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# Delta Ultimate Integrated AC Servo Drive with Excellent Performance ASDA-M Series User Manual



## Delta Ultimate Integrated AC Servo Drive with Excellent Performance ASDA-M Series User Manual

www.delta.com.tw/ia



# Preface

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Thank you for purchasing ASDA-M. This user manual provides the related information of ASDA-M series servo drives and ECMA series servo motors. This manual includes:

- Installation and inspection of servo drive and servo motor
- The configuration of servo drive
- Procedures of trial run
- Control function and adjustment methods of servo drive
- Parameters
- Communication protocol
- Maintenance and inspections
- Troubleshooting

This manual addresses personnel with the following qualifications:

- Servo system designers
- Installation or wiring personnel
- Trial and tuning personnel
- Maintenance and inspection personnel

Before using the product, please read through this manual carefully in order to ensure the correct use of the product. In addition, please place this manual safely for quick reference whenever is needed. Please follow the rules below if you have not finished reading this manual yet.

- No water, corrosive gas and inflammable gas are allowed in installation environment.
- Three-phase power is prohibited to connect to U, V and W connector when wiring. It is possible to damage the servo drive.
- Ground is a must.
- Do not disconnect the servo drive, motor or change the wiring when connecting to the power.
- Be ensured that the emergency stop can be activated anytime before connecting to the power and operation.
- Do not touch the heat sink to avoid scald before connecting to the power and operation.

If you have any enquiry, please contact the distributors or DELTA customer service center.

## Safety Precautions

ASDA-M series is the high resolution and open type servo drive. It should be installed in a shielded control box during operation. This servo drive uses precise feedback control and the digital signal processor with high-speed calculation function to control the current output which generated by IGBT so as to operate three-phase permanent magnet synchronous motors (PMSM) and to achieve precise positioning.

ASDA-M is applicable on industrial application and is suggested to be installed in the panel-board of the user manual. (Servo drives, wire rod and motors all should be installed in the environment which complies with the minimum requirement of UL Level 1.)

Pay special attention to the following safety precautions anytime during inspection, installation, wiring, operation and examination.

The symbol of **danger**, **warning** and **stop** represent:



It indicates the potential hazards. It is possible to cause severe injury or fatal harm if not follow the instructions.



It indicates the potential hazards. It is possible to cause minor injury or lead to serious damage of the product or even malfunction if not follow the instructions.



It indicates the absolute prohibited activity. It is possible to damage the product or cannot be used due to malfunction if not follow the instructions.

### Inspection



- Please follow the instruction when using servo drive and servo motor, or it is possible to cause fire or malfunction.

### Installation



- It is prohibited to expose the product with the environment which containing water, corrosive gas, inflammable gas, etc. Or it is possible to cause electric shock or fire.

### Wiring



- Please connect the ground terminal to class-3 ground system (under 100 Ω), poor grounding may result in electric shock or fire.
- Do not connect the three-phase source to the motor output terminal U, V and W. Or it is possible to cause personnel injury or fire.
- Please tighten the screws of the power and motor output terminal. Or it is possible to cause fire.
- Please connect wiring according to the wire rod in order to prevent any danger.

## Operation



- Before the operation, please change the parameter setting value according to the needs. If it is not adjusted to the correct setting value, it is possible to lead to malfunction of the machine or the operation might out of control.
- Before the machine starts to operate, please be ensured the emergency stop can be activated anytime.



- During the operation, it is prohibited to touch any rotating motor parts. Or it is possible to cause personnel injury.



- In order to prevent any accident, please separate the couplings and belts of the machine and isolate them. Then conduct the initial trial run.
- If users fail to operate the machine properly after the servo motor connects to the equipments, it would cause the damage of the equipments and lead to the personnel injury.
- In order to prevent the danger, it is strongly recommended to check if the motor can operate normally without load first. Then, operate the motor with load.
- Do not touch the heat sink of the servo drive. Or it is possible to cause scald due to the high temperature.

## Maintenance and Inspection



- It is prohibited to touch the internal parts of the servo drive and servo motor. Or it is possible to cause electric shock.
- It is prohibited to disassemble the panel of the servo drive when turning on the power. Or it is possible to cause electric shock.
- Do not touch the ground terminal within 10 minutes after turning off the power. Or the residual voltage may cause electric shock.
- Do not disassemble the motor. Or it is possible to cause electric shock or personnel injury.
- Do not change the wiring when the power is on. Or it is possible to cause electric shock or personnel injury.
- Only the qualified electrical and electronics professionals can install, wire and maintain the servo drive and servo motor.

## Main Circuit Wiring



- Do not put the power cable and the encoder cable in the same channel and bond them together. Please separate the power cable and the encoder cable for at least 30 centimeters ( = 11.8 inches) when wiring.
- Please use stranded wires and multi-core shielded-pair wires for the encoder cables and encoder feedback cables. The maximum length of command input cable is 3 meters ( = 9.84 feet) and the maximum length of feedback cable is 20 meters ( = 65.62 feet).
- The high voltage might remain in the servo motor even when the power is off. Do not touch the power terminal temporarily (at least 10 minutes). Please conduct the inspection not until the indicator light, **CHARGE** is off.





- Do not turn the power on and off too often. If continuous power on and off is needed, please be ensured the interval is one minute at most.

### Terminal Wiring of the Main Circuit



- When wiring, please disassemble the terminal socket from the servo drive.
- One terminal of the terminal socket for one electric wire only.
- When inserting the electric wires, do not connect the conductor to the adjacent wire.
- Before connecting to the power, please inspect and be ensured the wiring is correct.



#### **NOTE**

If there is any difference of each version, please refer to DELTA' s website (<http://www.delta.com.tw/industrialautomation/>) for the latest information.

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## **Appendix A Accessories**

## **Appendix B Maintenance and Inspection**

# Chapter 1 Inspection and Model Explanation

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## 1.1 Inspection

In order to prevent the negligence during purchasing and delivery, please inspect the following items carefully.

- Please check if the product is what you have purchased: check the part number of the motor and the servo drive on the nameplate. Refer to the next page for the model explanation.
- Check if the motor shaft can rotate smoothly: Rotate the motor shaft by hand. If it can be rotated smoothly, it means the motor shaft is normal. However, it cannot be rotated by hand if the motor has an electromagnetic brake.
- Check if there is any damage shown on its appearance: visually check if there is any damage or scrape of the appearance.
- Check if there is any loose screw: If the screws are un-tightened or fall off.

If any of the above situations happens, please contact the distributors to solve the problems.

A complete and workable servo set should include:

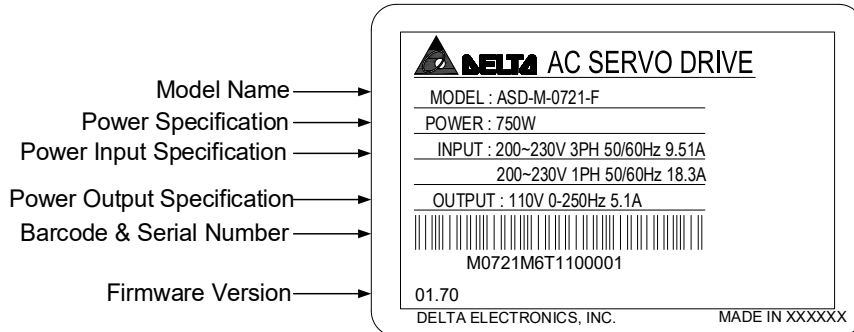
- (1) A Servo drive and a servo motor
- (2) Three UVW motor power cables, the U, V and W wires can connect to the socket attached by the servo drive and another side is the plug which could connect to the socket of the motor. And a green ground wire which should be locked to the ground terminal of the servo drive. (selective purchase)
- (3) Three encoder cables which connect to the socket of the encoder. One side of it connects to CN2 servo drive and another side is the plug. (selective purchase)
- (4) 50-PIN connector which is used in CN1 (3M analog product) (selective purchase)
- (5) 20-PIN connector which is used in CN2 (3M analog product) (selective purchase)
- (6) 6-PIN connector which is used in CN3 (IEEE 1394 analog product) and is for general communication (RS485) (selective purchase)
- (7) 4-PIN connector which used in CN4 (USB Type B product) (selective purchase)
- (8) RJ45 connector which used in CN6 and is for high-speed communication (selective purchase)
- (9) Servo drive power input:
  - (a) 750W and 1.5kW: 2 PIN fast connector (L1c, L2c)
  - (b) 750W and 1.5kW: 3 PIN fast connector (R, S, T)
- (10) 3 sets of 3-PIN fast connector (U, V, W)
- (11) 4-PIN fast connector (P<sup>+</sup>, D, C, <sup>-</sup>)
- (12) A plastic lever (attached in all series)
- (13) A metal short-circuit chip (attached in all series)
- (14) An installation manual

