02
✓	G7-11 (0xE8B)	AO11 Bias	-100.00–100.00%	0.00
✓	G7-12 (0xE8C)	AO11 Gain	-500.0–500.0%	100.0
✓	G7-13 (0xE8D)	AO11 Output Method	0: Absolute Value 1: 0% Negative; 0–100% Positive 2: 0–50% Negative; 50–100% Positive	0
✓	G7-14 (0xE8E)	Virtual AO11 Output	0.00–100.00 PCT	0.00

H. Fault & Protection

H0. Fault Handle

Pr.	Parameter Name	Setting Range	Default
H0-00 (0xF40)	Fault Reset MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
H0-01 (0xF41)	Fault Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
H0-02 (0xF42)	Warning Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
H0-03 (0xF43)	Fault Auto Reset Allowed Sel	bit 0: ocA/ocd/ocn bit 1: ovA/ovd/ovn/ovs bit 2: LvA/Lvd/Lvn bit 3: Orp bit 4: oH1/oH2 bit 5: EF bit 6: EF1 bit 7: oL bit 8: Eol1/Eol2 bit 9: oH3 bit 10: ot1/ot2 bit 11: uC bit 12: AFE/ACE bit 13: GFF bit 14: Reserve bit 15: Reserve	0
H0-04 (0xF44)	Fault Restart MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0

	Pr.	Parameter Name	Setting Range	Default
	H0-05 (0xF45)	Restart Speed Tracking	0: Max output FREQ 1: FREQ before stop 2: Min output FREQ 3: Auto Estimation	0
	H0-06 (0xF46)	Fault Restart No.	0–10 times	0
	H0-07 (0xF47)	Fault Restart No. Remain	0–10	Read only
	H0-08 (0xF48)	Fault Restart No. Reset Time	0.0–600.0 sec.	60.0
↗	H0-09 (0xF49)	Fault Auto Reset Delay Time	1.0–600.0 sec.	1.0
↗	H0-10 (0xF4A)	Fault Restart Delay Time	1.0–600.0 sec.	1.0
↗	H0-11 (0xF4B)	STO Definition Sel	0: STO Fault 1: Fault at Run; Warning at Stop 2: STO Warning 3: No STO Display at Stop	0
↗	H0-12 (0xF4C)	STO1/2 Allowable Duration	40–480 ms	40
↗	H0-13 (0xF4D)	STO Indn Delay Time	40–1000 ms	40
↗	H0-14 (0xF4E)	STO Auto Reset	0: Disable 1: Enable	0
↗	H0-15 (0xF4F)	STO Output logic A	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	H0-16 (0xF50)	STO Output logic B	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	H0-17 (0xF51)	Fault Output Indn 1	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

	Pr.	Parameter Name	Setting Range	Default
✓	H0-18 (0xF52)	Fault Output Indn 2	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	H0-19 (0xF53)	Fault Output Indn 3	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	H0-20 (0xF54)	Fault Output Indn 4	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	H0-21 (0xF55)	Fault Output Option 1	0–65535	0
✓	H0-22 (0xF56)	Fault Output Option 2	0–65535	0
✓	H0-23 (0xF57)	Fault Output Option 3	0–65535	0
✓	H0-24 (0xF58)	Fault Output Option 4	0–65535	0

H1. Voltage Protection

	Pr.	Parameter Name	Setting Range	Default
	H1-00 (0xF80)	ov Warning Level	0.0–820.0 V_{DC}	740.0
✓	H1-01 (0xF81)	ov Warning Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
	H1-02 (0xF82)	Lv Fault Level	Non Lower harmonic models: 300.0–440.0 V_{DC} / 150.0–220.0 V_{DC}	360.0/ 180.0
			Lower harmonic models: 200.0–400.0 V_{DC} / 100.0–200.0 V_{DC}	200.0/ 100.0
	H1-05 (0xF85)	Lv Fault Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

	Pr.	Parameter Name	Setting Range	Default
✓	H1-06 (0xF86)	Restart after Power Loss	0: Disable 1: FREQ before power loss 2: Max Output FREQ 3: Min Output FREQ 4: Auto Estimation	0
✓	H1-07 (0xF87)	Power Loss Time Allowed	0.0–20.0 sec.	2.0
✓	H1-08 (0xF88)	ov Stall Prev Level	460V models: 0.0–900.0 V_{DC}	760.0
✓	H1-09 (0xF89)	Stall Prev Function Sel	0: Basic OC+Basic OV 1: Basic OC+Smart OV 2: Smart OC+Basic OV 3: Smart OC+ Smart OV	3
	H1-10 (0xF8A)	OV Stall Prev Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
✓	H1-11 (0xF8B)	Smart ov P Gain	0–65535	Depending on the model power
✓	H1-12 (0xF8C)	Smart ov I Gain	0.000–65.535	Depending on the model power
✓	H1-13 (0xF8D)	Smart ov D Gain	0–65535	Depending on the model power

H2. Current Protection

	Pr.	Parameter Name	Setting Range	Default
	H2-00 (0xFC0)	GFF Detect Level	0–200%	60
	H2-04 (0xFC4)	Output Current Limit	Depending on the models (100% corresponds to the drive's continuous current)	100
✓	H2-05 (0xFC5)	ocA Stall Prev Level	0–100%	90
✓	H2-06 (0xFC6)	Weak Flux oc Stall Prev Level	0–100%	100
✓	H2-07 (0xFC7)	ocn Stall Prev Level	0–100%	90

	Pr.	Parameter Name	Setting Range	Default
↗	H2-08 (0xFC8)	ocn Stall Prev Decel Sel	0: Current Decel Time 1: Decel Time 1 2: Decel Time 2 3: Decel Time 3 4: Decel Time 4 5: By Quick Stop Time	0
	H2-09 (0xFC9)	oc Stall Prev Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
↗	H2-10 (0xFCA)	Smart oc P Gain	0–65535	Depending on the model power
↗	H2-11 (0xFCB)	Smart oc I Gain	0.000–65.535	Depending on the model power
↗	H2-12 (0xFCC)	Low Current Detect Level	0.0–100.0%	0.0
↗	H2-13 (0xFCD)	Low Current Detect Time	0.00–360.00 sec.	0.00
↗	H2-14 (0xFCE)	Low Current Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
↗	H2-15 (0xFCF)	Low Current Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

H3. Phase Loss Protection

	Pr.	Parameter Name	Setting Range	Default
	H3-00 (0x1000)	OrP Action	1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	1
↗	H3-01 (0x1001)	OrP Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
	H3-02 (0x1002)	OPL Detect Level	0.00–100.00%	1.00
	H3-03 (0x1003)	OPL Detect Time	0.000–65.535 sec.	3.000
	H3-04 (0x1004)	OPL DC Brake Time	0.000–65.535 sec.	0.000
	H3-05 (0x1005)	OPL Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
↗	H3-06 (0x1006)	U Phase Loss Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	H3-07 (0x1007)	V Phase Loss Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	H3-08 (0x1008)	W Phase Loss Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

H4. Drive Heat Protection

Pr.	Parameter Name	Setting Range	Default
H4-00 (0x1040)	IGBT oH Warning Level	0–95%	95
H4-01 (0x1041)	Cap oH Warning Level	0–95%	95
H4-02 (0x1042)	Drive oH Warning Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
H4-03 (0x1043)	Fan Control Sel	0: Always OFF 1: Always ON 2: Fan ON after Drive Start 3: By IGBT Temp	1
H4-05 (0x1045)	CF Derating Protection	0: Reduce CF & Current Limit 1: Fix CF & Reduce Current Limit 2: Reduce CF & Fix Current Limit	0

H5. Motor Overload Protection

Pr.	Parameter Name	Setting Range	Default
H5-00 (0x1080)	ot Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
H5-01 (0x1081)	ot Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
H5-02 (0x1082)	Normal Speed ot Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
H5-03 (0x1083)	Normal Speed ot Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

	Pr.	Parameter Name	Setting Range	Default
✓	H5-04 (0x1084)	IM1/SM ot Level	0–250% (100% = motor rated current)	120
✓	H5-05 (0x1085)	IM1/SM ot Detect Time	0.0–10.0 sec.	3.0
✓	H5-06 (0x1086)	IM1/SM N-Speed ot Level	0–250% (100% = motor rated current)	120
✓	H5-07 (0x1087)	IM1/SM N-Speed ot Detect Time	0.0–10.0 sec.	3.0
	H5-08 (0x1088)	IM1/SM EoL1 Mode	0: Disable 1: Variable Torque mode 2: Constant Torque mode 3: High Precision mode	0
✓	H5-09 (0x1089)	IM1/SM EoL1 Detect Time	30.0–600.0 sec.	60.0
✓	H5-10 (0x108A)	IM1/SM EoL1 Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H5-11 (0x108B)	IM1/SM HP Mode Max Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	100
✓	H5-12 (0x108C)	IM1/SM HP Mode 0 RPM Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	40
✓	H5-13 (0x108D)	IM1/SM HP Mode Switch FREQ	0.00–599.00 Hz	Refer to Desc. of Parameters
✓	H5-15 (0x1090)	IM2 ot Level	0–250% 100% = motor rated current	120
✓	H5-16 (0x1091)	IM2 ot Detect Time	0.0–10.0 sec.	0.1
✓	H5-17 (0x1092)	IM2 N-Speed ot Level	0–250% 100% = motor rated current	120
✓	H5-18 (0x1093)	IM2 N-Speed ot Detect Time	0.0–10.0 sec.	0.1
	H5-19 (0x1094)	IM2 EoL1 Mode	0: Disable 1: Variable Torque mode 2: Constant Torque mode 3: High Precision mode	0
✓	H5-20 (0x1095)	IM2 EoL1 Detect Time	30.0–600.0 sec.	60.0

	Pr.	Parameter Name	Setting Range	Default
✓	H5-21 (0x1096)	IM2 EoL1 Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H5-22 (0x1097)	IM2 HP Mode Max Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	100
✓	H5-23 (0x1098)	IM2 HP Mode 0 RPM Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	40
✓	H5-24 (0x1099)	IM2 HP Mode Switch FREQ	0.00–599.00 Hz	Refer to Desc. of Parameters
✓	H5-26 (0x109C)	IM3 ot Level	0–250% 100% = motor rated current	120
✓	H5-27 (0x109D)	IM3 ot Detect Time	0.0–10.0 sec.	0.1
✓	H5-28 (0x109E)	IM3 N-Speed ot Level	0–250% 100% = motor rated current	120
✓	H5-29 (0x109F)	IM3 N-Speed ot Detect Time	0.0–10.0 sec.	0.1
	H5-30 (0x10A0)	IM3 EoL1 Mode	0: Disable 1: Variable Torque mode 2: Constant Torque mode 3: High Precision mode	0
✓	H5-31 (0x10A1)	IM3 EoL1 Detect Time	30.0–600.0 sec.	60.0
✓	H5-32 (0x10A2)	IM3 EoL1 Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H5-33 (0x10A3)	IM3 HP Mode Max Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	100
✓	H5-34 (0x10A4)	IM3 HP Mode 0 RPM Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	40
✓	H5-35 (0x10A5)	IM3 HP Mode Switch FREQ	0.00–599.00 Hz	Refer to Desc. of Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	H5-37 (0x10A8)	IM4 ot Level	0–250% 100% = motor rated current	120
✓	H5-38 (0x10A9)	IM4 ot Detect Time	0.0–10.0 sec.	0.1
✓	H5-39 (0x10AA)	IM4 N-Speed ot Level	0–250% 100% = motor rated current	120
✓	H5-40 (0x10AB)	IM4 N-Speed ot Detect Time	0.0–10.0 sec.	0.1
	H5-41 (0x10AC)	IM4 EoL1 Mode	0: Disable 1: Variable Torque mode 2: Constant Torque mode 3: High Precision mode	0
✓	H5-42 (0x10AD)	IM4 EoL1 Detect Time	30.0–600.0 sec.	60.0
✓	H5-43 (0x10AE)	IM4 EoL1 Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H5-44 (0x10AF)	IM4 HP Mode Max Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	100
✓	H5-45 (0x10B0)	IM4 HP Mode 0 RPM Torque	0–250% 100% = motor rated torque (vector) or rated current (scalar)	40
✓	H5-46 (0x10B1)	IM4 HP Mode Switch FREQ	0.00–599.00 Hz	Refer to Desc. of Parameters
✓	H5-48 (0x10B4)	Over Slip Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H5-49 (0x10B5)	Over Slip Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
	H5-50 (0x10B6)	IM1 Max Slip FREQ	0.00–200.00 Hz	20.00
	H5-51 (0x10B7)	IM2 Max Slip FREQ	0.00–200.00 Hz	20.00
	H5-52 (0x10B8)	IM3 Max Slip FREQ	0.00–200.00 Hz	20.00

Pr.	Parameter Name	Setting Range	Default
H5-53 (0x10B9)	IM4 Max Slip FREQ	0.00–200.00 Hz	20.00
H5-54 (0x10BA)	Over Slip Level	0.0–100.0%	0.0
H5-55 (0x10BB)	Over Slip Detect Time	0.0–10.0 sec.	1.0

H6. Motor Heat Protection

Pr.	Parameter Name	Setting Range	Default
H6-00 (0x10C0)	Motor Temp 1	-20–200°C	Read only
H6-01 (0x10C1)	Motor Temp Fdk 1 AI Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
H6-02 (0x10C2)	Motor Temp 1 AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
H6-03 (0x10C3)	Motor Temp 1 Sensor Type	0: Disable 1: PTC 2: KTY84 3: PT100 4: PT1000	0
H6-04 (0x10C4)	Motor Temp 1 Derating Level	0.0–100.0% 0.0–150.0°C (Motor Temp.1 overheating detection level)	40.0 100.0
H6-05 (0x10C5)	Motor Temp 1 Derating Delay	0.0–600.0 sec.	60.0
H6-06 (0x10C6)	Motor Temp 1 Derating FREQ	0.00–599.00 Hz (c2-19 lower limit freq.)–(c2-18 upper limit freq.)	0.00
H6-07 (0x10C7)	Motor Temp 1 OH Detect Level	0.0–100.0% 0.0–150.0°C	50.0 125.0
H6-08 (0x10C8)	Motor Temp 1 OH Detect Time	0.0–600.0 sec.	60.0
H6-09 (0x10C9)	Motor Temp 1 OH Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0

Pr.	Parameter Name	Setting Range	Default
H6-10 (0x10CA)	Motor Temp 1 OH Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
H6-11 (0x10CB)	Motor Temp 2	-20–200°C	Read only
H6-12 (0x10CC)	Motor Temp Fdk 2 AI Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
H6-13 (0x10CD)	Motor Temp 2 AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
H6-14 (0x10CE)	Motor Temp 2 Sensor Type	0: Disable 1: PTC 2: KTY84 3: PT100 4: PT1000	0
H6-15 (0x10CF)	Motor Temp 2 Derating Level	0.0–100.0% 0.0–150.0°C (Motor Temp.2 overheating detection level)	40.0 100.0
H6-16 (0x10D0)	Motor Temp 2 Derating Delay	0.0–600.0 sec.	60.0
H6-17 (0x10D1)	Motor Temp 2 Derating FREQ	0.00–599.00 Hz (c2-19 lower limit freq.)–(c2-18 upper limit freq.)	0.00
H6-18 (0x10D2)	Motor Temp 2 OH Detect Level	0.0–100.0% 0.0–150.0°C	50.0 125.0
H6-19 (0x10D3)	Motor Temp 2 OH Detect Time	0.0–600.0 sec.	60.0
H6-20 (0x10D4)	Motor Temp 2 OH Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0

	Pr.	Parameter Name	Setting Range	Default
✓	H6-21 (0x10D5)	Motor Temp 2 OH Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

H7. Overload / Underload Handle

	Pr.	Parameter Name	Setting Range	Default
✓	H7-00 (0x1100)	Load Compare Src	0: Output Amp/ motor rated Amp 1: Output torque/ motor rated torque 2: Output power/ motor rated power 3: Output power/ driver rated power	0
✓	H7-01 (0x1101)	L/F Overload Curve Sel	0: Disable 1: User Defined 2: 1.5th power curve 3: 2nd power curve 4: 3rd power curve	0
✓	H7-02 (0x1102)	L/F Overload Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
✓	H7-03 (0x1103)	L/F Overload Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	H7-04 (0x1104)	L/F Overload Detect Time	0.0–600.0 sec.	10.0
✓	H7-05 (0x1105)	Overload L/F FREQ Set 1	0.00–H7-06 (Hz)	5.00
✓	H7-06 (0x1106)	Overload L/F FREQ Set 2	H7-05–H7-07 (Hz)	5.00
✓	H7-07 (0x1107)	Overload L/F FREQ Set 3	H7-06–H7-08 (Hz)	5.00
✓	H7-08 (0x1108)	Overload L/F FREQ Set 4	H7-07–H7-09 (Hz)	5.00
✓	H7-09 (0x1109)	Overload L/F FREQ Set 5	H7-08–599.00 (Hz)	5.00
✓	H7-10 (0x110A)	Overload L/F Load Set 1	0.0–200.0%	150.0
✓	H7-11 (0x110B)	Overload L/F Load Set 2	0.0–200.0%	150.0
✓	H7-12 (0x110C)	Overload L/F Load Set 3	0.0–200.0%	150.0

	Pr.	Parameter Name	Setting Range	Default
↗	H7-13 (0x110D)	Overload L/F Load Set 4	0.0–200.0%	150.0
↗	H7-14 (0x110E)	Overload L/F Load Set 5	0.0–200.0%	150.0
↗	H7-15 (0x110F)	L/F Underload Curve Sel	0: Disable 1: User Defined 2: 1.5th power curve 3: 2nd power curve 4: 3rd power curve	0
↗	H7-16 (0x1110)	L/F Underload Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
↗	H7-17 (0x1111)	L/F Underload Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	H7-18 (0x1112)	L/F Underload Detect Time	0.0–600.0 sec.	10.0
↗	H7-19 (0x1113)	Underload L/F FREQ Set 1	0.00–H7-20 (Hz)	5.00
↗	H7-20 (0x1114)	Underload L/F FREQ Set 2	H7-19–H7-21 (Hz)	5.00
↗	H7-21 (0x1115)	Underload L/F FREQ Set 3	H7-20–H7-22 (Hz)	5.00
↗	H7-22 (0x1116)	Underload L/F FREQ Set 4	H7-21–H7-23 (Hz)	5.00
↗	H7-23 (0x1117)	Underload L/F FREQ Set 5	H7-22–599.00 (Hz)	5.00
↗	H7-24 (0x1118)	Underload L/F Load Set 1	0.0–200.0%	10.0
↗	H7-25 (0x1119)	Underload L/F Load Set 2	0.0–200.0%	15.0
↗	H7-26 (0x111A)	Underload L/F Load Set 3	0.0–200.0%	25.0
↗	H7-27 (0x111B)	Underload L/F Load Set 4	0.0–200.0%	30.0
↗	H7-28 (0x111C)	Underload L/F Load Set 5	0.0–200.0%	30.0

H8. Speed Fdk Protection

	Pr.	Parameter Name	Setting Range	Default
↗	H8-00 (0x1140)	Speed Deviation Detect Level	0–50%	50
↗	H8-01 (0x1141)	Speed Deviation Detect Time	0.0–10.0 sec.	0.5
↗	H8-02 (0x1142)	Speed Deviation Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
↗	H8-03 (0x1143)	Over Speed Detect Level	0–120%	115
↗	H8-04 (0x1144)	Over Speed Detect Time	0.0–10.0 sec.	0.5
↗	H8-05 (0x1145)	Over Speed Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0
↗	H8-06 (0x1146)	Direction Error Detect Time	0.0–10.0 sec.	1.0
↗	H8-07 (0x1147)	Direction Error Action	0: Warning & Continue OPER 1: Fault & Ramp to Stop 2: Fault & Auto-Decel 3: Fault & Coast to Stop 4: Fault & by Quick Stop Time	0

J. Application Function

∗J0. Additional Function

Pr.	Parameter Name	Setting Range	Default
J0-00 (0x11C0)	UVW MC Action Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

J1. AES Function

Pr.	Parameter Name	Setting Range	Default
J1-00 (0x1200)	AES Auto Energy Saving Mode	0: Disable 1: PFO Power Factor Optimization 2: PLO Power Loss Optimization	0
J1-01 (0x1201)	AES Min FREQ	0.00–40.00 Hz	10.00
J1-02 (0x1202)	AES Delay Time	0.0–600.0 sec.	5.0
J1-03 (0x1203)	AES Max Voltage Drop	0–70%	60
J1-04 (0x1204)	PFO Target Power Factor Angle	35.00–65.00 deg	40.00
J1-05 (0x1205)	PFO Voltage Regulation Rate	1–100%	10
J1-06 (0x1206)	PLO Loss Coefficient	0–100%	1
J1-07 (0x1207)	PLO Kp Gain	0.001–60.000 pu	0.050
J1-08 (0x1208)	PLO Ki Gain	0.001–60.000 pu	0.020

J2. dEb Function

Pr.	Parameter Name	Setting Range	Default
J2-00 (0x1240)	dEb Function Sel	0: Disable 1: Auto-decel, stop after restore 2: Auto-decel, run after restore 3: Low speed high voltage control 4: All high voltage control 5: dEb Decel, stop after restore 6: FOC Decel, stop after restore 7: FOC Decel, run after restore	0
J2-01 (0x1241)	dEb Action Level	0.0–200.0 V_{DC}	20.0
J2-02 (0x1242)	dEb Reset Bias Level	0.0–200.0 V_{DC}	20.0

	Pr.	Parameter Name	Setting Range	Default
↗	J2-03 (0x1243)	dEb Function Reset Time	0.0–25.0 sec.	3.0
↗	J2-04 (0x1244)	dEb P Gain	0.00–655.35	1.00
↗	J2-05 (0x1245)	dEb I Gain	0.000–65.535	0.100
↗	J2-06 (0x1246)	dEb Decel Time	0.00–600.00 sec.	60.00
	J2-09 (0x1249)	dEb Output Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
↗	J2-07 (0x1247)	FOC dEb Torque Feedforward	0–100%	80
↗	J2-08 (0x1248)	FOC dEb Coat Stop FREQ	0.00–599.00 Hz	0.00

J3. TEC Function

	Pr.	Parameter Name	Setting Range	Default
	J3-00 (0x1280)	TEC Function Sel	0: Disable 1: Enable	0
↗	J3-01 (0x1281)	TEC Voltage Regulation Gain	0.00–500.00%	0.50
↗	J3-02 (0x1282)	TEC Voltage Regulation LPF	0.000–65.535 sec.	0.050

J4. Preheat Function

	Pr.	Parameter Name	Setting Range	Default
↗	J4-00 (0x12C0)	Preheat MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
	J4-01 (0x12C1)	Preheat Delay Time	5–3000 sec.	5
↗	J4-03 (0x12C3)	Preheat Current Cmd	0–100%	0
↗	J4-06 (0x12C6)	Preheat Time	0–100%	0

Pr.	Parameter Name	Setting Range	Default
J4-07 (0x12C7)	Preheat Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

J5. Fire Mode

Pr.	Parameter Name	Setting Range	Default
J5-00 (0x1300)	FireMode Status	bit 0: FireMode enabled 0 = FireMode is disabled 1 = FireMode is enabled bit 1: FireMode active 0 = FireMode is inactive 1 = FireMode is active bit 2: FireMode direction is forward 0 = FireMode direction is not forward 1 = FireMode direction is forward bit 3: FireMode direction is reverse 0 = FireMode direction is not reverse 1 = FireMode direction is reverse bit 4: FireMode stop mode is active 0 = FireMode stop mode is not active 1 = FireMode stop mode is active bit 5: FireMode Pr lock status 0 = FireMode Pr unlock 1 = FireMode Pr locked bit 6: Run enable 0 = Not allow to Run 1 = Allow to Run bit 7: Start Enable 0 = Not allow to Start 1 = Allow to Start bit 8–15: Reserve	Read only
J5-01 (0x1301)	FireMode	0: Ddisable 1: Enable, Limited OPER 2: Enable, Unlimited OPER	0

Pr.	Parameter Name	Setting Range	Default
J5-02 (0x1302)	FireMode MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
J5-03 (0x1303)	FireMode FREQ Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi-step speed 17: FireMode FREQ Cmd 18: Up/Down terminal 19: STOP 20: PID	0
J5-04 (0x1304)	FireMode Direction MI Src	0: FWD 1: REV 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
J5-05 (0x1305)	FireMode FREQ Cmd	0.00–599.00 Hz	60.00
J5-06 (0x1306)	FireMode Control bits	bit 0: RUN Enable bit 1: Start Enable bit 2: FireMode PR Lock bit 3–bit15: Reserve	0
J5-07 (0x1307)	FireMode Fault Handle	0: Manual reset 1: Automatic reset	0
J5-08 (0x1308)	FireMode Auto Reset Times	1–5	1
J5-09 (0x1309)	FireMode Auto Reset Delay	5.0–120.0 sec.	5.0
J5-10 (0x130A)	FireMode Log 1 Start Date	0–31129999	Read only
J5-11 (0x130C)	FireMode Log 1 Start Time	0–245959	Read only
J5-12 (0x130E)	FireMode Log 1 End Date	0–31129999	Read only
J5-13 (0x1310)	FireMode Log 1 End Time	0–245959	Read only

Pr.	Parameter Name	Setting Range	Default
J5-14 (0x1312)	FireMode Log 1 Fault Code	0–65535	Read only
J5-15 (0x1313)	FireMode Log 1 Warning Code	0–65535	Read only
J5-16 (0x1314)	FireMode Log 1 Warranty Fault	0–65535	Read only
J5-17 (0x1315)	FireMode Log 2 Start Date	0–31129999	Read only
J5-18 (0x1317)	FireMode Log 2 Start Time	0–245959	Read only
J5-19 (0x1319)	FireMode Log 2 End Date	0–31129999	Read only
J5-20 (0x131B)	FireMode Log 2 End Time	0–245959	Read only
J5-21 (0x131D)	FireMode Log 2 Fault Code	0–65535	Read only
J5-22 (0x131E)	FireMode Log 2 Warning Code	0–65535	Read only
J5-23 (0x131F)	FireMode Log 2 Warranty Fault	0–65535	Read only
J5-24 (0x1320)	FireMode Log 3 Start Date	0–31129999	Read only
J5-25 (0x1322)	FireMode Log 3 Start Time	0–245959	Read only
J5-26 (0x1324)	FireMode Log 3 End Date	0–31129999	Read only
J5-27 (0x1326)	FireMode Log 3 End Time	0–245959	Read only
J5-28 (0x1328)	FireMode Log 3 Fault Code	0–65535	Read only
J5-29 (0x1329)	FireMode Log 3 Warning Code	0–65535	Read only
J5-30 (0x132A)	FireMode Log 3 Warranty Fault	0–65535	Read only
J5-31 (0x132B)	FireMode Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0

J6. Time Function

	Pr.	Parameter Name	Setting Range	Default
↗	J6-00 (0x1340)	Low Battery Action	0: No warning 1: Warning after power on 2: Warning each hour 3: Warning each day	0
↗	J6-01 (0x1341)	Time Function1	bit0: Timer 1 bit1: Timer 2	0
↗	J6-02 (0x1342)	Time Function2	bit2: Timer 3 bit3: Timer 4	0
↗	J6-03 (0x1343)	Time Function3	bit4: Timer 5 bit5: Timer 6	0
			bit6: Timer 7 bit7: Timer 8 bit8: Timer 9 bit9: Timer 10	
↗	J6-04 (0x1344)	Time Function 1 MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	J6-05 (0x1345)	Time Function 2 MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	J6-06 (0x1346)	Time Function 3 MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
↗	J6-07 (0x1347)	Timer 1 Configuration	bit0: Monday	0
↗	J6-10 (0x134B)	Timer 2 Configuration	bit1: Tuesday	0
↗	J6-13 (0x134F)	Timer 3 Configuration	bit2: Wednesday	0
↗	J6-16 (0x1353)	Timer 4 Configuration	bit3: Thursday	0
↗	J6-19 (0x1357)	Timer 5 Configuration	bit4: Friday	0
↗	J6-22 (0x135B)	Timer 6 Configuration	bit5: Saturday	0
↗	J6-25 (0x135F)	Timer 7 Configuration	bit6: Sunday	0

	Pr.	Parameter Name	Setting Range	Default
✓	J6-28 (0x1363)	Timer 8 Configuration	bit7: Activation 1	0
✓	J6-31 (0x1367)	Timer 9 Configuration	bit8: Activation 2	0
✓	J6-34 (0x136B)	Timer 10 Configuration	bit9: Activation 3	0
			bit10: Activation 4 bit11: Exception bit12: Holiday bit13: Workday	
✓	J6-08 (0x1348)	Timer 1 Start Time	00:00–23:59	00:00
✓	J6-09 (0x1349)	Timer 1 Duration	00:00:00–07:00:00	00:00:00
✓	J6-11 (0x134C)	Timer 2 Start Time	00:00–23:59	00:00
✓	J6-12 (0x134D)	Timer 2 Duration	00:00:00–07:00:00	00:00:00
✓	J6-14 (0x1350)	Timer 3 Start Time	00:00–23:59	00:00
✓	J6-15 (0x1351)	Timer 3 Duration	00:00:00–07:00:00	00:00:00
✓	J6-17 (0x1354)	Timer 4 Start Time	00:00–23:59	00:00
✓	J6-18 (0x1355)	Timer 4 Duration	00:00:00–07:00:00	00:00:00
✓	J6-20 (0x1358)	Timer 5 Start Time	00:00–23:59	00:00
✓	J6-21 (0x1359)	Timer 5 Duration	00:00:00–07:00:00	00:00:00
✓	J6-23 (0x135C)	Timer 6 Start Time	00:00–23:59	00:00
✓	J6-24 (0x135D)	Timer 6 Duration	00:00:00–07:00:00	00:00:00
✓	J6-26 (0x1360)	Timer 7 Start Time	00:00–23:59	00:00
✓	J6-27 (0x1361)	Timer 7 Duration	00:00:00–07:00:00	00:00:00
✓	J6-29 (0x1364)	Timer 8 Start Time	00:00–23:59	00:00
✓	J6-30 (0x1365)	Timer 8 Duration	00:00:00–07:00:00	00:00:00
✓	J6-32 (0x1368)	Timer 9 Start Time	00:00–23:59	00:00
✓	J6-33 (0x1369)	Timer 9 Duration	00:00:00–07:00:00	00:00:00
✓	J6-35 (0x136C)	Timer 10 Start Time	00:00–23:59	00:00
✓	J6-36 (0x136D)	Timer 10 Duration	00:00:00–07:00:00	00:00:00

	Pr.	Parameter Name	Setting Range	Default
✓	J6-37 (0x136F)	Activation 1 Start Date	01:01–31:12	01:01
✓	J6-38 (0x1370)	Activation 1 End Date	01:01–31:12	01:01
✓	J6-39 (0x1371)	Activation 2 Start Date	01:01–31:12	01:01
✓	J6-40 (0x1372)	Activation 2 End Date	01:01–31:12	01:01
✓	J6-41 (0x1373)	Activation 3 Start Date	01:01–31:12	01:01
✓	J6-42 (0x1374)	Activation 3 End Date	01:01–31:12	01:01
✓	J6-43 (0x1375)	Activation 4 Start Date	01:01–31:12	01:01
✓	J6-44 (0x1376)	Activation 4 End Date	01:01–31:12	01:01
✓	J6-45 (0x1377)	Exception Enable Number	0–12	3
✓	J6-46 (0x1378)	Exception Type	bit0: Exception 1 bit1: Exception 2 bit2: Exception 3 bit3: Exception 4 bit4: Exception 5 bit5: Exception 6 bit6: Exception 7 bit7: Exception 8 bit8: Exception 9 bit9: Exception 10 bit10: Exception 11 bit11: Exception 12	0
✓	J6-47 (0x1379)	Exception 1 Start Date	01:01–31:12	01:01
✓	J6-48 (0x137A)	Exception 1 Duration Days	0–60 day	0
✓	J6-49 (0x137B)	Exception 2 Start Date	01:01–31:12	01:01
✓	J6-50 (0x137C)	Exception 2 Duration Days	0–60 day	0
✓	J6-51 (0x137D)	Exception 3 Start Date	01:01–31:12	01:01
✓	J6-52 (0x137E)	Exception 3 Duration Days	0–60 day	0
✓	J6-53 (0x137F)	Exception 4 Start Date	01:01–31:12	01:01
✓	J6-54 (0x1380)	Exception 5 Start Date	01:01–31:12	01:01
✓	J6-55 (0x1381)	Exception 6 Start Date	01:01–31:12	01:01

	Pr.	Parameter Name	Setting Range	Default
↗	J6-56 (0x1382)	Exception 7 Start Date	01:01–31:12	01:01
↗	J6-57 (0x1383)	Exception 8 Start Date	01:01–31:12	01:01
↗	J6-58 (0x1384)	Exception 9 Start Date	01:01–31:12	01:01
↗	J6-59 (0x1385)	Exception 10 Start Date	01:01–31:12	01:01
↗	J6-60 (0x1386)	Exception 11 Start Date	01:01–31:12	01:01
↗	J6-61 (0x1387)	Exception 12 Start Date	01:01–31:12	01:01

L. PLC Function

L0. InnerPLC Handle

	Pr.	Parameter Name	Setting Range	Default
	L0-00 (0x1400)	InnerPLC Address	0–254	2
	L0-01 (0x1401)	InnerPLC Control Word	0–65535 bit0: 0: Maintain FREQ 1: Reset FREQ bit1–15: Reserve	0
↗	L0-02 (0x1402)	InnerPLC Cmd Control Mask	0–65535 bit0: OPER Cmd bit1: FREQ Cmd bit2–15: Reserve	65535
↗	L0-03 (0x1403)	InnerPLC MI Mask	0–65535 bit0: MI1 bit1: MI2 bit2: MI3 bit3: MI4 bit4: MI5 bit5: MI6 bit6–7: Reserve bit8–13: MI10–MI15 (IO extension card) bit14–15: Reserve	65535
↗	L0-04 (0x1404)	InnerPLC MO Mask	0–65535 bit0: Relay1 bit1: Relay2 bit2: MO1 bit3: MO2 bit4–8: Reserve bit9–14: MO10–MO15 (IO extension card) bit15: Reserve	65535
↗	L0-05 (0x1405)	InnerPLC AI Mask	0–65535 bit0: AI1 bit1: AI2 bit2: AI3 bit3–4: Reserve bit5–6: AI10–AI11 (AIO extension card) bit7–15: Reserve	65535

Pr.	Parameter Name	Setting Range	Default
L0-06 (0x1406)	InnerPLC AO Mask	0–65535 bit0: AO1 bit1: AO2 bit2–3: Reserve bit4–5: AO10–AO11 (AIO extension card) bit6–15: Reserve	65535
L0-07 (0x1407)	InnerPLC Mode Switch Src 1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: M10–M15 (IO extension card)	0
L0-08 (0x1408)	InnerPLC Mode Switch Src 2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: M10–M15 (IO extension card)	0

L1. InnerPLC App Pr 0–49

Pr.	Parameter Name	Setting Range	Default
L1-00 (0x1440)	InnerPLC App Parameter 0	0–0xFFFF	0
L1-01 (0x1441)	InnerPLC App Parameter 1	0–0xFFFF	0
L1-02 (0x1442)	InnerPLC App Parameter 2	0–0xFFFF	0
L1-03 (0x1443)	InnerPLC App Parameter 3	0–0xFFFF	0
L1-04 (0x1444)	InnerPLC App Parameter 4	0–0xFFFF	0
L1-05 (0x1445)	InnerPLC App Parameter 5	0–0xFFFF	0
L1-06 (0x1446)	InnerPLC App Parameter 6	0–0xFFFF	0
L1-07 (0x1447)	InnerPLC App Parameter 7	0–0xFFFF	0
L1-08 (0x1448)	InnerPLC App Parameter 8	0–0xFFFF	0
L1-09 (0x1449)	InnerPLC App Parameter 9	0–0xFFFF	0
L1-10 (0x144A)	InnerPLC App Parameter 10	0–0xFFFF	0
L1-11 (0x144B)	InnerPLC App Parameter 11	0–0xFFFF	0
L1-12 (0x144C)	InnerPLC App Parameter 12	0–0xFFFF	0

	Pr.	Parameter Name	Setting Range	Default
✓	L1-13 (0x144D)	InnerPLC App Parameter 13	0–0xFFFF	0
✓	L1-14 (0x144E)	InnerPLC App Parameter 14	0–0xFFFF	0
✓	L1-15 (0x144F)	InnerPLC App Parameter 15	0–0xFFFF	0
✓	L1-16 (0x1450)	InnerPLC App Parameter 16	0–0xFFFF	0
✓	L1-17 (0x1451)	InnerPLC App Parameter 17	0–0xFFFF	0
✓	L1-18 (0x1452)	InnerPLC App Parameter 18	0–0xFFFF	0
✓	L1-19 (0x1453)	InnerPLC App Parameter 19	0–0xFFFF	0
✓	L1-20 (0x1454)	InnerPLC App Parameter 20	0–0xFFFF	0
✓	L1-21 (0x1455)	InnerPLC App Parameter 21	0–0xFFFF	0
✓	L1-22 (0x1456)	InnerPLC App Parameter 22	0–0xFFFF	0
✓	L1-23 (0x1457)	InnerPLC App Parameter 23	0–0xFFFF	0
✓	L1-24 (0x1458)	InnerPLC App Parameter 24	0–0xFFFF	0
✓	L1-25 (0x1459)	InnerPLC App Parameter 25	0–0xFFFF	0
✓	L1-26 (0x145A)	InnerPLC App Parameter 26	0–0xFFFF	0
✓	L1-27 (0x145B)	InnerPLC App Parameter 27	0–0xFFFF	0
✓	L1-28 (0x145C)	InnerPLC App Parameter 28	0–0xFFFF	0
✓	L1-29 (0x145D)	InnerPLC App Parameter 29	0–0xFFFF	0
✓	L1-30 (0x145E)	InnerPLC App Parameter 30	0–0xFFFF	0
✓	L1-31 (0x145F)	InnerPLC App Parameter 31	0–0xFFFF	0
✓	L1-32 (0x1460)	InnerPLC App Parameter 32	0–0xFFFF	0
✓	L1-33 (0x1461)	InnerPLC App Parameter 33	0–0xFFFF	0
✓	L1-34 (0x1462)	InnerPLC App Parameter 34	0–0xFFFF	0
✓	L1-35 (0x1463)	InnerPLC App Parameter 35	0–0xFFFF	0
✓	L1-36 (0x1464)	InnerPLC App Parameter 36	0–0xFFFF	0
✓	L1-37 (0x1465)	InnerPLC App Parameter 37	0–0xFFFF	0

Pr.	Parameter Name	Setting Range	Default
L1-38 (0x1466)	InnerPLC App Parameter 38	0–0xFFFF	0
L1-39 (0x1467)	InnerPLC App Parameter 39	0–0xFFFF	0
L1-40 (0x1468)	InnerPLC App Parameter 40	0–0xFFFF	0
L1-41 (0x1469)	InnerPLC App Parameter 41	0–0xFFFF	0
L1-42 (0x146A)	InnerPLC App Parameter 42	0–0xFFFF	0
L1-43 (0x146B)	InnerPLC App Parameter 43	0–0xFFFF	0
L1-44 (0x146C)	InnerPLC App Parameter 44	0–0xFFFF	0
L1-45 (0x146D)	InnerPLC App Parameter 45	0–0xFFFF	0
L1-46 (0x146E)	InnerPLC App Parameter 46	0–0xFFFF	0
L1-47 (0x146F)	InnerPLC App Parameter 47	0–0xFFFF	0
L1-48 (0x1470)	InnerPLC App Parameter 48	0–0xFFFF	0
L1-49 (0x1471)	InnerPLC App Parameter 49	0–0xFFFF	0

L2. InnerPLC APP Pr 50–99

Pr.	Parameter Name	Setting Range	Default
L2-00 (0x1480)	InnerPLC App Parameter 50	0–0xFFFF	0
L2-01 (0x1481)	InnerPLC App Parameter 51	0–0xFFFF	0
L2-02 (0x1482)	InnerPLC App Parameter 52	0–0xFFFF	0
L2-03 (0x1483)	InnerPLC App Parameter 53	0–0xFFFF	0
L2-04 (0x1484)	InnerPLC App Parameter 54	0–0xFFFF	0
L2-05 (0x1485)	InnerPLC App Parameter 55	0–0xFFFF	0
L2-06 (0x1486)	InnerPLC App Parameter 56	0–0xFFFF	0
L2-07 (0x1487)	InnerPLC App Parameter 57	0–0xFFFF	0
L2-08 (0x1488)	InnerPLC App Parameter 58	0–0xFFFF	0
L2-09 (0x1489)	InnerPLC App Parameter 59	0–0xFFFF	0
L2-10 (0x148A)	InnerPLC App Parameter 60	0–0xFFFF	0

	Pr.	Parameter Name	Setting Range	Default
↗	L2-11 (0x148B)	InnerPLC App Parameter 61	0–0xFFFF	0
↗	L2-12 (0x148C)	InnerPLC App Parameter 62	0–0xFFFF	0
↗	L2-13 (0x148D)	InnerPLC App Parameter 63	0–0xFFFF	0
↗	L2-14 (0x148E)	InnerPLC App Parameter 64	0–0xFFFF	0
↗	L2-15 (0x148F)	InnerPLC App Parameter 65	0–0xFFFF	0
↗	L2-16 (0x1490)	InnerPLC App Parameter 66	0–0xFFFF	0
↗	L2-17 (0x1491)	InnerPLC App Parameter 67	0–0xFFFF	0
↗	L2-18 (0x1492)	InnerPLC App Parameter 68	0–0xFFFF	0
↗	L2-19 (0x1493)	InnerPLC App Parameter 69	0–0xFFFF	0
↗	L2-20 (0x1494)	InnerPLC App Parameter 70	0–0xFFFF	0
↗	L2-21 (0x1495)	InnerPLC App Parameter 71	0–0xFFFF	0
↗	L2-22 (0x1496)	InnerPLC App Parameter 72	0–0xFFFF	0
↗	L2-23 (0x1497)	InnerPLC App Parameter 73	0–0xFFFF	0
↗	L2-24 (0x1498)	InnerPLC App Parameter 74	0–0xFFFF	0
↗	L2-25 (0x1499)	InnerPLC App Parameter 75	0–0xFFFF	0
↗	L2-26 (0x149A)	InnerPLC App Parameter 76	0–0xFFFF	0
↗	L2-27 (0x149B)	InnerPLC App Parameter 77	0–0xFFFF	0
↗	L2-28 (0x149C)	InnerPLC App Parameter 78	0–0xFFFF	0
↗	L2-29 (0x149D)	InnerPLC App Parameter 79	0–0xFFFF	0
↗	L2-30 (0x149E)	InnerPLC App Parameter 80	0–0xFFFF	0
↗	L2-31 (0x149F)	InnerPLC App Parameter 81	0–0xFFFF	0
↗	L2-32 (0x14A0)	InnerPLC App Parameter 82	0–0xFFFF	0
↗	L2-33 (0x14A1)	InnerPLC App Parameter 83	0–0xFFFF	0
↗	L2-34 (0x14A2)	InnerPLC App Parameter 84	0–0xFFFF	0
↗	L2-35 (0x14A3)	InnerPLC App Parameter 85	0–0xFFFF	0

	Pr.	Parameter Name	Setting Range	Default
↗	L2-36 (0x14A4)	InnerPLC App Parameter 86	0–0xFFFF	0
↗	L2-37 (0x14A5)	InnerPLC App Parameter 87	0–0xFFFF	0
↗	L2-38 (0x14A6)	InnerPLC App Parameter 88	0–0xFFFF	0
↗	L2-39 (0x14A7)	InnerPLC App Parameter 89	0–0xFFFF	0
↗	L2-40 (0x14A8)	InnerPLC App Parameter 90	0–0xFFFF	0
↗	L2-41 (0x14A9)	InnerPLC App Parameter 91	0–0xFFFF	0
↗	L2-42 (0x14AA)	InnerPLC App Parameter 92	0–0xFFFF	0
↗	L2-43 (0x14AB)	InnerPLC App Parameter 93	0–0xFFFF	0
↗	L2-44 (0x14AC)	InnerPLC App Parameter 94	0–0xFFFF	0
↗	L2-45 (0x14AD)	InnerPLC App Parameter 95	0–0xFFFF	0
↗	L2-46 (0x14AE)	InnerPLC App Parameter 96	0–0xFFFF	0
↗	L2-47 (0x14AF)	InnerPLC App Parameter 97	0–0xFFFF	0
↗	L2-48 (0x14B0)	InnerPLC App Parameter 98	0–0xFFFF	0
↗	L2-49 (0x14B1)	InnerPLC App Parameter 99	0–0xFFFF	0

n. Communication

n0. COM Card Information

Pr.	Parameter Name	Setting Range	Default
n0-00 (0x1540)	RS-485 COM Port Protocol Sel	0: Modbus Slave 1: Modbus Master 2: BACnet MS/TP	0
↗ n0-01 (0x1541)	COM Card Timeout Disposal	0: By COM Stop Method and display Warning 1: By OPER FREQ after COM Timeout and display Warning 2: By Drive Stop Method and display Warning 3: By Drive Stop Method and display Fault 4: By Drive Stop Method and display Warning after stop 5: By Drive Stop Method and display Fault after stop	0
↗ n0-02 (0x1542)	OPER FREQ after COM Timeout	0.00–599.00 Hz	0.00
n0-03 (0x1543)	COM Card ID	0: N/A 1: DeviceNet 2: Profibus-DP 3: CANopen 5: EtherNet 8: BACnet IP 12: Profinet	Read only
n0-04 (0x1544)	COM Card Version	0–65535	Read only
n0-05 (0x1545)	COM Card Date Code	0–65535	Read only

n1. Modbus

Pr.	Parameter Name	Setting Range	Default
n1-00 (0x1580)	Modbus Decoding Method	0: Delta Defined 2000 1: Delta Defined 6000	0
↗ n1-01 (0x1581)	Modbus Address	1–254	1
↗ n1-02 (0x1582)	Modbus COM Baud Rate	0: 4.8 Kbps 1: 9.6 Kbps 2: 19.2 Kbps 3: 38.4 Kbps 4: 57.6 Kbps 5: 76.8 Kbps 6: 115.2 Kbps	1

	Pr.	Parameter Name	Setting Range	Default
↗	n1-03 (0x1583)	Modbus Package Format	0: 7, N, 2 (ASCII) 1: 7, E, 1 (ASCII) 2: 7, O, 1 (ASCII) 3: 7, E, 2 (ASCII) 4: 7, O, 2 (ASCII) 5: 8, N, 1 (ASCII) 6: 8, N, 2 (ASCII) 7: 8, E, 1 (ASCII) 8: 8, O, 1 (ASCII) 9: 8, E, 2 (ASCII) 10: 8, O, 2 (ASCII) 11: 8, N, 1 (RTU) 12: 8, N, 2 (RTU) 13: 8, E, 1 (RTU) 14: 8, O, 1 (RTU) 15: 8, E, 2 (RTU) 16: 8, O, 2 (RTU)	0
↗	n1-04 (0x1584)	Modbus Timeout Check Time	0.0–100.0 sec.	0.0
↗	n1-05 (0x1585)	Modbus Timeout Disposal	0: Continue OPER 1: Warning & continue OPER 2: Fault & ramp to stop 3: Fault & coast to stop	0
↗	n1-06 (0x1586)	Modbus Response Delay Time	0.0–200.0 ms	2.0
↗	n1-07 (0x1587)	Modbus MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
↗	n1-08 (0x1588)	Modbus AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0
	n1-09 (0x1589)	Modbus Master Target Selection	0: None 1: InnerPLC 2: D2D	0

	Pr.	Parameter Name	Setting Range	Default
*	n1-10 (0x1590)	Modbus Special Function	bit0 = 0: 0x2104 decimal point varies with the value bit0 = 1: 0x2104 decimal point is fixed to one decimal point	0

*n2. CANopen

	Pr.	Parameter Name	Setting Range	Default
	n2-00 (0x1590)	CANopen Decoding Method	0: Delta Defined 2000 1: Delta Defined 6000 2: DS402	0
	n2-01 (0x1591)	CANopen Slave Address	0–127	0
	n2-02 (0x1592)	CANopen COM Baud Rate	0: 1 Mbps 1: 500 Kbps 2: 250 Kbps 3: 125 Kbps 4: 100 Kbps 5: 50 Kbps	1
	n2-03 (0x1593)	CANopen Master Function	0: Disable 1: Enable	0
	n2-04 (0x1594)	CANopen Master Address	0–127	100
	n2-05 (0x1595)	CANopen Control Word	0–0xFFFF	0
↗	n2-06 (0x1596)	CANopen MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
↗	n2-07 (0x1597)	CANopen AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0
	n2-08 (0x1598)	CANopen CiA 301 Status	0: Initialising 1: Reset Application 2: Reset COM 3: Pre-Operational 4: Operational 5: Stopped	Read only

Pr.	Parameter Name	Setting Range	Default
n2-09 (0x1599)	CANopen CiA 402 Status	0: Not ready to switch on 1: Switch on Disabled 2: Ready to switch on 3: Switched on 4: Operation Enabled 5: Quick stop active 6: Fault reaction active 7: Fault	Read only
n2-10 (0x159A)	CANopen Fault REC	bit0: CANopen Guarding Timeout bit1: CANopen Heartbeat Timeout bit2: CANopen Bus-off bit3: CANopen SYNC Timeout bit4: CANopen Format Error	Read only

n3. BACnet

Pr.	Parameter Name	Setting Range	Default
n3-00 (0x15A0)	BACnet MS/TP Decoding Method	0: Delta defined 2000	0
n3-01 (0x15A1)	BACnet MAC ID	0–127	10
n3-02 (0x15A2)	Max BACnet MAC ID Setting	0–127	127
n3-03 (0x15A3)	BACnet COM Baud Rate	0: 9.6 Kbps 1: 19.2 Kbps 2: 38.4 Kbps 3: 76.8 Kbps	2
n3-04 (0x15A4)	BACnet Device ID	0–4194303	10
n3-05 (0x15A6)	BACnet Password	0–65535	0
n3-06 (0x15A7)	BACnet MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
n3-07 (0x15A8)	BACnet AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0

＊n4. DeciveNET & Profibus

	Pr.	Parameter Name	Setting Range	Default
	n4-00 (0x15B0)	DeviceNET Decoding Method	0: Delta Defined 2000 1: Delta Defined 6000	0
✓	n4-01 (0x15B1)	DeviceNET Address	0–63	1
✓	n4-02 (0x15B2)	DeviceNET COM Baud Rate	0: 10 Kbps 1: 20 Kbps 2: 50 Kbps 3: 100 Kbps 4: 125 Kbps 5: 250 Kbps 6: 500 Kbps 7: 800 Kbps 8: 1 Mbps	3
✓	n4-03 (0x15B3)	DeviceNet Control Word	0–0xFFFF bit0 = 0: standard bit0 = 1: Delta Defined	0
✓	n4-04 (0x15B4)	DeviceNET MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
✓	n4-05 (0x15B5)	DeviceNET AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0
	n4-06 (0x15B6)	Profibus Decoding Method	0: Delta Defined 2000 1: Delta Defined 6000	0
	n4-07 (0x15B7)	Profibus Address	1–125	1
✓	n4-08 (0x15B8)	Profibus MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve bit9–14: MO10–MO15	0
✓	n4-09 (0x15B9)	Profibus AO Mask	0: Disable 1: Enable bit0–1: AO1–2	0

Pr.	Parameter Name	Setting Range	Default
		bit2–3: Reserve bit4–5: AO10–AO11	

∗n5. EtherNET

	Pr.	Parameter Name	Setting Range	Default
	n5-00 (0x15C0)	EtherNET Decoding Method	0: Delta Defined 2000 1: Delta Defined 6000	0
	n5-01 (0x15C1)	EtherNET IP Configuration	0: Static IP 1: DHCP 2: BOOTP	0
✓	n5-02 (0x15C2)	EtherNET IP Address 1	0–223	0
✓	n5-03 (0x15C3)	EtherNET IP Address 2	0–255	0
✓	n5-04 (0x15C4)	EtherNET IP Address 3	0–255	0
✓	n5-05 (0x15C5)	EtherNET IP Address 4	0–255	0
✓	n5-06 (0x15C6)	EtherNET Mask Address 1	0–255	0
✓	n5-07 (0x15C7)	EtherNET Mask Address 2	0–255	0
✓	n5-08 (0x15C8)	EtherNET Mask Address 3	0–255	0
✓	n5-09 (0x15C9)	EtherNET Mask Address 4	0–255	0
✓	n5-10 (0x15CA)	EtherNET Gateway Address 1	0–223	0
✓	n5-11 (0x15CB)	EtherNET Gateway Address 2	0–255	0
✓	n5-12 (0x15CC)	EtherNET Gateway Address 3	0–255	0
✓	n5-13 (0x15CD)	EtherNET Gateway Address 4	0–255	0
✓	n5-14 (0x15CE)	EtherNET Password	0–4294967295	0
	n5-15 (0x15CF)	EtherNET Reset	0: Disable 1: Reset	0
	n5-16 (0x15D0)	EtherNET Control Word	bit0: Enable IP filter bit1: Enable Internet parameters bit2: Enable Login Password	0
✓	n5-17 (0x15D1)	EtherNET MO Mask	0: Disable 1: Enable bit0–1: Relay1–2 bit2–3: MO1–MO2 bit4–8: Reserve	0

Pr.	Parameter Name	Setting Range	Default
		bit9–14: MO10–MO15	
n5-18 (0x15D2)	EtherNET AO Mask	0: Disable 1: Enable bit0–1: AO1–2 bit2–3: Reserve bit4–5: AO10–AO11	0
n5-19 (0x15D3)	EtherNET Status	bit0: Enable login password	Read only
n5-20 (0x15D4)	EIP COM Card Identify Method	0: by the device's family 1: by the device's series	1
n5-21 (0x15D5)	Max. Mapping Address of EIP Data Exchange	0: 0x7FFF 1: 0xFFFF	1

o. Monitor & Recorder

o0. Status Monitor

Pr.	Parameter Name	Setting Range	Default
o0-00 (0x1640)	Digital Keypad Display Selection 1	0: Display output current (A) (unit: Amp) 1: Display counter value (c) (Unit: CNT) 2: Display the motor's actual output frequency (H.) (Unit: Hz) 3: Display the drive's DC bus voltage (v) (Unit: V_{DC}) 4: Display the drive's output voltage (E) (Unit: V_{AC}) 5: Display the drive's output power angle (n) (Unit: deg) 6: Display the drive's output power (P) (Unit: kW) 7: Display the motor speed rpm (r) (Unit: rpm) 8: Display the drive's estimated output torque, motor's rated torque is 100% (t) (Unit: %) 9: FREQ Cmd (Unit: Hz) 11: Display AI1 analog input terminal signal (1.) (Unit: %) 12: Display AI2 analog input terminal signal (2.) (Unit: %) 13: Display AI3 analog input terminal signal (3.) (Unit: %) 14: Display the drive's IGBT temperature (i.) (Unit: °C) 15: Display the drive's capacitance temperature (c.) (Unit: °C) 16: The digital input status (ON / OFF) (i) 17: The digital output status (ON / OFF) (o) 18: Display multi-step speed (S) 19: The corresponding CPU digital input pin status (d) 20: The corresponding CPU digital output pin status (0.) 21: Display the drive's IGBT temperature (i.) (Unit: %) 22: Display the drive's capacitance temperature (c.) (Unit: %) 25: Overload count (0.00–100.00%) (o.) (Unit: %) 26: Ground fault GFF (G.) (Unit: %) 27: DC bus voltage ripple (r.) (Unit: V_{DC}) 28: Display PLC register D1043 data (C) 29: Display PM pole SECT (4.) 32: Operation speed of fan 1 (F.) (Unit: %)	9
o0-01 (0x1641)	Digital Keypad Display Selection 2		2
o0-02 (0x1642)	Digital Keypad Display Selection 3		0
o0-60 (0x167C)	Digital Keypad Display Selection 4		3
o0-61 (0x167D)	Digital Keypad Display Selection 5		4
o0-62 (0x167E)	Digital Keypad Display Selection 6		6

Pr.	Parameter Name	Setting Range	Default
		33: Operation speed of fan 2 (F.) (Unit: %) 34: Operation speed of fan 3 (F.) (Unit: %) 36: Present operating carrier frequency of the drive (Unit: Hz) (J.) 38: Display the drive status (6.) 39: Display the drive's estimated output torque, positive and negative, using Nt-m as unit (t 0.0: positive torque; -0.0: negative torque (C.) 41: kWh display (J) (Unit: kWh) 42: P-PID1 reference (h.) (Unit: %) 43: P-PID2 reference (y) (Unit: %) 44: P-PID1 feedback (b) (Unit: %) 45: P-PID2 feedback (y.) (Unit: %) 46: P-PID1 output frequency (b.) (Unit: Hz) 47: P-PID2 output frequency (u.) (Unit: Hz) 48: Hardware ID 49: Motor temperature (KTY84-130 only) 51: PMSVC torque offset 52: AI10% 53: AI11% 54: Hardware ID 2 55: Hardware ID 3 68: STO version (d) 69: STO checksum high word (d) 70: STO checksum low word (d) 71: B-PID1 reference (h.) (Unit: %) 72: B-PID1 feedback (b) (Unit: %) 73: B-PID1 output (b.) (Unit: %) 74: B-PID2 reference (h.) (Unit: %) 75: B-PID2 feedback (b) (Unit: %) 76: B-PID2 output (b.) (Unit: %) 77: B-PID3 reference (h.) (Unit: %) 78: B-PID3 feedback (b) (Unit: %) 79: B-PID3 output (b.) (Unit: %) 80: B-PID4 reference (h.) (Unit: %) 81: B-PID4 feedback (b) (Unit: %) 82: B-PID4 output (b.) (Unit: %) 83: P-PID1 reference & feedback (Unit: %) 84: P-PID2 reference & feedback (Unit: %) 85: B-PID1 reference & feedback (Unit: %)	

	Pr.	Parameter Name	Setting Range	Default
			86: B-PID2 reference & feedback (Unit: %) 87: B-PID3 reference & feedback (Unit: %) 88: B-PID4 reference & feedback (Unit: %)	
✓	o0-03 (0x1643)	Current Display Filter Time	0.001–65.535 sec.	0.500
✓	o0-04 (0x1644)	DC bus Display Filter Time	0.001–65.535 sec.	0.500
✓	o0-05 (0x1645)	Status Display Filter Time	0.001–65.535 sec.	0.500
✓	o0-06 (0x1646)	Drive Ready Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	o0-07 (0x1647)	Run Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	o0-08 (0x1648)	Output Amp Detection Level	0.0–200.0%	0.0
✓	o0-09 (0x1649)	Output Amp Exceed Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	o0-10 (0x164A)	Output Amp under Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	o0-11 (0x164B)	Target Speed Width	0.1–5.0%	0.1
✓	o0-12 (0x164C)	At Target Speed Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
✓	o0-13 (0x164D)	Output FREQ Detection Level	0.00–599.00 Hz	30.00

	Pr.	Parameter Name	Setting Range	Default
↗	o0-14 (0x164E)	Output FREQ Exceed Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-15 (0x164F)	Output FREQ under Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-16 (0x1650)	Output FREQ1 Level	0.00–599.00 Hz	60.00
↗	o0-17 (0x1651)	Output FREQ1 Width	0.00–599.00 Hz	2.00
↗	o0-18 (0x1652)	At Output FREQ1 Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-19 (0x1653)	Output FREQ2 Level	0.00–599.00 Hz	60.00
↗	o0-20 (0x1654)	Output FREQ2 Width	0.00–599.00 Hz	2.00
↗	o0-21 (0x1655)	At Output FREQ2 Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-22 (0x1656)	0 Hz Cmd Indn at Run	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-23 (0x1657)	0 Hz Cmd Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-24 (0x1658)	0 Hz Width	0.1–5.0%	0.1

	Pr.	Parameter Name	Setting Range	Default
↗	o0-25 (0x1659)	0 Hz Output Indn at Run	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15	0
↗	o0-26 (0x165A)	0 Hz Output Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10~15	0
↗	o0-27 (0x165B)	FREQ Cmd AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-28 (0x165C)	FREQ Profile AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-29 (0x165D)	Motor RPM AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-30 (0x165E)	Output FREQ AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-31 (0x165F)	Output Current AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-32 (0x1660)	Output Voltage AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
↗	o0-34 (0x1662)	Output Torque AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

Pr.	Parameter Name	Setting Range	Default
o0-35 (0x1663)	Output Power AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
o0-36 (0x1664)	Power Factor AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0
o0-37 (0x1665)	Recent 1Hr OPER KW-hour	0.0–6553.5 kW-hour	Read only
o0-38 (0x1666)	Cumulative OPER KW-hour	0.0–999.9 kW-hour	Read only
o0-39 (0x1667)	Cumulative OPER MW-hour	0–999 MW-hour	Read only
o0-40 (0x1668)	Cumulative OPER GW-hour	0–999 GW-hour	Read only
o0-41 (0x1669)	Cumulative OPER Minutes	0–60 min	Read only
o0-42 (0x166A)	Cumulative OPER Hours	0–24 hr	Read only
o0-43 (0x166B)	Cumulative OPER Days	0–65535 day	Read only
o0-44 (0x166C)	Drive Output Efficiency	0.0–99.9%	Read only
o0-45 (0x166D)	Drive Output PF Angle	-90.0–90.0 deg	Read only
o0-46 (0x166E)	Drive Output Apparent Power	0.0–6553.5 kVA	Read only
o0-47 (0x166F)	Drive Output Active Power	0.0–6553.5 kW	Read only
o0-48 (0x1670)	Drive Output Reactive Power	0.0–6553.5 kVar	Read only
o0-49 (0x1671)	Motor Rated Power Consumed	0.00–100.00%	100.00
o0-50 (0x1672)	kW-hour Power Saved	0.0–999.9 kW-hour	Read only
o0-51 (0x1673)	MW-hour Power Saved	0–999 MW-hour	Read only
o0-52 (0x1674)	GW-hour Power Saved	0–999 GW-hour	Read only

Pr.	Parameter Name	Setting Range	Default
o0-53 (0x1675)	Carbon Emission Reduction	0.0–6553.5 tn	Read only
o0-54 (0x1676)	Carbon Emission Factor	0.000–65.535 tn/MWh	0.500
↗ o0-55 (0x1677)	Power Saved Record Reset	0–1	0
↗ o0-59 (0x167B)	DC bus Voltage AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

o1. Signal & Recorder Function

Pr.	Parameter Name	Setting Range	Default
o1-00 (0x1680)	Signal Sampling Rate	0: 1 kHz 1: 2 kHz 2: 5 kHz 3: 10 kHz	0
o1-01 (0x1681)	Channel 1 Signal Sel	0: Signal Address 1–150 (Number of Signal List)	18
o1-02 (0x1682)	Channel 1 Signal Address	0–0xFFFFFFFF	0
o1-03 (0x1683)	Channel 1 Data Type	0: UBYTE 1: SBYTE 2: UWORD 3: SWORD 4: ULONG 5: SLONG 6: FLOAT	2
o1-04 (0x1684)	Channel 1 Filter Time	0.0–6553.5 ms	0.0
o1-05 (0x1685)	Channel 2 Signal Sel	0–150	6
o1-06 (0x1686)	Channel 2 Signal Address	0–0xFFFFFFFF	0
o1-07 (0x1687)	Channel 2 Data Type	0–6	2
o1-08 (0x1688)	Channel 2 Filter Time	0.0–6553.5 ms	0.0
o1-09 (0x1689)	Channel 3 Signal Sel	0–150	31
o1-10 (0x168A)	Channel 3 Signal Address	0–0xFFFFFFFF	0
o1-11 (0x168B)	Channel 3 Data Type	0–6	5

Pr.	Parameter Name	Setting Range	Default
o1-12 (0x168C)	Channel 3 Filter Time	0.0–6553.5 ms	0.0
o1-13 (0x168D)	Channel 4 Signal Sel	0–150	34
o1-14 (0x168E)	Channel 4 Signal Address	0–0xFFFFFFFF	0
o1-15 (0x168F)	Channel 4 Data Type	0–6	3
o1-16 (0x1691)	Channel 4 Filter Time	0.0–6553.5 ms	0.0
o1-17 (0x1692)	Channel 5 Signal Sel	0–150	11
o1-18 (0x1693)	Channel 5 Signal Address	0–0xFFFFFFFF	0
o1-19 (0x1694)	Channel 5 Data Type	0–6	2
o1-20 (0x1696)	Channel 5 Filter Time	0.0–6553.5 ms	0.0
o1-21 (0x1697)	Channel 6 Signal Sel	0–150	24
o1-22 (0x1698)	Channel 6 Signal Address	0–0xFFFFFFFF	0
o1-23 (0x1699)	Channel 6 Data Type	0–6	3
o1-24 (0x169B)	Channel 6 Filter Time	0.0–6553.5 ms	0.0
o1-25 (0x169C)	Channel 7 Signal Sel	0–150	3
o1-26 (0x169D)	Channel 7 Signal Address	0–0xFFFFFFFF	0
o1-27 (0x169E)	Channel 7 Data Type	0–6	3
o1-28 (0x16A0)	Channel 7 Filter Time	0.0–6553.5 ms	0.0
o1-29 (0x16A1)	Channel 8 Signal Sel	0–150	4
o1-30 (0x16A2)	Channel 8 Signal Address	0–0xFFFFFFFF	0
o1-31 (0x16A3)	Channel 8 Data Type	0–6	3
o1-32 (0x16A5)	Channel 8 Filter Time	0.0–6553.5 ms	0.0
↯ o1-33 (0x16A6)	Recorder Function	0: Disable 1: One-Time Record 2: Continuously Record	0

Pr.	Parameter Name	Setting Range	Default
o1-34 (0x16A7)	Recorder Trigger Method	0: Src A 1: Src A Reverse 2: Src A and Src B 3: Src A or Src B 4: Src A xor Src B	0
o1-35 (0x16A8)	Recorder Trigger Src A	1–8 Monitor No.	1
o1-36 (0x16AA)	Recorder Trigger Src B	1–8 Monitor No.	1
o1-37 (0x16AB)	Recorder Time Setting	20–600 sec.	20
o1-38 (0x16AC)	Recorder 1 Channel Src	0–8 Channel No.	1
o1-39 (0x16AD)	Recorder 2 Channel Src	0–8 Channel No.	2
o1-40 (0x16AF)	Recorder 3 Channel Src	0–8 Channel No.	3
o1-41 (0x16B0)	Recorder 4 Channel Src	0–8 Channel No.	4
o1-42 (0x16B1)	Recorder 5 Channel Src	0–8 Channel No.	5
o1-43 (0x16B2)	Recorder 6 Channel Src	0–8 Channel No.	6
o1-44 (0x16B4)	Recorder 7 Channel Src	0–8 Channel No.	7
o1-45 (0x16B5)	Recorder 8 Channel Src	0–8 Channel No.	8

o2. Monitor Function

Pr.	Parameter Name	Setting Range	Default
o2-00 (0x16C0)	Monitor Trigger Status	0–0x00FF	Read only
o2-01 (0x16C1)	Monitor 1 Channel Src	1–8 Channel No.	1
o2-02 (0x16C2)	Monitor 1 Trigger Method	0: Disable 1: Low 2: High 3: Abs Low 4: Abs High 5: Low & High 6: Abs Low & Abs High 7: Hysteresis	2

Pr.	Parameter Name	Setting Range	Default
o2-03 (0x16C3)	Monitor 1 Trigger Action	0: Disable 1: Warning & Continue OPER 2: Error and Ramp Stop 3: Error and Coast Stop	0
o2-04 (0x16C4)	Monitor 1 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-05 (0x16C5)	Monitor 1 Upper Limit	-21474836.00–21474836.00	0.00
o2-06 (0x16C7)	Monitor 1 Lower Limit	-21474836.00–21474836.00	0.00
o2-07 (0x16C9)	Monitor 1 Hysteresis	0.00–100000.00	0.00
o2-08 (0x16CB)	Monitor 2 Channel Src	1–8 Channel No.	2
o2-09 (0x16CC)	Monitor 2 Trigger Method	0–7	0
o2-10 (0x16CD)	Monitor 2 Trigger Action	0–3	0
o2-11 (0x16CE)	Monitor 2 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-12 (0x16CF)	Monitor 2 Upper Limit	-21474836.00–21474836.00	0.00
o2-13 (0x16D1)	Monitor 2 Lower Limit	-21474836.00–21474836.00	0.00
o2-14 (0x16D3)	Monitor 2 Hystersis	0.00–100000.00	0.00
o2-15 (0x16D5)	Monitor 3 Channel Src	1–8 Channel No.	3
o2-16 (0x16D6)	Monitor 3 Trigger Method	0–7	0
o2-17 (0x16D7)	Monitor 3 Trigger Action	0–3	0

Pr.	Parameter Name	Setting Range	Default
o2-18 (0x16D8)	Monitor 3 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-19 (0x16D9)	Monitor 3 Upper Limit	-21474836.00–21474836.00	0.00
o2-20 (0x16DB)	Monitor 3 Lower Limit	-21474836.00–21474836.00	0.00
o2-21 (0x16DD)	Monitor 3 Hystersis	0.00–100000.00	0.00
o2-22 (0x16DF)	Monitor 4 Channel Src	1–8 Channel No.	4
o2-23 (0x16E0)	Monitor 4 Trigger Method	0–7	0
o2-24 (0x16E1)	Monitor 4 Trigger Action	0–3	0
o2-25 (0x16E2)	Monitor 4 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-26 (0x16E3)	Monitor 4 Upper Limit	-21474836.00–21474836.00	0.00
o2-27 (0x16E5)	Monitor 4 Lower Limit	-21474836.00–21474836.00	0.00
o2-28 (0x16E7)	Monitor 4 Hystersis	0.00–100000.00	0.00
o2-29 (0x16E9)	Monitor 5 Channel Src	1–8 Channel No.	5
o2-30 (0x16EA)	Monitor 5 Trigger Method	0–7	0
o2-31 (0x16EB)	Monitor 5 Trigger Action	0–3	0
o2-32 (0x16EC)	Monitor 5 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-33 (0x16ED)	Monitor 5 Upper Limit	-21474836.00–21474836.00	0.00
o2-34 (0x16EF)	Monitor 5 Lower Limit	-21474836.00–21474836.00	0.00

Pr.	Parameter Name	Setting Range	Default
o2-35 (0x16F1)	Monitor 5 Hystersis	0.00–100000.00	0.00
o2-36 (0x16F3)	Monitor 6 Channel Src	1–8 Channel No.	6
o2-37 (0x16F4)	Monitor 6 Trigger Method	0–7	0
o2-38 (0x16F5)	Monitor 6 Trigger Action	0–3	0
o2-39 (0x16F6)	Monitor 6 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-40 (0x16F7)	Monitor 6 Upper Limit	-21474836.00–21474836.00	0.00
o2-41 (0x16F9)	Monitor 6 Lower Limit	-21474836.00–21474836.00	0.00
o2-42 (0x16FB)	Monitor 6 Hystersis	0.00–100000.00	0.00
o2-43 (0x16FD)	Monitor 7 Channel Src	1–8 Channel No.	7
o2-44 (0x16FE)	Monitor 7 Trigger Method	0–7	0
o2-45 (0x16FF)	Monitor 7 Trigger Action	0–3	0
o2-46 (0x1700)	Monitor 7 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1~MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0
o2-47 (0x1701)	Monitor 7 Upper Limit	-21474836.00–21474836.00	0.00
o2-48 (0x1703)	Monitor 7 Lower Limit	-21474836.00–21474836.00	0.00
o2-49 (0x1705)	Monitor 7 Hystersis	0.00–100000.00	0.00
o2-50 (0x1707)	Monitor 8 Channel Src	1–8 Channel No.	8
o2-51 (0x1708)	Monitor 8 Trigger Method	0–7	0
o2-52 (0x1709)	Monitor 8 Trigger Action	0–3	0
o2-53 (0x170A)	Monitor 8 Trigger Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2	0

Pr.	Parameter Name	Setting Range	Default
		5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	
o2-54 (0x170B)	Monitor 8 Upper Limit	-21474836.00–21474836.00	0.00
o2-55 (0x170D)	Monitor 8 Lower Limit	-21474836.00–21474836.00	0.00
o2-56 (0x170F)	Monitor 8 Hystersis	0.00–100000.00	0.00

o3. PDM Function

Pr.	Parameter Name	Setting Range	Default
o3-00 (0x1740)	Component Life Status	bit0: IGBT Life bit1: DC bus Cap Life bit2: PB Cap Life bit3: Fan Life bit4: PB Relay Life bit5: IO Relay 1 Life bit6: IO Relay 2 Life bit7: Fan Spd Fdb 1 bit8: Fan Spd Fdb 2 bit9: Fan Spd Fdb 3	0000h
o3-01 (0x1741)	Component Lift Lower than Level Indn	0: Disable 1–2: Relay 1–2 3–4: MO1–2 5–9: Reserve 10–15: MO/Relay 10–15	0
o3-02 (0x1742)	IGBT Life	0.00–100.00%	100.00
o3-03 (0x1743)	DC bus Cap Life	0.00–100.00%	100.00
o3-04 (0x1744)	PB Cap Life	0.00–100.00%	100.00
o3-05 (0x1745)	Fan Life	0.00–100.00%	100.00
o3-06 (0x1746)	PB Relay Life	0.00–100.00%	100.00
o3-07 (0x1747)	IO Relay1 Life	0.00–100.00%	100.00
o3-08 (0x1748)	IO Relay2 Life	0.00–100.00%	100.00
o3-09 (0x1749)	IGBT Life Warring Level	0.00–100.00%	10.00
o3-10 (0x174A)	DC bus Cap Life Warring Level	0.00–100.00%	10.00

Pr.	Parameter Name	Setting Range	Default
o3-11 (0x174B)	PB Cap Life Warring Level	0.00–100.00%	10.00
o3-12 (0x174C)	Fan Life Warring Level	0.00–100.00%	10.00
o3-13 (0x174D)	PB Relay Life Warring Level	0.00–100.00%	10.00
o3-14 (0x174E)	IO Relay1 Life Warring Level	0.00–100.00%	10.00
o3-15 (0x174F)	IO Relay2 Life Warring Level	0.00–100.00%	10.00
o3-16 (0x1750)	System Life	0.00–100.00%	100.00
* o3-18 (0x1572)	Estimated Life Remains	0.0–6553.5 day	0.0

o4. Fault Record 1–2

Pr.	Parameter Name	Setting Range	Default
o4-00 (0x1780)	Fault Code REC 1	0–65535	Read only
o4-01 (0x1781)	OPER Time at Fault REC 1	0–2359 hr/min	Read only
o4-02 (0x1782)	OPER Days at Fault REC 1	0–65535 day	Read only
o4-03 (0x1783)	Date of Fault REC 1	0–1231 month/day	Read only
o4-04 (0x1784)	Time of Fault REC 1	0–2359 hr/min	Read only
o4-05 (0x1785)	FREQ Cmd at Fault REC 1	0.00–599.00	Read only
o4-06 (0x1786)	Output FREQ at Fault REC 1	0.00–599.00	Read only
o4-07 (0x1787)	Output Current at Fault REC 1	0.0–6553.5 A	Read only
o4-08 (0x1788)	Output Voltage at Fault REC 1	0.0–6553.5 V_{DC}	Read only
o4-09 (0x1789)	DC bus at Fault REC 1	0.0–6553.5 V_{DC}	Read only
o4-10 (0x178A)	IGBT Temp at Fault REC 1	-3276.8–3276.7°C	Read only
o4-11 (0x178B)	Cap Temp at Fault REC 1	-3276.8–3276.7°C	Read only
o4-12 (0x178C)	Fan Speed at Fault REC 1	0–65535 rpm	Read only

Pr.	Parameter Name	Setting Range	Default
o4-13 (0x178D)	Motor Speed at Fault REC 1	0–65535 rpm	Read only
o4-15 (0x178F)	Output Torque at Fault REC 1	0.0–6553.5%	Read only
o4-16 (0x1790)	MI Status at Fault REC 1	0000h–FFFFh	Read only
o4-17 (0x1791)	MO/Rly Status at Fault REC 1	0000h–FFFFh	Read only
o4-18 (0x1792)	Drive Status at Fault REC 1	0000h–FFFFh	Read only
o4-19 (0x1793)	Fault Code REC 2	0–65535	Read only
o4-20 (0x1794)	OPER Time at Fault REC 2	0–2359 hr/min	Read only
o4-21 (0x1795)	OPER Days at Fault REC 2	0–65535 day	Read only
o4-22 (0x1796)	Date of Fault REC 2	0–1231 month/day	Read only
o4-23 (0x1797)	Time of Fault REC 2	0–2359 hr/min	Read only
o4-24 (0x1798)	FREQ Cmd at Fault REC 2	0.00–599.00 Hz	Read only
o4-25 (0x1799)	Output FREQ at Fault REC 2	0.00–599.00 Hz	Read only
o4-26 (0x179A)	Output Current at Fault REC 2	0.0–6553.5 A	Read only
o4-27 (0x179B)	Output Voltage at Fault REC 2	0.0–6553.5 V_{DC}	Read only
o4-28 (0x179C)	DC bus at Fault REC 2	0.0–6553.5 V_{DC}	Read only
o4-29 (0x179D)	IGBT Temp at Fault REC 2	-3276.8–3276.7°C	Read only
o4-30 (0x179E)	Cap Temp at Fault REC 2	-3276.8–3276.7°C	Read only
o4-31 (0x179F)	Fan Speed at Fault REC 2	0–65535 rpm	Read only
o4-32 (0x17A0)	Motor Speed at Fault REC 2	0–65535 rpm	Read only
o4-34 (0x17A2)	Output Torque at Fault REC 2	0.0–6553.5%	Read only

Pr.	Parameter Name	Setting Range	Default
o4-35 (0x17A3)	MI Status at Fault REC 2	0000h–FFFFh	Read only
o4-36 (0x17A4)	MO/Rly Status at Fault REC 2	0000h–FFFFh	Read only
o4-37 (0x17A5)	Drive Status at Fault REC 2	0000h–FFFFh	Read only

o5. Fault Record 3–4

Pr.	Parameter Name	Setting Range	Default
o5-00 (0x17C0)	Fault Code REC 3	0–65535	Read only
o5-01 (0x17C1)	OPER Time at Fault REC 3	0–2359 hr/min	Read only
o5-02 (0x17C2)	OPER Days at Fault REC 3	0–65535 day	Read only
o5-03 (0x17C3)	Date of Fault REC 3	0–1231 month/day	Read only
o5-04 (0x17C4)	Time of Fault REC 3	0–2359 hr/min	Read only
o5-05 (0x17C5)	FREQ Cmd at Fault REC 3	0.00–599.00 Hz	Read only
o5-06 (0x17C6)	Output FREQ at Fault REC 3	0.00–599.00 Hz	Read only
o5-07 (0x17C7)	Output Current at Fault REC 3	0.0–6553.5 A	Read only
o5-08 (0x17C8)	Output Voltage at Fault REC 3	0.0–6553.5 V_{DC}	Read only
o5-09 (0x17C9)	DC bus at Fault REC 3	0.0–6553.5 V_{DC}	Read only
o5-10 (0x17CA)	IGBT Temp at Fault REC 3	-3276.8–3276.7°C	Read only
o5-11 (0x17CB)	Cap Temp at Fault REC 3	-3276.8–3276.7°C	Read only
o5-12 (0x17CC)	Fan Speed at Fault REC 3	0–65535 rpm	Read only
o5-13 (0x17CD)	Motor Speed at Fault REC 3	0–65535 rpm	Read only
o5-15 (0x17CF)	Output Torque at Fault REC 3	0.0–6553.5%	Read only

Pr.	Parameter Name	Setting Range	Default
o5-16 (0x17D0)	MI Status at Fault REC 3	0000h–FFFFh	Read only
o5-17 (0x17D1)	MO/Rly Status at Fault REC 3	0000h–FFFFh	Read only
o5-18 (0x17D2)	Drive Status at Fault REC 3	0000h–FFFFh	Read only
o5-19 (0x17D3)	Fault Code REC 4	0–65535	Read only
o5-20 (0x17D4)	OPER Time at Fault REC 4	0–2359 hr/min	Read only
o5-21 (0x17D5)	OPER Days at Fault REC 4	0–65535 day	Read only
o5-22 (0x17D6)	Date of Fault REC 4	0–1231 month/day	Read only
o5-23 (0x17D7)	Time of Fault REC 4	0–2359 hr/min	Read only
o5-24 (0x17D8)	FREQ Cmd at Fault REC 4	0.00–599.00 Hz	Read only
o5-25 (0x17D9)	Output FREQ at Fault REC 4	0.00–599.00 Hz	Read only
o5-26 (0x17DA)	Output Current at Fault REC 4	0.0–6553.5 A	Read only
o5-27 (0x17DB)	Output Voltage at Fault REC 4	0.0–6553.5 V_{DC}	Read only
o5-28 (0x17DC)	DC bus at Fault REC 4	0.0–6553.5 V_{DC}	Read only
o5-29 (0x17DD)	IGBT Temp at Fault REC 4	-3276.8–3276.7°C	Read only
o5-30 (0x17DE)	Cap Temp at Fault REC 4	-3276.8–3276.7°C	Read only
o5-31 (0x17DF)	Fan Speed at Fault REC 4	0–65535 rpm	Read only
o5-32 (0x17E0)	Motor Speed at Fault REC 4	0–65535 rpm	Read only
o5-34 (0x17E2)	Output Torque at Fault REC 4	0.0–6553.5%	Read only
o5-35 (0x17E3)	MI Status at Fault REC 4	0000h–FFFFh	Read only
o5-36 (0x17E4)	MO/Rly Status at Fault REC 4	0000h–FFFFh	Read only

Pr.	Parameter Name	Setting Range	Default
o5-37 (0x17E5)	Drive Status at Fault REC 4	0000h–FFFFh	Read only

o6. Fault Record 5–6

Pr.	Parameter Name	Setting Range	Default
o6-00 (0x1800)	Fault Code REC 5	0–65535	Read only
o6-01 (0x1801)	OPER Time at Fault REC 5	0–2359 hr/min	Read only
o6-02 (0x1802)	OPER Days at Fault REC 5	0–65535 day	Read only
o6-03 (0x1803)	Date of Fault REC 5	0–1231 month/day	Read only
o6-04 (0x1804)	Time of Fault REC 5	0–2359 hr/min	Read only
o6-05 (0x1805)	FREQ Cmd at Fault REC 5	0.00–599.00 Hz	Read only
o6-06 (0x1806)	Output FREQ at Fault REC 5	0.00–599.00 Hz	Read only
o6-07 (0x1807)	Output Current at Fault REC 5	0.0–6553.5 A	Read only
o6-08 (0x1808)	Output Voltage at Fault REC 5	0.0–6553.5 V_{DC}	Read only
o6-09 (0x1809)	DC bus at Fault REC 5	0.0–6553.5 V_{DC}	Read only
o6-10 (0x180A)	IGBT Temp at Fault REC 5	-3276.8–3276.7°C	Read only
o6-11 (0x180B)	Cap Temp at Fault REC 5	-3276.8–3276.7°C	Read only
o6-12 (0x180C)	Fan Speed at Fault REC 5	0–65535 rpm	Read only
o6-13 (0x180D)	Motor Speed at Fault REC 5	0–65535 rpm	Read only
o6-15 (0x180F)	Output Torque at Fault REC 5	0.0–6553.5%	Read only
o6-16 (0x1810)	MI Status at Fault REC 5	0000h–FFFFh	Read only
o6-17 (0x1811)	MO/Rly Status at Fault REC 5	0000h–FFFFh	Read only

Pr.	Parameter Name	Setting Range	Default
o6-18 (0x1812)	Drive Status at Fault REC 5	0000h–FFFFh	Read only
o6-19 (0x1813)	Fault Code REC 6	0–65535	Read only
o6-20 (0x1814)	OPER Time at Fault REC 6	0–2359 hr/min	Read only
o6-21 (0x1815)	OPER Days at Fault REC 6	0–65535 day	Read only
o6-22 (0x1816)	Date of Fault REC 6	0–1231 month/day	Read only
o6-23 (0x1817)	Time of Fault REC 6	0–2359 hr/min	Read only
o6-24 (0x1818)	FREQ Cmd at Fault REC 6	0.00–599.00 Hz	Read only
o6-25 (0x1819)	Output FREQ at Fault REC 6	0.00–599.00 Hz	Read only
o6-26 (0x181A)	Output Current at Fault REC 6	0.0–6553.5 A	Read only
o6-27 (0x181B)	Output Voltage at Fault REC 6	0.0–6553.5 V_{DC}	Read only
o6-28 (0x181C)	DC bus at Fault REC 6	0.0–6553.5 V_{DC}	Read only
o6-29 (0x181D)	IGBT Temp at Fault REC 6	-3276.8–3276.7°C	Read only
o6-30 (0x181E)	Cap Temp at Fault REC 6	-3276.8–3276.7°C	Read only
o6-31 (0x181F)	Fan Speed at Fault REC 6	0–65535 rpm	Read only
o6-32 (0x1820)	Motor Speed at Fault REC 6	0–65535 rpm	Read only
o6-34 (0x1822)	Output Torque at Fault REC 6	0.0–6553.5%	Read only
o6-35 (0x1823)	MI Status at Fault REC 6	0000h–FFFFh	Read only
o6-36 (0x1824)	MO/Rly Status at Fault REC 6	0000h–FFFFh	Read only
o6-37 (0x1825)	Drive Status at Fault REC 6	0000h–FFFFh	Read only

P. PID Function

P0. Process PID1

	Pr.	Parameter Name	Setting Range	Default
↗	P0-00 (0x1880)	P-PID1/P-PID2 Switch Src	0: P-PID1 1: P-PID2 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
↗	P0-01 (0x1881)	P-PID1 Function	0: Disable 1: Enable	0
↗	P0-02 (0x1882)	P-PID1 Ref1 Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi Setpoint 17: B-PID1 Output 18: Pulse Train 19: Current Pressure Cmd	0
↗	P0-03 (0x1883)	P-PID1 Ref2 Src		0
↗	P0-04 (0x1884)	P-PID1 Fdk1 Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: B-PID1 Fdk 17: B-PID1 Output 18: Pulse Train	0
↗	P0-05 (0x1885)	P-PID1 Fdk2 Src		0

	Pr.	Parameter Name	Setting Range	Default
↗	P0-06 (0x1886)	P-PID1 Ref Math	0: Ref1 1: Ref1 + K*Ref2 2: Ref1 – K*Ref2 3: Ref1*K*Ref2 4: Ref1/K*Ref2 5: MIN(Ref1, Ref2) 6: MAX(Ref1, Ref2) 7: AVE(Ref1, Ref2) 8: K*sqrt(Ref1) 9: K*sqrt(Ref1-Ref2) 10: K*sqrt(Ref1+Ref2) 11: sqrt(Ref1)+K*sqrt(Ref2) 12: $(Ref1 – K*Ref2)^2$ 13: $(Ref1)^2 + K* (Ref2)^2$	0
↗	P0-07 (0x1887)	P-PID1 Ref K Gain	-300.00–300.00	1.00
↗	P0-08 (0x1888)	P-PID1 Fdk Math	0: Fdk1 1: Fdk1 + K*Fdk2 2: Fdk1 – K*Fdk2 3: Fdk1*K*Fdk2 4: Fdk1/K*Fdk2 5: MIN(Fdk1, Fdk2) 6: MAX(Fdk1, Fdk2) 7: AVE(Fdk1, Fdk2) 8: K*sqrt(Fdk1) 9: K*sqrt(Fdk1-Fdk2) 10: K*sqrt(Fdk1+Fdk2) 11: sqrt(Fdk1)+K*sqrt(Fdk2) 12: $(Fdk1 – K*Fdk2)^2$ 13: $(Fdk1)^2 + K* (Fdk2)^2$	0
↗	P0-09 (0x1889)	P-PID1 Fdk K Gain	-300.00–300.00	1.00
↗	P0-10 (0x188A)	P-PID1 Decimal Point	0: No Decimal Point 1: One Decimal Point 2: Two Decimal Point 3: Three Decimal Point	2
↗	P0-11 (0x188B)	P-PID1 Unit	0: Hz 1: rpm 2: % 3: m/s 4: kW	0

	Pr.	Parameter Name	Setting Range	Default
			5: HP 6: ppm 7: 1/m 8: kg/s 9: kg/m 10: kg/h 11: lb/s 12: lb/m 13: lb/h 14: ft/s 15: ft/m 16: m 17: ft 18: degC 19: degF 20: mbar 21: bar 22: Pa 23: kPa 24: mWG 25: inWG 26: ftWG 27: psi 28: atm 29: L/s 30: L/m 31: L/h 32: m3/s 33: m3/h 34: GPM 35: CFM 36: kg 37: kg/cm^2	
↗	P0-12 (0x188C)	P-PID1 Setpoint	P0-14–P0-13 (PID1 unit)	0
↗	P0-13 (0x188D)	P-PID1 Setpoint Upper Limit	-30000–30000 PID unit	10000
↗	P0-14 (0x188E)	P-PID1 Setpoint Lower Limit	-30000–P0-13 setting value (PID unit)	0
↗	P0-15 (0x188F)	P-PID1 Setpoint Accel Time	0.0–1800.0 sec.	0.0

	Pr.	Parameter Name	Setting Range	Default
✓	P0-16 (0x1890)	P-PID1 Setpoint Decel Time	0.0–1800.0 sec.	0.0
✓	P0-17 (0x1891)	P-PID1 Fdk Filter Time	0.000–30.000 sec.	0.000
✓	P0-18 (0x1892)	P-PID1 Setpoint Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P0-19 (0x1893)	P-PID1 Error OPER	0: PID1 err = PID1 Ref – PID1 Fdk 1: PID1 err = PID1 Fdk – PID1 Ref	0
✓	P0-20 (0x1894)	P-PID1 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P0-21 (0x1895)	P-PID1 Multi Setpoint Src2	0–38	0
✓	P0-22 (0x1896)	P-PID1 Multi Setpoint1	P0-14–P0-13 (PID1 unit)	0
✓	P0-23 (0x1897)	P-PID1 Multi Setpoint2	-30000–30000 PID1 unit	0
✓	P0-24 (0x1898)	P-PID1 Multi Setpoint3	-30000–30000 PID1 unit	0
✓	P0-25 (0x1899)	P-PID1 Multi Setpoint4	-30000–30000 PID1 unit	0
✓	P0-26 (0x189A)	P-PID1 Output Upper Limit Src	0: P-PID1 Output Upper Limit 1: P-PID2 Output 2: B-PID1 Output 3: B-PID2 Output 4: B-PID3 Output 5: B-PID4 Output	0
✓	P0-27 (0x189B)	P-PID1 Output Upper Limit	0.00–600.00 Hz	60.00
✓	P0-28 (0x189C)	P-PID1 Output Lower Limit	0.00–P0-27 setting value (Hz)	0.00

	Pr.	Parameter Name	Setting Range	Default
✓	P0-29 (0x189D)	P-PID1 P Gain	0.01–100.00	1.00
✓	P0-30 (0x189E)	P-PID1 I Time	0.0–6000.0 sec.	60.0
✓	P0-31 (0x189F)	P-PID1 D Time	0.000–10.000 sec.	0.000
✓	P0-32 (0x18A0)	P-PID1 Derivative Filter	0.0–10.0 sec.	0.0
✓	P0-33 (0x18A1)	P-PID1 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P0-34 (0x18A2)	P-PID1 Setpoint Deadband	0–10000	0
✓	P0-35 (0x18A3)	P-PID1 Deadband Delay	0.0–3600.0 sec.	0.0
✓	P0-36 (0x18A4)	P-PID1 Sleep Ref Src	0: Disable 1: Motor FREQ 2: Fdk value	0
✓	P0-37 (0x18A5)	P-PID1 Sleep FREQ Level	0.00–60.00 Hz	0.00
✓	P0-38 (0x18A6)	P-PID1 Sleep Fdk Range	0.00–100.00%	0.00
✓	P0-39 (0x18A7)	P-PID1 Sleep Delay Time	0.0–3600.0 sec.	60.0
✓	P0-40 (0x18A8)	P-PID1 Sleep Boost Time	0.0–3600.0 sec.	0.0
✓	P0-41 (0x18A9)	P-PID1 Sleep Boost Value	0–30000 PID1 unit	0
✓	P0-42 (0x18AA)	P-PID1 Wake Error Level	0–10000 PID1 unit	0
✓	P0-43 (0x18AB)	P-PID1 Wake Delay Time	0.00–60.00 PID1 unit	0.50
✓	P0-44 (0x18AC)	P-PID1 Track Enable Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve	0

Pr.	Parameter Name	Setting Range	Default
		31–38: Monitor 1–8	
P0-45 (0x18AD)	P-PID1 Track Ref Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve	0
P0-46 (0x18AE)	P-PID1 Output Delay Time	0.000–30.000 sec.	0.000
P0-47 (0x18AF)	P-PID1 Fdk Error Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0

∗P1. Process PID2

Pr.	Parameter Name	Setting Range	Default
P1-00 (0x18C0)	P-PID2 Function	0: Disable 1: Enable	0
P1-01 (0x18C1)	P-PID2 Ref1 Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi Setpoint 17: B-PID1 Output 18: Pulse Train 19: Current pressure cmd	0
P1-02 (0x18C2)	P-PID2 Ref2 Src		0

Pr.	Parameter Name	Setting Range	Default
P1-03 (0x18C3)	P-PID2 Fdk1 Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: B-PID1 Fdk 17: B-PID1 Output 18: Pulse Train	0
P1-04 (0x18C4)	P-PID2 Fdk2 Src		0
P1-05 (0x18C5)	P-PID2 Ref Math	0: Ref1 1: Ref1 + K*Ref2 2: Ref1 – K*Ref2 3: Ref1*K*Ref2 4: Ref1/K*Ref2 5: MIN(Ref1, Ref2) 6: MAX(Ref1, Ref2) 7: AVE(Ref1, Ref2) 8: K*sqrt(Ref1) 9: K*sqrt(Ref1-Ref2) 10: K*sqrt(Ref1+Ref2) 11: sqrt(Ref1)+K*sqrt(Ref2) 12: $(Ref1 – K*Ref2)^2$ 13: $(Ref1)^2 + K* (Ref2)^2$	0
P1-06 (0x18C6)	P-PID2 Ref K Gain	-300.00–300.00	1.00
P1-07 (0x18C7)	P-PID2 Fdk Math	0: Fdk1 1: Fdk1 + K*Fdk2 2: Fdk1 – K*Fdk2 3: Fdk1*K*Fdk2 4: Fdk1/K*Fdk2 5: MIN(Fdk1, Fdk2) 6: MAX(Fdk1, Fdk2) 7: AVE(Fdk1, Fdk2) 8: K*sqrt(Fdk1) 9: K*sqrt(Fdk1-Fdk2) 10: K*sqrt(Fdk1+Fdk2)	0

	Pr.	Parameter Name	Setting Range	Default
			11: sqrt(Fdk1)+K*sqrt(Fdk2) 12: (Fdk1 – K*Fdk2)^2 13: (Fdk1)^2 +K* (Fdk2)^2	
✓	P1-08 (0x18C8)	P-PID2 Fdk K Gain	-300.00–300.00	1.00
✓	P1-09 (0x18C9)	P-PID2 Decimal Point	0: No Decimal Point 1: One Decimal Point 2: Two Decimal Point 3: Three Decimal Point	2
✓	P1-10 (0x18CA)	P-PID2 Unit	Refer to Pr.P0-11	0
✓	P1-11 (0x18CB)	P-PID2 Setpoint	-30000–30000 PID2 unit	0
✓	P1-12 (0x18CC)	P-PID2 Setpoint Upper Limit	-30000–30000 PID unit	10000
✓	P1-13 (0x18CD)	P-PID2 Setpoint Lower Limit	-30000–P1-12 setting value (PID unit)	0
✓	P1-14 (0x18CE)	P-PID2 Setpoint Accel Time	0.0–1800.0 sec.	0.0
✓	P1-15 (0x18CF)	P-PID2 Setpoint Decel Time	0.0–1800.0 sec.	0.0
✓	P1-16 (0x18D0)	P-PID2 Fdk Filter Time	0.000–30.000 sec.	0.000
✓	P1-17 (0x18D1)	P-PID2 Setpoint Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P1-18 (0x18D2)	P-PID2 Error OPER	0: PID2 err = PID2 Ref – PID2 Fdk 1: PID2 err = PID2 Fdk – PID2 Ref	0
✓	P1-19 (0x18D3)	P-PID2 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0

	Pr.	Parameter Name	Setting Range	Default
✓	P1-20 (0x18D4)	P-PID2 Multi Setpoint Src2	0–38	0
✓	P1-21 (0x18D5)	P-PID2 Multi Setpoint1	-30000–30000 PID2unit	0
✓	P1-22 (0x18D6)	P-PID2 Multi Setpoint2	-30000–30000 PID2 unit	0
✓	P1-23 (0x18D7)	P-PID2 Multi Setpoint3	-30000–30000 PID2 unit	0
✓	P1-24 (0x18D8)	P-PID2 Multi Setpoint4	-30000–30000 PID2 unit	0
✓	P1-25 (0x18D9)	P-PID2 Output Upper Limit Src	0: P-PID1 Output Upper Limit 1: P-PID2 Output 2: B-PID1 Output 3: B-PID2 Output 4: B-PID3 Output 5: B-PID4 Output	0
✓	P1-26 (0x18DA)	P-PID2 Output Upper Limit	0.00–600.00 Hz	60.00
✓	P1-27 (0x18DB)	P-PID2 Output Lower Limit	0.00–P1-26 setting value (Hz)	0.00
✓	P1-28 (0x18DC)	P-PID2 P Gain	0.01–100.00	1.00
✓	P1-29 (0x18DD)	P-PID2 I Time	0.0–6000.0 sec.	60.0
✓	P1-30 (0x18DE)	P-PID2 D Time	0.000–10.000 sec.	0.000
✓	P1-31 (0x18DF)	P-PID2 Derivative Filter	0.0–10.0 sec.	0.0
✓	P1-32 (0x18E0)	P-PID2 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P1-33 (0x18E1)	P-PID2 Deadband Zone	0–10000	0
✓	P1-34 (0x18E2)	P-PID2 Deadband Delay	0.0–3600.0 sec.	0.0
✓	P1-35 (0x18E3)	P-PID2 Sleep Ref Src	0: Disable 1: Motor FREQ 2: Fdk value	0
✓	P1-36 (0x18E4)	P-PID2 Sleep FREQ Level	Low limit Freq–High limit Freq Hz 0.00–60.00 Hz	0.00

	Pr.	Parameter Name	Setting Range	Default
✓	P1-37 (0x18E5)	P-PID2 Sleep Fdk Range	0.00–100.00%	0.00
✓	P1-38 (0x18E6)	P-PID2 Sleep Delay Time	0.0–3600.0 sec.	60.0
✓	P1-39 (0x18E7)	P-PID2 Sleep Boost Time	0.0–3600.0 sec.	0.0
✓	P1-40 (0x18E8)	P-PID2 Sleep Boost Value	0–30000 PID2 unit	0
✓	P1-41 (0x18E9)	P-PID2 Wake Error Level	0–10000 PID2 unit	0
✓	P1-42 (0x18EA)	P-PID2 Wake Delay Time	0.00–60.00 PID2 unit	0.50
✓	P1-43 (0x18EB)	P-PID2 Track Enable Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P1-44 (0x18EC)	P-PID2 Track Ref Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve	0
✓	P1-45 (0x18ED)	P-PID2 Output Delay Time	0.000–30.000 sec..	0.000
	P1-46 (0x18EE)	P-PID2 Fdk Error Indn	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay10–15 16–19: Reserve	0

P2. Basic PID1

	Pr.	Parameter Name	Setting Range	Default
↗	P2-00 (0x1900)	B-PID1 Function	0: Disable 1: Enable 2: Enable after Run	0
↗	P2-01 (0x1901)	B-PID1 Ref Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi Setpoint 17: Pulse Train	0
↗	P2-02 (0x1902)	B-PID1 Fdk Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Pulse Train	0
↗	P2-03 (0x1903)	B-PID1 Setpoint	-30000–30000 PID unit	0
↗	P2-04 (0x1904)	B-PID1 Setpoint Upper Limit	-30000–30000 PID unit	10000
↗	P2-05 (0x1905)	B-PID1 Setpoint Lower Limit	-30000–30000 PID unit	0
↗	P2-06 (0x1906)	B-PID1 Fdk Filter Time	0.000–30.000 sec.	0.000
↗	P2-07 (0x1907)	B-PID1 Error OPER	0: PID1 err = PID1 Ref – PID1 Fdk 1: PID1 err = PID1 Fdk – PID1 Ref	0

	Pr.	Parameter Name	Setting Range	Default
↗	P2-08 (0x1908)	B-PID1 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
↗	P2-09 (0x1909)	B-PID1 Multi Setpoint Src2	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
↗	P2-10 (0x190A)	B-PID1 Multi Setpoint1	-30000–30000 PID1 unit	0
↗	P2-11 (0x190B)	B-PID1 Multi Setpoint2	-30000–30000 PID1 unit	0
↗	P2-12 (0x190C)	B-PID1 Multi Setpoint3	-30000–30000 PID1 unit	0
↗	P2-13 (0x190D)	B-PID1 Multi Setpoint4	-30000–30000 PID1 unit	0
↗	P2-14 (0x190E)	B-PID1 Output Upper Limit	-30000–30000	10000
↗	P2-15 (0x190F)	B-PID1 Output Lower Limit	-30000–30000	0
↗	P2-16 (0x1910)	B-PID1 P Gain	0.01–100.00	1.00
↗	P2-17 (0x1911)	B-PID1 I Time	0.0–6000.0 sec.	60.0
↗	P2-18 (0x1912)	B-PID1 D Time	0.000–10.000 sec.	0.000
↗	P2-19 (0x1913)	B-PID1 Derivative Filter	0.0–10.0 sec.	0.0

Pr.	Parameter Name	Setting Range	Default
P2-20 (0x1914)	B-PID1 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
P2-21 (0x1915)	B-PID1 Deadband Zone	0–10000	0
P2-22 (0x1916)	B-PID1 Deadband Delay	0.0–3600.0 sec.	0.0
P2-23 (0x1917)	B-PID1 Output AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

∗P3. Basic PID2

Pr.	Parameter Name	Setting Range	Default
P3-00 (0x1940)	B-PID2 Function	0: Disable 1: Enable 2: Enable after Run	0
P3-01 (0x1941)	B-PID2 Ref Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi Setpoint 17: Pulse Train	0
P3-02 (0x1942)	B-PID2 Fdk Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve	0

	Pr.	Parameter Name	Setting Range	Default
			7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Pulse Train	
↗	P3-03 (0x1943)	B-PID2 Setpoint	-30000–30000 PID unit	0
↗	P3-04 (0x1944)	B-PID2 Setpoint Upper Limit	-30000–30000 PID unit	10000
↗	P3-05 (0x1945)	B-PID2 Setpoint Lower Limit	-30000–30000 PID unit	0
↗	P3-06 (0x1946)	B-PID2 Fdk Filter Time	0.000–30.000 sec.	0.000
↗	P3-07 (0x1947)	B-PID2 Error OPER	0: PID1 err = PID1 Ref – PID1 Fdk 1: PID1 err = PID1 Fdk – PID1 Ref	0
↗	P3-08 (0x1948)	B-PID2 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
↗	P3-09 (0x1949)	B-PID2 Multi Setpoint Src2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
↗	P3-10 (0x194A)	B-PID2 Multi Setpoint1	-30000–30000 PID unit	0
↗	P3-11 (0x194B)	B-PID2 Multi Setpoint2	-30000–30000 PID unit	0
↗	P3-12 (0x194C)	B-PID2 Multi Setpoint3	-30000–30000 PID unit	0
↗	P3-13 (0x194D)	B-PID2 Multi Setpoint4	-30000–30000 PID unit	0
↗	P3-14 (0x194E)	B-PID2 Output Upper Limit	-30000–30000 Hz	10000

	Pr.	Parameter Name	Setting Range	Default
✓	P3-15 (0x194F)	B-PID2 Output Lower Limit	-30000–30000 Hz	0
✓	P3-16 (0x1950)	B-PID2 P Gain	0.01–100.00	1.00
✓	P3-17 (0x1951)	B-PID2 I Time	0.0–6000.0 sec.	60.0
✓	P3-18 (0x1952)	B-PID2 D Time	0.000–10.000 sec.	0.000
✓	P3-19 (0x1953)	B-PID2 Derivative Filter	0.0–10.0 sec.	0.0
✓	P3-20 (0x1954)	B-PID2 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P3-21 (0x1955)	B-PID2 Deadband Zone	0–10000	0
✓	P3-22 (0x1956)	B-PID2 Deadband Delay	0.0–3600.0 sec.	0.0
✓	P3-23 (0x1957)	B-PID2 Output AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

∗P4. Basic PID3

	Pr.	Parameter Name	Setting Range	Default
✓	P4-00 (0x1980)	B-PID3 Function	0: Disable 1: Enable 2: Enable after Run	0
✓	P4-01 (0x1981)	B-PID3 Ref Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve	0

	Pr.	Parameter Name	Setting Range	Default
			16: Multi Setpoint 17: Pulse Train	
✓	P4-02 (0x1982)	B-PID3 Fdk Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Pulse Train	0
✓	P4-03 (0x1983)	B-PID3 Setpoint	-30000–30000 PID unit	0
✓	P4-04 (0x1984)	B-PID3 Setpoint Upper Limit	-30000–30000 PID unit	10000
✓	P4-05 (0x1985)	B-PID3 Setpoint Lower Limit	-30000–30000 PID unit	0
✓	P4-06 (0x1986)	B-PID3 Fdk Filter Time	0.000–30.000 sec.	0.000
✓	P4-07 (0x1987)	B-PID3 Error OPER	0: PID1 err = PID1 Ref – PID1 Fdk 1: PID1 err = PID1 Fdk – PID1 Ref	0
✓	P4-08 (0x1988)	B-PID3 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P4-09 (0x1989)	B-PID3 Multi Setpoint Src2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0

	Pr.	Parameter Name	Setting Range	Default
✓	P4-10 (0x198A)	B-PID3 Multi Setpoint1	-30000–30000 PID3 unit	0
✓	P4-11 (0x198B)	B-PID3 Multi Setpoint2	-30000–30000 PID3 unit	0
✓	P4-12 (0x198C)	B-PID3 Multi Setpoint3	-30000–30000 PID3 unit	0
✓	P4-13 (0x198D)	B-PID3 Multi Setpoint4	-30000–30000 PID3 unit	0
✓	P4-14 (0x198E)	B-PID3 Output Upper Limit	-30000–30000	10000
✓	P4-15 (0x198F)	B-PID3 Output Lower Limit	-30000–30000	0
✓	P4-16 (0x1990)	B-PID3 P Gain	0.01–100.00	1.00
✓	P4-17 (0x1991)	B-PID3 I Time	0.0–6000.0 sec.	60.0
✓	P4-18 (0x1992)	B-PID3 D Time	0.000–10.000 sec.	0.000
✓	P4-19 (0x1993)	B-PID3 Derivative Filter	0.0–10.0 sec.	0.0
✓	P4-20 (0x1994)	B-PID3 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P4-21 (0x1995)	B-PID3 Deadband Zone	0–10000	0
✓	P4-22 (0x1996)	B-PID3 Deadband Delay	0.0–3600.0 sec.	0.0
✓	P4-23 (0x1997)	B-PID3 Output AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

∗P5. Basic PID4

	Pr.	Parameter Name	Setting Range	Default
✓	P5-00 (0x19C0)	B-PID4 Function	0: Disable 1: Enable 2: Enable after Run	0

	Pr.	Parameter Name	Setting Range	Default
↗	P5-01 (0x19C1)	B-PID4 Ref Src	0: Disable 1: Keypad 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Multi Setpoint 17: Pulse Train	0
↗	P5-02 (0x19C2)	B-PID4 Fdk Src	0: Disable 1: Reserve 2: RS-485 3: USB 4: COM Card 5–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11 14–15: Reserve 16: Pulse Train	0
↗	P5-03 (0x19C3)	B-PID4 Setpoint	-30000–30000 PID unit	0
↗	P5-04 (0x19C4)	B-PID4 Setpoint Upper Limit	-30000–30000 PID unit	10000
↗	P5-05 (0x19C5)	B-PID4 Setpoint Lower Limit	-30000–30000 PID unit	0
↗	P5-06 (0x19C6)	B-PID4 Fdk Filter Time	0.000–30.000 sec.	0.000
↗	P5-07 (0x19C7)	B-PID4 Error OPER	0: PID1 err = PID1 Ref – PID1 Fdk 1: PID1 err = PID1 Fdk – PID1 Ref	0
↗	P5-08 (0x19C8)	B-PID4 Multi Setpoint Src1	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0

	Pr.	Parameter Name	Setting Range	Default
✓	P5-09 (0x19C9)	B-PID4 Multi Setpoint Src2	0: OFF 1: ON 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P5-10 (0x19CA)	B-PID4 Multi Setpoint1	-30000–30000 PID4 unit	0
✓	P5-11 (0x19CB)	B-PID4 Multi Setpoint2	-30000–30000 PID4 unit	0
✓	P5-12 (0x19CC)	B-PID4 Multi Setpoint3	-30000–30000 PID4 unit	0
✓	P5-13 (0x19CD)	B-PID4 Multi Setpoint4	-30000–30000 PID4 unit	0
✓	P5-14 (0x19CE)	B-PID4 Output Upper Limit	-30000–30000	10000
✓	P5-15 (0x19CF)	B-PID4 Output Lower Limit	-30000–30000	0
✓	P5-16 (0x19D0)	B-PID4 P Gain	0.01–100.00	1.00
✓	P5-17 (0x19D1)	B-PID4 I Time	0.0–6000.0 sec.	60.0
✓	P5-18 (0x19D2)	B-PID4 D Time	0.000–10.000 sec.	0.000
✓	P5-19 (0x19D3)	B-PID4 Derivative Filter	0.0–10.0 sec.	0.0
✓	P5-20 (0x19D4)	B-PID4 Output Freeze Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15 16–25: Reserve 26–28: Time Function 1–3 29–30: Reserve 31–38: Monitor 1–8	0
✓	P5-21 (0x19D5)	B-PID4 Deadband Zone	0–10000	0
✓	P5-22 (0x19D6)	B-PID4 Deadband Delay	0.0–3600.0 sec.	0.0
✓	P5-23 (0x19D7)	B-PID4 Output AO Sel	0: Disable 1–2: AO1–AO2 3–4: Reserve 5–6: AO10–AO11	0

U. Industry

U0. Pump Function

	Pr.	Parameter Name	Setting Range	Default
	U0-00 (0x1B00)	Circulation Control	0: Disable 1: Time Circulation 2: QTY Circulation 3: QTY Control 4: QTY + Time Circulation 5: QTY Control + Time Circulation	0
	U0-01 (0x1B01)	Number of Pump	1–8	1
	U0-02 (0x1B02)	Pump Status Word	0–0xFFFF	Read only
↗	U0-03 (0x1B03)	Pump Switch Type	0: by the sequence 1: by the least running time	0
↗	U0-04 (0x1B04)	Circulation Time	0–65000 min.	0
↗	U0-05 (0x1B05)	Time Circulation Switch Delay	0.1–3600.0 sec.	0.1
	U0-06 (0x1B06)	Time Circulation Output Delay	1.0–100.0 sec.	1.0
↗	U0-07 (0x1B07)	AUX Pump Active FREQ Level	0.00–599.00 Hz	60.00
↗	U0-08 (0x1B08)	AUX Pump Active Check Time	1.0–3600.0 sec.	10.0
↗	U0-09 (0x1B09)	AUX Pump Active Delay Time	1.0–3600.0 sec.	1.0
	U0-10 (0x1B0A)	QTY Circulation Output Delay	1.0–100.0 sec.	1.0
↗	U0-11 (0x1B0B)	AUX Pump Deactive FREQ Level	0.00–599.00 Hz	0.00
↗	U0-12 (0x1B0C)	AUX Pump Deactive Check Time	1.0–3600.0 sec.	1.0
↗	U0-13 (0x1B0D)	QTY Circulation Fault Action	0: Stop All Pumps 1: Stop MAS Pump	0
↗	U0-14 (0x1B0E)	Output FREQ Reached Range	0.00–100.00%	1.00

Pr.	Parameter Name	Setting Range	Default
U0-15 (0x1B0F)	Pump 1 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-16 (0x1B10)	Pump 2 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-17 (0x1B11)	Pump 3 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-18 (0x1B12)	Pump 4 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-19 (0x1B13)	Pump 5 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-20 (0x1B14)	Pump 6 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0

Pr.	Parameter Name	Setting Range	Default
U0-21 (0x1B15)	Pump 7 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-22 (0x1B16)	Pump 8 Output Enable Sel	0: Disable 1–2: Relay1–2 3–4: MO1–MO2 5–9: Reserve 10–15: MO/Relay 10–15 16–19: Reserve	0
U0-23 (0x1B17)	Pump 1 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-24 (0x1B18)	Pump 2 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-25 (0x1B19)	Pump 3 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-26 (0x1B1A)	Pump 4 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-27 (0x1B1B)	Pump 5 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0

Pr.	Parameter Name	Setting Range	Default
U0-28 (0x1B1C)	Pump 6 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-29 (0x1B1D)	Pump 7 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-30 (0x1B1E)	Pump 8 Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-31 (0x1B1F)	Multi Pump Stop MI Src	0: Disable 1: Enable 2–7: MI1–MI6 8–9: Reserve 10–15: MI10–MI15	0
U0-32 (0x1B20)	Pump 1 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-33 (0x1B22)	Pump 2 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-34 (0x1B24)	Pump 3 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-35 (0x1B26)	Pump 4 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-36 (0x1B28)	Pump 5 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-37 (0x1B2A)	Pump 6 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-38 (0x1B2C)	Pump 7 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only
U0-39 (0x1B2E)	Pump 8 Operating Time	H-word: 65535 → 65535 hours L-word: 05959 → 59 mimutes/ 59 seconds	Read only

Pr.	Parameter Name	Setting Range	Default
↗ U0-40 (0x1B30)	Pump Operating Time Erase	0: Disable 1: Erase Pump1 Operating Time 2: Erase Pump2 Operating Time 3: Erase Pump3 Operating Time 4: Erase Pump4 Operating Time 5: Erase Pump5 Operating Time 6: Erase Pump6 Operating Time 7: Erase Pump7 Operating Time 8: Erase Pump8 Operating Time 10: Erase all Pumps Operating Time	0

U1. Pump Schedule

Pr.	Parameter Name	Setting Range	Default
↗ U1-00 (0x1B40)	Pump Schedule Setting	bit0: Weekday bit1: Weekend bit2: Appt bti3–bit15: Reserve	0
↗ U1-01 (0x1B41)	Weekend Definition	0: Saturday and Sunday 1: Sunday 2: No Weekend	0
U1-02 (0x1B42)	Pressure Cmd Output	-30000–30000	0
↗ U1-03 (0x1B43)	Weekday Start Time 1	00:00–23:59	0
↗ U1-04 (0x1B44)	Weekday Pressure Setpoint 1	-30000–30000	0
↗ U1-05 (0x1B45)	Weekday Start Time 2	00:00–23:59	0
↗ U1-06 (0x1B46)	Weekday Presssure Setpoint 2	-30000–30000	0
↗ U1-07 (0x1B47)	Weekday Start Time 3	00:00–23:59	0
↗ U1-08 (0x1B48)	Weekday Pressure Setpoint 3	-30000–30000	0
↗ U1-09 (0x1B49)	Weekday Start Time 4	00:00–23:59	0
↗ U1-10 (0x1B4A)	Weekday Pressure Setpoint 4	-30000–30000	0
↗ U1-11 (0x1B4B)	Weekday Start Time 5	00:00–23:59	0
↗ U1-12 (0x1B4C)	Weekday Pressure Setpoint 5	-30000–30000	0
↗ U1-13 (0x1B4D)	Weekend Start Time 1	00:00–23:59	0

	Pr.	Parameter Name	Setting Range	Default
✓	U1-14 (0x1B4E)	Weekend Pressure Setpoint 1	-30000–30000	0
✓	U1-15 (0x1B4F)	Weekend Start Time 2	00:00–23:59	0
✓	U1-16 (0x1B50)	Weekend Pressure Setpoint 2	-30000–30000	0
✓	U1-17 (0x1B51)	Weekend Start Time 3	00:00–23:59	0
✓	U1-18 (0x1B52)	Weekend Pressure Setpoint 3	-30000–30000	0
✓	U1-19 (0x1B53)	Weekend Start Time 4	00:00–23:59	0
✓	U1-20 (0x1B54)	Weekend Pressure Setpoint 4	-30000–30000	0
✓	U1-21 (0x1B55)	Weekend Start Time 5	00:00–23:59	0
✓	U1-22 (0x1B56)	Weekend Pressure Setpoint 5	-30000–30000	0
✓	U1-23 (0x1B57)	Appt Start Date 1	01:01–12:31	101
✓	U1-24 (0x1B58)	Appt End Date 1	01:01–12:31	101
✓	U1-25 (0x1B59)	Appt Start Date 2	01:01–12:31	101
✓	U1-26 (0x1B5A)	Appt End Date 2	01:01–12:31	101
✓	U1-27 (0x1B5B)	Appt Start Date 3	01:01–12:31	101
✓	U1-28 (0x1B5C)	Appt End Date 3	01:01–12:31	101
✓	U1-29 (0x1B5D)	Appt Start Date 4	01:01–12:31	101
✓	U1-30 (0x1B5E)	Appt End Date 4	01:01–12:31	101
✓	U1-31 (0x1B5F)	Appt Start Date 5	01:01–12:31	101
✓	U1-32 (0x1B60)	Appt End Date 5	01:01–12:31	101
✓	U1-33 (0x1B61)	Appt Start Time 1	00:00–23:59	0
✓	U1-34 (0x1B62)	Appt Pressure Setpoint 1	-30000–30000	0
✓	U1-35 (0x1B63)	Appt Start Time 2	00:00–23:59	0
✓	U1-36 (0x1B64)	Appt Pressure Setpoint 2	-30000–30000	0
✓	U1-37 (0x1B65)	Appt Start Time 3	00:00–23:59	0

Pr.	Parameter Name	Setting Range	Default
U1-38 (0x1B66)	Appt Pressure Setpoint 3	-30000–30000	0
U1-39 (0x1B67)	Appt Start Time 4	00:00–23:59	0
U1-40 (0x1B68)	Appt Pressure Setpoint 4	-30000–30000	0
U1-41 (0x1B69)	Appt Start Time 5	00:00–23:59	0
U1-42 (0x1B6A)	Appt Pressure Setpoint 5	-30000–30000	0

U2. Fluid Estimator

Pr.	Parameter Name	Setting Range	Default
U2-00 (0x1B80)	Flow Estimation Method	0: Disable 1: Q-H Estimation 2: Q-P Estimation	0
U2-01 (0x1B81)	Cavitation Detect Control Bit	bit 0: Cavitaion Enable bit 1: Flow Input Sel bit 2: Cavitation Warning bit3–bit15: Reserve	0
U2-02 (0x1B82)	Flow Estimation Status Bit	bit 0: Q-H Estimation bit 1: Q-P Estimation bit 2: Cavitation Detecting bit 3: Q-H Setting Incomplete bit 4: Fluid Density Setting Incorrect bit 5: Pump Rated RPM Setting Incorrect bit 6: Inlet Diameter too Small bit 7: Outlet Diameter too Small bit 8: RPM under Flow Esitmation Limit bit 9: Incomplete Setting of Cavitation bit 10: RPM under Cavitation Limit	Read only
U2-03 (0x1B83)	Inlet Pressure AI Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
U2-04 (0x1B84)	Inlet Pressure AI Max Value	AVI: 0–10 V ACI: 0–20 mA / 4–20 mA	0
U2-05 (0x1B85)	Inlet Pressure Decimal Point	0: No Decimal Point 1: One Decimal Point 2: Two Decimal Point 3: Three Decimal Point	0

	Pr.	Parameter Name	Setting Range	Default
✓	U2-06 (0x1B86)	Inlet Pressure Unit	0: mbar 1: bar 2: Pa 3: kPa 4: mWG 5: inWG 6: ftWG 7: psi 8: atm	0
✓	U2-07 (0x1B87)	Outlet Pressure AI Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
✓	U2-08 (0x1B88)	Outlet Pressure AI Max Value	AVI: 0–10 V ACI: 0–20 mA / 4–20 mA	10
✓	U2-09 (0x1B89)	Outlet Pressure Decimal Point	0: No Decimal Point 1: One Decimal Point 2: Two Decimal Point 3: Three Decimal Point	0
✓	U2-10 (0x1B8A)	Outlet Pressure Unit	0: mbar 1: bar 2: Pa 3: kPa 4: mWG 5: inWG 6: ftWG 7: psi 8: atm	0
✓	U2-11 (0x1B8B)	Flow Meter AI Src	0: Disable 1–6: Reserve 7–9: AI1–AI3 10–11: Reserve 12–13: AI10–AI11	0
✓	U2-12 (0x1B8C)	Flow Meter AI Max Value	AVI: 0–10 V ACI: 0–20 mA / 4–20 mA	10
✓	U2-13 (0x1B8D)	Flow Decimal Point	0: No Decimal Point 1: One Decimal Point 2: Two Decimal Point 3: Three Decimal Point	0

	Pr.	Parameter Name	Setting Range	Default
↗	U2-14 (0x1B8E)	Flow Unit	0: L/s 1: L/m 2: L/h 3: m3/s 4: m3/h 5: GPM 6: CFM	0
	U2-15 (0x1B8F)	Inlet Pressure Display	-30000–30000 (Unit: refer to Pr.U2-06)	Read only
	U2-16 (0x1B9A)	Outlet Pressure Display	-30000–30000 (Unit: refer to Pr.U2-10)	Read only
	U2-17 (0x1B9B)	Flow Meter Output	0–4294967295 (Unit: refer to Pr.U2-14)	Read only
	U2-18 (0x1B9D)	Flow Estimation Output	0–4294967295 (Unit: refer to Pr.U2-14)	Read only
↗	U2-19 (0x1B9E)	Flow Accumulated Src	0: Flow Estimation 1: Flow Meter	0
	U2-20 (0x1B9F)	Flow Accumulated m^3	0.0–999.9 m^3	Read only
	U2-21 (0x1BA1)	Flow Accumulated km^3	0–65535 km^3	Read only
↗	U2-22 (0x1BA3)	Flow Accumulated Reset	0: Disable 1: Reset after Power On 2: Reset Immediately	0
↗	U2-23 (0x1BA4)	Pump Inlet Diameter	0.0–6500.0 mm	0.0
↗	U2-24 (0x1BA5)	Pump Outlet Diameter	0.0–6500.0 mm	0.0
↗	U2-25 (0x1BA6)	Pump Rated Speed	0–65535 rpm	3000
↗	U2-26 (0x1BA7)	Fluid Density	0.0–6550.0 kg/m^3	995.7
↗	U2-27 (0x1BA8)	Fluid Oper Temp	0.00–600.00°C	30.00
↗	U2-28 (0x1BA9)	Pressure Sensor Height Diff	-30.00–30.00 m	0.00
↗	U2-29 (0x1BAA)	Cavitation Detect Tolerance	0.00–600.00 m	0.00
↗	U2-30 (0x1BAB)	Pump Curve Head 1	0.00–655.00 m	0.00
↗	U2-31 (0x1BAC)	Pump Curve Head 2	0.00–655.00 m	0.00
↗	U2-32 (0x1BAD)	Pump Curve Head 3	0.00–655.00 m	0.00

Pr.	Parameter Name	Setting Range	Default
U2-33 (0x1BAE)	Pump Curve Head 4	0.00–655.00 m	0.00
U2-34 (0x1BAF)	Pump Curve Head 5	0.00–655.00 m	0.00
U2-35 (0x1BB0)	Pump Curve Flow 1	0.00–655.00 m³/hr	0.00
U2-36 (0x1BB1)	Pump Curve Flow 2	0.00–655.00 m³/hr	0.00
U2-37 (0x1BB2)	Pump Curve Flow 3	0.00–655.00 m³/hr	0.00
U2-38 (0x1BB3)	Pump Curve Flow 4	0.00–655.00 m³/hr	0.00
U2-39 (0x1BA8)	Pump Curve Flow 5	0.00–655.00 m³/hr	0.00
U2-40 (0x1BB4)	Pump Curve Power 1	0.00–655.00 kW	0.00
U2-41 (0x1BB5)	Pump Curve Power 2	0.00–655.00 kW	0.00
U2-42 (0x1BB6)	Pump Curve Power 3	0.00–655.00 kW	0.00
U2-43 (0x1BB7)	Pump Curve Power 4	0.00–655.00 kW	0.00
U2-44 (0x1BB8)	Pump Curve Power 5	0.00–655.00 kW	0.00
U2-45 (0x1BB9)	Pump Curve NPSHr 1	0.00–655.00 m	0.00
U2-46 (0x1BBA)	Pump Curve NPSHr 2	0.00–655.00 m	0.00
U2-47 (0x1BBB)	Pump Curve NPSHr 3	0.00–655.00 m	0.00
U2-48 (0x1BBB)	Pump Curve NPSHr 4	0.00–655.00 m	0.00
U2-49 (0x1BBC)	Pump Curve NPSHr 5	0.00–655.00 m	0.00

U3. Pump Protection

Pr.	Parameter Name	Setting Range	Default
U3-00 (0x1BC0)	Pressure Protection Src	0: Disable 1: P-PID1 Fdk 2: P-PID2 Fdk	0
U3-01 (0x1BC1)	Heavy Leakage Detect Level	0–85%	85
U3-02 (0x1BC2)	Heavy Leakage Detect time	0.1–300.0 sec.	15.0
U3-03 (0x1BC3)	Heavy Leakage Current Level	0–100%	20

Pr.	Parameter Name	Setting Range	Default
U3-04 (0x1BC4)	Heavy Leakage Treatment	0: Warning & Continue OPER 1: Fault & Coast to Stop 2: Fault & Ramp to Stop	0
U3-05 (0x1BC5)	Hi-Pressure Alarm Level	0–50%	25
U3-06 (0x1BC6)	Hi-Pressure Alarm Detect Time	0.1–300.0 sec.	5.0
U3-07 (0x1BC7)	Hi-Pressure Alarm Treatment	1: Fault & Coast to Stop 2: Fault & Ramp to Stop	1
U3-08 (0x1BC8)	Lo-Pressure Alarm Level	0–50%	25
U3-09 (0x1BC9)	Lo-Pressure Alarm Detect Time	0.1–300.0 sec.	5.0
U3-10 (0x1BCA)	Lo-Pressure Alarm Treatment	0: Warning & Continue OPER 1: Fault & Coast to Stop 2: Fault & Ramp to Stop	0
U3-11 (0x1BCB)	Dry Pump Curve Autotune	0: Disable 1: Enable	0
U3-12 (0x1BCC)	50% Rated FREQ Output Power	0–120%	0
U3-13 (0x1BCD)	100% Rated FREQ Output Power	0–120%	0
U3-14 (0x1BCE)	Dry Pump Detect Level	0–50%	10
U3-15 (0x1BCF)	Dry Pump Detect Function	0: Disable 1: Enable	0
U3-16 (0x1BD0)	Dry Pump Detect Time	0.0–300.0 sec.	15.0
U3-17 (0x1BD1)	Dry Pump Restart Delay Time	1–1000 min	30
U3-18 (0x1BD2)	Dry Pump Restart Times Limit	0–20	5
U3-19 (0x1BD3)	Dry Pump Alarm Treatment	1: Warning & Coast to Stop 2: Warning & Ramp to Stop	1
U3-20 (0x1BD4)	Pump Clean Function	0: Disable 1: Enable by MI Src 2: Enable by Jam Current Limit 3: Enable by Scheduled Time	0

Pr.	Parameter Name	Setting Range	Default
U3-21 (0x1BD5)	Pump Clean Function MI Src	0: Disable 1: Reserve 2–7: MI1–MI6 5–9: Reserve 10–15: MI10–MI15	0
U3-22 (0x1BD6)	Jam Current Detect Level	0–Max. setting value for H2-05	Default for H2-05
U3-23 (0x1BD7)	Jam Current Detect Time	0.0–300.0 sec.	60.0
U3-24 (0x1BD8)	Pump Clean Weekday Sel	bit 0: Sunday bit 1: Monday bit 2: Tuesday bit 3: Wednesday bit 4: Thursday bit 5: Friday bit 6: Saturday bit 7–bit15: Reserve	0
U3-25 (0x1BD9)	Pump Clean Start Time	00:00–23:59	0
U3-26 (0x1BDA)	Pump Clean Cycle Times	1–30	5
U3-27 (0x1BDB)	Pump Clean FWD FREQ	0.00–Fmax Hz	40.00
U3-28 (0x1BDC)	Pump Clean FWD Time	0.0–300.0 sec.	2.0
U3-29 (0x1BDD)	Pump Clean REV FREQ	0.00–Fmax Hz	40.00
U3-30 (0x1BDE)	Pump Clean REV Time	0.0–300.0 sec.	2.0
U3-31 (0x1BEF)	Pump Clean Accel Time	0.0–300.0 sec.	1.0
U3-32 (0x1BF0)	Pump Clean Decel Time	0.0–300.0 sec.	1.0

U4. Master-Slave Multi-Pump Control

Pr.	Parameter Name	Setting Range	Default
U4-00 (0x1C00)	Master-Slave Pump Control	bit 0: Enable bit 1: Backup Master bit2–15: Reserve	0
U4-01 (0x1C01)	Master-Slave Pump Status	0: No Master-Slave Control 1: Master 2: Slave	Read only

Pr.	Parameter Name	Setting Range	Default
U4-02 (0x1C02)	Pump AI Fdk Loss Treatment	0: No Warning 1: ANL Warning & Continue OPER 2: ACE Fault & Stop OPER	0
U4-03 (0x1C03)	Pump FREQ at Fdk Loss	0–FMAX Hz	0
U4-04 (0x1C04)	Setpoint Deviation Level	0–50%	0
U4-05 (0x1C05)	Setpoint Deviation Detect T	1–600 sec.	10
U4-06 (0x1C06)	Low Consump Restart Offset	0–50%	10
U4-07 (0x1C07)	High Consump Restart Offset	0–100%	0
U4-08 (0x1C08)	High Consump Detect Time	0.1–10.0 sec.	0.5
U4-09 (0x1C09)	FREQ to Start Aux Pump	0.00–Fmax Hz	Fmax
U4-10 (0x1C0A)	Delay to Start Aux Pump	0.0–120.0 sec.	1.0
U4-11 (0x1C0B)	Pump Start-up Sequence Sel	0: by Sequence of Pump 1: by OPER Time	1
U4-12 (0x1C0C)	Cycle Time Sel	0: Disable 1: by Absolute Time of Circulation 2: by Constant Time of Circulation	2
U4-13 (0x1C0D)	Absolute Time of Circulation	00:00–23:59	00:00
U4-14 (0x1C0E)	Constant Time of Circulation	0.0–200.0 hr	5.0
U4-15 (0x1C0F)	FREQ Drop% of Water Consump	0.0–50.0%	5.0
U4-16 (0x1C10)	Sleep Pressure Boost Delay	0.0–120.0 sec.	10.0
U4-17 (0x1C11)	Sleep Pressure Boost Setting	0.0–50.0%	0.0

Chapter 13 Descriptions of Parameter Settings

A. Fundamental Setting

b. Pr Management & Macro

C. Control Mode & Cmd Scheme

d. Motor Parameter

E. VF Control & SVC

F. FOC

G. IO Setting

H. Fault & Protection

J. Application Function

L. PLC Function

n. Communication

o. Monitor & Recorder

P. PID Function

U. Industry

A. Fundamental Setting

A0. Drive Information

You can set this parameter during operation

A0-00 Drive Identity Code

(0x00) Default: Read only

Settings Read only

A0-01 Drive Cont. Rated Current

(0x01) Default: Read only

Settings Read only

A0-02 Drive Max. Output Current

(0x02) Default: Read only

Settings Read only

Pr. A-00 displays the AC motor drive identity code. You can also identify the model by reading the current value from Pr. A0-01 or the barcode on the drive.