## 1.2 Product Model

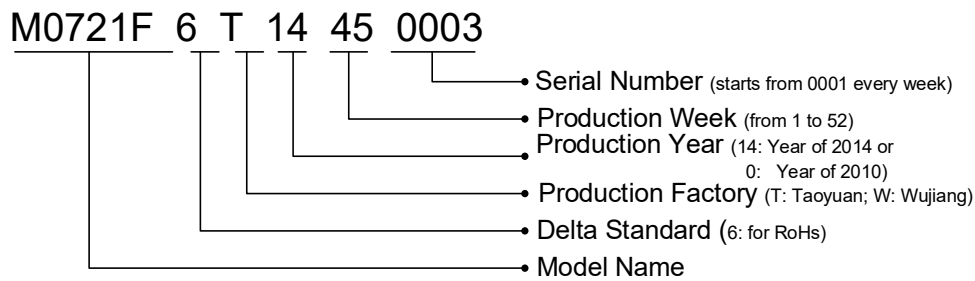
### 1.2.1 Nameplate Information

#### ASDA-M Series Servo Drive

##### ■ Nameplate Information

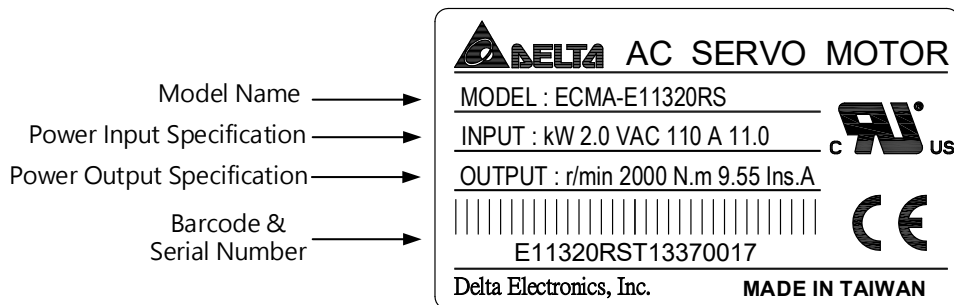


##### ■ Serial Number

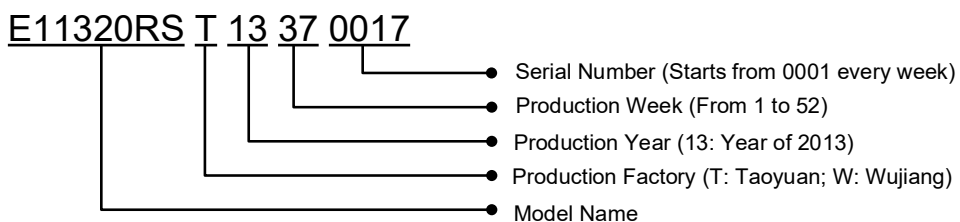


#### ECMA Series Servo Motor

##### ■ Nameplate Information



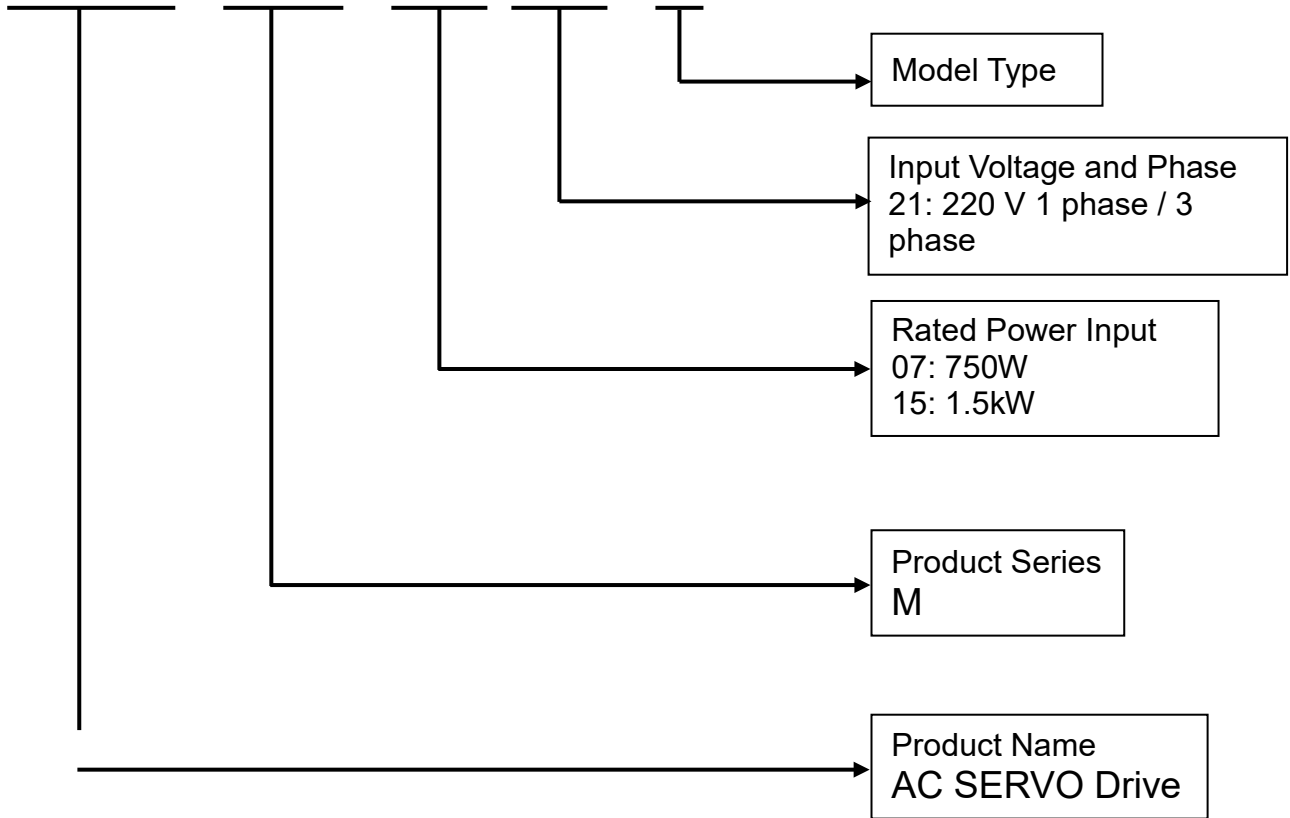
##### ■ Serial Number



## 1.2.2 Model Explanation

### ASDA-M Series Servo Drive

A S D - M - 0 7 2 1 - L



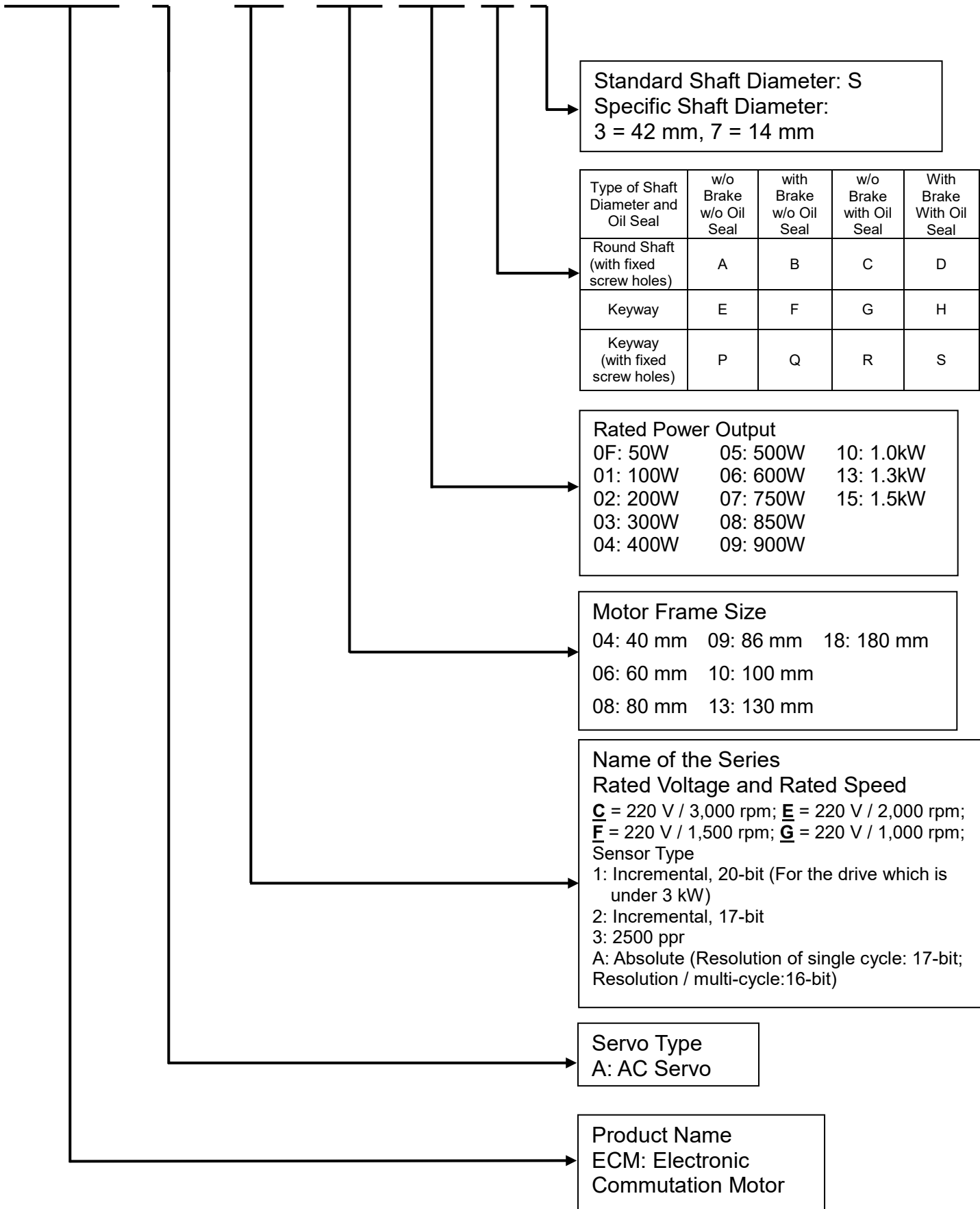
#### Model Type

Type	Full-closed Loop	CANopen	DMCNET	E-CAM
<b>M</b>	○	○	×	○
<b>F</b>	○	×	○	○
<b>L</b>	○	×	×	×
<b>R</b>	○	×	○	○



**ECMA Series Servo Motor**

**E C M A - C 1 0 6 0 2 E S**



Standard Shaft Diameter: S  
 Specific Shaft Diameter:  
 3 = 42 mm, 7 = 14 mm

Type of Shaft Diameter and Oil Seal	w/o Brake w/o Oil Seal	with Brake w/o Oil Seal	w/o Brake with Oil Seal	With Brake With Oil Seal
Round Shaft (with fixed screw holes)	A	B	C	D
Keyway	E	F	G	H
Keyway (with fixed screw holes)	P	Q	R	S

Rated Power Output  
 0F: 50W      05: 500W      10: 1.0kW  
 01: 100W     06: 600W      13: 1.3kW  
 02: 200W     07: 750W      15: 1.5kW  
 03: 300W     08: 850W  
 04: 400W     09: 900W

Motor Frame Size  
 04: 40 mm    09: 86 mm    18: 180 mm  
 06: 60 mm    10: 100 mm  
 08: 80 mm    13: 130 mm

Name of the Series  
 Rated Voltage and Rated Speed  
C = 220 V / 3,000 rpm; E = 220 V / 2,000 rpm;  
F = 220 V / 1,500 rpm; G = 220 V / 1,000 rpm;  
 Sensor Type  
 1: Incremental, 20-bit (For the drive which is under 3 kW)  
 2: Incremental, 17-bit  