The AC motor drive protection level is mainly based on Pr. A0-01, supplemented by Pr. A0-02.

Model	Identity Code	Voltage	Power (kW)	Power (HP)	Cont. Current
VFD3A0VP43ANTAA	54	460V	0.75	1	3
VFD4A2VP43ANTAA	55	460V	1.5	2	4.2
VFD5A6VP43ANTAA	56	460V	2.2	3	5.6
VFD7A2VP43ANTAA	57	460V	3	4	7.2
VFD011VP43ANTAA	58	460V	4	5	11
VFD013VP43ANTAA	59	460V	5.5	7.5	13
VFD018VP43ANTAA	60	460V	7.5	10	18
VFD025VP43ANTAA	61	460V	11	15	25
VFD032VP43ANTAA	62	460V	15	20	32
VFD038VP43ANTAA	63	460V	18.5	25	38
VFD045VP43ANTCA	64	460V	22	30	45
VFD062VP43ANTCA	65	460V	30	40	62
VFD073VP43ANTCA	66	460V	37	50	73
VFD090VP43ANTCA	67	460V	45	60	90
VFD110VP43AFTCA	68	460V	55	75	110
VFD150VP43AFTCA	69	460V	75	100	150
VFD180VP43AFTCA	70	460V	90	125	180
VFD220VP43AFTCA	71	460V	110	150	220
VFD260VP43AFTCA	72	460V	132	175	260
VFD310VP43AFTCA	73	460V	160	215	310
VFD370VP43AFTCA	74	460V	185	250	370
VFD395VP43AFTCA	75	460V	200	270	395
VFD460VP43AFTCA	76	460V	220	300	460
VFD485VP43AFTCA	77	460V	250	340	485

Model	Identity Code	Voltage	Power (kW)	Power (HP)	Cont. Current
VFD3A0VP43BFTAA	78	460V	0.75	1	3
VFD4A2VP43BFTAA	79	460V	1.5	2	4.2
VFD5A6VP43BFTAA	80	460V	2.2	3	5.6
VFD7A2VP43BFTAA	81	460V	3	4	7.2
VFD011VP43BFTAA	82	460V	4	5	11
VFD013VP43BFTAA	83	460V	5.5	7.5	13
VFD018VP43BFTAA	84	460V	7.5	10	18
VFD025VP43BFTAA	85	460V	11	15	25
VFD032VP43BFTAA	86	460V	15	20	32
VFD038VP43BFTAA	87	460V	18.5	25	38
VFD045VP43BFTCA	88	460V	22	30	45
VFD062VP43BFTCA	89	460V	30	40	62
VFD073VP43BFTCA	90	460V	37	50	73
VFD090VP43BFTCA	91	460V	45	60	90
VFD110VP43BFTCA	92	460V	55	75	110
VFD150VP43BFTCA	93	460V	75	100	150
VFD180VP43BFTCA	94	460V	90	125	180
VFD220VP43BFTCA	95	460V	110	150	220
VFD260VP43BFTCA	96	460V	132	175	260
VFD310VP43BFTCA	97	460V	160	215	310
VFD370VP43BFTCA	98	460V	185	250	370
VFD395VP43BFTCA	99	460V	200	270	395
VFD460VP43BFTCA	100	460V	220	300	460
VFD485VP43BFTCA	101	460V	250	340	485
VFD045VP43BSTCA	112	460V	22	30	45
VFD062VP43BSTCA	113	460V	30	40	62
VFD073VP43BSTCA	114	460V	37	50	73
VFD090VP43BSTCA	115	460V	45	60	90
VFD110VP43BSTCA	116	460V	55	75	110
VFD150VP43BSTCA	117	460V	75	100	150
VFD180VP43BSTCA	118	460V	90	125	180
VFD220VP43BSTCA	119	460V	110	150	220
VFD260VP43BSTCA	120	460V	132	175	260
VFD310VP43BSTCA	121	460V	160	215	310
VFD370VP43BSTCA	122	460V	185	250	370
VFD395VP43BSTCA	123	460V	200	270	395
VFD460VP43BSTCA	124	460V	220	300	460
VFD485VP43BSTCA	125	460V	250	340	485
VFD530VP43SHTCA	158	460V	280	375	530
VFD616VP43SHTCA	159	460V	315	425	616
VFD683VP43SHTCA	160	460V	355	475	683
VFD770VP43SHTCA	161	460V	400	530	770

Model	Identity Code	Voltage	Power (kW)	Power (HP)	Cont. Current
VFD866VP43SHTCA	162	460V	450	600	866
VFD930VP43SHTCA	163	460V	500	665	930
VFD1K1VP43SHTCA	164	460V	560	745	1100
VFD1K2VP43SHTCA	165	460V	630	840	1212

A0-03 Control Board FW Version

(0x03) Default: Read only

Settings 0.00–655.35

A0-05 Control Board FW Date Code

(0x05) Default: Read only

Settings 0–65535

📖 Pr. A0-03 and A0-05 display the current drive firmware version and its date code.

A0-06 Power Board FW Version

(0x06) Default: Read only

Settings 0.00–655.35

A0-08 Power Board FW Date Code

(0x08) Default: Read only

Settings 0–65535

📖 Pr. A0-06 and A0-08 display the current drive power board version and its date code.

A0-29 Drive Light Load Output Current

(0x1D) Default: Read only

Settings Read only

A1. Control Handle

You can set this parameter during operation

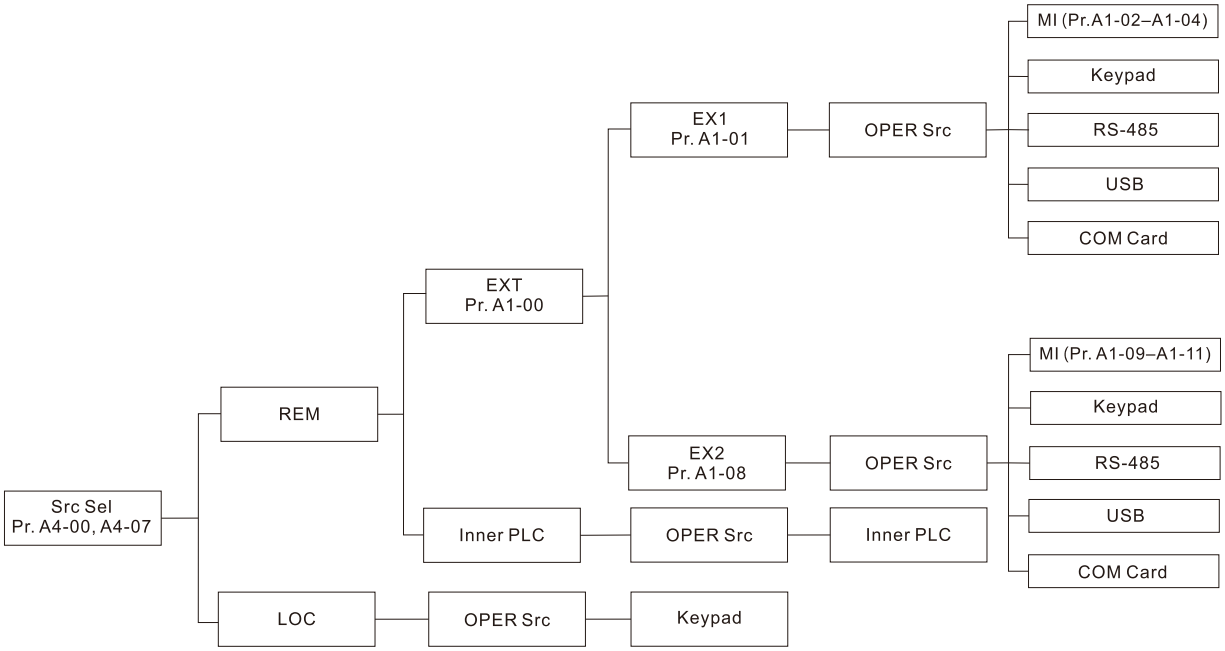
A1-00 EX1/EX2 Switch Src

(0x40) Default: 0

Settings 0: External 1
1: External 2
2–7: MI1–MI6
8–10: Reserve
10–15: MI10–MI15

- As shown in the operation command source in the figure below, there are two sources of EX1/ EX2 for external control of the drive, which can be switched through parameter setting or MI terminal.
- The relevant parameters for EX1 channel are Pr. A1-01–A1-07, and that for EX2 channel are Pr. A1-08–A1-14.
- When the switching source is set to 0, the EX1 channel will be used; if it is set to 1, the EX2 channel will be used.
- When the switching source is set as MI terminal, for example: MI1, the EX1 channel will be used for MI1 OFF and the EX2 channel will be used for MI1 ON.
- This parameter is set to select the switching source of EX1/ EX2, NOT the source selection of EX1/ EX2 operation command.
- The AC motor drive adopts function-specified MI setting and supports distinct functions to specify the same MI terminal, for example, you can set both Pr.A1-02 and A1-09 EX1/ EX2 S1 Source as MI2.
- MI / MO functional difference:

Functional Difference	MI	MO
Function-specified MI / MO in One-way / Two-way	One-way	Two-way
Stacking (Repeat Setting)	Yes	No



A1-01 EX1 OPER Cmd Src

(0x41)

A1-08 EX2 OPER Cmd Src

(0x48) Default: 0

Settings
0: Disable
1: S1 Start
2: S1 Start, S2 Dir
3: S1 FWD, S2 REV
4: S1 Start, S2 Stop
5: S1 Start, S2 Stop, S3 Dir
6: S1 FWD, S2 REV, S3 Stop
7: Keypad
8: RS-485
9: USB
10: EX. COM

📖 This parameter sets the configuration of the terminals which control the operation, there are six different control modes, including single-wire, two-wire, and three-wire control modes.

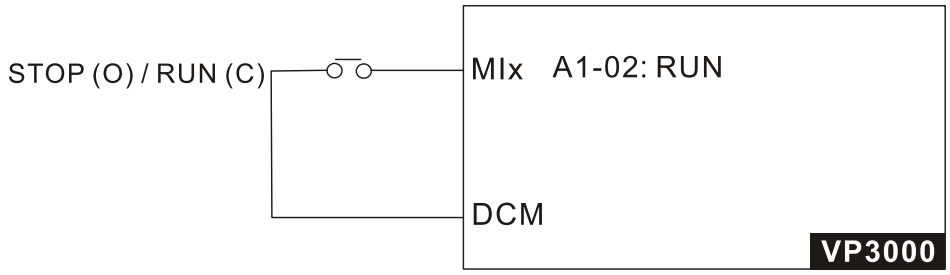
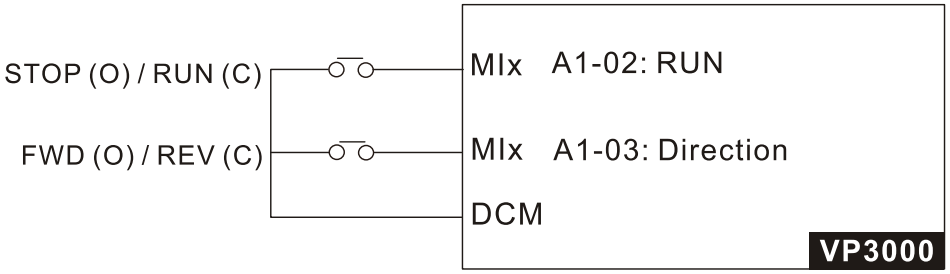
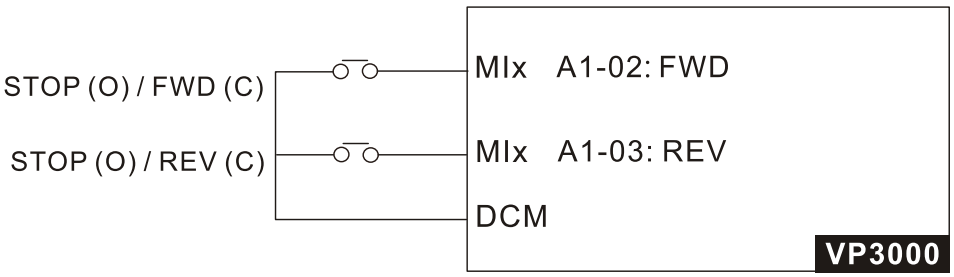
📖 The abbreviation in the following diagrams represents:

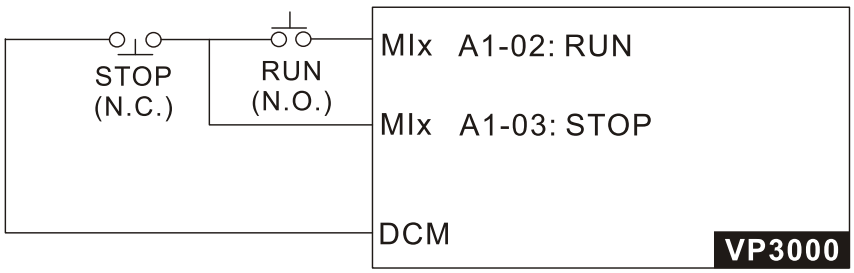
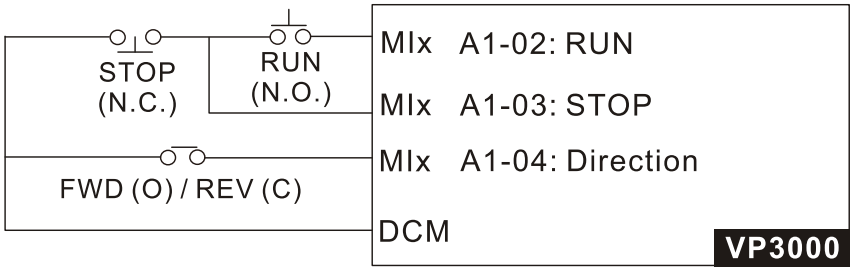
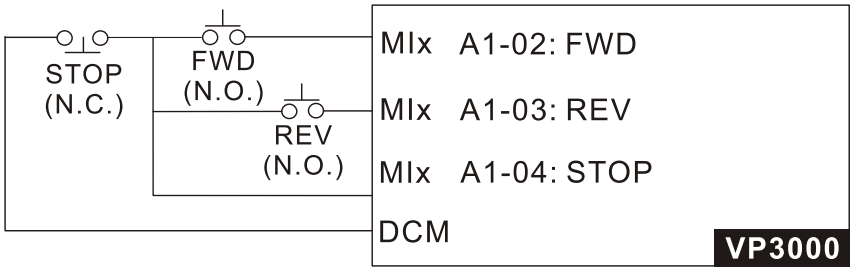
(O): Open

(C): Close

(N.O.): Normal Open

(N.C.): Normal Close

A1-01/ A1-08	External Terminal Control Circuits
Setting value: 1 Single-wire operation control RUN	
Setting value: 2 Two-wire operation control RUN Direction	
Setting value: 3 Two-wire operation control FWD REV	

A1-01/ A1-08	External Terminal Control Circuits
Setting value: 4 Two-wire operation control RUN STOP	
Setting value: 5 Three-wire operation control RUN STOP Direction	
Setting value: 6 Three-wire operation control FWD REV STOP	

Refer to Pr. A4-00 HOA/ LoRe selection, when it is set as AUTO or REM mode, Pr. A1-01 and A1-08 set the AC motor drive operation command source. Refer to the drive operation roadmap shown in the figure 1 and figure 2 below.

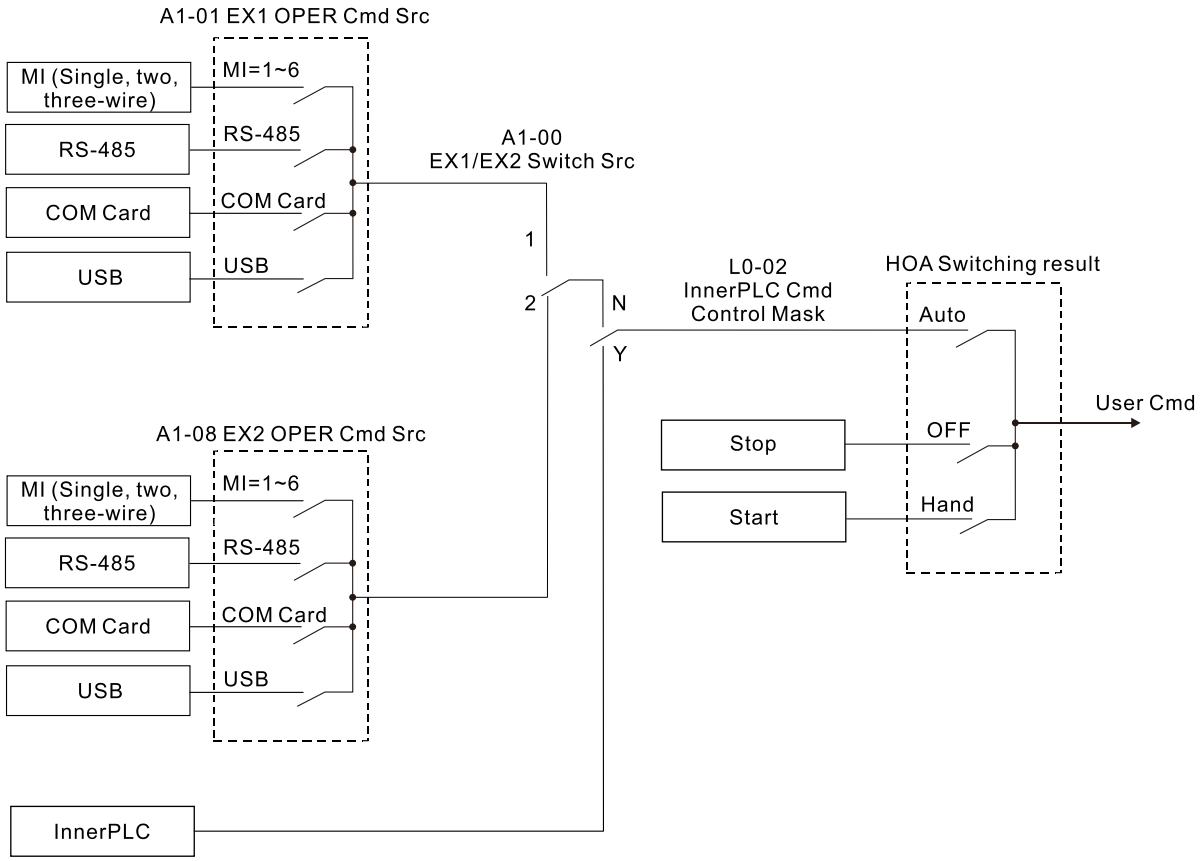


Figure 1 Drive Operation Roadmap (HOA)

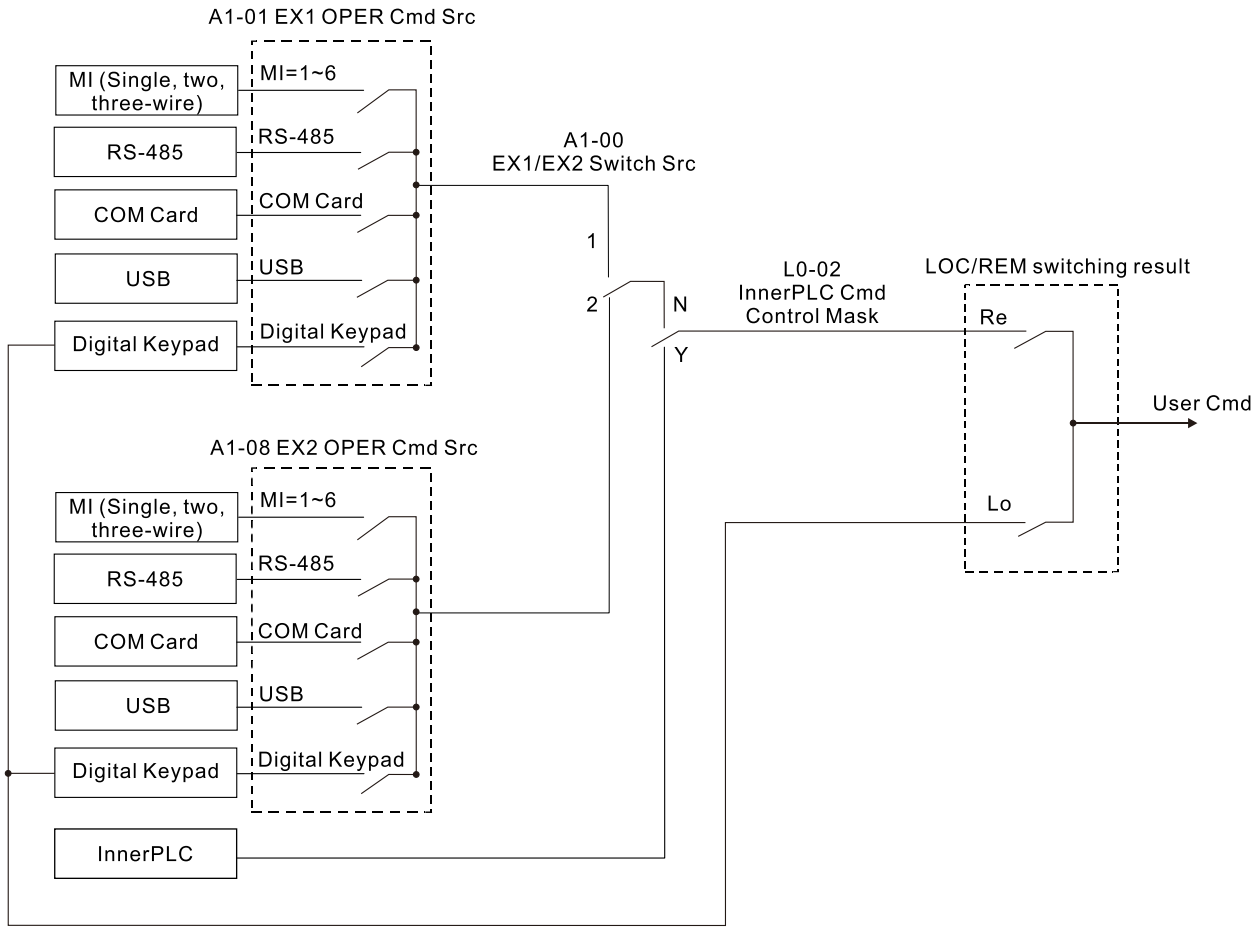


Figure 2 Drive operation diagram (LoRe)

Continuing from the above, when the operation command source is set as communication, for example, the set value is 8: 2000H, the position writes in 2 for the drive to run; 1 for the drive to stop.

A1-01	Communication Control
Setting value: 7–10	**2000H** bit0–1: Run/ Stop/ JOG bit4–5: FWD/ REV **2002H** bit1: Reset
Setting value: 7–10	**6000H** bit1: DIR bit3: HALT bit4: LOCK bit5: JOG bit7: Servo ON bit15: Reset

A1-02 EX1 S1 Src

(0x42)

A1-09 EX2 S1 Src

(0x49) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects terminal for external control source 1.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

A1-03 EX1 S2 Src

(0x43)

A1-10 EX2 S2 Src

(0x4A) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects terminal for external control source 2.
- Refer to description of Pr. A1-02 and A1-09.

A1-04 EX1 S3 Src

(0x44)

A1-11 EX2 S3 Src

(0x4B) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects terminal for external control source 3.
- Refer to description of Pr. A1-02 and A1-09.

A1-05 EX1 S1 Trigger Method

(0x45)

A1-12 EX2 S1 Trigger Method

(0x4C) Default: 0

Settings 0: Edge Triggered
1: Level Triggered

- Selects starting signal for external control source 1.
- The edge trigger means that the switch starts when detecting the rising edge process from OFF to ON; the level trigger means that the switch starts when detecting the process from OFF to ON and it must stay in the ON position.
- The trigger method is only valid at RUN command, and the STOP command is always level triggered. Take option 1 of Pr. A1-01/ A1-08 as an example, when you choose edge triggered, the status of MI changes from OFF to ON as a RUN command; when you choose level triggered, the MI status is ON as a RUN command. No matter which trigger method is selected, when the MI status is OFF, it is regarded as a STOP command.
- Option 4–6 of Pr. A1-01/ A1-08 do not support level triggered.

A1-06 EX1 S2 Trigger Method

(0x46)

A1-13 EX2 S2 Trigger Method

(0x4D) Default: 0

Settings 0: Edge Triggered
1: Level Triggered

- Selects starting signal for external control source 2.
- Refer to description of Pr. A1-05 and A1-12.

A1-07 EX1 S3 Trigger Method

(0x47)

A1-14 EX2 S3 Trigger Method

(0x4E) Default: 0

Settings 0: Edge Triggered
1: Level Triggered

- Selects starting signal for external control source 3.
- Refer to description of Pr. A1-05 and A1-12.

A1-15 Halt Decel Method

(0x4F) Default: 0

Settings 0: Ramp to stop
1: By Quick Stop Time
2: Auto-Decel

- When the Halt enables, it decelerates to 0 and enters zero-speed control; when the Halt disables, it returns to the target speed set by the user.
- 0: It decelerates based on the setting for Pr. C2-00–C2-07 (Accel / Decel time 1–4).

- 1: The Halt decelerates based on the setting for Pr. C2-14 (Quick stop time).
- 2: The Halt decelerates based on the setting for Pr. A2-00 = 2 (Auto-Decel).

A1-16 Halt MI Src

(0x50) Default: 0

Settings
0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects the Halt MI source.

A1-17 Lock MI Src

(0x51) Default: 0

Settings
0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects the Lock MI source.
- When the Lock enables, it locks the current output frequency and stops following the frequency command; when the Lock disables, it unlocks the current output frequency and continues following the target frequency command.
- When Halt and Lock are enabled at the same time, the Halt has higher priority than Lock.

A1-21 Run Enable MI Src

(0x56) Default: 0

Settings
0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Selects the run enable MI source.
- The default of the Run Enable MI Source is OFF, that is, the drive is not limited to the on-off state of this function.
- When the Run Enable MI Source is specified, this function is enabled.
- Run Enable determines whether the actual operation is valid or not. When the drive is stopped and the Run Enable function is ON but not enabled (MI OFF), the keypad displays Run Disabled warning message; when the Run Enable function is ON and enabled (MI ON), the keypad clears the warning and gives the run command, and then the drive can run.
- Continuing from the above, after the drive starts to run after issuing the run command, if the Run Enable function is switched off (MI OFF), the drive stops according to the stop method set in Pr. A1-22, and only resumes to run when the Run Enable function is enabled again.

A1-22 Run Disable Stop Method

(0x57) Default: 0

Settings 0: Coast to stop
1: Ramp to stop
2: By Quick Stop Time
3: Auto-Decel

0: The AC motor drive stops output immediately, and the motor coasts to stop according to the load inertia.

- Use “ramp to stop” for the safety of personnel or to prevent material from being wasted in applications where the motor must stop immediately after the drive stops. You must set the deceleration time accordingly.
- If idling is allowed or the load inertia is large, use “coast to stop”. For example: blowers, punching machines and pumps.

1: it decelerates based on the setting for Pr. C2-00–C2-07 (Accel / Decel time 1–4).

2: it decelerates based on the setting for Pr. C2-14 (Quick stop time).

A1-23 Run Enable Indn

(0x58) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

Relay 1–2 and MO1–MO2 are control board multi-function (contact, photo coupler) output terminals; MO/ Relay 10–15 are extension card multi-function output terminals (contact, photo coupler).

When the drive is in Run Enable status, the specified MO contact activates.

A1-24 OPER Cmd by Kpd Indn

(0x59) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

When the drive operation command source is digital keypad, the specified MO contact activates.

A1-25 Forward Cmd Indn

(0x5A) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

When the drive is not in STOP status and operates in FWD direction, the specified MO contact activates.

A1-26 Reverse Cmd Indn

(0x5B) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

When the drive is not in STOP status and operates in REV direction, the specified MO contact activates.

A1-27 FWD / REV Direction Setting

(0x5C) Default: 0

Settings 0: Enable FWD/ REV
1: FWD only
2: REV only

This parameter avoids damage to the equipment caused by the motor forward and reverse operation due to mis-operation. Use this parameter to limit the motor operation direction to forward or reverse. When the load of the motor only allows one running direction, this parameter limits the running direction of the motor to avoid equipment caused by user mis-operation.

A1-28 Forward Phase Sel

(0x5D) Default: 0

Settings 0: UVW
1: UWV

Switches the motor operation direction. If the phase sequence of the motor wiring is wrong, which makes the motor rotate in the wrong direction and cannot be re-wired, use this parameter to change the motor operation direction.

A1-29 Base Block MI Src

(0x5E) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

Selects the Base Block MI source.

A1-30 Base Block Time

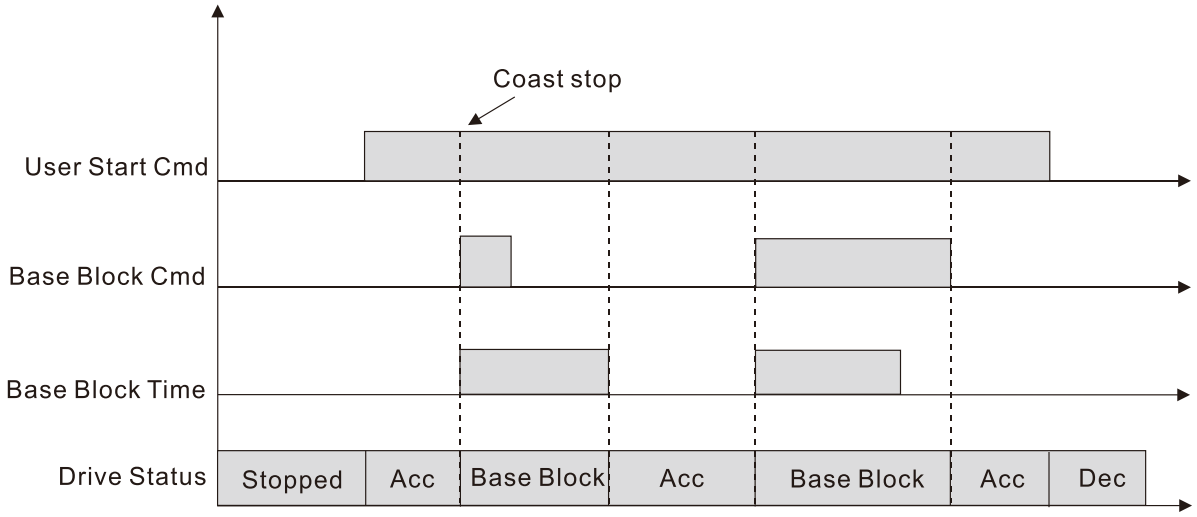
(0x5F) Default: Demagnetization time set

Settings Demagnetization time setting–5.0 sec.

The setting range of Pr. A1-30 is affected by the IM demagnetization time setting. Pr. A3-16 sets the IM Demagnetize Time.

Pr. A1-30 sets the delay time for the motor to coast to stop and restart after the Base Block occurs.

When the MI ON specified by the Base Block stops the output of the drive, and keeps stopping output within the Base Block time, after the Base Block command disappears and the Base Block time ends, or after the Base Bock time ends and the Base Block command disappears, if the operation command exists, the drive can be restarted. Refer to the sequential diagram below:



The operation command given in the delay time for the motor to coast to stop and restart will be memorized, after the delay time, the motor operates or stops according to the last operation command.

A1-31 Base Block Indn

(0x60) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

When the AC motor drive is in Base Block status, the specified MO contact activates.

A1-32 External Fault MI Src

(0x61) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

Selects the External Fault MI source.

A1-33 External Fault Stop Method

(0x62) Default: 0

Settings 0: Coast to stop
1: Ramp to stop
2: By EF decel Time
3: Auto-Decel

0: The motor coasts to stop according to the load inertia.

1: It decelerates based on the setting for Pr. C2-00–C2-07 (Accel / Decel time 1–4).

2: The drive stops according to the External Fault Deceleration Time set int Pr. A1-34.

A1-34 External Fault Decel Time

(0x63) Default: 10.0 / 60.00

Settings 0.0–6000.0 sec.
0.00–600.00 sec.

Sets the deceleration time after the external fault occurs.

A2. Stop Method

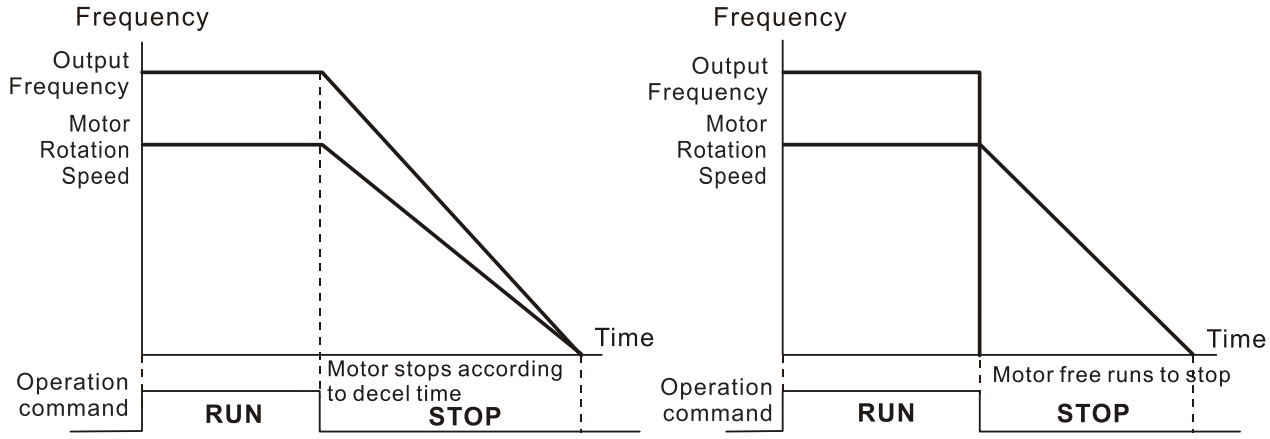
You can set this parameter during operation

A2-00 Stop Method

(0x80) Default: 0

Settings 0: Ramp to stop
1: Coast to stop
2: Auto-Decel

Determines how the motor is stopped when the AC motor drive receives the Stop command.



Ramp to stop and Coast to stop

Setting 0: The AC motor drive decelerates to 0 Hz or the minimum output frequency (Pr. C2-27) according to the set deceleration time (for example, Pr. C2-01 Decel Time 1), and then to stop.

Setting 1: The AC motor drive stops output immediately, and the motor coasts to stop according to the load inertia.

- ☑ Use “ramp to stop” for the safety of personnel or to prevent material from being wasted in applications where the motor must stop immediately after the drive stops. You must set the deceleration time accordingly.
- ☑ If idling is allowed or the load inertia is large, use “coast to stop”.
  For example: blowers, punching machines and pumps.

Setting 2:

1. The AC motor drive ramps to stop according to the voltage upper limit. After the stop command is issued, the drive ramps to stop with the maximum voltage upper limit that can be set until the motor stops, and then the drive stops output after the deceleration is completed.
2. The auto-deceleration voltage limit adopts closed-loop control. During deceleration, Pr. A2-05 Decel Voltage Limit will be referred to as the control target command. When the DC bus voltage exceeds the deceleration voltage upper limit, the controller adjusts the output frequency increasing according to the closed-loop response until the DC bus voltage equals to the deceleration voltage upper limit. If the DC bus voltage is still higher than the deceleration voltage upper limit during the adjustment, the output frequency increases to Pr. C2-17 Maximum Operation Frequency.
3. It is suitable for occasions where the motor load changes frequently, and the fixed stop time

is not required when the machine stops.

Because the stop time varies with the load, if it is set properly, there will be no oc problem caused by deceleration and braking.

4. The actual deceleration time depends on different working conditions, and the goal is to stop with the fastest deceleration time. If you need time planning to stop, set this parameter to 0 (ramp to stop).

A2-01 Quick Stop MI Src

(0x81) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

🕮 Selects the quick stop MI source.

🕮 MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

A2-02 Quick Stop Method

(0x82) Default: 0

Settings 0: By Quick Stop Time
1: Coast to stop
2: Auto-Decel
3: Ramp to stop

🕮 0: The drive decelerates the motor to 0 Hz according to Pr. C2-14 Quick Stop Time.

🕮 Refer to Pr. A2-00 for the rest of descriptions.

A2-03 Emergency Stop MI Src

(0x83) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

🕮 Selects the emergency stop MI source.

🕮 Refer to Pr. A2-00 for the rest of descriptions.

A2-05 Decel Voltage Limit

(0x85) Default: Depending on the models

Settings Depending on the models (V)

🕮 The AC motor drive ramps to stop according to the voltage upper limit. After the stop command is issued, the drive ramps to stop with the maximum voltage upper limit that can be set until the motor stops, and then the drive stops output after the deceleration is completed.

A2-06 Zero Speed Delay Level

(0x86) Default: 1.00

Settings 0.00–599.00 Hz

0: Disable zero speed delay function

A2-07 Zero Speed Delay Time

(0x87) Default: 0

Settings 0.0–6553.5 sec.

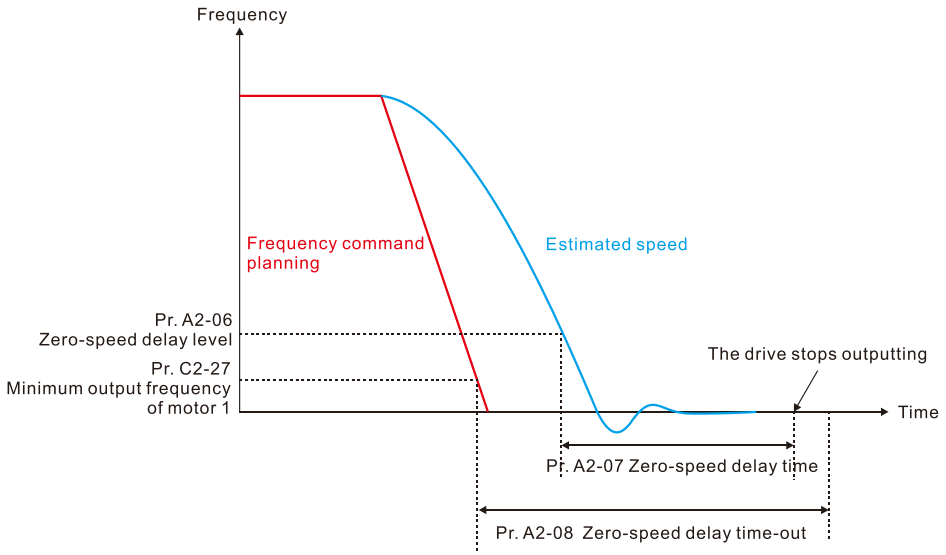
- This function Applies to IMFOCPG and IMFOC control modes.
- When setting Pr. A2-06 Zero Speed Delay Level to 0, the zero speed delay function is disabled.
- In application for large inertia or rapid deceleration, it often occurs that the frequency command programs decelerating to the minimum frequency, the drive stops outputting at that moment, but the motor's actual speed has not reached zero-speed yet, therefore, the motor goes to free-run status.
- The zero-speed delay function refers to the actual (or estimated) rotor frequency, it counts the setting time of Pr. A2-07 after the actual (or estimated) rotor frequency reaches the setting level of Pr. A2-06, then the drive stops outputting.
- The counting starts when the actual (or estimated) rotor frequency reaches the setting level of Pr. A2-06 for the first time, it the frequency jumps out of the level during the process, it will not restart the counting.

A2-08 Zero Speed Delay Timeout

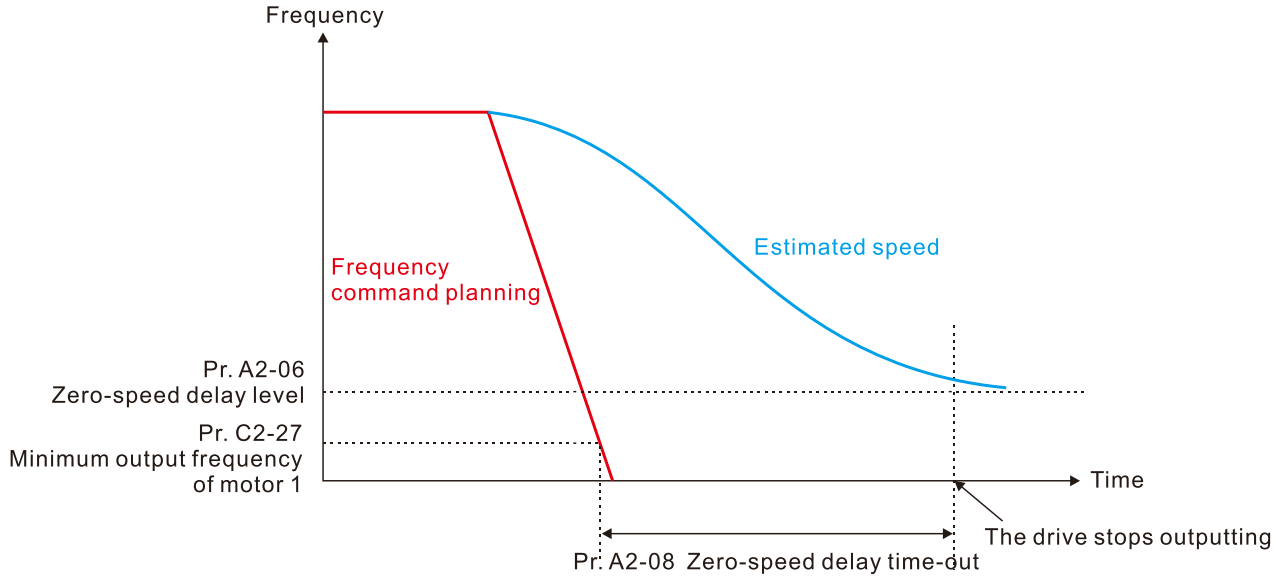
(0x88) Default: 0

Settings 0.0–6553.5 sec.

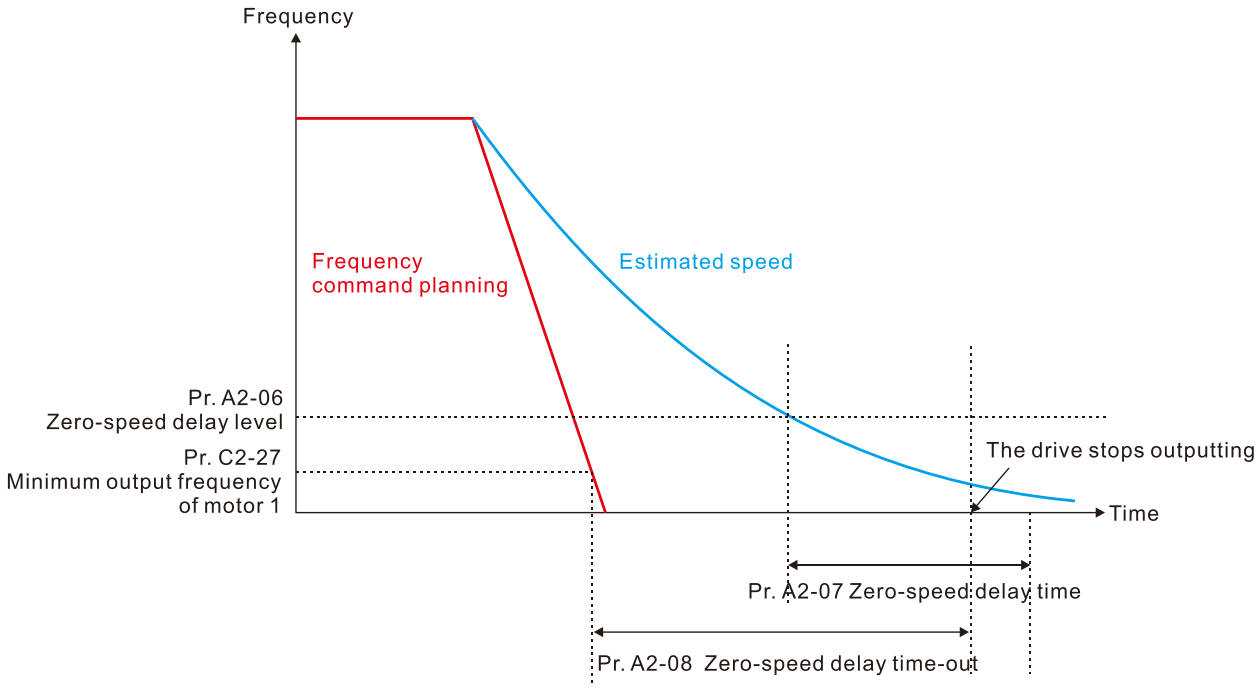
- If the actual (or estimated) rotor frequency fails to restrain under Pr. A2-06 frequency level, and the difference error is not triggered, the drive may be unable to stop outputting. Set this parameter for this condition. When the frequency command decelerates to the minimum frequency and starts to count, this function forces the drive to stop outputting when it reaches the Pr. A2-08 setting time.
- The actual motor speed reaches the Pr. A2-06 level in Pr. A2-08 setting time, and the drive stops outputting when the counting reaches Pr. A2-07 setting time (Pr. A2-08 setting time is still counting):



📖 The motor actual speed does not reach the Pr. A2-06 level in Pr. A2-08 setting time:



📖 The motor actual speed reaches the Pr. A2-06 level in Pr. A2-08 setting time, but does not reach to 0 Hz in Pr. A2-08 setting time:



A3. Start & Stop Function

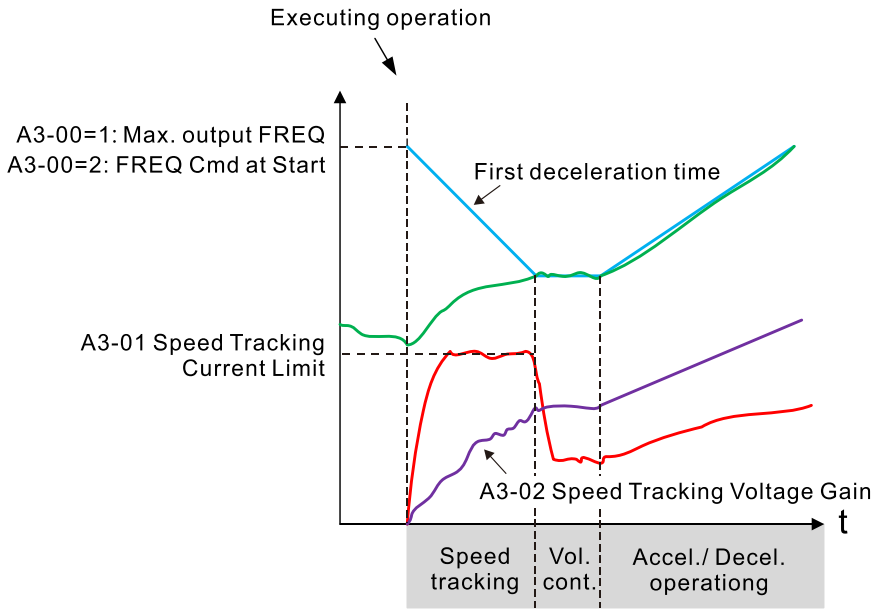
You can set this parameter during operation

A3-00 Start Speed Tracking

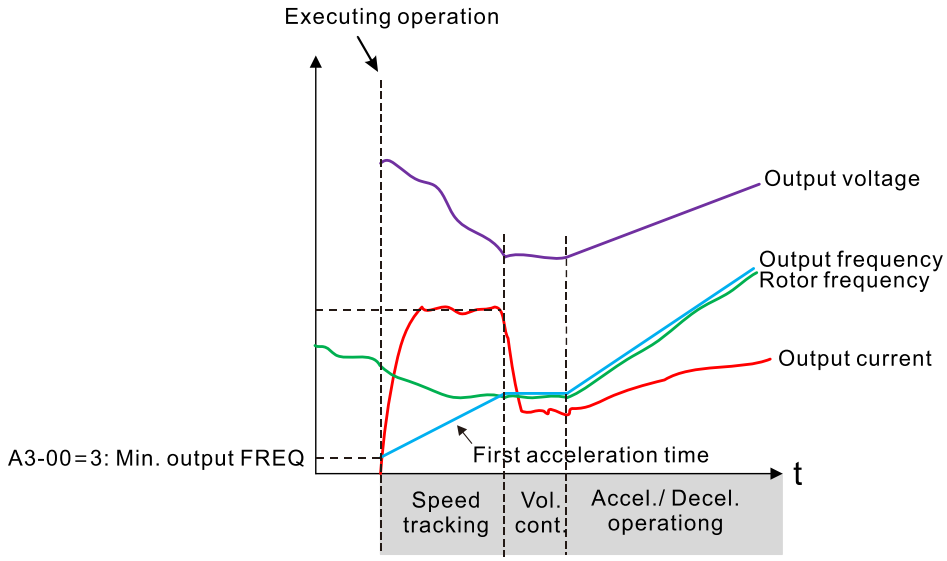
(0xC0) Default: 0

Settings 0: Disable
1: Max. output FREQ
2: FREQ Cmd at Start
3: Min Output FREQ
4: Rotor FREQ

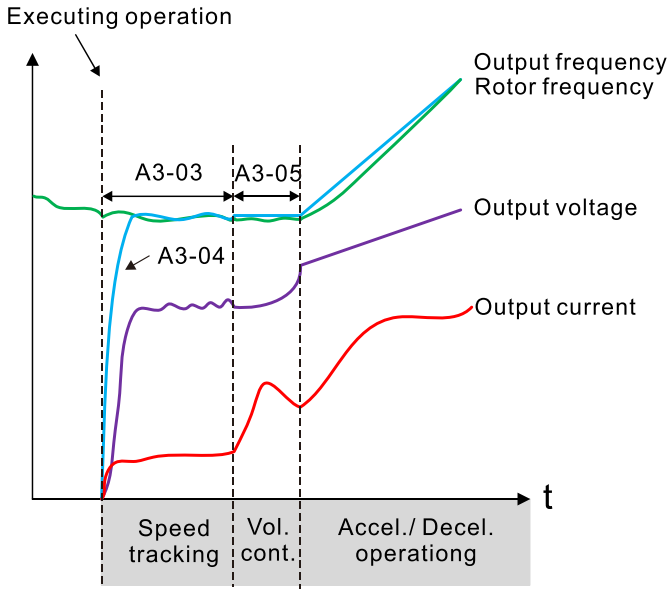
- The speed tracking function is most applicable for large inertia loading system, such as punch, pumps, and fans. If the motor is rotating with a large inertia load without control and the speed tracking function is not enabled, it will take a long time for the load to stop rotating before the motor runs; after enabling this function, the motor can run immediately without waiting for the load to stop. After tracking to the load speed, it can be used as the initial speed for further acceleration and deceleration.
- When using IM and Pr. A3-00 = 1–3, it is a scalar speed tracking. Option 1 and 2 is suitable for occasions where the normal rotation is at a relatively high speed. The command and command direction at this time will be used as the initial frequency, and the drive uses the first deceleration time to perform deceleration sweeping frequency to zero speed for speed tracking. Option 3 is suitable for tracking occasions where the normal rotation is with relatively low speed, which uses zero speed as the initial frequency and accelerates sweeping frequency with the first acceleration time for speed tracking. While sweeping frequency, the current will reach to the Pr. A3-01 level, and controls the current according to Pr. A3-02 voltage gain. When the rotor speed reaches the sweeping frequency, the current drops suddenly, and the speed tracking is completed, the drive continues the acceleration or deceleration operation.
- When using IM and Pr. A3-00 = 4, it is a vector speed tracking. When starting, it instantly searches the rotor frequency automatically, controls the current at no-load current and perform speed tracking for the setting time of Pr. A3-03. The frequency filters for the time setting of Pr. A3-04, and perform voltage transient for the time of Pr. A3-05 when the filter time is up. When the voltage transient is completed, the speed tracking completes, and the drive continues the acceleration and deceleration operation. Compared to option 1 to 3, option 4 can complete speed tracking with smaller output current and smoother rotor speed changes.



A3-00=1, 2 action



A3-00=3 action



A3-00=4 action

- In the IMVF and IMSVC modes, when Pr. A3-00 = 1–3, it can be used without performing parameter auto-tuning in advance, when Pr. A3-00 = 4, it is recommended to perform parameter auto-tuning first. If the tracking speed is lower than the motor rated frequency, static auto-tuning can be used; if the tracking speed is higher than the motor rated frequency, then it is recommended to use dynamic auto-tuning.
- The auto-tuning before speed tracking is necessary in IMFOC mode; therefore, the more advanced mode 4 is used as the speed tracking method when Pr. A3-00 is set as 1–4.
- When using PM or SynRM, set Pr. A3-00 > 0 to enable the speed tracking function.

A3-01 Speed Tracking Current Limit

(0xC1) Default: 100

Settings 20–200%

- 100% corresponds to the motor rated current, internal limits the maximum to 120% of drive rated current.
- Applies to Pr. A3-00 = 1–3.
- The AC motor drive executes speed tracking only when the drive output current reaches to this level.
- The maximum current for speed tracking affects the synchronous time. The larger the parameter setting is, the faster the synchronization occurs. However, if the parameter setting is too large, the overload protection function may be activated.

A3-02 Speed Tracking Voltage Gain

(0xC2) Default: 100

Settings 1–200%

- Applies to Pr. A3-00 = 1–3.
- If oL and oc occurs during speed tracking, adjust Pr. A3-02 to adjust the speed tracking voltage gain for a better current control.

A3-03 Speed Tracking Time

(0xC3) Default: 1.000

Settings 0.100–10.000 sec.

A3-04 Speed Tracking FREQ Filter

(0xC4) Default: 0.050

Settings 0.001–10.000 sec.

A3-05 Speed Tracking Transient Time

(0xC5) Default: 0.500

Settings 0.100–10.000 sec.

- Applies to Pr. A3-00 = 4.
- Pr. A3-03 and A3-04 automatically bring out suggested value after parameter auto-tuning, which can be adjusted according to your needs.

A3-06 DC Brake Current Level

(0xC6) Default: 100

Settings 0–150%

- Sets the level of the DC brake current output to the motor at start-up and stop. This parameter is based on the motor rated current as 100%, if it exceeds 150% of the drive rated current, it outputs based on 150% of the drive rated current. When you set this parameter, increase the level slowly to reach the desired holding torque. DO NOT use the DC brake for mechanical retention, otherwise injury or accident may occur.
- It is recommended to use IM or SynRM for this parameter, the PM has the magnetic field itself, using the DC brake may cause the motor run in a reverse direction, therefore, it is not recommended to use it for PM.

A3-07 DC Brake Time at Start

(0xC7) Default: 0.0

Settings 0.0–60.0 sec.

- The motor may continue rotating after the drive stops output due to external forces or the inertia of the motor itself. If you use the drive with the motor rotating, it may cause motor damage or trigger drive protection due to over-current. This parameter outputs DC current, generating torque to force the motor stop to get a stable start before motor operation. This parameter determines the duration of the DC brake current output to the motor when the drive starts up. Setting this parameter to 0.0 disables the DC brake at start-up.
- The PM has the magnetic field itself, using the DC brake may cause the motor run in a reverse direction, therefore, it is not recommended to use DC brake for PM.
  Use Pr. A3-12 (PM Zero Voltage Time at Start) to force the motor decelerate or to stop.

A3-08 DC Brake Time at Stop

(0xC8) Default: 0.0

Settings 0.0–60.0 sec.

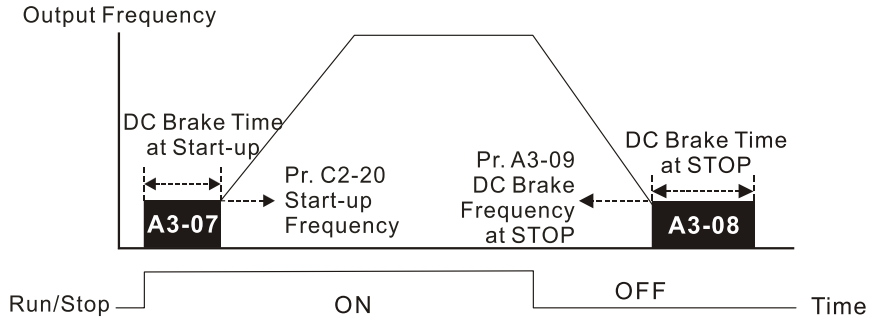
- The motor may continue rotating after the drive stops output due to external forces or the inertia of the motor itself. This parameter outputs DC current, generating torque to force the motor stop after the drive stops output to make sure that the motor stops.
- This parameter determines the duration of the DC Brake current output to the motor when braking. To enable the DC brake at STOP, you must set Pr. A2-00 (Stop Method) to 0 (ramp to stop). Set Pr. A3-08 to 0.0 to disable the DC brake at stop.

A3-09 DC Brake Frequency at Stop

(0xC9) Default: 0.00

Settings 0.00–599.00 Hz

- Determines the start frequency of the DC brake before the drive ramps to stop. When this setting is less than Pr. C2-20 (Start Frequency), the start frequency for the DC brake begins at the minimum frequency.



DC Brake Output Timing Diagram

- Use the DC brake before running the motor when the load is movable at stop, such as with fans and pumps. The motor is in free running status and in unknown rotation direction before the drive starts up. Execute the DC brake before you start the motor.
- Use the DC Brake at STOP when you need to stop the motor quickly or to control the positioning. Such as cranes or cutting machines.

A3-10 DC Brake Kp Gain

(0xCA) Default: 0.020

Settings 0.000–60.000 pu

A3-11 DC Brake Ki Gain

(0xCB) Default: 0.500

Settings 0.000–60.000 pu

- This parameter sets the controller PI gain when the DC brake function activates.
- Kp gain adjusts the current transient response, Ki gain adjusts the current steady-state response.

A3-12 PM Zero Voltage Time at Start

(0xCC) Default: 0.0

Settings 0.0–60.0 sec.

A3-13 PM Zero Voltage Time at Stop

(0xCD) Default: 0.0

Settings 0.0–60.0 sec.

- When the motor needs to be kept still during start-up, adjust Pr. A3-12; when the motor needs to be quickly stopped within a short deceleration time, adjust Pr. A3-13.
- When enabling speed tracking function (Pr. A3-00 ≠ 0) and the PM rotor speed is too low or closed to zero, the drive executes zero voltage according to the setting for Pr. A3-12.
- When the motor is in static status at start-up, this increases the accuracy when estimating angles. In order to put the motor in static state, set the three-phase drive output to 0 V to the motor. The Pr. A3-12 and A3-13 setting time is the length of time when three-phase output at 0 V.
- It is possible that even when you apply this parameter, the motor cannot go into the static state because of inertia or external force. If the motor does not go into the static state in the setting time, increase the setting value of Pr. A3-12 and A3-13 appropriately.
- If Pr. A3-12 and A3-13 are too high, the start-up time is longer. If it is too low, then the braking performance is weak.

A3-14 IM Magnetize Time at Start

(0xCE) Default: 0.0

Settings 0.0–60.0 sec.

A3-15 IM Magnetize Current at Start

(0xCF) Default: 0

Settings 0–100%

- This function is only valid in IMFOC mode, the 100% magnetize current corresponds to the motor rated current.
- Because the stator and rotor of an IM need to establish their own magnetic field, a large torque is required when the motor is started. The magnetize function pre-establishes a magnetic field before the motor runs can shorten the torque output time.
- After the drive goes from stationary to RUN, it executes the magnetizing function according to the set time and magnetize current.
- In the following conditions, the magnetize function does not work:
  - Operates from Stand by
  - When speed tracking is enabled
  - In JOG mode

A3-16 IM Demagnetize Time

(0xD0) Default: Depending on the models

Settings 0.0–5.0 sec.

- Sets the delay time for the motor to coast to stop and restart.
- When momentary power loss is detected, the AC motor drive blocks its output and then waits for a specified period of time before resuming operation. Set this parameter to the time that allows the residual voltage at the output side to decrease to 0 V before activating the drive again.
- Following table is the recommended setting for re-start delay time of each model power. You must set Pr. A3-16 according to this table (the default of each model power is based on this table as well).

kW	0.75	1.5	2.2	3.7	4.0	5.5	7.5	11.0	15.0	18.5	22.0
HP	1	2	3	5	5.5	7.5	10	15	20	25	30
Delay Time (sec.)	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1	1.1	1.2

kW	30.0	37.0	45.0	55.0	75.0	90.0	110.0	132.0	160.0	185.0	200.0
HP	40	50	60	75	100	125	150	175	215	250	270
Delay Time (sec.)	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3

kW	220.0	250.0	280.0	315.0	355.0	400.0	500.0	560.0	630.0
HP	300	340	375	425	475	530	675	750	850
Delay Time (sec.)	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.2	3.4

A3-17 SM Rotor Initial Detection

(0xD1) Default: 1

Settings 0: Disable
1: Force Alignment
2: Pulse inject
3: HFI

- In order to stably start the SM, the SM needs to obtain the angle information of the rotor through the initial angle detection when starting.
- When setting the speed mode as PMSVC (Pr. C0-02 = 1) or PM FOC (Pr. C0-02 = 2):
  - For IPM, the setting value is suggested to be 3.
  - For SPM, the setting value is suggested to be 2.
  - You can choose the setting 1 if the result is not good of setting as 2 or 3.

A3-18 Force Alignment Current Value

(0xD2) Default: 50

Settings 0–150%

A3-19 Force Alignment Time

(0xD3) Default: 2.0

Settings 0.0–10.0 sec.

- Applies to Pr. A3-17 = 1.
- Based on the motor rated current, Pr. A3-18 and A3-19 set the force alignment current and time of the rotor initial angle, and the rotor rotates during the detection process.

A3-20 Pulse Inject Curr Threshold

(0xD4) Default: 100

Settings 0–300%

- Applies to Pr. A3-17 = 2 or 3.
- Based on the motor rated current, the angle range is estimated when the pulse current reaches this level, and the rotor does not rotate during the detection process.
- The parameter affects the value of the pulse during the angle detection. The larger the pulse, the higher the accuracy of rotator's position. But a larger pulse might cause oc.
- Increase the parameter when the running direction and the command are opposite during start-up. If oc occurs at start-up, then decrease the parameter.
- Refer to Chapter 5 Initial Operation and Adjustment for detailed motor adjustment procedure.

A3-21 HFI Frequency

(0xD5) Default: 1000

Settings 200–2400 Hz

- Applies to Pr. A3-17 = 3 or IPM sensorless control mode, sets the frequency command of high-frequency injection signal.
- If the motor rated frequency (for example: 400 Hz) is too close to the set frequency of this parameter (for example: default 500 Hz), it might affect the accuracy of the angle detection. Therefore, it is recommended to adjust this parameter with setting value of Pr. E0-01 (IM1 VF

Max Frequency).

- If the carrier setting value of Pr. A5-00 is lower than Pr. A3-21 × 10, then increase the carrier frequency.

A3-22 HFI Amplitude

(0xD6) Default: 30

Settings 0–100%

- Applies to Pr. A3-17 = 3 or IPM sensorless control mode, sets the magnitude command for the high-frequency injection signal.
- Increasing the parameter can increase the accuracy of the angle estimation, but the electromagnetic noise might be louder if the setting value is too high.
- The system uses this parameter when the motor's parameter is "Auto". This parameter influences the angle estimation accuracy.
- When the ratio of the salient pole (Lq/Ld) is lower, increase Pr. A3-22 to make the angle detection more accurate

A4. HOA / LoRe Setting

You can set this parameter during operation

A4-00 HOA/ LoRe Sel.

(0x100) Default: 0

Settings 0: HOA
1: LoRe

0: Standard HOA (Hand-Off-Auto) function, refer to Figure 1 below.
1: LoRd (Local/ Remote) function, refer to Figure 2 below.

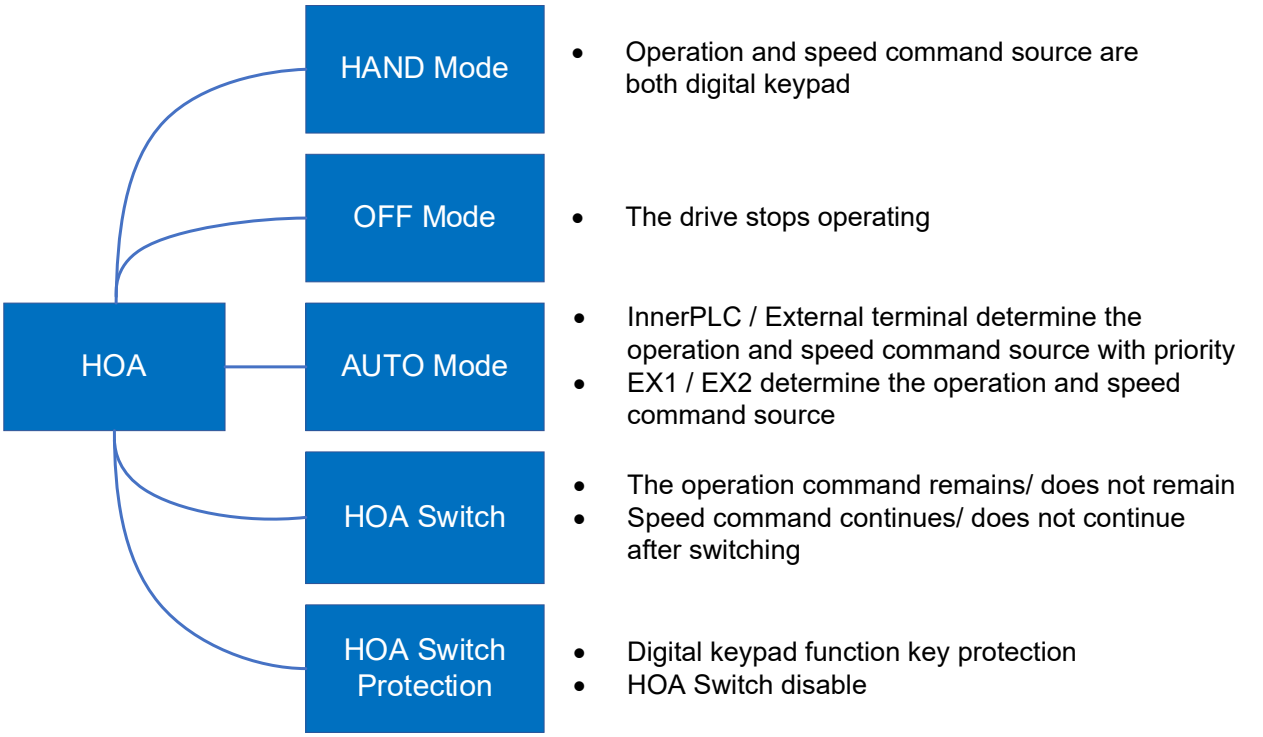


Figure 1: HOA function

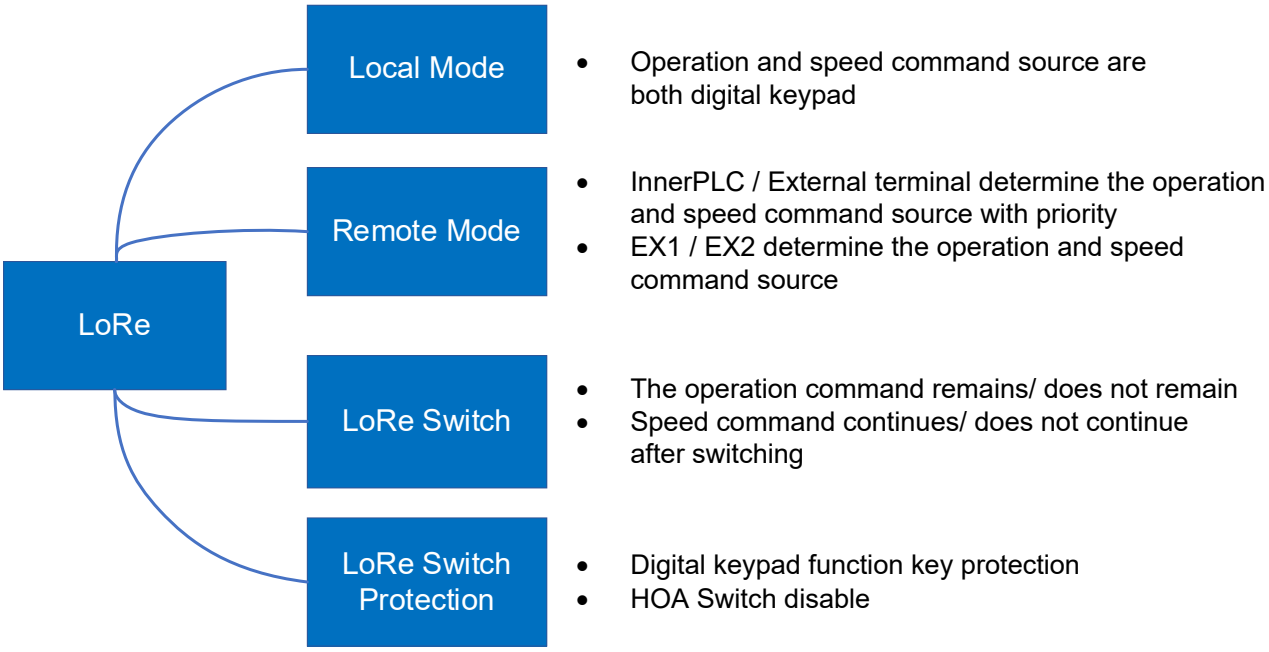
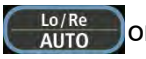


Figure 2: LoRe function

📖 Setting 0:

1. HAND mode: The frequency command and operation command sources are fixed to keypad. When executing key function (or) and the operation LED is ON, it means that the drive is operating. Refer to Section 4-1-3 for detailed keypad function.
2. OFF mode:
   - The drive executes STOP command. When executing key function (or) and the STOP LED is ON, it means that the drive is STOP or is stopping.
   - In OFF mode, the LCD keypad KPV-CC01 can give the JOG command; but it cannot give JOG command in AUTO and HAND modes.
   - During JOG operation, you cannot switch to AUTO or OFF modes, nor can it perform general operation in HAND mode. It will return to OFF mode when the JOG deceleration is completed.
3. In AUTO mode: When the InnerPLC mask and MI multi-speed function are not enabled, the frequency command and operation source operate according to the setting of Pr. A1-00 (EX1/ EX2 Switch Source), such as Pr. C1-01 (EX1 Main Frequency Source) and Pr. A1-01 (EX1 Operation Command Source). When executing key function ( or) and the operation LED is ON (the Lo/Re AUTO key for KPV-CC01 on the left has no indication light), it means that the drive has switched to AUTO mode (you can check from the KPV-CC01 screen), and it can only operate after setting the above parameters.
4. In AUTO mode, when the drive is powered off and on again or the drive has an error, it remains at AUTO mode; when the above situations occur in HAND and OFF modes, it is OFF mode.
5. When setting as 0, the HOA function can only be switched by the keypad; when setting as 1, you can switch the LoRe function through Pr. A4-05.

📖 Setting 1:

1. Local mode: (The status is displayed on KPV-CC01 synchronously), the frequency command and operation command sources are fixed to keypad. When executing key function ( ) and the operation LED is ON, it means that the drive is operating.
2. Remote mode:
   - When the InnerPLC mask and MI multi-speed function are not enabled, the frequency command and operation source operate according to the setting of Pr. A1-00 (EX1/ EX2 Switch Source), such as Pr. C1-01 (EX1 Main Frequency Source) and Pr. A1-01 (EX1 Operation Command Source). When executing key , you can check the current LoRe mode through KPV-CC01, and it can only operate after setting the above parameters.
   - When the drive is powered off and on again or the drive has an error, it remains at Remote mode. Refer to description of Pr. A4-05.
3. The keypad can issue JOG commands under Local mode; in the Remote mode, if the operation source is the keypad, it can also issue the JOG command.

📖 LCD digital keypad KPV-CC01 supports HOA and LoRe functions; LED digital keypad KPV-CE02 only supports HOA function. When the former is connected to the drive, it can use and switch HOA and LoRd functions; when the latter is connected to the drive, it automatically

switches to HOA.

- When the drive is not connected to any keypad, you can switch the HOA and LoRe functions by setting communication parameters.
- Use KPV-CC01 to set Pr. A4-00 = 1 (LoRe), when switching the keypad to KPV-CE02, Pr. A4-00 automatically switches to 0 (HOA). If you set Pr. A1-01 = 7 (digital keypad), Pr. A1-01 returns to the default (0).

Pr. Function/ Keypad Set Pr. Range	KPV-CC01 LCD Keypad	KPV-CE02 LED Keypad
Pr. A4-00 HOA/ LoRe Sel.	0–1	0 (1 Disable)
A1-01 EX1 OPER Cmd Src	0–10	0–10 (7 Disable)
HOA and LoRe function	HOA and LoRe function	HOA

- In HAND (Local) mode, the frequency command and operation sources are fixed to keypad; the operation source cannot set to keypad under AUTO mode, but it can be set to keypad under Remote mode.
- When you set the operation source to digital keypad in Remote mode, after you switch back to AUTO mode, the operation source will change to disable.

A4-01 AUTO Lock MI Src

(0x101) Default: 0

Settings
0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

- Prevents accidental switching to MI sources out of the AUTO mode. You can enable this function by setting parameters or by the MI terminal.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

A4-02 AUTO Lock Mode

(0x102) Default: 0

Settings
0: AUTO to OFF Disable
1: AUTO to HAND Disable
2: AUTO to HAND & OFF Disable

- 0: When switching from AUTO to OFF mode, the drive remains at AUTO status and does not switch. The drive is able to switch from AUTO to OFF mode if you switch from AUTO to HAND mode first, and then switch to OFF mode.
- 1: When switching from AUTO to HAND mode, the drive remains at AUTO status and does not switch. To switch from AUTO to HAND mode, you can switch from AUTO to OFF mode first, and then switch to HAND mode.
- 2: When switching from AUTO to HAND or OFF mode, the drive remains at AUTO status and does not switch. Disable the function (Pr. A4-01 AUTO Lock MI Source) first before switching the mode.

- 1 or 2: When the lock mode is triggered under HAND mode, the drive stops according to the set stop method and will be in OFF mode after stop.

A4-03 AUTO Initial FREQ Cmd

(0x103) Default: 0

Settings 0: FREQ before switch
1: AUTO mode FREQ

- 0: The frequency command maintains the frequency command before switching and runs with the changed frequency command after it is changed. It should be noted that this method is only applicable to occasions that the frequency command source is the keypad or a non-periodic update communication command, it is not applicable to analog input or periodic update communication commands.
- 1: The frequency command is set according to the frequency command source in AUTO mode, if the switched source is set as the keypad, it runs according to the frequency command from the keypad.

A4-04 HAND Initial FREQ Cmd

(0x104) Default: 0

Settings 0: FREQ before switch
1: HAND mode FREQ

- 0: The frequency command maintains the frequency command before switching and runs with the changed frequency command after it is changed. It should be noted that this method is only applicable to occasions that the frequency command source is the keypad or a non-periodic update communication command, it is not applicable to analog input or periodic update communication commands.
- 1: The frequency command source is fixed to keypad in HAND mode.
- The drive issues operation command simultaneously in HAND mode. If the drive is in operation status before switch, it will not stop after switch; if it is in stop status before switch, it will start operation after switch.

A4-05 LoRe Switch Src

(0x105) Default: 20

Settings 0: Remote
1: Local
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–19: Reserve
20: Keypad

- Local/ Remote can be switched through parameter setting, MI terminals or keypad.
- In LoRe mode, the default of LoRe switching source is Keypad, you can directly switch Local/ Remote mode when connecting to KPV-CC01.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card

multi-function input terminals.

- When setting MI terminals, MI ON is local, and MI OFF is remote.
- 20: If the drive is in Local mode before rebooting the power, then it automatically switches to Remote mode after power is ON. Other settings are not limited to this.

A4-06 Remote Lock MI Src

(0x106) Default: 0

Settings	0: Disable
	1: Enable
	2–7: MI1–MI6
	8–9: Reserve
	10–15: MI10–MI15

- Prevents accidental switching to MI sources out of the Remote mode. You can enable this function by setting parameters or by the MI ON.
- If it is in Local mode before the Remote Lock function is enabled, it will force to switch to Remote mode after enabling this function and will return to the previous mode when the function is disabled.

A4-07 Remote Keypad STOP Enable

(0x107) Default: 0

Settings	0: Disable
	1: Enable

- This parameter is only available in LoRe mode.
- When the drive operation source is the Keypad, it performs OFF command and is not affected by this parameter.
- When the drive operation source is not the Keypad, it performs OFF command and will be affected by this parameter; when setting this parameter to 1, the drive stops.

A4-08 Remote Initial FREQ Cmd

(0x108) Default: 0

Settings	0: FREQ before switch
	1: Remote mode FREQ

- 0: The frequency command maintains the frequency command before switching and runs with the changed frequency command after it is changed. It should be noted that this method is only applicable to occasions that the frequency command source is the keypad or a non-periodic update communication command, it is not applicable to analog input or periodic update communication commands.
- 1: The frequency command is set according to the frequency command source in Remote mode, if the switched source is set as the Keypad, it runs according to the frequency command from the keypad.

A4-09 Local Initial FREQ Cmd

(0x109) Default: 0

Settings 0: FREQ before switch
1: Local mode FREQ

- 0: The frequency command maintains the frequency command before switching and runs with the changed frequency command after it is changed. It should be noted that this method is only applicable to occasions that the frequency command source is the keypad or a non-periodic update communication command, it is not applicable to analog input or periodic update communication commands.
- 1: The frequency command source is fixed to Keypad in Local mode.

A4-10 LoRe Switch Action

(0x10E) Default: 2

Settings 0: Always stop
1: Remote Start Cmd
2: Local Start Cmd
3: Start Cmd before Switch

- Selects the switch action for LoRe operation command. 0: LoRe switch will force to stop
- 1: When switching to Local, the operation command continues to operate from the Remote source setting.
- 2: When switching to Remote, the operation command continues to operate from the Local source setting. If the source of the Remote operation command is MI ON after switching, the Local operation command continues to the Remote mode.
- If the operation command is communication or keypad after LoRe switch, it operates according to the parameter setting after switching.

∗A5. Carrier FREQ Adjustment

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ A5-00 CF Setting

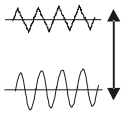
(0x140) Default: Depending on the models

Settings Depending on the modes–15.0 kHz

🕮 Sets the PWM output carrier frequency.

Control Mode / Model VFDxxxVP43xxxXx	VF, SVC		PMFOC		SRMFOC	
	Settings	Default (40°C)	Settings	Default (40°C)	Settings	Default (40°C)
VFD3A0–018VP43xxxxx	3–15 kHz	9 kHz	3–8 kHz	8 kHz	3–8 kHz	8 kHz
VFD025–032VP43xxxAx VFD025–032VP43xxxCx	3–15 kHz 3–12 kHz	8 kHz 6 kHz	3–8 kHz	8 kHz	3–8 kHz	8 kHz
VFD038VP43xxxAx VFD038VP43xxxCx	3–15 kHz 3–12 kHz	6 kHz 6 kHz	3–8 kHz	6 kHz	3–8 kHz	6 kHz
VFD045–220VP43xxxxx	3–12 kHz	6 kHz	3–8 kHz	6 kHz	3–8 kHz	6 kHz
VFD260–310VP43xxxxx	3–12 kHz	3 kHz	3–8 kHz	3 kHz	3–8 kHz	3 kHz
VFD370–485VP43xxxxx	2–12 kHz	3 kHz	2–8 kHz	3 kHz	2–8 kHz	3 kHz
VFD530–1k2VP43xxxxx	2–9 kHz	3 kHz	2–8 kHz	3 kHz	2–8 kHz	3 kHz

🕮 The PWM output carrier frequency has an absolute influence on the electromagnetic noise of the motor. It also influences the AC motor drive heat dissipation, and the surrounding interference. Therefore, if the surrounding noise is greater than the motor noise, lower the carrier frequency to reduce the temperature rise. Although the motor has quiet operation in the higher carrier frequency, the entire wiring and interference prevention should still be taken into consideration.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise or Leakage Current	Heat Dissipation	Current Wave
2kHz	Significant	Minimal	Minimal	
8kHz	↕	↕	↕	
15kHz	Minimal	Significant	Significant	

🕮 When the carrier frequency is higher than the default value, it must be protected by load reduction. Refer to Pr. H4-05 for further setting and description.

↗ A5-01 Over-Modulation Gain

(0x141) Default: 100

Settings 80–100%

🕮 When the output voltage is saturated, you can increase the over-modulation gain to increase the

output voltage, so as to reduce output current and improve motor efficiency. However, if the gain is too large, it may produce a low frequency harmonic driven by a six-step square wave.

🕮 Increase the parameter value gradually and monitor whether the output current is improved (the output current decreases), or whether the operation performance is improved, so as to obtain the best over-modulation gain value.

A5-12 RPWM Sel

(0x14C) Default: 0

Settings 0: Disable
1: RPWM Mode 1
2: RPWM Mode 2
3: RPWM Mode 3

🕮 The RPWM function is enabled when this parameter is not set to 0, and the carrier of the drive is randomly distributed based on the center of current setting of Pr. A5-00.

🕮 After RPWM function is enabled, it can reduce the harsh noise concentrated at a specific high frequency, and the audio frequency of the motor operation will change accordingly (usually from a sharper audio frequency to a low rustling sound).

🕮 This function provides three RPWM modes (RPWM Mode 1 to Mode 3). Each mode corresponds to different carrier frequency distribution method, the corresponded electromagnetic noise distribution and sound are different as well.

🕮 When enabling RPWM function and Pr. A5-13 RPWM Range setting is valid, the setting upper limit of Pr. A5-00 Carrier Frequency changes to 8 kHz, and its lower limit remains as the lower limit of each model. In this case, the actual output upper limit of random carrier frequency is 9 kHz, and the lower limit is automatically limited according to the conditions of each model.

A5-13 RPWM Range

(0x14D) Default: 0.0

Settings 0.0–Carrier frequency setting kHz

🕮 When Pr. A5-00 Carrier Frequency is set as 4 kHz and the RPWM function is enabled, Pr. A5-13 RPWM Range is set as 2.0 kHz, the output carrier is based on 4 kHz and the random frequency distribution range is +/- 1 kHz, that is, it changes randomly within 3–5 kHz.

A5-14 AVR Function

(0x14E) Default: 0

Settings 0: Enable
1: Disable during decel
2: Disable

🕮 The AC motor drive uses DC bus voltage as a voltage source to calculate how the current output voltage command is converted into the switching opening of the power element, so as to complete the line-to-line voltage output to the motor and ensure the accuracy of the output voltage and the voltage command. When the parameter is set as 0 to enable the AVR function, the DC bus information will be filtered according to the filter time of Pr. A5-16, and the switching opening of the power element will be adjusted in real time based on this. When the parameter is

set as 1 to disable the AVR function during deceleration, the drive decelerates to trigger the instant DC bus as a fixed voltage source to control the switching opening base of the power element. When the parameter is set as 2 to disable the AVR function, it uses the instant DC bus triggered by the operation as a fixed voltage source to control the switching opening base of the power element.

- When the parameter is set as 0 to enable the AVR function, if the drive input power is unstable, or the load condition is unstable and the DC bus voltage fluctuates sharply, then the line-to-line voltage output by the motor regulated by the AVR will easily oscillate, which will easily cause the load fluctuates and affect the DC bus, resulting in a negative cycle that leads to OV, OC, etc. When the above problem occurs, increase the filter time of Pr. A5-16 to reduce the vibration of power element opening to stable the system. In the contrary, if there is an extremely fast output voltage response time requirement, and the specification is smaller than the filter time of Pr. A5-16, decrease the filter time to meet the demand.
- When a system with a large inertia has a faster deceleration requirement, and the DC bus oscillates violently during deceleration and causes OV and OC, set this parameter to 1 to stabilize the power element opening during deceleration, and further stabilize DC bus during deceleration and obtain a better deceleration efficiency.
- When the drive input power is extreme unstable, the input power is lack of phase, or the impedance of the drive and the mains are extremely mismatched, causing the DC bus to oscillate violently during normal operation and resulting OV and OC, set this parameter as 2 to disable the AVR function, and to stabilize the power element opening in normal operation, so the DC bus is stabilized and a better control efficiency is obtained.

A5-15 AVR DC bus Filter Time

(0x14F) Default: 0.01

Settings 0.001–1.000 sec.

- Usually, you do not need to set the AVR DC bus filter time.
- If the time constant is set small, the response will be fast; otherwise, the response will be slow.

A5-16 DC bus Filter Time

(0x150) Default: 0.010

Settings 0.000–10.000 sec.

- The smaller the time setting, the faster the output voltage response; otherwise, the slower the response.

A5-17 DC bus Ripple Suppression

(0x151) Default: Depending on the models

Settings 0: Disable
1: Manual COMP

- When the drive loads the motor, the DC bus ripple voltage may cause DC bus voltage oscillations due to the rapid load extraction of the motor. The ripple suppression function can affectively suppress it to achieve the DC bus ripple voltage stabilization effect.

- Related parameters of DC bus ripple suppression are Pr. A5-17–A5-19, and it is applicable to models with the second last digit C (VFDxxxVP43xxxCx).
- Setting 0: DC bus Ripple Suppression is disabled. For the models with the second last digit A (VFDxxxVP43xxxAx), Pr. A5-17–A5-19 has no function, it is recommended to set Pr. A5-17 to 0.
- Setting 1, the suppression operates according to Pr. A5-18 and A5-19.

Pr.	A5-17	A5-18	A5-19	Applicable models
Settings	0	x	x	Frame C and below, model name with the second last digit A VFDxxxVP43xxx**A**x
	1	v	v	Frame C and below, model name with the second last digit C VFDxxxVP43xxx**C**x Frame D and above

A5-18 DC bus Ripple Suppress Gain

(0x152) Default: 0.00

Settings 0.00–50.00

- Sets the DC bus suppression manual compensation gain.
- When there is a high DC link voltage fluctuation during the drive operation, the drive detects the DC voltage signal and compensates the voltage through the controller and performs manual compensation according to the parameter setting to achieve the DC link voltage shock suppression effect.

A5-19 DC bus Ripple Suppress Limit

(0x153) Default: 10

Settings 5–30%

- Sets the upper limit of DC bus suppression manual compensation voltage. Avoids the risk of OC or OV failure when the compensation gain is set too large.

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b. Pr Management & Macro

b0. Pr Management

✓ You can set this parameter during operation

✓ b0-00 Access Permission

(0x200) Default: 0

Settings 0: Normal
1: Advanced

📖 There are three levels in VP3000 parameter structure: Main Parameter Group, Subgroup and Parameter. Each level has its own defined parameter access permission.

📖 The drive parameter definition is divided into normal and advanced parameters according to the access permission, the differences are shown in the following table.

Access Permission	Display Pr. Inf.	Set Pr.	Functions	Pr. Qty
0: Normal	Normal	Normal	● Advanced parameter subgroup (for example, Subgroup A5) cannot be operated ● Advanced parameters (for example, Pr.F2-20–F2-24) cannot be operated	Less
1: Advanced	Normal and advanced parameters	Normal and advanced parameters	● Advanced parameter subgroups (for example, Subgroup A5) are available ● Advanced parameters (for example, Pr.F2-20–F2-24) are available	More

📖 The AC motor drive functions are positively correlated with the number of parameters. For easy use and quick adjustment, the default of the parameter access permission for new machines is normal parameter (refer to the table below), in this case, you can only use parameters with access permission “Normal”, such as Subgroup A0. If you need to use advanced parameter functions, such as Subgroup A5, set Pr.b0-00 as 2 (Advanced) to unlock these parameters for use.

📖 When the parameter access permission is set as 0: Normal, the parameter operation screen on the digital keypad displays each parameter subgroup in sequence across the main parameter group. For example, when entering the operation page of parameter main group A, the keypad displays parameter subgroup A0–A4 and goes down to subgroup b0–b1, C0–C3 in sequence.

📖 The access permission of the parameter is marked on the upper left of the parameter number in the user manual. When the star symbol ＊ appears, it means that the parameter is an advanced parameter, otherwise it is a normal parameter.

📖 The parameter access permission setting has not correlation with parameter backup action. Even when the access permission is set as normal, the advanced parameters (such as Subgroup A5) can still be copied. The following table lists parameter access and backup permissions. Refer to the description below for parameter backup function:

(1) The drive supports parameter backup on different firmware version, model power or voltage. There is no need to set by the user.

(2) Parameter group d, F and E4 are not available for parameter backup when copying parameters of different models.

(3) Parameter group d, E, F, E4, H1 and J2 are not available for parameter backup when copying parameters of different voltages.

Main Group	Subgroup	Parameter Group Name	Access Permission	Parameter Backup	
				Different Models	Different Voltage
A		Fundamental Setting	Normal		
	A0	Drive Information	Normal	Yes	Yes
	A1	Control Handle	Normal	Yes	Yes
	A2	Stop Method	Normal	Yes	Yes (Except Pr. A2-05)
	A3	Start & Stop Function	Normal	Yes	Yes
	A4	HOA/LoRe Setting	Normal	Yes	Yes
	A5	Carrier FREQ Adjustment	Advanced (＊)	Yes (Except Pr.A5-00)	Yes (Except Pr.A5-00)
b		Pr Management & Macro	Normal		
	b0	Pr Management	Normal	Yes	Yes
	b1	Application Macro	Normal	Yes	Yes
	b2	Pr Modified REC 1-10	Advanced (＊)	Yes	Yes
	b3	Pr Modified REC 11-20	Advanced (＊)	Yes	Yes
c		Control Mode & Cmd Scheme	Normal		
	c0	Motor Control Mode	Normal	Yes	Yes
	c1	FREQ Cmd Handle	Normal	Yes	Yes
	c2	Accel / Decel & Speed Limit	Normal	Yes	Yes
	c3	JOG Setting	Normal	Yes	Yes
d		Motor Parameter	Normal		
	d0	IM Switching	Advanced (＊)	No	No
	d1	IM1 Parameter & Autotune	Normal	No	No
	d2	IM2 Parameter & Autotune	Advanced (＊)	No	No
	d3	IM3 Parameter & Autotune	Advanced (＊)	No	No
	d4	IM4 Parameter & Autotune	Advanced (＊)	No	No
	d5	SM Parameter & Autotune	Normal	No	No
E		VF Control & SVC	Normal		
	E0	IM1 VF Control & SVC	Normal	Yes	No
	E1	IM2 VF Control & SVC	Advanced (＊)	Yes	No
	E2	IM3 VF Control & SVC	Advanced (＊)	Yes	No
	E3	IM4 VF Control & SVC	Advanced (＊)	Yes	No
	E4	SM SVC	Normal	No	No
F		FOC	Normal		
	F0	IM FOC	Normal	No	No
	F1	SM FOC	Normal	No	No
	F2	ASR Setting	Normal	No	No
	F3	ACR Setting	Advanced (＊)	No	No

Main Group	Subgroup	Parameter Group Name	Access Permission	Parameter Backup	
				Different Models	Different Voltage
G		IO Setting	Normal		
	G0	MI Setting	Normal	Yes	Yes
	G1	MO Setting	Normal	Yes	Yes
	G2	AI Setting	Normal	Yes	Yes
	G3	AO Setting	Normal	Yes	Yes
	G4	Extension MI Setting	Advanced (✻)	Yes	Yes
	G5	Extension MO Setting	Advanced (✻)	Yes	Yes
	G6	Extension AI Setting	Advanced (✻)	Yes	Yes
	G7	Extension AO Setting	Advanced (✻)	Yes	Yes
H		Fault & Protection	Normal		
	H0	Fault Handle	Normal	Yes	Yes
	H1	Voltage Protection	Normal	Yes	No
	H2	Current Protection	Normal	Yes (Except Pr.H2-01)	Yes (Except Pr.H2-01)
	H3	Phase Loss Protection	Normal	Yes	Yes
	H4	Drive Heat Protection	Normal	Yes	Yes
	H5	Motor Overload Protection	Normal	Yes	Yes
	H6	Motor Heat Protection	Normal	Yes	Yes
	H7	Overload / Underload Handle	Normal	Yes	Yes
	H8	Speed Fdk Protection	Normal	Yes	Yes
J		Application Function	Normal		
	J0	Additional Function	Advanced (✻)	Yes	Yes
	J1	AES Function	Normal	Yes	Yes
	J2	dEb Function	Normal	Yes	No
	J3	TEC Function	Normal	Yes	Yes
	J4	Preheat Function	Normal	Yes	Yes
	J5	Fire Mode	Normal	Yes	Yes
	J6	Time Function	Normal	Yes	Yes
L		PLC Function	Normal		
	L0	InnerPLC Handle	Normal	Yes	Yes
	L1	InnerPLC App Pr 0-49	Normal	Yes	Yes
	L2	InnerPLC App Pr 50-99	Normal	Yes	Yes
n		Communication	Normal		
	n0	COM Card Information	Normal	Yes	Yes
	n1	Modbus	Normal	Yes	Yes
	n2	CANopen	Advanced (✻)	Yes	Yes
	n3	BACnet	Normal	Yes	Yes
	n4	DeviceNET & Profibus	Advanced (✻)	Yes	Yes
	n5	EtherNET	Advanced (✻)	Yes	Yes

Main Group	Subgroup	Parameter Group Name	Access Permission	Parameter Backup	
				Different Models	Different Voltage
o		Monitor & Recorder	Normal		
	o0	Status Monitor	Normal	Yes	Yes
	o1	Signal & Recorder Function	Normal	Yes	Yes
	o2	Monitor Function	Normal	Yes	Yes
	o3	PDM Function	Normal	Yes	Yes
	o4	Fault Record 1-2	Normal	Yes	Yes
	o5	Fault Record 3-4	Normal	Yes	Yes
	o6	Fault Record 5-6	Normal	Yes	Yes
P		PID Function	Normal		
	P0	Process PID1	Normal	Yes	Yes
	P1	Process PID2	Advanced (✻)	Yes	Yes
	P2	Basic PID1	Normal	Yes	Yes
	P3	Basic PID2	Advanced (✻)	Yes	Yes
	P4	Basic PID3	Advanced (✻)	Yes	Yes
	P5	Basic PID4	Advanced (✻)	Yes	Yes
U		Industry	Normal		
	U0	Pump Function	Normal	Yes	Yes
	U1	Pump Schedule	Normal	Yes	Yes
	U2	Fluid Estimator	Normal	Yes	Yes
	U3	Pump Protection	Normal	Yes	Yes
	U4	Master-Slave Multi-Pump Control	Normal	Yes	Yes

b0-01 Parameter Reset

(0x201) Default: 0

Settings 0: Reserve
5: Reset kWh
6: Reset PLC
7: Reset CANopen Slave index
9: Reset 50 Hz default
10: Reset 60 Hz default
11–12: Reserve
13: Reset parameter and setting

- 🕮 If the password function is set (Pr.b0-02 and b0-04) when executing parameter reset, you must unlock the password (Pr.b0-03 and b0-05) to clear previous set password before reset the parameters.
- 🕮 9 or 10: Only reset parameters.
- 🕮 13: Reset parameters and start keypad setting (including language, parameter reset, time setting and start-up wizard, etc.) after reboot the drive.
- 🕮 5: You can return the kWh displayed value to 0 even during drive operation.

- 6: Clear the internal PLC program (includes the related settings of PLC internal CANopen master).
- 7: Reset the related settings of CANopen Slave index.

b0-02 Password Setting

(0x202)

b0-04 Read-Only Password Setting

(0x204) Default: 0

Settings 0–65535

- The first-level password of the parameter is b0-02 (Password Setting), and the second-level password is b0-04 (Read-only Password Setting).
- This parameter is for setting the password protection. Password can be set directly the first time. After setting, the password protection is activated. At this time, if you want to change any of the parameter settings, you must enter the correct password in Pr.b0-03/ b0-05 to deactivate the password temporarily, this parameter becomes 0 and you can set any parameter. The password protection function is automatically established after rebooting the drive.
- When you enter the correct password in Pr.b0-03/ b0-05, the drive temporarily unlocks the password, and then set this parameter to 0 to cancel the password protection. Otherwise, password protection is always reactivated after you reboot the motor drive.

b0-03 Password

(0x203)

b0-05 Read-Only Password

(0x205) Default: 0

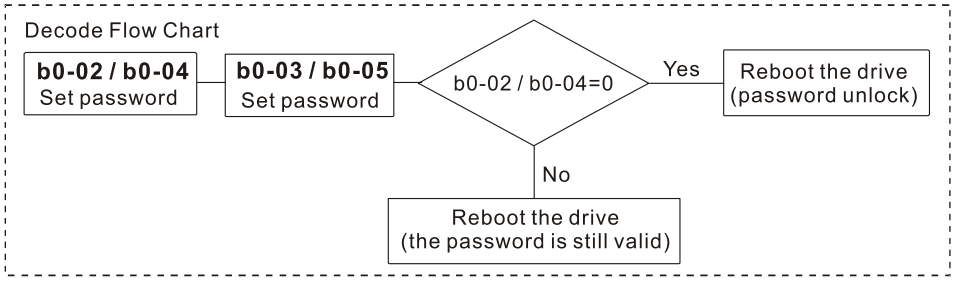
Settings 0–65535

- The first-level password of the parameter is b0-02 (Password Setting), and the second-level password is b0-04 (Read-only Password Setting).
- The parameter locking function allows the project developer using the drive to manage the personnel who operate the equipment hierarchically.
- The parameter locking function distinguishes between the first and second levels. After setting the first level (Pr.b0-02 Password setting), the parameter value is read as 0, and you cannot read the actual parameter value. The parameters can only be read after setting the second level (Pr.b0-04 Read-only password setting).

Pr Lock Level	Pr Lock Method	Pr Status	Decode Method	Access Permission
1st level locked	Set Pr.b0-02 Password Setting	The Pr attribute becomes read-only and displays 0. (Only Pr.b0-03 and b0-05 can be set)	Enter password in Pr.b0-03	Low (e.g. end-user)
2nd level locked	Set Pr.b0-04 Read-Only Password Setting	The parameter attribute is read-only, other functions are normal (Only Pr.b0-02, b0-03 and b0-05 can be set)	Enter read-only password in b0-05	Medium (e.g. distributors)

Pr Lock Level	Pr Lock Method	Pr Status	Decode Method	Access Permission
Unlock	N/A	The drive operates and displays normally.	N/A	Normal (for example: equipment manufacturer)

- The unlock method for the first level locking is entering the same password as Pr.b0-02 into Pr.b0-03; and to unlock the second level, enter the same password as Pr.b0-04 into Pr.b0-05.
- When the parameters are not locked, you can set the first or second level parameter locking function according to your needs. If you need to use both the parameters' functions of the first and the second level, the second level should be locked first (the access permission is medium), and then lock the first level (the access permission is low); otherwise, the second level cannot be locked if you lock the first level firs.
- Under parameter locked status, the unlock principle is the same as above. When the first and second level parameters need to be used at the same time, you can unlock the second level directly; if only the first level parameters are unlocked, then the second level needs to be unlocked again.
- The first and second level parameter lock functions can be used together, when the functions are enabled:
  - You can unlock the first or second level parameters respectively according to the above methods.
  - Directly enter the password of the second level to unlock the first and the second level parameters.
  - Regardless of unlocking the first or the second level parameters, if you enter the wrong password three times during the process, the drive pops up a parameter unlock failure message, indicating that the fault cannot be reset manually. You must power off and reboot the drive and enter the correct password again to complete the unlock.
  - Refer to the table above for the access permission and parameter status corresponding to each level after unlocking.
- Password Decode Flow Chart

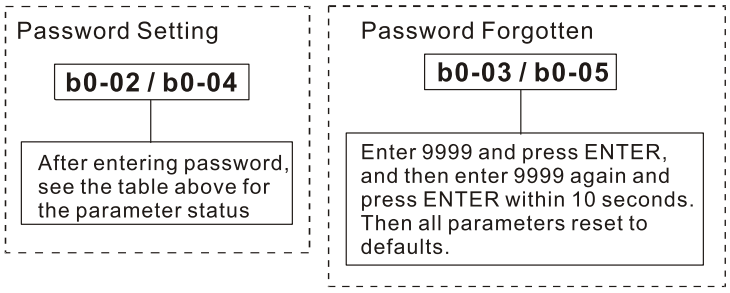


- After the parameter lock function is enabled, be sure to write down the password to avoid problems in the future.
- The parameter lock function is used to prevent personnel from setting other parameters by accident.
- The keypad backup function works normally only when the password protection is deactivated (temporarily or permanently) Password set in Pr.b0-02 and b0-04 cannot be copied to the

keypad. When copying parameters from the keypad to the motor drive, set the password in b0-02 and b0-04 manually again in the motor drive to activate password protection.

🕮 If you forget the password, clear the password setting by input 9999 in Pr.b0-03 / b0-05 and press the ENTER key, then enter 9999 again and press ENTER within 10 seconds (if the above action takes more than 10 seconds, repeat the process again). After decoding, all the settings return to default.

🕮 Password Function Flow Chart



b0-06 Failed password attempts

(0x206) Default: Read only

Settings 0–3

🕮 When the b0-03/ b0-05 input password is different from the b0-02/ b0-04 password, and the number of errors reaches the set value of this parameter, the drive shows the parameter unlock failure fault code, and this fault cannot be reset manually (even after you enter the correct password again). You must power off and reboot the drive to clear this fault, and then enter the correct password to unlock the parameter locked/ read-only status.

b0-07 Parameter Lock Status

(0x207) Default: Read only

Settings bit0: Parameter hidden
bit1: Parameter read-only
bit2: Reserve
bit3: Over PW attempts limit
bit4: FireMode parameter lock

🕮 Use the password function (Pr.b0-02–b0-05) to protect the parameter information. When the password is set in Pr.b0-02 or b0-04, the corresponding bit0 or bit1 will be ON. When Pr.b0-03 or b0-05 unlocks parameter more than 3 times (not included), bit3 will be ON.

🕮 When using the fire mode password function, Pr.J5-06 bit2 is ON, the corresponding bit4 for b0-07 will be ON.

bit	4	3	2	1	0
Parameter Lock Status	FireMode parameter lock	Over PW attempts limit	Reserved	Parameters read-only	Parameter hidden
Description	When Pr.J5-06 is enabled, the bit is ON.	When the password fails to unlock for over 3 times, this bit is ON.	N/A	When Pr.b0-04 is enabled, this bit is ON.	When Pr.b0-02 is enabled, this bit is ON.

＊ b0-12 Parameter Control Bit

(0x20D) Default: 0

Settings bit0: Disable the ‘force unlock’ function
bit0 = 0: OFF (allow forced unlock)
bit0 = 1: ON (not allow forced unlock)

- 🕮 Parameter setting of the drive is highly related to the industry process. Enabling the password function (Pr.b0-02–b0-07) can protect the confidentiality of the drive parameter settings on the device from exposed, but it cannot prevent personnel from resetting the drive parameters by mistake, causing the device to be paralyzed and unable to operate normally. To avoid the above misoperation, you may consider enabling this function.
- 🕮 bit0 = 0 OFF: Parameters can be forced unlock. When the password function is enabled but the password is lost, refer to description in Pr.b0-03 / b0-05 to unlock and reset the parameters to the default value.
- 🕮 bit0 = 1 ON: Parameters cannot be forced unlock. When the password function is enabled but the password is lost, you cannot unlock the parameter. Pay extra attention on the use and keep the password properly.
- 🕮 The drive parameter settings are user’s intellectual property. Regardless of whether the force unlock function is enabled or not, users should take responsibility for protecting the password when using the password function. If the password is lost, Delta cannot and has no right to unlock the password and must replace the control board if necessary to allow the drive to operate.

b1. Application MACRO

You can set this parameter during operation

b1-00 MACRO Sel

(0x240) Default: 0

Settings
0: Reserve
1: User Defined
2: Basic operation
3: 3-Wire-1
4: 3-Wire-2
5: HOA switch
6: Multi-speed
7: PID
16: Compressor
17: PM compressor
18: Fan
19: Pump
20: AHU

- The AC motor drive integrates the commonly used parameters for fans and pumps into application macros for facilitate user operations.
- The MACRO selections are basic operation, 3-wire-1, compressor, fan, pump, and AHU (Air Handling Unit). After you select the application, Pr. Group b1 brings out the corresponding parameter index, and you can read or edit the parameter settings for the application in the App Macros and Quick Setting page of the digital keypad. For example: when you select b1-00 = 16 (Compressor), the corresponding parameters and setting values will be displayed in Pr.b1-01–b1-20. To view or to edit the parameter setting values, refer to the above description or Chapter 4 Operation Interface for detailed information.
- Refer to the following tables for the corresponded parameters and set values of each application macro according to the MACRO selection.
- When the drive does not provide application macros, or the provided macro is not suitable for use, user-defined methods are provided to create application macros.
- Setting value 1: User Defined
  Check the parameters that are going to add into the macro first. For example, the firmware version that is going to add into the drive has two parameters: A0-03 Control Board FW Version and A0-06 Power Board FW Version. Check the corresponding address of the parameters in Chapter 12 Summary of Parameter Settings or Chapter 13 Description of Parameter Settings (A0-03 corresponds to 0003h, A0-06 corresponds to 0006h), and input 0003h and 0006h to Pr. b1-01 and b1-02 respectively. This completes the creation of user defined application macros.

Pr.	Parameter Name
A0-00 (0x00)	Drive Identity Code
A0-01 (0x01)	Drive Cont. Rated Current
A0-02 (0x02)	Drive Max. Output Current
A0-03 (0x03)	Control Board FW Version
A0-05 (0x05)	Control Board FW Date Code
A0-06 (0x06)	Power Board FW Version
A0-08 (0x08)	Power Board FW Date Code

📖 Setting value 2: Basic operation

The following table lists the relevant basic operation parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-01	EX1 OPER Cmd Src	3: S1 FWD, S2 REV
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	A1-03	EX1 S2 Src	3: MI2
b1-04	C1-01	EX1 Main FREQ Src	7: AI1
b1-05	C1-19	Multi Speed MI Src 1	4: MI3
b1-06	C1-20	Multi Speed MI Src 2	5: MI4
b1-07	C1-23	Multi Speed 1	1000
b1-08	C1-24	Multi Speed 2	0
b1-09	C1-25	Multi Speed 3	5000
b1-10	C3-03	JOG MI Src	6: MI5
b1-11	A2-03	Emergency Stop MI Src	7: MI6
b1-12	G1-04	RY1 Function Sel	1: Indication during RUN
b1-13	G1-06	RY2 Function Sel	11: Malfunction indication
b1-14	G1-08	MO1 Function Sel	9: Drive is ready
b1-15	G2-03	AI1 Signal Type	0: 0–10V
b1-16	G3-01	AO1 Function Sel	8: Output frequency AO selection
b1-17	G3-15	AO2 Function Sel	3: Output current AO selection
b1-18	G3-02	AO1 Signal Type	2: 0–20 mA
b1-19	G3-16	AO2 Signal Type	2: 0–20 mA

🕮 Setting value 3: 3-Wire-1

The following table lists the relevant 3-Wire-1 application parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-01	EX1 OPER Cmd Src	5: S1 Start, S2 Stop, S3 Dir
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	A1-03	EX1 S2 Src	3: MI2
b1-04	A1-04	EX1 S3 Src	4: MI3
b1-05	C1-01	EX1 Main FREQ Src	7: AI1
b1-06	C1-19	Multi Speed MI Src 1	5: MI4
b1-07	C1-20	Multi Speed MI Src 2	6: MI5
b1-08	C1-23	Multi Speed 1	1000
b1-09	C1-24	Multi Speed 2	0
b1-10	C1-25	Multi Speed 3	5000
b1-11	A2-03	Emergency Stop MI Src	7: MI6
b1-12	G1-04	RY1 Function Sel	1: Indication during RUN
b1-13	G1-06	RY2 Function Sel	11: Malfunction indication
b1-14	G1-08	MO1 Function Sel	9: Drive is ready
b1-15	G2-03	AI1 Signal Type	0: 0–10V
b1-16	G3-01	AO1 Function Sel	8: Output frequency AO selection
b1-17	G3-15	AO2 Function Sel	3: Output current AO selection
b1-18	G3-02	AO1 Signal Type	2: 0–20 mA
b1-19	G3-16	AO2 Signal Type	2: 0–20 mA

🕮 Setting value 4: 3-Wire-2

The following table lists the relevant 3-Wire-1 application parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-01	EX1 OPER Cmd Src	6: S1 FWD, S2 REV, S3 Stop
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	A1-03	EX1 S2 Src	3: MI2
b1-04	A1-04	EX1 S3 Src	4: MI3
b1-05	C1-01	EX1 Main FREQ Src	7: AI1
b1-06	C1-19	Multi Speed MI Src 1	5: MI4
b1-07	C1-20	Multi Speed MI Src 2	6: MI5
b1-08	C1-23	Multi Speed 1	1000
b1-09	C1-24	Multi Speed 2	0
b1-10	C1-25	Multi Speed 3	5000
b1-11	A2-03	Emergency Stop MI Src	7: MI6
b1-12	G1-04	RY1 Function Sel	1: Indication during RUN
b1-13	G1-06	RY2 Function Sel	11: Malfunction indication
b1-14	G1-08	MO1 Function Sel	9: Drive is ready

Pr. Correspondence		Parameter Name	Setting Value
b1-15	G2-03	AI1 Signal Type	0: 0–10V
b1-16	G3-01	AO1 Function Sel	8: Output frequency AO selection
b1-17	G3-15	AO2 Function Sel	3: Output current AO selection
b1-18	G3-02	AO1 Signal Type	2: 0–20 mA
b1-19	G3-16	AO2 Signal Type	2: 0–20 mA

📖 Setting value 5: HOA switch

The following table lists the relevant HOA switch parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-00	EX1/EX2 switch Src	6: MI5
b1-02	A1-01	EX1 OPER Cmd Src	3: S1 FWD, S2 REV
b1-03	A1-02	EX1 S1 Src	2: MI1
b1-04	A1-03	EX1 S2 Src	3: MI2
b1-05	A1-08	EX2 OPER Cmd Src	8: RS-485
b1-06	C1-01	EX1 Main FREQ Src	7: AI1
b1-07	C1-05	EX2 Main FREQ Src	2: RS-485
b1-08	C1-19	Multi Speed MI Src 1	4: MI3
b1-09	C1-20	Multi Speed MI Src 2	5: MI4
b1-10	C1-23	Multi Speed 1	1000
b1-11	C1-24	Multi Speed 2	0
b1-12	C1-25	Multi Speed 3	5000
b1-13	A2-03	Emergency Stop MI Src	7: MI6
b1-14	G1-04	RY1 Function Sel	1: Indication during RUN
b1-15	G1-06	RY2 Function Sel	11: Malfunction indication
b1-16	G1-08	MO1 Function Sel	9: Drive is ready
b1-17	G2-03	AI1 Signal Type	0: 0–10V
b1-18	G3-01	AO1 Function Sel	8: Output frequency AO selection
b1-19	G3-15	AO2 Function Sel	3: Output current AO selection
b1-20	G3-02	AO1 Signal Type	2: 0–20 mA
b1-21	G3-16	AO2 Signal Type	2: 0–20 mA

🕮 Setting value 6: Multi speed

The following table lists the relevant multi-speed parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-01	EX1 OPER Cmd Src	1: S1 Start
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	C1-01	EX1 Main FREQ Src	7: AI1
b1-04	C1-19	Multi Speed MI Src 1	3: MI2
b1-05	C1-20	Multi Speed MI Src 2	4: MI3
b1-06	C1-21	Multi Speed MI Src 3	5: MI4
b1-07	C1-22	Multi Speed MI Src 4	6: MI5
b1-08	C1-23	Multi Speed 1	500
b1-09	C1-24	Multi Speed 2	800
b1-10	C1-25	Multi Speed 3	1000
b1-11	C1-26	Multi Speed 4	1200
b1-12	C1-27	Multi Speed 5	1500
b1-13	C1-28	Multi Speed 6	1800
b1-14	C1-29	Multi Speed 7	2000
b1-15	C1-30	Multi Speed 8	2500
b1-16	C1-31	Multi Speed 9	3000
b1-17	C1-32	Multi Speed 10	3500
b1-18	C1-33	Multi Speed 11	4000
b1-19	C1-34	Multi Speed 12	4500
b1-20	C1-35	Multi Speed 13	5000
b1-21	C1-36	Multi Speed 14	5500
b1-22	C1-37	Multi Speed 15	6000
b1-23	A2-03	Emergency Stop MI Src	7: MI6
b1-24	G1-04	RY1 Function Sel	1: Indication during RUN
b1-25	G1-06	RY2 Function Sel	11: Malfunction indication
b1-26	G1-08	MO1 Function Sel	9: Drive is ready
b1-27	G2-03	AI1 Signal Type	0: 0–10V
b1-28	G3-01	AO1 Function Sel	8: Output frequency AO selection
b1-29	G3-15	AO2 Function Sel	3: Output current AO selection
b1-30	G3-02	AO1 Signal Type	2: 0–20 mA
b1-31	G3-16	AO2 Signal Type	2: 0–20 mA

📖 Setting value 7: PID

The following table lists the relevant PID application parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	A1-01	EX1 OPER Cmd Src	1: S1 Start
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	A1-27	FWD / REV Direction Setting	1: FWD only
b1-04	C1-01	EX1 Main FREQ Src	18: PID
b1-05	P0-01	P-PID1 Function	1: Enable
b1-06	P0-10	P-PID1 Decimal Point	1: One decimal point
b1-07	P0-11	P-PID1 Unit	21: bar
b1-08	P0-13	P-PID1 Setpoint Upper Limit	160
b1-09	A2-03	Emergency Stop MI Src	5: MI4
b1-10	o0-07	Run Indn	1: Relay 1
b1-11	H0-01	Fault Indn	2: Relay 2
b1-12	o0-06	Drive Ready Indn	3: MO1
b1-13	P0-02	P-PID1 Ref1 Src	1: Keypad
b1-14	P0-12	P-PID1 Setpoint	8
b1-15	G2-03	AI1 Signal Type	0: 0–10V
b1-16	P0-04	P-PID1 Fdk1 Src	8: AI2
b1-17	P0-19	P-PID1 Error OPER	0: PID1 err = PID1 Ref– PID1 Fdk
b1-18	P0-27	P-PID1 Output Upper Limit	6000
b1-19	P0-28	P-PID1 Output Lower Limit	0
b1-20	P0-29	P-PID1 P Gain	500
b1-21	P0-30	P-PID1 I Time	100
b1-22	P0-31	P-PID1 D Time	1000
b1-23	G2-22	AI2 Signal Type	0: 0–10V
b1-24	o0-30	Output FREQ AO Sel	1: AO1
b1-25	o0-31	Output Current AO Sel	2: AO2
b1-26	G3-02	AO1 Signal Type	2: 0–20 mA
b1-27	G3-16	AO2 Signal Type	2: 4–20 mA
b1-28	o0-00	Digital Keypad Display Sel 1	42: P-PID1 reference
b1-29	o0-01	Digital Keypad Display Sel 2	44: P-PID1 feedback
b1-30	o0-02	Digital Keypad Display Sel 3	46: P-PID1 output frequency

📖 Setting value 16: Compressor

The following table lists the relevant compressor application parameters.

Pr. Correspondence		Parameter Name	Setting Value
b1-01	C0-02	Motor Control Method	0: VF
b1-02	A1-01	EX1 OPER Cmd Src	0: Disable
b1-03	C1-01	EX1 Main FREQ Src	1: Keypad
b1-04	A2-00	Stop Method	0: Ramp to stop
b1-05	A1-27	FWD / REV Direction Setting	1: FWD only
b1-06	C2-17	Max. OPER FREQ	Same as Default
b1-07	E0-01	IM1 VF Max FREQ	Same as Default
b1-08	E0-02	IM1 VF Max Voltage	Same as Default
b1-09	E0-11	IM1 VF Mid FREQ 1	Same as Default
b1-10	E0-12	IM1 VF Mid FREQ 1	Same as Default
b1-11	C2-18	FREQ Upper Limit	599
b1-12	C2-19	FREQ Lower Limit	0
b1-13	C2-00	Accel Time 1	5s
b1-14	C2-01	Decel Time 1	5s
b1-15	E0-00	IM1 VF Curve Sel	0: Manual VF curve
b1-16	d1-02	IM1 Rated current	Same as Default
b1-17	H1-08	Over-voltage Stall Prevention	760.0
b1-18	H1-09	Stall Prev Function Sel	3: Smart OC + Smart OV
b1-19	H1-06	Restart after Power Loss	0: Disable
b1-20	H1-07	Power Loss Time Allowed	2

📖 Setting value 17: PM compressor

The following table lists the relevant PM compressor application parameters.

Pr. Correspondence		Parameter Name	Setting value
b1-01	A1-01	EX1 OPER Cmd Src	8: RS-485
b1-02	A1-02	EX1 S1 Src	2: MI1
b1-03	A1-27	FWD / REV Direction Setting	1: FWD only
b1-04	A2-00	Stop Method	1: Coast to stop
b1-05	A3-00	Start Speed Tracking	
b1-06	A3-17	SM Rotor Initial Detection	2: Pulse inject
b1-07	C0-00	Motor Type	1: PM
b1-08	C0-02	Motor Control Method	2: FOC
b1-09	C1-01	EX1 Main FREQ Src	2: RS-485
b1-10	C2-00	Accel Time 1	
b1-11	C2-01	Decel Time 1	
b1-12	C2-19	FREQ Lower Limit	0

Pr. Correspondence		Parameter Name	Setting value
b1-13	F1-01	IF Cmd	
b1-14	F1-09	Observer High Speed Gain	
b1-15	F2-01	System Inertia	500
b1-16	F2-06	ASR High-Speed BW	
b1-17	G1-04	RY1 Function Sel	11: Malfunction indication
b1-18	G1-06	RY2 Function Sel	1: Indication during RUN
b1-19	H2-04	Output Current Limit	
b1-20	n1-01	Modbus Address	
b1-21	n1-02	Modbus COM Baud Rate	
b1-22	n1-03	Modbus Package Format	11: 8, N, 1 (RTU)
b1-23	n1-04	Modbus Timeout Check Time	50
b1-24	n1-05	Modbus Timeout Disposal	1: Warning & continue OPER
b1-25	o0-00	Digital Keypad Display Sel 1	3: Display the drive's DC bus voltage
b1-26	o0-01	Digital Keypad Display Sel 2	4: Display the drive's output voltage
b1-27	o0-02	Digital Keypad Display Sel 3	14: Display the drive's IGBT temperature

📖 Setting value 18: Fan

The following table lists the relevant fan application parameters.

Pr. Correspondence		Parameter Name	Setting value
b1-01	C0-02	Motor Control Method	0: VF
b1-02	A1-01	EX1 OPER Cmd Src	0: Disable
b1-03	C1-01	EX1 Main FREQ Src	1: Keypad
b1-04	A2-00	Stop Method	0: Ramp to stop
b1-05	A1-27	FWD / REV Direction Setting	1: FWD only
b1-06	C2-17	Max. OPER FREQ	Same as Default
b1-07	E0-01	IM1 VF Max FREQ	Same as Default
b1-08	E0-02	IM1 VF Max Voltage	Same as Default
b1-09	E0-11	IM1 VF Mid FREQ 1	Same as Default
b1-10	E0-12	IM1 VF Mid FREQ 1	Same as Default
b1-11	C2-00	Accel Time 1	Same as Default
b1-12	C2-02	Accel Time 2	Same as Default
b1-13	E0-00	IM1 VF Curve Sel	0: Manual VF curve
b1-14	d1-02	IM1 Rated current	Same as Default
b1-15	H1-08	Ov Stall Prev Level	760.0
b1-16	H1-09	Stall Prev Function Sel	3: Smart OC + Smart OV
b1-17	H1-06	Restart after Power Loss	0: Disable
b1-18	H1-07	Power Loss Time Allowed	2
b1-19	A3-01	Speed Tracking Current Limit	100%
b1-20	A3-00	Start Speed Tracking	0: Disable

🕮 Setting value 19: Pump

The following table lists the relevant pump application parameters.

Pr. Correspondence		Parameter Name	Setting value
b1-01	C0-02	Motor Control Method	0: VF
b1-02	A1-01	EX1 OPER Cmd Src	0: Disable
b1-03	C1-01	EX1 Main FREQ Src	1: Keypad
b1-04	A1-27	FWD / REV Direction Setting	1: FWD only
b1-05	C2-17	Max. OPER FREQ	Same as Default
b1-06	E0-01	IM1 VF Max FREQ	Same as Default
b1-07	E0-02	IM1 VF Max Voltage	Same as Default
b1-08	E0-11	IM1 VF Mid FREQ 1	Same as Default
b1-09	E0-12	IM1 VF Mid FREQ 1	Same as Default
b1-10	C2-19	FREQ Lower Limit	0
b1-11	C2-00	Accel Time 1	1.0s
b1-12	C2-01	Decel Time 1	1.0s
b1-13	E0-00	IM1 VF Curve Sel	0: Manual VF curve
b1-14	H1-08	Ov Stall Prev Level	760.0
b1-15	H1-09	Stall Prev Function Sel	3: Smart OC + Smart OV
b1-16	H1-06	Restart after Power Loss	0: Disable
b1-17	H1-07	Power Loss Time Allowed	2

🕮 Group setting 20: Air Handling Unit (AHU)

The following table lists the relevant AHU application parameters.

Pr. Correspondence		Parameter Name	Setting value
b1-01	o0-00	Digital Keypad Display Sel 1	2: Display the motor's actual output frequency (H.)
b1-02	C0-02	Motor Control Method	0: VF
b1-03	A1-01	EX1 OPER Cmd Src	2: S1 Start, S2 Dir
b1-04	A1-02	EX1 S1 Src	2: MI1
b1-05	A1-03	EX1 S2 Src	3: MI2
b1-06	C1-01	EX1 Main FREQ Src	7: AI1
b1-07	A2-00	Stop Method	1: Coast to stop
b1-08	A1-27	FWD / REV Direction Setting	1: FWD only
b1-09	C2-17	Max. OPER FREQ	50
b1-10	E0-01	IM1 VF Max FREQ	50
b1-11	E0-02	IM1 VF Max Voltage	380
b1-12	E0-13	IM1 VF Min FREQ	0.1
b1-13	C2-18	FREQ Upper Limit	50
b1-14	C2-19	FREQ Lower Limit	35
b1-15	C1-10	Zero-speed Behavior	2: Min output FREQ
b1-16	E0-00	IM1 VF Curve Sel	2: 2nd power V/F curve

Pr. Correspondence		Parameter Name	Setting value
b1-17	A4-00	HOA / LoRe Sel	1: LoRe
b1-18	A4-05	LoRe Switch Src	4: MI3
b1-19	A4-10	LoRe Switch Action	3: Start Cmd before Switch
b1-20	H0-01	Fault Indn	1: Relay 1
b1-21	A1-23	Run Enable Indn	2: Relay 2
b1-22	G2-03	AI1 Signal Type	0: 0–10 V
b1-23	G3-01	AO1 Function Sel	165Eh: Output FREQ AO Sel
b1-24	G3-02	AO1 Signal Type	2: 4–20 mA
b1-25	H1-06	Restart after Power Loss	2: Max output FREQ
b1-26	H0-06	Fault Restart No.	0
b1-27	H0-10	Fault Restart Delay Time	60

- **b1-01** MACRO Parameter 1
  (0x241)
- **b1-02** MACRO Parameter 2
  (0x242)
- **b1-03** MACRO Parameter 3
  (0x243)
- **b1-04** MACRO Parameter 4
  (0x244)
- **b1-05** MACRO Parameter 5
  (0x245)
- **b1-06** MACRO Parameter 6
  (0x246)
- **b1-07** MACRO Parameter 7
  (0x247)
- **b1-08** MACRO Parameter 8
  (0x248)
- **b1-09** MACRO Parameter 9
  (0x249)
- **b1-10** MACRO Parameter 10
  (0x24A)
- **b1-11** MACRO Parameter 11
  (0x24B)
- **b1-12** MACRO Parameter 12
  (0x24C)
- **b1-13** MACRO Parameter 13
  (0x24D)
- **b1-14** MACRO Parameter 14
  (0x24E)

- **b1-15** MACRO Parameter 15
  (0x24F)
- **b1-16** MACRO Parameter 16
  (0x250)
- **b1-17** MACRO Parameter 17
  (0x251)
- **b1-18** MACRO Parameter 18
  (0x252)
- **b1-19** MACRO Parameter 19
  (0x253)
- **b1-20** MACRO Parameter 20
  (0x254)
- **b1-21** MACRO Parameter 21
  (0x255)
- **b1-22** MACRO Parameter 22
  (0x256)
- **b1-23** MACRO Parameter 23
  (0x257)
- **b1-24** MACRO Parameter 24
  (0x258)
- **b1-25** MACRO Parameter 25
  (0x259)
- **b1-26** MACRO Parameter 26
  (0x25A)
- **b1-27** MACRO Parameter 27
  (0x25B)
- **b1-28** MACRO Parameter 28
  (0x25C)
- **b1-29** MACRO Parameter 29
  (0x25D)
- **b1-30** MACRO Parameter 30
  (0x25E)
- **b1-31** MACRO Parameter 31
  (0x25F)
- **b1-32** MACRO Parameter 32
  (0x260)
- **b1-33** MACRO Parameter 33
  (0x261)
- **b1-34** MACRO Parameter 34
  (0x262)
- **b1-35** MACRO Parameter 35
  (0x263)

- **b1-36** MACRO Parameter 36
  (0x264)
- **b1-37** MACRO Parameter 37
  (0x265)
- **b1-38** MACRO Parameter 38
  (0x266)
- **b1-39** MACRO Parameter 39
  (0x267)
- **b1-40** MACRO Parameter 40
  (0x268)
- **b1-41** MACRO Parameter 41
  (0x269)
- **b1-42** MACRO Parameter 42
  (0x26A)
- **b1-43** MACRO Parameter 43
  (0x26B)
- **b1-44** MACRO Parameter 44
  (0x26C)
- **b1-45** MACRO Parameter 45
  (0x26D)
- **b1-46** MACRO Parameter 46
  (0x26E)
- **b1-47** MACRO Parameter 47
  (0x26F)
- **b1-48** MACRO Parameter 48
  (0x270)
- **b1-49** MACRO Parameter 49
  (0x271)
- **b1-50** MACRO Parameter 50
  (0x272)
- **b1-51** MACRO Parameter 51
  (0x273)
- **b1-52** MACRO Parameter 52
  (0x274)
- **b1-53** MACRO Parameter 53
  (0x275)
- **b1-54** MACRO Parameter 54
  (0x276)
- **b1-55** MACRO Parameter 55
  (0x277)
- **b1-56** MACRO Parameter 56
  (0x278)

b1-57 MACRO Parameter 57

(0x279)

b1-58 MACRO Parameter 58

(0x27A)

b1-59 MACRO Parameter 59

(0x27B)

b1-60 MACRO Parameter 60

(0x27C) Default: 0

Settings 0–65535

📖 Pr.b1-01–b1-60: Macro parameter 1–60.

∗b2. Pr Modified REC 1–10

∗ Advanced parameters, set Pr.b0-00 to unlock

b2-00 REC 1 Pr Address

(0x280) Default: Read only

b2-01 REC 1 Original Setting

(0x281) Default: Read only

b2-02 REC 1 New Setting

(0x282) Default: Read only

b2-03 REC 1 Year

(0x283) Default: Read only

b2-04 REC 1 Date

(0x284) Default: Read only

b2-05 REC 1 Time

(0x285) Default: Read only

Settings 0–2359

- 🕮 The parameter modified record provides 20 groups, each group corresponds to 6 parameters (b2-00–b2-59, b3-00–b3-59). It records the parameter address, original setting, new setting, and time.
- 🕮 When the parameter is changed, the first record is stored in b2-00–b2-05; when another parameter is changed, the latest record is retained in b2-00–b2-05, the previous record is pushed backwards to b2-06–b2-11 and so on.
- 🕮 When the parameters reset to the default (Pr.b0-01), all the parameter modified records (b2-00–b2-59, b3-00–b3-59) return to 0.

b2-06 REC 2 Pr Address

(0x286) Default: Read only

b2-07 REC 2 Original Setting

(0x287) Default: Read only

b2-08 REC 2 New Setting

(0x288) Default: Read only

b2-09 REC 2 Year

(0x289) Default: Read only

b2-10 REC 2 Date

(0x28A) Default: Read only

b2-11 REC 2 Time

(0x28B) Default: Read only

b2-12 REC 3 Pr Address

(0x28C) Default: Read only

b2-13 REC 3 Original Setting

(0x28D) Default: Read only

b2-14 REC 3 New Setting

(0x28E) Default: Read only

b2-15 REC 3 Year

(0x28F) Default: Read only

b2-16 REC 3 Date

(0x290) Default: Read only

b2-17 REC 3 Time

(0x291) Default: Read only

b2-18 REC 4 Pr Address

(0x292) Default: Read only

b2-19 REC 4 Original Setting

(0x293) Default: Read only

b2-20 REC 4 New Setting

(0x294) Default: Read only

b2-21 REC 4 Year

(0x295) Default: Read only

b2-22 REC 4 Date

(0x296) Default: Read only

b2-23 REC 4 Time

(0x297) Default: Read only

b2-24 REC 5 Pr Address

(0x298) Default: Read only

b2-25 REC 5 Original Setting

(0x299) Default: Read only

b2-26 REC 5 New Setting

(0x29A) Default: Read only

b2-27 REC 5 Year

(0x29B) Default: Read only

b2-28 REC 5 Date

(0x29C) Default: Read only

b2-29 REC 5 Time

(0x29D) Default: Read only

b2-30 REC 6 Pr Address

(0x29E) Default: Read only

b2-31 REC 6 Original Setting

(0x29F) Default: Read only

b2-32 REC 6 New Setting

(0x2A0) Default: Read only

b2-33 REC 6 Year

(0x2A1) Default: Read only

b2-34 REC 6 Date

(0x2A2) Default: Read only

b2-35 REC 6 Time

(0x2A3) Default: Read only

b2-36 REC 7 Pr Address

(0x2A4) Default: Read only

b2-37 REC 7 Original Setting

(0x2A5) Default: Read only

b2-38 REC 7 New Setting

(0x2A6) Default: Read only

b2-39 REC 7 Year

(0x2A7) Default: Read only

b2-40 REC 7 Date

(0x2A8) Default: Read only

b2-41 REC 7 Time

(0x2A9) Default: Read only

b2-42 REC 8 Pr Address

(0x2AA) Default: Read only

b2-43 REC 8 Original Setting

(0x2AB) Default: Read only

b2-44 REC 8 New Setting

(0x2AC) Default: Read only

b2-45 REC 8 Year

(0x2AD) Default: Read only

b2-46 REC 8 Date

(0x2AE) Default: Read only

b2-47 REC 8 Time

(0x2AF) Default: Read only

b2-48 REC 9 Pr Address

(0x2B0) Default: Read only

b2-49 REC 9 Original Setting

(0x2B1) Default: Read only

b2-50 REC 9 New Setting

(0x2B2) Default: Read only

b2-51 REC 9 Year

(0x2B3) Default: Read only

b2-52 REC 9 Date

(0x2B4) Default: Read only

b2-53 REC 9 Time

(0x2B5) Default: Read only

b2-54 REC 10 Pr Address

(0x2B6) Default: Read only

b2-55 REC 10 Original Setting

(0x2B7) Default: Read only

b2-56 REC 10 New Setting

(0x2B8) Default: Read only

b2-57 REC 10 Year

(0x2B9) Default: Read only

b2-58 REC 10 Date

(0x2BA) Default: Read only

b2-59 REC 10 Time

(0x2BB) Default: Read only

Settings 0–2359

📖 Refer to description of b2-00–b2-05.

∗b3. Pr Modified REC 11–20

∗ Advanced parameters, set Pr.b0-00 to unlock

b3-00 REC 11 Pr Address
(0x2C0) Default: Read only

b3-01 REC 11 Original Setting
(0x2C1) Default: Read only

b3-02 REC 11 New Setting
(0x2C2) Default: Read only

b3-03 REC 11 Year
(0x2C3) Default: Read only

b3-04 REC 11 Date
(0x2C4) Default: Read only

b3-05 REC 11 Time
(0x2C5) Default: Read only

b3-06 REC 12 Pr Address
(0x2C6) Default: Read only

b3-07 REC 12 Original Setting
(0x2C7) Default: Read only

b3-08 REC 12 New Setting
(0x2C8) Default: Read only

b3-09 REC 12 Year
(0x2C9) Default: Read only

b3-10 REC 12 Date
(0x2CA) Default: Read only

b3-11 REC 12 Time
(0x2CB) Default: Read only

b3-12 REC 13 Pr Address
(0x2CC) Default: Read only

b3-13 REC 13 Original Setting
(0x2CD) Default: Read only

b3-14 REC 13 New Setting
(0x2CE) Default: Read only

b3-15 REC 13 Year
(0x2CF) Default: Read only

b3-16 REC 13 Date
(0x2D0) Default: Read only

b3-17 REC 13 Time
(0x2D1) Default: Read only

b3-18 REC 14 Pr Address
(0x2D2) Default: Read only

b3-19 REC 14 Original Setting
(0x2D3) Default: Read only

b3-20 REC 14 New Setting

(0x2D4) Default: Read only

b3-21 REC 14 Year

(0x2D5) Default: Read only

b3-22 REC 14 Date

(0x2D6) Default: Read only

b3-23 REC 14 Time

(0x2D7) Default: Read only

b3-24 REC 15 Pr Address

(0x2D8) Default: Read only

b3-25 REC 15 Original Setting

(0x2D9) Default: Read only

b3-26 REC 15 New Setting

(0x2DA) Default: Read only

b3-27 REC 15 Year

(0x2DB) Default: Read only

b3-28 REC 15 Date

(0x2DC) Default: Read only

b3-29 REC 15 Time

(0x2DD) Default: Read only

b3-30 REC 16 Pr Address

(0x2DE) Default: Read only

b3-31 REC 16 Original Setting

(0x2DF) Default: Read only

b3-32 REC 16 New Setting

(0x2E0) Default: Read only

b3-33 REC 16 Year

(0x2E1) Default: Read only

b3-34 REC 16 Date

(0x2E2) Default: Read only

b3-35 REC 16 Time

(0x2E3) Default: Read only

b3-36 REC 17 Pr Address

(0x2E4) Default: Read only

b3-37 REC 17 Original Setting

(0x2E5) Default: Read only

b3-38 REC 17 New Setting

(0x2E6) Default: Read only

b3-39 REC 17 Year

(0x2E7) Default: Read only

b3-40 REC 17 Date

(0x2E8) Default: Read only

b3-41 REC 17 Time

(0x2E9) Default: Read only

b3-42 REC 18 Pr Address

(0x2EA) Default: Read only

b3-43 REC 18 Original Setting

(0x2EB) Default: Read only

b3-44 REC 18 New Setting

(0x2EC) Default: Read only

b3-45 REC 18 Year

(0x2ED) Default: Read only

b3-46 REC 18 Date

(0x2EE) Default: Read only

b3-47 REC 18 Time

(0x2EF) Default: Read only

b3-48 REC 19 Pr Address

(0x2F0) Default: Read only

b3-50 REC 19 New Setting

(0x2F2) Default: Read only

b3-51 REC 19 Year

(0x2F3) Default: Read only

b3-52 REC 19 Date

(0x2F4) Default: Read only

b3-53 REC 19 Time

(0x2F5) Default: Read only

b3-54 REC 20 Pr Address

(0x2F6) Default: Read only

b3-55 REC 20 Original Setting

(0x2F7) Default: Read only

b3-56 REC 20 New Setting

(0x2F8) Default: Read only

b3-57 REC 20 Year

(0x2F9) Default: Read only

b3-58 REC 20 Date

(0x2FA) Default: Read only

b3-59 REC 20 Time

(0x2FB) Default: Read only

Settings 0–2359

📖 Refer to description of b2-00–b2-05.

C. Control Mode & Cmd Scheme

C0. Motor Control Mode

C0-00 Motor Type

(0x400) Default: 0

Settings 0: IM
1: PM
2: SynRM

🕮 Use this parameter to select motor type.

C0-02 Motor Control Method

(0x402) Default: 0

Settings 0: VF
1: SVC
2: FOC

🕮 Use this parameter to select motor control method.

🕮 Determine the motor control method through Pr.C0-00 and C0-02, as shown in the table below:

	IM	PM	SynRM
VF	IMVF	-	-
SVC	IMSVC	SMSVC	SMSVC
FOC	IMFOC	SMFOC	SMFOC

C1. FREQ Cmd Handle

You can set this parameter during operation

C1-00 EX1 Main and Aux FREQ Math

(0x440) Default: 0

C1-04 EX2 Main & Aux FREQ Math

(0x444) Default: 0

Settings
0: Main FREQ
1: Aux FREQ
2: ADD
3: SUB
4: MULTI
5: DIV
6: MAX
7: MIN

- Selects the mathematical operation method of the main and auxiliary frequency.
- Pr.C1-00 = 0 Main frequency: It means EX1 has only main frequency and no auxiliary frequency. Similarly, if Pr.C1-00 = 1, it means that EX1 has only auxiliary frequency but no main frequency.
- Use Pr.C1-01 and C1-02 to select EX1 main and auxiliary frequency source; use Pr.C1-05 and C1-06 for EX2 main and auxiliary frequency source selection.

C1-01 EX1 Main FREQ Src

(0x441) Default: 1

C1-05 EX2 Main FREQ Src

(0x445) Default: 1

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Up/down keys
17: Pulse Train
18: PID

- This parameter selects EX1/ EX2 main frequency source.
- For example, when selection AI source (AI1–AI3):
  Set Pr.C1-01 = 7 (AI1) as the main frequency source; Pr.G2-03 = 0, AI1 signal type is 0–10 V; Pr.C2-17 maximum operation frequency = 60.00 Hz, AI input 0–100% corresponds to 0.00 Hz in Pr.C2-17. When the AI1 input 5V (50%), the main frequency command is 60 Hz × 50% = 30 Hz.

- 17: When setting pulse input as the main frequency source, Frequency command (Hz) = Input pulse frequency.
- 16: When setting the Up/Down terminal as the main frequency source, you can set the MI source for speed up and down. When you set MI1 as the speed up command source and MI1 is ON, the speed command increases according to the parameter setting in Up/ Down mode; when you set MI2 as the speed down command source and MI2 is ON, the speed command decreases according to the parameter setting in Up/ Down mode. If both MI sources of speed up and down are the same (MI1 = MI2 = ON or OFF), the speed command remains.
- 18: When selecting PID as the main frequency source, the frequency command source is the output of the PID function.
- The AC motor drive adopts function-specified AI setting and supports distinct functions to specify the same AI terminal, for example, you can set both Pr.C1-01 and C1-05 EX1 / EX2 main frequency source as AI2.

C1-02 EX1 Aux FREQ Src

(0x442) Default: 0

C1-06 EX2 Aux FREQ Src

(0x446) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Up/down keys
17: Pulse Train
18: PID

- This parameter selects EX1/ EX2 auxiliary frequency source.

C1-03 EX1 Aux FREQ Gain

(0x443) Default: 100.0

C1-07 EX2 Aux FREQ Gain

(0x447) Default: 100.0

Settings -200.0–200.00%

- This parameter sets the EX1/ EX2 auxiliary frequency gain.
- For example: Pr.C1-00 = 2 (ADD), Pr.C1-01 = 1 (Keypad), Pr.C1-02 = 7 (AI1), Pr.C1-03 = 10% and Pr.C2-17 = 50 Hz
  Main frequency: Keypad frequency F = 30 Hz
  Auxiliary frequency: AI1 = 5V, 30 Hz × 10% = 3 Hz

EX1 frequency command = main frequency + auxiliary frequency = 30 + 3 = 33 Hz

C1-08 Keypad FREQ Cmd

(0x448) Default: 60.00

Settings 0.00–599.00 Hz

This parameter displays the frequency command setting value of the main page when the frequency command source is Digital Keypad. Meanwhile, you can enter this parameter setting page to set the frequency command on the main page as well.

C1-09 FREQ Cmd REC

(0x449) Default: 60.00

Settings 0.00–599.00 Hz

This parameter displays the last frequency command setting value before power-off when the frequency command source is RS-485.

To run directly with the set value before the last power-off after the drive reboots, the drive needs to record the frequency command set before the power-off and use this recorded frequency command as the initial value of the frequency command after power-on.

C1-10 Zero-Speed Behavior

(0x44A) Default: 0

Settings 0: Output ready
1: Zero-speed run
2: Min output FREQ

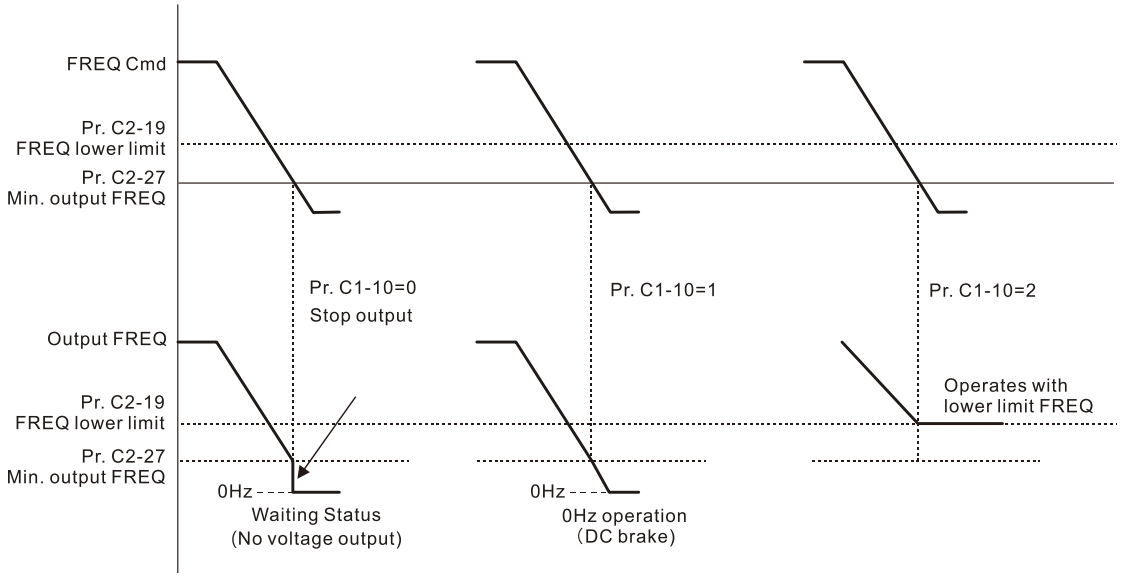
When the drive frequency command is < Fmin (Pr.C2-27), the drive activates according to the setting for this parameter.

0: the drive is in standby status (there is no voltage output from U, V and W)

1: in V/F, SVC and FOC Sensorless modes, the drive executes DC brake with VF minimum voltage (Pr.E0-14, E1-14, E2-14 and E3-14).

2: in V/F, SVC and FOC Sensorless modes, the drive operates according to Fmin (Pr.E0-13, E1-13, E2-13 and E3-13) and Vmin (Pr.E0-14, E1-14, E2-14 and E3-14).

Frequency command < Pr.C2-27 Min. output frequency:



C1-11 Pulse Train MI Src

(0x44B) Default: 0

Settings 0: Disable
1–5: Reserve
6: MI5

- This parameter enables the pulse train function.
- Use only MI5 terminal for pulse train input.

C1-12 Pulse Train Filter Time

(0x44C) Default: 0.100

Settings 0.000–65.535 sec.

- This parameter sets the filter time for pulse command.

C1-13 FREQ Cmd Up Key MI Src

(0x44D) Default: 0

C1-14 FREQ Cmd Down Key MI Src

(0x44E) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

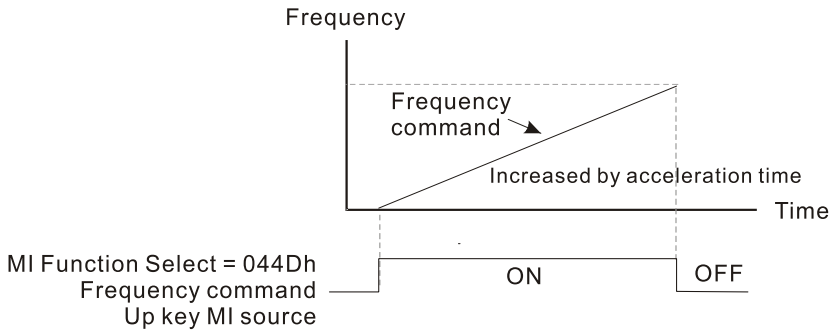
- You can choose up key or down key as the main frequency source.
- Use this parameter to select the MI source for frequency up and down command. For example:
  Pr.C1-13 = 2 (MI1): when the MI1 terminal is ON, sets the frequency up command with Up/Down mode.
  Pr.C1-14 = 3 (MI2): when the MI2 terminal is ON, sets the frequency down command with Up/Down mode.

C1-15 Up/Down Accel/ Decel Method

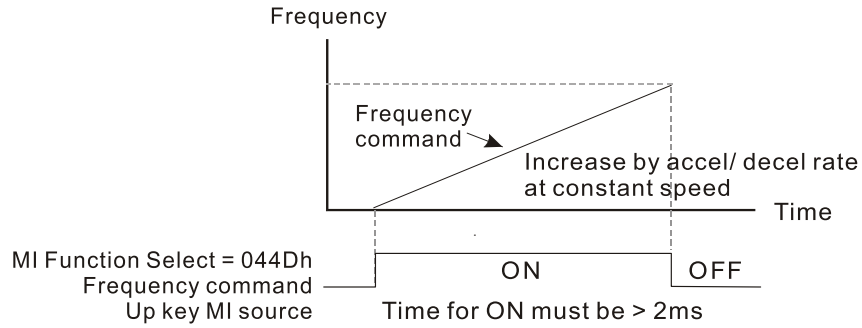
(0x44F) Default: 0

Settings 0: Accel/ Decel time
1: Up/Down Accel/Decel rate

- This parameter determines the up and down mode of the frequency command of the up/ down terminal.
- Pr.C1-15 = 0 (Accel/ Decel time): The up/ down terminal increases / decreases the frequency command (F) according to the setting for acceleration or deceleration time (refer to Pr.C2-00–C2-07).



📖 Pr.C1-15 = 1 (Up/ Down Accel/ Decel Rate): The up/ down terminal increases/ decreases the frequency command (F) according to the setting of Pr.C1-16 and Pr.C1-17.



C1-16 Up/Down Accel/ Decel Rate

(0x450) Default: 0.001

Settings 0.001–1.000 Hz/ms

C1-17 Up/Down Accel/ Decel Rate Unit

(0x451) Default: 0

Settings 0: Hz/ms
1: Hz/100ms

📖 When selecting up/down accel/ decel rate for the up/down mode, the frequency up/ down command is determined by the up/ down acceleration and deceleration rate and its units.

C1-18 Multi Speed Mode

(0x452) Default: 0

Settings 0: 16 Speed
1: 4 Speed

📖 Use this parameter to select 16 speed or 4 speed for the multi-speed mode.

C1-19 Multi Speed MI Src 1

(0x453) Default: 0

C1-20 Multi Speed MI Src 2

(0x454) Default: 0

C1-21 Multi Speed MI Src 3

(0x455) Default: 0

C1-22 Multi Speed MI Src 4

(0x456) Default: 0

Settings 0: Disable
1: Reserved
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

📖 Use Pr.C1-19–C1-22 to select the multi-speed MI source. Sets the operated speed through the MI terminal (use Pr.C1-18 to select 4 speed or 16 speed).

C1-23 Multi Speed 1

(0x457) Default: 0.00

C1-24 Multi Speed 2

(0x458) Default: 0.00

C1-25 Multi Speed 3

(0x459) Default: 0.00

C1-26 Multi Speed 4

(0x45A) Default: 0.00

C1-27 Multi Speed 5

(0x45B) Default: 0.00

C1-28 Multi Speed 6

(0x45C) Default: 0.00

C1-29 Multi Speed 7

(0x45D) Default: 0.00

C1-30 Multi Speed 8

(0x45E) Default: 0.00

C1-31 Multi Speed 9

(0x45F) Default: 0.00

C1-32 Multi Speed 10

(0x460) Default: 0.00

C1-33 Multi Speed 11

(0x461) Default: 0.00

C1-34 Multi Speed 12

(0x462) Default: 0.00

C1-35 Multi Speed 13

(0x463) Default: 0.00

C1-36 Multi Speed 14

(0x464) Default: 0.00

C1-37 Multi Speed 15

(0x465) Default: 0.00

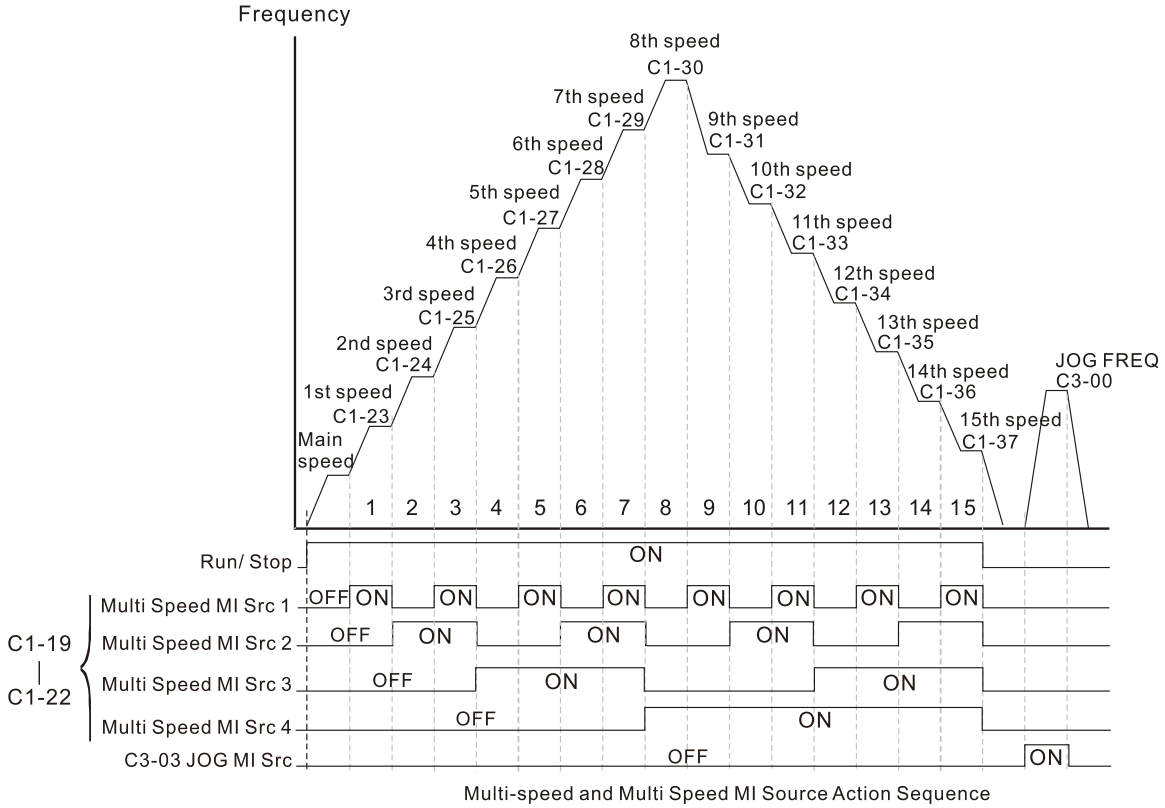
Settings 0.00–599.00 Hz

🕮 Sets Multi speed 1–15 separately with Pr.C1-23–C1-37.

🕮 Explanation for the timing diagram of the multi-step speed and multi speed MI source:

Related parameters:

- Pr.C1-23–C1-37: Multi speed 1–15
- Pr.C1-19–C1-22: Multi Speed MI Src 1–4
- The figure below shows the multi-speed via external terminals sequence and the multi-speed switching combination.



Multi-speed and Multi Speed MI Source Action Sequence

C1-38 Negative FREQ Cmd Define

(0x466) Default: 0

Settings 0: Always 0 Hz

1: Negative is reverse

🕮 This parameter defines the action when AI is set as negative frequency command.

🕮 For the analog input (AI) frequency source that has positive/ negative frequency commands and accepts forward/ reverse command, it operates according to Pr.C1-38 setting.

When Pr.C1-38 = 0, the negative frequency command is not accepted and will be regarded as 0 Hz command. The drive operation direction is determined by the forward/ reverse command.

When Pr.C1-38 = 1, the negative frequency command is accepted. The positive and negative signals of the frequency command determine the drive operating in forward/ reverse direction and the forward/ reverse command is invalid at this moment.

For example: when the analog input frequency command is -30 Hz:
Pr.C1-38 = 0: the drive operates according to the setting for Pr.C1-10 Zero-speed Behavior.
Pr.C1-38 = 1: the drive operates in reverse for 30 Hz.

C1-39 AI Res Switch MI Src

(0x467) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

Use Pr.C1-39 to enable or disable the AI resolution switch function, or to select the MI terminal that is going to enable.

C1-40 AI Res Switch Max FREQ

(0x468) Default: 60.00

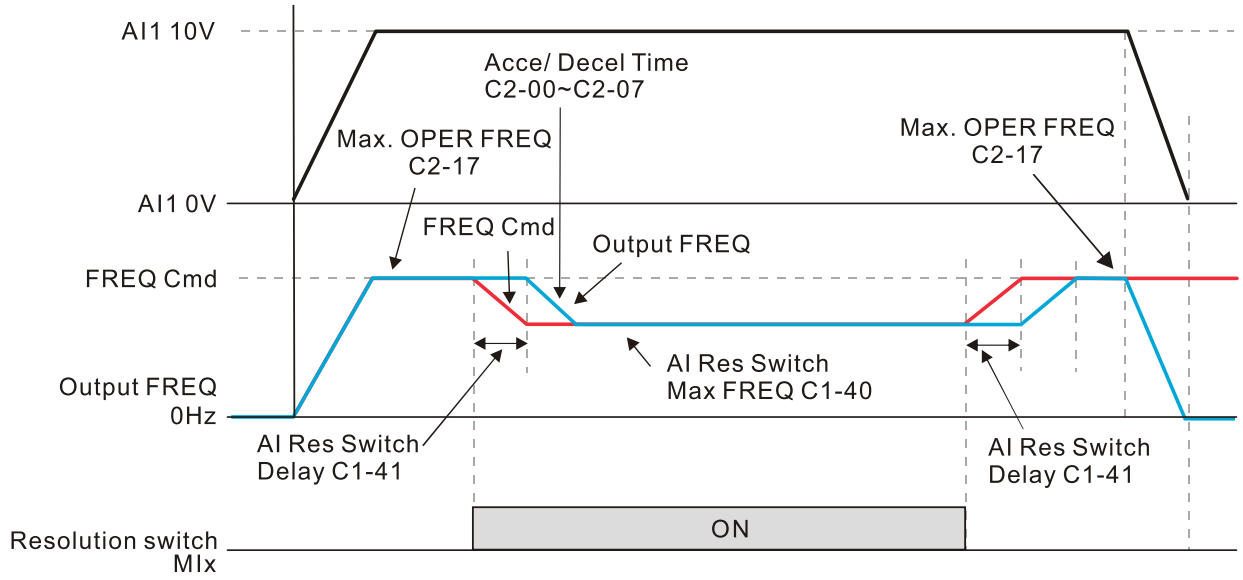
Settings 0.00–599.00 Hz

C1-41 AI Res Switch Delay

(0x469) Default: 0.000

Settings 0.000–65.000 sec.

Complements the unstable speed or positioning caused by insufficient analog input resolution, use it with Pr.C1-39 enabling the AI resolution switch function.



C1-42 User-Defined FREQ Cmd Unit

(0x46A) Default: 0

Settings 0: Hz
1: %

C1-43 User-Defined FREQ Cmd Upper Limit

(0x46B) Default: 100.00

Settings 0.00–655.35

C1-44 User-Defined FREQ Cmd Decimal Point

(0x46C) Default: 2

Settings 1: One decimal point
2: Two decimal points

- Pr.C1-42–C1-44 are parameters of physical quantity conversion function, which has no direct correlation with PID physical quantity unit. To use PID physical quantity conversion, set parameters in Group P for further setting.
- The physical quantity conversion function converts the physical quantity to a frequency command and sends it to the drive. When the controller sends a percentage (%) command to the drive, the drive responds to the F frequency command value (Hz). Set Pr.C1-42 = 1 (%) to use this function.
- The above conversion function is only valid when the frequency command source is communication and using 2001H as the communication address.
- Pr.C1-42 – C1-44 are correlative parameters. When the physical quantity conversion function is enabled (Pr.C1-42 = 1), the upper limit (Pr.C1-43) has different range according to the setting of the decimal points (Pr.C1-44).

C2. Accel / Decel & Speed Limit

You can set this parameter during operation

C2-00 Accel Time 1

(0x480)

C2-01 Decel Time 1

(0x481)

C2-02 Accel Time 2

(0x482)

C2-03 Decel Time 2

(0x483)

C2-04 Accel Time 3

(0x484)

C2-05 Decel Time 3

(0x485)

C2-06 Accel Time 4

(0x486)

C2-07 Decel Time 4

(0x487)

Default: 10.00

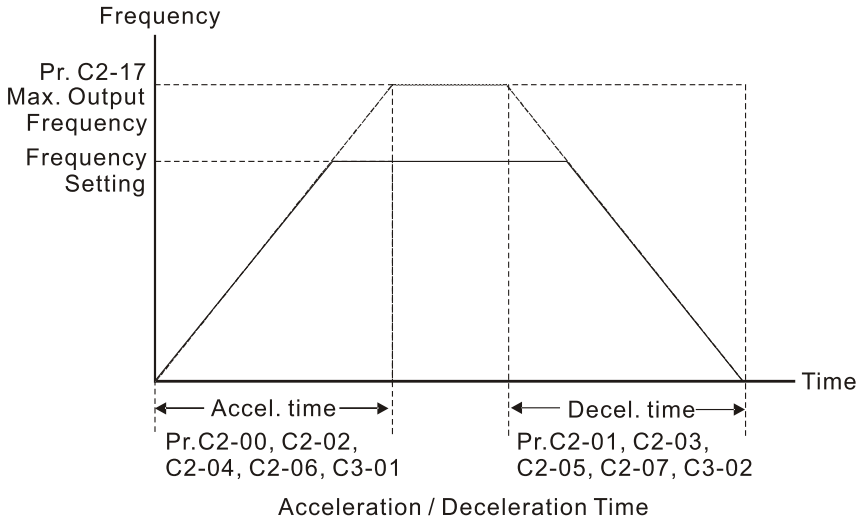
Default: 60.00

(30HP and above models)

Settings Pr.C2-13 = 0: 0.00–600.00 sec.

Pr.C2-13 = 1: 0.0–6000.0 sec.

The acceleration time determines the time required for the AC motor drive to ramp from 0.00 Hz to the maximum operation frequency (Pr.C2-17). The deceleration time determines the time required for the AC motor drive to decelerate from the maximum operation frequency (Pr.C2-17) down to 0.00 Hz.



The deceleration time is invalid when using auto-deceleration setting.

With the enabled torque limits and stall prevention functions, the actual acceleration and deceleration time are longer than the set acceleration/ deceleration time.

Setting the acceleration and deceleration time too short may trigger the drive protection function (Pr.H2-05 Over-current Stall Prevention during Acceleration or Pr.H1-08 Over-voltage Stall

Prevention); therefore, the actual acceleration/ deceleration time will be longer than the set acceleration/ deceleration time.

- Setting the acceleration time too short may cause motor damage or trigger drive protection due to over-current during the drive acceleration.
- Setting the deceleration time too short may cause motor damage or trigger drive protection due to over-current during the drive deceleration or over-voltage of DC bus.
- The default is Accel/ Decel Time 1 (Pr.C2-00, C2-01). You can select the other Accel/ Decel Time 2–4 (Pr. C2-02–C2-07) of the drive by setting the multi-function terminal and its digital status. There are four acceleration and deceleration selections in total.
- When you use this function with the S-curve acceleration/ deceleration (Pr. C2-08–Pr. C2-11), the actual acceleration and deceleration time are longer than the setting.

C2-08 Start of Accel S-curve Time

(0x488) Default: 0.20 / 0.2

C2-09 End of Accel S-curve Time

(0x489) Default: 0.20 / 0.2

C2-10 Start of Decel S-curve Time

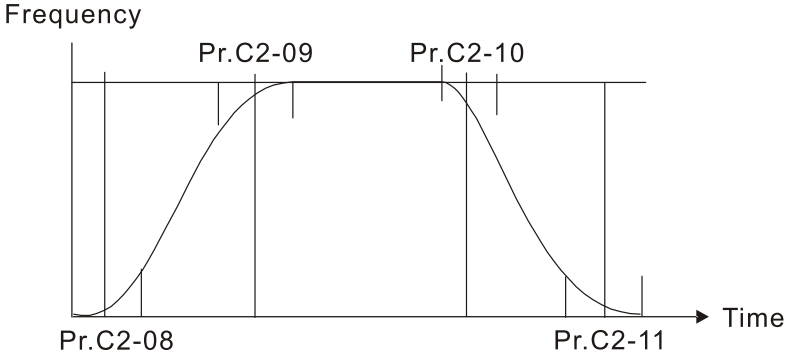
(0x48A) Default: 0.20 / 0.2

C2-11 End of Decel S-curve Time

(0x48B) Default: 0.20 / 0.2

Settings Pr.C2-13 = 0: 0.00–25.00 sec.
Pr.C2-13 = 1: 0.0–250.0 sec.

- Using the S-curve acceleration/ deceleration time can reduce the impact of the drive when it starts to accelerate or stops.
- The acceleration and deceleration curve adjusts the acceleration and deceleration S-curve. When enabled, the drive produces a different acceleration and deceleration curve according to the acceleration and deceleration time.
- The S-curve function is invalid when you set the acceleration and deceleration time to 0.
- When Pr.C2-00, C2-02, C2-06 and C2-06 ≥ Pr.C2-08 and C2-09, the actual acceleration time is as follows:
  The actual acceleration time = Pr.C2-00, C2-02, C2-04, C2-06 + (Pr.C2-08 + C2-09) ÷ 2
- When Pr.C2-01, C2-03, C2-07 and C2-06 ≥ Pr.C2-10 and C2-11, the actual deceleration time is as follows:
  The actual deceleration time = Pr.C2-01, C2-03, C2-05, C2-07 + (Pr.C2-10 + C2-11) ÷ 2



C2-12 Accel/ Decel 1/4 Switch FREQ

(0x48C) Default: 0.00

Settings 0.00–599.00 Hz

This function does not require the external terminal switching function; it switches the acceleration and deceleration time automatically according to the Pr.C2-12 setting. If you set the external terminal, the external terminal has priority over Pr.C2-12.

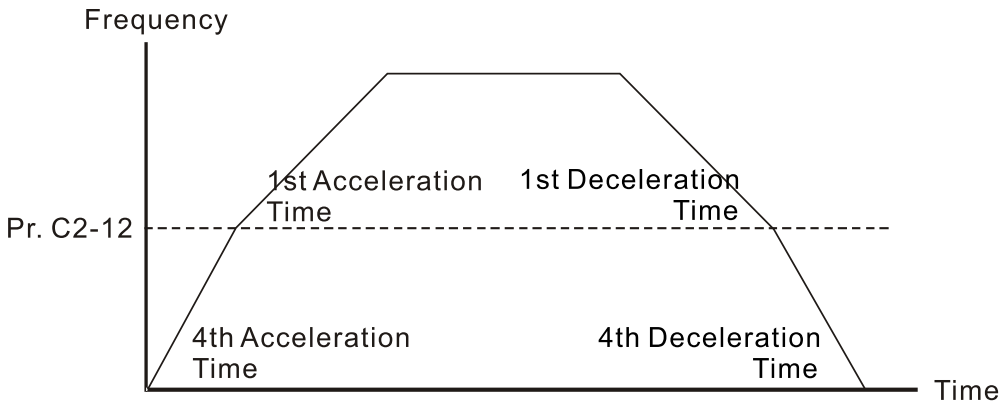
Use this parameter to set the switch frequency between acceleration and deceleration slope. The First / Fourth Accel. / Decel. slope is calculated by the Max. Operation Frequency (Pr.C2-17) ÷ acceleration / deceleration time.

Example:

When the Max. Operation Frequency (Pr.C2-17) = 80 Hz, and Accel/ Decel 1/4 Switch Frequency (Pr.C2-12) = 40 Hz:

a. If Acceleration Time 1 (Pr.C2-00) = 10 sec., Acceleration Time 4 (Pr.C2-06) = 6 sec., then the acceleration time is 3 sec. for 0–40 Hz and 5 sec. for 40–80 Hz.

b. If Deceleration Time 1 (Pr.C2-01) = 8 sec., Deceleration Time 4 (Pr.C2-07) = 2 sec., then the deceleration time is 4 sec. for 80–40 Hz and 1 sec. for 40–0 Hz.



1st/4th Acceleration/Deceleration Frequency Switching

C2-13 Accel/ Decel Time unit

(0x48D) Default: 0

Settings 0: 0.01 sec.

1: 0.1 sec.

Selects the numerical unit of the acceleration/ deceleration time.

C2-14 Quick Stop Time

(0x48E) Default: 10

Default: 60.00

(30HP and above models)

Settings Pr.C2-13 = 0: 0.00–600.00 sec.

Pr.C2-13 = 1: 0.0–6000.0 sec.

When using quick stop, Pr.C2-14 determines the time required for the AC motor drive to decelerate from the maximum operation frequency (Pr.C2-17) down to 0.00 Hz.

C2-15 Accel/ Decel Switch MI Src 1

(0x48F) Default: 0

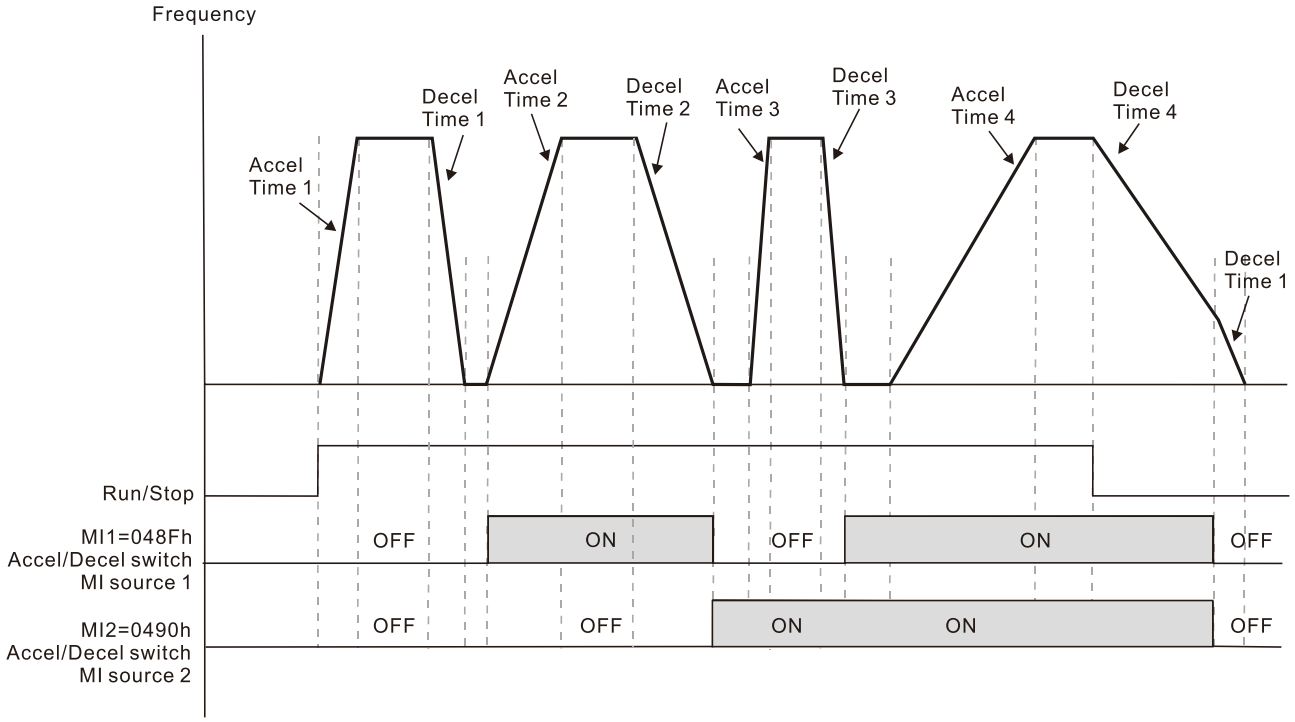
C2-16 Accel/ Decel Switch MI Src 2

(0x490) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

Use Pr.C2-15–C2-16 to select the acceleration/ deceleration switch MI source. You can select the acceleration and deceleration time (Pr.C2-00–C2-07) of the drive from the digital status of the MI terminals.

MI Source 1 Status	MI Source 2 Status	Accel/ Decel Time Selection
OFF	OFF	Accel/ Decel Time 1 (Pr.C2-00–C2-01)
ON	OFF	Accel/ Decel Time 2 (Pr.C2-02–C2-03)
OFF	ON	Accel/ Decel Time 3 (Pr.C2-04–C2-05)
ON	ON	Accel/ Decel Time 4 (Pr.C2-06–C2-07)



C2-17 Max. OPER FREQ

(0x491) Default: 60.00

Settings 0.00–599.00 Hz

Sets the maximum operation frequency of the drive. All the AC motor drive frequency command sources (analog inputs 0–10 V, 4–20 mA, 0–20 mA, ±10 V) are scaled to correspond to the output frequency range.

Maximum operation frequency vs. Carrier:

Carrier Setting	Max. Output Frequency
2k	200 Hz
3k	300 Hz
4k	400 Hz
5k	500 Hz
6k	599 Hz

There is no limit to Pr.C2-17 Max. Operation Frequency setting. However, when the relation between the set carrier and the maximum operation frequency does not match, the actual output frequency will be limited to the max. operation frequency corresponding to the carrier.

For example:

Pr.C2-17 = 400.00 Hz, when the carrier is set as 2 kHz, the maximum output frequency = 200.00 Hz.

If the drive can only operate at 200.00 Hz and F = 400.00 Hz, the actual output frequency is displayed as H = 200.00 Hz.

C2-18 FREQ Upper Limit

(0x492) Default: 599.00

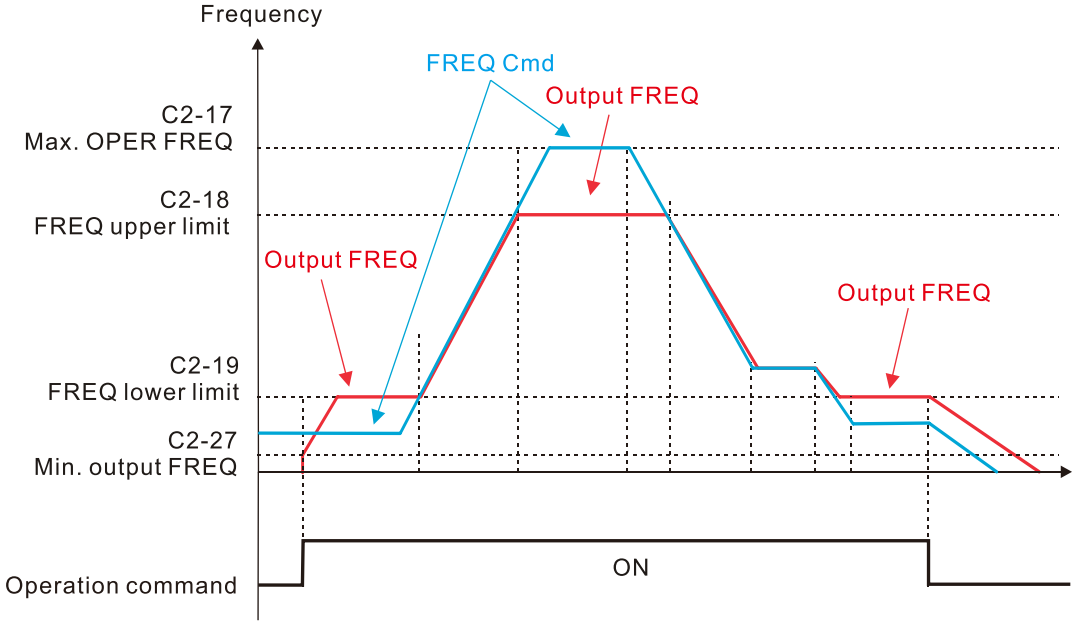
Settings Frequency lower limit–599.00 (Hz)

C2-19 FREQ Lower Limit

(0x493) Default: 0.00

Settings 0.00–Frequency upper limit (Hz)

If the output frequency setting is higher than the upper limit (Pr.C2-18), the drive runs with the frequency upper limit. If the output frequency setting is lower than the lower limit (Pr.C2-19) but higher than the minimum output frequency (Pr.C2-27), the drive runs with the frequency lower limit. (Pr.C2-18 setting value must be > Pr.C2-19 setting value).



Use the output frequency upper and lower limit settings to prevent operator misuse, overheating caused by the motor's operating at a too low frequency, or mechanical wear due to a too high speed.

- If the frequency upper limit setting is 50 Hz and the frequency setting is 60 Hz, the maximum operation frequency is 50 Hz.
- If the frequency lower limit setting is 10 Hz and the minimum output frequency setting (Pr.C2-27) is 1.5 Hz, then the drive operates at 10 Hz when the Frequency command is higher than Pr.C2-27 but lower than 10 Hz. If the Frequency command is lower than Pr.C2-27 (Min. Output Frequency), the drive selects the action according to Pr.C1-10 (Zero-speed Behavior).

C2-20 Start FREQ

(0x494) Default: 0.50

Settings 0.00–motor's max. operation frequency (Hz)

- When the starting frequency is larger than the minimum output frequency, the drive frequency output starts when the starting frequency reaches the F command.
- Refer to Pr.C2-27 for the relation between the minimum output frequency, frequency lower limit, start frequency, frequency command and the actual output frequency.

C2-21 Skip FREQ 1 Upper Limit

(0x495) Default: 0

Settings Skip frequency 1 lower limit–motor's max. operation frequency (Hz)

C2-22 Skip FREQ 1 Lower Limit

(0x496) Default: 0

Settings 0–Skip frequency 1 upper limit (Hz)

C2-23 Skip FREQ 2 Upper Limit

(0x497) Default: 0

Settings Skip frequency 2 lower limit–motor's max. operation frequency (Hz)

C2-24 Skip FREQ 2 Lower Limit

(0x498) Default: 0

Settings 0–Skip frequency 2 upper limit (Hz)

C2-25 Skip FREQ 3 Upper Limit

(0x499) Default: 0

Settings Skip frequency 3 lower limit–motor's max. operation frequency (Hz)

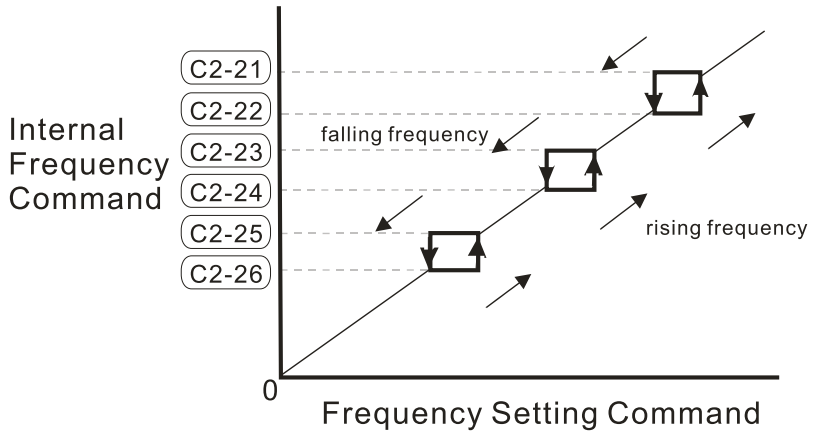
C2-26 Skip FREQ 3 Lower Limit

(0x49A) Default: 0

Settings 0–Skip frequency 3 upper limit (Hz)

- Sets the skip frequency ranges for the AC motor drive. Provides three sets of skip frequency parameters for setting, and the range of the three sets of kip frequency setting ranges are allowed to overlap. However, between the same set of skip frequency, the lower limit value must be smaller than the upper limit value.
- The skip frequencies are useful when a motor has resonance vibration at a specific frequency bandwidth. Skipping this frequency avoids the vibration. There are three frequency skip zones available.
- You can set the Frequency command (F) within the range of skip frequencies. Then the output frequency (H) is limited to the lower limit of skip frequency ranges.

🕮 During acceleration and deceleration, the output frequency still passes through the skip frequency ranges.



C2-27 Min Output FREQ

(0x49B) Default: 0.50

Settings 0.00–motor's max. operation frequency (Hz)

🕮 When the drive executes the stop action and the speed planning command is lower than the minimum output frequency, it is regarded as the completion of the stop, and the drive is in the stop output control status. When the speed command is set as 0 for zero-speed control and the speed planning command is lower than the minimum output frequency, it is regarded as entering zero-speed operation. Refer to Pr.C1-10 for zero-speed operation description.

🕮 Relation between speed command upper and lower limits/ start speed and minimum output frequency:

a. If the frequency command is < min. output frequency when starting up, the drive directly enters zero-speed operation at start, if it is during the operation, the drive enters zero-speed operation after decelerating to the min. output frequency. For zero-speed operation behavior, refer to Pr.C1-10 Zero-speed Behavior.

b. When starting up the drive, if the frequency command is > the min. output frequency and the start frequency is > the min. output frequency, the drive operates with the start speed; if the frequency command is > the min. output frequency and the start frequency is < the min. output frequency, the drive operates with the minimum frequency.

c. If the frequency lower limit is > min. output frequency, when the frequency command < min. output frequency, the drive operates according to the frequency lower limit.

d. Refer to the diagram below for the relation between frequency upper and lower limits/ start frequency and minimum output frequency.

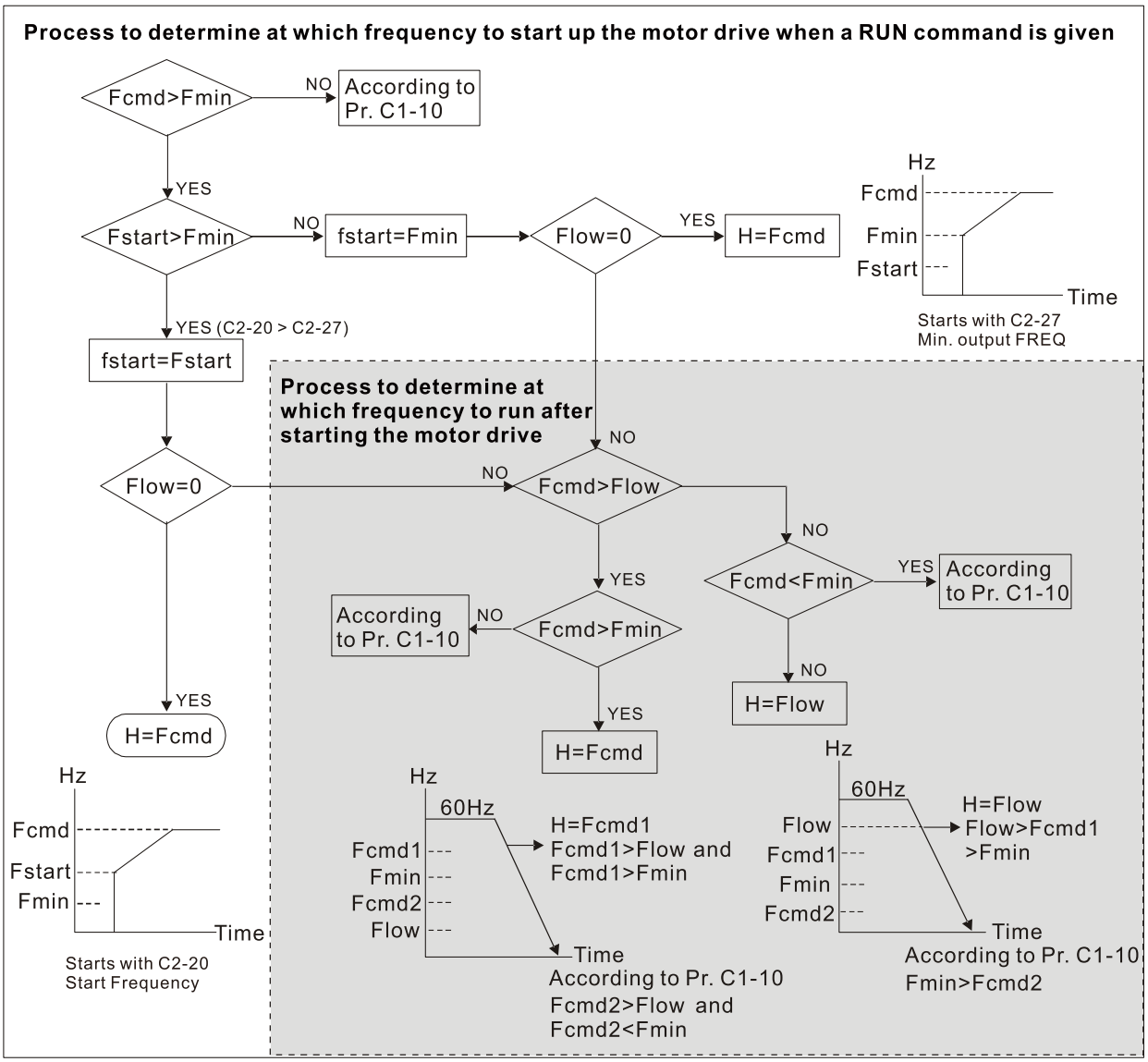
Fcmd: frequency command

Fstart: start-up frequency (Pr.C2-20)

fstart: actual start-up frequency of the drive

Fmin: min. output frequency (Pr.C2-27)

Flow: output frequency lower limit (Pr.C2-19)



- When Fcmd > Fmind and Fcmd < Fstart:
  If Fcmd > Flow, the drive runs directly by Fcmd. If Flow ≥ Fcmd, the drive runs with Fcmd, and then rises to Flow according to acceleration time.
- The drive's output frequency goes directly to 0 when decelerating to Fmin.

C3. JOG Setting

You can set this parameter during operation

C3-00 JOG FREQ

(0x4C0) Default: 6.00

Settings 0.00–Max. operation frequency (Hz)

C3-01 JOG Accel Time

(0x4C1) Default: 10.00 / 10.0

C3-02 JOG Decel Time

(0x4C2) Default: 10.00 / 10.0

Settings Pr.C2-13 = 0: 0.00–600.00 sec.

Pr.C2-13 = 1: 0.0–6000.0 sec.

C3-03 JOG MI Src

(0x4C3) Default: 0

Settings 0: Disable

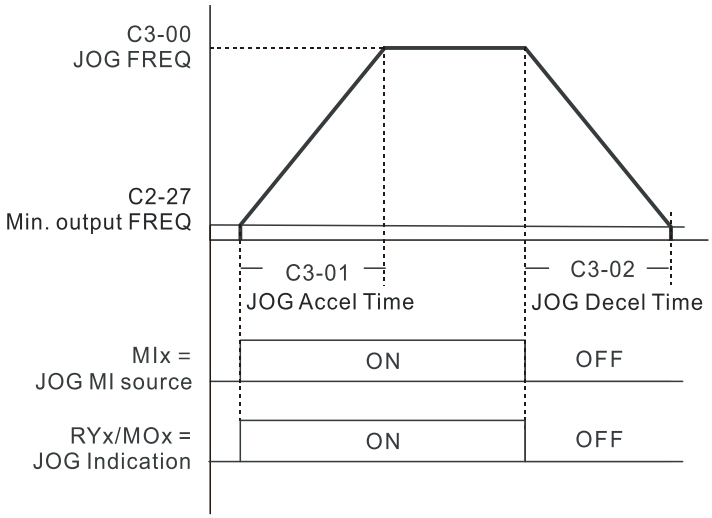
1: Reserved

2–7: MI1–MI6

5–9: Reserved

10–15: MI10–MI15

- When using JOG function, you can execute JOG operation by selecting the MI source through parameters or using the F3 key on the digital keypad KPV-CC01.
- When the switch of JOG MI terminal is ON, the AC motor drive accelerates from 0 Hz to the JOG frequency (Pr.C3-00). When the switch of JOG MI terminal is OFF, the AC motor drive decelerates from the JOG frequency to stop.
- The drive does not execute JOG command during normal operation. If the drive receives a normal operation command as the operation source during the JOG operation, the drive executes normal operation.
- The JOG acceleration/ deceleration time (Pr.C3-01, C3-02) is the time for the drive accelerates from 0.0 Hz to Pr.C3-00 JOG frequency.
- The JOG MI terminal is valid when the source of the operation command is the external terminal.
- The JOG operation can only be executed when the drive is at STOP status or when there is no RUN command.



C3-04 JOG Indn

(0x4C4) Default: 0

Settings	0: Disable
	1–2: Relay1–Relay2
	3–4: MO1–MO2
	5–9: Reserved
	10–15: MO/Relay10–15

- This parameter selects the JOG indication source.
- When the drive executes JOG command, the selected contact is ON.

d. Motor Parameter

∗ d0. IM Switching

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

d0-00 IM 1–4 Sel

(0x640) Default: 1

Settings 1: IM1
2: IM2
3: IM3
4: IM4
5: IM1/ IM2 switch
6: IM1–IM4 switch
7: IM Y-D switch enable

🕮 5: Use a set of MI to switch IM1 and IM2 according to the IM Switch Src 1 (Pr.d0-01) as follows:

Induction Motor	IM Switch MI Src 1 (Pr.d0-01)
IM1	OFF
IM2	ON

🕮 6: Use two sets of MI to switch IM1–4 according to the IM Switch Src 1/ 2 (Pr.d0-01 and d0-02) as follows:

Induction Motor	IM Switch MI Src 1 (Pr.d0-01)	IM Switch MI Src 2 (Pr.d0-02)
IM1	OFF	OFF
IM2	ON	OFF
IM3	OFF	ON
IM4	ON	ON

🕮 7: Enable IM Y-D switch according to Pr.d0-03 (Y-D Switch FREQ).

↗ d0-01 IM Switch MI Src 1

(0x641) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

↗ d0-02 IM Switch MI Src 2

(0x642) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

d0-03 Y-D Switch FREQ

(0x643) Default: 60.00

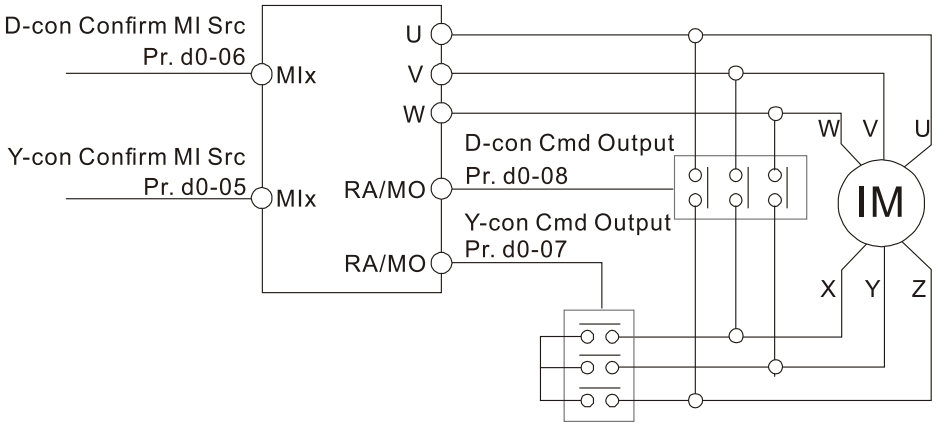
Settings 0.00–599.00 Hz

d0-04 Y-D Switch Delay Time

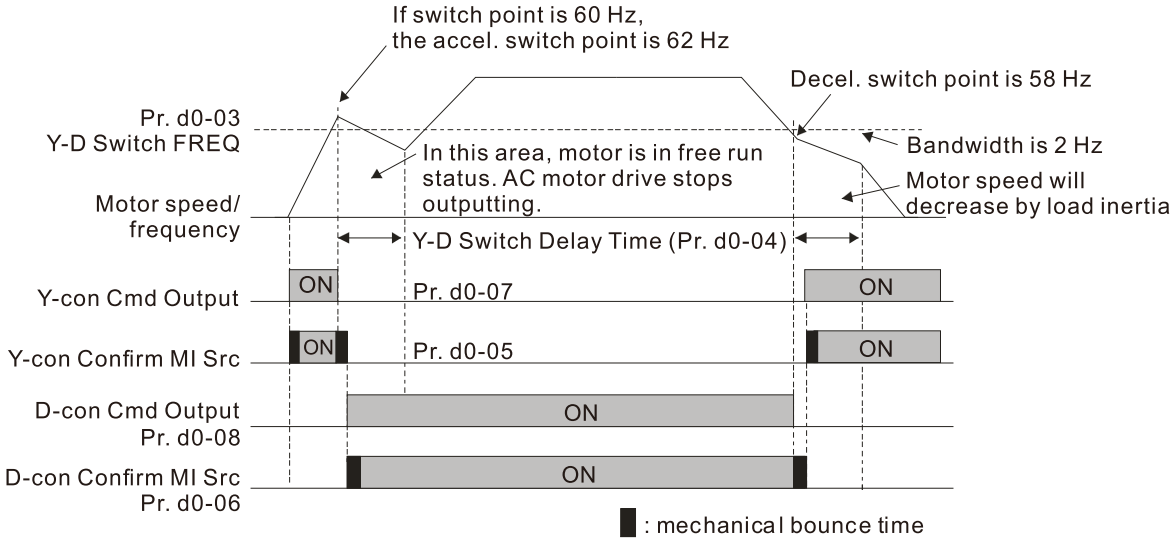
(0x644) Default: 0.200

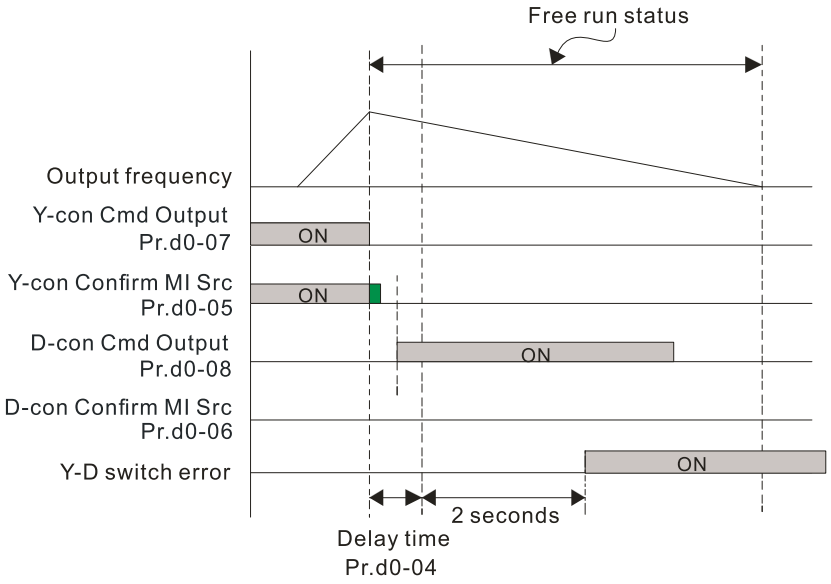
Settings 0.000–60.000 sec.

- You can apply Pr.d0-00 = 7, d0-03 and d0-04 in a wide range of motors, and the motor coil executes the Y-connection/ D-connection switch as required. (The wide range motors are related to the motor design. In general, the motor has higher torque with low-speed Y-connection and has higher speed with high-speed D-connection.)
- Set Pr.d0-00 as 7 to enable and disable the switch of Y-connection/ D-connection.
- When you set Pr.d0-00 as 7, the drive uses Pr.d0-03 setting and current motor frequency to switch the current motor to Y-connection or D-connection. You can switch the relevant motor parameter settings simultaneously.
- Pr.d0-04 sets the switch delay time of Y-connection and D-connection.
- When the output frequency reaches Y-connection/ D-connection switch frequency, the drive delays according to Pr.d0-04 before activating the multi-function output terminals.



Y-D connection switch: can be used for wide range motor
Y-connection for low speed: higher torque can be used for rigid tapping
D-connection for high speed: higher torque can be used for high-speed drilling





d0-05 Y-con Confirm MI Src

(0x645) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

d0-06 D-con Confirm MI Src

(0x646) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

d0-07 Y-con Cmd Output

(0x647) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

d0-08 D-con Cmd Output

(0x648) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

d1. IM1 Parameter & Autotune

d1-00 IM Autotune

(0x680) Default: 0

Settings 0: Disable
1: IM static autotune
2: IM simple active autotune
3: IM advanced active autotune
4: Reserve

📖 Refer to Chapter 5 “Initial Operation and Adjustment” for details of motor adjustment process.

d1-01 IM1 Rated Power

(0x681) Default: Depending on the models

Settings 0.0–6553.5 kW

📖 Sets the IM rated power. The default is the power value of the drive.

d1-02 IM1 Rated Current

(0x682) Default: Depending on the models

Settings Depending on the models–6553.5 A

📖 Set this value according to the rated current of the motor as indicated on the motor nameplate. Default of the motor rated current is 90%, the maximum value is 120% and the minimum value is 40%.

d1-03 IM1 Rated Voltage

(0x683) Default: Depending on the models

Settings Depending on the models (V)

📖 Sets the rated voltage for the motor as indicated on the motor nameplate. The default is the rated voltage of the drive.

📖 When setting Pr.d1-03, Pr.E0-02 IM1 VF Max. Voltage will be changed simultaneously.

d1-04 IM1 Rated Speed

(0x684) Default: Depending on the number of poles

Settings 0–Depending on the number of poles (rpm)

📖 Sets the IM rated operation speed.

d1-05 IM1 Rated FREQ

(0x685) Default: 60.00

Settings 0.00–599.00 Hz

📖 Sets the IM rated operation frequency.

📖 When setting Pr.d1-05, Pr.E0-01 IM1 VF Max. FREQ will be changed simultaneously.

d1-06 IM1 Pole Number

(0x686) Default: 4

Settings 2–64 poles

🕮 Sets the pole number for the IM rotor. It cannot be an odd number.

d1-07 IM1 No-Load Current

(0x687) Default: Depending on the models

Settings 0.0–6553.5 A

🕮 Sets the no-load Current for the IM. For models with 110 kW and above, the default is 20% of the motor rated current.

d1-08 IM1 Rs

(0x688) Default: Depending on the models

Settings 0.000–65.535 Ω

🕮 Sets the stator resistance of the motor with parameter auto-tuning, and it can be detected automatically.

d1-09 IM1 Rr

(0x689) Default: Depending on the models

Settings 0.000–65.535 Ω

🕮 Sets the rotor resistance of the motor with parameter auto-tuning, and it can be detected automatically.

d1-10 IM1 Lm

(0x68A) Default: Depending on the models

Settings 0.0–6553.5 mH

🕮 Sets the magnetizing inductance of the motor with parameter auto-tuning, and it can be detected automatically.

d1-11 IM1 Lx

(0x68B) Default: Depending on the models

Settings 0.0–6553.5 mH

🕮 Sets the stator inductance of the motor with parameter auto-tuning, and it can be detected automatically.

∗d2. IM2 Parameter & Autotune

∗ Advanced parameters, set Pr.b0-00 to unlock

d2-00 IM2 Rated Power

(0x6C0) Default: Depending on the models

Settings 0.0–6553.5 kW

📖 Sets the IM rated power. The default is the power value of the drive.

d2-01 IM2 Rated Current

(0x6C1) Default: Depending on the models

Settings Depending on the models (V)

📖 Set this value according to the rated current of the motor as indicated on the motor nameplate. Default of the motor rated current is 90%, the maximum value is 120% and the minimum value is 40%.

d2-02 IM2 Rated Voltage

(0x6C2) Default: Depending on the models

Settings Depending on the models (V)

📖 Sets the rated voltage for the motor as indicated on the motor nameplate. The default is the rated voltage of the drive.

d2-03 IM2 Rated Speed

(0x6C3) Default: Depending on the number of poles

Settings 0–Depending on the number of poles (rpm)

📖 Sets the IM rated operation speed.

d2-04 IM2 Rated FREQ

(0x6C4) Default: 60.00

Settings 0.00–599.00 Hz

📖 Sets the IM rated operation frequency.

d2-05 IM2 Pole Number

(0x6C5) Default: 4

Settings 2–64 poles

📖 Sets the pole number for the IM rotor. It cannot be an odd number.

d2-06 IM2 No-Load Current

(0x6C6) Default: Depending on the models

Settings 0–Depending on the rated current (A)

📖 Sets the no-load Current for the IM. For models with 110 kW and above, the default is 20% of the motor rated current.

d2-07 IM2 Rs

(0x6C7) Default: Depending on the models

Settings 0.000–65.535 Ω

📖 Sets the stator resistance of the motor with parameter auto-tuning, and it can be detected automatically.

d2-08 IM2 Rr

(0x6C8) Default: Depending on the models

Settings 0.000–65.535 Ω

📖 Sets the rotor resistance of the motor with parameter auto-tuning, and it can be detected automatically.

d2-09 IM2 Lm

(0x6C9) Default: 0

Settings 0.0–6553.5 mH

📖 Sets the magnetizing inductance of the motor with parameter auto-tuning, and it can be detected automatically.

d2-10 IM2 Lx

(0x6CA) Default: 0

Settings 0.0–6553.5 mH

📖 Sets the stator inductance of the motor with parameter auto-tuning, and it can be detected automatically.

∗d3. IM3 Parameter & Autotune

∗ Advanced parameters, set Pr.b0-00 to unlock

d3-00 IM3 Rated Power

(0x700) Default: Depending on the models

Settings 0.0–6553.5 kW

d3-01 IM3 Rated Current

(0x701) Default: Depending on the models

Settings Depending on the models (V)

d3-02 IM3 Rated Voltage

(0x702) Default: Depending on the models

Settings Depending on the models (V)

d3-03 IM3 Rated Speed

(0x703) Default: Depending on the number of poles

Settings 0–Depending on the number of poles (rpm)

d3-04 IM3 Rated FREQ

(0x704) Default: 60.00

Settings 0.00–599.00 Hz

d3-05 IM3 Pole Number

(0x705) Default: 4

Settings 2–64 poles

d3-06 IM3 No-Load Current

(0x706) Default: Depending on the models

Settings 0–Depending on the rated current (A)

d3-07 IM3 Rs

(0x707) Default: Depending on the models

Settings 0.000–65.535 Ω

d3-08 IM3 Rr

(0x708) Default: Depending on the models

Settings 0.000–65.535 mH

d3-09 IM3 Lm

(0x709) Default: 0.0

Settings 0.0–6553.5 mH

d3-10 IM3 Lx

(0x70A) Default: 0.0

Settings 0.0–6553.5 mH

📖 Refer to descriptions of Parameter Group d2 (IM2 Parameter & Autotune).

∗d4. IM4 Parameter & Autotune

∗ Advanced parameters, set Pr.b0-00 to unlock

d4-00 IM4 Rated Power

(0x740) Default: Depending on the models

Settings 0.0–6553.5 kW

d4-01 IM4 Rated Current

(0x741) Default: Depending on the models

Settings Depending on the models (V)

d4-02 IM4 Rated Voltage

(0x742) Default: Depending on the models

Settings Depending on the models (V)

d4-03 IM4 Rated Speed

(0x743) Default: Depending on the number of poles

Settings 0–Depending on the number of poles (rpm)

d4-04 IM4 Rated FREQ

(0x744) Default: 60.00

Settings 0.00–599.00 Hz

d4-05 IM4 Pole Number

(0x745) Default: 4

Settings 2–64 poles

d4-06 IM4 No-Load Current

(0x746) Default: Depending on the models

Settings 0–Depending on the rated current (A)

d4-07 IM4 Rs

(0x747) Default: Depending on the models

Settings 0.000–65.535 Ω

d4-08 IM4 Rr

(0x748) Default: Depending on the models

Settings 0.000–65.535 Ω

d4-09 IM4 Lm

(0x749) Default: 0

Settings 0.0–6553.5 mH

d4-10 IM4 Lx

(0x74A) Default: 0

Settings 0.0–6553.5 mH

📖 Refer to descriptions of Parameter Group d2 (IM2 Parameter & Autotune).

d5. SM Parameter & Autotune

d5-00 SM Autotune

(0x780) Default: 0

Settings 0: Disable
1: SM static autotune
2: SM blocked rotor autotune
3: SM active autotune
4: Reserve

📖 Refer to Chapter 5 “Initial Operation and Adjustment” for details of motor adjustment process.

d5-01 SM Rated power

(0x781) Default: Depending on the models

Settings 0.1–6553.5 kW

📖 Sets the SM rated power. The default is the power value of the drive.

d5-02 SM Rated Current

(0x782) Default: Depending on the models

Settings Depending on the models (V)

📖 Set this value according to the rated current of the motor as indicated on the motor nameplate. Default of the motor rated current is 90%, the maximum value is 120% and the minimum value is 40%.

d5-03 SM Rated Voltage

(0x783) Default: Depending on the models

Settings Depending on the models (V)

📖 Sets the rated voltage for the motor as indicated on the motor nameplate.

d5-04 SM Rated Speed

(0x784) Default:
PM: 1800/ SynRM: 1500

Settings 0–65535 rpm

📖 Sets the rated speed for the SM.

d5-05 SM Pole Number

(0x785) Default:
PM: 8/ SynRM: 4

Settings 2–65535 poles

📖 Sets the pole number for the SM rotor. It cannot be an odd number.

d5-06 SM Rs

(0x786) Default: 1.000

Settings 0–65.535 Ω (Digit of the decimal points varies with the motor's power)

📖 Sets the stator resistance of the motor with parameter auto-tuning, and it can be detected automatically.

d5-07 SM Ld

(0x787) Default: 10.00

Settings 0.00–655.35 mH

📖 Sets the d-axis inductance of the motor with parameter auto-tuning, and it can be detected automatically.

d5-08 SM Lq

(0x788) Default: 10.00

Settings 0.00–655.35 mH

📖 Sets the q-axis inductance of the motor with parameter auto-tuning, and it can be detected automatically.

d5-10 SM BEMF Constant

(0x78A) Default: 0

Settings 0–6553.5 V/krpm

📖 Permanent magnet motor parameter Ke ($V_{phase,\ rms}$/ krpm).

📖 When Pr.d5-00 = 3, parameter Ke is calculated according to the motor's actual operation and can be detected automatically.

📖 When Pr.d5-00 = 1 or 2, parameter Ke is automatically calculated according to the motor power, rated current and rotor speed.

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E. VF Control & SVC

E0. IM1 VF Control & SVC

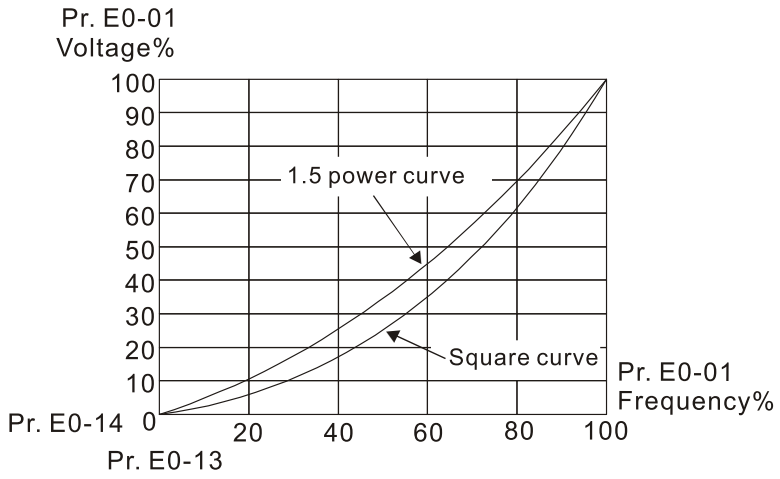
You can set this parameter during operation

E0-00 IM1 VF Curve Sel

(0x840) Default: 0

Settings
0: Manual VF curve
1: 1.5th power V/F curve
2: 2nd power V/F curve
3: 60 Hz with rated 50 Hz
4: 72 Hz with rated 60 Hz
5: 50 Hz, 3rd power decreasing
6: 50 Hz, 2nd power decreasing
7: 60 Hz, 3rd power decreasing
8: 60 Hz, 2nd power decreasing
9: 50 Hz, Mid starting torque
10: 50 Hz, Large starting torque
11: 60 Hz, Mid starting torque
12: 60 Hz, Large starting torque
13: 90 Hz with rated 60 Hz
14: 120 Hz with rated 60 Hz
15: 180 Hz with rated 60 Hz

- When setting to 0, refer to Pr.E0-01–E0-08 for IM1 V/F curve.
- When setting to 1 or 2, use only VF maximum frequency and voltage setting as the highest reference, and use the VF minimum frequency and voltage setting as the lowest reference.
- If the load of the motor is a variable torque load (torque is in direct proportion to the rotating speed, such as the load of a fan or a pump), the load torque is low at low rotating speed. You can decrease the input voltage appropriately to make the magnetic field of the input current smaller and reduce flux loss and iron loss for the motor to increase efficiency.
- When you set the V/F curve to high power, it has lower torque at low frequency, and the drive is not suitable for rapid acceleration and deceleration. Do NOT use this parameter for rapid acceleration and deceleration.



E0-01 IM1 VF Max FREQ

(0x841) Default: 60.00

Settings 3.00–599.00 Hz

📖 Set this parameter according to the motor's rated frequency on the motor nameplate. If the motor's rated frequency is 60 Hz, set this parameter to 60. If the motor's rated frequency is 50 Hz, set this parameter to 50.

E0-02 IM1 VF Max Voltage

(0x842) Default: Depending on the models

Settings Depending on the models

📖 Set this parameter according to the rated voltage on the motor nameplate. If the motor's rated voltage is 440 V, set this parameter to 440.0 V. If the motor's rated voltage is 400 V, set this parameter to 400.0 V.

📖 There are many motor types in the market and the power system for each country is different. The economical and convenient solution is to install an AC motor drive. Then there is no problem using the motor with different voltage and frequency inputs, and the motor drive can improve the original motor characteristics and useful life.

E0-03 IM1 VF Mid FREQ 5

(0x843) Default: 3.00

Settings 0.00–599.00 Hz

E0-04 IM1 VF Mid Voltage 5

(0x844) Default: Depending on the models

Settings Depending on the models

E0-05 IM1 VF Mid FREQ 4

(0x845) Default: 3.00

Settings 0.00–599.00 Hz

E0-06 IM1 VF Mid Voltage 4

(0x846) Default: Depending on the models

Settings Depending on the models

E0-07 IM1 VF Mid FREQ 3

(0x847) Default: 3.00

Settings 0.00–599.00 Hz

E0-08 IM1 VF Mid Voltage 3

(0x848) Default: Depending on the models

Settings Depending on the models

E0-09 IM1 VF Mid FREQ 2

(0x849) Default: 3.00

Settings 0.00–599.00 Hz

E0-10 IM1 VF Mid Voltage 2

(0x84A) Default: Depending on the models

Settings Depending on the models

E0-11 IM1 VF Mid FREQ 1

(0x84B) Default: 1.50

Settings 0.00–599.00 Hz

E0-12 IM1 VF Mid Voltage 1

(0x84C) Default: Depending on the models

Settings Depending on the models

E0-13 IM1 VF Min FREQ

(0x84D) Default: 0.50

Settings 0.00–599.00 Hz

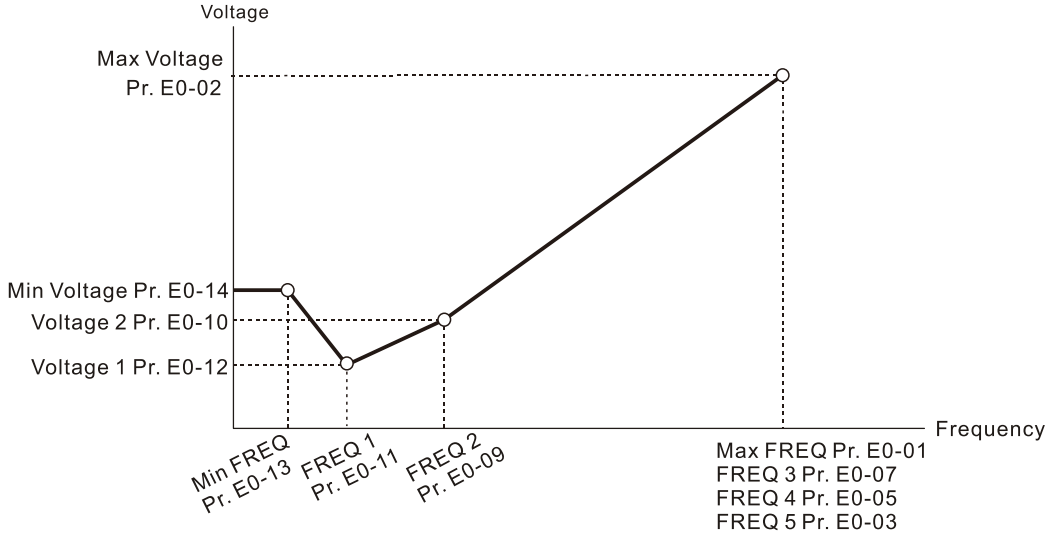
E0-14 IM1 VF Min Voltage

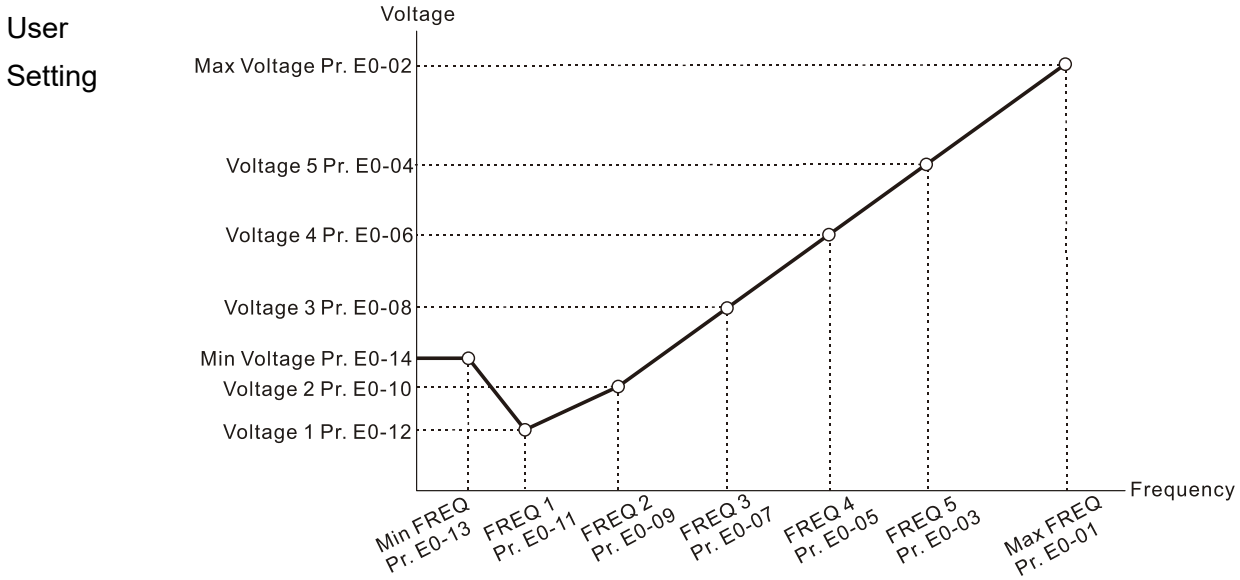
(0x84E) Default: Depending on the models

Settings Depending on the models

- You usually set the V/F curve according to the motor's allowable loading characteristics. Pay special attention to the motor's heat dissipation, dynamic balance, and bearing lubrication when the loading characteristics exceed the loading limit of the motor.
- There is no limit for the voltage setting, but a high voltage at a low frequency may cause motor damage, overheating, and trigger the stall prevention or the over-current protection; therefore, use low voltage at low frequency to prevent motor damage or drive error.
- The diagram below shows the V/F curve for motor 1. You can use the same V/F curve for motor 2–4.

Default





E0-16 IM1 VF Torque COMP Gain

(0x850) Default: 0.000

Settings 0.000–60.000 pu

- Setting 0 to disable this function.
- With a large motor load, a part of the drive output voltage is absorbed by the stator-winding resistor; therefore, the air gap magnetic field is insufficient. This causes insufficient voltage at motor induction and results in excessive output current but insufficient output torque. Auto-torque compensation can automatically adjust the output voltage according to the load and keep the air gap magnetic fields stable to get the optimal operation.
- In the V/F control, the voltage decreases in direct proportion with decreasing frequency. The torque decreases at low speed because of a decreasing AC impedance and an unchanged DC resistance. The auto-torque compensation function increases the output voltage at low frequency to get a higher starting torque.
- When the compensation gain is set too large, it may cause motor over-flux and result in a too large output current of the drive, motor overheating or trigger the drive's protection function.
- This parameter affects the output current when the drive runs. But the effect is smaller at the low-speed area.
- Set this parameter higher when the no-load current is too large, but the motor may vibrate if the setting is too high. If the motor vibrates when operating, reduce the setting.

E0-17 IM1 VF Torque COMP Filter

(0x851) Default: 0.300

Settings 0.000–60.000 sec.

- When the time constant setting is too large, the control is stable, but the control response is slow. When the time constant setting is too small, the control response is faster, but the control may be unstable. For optimal setting, adjust the setting based on the control stability or the control response.

E0-19 IM1 VF Slip COMP Gain

(0x853) Default: 0.000

Settings 0.000–60.000 pu

- The induction motor needs constant slip to produce electromagnetic torque. It can be ignored at higher motor speeds, such as rated speed or 2–3% of slip.
- However, during the drive operation, the slip and the synchronous frequency are in reverse proportion to produce the same electromagnetic torque. The slip is larger with the reduction of synchronous frequency. Moreover, the motor may stop when the synchronous frequency decreases to a specific value. Therefore, the slip seriously affects the motor speed accuracy at low speed.
- In another situation, when you use an induction motor with the drive, the slip increases when the load increases. It also affects the motor speed accuracy.
- Use this parameter to set the compensation frequency and reduce the slip to maintain the synchronous speed when the motor runs at the rated current in order to improve the accuracy of the drive.
- Apply the slip compensation after load and acceleration. Increase the compensation value from small to large gradually. When operates in the motor rated load, if the actual speed ratio is slower than expected, increase the parameter setting value; otherwise, decrease the setting value.
- Setting 1 means the rated current corresponds to one times the rated slip, setting 0 to disable this function.
- After compensation, the motor has rated torque, and the steady-state speed error can be limited within 20% of the rated slip.

E0-20 IM1 VF Slip COMP Filter

(0x854) Default: 0.100

Settings 0.000–60.000 sec.

- If you set this parameter to 60.00 sec., the compensation response time is the slowest; set this parameter to 0, then there is no filter; however, the system may be unstable if you set the time too short.

E0-21 IM1 VF Hunt COMP Gain

(0x855) Default: 1.000

Settings 0.000–60.000 pu

- By adjusting the oscillation compensation gain, you can eliminate or improve the oscillation of the motor at certain frequencies.
- Setting 1 means the torque oscillating quantity per pu compensates 1 pu of frequency, setting 0 to disable this function.

E0-22 IM1 VF Hunt COMP Filter

(0x856) Default: 1.0

Settings 0.0–6000.0 sec.

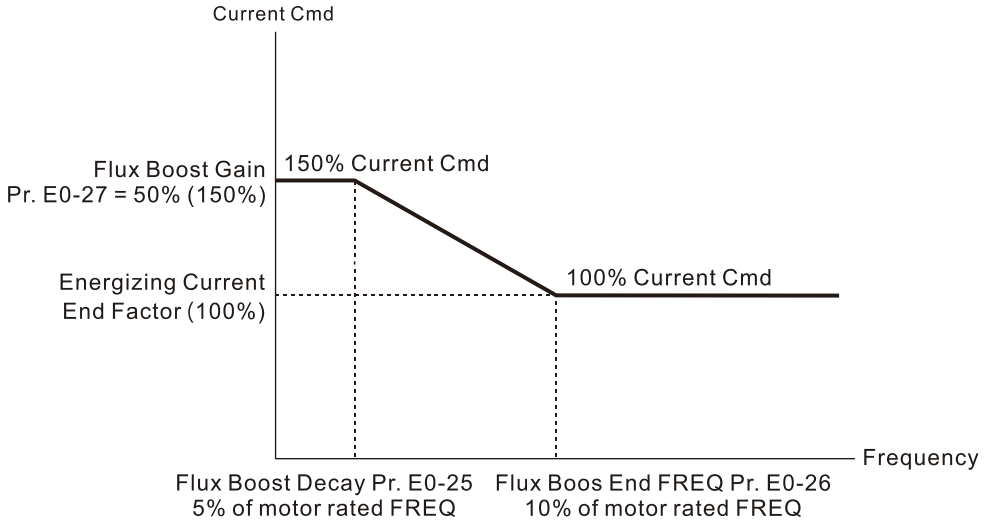
- The filter time constant of compensation frequency, set 0 for no filter.

E0-25 IM1 SVC Flux Boost Decay FREQ

(0x859) Default: 5

Settings 0–100%

- The SVC flux boost function can strengthen the excitation current command controlled by the low-frequency SVC to enhance the load capacity.
- When the frequency is higher than the setting of this parameter, the excitation current command decays.
- The set value corresponds to 100% of the motor rated frequency.



E0-26 IM1 SVC Flux Boost End FREQ

(0x85A) Default: 10

Settings 0–100%

- When the frequency reaches the set value of this parameter, the excitation current stops.
- The set value corresponds to 100% of the motor rated frequency.

E0-27 IM1 SVC Flux Boost Gain

(0x85B) Default: 20

Settings 0–100%

- The flux boost gain corresponds to 100% of the motor rated current, for example, when the parameter is set to 50, the output current is 150% of the motor rated current, which increases 50% of the excitation current.

E0-28 IM1 SVC Slip COMP Gain

(0x85C) Default: 1.000

Settings 0.000–2.000

- The induction motor needs constant slip to produce electromagnetic torque. It can be ignored at higher motor speeds, such as rated speed or 2–3% of slip.
- However, during the drive operation, the slip and the synchronous frequency are in reverse proportion to produce the same electromagnetic torque. The slip is larger with the reduction of synchronous frequency. Moreover, the motor may stop when the synchronous frequency decreases to a specific value. Therefore, the slip seriously affects the motor speed accuracy at low speed.

- In another situation, when you use an induction motor with the drive, the slip increases when the load increases. It also affects the motor speed accuracy.
- Use this parameter to set the compensation frequency and reduce the slip to maintain the synchronous speed when the motor runs at the rated current, in order to improve the accuracy of the drive.
- Apply the slip compensation after load and acceleration. Increase the compensation value from small to large gradually. When operates in the motor rated load, if the actual speed ratio is slower than expected, increase the parameter setting value; otherwise, decrease the setting value.

E0-29 IM1 SVC Slip COMP Filter

(0x85D) Default: 0.500

Settings 0.000–60.000 sec.

- If you set this parameter to 60 seconds, the compensation response time is the slowest; set the parameter to 0, then there is no filter; however, the system may be unstable if you set the time too short.

E0-30 IM1 SVC Torque COMP P Gain

(0x85E) Default: 0.050

Settings 0.000–60.000

E0-31 IM1 SVC Torque COMP I Gain

(0x85F) Default: 0.010

Settings 0.000–60.000

E0-32 IM1 SVC Torque COMP Filter

(0x860) Default: 0.500

Settings 0.000–60.000 sec.

- When the time constant setting is too large, the control is stable, but the control response is slow. When the time constant setting is too small, the control response is faster, but the control may be unstable. For optimal setting, adjust the setting based on the control stability or the control response.

E0-33 IM1 SVC Hunt COMP Gain

(0x861) Default: 0.500

Settings 0.000–60.000

- By adjusting the oscillation compensation gain, you can eliminate or improve the oscillation of the motor at certain frequencies.

E0-34 IM1 SVC Hunt COMP Filter

(0x862) Default: 1.0

Settings 0.0–6000.0 sec.

- The filter time constant of compensation frequency, set 0 for no filter.

∗E1. IM2 VF Control & SVC

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

E1-00 IM2 VF Curve Sel

(0x880) Default: 0

Settings
0: Manual VF curve
1: 1.5th power V/F curve
2: 2nd power V/F curve
3: 60Hz with rated 50Hz
4: 72Hz with rated 60Hz
5: 50 Hz, 3rd power decreasing
6: 50 Hz, 2nd power decreasing
7: 60 Hz, 3rd power decreasing
8: 60 Hz, 2nd power decreasing
9: 50Hz, Mid starting torque
10: 50Hz, Large starting torque
11: 60 Hz, Mid starting torque
12: 60 Hz, Large starting torque
13: 90 Hz with rated 60 Hz
14: 120 Hz with rated 60 Hz
15: 180 Hz with rated 60 Hz

↗ E1-01 IM2 VF Max FREQ

(0x881) Default: 60.00

Settings 3.00–599.00 Hz

↗ E1-02 IM2 VF Max Voltage

(0x882) Default: Depending on the models

Settings Depending on the models

↗ E1-03 IM2 VF Mid FREQ 5

(0x883) Default: 3.00

Settings 0.00–599.00 Hz

↗ E1-04 IM2 VF Mid Voltage 5

(0x884) Default: Depending on the models

Settings Depending on the models

↗ E1-05 IM2 VF Mid FREQ 4

(0x885) Default: 3.00

Settings 0.00–599.00 Hz

E1-06 IM2 VF Mid Voltage 4

(0x886) Default: Depending on the models

Settings Depending on the models

E1-07 IM2 VF Mid FREQ 3

(0x887) Default: 3.00

Settings 0.00–599.00 Hz

E1-08 IM2 VF Mid Voltage 3

(0x888) Default: Depending on the models

Settings Depending on the models

E1-09 IM2 VF Mid FREQ 2

(0x889) Default: 3.00

Settings 0.00–599.00 Hz

E1-10 IM2 VF Mid Voltage 2

(0x88A) Default: Depending on the models

Settings Depending on the models

E1-11 IM2 VF Mid FREQ 1

(0x88B) Default: 1.50

Settings 0.00–599.00 Hz

E1-12 IM2 VF Mid Voltage 1

(0x88C) Default: Depending on the models

Settings Depending on the models

E1-13 IM2 VF Min FREQ

(0x88D) Default: 0.50

Settings 0.00–599.00 Hz

E1-14 IM2 VF Min Voltage

(0x88E) Default: Depending on the models

Settings Depending on the models

E1-16 IM2 VF Torque COMP Gain

(0x890) Default: 0.000

Settings 0.000–60.000 pu

E1-17 IM2 VF Torque COMP Filter

(0x891) Default: 0.300

Settings 0.000–60.000 sec.

E1-19 IM2 VF Slip COMP Gain

(0x893) Default: 0.000

Settings 0.000–60.000 pu

E1-20 IM2 VF Slip COMP Filter

(0x894) Default: 0.100

Settings 0.000–60.000 sec.

E1-21 IM2 VF Hunt COMP Gain

(0x895) Default: 1.000

Settings 0.000–60.000 pu

E1-22 IM2 VF Hunt COMP Filter

(0x896) Default: 1.0

Settings 0.0–6000.0 sec.

E1-25 IM2 SVC Flux Boost Decay FREQ

(0x899) Default: 5

Settings 0–100%

E1-26 IM2 SVC Flux Boost End FREQ

(0x89A) Default: 10

Settings 0–100%

E1-27 IM2 SVC Flux Boost Gain

(0x89B) Default: 20

Settings 0–100%

E1-28 IM2 SVC Slip COMP Gain

(0x89C) Default: 1.000

Settings 0.000–2.000

E1-29 IM2 SVC Slip COMP Filter

(0x89D) Default: 0.500

Settings 0.000–60.000 sec.

E1-30 IM2 SVC Torque COMP P Gain

(0x89E) Default: 0.050

Settings 0.000–60.000

E1-31 IM2 SVC Torque COMP I Gain

(0x89F) Default: 0.010

Settings 0.000–60.000

E1-32 IM2 SVC Torque COMP Filter

(0x8A0) Default: 0.500

Settings 0.000–60.000 sec.

E1-33 IM2 SVC Hunt COMP Gain

(0x8A1) Default: 0.500

Settings 0.000–60.000

E1-34 IM2 SVC Hunt COMP Filter

(0x862) Default: 1.0

Settings 0.0–6000.0 sec.

📖 Refer to descriptions of Parameter Group E0 (IM1 VF Control & SVC).

∗E2. IM3 VF Control & SVC

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

E2-00 IM3 VF Curve Sel

(0x8C0) Default: 0

Settings 0: Manual VF curve
1: 1.5th power V/F curve
2: 2nd power V/F curve
3: 60Hz with rated 50Hz
4: 72Hz with rated 60Hz
5: 50 Hz, 3rd power decreasing
6: 50 Hz, 2nd power decreasing
7: 60 Hz, 3rd power decreasing
8: 60 Hz, 2nd power decreasing
9: 50Hz, Mid starting torque
10: 50Hz, Large starting torque
11: 60Hz, Mid starting torque
12: 60Hz, Large starting torque
13: 90Hz with rated 60Hz
14: 120Hz with rated 60Hz
15: 180Hz with rated 60Hz

↗ E2-01 IM3 VF Max FREQ

(0x8C1) Default: 60.00

Settings 3.00–599.00 Hz

↗ E2-02 IM3 VF Max Voltage

(0x8C2) Default: Depending on the models

Settings Depending on the models

↗ E2-03 IM3 VF Mid FREQ 5

(0x8C3) Default: 3.00

Settings 0.00–599.00 Hz

↗ E2-04 IM3 VF Mid Voltage 5

(0x8C4) Default: Depending on the models

Settings Depending on the models

↗ E2-05 IM3 VF Mid FREQ 4

(0x8C5) Default: 3.00

Settings 0.00–599.00 Hz

E2-06 IM3 VF Mid Voltage 4

(0x8C6) Default: Depending on the models

Settings Depending on the models

E2-07 IM3 VF Mid FREQ 3

(0x8C7) Default: 3.00

Settings 0.00–599.00 Hz

E2-08 IM3 VF Mid Voltage 3

(0x8C8) Default: Depending on the models

Settings Depending on the models

E2-09 IM3 VF Mid FREQ 2

(0x8C9) Default: 3.00

Settings 0.00–599.00 Hz

E2-10 IM3 VF Mid Voltage 2

(0x8CA) Default: Depending on the models

Settings Depending on the models

E2-11 IM3 VF Mid FREQ 1

(0x8CB) Default: 1.50

Settings 0.00–599.00 Hz

E2-12 IM3 VF Mid Voltage 1

(0x8CC) Default: Depending on the models

Settings Depending on the models

E2-13 IM3 VF Min FREQ

(0x8CD) Default: 0.50

Settings 0.00–599.00 Hz

E2-14 IM3 VF Min Voltage

(0x8CE) Default: Depending on the models

Settings Depending on the models

E2-16 IM3 VF Torque COMP Gain

(0x8D0) Default: 0.000

Settings 0.000–60.000 pu

E2-17 IM3 VF Torque COMP Filter

(0x8D1) Default: 0.300

Settings 0.000–60.000 sec.

E2-19 IM3 VF Slip COMP Gain

(0x8D3) Default: 0.000

Settings 0.000–60.000 pu

E2-20 IM3 VF Slip COMP Filter

(0x8D4) Default: 0.100

Settings 0.000–60.000 sec.

E2-21 IM3 VF Hunt COMP Gain

(0x8D5) Default: 1.000

Settings 0.000–60.000 pu

E2-22 IM3 VF Hunt COMP Filter

(0x8D6) Default: 1.0

Settings 0.0–6000.0 sec.

E2-25 IM3 SVC Flux Boost Decay FREQ

(0x8D9) Default: 5

Settings 0–100%

E2-26 IM3 SVC Flux Boost End FREQ

(0x8DA) Default: 10

Settings 0–100%

E2-27 IM3 SVC Flux Boost Gain

(0x8DB) Default: 20

Settings 0–100%

E2-28 IM3 SVC Slip COMP Gain

(0x8DC) Default: 1.000

Settings 0.000–2.000

E2-29 IM3 SVC Slip COMP Filter

(0x8DD) Default: 0.500

Settings 0.000–60.000 sec.

E2-30 IM3 SVC Torque COMP P Gain

(0x8DE) Default: 0.050

Settings 0.000–60.000

E2-31 IM3 SVC Torque COMP I Gain

(0x8DF) Default: 0.010

Settings 0.000–60.000

E2-32 IM3 SVC Torque COMP Filter

(0x8E0) Default: 0.500

Settings 0.000–60.000 sec.

E2-33 IM3 SVC Hunt COMP Gain

(0x8E1) Default: 0.500

Settings 0.000–60.000

E2-34 IM3 SVC Hunt COMP Filter

(0x8E2) Default: 1.0

Settings 0.0–6000.0 sec.

📖 Refer to descriptions of Parameter Group E0 (IM1 VF Control & SVC).

∗E3. IM4 VF Control & SVC

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

E3-00 IM4 VF Curve Sel

(0x900) Default: 0

Settings 0: Manual VF curve
1: 1.5th power V/F curve
2: 2nd power V/F curve
3: 60Hz with rated 50Hz
4: 72Hz with rated 60Hz
5: 50 Hz, 3rd power decreasing
6: 50 Hz, 2nd power decreasing
7: 60 Hz, 3rd power decreasing
8: 60 Hz, 2nd power decreasing
9: 50Hz, Mid starting torque
10: 50Hz, Large starting torque
11: 60Hz, Mid starting torque
12: 60Hz, Large starting torque
13: 90Hz with rated 60Hz
14: 120Hz with rated 60Hz
15: 180Hz with rated 60Hz

↗ E3-01 IM4 VF Max FREQ

(0x901) Default: 60.00

Settings 3.00–599.00 Hz

↗ E3-02 IM4 VF Max Voltage

(0x902) Default: Depending on the models

Settings Depending on the models

↗ E3-03 IM4 VF Mid FREQ 5

(0x903) Default: 3.00

Settings 0.00–599.00 Hz

↗ E3-04 IM4 VF Mid Voltage 5

(0x904) Default: Depending on the models

Settings Depending on the models

↗ E3-05 IM4 VF Mid FREQ 4

(0x905) Default: 3.00

Settings 0.00–599.00 Hz

E3-06 IM4 VF Mid Voltage 4

(0x906) Default: Depending on the models

Settings Depending on the models

E3-07 IM4 VF Mid FREQ 3

(0x907) Default: 3.00

Settings 0.00–599.00 Hz

E3-08 IM4 VF Mid Voltage 3

(0x908) Default: Depending on the models

Settings Depending on the models

E3-09 IM4 VF Mid FREQ 2

(0x909) Default: 3.00

Settings 0.00–599.00 Hz

E3-10 IM4 VF Mid Voltage 2

(0x90A) Default: Depending on the models

Settings Depending on the models

E3-11 IM4 VF Mid FREQ 1

(0x90B) Default: 1.50

Settings 0.00–599.00 Hz

E3-12 IM4 VF Mid Voltage 1

(0x90C) Default: Depending on the models

Settings Depending on the models

E3-13 IM4 VF Min FREQ

(0x90D) Default: 0.50

Settings 0.00–599.00 Hz

E3-14 IM4 VF Min Voltage

(0x90E) Default: Depending on the models

Settings Depending on the models

E3-16 IM4 VF Torque COMP Gain

(0x910) Default: 0.000

Settings 0.000–60.000 pu

E3-17 IM4 VF Torque COMP Filter

(0x911) Default: 0.300

Settings 0.000–60.000 sec.

E3-19 IM4 VF Slip COMP Gain

(0x913) Default: 0.000

Settings 0.000–60.000 pu

E3-20 IM4 VF Slip COMP Filter

(0x914) Default: 0.100

Settings 0.000–60.000 sec.

E3-21 IM4 VF Hunt COMP Gain

(0x915) Default: 1.000

Settings 0.000–60.000 pu

E3-22 IM4 VF Hunt COMP Filter

(0x916) Default: 1.0

Settings 0.0–6000.0 sec.

E3-25 IM4 SVC Flux Boost Decay FREQ

(0x919) Default: 5

Settings 0–100%

E3-26 IM4 SVC Flux Boost End FREQ

(0x91A) Default: 10

Settings 0–100%

E3-27 IM4 SVC Flux Boost Gain

(0x91B) Default: 20

Settings 0–100%

E3-28 IM4 SVC Slip COMP Gain

(0x91C) Default: 1.000

Settings 0.000–2.000

E3-29 IM4 SVC Slip COMP Filter

(0x91D) Default: 0.500

Settings 0.000–60.000 sec.

E3-30 IM4 SVC Torque COMP P Gain

(0x91E) Default: 0.050

Settings 0.000–60.000

E3-31 IM4 SVC Torque COMP I Gain

(0x91F) Default: 0.010

Settings 0.000–60.000

E3-32 IM4 SVC Torque COMP Filter

(0x920) Default: 0.500

Settings 0.000–60.000 sec.

E3-33 IM4 SVC Hunt COMP Gain

(0x921) Default: 0.500

Settings 0.000–60.000

E3-34 IM4 SVC Hunt COMP Filter

(0x922) Default: 1.0

Settings 0.0–6000.0 sec.

📖 Refer to descriptions of Parameter Group E0 (IM1 VF Control & SVC).

E4. SM SVC

You can set this parameter during operation

E4-00 SM LowFREQ Voltage COMP Level

(0x940) Default: 40

Settings 0–150%

Provide the output voltage at low frequency. Increase this parameter to enhance the loading performance at low frequency, and to avoid failure to start under load starting conditions.

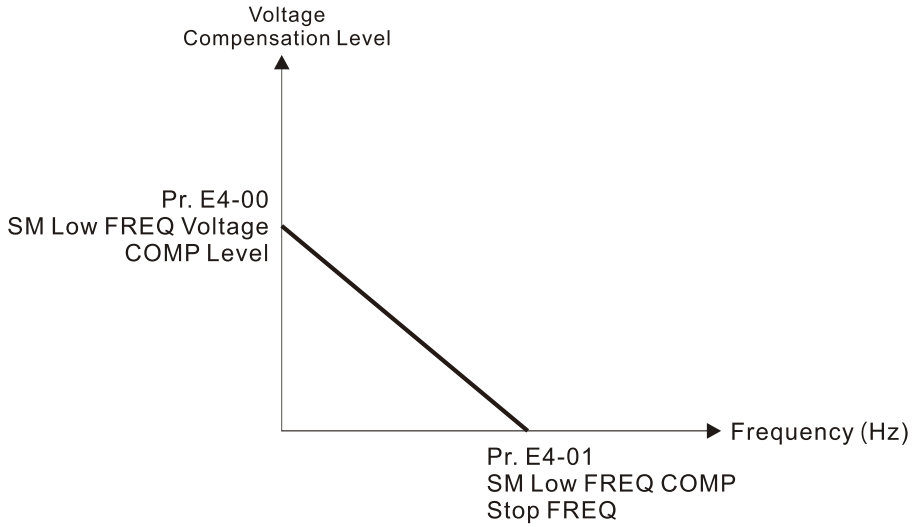
E4-01 SM LowFREQ COMP Stop FREQ

(0x941) Default: 20.00

Settings 0.00–599.00 Hz

Sets the stop frequency for low-frequency compensation voltage.

When controlling at low frequency, the motor may vibrate due to insufficient load capacity. Increase this parameter if the motor vibrates at frequency that close to the SM low frequency compensation stop frequency.



E4-02 SM Feed Forward Voltage Gain

(0x942) Default: 1.00

Settings 0.00–2.00

Adjusts the SMSVC voltage feedback forward gain, and to meet the demand of rapid feedback application.

Pr.E4-02 = 1.00 means forward feedback = Ke × motor rotor speed

E4-03 SM FREQ Hunting Gain

(0x943) Default: 0.100

Settings 0.000–60.000

Suppress frequency oscillation at start-up, increase the gain if low-frequency vibration occurs at the output frequency, and decrease the gain if high-frequency vibration occurs.

If the adjustment is too large or too small, the system control may be unstable. Adjust the gain according to the motor parameters and load applications.

0: no compensation.

E4-04 SM FREQ Hunting Filter

(0x944) Default: 0.100

Settings 0.000–60.000 sec.

📖 The filter time constant of compensation oscillation, set 0 for no filter.

E4-05 SM Torque COMP Gain

(0x945) Default: 20

Settings 0–5000

📖 The torque compensation function increases the output voltage at low frequency to get a higher starting torque.

📖 When the compensation gain is set too large, it may cause motor over-flux and result in a too large output current of the drive, motor overheating or trigger the drive's protection function.

📖 Set this parameter higher when the no-load current is too large, but the motor may vibrate if the setting is too high. If the motor vibrates when operating, reduce the setting.

📖 This parameter improves the output current during operation. The impact in the low speed is smaller.

E4-06 SM Torque COMP Filter

(0x946) Default: 0.100

Settings 0.000–60.000 sec.

📖 When the time constant setting is too large, the control is stable, but the control response is slow. When the time constant setting is too small, the control response is faster, but the control may be unstable. For optimal setting, adjust the setting based on the control stability or the control response.

E4-07 SM Angle Hunting Gain

(0x947) Default: 8.0

Settings 0.0–6000.0

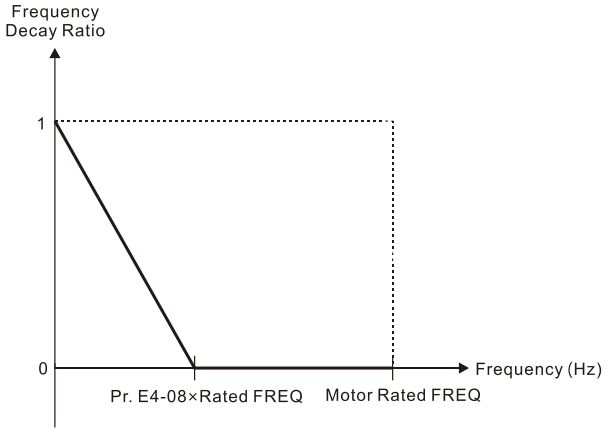
E4-08 SM Angle Hunting Decay FREQ

(0x948) Default: 0.4

Settings 0.0–6000.0

📖 When the output frequency is > Pr.E4-08 × rated frequency, there is no angle compensation.

📖 Increase this frequency parameter if there is oscillation with this frequency point during adjustment.



F. FOC

F0. IM FOC

You can set this parameter during operation

F0-00 IMFOC Speed Observer BW

(0xAC0) Default: 40

Settings 1–1000 Hz

Sets the speed observer bandwidth, a higher setting value makes the response of speed observer faster, but the noise will also increase.

F0-01 IMFOC Speed Observer Filter

(0xAC1) Default: 0.005

Settings 0.000–3.000 sec.

The filter time of speed observer, set this parameter to 0 for no filter.

F0-02 IMFOC Min Stator FREQ Level

(0xAC2) Default: 2.0

Settings 0.0–10.0%

Sets the stator frequency lower limit in operation status. This setting ensures the stability and accuracy of observer and avoids interferences from voltage, current and motor parameters.

F0-06 IMFOC Flux Boost Gain

(0xAC6) Default: 50

Settings 0–100%

When the frequency command is between the IMFOC flux boost decay frequency and the IMFOC flux boost end frequency, set this parameter to increase the flux boost gain. Take the no-load current as 100%.

F0-07 IMFOC Flux Boost Decay FREQ

(0xAC7) Default: 4

Settings 0–6%

The start frequency of low-speed flux boost decay. Take the rated frequency as 100%.

F0-08 IMFOC Flux Boost End FREQ

(0xAC8) Default: 20

Settings 0–30%

The end frequency of low-speed flux boost decay. Take the rated frequency as 100%.

F1. SM FOC

You can set this parameter during operation

F1-00 IF/HFI Sel

(0xB00) Default: 1

Settings 0: HFI
1: IF

- If the motor is IPM, PMA or SynRM, we suggest choosing HFI as low-frequency operation method, and adjust with Pr.F1-02, F1-06 and F1-07.
- If the motor is SPM, choose IF as low-frequency operation method, and adjust with Pr.F1-01.

F1-01 IF Cmd

(0xB01) Default: 40

Settings 0–150%

- Sets the current command when the drive operates in the low-speed area (the area whose frequency command is less than Pr.F1-04 is the low-speed area). When starting with heavy load or the forward and reverse operation stalls with load, increase setting for Pr.F1-01; if the starting current is too large or causes oc stall, decrease this parameter.

F1-02 HFI PLL BW Gain

(0xB02) Default: 100

Settings 10–500%

- This parameter affects the speed response when HFI starts. If you need fast response or rapid acceleration, increase this parameter; if there is speed wave or current oscillation, decrease this parameter.

F1-03 Speed Observer Filter BW

(0xB03) Default: 10

Settings 0–100 Hz

- Sets the speed observer bandwidth, a higher setting value makes the response of speed observer faster, but the noise will also increase.

F1-04 IF/HFI to SM Switch FREQ

(0xB04) Default: 20.00

Settings 0.00–599.00 Hz

F1-05 SM to IF/HFI Switch FREQ

(0xB05) Default: 20.00

Settings 0.00–599.00 Hz

- Sets the frequency for switching from low frequency to high frequency and sets the switch point for high and low frequencies of the speed observer.
- Sets the frequency for switching from high frequency to low frequency and sets the switch point for high and low frequencies of the speed observer.
- If the switch frequency is too low, the motor does not generate enough back-EMF to let the speed observer measure the right position and speed of the rotor when running at the switch frequency.

🕮 If the switch frequency is too high, the active range of I/F is too wide, which generates a larger current without energy saving. (If the current value for Pr.F1-01 is too high, the high switch frequency makes the drive continue to output with Pr.F1-01 setting value.)

F1-06 HFI Injection FREQ

(0xB06) Default: 500

Settings 200–1200 Hz

🕮 If the motor has high-frequency excitation noise, decrease setting for this parameter, but not less than 1/10 of the carrier frequency.

F1-07 HFI Injection Amplitude

(0xB07) Default: 15

Settings 0–100%

🕮 This parameter affects the starting performance of HFI. if the HFI cannot be started or has low-frequency speed oscillation, increase setting for this parameter; however, this will make the high-frequency excitation noise more obvious.

F1-08 Observer Low Speed Gain

(0xB08) Default: 100

Settings 10–1000%

🕮 Sets the observer gain when the observer speed is less than 1/5 of the motor rated speed.

🕮 Increase setting for this parameter to enhance the loading capacity at start.

F1-09 Observer High Speed Gain

(0xB09) Default: 100

Settings 10–1000%

🕮 Sets the observer gain when the observer speed is larger than or equal to 1/5 of the motor rated speed.

🕮 Increase setting for this parameter to enhance the loading capacity at high-speed area and the observer response.

🕮 When there is speed oscillation at high-speed area, decrease setting for this parameter.

F1-10 PLL P Gain

(0xB0A) Default: 100

Settings 10–1000%

🕮 Increase setting for this parameter to enhance the loading capacity at high-speed area and the observer response.

🕮 When the speed output frequency has high-frequency fluctuations, decrease setting for this parameter.

F1-11 PLL I Gain

(0xB0B) Default: 100

Settings 10–1000%

🕮 Decrease setting for this parameter to enhance the speed response during acceleration and deceleration.