 3: 2500 ppr  
 A: Absolute (Resolution of single cycle: 17-bit; Resolution / multi-cycle: 16-bit)

Servo Type  
 A: AC Servo

Product Name  
 ECM: Electronic Commutation Motor

## 1.3 Servo Drive and Corresponding Servo Motor

### ASDA-M Series Servo Drive

	Servo Drive	Corresponding Servo Motor
750W	ASD-M-0721-□	ECMA-C1040F□S ( S = 8 mm ) ECMA-C△0401□S ( S = 8 mm ) ECMA-C△0602□S ( S = 14 mm ) ECMA-C△0604□S ( S = 14 mm ) ECMA-C△0604□H ( H = high-inertia) ECMA-C△0804□7 ( 7 = 14 mm ) ECMA-C△0807□S ( S = 19 mm ) ECMA-C△0807□H ( H = high-inertia) ECMA-C△0907□S ( S = 16 mm ) ECMA-E△1305□S ( S = 22 mm ) ECMA-G△1303□S ( S = 22 mm ) ECMA-G△1306□S ( S = 22 mm )
1500W	ASD-M-1521-□	ECMA-C△0807□S ( S = 19 mm ) ECMA-C△0807□H ( H = high-inertia) ECMA-C△0907□S ( S = 16 mm ) ECMA-C△0910□S ( S = 16 mm ) ECMA-C△1010□S ( S = 22 mm ) ECMA-E△1310□S ( S = 22 mm ) ECMA-F△1308□S ( S = 22 mm ) ECMA-F△1313□S ( S = 22 mm ) ECMA-E△1315□S ( S = 22 mm ) ECMA-G△1309□S ( S = 22 mm )



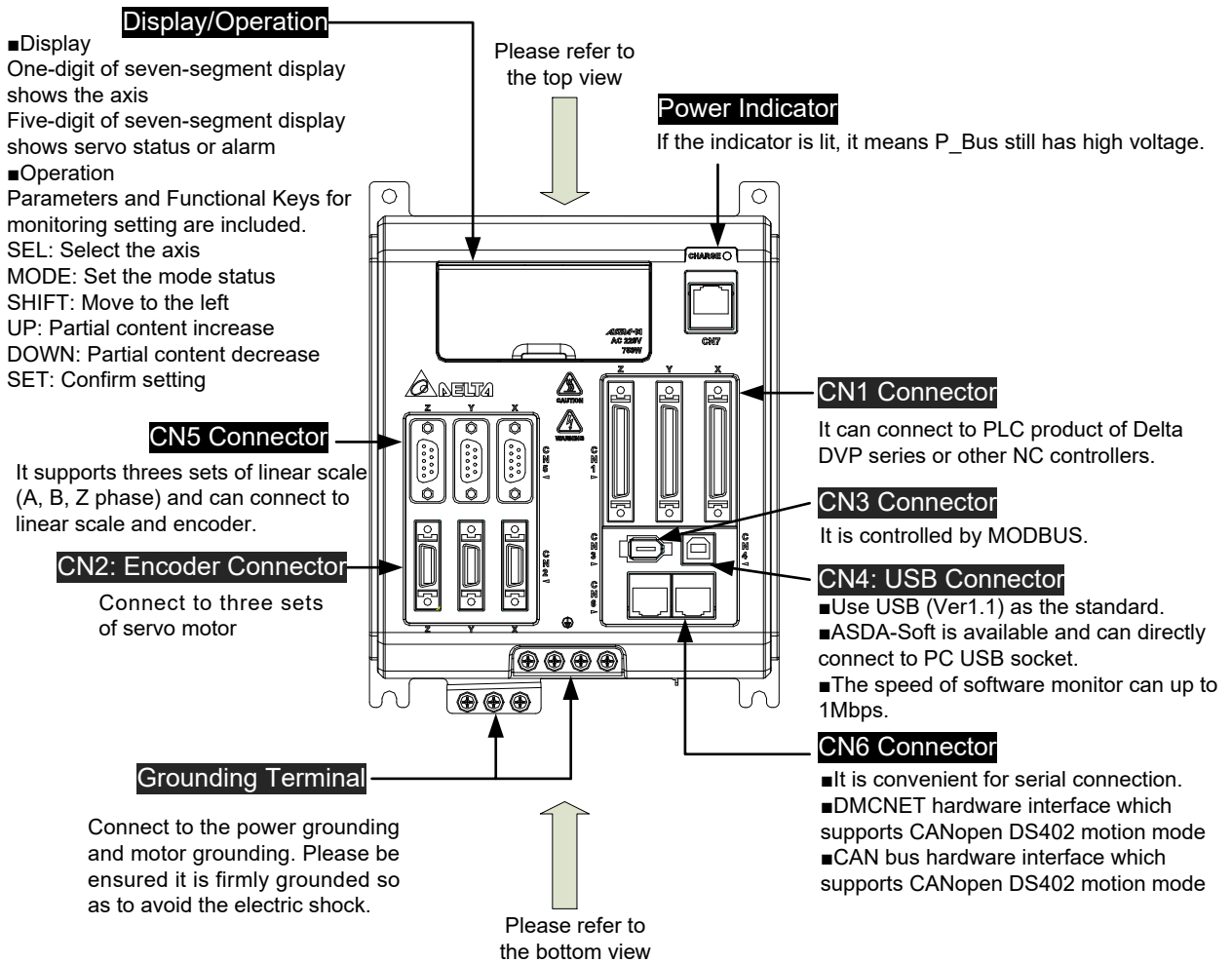
#### NOTE

- 1) Box, (□) at the end of the model name of the servo drive represents the code of ASDA-M. Please refer to the type of purchasing product information.
- 2) Triangle, (△) in the mode name of the servo motor represents the type of encoder.  
 △ = 1: incremental, 20-bit ; △ = 2: incremental, 17-bit; △ = 3: 2500 ppr; △ = A: Absolute. The listed model name is for reference. To purchase the product, please contact the local dealer for product availability.
- 3) Box, (□) in the model name of the servo motor represents the type of brake or keyway / oil seal.