F2. ASR Setting

↗ You can set this parameter during operation

∗Advanced parameters, set Pr.b0-00 to unlock

F2-00 Motor Inertia

(0xB40) Default: Depending on the models

Settings 0.1–1000000.0 kg-cm^2

📖 The rotor inertia corresponded to the motor.

📖 IM system inertia value (unit: kg-cm^2):

HP	kW	Setting	HP	kW	Setting	HP	kW	Setting
1	0.75	2.3	40	30	202.5	300	220	5139.0
2	1.5	4.3	50	37	355.5	340	250	5981.0
3	2.2	8.3	60	45	410.8	375	280	5981.0
5	3.7	14.8	75	55	494.8	425	315	5981.0
5	4.0	26.0	100	75	1056.5	475	355	5981.0
7	5.5	26.0	125	90	1275.3	530	400	5981.0
10	7.5	35.8	150	110	1900.0	600	450	5981.0
15	11	74.3	175	132	2150.0	675	500	5981.0
20	15	95.3	215	160	2800.0	750	560	5981.0
25	18.5	142.8	250	185	3550.0			
30	22	176.5	270	200	5139.0			

F2-01 System Inertia

(0xB42) Default: 1.00

Settings 0.01–600.00

📖 The rotor inertia corresponded to the system.

📖 Perform the operation test with load, run the motor in acceleration, deceleration and steady speed and observe the values. If values between speed feedback and speed command are close, steady-state error is small and overshoot is less, then this inertia is a better one.

📖 If the Iq current command from ASR has high-frequency glitch, then decrease the setting. If the response time of sudden loading is too slow, then increase the setting.

F2-02 ASR Calculation Sel

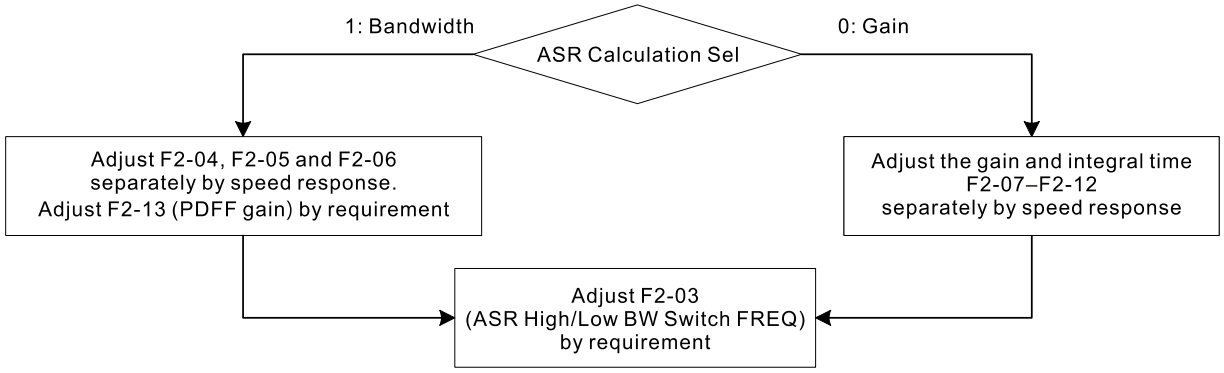
(0xB43) Default: 1

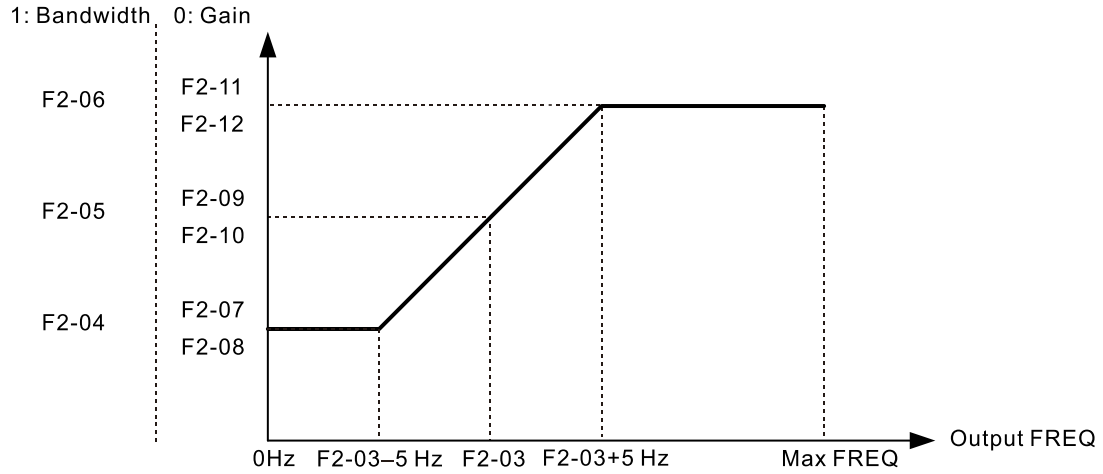
Settings 0: Gain

1: Bandwidth

📖 1: Bandwidth, use Pr.F2-04–F2-06 for adjustment.

📖 0: Gain, use Pr.F2-07–F2-12 for adjustment.





F2-03 ASR High/ Low BW Switch FREQ

(0xB44) Default: 7.00

Settings 0.00–Max. operation frequency (Hz)

- Sets the low-speed and high-speed ASR switching point in the FOC area. Provides flexibility to meet two needs: in the high-speed region of the estimator switch point it has a high response, and in the low-speed region of the estimator switch point it has a lower response. The recommended switching point is higher than Pr.F1-04.
- A low setting does not cover Pr.F1-04. If the setting is too high, the high-speed range is too narrow.

F2-04 ASR Zero-Speed BW

(0xB45) Default: 3.0

Settings 0.1–750.0 Hz

F2-05 ASR Low-Speed BW

(0xB46) Default: 3.0

Settings 0.1–750.0 Hz

F2-06 ASR High-Speed BW

(0xB47) Default: 3.0

Settings 0.1–750.0 Hz

- When setting F2-02 as 1: Bandwidth, you can adjust Pr.F2-04–F2-06 separately by speed response. The larger the setting value, the faster the response.
- When the holding torque is required to zero speed or stable frequency output is required at extremely low speed, properly increase setting for ASR zero speed bandwidth.

- When the output frequency oscillates at low-speed or the response is slow, increase setting for ASR low speed bandwidth.
- When the output current fluctuates severely at high speed and causes the machine to vibrate, decrease setting for ASR high speed bandwidth.

F2-07 ASR Zero-Speed Gain

(0xB48) Default: 3.0

Settings 0.1–750.0 Hz

F2-08 ASR Zero-Speed Integral Time

(0xB49) Default: 0.100

Settings 0.001–10.000 sec.

F2-09 ASR Low-Speed Gain

(0xB4A) Default: 3.0

Settings 0.1–750.0 Hz

F2-10 ASR Low-Speed Integral Time

(0xB4B) Default: 0.100

Settings 0.001–10.000 sec.

F2-11 ASR High-Speed Gain

(0xB4C) Default: 3.0

Settings 0.1–750.0 Hz

F2-12 ASR High-Speed Integral Time

(0xB4D) Default: 0.100

Settings 0.001–10.000 sec.

- When setting F2-02 as 0: Gain, you can adjust Pr.F2-07–F2-12 separately by speed response.
- The larger the setting value of gain, the faster the response, but fluctuation and oscillation may easily occur.
- The smaller the setting value of time, the faster the response, but fluctuation and oscillation may easily occur.

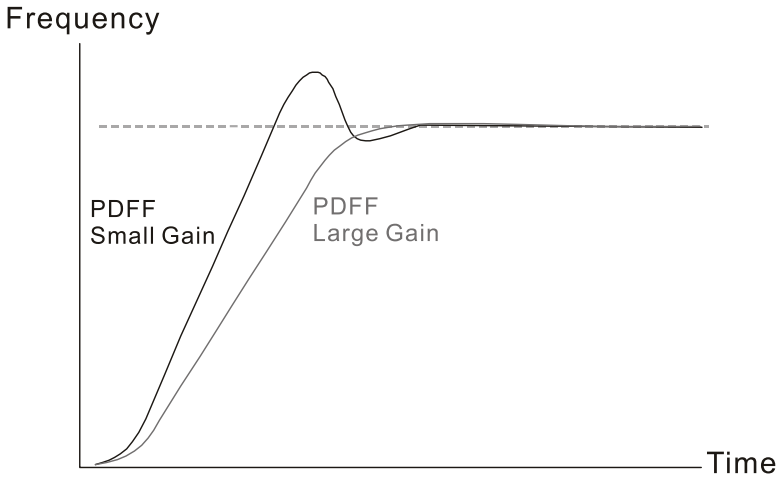
F2-13 PDFF Gain

(0xB4E) Default: 0.30

Settings 0.00–1.00 pu

- When Pr.d0-00 is set to 7, this parameter is invalid.
- When Pr.F2-02 is set to 1, this parameter is valid.
- If it is set to 0 pu, the control structure is pure IP control, which has the characteristics of a second-order system. Under the same bandwidth design, it has the advantages of fast response and anti-noise, but it will overshoot easily. If it is set to 1 pu, the control structure is pure PI control, which has the characteristics of a first-order system. The response is slower under the same bandwidth design, but it will not overshoot easily.
- To suppress speed overshoot, you can set the parameter to 0 first, and then increase the setting value to “a condition with best acceleration and without overshoot” when the acceleration time meets your application, but overshoot occurs.

- Increase the setting improves the overshoot of speed tracking, but an excessive value may reduce the transient response.
- Increase the setting enhances the system stiffness in high-speed steady state and reduce the speed transient fluctuation at a sudden loading.
- Ensure that you set Pr.F2-01 system inertia correctly to get excellent improvement of the speed response.



F2-14 ASR Speed Feedforward Gain

(0xB4F) Default: 0.00

Settings 0.00–100.00 pu

- The function enables when Pr.F2-02 = 0: Gain.
- Increase the setting for this parameter to reduce command tracking difference and improve the speed response. Use this function for speed tracking applications.
- Ensure that you set Pr.F2-01 system inertia correctly to get excellent improvement of the speed response.

F2-15 Torque Cmd Filter Time

(0xB50) Default: 5.0

Settings 0.0–6000.0 ms

- When the time constant setting is too large, the control is stable, but the control response is slow. When the time constant setting is too small, the control response is faster, but the control may be unstable. For optimal setting, adjust the setting based on the control stability or the control response.

F2-16 FWD Motoring Torque Limit

(0xB51) Default: 250.00

F2-17 FWD Regenerating Torque Limit

(0xB52) Default: 250.00

F2-18 REV Motoring Torque Limit

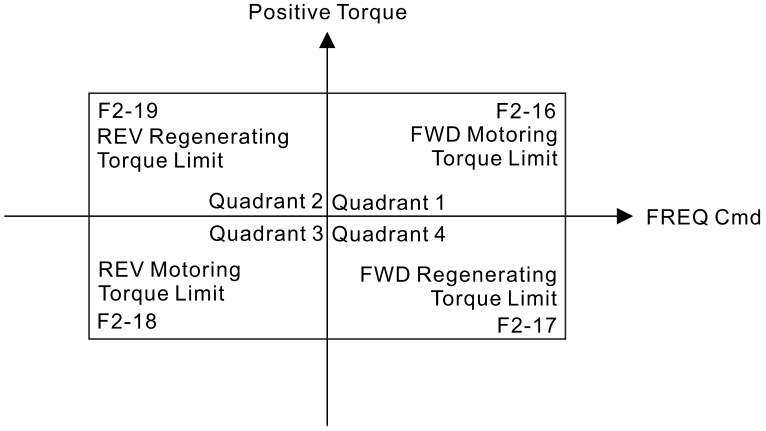
(0xB53) Default: 250.00

F2-19 REV Regenerating Torque Limit

(0xB54) Default: 250.00

Settings 0.00–300.00%

- Pr.F2-16–F2-19 limit the output torque and only apply to IMFOC and SMFOC control modes, the percentage base value is the motor rated torque.
- The calculation equation for the motor rated torque: $T(N-M)=\frac{P(Watt)}{\omega(rad/s)}$, P(W) value = Pr.d1-01; ω (rad/s) = Pr.d1-04, $\frac{RPM\times 2\pi}{60}=rad/s$.



F2-20 IMFOC AMR BW

(0xB55) Default: 10.0

Settings 0.1–750.0 Hz

- Sets the response speed of excitation axis (d-axis) control command, the time constant of control command is $1/[(F2-20)\times 2\pi]$ sec.

F2-21 IMFOC AMR Voltage Limit

(0xB56) Default: 100

Settings 0–110%

- Sets the voltage limit of excitation axis (d-axis) control command, 100% corresponds to the current DC bus voltage.
- When the back EMF reaches this voltage limit, it enters the flux weakening control.

F2-22 SMFOC AMR Kp Gain

(0xB57) Default: 1.00

Settings 0.00–3.00

F2-23 SMFOC AMR Ki Gain

(0xB58) Default: 0.20

Settings 0.00–3.00

- Active Magnetic Regulator Kp / Ki. Affects the response of magnetic regulation in the low magnetic area.
- If entering the low magnetic area and the input voltage (or DC bus) plummets (e.g., an unstable power net causes instant insufficient voltage, or a sudden load that makes DC bus drop), which causes the ACR diverge and oc, then increase the gain. If the Id value of a spur creates large noise in high-frequency output current, decrease the gain to reduce the noise, but it will also slow down the response.

F2-24 SMFOC AMR Id Filter Coefficient

(0xB59) Default: 10

Settings 0–1000

Sets the filter coefficient of Active Magnetic Regulator Id current in the flux weakening area.

∗F3. ACR Setting

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ F3-00 ACR Gain Calculation Sel

(0xB80) Default: 1

Settings 0: ACR BW
1: BW Calculated by CF

🕮 0: ACR bandwidth calculation gain, use Pr.F3-01 as a fixed bandwidth value.

🕮 1: Bandwidth calculated by carrier frequency, keep the set value 1 for general user that does not need high torque response.

↗ F3-01 ACR BW

(0xB81) Default: 300

Settings 10–3000 Hz

🕮 When setting F3-00 as 0: ACR BW, you can adjust Pr.F3-01 separately by current response. The larger the setting value, the faster the response. The converged time constant for current control is $1/([(F3-01)\times 2\pi]$ sec.

↗ F3-02 ACR d-Axis Kp Gain

(0xB82) Default: 1.00

Settings 0.01–100.00 pu

🕮 For adjusting the transient response of excitation axis (d-axis), the larger the setting value, the faster the response. If you set the value too large, it may cause current oscillation.

↗ F3-03 ACR d-Axis Ki Gain

(0xB83) Default: 1.00

Settings 0.01–100.00 pu

🕮 For adjusting the response of excitation axis (d-axis) in steady state, the larger the setting value, the faster the response. If you set the value too large, it may cause current oscillation.

↗ F3-04 ACR q-Axis Kp Gain

(0xB84) Default: 1.00

Settings 0.01–100.00 pu

🕮 For adjusting the transient response of torque axis (q-axis), the larger the setting value, the faster the response. If you set the value too large, it may cause current oscillation.

↗ F3-05 ACR q-Axis Ki Gain

(0xB85) Default: 1.00

Settings 0.01–100.00 pu

🕮 For adjusting the response of torque axis (q-axis) in steady-state, the larger the setting value, the faster the response. If you set the value too large, it may cause current oscillation.

G. IO Setting

G0. MI Setting

You can set this parameter during operation

G0-00 MI Mode Sel

(0xCC0) Default: 0

Settings 0: Low Active
1: High Active

G0-01 MI Status

(0xCC1) Default: Read only

Settings 0: Inactive
1: Active

- The displayed parameter format of MI mode selection and MI status is 000000b–111111b. The bits from right (bit0) to left (bit5) correspond to MI1–MI6 respectively, and bit8–13 correspond to MI10–MI15.
- MI mode selection defines the corresponding input meaning of MI signal as action (1) / no action (0).
- Take low active as an example, when MIx status is OFF, Pr.G0-01 MIx displays 0; when MIx status is ON, Pr.G0-01 MIx displays 1.

MI status	G0-00 MI Mode Sel	
	Low Active	High Active
ON	Action	No action
OFF	No action	Action

- The entity and virtual MI signals determine the MI enable status through the response time and mode selection (level setting). Refer to Figure 1 - MI signal processing diagram for the MI action logic.

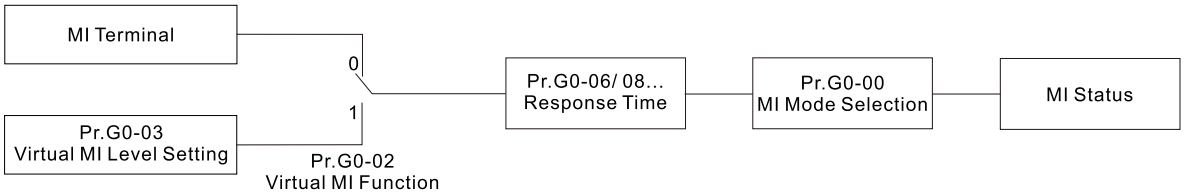


Figure 1 - MI signal processing diagram

G0-02 Virtual MI Function

(0xCC2) Default: 0

Settings 0: Disable
1: Enable

G0-03 Virtual MI Level Setting

(0xCC3) Default: 0

Settings 0: Low
1: High

- The function of virtual MI is the same as that of the entity MI terminals, the difference is that the former can set the action of the virtual MI through parameters. Refer to description of Pr.G0-00/ G0-01 for the action logic.

🕮 The displayed parameter format of virtual MI function and level setting is 000000b–111111b. The bits from right (bit0) to left (bit5) correspond to MI1–MI6 respectively, and bit8–13 correspond to MI10–MI15.

G0-06 MI1 Response Time

(0xCC6) Default: 0.001

G0-08 MI2 Response Time

(0xCC8) Default: 0.001

G0-10 MI3 Response Time

(0xCCA) Default: 0.001

G0-12 MI4 Response Time

(0xCCC) Default: 0.001

G0-14 MI5 Response Time

(0xCCE) Default: 0.001

G0-16 MI6 Response Time

(0xCD0) Default: 0.001

Settings 0.000–30.000 sec.

🕮 The MI response time setting can effectively avoid the bouncing phenomenon of the MI terminal.

🕮 This function is to delay and confirm the digital input terminal signal. The time for delay is also the time for confirmation. The confirmation prevents interference that could cause error in the input to the digital terminals. But in the meanwhile, it delays the response time though confirmation improves accuracy.

🕮 When MI signal changes (for example from low to high), it is regarded as transitioning to High only when the High status remains for the time longer than the MI response time. Refer to Figure 1 - MI signal processing diagram in Pr.G0-00 for the MI action logic.

G0-17 MI Count Src

(0xCD1) Default: 0

Settings 0: Disable
1–5: Reserve
6: MI5

G0-18 MI Count Clear Src

(0xCD2) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

G0-19 MI Count Reached Level

(0xCD3) Default: 0

Settings 0–60000
0: Disable

G0-20 MI Count Reset Level

(0xCD4) Default: 0

Settings 0–60000

0: Disable

G0-21 MI Count Reached MO Indn

(0xCD5) Default: 0

Settings 0: Disable

1–2: Relay1–Relay2

3–4: MO1–MO2

5–9: Reserve

10–15: MO/Relay10–15

G0-22 MI Count Reset MO Indn

(0xCD6) Default: 0

Settings 0: Disable

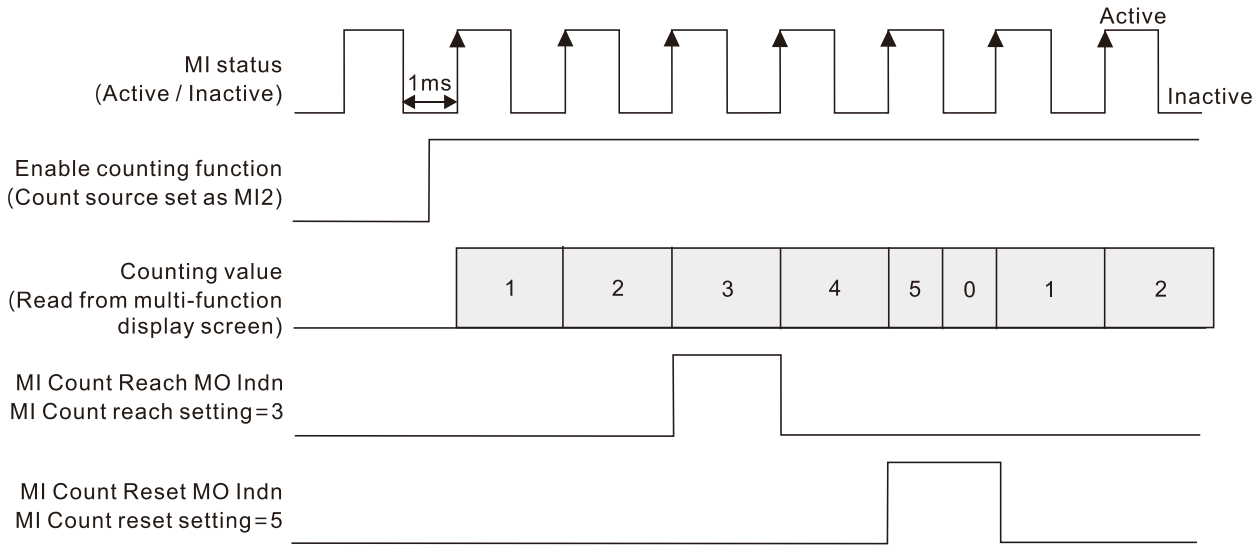
1–2: Relay1–Relay2

3–4: MO1–MO2

5–9: Reserve

10–15: MO/Relay10–15

- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.
- Relay 1–2 and MO1–MO2 are control board multi-function (contact, photo coupler) output terminals; MO/ Relay 10–15 are extension card multi-function output terminals (contact, photo coupler).
- MI count source only supports MI5, set Pr.G0-17 = 6 to enable this function.
- MI counting input: When MI5 is ON once, the count value displayed on the digital keypad will be incremented by “1” (when any of the status display parameter o0-00, o0-01 and o0-01 is set as 1, the digital keypad displays the count value).
- MI count clear source: Select MI1–MI6/ MI10–MI15, when specify the MIx as ON once, the counting value displayed on the digital keypad will be reset to “0”. Only when this signal disappears, the drive can accept the triggered signal at start to count.
- MI count reached MO indication: When the count value counts from 1 to reach the set value in this parameter, the corresponding MO terminal of “MI count reached MO indication” is activated. You can use this parameter as the end of counting to make the drive run from the low speed to stop.
- MI count reset MO indication: When the count value counts from 1 to reach the set value in this parameter, the corresponding MO terminal of “MI count reset MO indication” is activated, and the count value displayed on the digital keypad returns to 0.


MI status
(Active / Inactive)
1ms
Active
Inactive
Enable counting function
(Count source set as MI2)
Counting value
(Read from multi-function
display screen)
1
2
3
4
5
0
1
2
MI Count Reach MO Indn
MI Count reach setting=3
MI Count Reset MO Indn
MI Count reset setting=5

G1. MO Setting

✓ You can set this parameter during operation

✓ G1-00 MO Mode Sel

(0xD00) Default: 0

Settings 0: MO-MCM or RA-RC Close at Active
1: MO-MCM or RA-RC Open at Active

✓ G1-01 Virtual MO Function

(0xD01) Default: 0

Settings 0: Disable
1: Enable

✓ G1-02 Virtual MO Level Setting

(0xD02) Default: 0

Settings 0: Inactive
1: Active

G1-03 MO Status

(0xD03) Default: Read only

Settings 0: Inactive
1: Active

- MO mode selection refers to the behavior of the MO switch. You can choose MO-MCM or RA-RC to be closed when Pr.G1-03 is set as 0: Inactive, or that to be opened when Pr.G1-03 is set as 1: Active. For example: When RY1 function is selected as forward command indication and the drive frequency command is forward, RY1 activates. If the MO mode is set as 0, then MO-MCM or RA-RC will be closed when it activates.
- The parameter format of MO mode selection is 0000 0000 0000 0000b–1111 1111 1111 1111b. The bits from the right to the left (bit0–bit3) correspond to RY1–RY2, MO1–MO2 respectively, and the bits from right (bit9) to left (bit14) correspond to MO10–MO15 respectively.
  MO status displays the action status of the MO source. For example: RY1 is set as Forward command indication, it activates when the drive frequency command is forward and Pr.G1-03 bit0 displays as 1; bit0 is inactive when the drive operates with reverse command and Pr.G1-03 bit0 displays as 0.
- The MO status refers to the active status of MO source. For example, set RY1 as forward command indication, it activates when the drive frequency command is forward and Pr.G1-03 bit0 displays 1; the MO inactivates when the drive frequency command is reverse and Pr.G1-03 bit0 displays 0.
- The function of virtual MI is the same as that of the entity MI terminals, the difference is that the former can be turned on and off by setting parameters.
- When the virtual MO function is enabled (for example, Pr.G1-01 = 11b) and the virtual MO level is set as active (for example, Pr.G1-02 = 11b), then the status of RY1 and RY2 is ON.
- Pay extra attention that when the MOx function is defined before enabling the virtual MO function, after the virtual MO is enabled, the corresponding MO parameters settings (RY1 G1-04, RY2 G1-06, MO1 G1-08 and MO2 G1-10) will be automatically replaced by the changed 0D01h virtual MO function.

G1-04 RY1 Function Sel

(0xD04) Default: 11

G1-06 RY2 Function Sel

(0xD06) Default: 1

G1-08 MO1 Function Sel

(0xD08) Default: 66

G1-10 MO2 Function Sel

(0xD0A) Default: 67

Settings
0: No function
1: Indication during RUN
2: Operation speed reached
3: Output frequency reached 1
4: Output frequency reached 2
5: Zero speed during RUN (Frequency command)
6: Zero speed (Frequency command)
7: Over-torque indication
8: Over torque at constant speed
9: Drive is ready
10: Low voltage fault (Lv)
11: Malfunction indication
12: P-PID2 feedback error indication
13: Overheat warning
14: JOG indication
15: P-PID1 feedback error indication
16: Over-slip error indication
17: MI count value reaches MO indication
18: MI count value resets MO indication
19: Base Block
20: Warning indication
21: Over-voltage warning
22: Over-voltage stall prevention
23: Over-current stall prevention
24: Operation source is digital keypad
25: Forward command
26: Reverse command
27: Output current > Pr.o0-08 (Pr.o0-09)
28: Output current < Pr.o0-08 (Pr.o0-10)
29: Output frequency > Pr.o0-13 (Pr.o0-14)
30: Output frequency < Pr.o0-13 (Pr.o0-15)
31: Y-connection switching command
32: D-connection switching command
33: Zero speed during RUN (output frequency)

34: Zero speed (output frequency)
35: Error output selection 1
36: Error output selection 2
37: Error output selection 3
38: Error output selection 4
39: Motor 1 overheating
40: Motor 2 overheating
41: L/F overload
42: L/F underload
43: UVW magnetic contactor action indication
44: Low current
45: Run enable
46: dEb output
47: Preheat active
48: Fire mode
49: Modbus MO output mask
50: CANopen MO output mask
51: BACnet MO output mask
52: DeviceNet MO output mask
53: Profibus MO output mask
54: Ethernet MO output mask
55: Pump 1 ouptut enable selection
56: Pump 2ouptut enable selection
57: Pump 3 ouptut enable selection
58: Pump 4ouptut enable selection
59: Pump 5 ouptut enable selection
60: Pump 6 ouptut enable selection
61: Pump 7 ouptut enable selection
62: Pump 8 ouptut enable selection
63: U-phase Phase loss
64: V-phase Phase loss
65: W-phase Phase loss
66: STO output logic A
67: STO output logic B
68: Over-ripple voltage protection
69: Monitor 1 trigger indication
70: Monitor 2 trigger indication
71: Monitor 3 trigger indication
72: Monitor 4 trigger indication
73: Monitor 5 trigger indication
74: Monitor 6 trigger indication
75: Monitor 7 trigger indication

76: Monitor 8 trigger indication
77: Virtual MO function
78: Indication within AI level range
79: Component life lower than level indication

- There are two methods for MO function selection, one is to specify the function through MO, and the other is to specify the MO by functions, no matter which method is used, the two sides are synchronous. For example, Pr.G1-04 RY1 function selection is set to Run enable indication (MO assigned function), the setting of the corresponding Pr.A1-23 will also be changed and assigned to MO1 (the function is assigned to MO).
- The same MOx function can only be defined and selected as one single function. If the same MOx function is set repeatedly, the last setting will prevail, and the same MOx function previously set repeatedly returns to the default value. For example, A1-25 Forward command indication indicates that RY1 is specified first, and then A1-26 Reverse command indication indicates that RY1 is also specified, then the latter setting replaces the former, and the former will restore to the default value.
- Refer to the list for MO function selection. For example, setting 45 to specify the MO function as Pr.A1-23 Run enable indication. For its function description, refer to the detailed description of each parameter group.

G1-12 DFM MO Indn

(0xD0C) Default: 0

Settings 0: Disable
1–3: Reserve
4: MO2

G1-13 DFM Function Sel

(0xD0D) Default: 0

Settings 0: Disable
1: FREQ Cmd
2: FREQ Profile
3: Output FREQ

G1-14 DFM Output Gain

(0xD0E) Default: 1

Settings 1–100

- DMF MO indication only supports MO2. Note that when MO2 is used for DFM function, the terminal wiring uses the same MO2-MCM as the MO function.
- DFM digital frequency can be output as pulse wave at MO2 terminal according to Pr.G1-13 DFM function selection.
- Pr.G1-14 sets the digital frequency output signal (pulse, working cycle = 50%) of the drive digital output terminal (MO2-MCM). Output pulse per second = output frequency × Pr.G1-14.

G1-15 RY1 ON Response Time

(0xD0F) Default: 0.01

G1-16 RY1 OFF Response Time

(0xD10) Default: 0.01

G1-17 RY2 ON Response Time

(0xD11) Default: 0.01

G1-18 RY2 OFF Response Time

(0xD12) Default: 0.01

G1-19 MO1 ON Response Time

(0xD13) Default: 0.01

G1-20 MO1 OFF Response Time

(0xD14) Default: 0.01

G1-21 MO2 ON Response Time

(0xD15) Default: 0.01

G1-22 MO2 OFF Response Time

(0xD16) Default: 0.01

Settings 0.000–30.000 sec.

📖 This function is to delay and confirm the digital output terminal signal. The time for delay is also the time for confirmation and is divided into ON and OFF response time. It prevents high frequency changes of the digital terminal output; however, the response time will also be delayed.

📖 For example, MOx function is set as reverse command indication, when the drive frequency command changes from forward command to reverse command, the MOx output status will change from OFF to ON after the MOx response time.

G2. AI Setting

You can set this parameter during operation

G2-00 Virtual AI Function

(0xD40) Default: 0

Settings 0: Disable
1: Enable

When the virtual AI function is enabled, the AI input value is replaced by the virtual AI level (Pr.G2-12, G2-31, and G2-50) setting.

The parameter format of virtual AI function is 000000b–111111b. The bits from right (bit0) to left (bit2) correspond to AI1–AI3 respectively, and bit5–6 correspond to AI10–AI11.

G2-03 AI1 Signal Type

(0xD43) Default: 0

G2-22 AI2 Signal Type

(0xD56) Default: 2

G2-41 AI3 Signal Type

(0xD69) Default: 2

Settings 0: 0–10 V
1: 0–20 mA
2: 4–20 mA

Sets the analog input signal type and range.

The AI1 and AI2 signal types are set by Pr.G2-03 and G2-22.

The AI3 signal type parameter setting should be the same as AI3 analog input switch setting, the default of these two are both 4–20 mA signal type.

When using circulated pump function and the feedback signal type is ACI, it is limited to use AI3 for connection to ensure the function works normally. Refer to Section 3-4-1-2 The Wiring of Pressure Sensor for detailed information.

G2-04 AI1 Filter Time

(0xD44) Default: 0.02

G2-23 AI2 Filter Time

(0xD57) Default: 0.02

G2-42 AI3 Filter Time

(0xD6A) Default: 0.02

Settings 0.00–20.00 sec.

The analog signal input by the control terminal often contains noise, which affects the stability of the control. Use an input filter to eliminate this noise.

When the time constant setting is too large, the control is stable, but the control response is slow. When the time constant setting is too small, the control responses faster but it may be unstable. For optimal setting, adjust the setting based on the control stability or the control response.

G2-05 AI1 Low Value

(0xD45)

G2-24 AI2 Low Value

(0xD58)

G2-43 AI3 Low Value

(0xD6B)

Default:

Settings	0–10 V: 0.00–10.00 V	0.00
	0–20 mA: 0.00–20.00 mA	0.00
	4–20 mA: 4.00–20.00 mA	4.00

G2-06 AI1 Low %

(0xD46)

G2-25 AI2 Low %

(0xD59)

G2-44 AI3 Low %

(0xD6C)

Default: 0.00

Settings -100.00–100.00%

G2-07 AI1 Mid Value

(0xD47)

G2-26 AI2 Mid Value

(0xD5A)

G2-45 AI3 Mid Value

(0xD6D)

Default:

Settings	0–10 V: 0.00–10.00 V	5.00
	0–20 mA: 0.00–20.00 mA	10.00
	4–20 mA: 4.00–20.00 mA	12.00

G2-08 AI1 Mid %

(0xD48)

G2-27 AI2 Mid %

(0xD5B)

G2-46 AI3 Mid %

(0xD6E)

Default: 50.00

Settings -100.00–100.00%

G2-09 AI1 High Value

(0xD49)

G2-28 AI2 High Value

(0xD5C)

G2-47 AI3 High Value

(0xD6F)

Default:

Settings	0–10 V: 0.00–10.00 V	10.00
	0–20 mA: 0.00–20.00 mA	20.00
	4–20 mA: 4.00–20.00 mA	20.00

G2-10 AI1 High %

(0xD4A)

G2-29 AI2 High %

(0xD5D)

G2-48 AI3 High %

(0xD70) Default: 100.00

Settings -100.00–100.00%

- When the parameter AI signal type is the voltage type 0–10V analog input, the setting unit is voltage (V); when the signal type is current 0–20 mA or 4–20 mA input, the setting unit is current (mA).
- If the analog input is set as frequency command, 100% corresponds to Fmax (Pr.C2-17 maximum operation frequency).
- The voltage can only be input from low voltage to high voltage between AI1–AI3, which is low value ≤ mid value ≤ high value. There is no limit for the corresponding percentage, you can set it freely, and the calculation is linear between two points.
- When the voltage input is lower than the low value, the output percentage equals to the low percentage. For example, when Pr.G2-05 = 1 V and Pr.G2-06 = 10%, all of the output below 1V (including) is 10%.

G2-11 AI1 Signal Loss Action

(0xD4B)

G2-30 AI2 Signal Loss Action

(0xD5E)

G2-49 AI3 Signal Loss Action

(0xD71) Default: 0

Settings
0: Disable
1: Warn & Continue OPER
2: Fault & Ramp to Stop
3: Fault & Auto-Decel
4: Fault & Coast to Stop
5: Fault & by Quick Stop Time
6: Warning & FREQ Lower Limit OPER

- The signal loss function is only valid when the AI signal type is selected as 4–20 mA. When the AI signal type is set as 4–20 mA loss, the AI signal is regarded as loss when it is lower than 3.6 mA, and regarded as not loss when it returns to 4 mA.

G2-12 Virtual AI1 Input

(0xD4C)

G2-31 Virtual AI2 Input

(0xD5F)

G2-50 Virtual AI3 Input

(0xD72) Default: 0.00

Settings 0.00–100.00%

🕮 When the virtual AI function is enabled, the virtual AI input takes place of the actual input value.

G2-13 AI1 Display

(0xD4D)

G2-32 AI2 Display

(0xD60)

G2-51 AI3 Display

(0xD73) Default: Read only

Settings -100.00–100.00%

🕮 Displays the current AI signal percentage.

G2-59 AI Comparator Src

(0xD7B) Default: 0

Settings 0: Disable
1: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

🕮 Sets the analog input source.

G2-60 AI Comparator High Level

(0xD7C) Default: 50.0

Settings -100.0–100.0%

🕮 Sets the high level of analog input.

G2-61 AI Comparator Low Level

(0xD7D) Default: 10.0

Settings -100.0–100.0%

🕮 Sets the low level of analog input.

G2-62 AI Level in Range Indn

(0xD7E) Default: 0

Settings 0: Disable
1–2: Relay 1–2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay 10–15

When the analog signal is higher than the high level, Pr.G2-62 starts the corresponding output; when the analog signal is lower than the low level, it stops the corresponding output.

G3. AO Setting

You can set this parameter during operation

G3-00 Virtual AO Function

(0xD80) Default: 0

Settings 0: Disable
1: Enable

The parameter format of virtual AO function is 000000b–111111b. The bits from right (bit0) to left (bit1) correspond to AO1–AO2 respectively, and bit4–5 correspond to AO10–AIO11.

G3-07 Virtual AO1 Output

(0xD87) Default: 0.00

G3-21 Virtual AO2 Output

(0xD95) Default: 0.00

Settings 0.00–100.00 PCT

When the virtual AO function is enabled, the AO output value is replaced by the virtual AO level (Pr.G3-07, G3-21) setting.

G3-01 AO1 Function Sel

(0xD81) Default: 1

G3-15 AO2 Function Sel

(0xD8F) Default: 3

Settings 0: No function
1: FREQ Cmd AO selection
2: Motor speed AO selection
3: Output current AO selection
4: Output voltage AO selection
5: DC bus voltage AO selection
6: Power factor AO selection
7: Output power AO selection
8: Output frequency AO selection
9: FREQ profile AO selection
10: Output torque AO selection
11: Motor Temp 1 AO selection
12: Motor Temp 2 AO selection
13: Virtual AO selection
14: Modbus AO mask
15: CANopen AO mask
16: BACnet AO mask
17: DeviceNet AO mask
18: Profibus AO mask
19: Ethernet AO mask
20: B-PID1 output AO selection

21: B-PID2 output AO selection
22: B-PID3 output AO selection
23: B-PID4 output AO selection

📖 AO1 and AO2 can select the same function. For example, AO1 and AO2 can select the same function as Pr.o0-27 Frequency command AO Select.

G3-02 AO1 Signal Type

(0xD82) Default: 2

G3-16 AO2 Signal Type

(0xD90) Default: 2

Settings 0: 0–10 V
1: 0–20 mA
2: 4–20 mA

📖 Sets the analog output signal type and range.

G3-03 AO1 Filter Time

(0xD83) Default: 0.02

G3-17 AO2 Filter Time

(0xD91) Default: 0.02

Settings 0.00–20.00 sec.

📖 When the control signal is unstable, set the filter time to reduce the output signal fluctuation.

G3-04 AO1 Bias

(0xD84) Default: 0.00

G3-18 AO2 Bias

(0xD92) Default: 0.00

Settings -100.00–100.00%

📖 Signal type is 0–10V, take the output frequency as an example:
10V × (output frequency ÷ Pr.C2-17) × Pr.G3-05 + 10V × Pr.G3-04

📖 Signal type is 0–20 mA, take the output frequency as an example:
20 mA × (output frequency ÷ Pr.C2-17) × Pr.G3-05 + 20 mA × Pr.G3-04

📖 Signal type is 4–20 mA, take the output frequency as an example:
4 mA + 16 mA × (output frequency ÷ Pr.C2-17) × Pr.G3-05 + 16 mA × Pr.G3-04

📖 Sets the corresponding value when analog output 0%.

G3-05 AO1 Gain

(0xD85) Default: 100.0

G3-19 AO2 Gain

(0xD93) Default: 100.0

Settings -500.0–500.0%

📖 Adjusts the signal level of the analog signal outputs from the drive to the analog meter.

G3-06 AO1 Output Method

(0xD86) Default: 0

G3-20 AO2 Output Method

(0xD94) Default: 0

Settings 0: Absolute Value
1: 0% Negative; 0–100% Positive
2: 0–50% Negative; 50–100% Positive

📖 Sets the positive and negative range of the control signal indicated by the output signal range.

∗G4. Extension MI Setting

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

G4-00 Extension Card ID

(0xDC0) Default: Read only

Settings 0: None
1: EMV-A22A
5: EMV-D42A
6: EMV-R6AA

🕮 When an extension IO card has been inserted into the drive before powering on, this parameter displays after powering on to identify the type of extension IO card.

🕮 It means no extension card when this parameter displays 0.

↗ G4-02 MI10 Response Time

(0xDC2)

↗ G4-04 MI11 Response Time

(0xDC4)

↗ G4-06 MI12 Response Time

(0xDC6)

↗ G4-08 MI13 Response Time

(0xDC8)

↗ G4-10 MI14 Response Time

(0xDCA)

↗ G4-12 MI15 Response Time

(0xDCC) Default: 0.001

Settings 0.000–30.000 sec.

🕮 Refer to description of Pr.G0-06.

∗G5. Extension MO Setting

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

G5-00 Extension Card ID

(0xE00) Default: Read only

Settings 0: None
1: EMV-A22A
5: EMV-D42A
6: EMV-R6AA

🕮 When an extension IO card has been inserted into the drive before powering on, this parameter displays after powering on to identify the type of extension IO card.

🕮 It means no extension card when this parameter displays 0.

↗ G5-01 MO10 (RY10) Function Sel

(0xE01)

↗ G5-03 MO11 (RY11) Function Sel

(0xE03)

↗ G5-05 RY12 Function Sel

(0xE05)

↗ G5-07 RY13 Function Sel

(0xE07)

↗ G5-09 RY14 Function Sel

(0xE09)

↗ G5-11 RY15 Function Sel

(0xE0B) Default: 0

Settings 0–65535

🕮 Refer to description of Pr.G1-04.

↗ G5-02 MO10 (RY10) Response Time

(0xE02)

↗ G5-04 MO11 (RY11) Response Time

(0xE04)

↗ G5-06 RY12 Response Time

(0xE06)

↗ G5-08 RY13 Response Time

(0xE08)

↗ G5-10 RY14 Response Time

(0xE0A)

↗ G5-12 RY15 Response Time

(0xE0C)

Settings 0.000–30.000 sec.

G5-13 MO10 (RY10) ON Response Time

(0xE0D)

G5-14 MO10 (RY10) OFF Response Time

(0xE0E)

G5-15 MO11(RY11) ON Response Time

(0xE0F)

G5-16 MO11(RY11) OFF Response Time

(0xE10)

G5-17 RY12 ON Response Time

(0xE11)

G5-18 RY12 OFF Response Time

(0xE12)

G5-19 RY13 ON Response Time

(0xE13)

G5-20 RY13 OFF Response Time

(0xE14)

G5-21 RY14 ON Response Time

(0xE15)

G5-22 RY14 OFF Response Time

(0xE16)

G5-23 RY15 ON Response Time

(0xE17)

G5-24 RY15 OFF Response Time

(0xE18) Default: 0.01

Settings 0.000–30.000 sec.

📖 Refer to description of Pr.G1-15.

∗G6. Extension AI Setting

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

G6-00 Extension Card ID

(0xE40) Default: Read only

Settings 0: None
1: EMV-A22A
5: EMV-D42A
6: EMV-R6AA

🕮 When an extension IO card has been inserted into the drive before powering on, this parameter displays after powering on to identify the type of extension IO card.

🕮 It means no extension card when this parameter displays 0.

↗ G6-02 AI10 Signal Type

(0xE42)

↗ G6-14 AI11 Signal Type

(0xE4E) Default: 0

Settings 0: 0–10 V
1: 0–20 mA
2: 4–20 mA

🕮 Refer to description in Pr.G2-03.

↗ G6-03 AI10 Filter Time

(0xE43)

↗ G6-15 AI11 Filter Time

(0xE4F) Default: 0.02

Settings 0.00–20.00 sec.

🕮 Refer to description in Pr.G2-04.

↗ G6-04 AI10 Low Value

(0xE44)

↗ G6-16 AI11 Low Value

(0xE50) Default:

Settings	0–10 V: 0.00–10.00 V	0.00
	0–20 mA: 0.00–20.00 mA	0.00
	4–20 mA: 4.00–20.00 mA	4.00

🕮 Refer to description in Pr.G2-05.

↗ G6-05 AI10 Low %

(0xE45)

↗ G6-17 AI11 Low %

(0xE51) Default: 0.00

Settings -100.00–100.00%

🕮 Refer to description in Pr.G2-06.

G6-06 AI10 Mid Value

(0xE46)

G6-18 AI11 Mid Value

(0xE52) Default:

Settings	0–10 V: 0.00–10.00 V	5.00
	0–20 mA: 0.00–20.00 mA	10.00
	4–20 mA: 4.00–20.00 mA	12.00

📖 Refer to description in Pr.G2-07.

G6-07 AI10 Mid %

(0xE47)

G6-19 AI11 Mid %

(0xE53) Default: 50.00

Settings -100.00–100.00%

📖 Refer to description in Pr.G2-08.

G6-08 AI10 High Value

(0xE48)

G6-20 AI11 High Value

(0xE54) Default:

Settings	0–10 V: 0.00–10.00 V	10.00
	0–20 mA: 0.00–20.00 mA	20.00
	4–20 mA: 4.00–20.00 mA	20.00

📖 Refer to description in Pr.G2-09.

G6-09 AI10 High %

(0xE49)

G6-21 AI11 High %

(0xE55) Default: 100.00

Settings -100.00–100.00%

📖 Refer to description in Pr.G2-10.

G6-10 AI10 Signal Loss Action

(0xE4A)

G6-22 AI11 Signal Loss Action

(0xE56) Default: 0

Settings
0: Disable
1: Warn & Continue OPER
2: Fault & Ramp to Stop
3: Fault & Auto-Decel
4: Fault & Coast to Stop
5: Fault & by Quick Stop Time
6: Warning & FREQ Lower Limit OPER

📖 Refer to description in Pr.G2-11.

G6-11 Virtual AI10 Input

(0xE4B)

G6-23 Virtual AI11 Input

(0xE57) Default: 0.00

Settings 0.00–100.00%

📖 Refer to description in Pr.G2-12.

G6-12 AI10 Display

(0xE4C)

G6-24 AI11 Display

(0xE58) Default: Read only

Settings -100.00–100.00%

📖 Refer to description in Pr.G2-13.

∗G7. Extension AO Setting

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

G7-00 Extension Card ID

(0xE80) Default: Read only

Settings 0: None
1: EMV-A22A
5: EMV-D42A
6: EMV-R6AA

🕮 When an extension IO card has been inserted into the drive before powering on, this parameter displays after powering on to identify the type of extension IO card.

🕮 It means no extension card when this parameter displays 0.

↗ G7-01 AO10 Function Sel

(0xE81)

↗ G7-08 AO11 Function Sel

(0xE88) Default: 0

Settings 0–65535

🕮 Refer to description in Pr.G3-01.

↗ G7-02 AO10 Signal Type

(0xE82)

↗ G7-09 AO11 Signal Type

(0xE89) Default: 0

Settings 0: 0–10 V
1: 0–20 mA
2: 4–20 mA

🕮 Refer to description in Pr.G3-02.

↗ G7-03 AO10 Filter Time

(0xE83)

↗ G7-10 AO11 Filter Time

(0xE8A) Default: 0.02

Settings 0.00–20.00 sec.

🕮 Refer to description in Pr.G3-03.

↗ G7-04 AO10 Bias

(0xE84)

↗ G7-11 AO11 Bias

(0xE8B) Default: 0.00

Settings -100.00–100.00%

🕮 Refer to description in Pr.G3-04.

G7-05 AO10 Gain

(0xE85)

G7-12 AO11 Gain

(0xE8C) Default: 100.0

Settings -500.0–500.0%

📖 Refer to description in Pr.G3-05.

G7-06 AO10 Output Method

(0xE86)

G7-13 AO11 Output Method

(0xE8D) Default: 0

Settings 0: Absolute Value
1: 0% Negative; 0–100% Positive
2: 0–50% Negative; 50–100% Positive

📖 Refer to description in Pr.G3-06.

G7-07 Virtual AO10 Output

(0xE87)

G7-14 Virtual AO11 Output

(0xE8E) Default: 0.00

Settings 0.00–100.00 PCT

📖 Refer to description in Pr.G3-07.

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H. Fault & Protection

H0. Fault Handle

✎ You can set this parameter during operation

✎ H0-00 Fault Reset MI Src

(0xF40) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

🕮 Sets the corresponded fault handle function of multi-function terminals.

✎ H0-01 Fault Indn

(0xF41) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

🕮 Sets the corresponded fault indication of multi-function terminals.

✎ H0-02 Warning Indn

(0xF42) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

🕮 Sets the corresponded warning indication of multi-function terminals.

H0-03 Fault Auto Reset Allowed Sel

(0xF43) Default: 0

Settings bit 0: ocA/ ocd/ ocn
bit 1: ovA/ ovd/ ovn/ ovs
bit 2: LvA/ Lvd/ Lvn
bit 3: Orp
bit 4: oH1/ oH2
bit 5: EF
bit 6: EF1
bit 7: oL
bit 8: Eol1/ Eol2
bit 9: oH3
bit 10: ot1/ ot2

bit 11: uC
bit 12: AFE/ ACE
bit 13: GFF
bit 14: Reserve
bit 15: Reserve

📖 Sets the selection of fault restart type. To restart after fault, you cannot set Pr.H0-04 to 0.

H0-04 Fault Restart MI Src

(0xF44) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

📖 Sets the fault restart function and enable it through external terminals.

H0-05 Restart Speed Tracking

(0xF45) Default: 0

Settings 0: Max output FREQ
1: FREQ before stop
2: Min output FREQ
3: Auto Estimation

📖 Speed tracking is suitable for punch, fans, and other large inertia loads. For example, a mechanical punch usually has a large inertia flywheel, and the general stop method is coast to stop. If it needs to be restarted again, the flywheel may take 2–5 minutes or longer to stop. This parameter setting allows you to start the flywheel operating again without waiting until the flywheel stops completely.

📖 When using PM, the output frequency converts to the actual rotor speed from zero-speed.

📖 When using SynRM, Pr.H0-05 only supports setting 2 (speed tracking from the minimum output frequency).

H0-06 Fault Restart No.

(0xF46) Default: 0

Settings 0–10 times

📖 After a fault occurs, the AC motor drive can reset and restart automatically up to 10 times. If Pr.H0-06 is set to 0, there is no upper limit for auto restart time. The drive starts according to the Pr.H0-05 setting after restarting after fault.

📖 If the number of faults exceeds the Pr.H0-06 setting, the drive does not reset and restart until you press “RESET” manually and execute the operation command again.

H0-07 Fault Restart No. Remain

(0xF47) Default: Read only

Settings 0–10

📖 Displays the remaining fault auto reset times of the drive.

📖 There are two reset conditions for Pr.H0-07 reset:

1. When the number of resets is used up, the automatic restart will not activate and Pr.H0-07 returns to the setting value of Pr.H0-06.
2. If the number of resets has not been used up, the time of Pr.H0-08 will be counted after the latest automatic restart. After the counting is completed, Pr.H0-07 returns to the setting value of Pr.H0-06.

H0-08 Fault Restart No. Reset Time

(0xF48) Default: 60.0

Settings 0.0–600.0 sec.

📖 Sets the longest reset time of the fault auto restart time.

H0-09 Fault Auto Reset Delay Time

(0xF49) Default: 1.0

Settings 1.0–600.0 sec.

📖 Sets the delay time before fault auto reset.

H0-10 Fault Restart Delay Time

(0xF4A) Default: 1.0

Settings 1.0–600.0 sec.

📖 Sets the delay time before fault auto restart.

H0-11 STO Definition Sel

(0xF4B) Default: 0

Settings 0: STO Fault
1: Fault at Run; Warning at Stop
2: STO Warning
3: No STO Display at Stop

📖 Defines the STO as fault or warning when the STO occurs.

H0-12 STO1/2 Allowable Duration

(0xF4C) Default: 40

Settings 40–480 ms

📖 Sets the time difference between the STO channel detection.

H0-13 STO Indn Delay Time

(0xF4D) Default: 40

Settings 40–1000 ms

📖 Sets the delay time when the indication is triggered.

H0-14 STO Auto Reset

(0xF4E) Default: 0

Settings 0: Disable
1: Enable

📖 Determines whether the STO fault can be auto reset.

H0-15 STO Output logic A

(0xF4F) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

📖 Sets the corresponded STO output logic A of multi-function terminals.

H0-16 STO Output logic B

(0xF50) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

📖 Sets the corresponded STO output logic B of multi-function terminals.

H0-17 Fault Output Indn 1

(0xF51) Default: 0

H0-18 Fault Output Indn 2

(0xF52) Default: 0

H0-19 Fault Output Indn 3

(0xF53) Default: 0

H0-20 Fault Output Indn 4

(0xF54) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

📖 Set the corresponded fault output indication 1–4 of multi-function terminals, use these parameters with Pr.H0-21–H0-24.

H0-21 Fault Output Option 1

(0xF55) Default: 0

H0-22 Fault Output Option 2

(0xF56) Default: 0

H0-23 Fault Output Option 3

(0xF57) Default: 0

H0-24 Fault Output Option 4

(0xF58) Default: 0

Settings 0–65535

📖 Set the fault output code Pr.H0-21–H0-24, when the corresponded fault code occurs, it outputs the corresponded fault indication Pr.H0-17–H0-20.

H1. Voltage Protection

You can set this parameter during operation

H1-00 ov Warning Level

(0xF80) Default: 740.0

Settings 0.0–820.0 V_{DC}

0: No warning

Sets the judging level of over voltage. When the drive DC bus voltage is higher than the voltage level, the ov fault is triggered to stop output and coast to stop.

H1-01 ov Warning Indn

(0xF81) Default: 0

Settings 0: Disable

1–2: Relay1–Relay2

3–4: MO1–MO2

5–9: Reserve

10–15: MO/Relay 10–15

Sets the over-voltage warning indication of multi-function terminals.

H1-02 Lv Fault Indn

(0xF82) Default:

Settings Non Lower harmonic models:

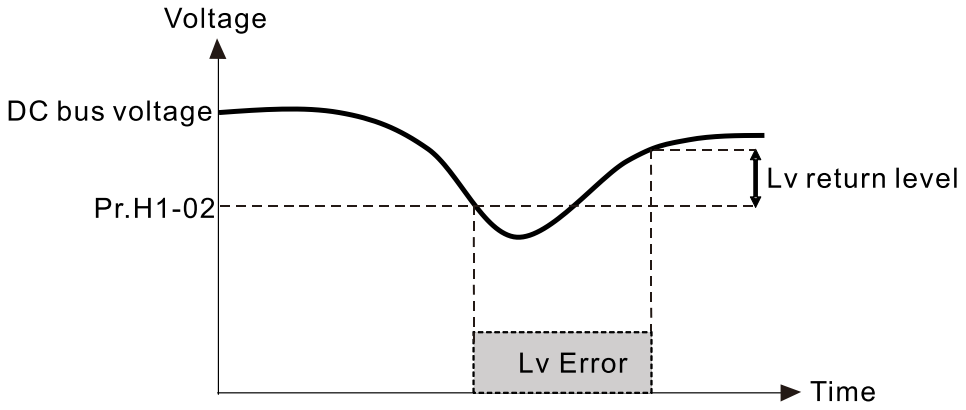
300.0–440.0 V_{DC} / 150.0–220.0 V_{DC} 360.0/ 180.0

Lower harmonic models:

200.0–400.0 V_{DC} / 100.0–200.0 V_{DC} 200.0/ 100.0

Sets the judging level of low voltage. When the drive DC bus voltage is lower than the low voltage level, the Lv fault is triggered to stop output and coast to stop.

The Lv return level of 460V models is 60V.



H1-05 Lv Fault Indn

(0xF85) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

🕮 Sets the corresponded low voltage fault indication of multi-function terminals.

H1-06 Restart after Power Loss

(0xF86) Default: 0

Settings 0: Disable
1: FREQ before power loss
2: Max output FREQ
3: Min output FREQ
4: Auto Estimation

🕮 Determines the operation mode when the drive restarts from a momentary power loss.

🕮 The power system connected to the drive may power off momentarily due to various reasons. This function allows the drive to keep outputting voltages after repowered and does not cause the drive to stop.

🕮 This function is only valid when the RUN command is enabled.

H1-07 Power Loss Time Allowed

(0xF87) Default: 2.0

Settings 0.0–20.0 sec.

🕮 Determines the maximum time of allowable power loss. If the duration of a power loss exceeds this parameter setting, the AC motor drive stops output after the power recovers.

🕮 The function of restart after loss is valid when the AC motor drive displays “Lv” during the maximum allowable power loss time. If the AC motor drive powers off due to overload which even does not exceed the allowed power loss duration, Pr.H1-06 is invalid after the power recovers

H1-08 ov Stall Prev Level

(0xF88) Default: 760.0

Settings 0.0–900.0 V_{DC}

🕮 When Pr.H1-08 is set to 0.0, the over-voltage stall prevention function is disabled.

🕮 Setting Pr.H1-08 to a value > 0.0 enables the over-voltage stall prevention. This setting refers to the power supply system and loading. If the setting is too low, then over-voltage stall prevention is easily activated, which may increase the deceleration time.

🕮 When Pr.H1-09 (Stall Prev Function Sel) is set as 0–3, and the used drive is general model (VFDxxxVP43xxxAx), the default of Pr.H1-08 (ov Stall Prev Level) is set as parameter setting.

🕮 When Pr.H1-09 (Stall Prev Function Sel) is set as 1 or 3, and the used drive is the lower harmonic model (VFDxxxVP43xxxCx), the default of Pr.H1-08 (ov Stall Prev Level) is dynamically adjusted by the system.

H1-09 Stall Prev Function Sel

(0xF89) Default: 3

Settings 0: Basic OC+Basic OV
1: Basic OC+Smart OV
2: Smart OC+Basic OV
3: Smart OC+Smart OV

🕮 A comparison between basic stall prevention and smart stall prevention:

Type	Over-voltage			Over-current (oc)		
	Descriptions	Action	Pr.	Descriptions	Action	Pr.
Basic	Frequency maintains during deceleration	Deceleration stops	H1-08	Frequency maintains during acceleration	Acceleration stops	H2-05
				Frequency decreases at constant speed	Frequency gradually decreases	H2-07
Smart	Frequency increases during accel./ decel./ constant speed	Full PID control	H1-08	Frequency decreases during accel./ decel.	Full PID control	H2-05
				Frequency decreases at constant speed	Full PID control	H2-07

🕮 Pr.H1-09 (stall prevention function selection) and Pr.J3-00 (TEC function) can be used together.

🕮 If you use smart over-voltage or smart over-current stall prevention for industries that require fast response, you can adjust the value of Smart OV PID controller (Pr.H1-11–H1-13).

🕮 When using smart over-voltage function, the drive decelerates to stop with the fastest deceleration time according to different working condition, rather than the first to fourth deceleration time (Pr.C2-01–C2-09).

🕮 When you choose the smart over-voltage stall prevention and the drive is a lower harmonic model, Pr.H1-08 ov Stall Prev Level will be adjusted dynamically.

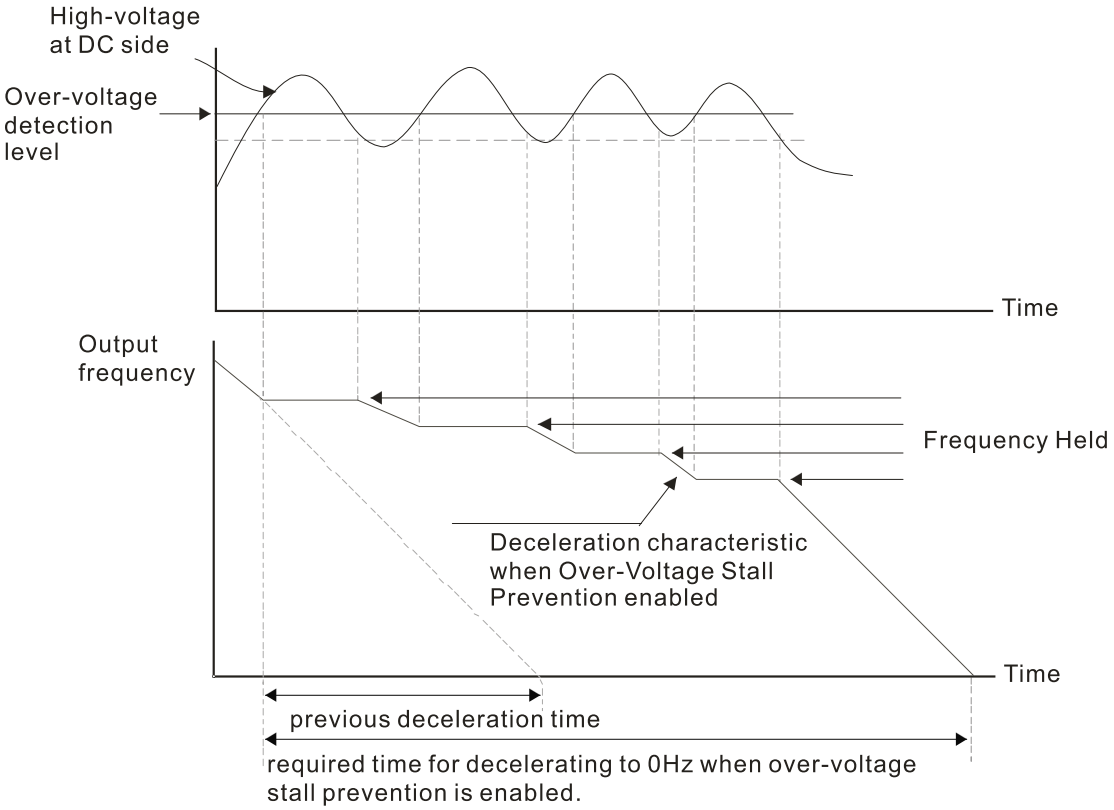
Basic Over-voltage Stall Prevention

🕮 This parameter is suitable for uncertain load inertia. When stopping under normal load, the over-voltage does not occur during deceleration and meet the deceleration time setting. Sometimes it may not stop due to over-voltage during decelerating to STOP when the load regenerative inertia increases. In this case, the AC motor drive extends the deceleration time automatically until the drive stops.

🕮 Due to the motor load inertia, the motor may exceed the synchronous speed when the drive decelerates; in this case, the motor becomes generator. If the motor load inertia is larger or the setting for drive derating time is too small, the motor regenerates energy to the drive, and makes the DC bus voltage increase to the maximum allowable value. When you enable basic over-voltage stall prevention and the DC bus voltage detected is too high, the drive stops decelerating (output frequency remains unchanged) until the DC bus voltage drops below the setting value.

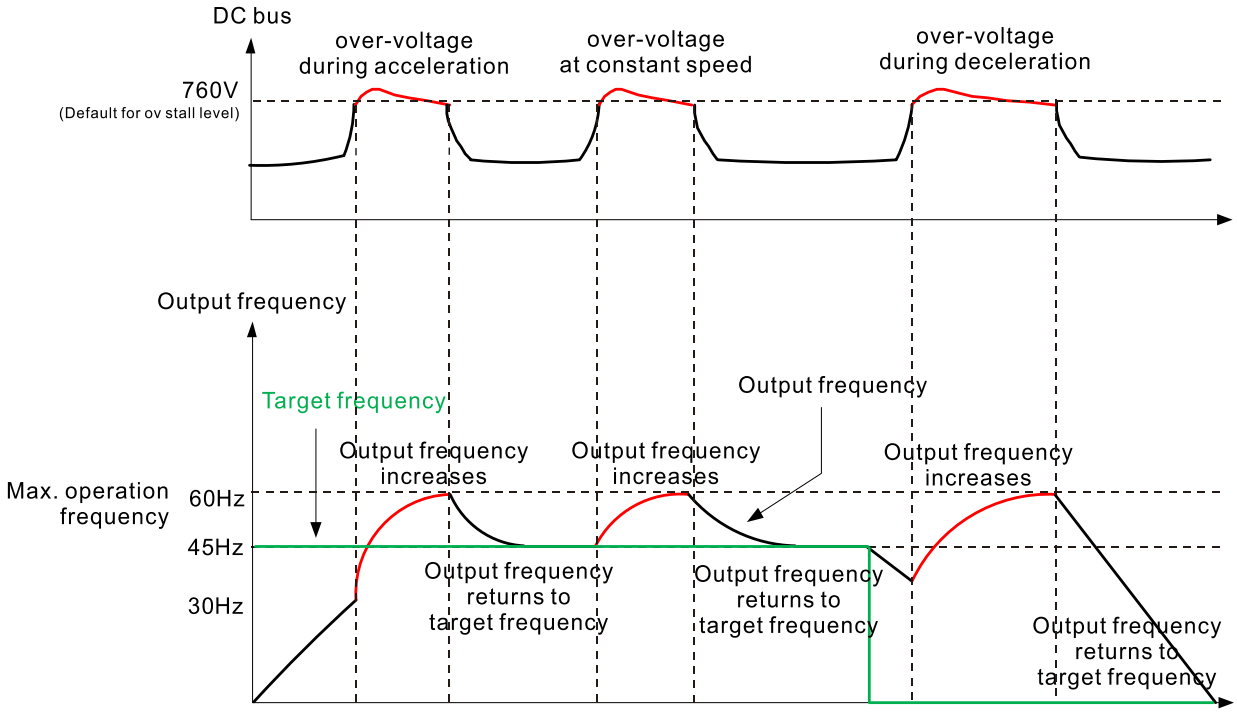
🕮 When the over-voltage stall prevention is enabled, the drive deceleration time is larger than the setting time.

🕮 If the deceleration time affects your application, it is not recommended to use this function. You can increase the deceleration time properly.



Smart Over-voltage Stall Prevention

The smart over-voltage stall prevention adopts closed-loop control. During acceleration, constant speed and deceleration, Pr.H1-08 Over-voltage Stall Prevention will be referred to as the control target command. When the DC bus voltage exceeds the stall prevention level, the controller adjusts the output frequency increasing according to the closed-loop response until the DC bus voltage is lower than the stall prevention level, and then returns to the target frequency based on the originally set deceleration time after the situation is relieved. If the DC bus is still higher than the stall prevention level during the adjustment, the output frequency increases to Pr.C2-17 Maximum Operation Frequency.

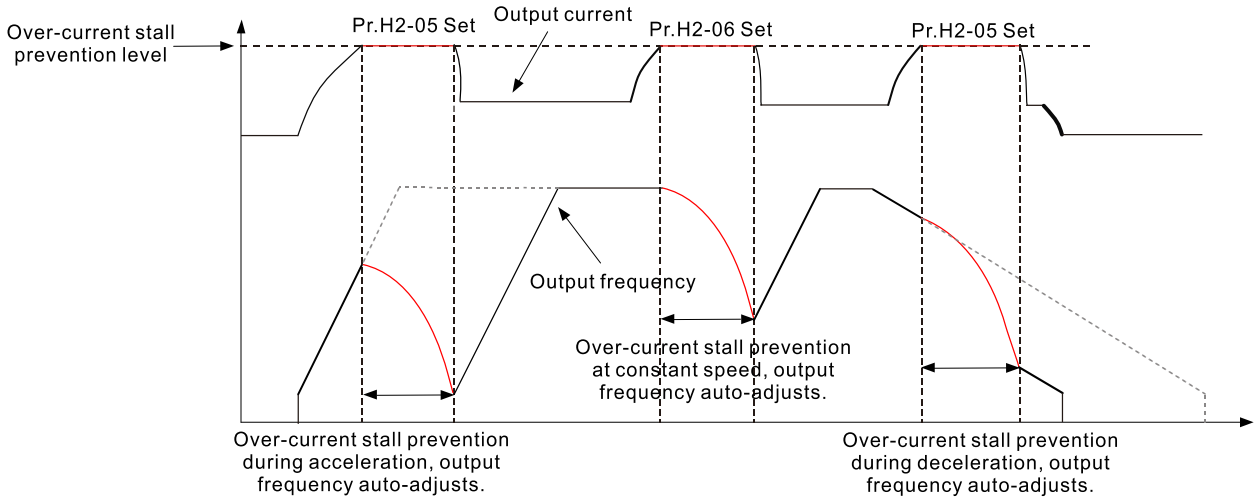


Basic Over-current Stall Prevention

- When the output current exceeds the over-current stall prevention level (Pr.H2-05) during acceleration, the output frequency stops accelerating. The output frequency continues to accelerate when the output current drops below the stall prevention level to protect the drive.
- When the output current exceeds the over-current stall prevention level during operation (Pr.H2-07), the output frequency decreases according to the setting for acceleration/ deceleration time selection for over-current stall prevention at constant speed (Pr.H2-07). When the output current drops below the stall prevention level, the output frequency accelerates to the target frequency according to its previous set acceleration time to protect the drive.

Smart Over-current Stall Prevention

- The smart over-current stall prevention adopts closed-loop control. It takes the setting for Pr.H2-05 (over-current stall prevention during acceleration) as target command during acceleration / deceleration and takes setting for Pr.H2-07 (over-current stall prevention during operation) as target command at constant speed. When the output current exceeds the stall prevention level, the Smart OC PI controller (Pr.H2-10, H2-11) decreases the output frequency gradually according to the closed-loop response until the current drops below the stall prevention level and returns to target frequency based on the previous setting when the current is lower than the stall prevention level. If the output current is still higher than the stall prevention level during the adjustment, the output frequency decreases to the minimum output frequency.



H1-10 OV Stall Prev Indn

(0xF8A) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

- Sets the corresponded over-voltage stall prevention indication of multi-function terminals.

H1-11 Smart ov P Gain

(0xF8B) Default: Depending on the models

Settings 0–65535

📖 Sets the proportional gain of smart over-voltage stall prevention.

H1-12 Smart ov I Gain

(0xF8C) Default: Depending on the models

Settings 0–65535

📖 Sets the integral gain of smart over-voltage stall prevention.

H1-13 Smart ov D Gain

(0xF8D) Default: Depending on the models

Settings 0–65535

📖 Sets the differential gain of smart over-voltage stall prevention.

H2. Current Protection

✍ You can set this parameter during operation

H2-00 GFF Detect Level

(0xFC0) Default: 60

Settings 0–200%

🕮 100% corresponds to the drive light load rated current.

H2-04 Output Current Limit

(0xFC4) Default: 100

Settings 0– Depending on the models (unit: %)
(100% corresponds to the drive continuous current)

🕮 Sets the maximum output current of the drive, determines the drive output current limit with Pr.F2-16–F2-19. When the control mode is PMFOC and SynRM FOC, and the drive output current reaches the set current limit, the output frequency automatically decreases as the over-current stall prevention action.

🕮 This parameter is NOT applicable for VF and SVC control modes.

✍ H2-05 ocA Stall Prev Level

(0xFC5) Default: 90

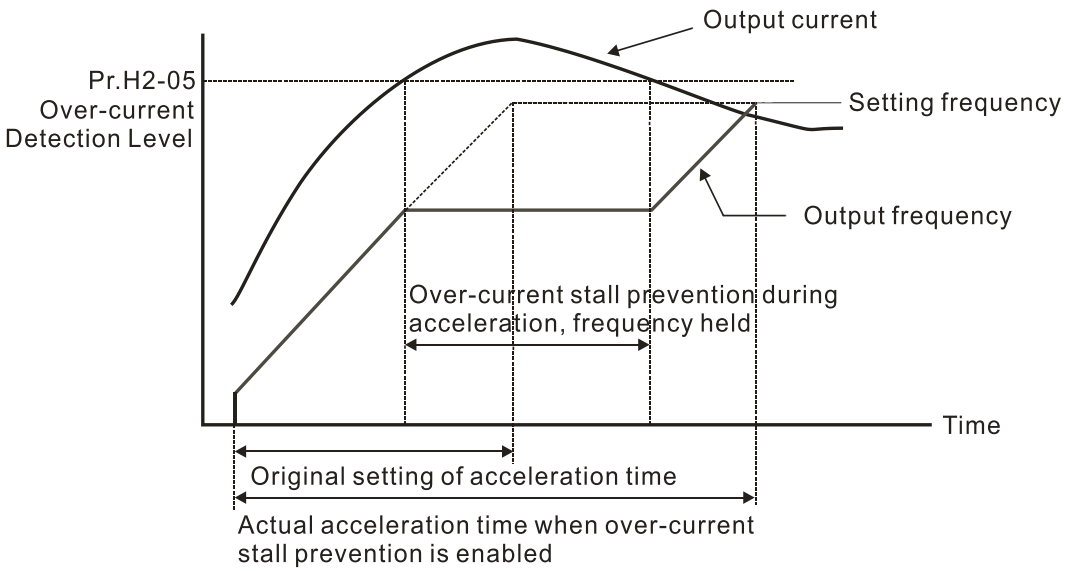
Settings 0–100%

🕮 If the motor load is too large or the drive acceleration time is too short, the output current of the drive may be too high during acceleration, and it may cause motor damage or trigger the drive protection functions (oL, oc, etc.). Use this parameter to prevent these situations.

🕮 As the following figure shown, the drive output current may increase abruptly and exceed the setting of Pr.H2-05 during acceleration. In this case, the drive stops accelerating and keeps the output frequency constant, and then continues to accelerate until the output current decreases.

🕮 When the over-voltage stall prevention is enabled, the drive acceleration time is larger than the setting time.

🕮 When the over-current stall prevention occurs because the motor capacity is too small or operates in the default, decrease Pr.H2-05 setting value.

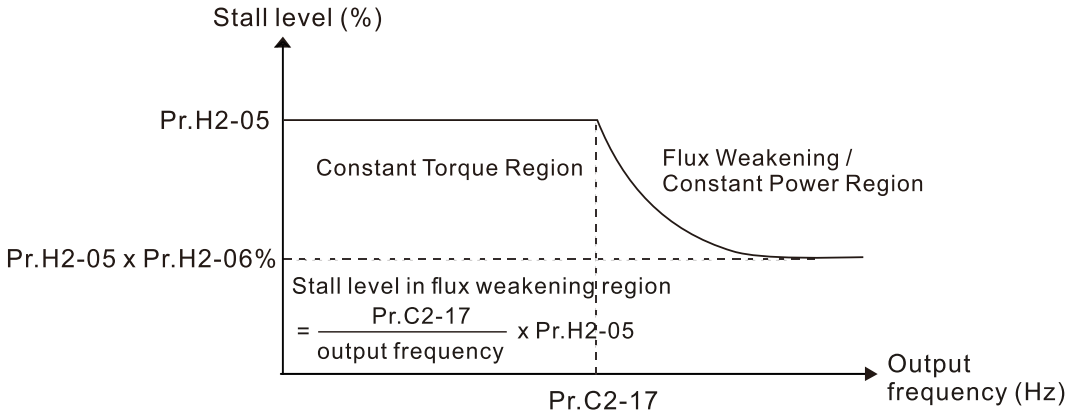


H2-06 Weak Flux oc Stall Prev Level

(0xFC6) Default: 100

Settings 0–100%

- Sets the over-current stall prevention level when the motor operation frequency is larger than Pr.d1-05 (IM1 Rated Frequency). This parameter only works during acceleration and for IM applications.
- Example: Pr.H2-05 = 150%, Pr.H2-06 = 80%.
  When the motor operation frequency is larger than Pr.d1-05 (IM1 Rated Frequency), the lowest over-current stall prevention level during acceleration is:
  Pr.H2-05 × Pr.H2-06 = 150 × 80% = 120%
- Pr.H2-06 is invalid when the over-current stall prevention activates according to Pr.H2-07 at constant speed.

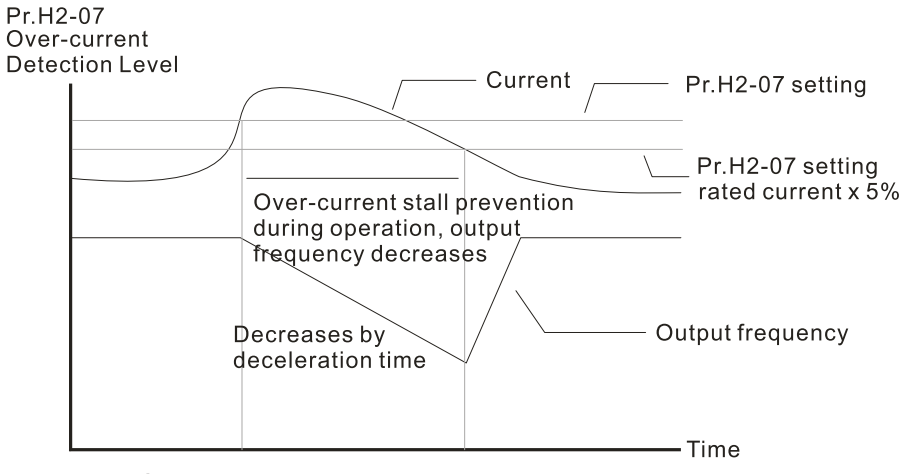


H2-07 ocn Stall Prev Level

(0xFC7) Default: 90

Settings 0–100%

- This is a protection for the drive to decrease output frequency automatically when the motor over-loads abruptly during constant motor operation.
- If the output current exceeds the setting value for Pr.H2-07 when the drive is operating, the drive decelerates according to the Pr.H2-08 setting to prevent the motor from stalling. The lower limit for the over-current stall prevention is determined by Pr.C2-19.



Over-current stall prevention during operation

H2-08 ocn Stall Prev Decel Sel

(0xFC8) Default: 0

Settings 0: Current Decel Time
1: Decel Time 1
2: Decel Time 2
3: Decel Time 3
4: Decel Time 4
5: By Quick Stop Time

Selects the deceleration time when over-current stall prevention occurs at constant speed.

H2-09 oc Stall Prev Indn

(0xFC9) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15
16–19: Reserve

Sets the corresponded over-current stall prevention indication of multi-function terminals.

H2-10 Smart oc P Gain

(0xFCA) Default: Depending on the models

Settings 0–65535

Sets the proportional gain of smart over-current stall prevention.

H2-11 Smart oc I Gain

(0xFCB) Default: Depending on the models

Settings 0.000–65.535

Sets the integral gain of smart over-current stall prevention.

H2-12 Low Current Detect Level

(0xFCC) Default: 0.0

Settings 0.0– 100.0%

100% corresponds to the drive light load rated current.

H2-13 Low Current Detect Time

(0xFCD) Default: 0.00

Settings 0.00–360.00 sec.

H2-14 Low Current Action

(0xFCE) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

- When the drive output current is lower that the set level in Pr.H2-12, and the low current output time exceeds the detect time of Pr.H2-13, the drive activates according to Pr.H2-14. It can be used with MO terminal 0FCFh (low current output).
- The low current detection does not activate when the drive is in sleep mode or standby mode.
- Pr.H2-12 low current detect level is based on the drive rated current, the equation is: Pr.A0-01 (drive rated current) × Pr.H2-12 (Low current detect level) % = Low current detection level (A).

H2-15 Low Current Indn

(0xFCF) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

- Sets the corresponded low current indication of multi-function terminals.

H3. Phase Loss Protection

You can set this parameter during operation

H3-00 OrP Action

(0x1000) Default: 1

Settings 1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The drive activates according to Pr.H3-00 when the DC bus ripple voltage meets the following conditions:

- DC bus ripple frequency ≤ 166 Hz
- Starts counting time when the vibration amplitude is larger than 60V (440V models) for 20 times continuously.

H3-01 OrP Indn

(0x1001) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

Sets the corresponded DC bus over-voltage protection indication of multi-function terminals.

H3-02 OPL Detect Level

(0x1002) Default: 1.00

Settings 0.00–100.00 sec. (100% corresponds to the drive rated current)
0: Disable

H3-03 OPL Detect Time

(0x1003) Default: 3.000

Settings 0.000–65.535 sec.

H3-04 OPL DC Brake Time

(0x1004) Default: 0.000

Settings 0.000–65.535 sec.

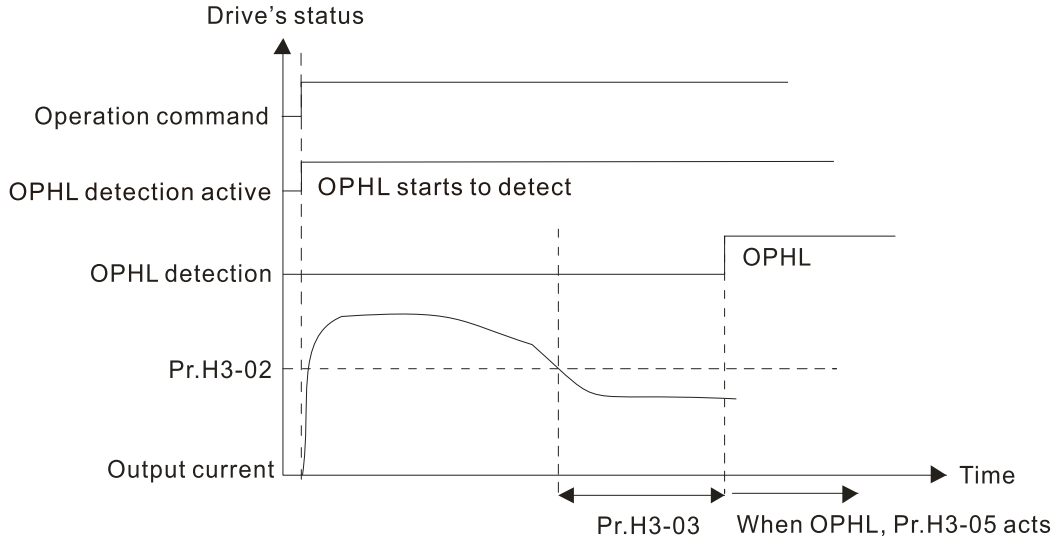
There are two situations for the output phase loss detection: “detect when the drive is in operation” and “detect before operation”. Setting Pr.H3-04 to 0 disables the OPHL detection function before operation.

The OPHL detection during operation is only valid for IM applications, and the OPHL detection before operation is available for all types of motors.

The status of output phase loss detection is as following:

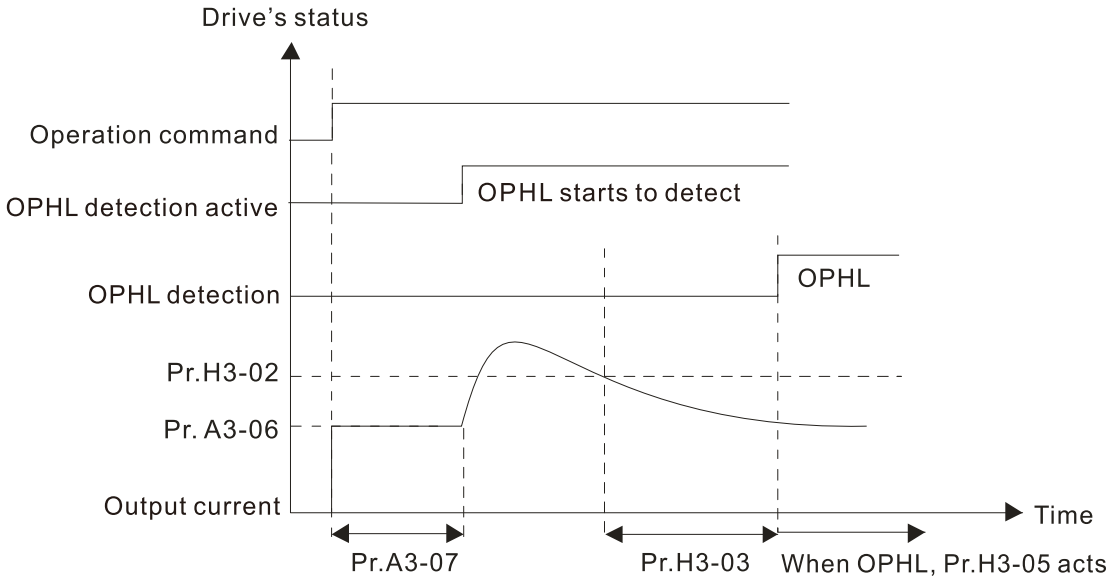
- Status 1: The drive is in operation

  When any phase is less than Pr.H3-02 level and exceeds the Pr.H3-03 setting time, the drive executes according to Pr.H3-05 setting.



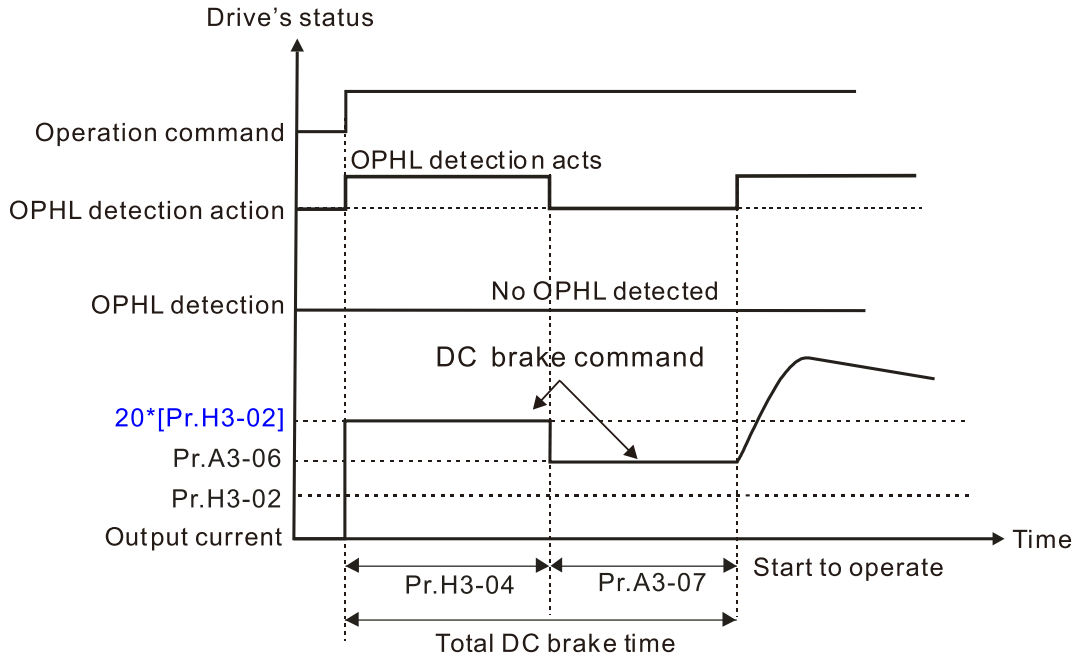
- Status 2: The drive is in STOP, Pr.H3-03 ≠ 0; Pr.H3-04 ≠ 0; Pr.A3-06 and A3-07 ≠ 0

  After the drive starts, the DC brake operates according to Pr.A3-06 and A3-07. During this period, OPHL detection is not active. After the DC brake action is completed, the drive starts to run and enables the OPHL protection as mentioned above in status 1.

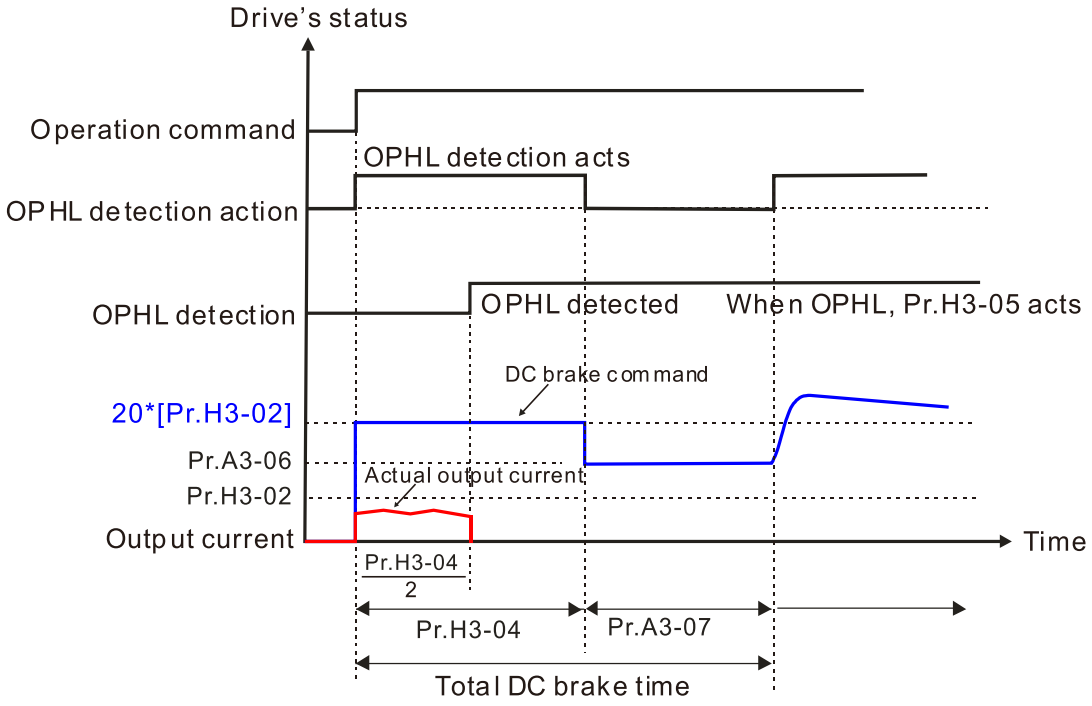


- Status 3: The drive is in STOP, Pr.H3-03 ≠ 0; Pr.H3-04 ≠ 0
  When the drive starts, it executes Pr.H3-04 first, and then executes Pr.A3-07 (DC brake). The DC brake current level in this state includes two parts: one is 20 times the Pr.H3-02 setting value in Pr. H3-04 setting time (if the value is larger than Pr.A3-06, then takes Pr.A3-06 as the level); the other is the Pr.A3-07 setting value if Pr.A3-06 setting time. The total DC brake time T = Pr.H3-04 + Pr.A3-07.

Status 3-1: Pr.H3-04 ≠ 0, Pr.A3-07 ≠ 0 (No OPHL detection before operation)

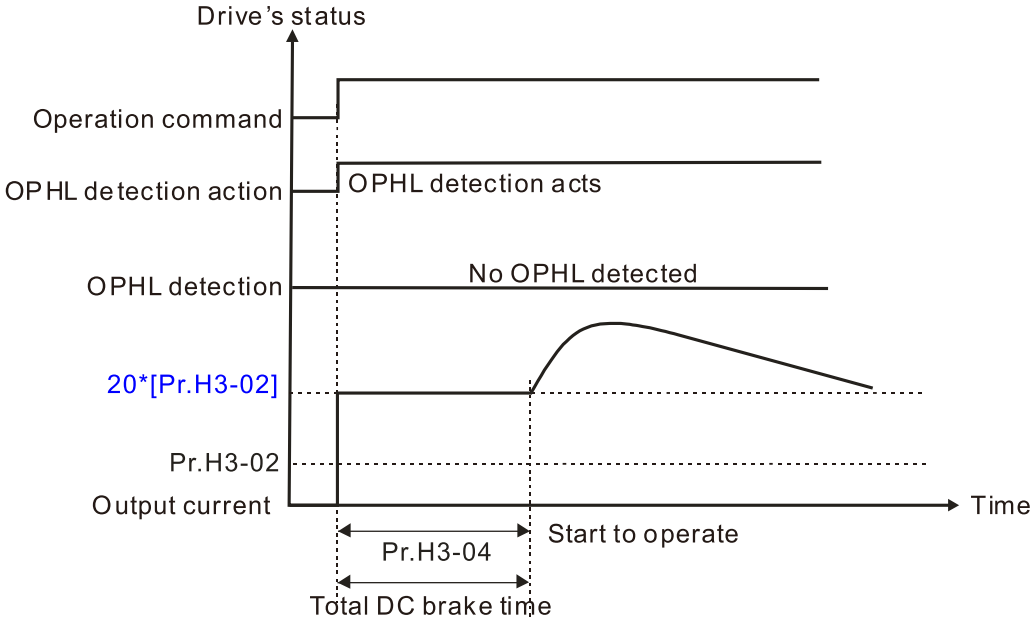


Status 3-2: Pr.H3-04 ≠ 0, Pr.A3-07 ≠ 0 (OPHL detected before operation)
In this period, if an OPHL occurs within the time for Pr.H3-04, the drive executes Pr.H3-05 setting after the drive starts counting for half the time of Pr.H3-04.

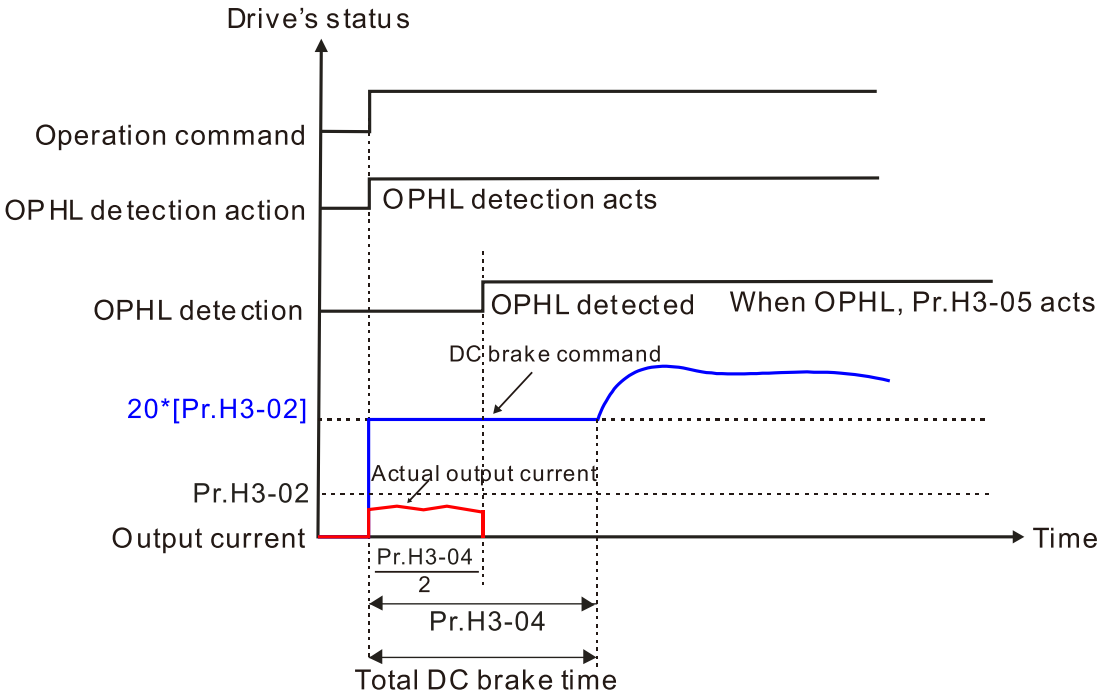


- Status 4: The drive is in STOP, Pr.H3-04 ≠ 0; Pr.A3-07 = 0
  When the drive starts, it executes Pr.H3-04 as the DC brake. The DC brake current level is 20 times the Pr.H3-02 setting value.

Status 4-1: Pr.H3-04 ≠ 0, Pr.A3-07 = 0 (No OPHL detection before operation)



Status 4-2: Pr.H3-04 ≠ 0, Pr.A3-07 = 0 (OPHL detected before operation)
In this period, if an OPHL occurs within the time for Pr.H3-04, the drive executes Pr.H3-05 setting after the drive starts counting for half the time of Pr.H3-04.



H3-05 OPL Action

(0x1005) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

🕮 The phase loss protection is activated when Pr.H3-05 is not set to 0.

H3-06 U Phase Loss Indn

(0x1006) Default: 0

H3-07 V Phase Loss Indn

(0x1007) Default: 0

H3-08 W Phase Loss Indn

(0x1008) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

🕮 Sets the corresponded U, V and W phase loss indication of multi-function terminals.

H4. Drive Heat Protection

You can set this parameter during operation

H4-00 IGBT oH Warning Level

(0x1040) Default: 95

Settings 0–95%

When the IGBT temperature is higher than Pr.H4-00 setting value, the drive gives the overheat warning.

H4-01 Cap oH Warning Level

(0x1041) Default: 95

Settings 0–95%

When the capacitance temperature is higher than Pr.H4-01 setting value, the drive gives the overheat warning.

H4-02 Drive oH Warning Indn

(0x1042) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

Sets the corresponded drive overheat warning indication of multi-function terminals.

H4-03 Fan Control Sel

(0x1043) Default: 1

Settings 0: Always OFF
1: Always ON
2: Fan ON after Drive Start
3: By IGBT Temp

Sets the fan running conditions.

0: The fan is OFF.

1: The fan runs immediately after the drive is power ON.

2: The fan runs while the drive is operating, and in one minute after the drive stops.

3: The fan runs when the IGBT temperature is > 60°C.

H4-05 CF Derating Protection

(0x1045) Default: 0

Settings 0: Reduce CF & Current Limit
1: Fix CF & Reduce Current Limit
2: Reduce CF & Fix Current Limit

The maximum allowable output frequency and the corresponded carrier frequency lower limit under each control mode:

- VF, SVC: 599 Hz, 6K
- FOC sensorless (IM): 300 Hz, 6K

- FOC sensorless (PM): 500 Hz, 10K

📖 Setting 0:

- Actual over-current stall prevention level = derating ratio × over-current stall prevention level (Pr.H2-05, H2-07).
- Rated current derating level = derating ratio × drive rated current (A0-01).
- When the operating point is greater than the derating curve, the carrier frequency (Fc) output by the drive decreases automatically according to the ambient temperature, overload output current and time.
- Applicable conditions: Select this mode in occasions that the frequency overload does not occur frequently, the carrier frequency is mainly concerned when the output current is below the rated current, and the carrier change caused by short-term overload is acceptable.

📖 Setting 1:

- When the operating point is greater than the derating curve, the carrier frequency (Fc) output by the drive is fixed to the default value.
- Applicable conditions: Select this mode if the change of carrier frequency and motor noise caused by ambient temperature and frequent overload are not acceptable.

📖 Setting 2:

- The protection method and action are set to 0, but this disables the current limit when output current is the derating ratio × 160% of output current in normal load, and derating ratio × 130% of output current in light load.
- The advantage is that it can provide a higher starting output current when carrier frequency setting is higher than the default value. The disadvantage is that the carrier frequency derates easily when it overloads. For example: when Pr.H4-05 = 0 or 1, the over-current stall prevention level = Ratio × Pr.H2-05. When Pr.H4-05 = 2, the over-current stall prevention level = Pr.H2-05.

H5. Motor Overload Protection

You can set this parameter during operation

H5-00 ot Action

(0x1080) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The over-torque protection is activated when Pr.H5-00 is not set to 0.

H5-01 ot Indn

(0x1081) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

Sets the corresponded over torque indication of multi-function terminals.

H5-02 Normal Speed ot Action

(0x1082) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The over-torque protection at constant speed is activated when Pr.H5-02 is not set to 0.

H5-03 Normal Speed ot Indn

(0x1083) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

Sets the corresponded over-torque indication at constant speed multi-function terminals.

H5-04 IM1/ SM ot Level

(0x1084)

H5-15 IM2 ot Level

(0x1090)

H5-26 IM3 ot Level

(0x109C)

H5-37 IM4 ot Level

(0x10A8) Default: 120

Settings 0–250%

📖 100% corresponds to the motor rated current.

H5-05 IM1/ SM ot Detect Time

(0x1085) Default: 3.0

H5-16 IM2 ot Detect Time

(0x1091)

H5-27 IM3 ot Detect Time

(0x109D)

H5-38 IM4 ot Detect Time

(0x10A9) Default: 0.1

Settings 0.0–10.0 sec.

H5-06 IM1/ SM N-Speed ot Level

(0x1086)

H5-17 IM2 N-Speed ot Level

(0x1092)

H5-28 IM3 N-Speed ot Level

(0x109E)

H5-39 IM4 N-Speed ot Level

(0x10AA) Default: 120

Settings 0–250%

📖 100% corresponds to the motor rated current.

H5-07 IM1/ SM N-Speed ot Detect Time

(0x1087) Default: 3.0

H5-18 IM2 N-Speed ot Detect Time

(0x1093)

H5-29 IM3 N-Speed ot Detect Time

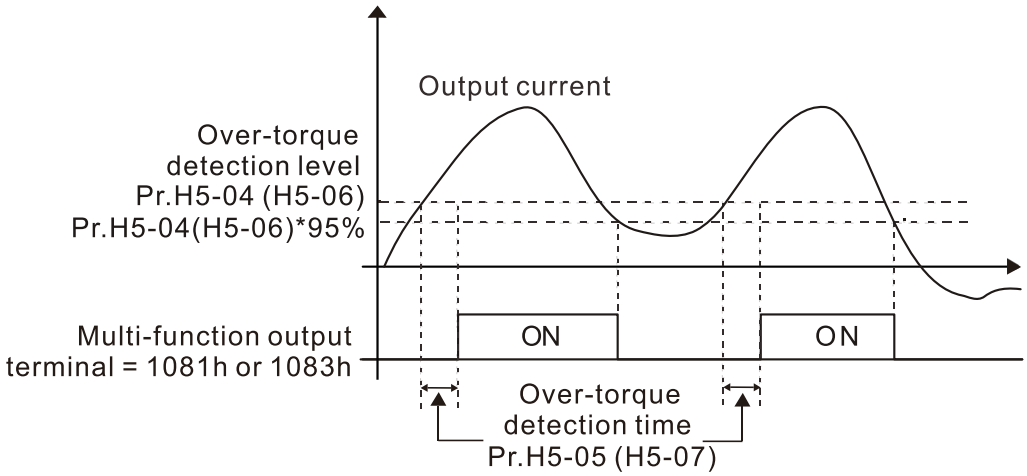
(0x109F)

H5-40 IM4 N-Speed ot Detect Time

(0x10AB) Default: 0.1

Settings 0.0–10.0 sec.

- When the output current exceeds the over torque detect level (Pr.H5-04, H5-06) and the over torque detect time (Pr.H5-05, H5-07), the over-torque detection activates according to the setting for Pr.H5-00 or H5-02.
- When Pr.H5-00 or H5-02 is set to 0, after the over-torque is detected, the drive displays ot1/ ot2 warning and continues operating until the output current is smaller than 5% of the over-torque detect level, then the warning is released.
- When Pr.H5-00 or H5-02 is set to 1–4, after the over-torque is detected, the drive shows ot1/ ot2 fault and stops running according to the set stop method until the fault is reset manually.



H5-08 IM1/ SM EoL1 Mode

(0x1088)

H5-19 IM2 EoL1 Mode

(0x1094)

H5-30 IM3 EoL1 Mode

(0x10A0)

H5-41 IM4 EoL1 Mode

(0x10AC) Default: 0

Settings 0: Disable
1: Variable Torque mode
2: Constant Torque mode
3: High Precision mode

- Prevents self-cooled motor from overheating under low speed. Use an electronic thermal relay to limit the drive's output power.

When the power is cycled frequently, if the power is switched OFF, the electronic thermal relay protection is reset; therefore, even setting the parameter to 0 or 1 may not protect the motor well. If there are several motors connected to one drive, install an electronic thermal relay in each motor.

H5-09 IM1/ SM EoL1 Detect Time

(0x1089)

H5-20 IM2 EoL1 Detect Time

(0x1095)

H5-31 IM3 EoL1 Detect Time

(0x10A1)

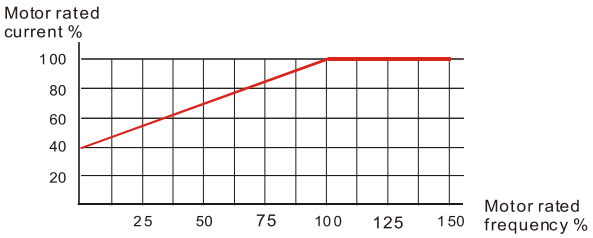
H5-42 IM4 EoL1 Detect Time

(0x10AD) Default: 60.0

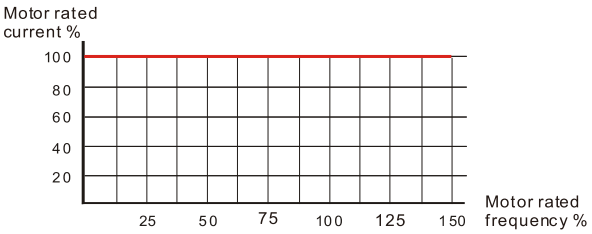
Settings 30.0–600.0 sec.

Set the parameter to 150% of motor rated current and use with the setting of Pr.H5-09 to prevent motor damage due to overheating. When it reaches the setting, the drive displays EoL1–4 and the motor coasts to stop.

Use this parameter to set the action time of electronic thermal relay. It works based on the I^2t characteristic curve of electronic thermal relay, the output frequency and current of the drive, and the operation time to protect motor from overheating.



Motor cooling curve with shaft-fixed fan



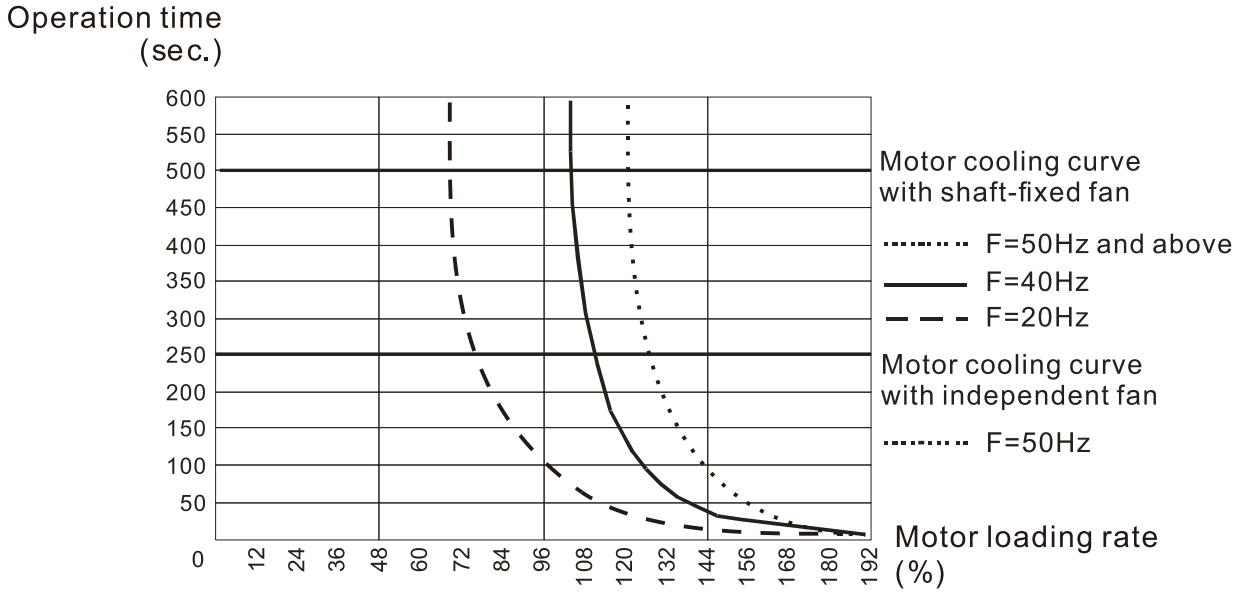
Motor cooling curve with independent fan

The action of electronic thermal relay depends on the setting for Pr.H5-08/ H5-19.

3. Pr.H5-08/ H5-19 is set to 1 (using variable torque mode):
   When the output current of motor drive is higher than 150% of the motor rated current (refer to the motor rated current % corresponded to the motor rated frequency in the motor cooling curve with independent fan), motor drive starts to count the time. The electronic thermal relay acts when the accumulated time exceeds Pr.H5-09 or Pr.H5-20.
4. Pr.H5-08/ H5-19 is set to 2 (using constant torque mode):
   When the output current of the drive is higher than 150% of the motor rated current (refer to the motor rated current % corresponded to the motor rated frequency in the motor cooling curve with shaft-fixed fan), the drive starts to count the time. The electronic thermal relay acts when the accumulated time exceeds Pr.H5-09 or Pr.H5-20.
5. If the motor's rated current (Pr.d1-02) is not set, then set 90% of the drive rated current (Pr.A0-01) as the default of this parameter.

The actual electronic thermal relay action time adjusts according to the drive output current (shown as the motor loading rate %). The action time is short when the current is high, and the action time is long when the current is low. Refer to the following diagram: (The motor cooling

curve with shaft-fixed fan and motor cooling curve with independent fan F = 50 Hz are the same one.)



H5-10 IM1/ SM EoL1 Action

(0x108A)

H5-21 IM2 EoL1 Action

(0x1096)

H5-32 IM3 EoL1 Action

(0x10A2)

H5-43 IM4 EoL1 Action

(0x10AE) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The EoL action is activated when this parameter is not set to 0.

H5-11 IM1/ SM HP Mode Max Torque

(0x108B)

H5-22 IM2 HP Mode Max Torque

(0x1097)

H5-33 IM3 HP Mode Max Torque

(0x10A3)

H5-44 IM4 HP Mode Max Torque

(0x10AF) Default: 100

Settings 0–250%
100% = motor rated torque (vector) or rated current (scalar)

100% corresponds to the motor rated torque.

H5-12 IM1/ SM HP Mode 0 RPM Torque

(0x108C)

H5-23 IM2 HP Mode 0 RPM Torque

(0x1098)

H5-34 IM3 HP Mode 0 RPM Torque

(0x10A4)

H5-45 IM4 HP Mode 0 RPM Torque

(0x10B0) Default: 40

Settings 0–250%

100% = motor rated torque (vector) or rated current (scalar)

📖 100% corresponds to the motor rated torque.

H5-13 IM1/ SM HP Mode Switch FREQ

(0x108D)

H5-24 IM2 HP Mode Switch FREQ

(0x1099)

H5-35 IM3 HP Mode Switch FREQ

(0x10A5)

H5-46 IM4 HP Mode Switch FREQ

(0x10B1) Default: See descriptions

Settings 0.00–599.00 Hz

📖 For high precision application, the electronic thermal relay can set the corresponding relation between the motor load level and the motor speed as a protection mechanism.

📖 When the motor speed is ≥ high precision mode switch frequency (Pr.H5-13), the equation of motor load level is:

Motor torque × [reciprocal of Pr.H5-13]

When the motor speed is < high precision mode switch frequency (Pr.H5-13), the equation of motor load level is:

Motor torque × reciprocal of [(Pr.H5-11 – H5-12) ÷ (Pr.H5-13 × motor speed + H5-12)]

H5-48 Over Slip Action

(0x10B4) Default: 0

Settings 0: Warning & continue OPER

1: Fault and ramp to stop

2: Fault & Auto-Decel

3: Fault & coast to stop

4: Fault & by Quick Stop Time

📖 The over slip protection is activated when Pr.H5-48 is not set to 0.

H5-49 Over Slip Indn

(0x10B5) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15

🕮 Sets the over slip indication of multi-function terminals.

H5-50 IM1 Max Slip FREQ

(0x10B6)

H5-51 IM2 Max Slip FREQ

(0x10B7)

H5-52 IM3 Max Slip FREQ

(0x10B8)

H5-53 IM4 Max Slip FREQ

(0x10B9) Default: 20.00

Settings 0.00–200.00 Hz

H5-54 Over Slip Level

(0x10BA) Default: 0.0

Settings 0.0–100.0%

H5-55 Over Slip Detect Time

(0x10BB) Default: 1.0

Settings 0.0–10.0 sec.

🕮 Pr.H5-50–H5-55 define the allowable slip value during the drive operation and the treatment when the slip exceeds the setting value.

H6. Motor Heat Protection

You can set this parameter during operation

H6-00 Motor Temp 1

(0x10C0)

H6-11 Motor Temp 2

(0x10CB) Default: Read only

Settings -20–200°C

Display the temperature of the motor that currently connected to the AC motor drive. When using PTC, the displayed unit is %; when using KTY84, PT100 and PT1000, the displayed unit is °C.

H6-01 Motor Temp Fdk 1 AI Src

(0x10C1)

H6-12 Motor Temp Fdk 2 AI Src

(0x10CC) Default: 0

Settings 0: Disable
1–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

Sets the current source of motor temperature sensor.

H6-02 Motor Temp 1 AO Sel

(0x10C2)

H6-13 Motor Temp 2 AO Sel

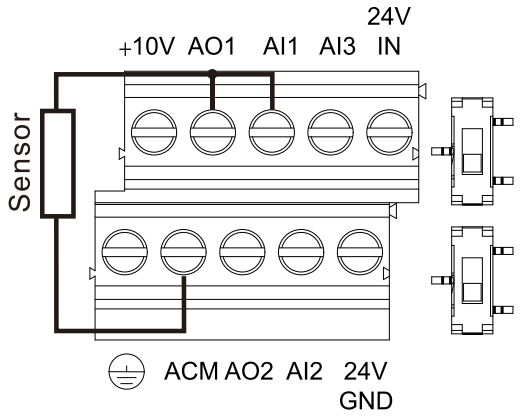
(0x10CD) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

Set the AO according to distinct types of temperature sensor listed in the table below.

Sensor Type	AO Format	AO Output Percentage (%)	Equivalent Output Current (mA)
PTC	0–20 mA	Virtual AO outputs percentage	
KTY84	0–20 mA	5.00	1
PT100	0–20 mA	25.00	5
PT1000	0–20 mA	2.50	0.5

The wiring of the temperature wiring refers to the following figure.



Set the AO according to different types of temperature sensors as listed in the table below.

Sensor Type	AO Format	AO Output Percentage Setting (%)	Equivalent Output Current (mA)
PTC	0~20 mA	Virtual AO outputs percentage	
KTY84	0~20 mA	5.00	1
PT100	0~20 mA	25.00	5
PT1000	0~20 mA	2.50	0.5

The temperature sensor usage example and using steps are as following:

1. Wire the sensor according to the wiring diagram above.
2. Set parameters:

Pr.	Parameter Name	Setting Value
H6-01	Motor Temp Fdk 1 AI Src	7 (AI1)
H6-02	Motor Temp 1 AO Sel	1 (AO1)
H6-03	Motor Temp 1 Sensor Type	3 (PT100)
G2-03	AI1 Signal Type	0 (0–10V)
G3-02	AO1 Signal Type	1 (0–20 mA)
o0-00	Status Display 1	49 (Motor temperature)

3. The temperature will be displayed on User-defined page or Pr.H6-00 (Motor Temp1).

H6-03 Motor Temp 1 Sensor Type

(0x10C3)

H6-14 Motor Temp 2 Sensor Type

(0x10CE) Default: 0

Settings 0: Disable
1: PTC
2: KTY84
3: PT100
4: PT1000

Sets the motor temperature sensor type.

When setting the sensor type as PTC, the displayed unit of Pr.H6-00 and H6-01 is %.
When setting the sensor type as KTY84, PT100 and PT1000, the displayed unit of Pr.H6-00 and H6-01 is °C.

H6-04 Motor Temp 1 Derating Level

(0x10C4)

H6-15 Motor Temp 2 Derating Level

(0x10CF) Default:

Settings	0.0–100.0%	40.0
	0.0–150.0°C (Motor Temp.1 / 2 overheating detection level)	100.0

📖 Sets the motor temperature detection level of derating protection.

H6-05 Motor Temp 1 Derating Delay

(0x10C5)

H6-16 Motor Temp 2 Derating Delay

(0x10D0) Default: 60.0

Settings 0.0–600.0 sec.

📖 Sets the derating delay time of the motor temperature level.

H6-06 Motor Temp 1 Derating FREQ

(0x10C6)

H6-17 Motor Temp 2 Derating FREQ

(0x10D1) Default: 0.00

Settings 0.00–599.00 Hz

📖 Sets the drive output frequency limit of derating protection.

H6-07 Motor Temp 1 OH Detect Level

(0x10C7)

H6-18 Motor Temp 2 OH Detect Level

(0x10D2) Default:

Settings	0.0–100.0%	50.0
	0.0–150.0°C	125.0

📖 Setting 0 to disable the function, but the motor temperature feedback is still displayed.

📖 The unit is % when using PTC, and that of other occasions is °C.

H6-08 Motor Temp 1 OH Detect Time

(0x10C8)

H6-19 Motor Temp 2 OH Detect Time

(0x10D3) Default: 60.0

Settings 0.0–600.0 sec.

📖 Sets the motor temperature level detect time when the temperature reaches the overheat protection.

H6-09 Motor Temp 1 OH Action

(0x10C9)

H6-20 Motor Temp 2 OH Action

(0x10D4) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

📖 The overheat protection is activated when this parameter is not set to 0.

H6-10 Motor Temp 1 OH Indn

(0x10CA)

H6-21 Motor Temp 2 OH Indn

(0x10D5) Default: 0

Settings 0: Disable
1–2: Relay 1–2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay 10–15

📖 Sets the overheat indication of multi-function terminals.

H7. Overload/ Underload Handle

You can set this parameter during operation

H7-00 Load Compare Src

(0x1100) Default: 0

Settings 0: Output Amp/ motor rated Amp
1: Output torque/ motor rated torque
2: Output power/ motor rated power
3: Output power/ driver rated power

Through different load compare sources, it provides user-defined derating conditions to prevent and reduce drive stopping due to overload.

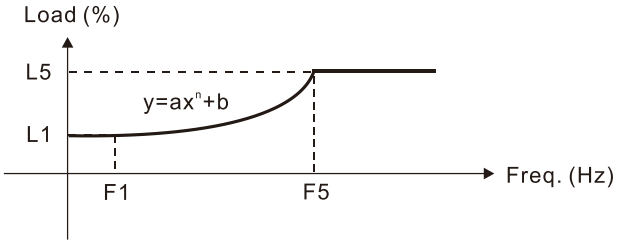
H7-01 L/F Overload Curve Sel

(0x1101) Default: 0

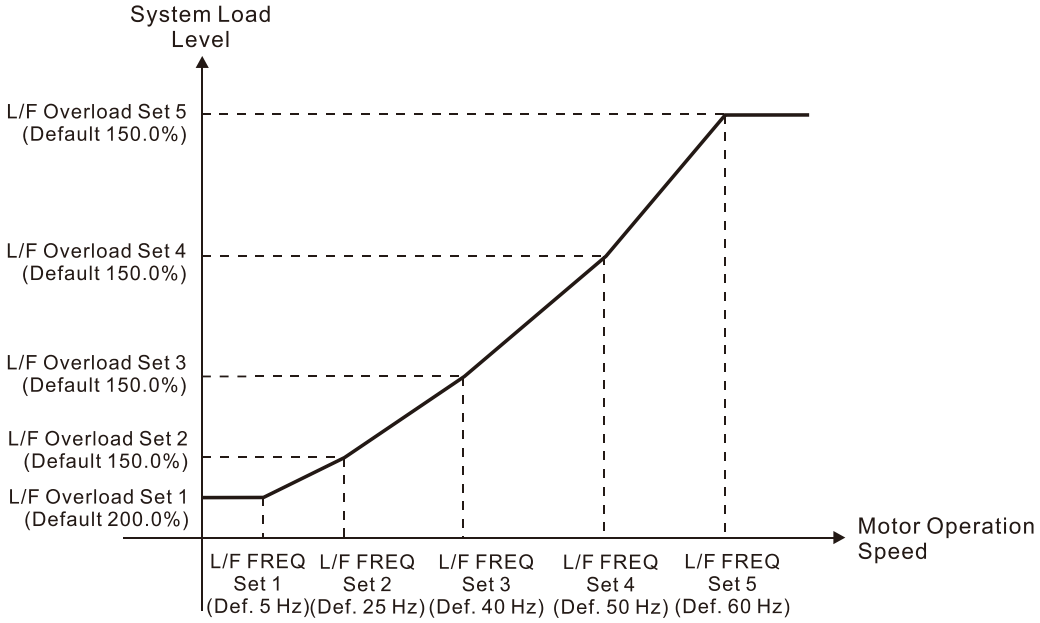
Settings 0: Disable
1: User Defined
2: 1.5th power curve
3: 2nd power curve
4: 3rd power curve

Pr.H7-01 selects user-defined or built-in curves.

When selecting a power type curve, the final curve is determined with reference to the setpoint 1 and setpoint 5 set by the user (that affects the coefficients a and b in the figure below), as shown in the following figure.



When selecting user defined curve, the overload level is set using the overload parameters. The proportional relation is as shown in the following figure.



H7-02 L/F Overload Action

(0x1102) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

- The L/F overload protection is activated when this parameter is not set to 0.
- Setting 0: The drive decelerates according to the current deceleration time until the overload condition is cleared.

H7-03 L/F Overload Indn

(0x1103) Default: 0

Settings 0: Disable
1–2: Relay 1–2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay 10–15

- Sets the overload indication of multi-function terminals.

H7-04 L/F Overload Detect Time

(0x1104) Default: 10.0

Settings 0.0–600.0 sec.

- When the system load is > Pr.H7-10–H7-14 and remains in the frequency range of Pr.H7-05–H7-09 for the detect time more than Pr.H7-04, the drive executes the overload condition according to Pr.H7-03.

H7-05 Overload L/F FREQ Set 1

(0x1105)

H7-06 Overload L/F FREQ Set 2

(0x1106)

H7-07 Overload L/F FREQ Set 3

(0x1107)

H7-08 Overload L/F FREQ Set 4

(0x1108)

H7-09 Overload L/F FREQ Set 5

(0x1109) Default: 5.00

Settings 0.00–599.00 Hz

- Setpoints are related in order of magnitude (the drive performs interpolation processing on the speed value internally), the relation between the speed parameter settings should be Setpoint 5 ≥ Setpoint 4 ≥ Setpoint 3 ≥ Setpoint 2 ≥ Setpoint 1.

H7-10 Overload L/F Load Set 1

(0x110A)

H7-11 Overload L/F Load Set 2

(0x110B)

H7-12 Overload L/F Load Set 3

(0x110C)

H7-13 Overload L/F Load Set 4

(0x110D)

H7-14 Overload L/F Load Set 5

(0x110E) Default: 150.0

Settings 0.0–200.0%

🕮 Set the load according to the frequency of Pr.H7-05–H7-09.

H7-15 L/F Underload Curve Sel

(0x110F) Default: 0

Settings 0: Disable
1: User Defined
2: 1.5th power curve
3: 2nd power curve
4: 3rd power curve

🕮 Pr.H7-15 selects user-defined or built-in curves.

H7-16 L/F Underload Action

(0x1110) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

🕮 The L/F underload protection is activated when this parameter is not set to 0.

H7-17 L/F Underload Indn

(0x1111) Default: 0

Settings 0: Disable
1–2: Relay 1–2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay 10–15

🕮 Sets the underload indication of multi-function terminals.

H7-18 L/F Underload Detect Time

(0x1112) Default: 10.0

Settings 0.0–600.0 sec.

When the system load is < Pr.H7-24–H7-28 and within the frequency range of Pr.H7-17–H7-23 for the detect time that exceeds Pr.H7-18, the drive executes the underload conditions according to Pr.H7-17.

H7-19 Underload L/F FREQ Set 1

(0x1113)

H7-20 Underload L/F FREQ Set 2

(0x1114)

H7-21 Underload L/F FREQ Set 3

(0x1115)

H7-22 Underload L/F FREQ Set 4

(0x1116)

H7-23 Underload L/F FREQ Set 5

(0x1117) Default: 5.00

Settings 0.00–599.00 Hz

Setpoints are related in order of magnitude (the drive performs interpolation processing on the speed value internally), the relation between the speed parameter settings should be Setpoint 5 ≥ Setpoint 4 ≥ Setpoint 3 ≥ Setpoint 2 ≥ Setpoint 1.

H7-24 Underload L/F Load Set 1

(0x1118) Default: 10.0

H7-25 Underload L/F Load Set 2

(0x1119) Default: 15.0

H7-26 Underload L/F Load Set 3

(0x111A) Default: 25.0

H7-27 Underload L/F Load Set 4

(0x111B) Default: 30.0

H7-28 Underload L/F Load Set 5

(0x111C) Default: 30.0

Settings 0.0–200.0%

Set the load according to the frequency of Pr.H7-24–H7-28.

H8. Speed Feedback Protection

You can set this parameter during operation

H8-00 Speed Deviation Detect Level

(0x1140) Default: 50

Settings 0–50%

This parameter is valid only in FOC mode.

H8-01 Speed Deviation Detect Time

(0x1141) Default: 0.5

Settings 0.0–10.0 sec.

H8-02 Speed Deviation Action

(0x1142) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The speed deviation protection is activated when this parameter is not set to 0.

H8-03 Over Speed Detect Level

(0x1143) Default: 115

Settings 0–120%
0: Disable

This parameter is valid only in FOC mode.

H8-04 Over Speed Detect Time

(0x1144) Default: 0.5

Settings 0.0–10.0 sec.

H8-05 Over Speed Action

(0x1145) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

The over speed protection is activated when this parameter is not set to 0.

H8-06 Direction Error Detect Time

(0x1146) Default: 1.0

Settings 0.0–10.0 sec.
0: Disable

H8-07 Direction Error Action

(0x1147) Default: 0

Settings 0: Warning & continue OPER
1: Fault and ramp to stop
2: Fault & Auto-Decel
3: Fault & coast to stop
4: Fault & by Quick Stop Time

📖 The direction error protection is activated when this parameter is not set to 0.

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J. Application Function

∗J0. Additional Function

✓ You can set this parameter during operation.

∗ Advanced parameters, set Pr.b0-00 to unlock

✓ J0-00 UVW MC Action Indn

(0x11C0) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

🕮 Selects terminals that control the action of the UVW electromagnetic contactor, and it needs to be used with MI function = 0055h Run Enable.

🕮 When the MI terminal = Run Enable activates, the selected terminal contact in Pr.J0-00 activates.

J1. AES Function

✓ You can set this parameter during operation.

✓ J1-00 AES Auto Energy Saving Mode

(0x1200) Default: 0

Settings 0: Disable
1: PFO Power Factor Optimization
2: PLO Power Loss Optimization

🕮 Applicable control modes for Pr.J1-00:

Settings/ Control Mode	Induction Motor (IM)			Permanent Magnet Synchronous AC Motor (PM)		Synchronous Reluctance Motor (SynRM)	
	VF	SVC	FOC	PMSVC	PMFOC	SVC	FOC
1: PFO Power Factor Optimization	✓						
2: PLO Power Loss Optimization	✓						

🕮 Pr.J1-00 = 1 Power Factor Optimization (PFO):

- When energy-saving is enabled, the motor acceleration/ deceleration operates with full voltage. During constant speed operation, it automatically calculates the best voltage value according to the load power. This function is not suitable for fluctuating loads or loads that are nearly full during operation.
- The prerequisites for power factor optimization are:
  A. Power factor angle is > Pr.J1-04 (PFO Target Power Factor Angle)
  B. Output frequency is > Pr.J1-01 (AES Min FREQ)
  C. The drive is in a steady-state output frequency status (speed fluctuation < ±1% of rated frequency)
  D. Time for steady-state output frequency is > Pr.J1-02 (AES Delay Time)

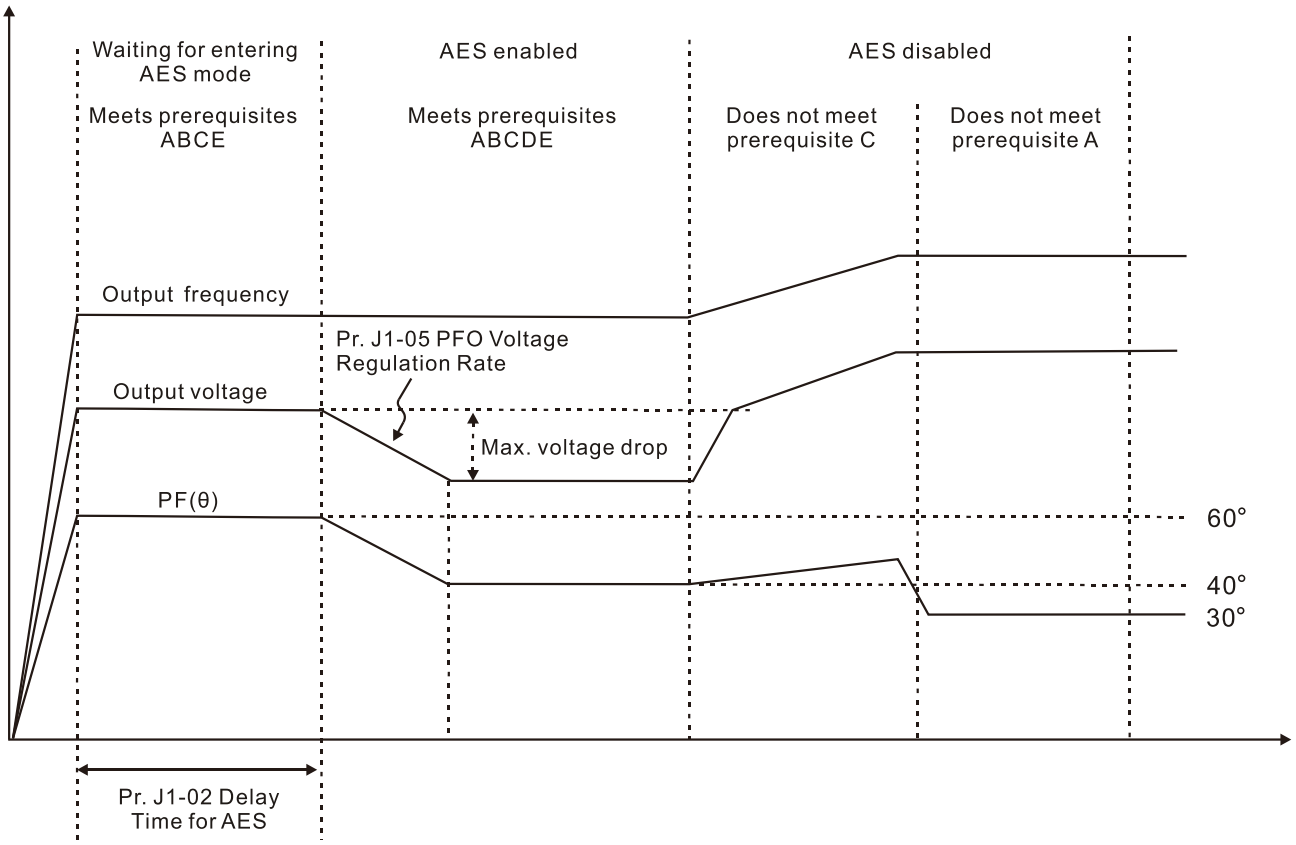
E. Output current is ≤ 90% of the drive rated current

- The prerequisites for invalid power factor optimization are:
  1. A change output frequency
  2. Output current is > 90% of the drive rated current

🕮 If the prerequisites A, B, C, D and E are met at the same time, the drive enters the energy-saving mode and starts to adjust the energy-saving voltage according to the upper limit of Pr.J1-03 (AES Max Voltage Drop).

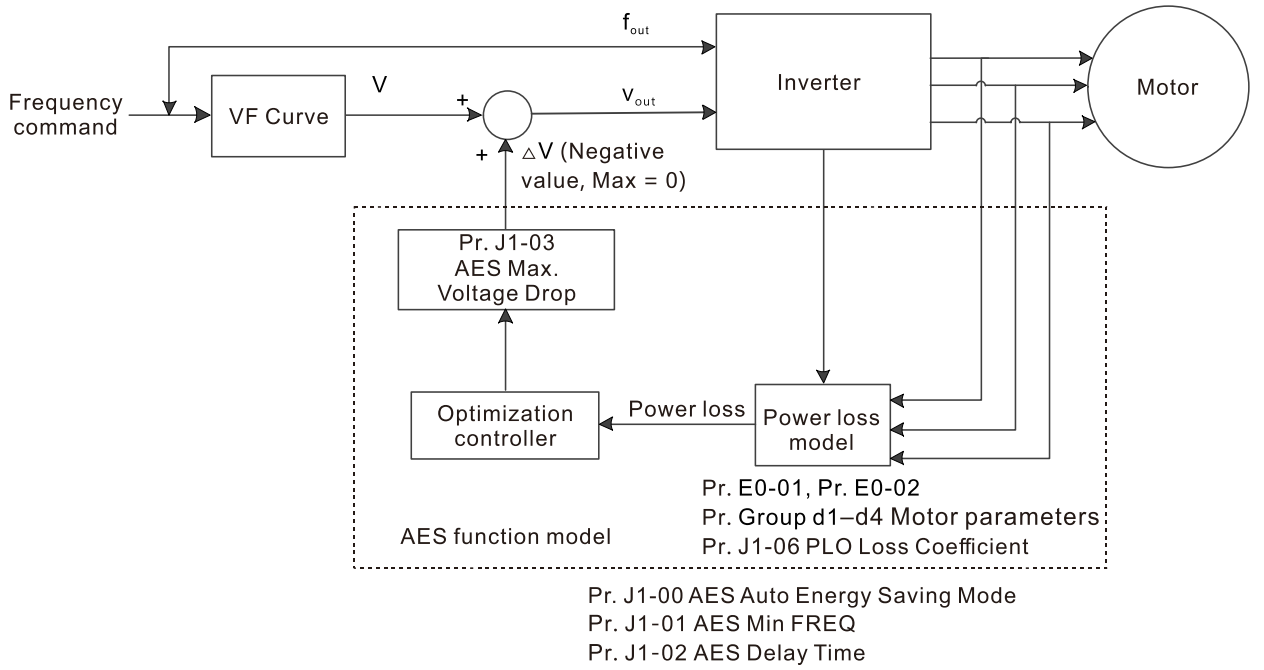
🕮 If condition A reaches the target value first, the voltage reduction will be stopped.

🕮 If the energy-saving mode is skipped, the voltage returns to the original VF voltage output value, as shown in the figure below.

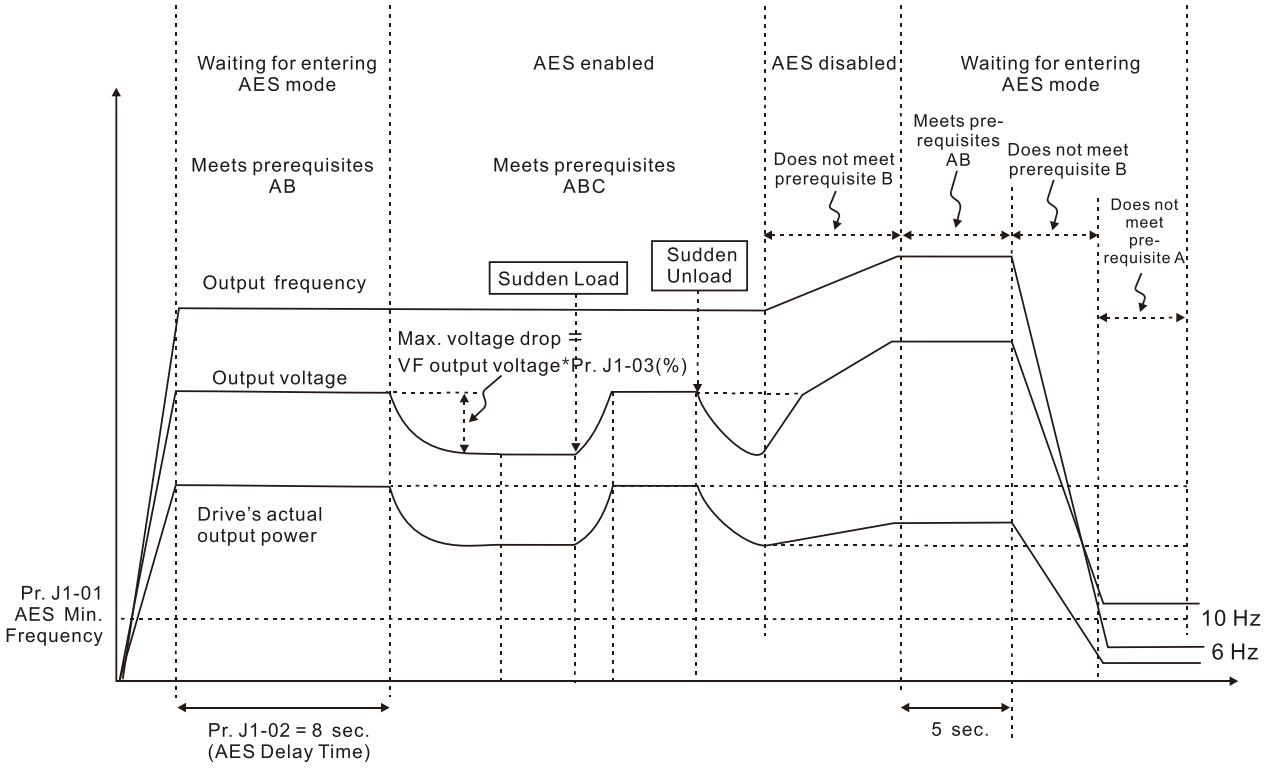


🕮 Pr.J1-00 = 2 Power Loss Optimization (PLO):

- The current operating loss of the motor is calculated through the motor parameters auto-tune and the energy-saving coefficient, and the power loss is minimized by controlling the output voltage to achieve the optimization of energy saving.
- Control diagram of power loss optimization:



- The prerequisites for power loss optimization are:
  A. Output frequency is > Pr.J1-01 (AES Min FREQ)
  B. The drive is in a steady-state output frequency status (speed fluctuation < ±1% of rated frequency)
  C. Time for steady-state output frequency is > Pr.J1-02 (AES Delay Time)
- The prerequisites for invalid power loss optimization are:
  1. Skip steady-state output frequency
  2. The consumption model will automatically judge the voltage drop and may judge as no voltage drop under medium and no load situation.



📖 The energy-saving function is invalid during the drive acceleration and deceleration. To make it valid, the prerequisites need to be verified again.

J1-01 AES Min FREQ

(0x1201) Default: 10.00

Settings 0.00–40.00 Hz

- The drive output frequency must be higher than Pr.J1-01 to make the drive determine whether to run in a steady-state output frequency.
- In general, larger power and voltage can give more energy-savings; lower power and voltage produce less energy-savings. However, too low power and voltage are not suitable for low-speed operation because it needs a larger starting current. Pr.J1-01 is the parameter that limits the minimum frequency when AES is enabled (Pr.J1-01 to Pr.E0-01 is the frequency range – from minimum to maximum – that you can use for the AES function).

J1-02 AES Delay Time

(0x1202) Default: 5.0

Settings 0.0–600.0 sec.

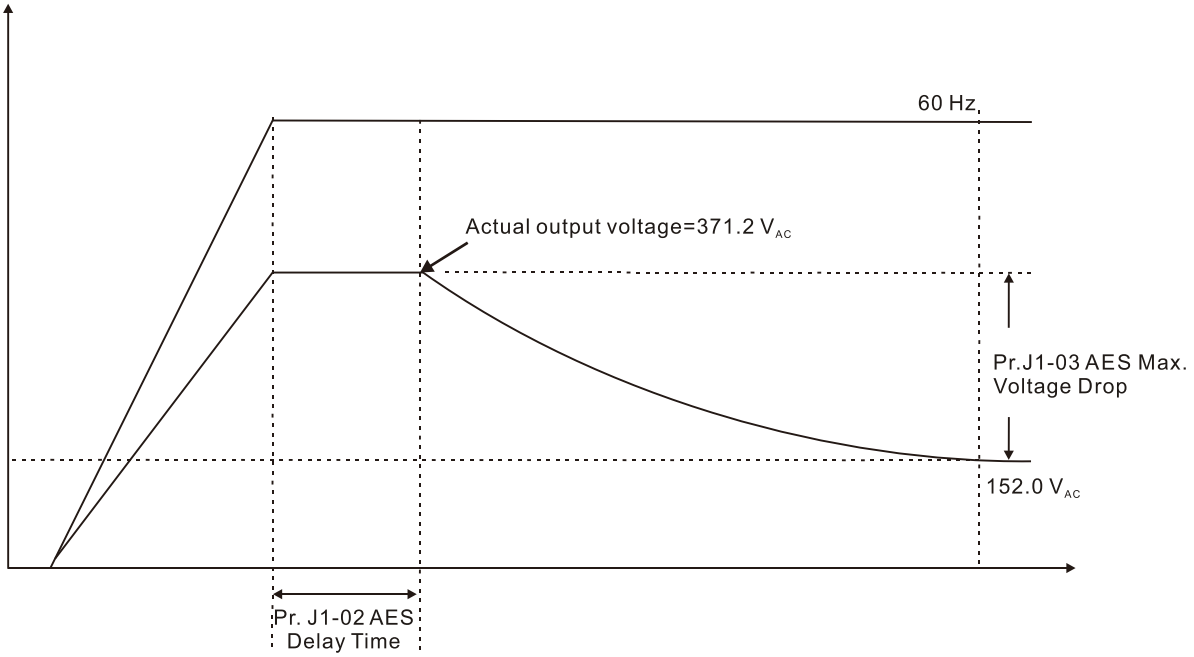
- When the drive runs in a steady-state output frequency, and exceeds Pr.J1-02 setting time, the drive enters the energy-saving mode.

J1-03 AES Max Voltage Drop

(0x1203) Default: 60

Settings 0–70%

- Defines the maximum allowed voltage drop when the drive is in energy-saving mode.
- The drive has bigger energy-saving efficiency when running in no-load or light-load. To ensure the basic excitation voltage of the motor operation, you can use this parameter as the upper limit ratio (%) of the maximum voltage drop of the output voltage.
- Maximum voltage drop = voltage command corresponding to the frequency command in the VF table (take Motor 1 VF curve as an example, Pr.E0-01–E1-14) × Pr.J1-03 (%)
  For example:
  (1) Pr.E0-01 = 60 Hz, Pr.E0-02 = 380 V_{AC}, current frequency command is 60 Hz, the actual motor output is 371.2 V_{AC}, and Pr.J1-03 = 60%, then
  The maximum voltage drop = 380 V (voltage command corresponding to the frequency command in the VF table: 60 Hz corresponds to 380V) × 60% = 228 V_{AC}
  (2) If the current frequency command is 30 Hz, the corresponded voltage in the VF table is 200 V_{AC}, and Pr.J1-03 = 60%, then
  The maximum voltage drop = 200V × 60% = 120 V_{AC}



J1-04 PFO Target Power Factor Angle

(0x1204) Default: 40.00

Settings 35.00–65.00°

- Use this function when Pr.J1-00 = 1. If the current power factor angle is larger than Pr.J1-04 target power factor angle, the drive continuously adjusts the energy-saving until it is smaller than Pr.J1-04.
- This parameter is the angle θ between active power and reactive power. The smaller Cos θ, the lower the reactive power, and the lower the consumption.

J1-05 PFO Voltage Regulation Rate

(0x1205) Default: 10

Settings 1–100%

- When entering the energy-saving mode, the drive starts to adjust the energy-saving voltage according to Pr.J1-05 (PFO Voltage Regulation Rate).

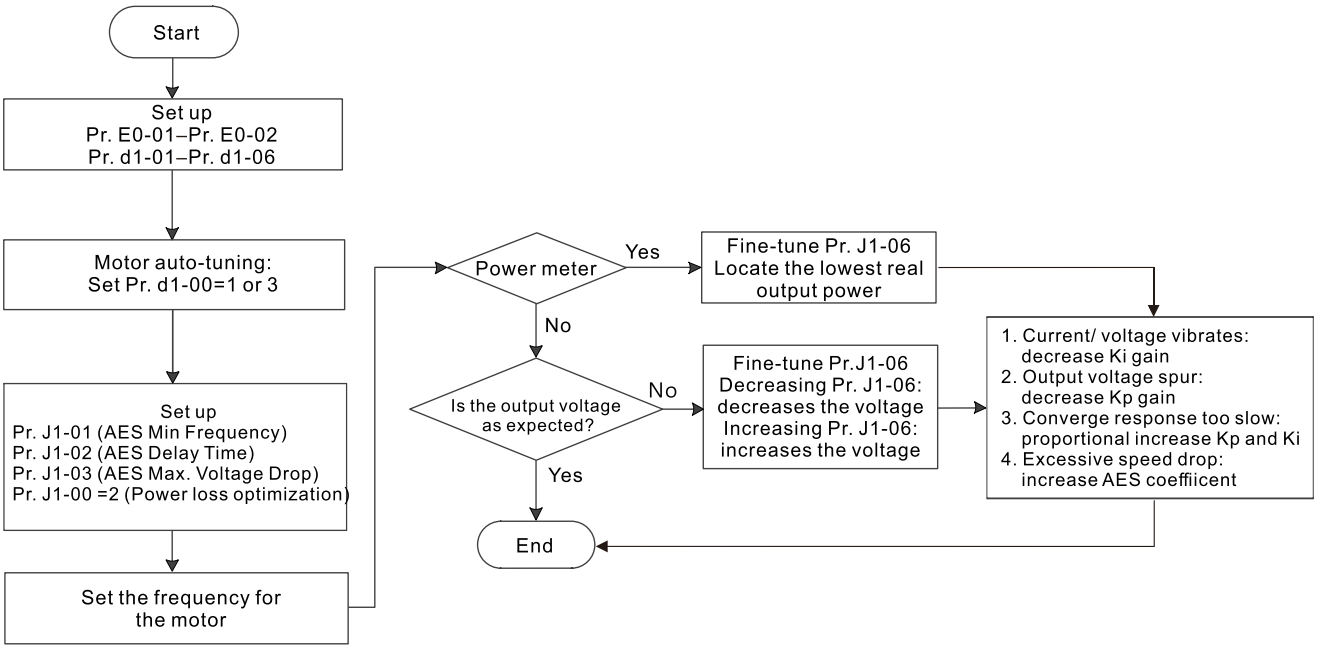
J1-06 PLO Loss Coefficient

(0x1206) Default: 1

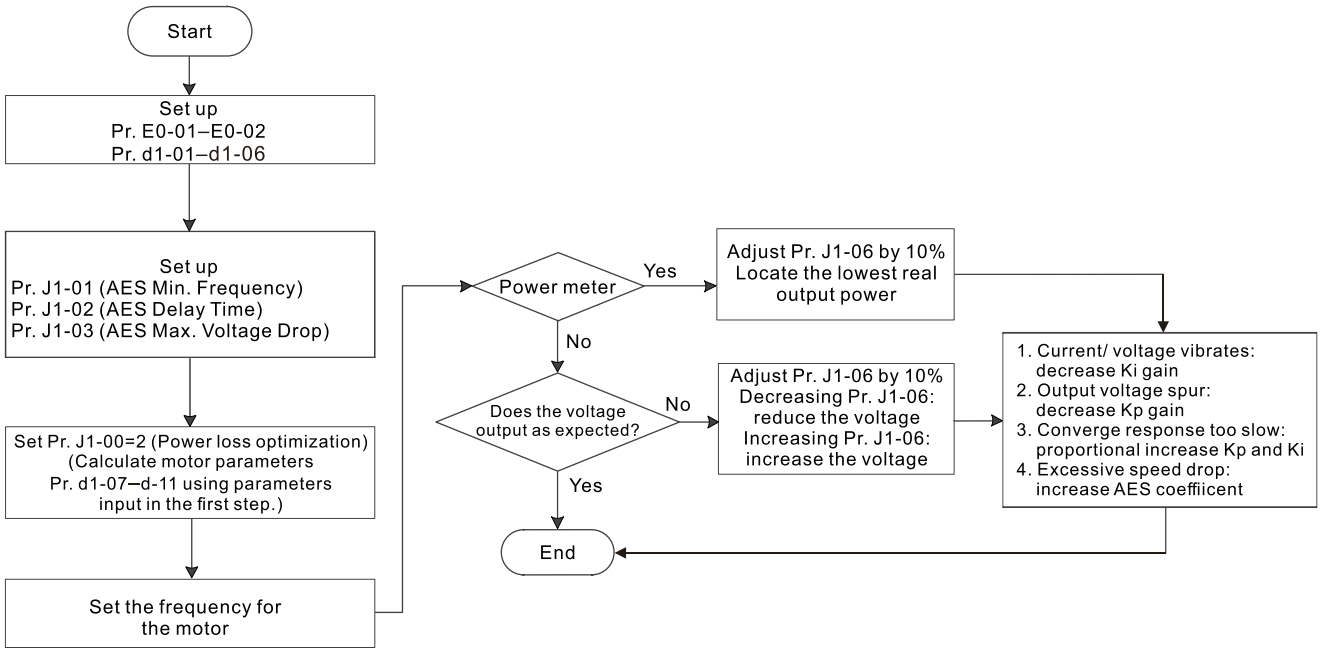
Settings 0–100%

- Defines the motor power loss constant. Default 100% corresponds to the drive iron loss constant that is calculated by motor parameter auto-tuning or motor nameplate information.
- Pr.J1-06 affects the final steady-state output voltage value for the energy-saving control. The larger the Pr.J1-06 setting value, the higher the steady-state output voltage (the smaller the voltage drop). The smaller the setting value, the lower the steady-state output voltage (the larger the voltage drop).
- Refer to Parameter group d1–d4 for PLO loss optimization with motor parameter auto-tuning (recommended).

See below for the flowchart of PLO loss optimization with motor parameter auto-tuning (recommended):



See below for the flowchart of PLO loss optimization without motor parameter auto-tuning (recommended):



J1-07 PLO Kp Gain

(0x1207) Default: 0.050

Settings 0.001–60.000%

J1-08 PLO Ki Gain

(0x1208) Default: 0.020

Settings 0.001–60.000%

- Pr.J1-07 and J1-08 are the Kp gain and Ki gain for the automatic energy optimization controller. Adjusting Kp and Ki gain can affect the response speed from energy saving to steady-state voltage and the stability of the steady-state voltage, but it does not affect the final steady-state voltage value.
- If the output current and voltage vibrates, decrease the Ki gain; If the output current and voltage spurs, decrease the Kp gain. If the convergence to steady-state response is too slow, then proportionally increase Kp and Ki gains.

J2. dEb Function

You can set this parameter during operation.

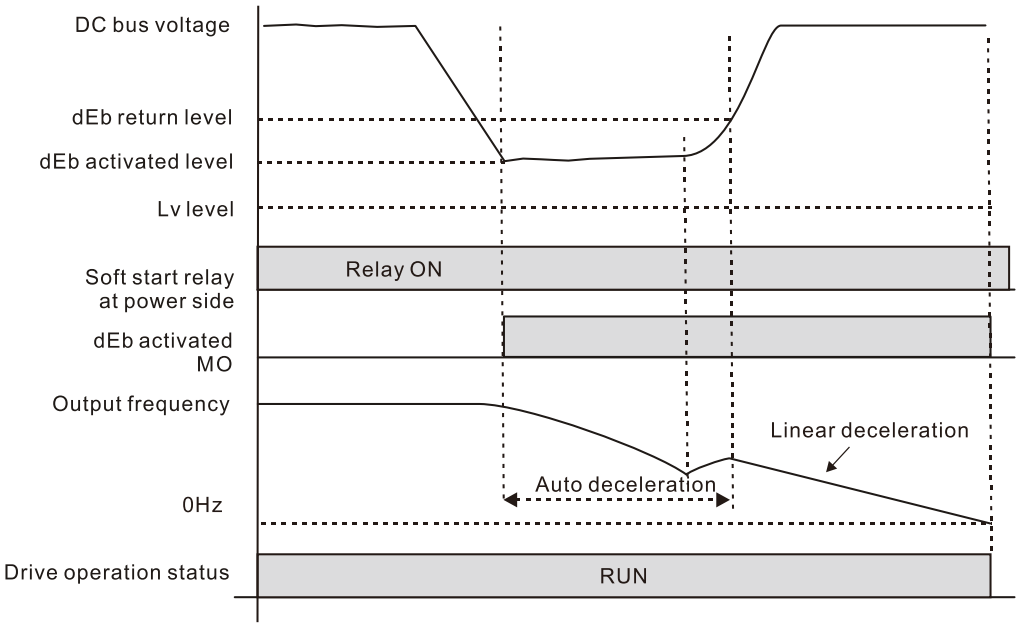
J2-00 dEb Function Sel

(0x1240) Default: 0

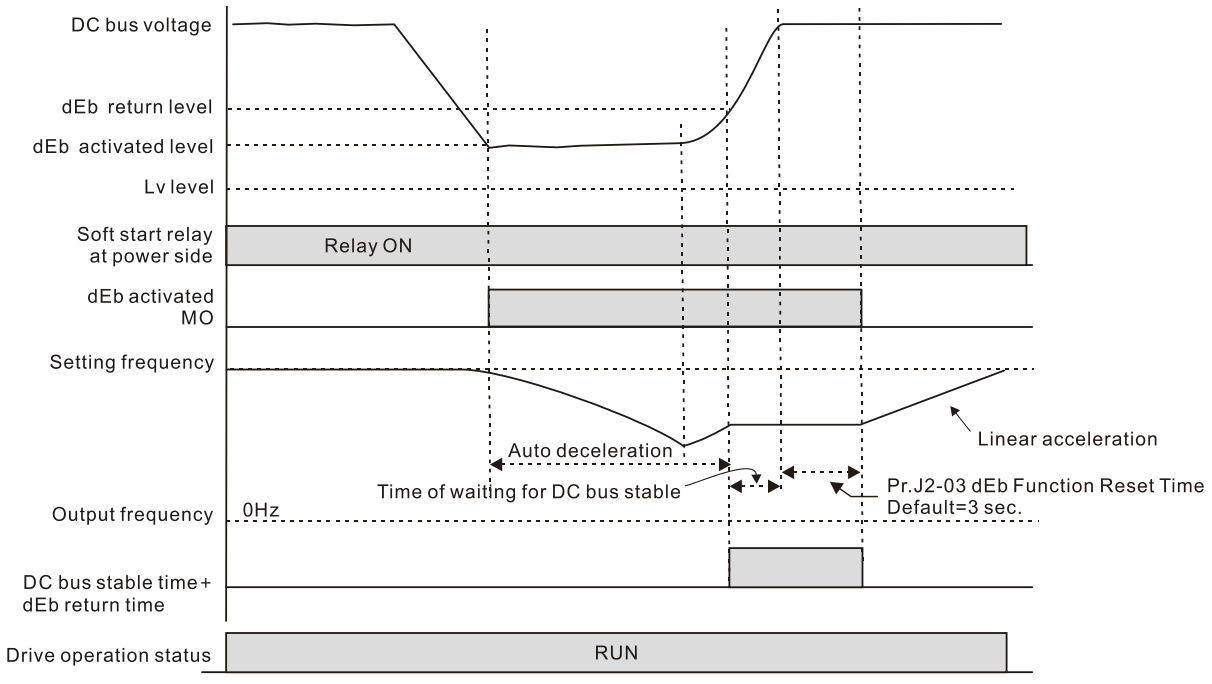
Settings
0: Disable
1: Auto-decel, stop after restore
2: Auto-decel, run after restore
3: Low speed high voltage control
4: All high voltage control
5: dEb Decel, stop after restore
6: FOC Decel, stop after restore
7: FOC Decel, run after restore

- dEb (Deceleration Energy Backup) makes the motor decelerate to stop when momentary power loss occurs. When the power loss is instantaneous, use this function to make the motor decelerate to zero speed. If the power recovers at this time, the drive restarts the motor after the dEb return time.
- Lv return level: Default value depends on the drive power model.
- Lv return level = Pr.H1-02 + H1-03.
- Lv level: Default = Pr.H1-02 (Lv Fault Level)
- During dEb operation, other protection such as ryF, ov, oc, occ and EF may interrupt it, and these error codes are recorded.
- The B.B. function does not work when executing dEb. The B.B. function is enabled after the dEb function finishes.
- The following explains the dEb action:
  When the DC voltage drops below the dEb setting level, the dEb function starts to work (soft start relay remains closed), and the drive executes auto-deceleration.

- Situation 1: Momentary power loss, or too low and unstable power voltage, or power supply sliding down because of sudden heavy load.
  Pr.J2-00 = 1 “dEb active, DC bus voltage returns, output frequency does not return”
  When the power recovers and DC bus voltage exceeds the dEb return level, the drive automatically decelerates and switches to ramp stop mode until 0 Hz and stops. The keypad displays the” dEb” warning until you manually reset it, so you can see the reason for the stop.



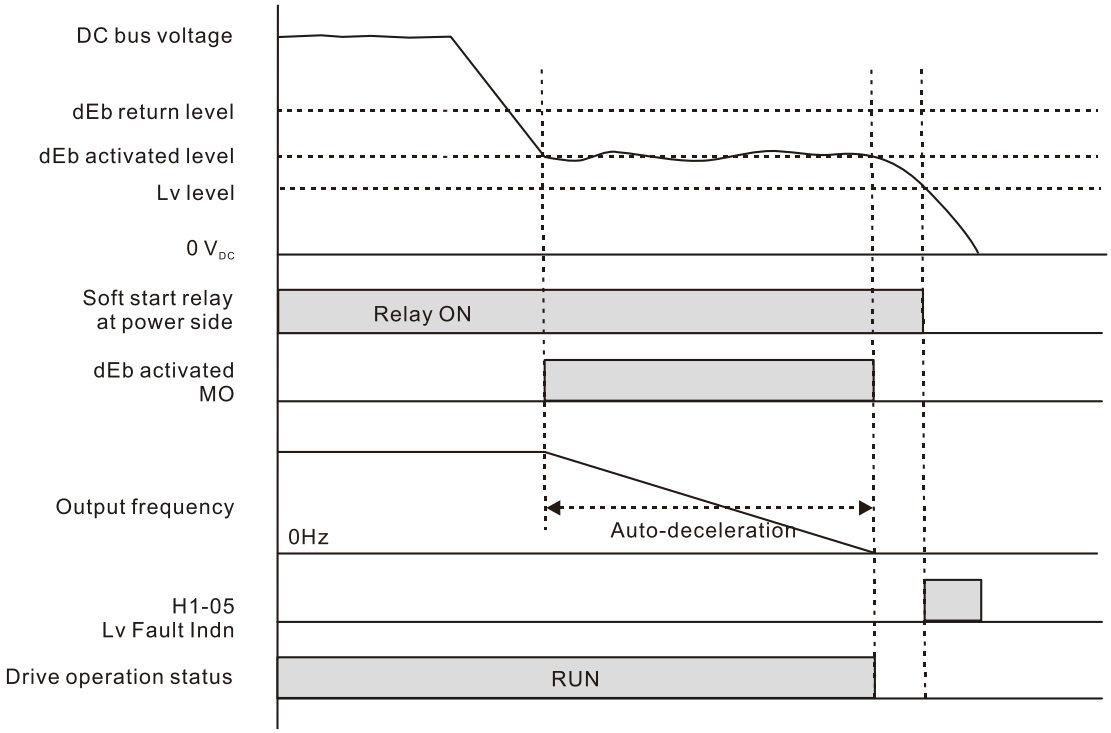
- Situation 2: Momentary power loss, or too low and unstable power voltage, or power supply sliding down because of sudden heavy load.
  Pr.J2-00 = 2 “dEb active, DC bus voltage returns, output frequency returns”
  During the dEb deceleration (includes 0 Hz run), if the power recovers to a voltage higher than dEb return level, the drive maintains the frequency for the set time of Pr.J2-03 (default = 3 sec.) and then accelerates again. The “dEb” warning on the keypad is automatically cleared.



- Situation 3: Unexpected power shut down or power loss

  Pr.J2-00 = 1 “dEb active, DC bus voltage returns, the output frequency does not return”

  The keypad displays the “dEb” warning, and the drive stops after decelerating to the lowest operating frequency. When the DC bus voltage is lower than the Lv level, the drive disconnects the soft start relay until the power completely runs out.



- Situation 4:

  Pr.J2-00 = 2 “dEb active, DC bus voltage returns, the output frequency returns”

  Same as Situation 3. The drive decelerates to 0 Hz. The DC bus voltage continues to decrease until the voltage is lower than the Lv level, and then the drive disconnects the soft start relay. The keypad displays “dEb” warning until the drive completely runs out of power.

- Situation 5:

  Pr.J2-00 = 3 “dEb low voltage control, when the speed is lower than 1/4 rated motor speed, DC bus voltage rises to 350 V_{DC} / 700 V_{DC}, the drive ramps to stop.

  The drive decelerates to 0 Hz. The DC bus voltage continues to decrease until the voltage is lower than the Lv level, and then the drive disconnects the soft start relay. The soft start relay closes again after the power recovers and the DC bus voltage is higher than the Lv return level. When the DC bus voltage is higher than the dEb return level, the drive maintains the frequency for the set time of Pr.J2-03 (default = 3 sec.) and starts to accelerate linearly, and the dEb warning on the keypad is automatically cleared.

- Situation 6:

  Pr.J2-00 = 4, dEb high-voltage control. When dEb occurs, the DC bus voltage control level rises to 350 V_{DC} / 700 V_{DC} to ramp to stop. Even though the power recovers and the frequency does not return, dEb activates until the motor decelerates to 0 Hz.

  (1) When dEb activates, it sends dEb warning. When the output frequency reaches 0Hz, the operation status is STOP and disables the dEb function, the dEb warning continues.

(2) If power does not recover, the DC bus voltage drops until reaches the Lv level, the drive LvS error occurs (keypad displays LvS error that covers the dEb display), the Soft Start Relay will be OFF.

- Situation 7:
  Pr.J2-00 = 6, select this dEb control mode when using FOC control. When dEb occurs, the DC bus voltage control level automatically adjusts based on the input power voltage and the motor speed. When the power recovers and DC bus voltage exceeds the dEb return level, the drive automatically decelerates and switches to ramp stop mode until 0 Hz and stops. The keypad displays the" dEb" warning until you manually reset it, so you can see the reason for the stop.

- Situation 8:
  Pr.J2-00 = 7, select this dEb control mode when using FOC control. When dEb occurs, the DC bus voltage control level automatically adjusts based on the input power voltage and the motor speed. When the power recovers, the drive accelerates again. The "dEb" warning on the keypad is automatically cleared.

J2-01 dEb Action Level

(0x1241) Default: 20.0

Settings 0.0–200.0 V_{DC}

- When Pr.J2-00 = 1–5, dEb action level = Lv return level + Pr.J2-01 dEb action (Bias) level
- When Pr.J2-00 = 6–7, dEb action level = DC bus – 200V + Pr.J2-01 dEb action (Bias) level

J2-02 dEb Reset Bias Level

(0x1242) Default: 20.0

Settings 0.0–200.0 V_{DC}

- Prevents action vibration caused by dEb action level = reset level.
- When Pr.J2-00 = 1–5, dEb reset level = dEb action level + Pr.J2-02 dEb Reset Bias Level.
- When Pr.J2-00 = 6–7, dEb reset level = DC bus – Pr.J2-02 dEb Reset Bias Level.

J2-03 dEb Function Reset Time

(0x1243) Default: 3.0

Settings 0.0–25.0 sec.

- When the voltage returns to above the dEb reset level, the drive remains operating at constant speed, and then accelerates/ decelerates to the target frequency after the counting. The time of this process is still the dEb action time.

J2-04 dEb P Gain

(0x1244) Default: 1.00

Settings 0.00–655.35

- Sets the PI gain of the DC bus voltage controller when the dEb function activates.
- If the DC bus voltage drops too fast, or the speed oscillation occurs during deceleration after the dEb function activates, adjusts the proportional gain and integral gain.
- When the external inertia is large or the friction force is large, the corresponding energy change is more severe. Adjust the gain value to avoid Lv fault occurs at the beginning.

- When the DC bus voltage fluctuates violently during the control process, decrease the gain value to avoid oc or ov fault occur during the process.
- Proportional gain: Increase the P gain to quicken the control response, but the oscillation may occur if the setting is too large.

J2-05 dEb I Gain

(0x1245) Default: 0.100

Settings 0.000–65.535

- Integral gain: Use the I gain to decrease the steady-state error to zero and increase the setting to quicken the response speed.
- If the DC bus voltage fluctuates greatly and violently, the adjustment process will trigger the protection, and the integral value can be decreased.

J2-06 dEb Decel Time

(0x1246) Default: 60.00

Settings 0.00–600.00 sec.

- The deceleration time when Pr.J2-00 = 5 (dEb Decel, stop after restore).

J2-07 FOC dEb Torque Feedforward

(0x1247) Default: 80

Settings 0–100%

- The feedforward control parameter that improves the PI controller response speed in the FOC dEb function.
- This function is only valid when Pr.J2-00 = 6 or 7.

J2-08 FOC dEb Coat Stop FREQ

(0x1248) Default: 0.00

Settings 0.00–599.00 Hz

- This parameter is valid only when Pr.J2-00 = 6 or 7.
- When the motor output frequency is lower than the frequency set in Pr.J2-08 during dEb actuation, the motor coasts to stop.
- When Pr.J2-08 = 0, this function is disabled.

J2-09 dEb Output Indn

(0x1249) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
16–19: Reserved

- The output indication when dEb activates.

J3. TEC Function

✓ You can set this parameter during operation.

J3-00 TEC Function Sel

(0x1280) Default: 0

Settings 0: Disable
1: Enable

- When the drive DC bus voltage rises, the motor regenerative energy can be consumed to the motor through the drive control, so as to avoid triggering an over-voltage fault that causes the drive to stop without adding the brake resistors.
- During the drive operation (acceleration, constant speed, and deceleration), the output voltage can be adjusted according to the current regenerative energy. Consume the regenerative energy in a timely manner to reduce the risk of over-voltage and set the intensity of output voltage adjustment through Pr.J3-01 (TEC Voltage Regulation Gain).
- The TEC function is valid in the operating conditions of acceleration, constant speed, and deceleration. It can achieve the best deceleration effect when combined with the smart over-voltage stall prevention function during the deceleration.
- This function only applies to induction motor.

✓ J3-01 TEC Voltage Regulation Gain

(0x1281) Default: 0.50

Settings 0.00–500.00%

- During acceleration, constant speed, and deceleration, output appropriate voltage value according to the DC bus regenerating trend to suppress the over-voltage. And adjust the magnetization voltage intensity through Pr.J3-01 (TEC Voltage Regulation Gain).
- When the parameter increases, the drive output current and the efficiency of consuming regenerative energy will be increased, and vice versa.
- When adjusting parameters, the drive output current should be controlled below 80% of the motor rated current to avoid overheating of the motor.

✓ J3-02 TEC Voltage Regulation LPF

(0x1282) Default: 0.050

Settings 0.000–65.535 sec.

- Sets the filter constant.

J4. Preheat Function

You can set this parameter during operation.

J4-00 Preheat MI Src

(0x12C0) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

- Selects the preheat MI source. You can enable this function by setting parameters or by the MI terminal.
- When the preheat function is enabled (Pr.J4-00 ≠ 0 or 8–9), and the enabling method is set as MI terminal and MI = ON), the function activates according to Pr.J4-03 and J4-06.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

J4-01 Preheat Delay Time

(0x12C1) Default: 5

Settings 5–3000 sec.

- The delay time after the motor stops and before the preheating function executes.

J4-03 Preheat Current Cmd

(0x12C3) Default: 0

Settings 0–100%

- When a motor drive is not in operation (STOP) and is placed in a cold and humid environment, enabling the preheating function to output DC current to heat up the motor drive can prevent the invasion of humidity into the motor drive, which creates condensation affects the normal function of the motor drive.
- Sets the output current level from the motor drive to the motor after enabling the preheating. The percentage of the preheating DC current is 100% of the rated current of the motor drive. When set to 0%, there is no output current.
- Therefore, when you set this parameter, slowly increase the percentage to reach the desired preheating temperature.

J4-06 Preheat Time

(0x12C6) Default: 0

Settings 0–100%

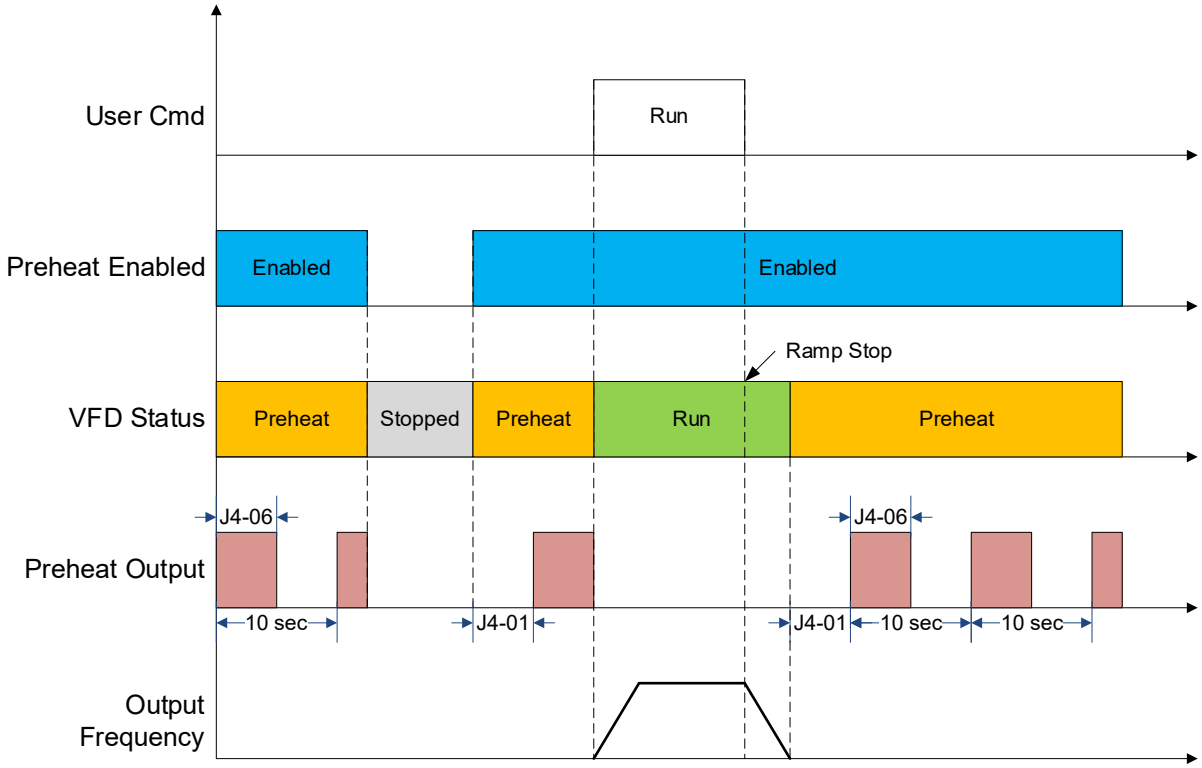
- Sets the motor output current cycle percentage of preheating. 0–100% corresponds to 0–10 seconds. When set to 0%, there is no output current. When set to 100%, there is a continuous output.
- For example, when set to 50%, the time for the motor output current in one cycle is 5 seconds each for ON and OFF, and after the drive stops (STOP), it automatically feeds the continuous periodic DC preheating motor.

- When the preheat MI source is the MI terminal, the preheating command (MI ON) enables the preheating function and continues to operate periodically with the MI signal until the drive runs (RUN) or the preheat command stops preheating (MI OFF), or the parameter turns off preheating function (Pr.J4-00, J4-03 and J4-06 are all set to 0).
- Preheat function starts: When Pr.J4-00, J4-03 and J4-06 are not set to 0, the preheat function starts.
- Preheating function: When the AC motor drive is in operation (RUN) or stops operating (STOP), set the above parameters (when Pr.J4-00 Preheat MI Source is set as MI, and MI is ON), the Preheat function is enabled whenever the motor drive is in STOP status and lasts for the time set in Pr.J4-01.

Sequential Diagram of the Preheating Function

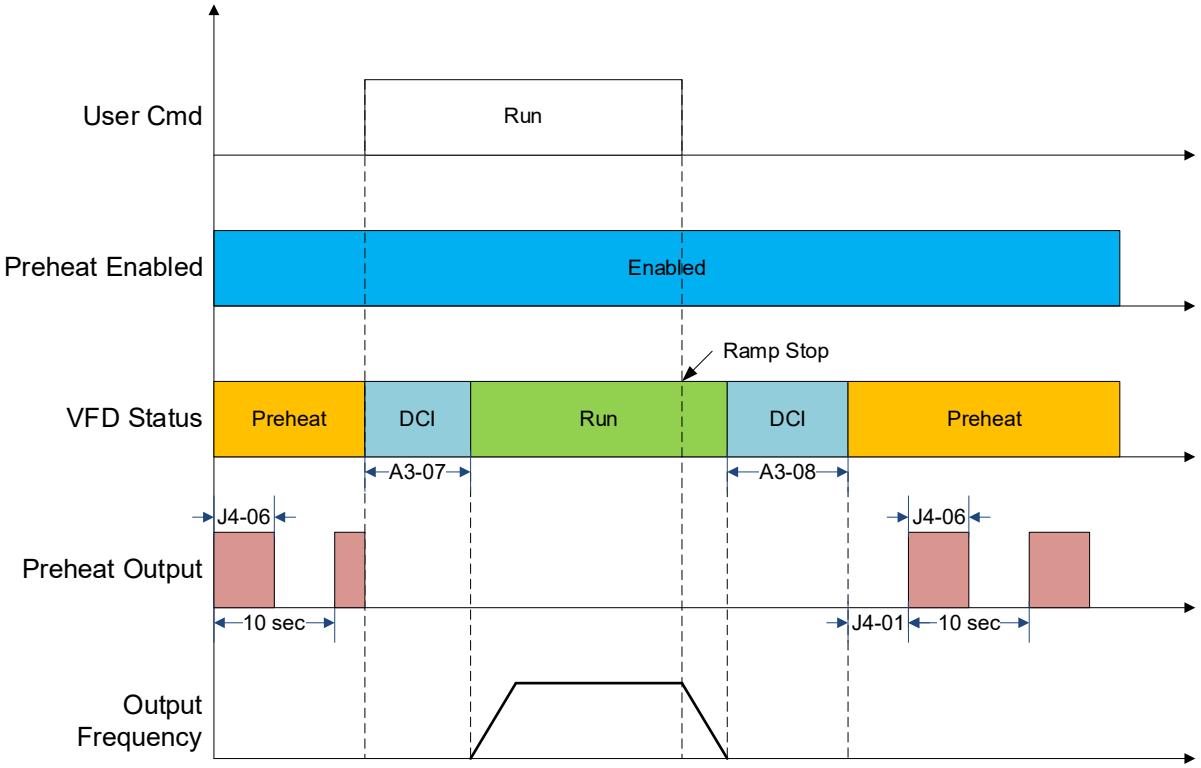
1. Preheating function description

   Set Pr.J4-00, J4-03 and J4-06 not to zero (50% in the diagram, when Pr.J4-00 source selection is set as MI and MI is ON), if the AC motor drive is in STOP status and lasts for the time of Pr.J4-01, the preheating is enabled to output DC current. At the same time, MO (Preheat output indication) is ON, and the sequence of preheat goes from ON (5 sec.) to OFF (5 sec.). When the preheating function is enabled and the drive is in operation (RUN), the preheat function stops temporarily and the MO is OFF. The preheat function restarts when the drive stops (STOP) for the time of Pr.J4-01.



2. Preheating works with DC brake function

When DC brake and preheating are both enabled at the same time, the AC motor drive operates with the same logic described above for preheating. The only difference is that no matter the drive is in operation (RUN) or stops operating (STOP), DC brake enables first. When the drive stops for the time set in Pr.J4-01, preheating is activated.



J4-07 Preheat Indn

(0x12C7) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- Selects preheat indication output signal. When the function activates, the corresponded output terminal indicates.
- Relay 1–2 and MO1–MO2 are control board multi-function (contact, photo coupler) output terminals; MO/ Relay 10–15 are extension card multi-function output terminals (contact, photo coupler).

J5. FireMode

J5-00 FireMode Status

(0x1300) Default: Read only

Settings bit 0: FireMode enabled
0 = FireMode OFF
1 = FireMode ON
bit 1: FireMode active
0 = FireMode is inactive
1 = FireMode is active
bit 2: FireMode direction is forward
0 = FireMode direction is not forward
1 = FireMode direction is forward
bit 3: FireMode direction is reverse
0 = FireMode direction is not reverse
1 = FireMode direction is reverse
bit 4: FireMode stop mode is active
0 = FireMode stop mode is inactive
1 = FireMode stop mode is active
bit 5: FireMode parameter lock
0 = FireMode parameter is not locked
1 = FireMode parameter lock
bit 6: Run enable
0 = Not allow to Run
1 = Allow to Run
bit 7: Start Enable
0 = Not allow to Start
1 = Allow to Start
bit 8–15: Reserve

🕮 Displays the FireMode status. For example, when the FireMode is ON and operates in forward direction, bit0–2 is ON.

J5-01 FireMode

(0x1301) Default: 0

Settings 0: Disable
1: Enable, Limited OPER
2: Enable, Unlimited OPER

🕮 Setting 0: FireMode function is disabled.

🕮 Setting 1: FireMode function is enabled. When a high priority fault occurs during the fire, the drive automatically resets and operates with a limit. (Refer to description of Pr.J5-07–J5-09.)

🕮 Setting 2: FireMode function is enabled. When a high priority fault occurs during the fire, the drive automatically resets and operates without limit. (Refer to description of Pr.J5-07–J5-09.)

🕮 The fire mode is used to force the drive to operate from normal mode to the fire mode when an emergency or fire drill event occurs, so as to help resolve on-site incidents.

- When the drive switches from normal mode to the fire mode and is in operation, the drive operates at its maximum capacity and limit, which means that the drive protection such as LVx low voltage will be ignored, so the drive could continue operating to perform its function.
- From the above, when the drive is in fire mode and the fire mode record 1–3 warranty error code is recorded (0 for no record), the original warranty condition of the drive will be invalid. That is, the after-sales service will be handled out of the warranty.
- Refer to description in Pr.J5-07 Table 2 for high/ low priority.
- If there is a low priority fault before running in fire mode, the drive automatically clears the fault and runs after operating in fire mode.
- If there is a high priority fault before running in fire mode, the fire mode fault treatment is set to auto reset. When the fault state ends after the fire mode operation, the drive automatically clears the fault and continues operating.
- If there is a high-priority fault before running in fire mode, and the fire mode error treatment is set to manual reset, then the fault must be manually reset after running in fire mode before running.
- During the fire mode operation, any behavior and state of HOA/ Local Remote will be ignored and controlled in speed mode. After the fire mode is released, it returns to the current state of HOA/ Local Remote, including the motor control method.

J5-02 FireMode MI Src

(0x1302) Default: 0

Settings
0: Disable
1: Reserved
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

- FireMode MI Src When the fire mode is enabled and the specified MI source is ON, the drive FireMode operates.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

J5-03 FireMode FREQ Src

(0x1303) Default: 0

Settings
0: Disable
1–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi-step speed
17: FireMode FREQ Cmd
18: Up/Down terminal
19: STOP
20: PID

- Selects FireMode frequency source.

- Setting 7–9, 12–13: Operates according to the AIx signal corresponded value. AI signal 0–10V/ 4–20 mA, 0 Hz corresponds to the maximum operation frequency (Pr.C2-17).
- AI1–AI3 are analog input terminals of control board, AI10–AI11 are analog input terminals for IO extension card.
- 16: Operates according to multi-speed setting Pr.C1-18–C1-37.
- 17: Operates according to FireMode frequency command Pr.J5-05.
- 18: Operates according to Up/ Down terminals Pr.C1-13–C1-15.
- 19: Does not run when the fire mode activates.
- 20: Operates according to PID function (refer to Parameter Group P).

J5-04 FireMode Direction MI Src

(0x1304) Default: 0

Settings 0: FWD
1: REV
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

- Selects FireMode direction MI source, through parameter setting direction or MI terminals to switch the selection. When setting MI1 = OFF, the direction is forward; MI1 = ON, the direction is reverse.
- MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

J5-05 FireMode FREQ Cmd

(0x1305) Default: 60.00

Settings 0.00–599.00 Hz

- When FireMode is enabled (Pr.J5-01 ≠ 0) and the FireMode MI source is specified (for example, Pr.J5-02 = 2, MI1), and the FireMode speed source is set as FireMode frequency command (Pr.J5-03 = 17), FireMode frequency command (Pr.J5-05) is set as 60 Hz; when MI1 ON, the drive is in FireMode and operates to 60 Hz.

J5-06 FireMode Control bits

(0x1306) Default: 0

Settings bit 0: RUN Enable
bit 2: FireMode PR Lock
bit 3–15: Reserved

- The FireMode can be used with RUN Enable function (refer to description of Pr.A1-21).
- bit 0: When the bit is OFF, the FireMode operation is not affected by the RUN Enable function (ON or OFF); when the bit is ON, the FireMode operation is affected by the RUN enable function and the digital keypad displays “Run Disabled” warning message. The MI source specified in Pr.A1-21 must be ON, then the “Run Disabled” message of the digital keypad disappears, and the drive goes into FireMode when the fire occurs.

- As above, when the RUN Enable function is switched from ON to OFF during the FireMode operation, the digital keypad displays “Run Disabled” warning message, but the FireMode will be still operating.
- When the drive switches from FireMode back to normal mode operation, regardless of whether the drive operates with RUN Enable function, it ramps to stop.
- When the FireMode is in progress, for the fire protection priority and safety consideration, all parameters of the drive are not accepted to be changed, so as to ensure that the drive controls the fire field through the fire protection system and is not interfered by other factors.
- bit 2: The FireMode parameters (Pr.J5-01–J5-09, J5-31) can only be edited when the bit is OFF in normal mode; the parameters cannot be edited when the bit is ON.

J5-07 FireMode Fault Handle

(0x1307) Default: 0

Settings 0: Manual reset
1: Automatic reset

J5-08 FireMode Auto Reset Times

(0x1308) Default: 1

Settings 1–5

J5-09 FireMode Auto Reset Delay

(0x1309) Default: 5.0

Settings 5.0–120.0 sec.

- During the FireMode operation, when a low priority fault occurs, the drive does not stop and continues operating. If a high priority fault occurs, the drive handles the fault according to Pr.J5-07–J5-09 (Table 1). Refer to description in Table 2 for the high/ low priority.
- Enable the FireMode (Pr.J5-01 = 1) and set the FireMode fault treatment as automatic reset (Pr.J5-07 = 1), when the drive is in FireMode and a high priority fault occurs, the drive stops and waits for the fault returning to normal level (for example, ov fault occurs if the voltage exceeds), there will be a limit according to the reset times setting (Pr.J5-08) to automatically reset the fault, the drive restarts after the delay time (Pr.J5-09) and operates to the frequency command specified in FireMode.
- As above, when the reset time reaches the setting value, for example 5 times (Pr.J5-08), when the sixth fault occurs, the drive stops and does not auto reset the fault. In this case, you must manually reset the fault.
- Enable the FireMode (Pr.J5-01 = 2) and set the FireMode fault treatment as automatic reset (Pr.J5-07 = 1), when the drive is in FireMode and a high priority fault occurs, the drive stops and waits for the fault returning to normal level (for example, ov fault occurs if the voltage exceeds), the drive will auto reset the fault without limit and restarts after the delay time (Pr.J5-09) and operates to the frequency command specified in FireMode. **It is important to note that the unlimited automatic fault reset will not stop until the FireMode stops or the drive is damaged and cannot operate, it also affects the product warranty.**

Table 1 - Fault treatment parameters under FireMode

J5-01 (FireMode)	J5-07 = 1 Automatic reset (FireMode Fault Handle)	J5-08 (FireMode Auto Reset Times)	J5-09 (FireMode Auto Reset Delay)
0: Disable	X	X	X
1: Enable, Limited OPER	V	V	V
2: Enable, Unlimited OPER	V	X	V

- When FireMode is in progress, the fault message in Table 2 will be detected, recorded, and handled with or without stopping the drive.
- When a low priority fault occurs during FireMode operation, regardless of the setting of Pr.J5-07, the drive does not stop and continues operating.
- When a high priority fault occurs during FireMode operation, the drive resets the fault through Pr.J5-07. In all the faults, the high priority fault*1 can only be manually reset, but the high priority fault*2 cannot be reset through manually/ automatic reset mode. It can only be cleared by rebooting the drive, and the fault must be cleared before the drive restarts.

Table 2 - Fault detection under each mode. (V means detectable)

Code	Fault Name	Normal Mode	FireMode	
			High Priority	Low Priority
1	Over-current during acceleration (ocA)	V	V	
2	Over-current during deceleration (ocd)	V	V	
3	Over-current during steady operation (ocn)	V	V	
4	Ground fault (GFF)	V		V
5	IGBT short circuit between upper bridge and lower bridge (occ)	V	V	
6	Over-current at stop (ocS)	V	V	
7	Over-voltage during acceleration (ovA)	V	V	
8	Over-voltage during deceleration (ovd)	V	V	
9	Over-voltage at constant speed (ovn)	V	V	
10	Over-voltage at stop (ovS)	V	V	
11	Low-voltage during acceleration (LvA)	V		V
12	Low-voltage during deceleration (Lvd)	V		V
13	Low-voltage at constant speed (Lvn)	V		V
15	Phase loss protection (OrP)	V		V
16	IGBT overheating (oH1)	V		V
17	Capacitor overheating (oH2)	V		V
18	IGBT temperature detection failure (tH1o)	V		V
19	Capacitor hardware error (tH2o)	V		V
21	Over load (oL)	V		V
22	Electronic thermal relay 1 protection (EoL1)	V		V
23	Electronic thermal relay 2 protection (EoL2)	V		V
24	Motor overheating PTC / KTY84 / PT100 / PT1000 (oH3)	V		V
25	Interrupt Error (INTR)	V		V
26	Over-torque 1 (ot1)	V		V
27	Over-torque 2 (ot2)	V		V

Code	Fault Name	Normal Mode	FireMode	
			High Priority	Low Priority
28	Under current (uC)	V		V
30	EEPROM write error (cF1)	V		V
31	EEPROM read error (cF2)	V	V*1	
33	U-phase error (cd1)	V	V*1	
34	V-phase error (cd2)	V	V*1	
35	W-phase error (cd3)	V	V*1	
37	oc hardware error (Hd1)	V	V*1	
39	occ hardware error (Hd3)	V	V*1	
40	Auto-tuning error (AUE)	V		V
48	AI1 loss (ACE)	V		V
49	External fault (EF)	V		V
50	Emergency stop (EF1)	V		V
51	External base block (bb)	V		V
52	Password is locked (Pcod)	V		V
58	Modbus transmission time-out (CE10)	V		V
61	Y-connection/ D-connection switch error (ydc)	V		V
63	Over slip error (oSL)	V		V
68	Reverse direction of the speed feedback (SdRv)	V		V
69	Over speed rotation feedback (SdOr)	V		V
70	Large deviation of speed feedback (SdDe)	V		V
71	Watchdog (WDTT)	V		V
72	STO loss (STL1)	V	V*2	
76	Safe Torque Off (STO)	V	V*1	
77	STO loss 2 (STL2)	V	V*2	
79	Safe Torque Off 1 (STO1)	V	V*1	
80	Safe Torque Off 2 (STO2)	V	V*1	
82	Output phase loss U phase (OPHL)	V		V
83	Output phase loss V phase (OPHL)	V		V
84	Output phase loss W phase (OPHL)	V		V
87	Overload protection at low frequency (oL3)	V		V
88	Model ID Change (IDCH)	V	V*1	
89	Rotor position detection error (RoPd)	V		V
90	Forced to stop (FStp)	V		V
94	Initializing power board communication error when power ON (POCF)	V		V
95	Board identification error during power-on initialization (IDDE)	V		V
96	Power board communication error (PMCF)	V		V
97	AI2 loss (ACE)	V		V
98	AI3 loss (ACE)	V		V
99	AI10 loss (ACE)	V		V
100	AI11 loss (ACE)	V		V
101	CANopen guarding error (CGdE)	V		V
102	CANopen heartbeat error (CHbE)	V		V
104	CANopen bus off error (CbFE)	V		V
114	ECAP models over voltage (ECOV)	V	V	

Code	Fault Name	Normal Mode	FireMode	
			High Priority	Low Priority
115	ECAP models low voltage (ECLV)	V		V
118	Monitor signal 1 trigger (BX1e)	V		V
119	Monitor signal 2 trigger (BX2e)	V		V
120	Monitor signal 3 trigger (BX3e)	V		V
121	Monitor signal 4 trigger (BX4e)	V		V
122	Monitor signal 5 trigger (BX5e)	V		V
123	Monitor signal 6 trigger (BX6e)	V		V
124	Monitor signal 7 trigger (BX7e)	V		V
125	Monitor signal 8 trigger (BX8e)	V		V
132	Under load protection (ULD)	V		V
133	Over load protection (OLD)	V		V
134	Electronic thermal relay 3 protection (EOL3)	V		V
135	Electronic thermal relay 4 protection (EOL4)	V		V
142	Auto-tune error (AUE1) (No-feedback current error)	V		V
143	Auto-tune error (AUE2) (Motor phase loss error)	V		V
144	Auto-tune error (AUE3) (No-load current (I_0) error)	V		V
148	Auto-tune error (AUE4) (Lsigma measuring error)	V		V
149	Auto-tune error (AUE5)	V		V
150	Auto-tune error (AUE6)	V		V
151	Auto-tune error (AUE7)	V		V
152	Auto-tune error (AUE8)	V		V
153	Auto-tune error (AUE9)	V		V
154	Auto-tuning error (AUEa)	V		V
155	Auto-tuning error (AUEb)	V		V
156	Auto-tuning error (AUEc)	V		V
213	Protection initialization error (ThIF)	V		V
214	Power-on process initialization time-out (POTO)	V		V
220	Parameter copy write-in unfinished (CWF)	V		V
224	STO execution time-out (STOT)	V	V*2	
225	STO ROM verification failure (STOR)	V	V*2	
226	STO loss (STOL)	V	V*2	
227	STO Channel 1 error (STC1)	V	V*2	
228	STO Channel 2 error (STC2)	V	V*2	
229	STO Channel 1 time-out (SPC1)	V	V*2	
230	STO Channel 2 time-out (SPC2)	V	V*2	
231	STO Gate check error (SGBE)	V	V*2	
232	STO power 24V over voltage (S24O)	V	V*2	

Code	Fault Name	Normal Mode	FireMode	
			High Priority	Low Priority
233	STO power 24V under voltage (S24U)	V	V*2	
234	STO power 6V over voltage (S6OV)	V	V*2	
235	STO power 6V under voltage (S6UV)	V	V*2	
236	STO power 5V over voltage (S5OV)	V	V*2	
237	STO power 5V under voltage (S5UV)	V	V*2	
238	STO Watchdog (SWDG)	V	V*2	
239	STO sampling failure (SADE)	V	V*2	
240	STO execution time too short (SEBL)	V	V*2	
241	STO execution time too high (SEAB)	V	V*2	
260	Control board identification error (CBER)	V	V	
300	Large amount leakage error (LEKE)	V		V
301	High pressure error (HPS)	V		V
302	Low pressure error (LPSE)	V		V
303	Dry pump error (dryE)	V		V
304	Dry pump auto-tune error (dAUE)	V		V
305	Pipe blockage (JAME)	V		V
306	ExCOM card break (ECCb)	V		V
307	Communication time-out (ECto)	V		V

J5-10 FireMode Log 1 Start Date

(0x130A) Default: Read only

Settings 0–31129999

J5-11 FireMode Log 1 Start Time

(0x130C) Default: Read only

Settings 0–245959

J5-12 FireMode Log 1 End Date

(0x130E) Default: Read only

Settings 0–31129999

J5-13 FireMode Log 1 End Time

(0x1310) Default: Read only

Settings 0–245959

J5-14 FireMode Log 1 Fault Code

(0x1312) Default: Read only

Settings 0–65535

J5-15 FireMode Log 1 Warning Code

(0x1313) Default: Read only

Settings 0–65535

J5-16 FireMode Log 1 Warranty Fault

(0x1314) Default: Read only

Settings 0–65535

J5-17 FireMode Log 2 Start Date

(0x1315) Default: Read only

Settings 0–31129999

J5-18 FireMode Log 2 Start Time

(0x1317) Default: Read only

Settings 0–245959

J5-19 FireMode Log 2 End Date

(0x1319) Default: Read only

Settings 0–31129999

J5-20 FireMode Log 2 End Time

(0x131B) Default: Read only

Settings 0–245959

J5-21 FireMode Log 2 Fault Code

(0x131D) Default: Read only

Settings 0–65535

J5-22 FireMode Log 2 Warning Code

(0x131E) Default: Read only

Settings 0–65535

J5-23 FireMode Log 2 Warranty Fault

(0x131F) Default: Read only

Settings 0–65535

J5-24 FireMode Log 3 Start Date

(0x1320) Default: Read only

Settings 0–31129999

J5-25 FireMode Log 3 Start Time

(0x1322) Default: Read only

Settings 0–245959

J5-26 FireMode Log 3 End Date

(0x1324) Default: Read only

Settings 0–31129999

J5-27 FireMode Log 3 End Time

(0x1326) Default: Read only

Settings 0–245959

J5-28 FireMode Log 3 Fault Code

(0x1328) Default: Read only

Settings 0–65535

J5-29 FireMode Log 3 Warning Code

(0x1329) Default: Read only

Settings 0–65535

J5-30 FireMode Log 3 Warranty Fault

(0x132A) Default: Read only

Settings 0–65535

- In the fire mode, records three groups of relevant information during the fire for investigation. Each set of record information includes a total of 7 parameters including start date and time, end date and time, fault code, warning code and warranty code. There are 21 related record parameters in total (Pr.J5-10–J5-30).
- The date in the parameter is expressed in the form of “day/ month/ AD year”, a total of 8 codes. The time expression is the 24-hour format “hour/ minute/ second” with a total of 8 codes.
- For information about fault codes and warning codes, refer to Chapter 8 Fault Treatment. The scope of fault code records covers low priority and high priority faults (Table 2).
- During the fire, no matter how many faults has occurred, only the first fault code, warning code and warranty code will be recorded. For example, there are three faults 13 (Lvn), 12 (Lvd) and 11 (LvA) occurred in the fire, only the first fault code (13) will be recorded.
- For example, there are 3 faults (13 Lvn, 12 Lvd and 11 LvA) during the first fire (Table 3), and there is no warning and warranty code. The start and end date of Record 1 is 01/05/2023, the start and end time of Record 1 is 00/00/00 to 00/10/00, a total of 10 minutes, and the record fault code is 13 (Lvn).
- For example, there are 2 faults (11 Lvn and 5 occ) during the first fire (Table 3), and there is no warning code. The start and end date of Record 3 is 20/05/2023, the start and end time of Record 3 is 18/00/00 to 18/30/00, the fault code of Record 3 is 11 (LvA) and the warranty code is 5 (occ).
- From the above, since the warranty fault record is 5 (oc), the original warranty condition of the drive will be invalid, and the after-sales service will be handled outside the warranty.
- Since there are only 3 parameters in the fire mode record, the related information will be saved in Pr.J5-10–J5-16 when the first fire occurs. The information of the second fire occurrence will also exist in the same position, but the original information of the first fire will be pushed back to Pr.J5-17–J5-23. In the same way, the record information is stacked backwards, and the latest fire related information will be saved in Pr.J5-10–J5-16.

Table 3 - Parameter record method

Fire Occurrence Time / FireMode Record	1st Fire	2nd Fire	3rd Fire	4th Fire
	(J5-02 MI OFF to ON to OFF)			
J5-10 FireMode Log 1 Start Date	01052023	10052023	20052023	01062023
J5-11 FireMode Log 1 Start Time	000000	090000	180000	120000
J5-12 FireMode Log 1 End Date	01052023	10052023	20052023	01062023
J5-13 FireMode Log 1 End Time	001000	095900	183000	120500
J5-14 FireMode Log 1 Fault Code	13 (Lvn)	1 (ocA)	11 (LvA)	7 (ovA)

Fire Occurrence Time / FireMode Record	1st Fire	2nd Fire	3rd Fire	4th Fire
	(J5-02 MI OFF to ON to OFF)			
J5-15 FireMode Log 1 Warning Code	0	0	0	0
J5-16 FireMode Log 1 Warranty Fault	0	0	5 (occ)	0
J5-17 FireMode Log 2 Start Date	0	(J5-10) 01052023	(J5-10) 10052023	(J5-10) 20052023
J5-18 FireMode Log 2 Start Time	0	(J5-11) 000000	(J5-11) 090000	(J5-11) 180000
J5-19 FireMode Log 2 End Date	0	(J5-12) 01052023	(J5-12) 10052023	(J5-12) 20052023
J5-20 FireMode Log 2 End Time	0	(J5-13) 001000	(J5-13) 095900	(J5-13) 183000
J5-21 FireMode Log 2 Fault Code	0	(J5-14) 13 (Lvn)	(J5-14) 1 (ocA)	(J5-14) 0
J5-22 FireMode Log 2 Warning Code	0	(J5-15) 0	(J5-15) 0	(J5-15) 0
J5-23 FireMode Log 2 Warranty Fault	0	(J5-16) 0	(J5-16) 0	(J5-16) 5 (occ)
J5-24 FireMode Log 3 Start Date	0	0	(J5-10) 01052023	(J5-10) 10052023
J5-25 FireMode Log 3 Start Time	0	0	(J5-11) 000000	(J5-11) 090000
J5-26 FireMode Log 3 End Date	0	0	(J5-12) 01052023	(J5-12) 10052023
J5-27 FireMode Log 3 End Time	0	0	(J5-13) 001000	(J5-13) 095900
J5-28 FireMode Log 3 Fault Code	0	0	(J5-14) 13 (Lvn)	(J5-14) 1 (ocA)
J5-29 FireMode Log 3 Warning Code	0	0	(J5-15) 0	(J5-15) 0
J5-30 FireMode Log 3 Warranty Fault	0	0	(J5-16) 0	(J5-16) 0

J5-31 FireMode Indn

(0x132B) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- When the drive is in Fire Mode, the specified MO contact activates.
- Relay 1–2 and MO1–MO2 are control board multi-function (contact, photo coupler) output terminals; MO/ Relay 10–15 are extension card multi-function output terminals (contact, photo coupler).

J6. Time Function

You can set this parameter during operation.

J6-00 Low Battery Action

(0x1340) Default: 0

Settings 0: No warning
1: Warning after power on
2: Warning each hour
3: Warning each day

Install a button-type battery CR2032 in the drive before using the scheduling function and set the Calendar through the digital keypad.

When the drive detects low battery of the CR2032, it prompts according to this parameter.

J6-01 Time Function 1

(0x1341) Default: 0

J6-02 Time Function 2

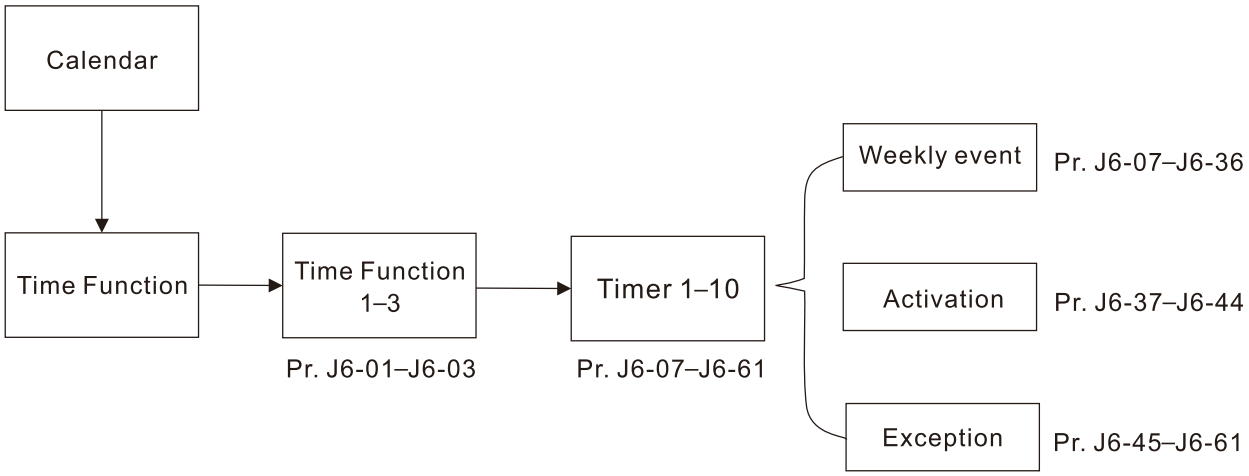
(0x1342) Default: 0

J6-03 Time Function 3

(0x1343) Default: 0

Settings bit0: Timer 1
bit1: Timer 2
bit2: Timer 3
bit3: Timer 4
bit4: Timer 5
bit5: Timer 6
bit6: Timer 7
bit7: Timer 8
bit8: Timer 9
bit9: Timer 10

The scheduling function switches different groups of PID functions according to the planning of the timer. For example, you can switch to program PID2 for water level control when the water consumption is low at night; and switch back to PID1 for low control when the water consumption is high at daytime.



- 🕮 There are 3 time functions for VP3000, each Time Function has 10 timers that can be activated separately. When activate one timer, the corresponded bit is ON, and the bit is OFF when disable the timer.
- 🕮 When setting Pr.J6-01 Time Function 1 to enable Timer 1–3, the corresponded bit0–2 is ON, other bits are OFF; when setting Pr.J6-02 Time Function 2 to enable Timer 3–4, the corresponded bit2–3 is ON, other bits are OFF.

J6-04 Time Function 1 MI Src

(0x1344) Default: 0

J6-05 Time Function 2 MI Src

(0x1345) Default: 0

J6-06 Time Function 3 MI Src

(0x1346) Default: 0

Settings
0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserved
10–15: MI10–MI15

- 🕮 The Time Function must be enabled through parameter settings or turn ON the specified MI terminal.
- 🕮 MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

J6-07 Timer 1 Configuration

(0x1347) Default: 0

Settings
bit0: Monday
bit1: Tuesday
bit2: Wednesday
bit3: Thursday
bit4: Friday
bit5: Saturday
bit6: Sunday
bit7: Activation 1
bit8: Activation 2
bit9: Activation 3
bit10: Activation 4
bit11: Exception
bit12: Holiday
bit13: Workday

J6-08 Timer 1 Start Time

(0x1348) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-09 Timer 1 Duration

(0x1349) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

J6-37 Activation 1 Start Date

(0x136F) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-38 Activation 1 End Date

(0x1370) Default: 1:01 AM

Settings 01:01–31:12 (dd:mm)

- The time function determines the final output of the timer based on the combination and setting of the weekly events, activation, and exception schedule.
- The weekly events selections are Monday to Sunday (bit0–6), the activations are Activation 1–4 (bit7–10), and the exceptions are holiday and workday (bit12–13).
- There are ten timers in the Time Function. The weekly event of each timer can set timer configuration, start/ end date, and duration (Pr.J6-07–J6-36), and the maximum duration can be set to 7 days (day:hour:minute, 07:00:00).
- As above, the activation of each timer can set the activation start date and activation end date, which provides Activation 1–4, a total of 4 groups of activation settings (Pr.J6-37–J6-44). In addition, the start date can be set larger than the end date. For example, the start date is 1/12, end date is 31/1, then the activation would be 1/12–31/12 and 1/1–31/1.
- As above, refer to the parameter description for the exception time function of each timer. When setting the exception time as workday, bit11 and bit13 must be ON.
  - Example 1:
    If the weekly event is set as 8:00 AM to 5:00 PM on Monday, Wednesday, and Friday, then set the timer bit0, 2, and 4 to ON; set the start time as 8:00 (hour:minute, 08:00) and the duration time as 9 hours (hour:minute, 09:00), then the final output would be as the table below.
  - Example 2:
    If the weekly event is set as Monday, Wednesday and Friday from 8:00 AM to 5:00 PM the next day, then set the timer bit0, 2, and 4 to ON; set the start time as 8:00 (hour:minute, 08:00) and the duration time as 1 day and 9 hours (day:hour:minute, 01:09:00), then the final output would be as the table below.
  - Example 3:
    If the weekly event is set from 00:00 AM to 5:00 PM the day after tomorrow on Sunday, set the timer bit6 to ON; and set the start time as 0:00 (hour:minute, 00:00) and the duration time as 2 day and 17 hours (day:hour:minute, 02:17:00), then the final output would be as the table below.
  - Example 4:
    If the weekly event is set as Monday, Wednesday and Friday from 11:00 AM to 10:00 AM the next day, set the timer bit0, 2, and 4 to ON; and set the start time as 11:00 (hour:minute, 11:00) and the duration time as 23 hours (day:hour:minute, 00:23:00), the activation start date to 3/1 (day:month, 03:01) and end date to 6/1 (day:month, 06:01), then the final output

would be as the table below.

- Example 5:

  If the weekly event is set from 8:00 AM to 5:00 PM from Monday to Friday, set the timer bit0–4 to ON; and set the start time as 8:00 (hour:minute, 08:00) and the duration time as 9 hours (hour:minute, 09:00), set the exception as 1, exception type bit0 as OFF (workday), and the exception 1 start day as 7/1 (day:month: 07:01), exception 1 duration as 2 days, then the final output would be as the table below.

bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	Settings
Work-day	Holiday	Excep-tion Type	Activa-tion 4	Activa-tion 3	Activa-tion 2	Activa-tion 1	Sun.	Sat.	Fri.	Thurs.	Wed.	Tues.	Mon.	Content
									ON		ON		ON	Example 1 Weekly event
									8:00 – 17:00		8:00 – 17:00		8:00 – 17:00	Final Output
									ON		ON		ON	Example 2 Weekly Event
								0:00 – 17:00	8:00 – 23:59	0:00 – 17:00	8:00 – 23:59	0:00 – 17:00	8:00 – 23:59	Final Output
							ON							Example 3 Weekly Event
							0:00 – 23:59					0:00 – 17:00	0:00 – 23:59	Final Output
									ON		ON		ON	Example 4
								0:00 – 10:00	11:00 – 23:59 (6/1)	0:00 – 10:00	11:00 – 23:59 (4/1)	0:00 – 10:00	11:00 – 23:59 (2/1)	Weekly Event
						ON			6/1	5/1	4/1	3/1		Activation
									11:00 – 23:59	0:00 – 10:00	11:00 – 23:59	0:00 – 10:00		Final Output
									ON	ON	ON	ON	ON	Example 5
									8:00 – 17:00 (6/1)	8:00 – 17:00 (5/1)	8:00 – 17:00 (4/1)	8:00 – 17:00 (3/1)	8:00 – 17:00 (2/1)	Weekly Event
ON		ON					8/1	7/1						Exception Workday
							0:00 – 23:59	0:00 – 23:59	8:00 – 17:00	8:00 – 17:00	8:00 – 17:00	8:00 – 17:00	8:00 – 17:00	Final Output

J6-10 Timer 2 Configuration

(0x134B) Default: 0

Settings 0–16383

J6-11 Timer 2 Start Time

(0x134C) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-12 Timer 2 Duration

(0x134D) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-13 Timer 3 Configuration

(0x134F) Default: 0

Settings 0–16383

J6-14 Timer 3 Start Time

(0x1350) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-15 Timer 3 Duration

(0x1351) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-16 Timer 4 Configuration

(0x1353) Default: 0

Settings 0–16383

J6-17 Timer 4 Start Time

(0x1354) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-18 Timer 4 Duration

(0x1355) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-19 Timer 5 Configuration

(0x1357) Default: 0

Settings 0–16383

J6-20 Timer 5 Start Time

(0x1358) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-21 Timer 5 Duration

(0x1359) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-22 Timer 6 Configuration

(0x135B) Default: 0

Settings 0–16383

J6-23 Timer 6 Start Time

(0x135C) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-24 Timer 6 Duration

(0x135D) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-25 Timer 7 Configuration

(0x135F) Default: 0

Settings 0–16383

J6-26 Timer 7 Start Time

(0x1360) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-27 Timer 7 Duration

(0x1361) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-28 Timer 8 Configuration

(0x1363) Default: 0

Settings 0–16383

J6-29 Timer 8 Start Time

(0x1364) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-30 Timer 8 Duration

(0x1365) Default: 00:00:00

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-31 Timer 9 Configuration

(0x1367) Default: 0

Settings 0–16383

J6-32 Timer 9 Start Time

(0x1368) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-33 Timer 9 Duration

(0x1369) Default: 12:00:00 AM

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-34 Timer 10 Configuration

(0x136B) Default: 0

Settings 0–16383

J6-35 Timer 10 Start Time

(0x136C) Default: 00:00

Settings 00:00–23:59 (hh:mm)

J6-36 Timer 10 Duration

(0x136D) Default: 12:00:00 AM

Settings 00:00:00–07:00:00 (dd:hh:mm)

📖 Refer to description of Pr.J6-07.

J6-39 Activation 2 Start Date

(0x1371) Default: 01:01

Settings 01:01–31:12

J6-40 Activation 2 End Date

(0x1372) Default: 01:01

Settings 01:01–31:12

📖 Refer to description of Pr.J6-37, J6-38.

J6-41 Activation 3 Start Date

(0x1373) Default: 01:01

Settings 01:01–31:12

J6-42 Activation 3 End Date

(0x1374) Default: 1:01 AM

Settings 01:01–31:12

📖 Refer to description of Pr.J6-37, J6-38.

J6-43 Activation 4 Start Date

(0x1375) Default: 01:01

Settings 01:01–31:12

J6-44 Activation 4 End Date

(0x1376) Default: 01:01

Settings 01:01–31:12

📖 Refer to description of Pr.J6-37, J6-38.

J6-45 Exception Enable Number

(0x1377) Default: 3

Settings 0–12

📖 There are 12 exception schedules in total. This parameter defines the enable number of exception schedule, for example, when you set this parameter to 6, the exception schedules are enabled in order from 1 to 6.

J6-46 Exception Type

(0x1378) Default: 0

Settings bit0: Exception 1
bit1: Exception 2
bit2: Exception 3
bit3: Exception 4
bit4: Exception 5
bit5: Exception 6
bit6: Exception 7
bit7: Exception 8
bit8: Exception 9
bit9: Exception 10
bit10: Exception 11
bit11: Exception 12

- This parameter defines the type of exception schedule 1–12 as workday (default) or holiday.
- When the exception is defined as workday, the corresponded bit is OFF; if it is defined as holiday, the corresponded bit is ON.
- When Pr.J6-46 defines Exception 1–3 as holiday and the rest of exceptions are workday, then the corresponded bit0–2 is ON, and the other bits are OFF.

J6-47 Exception 1 Start Date

(0x1379) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-48 Exception 1 Duration Days

(0x137A) Default: 0

Settings 0–60 days

- Defines 12 groups (Pr.J6-45–J6-61) of exception dates.
- The first 3 groups set the interval, for example, the start date is 1/1 (day:month, 01:01) and the duration is 3 days, the exception time is set from 1/1 to 3/1.
- The last 9 groups set the start date, for example, the start date is 28/2 (day:month, 28:02), the exception time is 28/2 from 00:00 to 23:59 on the day.

J6-49 Exception 2 Start Date

(0x137B) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-50 Exception 2 Duration Days

(0x137C) Default: 0

Settings 0–60 day

- Refer to description of Pr.J6-47, J6-48.

J6-51 Exception 3 Start Date

(0x137D) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-52 Exception 3 Duration Days

(0x137E) Default: 0

Settings 0–60 day

📖 Refer to description of Pr.J6-47, J6-48.

J6-53 Exception 4 Start Date

(0x137F) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-54 Exception 5 Start Date

(0x1380) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-55 Exception 6 Start Date

(0x1381) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-56 Exception 7 Start Date

(0x1382) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-57 Exception 8 Start Date

(0x1383) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-58 Exception 9 Start Date

(0x1384) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-59 Exception 10 Start Date

(0x1385) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-60 Exception 11 Start Date

(0x1386) Default: 01:01

Settings 01:01–31:12 (dd:mm)

J6-61 Exception 12 Start Date

(0x1387) Default: 01:01

Settings 01:01–31:12 (dd:mm)

📖 Refer to description of Pr.J6-47.

n. Communication

n0. COM Card Information

You can set this parameter during operation

n0-00 RS-485 COM Port Protocol Sel

(0x1540) Default: 0

Settings 0: Modbus Slave
1: Modbus Master
2: BACnet MS/TP

n0-01 COM Card Timeout Disposal

(0x1541) Default: 0

Settings 0: By COM Stop Method and display Warning
1: By OPER FREQ after COM Timeout and display Warning
2: By Drive Stop Method and display Warning
3: by Drive Stop Method and display Fault
4: by Drive Stop Method and display Warning after stop
5: by Drive Stop Method and display Fault after stop

- Defines the treatment when communication timeout. Communication timeout is defined as communication disconnection between COM card and upper controller (ECto) or disconnection of the communication card (ECCb).
- 0: Displays Warning after COM is OFF. When ECto occurs, the communication card gives the stop command (0x2000 = 1, 0x6000 = 0); when ECCb occurs, the drive gives the stop command (0x2000 = 1, 0x6000 = 0) and the screen displays Warning message.
- 1: Displays Warning after COM is OFF. When ECto or ECCb occurs, the drive operates the specified frequency according to Pr.n0-02 and the screen displays Warning message.
- 2: Displays Warning after COM is OFF. When ECto or ECCb occurs, the drive stops according to the setting for Pr.A2-00 Stop Method and the screen displays Warning message.
- 3: Displays Fault after COM is OFF. When ECto or ECCb occurs, the drive stops according to the setting for Pr.A2-00 Stop Method and the screen displays Fault message.
- 4: Displays Warning after COM is OFF. When ECto or ECCb occurs, the drive stops according to the setting for Pr.A2-00 Stop Method and the screen displays Warning message after the drive stops.
- 5: Displays Fault after COM is OFF. When ECto or ECCb occurs, the drive stops according to the setting for Pr.A2-00 Stop Method and the screen displays Fault message after the drive stops.

n0-02 OPER FREQ after COM Timeout

(0x1542) Default: 0.00

Settings 0.00–599.00 Hz

- When you set Pr.C1-01 as 2 (RS-485 serial communication input) and Pr.n0-01 = 1, the AC motor drive operates with the frequency set in this parameter whenever communication timeout occurs.

n0-03 COM Card ID

(0x1543) Default: Read only

Settings 0: N/A
1: DeviceNet
2: Profibus-DP
3: CANopen
5: EtherNet
8: BACnet IP
12: Profinet

n0-04 COM Card Version

(0x1544) Default: Read only

Settings Read only

n0-05 COM Card Date Code

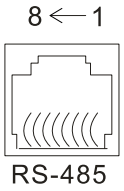
(0x1545) Default: Read only

Settings Read only

📖 This parameter shows the year, week, and day when the program is completed.

n1. Modbus

When using the communication interface, the diagram on the right shows the communication port pin definitions. We recommend that you connect the AC motor drive to your PC by using Delta IFD6530 or IFD6500 as a communication converter. Refer to the RJ45 terminal on Section 3-4-1 Wiring for details of the communication port on the right. Refer to Section 6-1 Modbus Communication for more details.



Modbus RS-485
Pin 1–2,7,8: Reserved
Pin 3, 6: GND
Pin 4: SG-
Pin 5: SG+

You can set this parameter during operation

n1-00 Modbus Decoding Method

(0x1580) Default: 0

Settings 0: Delta defined 2000
1: Delta defined 6000

		Decoding Method 1	Decoding Method 2
Source of Operation Control	Digital Keypad	Digital keypad controls the drive action regardless of decoding method 1 or 2.	
	External Terminal	External terminal controls the drive action regardless of decoding method 1 or 2.	
	RS-485	Refer to address: 2000h–20FFh	Refer to address: 6000h–60FFh
	CANopen	Refer to index: 2020-01h–2020-FFh	Refer to index: 2060-01h–2060-FFh
	COM Card	Refer to address: 2000h–20FFh	Refer to address: 6000h–60FFh
	PLC	PLC command controls the drive action regardless of decoding method 1 or 2.	

n1-01 Modbus Address

(0x1581) Default: 1

Settings 1–254

Sets the communication address for the drive if the AC motor drive is controlled through RS-485 serial communication. The communication address for each AC motor drive must be unique.

n1-02 Modbus COM Baud Rate

(0x1582) Default: 2

Settings 0: 4.8 Kbps
1: 9.6 Kbps
2: 19.2 Kbps
3: 38.4 Kbps
4: 57.6 Kbps
5: 76.8 Kbps
6: 115.2 Kbps

Sets the transmission speed between the computer and the AC motor drive.

n1-03 Modbus Package Format

(0x1583) Default: 1

Settings
0: 7, N, 2 (ASCII)
1: 7, E, 1 (ASCII)
2: 7, O, 1 (ASCII)
3: 7, E, 2 (ASCII)
4: 7, O, 2 (ASCII)
5: 8, N, 1 (ASCII)
6: 8, N, 2 (ASCII)
7: 8, E, 1 (ASCII)
8: 8, O, 1 (ASCII)
9: 8, E, 2 (ASCII)
10: 8, O, 2 (ASCII)
11: 8, N, 1 (RTU)
12: 8, N, 2 (RTU)
13: 8, E, 1 (RTU)
14: 8, O, 1 (RTU)
15: 8, E, 2 (RTU)
16: 8, O, 2 (RTU)

Control by PC (Computer Link)

When using the RS-485 serial communication interface, you must specify each drive's communication address in Pr.n1-01. The computer then implements control using the drives' individual addresses.

Modbus ASCII (American Standard Code for Information Interchange): Each byte of data is the combination of two ASCII characters. For example, one byte of data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

n1-04 Modbus Timeout Check Time

(0x1584) Default: 0.0

Settings 0.0–100.0 sec.

Sets the communication time-out value.

n1-05 Modbus Timeout Disposal

(0x1585) Default: 0

Settings
0: Continue OPER
1: Warning & continue OPER
2: Fault & ramp to stop
3: Fault & coast to stop

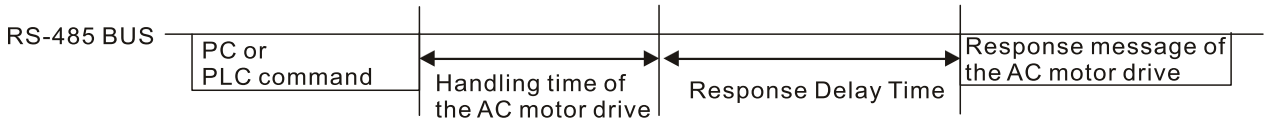
Determines the treatment when an error is detected that the host controller does not continuously transmit data to the AC motor drive during Modbus communication. The detection time is based on the Pr.n1-04 setting.

✓ n1-06 Modbus Response Delay Time

(0x1586) Default: 2.0

Settings 0.0–200.0 ms

🕮 If the host controller does not finish the transmitting/receiving process, you can use this parameter to set the response delay time after the AC motor drive receives communication command as shown in the following picture.



✓ n1-07 Modbus MO Mask

(0x1587) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

✓ n1-08 Modbus AO Mask

(0x1588) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

n1-09 Modbus Master Target Selection

(0x1589) Default: 0

Settings 0: None
1: InnerPLC
2: D2D

🕮 Select the Modbus Master target through this parameter before using Modbus Master function.

✳ n1-10 Modbus Special Function

(0x1590) Default: 0

Settings bit0 = 0: 0x2104 decimal point varies with the value
bit0 = 1: 0x2104 decimal point is fixed to one decimal point

🕮 Sets the 0x2104 decimal point configuration of Modbus communication output current.

＊n2. CANopen

↗ You can set this parameter during operation

＊ Advanced parameters, set Pr.b0-00 to unlock

n2-00 CANopen Decoding Method

(0x1590) Default: 0

Settings 0: Delta defined 2000
1: Delta defined 6000
2: DS402

Source of OPER control	Decoding Method 1	Decoding Method 2	Decoding Method 3
CANopen	Refer to index: 2020-01h–2020-FFh	Refer to address: 3000-01h–307F-40h	DS402 object (6007-00h…)

n2-01 CANopen Slave Address

(0x1591) Default: 0

Settings 0: Disable
1–127

n2-02 CANopen COM Baud Rate

(0x1592) Default: 0

Settings 0: 1 Mbps
1: 500 Kbps
2: 250 Kbps
3: 125 Kbps
4: 100 Kbps
5: 50 Kbps

n2-03 CANopen Master Function

(0x1593) Default: 0

Settings 0: Disable
1: Enable

n2-04 CANopen Master Address

(0x1594) Default: 100

Settings 0–127

n2-05 CANopen Control Word

(0x1595) Default: 0

Settings 0–0xFFFF

n2-06 CANopen MO Mask

(0x1596) Default: 0

Settings
0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

n2-07 CANopen AO Mask

(0x1597) Default: 0

Settings
0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

n2-08 CANopen CiA 301 Status

(0x1598) Default: Read only

Settings
0: Initializing
1: Reset Application
2: Reset COM
3: Pre-operational
4: Operational
5: Stopped

n2-09 CANopen CiA 402 Status

(0x1599) Default: Read only

Settings
0: Not ready to switch on
1: Switch on Disabled
2: Ready to switch on
3: Switched on
4: Operation enabled
5: Quick stop active
6: Fault reaction active
7: Fault

n2-10 CANopen Fault REC

(0x1599) Default: Read only

Settings
bit0: CANopen Guarding Timeout
bit1: CANopen Heartbeat Timeout
bit2: CANopen Bus-off
bit3: CANopen SYNC Timeout
bit4: CANopen Format Error

n3. BACnet MS/TP

You can set this parameter during operation

n3-00 BACnet MS/TP Decoding Method

(0x15A0) Default: 0

Settings 0: Delta defined 2000

Refer to description of Pr.n1-00.

n3-01 BACnet MAC ID

(0x15A1) Default: 10

Settings 0–127

n3-02 Max BACnet MAC ID Setting

(0x15A2) Default: 127

Settings 0–127

n3-03 BACnet COM Baud Rate

(0x15A3) Default: 2

Settings 0: 9.6 Kbps
1: 19.2 Kbps
2: 38.4 Kbps
3: 76.8 Kbps

n3-04 BACnet Device ID

(0x15A4) Default: 10

Settings 0–4194303

n3-05 BACnet Password

(0x15A6) Default: 0

Settings 0–65535

n3-06 BACnet MO Mask

(0x15A7) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

n3-07 BACnet AO Mask

(0x15A8) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

＊n4. DeciveNet & Profibus

↗ You can set this parameter during operation

＊ Advanced parameters, set Pr.b0-00 to unlock

n4-00 DeviceNet Decoding Method

(0x15B0) Default: 0

Settings 0: Delta defined 2000
1: Delta defined 6000

📖 Refer to description of Pr.n1-00.

↗ n4-01 DeviceNET Address

(0x15B1) Default: 1

Settings 0–63

↗ n4-02 DeviceNet COM Baud Rate

(0x15B2) Default: 3

Settings 0: 10 Kbps
1: 20 Kbps
2: 50 Kbps
3: 100 Kbps
4: 125 Kbps
5: 250 Kbps
6: 500 Kbps
7: 800 Kbps
8: 1 Mbps

↗ n4-03 DeviceNet Control Word

(0x15B3) Default: 0

Settings bit0 Additional setting of COM card speed rate
bit 0 = 0: Standard
bit0 = 1: Delta Defined

↗ n4-04 DeviceNet MO Mask

(0x15B4) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

n4-05 DeviceNET AO Mask

(0x15B5) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

n4-06 Profibus Decoding Method

(0x15B6) Default: 0

Settings 0: Delta defined 2000
1: Delta defined 6000

Refer to description of Pr.n1-00.

n4-07 Profibus Address

(0x15B7) Default: 1

Settings 1–125

n4-08 Profibus MO Mask

(0x15B8) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

n4-09 Profibus AO Mask

(0x15B9) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

∗n5. EtherNET

✓ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

n5-00 EtherNET Decoding Method

(0x15C0) Default: 0

Settings 0: Delta defined 2000
1: Delta defined 6000

📖 Refer to description of Pr.n1-00.

n5-01 EtherNET IP Configuration

(0x15C1) Default: 0

Settings 0: Static IP
1: DHCP
2: BOOTP

📖 0: Set the IP address manually.

📖 1: IP address is dynamically set by the host controller.

📖 2: IP address is assigned by BOOTP server based on the device's MAC address.

✓ n5-02 EtherNET IP Address 1

(0x15C2) Default: 0

Settings 0–223

✓ n5-03 EtherNET IP Address 2

(0x15C3) Default: 0

Settings 0–255

✓ n5-04 EtherNET IP Address 3

(0x15C4) Default: 0

Settings 0–255

✓ n5-05 EtherNET IP Address 4

(0x15C5) Default: 0

Settings 0–255

📖 Use Pr.n5-02–n5-05 with a EtherNET communication card.

✓ n5-06 EtherNET Mask Address 1

(0x15C6) Default: 0

Settings 0–255

✓ n5-07 EtherNET Mask Address 2

(0x15C7) Default: 0

Settings 0–255

✓ n5-08 EtherNET Mask Address 3

(0x15C8) Default: 0

Settings 0–255

n5-09 EtherNET Mask Address 4

(0x15C9) Default: 0

Settings 0–255

n5-10 EtherNET Gateway Address 1

(0x15CA) Default: 0

Settings 0–223

n5-11 EtherNET Gateway Address 2

(0x15CB) Default: 0

Settings 0–255

n5-12 EtherNET Gateway Address 3

(0x15CC) Default: 0

Settings 0–255

n5-13 EtherNET Gateway Address 4

(0x15CD) Default: 0

Settings 0–255

n5-14 EtherNET Password

(0x15CE) Default: 0

Settings 0–4294967295

n5-15 EtherNET Reset

(0x15CF) Default: 0

Settings 0: Disable
1: Reset

n5-16 EtherNET Control Word

(0x15D0) Default: 0

Settings bit0: Enable IP filter
bit1: Enable Internet parameters
bit2: Enable Login Password

📖 bit1: When the IP address is set, this bit is enabled. After updating the parameters for the communication card, this bit changes to disabled.

📖 bit2: When you enter the login password, this bit is enabled. After updating the parameters for the communication card, this bit changes to disabled.

n5-17 EtherNET MO Mask

(0x15D1) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: Relay1–2
bit 2–3: MO1–MO2
bit 4–8: Reserved
bit 9–14: MO10–MO15

n5-18 EtherNET AO Mask

(0x15D2) Default: 0

Settings 0: Disable
1: Enable
bit 0–1: AO1–AO2
bit 2–3: Reserved
bit 4–5: AO10–AO11

n5-19 EtherNET Status

(0x15D3) Default: Read only

Settings bit0: Enable login password

📖 bit0: When the communication card is set with a password, this bit is enabled. When the password is cleared, this bit changes to disabled.

n5-20 EIP COM Card Identify Method

(0x15D4) Default: 1

Settings 0: by the device's family
1: by the device's series

📖 0: by the device’s family, for example: CMC-EIP02.

📖 1: by the device’s series, for example: VP3000 (CMC-EIP02).

n5-21 Max. Mapping Address of EIP Data Exchange

(0x15D5) Default: 1

Settings 0: 0x7FFF
1: 0xFFFF

📖 0: Use with other software; 1: use with Delta software.

📖 Regardless of the used software, if the default value 1 is used and the EIP function works normally, there is no need to change this parameter setting; otherwise, use setting value 0.

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o. Monitor & Recorder

o0. Status Monitor

You can set this parameter during operation

o0-00 Digital Keypad Display Selection 1

(0x1640) Default: 9

o0-01 Digital Keypad Display Selection 2

(0x1641) Default: 2

o0-02 Digital Keypad Display Selection 3

(0x1642) Default: 0

o0-60 Digital Keypad Display Selection 4

(0x167C) Default: 3

o0-61 Digital Keypad Display Selection 5

(0x167D) Default: 4

o0-62 Digital Keypad Display Selection 6

(0x167E) Default: 6

Settings
0: Display output current (A) (unit: Amp)
1: Display counter value (c) (Unit: CNT)
2: Display the motor's actual output frequency (H.) (Unit: Hz)
3: Display the drive's DC bus voltage (v) (Unit: V_{DC})
4: Display the drive's output voltage (E) (Unit: V_{AC})
5: Display the drive's output power angle (n) (Unit: deg)
6: Display the drive's output power (P) (Unit: kW)
7: Display the motor speed rpm (r) (Unit: rpm)
8: Display the drive's estimated output torque, motor's rated torque is 100% (t) (Unit: %)
9: Frequency command (Unit: Hz)
11: Display AI1 analog input terminal signal (1.) (Unit: %)
12: Display AI2 analog input terminal signal (2.) (Unit: %)
13: Display AI3 analog input terminal signal (3.) (Unit: %)
14: Display the drive's IGBT temperature (i.) (Unit: °C)
15: Display the drive's capacitance temperature (c.) (Unit: °C)
16: The digital input status (ON / OFF) (i)
17: The digital output status (ON / OFF) (o)
18: Display multi-step speed (S)
19: The corresponding CPU digital input pin status (d)
20: The corresponding CPU digital output pin status (0.)
21: Display the drive's IGBT temperature (i) (Unit: %)
22: Display the drive's capacitance temperature (c.) (Unit: %)
25: Overload count (0.00–100.00%) (o.) (Unit: %)
26: Ground fault GFF (G.) (Unit: %)
27: DC bus voltage ripple (r.) (Unit: V_{DC})
28: Display PLC register D1043 data (C)

29: Display PM pole SECT (4.)
32: Operation speed of fan 1 (F.) (Unit: %)
33: Operation speed of fan 2 (F.) (Unit: %)
34: Operation speed of fan 3 (F.) (Unit: %)
36: Present operating carrier frequency of the drive (Unit: Hz) (J.)
38: Drive Status (6.)
39: Display the drive's estimated output torque, positive and negative, using Nt-m as unit (t 0.0: positive torque; -0.0: negative torque (C.)
41: kWh display (J) (Unit: kWh)
42: P-PID1 reference (h.) (Unit: %)
43: P-PID2 reference (h.) (Unit: %)
44: P-PID1 feedback (b) (Unit: %)
45: P-PID2 feedback (b) (Unit: %)
46: P-PID1 output frequency (b.) (Unit: Hz)
47: P-PID2 output frequency (b.) (Unit: Hz)
48: Hardware ID 1 (0)
49: Motor temperature (KTY84-130 only) (c.) (Unit: %)
51: PMSVC torque offset (t.)
52: AI10% (7.) (Unit: %)
53: AI11% (8.) (Unit: %)
54: Hardware ID 2 (0)
55: Hardware ID 3 (0)
68: STO version (d)
69: STO checksum-high word (d)
70: STO checksum-low word (d)
71: B-PID1 reference (h.) (Unit: %)
72: B-PID1 feedback (b) (Unit: %)
73: B-PID1 output (b.) (Unit: %)
74: B-PID2 reference (h.) (Unit: %)
75: B-PID2 feedback (b) (Unit: %)
76: B-PID2 output (b.) (Unit: %)
77: B-PID3 reference (h.) (Unit: %)
78: B-PID3 feedback (b) (Unit: %)
79: B-PID3 output (b.) (Unit: %)
80: B-PID4 reference (h.) (Unit: %)
81: B-PID4 feedback (b) (Unit: %)
82: B-PID4 output (b.) (Unit: %)
83: P-PID1 reference & feedback (Unit: %)
84: P-PID2 reference & feedback (Unit: %)
85: B-PID1 reference & feedback (Unit: %)
86: B-PID2 reference & feedback (Unit: %)
87: B-PID3 reference & feedback (Unit: %)

88: B-PID4 reference & feedback (Unit: %)

- Pr.o0-00–o0-02, Pr.o0-60–o0-62 set the internal value of the drive, input and output values, status, physical quantity, etc. that the user needs to observe.
- When setting as 9 and the frequency command is set as digital keypad, user can set the frequency command value on the displayed page.
- Option 83–88 can display the reference and feedback value of P-PID and B-PID simultaneously.

o0-03 Current Display Filter Time

(0x1643) Default: 0.500

Settings 0.001–65.535 sec.

- Set this parameter to reduce the fluctuation of the current display value on the keypad.

o0-04 DC bus Display Filter Time

(0x1644) Default: 0.500

Settings 0.001–65.535 sec.

- Set this parameter to reduce the fluctuation of the DC bus display value on the keypad.

o0-05 Status Display Filter Time

(0x1645) Default: 0.500

Settings 0.001–65.535 sec.

- Sets the general filter time for the output frequency, motor rpm and power display on the digital keypad. (VP3000 does not have motor speed feedback, therefore, the above motor rpm is the value converted from the output frequency.)

o0-06 Drive Ready Indn

(0x1646) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- Selects the MO/Relay terminal for the “Drive Ready” status indication.
- If the AC motor drive starts without any abnormal status, the terminal contact selected in Pr.o0-06 activates.

o0-07 Run Indn

(0x1647) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- Selects the MO/Relay terminal for the “Drive RUN” status indication.

📖 When the AC motor drive is in the non-stop status, the terminal contact selected in Pr.o0-07 activates.

o0-08 Output Amp Detection Level

(0x1648) Default: 0.0

Settings 0.0–200.00%

o0-09 Output Amp Exceed Indn

(0x1649) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

o0-10 Output Amp under Indn

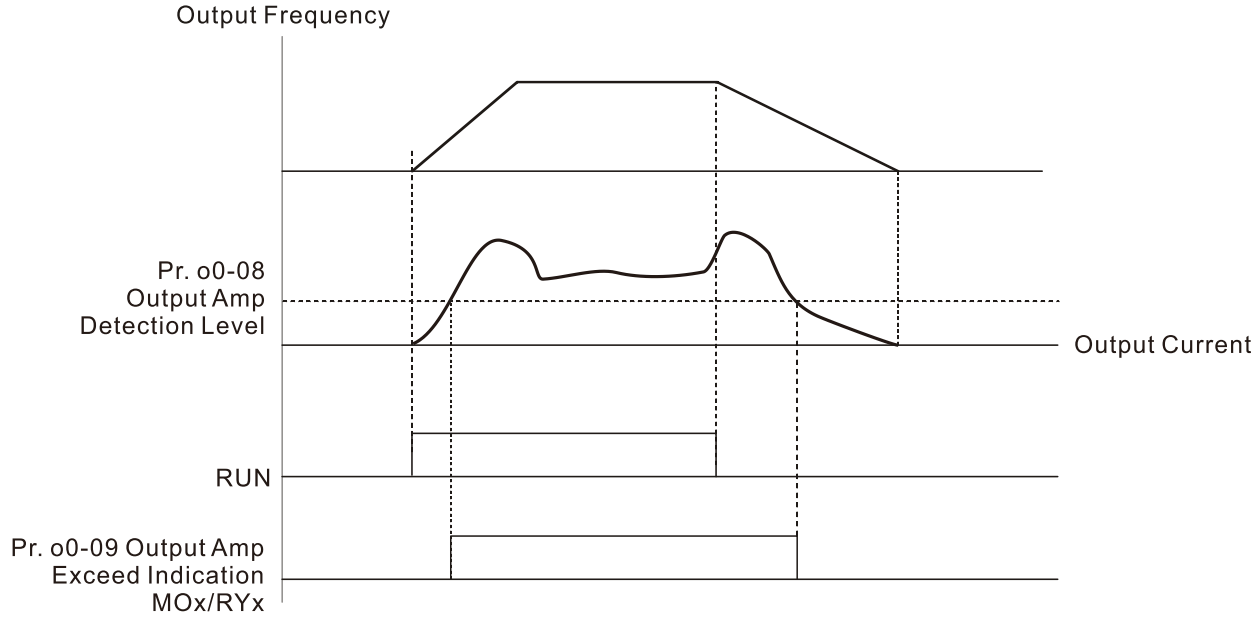
(0x164A) Default: 0

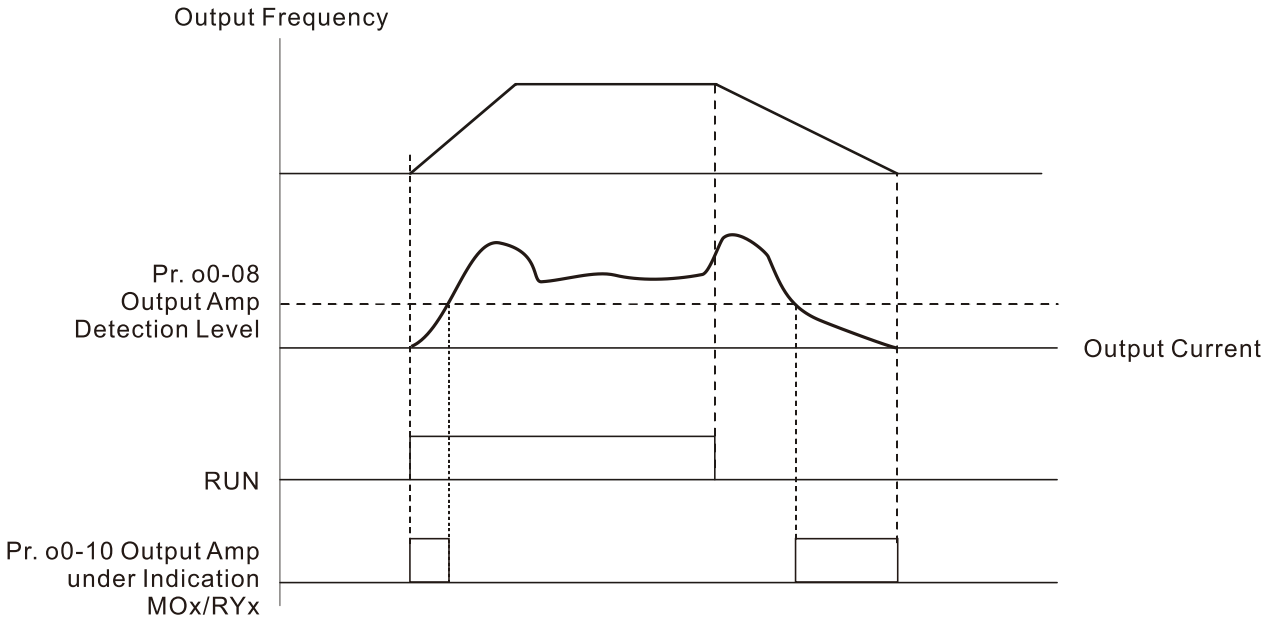
Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

📖 Pr.o0-08 is the detection level of Pr. o0-09 and o0-10. 100% corresponds to Pr.A0-01 Drive continuous rated current.

📖 When the drive output current is higher than Pr.o0-08 current level, the terminal contact selected in Pr.o0-09 activates.

📖 When the drive output current is lower than Pr.o0-08 current level, the terminal contact selected in Pr.o0-10 activates.





o0-11 Target Speed Width

(0x164B) Default: 0.1

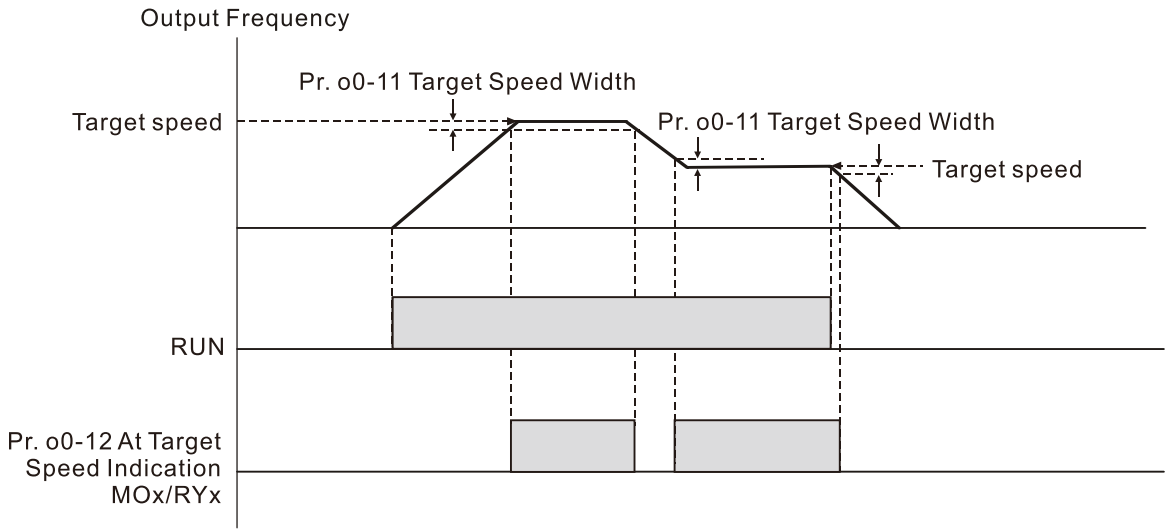
Settings 0.1–5.0%

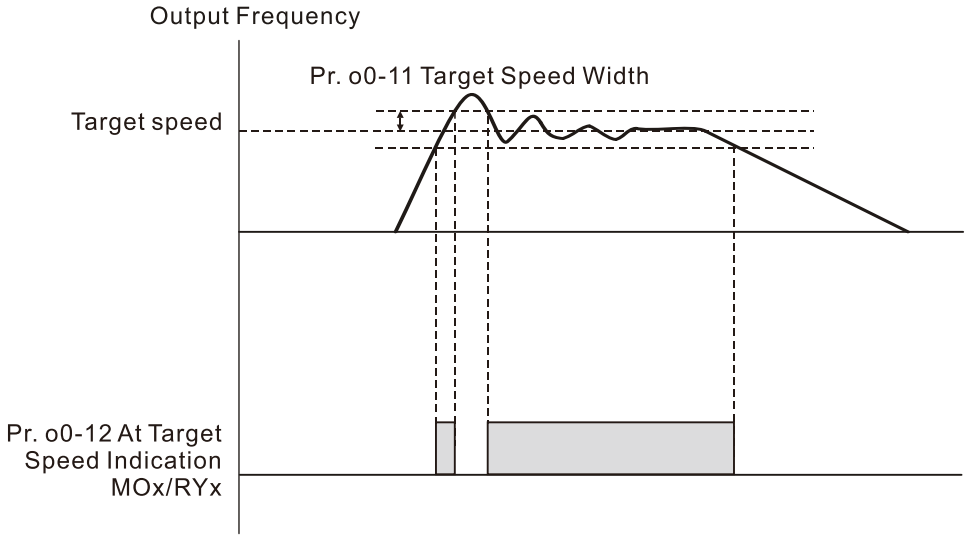
o0-12 At Target Speed Indn

(0x164C) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- When the drive output frequency reaches the set speed width in Pr.o0-11, the terminal contact selected in Pr.o0-12 activates.
- When Pr.d1-04 IM1 rated speed = 1750 rpm, target speed = 800 rpm and Pr.o0-11 = 1%, the terminal contact selected in Pr.o0-12 activates within the range of “800 +/- 17.5” rpm.





o0-13 Output FREQ Detection Level

(0x164D) Default: 30.00

Settings 0.00–599.00 Hz

o0-14 Output FREQ Exceed Indn

(0x164E) Default: 0

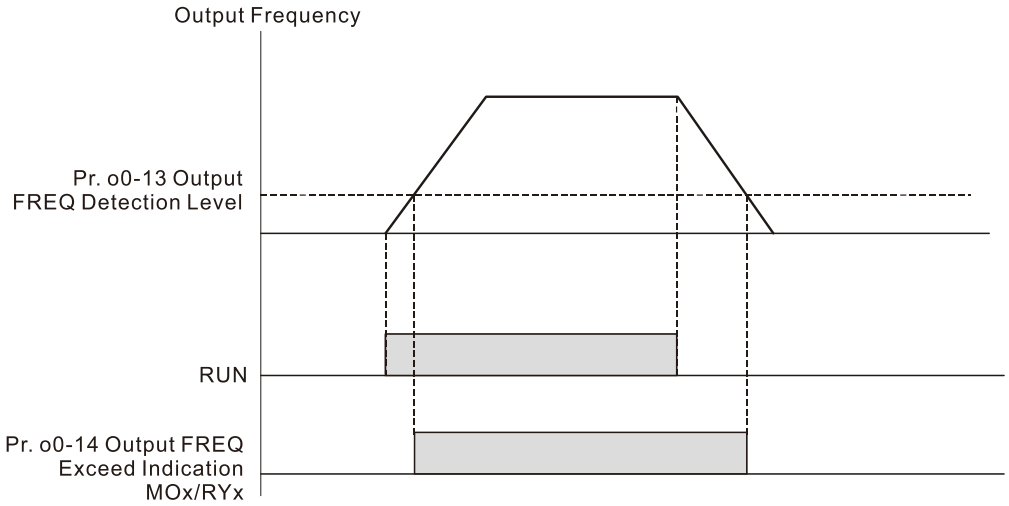
Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

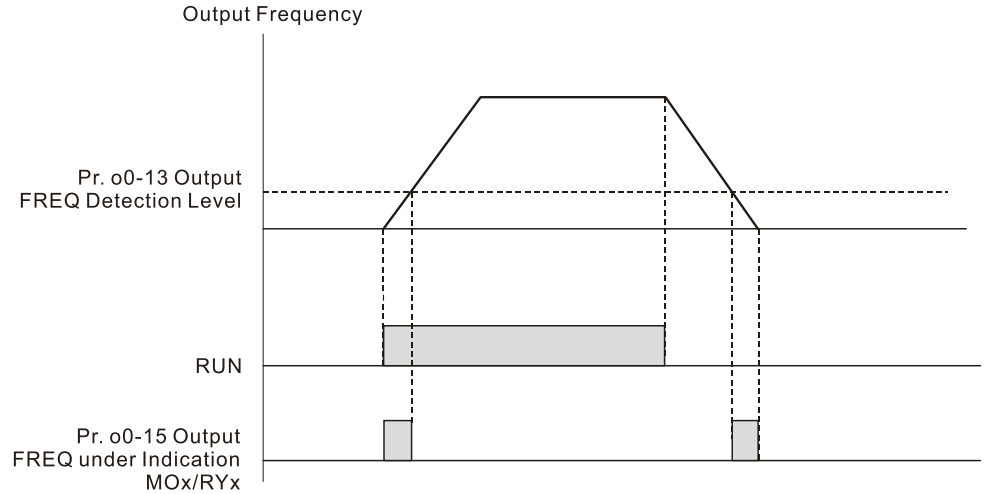
o0-15 Output FREQ under Indn

(0x164F) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- When the drive output frequency is higher than the setting for Pr.o0-13 (actual output frequency H ≥ Pr.o0-13, the terminal contact selected in Pr.o0-14 activates.
- When the drive output frequency is lower than the setting for Pr.o0-13 (actual output frequency H < Pr.o0-13), the terminal contact selected in Pr.o0-15 activates.





o0-16 Output FREQ1 Level

(0x1650) Default: 60.00

Settings 0.00–599.00 Hz

o0-17 Output FREQ1 Width

(0x1651) Default: 2.00

Settings 0.00–599.00 Hz

o0-18 At Output FREQ1 Indn

(0x1652) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

o0-19 Output FREQ2 Level

(0x1653) Default: 60.00

Settings 0.00–599.00 Hz

o0-20 Output FREQ2 Width

(0x1654) Default: 2.00

Settings 0.00–599.00 Hz

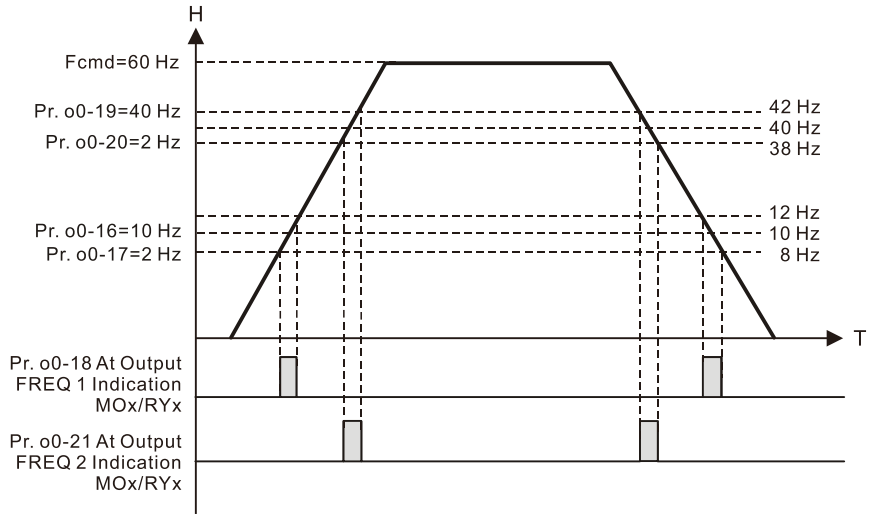
o0-21 At Output FREQ2 Indn

(0x1655) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

When the drive output frequency reaches Pr.o0-16 output frequency 1 level, the terminal contact selected in Pr.o0-18 activates.

When the drive output frequency reaches Pr.o0-19 output frequency 2 level, the terminal contact selected in Pr.o0-21 activates.



o0-22 0 Hz Cmd Indn at Run

(0x1656) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

When the AC motor drive frequency command is set to 0, the terminal contact selected in Pr.o0-22 activates.

This function only activates when the drive is in operation.

o0-23 0 Hz Cmd Indn

(0x1657) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

When the AC motor drive frequency command is set to 0 or stop, the terminal contact selected in Pr.o0-23 activates.

o0-24 0 Hz Width

(0x1658) Default: 0.1

Settings 0.1–5.0%

o0-25 0 Hz Output Indn at Run

(0x1659) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

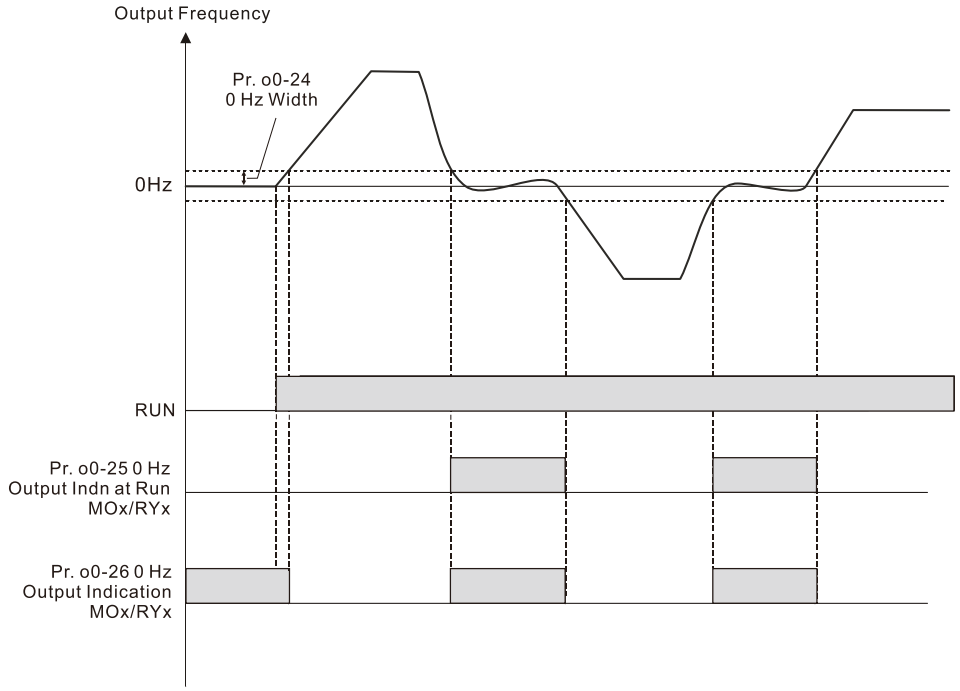
- When the drive actual output frequency is 0, the terminal contact selected in Pr.o0-25 activates.
- This function only activates when the drive is in operation.

o0-26 0 Hz Output Indn

(0x165A) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15

- When the drive actual output frequency is 0 or stopped, the terminal contact selected in Pr.o0-26 activates.



o0-27 FREQ Cmd AO Sel

(0x165B) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Use this parameter to select analog output terminals that are defined as “Frequency command output”.