The above table shows the specification of servo drive which has triple rated current. If the user needs the servo drive which has six times of the rated current, please contact with distributors. For detailed specification of the servo motor and servo drive, please refer to the appendix.

# 1.4 Features of Servo Drive

## ASDA-M Series Servo Drive



## ASDA-M Series Servo Drive (top view)

### Control Circuit Power

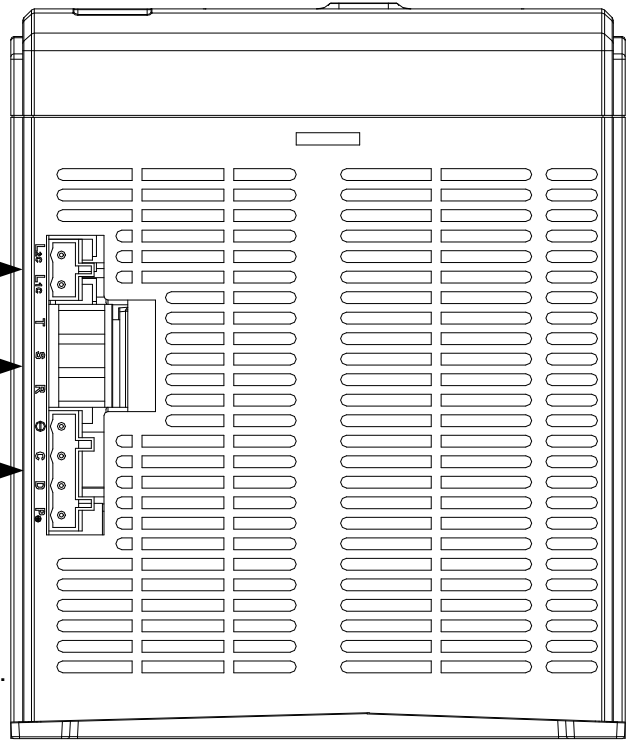
L1c, L2c provides single / three-phase  
200 ~ 230 Vac, power of 50 / 60 Hz

### Main Circuit Power

R, S, T connect to the main circuit  
power AC200 ~ 230 V of the servo  
motor, power of 50 / 60 Hz

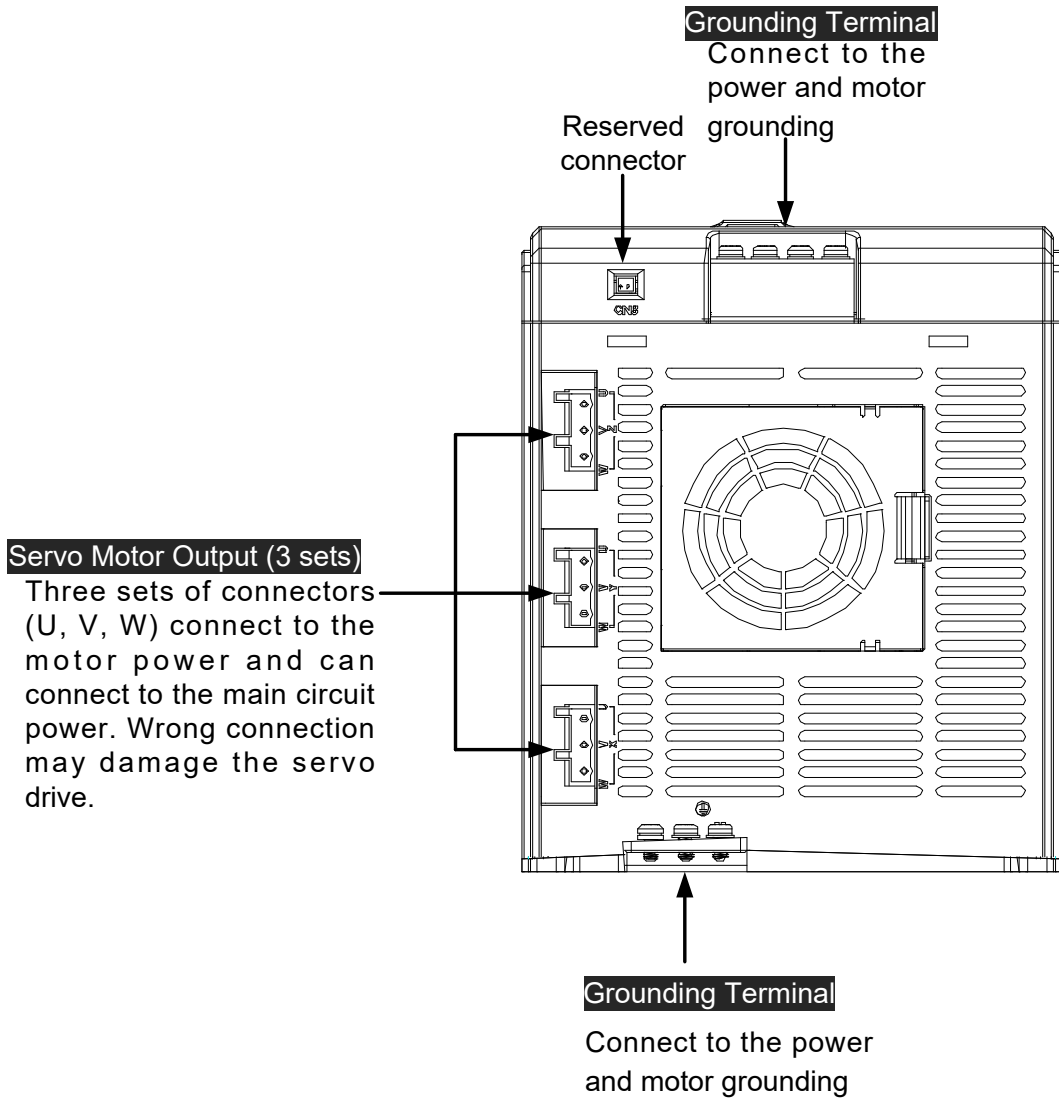
### Regenerative Resistor

- 1) When using external regenerative resistor,  
P $\oplus$  and C connect to resistor;  
The contact of P $\oplus$  and D should be opened.
- 2) When using internal regenerative resistor,  
The contact of P $\oplus$  and C should be opened;  
The contact of P $\oplus$  and D should be closed.
- 3) When using external brake unit,  
P $\oplus$  and  $\ominus$  connect to brake unit;  
The contact of P $\oplus$ , C and P $\oplus$ , D should be opened.





### ASDA-M Series Servo Drive (bottom view)



# Chapter 2 Installation

---

## 2.1 Notes

Please pay special attention to the followings:

- 1) Do not strain the cable connection between the servo drive and the servo motor.
- 2) Make sure each screw is tightened when fixing the servo drive.
- 3) The motor shaft and the ball screw should be parallel.
- 4) If the connection between the servo drive and the servo motor is over 20 meters, please thicken the connecting wire, UVW as well as the encoder cable.
- 5) Tighten the fixed four screws of the motor.

## 2.2 Ambient Conditions of Storage

Before the installation, this product has to be kept in shipping carton. In order to retain the warranty coverage and for the maintenance, please follow the instructions below when storage, if the product is not in use temporarily:

- Store the product in a dry and dust-free location.
- Store the product within an ambient temperature range of -20 °C to +65 °C.
- Store the product within a relative humidity range of 0 % to 90 % and a non-condensing environment.
- Avoid storing the product in the environment of corrosive gas and liquid.
- It is better to store the product in shipping carton and put it on the shelf or working platform.

## 2.3 Ambient Conditions of Installation

The best temperature of this servo drive is between 0 °C and 55 °C. If the temperature is over 45 °C, please place the product in a well-ventilated environment so as to ensure its reliability performance. If the product is installed in an electric box, make sure the size of the electric box and its ventilation condition will not overheat and endanger the internal electronic device. Also, pay attention to the vibration of the machine. Check if the vibration will influence the electronic device of the electric box. Besides, the ambient conditions should also include:

- Location has no over-heat device.
- Location has no water drop, vapor, dust and oily dust.
- Location has no corrosive and inflammable gas and liquid.
- Location has no airborne dust and metal particles.
- Location has solid foundation and no vibration.
- Location has no interference of electromagnetic noise.

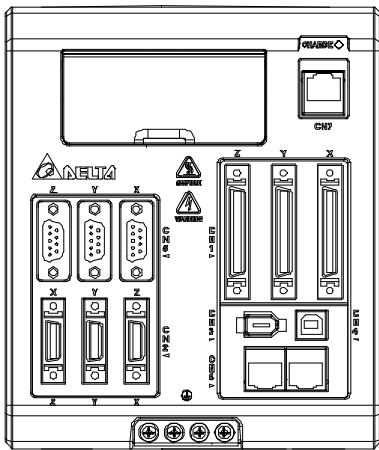
The ambient temperature of the motor is between 0 °C and 40 °C and the ambient conditions include:

- Location has no over-heat device.
- Location has not water drop, vapor, dust and oily dust.
- Location has no corrosive and inflammable gas and liquid.
- Location has no airborne dust and metal particles.

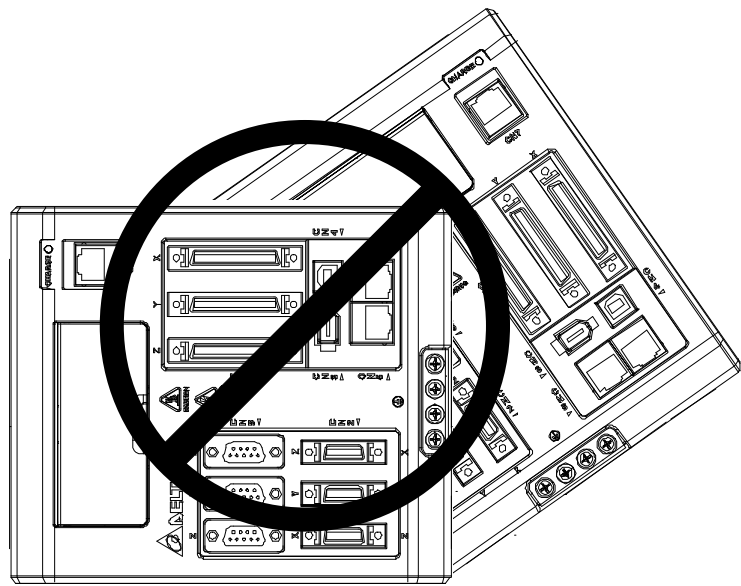
## 2.4 Installation Direction and Space

### Notes:

Follow the instructions for installation direction. Otherwise it is possible to cause malfunction. In order to have well-cooling and circulation effect, the enough space between adjacent objects and the baffle is needed. Or it might result in malfunction. When installing AC servo drive, do not seal the suction hole and the vent hole. Do not place the drive in a horizontal direction, or it might cause malfunction.



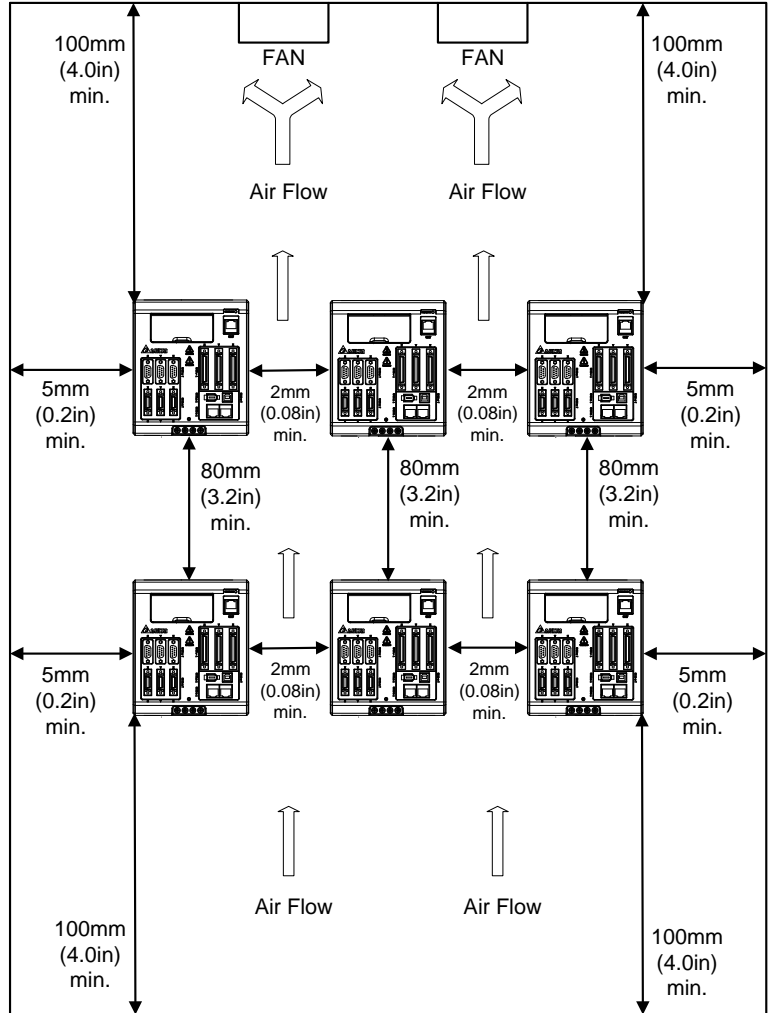
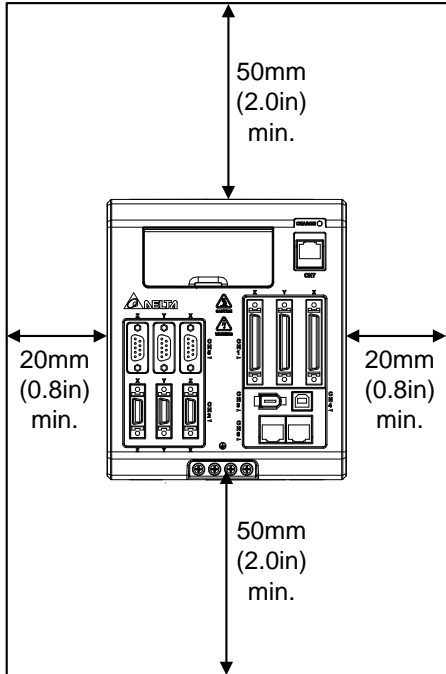
Correct



Incorrect

**Dimensions:**

In order to have smaller wind resistance of the fan and increase the ventilation, please follow the suggested clearance value when installing one or more than one servo drives. (Refer to the following diagrams.)



**NOTE** The above diagrams are not in equal proportion. Please refer to the annotation.

## 2.5 Specification of Circuit Breaker and Fuse

**Caution: Please use the fuse and circuit breaker that is recognized by UL / CSA.**

Servo Drive Model	Circuit breaker	Fuse (Class T)
Operation Mode	General	General
ASD-M-0721-□	30A	50A
ASD-M-1521-□	70A	140A



### NOTE

If the servo drive equips with earth leakage circuit breaker for avoiding electric leakage, please choose the current sensitivity which is over 200mA and can continue up to 0.1 seconds.

## 2.6 EMI Filters Selection

Item	Power	Servo Drive Model	EMI Filter Model	FootPrint
1	750W	ASD-M-0721-□	20TDT1W4D	N
2	1500W	ASD-M-1521-□	20TDT1W4D	N

### EMI Filter Installation

All electronic equipment (including servo drive) generates high or low frequency noise during operation and interfere the peripheral equipment via conduction or radiation. With EMI Filter and the correct installation, much interference can be eliminated.

When installing servo drive and EMI Filter, please follow the instructions of the user manual and make sure it meets the following specification.

1. EN61000-6-4 (2001)
2. EN61800-3 (2004) PDS of category C2
3. EN55011+A2 (2007) Class A Group 1

## General Precaution

In order to ensure the best performance of EMI Filter, apart from the instructions of servo drive installation and wiring, please follow the precautions mention below:

1. The servo drive and EMI Filter should be installed on the same metal plate.
2. When installing servo drive and EMI Filter, the servo drive should be installed above the EMI Filter.
3. The wiring should be as short as possible.
4. The metal plate should be well grounded.
5. The metal cover of the servo drive and EMI Filter or grounding should be firmly fixed on the metal plate. Also, the contact area should be as large as possible.

## Motor Cable Selection and Installation Precautions

The selection of motor cables and correct installation affect the performance of EMI Filter. Please follow the precautions mention below.

1. Use the cable that has braid shielding (The effect of double shielding is better)
2. The shield on both sides of the motor cable should be grounded in the shortest distance and the largest contact area.
3. The protective paint of the U-shape saddle and metal plate should be removed in order to ensure the good contact. Please see disgram 1.
4. It should have correct connection between the braid shielding of the motor cable and the metal plate. The braid shielding on both sides of the motor cable should be fixed by the U-shape saddle and metal plate. Please see diagram 2 for the correct connection.

Remove any paint on metal saddle for good ground contact with the plate and shielding.