📖 100% corresponds to Pr.C2-17 maximum operation frequency.

o0-28 FREQ Profile AO Sel

(0x165C) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Use this parameter to select analog output terminals that are defined as “Frequency profile”.

📖 100% corresponds to Pr.C2-17 maximum operation frequency.

o0-29 Motor RPM AO Sel

(0x165D) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Use this parameter to select analog output terminals that are defined as “Motor speed output”.

📖 100% corresponds to Pr.C2-17 maximum operation frequency.

o0-30 Output FREQ AO Sel

(0x165E) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Use this parameter to select analog output terminals that are defined as “Output frequency output”.

📖 100% corresponds to Pr.C2-17 maximum operation frequency.

o0-31 Output Current AO Sel

(0x165F) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

🕮 Use this parameter to select analog output terminals that are defined as “Output current output”.

🕮 100% corresponds to 2.5 times of Pr.A0-01 drive continuous rated current.

o0-32 Output Voltage AO Sel

(0x1660) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

🕮 Use this parameter to select analog output terminals that are defined as “Output voltage output”.

🕮 100% corresponds to 2 times of motor rated voltage.

o0-34 Output Torque AO Sel

(0x1662) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

🕮 Use this parameter to select analog output terminals that are defined as “Output torque”.

🕮 The motor rated torque is 100%.

o0-35 Output Power AO Sel

(0x1663) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

🕮 Use this parameter to select analog output terminals that are defined as “Output power”.

🕮 100% corresponds to 2 times of the drive rated power.

o0-36 Power Factor AO Sel

(0x1664) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

🕮 Use this parameter to select analog output terminals that are defined as “Power factor”.

🕮 Power factor -1.000–1.000 correspond to -100%–100%.

o0-59 DC bus Voltage AO Sel

(0x167B) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

- Use this parameter to select analog output terminals that are defined as “DC bus voltage”.
- 460V models: 100% corresponds to 900 V_{DC}.

o0-37 Recent 1Hr OPER KW-hour

(0x1665) Default: Read only

Settings 0.0–6553.5 kW-hour

- Degree (kW-hr): Often referred to as kilowatt-hour, it is a unit of energy, which is equivalent to the energy consumed by an electrical device with a power of 1000 watts after 1 hour of use, which is equal to 3.6 million joules. “Kilowatt-hour” is usually used as a unit of billing for electricity delivered by power companies to consumers.
- Pr.o0-37 displays the power consumption of the drive in the previous hour.

o0-38 Cumulative OPER KW-hour

(0x1666) Default: Read only

Settings 0.0–999.9 kW-hour

o0-39 Cumulative OPER MW-hour

(0x1667) Default: Read only

Settings 0–999 MW-hour

o0-40 Cumulative OPER GW-hour

(0x1668) Default: Read only

Settings 0–999 MW-hour

- The accumulative operating degrees are recorded in three units of degrees (kW-hour), thousand degrees (MW-hour) and million degrees (GW-hour). When the accumulated degree reaches 1,000 degrees, carry to 1,000 degrees; when the thousand degrees accumulated to 1,000,000 degrees, carry to million degrees. If the degree is less than one hour, it will be discarded and not recorded.
- Pr.o0-38–o0-40 are the accumulative motor operating degrees (kW-hour), accumulative motor operating thousand degrees (MW-hour) and accumulative motor operating million degrees (GW-hour).
- The total accumulative motor operating degrees is (GW+MW+kW)-hour.
- The parameters related to the operating degree record can be cleared through the reset kWh function in the parameter reset function.
- The operating degree record parameter is only available for reading, it cannot be manually modified or written into any value.
- When executing parameter copy function, the operating degree record parameters cannot be copied.

o0-41 Cumulative OPER Minutes

(0x1669) Default: 0

Settings 0–60 minutes

o0-42 Cumulative OPER Hours

(0x166A) Default: 0

Settings 0–24 hours

o0-43 Cumulative OPER Days

(0x166B) Default: 0

Settings 0–65535 days

- Pr.o0-41–o0-43 are the accumulative operating minutes, operating hours and operating days of the drive.
- The total accumulative operating time of the drive: days + hours + minutes.
- Set these parameter as 0 to clear the accumulative value. An operation time shorter than 60 seconds is not recorded.

o0-44 Drive Output Efficiency

(0x166C) Default: Read only

Settings 0.0–99.9%

- This parameter is the immediate output frequency of the drive.

o0-45 Drive Output PF Angle

(0x166D) Default: Read only

Settings -90.0–90.0 deg

- This parameter is the immediate output power angle of the drive.

o0-46 Drive Output Apparent Power

(0x166E) Default: Read only

Settings 0.0–6553.5 kVA

- This parameter is the immediate output apparent power of the drive.

o0-47 Drive Output Active Power

(0x166F) Default: Read only

Settings 0.0–6553.5 kW

- This parameter is the immediate output active power of the drive.

o0-48 Drive Output Reactive Power

(0x1670) Default: Read only

Settings 0.0–6553.5 kVar

- This parameter is the immediate output reactive power of the drive.

o0-49 Motor Rated Power Consumed

(0x1671) Default: 100.00

Settings 0.00–100.00%

- This parameter is the average power consumed by the motor under constant frequency

operation (drive by mains power instead of the AC motor drive).

- 100% corresponds to the motor rated power.
- According to Pr.o0-49 (Motor Rated Power Consumed), the operating degrees consumed by the motor at a constant frequency can be calculated under the same operation time. Subtract this information from the accumulative operating degrees calculated by the drive to the possible energy saved by using the drive and record the value in Pr.o0-50–o0-52 respectively.
- If it is set to 0, the energy-saving degree function will not be counted.

o0-50 kW-hour Power Saved

(0x1672) Default: Read only

Settings 0.0–999.9 kW-hour

o0-51 MW-hour Power Saved

(0x1673) Default: Read only

Settings 0–999 MW-hour

o0-52 GW-hour Power Saved

(0x1674) Default: Read only

Settings 0–999 MW-hour

- Pr.o0-50–o0-52 are the accumulative power degrees (kW-hour), thousand degrees (MW-hour) and million degrees (GW-hour) saved by the operation of the drive.
- The total accumulative power saved degrees is (GW+MW+kW)-hour.

o0-53 Carbon Emission Reduction

(0x1675) Default: Read only

Settings 0.0–6553.5 tn

- Carbon emission (tn): Carbon emissions refer to the greenhouse gases directly or indirectly produced by human activities. The total weight of these greenhouse gases is called carbon emissions. Of the various greenhouse gases, carbon dioxide (CO2) takes the most proportion in the atmosphere. Therefore, the weight of carbon dioxide is the most common measure of carbon emissions. For example, the production of one kilowatt-hour of electricity will produce 0.554 kg of carbon dioxide, which can also be explained as “the production of electricity generates carbon emissions, and the carbon emissions per kilowatt-hour of electricity are 0.554 kg”.
- This parameter is the cumulated calculation of the AC motor drive carbon emission reduction.
- Using the total cumulative operating energy savings and the carbon emission coefficient to calculate the carbon emission reduction of the drive.

o0-54 Carbon Emission Factor

(0x1676) Default: 0.500

Settings 0.000–65.535 tn/MWh

- Use Pr.o0-54 to set the carbon emission coefficient (the definition of carbon emission coefficient is different for each country; it will be adjusted year by year according to the fuel power generation. For example, the carbon emission coefficient of Taiwan from 2004 to 2009 is 0.562–0.509.)

o0-55 Power Saved Record Reset

(0x1677) Default: 0

Settings 0–1

0: Disable

- Set Pr.o0-55 as 1 to reset the cumulative power saved record, after the reset, this parameter returns to 0.
- Parameters related to energy saving during operation can only be cleared to zero by setting Pr.o0-55 to 1. Parameter initialization cannot modify these parameters.
- When executing parameter copy function, the parameters related to energy saving during operation cannot be copied.
- Because the energy saving may not be accumulated only with the motor, but also accumulate with the construction of the factory. When the motor is replaced, it is still necessary to continue accumulating based on the current accumulated value as the complete energy saving data of the whole plant.

o1. Signal & Recorder Function

For the convenience of using the drive, VP3000 allows the user to select 8 groups of real-time signal monitoring and recording function.

When the signal exceeds the range set by the user, or when a specific condition is met, a Signal Even can be triggered. When the signal event is established, it can trigger a warning or fault message of the drive, or as a trigger for the signal record module. This function records the signal waveform of the specific period before the event occurs to the SD card.

NOTE: the SD card must be formatted as FAT32 first.

Regardless of the signal monitoring or signal recording function, the signal source can be specified through the menu, or you can specify the signal source of monitoring directly by inputting the monitoring address.

- Pr.o1-00–o1-32: Signal channel 1–8 settings (including channel signal selection, signal address, signal data type, channel filter time, etc. of each channel.)
- Pr.o1-33–o1-45: Recorder 1–8 settings (including recorder function selection, trigger method, trigger source A & B selection, recorder time setting, channel source, etc. of recorder 1–8)
- Pr.o2-00–o2-56: Monitor 1–8 settings (including channel source selection, trigger method, trigger action, trigger indication, upper and lower limits, monitor hysteresis, etc. of monitor 1–8)

Recorder Function Quick Start

Step 1: The related motor and control parameters have been adjusted (refer to Chapter 5 Initial Operation and Adjustment in User Manual).

Step 2: Insert the SD card to the drive and format the SD card (Keypad menu 12 SD Card Management \ Format SD card. Refer to Chapter 4 Keypad in the User Manual).

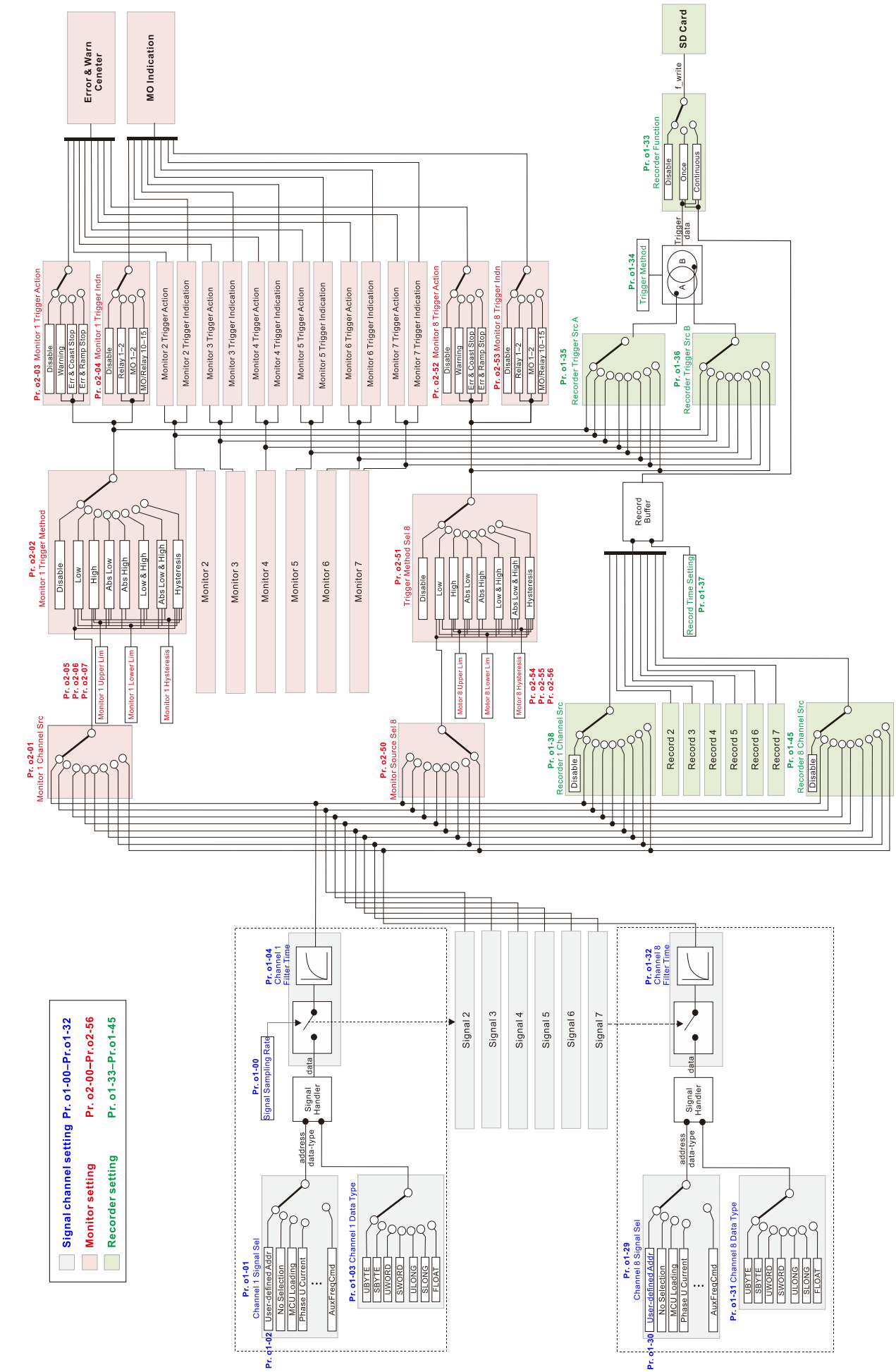
Step 3: The waveform can be recorded after enabling the recorder function*1. Set Pr.o1-33 ≥ 1 to enable the recorder function, set it to 0 to disable the function. The recorder only records once when Pr.o1-33 is set as 1 and the trigger event is established*2. When Pr.o1-33 is set as 2 and the trigger event is established*2, it records multiple times until the capacity of SD card is full or records on a loop.

Step 4: Refer to Chapter 4 for descriptions of reviewing recorder data.

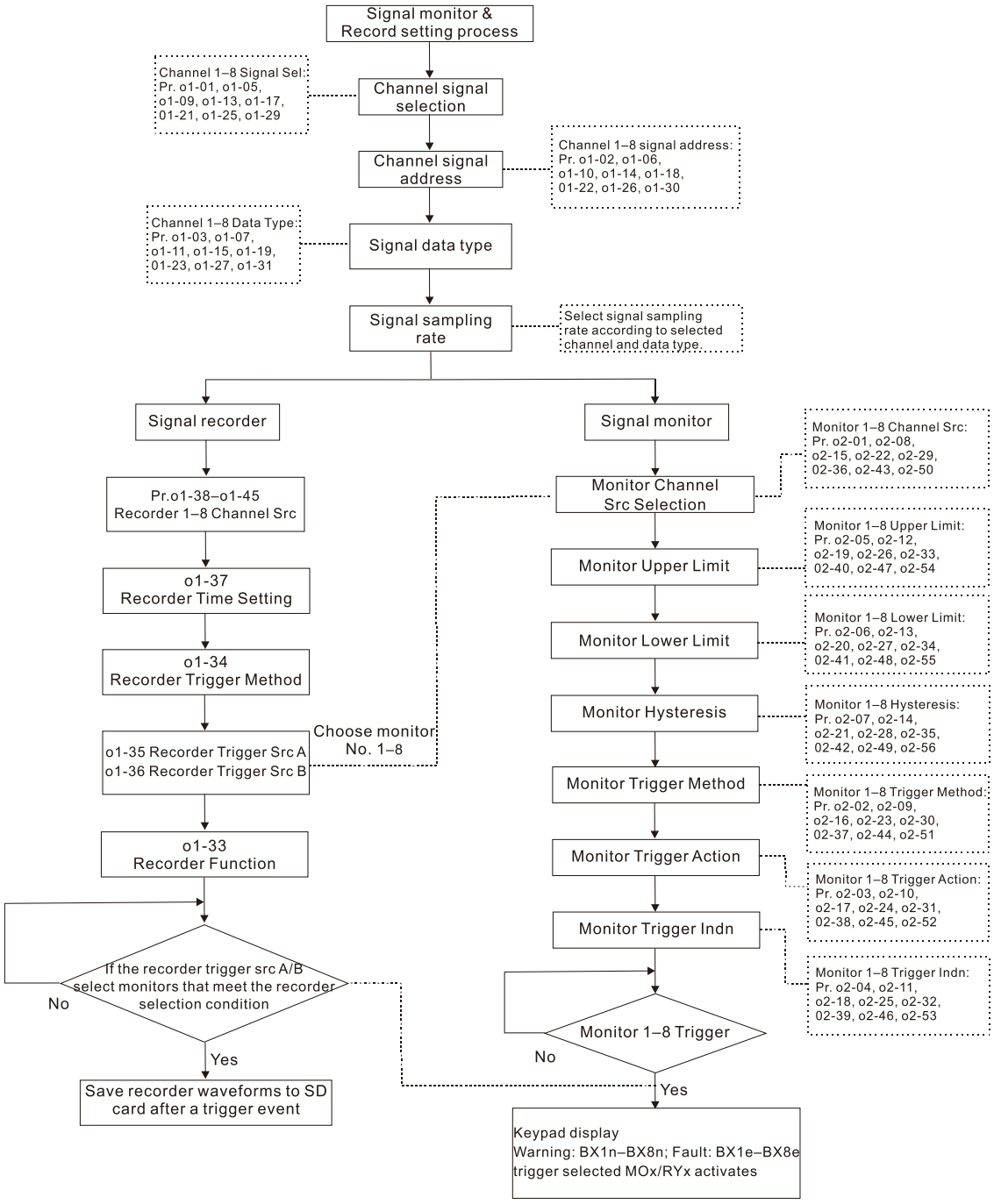
NOTE:

1. The drive automatically configures with the common signal*2 according to the selected motor and control mode, for example, the default channel signals of IMVF and IMFOC are different, refer to the Channel 1 signal table in Pr.o1-01 for further description.
2. The trigger event establishes once a fault occurs to the drive, and that current waveform record is saved in the SD card.

📖 Diagram of channel selection, monitor and recorder function.



Setting process of channel selection, monitor and recorder function:



You can set this parameter during operation

o1-00 Signal Sampling Rate

(0x1680) Default: 0

Settings 0: 1 kHz
1: 2 kHz
2: 5 kHz
3: 10 kHz

Use this parameter to set the signal sampling rate of the channel. The signal record module can select the appropriate sampling rate for signal sampling.

Due to the limitation of SD card write-in rate and buffer zone, the defined data stream speed of the record is 80 KB/s.

Sampling Rate →

Total byte Number: Data Stream	1k	2k	5k	10k
1	1	2	5	10
4	4	8	20	40
8	8	16	40	80
10	10	20	50	~~100~~
12	12	24	60	
14	14	28	70	
16	16	32	80	
18	18	36	~~90~~	
20	20	40		
22	22	44		
24	24	48		
26	26	52		
28	28	56		
30	30	60		
32	32	64		

The data stream in the gray zone is > 80 KB/s, the fool-proof logic prevents parameters from being set to this area.

📖 For example: Pr.o1-00 = 3, 10 kHz

Pr.o1-01 = 31, o1-03 = 5 SLONG (4-byte)

Pr.o1-05 = 39, o1-07 = 2 UWORD (2-byte)

Pr.o1-09 = 33, o1-03 = 6 FLOAT (4-byte)

If setting Pr.o1-38 = 1 (Recorder 1 Source = Channel 1) uses 40 KB/s, Pr.o1-39 = 2 (Recorder 2 Source = Channel 2) uses 20 KB/s, then setting Pr.o1-40 = 3 (Recorder 3 Source = Channel 3) will exceed the limitation of 80 KB/s, Pr.o1-40 will automatically return to 0 (Disable) via the fool-proof mechanism.

	Pr.	ID No.	Description	Data Stream
	o1-00	3	Sampling Rate = 10 kHz	-
Channel 1 Setting	o1-01	31	User Frequency Cmd	-
	o1-03	5 (automatically input)	SLONG (4-byte)	-
Channel 2 Setting	o1-05	39	Motor Ctrl State	-
	o1-07	2 (automatically input)	UWORD (2-byte)	-
Channel 3 Setting	o1-09	33	Speed Reference	-
	o1-11	6 (automatically input)	FLOAT (4-byte)	-
Recorder Setting	o1-38	1	Recorder 1 Source = Channel 1	40 KB/s
	o1-39	2	Recorder 2 Source = Channel 2	60 KB/s
	o1-40	3	Recorder 3 Source = Channel 3	100 KB/s
Fool-proof Logic	o1-40	0 (automatically return)	Recorder 3 Source = OFF	60 KB/s

o1-01 Channel 1 Signal Sel

(0x1681) Default: 18

o1-05 Channel 2 Signal Sel

(0x1685) Default: 6

o1-09 Channel 3 Signal Sel

(0x1689) Default: 31

o1-13 Channel 4 Signal Sel

(0x168D) Default: 34

o1-17 Channel 5 Signal Sel

(0x1692) Default: 11

o1-21 Channel 6 Signal Sel

(0x1697) Default: 24

o1-25 Channel 7 Signal Sel

(0x169C) Default: 3

o1-29 Channel 8 Signal Sel

(0x16A1) Default: 4

Settings 0: Signal Address
1–55 (Number of Signal List)

- Pr.o1-01, o1-05, o1-09, o1-13, o1-17, o1-21, o1-25 and o1-29 select the signal of Channel 1–8 (refer to Signal Channel Selection Table).
- When Pr.o1-01 = 0, it means that the signal in the channel signal selection table is not used, and the specific signal address can be directly set in Pr.o1-02.
- Channel signal selection will list the number of decimal Dn (n represents 1–3 decimal digits) of the monitoring item in each option, for example, when it is set as 3, the signal selection is U Current (%, D2), where D2 represents the U-phase current with 2 decimal digits.
- Channel Signal Selection Table:

Channel Signal Selection List (Pr.o1-01, o1-05, o1-09, o1-13, o1-17, o1-21, o1-25, o1-29)			Channel Data Type (Pr.o1-03, o1-07, o1-11, o1-15, o1-19, 01-23, o1-27, o1-31)		Number of Byte
ID No.	Description	Description	Settings	Description	
0	User-defined Address	The signal address corresponds to Pr.o1-02 Channel 1	User inputs	0: UBYTE 1: SBYTE 2: UWORD 3: SWORD 4: ULONG 5: SLONG 6: FLOAT	0
1	No selection	No selection	2 (Pr. auto fill in)	UWORD	2
2	MCU Loading (%, D2)	MCU Loading	2 (Pr. auto fill in)	UWORD	2
3	U Current (%)	U-phase current (Pr.A0-01 as 100%)	3 (Pr. auto fill in)	SWORD	2
4	V Current (%)	V-phase current (Pr.A0-01 as 100%)	3 (Pr. auto fill in)	SWORD	2

Channel Signal Selection List (Pr.o1-01, o1-05, o1-09, o1-13, o1-17, o1-21, o1-25, o1-29)			Channel Data Type (Pr.o1-03, o1-07, o1-11, o1-15, o1-19, 01-23, o1-27, o1-31)		Number of Byte
ID No.	Description	Description	Settings	Description	
5	W Current (%)	W-phase current (Pr.A0-01 as 100%)	3 (Pr. auto fill in)	SWORD	2
6	VBus HBW LPF (V)	DC bus feedback (Cap-less models)	2 (Pr. auto fill in)	UWORD	2
7	VBus SW LPF (V)	DC bus feedback (through the software filter)	2 (Pr. auto fill in)	UWORD	2
8	None	None	0 (Pr. auto fill in)	UBYTE	1
9–10	Reserve	Reserve	2 (Pr. auto fill in)	UWORD	2
11	OutputAmp RMS (%, D2)	Output Current (Pr.A0-01 as 100%)	2 (Pr. auto fill in)	UWORD	2
12	OutputAmp RMS LPF (%, D2)	Output Current (Low Pass Filter)	2 (Pr. auto fill in)	UWORD	2
13	Carrier Frequency (Hz)	Carrier Frequency	2 (Pr. auto fill in)	UWORD	2
14	PWM mode (0: SV, 1: DP)	PWM mode	2 (Pr. auto fill in)	UWORD	2
15–17	Reserve	Reserve	3 (Pr. auto fill in)	SWORD	2
18	Top Fault Code	Fault code	2 (Pr. auto fill in)	UWORD	2
19	Vde Cmd (V, D1)	d-axis voltage command	3 (Pr. auto fill in)	SWORD	2
20	Vqe Cmd (V, D1)	q-axis voltage command	3 (Pr. auto fill in)	SWORD	2
21	Vas Cmd (V, D1)	A-phase voltage command	3 (Pr. auto fill in)	SWORD	2
22	Vbs Cmd (V, D1)	B-phase voltage command	3 (Pr. auto fill in)	SWORD	2
23	Vcs Cmd (V, D1)	C-phase voltage command	3 (Pr. auto fill in)	SWORD	2
24	Output voltage (Vac, D1)	Output voltage	3 (Pr. auto fill in)	SWORD	2
25	Id Reference (A, D2)	d-axis current command	3 (Pr. auto fill in)	SWORD	2
26	Iq Reference (A, D2)	q-axis current command	3 (Pr. auto fill in)	SWORD	2
27	Id Feedback (A, D2)	d-axis current feedback	3 (Pr. auto fill in)	SWORD	2
28	Iq Feedback (A, D2)	q-axis current feedback	3 (Pr. auto fill in)	SWORD	2
29	ACR Bandwidth (Hz)	ACR BW	2 (Pr. auto fill in)	UWORD	2
30	ASR Bandwidth (Hz, D1)	ASR Bandwidth	2 (Pr. auto fill in)	UWORD	2
31	User Frequency Cmd (Hz, D3)	User frequency command (Hz, D3)	5 (Pr. auto fill in)	SLONG	4
32	Speed Reference (Hz, D1)	Speed reference (Hz, D1)	3 (Pr. auto fill in)	SWORD	2
33–34	None	None	0 (Pr. auto fill in)	UBYTE	1
35	Output Frequency (I32, Hz, D2)	Output frequency (I32, Hz, D2)	5 (Pr. auto fill in)	SLONG	4
36	Estimated speed (Hz, D2)	Estimated speed	3 (Pr. auto fill in)	SWORD	2
37	Estimate torque (%, D1)	Estimated torque	3 (Pr. auto fill in)	SWORD	2
38	Reserve	Reserve	2 (Pr. auto fill in)	UWORD	2

Channel Signal Selection List (Pr.o1-01, o1-05, o1-09, o1-13, o1-17, o1-21, o1-25, o1-29)			Channel Data Type (Pr.o1-03, o1-07, o1-11, o1-15, o1-19, 01-23, o1-27, o1-31)		Number of Byte
ID No.	Description	Description	Settings	Description	
39	Motor Ctrl State	Motor control state	2 (Pr. auto fill in)	UWORD	2
40	None	None	0 (Pr. auto fill in)	UBYTE	1
41	Active power (%, D3)	Active power (Pr.d1-01 as 100%)	3 (Pr. auto fill in)	SWORD	2
42	Reactive power (%, D3)	Reactive power (Pr.d1-01 as 100%)	3 (Pr. auto fill in)	SWORD	2
43	Power factor (D3)	Power factor	3 (Pr. auto fill in)	SWORD	2
44	Power Factor Ang (Deg, D2)	Power factor angle	3 (Pr. auto fill in)	SWORD	2
45	Mi Status	MI status	2 (Pr. auto fill in)	UWORD	2
46	Mo Status	MO status	2 (Pr. auto fill in)	UWORD	2
47	Ai1 ValuePct (%, D2)	AI1 percentage value	2 (Pr. auto fill in)	UWORD	2
48	Ai2 ValuePct (%, D2)	AI2 percentage value	2 (Pr. auto fill in)	UWORD	2
49	Ai3 ValuePct (%, D2)	AI3 percentage value	2 (Pr. auto fill in)	UWORD	2
50	Ao1 ValuePct (%, D2)	AO1 percentage value	2 (Pr. auto fill in)	UWORD	2
51	Ao2 ValuePct (%, D2)	AO2 percentage value	2 (Pr. auto fill in)	UWORD	2
52	Ao10 ValuePct (%, D2)	AO10 percentage value	2 (Pr. auto fill in)	UWORD	2
53	Ao11 ValuePct (%, D2)	AO11 percentage value	2 (Pr. auto fill in)	UWORD	2
54	Main Freq Cmd (Hz, D3)	Main frequency command	5 (Pr. auto fill in)	SLONG	4
55	Aux Freq Cmd (Hz, D3)	Auxiliary frequency command	5 (Pr. auto fill in)	SLONG	4
56–57	Reserve	Reserve	2 (Pr. auto fill in)	UWORD	2
58	CAP NTC Degree (D2)	Capacitor NTC temperature	3 (Pr. auto fill in)	SWORD	2
59	IGBT NTC Max Degree (D2)	IGBT NTC max. temperature	3 (Pr. auto fill in)	SWORD	2
60	PPID1 Fcmd Out (Hz, D3)	P-PID1 output frequency	3 (Pr. auto fill in)	SWORD	2
61	PPID1 Reference (D3)	P-PID1 reference	3 (Pr. auto fill in)	SWORD	2
62	PPID2 Feedback (D3)	P-PID1 feedback	3 (Pr. auto fill in)	SWORD	2
63	PPID2 Fcmd Out (Hz, D3)	P-PID2 output frequency	3 (Pr. auto fill in)	SWORD	2
64	PPID2 Reference (D3)	P-PID2 reference	3 (Pr. auto fill in)	SWORD	2
65	PPID2 Feedback (D3)	P-PID2 feedback	3 (Pr. auto fill in)	SWORD	2
66	B-PID1 Reference (%, D3)	B-PID1 reference	2 (Pr. auto fill in)	UWORD	2
67	B-PID1 Feedback (%, D3)	B-PID1 feedback	2 (Pr. auto fill in)	UWORD	2
68	B-PID1 Output (%, D3)	B-PID1 output frequency	2 (Pr. auto fill in)	UWORD	2
69	B-PID2 Reference (%, D3)	B-PID2 reference	2 (Pr. auto fill in)	UWORD	2
70	B-PID2 Feedback (%, D3)	B-PID2 feedback	2 (Pr. auto fill in)	UWORD	2
71	B-PID2 Output (%, D3)	B-PID2 output frequency	2 (Pr. auto fill in)	UWORD	2
72–73	Reserve	Reserve	2 (Pr. auto fill in)	UWORD	2

- The function defines the setting value according to the selected motor and control mode, you can also change the setting value manually.
- When the control mode is set as IMVF/ IMSVC/ SMSVC, the channel signal selection will be automatically set as below. The total number of Byte is 20 and the maximum sampling rate of Pr.o1-00 can only be set as 2 kHz.

Pr.	Pr. Name	Setting Value	Option	Number of Byte
o1-01	Channel 1 Signal Selection	18	Top Fault Code	2
o1-05	Channel 2 Signal Selection	6	VBus HBW LPF (V, D1)	2
o1-09	Channel 3 Signal Selection	31	UserFrequencyCmd (Hz, D3)	4
o1-13	Channel 3 Signal Selection	35	Output Frequency (I32, Hz, D2)	4
o1-17	Channel 4 Signal Selection	11	OutputAmp RMS (%, D2)	2
o1-21	Channel 5 Signal Selection	24	Output voltage (Vac, D1)	2
o1-25	Channel 6 Signal Selection	3	U Current (%)	2
o1-29	Channel 7 Signal Selection	4	V Current (%)	2

- When the control mode is set as IMFOC/ SMFOC, the channel signal selection will be automatically set as below. The total number of Byte is 18 and the maximum sampling rate of Pr.o1-00 can only be set as 2 kHz.

Pr.	Pr. Name	Setting Value	Option	Number of Byte
o1-01	Channel 1 Signal Selection	18	Top Fault Code	2
o1-05	Channel 2 Signal Selection	6	VBus HBW LPF (V, D1)	2
o1-09	Channel 3 Signal Selection	31	UserFrequencyCmd (Hz, D3)	4
o1-13	Channel 3 Signal Selection	36	Estimated Speed (Hz, D2)	2
o1-17	Channel 4 Signal Selection	25	Id Reference (A, D2)	2
o1-21	Channel 5 Signal Selection	26	Iq Reference (A, D2)	2
o1-25	Channel 6 Signal Selection	27	Id Feedback (A, D2)	2
o1-29	Channel 7 Signal Selection	28	Iq Feedback (A, D2)	2

o1-02 Channel 1 Signal Address

(0x1682) Default: 0

o1-06 Channel 2 Signal Address

(0x1686) Default: 0

o1-10 Channel 3 Signal Address

(0x168A) Default: 0

o1-14 Channel 4 Signal Address

(0x168E) Default: 0

o1-18 Channel 5 Signal Address

(0x1693) Default: 0

o1-22 Channel 6 Signal Address

(0x1698) Default: 0

o1-26 Channel 7 Signal Address

(0x169D) Default: 0

o1-30 Channel 8 Signal Address

(0x16A2) Default: 0

Settings 0–0xFFFFFFFF

📖 When Channel 1–8 signal selection = 0 “Signal Address”, it means that the signal in the channel signal selection table is not used. You can set the specific signal address through Pr.o1-02, o1-06, o1-10, o1-14, o1-18, o1-22, o1-26 and o1-30.

o1-03 Channel 1 Data Type

(0x1683) Default: 2

o1-07 Channel 2 Data Type

(0x1687) Default: 2

o1-11 Channel 3 Data Type

(0x168B) Default: 5

o1-15 Channel 4 Data Type

(0x168F) Default: 3

o1-19 Channel 5 Data Type

(0x1694) Default: 2

o1-23 Channel 6 Data Type

(0x1699) Default: 3

o1-27 Channel 7 Data Type

(0x169E) Default: 3

o1-31 Channel 8 Data Type

(0x16A3) Default: 3

Settings
0: UBYTE
1: SBYTE
2: UWORD
3: SWORD
4: ULONG
5: SLONG
6: FLOAT

📖 Pr.o1-03, o1-07, o1-11, o1-15, o1-19, o1-23, o1-27 and o1-31 select the data type of Channel 1–8.

📖 If Pr.o1-01 is set as VFD default, then Pr.o1-03 automatically writes in the corresponded data type.

📖 For example: Pr.o1-01 = 11 (output current), Pr.o1-03 automatically writes in 2 (UWORD).

o1-04 Channel 1 Filter Time

(0x1684) Default: 0.0

o1-08 Channel 2 Filter Time

(0x1688) Default: 0.0

o1-12 Channel 3 Filter Time

(0x168C) Default: 0.0

o1-16 Channel 4 Filter Time

(0x1691) Default: 0.0

o1-20 Channel 5 Filter Time

(0x1696) Default: 0.0

o1-24 Channel 6 Filter Time

(0x169B) Default: 0.0

o1-28 Channel 7 Filter Time

(0x16A0) Default: 0.0

o1-32 Channel 8 Filter Time

(0x16A5) Default: 0.0

Settings 0.0–6553.5 ms

📖 Pr.o1-04, o1-08, o1-12, o1-16, o1-20, o1-24, o1-28 and o1-32 set the low pass filter time of Channel 1–8.

o1-33 Recorder Function

(0x16A6) Default: 0

Settings 0: Disable
1: One-Time Record
2: Continuously Record

📖 The recorder function saves data to the SD card. Refer to Section 4-2-1 for precautions before using this function.

📖 The following table shows the combination of function A, B and C that can be used at the same time, for example, use A, B and C separately as single function, or use function B and C at the same time.

📖 From the following table, Functions A and C cannot be used at the same time. If you misuse these two functions, it will display the SDih (SD card function exhibited execution) message on the keypad. When you enable Function A, and then enable Function C, the drive executes Function C instead of Function A. If you enable Function C first, Function A will not be allowed to enable.

Function	A	B	C
	Drive – Recorder	Designer Software – Waveform Monitoring	Drive – PLC
Use at the same time	✓	x	x
	x	✓	x
	x	x	✓
	x	✓	✓

- Pr.o1-33 selects the operation method of the continuously record or the one-time record.
- Continuously record: When the trigger condition is established, the signal data will be continuously written to the SD card according to the sampling frequency and record length set at that time.
- One-time record: Only records the data within a specific time range before and after the trigger event occurs (set by Pr.o1-37) to the SD card. When the one-time record completes, the parameter automatically returns to 0.
- When you enable the recorder function (Pr.o1-33 ≥ 1) after the drive starts:
  - If none of the trigger event occurs before the drive is powered off, the recorder function will be automatically enabled in the next bootup.
  - If any of the trigger event occurs before the drive is powered off:
    Pr.o1-33 = 1 (One-time record), the recorder function will not be enabled in the next bootup.
    Pr.o1-33 = 2 (Continuously record), the recorder function will automatically enable in the next bootup. It stops operation when you disable the recorder function (Pr.o1-33 = 0).
- When the recorder function is enabled (Pr.o1-33 ≥ 1), if you need to change the original setting 1 (One-time record) to 2 (Continuously record), you must disable the function before changing the setting. The setting sequence of Pr.o1-33 would be 1 (One-time record) → 0 (Disable) → 2 (Continuously record).

o1-34 Recorder Trigger Method

(0x16A7) Default: 0

Settings 0: Src A
1: Src A Reverse
2: Src A and Src B
3: Src A or Src B
4: Src A xor Src B

- Use Pr.o1-34 to select the trigger method of the recorder.
- For example: Pr.o1-34 = 2 (Source A and source B), when the monitoring conditions selected in Pr.o1-35 and o1-36 are triggered, the recorder function records the waveform to the SD card according to Pr.o1-33 and o1-37 settings.

o1-35 Recorder Trigger Src A

(0x16A8) Default: 1

o1-36 Recorder Trigger Src B

(0x16AA) Default: 1

Settings 1–8 Monitor No.

- Pr.o1-35 and o1-36 set the monitor of source A and source B respectively.

o1-37 Recorder Time Setting

(0x16AB) Default: 20

Settings 20–600 sec.

- The user can specify the recording data length when triggering: the recording length before triggering is determined by Pr.o1-37, and the recording length after the triggering is always 20 seconds.

o1-38 Recorder 1 Channel Src

(0x16AC) Default: 0

o1-39 Recorder 2 Channel Src

(0x16AD) Default: 0

o1-40 Recorder 3 Channel Src

(0x16AF) Default: 0

o1-41 Recorder 4 Channel Src

(0x16B0) Default: 0

o1-42 Recorder 5 Channel Src

(0x16B1) Default: 0

o1-43 Recorder 6 Channel Src

(0x16B2) Default: 0

o1-44 Recorder 7 Channel Src

(0x16B4) Default: 0

o1-45 Recorder 8 Channel Src

(0x16B5) Default: 0

Settings 0–8 Channel No.

📖 Pr.o1-38–o1-44 select the channel source of recorder 1–8.

o2. Monitor Function

o2-00 Monitor Trigger Status

(0x16C0) Default: Read only

Settings 0–0x00FF

📖 This parameter displays the trigger status of Monitor 1–8. bit0–bit7 correspond to Monitor 1–8 respectively.

📖 For example: Pr.o2-00 = 0000 0000 0000 0001, it means that the signal of Monitor 1 reaches the Monitor 1 trigger condition set in Pr.o2-02.

o2-01 Monitor 1 Channel Src

(0x16C1) Default: 1

o2-08 Monitor 2 Channel Src

(0x16CB) Default: 2

o2-15 Monitor 3 Channel Src

(0x16D5) Default: 3

o2-22 Monitor 4 Channel Src

(0x16DF) Default: 4

o2-29 Monitor 5 Channel Src

(0x16E9) Default: 5

o2-36 Monitor 6 Channel Src

(0x16F3) Default: 6

o2-43 Monitor 7 Channel Src

(0x16FD) Default: 7

o2-50 Monitor 8 Channel Src

(0x1707) Default: 8

Settings 1–8 Channel No.

📖 Pr.o2-01, o2-08, o2-15, o2-22, o2-29, o2-36, o2-43 and o2-50 select the signal channel source of Monitor 1–8.

o2-02 Monitor 1 Trigger Method

(0x16C2) Default: 2

o2-09 Monitor 2 Trigger Method

(0x16CC) Default: 0

o2-16 Monitor 3 Trigger Method

(0x16D6) Default: 0

o2-23 Monitor 4 Trigger Method

(0x16E0) Default: 0

o2-30 Monitor 5 Trigger Method

(0x16EA) Default: 0

o2-37 Monitor 6 Trigger Method

(0x16F4) Default: 0

o2-44 Monitor 7 Trigger Method

(0x16FE) Default: 0

o2-51 Monitor 8 Trigger Method

(0x1708) Default: 0

Settings
0: Disable
1: Low
2: High
3: Abs Low
4: Abs High
5: Low & High
6: Abs Low & Abs High
7: Hysteresis

📖 Pr.o2-02, o2-09, o2-16, o2-23, o2-30, o2-37, o2-44 and o2-51 select the trigger method of Monitor 1–8.

📖 Trigger action and non-action conditions:

Trigger method = 1 Low:

Action condition: the signal selected by the monitor is lower than [the monitor lower limit – (0.5 × hysteresis)].

Non-action condition: the signal selected by the monitor is higher than [the monitor lower limit + (0.5 × hysteresis)].

Trigger method = 2 High:

Action condition: the signal selected by the monitor is higher than [the monitor upper limit + (0.5 × hysteresis)].

Non-action condition: the signal selected by the monitor is lower than [the monitor upper limit – (0.5 × hysteresis)].

Trigger method = 3 Abs Low:

Action condition: the absolute value of signal selected by the monitor is lower than the absolute value of [the monitor lower limit – (0.5 × hysteresis)].

Non-action condition: the absolute value of signal selected by the monitor is higher than the absolute value of [the monitor lower limit + (0.5 × hysteresis)].

Trigger method = 4 Abs High:

Action condition: the absolute value of signal selected by the monitor is higher than the absolute value of [the monitor upper limit + (0.5 × hysteresis)].

Non-action condition: the absolute value of signal selected by the monitor is lower than the absolute value of [the monitor upper limit – (0.5 × hysteresis)].

Trigger method = 5 Low & High:

Action condition: the signal selected by the monitor is higher than [the monitor upper limit + (0.5 × hysteresis)] or lower than [the monitor lower limit – (0.5 × hysteresis)].

Non-action condition: the signal selected by the monitor is between [the monitor upper limit – (0.5 × hysteresis)] and [the monitor lower limit + (0.5 × hysteresis)].

Trigger method = 6 Abs Low & Abs High:

Action condition: the absolute value of signal selected by the monitor is higher than the absolute value of [the monitor upper limit + (0.5 × hysteresis)] or lower than the absolute value of [the

monitor lower limit – (0.5 × hysteresis)].
Non-action condition: the absolute value of signal selected by the monitor is between the absolute value of [the monitor upper limit – (0.5 × hysteresis)] and [the monitor lower limit + (0.5 × hysteresis)].
Trigger method = 7 Hysteresis:
Action condition: the signal selected by the monitor is higher than [the monitor upper limit + (0.5 × hysteresis)].
When the signal is between [the monitor upper limit + (0.5 × hysteresis)] and [the monitor lower limit – (0.5 × hysteresis)], the action status remains.
Non-action condition: the signal selected by the monitor is lower than [the monitor lower limit – (0.5 × hysteresis)].

📖 For example: Pr.o1-01 = 93 (Capacitor NTC temperature), Pr.o2-01 = 1 (Channel 1), Pr.o2-02 = 2 (high), Pr.o2-05 = +100.00 and Pr.o2-07 = 2.00.
Action condition: the signal selected by the monitor is higher than [the monitor upper limit + (0.5 × hysteresis)].
The signal is higher than 100.00 + (0.5×2.00) = 100.00 + 1.00 = 101.00
Non-action condition: the signal selected by the monitor is lower than [the monitor upper limit – (0.5 × hysteresis)].
The signal is lower than 100.00 – (0.5×2.00) = 100.00 – 1.00 = 99.00

o2-03 Monitor 1 Trigger Action
(0x16C3) Default: 0

o2-10 Monitor 2 Trigger Action
(0x16CD) Default: 0

o2-17 Monitor 3 Trigger Action
(0x16D7) Default: 0

o2-24 Monitor 4 Trigger Action
(0x16E1) Default: 0

o2-31 Monitor 5 Trigger Action
(0x16EB) Default: 0

o2-38 Monitor 6 Trigger Action
(0x16F5) Default: 0

o2-45 Monitor 7 Trigger Action
(0x16FF) Default: 0

o2-52 Monitor 8 Trigger Action
(0x1709) Default: 0

Settings
0: Disable
1: Warning
2: Fault & ramp to stop
3: Fault & coast to stop

📖 Pr.o2-03, o2-10, o2-17, o2-24, o2-31, o2-38, o2-45 and o2-52 respectively set the trigger action of the monitor selected in o2-01, o2-08, o2-15, o2-22, o2-29, o2-36, o2-43 and o2-50.

o2-04 Monitor 1 Trigger Indn

(0x16C4) Default: 0

o2-11 Monitor 2 Trigger Indn

(0x16CE) Default: 0

o2-18 Monitor 3 Trigger Indn

(0x16D8) Default: 0

o2-25 Monitor 4 Trigger Indn

(0x16E2) Default: 0

o2-32 Monitor 5 Trigger Indn

(0x16EC) Default: 0

o2-39 Monitor 6 Trigger Indn

(0x16F6) Default: 0

o2-46 Monitor 7 Trigger Indn

(0x1700) Default: 0

o2-53 Monitor 8 Trigger Indn

(0x170A) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserved
10–15: MO/Relay10–15
16–19: Reserved

📖 After the monitor selected in Pr.o2-01, o2-08, o2-15, o2-22, o2-29, o2-36, o2-43, and o2-50 is triggered, the terminal contact selected in o2-04, o2-11, o2-18, o2-25, o2-32, o2-39, o2-46 and o2-53 activates respectively.

o2-05 Monitor 1 Upper Limit

(0x16C5) Default: 0.00

o2-12 Monitor 2 Upper Limit

(0x16CF) Default: 0.00

o2-19 Monitor 3 Upper Limit

(0x16D9) Default: 0.00

o2-26 Monitor 4 Upper Limit

(0x16E3) Default: 0.00

o2-33 Monitor 5 Upper Limit

(0x16ED) Default: 0.00

o2-40 Monitor 6 Upper Limit

(0x16F7) Default: 0.00

o2-47 Monitor 7 Upper Limit

(0x1701) Default: 0.00

o2-54 Monitor 8 Upper Limit

(0x170B) Default: 0.00

Settings -21474836.00–21474836.00

📖 Pr.o2-05, o2-12, o2-19, o2-26, o2-33, o2-40, o2-47, and o2-54 set the upper limit of Monitor 1–8 respectively.

o2-06 Monitor 1 Lower Limit

(0x16C7) Default: 0.00

o2-13 Monitor 2 Lower Limit

(0x16D1) Default: 0.00

o2-20 Monitor 3 Lower Limit

(0x16DB) Default: 0.00

o2-27 Monitor 4 Lower Limit

(0x16E5) Default: 0.00

o2-34 Monitor 5 Lower Limit

(0x16EF) Default: 0.00

o2-41 Monitor 6 Lower Limit

(0x16F9) Default: 0.00

o2-48 Monitor 7 Lower Limit

(0x1703) Default: 0.00

o2-55 Monitor 8 Lower Limit

(0x170D) Default: 0.00

Settings -21474836.00–21474836.00

📖 Pr.o2-06, o2-13, o2-20, o2-27, o2-34, o2-40, o2-48, and o2-55 set the lower limit of Monitor 1–8 respectively.

o2-07 Monitor 1 Hysteresis

(0x16C9) Default: 0.00

o2-14 Monitor 2 Hysteresis

(0x16D3) Default: 0.00

o2-21 Monitor 3 Hysteresis

(0x16DD) Default: 0.00

o2-28 Monitor 4 Hysteresis

(0x16E7) Default: 0.00

o2-35 Monitor 5 Hysteresis

(0x16F1) Default: 0.00

o2-42 Monitor 6 Hysteresis

(0x16FB) Default: 0.00

o2-49 Monitor 7 Hysteresis

(0x1705) Default: 0.00

o2-56 Monitor 8 Hysteresis

(0x170F) Default: 0.00

Settings 0.00–100000.00

📖 Pr.o2-07, o2-14, o2-21, o2-28, o2-35, o2-40, o2-49, and o2-56 set the hysteresis of Monitor 1–8 respectively.

o3. PDM Function

For the life estimation of the AC motor drive key components, it includes the life of fans, capacitors, IGBTs, relays, etc. When the remaining life of any key component is lower than the set value, the specified output terminal acts as an indication.

↗ You can set this parameter during operation

＊Advanced parameters, set Pr.b0-00 to unlock this parameter

o3-00 Component Life Status

(0x1740) Default: 0000h

Settings
- bit0: IGBT Life
- bit1: DC bus Cap Life
- bit2: PB Cap Life
- bit3: Fan Life
- bit4: PB Relay Life
- bit5: IO Relay 1 Life
- bit6: IO Relay 2 Life
- bit7: Fan Spd Fdb 1
- bit8: Fan Spd Fdb 2
- bit9: Fan Spd Fdb 3

🕮 This parameter represents whether the service life of each main component is lower than the set level. bitx = 1 means the service life of that component is lower than the set level. The user can know whether the service life of each component is abnormal from Pr.o3-00.

🕮 For example: Pr.o3-00 = 0001h means that the service life of IGBT is lower than the set value in Pr.o3-09.

🕮 When the service life of component is abnormal, the keypad displays status code PD01–10 (not warning codes). For example: when the keypad displays PD01, it means that the IGBT life is abnormal.

🕮 bit7–9 are the feedback signals of fan 1–3 respectively. The software controls the comparison between the fan speed and the actual feedback speed. When the error between the above two speeds exceeds 20%, the status of bit7–9 changes from 0 to 1.

🕮 Fan 1: the fan installed in the external fan position 1.
Fan 2: the fan installed in the external fan position 2.
Fan 1: the fan installed in the internal fan position 1.

↗ o3-01 Component Life Lower than Level Indn

(0x1741) Default: 0

Settings
- 0: Disable
- 1–2: Relay 1–2
- 3–4: MO1–MO2
- 5–9: Reserved
- 10–15: MO/Relay 10–15

🕮 When the service life of any component is lower than the set level, the terminal contact selected in Pr.o3-01 activates.

o3-02 IGBT Life

(0x1742) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of IGBT.

o3-03 DC bus Cap Life

(0x1743) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of DC bus capacitor.

o3-04 PB Cap Life

(0x1744) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of power board capacitor.

o3-05 Fan Life

(0x1745) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of fan.

o3-06 PB Relay Life

(0x1746) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of power relay.

o3-07 IO Relay1 Life

(0x1747) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of power board relay 1.

o3-08 IO Relay2 Life

(0x1748) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the current life estimation of power board relay 2.

o3-09 IGBT Life Warring Level

(0x1749) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of IGBT is lower than the setting for Pr.o3-09, Pr.o3-00 bit0 = 1.

o3-10 DC bus Cap Life Warring Level

(0x174A) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of DC bus capacitor is lower than the setting for Pr.o3-10, Pr.o3-00 bit1=1.

o3-11 PB Cap Life Warring Level

(0x174B) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of PB capacitor is lower than the setting for Pr.o3-11, Pr.o3-00 bit2 = 1.

o3-12 Fan Life Warring Level

(0x174C) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of fan is lower than the setting for Pr.o3-12, Pr.o3-00 bit3 = 1.

o3-13 PB Relay Life Warring Level

(0x174D) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of power relay is lower than the setting for Pr.o3-13, Pr.o3-00 bit4 = 1.

o3-14 IO Relay 1 Life Warring Level

(0x174E) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of IO relay 1 is lower than the setting for Pr.o3-14, Pr.o3-00 bit5 = 1.

o3-15 IO Relay 2 Life Warring Level

(0x174F) Default: 10.00

Settings 0.00–100.00%

📖 When the service life of IO relay 2 is lower than the setting for Pr.o3-15, Pr.o3-00 bit6 = 1.

o3-16 System Life

(0x1750) Default: 100.00

Settings 0.00–100.00%

📖 This parameter displays the percentage of the remaining service life of the drive.

＊ o3-18 Estimated Life Remains

(0x1752) Default: 0.0

Settings 0.0–6553.5 days

📖 The remaining life of the system is estimated based on the minimum remaining life of the key components and the system running time.

📖 Average daily consumption rate = (100% – system life display) ÷ (system operating time), use this value to calculate the remaining life. Remaining life = existing life ÷ average daily consumption rate.

For example: Pr.o3-15 = 300 days, Pr.o3-14 = 70%

The average daily consumption (100% – 70%) ÷ 300 = 0.1% Life

The life remains = 70% ÷ 0.1% = 700 (day)

o4. Fault Record 1–2

o4-00 Fault Code REC 1

(0x1780) Default: Read only

o4-19 Fault Code REC 2

(0x1793) Default: Read only

Settings
0: No fault record
1: Over-current during acceleration (ocA)
2: Over-current during deceleration (ocd)
3: Over-current during steady operation (ocn)
4: Ground fault (GFF)
5: IGBT short circuit between upper bridge and lower bridge (occ)
6: Over-current at stop (ocS)
7: Over-voltage during acceleration (ovA)
8: Over-voltage during deceleration (ovd)
9: Over-voltage at constant speed (ovn)
10: Over-voltage at stop (ovS)
11: Low-voltage during acceleration (LvA)
12: Low-voltage during deceleration (Lvd)
13: Low-voltage at constant speed (Lvn)
15: Phase loss protection (OrP)
16: IGBT overheating (oH1)
17: Capacitor overheating (oH2)
18: IGBT temperature detection failure (tH1o)
19: Capacitor hardware error (tH2o)
21: Over load (oL)
22: Electronic thermal relay 1 protection (EoL1)
23: Electronic thermal relay 2 protection (EoL2)
24: Motor overheating (oH3) PTC / KTY84 / PT100 / PT1000 (oH3)
25: Interrupt error (INTR)
26: Over-torque 1 (ot1)
27: Over-torque 2 (ot2)
28: Under current (uC)
30: EEPROM write error (cF1)
31: EEPROM read error (cF2)
32: EEPROM Error (cF3)
33: U-phase error (cd1)
34: V-phase error (cd2)
35: W-phase error (cd3)
37: oc hardware error (Hd1)
39: oc hardware error (Hd3)
40: Auto-tuning error (AUE)
48: AI1 loss (ACE)

49: External fault (EF)
50: Emergency stop (EF1)
52: Password is locked (Pcod)
58: Modbus transmission time-out (CE10)
61: Y-connection/ D-connection switch error (ydc)
63: Over slip error (oSL)
68: Reverse direction of the speed feedback (SdRv)
69: Over speed rotation feedback (SdOr)
70: Large deviation of speed feedback (SdDe)
71: Watchdog (WDTT)
72: STO Loss 1 (STL1)
76: Safe torque off (STO)
77: STO Loss 2 (STL2)
79: Safe torque off 1 (STO1)
80: Safe torque off 2 (STO2)
82: Output phase loss U phase (OPHL)
83: Output phase loss V phase (OPHL)
84: Output phase loss W phase (OPHL)
87: Overload protection at low frequency (oL3)
88: Model ID change (IDCH)
89: Rotor position detection error (RoPd)
94: Initializing power board communication error when power ON (POCF)
95: Board identification error during power-on initialization (IDDE)
96: Power board communication error (PMCF)
97: AI2 loss (ACE)
98: AI3 loss (ACE)
99: AI10 loss (ACE)
100: AI11 loss (ACE)
101: CANopen guarding error (CGdE)
102: CANopen heartbeat error (CHbE)
104: CANopen bus off error (CbFE)
114: ECAP models over voltage (ECOV)
115: ECAP models over voltage (ECOV)
118: Monitor signal 1 trigger (BX1e)
119: Monitor signal 2 trigger (BX2e)
120: Monitor signal 3 trigger (BX3e)
121: Monitor signal 4 trigger (BX4e)
122: Monitor signal 5 trigger (BX5e)
123: Monitor signal 6 trigger (BX6e)
124: Monitor signal 7 trigger (BX7e)
125: Monitor signal 8 trigger (BX8e)
132: Under load protection (ULD)

133: Overload protection (OLD)
134: Electronic thermal relay 3 protection (EOL3)
135: Electronic thermal relay 4 protection (EOL4)
142: Auto-tune error (AUE1)
143: Auto-tune error (AUE2)
144: Auto-tune error (AUE3)
148: Auto-tune error (AUE4)
149: Auto-tune error (AUE5)
150: Auto-tune error (AUE6)
151: Auto-tune error (AUE7)
152: Auto-tune error (AUE8)
153: Auto-tune error (AUE9)
154: Auto-tune error (AUE10)
155: Auto-tune error (AUE11)
156: Auto-tune error (AUE12)
213: Protection initialization error (ThIF)
214: Power-on process initialization time-out (POTO)
220: Parameter copy write-in unfinished (CWF)
224: STO execution time-out (STOT)
225: STO ROM verification failure (STOR)
226: STO loss (STOL)
227: STO Channel 1 error (STC1)
228: STO Channel 2 error (STC2)
229: STO Channel 1 time-out (SPC1)
230: STO Channel 2 time-out (SPC2)
231: STO Gate check error (SGBE)
232: STO power 24V over voltage (S24O)
233: STO power 24V under voltage (S24U)
234: STO power 6V over voltage (S6OV)
235: STO power 6V under voltage (S6UV)
236: STO power 5V over voltage (S5OV)
237: STO power 5V under voltage (S5UV)
238: STO Watchdog (SWDG)
239: STO sampling failure (SADE)
240: STO execution time too short (SEBL)
241: STO execution time too high (SEAB)
260: Control board identification error (CBER)
300: Large amount leakage error (LEKE)
301: High pressure error (HPS)
302: Low pressure error (LPSE)
303: Dry pump error (dryE)
304: Dry pump auto-tune error (dAUE)

305: Pipe blockage (JAME)

306: ExCOM card break (ECCb)

307: Communication time-out (ECto)

📖 This parameter displays the Fault Record 1–2.

o4-01 OPER Time at Fault REC 1

(0x1781) Default: Read only

Settings 0–2359 hours/ minutes

o4-02 OPER Days at Fault REC 1

(0x1782) Default: Read only

Settings 0–65535 days

o4-20 OPER Time at Fault REC 2

(0x1794) Default: Read only

Settings 0–2359 hours/ minutes

o4-21 OPER Days at Fault REC 2

(0x1795) Default: Read only

Settings 0–65535 days

📖 Pr.o4-01 and o4-02 display the accumulative operation time of the drive at “Fault record 1”; Pr.o4-20 and o4-21 display the accumulative operation time of the drive at “Fault record 2”.

📖 For example: Pr.o4-01 = 2129, o4-02 = 234, the accumulative operation time of the drive at “Fault record 1” is 234 days 21 hours and 29 minutes.

o4-03 Date of Fault REC 1

(0x1783) Default: Read only

Settings 0–1231 month/day

o4-04 Time of Fault REC 1

(0x1784) Default: Read only

Settings 0–2359 hours/ minutes

o4-22 Date of Fault REC 2

(0x1796) Default: Read only

Settings 0–1231 month/day

o4-23 Time of Fault REC 2

(0x1797) Default: Read only

Settings 0–2359 hours/ minutes

📖 Pr.o4-03 and o4-04 display the time of “Fault record 1”; Pr.o4-22 and o4-23 display the time of “Fault record 2”.

📖 For example: Pr.o4-03 = 0509, o4-04 = 1834, “Fault record 1” occurs at 18:34 on May 9th.

o4-05 FREQ Cmd at Fault REC 1

(0x1785) Default: Read only

Settings 0.00–599.00

o4-24 FREQ Cmd at Fault REC 2

(0x1798) Default: Read only

Settings 0.00–599.00 Hz

🕮 Displays the frequency command at Fault record 1–2.

o4-06 Output FREQ at Fault REC 1

(0x1786) Default: Read only

Settings 0.00–599.00

o4-25 Output FREQ at Fault REC 2

(0x1799) Default: Read only

Settings 0.00–599.00 Hz

🕮 Displays the output frequency at Fault record 1–2.

o4-07 Output Current at Fault REC 1

(0x1787) Default: Read only

Settings 0.0–6553.5 A

o4-26 Output Current at Fault REC 2

(0x179A) Default: Read only

Settings 0.0–6553.5 A

🕮 Displays the output current at Fault record 1–2.

o4-08 Output Voltage at Fault REC 1

(0x1788) Default: Read only

Settings 0.0–6553.5 V_{DC}

o4-27 Output Voltage at Fault REC 2

(0x179B) Default: Read only

Settings 0.0–6553.5 V_{DC}

🕮 Displays the output voltage at Fault record 1–2.

o4-09 DC bus at Fault REC 1

(0x1789) Default: Read only

Settings 0.0–6553.5 V_{DC}

o4-28 DC bus at Fault REC 2

(0x179C) Default: Read only

Settings 0.0–6553.5 V_{DC}

🕮 Displays the DC bus voltage at Fault record 1–2.

o4-10 IGBT Temp at Fault REC 1

(0x178A) Default: Read only

Settings -3276.8–3276.7°C

o4-29 IGBT Temp at Fault REC 2

(0x179D) Default: Read only

Settings -3276.8–3276.7°C

🕮 Displays the IGBT temperature at Fault record 1–2.

o4-11 Cap Temp at Fault REC 1

(0x178B) Default: Read only

Settings -3276.8–3276.7°C

o4-30 Cap Temp at Fault REC 2

(0x179E) Default: Read only

Settings -3276.8–3276.7°C

🕮 Displays the capacitor temperature at Fault record 1–2.

o4-12 Fan Speed at Fault REC 1

(0x178C) Default: Read only

Settings 0–65535 rpm

o4-31 Fan Speed at Fault REC 2

(0x179F) Default: Read only

Settings 0–65535 rpm

🕮 Displays the fan speed at Fault record 1–2.

o4-13 Motor Speed at Fault REC 1

(0x178D) Default: Read only

Settings 0–65535 rpm

o4-32 Motor Speed at Fault REC 2

(0x17A0) Default: Read only

Settings 0–65535 rpm

🕮 Displays the motor speed at Fault record 1–2.

o4-15 Output Torque at Fault REC 1

(0x178F) Default: Read only

Settings 0.0–6553.5%

o4-34 Output Torque at Fault REC 2

(0x17A2) Default: Read only

Settings 0.0–6553.5%

🕮 Displays the output torque at Fault record 1–2.

🕮 The motor rated torque is 100%.

o4-16 MI Status at Fault REC 1

(0x1790) Default: Read only

Settings 0000h–FFFFh

o4-35 MI Status at Fault REC 2

(0x17A3) Default: Read only

Settings 0000h–FFFFh

📖 Displays the MI status at Fault record 1–2.

o4-17 MO/Rly Status at Fault REC 1

(0x1791) Default: Read only

Settings 0000h–FFFFh

o4-36 MO/Rly Status at Fault REC 2

(0x17A4) Default: Read only

Settings 0000h–FFFFh

📖 Displays the MO status at Fault record 1–2.

o4-18 Drive Status at Fault REC 1

(0x1792) Default: Read only

Settings 0000h–FFFFh

o4-37 Drive Status at Fault REC 2

(0x17A5) Default: Read only

Settings 0000h–FFFFh

📖 Displays the drive status at Fault record 1–2.

o5. Fault Record 3–4

o5-00 Fault Code REC 3

(0x17C0) Default: Read only

Settings 0–65535

o5-01 OPER Time at Fault REC 3

(0x17C1) Default: Read only

Settings 0–2359 hours/ minutes

o5-02 OPER Days at Fault REC 3

(0x17C2) Default: Read only

Settings 0–65535 days

o5-03 Date of Fault REC 3

(0x17C3) Default: Read only

Settings 0–1231 month/day

o5-04 Time of Fault REC 3

(0x17C4) Default: Read only

Settings 0–2359 hours/ minutes

o5-05 FREQ Cmd at Fault REC 3

(0x17C5) Default: Read only

Settings 0.00–599.00 Hz

o5-06 Output FREQ at Fault REC 3

(0x17C6) Default: Read only

Settings 0.00–599.00 Hz

o5-07 Output Current at Fault REC 3

(0x17C7) Default: Read only

Settings 0.0–6553.5 A

o5-08 Output Voltage at Fault REC 3

(0x17C8) Default: Read only

Settings 0.0–6553.5 V_{DC}

o5-09 DC bus at Fault REC 3

(0x17C9) Default: Read only

Settings 0.0–6553.5 V_{DC}

o5-10 IGBT Temp at Fault REC 3

(0x17CA) Default: Read only

Settings -3276.8–3276.7°C

o5-11 Cap Temp at Fault REC 3

(0x17CB) Default: Read only

Settings -3276.8–3276.7°C

o5-12 Fan Speed at Fault REC 3

(0x17CC) Default: Read only

Settings 0–65535 rpm

o5-13 Motor Speed at Fault REC 3

(0x17CD) Default: Read only

Settings 0–65535 rpm

o5-15 Output Torque at Fault REC 3

(0x17CF) Default: Read only

Settings 0.0–6553.5%

o5-16 MI Status at Fault REC 3

(0x17D0) Default: Read only

Settings 0000h–FFFFh

o5-17 MO/Rly Status at Fault REC 3

(0x17D1) Default: Read only

Settings 0000h–FFFFh

o5-18 Drive Status at Fault REC 3

(0x17D2) Default: Read only

Settings 0000h–FFFFh

o5-19 Fault Code REC 4

(0x17D3) Default: Read only

Settings 0–65535

o5-20 OPER Time at Fault REC 4

(0x17D4) Default: Read only

Settings 0–2359 hours/ minutes

o5-21 OPER Days at Fault REC 4

(0x17D5) Default: Read only

Settings 0–65535 days

o5-22 Date of Fault REC 4

(0x17D6) Default: Read only

Settings 0–1231 month/day

o5-23 Time of Fault REC 4

(0x17D7) Default: Read only

Settings 0–2359 hours/ minutes

o5-24 FREQ Cmd at Fault REC 4

(0x17D8) Default: Read only

Settings 0.00–599.00 Hz

o5-25 Output FREQ at Fault REC 4

(0x17D9) Default: Read only

Settings 0.00–599.00 Hz

o5-26 Output Current at Fault REC 4

(0x17DA) Default: Read only

Settings 0.0–6553.5 A

o5-27 Output Voltage at Fault REC 4

(0x17DB) Default: Read only

Settings 0.0–6553.5 V_{DC}

o5-28 DC bus at Fault REC 4

(0x17DC) Default: Read only

Settings 0.0–6553.5 V_{DC}

o5-29 IGBT Temp at Fault REC 4

(0x17DD) Default: Read only

Settings -3276.8–3276.7°C

o5-30 Cap Temp at Fault REC 4

(0x17DE) Default: Read only

Settings -3276.8–3276.7°C

o5-31 Fan Speed at Fault REC 4

(0x17DF) Default: Read only

Settings 0–65535 rpm

o5-32 Motor Speed at Fault REC 4

(0x17E0) Default: Read only

Settings 0–65535 rpm

o5-34 Output Torque at Fault REC 4

(0x17E2) Default: Read only

Settings 0.0–6553.5%

o5-35 MI Status at Fault REC 4

(0x17E3) Default: Read only

Settings 0000h–FFFFh

o5-36 MO/Rly Status at Fault REC 4

(0x17E4) Default: Read only

Settings 0000h–FFFFh

o5-37 Drive Status at Fault REC 4

(0x17E5) Default: Read only

Settings 0000h–FFFFh

📖 Refer to description of Parameter Group o4.

o6. Fault Record 5–6

o6-00 Fault Code REC 5

(0x1800) Default: Read only

Settings 0–65535

o6-01 OPER Time at Fault REC 5

(0x1801) Default: Read only

Settings 0–2359 hours/ minutes

o6-02 OPER Days at Fault REC 5

(0x1802) Default: Read only

Settings 0–65535 days

o6-03 Date of Fault REC 5

(0x1803) Default: Read only

Settings 0–1231 month/day

o6-04 Time of Fault REC 5

(0x1804) Default: Read only

Settings 0–2359 hours/ minutes

o6-05 FREQ Cmd at Fault REC 5

(0x1805) Default: Read only

Settings 0.00–599.00 Hz

o6-06 Output FREQ at Fault REC 5

(0x1806) Default: Read only

Settings 0.00–599.00 Hz

o6-07 Output Current at Fault REC 5

(0x1807) Default: Read only

Settings 0.0–6553.5 A

o6-08 Output Voltage at Fault REC 5

(0x1808) Default: Read only

Settings 0.0–6553.5 V_{DC}

o6-09 DC bus at Fault REC 5

(0x1809) Default: Read only

Settings 0.0–6553.5 V_{DC}

o6-10 IGBT Temp at Fault REC 5

(0x180A) Default: Read only

Settings -3276.8–3276.7°C

o6-11 Cap Temp at Fault REC 5

(0x180B) Default: Read only

Settings -3276.8–3276.7°C

o6-12 Fan Speed at Fault REC 5

(0x180C) Default: Read only

Settings 0–65535 rpm

o6-13 Motor Speed at Fault REC 5

(0x180D) Default: Read only

Settings 0–65535 rpm

o6-15 Output Torque at Fault REC 5

(0x180F) Default: Read only

Settings 0.0–6553.5%

o6-16 MI Status at Fault REC 5

(0x1810) Default: Read only

Settings 0000h–FFFFh

o6-17 MO/Rly Status at Fault REC 5

(0x1811) Default: Read only

Settings 0000h–FFFFh

o6-18 Drive Status at Fault REC 5

(0x1812) Default: Read only

Settings 0000h–FFFFh

o6-19 Fault Code REC 6

(0x1813) Default: Read only

Settings 0–65535

o6-20 OPER Time at Fault REC 6

(0x1814) Default: Read only

Settings 0–2359 hours/ minutes

o6-21 OPER Days at Fault REC 6

(0x1815) Default: Read only

Settings 0–65535 days

o6-22 Date of Fault REC 6

(0x1816) Default: Read only

Settings 0–1231 month/day

o6-23 Time of Fault REC 6

(0x1817) Default: Read only

Settings 0–2359 hours/ minutes

o6-24 FREQ Cmd at Fault REC 6

(0x1818) Default: Read only

Settings 0.00–599.00 Hz

o6-25 Output FREQ at Fault REC 6

(0x1819) Default: Read only

Settings 0.00–599.00 Hz

o6-26 Output Current at Fault REC 6

(0x181A) Default: Read only

Settings 0.0–6553.5 A

o6-27 Output Voltage at Fault REC 6

(0x181B) Default: Read only

Settings 0.0–6553.5 V_{DC}

o6-28 DC bus at Fault REC 6

(0x181C) Default: Read only

Settings 0.0–6553.5 V_{DC}

o6-29 IGBT Temp at Fault REC 6

(0x181D) Default: Read only

Settings -3276.8–3276.7°C

o6-30 Cap Temp at Fault REC 6

(0x181E) Default: Read only

Settings -3276.8–3276.7°C

o6-31 Fan Speed at Fault REC 6

(0x181F) Default: Read only

Settings 0–65535 rpm

o6-32 Motor Speed at Fault REC 6

(0x1820) Default: Read only

Settings 0–65535 rpm

o6-34 Output Torque at Fault REC 6

(0x1822) Default: Read only

Settings 0.0–6553.5%

o6-35 MI Status at Fault REC 6

(0x1823) Default: Read only

Settings 0000h–FFFFh

o6-36 MO/Rly Status at Fault REC 6

(0x1824) Default: Read only

Settings 0000h–FFFFh

o6-37 Drive Status at Fault REC 6

(0x1825) Default: Read only

Settings 0000h–FFFFh

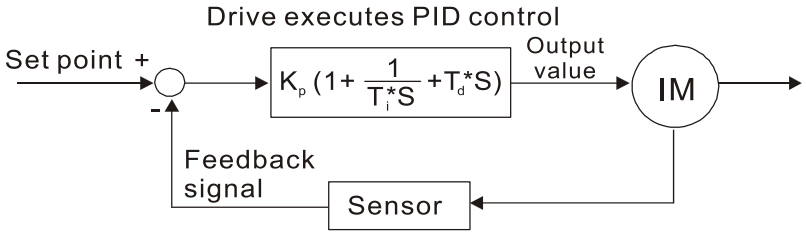
📖 Refer to description of Parameter Group o4.

P. PID Function

Common applications for PID control:

- Flow control: Use a flow sensor to feedback the flow data and perform accurate flow control.
- Pressure control: Use a pressure sensor to feedback the pressure data and perform precise pressure control.
- Air volume control: Use an air volume sensor to feedback the air volume data to achieve excellent air volume regulation.
- Temperature control: Use a thermocouple or thermistor to feedback temperature data for comfortable temperature control.
- Speed control: Use a speed sensor to feedback motor shaft speed or input another machine speed as a target value for synchronous control.

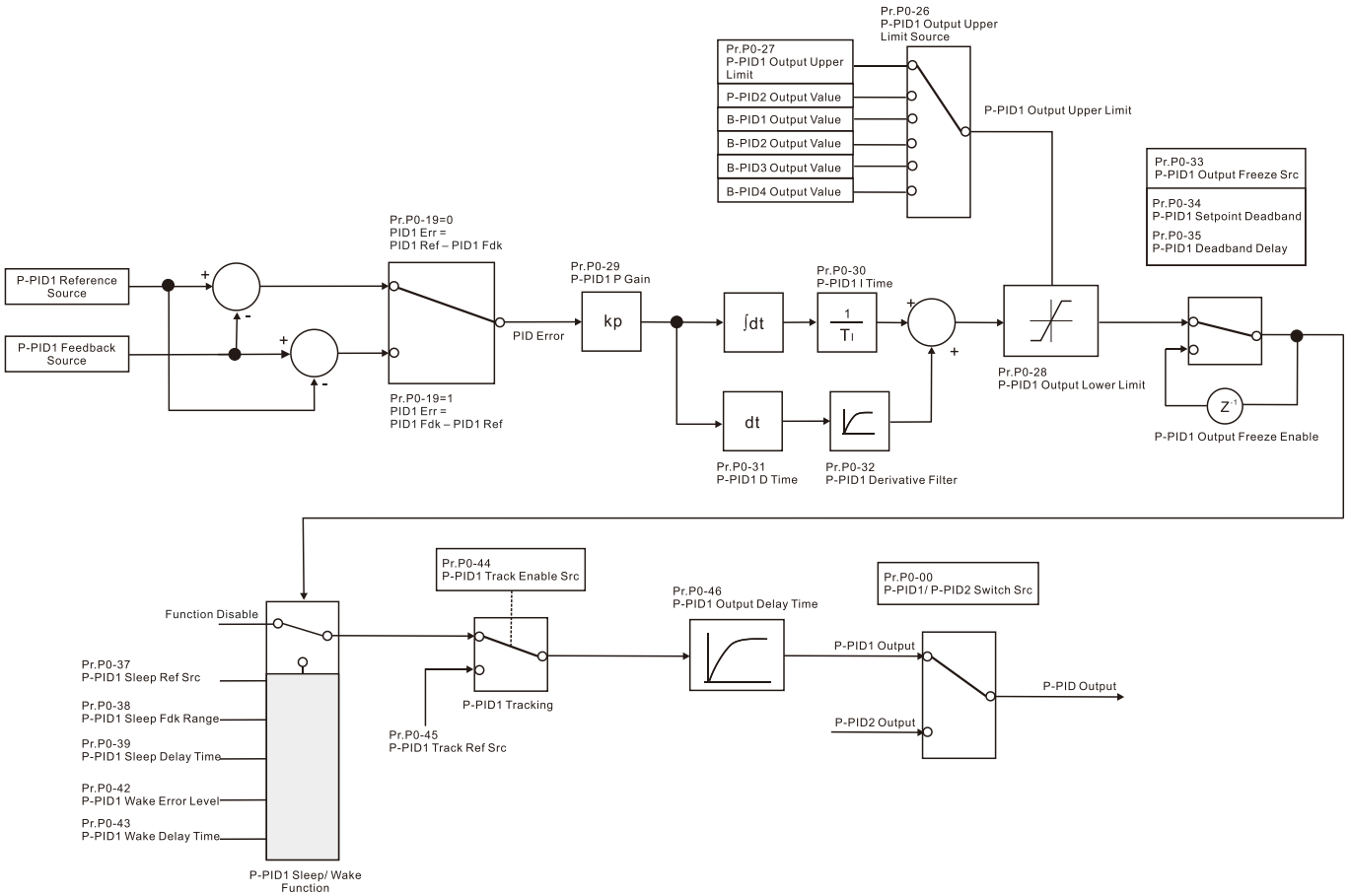
PID control loop:



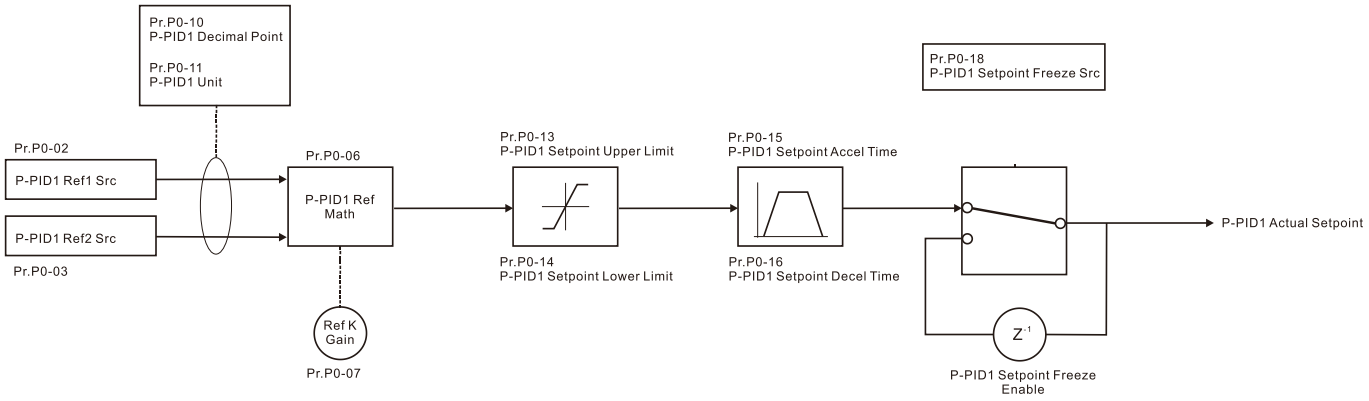
K_P Proportional Gain (P), T_i Integral Time (I), T_d Differential Time (D), S Calculation

P0. Process PID1

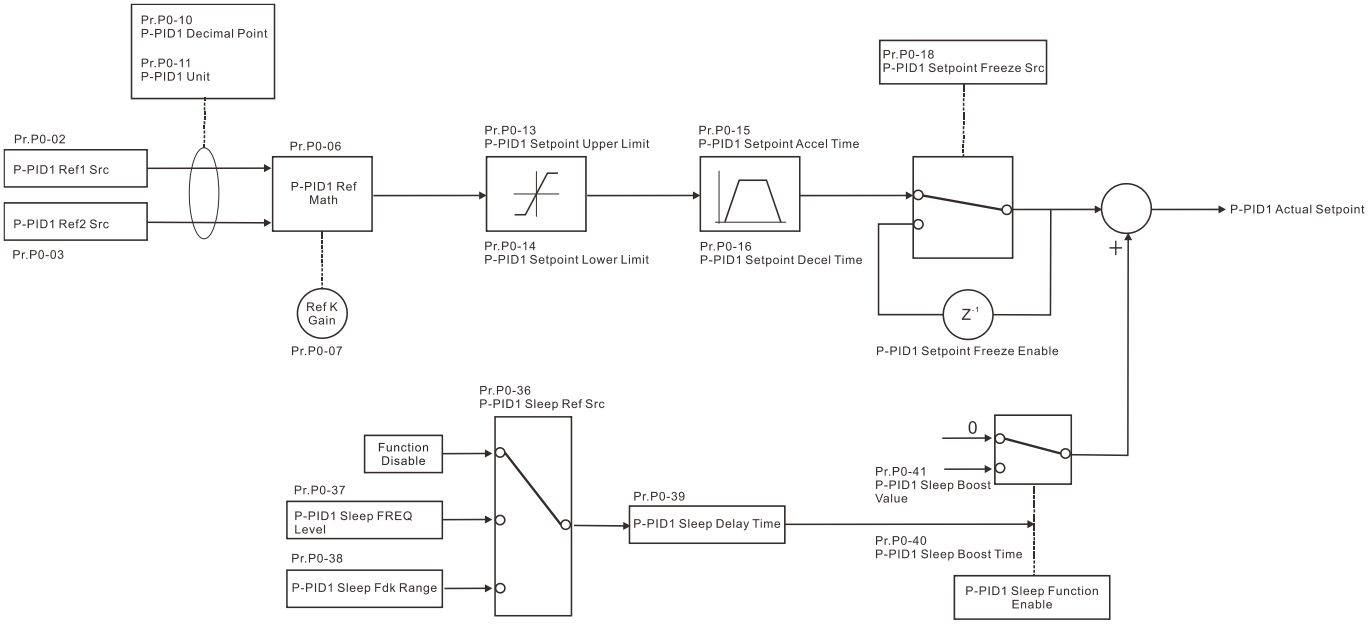
- Process PID1 control diagram:



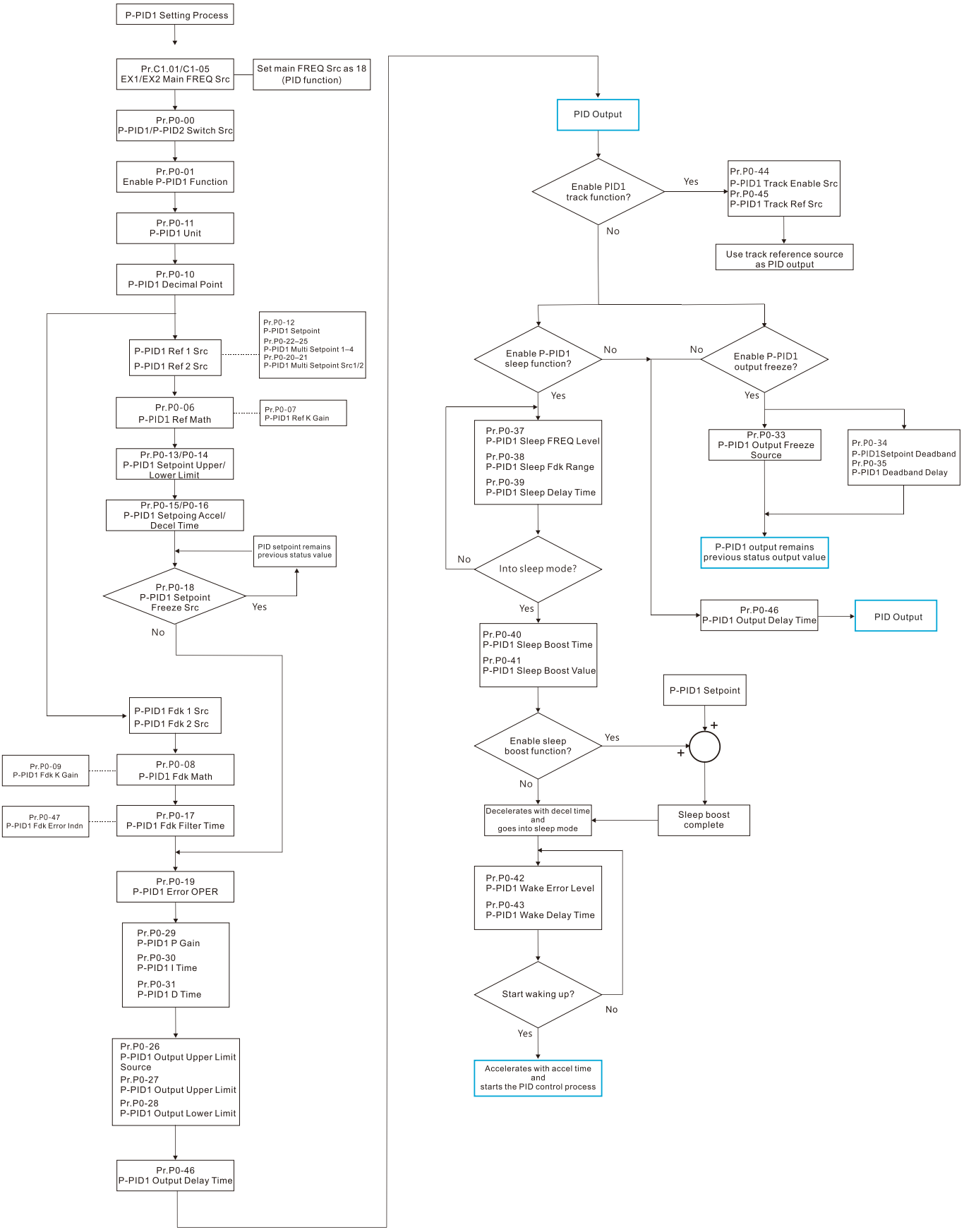
- Process PID1 setpoint diagram (not using sleep boost function)



- Process PID1 setpoint diagram (using sleep boost function)



- Process PID1 parameter setting process



You can set this parameter during operation

P0-00 P-PID1/P-PID2 Switch Src

(0x1880) Default: 0

Settings
0: P-PID1
1: P-PID2
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

- Use Pr.P0-00 to select using P-PID1 or P-PID2.
- Use the ON and OFF status of the MI terminal to determine: if it is ON, switch to P-PID2; if it is OFF, it would be P-PID1.
- Use the output of time module or monitor module to determine whether to use P-PID1 or P-PID2.

  For example: set Pr.P0-00 = 26 (Time function 1) as PID1/ PID2 switching source. In this case, set Time Function 1 first as, for example, 13:00–14:00 on Monday, when Time Function 1 activates, it automatically switches to PID2 at 13:00 on Monday, and returns to PID1 when the Time Function 1 is OFF after 14:00.
- The same principle for using Monitor module. You can set to the monitor a certain physical quantity (such as flow rate). Monitor 1 will activate when the physical quantity exceeds a certain value, and it switches to PID2 at this time.

P0-01 P-PID1 Function

(0x1881) Default: 0

Settings
0: Disable
1: Enable

- Pr.P0-01 determines whether to enable Process PID1.
- When using PID function, you need to set the main frequency source according to the selected EX1/ EX2 channel before use. For example, if you select EX1 channel, then Pr.C1-01 (EX1 Main FREQ Src) needs to be set as 18 (PID).
- When the following settings are complied, the digital keypad display selection (Pr.o0-00–o0-02 and Pr.o0-60–o0-62) is set as P-PID reference and the PID reference source is set as digital keypad (for example, Pr.P0-02 P-PID1 Ref1 Src = 1: Keypad), the keypad displays PID command value and the value can be set*[1]; otherwise, the PID command value will be displayed as 0.
  3. PID function is enabled.
  4. Main frequency source is set as PID.

  NOTE: *[1] P-PID Ref Math should be set as 0 (Pr.P0-06 and P1-05 set as 0, Reference 1). If it is not set as 0, the PID value will be displayed, but cannot be set.

P0-02 P-PID1 Ref1 Src

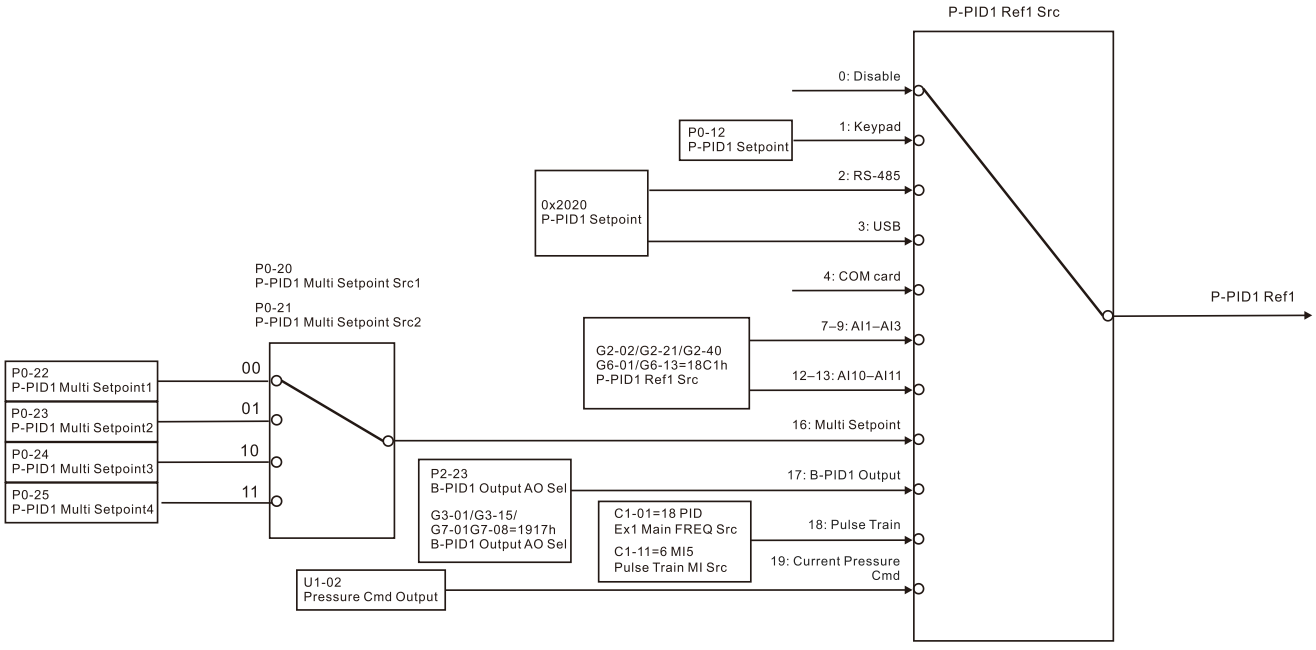
(0x1882) Default: 0

P0-03 P-PID1 Ref2 Src

(0x1883) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: B-PID1 Output
18: Pulse Train
19: Current Pressure Cmd

- Use Pr.P0-02 and P0-03 to select P-PID1 reference 1 and reference 2 source.
- You can set PID reference 1 and reference 2 sources as the same one. However, the AI source is an exception, PID reference 1 and reference 2 sources cannot be set as the same AI source.



P0-04 P-PID1 Fdk1 Src

(0x1884) Default: 0

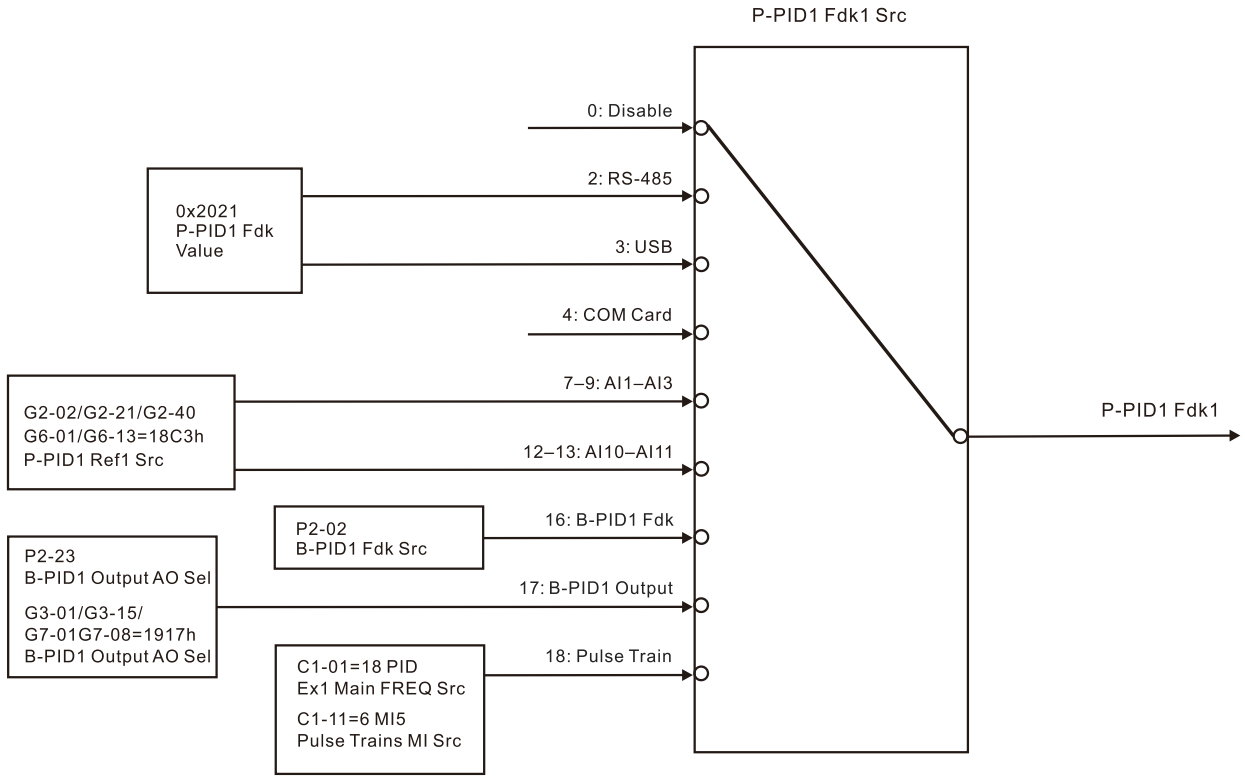
P0-05 P-PID1 Fdk2 Src

(0x1885) Default: 0

Settings
0: Disable
1: Reserve

2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: B-PID1 Fdk
17: B-PID1 Output
18: Pulse Train

Use Pr.P0-04 and P0-05 to select P-PID1 feedback 1 and feedback 2 source.



P0-06 P-PID1 Ref Math

(0x1886) Default: 0

Settings 0: Ref1
1: Ref1 + K*Ref2
2: Ref1 – K*Ref2
3: Ref1*K*Ref2
4: Ref1/K*Ref2
5: MIN(Ref1, Ref2)
6: MAX(Ref1, Ref2)
7: AVE(Ref1, Ref2)
8: K*sqrt(Ref1)
9: K*sqrt(Ref1-Ref2)

10: K*sqrt(Ref1+Ref2)
11: sqrt(Ref1)+K*sqrt(Ref2)
12: (Ref1 – K*Ref2)^2
13: (Ref1)^2 +K* (Ref2)^2

🕮 Use Pr.P0-06 to select the mathematical operation method for P-PID1 reference 1 and reference 2 source.

P0-07 P-PID1 Ref K Gain

(0x1887) Default: 1.00

Settings -300.00– 300.00

🕮 Use Pr.P0-06 to select the mathematical operation gain K for P-PID1 reference 1 and reference 2 source.

P0-08 P-PID1 Fdk Math

(0x1888) Default: 0

Settings 0: Fdk1
1: Fdk1 + K*Fdk2
2: Fdk1 – K*Fdk2
3: Fdk1*K*Fdk2
4: Fdk1/K*Fdk2
5: MIN(Fdk1, Fdk2)
6: MAX(Fdk1, Fdk2)
7: AVE(Fdk1, Fdk2)
8: K*sqrt(Fdk1)
9: K*sqrt(Fdk1-Fdk2)
10: K*sqrt(Fdk1+Fdk2)
11: sqrt(Fdk1)+K*sqrt(Fdk2)
12: (Fdk1 – K*Fdk2)^2
13: (Fdk1)^2 +K* (Fdk2)^2

🕮 Use Pr.P0-08 to select the mathematical operation method for P-PID1 feedback 1 and feedback 2 source.

P0-09 P-PID1 Fdk K Gain

(0x1889) Default: 1.00

Settings -300.00– 300.00

🕮 Use Pr.P0-09 to select the mathematical operation gain K of PID1 feedback 1/ 2 source.

P0-10 P-PID1 Decimal Point

(0x188A) Default: 2

Settings 0: No Decimal Point
1: One Decimal Point
2: Two Decimal Point
3: Three Decimal Point

🕮 Sets the decimal point of P-PID1 unit.

P0-11 P-PID1 Unit

(0x188B) Default: 0

Settings
0: Hz
0 1: rpm
2: %
3: m/s
4: kW
5: HP
6: ppm
7: 1/m
8: kg/s
9: kg/m
10: kg/h
11: lb/s
12: lb/m
13: lb/h
14: ft/s
15: ft/m
16: m
17: ft
18: degC
19: degF
20: mbar
21: bar
22: Pa
23: kPa
24: mWG
25: inWG
26: ftWG
27: psi
28: atm
29: L/s
30: L/m
31: L/h
32: m3/s
33: m3/h
34: GPM
35: CFM
36: kg
37: kg/cm^2

- Selects the using unit of P-PID1.
- Due to the displayed word limit of the keypad, if you select the unit as 37: kg/cm^2 (as shown in

the following Figure 1), the parameters associated with the PID will be displayed as abbreviated k/c2 (as shown in the following Figure 2).

When the PID unit is selected, the information associated with the PID will be displayed on the user-defined page (as shown in the following Figure 3).

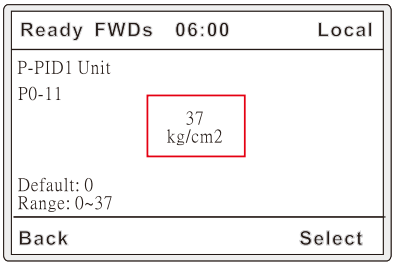


Figure 1

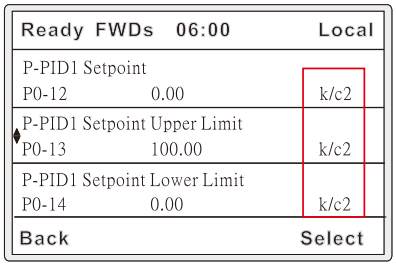


Figure 2

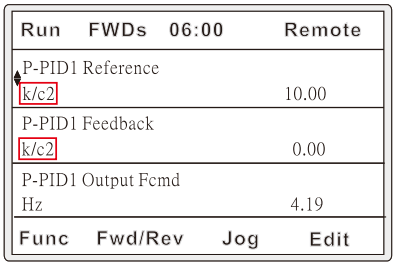


Figure 3

P0-12 P-PID1 Setpoint

(0x188C) Default: 0

Settings -30000–30000 PID1 unit

When setting Pr.P0-02 and P0-03 (P-PID1 Ref1/2 Src) = 1 (Keypad), Pr.P0-12 is the specified parameter of P-PID1 source.

P0-13 P-PID1 Setpoint Upper Limit

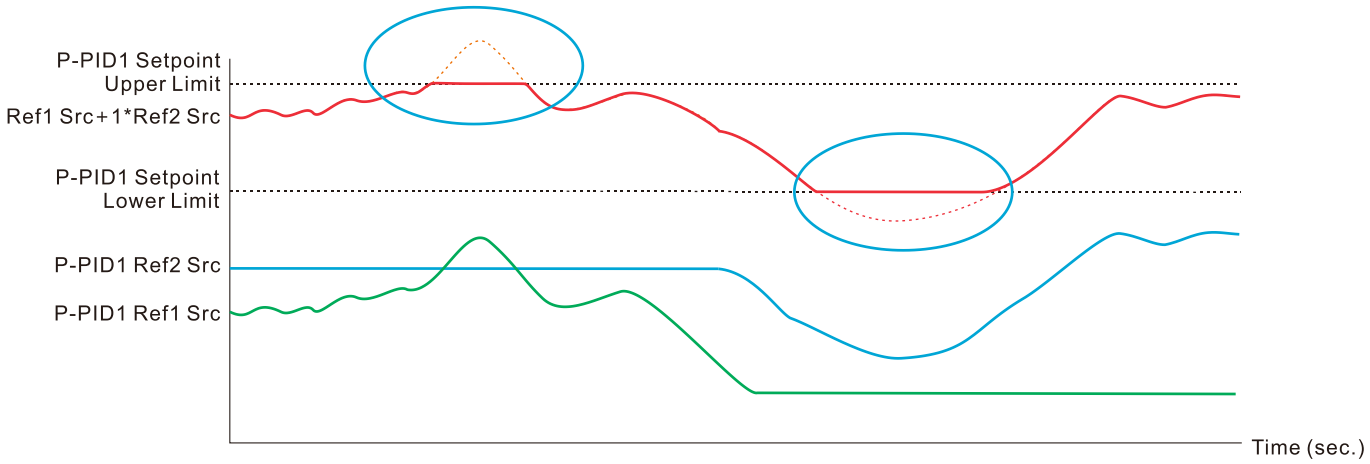
(0x188D) Default: 10000

P0-14 P-PID1 Setpoint Lower Limit

(0x188E) Default: 0

Settings -30000–30000 PID unit

Since VP3000 provides two sets of PID reference source for mathematical operation, the physical quantity setpoint on the system may exceed expectations. Use Pr.P0-13 and P0-14 to set the setpoint upper and lower limits of the PID setpoint calculation result, which can prevent the unexpected surge of the calculation source from exceeding the upper or lower limit that the system can withstand.



P0-15 P-PID1 Setpoint Accel Time

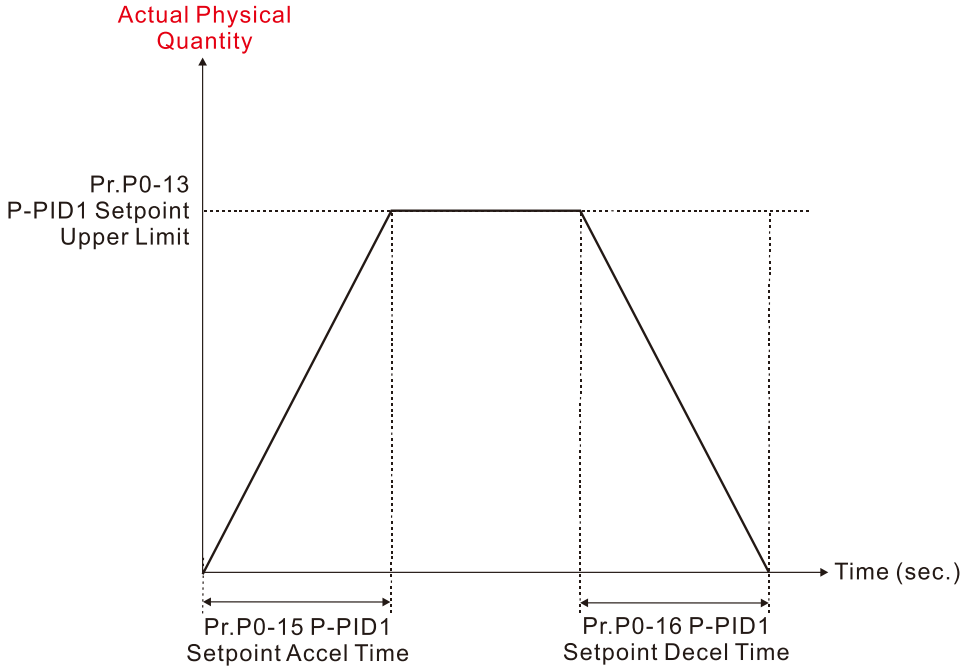
(0x188F) Default: 0.0

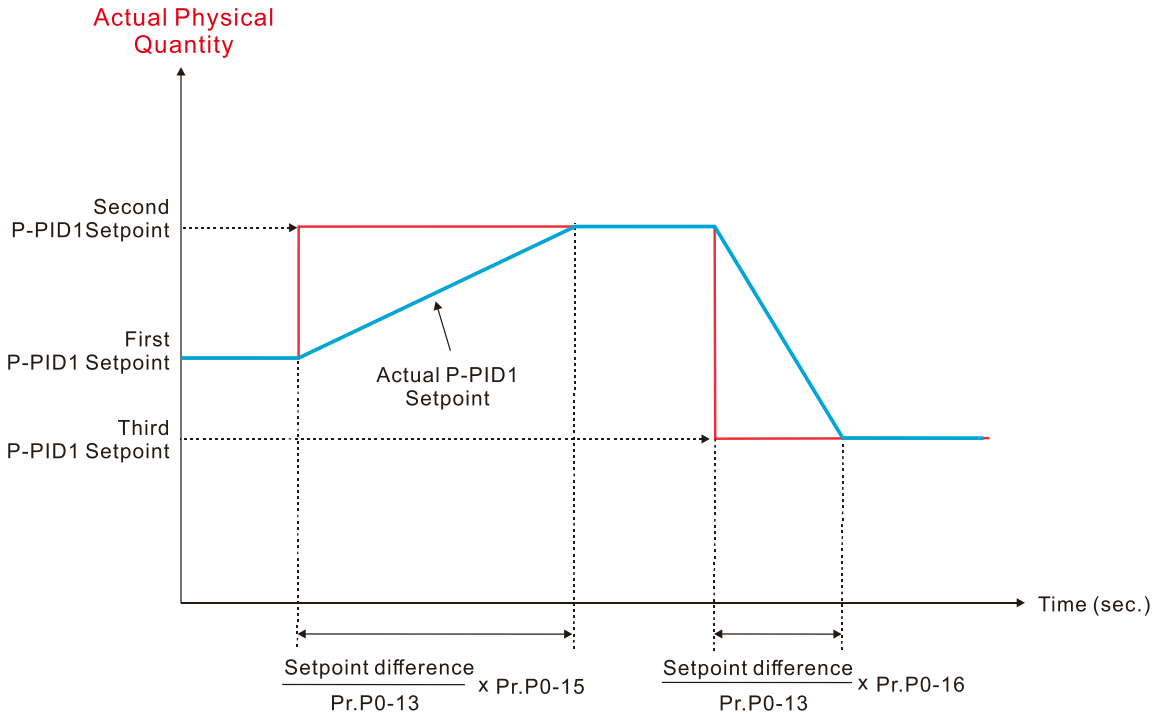
P0-16 P-PID1 Setpoint Decel Time

(0x1890) Default: 0.0

Settings 0.0–1800.0 sec.

- P-PID1 setpoint acceleration time determines the required time for the drive setpoint accelerates from 0 to Pr.P0-13 P-PID1 setpoint upper limit. P-PID1 setpoint deceleration time determines the required time for the drive setpoint decelerates from PID1 setpoint upper limit to 0.
- For applications that need to prevent the PID output drops or rises suddenly due to the PID setpoint step change, and affecting the application process or causing equipment damage, you can use Pr.P0-15 and P0-16 (P-PID1 setpoint accel/ decel time).





P0-17 P-PID1 Fdk Filter Time

(0x1891) Default: 0.000

Settings 0.000–30.000 sec.

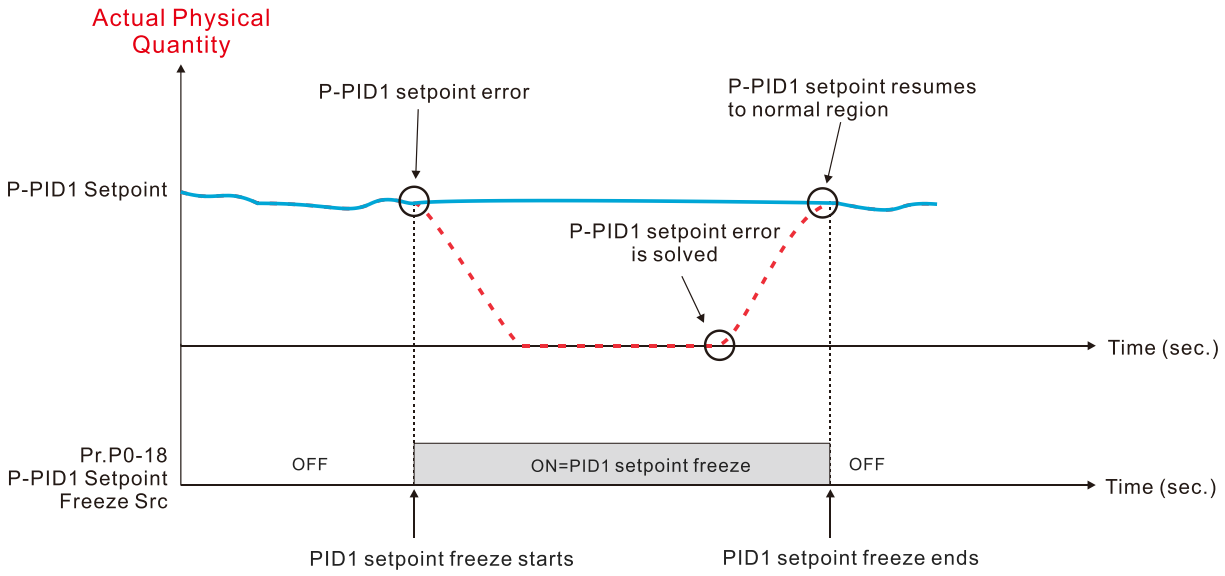
Filter the PID feedback that is last used for PID control to filter out the interference noise.

P0-18 P-PID1 Setpoint Freeze Src

(0x1892) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

When an error occurs to the PID reference source, this parameter freezes the PID setpoint to remain at the previous status output and repair the system in real time. After troubleshooting, you can use the previous set PID reference source as the PID control command.



P0-19 P-PID1 Error OPER

(0x1893) Default: 0

Settings 0: PID1 err = PID1 Ref – PID1 Fdk
1: PID1 err = PID1 Fdk – PID1 Ref

PID1 Error = Target value (set point) – Feedback Use this setting when the detection value increases if the output frequency increases.

PID1 Error = Feedback – Target value (set point) Use this setting when the detection value decreases if the output frequency increases.

P0-20 P-PID1 Multi Setpoint Src1

(0x1894) Default: 0

P0-21 P-PID1 Multi Setpoint Src2

(0x1895) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P0-22 P-PID1 Multi Setpoint1

(0x1896) Default: 0

P0-23 P-PID1 Multi Setpoint2

(0x1897) Default: 0

P0-24 P-PID1 Multi Setpoint3

(0x1898) Default: 0

P0-25 P-PID1 Multi Setpoint4

(0x1899) Default: 0

Settings -30000–30000 PID1 unit

When using Pr.P0-02 and P0-03 to select P-PID1 Ref1 Src and P-PID1 Ref2 Src as 16: Multi Setpoint, the AC motor drive follows the status of Pr.P0-20 and P0-21 (P-PID1 Multi Setpoint Src 1 & 2) to combine four groups of internal setting, as shown in the table below, and uses to determine the internal setting (Pr.P0-22–P0-25) as the PID1 set point.

P-PID1 Multi Setpoint Src / P-PID1 Multi Setpoint	P0-21	P0-20
	P-PID1 Multi Setpoint Src2	P-PID1 Multi Setpoint Src1
P-PID1 Multi Setpoint 1 (P0-22)	OFF	OFF
P-PID1 Multi Setpoint 2 (P0-23)	OFF	ON
P-PID1 Multi Setpoint 3 (P0-24)	ON	OFF
P-PID1 Multi Setpoint 4 (P0-25)	ON	ON

PID1 multi set point can also be set directly through P-PID1 multi set point source: Pr.P0-20 or P0-21 = 0 (OFF) or 1 (ON). You can also select MI1–MI6, MI10–MI15, Time function 1–3 or Monitor 1–3 to set the ON or OFF status.

P0-26 P-PID1 Output Upper Limit Src

(0x189A) Default: 0

Settings 0: P-PID1 Output Upper Limit
1: P-PID2 Output
2: B-PID1 Output
3: B-PID2 Output
4: B-PID3 Output
5: B-PID4 Output

P0-27 P-PID1 Output Upper Limit

(0x189B) Default: 60.00

Settings 0.00–600.00 Hz

P0-28 P-PID1 Output Lower Limit

(0x189C) Default: 0.00

Settings 0.00–P0-27 setting value (Hz)

User Pr.P0-26 to select P-PID1 output upper limit source.

Pr.P0-26 = 0: When P-PID1 outputs its upper limit, the setting of Pr.P0-27 is the output upper limit of P-PID1.

For example: refer to the diagram below

A: Pr.P0-26 = 0 (P-PID1 output upper limit)

When P-PID1 output is larger than Pr.P0-27 setting value, P-PID1 output = P-PID1 output upper limit.

B: Pr.P0-26 = 1 (P-PID2 output)

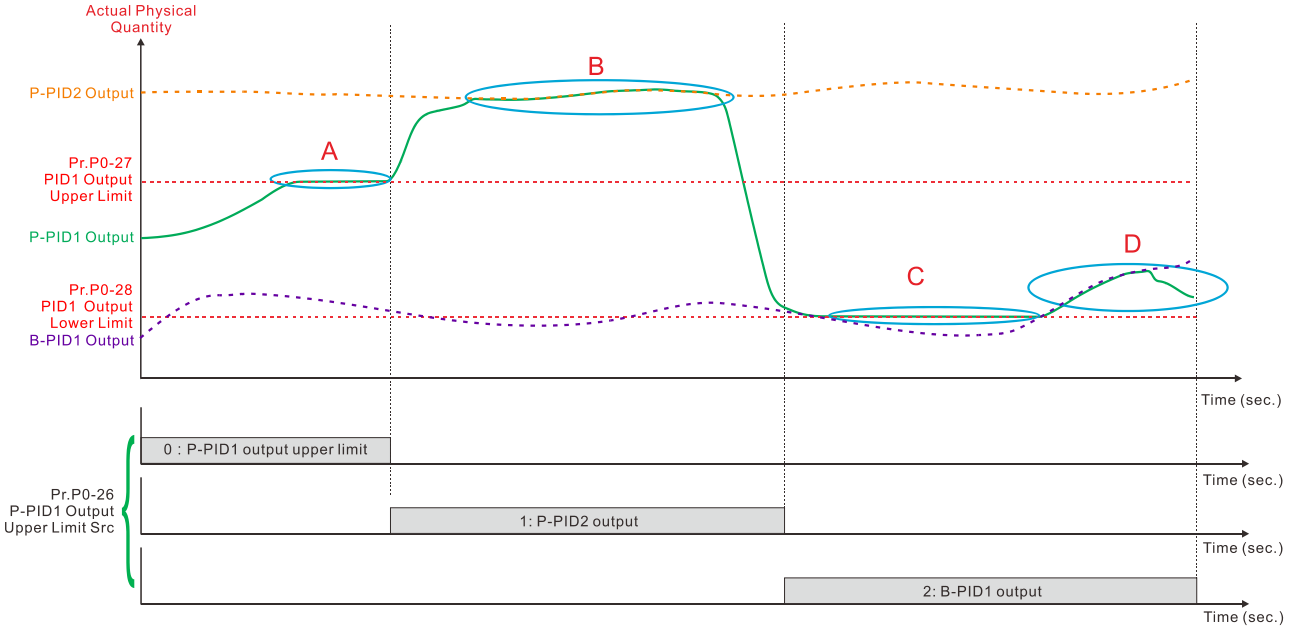
When P-PID1 output is larger than P-PID2 output, P-PID1 output = P-PID2 output.

C: Pr.P0-26 = 2 (B-PID1 output, if the B-PID1 output < Pr.P0-28 P-PID1 output lower limit)

When P-PID1 output is smaller than B-PID1 output, P-PID1 output = P-PID1 output lower limit.

D: Pr.P0-26 = 2 (B-PID1 output, if the B-PID1 output > Pr.P0-28 P-PID1 output lower limit)

When P-PID1 output is larger than B-PID1 output, P-PID1 output = B-PID1 output.



P0-29 P-PID1 P Gain

(0x189D) Default: 1.00

Settings 0.01– 100.00

- The P gain is mainly used to immediately reduce the deviation in proportion when there is a deviation in the system. Increasing proportional gain usually gets faster response speed. If you set the value too high, overshoot occurs, and it may cause system oscillation and instability. If you set the gain to a lower value, the response will be late.
- The output of P control is proportional to the input error signal. If the integral (I) time = 0 and the differential (D) time = 0, then only the P gain acts, and the system output has a steady-state error.
- Adjust Proportional Gain (P):
  Turn off the Ti and Td, or remain Ti and Td in constant value, then adjust the proportional gain (P).
  Increase: Faster status feedback, but excessive adjustment increases the overshoot.
  Decrease: Smaller overshoot, but excessive adjustment slows down the transient response.

P0-30 P-PID1 I Time

(0x189E) Default: 60.0

Settings 0.0–6000.0 sec.

- Use the integral controller to eliminate the deviation during stable system operation. The integral control does not stop working until the deviation is zero.
- The integral is affected by the integral time. When the integral time is long, there is a small I controller gain, with slower response and slow external control. When the integral time is short, there is a large I controller gain, with faster response and rapid external control. When the integral time is too short, it may cause overshoot or oscillation for the output frequency and system.
- Set Integral Time to 0.00 to disable the I controller.
- Adjust Integral Time (I):
  The integral time (I) accumulates from the time difference, if the vibration cycle is longer than the setting for integral time, the integration enhances. Increase the integral time (I) to reduce the vibration.
  Increase: Reduce the overshoot, excessive adjustment causes worse transient response.
  Decrease: Faster transient response, but the transient time will be longer and takes more time to achieve the steady state. Excessive adjustment causes larger overshoot.

P0-31 P-PID1 D Time

(0x189F) Default: 0.000

Settings 0.000–10.000 sec.

- Use the differential controller to show the system deviation change, as well as to preview the change in the deviation. You can use the differential controller to eliminate the deviation in order to improve the system state. Using a suitable differential time can reduce overshoot and shorten adjustment time; however, the differential operation increases noise interference. Note that a too large differential causes more noise interference. In addition, the differential shows the change,

and the differential output is 0 when there is no change. Note that you cannot use the differential control independently. You must use it with the other two controllers for the PD controller or PID controller.

- Sets the D controller gain to determine the deviation change response. Using a suitable differential time reduces the P and I controllers overshoot to decrease the oscillation for a stable system. A differential time that is too long may cause system oscillation.
- The differential controller acts on the change in the deviation and cannot reduce the interference. Do not use this function when there is significant interference.
- Adjust Differential Time (D):
  When the vibration cycle is shorter and continuous, it means that the differential time setting is too large and causes excessive output. Decrease the setting of D gain to reduce the vibration. If the D gain is set to 0, adjust the PID control again.

P0-32 P-PID1 Derivative Filter

(0x18A0) Default: 0.0

Settings 0.0–10.0 sec.

- Since the deviation controller acts on the change of deviation, its immunity to interference is poor. Use this parameter to filter the differential time (D) and eliminate the noise.

P0-33 P-PID1 Output Freeze Src

(0x18A1) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

- In the application of PID control, you can remain the PID output at previous status output through this function to prevent the motor stop running from unexpected events (for example, feedback sensor failure) or routine equipment maintenance, and to ensure that the drive remains outputting during troubleshooting or maintenance without motor stopping due to the above situation.

P0-34 P-PID1 Setpoint Deadband

(0x18A2) Default: 0

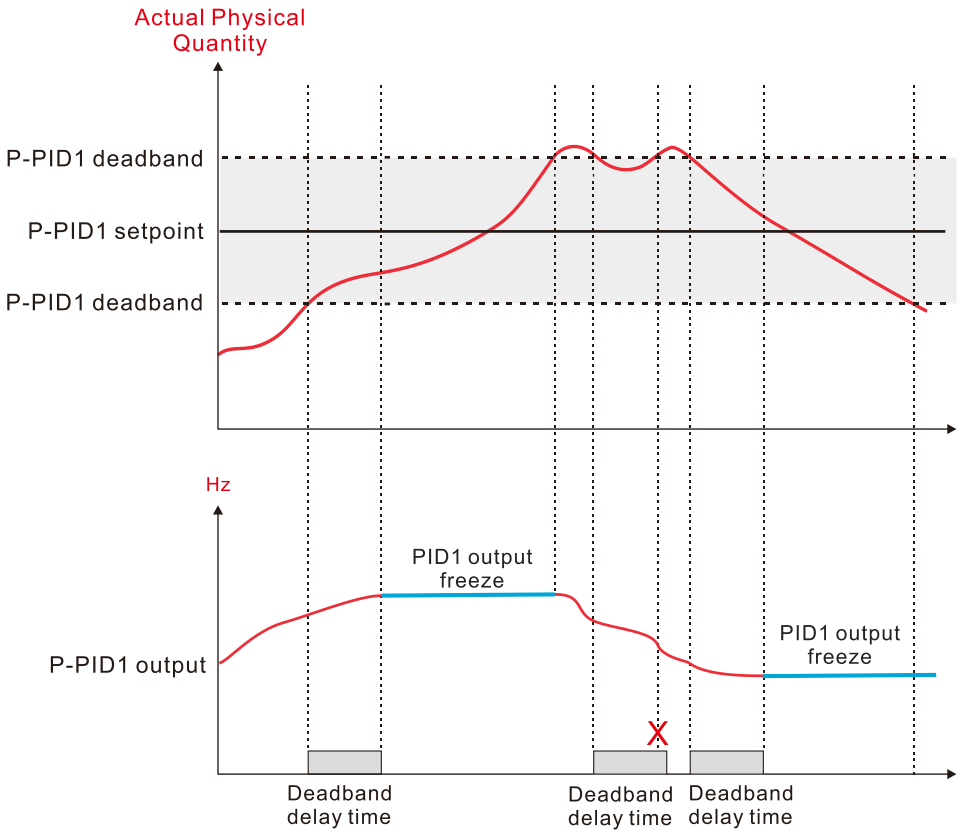
Settings 0–10000

P0-35 P-PID1 Deadband Delay

(0x18A3) Default: 0.0

Settings 0.0–3600.0 sec.

When the PID1 feedback enters P-PID1 set point dead band and remains for the dead band delay time, the PID1 output remains at the previous status output until the PID1 feedback exits the PID1 set point dead band range.



P0-36 P-PID1 Sleep Ref Src

(0x18A4) Default: 0

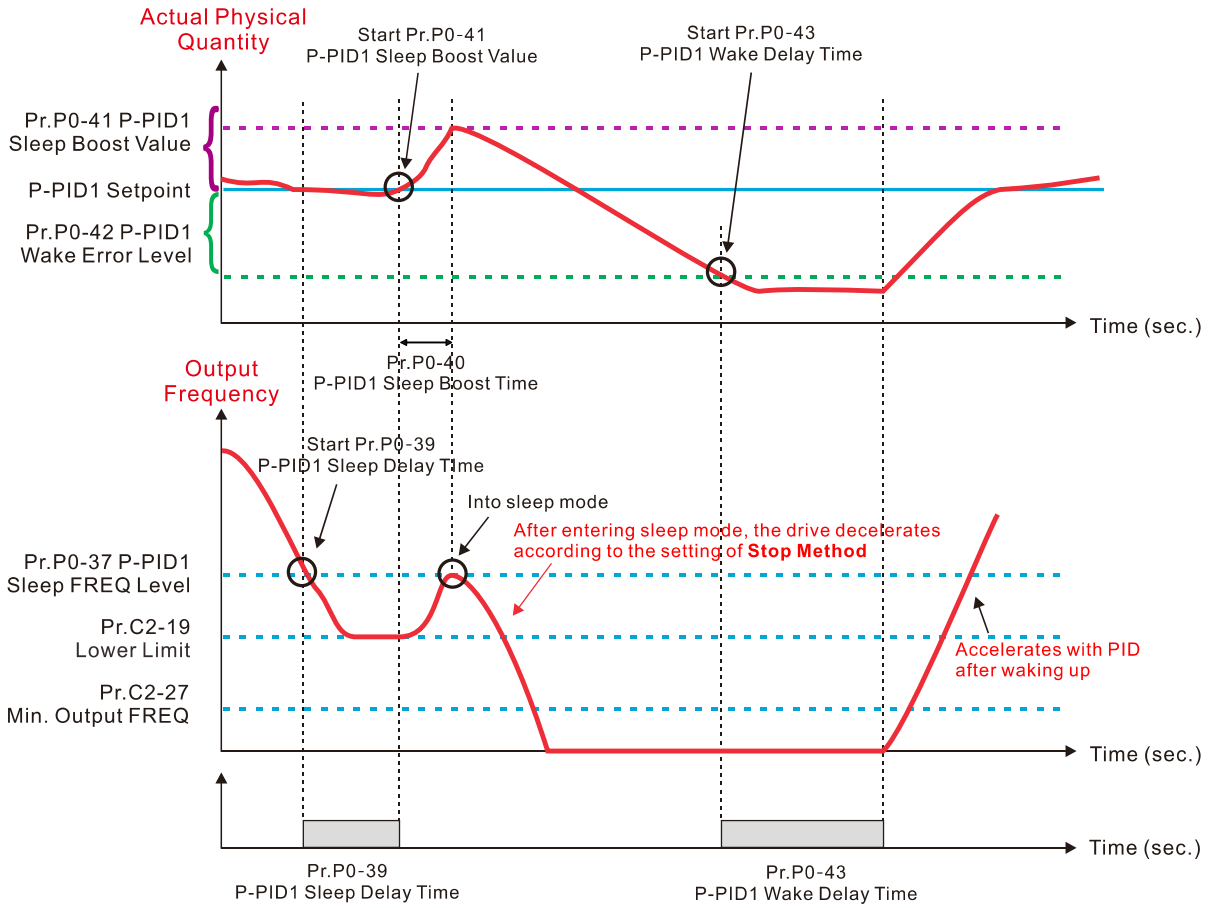
Settings 0: Disable

1: Motor FREQ

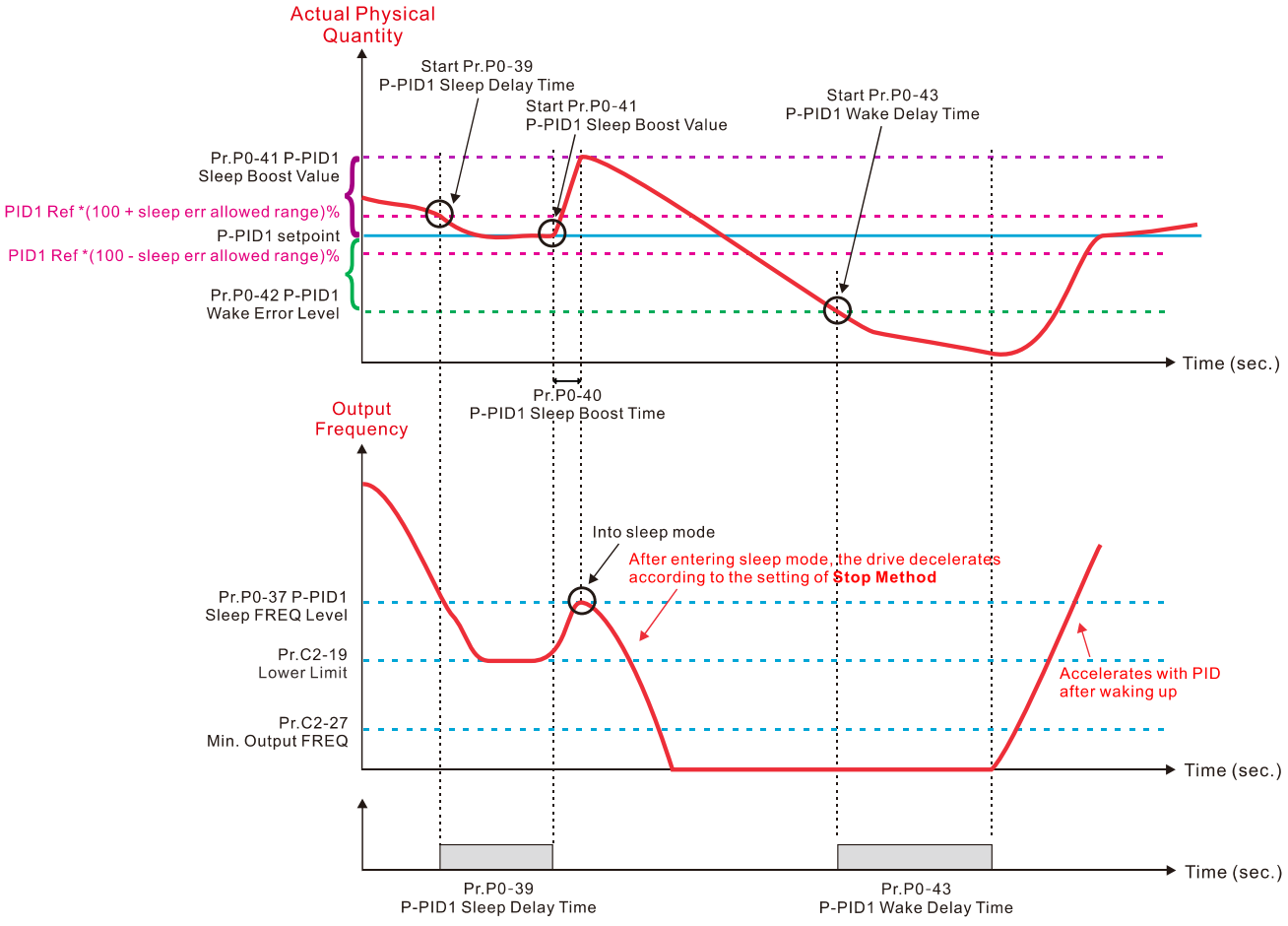
2: Fdk value

Under PID control, when the drive operates at an extremely low speed to maintain the physical quantity at the set point, the motor can be completely stopped through the sleep function to save energy, and to avoid running at low speed in the low efficiency range for a long time. When the physical quantity error needs to be controlled by the AC motor drive, you can wake the drive by setting the wake function. (Since the lubrication or cooling of some equipment depends on the speed of the motor, providing this function can prevent this type of equipment from running at low speed for a long time and cause premature mechanical aging.)

🕮 Pr.P0-36 P-PID1 sleep reference source = 1 (Motor Frequency)



🕮 Pr.P0-36 P-PID1 sleep reference source = 2 (Feedback Value)



P0-37 P-PID1 Sleep FREQ Level

(0x18A5) Default: 0.00

Settings 0.00–60.00 Hz

P0-38 P-PID1 Sleep Fdk Range

(0x18A6) Default: 0.00

Settings 0.00–100.00%

P0-39 P-PID1 Sleep Delay Time

(0x18A7) Default: 60.0

Settings 0.0–3600.0 sec.

- Sleep judgment: Pr.P0-36 P-PID1 sleep reference source = 1 (Motor Frequency)
  Under this sleep reference source, if you need to enable sleep function, set Pr.P0-37 (P-PID1 Sleep FREQ Level) > 0 and set Pr.P0-39 (P-PID1 Sleep Delay Time). When the motor operating frequency is lower than or equal to sleep level, the sleep delay time starts to count. During the counting:
  1. If the motor operating frequency is lower than or equal to sleep level, and the sleep delay time is reached, then the drive enters sleep mode.
  2. If the motor operating frequency is higher than sleep level during the delay time counting, then the drive skips out of the sleep delay count and remains at PID control.
- Sleep judgment: Pr.P0-36 P-PID1 sleep reference source = 2 (Feedback Value)
  Under this sleep reference source, if you need to enable sleep function, set Pr.P0-38 (P-PID1 Sleep Feedback Range) > 0 and set Pr.P0-39 (P-PID1 Sleep Delay Time). If the feedback physical quantity is in the range of [PID setpoint x (100± sleep error allowed range) %], the sleep detection starts to count. During the counting:
  1. If the feedback physical quantity exceeds the range of [PID setpoint × (100± sleep error allowed range) %], the drive skips out of the speed count and remains at PID control.
  2. If the feedback physical quantity exceeds the range of [PID setpoint × (100± sleep error allowed range) %], and the sleep detection count remains for the time× of sleep delay/ detect time, then the drive enters sleep mode.

P0-40 P-PID1 Sleep Boost Time

(0x18A8) Default: 0.0

Settings 0.0–3600.0 sec.

P0-41 P-PID1 Sleep Boost Value

(0x18A9) Default: 0

Settings 0–30000 PID1 unit

- Before entering sleep mode from the PID mode, the sleep boost will be performed first:
- If Pr.P0-40 (P-PID1 Sleep Boost Time) and Pr.P0-41 (P-PID1 Sleep Boost Value) are set as default (default are both 0), then the drive directly enters sleep mode.
- When Pr.P0-40 (P-PID Sleep Boost Time) and Pr.P0-41 (P-PID1 Sleep Boost Value) are both set > 0, the drive performs boosting to the physical quantity before entering the sleep mode and controls the actual physical quantity to PID set point + PID1 boost value with PID control.

- If the PID actual boost time does not complete the sleep boost time counting, and the actual physical quantity has controlled to PID set point + PID1 boost value, then drive directly enters the sleep mode.
- If the PID actual boost time reaches the set sleep boost time, but the actual physical quantity is not controlled to PID set point + PID1 boost value, the drive still enters the sleep mode.
- If the actual physical quantity feedback is lower than the PID set point during the PID boosting process, the drive skips from boosting mode back to PID control and re-executes the sleep judging logic.
- The stopping behavior in sleep mode refers to the parameter setting of stop method.

P0-42 P-PID1 Wake Error Level

(0x18AA) Default: 0

Settings 0–10000 PID1 unit

P0-43 P-PID1 Wake Delay Time

(0x18AB) Default: 0.50

Settings 0.00–60.00 PID1 unit

- Wake judgment:
  1. Pr.P0-36 P-PID1 sleep reference source = 1 (Motor Frequency):
     During sleep process, if [physical quantity set point – physical quantity feedback] is lower than or equal to the wake error and remains for the time set in wake delay time, the drive turns from sleep mode to PID control mode.
  2. Pr.P0-36 P-PID1 sleep reference source = 2 (Feedback Value):
     During sleep process, if the absolute value of [physical quantity set point – physical quantity feedback] is larger than the wake error and remains for the time set in wake delay time, the drive turns from sleep mode to PID control mode.

P0-44 P-PID1 Track Enable Src

(0x18AC) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

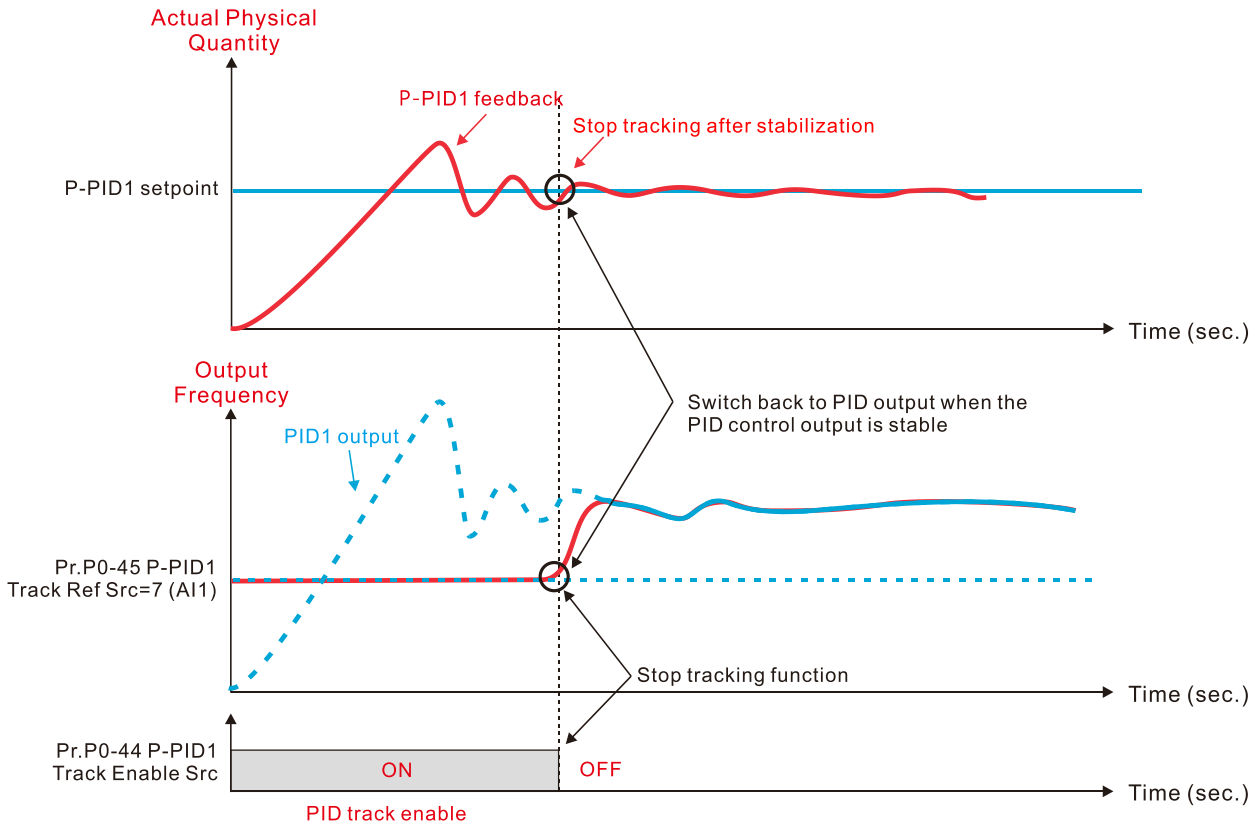
P0-45 P-PID1 Track Ref Src

(0x18AD) Default: 0

Settings 0: Disable
1: Reserved
2: RS-485

3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve

- For the application that is known the integral transient causes sudden frequency jump and severe vibration, or the physical quantity cannot be converge to the set point immediately at the initial stage of PID control (for example, in tension control occasions, if using PID control at the initial stage of furling, the PID control will be up to the maximum PID upper limit output since the tension cannot be established immediately; however, when the tension is established, the furling may be broken because the PID cannot response in time), you can enable the track function and use other sources (AI1–AI3 or Fieldbus) as PID output, and then switch back to PID output when the PID control output is stable, to prevent sudden frequency jump caused by the original integral transient.
- In certain applications that required higher accuracy and following of physical quantity, we usually decrease setting of integral time. Under this setting, when a larger physical quantity error occurs (system sudden disturbance), the convergence process usually causes severe frequency vibration, and the system will stabilize after a long time. The above situation of large physical quantity error rarely occurs to the application occasion and is not expected to adjust through PID controller parameters. In this case, you can use this function as PID output first, and switch back to PID output when the PID control output is stable.
- Pr.P0-45 determines the track reference source when using P-PID1 track function.



P0-46 P-PID1 Output Delay Time

(0x18AE) Default: 0.000

Settings 0.000–30.000 sec.

- Sets the time constant of the low pass filter for PID control output, increase the setting may affect the response speed of the drive.
- The frequency output for the PID controller will be filtered by a delay function. This function can slow down the change of output frequency, a long delay time means a large degree of filtering, and vice versa.
- An inappropriate setting of delay time may cause system vibration.

P0-47 P-PID1 Fdk Error Indn

(0x18AF) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15
16–19: Reserve

- PID feedback error indication is used when the sensor failure or there is wiring problem between the drive and the sensor.
- Selects the MO/Relay terminal for the “P-PID1 feedback error” status indication.
- When an error occurs to PID feedback, the terminal selected by Pr.P0-47 “activates”.
- You must use PID feedback error indication when using PID control. It can prevent dangerous status such as impact caused by rapid acceleration of the motor due to abnormal feedback.

∗P1. Process PID2

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ P1-00 P-PID2 Function

(0x18C0) Default: 0

Settings 0: Disable
1: Enable

📖 Refer to description in Pr.P0-01.

↗ P1-01 P-PID2 Ref1 Src

(0x18C1) Default: 0

↗ P1-02 P-PID2 Ref2 Src

(0x18C2) Default: 0

Settings 0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: B-PID1 Output
18: Pulse Train
19: Current Pressure Cmd

📖 Refer to description in Pr.P0-02 and P0-03.

↗ P1-03 P-PID2 Fdk1 Src

(0x18C3) Default: 0

↗ P1-04 P-PID2 Fdk2 Src

(0x18C4) Default: 0

Settings 0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

14–15: Reserve
16: B-PID1 Fdk
17: B-PID1 Output
18: Pulse Train

📖 Refer to description in Pr.P0-04 and P0-05.

P1-05 P-PID2 Ref Math

(0x18C5) Default: 0

Settings 0: Ref1
1: Ref1 + K*Ref2
2: Ref1 – K*Ref2
3: Ref1*K*Ref2
4: Ref1/K*Ref2
5: MIN(Ref1, Ref2)
6: MAX(Ref1, Ref2)
7: AVE(Ref1, Ref2)
8: K*sqrt(Ref1)
9: K*sqrt(Ref1-Ref2)
10: K*sqrt(Ref1+Ref2)
11: sqrt(Ref1)+K*sqrt(Ref2)
12: $(Ref1 – K*Ref2)^2$
13: $(Ref1)^2 + K* (Ref2)^2$

📖 Refer to description in Pr.P0-06.

P1-06 P-PID2 Ref K Gain

(0x18C6) Default: 1.00

Settings -300.00–300.00

📖 Refer to description in Pr.P0-07.

P1-07 P-PID2 Fdk Math

(0x18C7) Default: 0

Settings 0: Fdk1
1: Fdk1 + K*Fdk2
2: Fdk1 – K*Fdk2
3: Fdk1*K*Fdk2
4: Fdk1/K*Fdk2
5: MIN(Fdk1, Fdk2)
6: MAX(Fdk1, Fdk2)
7: AVE(Fdk1, Fdk2)
8: K*sqrt(Fdk1)
9: K*sqrt(Fdk1-Fdk2)
10: K*sqrt(Fdk1+Fdk2)
11: sqrt(Fdk1)+K*sqrt(Fdk2)

12: $(Fdk1 – K*Fdk2)^2$

13: $(Fdk1)^2 + K* (Fdk2)^2$

🕮 Refer to description in Pr.P0-08.

P1-08 P-PID2 Fdk K Gain

(0x18C8) Default: 1.00

Settings -300.00–300.00

🕮 Refer to description in Pr.P0-09.

P1-09 P-PID2 Decimal Point

(0x18C9) Default: 2

Settings 0: No Decimal Point

1: One Decimal Point

2: Two Decimal Point

3: Three Decimal Point

🕮 Refer to description in Pr.P0-10.

P1-10 P-PID2 Unit

(0x18CA) Default: 0

Settings Refer to Pr. P0-11

🕮 Refer to description in Pr.P0-11.

P1-11 P-PID2 Setpoint

(0x18CB) Default: 0

Settings -30000–30000 PID2 unit

🕮 Refer to description in Pr.P0-12.

P1-12 P-PID2 Setpoint Upper Limit

(0x18CC) Default: 10000

Settings -30000–30000 PID unit

P1-13 P-PID2 Setpoint Lower Limit

(0x18CD) Default: 0

Settings -30000–P1-12 setting value (PID unit)

🕮 Refer to description in Pr.P0-13 and P0-14.

P1-14 P-PID2 Setpoint Accel Time

(0x18CE) Default: 0.0

P1-15 P-PID2 Setpoint Decel Time

(0x18CF) Default: 0.0

Settings 0.0–1800.0 sec.

🕮 Refer to description in Pr.P0-15 and P0-16.

P1-16 P-PID2 Fdk Filter Time

(0x18D0) Default: 0.000

Settings 0.000–30.000 sec.

📖 Refer to description in Pr.P0-17.

P1-17 P-PID2 Setpoint Freeze Src

(0x18D1) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-18.

P1-18 P-PID2 Error OPER

(0x18D2) Default: 0

Settings 0: PID2 err = PID2 Ref – PID2 Fdk
1: PID2 err = PID2 Fdk – PID2 Ref

📖 Refer to description in Pr.P0-19.

P1-19 P-PID2 Multi Setpoint Src1

(0x18D3) Default: 0

P1-20 P-PID2 Multi Setpoint Src2

(0x18D4) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P1-21 P-PID2 Multi Setpoint1

(0x18D5) Default: 0

P1-22 P-PID2 Multi Setpoint2

(0x18D6) Default: 0

P1-23 P-PID2 Multi Setpoint3

(0x18D7) Default: 0

P1-24 P-PID2 Multi Setpoint4

(0x18D8) Default: 0

Settings -30000–30000 PID2 unit

📖 Refer to description in Pr.P0-20–P0-25.

P1-25 P-PID2 Output Upper Limit Src

(0x18D9) Default: 0

Settings 0: P-PID1 Output Upper Limit
1: P-PID2 Output
2: B-PID1 Output
3: B-PID2 Output
4: B-PID3 Output
5: B-PID4 Output

P1-26 P-PID2 Output Upper Limit

(0x18DA) Default: 60.00

Settings 0.00–600.00 Hz

P1-27 P-PID2 Output Lower Limit

(0x18DB) Default: 0.00

Settings 0.00–P1-26 setting value (Hz)

📖 Refer to description in Pr.P0-26–P0-28.

P1-28 P-PID2 P Gain

(0x18DC) Default: 1.00

Settings 0.01–100.00

📖 Refer to description in Pr.P0-29.

P1-29 P-PID2 I Time

(0x18DD) Default: 60.0

Settings 0.0–6000.0 sec.

📖 Refer to description in Pr.P0-30.

P1-30 P-PID2 D Time

(0x18DE) Default: 0.000

Settings 0.000–10.000 sec.

📖 Refer to description in Pr.P0-31.

P1-31 P-PID2 Derivative Filter

(0x18DF) Default: 0.0

Settings 0.0–10.0 sec.

📖 Refer to description in Pr.P0-32.

P1-32 P-PID2 Output Freeze Src

(0x18E0) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-33.

P1-33 P-PID2 Deadband Zone

(0x18E1) Default: 0

Settings 0–10000

P1-34 P-PID2 Deadband Delay

(0x18E2) Default: 0.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-34 and P0-35.

P1-35 P-PID2 Sleep Ref Src

(0x18E3) Default: 0

Settings 0: Disable
1: Motor FREQ
2: Fdk value

📖 Refer to description in Pr.P0-36.

P1-36 P-PID2 Sleep FREQ Level

(0x18E4) Default: 0.00

Settings Low limit Freq–High limit Freq Hz
0.00–60.00 Hz

P1-37 P-PID2 Sleep Fdk Range

(0x18E5) Default: 0.00

Settings 0.00–100.00%

P1-38 P-PID2 Sleep Delay Time

(0x18E6) Default: 60.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-37–P0-39.

P1-39 P-PID2 Sleep Boost Time

(0x18E7) Default: 0.0

Settings 0.0–3600.0 sec.

P1-40 P-PID2 Sleep Boost Value

(0x18E8) Default: 0

Settings 0–30000 PID2 unit

📖 Refer to description in Pr.P0-40–P0-41.

P1-41 P-PID2 Wake Error Level

(0x18E9) Default: 0

Settings 0–10000 PID2 unit

P1-42 P-PID2 Wake Delay Time

(0x18EA) Default: 0.50

Settings 0.00–60.00 PID2 unit

📖 Refer to description in Pr.P0-42–P0-43.

P1-43 P-PID2 Track Enable Src

(0x18EB) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P1-44 P-PID2 Track Ref Src

(0x18EC) Default: 0

Settings 0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve

📖 Refer to description in Pr.P0-44–P0-45.

P1-45 P-PID2 Output Delay Time

(0x18ED) Default: 0.000

Settings 0.000–30.000 sec.

📖 Refer to description in Pr.P0-46.

P1-46 P-PID2 Fdk Error Indn

(0x18EE) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay10–15
16–19: Reserve

Refer to description in Pr.P0-47.

P2. Basic PID1

You can set this parameter during operation

P2-00 B-PID1 Function

(0x1900) Default: 0

Settings
0: Disable
1: Enable
2: Enable after Run

Refer to description in Pr.P0-01.

P2-01 B-PID1 Ref Src

(0x1901) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: Pulse Train

Refer to description in Pr.P0-02.

P2-02 B-PID1 Fdk Src

(0x1902) Default: 0

Settings
0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Pulse Train

Refer to description in Pr.P0-04.

P2-03 B-PID1 Setpoint

(0x1903) Default: 0

Settings -30000–30000 PID unit

🕮 Refer to description in Pr.P0-12.

P2-04 B-PID1 Setpoint Upper Limit

(0x1904) Default: 10000

P2-05 B-PID1 Setpoint Lower Limit

(0x1905) Default: 0

Settings -30000–30000 PID unit

🕮 Refer to description in Pr.P0-13 and P0-14.

P2-06 B-PID1 Fdk Filter Time

(0x1906) Default: 0.000

Settings 0.000–30.000 sec.

🕮 Refer to description in Pr.P0-17.

P2-07 B-PID1 Error OPER

(0x1907) Default: 0

Settings 0: PID1 err = PID1 Ref – PID1 Fdk
1: PID1 err = PID1 Fdk – PID1 Ref

🕮 Refer to description in Pr.P0-19.

P2-08 B-PID1 Multi Setpoint Src1

(0x1908) Default: 0

P2-09 B-PID1 Multi Setpoint Src2

(0x1909) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P2-10 B-PID1 Multi Setpoint1

(0x190A) Default: 0

P2-11 B-PID1 Multi Setpoint2

(0x190B) Default: 0

P2-12 B-PID1 Multi Setpoint3

(0x190C) Default: 0

P2-13 B-PID1 Multi Setpoint4

(0x190D) Default: 0

Settings -30000–30000 PID1 unit

🕮 Refer to description in Pr.P0-20–P0-25.

P2-14 B-PID1 Output Upper Limit

(0x190E) Default: 10000

P2-15 B-PID1 Output Lower Limit

(0x190F) Default: 0

Settings -30000–30000

📖 Refer to description in Pr.P0-27–P0-28.

P2-16 B-PID1 P Gain

(0x1910) Default: 1.00

Settings 0.01–100.00

📖 Refer to description in Pr.P0-29.

P2-17 B-PID1 I Time

(0x1911) Default: 60.0

Settings 0.0–6000.0 sec.

📖 Refer to description in Pr.P0-30.

P2-18 B-PID1 D Time

(0x1912) Default: 0.000

Settings 0.000–10.000 sec.

📖 Refer to description in Pr.P0-31.

P2-19 B-PID1 Derivative Filter

(0x1913) Default: 0.0

Settings 0.0–10.0 sec.

📖 Refer to description in Pr.P0-32.

P2-20 B-PID1 Output Freeze Src

(0x1914) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-33.

P2-21 B-PID1 Deadband Zone

(0x1915) Default: 0

Settings 0–10000

P2-22 B-PID1 Deadband Delay

(0x1916) Default: 0.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-34 and P0-35.

P2-23 B-PID1 Output AO Sel

(0x1917) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Use this parameter to select analog output terminals that are defined as “Basic PID1 output”.

📖 The upper limit of Pr.P2-14 B-PID1 output is 100%.

∗P3. Basic PID2

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ P3-00 B-PID2 Function

(0x1940) Default: 0

Settings
0: Disable
1: Enable
2: Enable after Run

🕮 Refer to description in Pr.P0-01.

↗ P3-01 B-PID2 Ref Src

(0x1941) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: Pulse Train

🕮 Refer to description in Pr.P0-02.

↗ P3-02 B-PID2 Fdk Src

(0x1942) Default: 0

Settings
0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Pulse Train

🕮 Refer to description in Pr.P0-04.

P3-03 B-PID2 Setpoint

(0x1943) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-12.

P3-04 B-PID2 Setpoint Upper Limit

(0x1944) Default: 10000

P3-05 B-PID2 Setpoint Lower Limit

(0x1945) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-13 and P0-14.

P3-06 B-PID2 Fdk Filter Time

(0x1946) Default: 0.000

Settings 0.000–30.000 sec.

📖 Refer to description in Pr.P0-17.

P3-07 B-PID2 Error OPER

(0x1947) Default: 0

Settings 0: PID1 err = PID1 Ref – PID1 Fdk
1: PID1 err = PID1 Fdk – PID1 Ref

📖 Refer to description in Pr.P0-19.

P3-08 B-PID2 Multi Setpoint Src1

(0x1948) Default: 0

P3-09 B-PID2 Multi Setpoint Src2

(0x1949) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P3-10 B-PID2 Multi Setpoint1

(0x194A) Default: 0

P3-11 B-PID2 Multi Setpoint2

(0x194B) Default: 0

P3-12 B-PID2 Multi Setpoint3

(0x194C) Default: 0

P3-13 B-PID2 Multi Setpoint4

(0x194D) Default: 0

Settings -30000–30000 PID unit

Refer to description in Pr.P0-20–P0-25.

P3-14 B-PID2 Output Upper Limit

(0x194E) Default: 10000

P3-15 B-PID2 Output Lower Limit

(0x194F) Default: 0

Settings -30000–30000 Hz

Refer to description in Pr.P0-27–P0-28.

P3-16 B-PID2 P Gain

(0x1950) Default: 1.00

Settings 0.01–100.00

Refer to description in Pr.P0-29.

P3-17 B-PID2 I Time

(0x1951) Default: 60.0

Settings 0.0–6000.0 sec.

Refer to description in Pr.P0-30.

P3-18 B-PID2 D Time

(0x1952) Default: 0.000

Settings 0.000–10.000 sec.

Refer to description in Pr.P0-31.

P3-19 B-PID2 Derivative Filter

(0x1953) Default: 0.0

Settings 0.0–10.0 sec.

Refer to description in Pr.P0-32.

P3-20 B-PID2 Output Freeze Src

(0x1954) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-33.

P3-21 B-PID2 Deadband Zone

(0x1955) Default: 0

Settings 0–10000

P3-22 B-PID2 Deadband Delay

(0x1956) Default: 0.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-34 and P0-35.

P3-23 B-PID2 Output AO Sel

(0x1957) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Refer to description in Pr.P2-23.

∗P4. Basic PID3

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ P4-00 B-PID3 Function

(0x1980) Default: 0

Settings
0: Disable
1: Enable
2: Enable after Run

🕮 Refer to description in Pr.P0-01.

↗ P4-01 B-PID3 Ref Src

(0x1981) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: Pulse Train

🕮 Refer to description in Pr.P0-02.

↗ P4-02 B-PID3 Fdk Src

(0x1982) Default: 0

Settings
0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Pulse Train

🕮 Refer to description in Pr.P0-04.

P4-03 B-PID3 Setpoint

(0x1983) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-12.

P4-04 B-PID3 Setpoint Upper Limit

(0x1984) Default: 10000

P4-05 B-PID3 Setpoint Lower Limit

(0x1985) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-13 and P0-14.

P4-06 B-PID3 Fdk Filter Time

(0x1986) Default: 0.000

Settings 0.000–30.000 sec.

📖 Refer to description in Pr.P0-17.

P4-07 B-PID3 Error OPER

(0x1987) Default: 0

Settings 0: PID1 err = PID1 Ref – PID1 Fdk
1: PID1 err = PID1 Fdk – PID1 Ref

📖 Refer to description in Pr.P0-19.

P4-08 B-PID3 Multi Setpoint Src1

(0x1988) Default: 0

P4-09 B-PID3 Multi Setpoint Src2

(0x1989) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P4-10 B-PID3 Multi Setpoint1

(0x198A) Default: 0

P4-11 B-PID3 Multi Setpoint2

(0x198B) Default: 0

P4-12 B-PID3 Multi Setpoint3

(0x198C) Default: 0

P4-13 B-PID3 Multi Setpoint4

(0x198D) Default: 0

Settings -30000–30000 PID3 unit

📖 Refer to description in Pr.P0-20–P0-25.

P4-14 B-PID3 Output Upper Limit

(0x198E) Default: 10000

P4-15 B-PID3 Output Lower Limit

(0x198F) Default: 0

Settings -30000–30000

📖 Refer to description in Pr.P0-27–P0-28.

P4-16 B-PID3 P Gain

(0x1990) Default: 1.00

Settings 0.01–100.00

📖 Refer to description in Pr.P0-29.

P4-17 B-PID3 I Time

(0x1991) Default: 60.0

Settings 0.0–6000.0 sec.

📖 Refer to description in Pr.P0-30.

P4-18 B-PID3 D Time

(0x1992) Default: 0.000

Settings 0.000–10.000 sec.

📖 Refer to description in Pr.P0-31.

P4-19 B-PID3 Derivative Filter

(0x1993) Default: 0.0

Settings 0.0–10.0 sec.

📖 Refer to description in Pr.P0-32.

P4-20 B-PID3 Output Freeze Src

(0x1994) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve

10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-33.

P4-21 B-PID3 Deadband Zone

(0x1995) Default: 0

Settings 0–10000

P4-22 B-PID3 Deadband Delay

(0x1996) Default: 0.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-34 and P0-35.

P4-23 B-PID3 Output AO Sel

(0x1997) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Refer to description in Pr.P2-23.

∗P5. Basic PID4

↗ You can set this parameter during operation

∗ Advanced parameters, set Pr.b0-00 to unlock

↗ P5-00 B-PID4 Function

(0x19C0) Default: 0

Settings
0: Disable
1: Enable
2: Enable after Run

📖 Refer to description in Pr.P0-01.

↗ P5-01 B-PID4 Ref Src

(0x19C1) Default: 0

Settings
0: Disable
1: Keypad
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Multi Setpoint
17: Pulse Train

📖 Refer to description in Pr.P0-02.

↗ P5-02 B-PID4 Fdk Src

(0x19C2) Default: 0

Settings
0: Disable
1: Reserve
2: RS-485
3: USB
4: COM Card
5–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11
14–15: Reserve
16: Pulse Train

📖 Refer to description in Pr.P0-04.

P5-03 B-PID4 Setpoint

(0x19C3) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-12.

P5-04 B-PID4 Setpoint Upper Limit

(0x19C4) Default: 10000

P5-05 B-PID4 Setpoint Lower Limit

(0x19C5) Default: 0

Settings -30000–30000 PID unit

📖 Refer to description in Pr.P0-13 and P0-14.

P5-06 B-PID4 Fdk Filter Time

(0x19C6) Default: 0.000

Settings 0.000–30.000 sec.

📖 Refer to description in Pr.P0-17.

P5-07 B-PID4 Error OPER

(0x19C7) Default: 0

Settings 0: PID1 err = PID1 Ref – PID1 Fdk
1: PID1 err = PID1 Fdk – PID1 Ref

📖 Refer to description in Pr.P0-19.

P5-08 B-PID4 Multi Setpoint Src1

(0x19C8) Default: 0

P5-09 B-PID4 Multi Setpoint Src2

(0x19C9) Default: 0

Settings 0: OFF
1: ON
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

P5-10 B-PID4 Multi Setpoint1

(0x19CA) Default: 0

P5-11 B-PID4 Multi Setpoint2

(0x19CB) Default: 0

P5-12 B-PID4 Multi Setpoint3

(0x19CC) Default: 0

P5-13 B-PID4 Multi Setpoint4

(0x19CD) Default: 0

Settings -30000–30000 PID4 unit

📖 Refer to description in Pr.P0-20–P0-25.

P5-14 B-PID4 Output Upper Limit

(0x19CE) Default: 10000

P5-15 B-PID4 Output Lower Limit

(0x19CF) Default: 0

Settings -30000–30000

📖 Refer to description in Pr.P0-27–P0-28.

P5-16 B-PID4 P Gain

(0x19D0) Default: 1.00

Settings 0.01–100.00

📖 Refer to description in Pr.P0-29.

P5-17 B-PID4 I Time

(0x19D1) Default: 60.0

Settings 0.0–6000.0 sec.

📖 Refer to description in Pr.P0-30.

P5-18 B-PID4 D Time

(0x19D2) Default: 0.000

Settings 0.000–10.000 sec.

📖 Refer to description in Pr.P0-31.

P5-19 B-PID4 Derivative Filter

(0x19D3) Default: 0.0

Settings 0.0–10.0 sec.

📖 Refer to description in Pr.P0-32.

P5-20 B-PID4 Output Freeze Src

(0x19D4) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15
16–25: Reserve
26–28: Time Function 1–3
29–30: Reserve
31–38: Monitor 1–8

📖 Refer to description in Pr.P0-33.

P5-21 B-PID4 Deadband Zone

(0x19D5) Default: 0

Settings 0–10000

P5-22 B-PID4 Deadband Delay

(0x19D6) Default: 0.0

Settings 0.0–3600.0 sec.

📖 Refer to description in Pr.P0-34 and P0-35.

P5-23 B-PID4 Output AO Sel

(0x19D7) Default: 0

Settings 0: Disable
1–2: AO1–AO2
3–4: Reserve
5–6: AO10–AO11

📖 Refer to description in Pr.P2-23.

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U. Industry

U0. Pump Function

You can set this parameter during operation

U0-00 Circulation Control

(0x1B00) Default: 0

Settings
0: Disable
1: Time Circulation
2: QTY Circulation
3: QTY Control
4: QTY + Time Circulation
5: QTY Control + Time Circulation

- Setting 1: Under multi-pump operation, the pump circulation system is set according to the pump running time. One AC motor drive supports up to eight pumps control at a time, each pump is switched according to a fixed operation time and switching delay time. The following Diagram 1 demonstrates Time Circulation Application, and Table 1 lists related parameters for the pump circulation mode.
- Setting 2: With multiple pumps , the pump circulation system is carried out according to the flow demand. One AC motor drive supports up to four pumps control to expand the controlled flow or pressure range (refer to Diagram 2 Quantitative Circulation Application) and can execute PID operation with flow or pressure feedback signals. When controlling the flow, the pumps are in parallel connection; when controlling the pressure range, the pumps are in serial connection. Therefore, the pump is turned on or off according to the flow demand.
- Setting 3: With multiple pumps , the pump circulation system is carried out according to the flow demand. One AC motor drive supports up to eight pumps control to expand the controlled flow or pressure range (refer to Diagram 3 Quantitative Control Application). The drive can also execute PID operation with the flow and pressure feedback signal. When controlling the flow, the pumps are in parallel connection; when controlling the pressure range, the pumps are in serial connection. In addition, the AC motor drive controls one master pump in this mode, and the rest are supplied by the mains power to the auxiliary pumps.
- Setting 2 and 3: Suitable for applications where the AC motor drive controls cascaded pumps. The advantage is using a drive with lower power to control a wide range of flow or pressure so that the pump does not run all the time, and to reduce abrasion.
- Setting 4: Executes time-circulation under the quantitative circulation, so that the AC motor drive can run the idle pumps regularly (controls up to four sets of pumps) to achieve the average use and to prolong the life of each pump, also to avoid rust damage caused by a specific pump not being used for a long time.
- Setting 5: Executes time-circulation under the quantitative circulation, so that the AC motor drive can run the idle pumps periodically through the output contact lapping the mains power (controls up to eight sets of pumps) to achieve the average use and to prolong the life of each pump, also to avoid rust damage caused by a specific pump not being used for a long time.

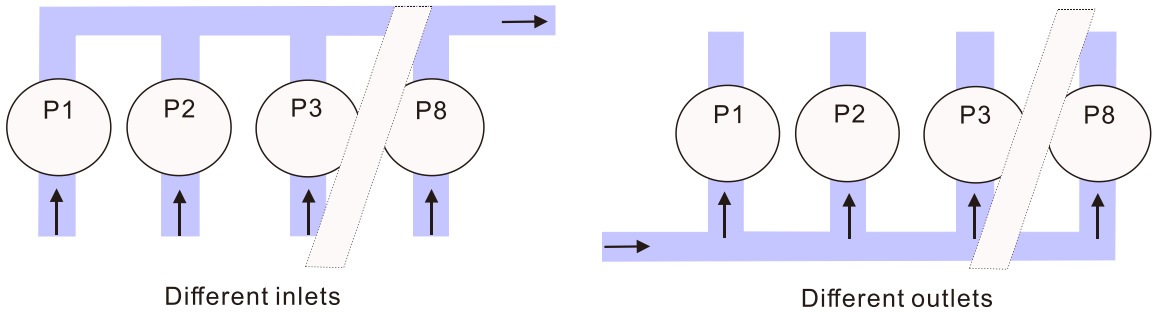


Diagram 1: Multi Inlets / Outlets Pump Application

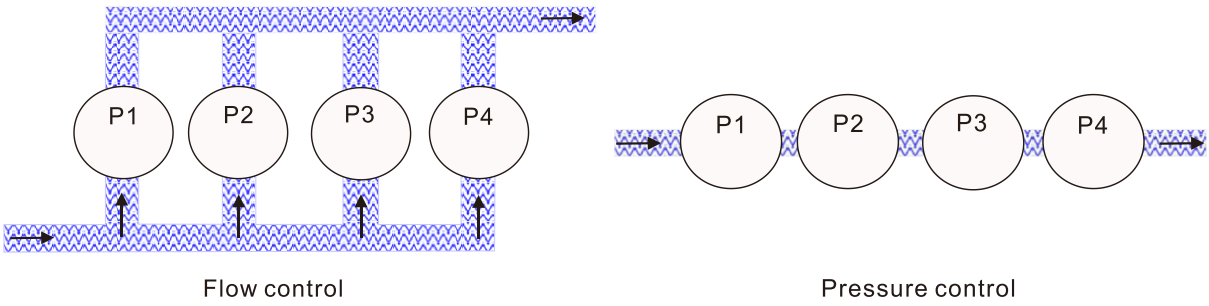


Diagram 2: QTY Circulation Application

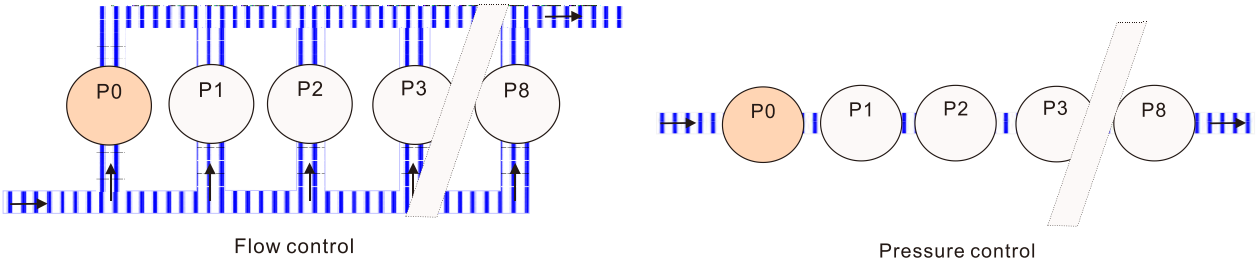


Diagram 3: QTY Control Application

Pr.	Pump Circulation Related Parameters					
U0-00 Circulation Control	0 Disable	1 Time Circulation	2 QTY Circulation	3 QTY Control	4 QTY + Time Circulation	5 QTY Control + Time Circulation
U0-01 Number of Pump	N/A	V	V	V	V	V
U0-02 Pump Status Word		V	V	V	V	V
U0-03 Pump Switch Type		V	-	-	V	V
U0-04 Circulation Time		V	-	-	V	V
U0-05 Time Circulation Switch Delay		V	-	-	-	-
U0-06 Time Circulation Output Delay		V	-	-	-	-

Pr.	Pump Circulation Related Parameters					
U0-07 AUX Pump Active FREQ Level		-	V	V	V	V
U0-08 AUX Pump Active Check Time		-	V	V	V	V
U0-09 AUX Pump Active Delay Time		-	V	-	V	V
U0-10 QTY Circulation Output Delay		-	V	-	V	-
U0-11 AUX Pump Deactive FREQ Level		-	V	-	V	-
U0-12 AUX Pump Deactive Check Time		-	V	V	V	V
U0-13 QTY Circulation Fault Action		-	V	-	V	-
U0-14 Output FREQ Reached Range		-	-	-	V	V
U0-15–U0-22 Pump 1–8 Output Enable Sel		V	V	V	V	V
U0-23–U0-31 Pump 1–8 Stop MI Src		V	V	V	V	V
U0-32–Uo-39 Pump 1–8 Operating Time		V	V	V	V	V
U0-40 Pump Operating Time Erase		V	V	V	V	V
A2-00 Stop Method		V	-	-	-	-
C2-19 FREQ Lower Limit		-	-	V	-	V

Table 1 Pump Circulation Related Parameters

U0-01 Number of Pump

(0x1B01) Default: 1

Settings 1–8

- According to Pr.U0-00 Circulation Control, Pr.U0-01 controls up to eight sets of pumps. After setting, the output terminal configuration of pump 1–8 automatically changes to the corresponding output content (refer to Table 2) and overwrites the previous set output terminal function. For example, when you set four sets of pumps, Pr.U0-15–U0-18 automatically correspond to 1 (RY1)–4 (MO2), and the rest of parameters (Pr.U0-19–U0-22) are set as 0 (Disable).
- When the setting for Pr.U0-01 is changed again (for example, changes from 4 to 2), Pr.U0-15 and U0-22 return to the default value listed in the Table 2 (column U0-01 number of pumps 02).

U0-01 Number of Pump	01	02	03	04	05	06	07	08
U0-15 Pump 1 Output Enable Sel	1 (RY1)	1 (RY1)	1 (RY1)	1 (RY1)	1 (RY1)	1 (RY1)	1 (RY1)	1 (RY1)
U0-16 Pump 2 Output Enable Sel	0	2 (RY2)	2 (RY2)	2 (RY2)	2 (RY2)	2 (RY2)	2 (RY2)	2 (RY2)

U0-01 Number of Pump	01	02	03	04	05	06	07	08
U0-17 Pump 3 Output Enable Sel	0	0	3 (MO1)	3 (MO1)	3 (MO1)	3 (MO1)	3 (MO1)	3 (MO1)
U0-18 Pump 4 Output Enable Sel	0	0	0	4 (MO2)	4 (MO2)	4 (MO2)	4 (MO2)	4 (MO2)
U0-19 Pump 5 Output Enable Sel	0	0	0	0	10 (RY10)	10 (RY10)	10 (RY10)	10 (RY10)
U0-20 Pump 6 Output Enable Sel	0	0	0	0	0	11 (RY11)	11 (RY11)	11 (RY11)
U0-21 Pump 7 Output Enable Sel	0	0	0	0	0	0	12 (RY12)	12 (RY12)
U0-22 Pump 8 Output Enable Sel	0	0	0	0	0	0	0	13 (RY13)

Table 2: Setting of Multi-function Output Terminal for Circulating Motors

U0-02 Pump Status Word

(0x1B02) Default: Read only

Settings 0–0xFFFF

- Pump operation status display bits. Displays the drive operation command to start or stop the multi-pump control function.
- bit0: Start or stop pump circulation mode.
- bit1–8: Current available pump number of the multi-pump system.
- bit9–10: The pressure increments or pressure decrement demand of multi-pump control, set as 0 when the pressure is balanced. bit00 is no demand, 01 means high demand and 10 means low demand.
- bit11: Pump operation basis.

bit	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
OFF	Pump 8 OFF	Pump 7 OFF	Pump 6 OFF	Pump 5 OFF	Pump 4 OFF	Pump 3 OFF	Pump 2 OFF	Pump 1 OFF	Pump circulation mode OFF
ON	Pump 8 ON	Pump 7 ON	Pump 6 ON	Pump 5 ON	Pump 4 ON	Pump 3 ON	Pump 2 ON	Pump 1 ON	Pump circulation mode ON

bit	bit 11	bit 10	bit 9
OFF	Pump runs in sequence	Pump balanced	Pump balanced
ON	Pump runs by time	Low pressure increment demand	High pressure increment demand

U0-03 Pump Switch Type

(0x1B03) Default: 0

Settings 0: by the sequence

1: by the least running Time

- Through selecting the logic of priority switching to achieve the purpose of using multiple motors on average in the pump circulation system.
- The priority of the terminal sequence is to match the corresponding multi-function output terminals in each circulation control mode (Pr.U0-00 = 1–5).
- Minimum operation time: Starts in the order from the motor with the minimum operating hours among all running motors.
- The minimum operation time is only applicable for operation time record under Time Circulation Mode, as listed in the table below.

Pump Switch Type / Circulation Control	Terminal order	Minimum operation time
Time Circulation	V	V
QTY Circulation	V	-
QTY Control	V	-
QTY + Time Circulation	V	V
QTY Control + Time Circulation	V	V

- When Pr.U0-00 (Circulation Control) = 1–5, you can choose to record the operation time with the priority of the terminal sequence.
- When Pr.U0-00 (Circulation Control) = 2–3, you can only choose the priority of the terminal sequence. When the minimum operation time priority is selected, it is an invalid selection.
- When the circulation control is enabled (Pr.U0-00 ≠ 0) and the setting for Pr.U0-03 is changed before the drive runs, the output terminal immediately changes; accordingly, in the contrary, when the circulation control is enabled (Pr.U0-00 ≠ 0) and the setting for Pr.U0-03 is changed after the drive runs, the output terminal status will be valid in the next circulation.
- When the minimum operation time is enabled, the drive sorts the operation hours according to the amount of running motors at the moment, and then choose the motor that has the minimum operation hour to start after RUN command.

  As Example 1 below shows, the drive starts Motor 2, which having the minimum operation time among all eight motors.

  As Example 2 below shows, the drive only starts Motor 1 to Motor 5. Motor 8 does not start despite having the minimum operation time. Moreover, if more than one motor has the same minimum operation hour, the number of the motor takes the priority. Therefore, Motor 3 starts rather than Motor 5.

Motor operation time-Example 1

Motor No. / Motor Status	Status	Hour	Min./Sec.
Motor 1	ON	0	59 59
Motor 2	ON	0	12 12
Motor 3	ON	2	00 00
Motor 4	ON	0	43 11
Motor 5	ON	1	33 00
Motor 6	ON	3	50 05
Motor 7	ON	1	05 22
Motor 8	ON	10	20 21

Motor operation time-Example 2

Motor No. / Motor Status	Status	Hour	Min./Sec.
Motor 1	ON	0	59 59
Motor 2	ON	5	12 12
Motor 3	ON	0	33 00
Motor 4	ON	0	43 11
Motor 5	ON	0	33 00
Motor 6	OFF	3	50 05
Motor 7	OFF	1	05 22
Motor 8	OFF	0	00 21

Table 3 Example for Pump Circulation Priority Selection (U0-03)

U0-04 Circulation Time

(0x1B04) Default: 0

Settings 0–65000 min.

📖 Sets the fixed time for circulation, the unit is minutes. If Pr.U0-04 = 0, stop the timing. The currently running motors continue operating until a Stop command is given.

U0-05 Time Circulation Switch Delay

(0x1B05) Default: 0.1

Settings 0.1–3600.0 sec.

U0-06 Time Circulation Output Delay

(0x1B06) Default: 1.0

Settings 1.0–100.0 sec.

📖 Under time circulation, when the current pump operates for the time of Pr.U0-04 and lasts for the switch delay time of Pr.U0-05 and the output delay time of Pr.U0-06, the next pump operates continuously.

📖 When the output terminal is switched, the U, V and W output side of the drive may output without completely connected due to the system hardware delay effect. Ensure that the UVW output side of the drive is completely connected by setting Pr.U0-06 (Time Circulation Output Delay), and to avoid over current of the drive.

U0-07 AUX Pump Active FREQ Level

(0x1B07) Default: 60.00

Settings 0.00–599.00 Hz

In quantitative circulation, quantitative control, Qty circulation + time circulation and Qty control + time circulation, the auxiliary pump active frequency level is required for the AC motor drive to drive the master pump.

U0-08 AUX Pump Active Check Time

(0x1B08) Default: 10.0

Settings 1.0–3600.0 sec.

In quantitative circulation, quantitative control, Qty circulation + time circulation and Qty control + time circulation, when the AC motor drive drives the Master pump and reaches Pr.U0-07 (AUX Pump Active FREQ Level) and Pr.U0-08 (AUX Pump Active Check Time), the auxiliary pump is started for pressurization.

U0-09 AUX Pump Active Delay Time

(0x1B09) Default: 1.0

Settings 1.0–3600.0 sec.

Sets the pump switching delay time for the Qty circulation pressurization or Qty circulation and Qty control + time circulation voltage stabilization.

U0-10 QTY Circulation Output Delay

(0x1B0A) Default: 1.0

Settings 1.0–100.0 sec.

Sets the output delay time before the drive starts the Master pump under Qty circulation or Qty circulation + time circulation.

U0-11 AUX Pump Deactive FREQ Level

(0x1B0B) Default: 0.00

Settings 0.00–599.00 Hz

Turn off the judging frequency of the auxiliary pump when decreasing pressure in QTY circulation or QTY + Time circulation mode.

U0-12 AUX Pump Deactive Check Time

(0x1B0C) Default: 1.0

Settings 1.0–3600.0 sec.

In quantitative circulation and Qty circulation + time circulation, when the drive output frequency is lower than Pr.U0-11 (AUX Pump Deactive FREQ Level) and Pr.U0-12 (AUX Pump Deactive Check Time), deactivate the auxiliary pump for pressurization.

In quantitative circulation and Qty control + time circulation, when the drive output frequency is lower than Pr.C2-19 (FREQ Lower Limit) and Pr.U0-12 (AUX Pump Deactive Check Time), deactivate the auxiliary pump for pressurization.

U0-13 QTY Circulation Fault Action

(0x1B0D) Default: 0

Settings 0: Stop All Pumps
1: Stop MAS Pump

📖 When a fault errors to the drive under Qty circulation or Qty circulation + time circulation mode, stop the pump according to the fault action.

U0-14 Output FREQ Reached Range

(0x1B0E) Default: 1.00

Settings 0.00–100.00%

📖 In Qty circulation + time circulation or Qty control + time circulation mode, when the output frequency reaches the range of (1± output frequency reached range) × frequency command and continues to exceed the pump circulation setting, it is judged as voltage stabilization and enters time circulation mode. Switch the current pump to the idle pump according to Pr.U0-03 (Pump Switch Type).

U0-15 Pump 1 Output Enable Sel

(0x1B0F) Default: 0

U0-16 Pump 2 Output Enable Sel

(0x1B10) Default: 0

U0-17 Pump 3 Output Enable Sel

(0x1B11) Default: 0

U0-18 Pump 4 Output Enable Sel

(0x1B12) Default: 0

U0-19 Pump 5 Output Enable Sel

(0x1B13) Default: 0

U0-20 Pump 6 Output Enable Sel

(0x1B14) Default: 0

U0-21 Pump 7 Output Enable Sel

(0x1B15) Default: 0

U0-22 Pump 8 Output Enable Sel

(0x1B16) Default: 0

Settings 0: Disable
1–2: Relay1–Relay2
3–4: MO1–MO2
5–9: Reserve
10–15: MO/Relay 10–15
16–19: Reserve

📖 Pump 1–8 output enable selection can flexibly enable, disable, or specify the output according to the setting.

📖 When Pr.U0-00 (Circulation Control) is set, the output terminal configuration of pump 1–8 automatically changes to the corresponding output content and overwrites the previous set output terminal function (refer to description in Pr.U0-01).

🕮 Relay 1–2 and MO1–MO2 are control board multi-function (contact, photo coupler) output terminals; MO/ Relay 10–15 are extension card multi-function output terminals (contact, photo coupler).

U0-23 Pump 1 Stop MI Src

(0x1B17) Default: 0

U0-24 Pump 2 Stop MI Src

(0x1B18) Default: 0

U0-25 Pump 3 Stop MI Src

(0x1B19) Default: 0

U0-26 Pump 4 Stop MI Src

(0x1B1A) Default: 0

U0-27 Pump 5 Stop MI Src

(0x1B1B) Default: 0

U0-28 Pump 6 Stop MI Src

(0x1B1C) Default: 0

U0-29 Pump 7 Stop MI Src

(0x1B1D) Default: 0

U0-30 Pump 8 Stop MI Src

(0x1B1E) Default: 0

U0-31 Multi Pump Stop MI Src

(0x1B1F) Default: 0

Settings 0: Disable
1: Enable
2–7: MI1–MI6
8–9: Reserve
10–15: MI10–MI15

🕮 Multi-pump circulation control can stop up to 8 motors. When the controlled motor fails or needs to be repaired, you can stop a single, multiple or all pumps through the setting of digital input terminal (refer to Table 4). You can enable this function by setting parameters or by the MI terminal.

🕮 MI1–MI6 are control board multi-function input terminals; MI10–MI15 are IO extension card multi-function input terminals.

🕮 When the specified digital input terminal is ON, the corresponded motor stops immediately and does not affect other operating motors.

🕮 When select multi pump stop MI source (for example, as MI1), when MI1 is OFF, the pump is ON. When MI1 is ON, the pump is OFF and the operating motor coasts to stop.

🕮 If the circulated pump turns off the motor (MI ON) before or during the circulation, when it takes turn to the stopped motor, the circulated pump skips it and runs to the next motor in sequence. If you turn on the stopped motor (MI OFF) before next circulation, it operates in sequence.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	5	6	7	8	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

Table 4 Correspondence between digital input terminal and pump stop

U0-32 Pump 1 Operating Time

(0x1B20) Default: Read only

U0-33 Pump 2 Operating Time

(0x1B22) Default: Read only

U0-34 Pump 3 Operating Time

(0x1B24) Default: Read only

U0-35 Pump 4 Operating Time

(0x1B26) Default: Read only

U0-36 Pump 5 Operating Time

(0x1B28) Default: Read only

U0-37 Pump 6 Operating Time

(0x1B2A) Default: Read only

U0-38 Pump 7 Operating Time

(0x1B2C) Default: Read only

U0-39 Pump 8 Operating Time

(0x1B2E) Default: Read only

Settings H-word: 65535 → 65535 hours
L-word: 05959 → 59 minutes/ 59 seconds

- 🕮 Records operation time for Pump 1–8, each parameter fully records hours: minutes: seconds.
- 🕮 When circulation control is enabled (Pr.U0-00 ≠ 0), the output frequency is > 0 Hz and output current is > 0 A, the motor operation time is recorded.
- 🕮 When the record reaches the upper limit 65535 hours (about 7.5 years), clear the motor operation time manually to keep tracking the operation status of each motor and the service life of the motor.
- 🕮 Pr.b0-01 (Parameter reset) does not clear the pump operation time record, you can only clear this record through Pr.U0-40.

U0-40 Pump Operating Time Erase

(0x1B30) Default: 0

Settings 0: Disable
1: Erase Pump1 Operating Time
2: Erase Pump2 Operating Time
3: Erase Pump3 Operating Time
4: Erase Pump4 Operating Time
5: Erase Pump5 Operating Time
6: Erase Pump6 Operating Time
7: Erase Pump7 Operating Time

8: Erase Pump8 Operating Time

10: Erase all Pumps Operating Time

- Clear the operation time for single pump or all pumps as needed.
- When setting 1, Pump 1 operation time returns to zero; when setting 10, all the operation time of Pump 1–8 return to zero, refer to Table 5.
- When the parameters are set and the pump operation time is erased, the parameter value automatically changes to 0. For example, when Pr.U0-40 is set as 1 and Pump 1 operation time is cleared, Pr.U0-32 and Pr.U0-40 return to the default 0.
- When the circulation control is enabled (Pr.U0-00 ≠ 0) and the setting is changed before the drive runs (Pr.U0-03 = 1 by the least running time and Pr.U0-40 = 10), the output terminal immediately changes the first starting priority to Pump 0; in the contrary, when the circulation control is enabled (Pr.U0-00≠0) and the setting is changed after the drive runs (Pr.U0-03 = 1 by the least running time and Pr.U0-40 = 10), the output terminal status will be valid in the next circulation, and the one with the smaller serial number will take priority.

Pump	Pump Operating Time (Operated hour: minute: second)	Pump Operating Time Erase
Pump 1	U0-32	U0-40 = 1 (Clear Pump 1)
Pump 2	U0-33	U0-40 = 2 (Clear Pump 2)
Pump 3	U0-34	U0-40 = 3 (Clear Pump 3)
Pump 4	U0-35	U0-40 = 4 (Clear Pump 4)
Pump 5	U0-36	U0-40 = 5 (Clear Pump 5)
Pump 6	U0-37	U0-40 = 6 (Clear Pump 6)
Pump 7	U0-38	U0-40 = 7 (Clear Pump 7)
Pump 8	U0-39	U0-40 = 8 (Clear Pump 8)
All pumps	N/A	U0-40 = 10 (Clear all pumps)

Table 5 Pump operation time and time erase

Circulation Control Mode

1. Time Circulation

- After the function enables, the pump operates according to the setting for Pr.U0-04 (Circulation Time). When the operation time is up, it executes the stop command and disconnects the output terminal. After the time of Pr.U0-05 (Time Circulation Switch Delay) and Pr.U0-06 (Time Circulation Output Delay), it connects the next sequence motor and starts to run to the target frequency (refer to Figure 4, 5, and 6), and repeat the circulation.
- The time circulation ramps to stop or coasts to stop according to the setting for Pr.A2-00 (Stop Method). When setting coast to stop, it is recommended to enable the speed tracking function to avoid over current of the drive caused by the motor rotor running freely.

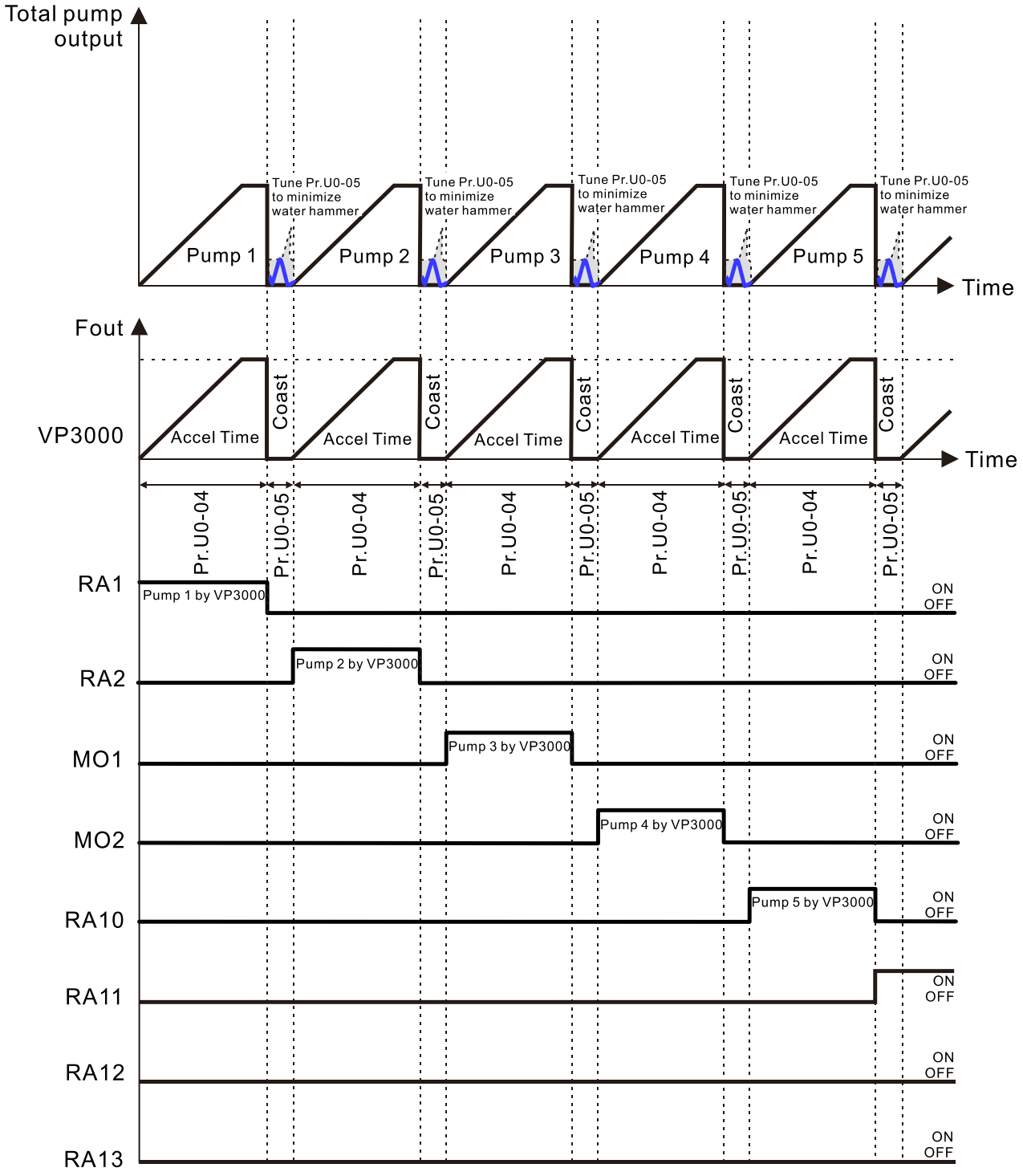


Figure 4 Time Circulation Terminal Sequence (Coast to stop)

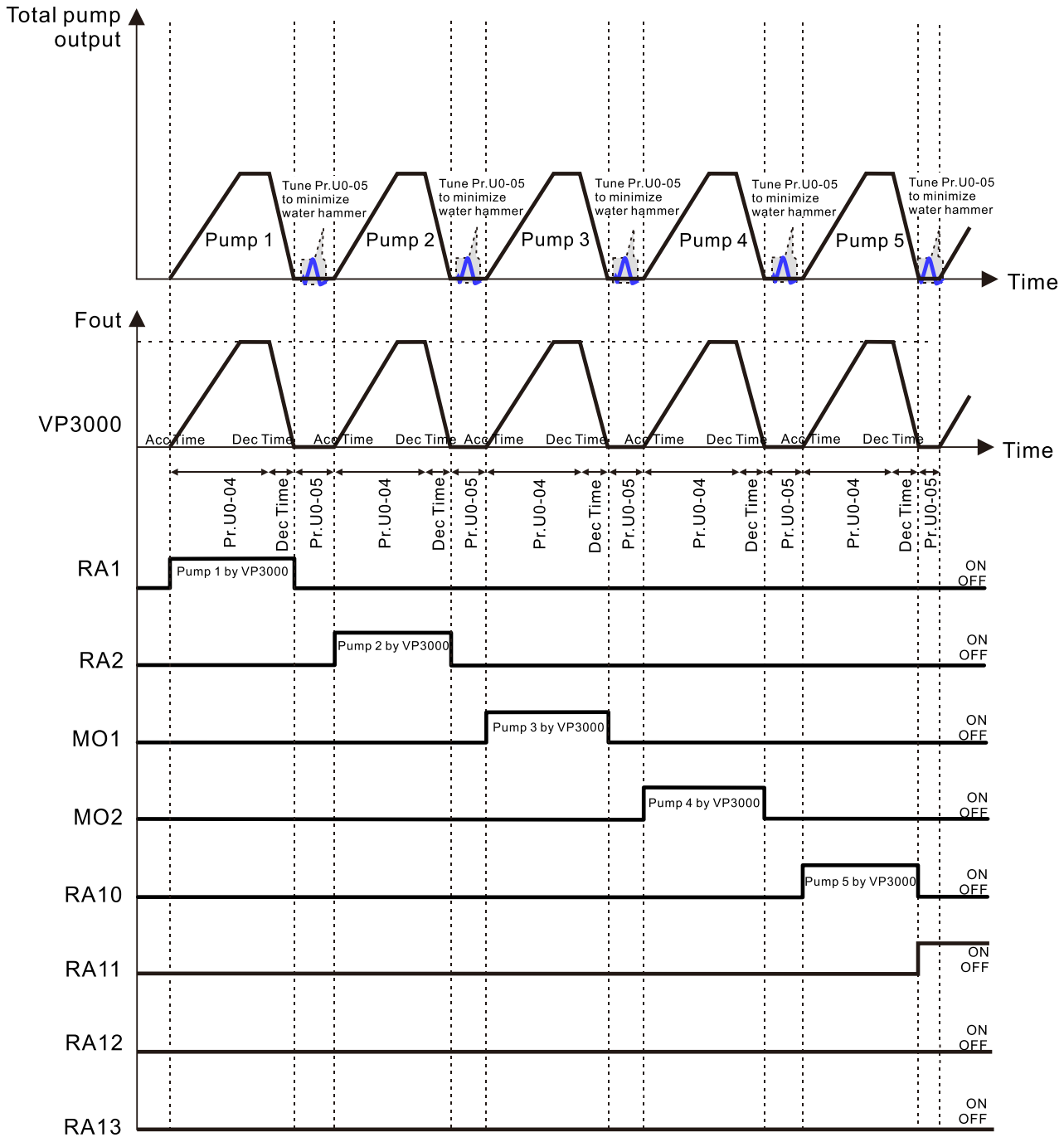


Figure 5 Time Circulation Terminal Sequence (Ramp to stop)

- The time circulation includes Pr.U0-05 (Time Circulation Switch Delay) and Pr.U0-06 (Time Circulation Output Delay) in pump-to-pump switching (refer to Figure 6).
- When the output terminal is switched, the U, V and W output side of the drive may output without completely connected due to the system hardware delay effect. Ensure that the UVW output side of the drive is completely connected by setting Pr.U0-06 (Time Circulation Output Delay), and to avoid over current of the drive.

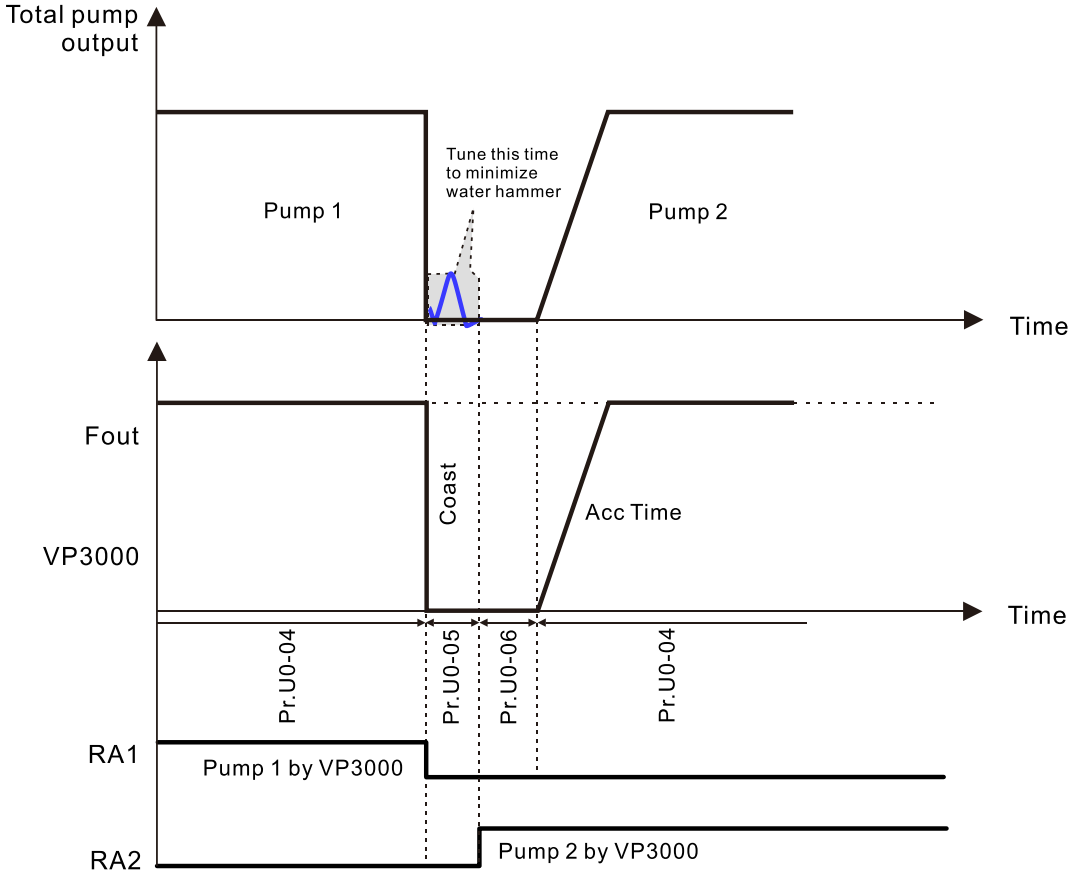


Figure 6 Time Circulation Output Delay Sequence

- Parameter Setting

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td>U0-00 = 1</td><td>Circulation Control is set as “Time Circulation”</td></tr>
<tr><td>U0-01 = X</td><td>Number of Pump
● Up to 8 sets, after setting, Pump 1–8 output enable automatically sets according to Pr. U0-01
<table>
<tr><td>U0-01</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td></td></tr>
<tr><td>U0-15
Pump 1
Output</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>Pump 1 by Drive</td></tr>
<tr><td>U0-16
Pump 2
Output</td><td>0</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>Pump 2 by Drive</td></tr>
<tr><td>U0-17
Pump 3
Output</td><td>0</td><td>0</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>Pump 3 by Drive</td></tr>
<tr><td>U0-18</td><td>0</td><td>0</td><td>0</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>Pump 4 by Drive</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td>Pump 4 Output</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>U0-19 Pump 5 Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>10 RA10</td><td>10 RA10</td><td>10 RA10</td><td>10 RA10</td><td>Pump 5 by Drive</td></tr>
<tr><td>U0-20 Pump 6 Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>11 RA11</td><td>11 RA11</td><td>11 RA11</td><td>Pump 6 by Drive</td></tr>
<tr><td>U0-21 Pump 7 Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>12 RA12</td><td>12 RA12</td><td>Pump 7 by Drive</td></tr>
<tr><td>U0-22 Pump 8 Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>13 RA13</td><td>Pump 8 by Drive</td></tr>
</table>
</td></tr>
<tr><td>U0-03 = X</td><td>Pump Switch Type
● Terminal sequence or minimum operation time</td></tr>
<tr><td>U0-04 = X</td><td>Circulation Time
● Pump Operating Time</td></tr>
<tr><td>U0-05 = X</td><td>Time Circulation Switch Delay
● Switch Delay Time between pumps</td></tr>
<tr><td>U0-06 = X</td><td>Time Circulation Output Delay
● Delay time before pump operates</td></tr>
<tr><td>U0-15–U0-22 = X</td><td>Pump 1–8 Output Enable Sel
● Pump output indication</td></tr>
<tr><td>U0-23–U0-31 = X</td><td>Pump 1–8 Stop MI Src
● Pumps inhibit output</td></tr>
<tr><td>U0-32–U0-39</td><td>Pump 1–8 Operating Time
● Pump actual operating time (read only)</td></tr>
<tr><td>U0-40 = X</td><td>Pump Operating Time Erase
● Reset operation time for single pump or all pumps</td></tr>
</table>

📖 Pumps inhibit output

Pump 1–8 Stop MI Src After setting and enabling MI, the corresponding pump can be stopped.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	5	6	7	8	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

📖 Wiring: Time Circulation (by time) can control up to eight motors. The following diagram shows an example of controlling four motors at the same time.

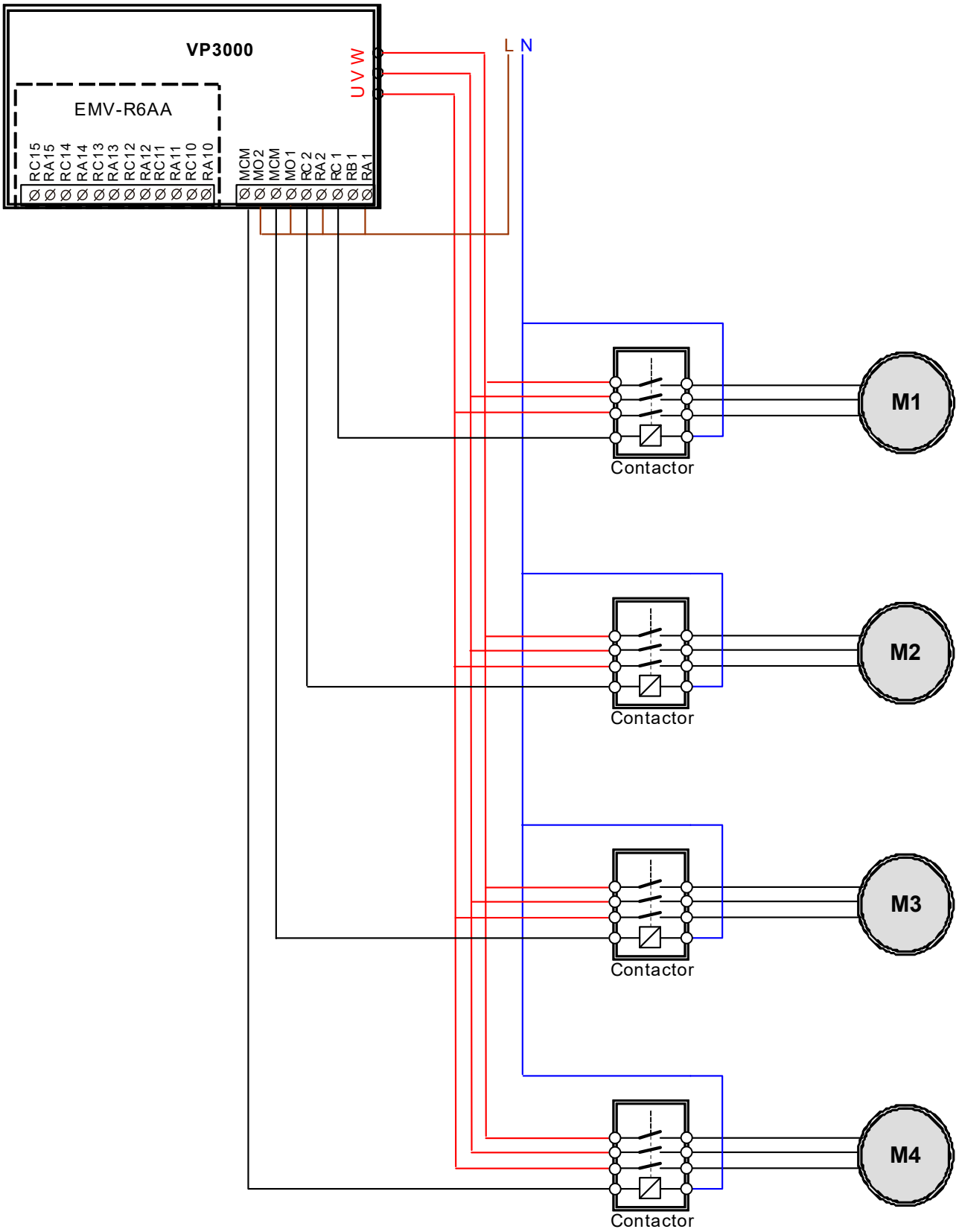


Figure 7 Time Circulation Wiring

2. QTY Circulation

- After the function is enabled, when the demand for water consumption increases, the master pump output frequency exceeds Pr.U0-07 (AUX Pump Active FREQ Level) and lasts for the time of Pr.U0-08 (AUX Pump Active Check Time), it selects the auxiliary pump with the prior pump switching mode according to the terminal sequence, and the master pump coasts to stop and disconnects the output terminal. After the auxiliary pump active delay time (Pr.U0-09), the master pump switches to mains power and connects with the next sequence motor for the time of Pr.U0-10 (QTY Circulation Output Delay), and then the AC motor drive starts another master pump (refer to Figure 8) for the incremental circulation according to the demand. In addition, adjust Pr.U0-09 (AUX Pump Active Delay Time) can alleviate water hammering, the actual value is fine-tuned according to the system.
- After the function is enabled, when the demand for water consumption decreases, the master pump output frequency is lower than Pr.U0-11 (AUX Pump Deactive FREQ Level) and lasts for the time of Pr.U0-12 (AUX Pump Deactive Check Time), it selects the auxiliary pump with the prior pump switching mode according to the terminal sequence and disconnects the output terminal. If the water demand still decreases for the time of Pr.U0-12, it stops the next auxiliary pump (refer to Figure 9) and repeats this circulation until all the auxiliary pumps are stopped. In addition, adjust Pr.U0-12 (AUX Pump Deactive Check Time) can alleviate water hammering, the actual value is fine-tuned according to the system.

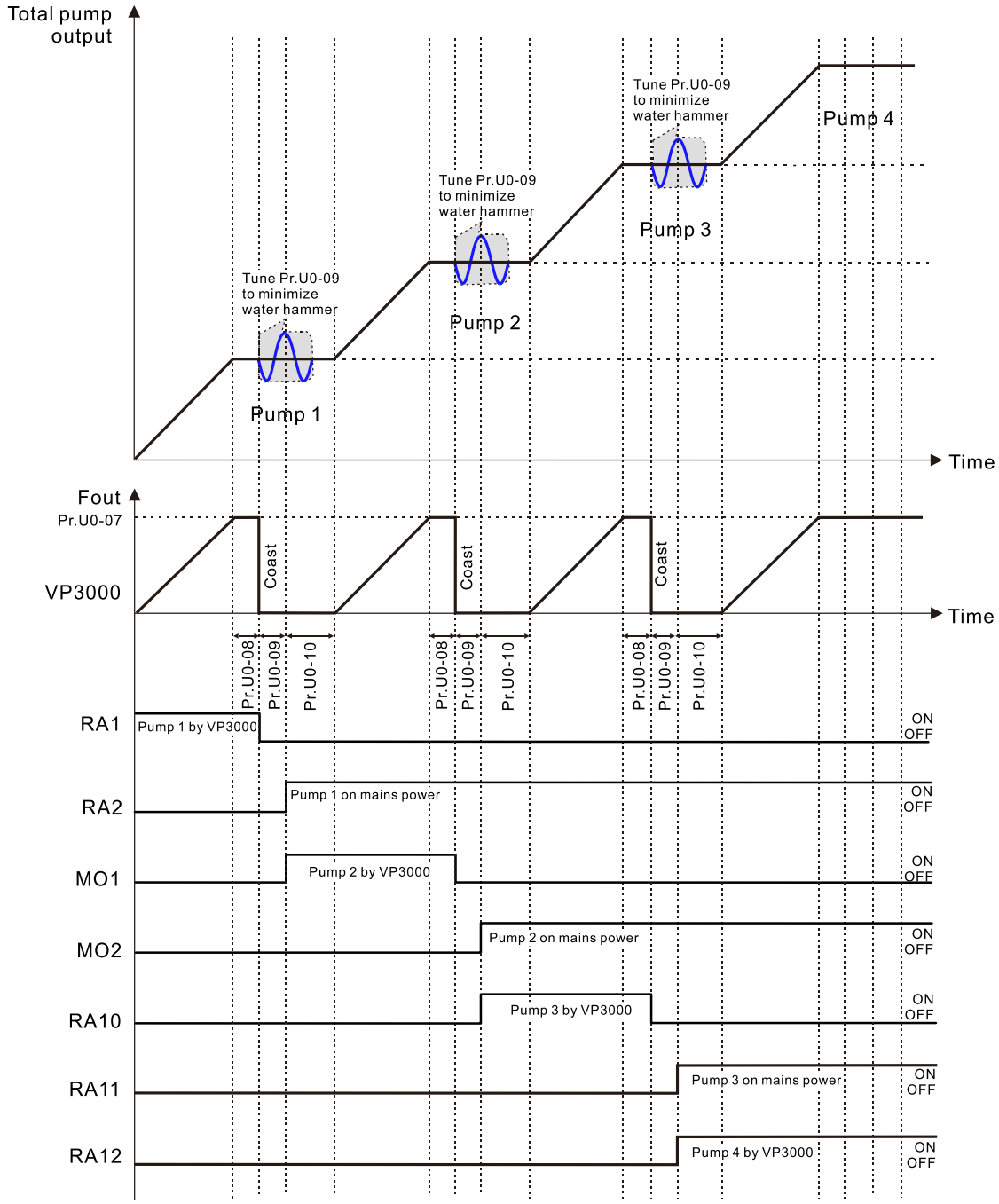


Figure 8 QTY Circulation Terminal Sequence (Pressure Increasing)

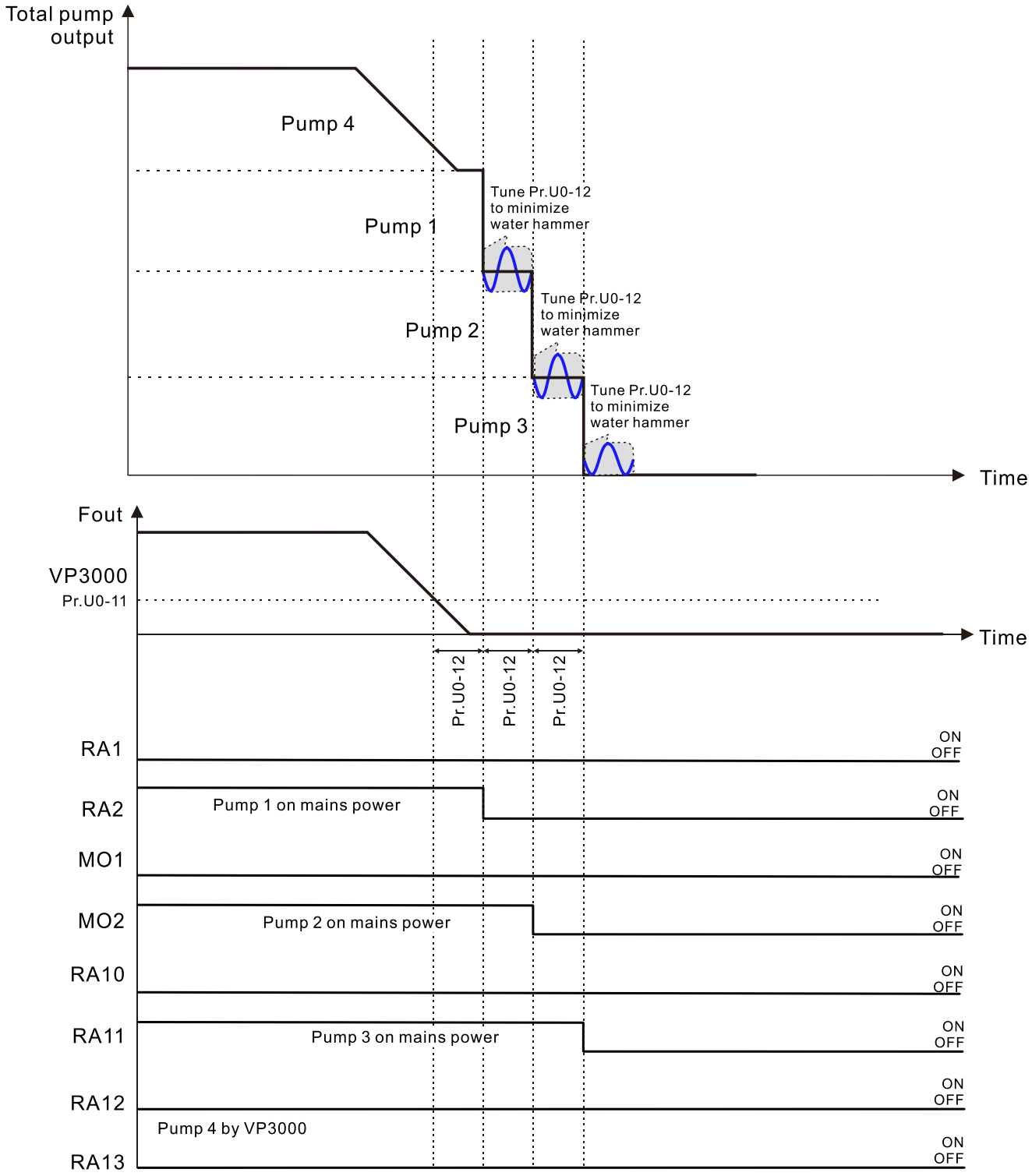


Figure 9 QTY Circulation Terminal Sequence (Pressure Decreasing)

📖 Parameter Setting

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td>U0-00 = 2</td><td>Circulation Control is set as “QTY Circulation”</td></tr>
<tr><td>U0-01 = X</td><td>Number of Pump
● Up to 4 sets of pumps, after setting, the pump output automatically enables according to Pr.U0-01
● Each set of pump uses two output terminals
<table>
<tr><th>U0-01</th><th>01</th><th>02</th><th>03</th><th>04</th><th></th></tr>
<tr><td>U0-15
Pump 1
Output</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>Pump 1 by Drive</td></tr>
<tr><td>U0-16
Pump 1
Output</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>Pump 1 by Main</td></tr>
<tr><td>U0-17
Pump 2
Output</td><td>0</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>Pump 2 by Drive</td></tr>
<tr><td>U0-18
Pump 2
Output</td><td>0</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>Pump 2 by Main</td></tr>
<tr><td>U0-19
Pump 3
Output</td><td>0</td><td>0</td><td>10
RA10</td><td>10
RA10</td><td>Pump 3 by Drive</td></tr>
<tr><td>U0-20
Pump 3
Output</td><td>0</td><td>0</td><td>11
RA11</td><td>11
RA11</td><td>Pump 3 by Main</td></tr>
<tr><td>U0-21
Pump 4
Output</td><td>0</td><td>0</td><td>0</td><td>12
RA12</td><td>Pump 4 by Drive</td></tr>
<tr><td>U0-22
Pump 4
Output</td><td>0</td><td>0</td><td>0</td><td>13
RA13</td><td>Pump 4 by Main</td></tr>
</table></td></tr>
<tr><td>U0-07 = X</td><td>AUX Pump Active FREQ Level
● AUX Pump Active Switching FREQ</td></tr>
<tr><td>U0-08 = X</td><td>AUX Pump Active Check Time
● AUX Pump Active Switching FREQ check time</td></tr>
<tr><td>U0-09 = X</td><td>AUX Pump Active Delay Time
● Switch Delay Time between pumps</td></tr>
<tr><td>U0-10 = X</td><td>QTY Circulation Output Delay
● Delay time before pump operates</td></tr>
<tr><td>U0-11 = X</td><td>AUX Pump Deactive FREQ Level
● AUX Pump Deactive Switching FREQ</td></tr>
<tr><td>U0-12 = X</td><td>AUX Pump Deactive Check Time
● AUX Pump Deactive Switching FREQ check time</td></tr>
<tr><td>U0-13 = X</td><td>QTY Circulation Fault Action
● Stop all pumps or the master pump output</td></tr>
</table>

Pr.	Description
U0-15–U0-22 = X	Pump 1–8 Output Enable Sel ● Pump output indication
U0-23–U0-31 = X	Pump 1–8 Stop MI Src ● Pumps inhibit output
U0-32–U0-39	Pump 1–8 Operating Time ● Pump actual operating time (read only)
U0-40 = X	Pump Operating Time Erase ● Reset operation time for single pump or all pumps

🕮 Disable Motor

Pump 1–4 Stop MI Src After setting and enabling MI, the corresponding pump can be stopped.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	-	-	-	-	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

- When the output of all motors is prohibited, the motors running on the mains stop, and the motors controlled by the AC motor drive coasts to stop.
- For the pumps controlled by the AC motor drive, if the MI is enabled, it will take effect in the next circulation.
- If a fault occurs during the QTY circulation, the pump output will be stopped according to Pr.U0-13 QTY Circulation Fault Action.

🕮 Wiring: Time Circulation (by time) can control up to four motors. The following diagram shows an example of controlling four motors at the same time.

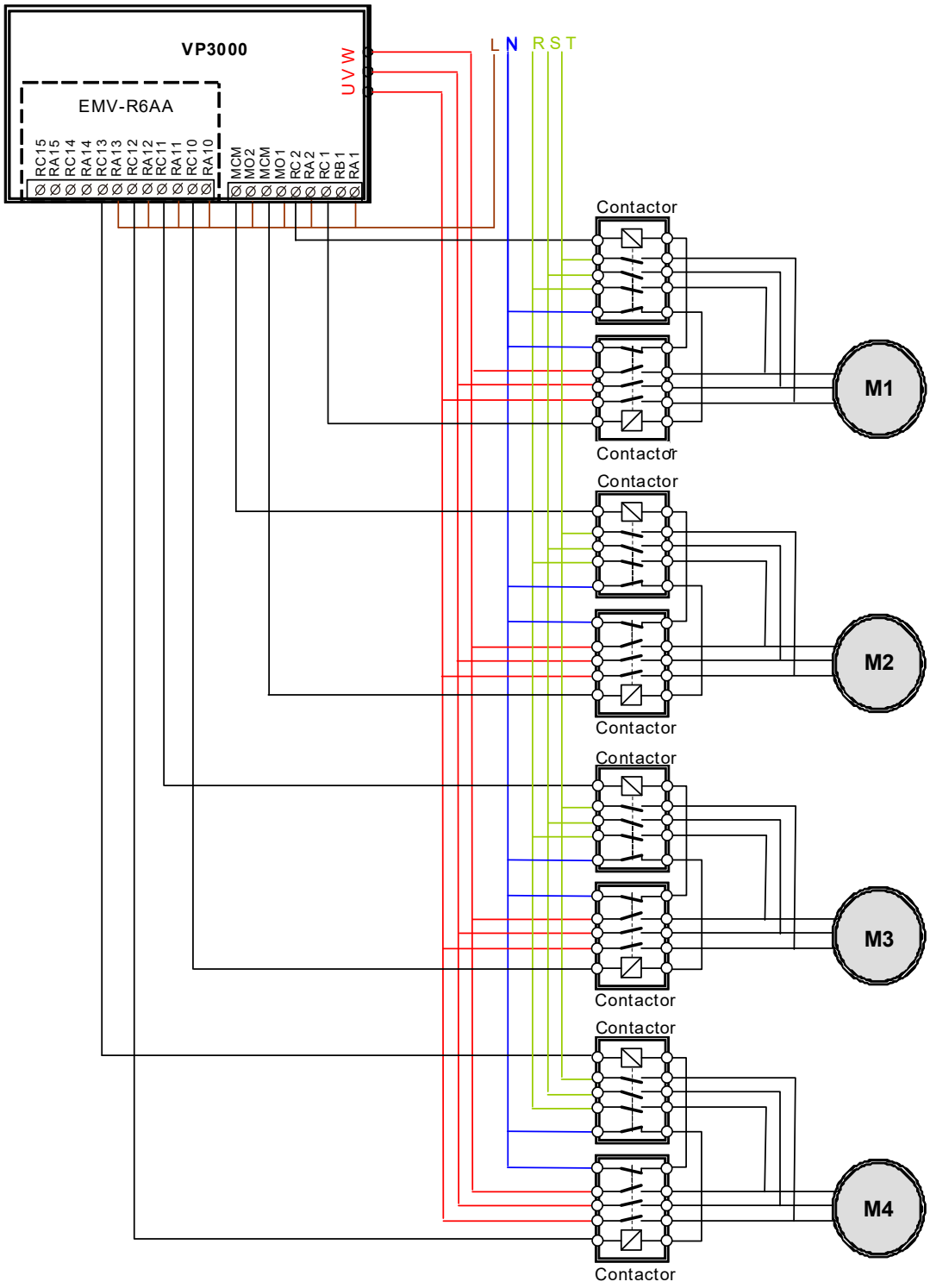


Figure 10 QTY Circulation Wiring

3. QTY Control

- After the function is enabled, when the demand for water consumption increases, the master pump output frequency exceeds Pr.U0-07 (AUX Pump Active FREQ Level) and lasts for the time of Pr.U0-08 (AUX Pump Active Check Time), the output terminal is OFF, and the auxiliary pump is started and connected to the mains power. When the demand remains unchanged for the time of Pr.U0-08 (AUX Pump Active Check Time), it turns off the output terminal and starts another auxiliary pump to connect to the mains power until all the auxiliary pumps are connected to the mains (refer to Figure 11).
- After the function is enabled, when the demand of water consumption decreases and the master pump output frequency is lower than or equal to the lower limit and lasts for the time of Pr.U0-12 (AUX Pump Deactive Check Time), disconnect the output terminal, and disconnect the auxiliary pump from the mains power. When the demand remains unchanged for the time of Pr.U0-12, disconnect the output terminal, and disconnect another auxiliary pump from the mains until all the auxiliary pumps are OFF (refer to Figure 12).
- The switching mode of the auxiliary pump is only based on the priority of the terminal sequence. Whenever the pressure increases or decreases, the terminal with smaller sequence takes the priority.

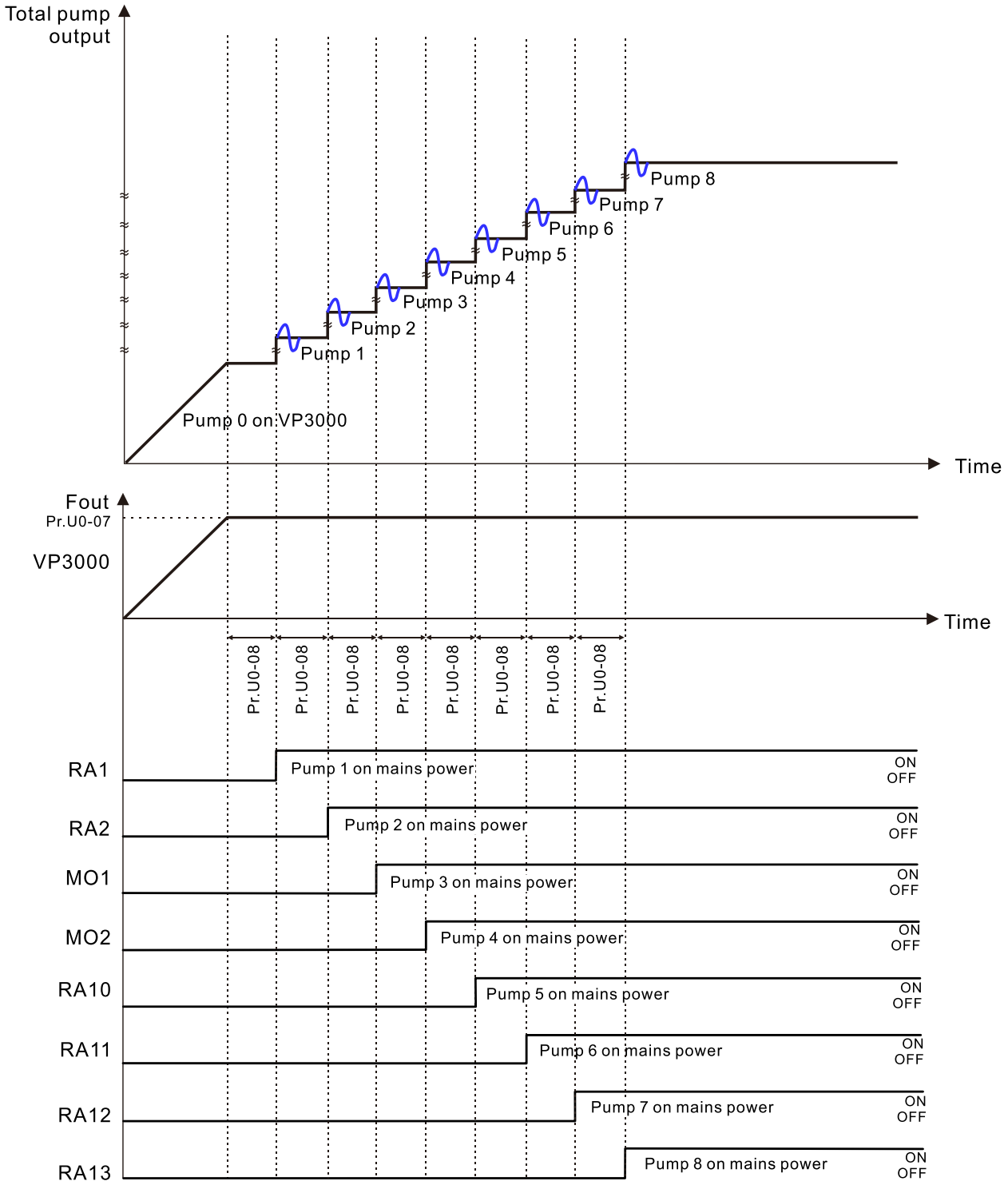


Figure 11 QTY Control Terminal Sequence (Pressure Increasing)

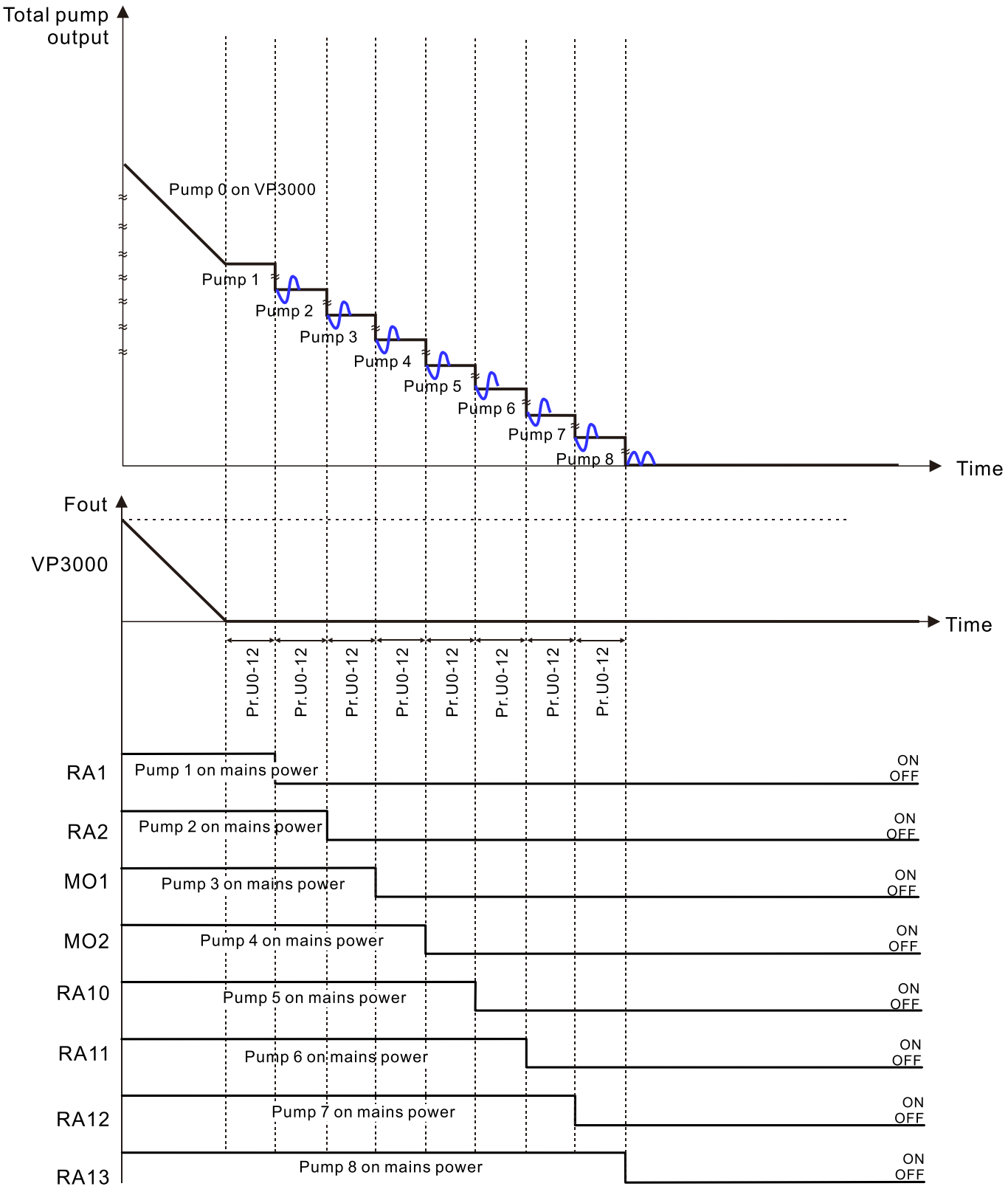


Figure 12 QTY Control Terminal Sequence (Pressure Decreasing)

🕮 Parameter Setting

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td>U0-00 = 3</td><td>Circulation Control is set as “QTY Control”</td></tr>
<tr><td>U0-01 = X</td><td>Number of Pump
● Up to 8 sets of pumps, after setting, the pump output automatically enables according to Pr.U0-01
<table>
<tr><td>U0-01</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td></td></tr>
<tr><td>U0-15
Pump 1
Output</td><td>1
RA1</td><td>1
RA</td><td>1
RA</td><td>1
RA</td><td>1
RA</td><td>1
RA</td><td>1
RA</td><td>1
RA</td><td>Pump 1 by Main</td></tr>
<tr><td>U0-16
Pump 2
Output</td><td>0</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>Pump 2 by Main</td></tr>
<tr><td>U0-17
Pump 3
Output</td><td>0</td><td>0</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>Pump 3 by Main</td></tr>
<tr><td>U0-18
Pump 4
Output</td><td>0</td><td>0</td><td>0</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>Pump 4 by Main</td></tr>
<tr><td>U0-19
Pump 5
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>10
RA10</td><td>10
RA10</td><td>10
RA10</td><td>10
RA10</td><td>Pump 5 by Main</td></tr>
<tr><td>U0-20
Pump 6
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>11
RA11</td><td>11
RA11</td><td>11
RA11</td><td>Pump 6 by Main</td></tr>
<tr><td>U0-21
Pump 7
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>12
RA12</td><td>12
RA12</td><td>Pump 7 by Main</td></tr>
<tr><td>U0-22
Pump 8
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>13
RA13</td><td>Pump 8 by Main</td></tr>
</table></td></tr>
<tr><td>U0-07 = X</td><td>AUX Pump Active FREQ Level
● AUX Pump Active Switching FREQ</td></tr>
<tr><td>U0-08 = X</td><td>AUX Pump Active Check Time
● AUX Pump Active Switching FREQ check time</td></tr>
<tr><td>C2-19 = X</td><td>FREQ Lower Limit
● AUX Pump Deactive Switching FREQ</td></tr>
<tr><td>U0-12 = X</td><td>AUX Pump Deactive Check Time
● When the auxiliary pump is decompressed, the output frequency is lower than or equal to the lower limit and the deactive check time.</td></tr>
<tr><td>U0-15–U0-22 = X</td><td>Pump 1–8 Output Enable Sel
● Pump output indication</td></tr>
<tr><td>U0-23–U0-31 = X</td><td>Pump 1–8 Stop MI Src
● Pumps inhibit output</td></tr>
<tr><td>U0-32–U0-39</td><td>Pump 1–8 Operating Time
● Pump actual operating time (read only)</td></tr>
</table>

Pr.	Description
U0-40 = X	Pump Operating Time Erase ● Reset operation time for single pump or all pumps

📖 Disable Motor

Pump 1–8 Stop MI Src After setting and enabling MI, the corresponding pump can be stopped.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	5	6	7	8	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

📖 Wiring: Fixed Quantity Control can control up to eight motors. The following diagram shows an example of controlling four motors at the same time.

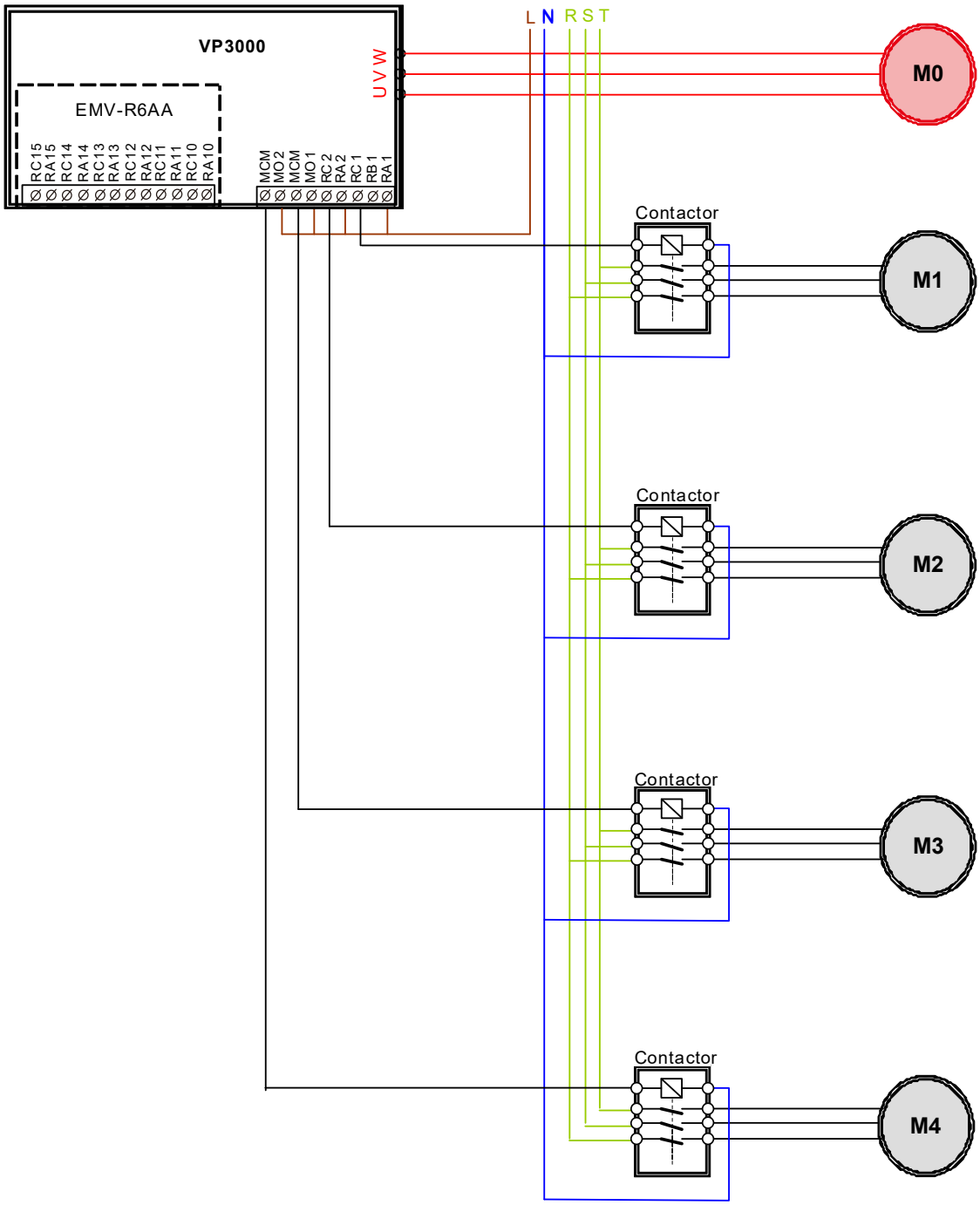


Diagram 13: QTY Control Wiring

4. QTY + Time Circulation

- Executes time-circulation under the quantitative circulation, so that the AC motor drive can run the idle pumps regularly to achieve the average use and to prolong the life of each pump, also to avoid rust damage caused by a specific pump not being used for a long time.
- Refer to the above for the QTY circulation function description. When the water pressure is balanced and there are idle pumps in the system, the pressure balance is identified within Pr.U0-14 (Output FREQ Reached Range) and for the time of Pr.U0-04 (Circulation Time), the current master pump is switched to mains power and transfers to auxiliary pumps, and then starts the next set of master pumps in sequence.
- The system supports up to 4 sets of pumps under QTY + time circulation mode. When the system water demand only needs single pump to balance the pressure, the AC motor drive runs single master pump according to Pr.U0-04 (Circulation Time) (refer to Figure 14), and then switches the master pump to Pump 2, Pump 3 and Pump 4 in sequence.

System Pump Qty / Pump Demand	One Pump (Situation 1)	2 Pumps (Situation 2)	3 Pumps (Situation 3)	4 Pumps
Pump 1	Master pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 2		Master pump	Auxiliary pump	Auxiliary pump
Pump 3			Master pump	Auxiliary pump
Pump 4				Master pump
Time Circulation Operation	Yes	Yes	Yes	No

- When the system water demand only needs two pumps to balance the pressure, and the AC motor drive runs one set of master pumps and the mains power supplies to one auxiliary pump, turn off the first auxiliary pump (Pump 1) first according to Pr.U0-04 (Circulation Time) to reduce the master pump pressure and increase the speed. The current master pump (Pump 2) then cuts off from the mains power to become an auxiliary pump, and the next pump (Pump 3) will be started as the master pump (refer to Figure 15), and so on.
- When the system water demand needs three pumps to balance the pressure, and the AC motor drive runs one set of master pumps and the mains power supplies to two auxiliary pumps, turn off the first auxiliary pump (Pump 1) first according to Pr.U0-04 (Circulation Time) to reduce the master pump pressure and increase the speed. The current master pump (Pump 3) then cuts off from the mains power to become an auxiliary pump, and the next pump (Pump 4) will be started as the master pump (refer to Figure 16), and so on.
- When the system water demand needs all pumps operation (or no idle pumps) to balance the pressure, the pumps remain in QTY circulation mode and will not enter time circulation mode.

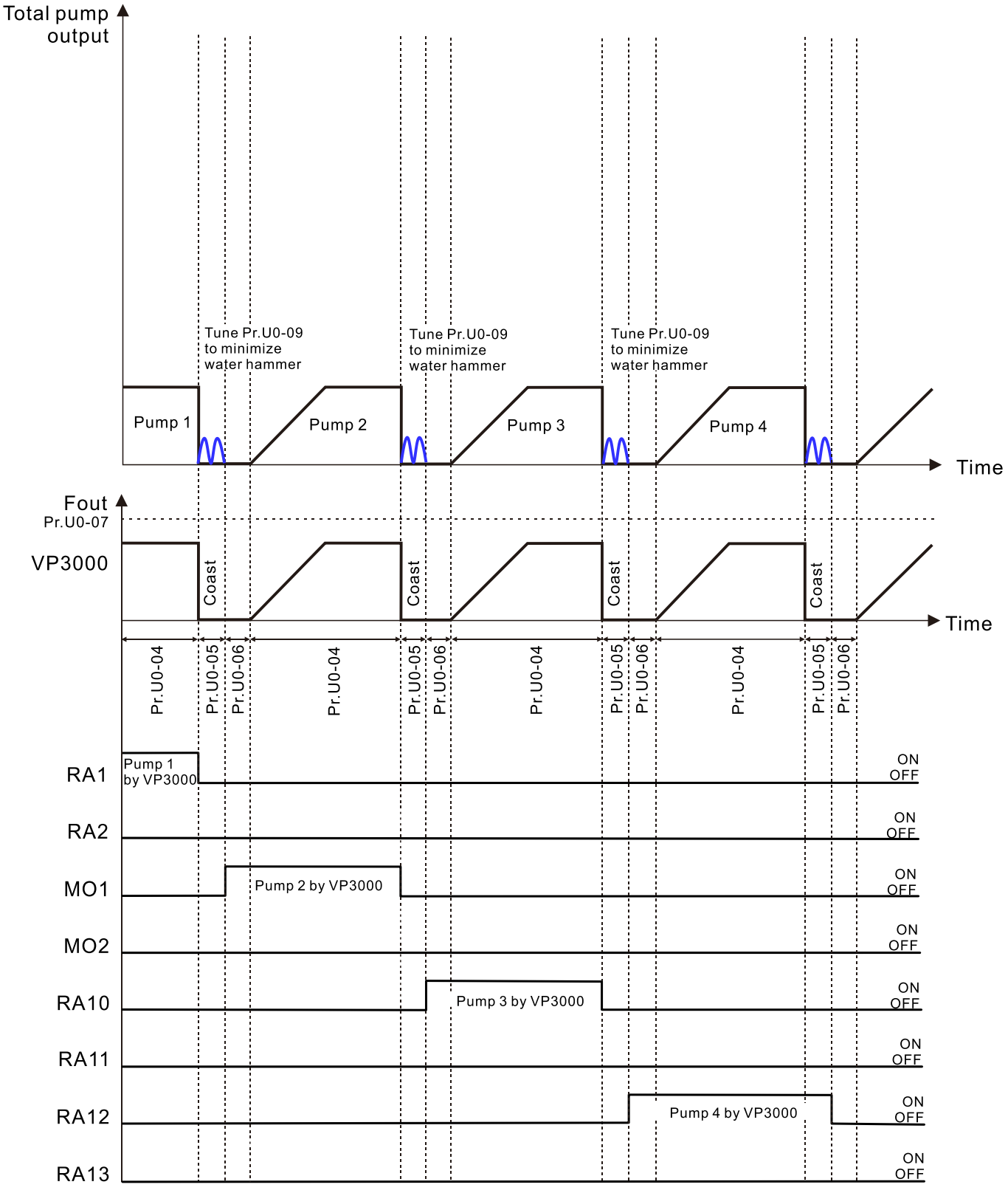


Figure 14 Situation 1 Sequence

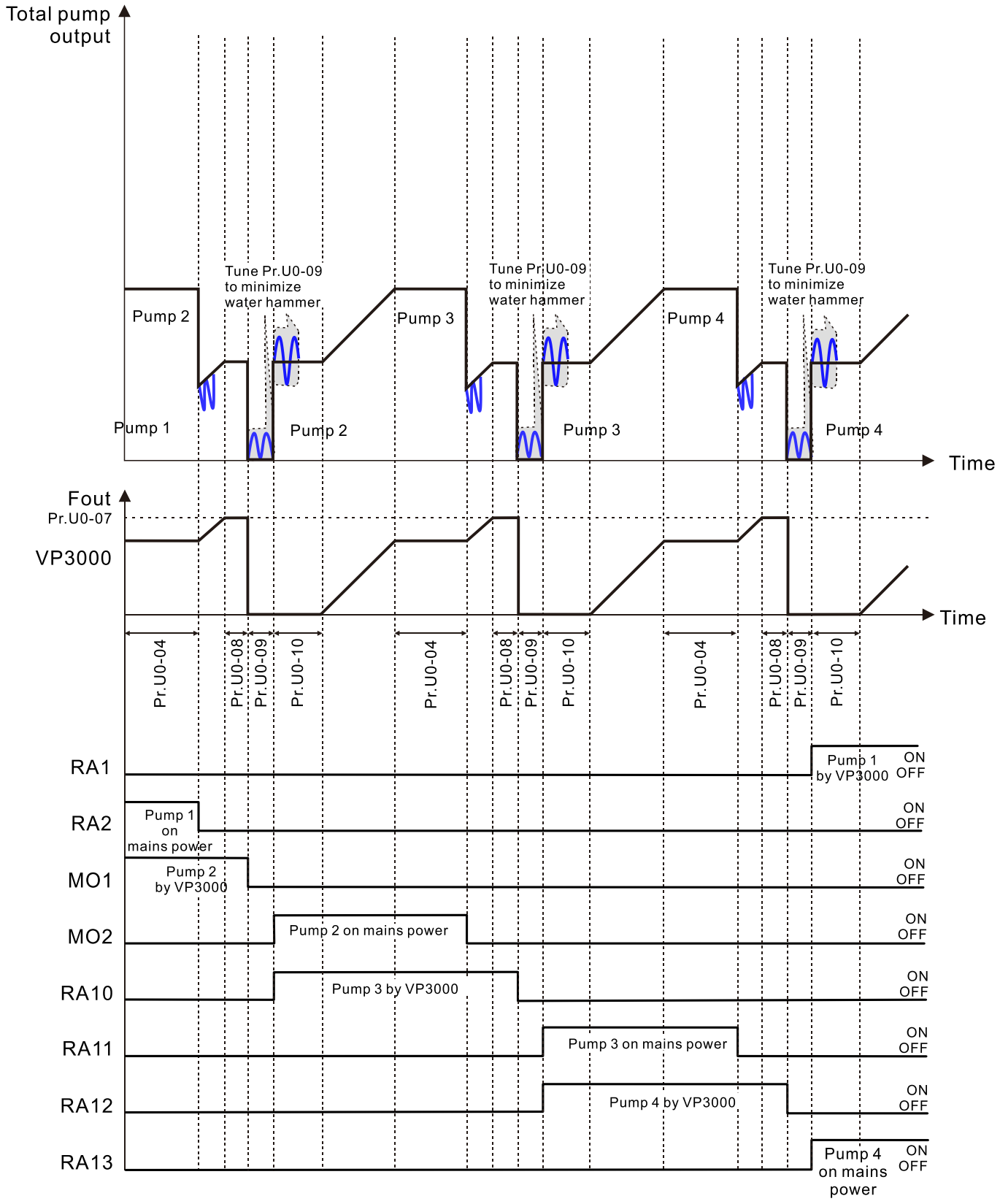


Figure 15 Situation 2 Sequence

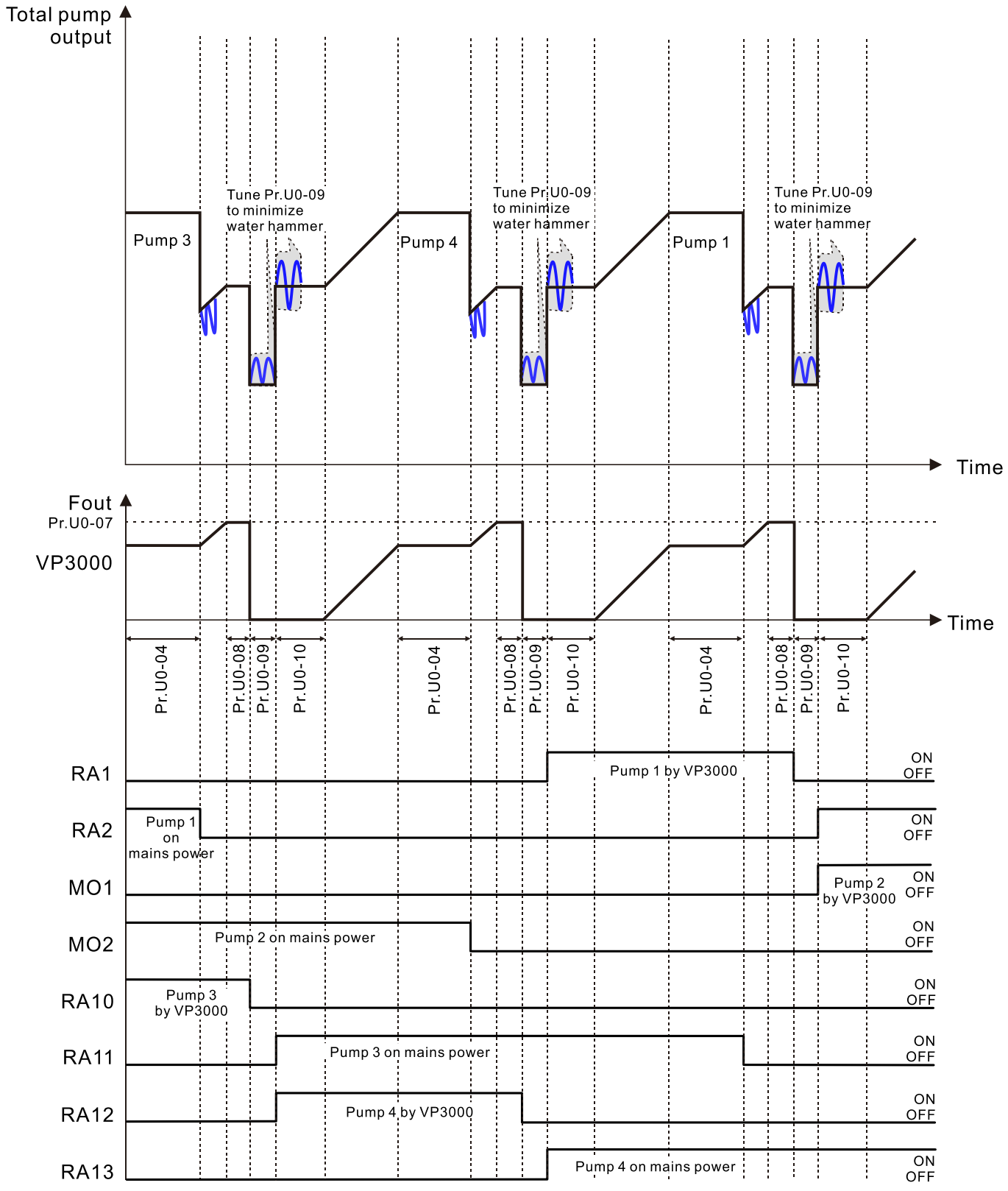


Figure 16 Situation 3 Sequence

🕮 Parameter Setting

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td>U0-00 = 4</td><td>Circulation Control is set as “QTY + Time Circulation”</td></tr>
<tr><td>U0-01 = X</td><td>Number of Pump
● Up to 4 sets of pumps, after setting, the pump output automatically enables according to Pr. U0-01
● Each set of pump uses two output terminals
<table>
<tr><td>U0-01</td><td>01</td><td>02</td><td>03</td><td>04</td><td></td></tr>
<tr><td>U0-15
Pump 1 Output</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>Pump 1 by Drive</td></tr>
<tr><td>U0-16
Pump 1 Output</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>Pump 1 by Main</td></tr>
<tr><td>U0-17
Pump 2 Output</td><td>0</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>Pump 2 by Drive</td></tr>
<tr><td>U0-18
Pump 2 Output</td><td>0</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>Pump 2 by Main</td></tr>
<tr><td>U0-19
Pump 3 Output</td><td>0</td><td>0</td><td>10
RA10</td><td>10
RA10</td><td>Pump 3 by Drive</td></tr>
<tr><td>U0-20
Pump 3 Output</td><td>0</td><td>0</td><td>11
RA11</td><td>11
RA11</td><td>Pump 3 by Main</td></tr>
<tr><td>U0-21
Pump 4 Output</td><td>0</td><td>0</td><td>0</td><td>12
RA12</td><td>Pump 4 by Drive</td></tr>
<tr><td>U0-22
Pump 4 Output</td><td>0</td><td>0</td><td>0</td><td>13
RA13</td><td>Pump 4 by Main</td></tr>
</table></td></tr>
<tr><td>U0-03 = X</td><td>Pump Switch Type
● Terminal sequence or minimum operation time</td></tr>
<tr><td>U0-04 = X</td><td>Circulation Time
● Pump Operating Time</td></tr>
<tr><td>U0-07 = X</td><td>AUX Pump Active FREQ Level
● AUX Pump Active Switching FREQ</td></tr>
<tr><td>U0-08 = X</td><td>AUX Pump Active Check Time
● AUX Pump Active Switching FREQ check time</td></tr>
<tr><td>U0-09 = X</td><td>AUX Pump Active Delay Time
● Switch Delay Time between pumps</td></tr>
<tr><td>U0-10 = X</td><td>QTY Circulation Output Delay
● Delay time before pump operates</td></tr>
<tr><td>U0-11 = X</td><td>AUX Pump Deactive FREQ Level
● AUX Pump Deactive Switching FREQ</td></tr>
<tr><td>U0-12 = X</td><td>AUX Pump Deactive Check Time
● AUX Pump Deactive Switching FREQ check time</td></tr>
<tr><td>U0-13 = X</td><td>QTY Circulation Fault Action
● Stop all pumps or the master pump output</td></tr>
<tr><td>U0-14 = X</td><td>Output FREQ Reached Range
● If the system reaches stable voltage</td></tr>
</table>

Pr.	Description
U0-15–U0-22 = X	Pump 1–8 Output Enable Sel ● Pump output indication
U0-23–U0-31 = X	Pump 1–8 Stop MI Src ● Pumps inhibit output
U0-32–U0-39	Pump 1–8 Operating Time ● Pump actual operating time (read only)
U0-40 = X	Pump Operating Time Erase ● Reset operation time for single pump or all pumps

📖 Disable Motor

Pump 1–4 Stop MI Src After setting and enabling MI, the corresponding pump can be stopped.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	-	-	-	-	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

- When the output of all motors is prohibited, the motors running on the mains stop, and the motors controlled by the AC motor drive coasts to stop.
- For the pumps controlled by the AC motor drive, if the MI is enabled, it will take effect in the next circulation.
- If a fault occurs during the QTY circulation, the pump output will be stopped according to Pr.U0-13 QTY Circulation Fault Action.