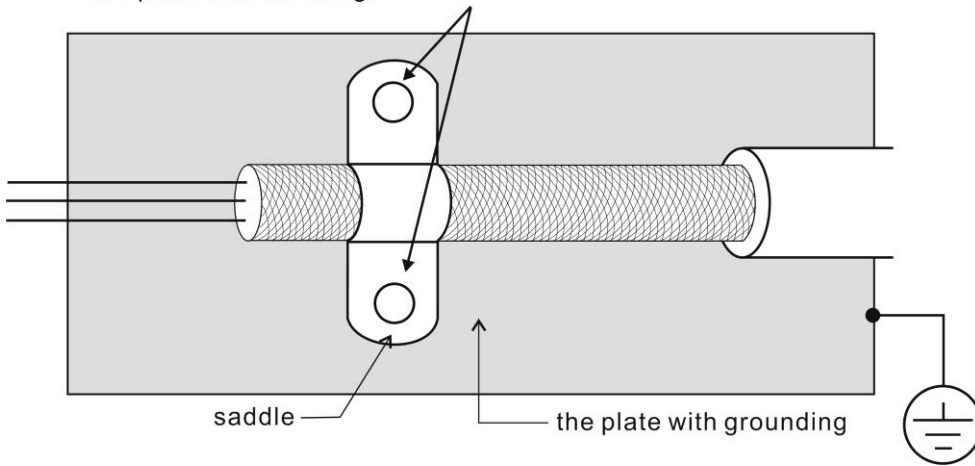


Diagram 1

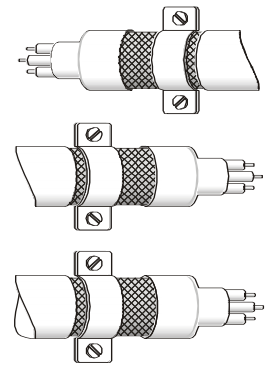
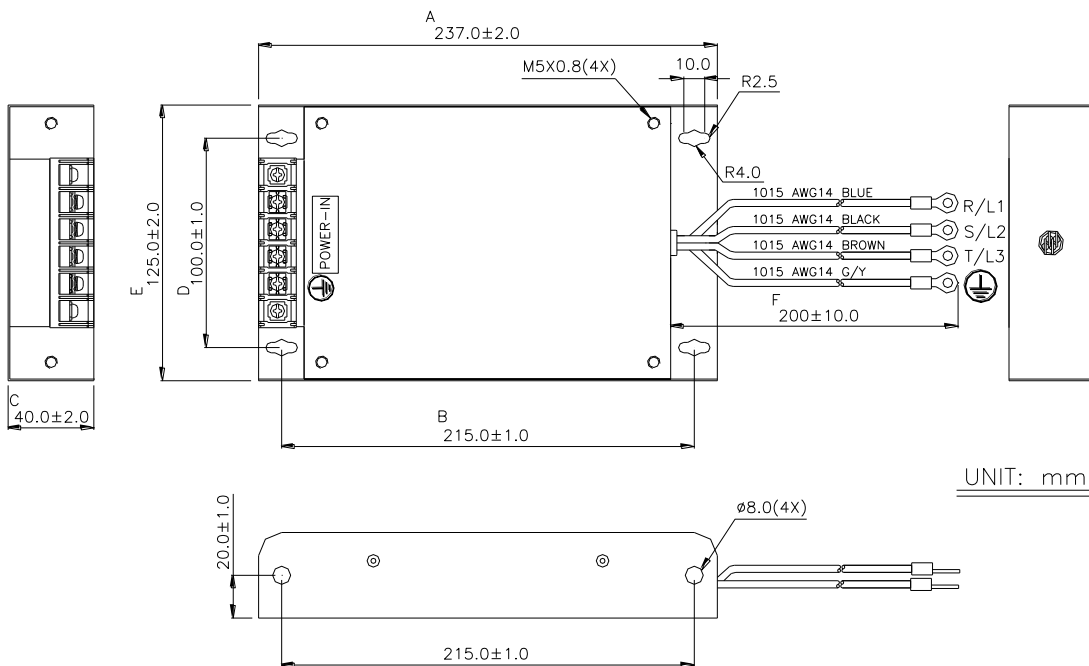


Diagram 2

### Dimensions of EMI Filter

Delta Part Number: 20TDT1W4D



UNIT: mm



## 2.7 Selection of Regenerative Resistor

When the direction of pull-out torque is different from the rotation, it means the electricity is sent back to the servo drive from the load-end. It becomes the capacitance of DC Bus and increases the voltage. When the voltage increases to a specific value, the come-back electricity can only be consumed by regenerative resistor. There is a built-in regenerative resistor in the servo drive. Users can also use the external regenerative resistor if needed.

The following table is the specification of built-in regenerative resistor provided by ASDA-M series.

Servo Drive (kW)	Specification of built-in regenerative resistor		*1 The capacity of built-in regenerative resistor (Watt)	Minimum allowable resistance (Ohm)
	Resistance (P1-52) (Ohm)	Capacity (P1-53) (Watt)		
0.75	40	60	30	30
1.5	20	100	50	20

\*1 The capacity of built-in regenerative resistor (average value) is 50 % of the rated capacity of the built-in regenerative resistor. The capacity of the external regenerative resistor is the same as the built-in one.

When the regenerative resistor exceeds the capacity of built-in regenerative resistor, the external regenerative resistor should be applied. Please pay special attention to the followings when using the regenerative resistor.

1. Please correctly set up the resistance (P1-52) and capacity (P1-53) of the regenerative resistor. Or it might influence the performance of this function.
2. If users desire to use the external regenerative resistor, please make sure the applied value is the same as the built-in regenerative resistor. If users desire to connect it in parallel to increase the power of regenerative resistor, please make sure the capacitance meets the requirements.
3. In natural environment, if the capacity of regenerative resistor (the average value) is within the rated capacity, the temperature of the capacitance will increase to 120°C or even higher (under the condition of regenerative energy keeps existing). For safety concerns, please apply the method of forced cooling in order to reduce the temperature of regenerative resistor. Or, it is suggested to use the regenerative

resistor which is equipped with thermal switches. Please contact the distributors for load characteristics of the regenerative resistor.

When using the external regenerative resistor, the resistor should connect to P, C terminal and the contact of P, D terminal should be opened. It is recommended to choose the above mentioned capacitance. For easy calculation of regenerative resistor capacity, except the energy consumed by IGBT, two ways are provided to select the capacity of external regenerative resistor.

### (1) Regenerative Power Selection

#### (a) When the external load on torque does not exist

If the motor operates back and forth, the energy generated by the brake will go into the capacitance of DC bus. When the voltage of the capacitance exceeds a specific value, the redundant energy will be consumed by regenerative resistor. Two ways of selecting regenerative resistor are provided here. The table below provides the energy calculation method. Users can refer to it and calculate the selected regenerative resistor.

Servo Drive (kW)	Motor	Rotor Inertia J ( $\times 10^{-4}$ kg.m <sup>2</sup> )	Regenerative power from empty load 3000 r / min to stop Eo (joule)	The Maximum regenerative power of capacitance Ec (joule)	
Low Inertia	0.75	ECMA-C $\Delta$ 040F□□	0.021	0.10	4.21
	0.75	ECMA-C $\Delta$ 0401□□	0.037	0.18	4.21
	0.75	ECMA-C $\Delta$ 0602□□	0.177	0.87	5.62
	0.75	ECMA-C $\Delta$ 0604□□	0.277	1.37	8.42
	0.75	ECMA-C $\Delta$ 0804□□	0.68	3.36	8.42
	0.75	ECMA-C $\Delta$ 0807□□	1.13	5.59	17.47
	0.75	ECMA-C $\Delta$ 0907□□	1.93	9.54	17.47
	1.5	ECMA-C $\Delta$ 1010□□	2.65	13.10	21.22
	1.5	ECMC-C $\Delta$ 0910□□	2.62	12.96	21.22
Medium Inertia	0.75	ECMA-E $\Delta$ 1305□□	8.17	40.40	8.42
	1.0	ECMA-E $\Delta$ 1310□□	8.41	41.59	21.22
Medium-High Inertia	1.5	ECMA-F $\Delta$ 1308□□	13.6	67.25	21.22

High Inertia	0.75	ECMA-G $\Delta$ 1303□□	8.17	17.96	8.42
	0.75	ECMA-G $\Delta$ 1306□□	8.41	18.48	17.47
	1.5	ECMA-G $\Delta$ 1309□□	11.18	24.57	21.22

$$E_o = J \cdot \omega^2 / 182 \text{ ( joule ) } , \omega : \text{ r / min}$$

Assume the load inertia is N times to the motor inertia and the motor decelerates from 3000 r / min to 0, its regenerative energy is  $(N+1) \times E_o$ . The consumed regenerative resistor is  $(N+1) \times E_o - E_c$  joule. If the cycle of back and forth operation is T sec, then the power of regenerative resistor it needs is  $2 \times ((N+1) \times E_o - E_c) / T$ .

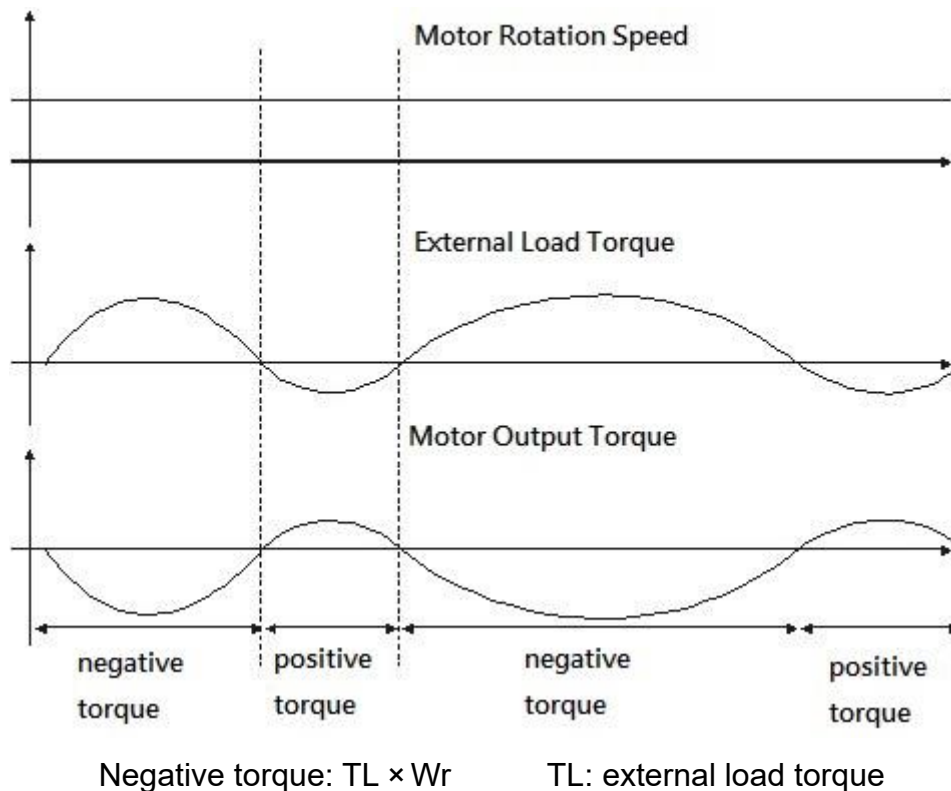
Followings are the calculation procedure:

Steps	Item	Calculation and Setting Method
1	Set the capacity of regenerative resistor to the maximum	Set P1-53 to the maximum value
2	Set T cycle of back and forth operation	Enter by the user
3	Set the rotational speed $\omega$	Enter by the user or read via P0-02
4	Set the load/motor inertia ratio N	Enter by the user or read via P0-02
5	Calculate the maximum regenerative energy $E_o$	$E_o = J \cdot \omega^2 / 182$
6	Set the absorbable regenerative energy $E_c$	Refer to the above table
7	Calculate the needful capacitance of regenerative resistor	$2 \times ((N+1) \times E_o - E_c) / T$

Take 400W as the example, the cycle of back and forth operation is  $T = 0.4$  sec, the maximum speed is 3000 r / min and the load inertia is 7 times to the motor inertia. Then, the needful power of regenerative resistor is  $2 \times ((7+1) \times 1.68 - 8) / 0.4 = 27.2$  W. If it is smaller than the built-in capacity of regenerative resistor, the built-in 60 W regenerative resistor will do. Generally speaking, when the need of the external load inertia is not much, the built-in regenerative is enough. The diagram below describes the actual operation. The smaller power of the regenerative resistor it has, the more energy it accumulates and the higher temperature will be. When the temperature is higher than a specific value, ALE05 occurs.

(b) When the external load torque exists, the motor is in reverse rotation.

Usually, the motor is in forward rotation, which means the torque output direction of the motor is the same as the rotation direction. However, in some applications, the direction of torque output is different from the rotation. In this situation, the motor is in reverse rotation. The external energy goes into the servo drive through the motor. The diagram below is one of the examples. When the motor is in constant speed, it is positive torque in most of the time and a huge amount of energy rapidly transmits to regenerative resistor.



For safety reasons, please calculate it by considering the safest situation.

For example, when the external load torque is the +70 % rated torque and the rotation reaches 3000 r / min, then take 400W (the rated torque is 1.27 Nt-m) as the example, the user has to connect a 40  $\Omega$  regenerative resistor which calculation is as follows:

$$2 \times (0.7 \times 1.27) \times (3000 \times 2 \times \pi / 60) = 560W.$$

## (2) Simple Selection

Choose the appropriate regenerative resistor according to the allowable frequency and empty load frequency in actual operation. The so-called empty allowable frequency is the frequency of continuous operation when the servo motor runs from 0 r / min to the rated speed and then decelerates from the rated speed to 0 r / min. The following table lists the allowable frequency of built-in regenerative resistor when the servo drive runs without load (times / min).

Allowable frequency of built-in regenerative resistor when the servo drive runs without load (times / min)					
Motor Capacity	600W	750W	900W	1.0kW	1.5kW
Corresponding Motor	06	07	09	10	15
ECMA□□C	-	312	-	137	-
ECMA□□E	-	-	-	42	32
ECMA□□G	42	-	31	-	-

When the servo motor runs with load, the allowable frequency will be different according to different load inertia or speed. The following is the calculation method.  $m$  represents load / motor inertia ratio.

$$\text{Allowable frequency} = \frac{\text{Allowable frequency when servo motor run without load}}{m + 1} \times \left( \frac{\text{Rated speed}}{\text{Operating speed}} \right)^2 \frac{\text{times}}{\text{min.}}$$

The comparison table of external regenerative resistor is provided below. Please choose the appropriate regenerative resistor according to the allowable frequency. The table below describes the suggested allowable frequency (times / min) of regenerative resistor when the servo drive runs without load.

Allowable frequency of regenerative resistor when the servo drive runs without load (times / min)					
Suggested Regenerative Resistor	Motor Capacity	ECMA□□C			
	200W	400W (F60)	400W (F80)	750W	1.0kW
	02	04	04	07	10
BR400W040 (400W 40 Ω)	-	8608	3506	2110	925
BR1K0W020 (1kW 20 Ω)	-	-	8765	5274	2312

Motor Capacity	ECMA□□E		
	0.5kW	1kW	1.5kW
Suggested Regenerative Resistor	05	1.0	15
BR400W040 (400W 40Ω)	291	283	213
BR1K0W020 (1kW 20Ω)	729	708	533

Motor Capacity	ECMA□□G		
	0.3kW	0.6kW	0.9kW
Suggested Regenerative Resistor	03	06	09
BR400W040 (400W 40 Ω)	292	283	213
BR1K0W020 (1kW 20 Ω)	729	708	533

If watt is not enough when using regenerative resistor, connecting the same regenerative resistor in parallel can increase the power.



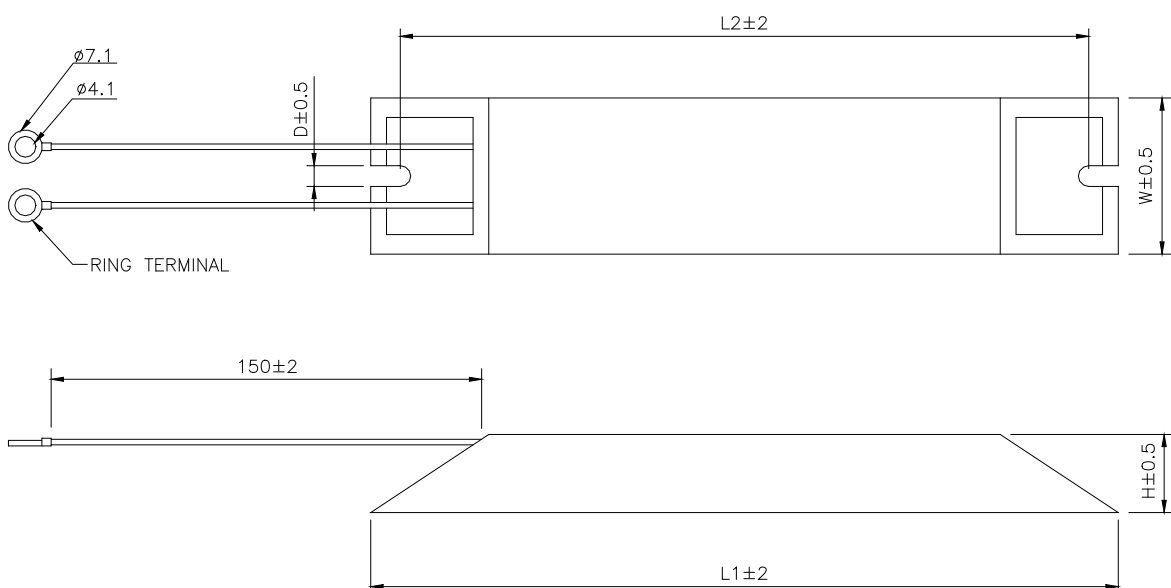
**NOTE**

ASDA-M can control three motors at the same time. If the energy of three motors goes into the servo drive, the power of regenerative resistor needs to be increased to three times of the origin.