📖 Wiring: QTY + Time Circulation can control up to four motors. The following diagram shows an example of wiring.

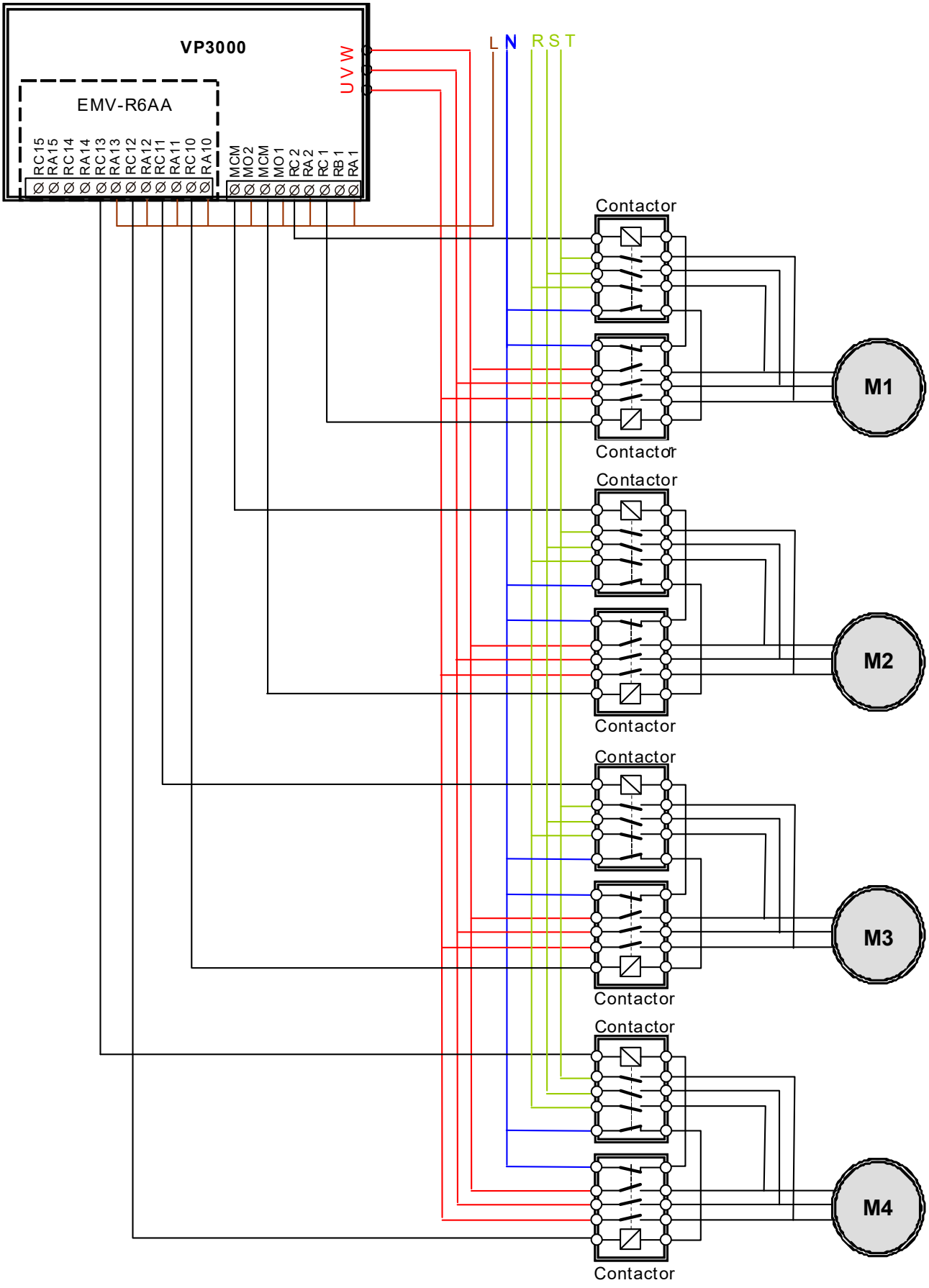


Figure 17 QTY + Time Circulation Wiring

5. QTY Control + Time Circulation

📖 Executes time-circulation under the quantitative circulation, so that the AC motor drive can run the idle pumps periodically through the output contact lapping the mains power to achieve the average use and to prolong the life of each pump, also to avoid rust damage caused by a specific pump not being used for a long time.

📖 Refer to the above for the QTY control function description. When the water pressure is balanced and there are idle pumps in the system, the pressure balance is identified within Pr.U0-14 (Output FREQ Reached Range) and for the time of Pr.U0-04 (Circulation Time), the current auxiliary pump is switched OFF according to Pr.U0-03 (Pump Switch Type), and then starts the next set of auxiliary pumps in sequence.

📖 The system supports up to 8 sets of pumps under QTY control + Time circulation mode. When the system water demand only needs two pumps to balance the pressure, and the AC motor drive runs one set of master pumps and the mains power supplies to one auxiliary pump, turn off the first auxiliary pump (Pump 1) first according to Pr.U0-04 (Circulation Time) for the time of Pr.U0-09 (AUX Pump Active Delay Time), and then start another auxiliary pump (Pump 2). After the next counting cycle, turn off the current auxiliary pump and the next auxiliary pump (Pump 3, refer to Figure 18) will be started after the time of Pr.U0-09 (AUX Pump Active Delay Time), and so on.

System Pump Qty / Pump Demand	2 Pumps Situation 1	3 Pumps Situation 2	4 Pumps	5 Pumps Situation 3	6 Pumps	7 Pumps	8 Pumps	9 Pumps
QTY Control Pump	Master pump	Master pump	Master pump	Master pump	Master pump	Master pump	Master pump	Master pump
Pump 1	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 2		Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 3			Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 4				Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 5					Auxiliary pump	Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 6						Auxiliary pump	Auxiliary pump	Auxiliary pump
Pump 7							Auxiliary pump	Auxiliary pump
Pump 8								Auxiliary pump
Time Circulation Operation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

📖 When the system water demand needs three pumps to balance the pressure, and the AC motor drive runs one set of master pumps and the mains power supplies to two auxiliary pumps, turn off the first auxiliary pump (Pump 1) first according to Pr.U0-04 (Circulation Time), and start another auxiliary pump (Pump 3, Pump 2 remains operation during the process) after the time of

Pr.U0-09 (AUX Pump Active Delay Time). After the next counting cycle, turn off the second auxiliary pump (Pump 2) and the fourth auxiliary pump (Pump 4, Pump 3 remains operation during the process, refer to Figure 19) will be started after the time of Pr.U0-09 (AUX Pump Active Delay Time), and so on.

- When the system water demand needs five pumps to balance the pressure, and the AC motor drive runs one set of master pump and the mains power supplies to four auxiliary pumps, turn off the first auxiliary pump (Pump 1) first according to Pr.U0-04 (Circulation Time), and start the fifth auxiliary pump (Pump 5, Pump 2–4 keep operating during the process) after the time of Pr.U0-09 (AUX Pump Active Delay Time). After the next counting cycle, turn off the second auxiliary pump (Pump 2) and start the sixth auxiliary pump (Pump 6, Pump 3–5 keep operating during the process) after the time of Pr.U0-09 (AUX Pump Active Delay Time), and so on.
- When the system water demand needs all pumps operation (or no idle pumps) to balance the pressure, the pumps remain in QTY control mode and will not enter time circulation mode.

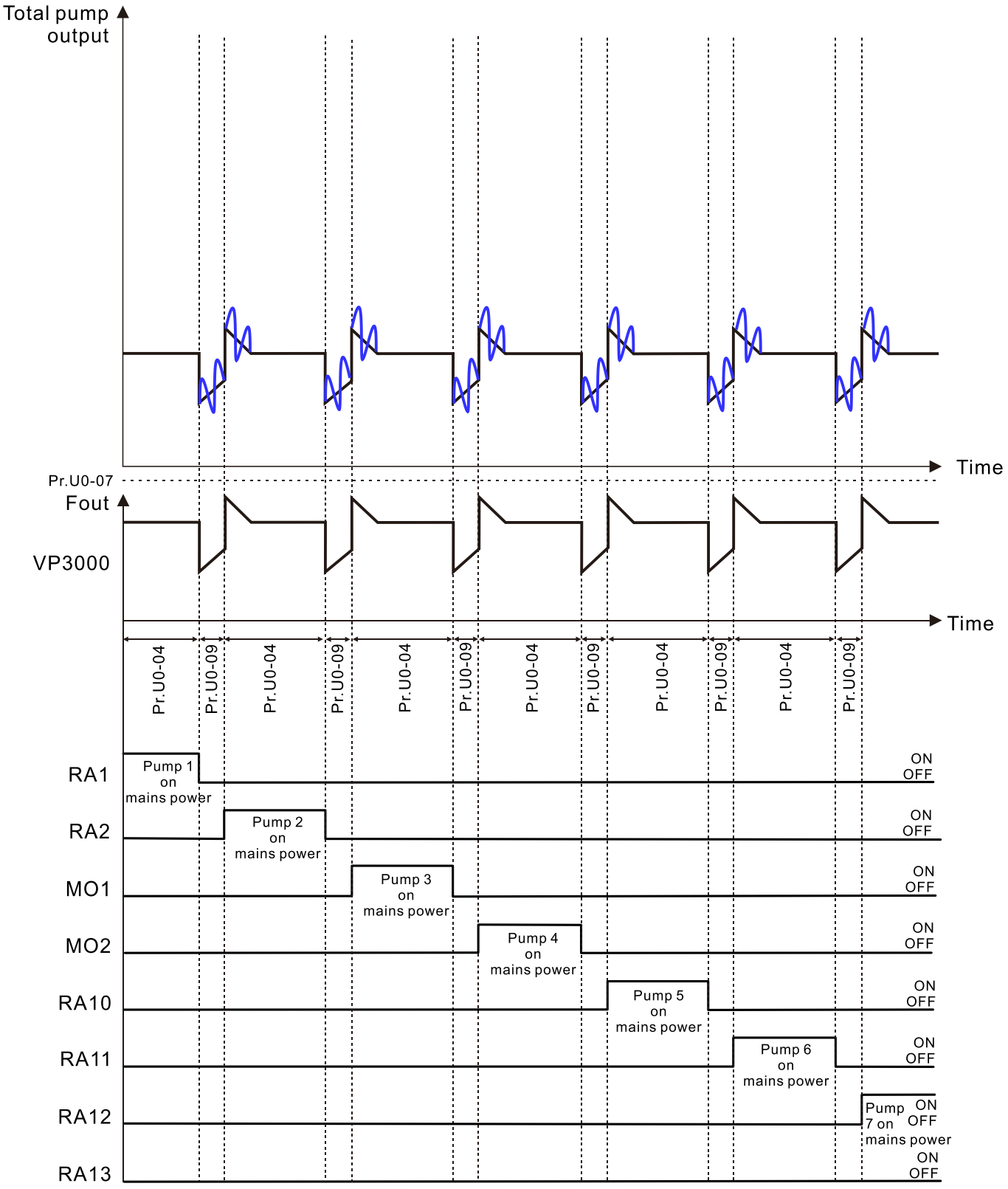


Figure 18 Situation 1 Sequence

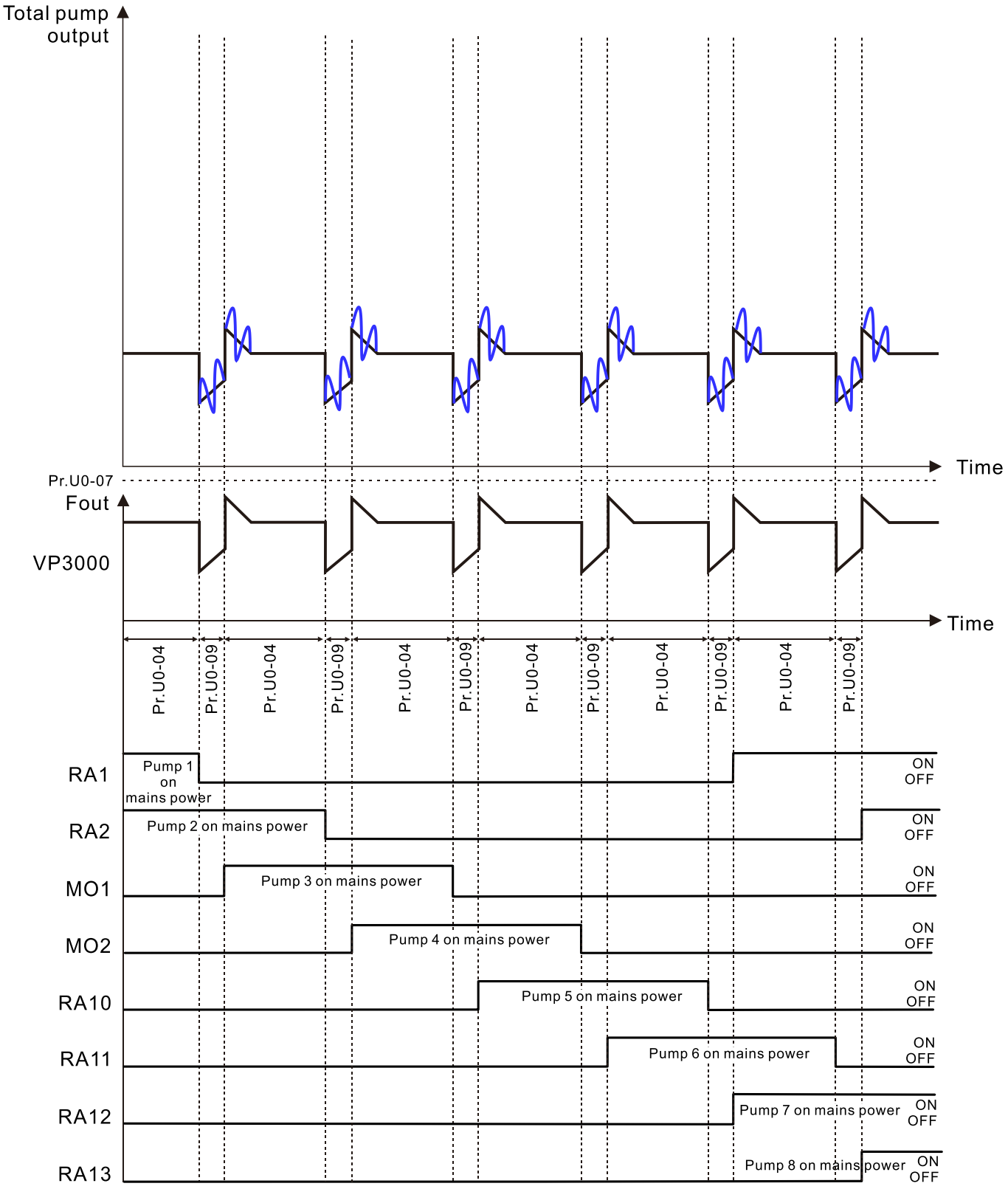


Figure 19 Situation 2 Sequence

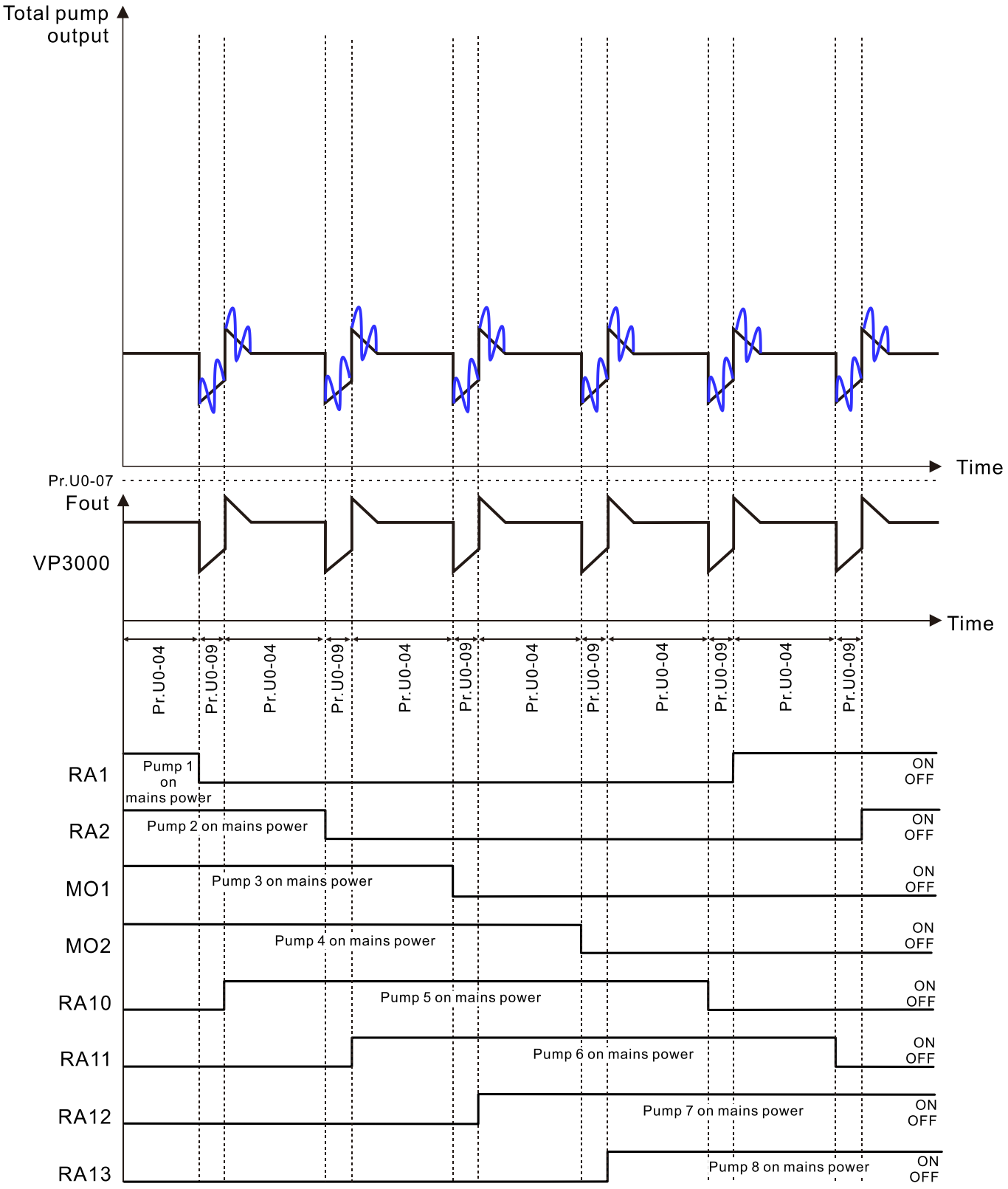


Figure 20 Situation 3 Sequence

🕮 Parameter Setting

<table>
<tr><th>Pr.</th><th>Description</th></tr>
<tr><td>U0-00 = 5</td><td>Circulation Control is set as “QTY control + Time Circulation”</td></tr>
<tr><td>U0-01 = X</td><td>Number of Pump
● Up to 8 sets of pumps, after setting, the pump output automatically enables according to Pr. U0-01
<table>
<tr><td>U0-01</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td></td></tr>
<tr><td>U0-15
Pump 1
Output</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>1
RA1</td><td>Pump 1 by Main</td></tr>
<tr><td>U0-16
Pump 2
Output</td><td>0</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>2
RA2</td><td>Pump 2 by Main</td></tr>
<tr><td>U0-17
Pump 3
Output</td><td>0</td><td>0</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>3
MO1</td><td>Pump 3 by Main</td></tr>
<tr><td>U0-18
Pump 4
Output</td><td>0</td><td>0</td><td>0</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>4
MO2</td><td>Pump 4 by Main</td></tr>
<tr><td>U0-19
Pump 5
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>10
RA10</td><td>10
RA10</td><td>10
RA10</td><td>10
RA10</td><td>Pump 5 by Main</td></tr>
<tr><td>U0-20
Pump 6
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>11
RA11</td><td>11
RA11</td><td>11
RA11</td><td>Pump 6 by Main</td></tr>
<tr><td>U0-21
Pump 7
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>12
RA12</td><td>12
RA12</td><td>Pump 7 by Main</td></tr>
<tr><td>U0-22
Pump 8
Output</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>13
RA13</td><td>Pump 8 by Main</td></tr>
</table></td></tr>
<tr><td>U0-03 = X</td><td>Pump Switch Type
● Terminal sequence or minimum operation time</td></tr>
<tr><td>U0-04 = X</td><td>Circulation Time
● Pump Operating Time</td></tr>
<tr><td>U0-07 = X</td><td>AUX Pump Active FREQ Level
● AUX Pump Active Switching FREQ</td></tr>
<tr><td>U0-08 = X</td><td>AUX Pump Active Check Time
● AUX Pump Active Switching FREQ check time</td></tr>
<tr><td>U0-09 = X</td><td>AUX Pump Active Delay Time
● Switch Delay Time between pumps</td></tr>
<tr><td>C2-19 = X</td><td>FREQ Lower Limit
● AUX Pump Deactive Switching FREQ</td></tr>
<tr><td>U0-12 = X</td><td>AUX Pump Deactive Check Time
● AUX Pump Deactive Switching FREQ check time</td></tr>
</table>

Pr.	Description
U0-14 = X	Output FREQ Reached Range ● If the system reaches stable voltage
U0-15–U0-22 = X	Pump 1–8 Output Enable Sel ● Pump output indication
U0-23–U0-31 = X	Pump 1–8 Stop MI Src ● Pumps inhibit output
U0-32–U0-39	Pump 1–8 Operating Time ● Pump actual operating time (read only)
U0-40 = X	Pump Operating Time Erase ● Reset operation time for single pump or all pumps

🕮 Disable Motor

Pump 1–8 Stop MI Src After setting and enabling MI, the corresponding pump can be stopped.

Pr.	U0-23	U0-24	U0-25	U0-26	U0-27	U0-28	U0-29	U0-30	U0-31
Pump OFF	1	2	3	4	5	6	7	8	ALL
Pump Stop MI Src	2–7 (MI1–6), 10–15 (MI10–15)								

🕮 Wiring: Fixed Quantity Control can control up to eight motors. The following diagram shows an example of controlling four motors at the same time.

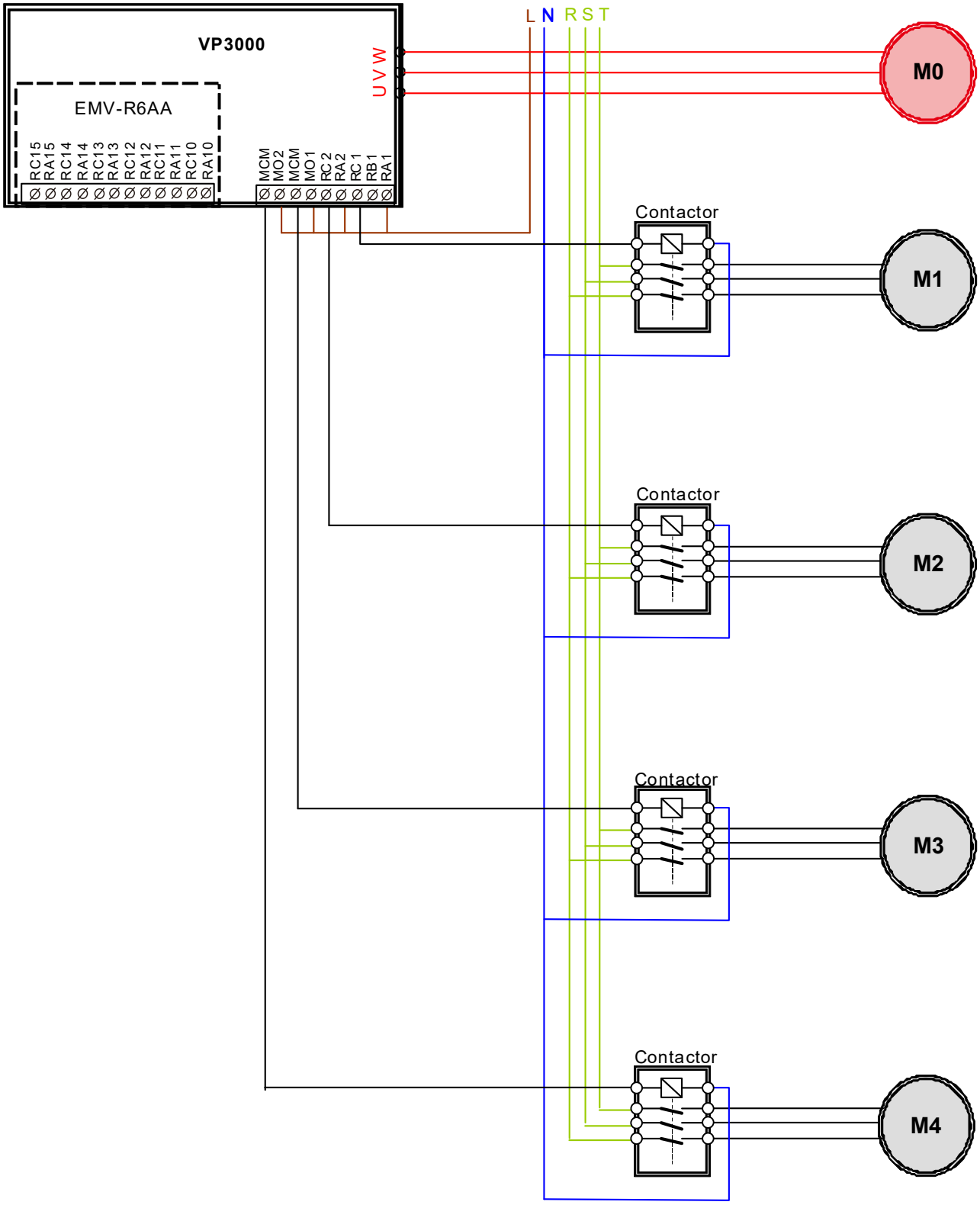


Figure 21 QTY Control + Time Circulation

U1. Pump Schedule

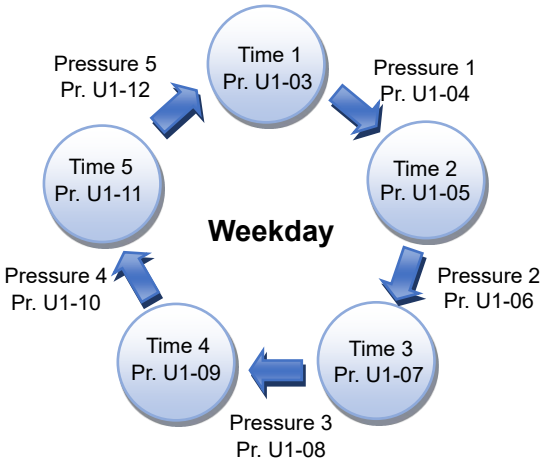
You can set this parameter during operation

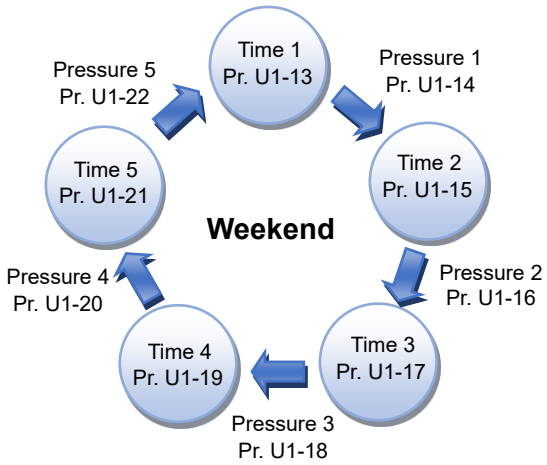
U1-00 Pump Schedule Setting

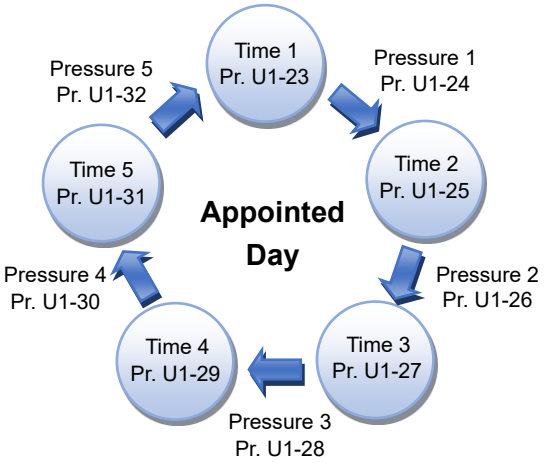
(0x1B40) Default: 0

Settings bit0: Weekday
bit1: Weekend
bit2: Appt
bti3–15: Reserve

- This parameter arranges the pump schedule. Correct the time before using this function.
- The schedule target pressure function is only valid when you set the PID reference source 1 & 2 in the parameter group P as “Current pressure command” first. The actual input of target pressure to the PID module will be limited by the parameters of P-PID1 & 2 setpoint upper and lower limits.
- To meet different water demands in various seasons, with the calendar actual time of the keypad and the pump schedule function, the user can arrange the target pressure in specific time period to achieve the purpose of energy saving. The schedule can be divided into three phases: Daily, weekend and appointed days, each phase can be set separately and:
  bit0 = 1 means the weekday schedule is enabled.
  bit1 = 1 means the weekend schedule is enabled.
  bit2 = 1 means the appointed schedule is enabled.
- Priority: Appointed day > weekend > weekday > date that is not in the schedule setting
- The latter set time must be greater than the previous set time, otherwise the subsequence time setting will be regarded as invalid, and the pump only runs to the valid time period in the end.
- There cannot be blank settings between each section of parameter settings. When the system detects that the parameters are blank, the setting is invalid.
- You can set the schedule less than 5 phases.
- The target pressure on non-scheduled days is default as 0 to avoid unexpected operation of the system.
- When entering a scheduled day from a non-scheduled day, it remains at the non-scheduled day target setting first and switches when the time of first period is reached.
- When entering a non-scheduled day from a scheduled day, it restores to the previous non-schedule day target pressure setting.
- When crossing days, the pressure operation setting is set according to the last effective time period of the previous day.



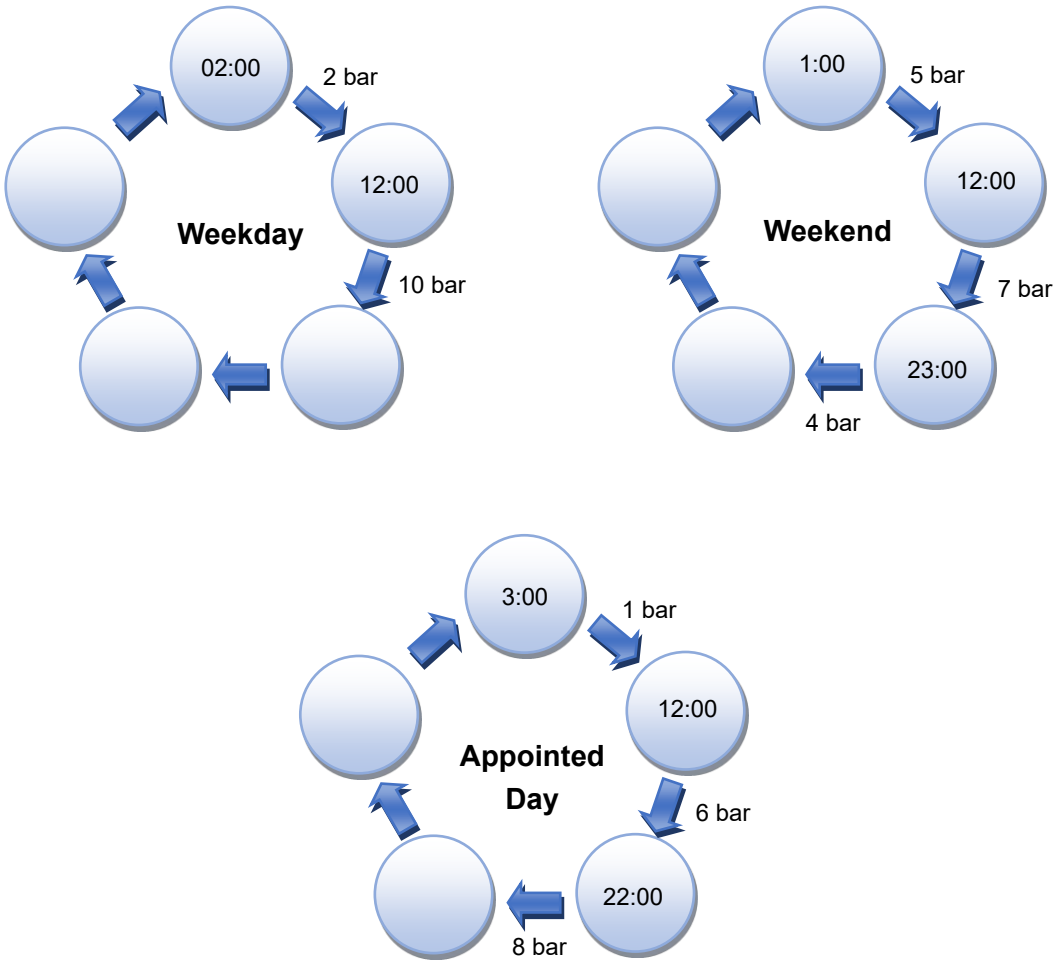




📖 For example:

- Weekend Definition is Saturday and Sunday (Pr. U1-01 = 0).
- Appointed day is defined as 2/1–2/5.

Setting Range	Weekday					Weekend		Week-day	Appointed Day					Week-end
									2/1	2/2	2/3	2/4	2/5	
Time	Mon.	Tues.	Wedn.	Thurs.	Fri.	Sat.	Sun.	Mon.	Tues.	Wedn.	Thurs.	Fri.	Sat.	Sun.
00:00	4	10	10	10	10	10	4	4	10	8	8	8	8	8
01:00	4	10	10	10	10	5	5	4	10	8	8	8	8	5
02:00	2	2	2	2	2	5	5	2	10	8	8	8	8	5
03:00	2	2	2	2	2	5	5	2	1	1	1	1	1	5
04:00	2	2	2	2	2	5	5	2	1	1	1	1	1	5
12:00	10	10	10	10	10	7	7	10	6	6	6	6	6	7
22:00	10	10	10	10	10	7	7	10	8	8	8	8	8	7
23:00	10	10	10	10	10	4	4	10	8	8	8	8	8	4
00:00	10	10	10	10	10	4	4	10	8	8	8	8	8	4



U1-01 Weekend Definition

(0x1B41) Default: 0

Settings 0: Saturday and Sunday
1: Sunday
2: No Weekend

📖 Weekend days can be defined according to the needs. Setting 0 means weekdays are from Monday to Friday, which means weekends are Saturday and Sunday; setting 1 means weekday is from Monday to Saturday, which means weekend is only Sunday.

U1-02 Pressure Cmd Output

(0x1B42) Default: 0

Settings -30000–30000

U1-03 Weekday Start Time 1

(0x1B43) Default: 0

Settings 00:00–23:59

U1-04 Weekday Pressure Setpoint 1

(0x1B44) Default: 0

Settings -30000–30000

U1-05 Weekday Start Time 2

(0x1B45) Default: 0

Settings 00:00–23:59

U1-06 Weekday Pressure Setpoint 2

(0x1B46) Default: 0

Settings -30000–30000

U1-07 Weekday Start Time 3

(0x1B47) Default: 0

Settings 00:00–23:59

U1-08 Weekday Pressure Setpoint 3

(0x1B48) Default: 0

Settings -30000–30000

U1-09 Weekday Start Time 4

(0x1B49) Default: 0

Settings 00:00–23:59

U1-10 Weekday Pressure Setpoint 4

(0x1B4A) Default: 0

Settings -30000–30000

U1-11 Weekday Start Time 5

(0x1B4B) Default: 0

Settings 00:00–23:59

U1-12 Weekday Pressure Setpoint 5

(0x1B4C) Default: 0

Settings -30000–30000

U1-13 Weekend Start Time 1

(0x1B4D) Default: 0

Settings 00:00–23:59

U1-14 Weekend Pressure Setpoint 1

(0x1B4E) Default: 0

Settings -30000–30000

U1-15 Weekend Start Time 2

(0x1B4F) Default: 0

Settings 00:00–23:59

U1-16 Weekend Pressure Setpoint 2

(0x1B50) Default: 0

Settings -30000–30000

U1-17 Weekend Start Time 3

(0x1B51) Default: 0

Settings 00:00–23:59

U1-18 Weekend Pressure Setpoint 3

(0x1B52) Default: 0

Settings -30000–30000

U1-19 Weekend Start Time 4

(0x1B53) Default: 0

Settings 00:00–23:59

U1-20 Weekend Pressure Setpoint 4

(0x1B54) Default: 0

Settings -30000–30000

U1-21 Weekend Start Time 5

(0x1B55) Default: 0

Settings 00:00–23:59

U1-22 Weekend Pressure Setpoint 5

(0x1B56) Default: 0

Settings -30000–30000

U1-23 Appt Start Date 1

(0x1B57) Default: 0

Settings 01:01–12:31

U1-24 Appt End Date 1

(0x1B58) Default: 101

Settings 01:01–12:31

U1-25 Appt Start Date 2

(0x1B59) Default: 101

Settings 01:01–12:31

U1-26 Appt End Date 2

(0x1B5A) Default: 101

Settings 01:01–12:31

U1-27 Appt Start Date 3

(0x1B5B) Default: 101

Settings 01:01–12:31

U1-28 Appt End Date 3

(0x1B5C) Default: 101

Settings 01:01–12:31

U1-29 Appt Start Date 4

(0x1B5D) Default: 101

Settings 01:01–12:31

U1-30 Appt End Date 4

(0x1B5E) Default: 101

Settings 01:01–12:31

U1-31 Appt Start Date 5

(0x1B5F) Default: 101

Settings 01:01–12:31

U1-32 Appt End Date 5

(0x1B60) Default: 101

Settings 01:01–12:31

- Start day ≤ End day: from the appointed start date (inclusive) to the appointed end date (inclusive), the pump operates to the set appointed start time (Pr.U1-33–U1-41).
- Start day > End day: from the appointed start date (inclusive) to the end of that year, and to the appointed end date (inclusive) in the next year, the pump operates to the set appointed start time (Pr.U1-33–U1-41).
- The date is invalid when setting as 00.00. The section of from that start date to end date is invalid.

U1-33 Appt Start Time 1

(0x1B61) Default: 0

Settings 00:00–23:59

U1-34 Appt Pressure Setpoint 1

(0x1B62) Default: 0

Settings -30000–30000

U1-35 Appt Start Time 2

(0x1B63) Default: 0

Settings 00:00–23:59

U1-36 Appt Pressure Setpoint 2

(0x1B64) Default: 0

Settings -30000–30000

U1-37 Appt Start Time 3

(0x1B65) Default: 0

Settings 00:00–23:59

U1-38 Appt Pressure Setpoint 3

(0x1B66) Default: 0

Settings -30000–30000

U1-39 Appt Start Time 4

(0x1B67) Default: 0

Settings 00:00–23:59

U1-40 Appt Pressure Setpoint 4

(0x1B68) Default: 0

Settings -30000–30000

U1-41 Appt Start Time 5

(0x1B69) Default: 0

Settings 00:00–23:59

U1-42 Appt Pressure Setpoint 5

(0x1B6A) Default: 0

Settings -30000–30000

- All the appointed days run with the appointed schedule and pressure setpoint, that is, when the set date is the appointed date in Pr.U1-23–U1-32, the schedule will be arranged according to Pr.U1-33–U1-42.
- The appointed date starts with the Appt Start Date and ends with the Appt End Date.
  For example: when setting 1/2 as the start date and 1/3 (13:00) as the end date, both 1/2 and 1/3 are the appointed dates and the pump operates to the set period of the time (1/3 12:59).
- If the end date is less than the start date, it will operate across years.
  For example: when setting 12/30 as the start date and 1/2 (13:00) as the end date, 12/30, 12/31, 1/1 and 1/2 are all the appointed dates and the pump operates to the set period of the time (1/2 12:59).

U2. Fluid Estimator

You can set this parameter during operation

U2-00 Flow Estimation Method

(0x1B80) Default: 0

Settings 0: Disable
1: Q-H Estimation
2: Q-P Estimation

Use the following two flow estimation methods to estimate the system flow without using a flow meter:

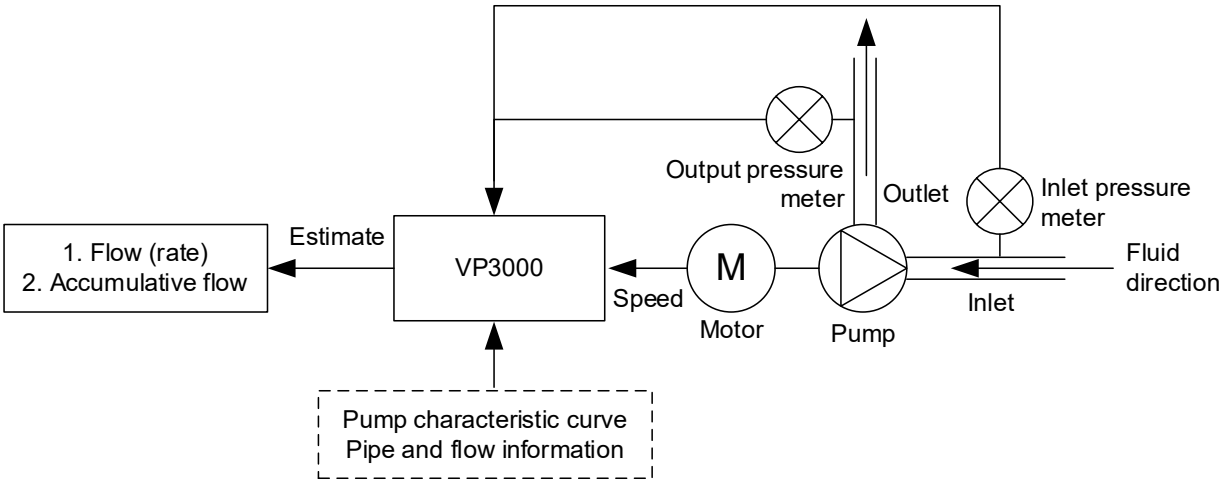
1: Q-H Estimation: install two pressure sensors at the inlet and outlet respectively and set Pr.U2-23–U2-39.

- The analog input function needs to set the corresponding parameters, set AI1 as pressure input (outlet), and set AI2 as pressure input (inlet).
- Set parameters of the inlet and outlet diameter, pump rated speed, fluid density, pressure sensor height difference, pump curve head 1–5, and pump curve flow 1–5.
- Set flow estimation method as 1 (enabling Q-H estimation), start the drive and begin operation. If any of the above parameters is not set, the estimation will not be performed (the estimated value is 0).

2: Q-P Estimation: set Pr.U2-23–U2-24 and U2-30–U2-44.

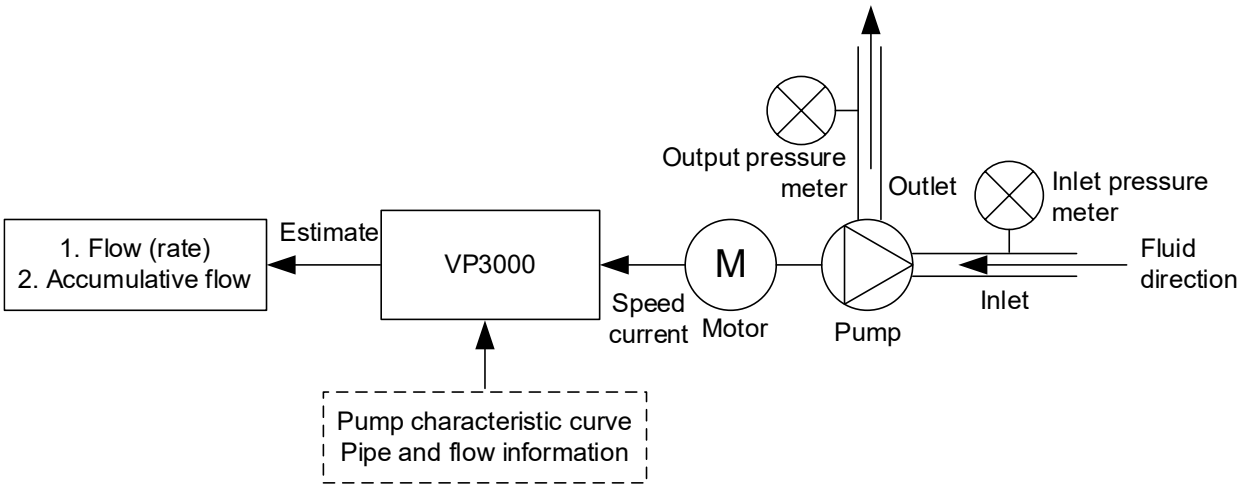
- Sets parameters of the inlet and outlet diameter, pump rated speed, fluid density, pump curve power 1–5 and pump curve flow 1–5 (P1–P5 and Q1–Q5 need to be set from large to small).
- Set flow estimation method as 2 (enabling Q-P estimation), start the drive and begin operation. If any of the above parameters is not set, the estimation will not be performed (the estimated value is 0).

Head method: use the drive to read the data from the pressure sensor at the pump inlet/ outlet and use the flow-head characteristic curve (Q-H curves) provided by the pump factory to calculate the flow and accumulated fluid of the pump system volume.



Item	Descriptions
Motor speed (rpm)	Input the rotor speed (rpm) estimated from the drive internal estimation.
Pump inlet and outlet pressure (bar)	Set the input outlet pressure and input inlet pressure from AI1 to AI3.
Pipe and fluid information	Including pump inlet and outlet diameters, fluid density and pump inlet/ outlet pressure sensor height difference, etc.
Pump characteristic curve	A two-dimensional look-up table curve is constructed from Q-H curve 1–5 and Q-H flow (rate) curve 1–5.

- Power method: use the motor shaft power calculated by the drive and the Q-P curves provided by the pump factory to calculate the flow and cumulative fluid volume of the pump system.



Item	Descriptions
Motor speed (rpm)	Input the rotor speed (rpm) estimated from the drive internal estimation.
Output torque (Nm)	Outputs from the drive internal estimated electromagnetic torque.
Output power (kW)	Outputs from the drive internal estimated motor shaft power.
Pipe and fluid information	Including the inlet / outlet diameters and fluid density.
Pump characteristic curve	A two-dimensional look-up table curve is constructed from Q-P curve 1–5 and Q-P flow (rate) curve 1–5.

- The estimation result will be updated after the drive starts operating and returns to 0 when the drive stops.
- When using Q-H estimation, It is suggested not to install a pressure reduction (such as a check valve) between the pressure sensor and the pump. The pressure reduction affects the estimation accuracy. If there is a pressure reduction between the pressure sensor and the pump, the error may reach more than 5% depending on the assembled pressure reduction. The error caused by the pressure reduction can be included in the Q-H parameters for correction.
- It is easy to cause inaccurate flow estimation when the inlet and outlet diameters are set below 0.005m. The flow estimation status bit will be used to remind the user whether the setting is within this area.

- It is easy to cause inaccurate flow estimation when the output speed is lower than 100 rpm. In general application scenarios, the efficiency of the water pump at low speed is not good, and the operation time is short. The flow estimation status bit is used to remind the user whether the setting is within this area.
- If the motor controlled by the drive is an induction motor, it is recommended to enable the slip compensation function to make the actual output speed consistent with the target speed and improve the accuracy of flow estimation.

U2-01 Cavitation Detect Control Bit

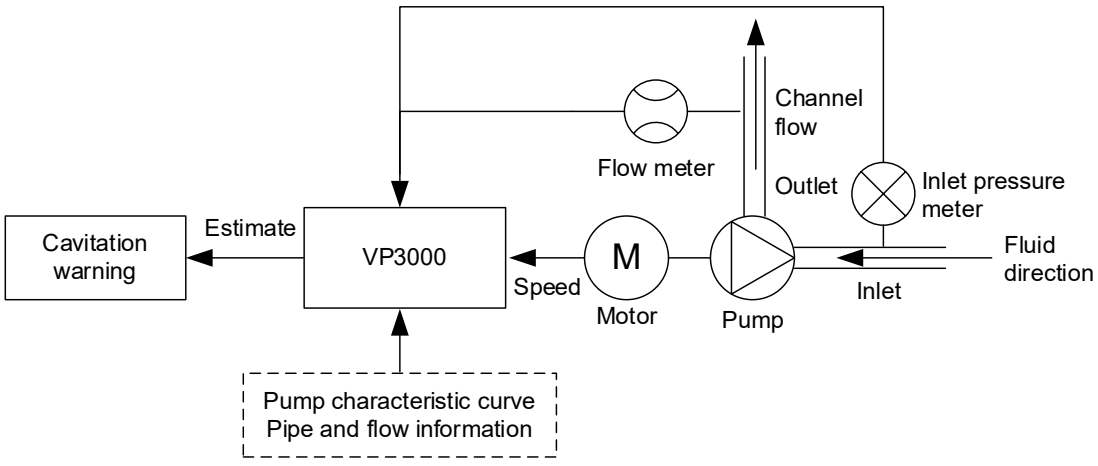
(0x1B81) Default: 0

Settings bit 0: Cavitation Enable
bit 1: Flow Input Sel
bit 2: Cavitation Warning
bit3–bit15: Reserve

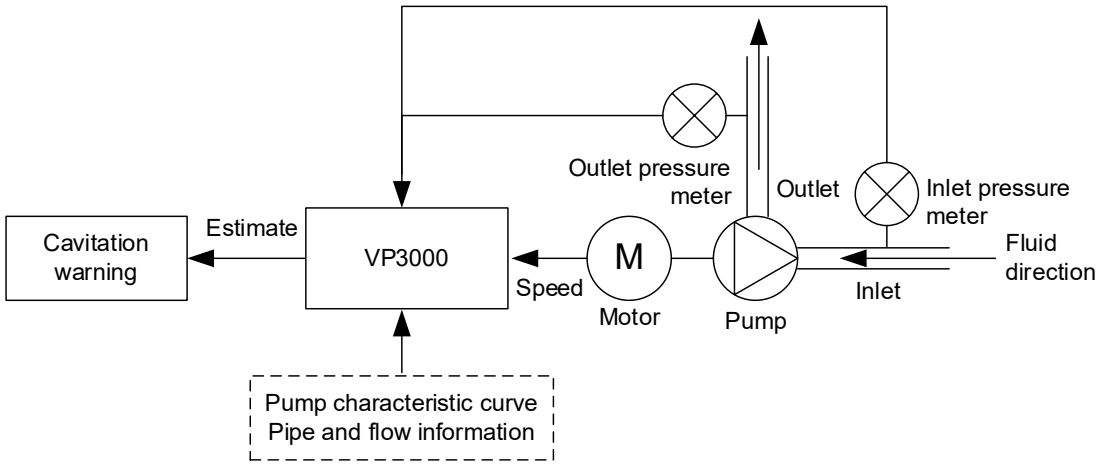
- Use the pressure sensor at the water pump inlet and the flow (rate) information of the flow channel, combined with the flow (rate) - required net positive suction head characteristic curve (HPSHr Curves) provided by the pump factory, to estimate whether there are bubbles in the water pump.

bit	Function	Setting
0	Cavitation enable	0: Disable Cavitation
		1: Enable Cavitation
1	Flow input selection	0: by analog flow meters
		1: by Q-H estimation
2	Cavitation warning	0: No warning
		1: Warn but continue operation

1. Use entity flow meters



2. Use Q-H to simulate the flow meter



Item	Descriptions
Motor speed (rpm)	Input the motor speed estimated from the drive.
Inlet pressure of the pump	Input the pressure value from external AI (the unit is Bar after switching from digital to analog).
Outlet pressure of the pump	Input the pressure value from external AI (the unit is Bar after switching from digital to analog).
Channel flow (rate)	Input the flow value from external AI (the unit is 0.01 m^3/hr after switching from digital to analog) or obtain the value from the flow estimation simulated calculation.
Pipe and fluid information	Including pipe diameters, fluid density and fluid temperature, etc.
Pump characteristic curve	Input the Q-H flow (rate) curve 1–5 and NPSHr curve 1–5 for the table look-up.
Cavitation warning	The drive shows warning when detecting cavitation, but it does not stop running.

📖 Defines the required flow to be detected by a flow meter or by the Q-H estimation method, refer to Pr.G2-02 for further description.

📖 When the cavitation is detected, the drive displays the warning Cavi to remind the user that cavitation may have occurred in the pipeline for early maintenance.

U2-02 Flow Estimation Status Bit

(0x1B82) Default: Read only

Settings
bit 0: Q-H Estimation
bit 1: Q-P Estimation
bit 2: Cavitation Detecting
bit 3: Q-H Setting Incomplete
bit 4: Fluid Density Setting Incorrect
bit 5: Pump Rated RPM Setting Incorrect
bit 6: Inlet Diameter too Small
bit 7: Outlet Diameter too Small
bit 8: RPM under Flow Estimation Limit
bit 9: Incomplete Setting of Cavitation
bit 10: RPM under Cavitation Limit

📖 This parameter indicates the estimating status of flow and cavitation.

bit	Status Description	Condition		Status
0	Q-H estimation is working	Any flag of bit3–bit8 is established		0
		All flags of bit3–bit8 are not established		1
1	Q-P estimation is working	Any flag of bit4–bit8 is established		0
		All flags of bit4–bit8 are not established		1
2	Cavitation detection is working	Any flag of bit4–bit7, bit9, bit10 is established		0
		bit4~bit7, bit9 and bit10 are not established		1
3	Q-H setting incomplete	The non-bit0 = 1 condition is established		0
		The following two conditions must be established: 1. Pr.U2-00 (Flow estimation method) = 1 (Q-H) 2. Any of the following parameters is set incorrectly: Pr.U2-03, U2-07 (Inlet pressure AI source), Pr.U2-04, U2-08 (Inlet pressure AI max value), Pr.U2-06, U2-10 (Inlet pressure unit)		1
4	Fluid density setting incorrect	Pr.U2-26 (Fluid density) ≠ 0		0
		Pr.U2-26 (Fluid density) = 0		1
5	Pump rated rpm setting incorrect	Pr.U2-25 (Pump rated speed) ≠ 0		0
		Pr.U2-25 (Pump rated speed) = 0		1
6	Inlet diameter too small (exceeds the limit of flow estimation)	Pr.U2-23 (Pump inlet diameter) < 0.005 m		0
		Pr.U2-23 (Pump inlet diameter) ≥ 0.005 m		1
7	Outlet diameter too small (exceeds the limit of flow estimation)	Pr.U2-24 (Pump outlet diameter) < 0.005 m		0
		Pr.U2-24 (Pump outlet diameter) ≥ 0.005 m		1
8	RPM under flow estimation limit	Motor speed ≥ 100 rpm		0
		Motor speed <100 rpm		1
9	Incomplete setting of cavitation	1. Pr.U2-01 (Cavitation detect control bit) sets the control bit as flow meter.	Parameter settings are complete	0
		2. Pr.U2-01 (Cavitation detect control) sets the control bit as Q-H estimation.	Parameter settings are incomplete	1
10	RPM under cavitation limit	Motor speed ≥ 100 rpm		0
		Motor speed < 100 rpm		1

U2-03 Inlet Pressure AI Src

(0x1B83) Default: 0

Settings 0: Disable
1–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

Sets the inlet pressure analog input signal source.

U2-04 Inlet Pressure AI Max Value

(0x1B84) Default: 10

Settings AVI: 0–10 V
ACI: 0–20 mA / 4–20 mA

Sets the maximum engineering value corresponding to the analog signal.

U2-05 Inlet Pressure Decimal Point

(0x1B85) Default: 0

Settings 0: No Decimal Point
1: One Decimal Point
2: Two Decimal Point
3: Three Decimal Point

U2-06 Inlet Pressure Unit

(0x1B86) Default: 0

Settings 0: mbar
1: bar
2: Pa
3: kPa
4: mWG
5: inWG
6: ftWG
7: psi
8: atm

Sets the inlet pressure unit (Pr.U2-06) and the decimal points (Pr.U2-05).

U2-07 Outlet Pressure AI Src

(0x1B87) Default: 0

Settings 0: Disable
1–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

Sets the outlet pressure analog input signal source.

U2-08 Outlet Pressure AI Max Value

(0x1B88) Default: 10

Settings AVI: 0–10 V
ACI: 0–20 mA / 4–20 mA

🕮 Sets the maximum engineering value corresponding to the analog signal.

U2-09 Outlet Pressure Decimal Point

(0x1B89) Default: 0

Settings 0: No Decimal Point
1: One Decimal Point
2: Two Decimal Point
3: Three Decimal Point

U2-10 Outlet Pressure Unit

(0x1B8A) Default: 0

Settings 0: mbar
1: bar
2: Pa
3: kPa
4: mWG
5: inWG
6: ftWG
7: psi
8: atm

🕮 Sets the outlet pressure unit (Pr.U2-10) and the decimal points (Pr.U2-09).

U2-11 Flow Meter AI Src

(0x1B8B) Default: 0

Settings 0: Disable
1–6: Reserve
7–9: AI1–AI3
10–11: Reserve
12–13: AI10–AI11

🕮 Sets the flow meter analog input signal source.

U2-12 Flow Meter AI Max Value

(0x1B8C) Default: 10

Settings 0–30000

🕮 Sets the maximum engineering value corresponding to the analog signal.

U2-13 Flow Decimal Point

(0x1B8D) Default: 0

Settings 0: No Decimal Point
1: One Decimal Point

2: Two Decimal Point
3: Three Decimal Point

U2-14 Flow Unit

(0x1B8E) Default: 0

Settings 0: L/s
1: L/m
2: L/h
3: m3/s
4: m3/h
5: GPM
6: CFM

📖 Sets the flow meter units (Pr.U2-14) and the decimal points (Pr.U2-13).

U2-15 Inlet Pressure Display

(0x1B8F) Default: Read only

Settings -30000–30000 (Unit: refer to Pr.U2-06, decimal point: refer to Pr.U2-05)

U2-16 Outlet Pressure Display

(0x1B9A) Default: Read only

Settings -30000–30000 (Unit: refer to Pr.U2-10, decimal point: refer to Pr.U2-09)

U2-17 Flow Meter Output

(0x1B9B) Default: Read only

Settings 0–4294967295 (Unit: refer to Pr.U2-14, decimal point: refer to Pr.U2-13)

U2-18 Flow Estimation Output

(0x1B9D) Default: Read only

Settings 0–4294967295 (Unit: refer to Pr.U2-14, decimal point: refer to Pr.U2-13)

U2-19 Flow Accumulated Src

(0x1B9E) Default: 0

Settings 0: Flow Estimation
1: Flow Meter

📖 Sets the accumulated flow signal source.

U2-20 Flow Accumulated m^3

(0x1B9F) Default: Read only

Settings 0.0–999.9 m^3

U2-21 Flow Accumulated km^3

(0x1BA1) Default: Read only

Settings 0–65535 km^3

📖 To execute flow estimation, you need to enable the flow estimation function (Pr.U2-00) and configure according to the instruction of Pr.U2-00, the estimated accumulative flow will be displayed in Pr.U2-20 and U2-21.

📖 If you need to reset the accumulative flow, refer to Pr.U2-22 description.

U2-22 Flow Accumulated Reset

(0x1BA3) Default: 0

Settings 0: Disable
1: Reset after Power On
2: Reset Immediately

- This parameter is power-off memory.
- Refer to Pr.U2-20 and U2-21 for flow volume.
- 0: No reset, the previous flow volume (Pr.U2-20 and U2-21) continues to accumulate every time it starts and stops accumulating when the accumulation reaches the limit value.
- 1: Reset the accumulated flow when the drive is first powered on and initialized.
- 2: Reset the accumulated flow immediately (it directly reset the accumulated flow after setting no matter the flow estimation function is operating or not).
- The flow accumulated value cannot be cleared through Pr.b0-01 Parameter Reset.

U2-23 Pump Inlet Diameter

(0x1BA4) Default: 0.0

Settings 0.0–6500.0 mm

U2-24 Pump Outlet Diameter

(0x1BA5) Default: 0.0

Settings 0.0–6500.0 mm

- The pipe diameter at pressure sensor location.
- If there is no pressure sensor, enter the pipe diameter of the pump inputs and outlets.

U2-25 Pump Rated Speed

(0x1BA6) Default: 3000

Settings 0–65535 rpm

U2-26 Fluid Density

(0x1BA7) Default: 995.7

Settings 0.0–6550.0 kg/m^3

- The density of the fluid in the pipe at the operating temperature.

U2-27 Fluid Oper Temp

(0x1BA8) Default: 30.00

Settings 0.00–600.00°C

U2-28 Pressure Sensor Height Diff

(0x1BA9) Default: 0.00

Settings -30.00–30.00 m

- The height difference = outlet – inlet.

U2-29 Cavitation Detect Tolerance

(0x1BAA) Default: 0.00

Settings 0.00–600.00 m

The larger value of this parameter, the easier the cavitation warning occurs. It is equivalent to increase the value of NPSHr (Pr.U2-45–U2-49), which can be protected before the cavitation occurs.

U2-30 Pump Curve Head 1

(0x1BAB) Default: 0.00

U2-31 Pump Curve Head 2

(0x1BAC) Default: 0.00

U2-32 Pump Curve Head 3

(0x1BAD) Default: 0.00

U2-33 Pump Curve Head 4

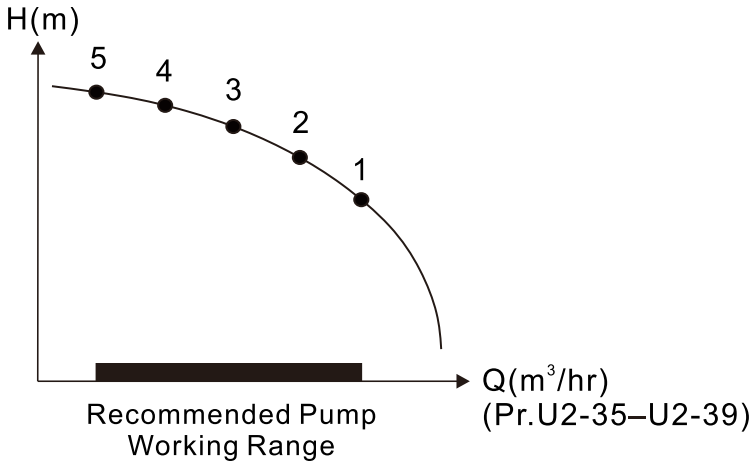
(0x1BAE) Default: 0.00

U2-34 Pump Curve Head 5

(0x1BAF) Default: 0.00

Settings 0.00–655.00 m

Refer to the head flow curve provided by the pump manufacturer.



U2-35 Pump Curve Flow 1

(0x1BB0) Default: 0.00

U2-36 Pump Curve Flow 2

(0x1BB1) Default: 0.00

U2-37 Pump Curve Flow 3

(0x1BB2) Default: 0.00

U2-38 Pump Curve Flow 4

(0x1BB3) Default: 0.00

U2-39 Pump Curve Flow 5

(0x1BA8) Default: 0.00

Settings 0.00–655.00 m^3/hr

Refer to the flow curve provided by the pump manufacturer.

U2-40 Pump Curve Power 1

(0x1BB4) Default: 0.00

U2-41 Pump Curve Power 2

(0x1BB5) Default: 0.00

U2-42 Pump Curve Power 3

(0x1BB6) Default: 0.00

U2-43 Pump Curve Power 4

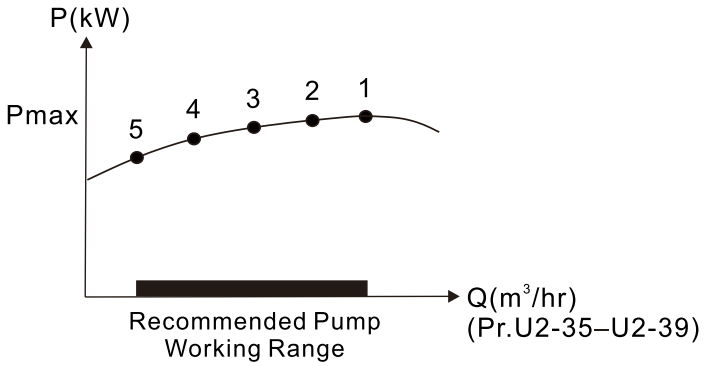
(0x1BB7) Default: 0.00

U2-44 Pump Curve Power 5

(0x1BB8) Default: 0.00

Settings 0.00–655.00 kW

Refer to the power flow curve provided by the pump manufacturer.



U2-45 Pump Curve NPSHr 1

(0x1BB9) Default: 0.00

U2-46 Pump Curve NPSHr 2

(0x1BBA) Default: 0.00

U2-47 Pump Curve NPSHr 3

(0x1BBB) Default: 0.00

U2-48 Pump Curve NPSHr 4

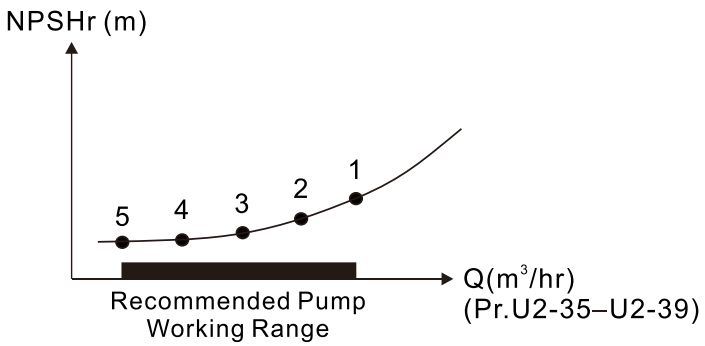
(0x1BBB) Default: 0.00

U2-49 Pump Curve NPSHr 5

(0x1BBC) Default: 0.00

Settings 0.00–655.00 m

Refer to the NPSHr curve provided by the pump manufacturer, select the above 5 curves, and ensure to cover the suggested pump working range.



U3. Pump Protection

U3-00 Pressure Protection Src

(0x1BC0) Default: 0

Settings 0: Disable
1: P-PID1 Fdk
2: P-PID2 Fdk

U3-01 Heavy Leakage Detect Level

(0x1BC1) Default: 85

Settings 0–85%

- The base is the target value set by the PID control.
- This parameter is the deviation from the target value set by the PID control.

U3-02 Heavy Leakage Detect time

(0x1BC2) Default: 15.0

Settings 0.1–300.0 sec.

U3-03 Heavy Leakage Current Level

(0x1BC3) Default: 20

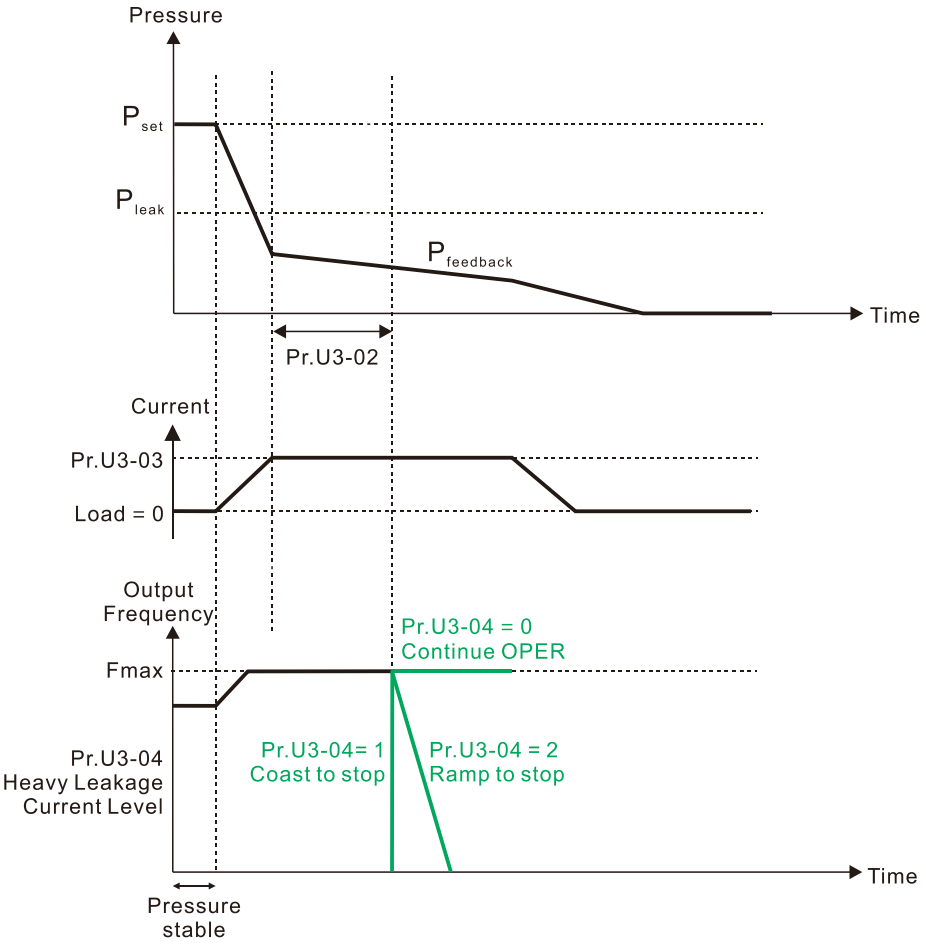
Settings 0–100%

U3-04 Heavy Leakage Treatment

(0x1BC4) Default: 0

Settings 0: Warning & continue OPER
1: Fault and coast to stop
2: Fault & Ramp to Stop

- P_{set} = Target pressure, $P_{feedback}$ = Feedback pressure, P_{leak} = Large leakage warning level.
- When the drive is operating and the frequency operates to the maximum frequency, the drive output current rated percentage is higher than Pr.U3-03 and the detected pressure feedback is smaller than the P_{leak} = Target pressure × (1 – Pr.U3-01) after the continuous time of Pr.U3-02, the heavy leakage is triggered. Select the treatment according to Pr.U3-04, and the AC motor drive displays warning LEKn or fault LEKE according to the setting.
- When the heavy leakage is triggered, the drive does not accept cleaning command.
- The heavy leakage pressure detection source should be set as single process / Basic PID analog feedback value.
- Operation status includes standby, accelerating, constant speed, decelerating and ramping to stop.
- When any of the Pr.U3-03 and U3-01 is set as 0, the heavy leakage loading detection function is disabled.



U3-05 Hi-Pressure Alarm Level

(0x1BC5) Default: 25

Settings 0–50%

🕮 This parameter is based on the target value set by the PID control.

U3-06 Hi-Pressure Alarm Detect Time

(0x1BC6) Default: 5.0

Settings 0.1–300.0 sec.

U3-07 Hi-Pressure Alarm Treatment

(0x1BC7) Default: 1

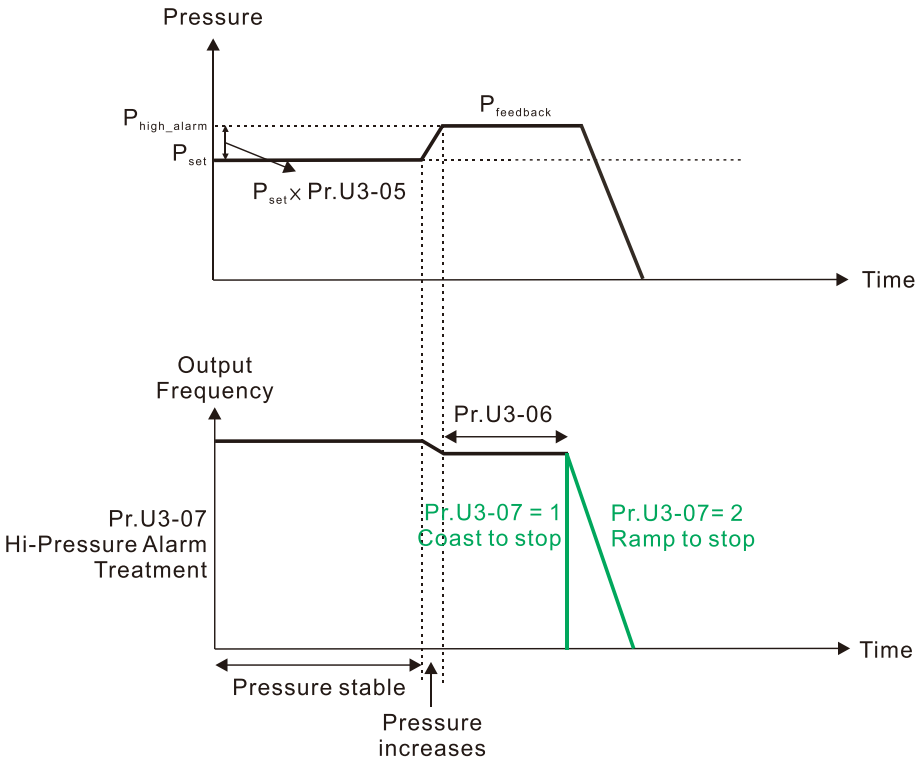
Settings 1: Fault and coast to stop

2: Fault & Ramp to Stop

🕮 P_{set} = Target pressure, $P_{feedback}$ = Feedback pressure, P_{high_alarm} = High pressure warning level.

🕮 When the detected feedback pressure is higher than the P_{high_alarm} = Target pressure × (1 + Pr.U3-05) for the continuous time of Pr.U3-06, the drive handles HPS fault according to Pr.U3-07 and coasts to stop or ramps to stop.

🕮 The pressure detection source should be set as single process / Basic PID analog feedback value.



U3-08 Lo-Pressure Alarm Level

(0x1BC8) Default: 25

Settings 0–50%

🕮 This parameter is based on the target value set by the PID control.

U3-09 Lo-Pressure Alarm Detect Time

(0x1BC9) Default: 5.0

Settings 0.1–300.0 sec.

U3-10 Lo-Pressure Alarm Treatment

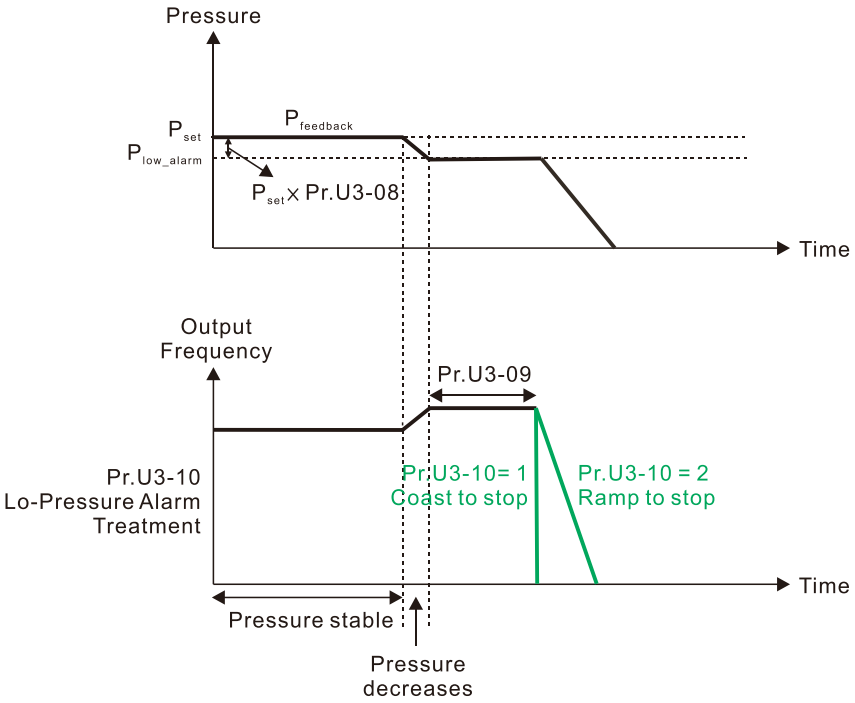
(0x1BCA) Default: 0

Settings 0: Warning & continue OPER
1: Fault and coast to stop
2: Fault & Ramp to Stop

🕮 P_{set} = Target pressure, $P_{feedback}$ = Feedback pressure, P_{low_alarm} = Low pressure warning level.

🕮 When the detected feedback pressure is lower than P_{low_alarm} = Target pressure × (1 – Pr.U3-08) for the continuous time of Pr.U3-09, the drive displays LPSn warning or LPSE fault according to the setting for Pr.U3-10.

🕮 The pressure detection source should be set as single process / Basic PID analog feedback value.

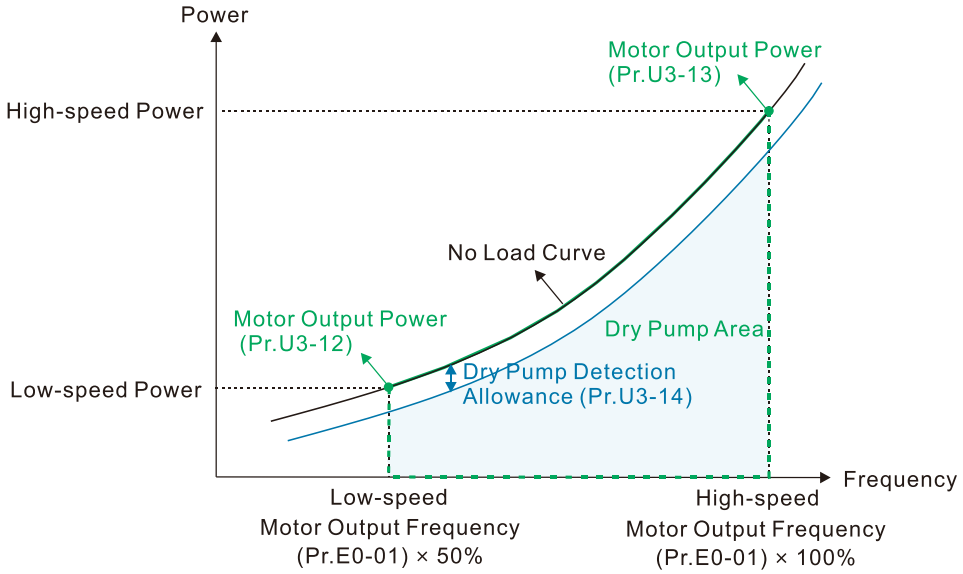


U3-11 Dry Pump Curve Autotune

(0x1BCB) Default: 0

Settings 0: Disable
1: Enable

- In the industry application, the pipe may have no water, or the water flow is exceptionally small or there is too much air in the pipe due to broken pipe/ source abnormality, which makes the water pump idle without load (low power) and causes increasing pump temperature and bearing loss.
- Establish an anhydrous state first, enable the load autotuning curve (Pr.U3-11 = 1) and press the RUN key, then the drive displays tUn and automatically runs to 50% and 100% of the rated frequency, and record the output power respectively for Pr.U3-12 and U3-13.
- If there is an error in the automatic detection curve, the drive displays a warning dAUE to remind the user to re-detect.
- The range below this load curve is the region where dry pump occurs.



- 🕮 Before dry pump auto-tunes, it is recommended to set the motor basic parameters (rated power/ rated current/ rated speed/ motor parameters, etc.) first, so that the tuned curve will be more realistic.
- 🕮 When the dryn warning is triggered, the drive will be in standby status and waiting for automatic restart.
- 🕮 When the dryn warning is triggered, the drive does not accept Start command.
- 🕮 When the dryn warning is triggered, the drive does not accept Cleaning command.
- 🕮 The drive can accept Stop command when the dryn warning is triggered and is waiting for restart, clears the dryn warning and returns Pr.U3-18 to the original user setting.

U3-12 50% Rated FREQ Output Power

(0x1BCC) Default: 0

Settings 0–120%

U3-13 100% Rated FREQ Output Power

(0x1BCD) Default: 0

Settings 0–120%

- 🕮 When Pr.U3-11 = 1 enables curve auto-tune, input the dry pump auto-tuning result to Pr.U3-12 and U3-13.

U3-14 Dry Pump Detect Level

(0x1BCE) Default: 10

Settings 0–50%

- 🕮 The value of this parameter determines the sensitivity of dry pump detection. The larger the setting, the harder it is to trigger dry pump warning dryn, and the smaller the setting, the easier it is to trigger dry pump warning.
- 🕮 The dry pump warning is easily to be triggered if the water consumption is too small, adjust this parameter to avoid the dry pump warning.

U3-15 Dry Pump Detect Function

(0x1BCF) Default: 0

Settings 0: Disable
1: Enable

U3-16 Dry Pump Detect Time

(0x1BD0) Default: 15.0

Settings 0.0–300.0 sec.

- 🕮 When the load is lower than the dry pump loading curve and remains for the time of Pr.U3-16, the drive gives the dryn warning and stops according to Pr.U3-19 (Dry Pump Alarm Treatment).

U3-17 Dry Pump Restart Delay Time

(0x1BD1) Default: 30

Settings 1–1000 min

U3-18 Dry Pump Restart Times Limit

(0x1BD2) Default: 5

Settings 0–20

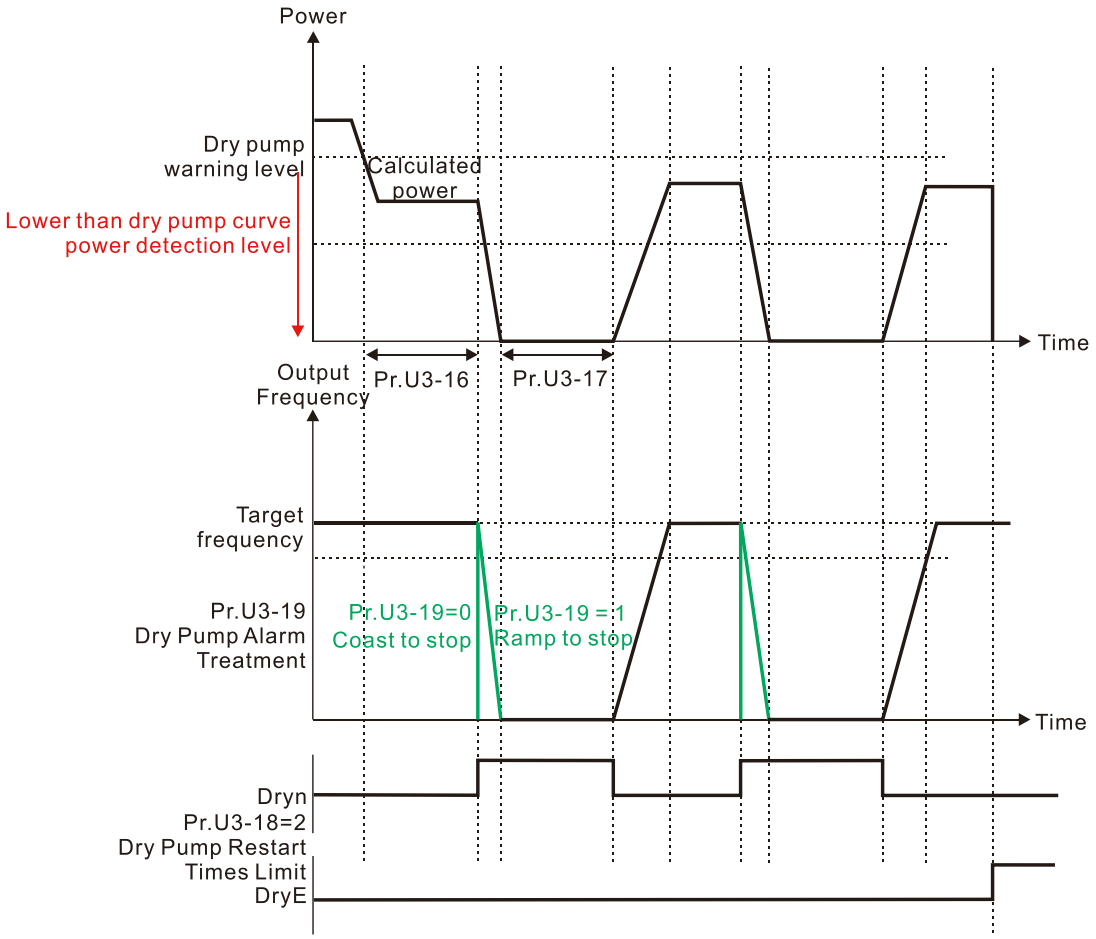
U3-19 Dry Pump Alarm Treatment

(0x1BD3) Default: 1

Settings 1: Warn and coast to stop

2: Warn and ramp to stop

- Re-detects whether the trigger condition of dry pump is still remained after the delay time of Pr.U3-17. If the trigger condition is cleared, the drive clears the dryn warning and resumes to the original state. If the dry pump condition still exists, the drive remains dryn warning and waits for the next detection restarts.
- If the restart time exceeds the setting value for Pr.U3-18, a dryE fault will be reported.
- When the dryE fault is triggered and reset, or when the drive power is cycled, Pr.U3-18 returns to the original user setting.



U3-20 Pump Clean Function

(0x1BD4) Default: 0

Settings 0: Disable

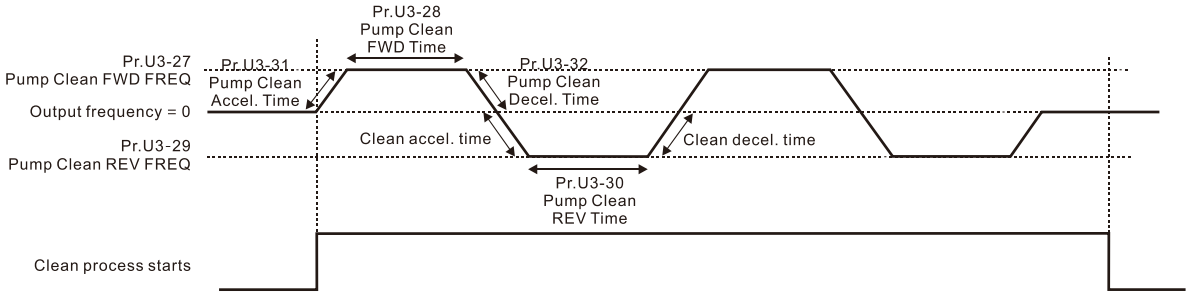
1: Enable by MI Src

2: Enable by Jam Current Limit

3: Enable by Scheduled Time

- There are three methods of cleaning function:

- Pr.U3-20 = 1, 3: DI (set Pr.U3-21 synchronously) and timing trigger (set Pr.U3-24 and U3-25 synchronously) are used for daily maintenance.
- Pr.U3-20 = 2: The cleaning function triggered by excessive jam current (set Pr.U3-24 and U3-25 synchronously) is used for protection.
- Regardless of whether the drive is currently running in forward or reverse direction, the cleaning process always starts from the forward direction.



📖 Enabled by MI source:

- Set specific MI terminal function as cleaning trigger.
- Pr.U3-26 (Pump clean cycle times) can set the cleaning cycles, which is counted as one cycle for forward and reverse once. Set Pr.U3-27 (Pump clean FWD frequency), Pr.U3-28 (Pump clean FWD time), Pr.U3-29 (Pump clean REV frequency), Pr.U3-30 (Pump clean REV time), Pr.U3-31 (Pump clean acceleration time) and Pr.U3-32 (Pump clean deceleration time), the MI is enabled for cleaning after setting the above parameters, and the drive resumes to the previous action when the cleaning completes (for example, if the drive was operating before cleaning, it resumes operation after the cleaning process, and accelerates/ decelerates according to the previous system setting).
- When the MI signal is established, the drive starts from the current operation status (forward or reverse) according to the system set acceleration / deceleration time, and executes the cleaning process when it moves to 0 Hz.
- When the MI signal is loss, it resumes to the drive previous action. For example, the previous action of the drive is RUN, it accelerates to the target frequency command according to the system set acceleration time; if the previous action of the drive is STOP, it decelerates to 0 Hz according to the system set deceleration time.
- The cleaning trigger method is set as level trigger when MI terminal is triggered. When MI is ON, the drive operates and the cleaning function operates; when MI is OFF, the cleaning function is disabled.

📖 Enabled by jam current limit:

- The setting range of Pr.U3-22 (Jam current detect level) and the actual loading correspond to Pr.H2-05 (ocA stall prevention level), the setting upper limit should be smaller than Pr.H2-05 and H2-07 (ocn stall prevention level) to prevent cleaning from being unable to triggered. And then set Pr.U3-23 (Jam current detect time), U3-26 (Pump clean cycle time), which can set the cleaning cycle that is counted as one cycle for forward and reverse once. Set Pr.U3-27 (Pump clean FWD frequency), Pr.U3-28 (Pump clean FWD time), Pr.U3-29 (Pump clean REV frequency), Pr.U3-30 (Pump clean REV time), Pr.U3-31 (Pump clean acceleration time) and Pr.U3-32 (Pump clean deceleration time).

- After setting the above parameters, as long as the drive is in operation (including accelerating, decelerating, in constant speed and decelerating and stop) and the current is higher than Pr.U3-22 (Jam current detect level) for the continuous time of Pr.U3-23 (Jam current detect time), the cleaning function is enabled. When the cleaning cycle completes, if the current is still larger than Pr.U3-22, the drive coasts to stop and triggers the JAME fault; if the current is not larger than the set Pr.U3-22, the drive resumes to previous action after the cleaning completes (for example, if the drive was in operation, it resumes to operation according to the previous set acceleration/ deceleration time after the cleaning completes).
- It is edge trigger when the cleaning function is set as over current trigger method. When the output current is larger than the setting cleaning load condition, it triggers the drive operation and cleaning operation. The cleaning function will be closed when the cleaning cycle completes.
- When the output current is larger than Pr.U3-22 and remains for the time of Pr.U3-23, it triggers the cleaning function, the drive displays CLE which means the cleaning function is operating. If the cleaning cycle (Pr.U3-26) is finished and the drive detects another stock within one cleaning cycle, it displays JAME fault and coasts to stop.

📖 Enabled by scheduled time:

- Verify if the calendar time is correct before enabling the cleaning function by scheduled time, and only enable the cleaning by this method after ensuring the time is correct. Pr.U3-24 (Pump clean weekday selection) sets the daily cleaning time. And then set Pr.U3-26 (Pump clean cycle time), which can set the cleaning cycle that is counted as one cycle for forward and reverse once, Pr.U3-27 (Pump clean FWD frequency), Pr.U3-28 (Pump clean FWD time), Pr.U3-29 (Pump clean REV frequency), Pr.U3-30 (Pump clean REV time), Pr.U3-31 (Pump clean acceleration time) and Pr.U3-32 (Pump clean deceleration time).
- Cleaning will start when the set day and time are reached and will resume to the previous drive action when the cleaning completes (for example, if the drive was operating, it resumes to operation according to the previous set acceleration/ deceleration time). If the scheduled cleaning has been started and the drive is suddenly powered off at this time, as long as the power is restored within the scheduled cleaning time range, it starts cleaning from 0 cycle and does not continue form the previous cleaning cycles.
- It is edge trigger when the cleaning function set as triggered by scheduled time. When the calendar time condition is met, it triggers the drive operation and cleaning operation. The cleaning function will be closed when the cleaning cycle completes.

📖 In the cleaning operation process triggered by the above each source, if the operation source is set as MI terminal or the keypad has given a STOP command, it ends the cleaning function and the drive operation. After the function is ended, it needs to go through the process of cleaning function MI terminal changes from OFF to ON, triggering the cleaning by scheduled time, and the over-current condition (during operation) again to enable the cleaning function.

Combination 1 of cleaning trigger and the user operation command

Trigger Event / Current Status	Keypad gives Start operation command	Keypad gives Stop operation command	MI gives Start operation command (OFF→ON)	MI gives Stop operation command (ON→OFF)
Cleaning command triggered	Cleaning operates	Stop operation*	Cleaning operates	Stop operation*
Cleaning is canceled/ ended	Normal operation	Stop operation	Normal operation	Stop operation

NOTE: * With a premise that user commands are issued during the cleaning.

Combination 2 of cleaning trigger and the user operation command

Trigger Event / Current Status	MI remains Start operation command (ON)	MI remains Stop operation command (OFF)
Cleaning command triggered	Cleaning operates	Cleaning operates
Cleaning is canceled/ ended	Stop operation	Stop operation

- Note that the cleaning action gives priority to forward and reverse rotation of the pump, Pr.A1-27 FWD/ REV direction setting is set directly to 0 (enable FWD/ REV) and resumes to user setting value after the cleaning function completes. It is NOT recommended to set parameters during cleaning process, which may cause the cleaning incomplete.
- If you enable the cleaning function during stop or at STOP status, the function will be started until the cleaning process completes.
- The cleaning process is set according to Pr.U3-26–U3-32.
- Correct the RTC time before setting Pr.U3-20 to 3.
- The AC motor drive displays CLE during the cleaning process, which means the cleaning function is operating, and resumes to the drive control mode before the cleaning when the cleaning process is completed. If the jam current still exists after the cleaning process triggered by the jam current, a JAME fault is displayed and the drive coasts to stop.

U3-21 Pump Clean Function MI Src

(0x1BD5) Default: 0

Settings 0: Disable
1: Reserve
2–7: MI1–MI6
5–9: Reserve
10–15: MI10–MI15

U3-22 Jam Current Detect Level

(0x1BD6) Default:
Default for H2-05

Settings 0–Max. setting value for H2-05

U3-23 Jam Current Detect Time

(0x1BD7) Default: 60.0

Settings 0.0–300.0 sec.

- The cleaning function will be triggered when the output current is larger than Pr.U3-22 and

remains for the time of Pr.U3-23, the drive displays CLE meaning the cleaning function is in operation. If the jam current still exists after the cleaning process, a JAME fault displays and the drive coasts to stop.

U3-24 Pump Clean Weekday Sel

(0x1BD8) Default: 0

Settings
bit 0: Sunday
bit 1: Monday
bit 2: Tuesday
bit 3: Wednesday
bit 4: Thursday
bit 5: Friday
bit 6: Saturday
bit 7–15: Reserved

U3-25 Pump Clean Start Time

(0x1BD9) Default: 0

Settings 00:00–23:59

📖 Timing cleaning function will be triggered on the time set in Pr.U3-24 and U3-25 every week.

U3-26 Pump Clean Cycle Times

(0x1BDA) Default: 5

Settings 1–30

U3-27 Pump Clean FWD FREQ

(0x1BDB) Default: 40.00

Settings 0.00–Fmax Hz

U3-28 Pump Clean FWD Time

(0x1BDC) Default: 2.0

Settings 0.0–300.0 sec.

U3-29 Pump Clean REV FREQ

(0x1BDD) Default: 40.00

Settings 0.00–Fmax Hz

U3-30 Pump Clean REV Time

(0x1BDE) Default: 2.0

Settings 0.0–300.0 sec.

U3-31 Pump Clean Accel Time

(0x1BEF) Default: 1.0

Settings 0.0–300.0 sec.

U3-32 Pump Clean Decel Time

(0x1BF0) Default: 1.0

Settings 0.0–300.0 sec.

U4. Master-Slave Multi-Pump Control

You can set this parameter during operation

U4-00 Master-Slave Pump Control

(0x1C00) Default: 0

Settings bit 0: Enable
bit 1: Backup Master
bit2–15: Reserve

In a multi-pump control system, it is necessary to perform operations such as increasing and decreasing slave pumps, constant pressure control , sleep boosting and wheel pumps based on the system pressure demand and actual pressure feedback amount.

Sets the backup master pump. Set bit1 as 1 to set the pump as the backup master pump.

The station defined in the multiple master pump system is as the following:

<table>
<tr><th colspan="2">Master Pump</th><th>Slave Pump</th></tr>
<tr><td colspan="2">The pump that gives command to the slave pump. Only the absolute master pump or the backup master pump is able to be the Master, and the pump status is displayed in Pr.U4-01 (Master-slave pump status), the digital keypad can display in the extra status column.</td><td rowspan="3">The pump that accepts commands from the master pump</td></tr>
<tr><td>Absolute Master Pump</td><td>Backup Master Pump</td></tr>
<tr><td>Address 1 (Pr.n1-01 = 1), it becomes the master pump when the drive has no fault</td><td>When the non-absolute master pump sets Pr.U4-00 (Master-slave pump control) bit1 = 1 (backup master).</td></tr>
</table>

Conditions for the establishment or departure of the master pump:

Changing Condition	Absolute Master Pump	Backup Master Pump
Changes from Salve to Master	N/A	1. No ANL warning 2. Pr.U4-00 bit0 = 1 (Enable master-slave pump control) 3. Pr.U4-00 bit1 = 1 (Backup master) 4. There are no other master pumps The event is triggered when all of the above conditions are met.
Changes from Master to Slave	N/A	1. Pr.U4-00 bit1 = 0 (Normal slave) 2. With ANL warning 3. There is a master pump with smaller address online (including absolute master) The event is triggered when any one of the above conditions is met.
Disengage multi-pump Control System	1. Pr.U4-00 bit0 = 0 (Disable master-slave pump control) 2. Non-system fault is triggered 3. With ANL warning and has triggered a fault The event is triggered when any one of the above conditions is met.	1. Pr.U4-00 bit0 = 0 (Disable master-slave pump control) 2. Non-system fault is triggered 3. With ANL fault triggered The event is triggered when any one of the above conditions is met.

Changing Condition	Absolute Master Pump	Backup Master Pump
Return to multi-pump Control System	1. Pr.U4-00 bit0 = 1 (Enable master-slave pump control) 2. Non-system fault is cleared 3. Without ANL warning or fault triggered The event is triggered when all of the above conditions are met.	1. Without ANL fault triggered 2. Non-system fault is cleared The event is triggered when all of the above conditions are met.
Remains Master status but stop	1. System fault is triggered 2. User gives STOP command The event is triggered when any one of the above conditions is met.	1. System fault is triggered 2. User gives STOP command The event is triggered when any one of the above conditions is met.

📖 Treatment for absolute master failure

Failure treatment: if a disconnection, power loss or malfunction occurs, the master becomes slave, and the master pump will be transferred to other pump numbers. Assumed that there are three roles of absolute master, backup master and slave on-line at the same time, the behaviors when they fail are summarized in the table below. The details are described in the following.

Fail Status	Absolute Master Pump	Backup Master Pump	Slave Pump
Communication cable disconnection	Continues operating and pressure command	Becomes master and continues the operation and pressure command from the absolute master.	If there is master on-line, it receives the command; if not, it operates according to Pr.U4-02 (Pump AI feedback loss treatment).
Malfunction, power loss	1. If it is a system fault, the whole system stops and does not allow to leave the master 2. If it is a non-system fault, it directly disengages the multi-pump system. 3. When the non-system fault is reset, the master will be retrieved.	1. If it is master pump, it leaves the master pump and disengage the multi-pump system. The next master pump continues the operation and pressure command from the previous master pump. 2. If it is a system fault, the whole system stops and does not allow to leave the master 3. If it is a non-system fault, it directly disengages the multi-pump system. 4. After the non-system fault is reset, the pump resumes to slave and operates according to command of master pump.	Disengage from the multi-pump system

Fail Status	Absolute Master Pump	Backup Master Pump	Slave Pump
Pressure sensor broken	If ANL and ACE are triggered, the multi-pump system will be separated. ANL will operate according to Pr.U4-02 (Pump AI feedback loss treatment), ACE will directly stop.	If ANL and ACE are triggered, the master will be given up and operates according to Pr.U4-02 (Pump AI feedback loss treatment).	Operates according to the master command; if not, it operates according to Pr.U4-02 (Pump AI feedback loss treatment).

U4-01 Master-Slave Pump Status

(0x1C01) Default: Read only

Settings 0: No Master-Slave Control
1: Master
2: Slave

🕮 Sets the pump as master or slave pump.

U4-02 Pump AI Fdk Loss Treatment

(0x1C02) Default: 0

Settings 0: No Warning
1: ANL Warning & Continue OPER
2: ACE Fault & Stop OPER

U4-03 Pump FREQ at Fdk Loss

(0x1C03) Default: 0

Settings 0–Fmax Hz

🕮 This parameter is only valid for Slave pump.

🕮 Refer to Pr.n1-05 (Modbus Timeout Disposal) and Pr.n1-04 (Modbus Timeout Check Time) for the communication failure conditions and fault handling.

🕮 If a disconnection occurs in the multi-pump circumstances, the frequency command of slave pump refers to Pr.U4-03.

U4-04 Setpoint Deviation Level

(0x1C04) Default: 0

Settings 0–50%

🕮 This parameter is based on the target value set by the PID control.

U4-05 Setpoint Deviation Detect T

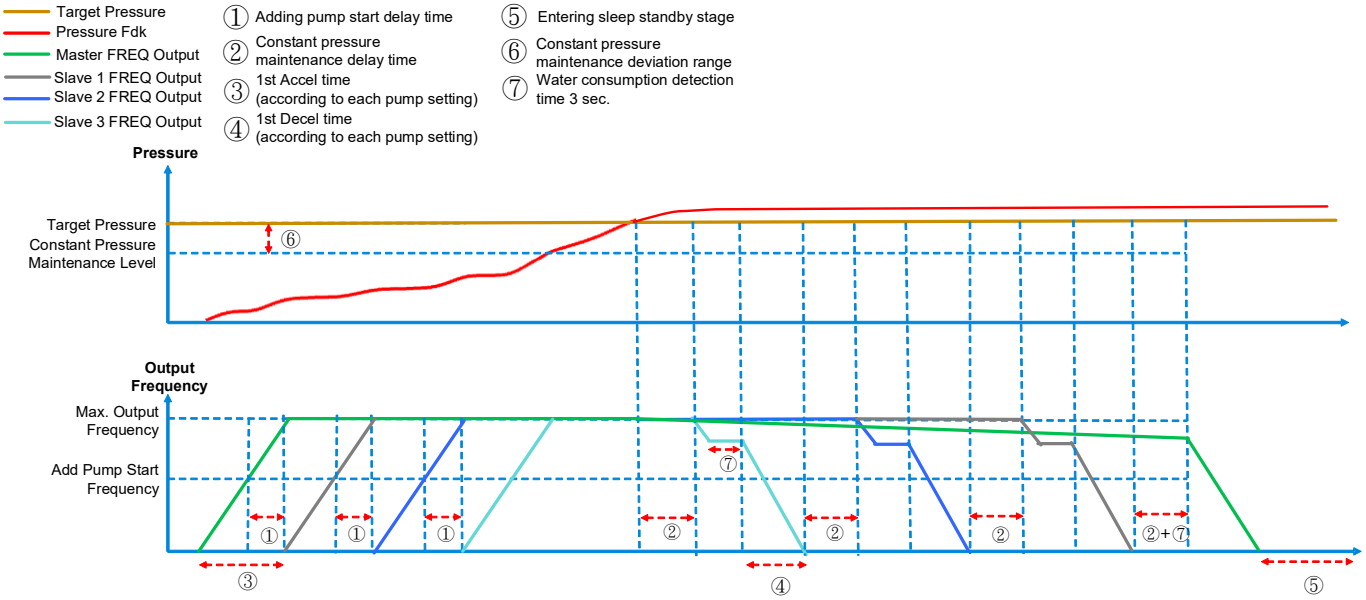
(0x1C05) Default: 10

Settings 1–600 sec.

🕮 If the deviation keeps within the range of Pr.U4-04 and exceeds the time set in Pr.U4-05, the AC motor drive decelerates to stop to be constant pressure status (this deceleration time is the setting for Pr.C2-03). The system is in standby status when the deviation is within the range of PID set point (Pr.U4-04) during deceleration. In standby status, when the system pressure is

lower than the condition of high consumption or low consumption of water, the AC motor drive resumes operation to provide the system pressurization.

📖 Refer to Pr.U4-06–U4-08 for setting methods of high consumption and low consumption.



U4-06 Low Consump Restart Offset

(0x1C06) Default: 10

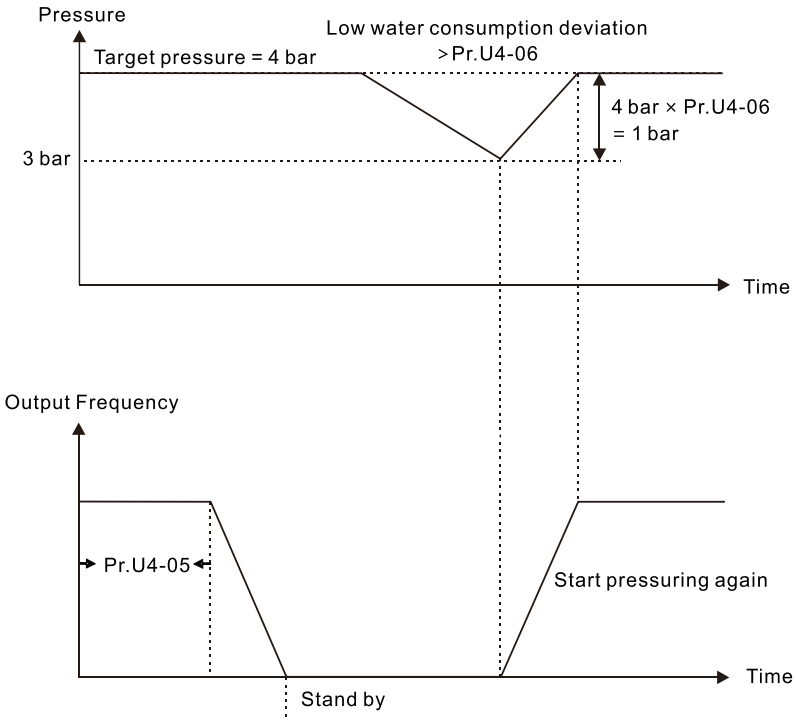
Settings 0–50%

📖 This parameter is based on the target value set by the PID control.

📖 When the system is in standby status and the pressure exceeds the deviation of low consumption, the AC motor drive starts the pressurization.

📖 Example for low consumption restart detection (set Pr.U4-06 = 25%):

When the AC motor drive is in constant pressure status, the feedback value drops to a deviation larger than or equal to 1 bar (4 bar × 25% = 1 bar). That is, the drive starts running when the feedback value is smaller than 3 bar.



U4-07 High Consump Restart Offset

(0x1C07) Default: 0

Settings 0–100%

📖 This parameter is based on the target value set by the PID control.

U4-08 High Consump Detect Time

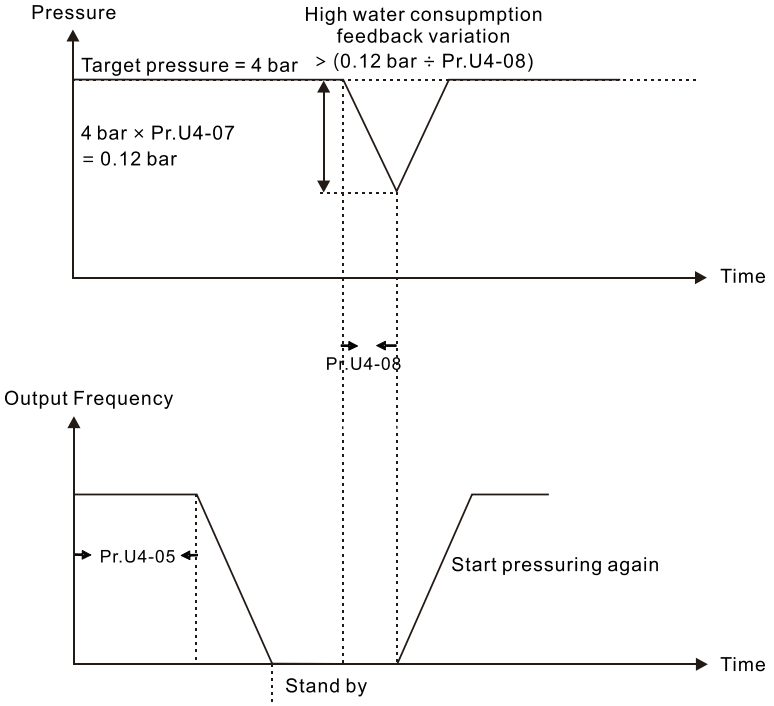
(0x1C08) Default: 0.5

Settings 0.1–10.0 sec.

📖 When the system is in standby status and the pressure change exceeds the feedback change value per unit time defined by Pr.U4-07 and U4-08, the AC motor drive starts the pressurization.

📖 Example for high consumption restart detection:

When the AC motor drive is in constant pressure status, it does not operate until the feedback change value exceeds 0.12 bar within 0.5 seconds, which means the AC motor drive starts operating when the feedback value is less than 3.88 bar within 0.5 seconds.



U4-09 FREQ to Start Aux Pump

(0x1C09) Default: Fmax

Settings 0.00–Fmax Hz

U4-10 Delay to Start Aux Pump

(0x1C0A) Default: 1.0

Settings 0.0–120.0 sec.

📖 This parameter is valid for master pump.

📖 Refer to Pr.A3-00 for the maximum operation frequency.

📖 The following two conditions must be met at the same time before adding pumps:

- Master feedback pressure < constant pressure level, and continuously counts for the time longer than Pr.U4-05 (Setpoint deviation detect T).
- The frequency output value of any slave being output on-line > Master set Pr.U4-09 (Frequency to start auxiliary pump).

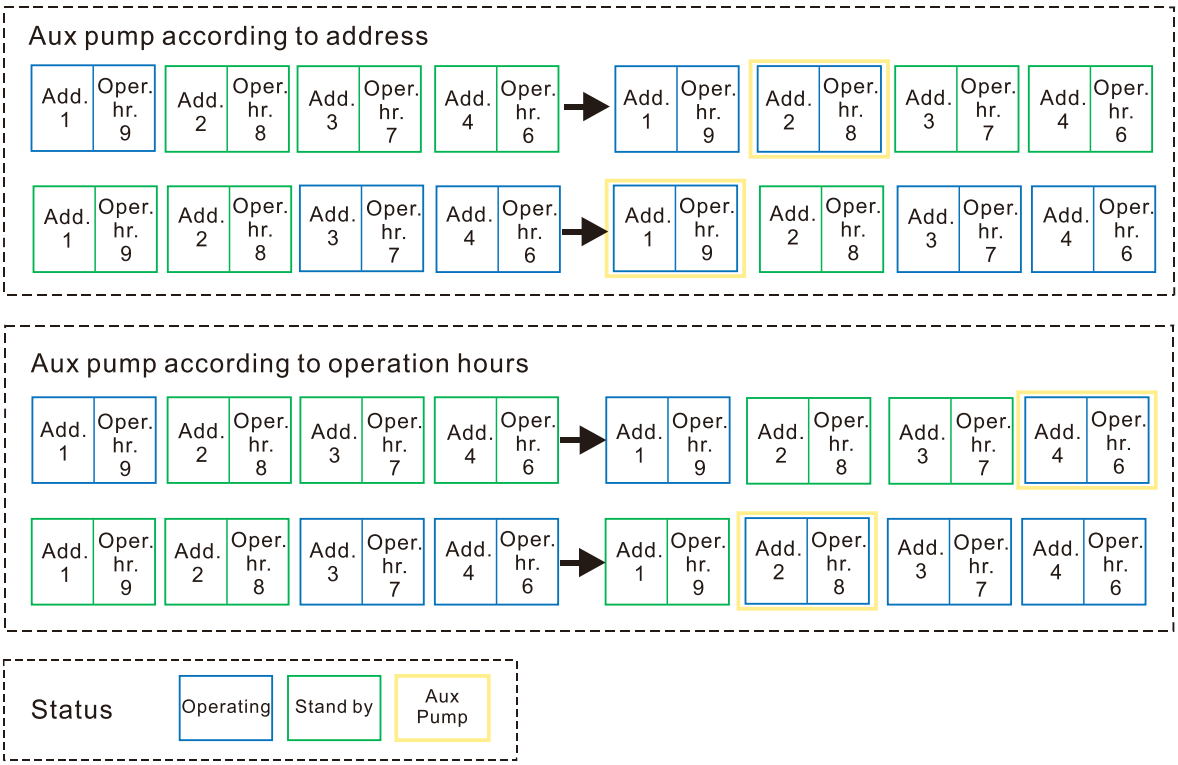
- The master feedback pressure of auxiliary pump frequency command < constant pressure maintenance level, which will accumulate to the maximum frequency.
- The definition of constant pressure maintenance level: Target pressure × [1 – Pr.U4-04 (Setpoint deviation level).
- The sequence of increasing and decreasing pumps can be set according to Pr.U4-11 (Pump start-up sequence selection).
- Reduce pump for multi-pump: The AC motor drive reduces the pump after confirming that the operation is stable based on the feedback pressure is larger than or equal to the setpoint for the detection time of Pr.U4-05.
- The pump being reduced directly gives 0 Hz frequency command, when the pump output frequency reduces to 0 Hz, it completes the reduce pump operation process.
- When the master gives a STOP command, all the master and slave pumps decelerate to 0 Hz.

U4-11 Pump Start-up Sequence Sel

(0x1C0B) Default: 1

Settings 0: by Sequence of Pump
1: by OPER Time

- 0: According to the sequence of pump (1 --> 2 --> 3 --> 4 --> 5 --> 6 --> 7 --> 8 --> 1).
- 1: According to the shortest operating time.



U4-12 Cycle Time Sel

(0x1C0C) Default: 2

Settings 0: Disable
1: by Absolute Time of Circulation
2: by Constant Time of Circulation

U4-13 Absolute Time of Circulation

(0x1C0D) Default: 00:00

Settings 00:00–23:59

U4-14 Constant Time of Circulation

(0x1C0E) Default: 5.0

Settings 0.0–200.0 hr

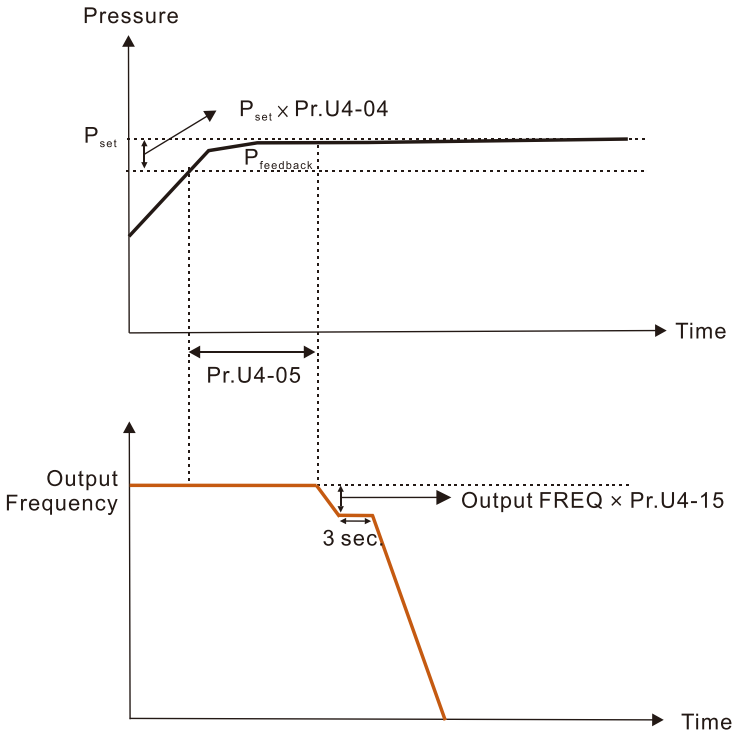
- This parameter is valid for master pump.
- Define the time circulation type according to Pr.U4-12. When the absolute time equals to Pr.U4-13 or the master pump operation time is larger than Pr.U4-14, starts switch master pump and auxiliary pump.

U4-15 FREQ Drop% of Water Consump

(0x1C0F) Default: 5.0

Settings 0.0–50.0%

- P_{set} = Target pressure, $P_{feedback}$ = Feedback pressure.
- During the pump reduction process, the operating frequency of the pump reduction station will be decelerated. The deceleration range is the operating frequency × Pr.U4-15 and lasts for 3 seconds. After water detection, the pump reduction station decelerates to 0 Hz. In this interval, if the feedback pressure of the master station is less than the constant pressure maintenance level or a low consumption restart condition is triggered, the pump reduction will be cancelled.



U4-16 Sleep Pressure Boost Delay

(0x1C10) Default: 10.0

Settings 0.0–120.0 sec.

🕮 If the pressure boost value has not reached the value before sleep after the set time in Pr.U4-16, the drive resumes to general control state.

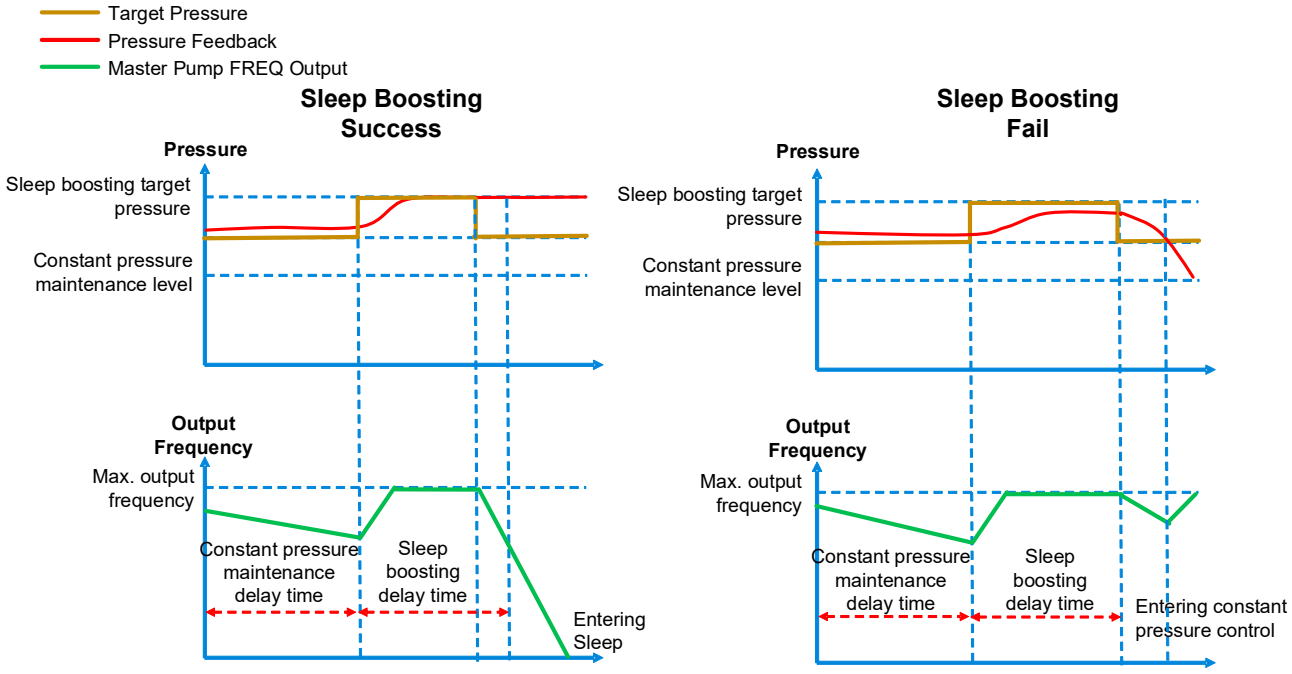
U4-17 Sleep Pressure Boost Setting

(0x1C11) Default: 0.0

Settings 0.0–50.0%

🕮 This parameter is based on the target value set by the PID control.

🕮 When entering sleep mode, the sleep target pressure equals to the target pressure × (1 + Pr.U4-17) to reach the target pressure value. you can increase Pr.U4-17 to increase the sleep time.



Appendix A. Revision History

Version	Add Information	
	Description	Related Chapter
FW V1.01 Manual V00	Horizontal lifting figures and description for Frame L and M	Chapter 2
	Dimensions for Frame L, M horizontal installation and IP20 installation	Chapter 2
	Multi-pump control communication cable wiring and pressure sensor wiring	Chapter 3
	SD card related function	Chapter 4, 8
	Chassis rail (MKVP-CR01) installation	Chapter 10
	IP20 shielded cover (MKVP-IP20L/ MKVP-IP20M) installation	Chapter 10
	Add Pr. n0-01 setting value and update its setting name and descriptions	Chapter 12, 13
	Add Pr. G3-01 and G3-15 setting value	Chapter 13
	Add Pr. H1-08 descriptions	Chapter 13
	Add descriptions of Parameter group o1	Chapter 13
FW V1.02 Manual V00	Add information for 18.5kW below models (built-in EMC C2)	Chapter 2, 3, 9, 10, 11
	Add information for Pin terminal and Tube terminal applicable for Frame A–F	Chapter 3
	Add information of Warning code 18 (dAvE)	Chapter 8
	Add information for operation noise, add RCM and KC certification	Chapter 11
	Add new unit definition and description for Pr.P0-11	Chapter 12, 13
FW V1.10 Manual V00	Add PLC Special D and Special M address table	Chapter 7
	Add Warning code 17 (oSPd), 33 (ORP) Add Fault codes 220 (CWF), 224–241 (STO fault codes), 260 (CBER)	Chapter 8
	Add CMC-EIP02 option card information	Chapter 10
	Add Sine wave filter information	Chapter 10
	Add descriptions of parameter before use	Chapter 12
	Add parameters: ● Group A: A0-29 ● Group b: b0-01=13, b0-12, b1-00=2–7, 16–17 ● Group C: C1-42–C1-44 ● Group G: G1-15–G1-22, G5-13–G5-24 ● Group n: n1-10, n5-21 ● Group o: o0-00=9, 32, 33, 71–88; o0-60–o0-62	Chapter 12, 13

Version	Modified Information	
	Description	Related Chapter
FW V1.01 Manual V00	Update description of Model Name	Chapter 1
	Update the upright lifting figures for Frame L and M	Chapter 2
	Update figures and descriptions for Chassis installation	Chapter 2
	Update dimensions and weights of Frame L and M	Chapter 2
	Update Fuse information	Chapter 3
	Update ring terminal dimensions of main circuit terminals	Chapter 3
	Update AC reactor information	Chapter 10
	Update 460V power supply capacity	Chapter 11
	Update derating curve and modify derating data	Chapter 11
	Update Pr. G3-01 description	Chapter 12, 13
	Update Pr. H1-02 description	Chapter 12, 13
	Update the symbol of “parameter can be set during run” of Pr. J4-00, J4-06	Chapter 12, 13
	Update description of Pr. G1-00–G1-03, G2-02	Chapter 13
	Update default setting of Pr. G2-04, G2-23, G2-42	Chapter 13
	Update settings of Pr. G2-13, G2-32, G2-51	Chapter 13
	Delete setting bit 1 of Pr. J5-06	Chapter 13
	Update description of Pr. o1-01, o1-05, o1-09, o1-13, o1-17, o1-21, o1-25, o1-29, o1-33	Chapter 13
	Update description of Pr. U1-00, U1-30–U1-32, U1-40–U1-42, U2-01, U2-02, U2-22, U3-01, U3-02–U3-04, U3-06–U3-07, U3-17–U3-20, U4-11, U4-15	Chapter 13
FW V1.02 Manual V00	Update nameplate description	Chapter 1
	Delete installation clearance of Frame L–M, update note description of horizontal installation, update Frame L–M dimensions and diagrams for Chassis installation	Chapter 2
	Update precautions for wiring and grounding	Chapter 3
	Adjust Chapter editing for long wiring application	Chapter 3, 10
	Update operation modes switching description of KPV-CE02	Chapter 4
	Update Modbus Address list and information (update 20xxh / 23xxh / 26xxh), add 21xxh, 22xxh, 60xxh, 61xxh)	Chapter 6
	Update information of AC reactors, EMC filers, Chassis rail installation and shielded wire length for VFD3A0VP model	Chapter 10
	Update information for General Features	Chapter 11
	Update description of Pr.A1-15, A2-00	
	Change Pr.E4-05 default value	Chapter 12, 13
	Update description of Pr.G3-01–G3-15	Chapter 13
	Update description of Pr.H0-07, H1-02, delete Pr.H4-04	Chapter 13

Version	Modified Information	
	Description	Related Chapter
	Update setting range of Parameter Group 05 FireMode record date	Chapter 13
	Update Pr.o1-01 Channel signal table	Chapter 13
	Update the QTY Control Terminal Sequence in Parameter Group U and setting ragne for Pr.U1-23–U1-32	Chapter 13
FW V1.10 Manual V00	Update AI1 – AI3 default, wiring (add AI3 Switch), pressure sensor wiring	Chapter 3
	Update STO descriptions	Chapter 3
	Update diagrams of control board (add AI3 switch)	Chapter 3, 6, 10
	Update digital keypad operation flow and descriptions	Chapter 4
	Update fault code reset conditions (Fault codes occ, oL3, EoL1–4)	Chapter 8
	Update settings and descriptions of parameter settings: ● Group A: A1-00 ● Group b: b0-00, b1-00 ● Group C: C1-01, C3-03 ● Group d: d1-03, d1-05 ● Group F: F2-21 ● Group G: G1-04, G1-06, G1-08, G1-10, G2-03, G2-41, G3-01, G3-15 ● Group H: H0-12, H0-13, H4-03, H5-05, H5-07 ● Gropu J: J5-07–J5-09 ● Group o: o0-03–o0-05, o4-00, 04-19 ● Group P: P0-01 Delete parameters: ● Group G: G0-05, G0-07, G0-09, G0-11, G0-13, G0-15, G1-05, G1-07, G1-09, G1-11, G4-01, G4-03, G4-07, G4-09, G4-11, G5-02, G5-04, G5-06, G5-08, G5-12, G6-01, G6-13 ● Gropu H: H1-04	Chapter 12, 13

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