Dimensions of Regenerative Resistor

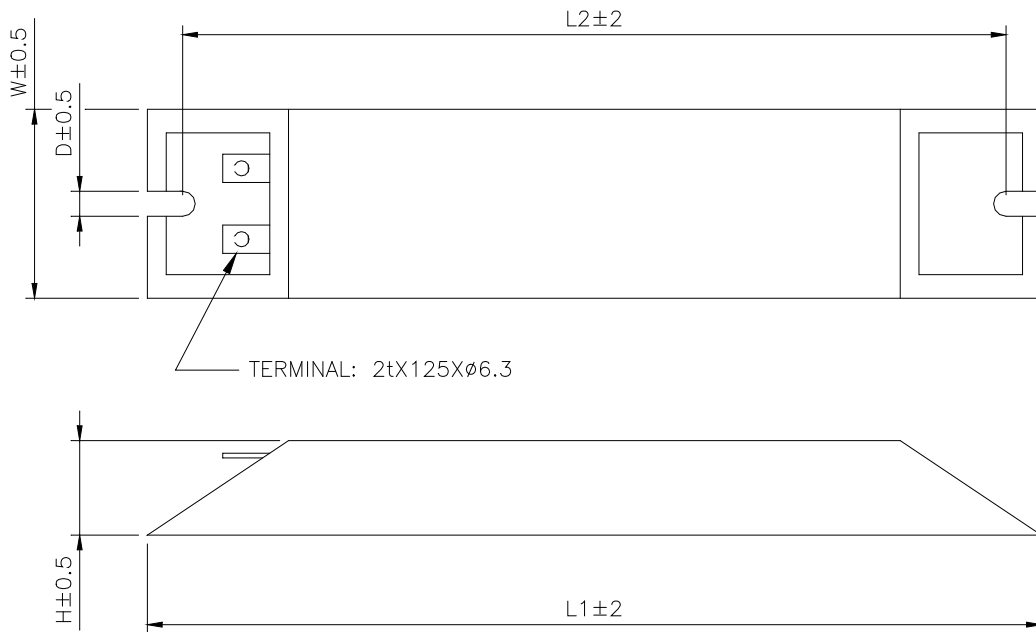
Delta Part Number: BR400W040 (400W 40 Ω)

L1	L2	H	D	W	MAX. WEIGHT (g)
265	250	30	5.3	60	930

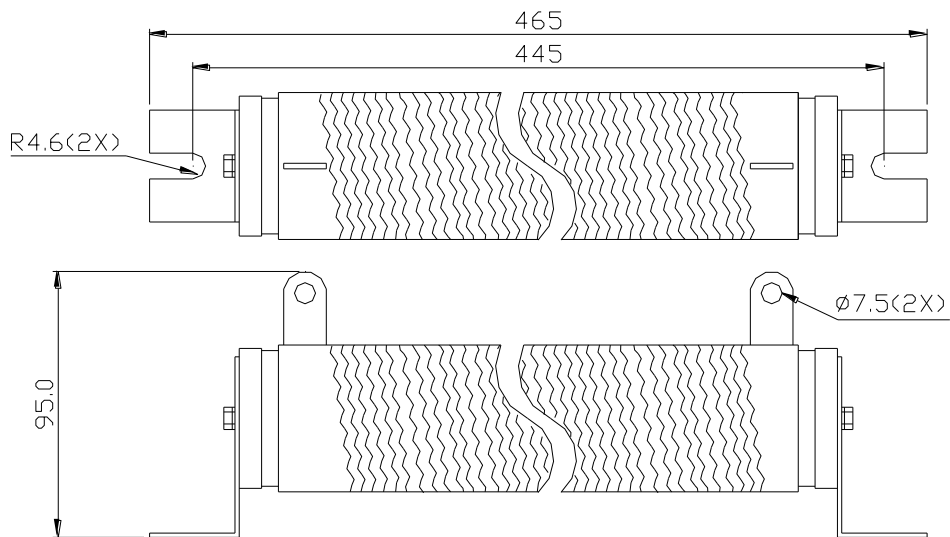


Delta Part Number: BR1K0W020 (1kW 20 Ω)

L1	L2	H	D	W	MAX. WEIGHT (g)
400	385	50	5.3	100	2800



Delta Part Number: BR1K5W005 (3kW 10 Ω)

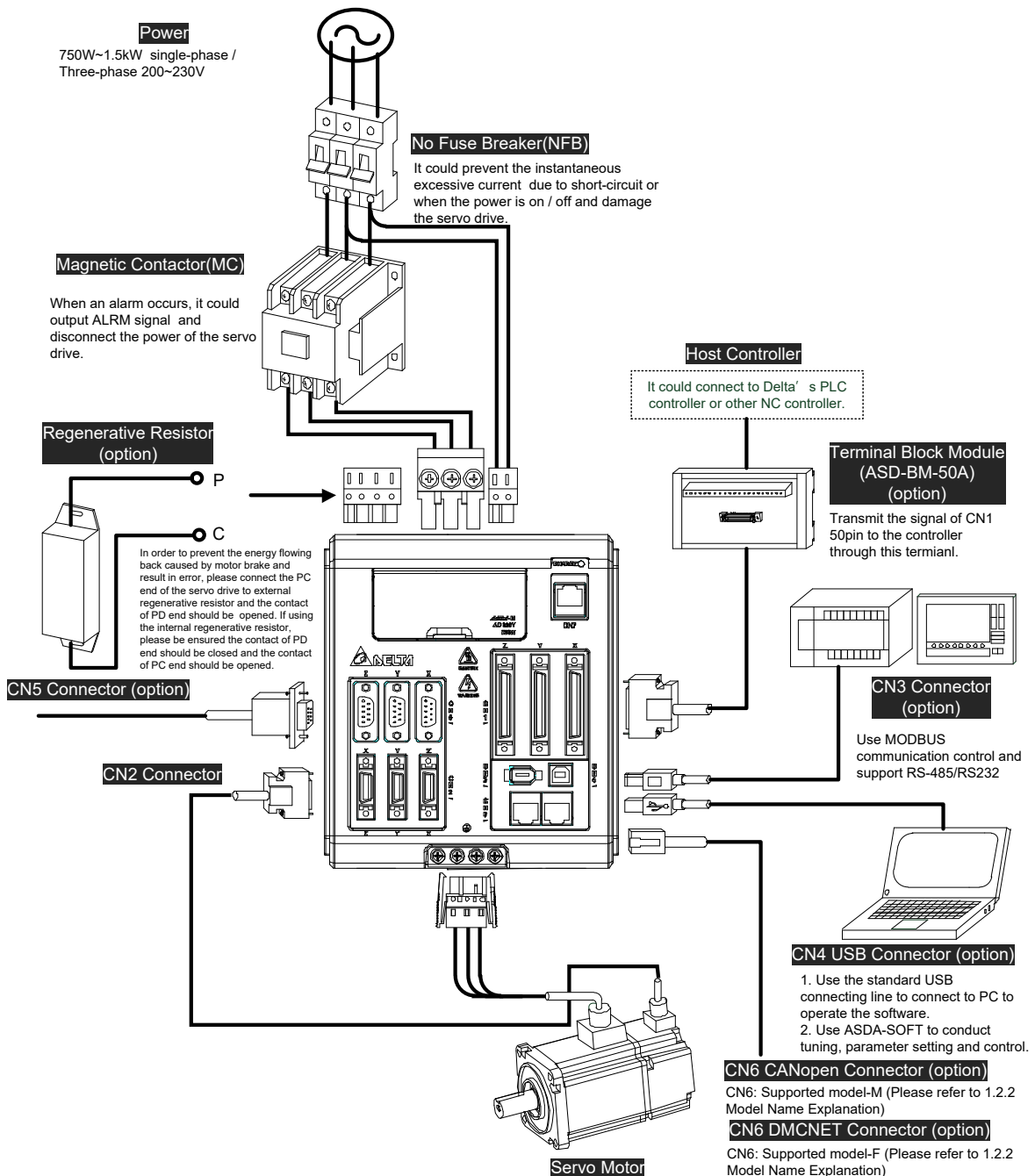


# Chapter 3 Wiring

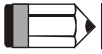
This chapter details the wiring method of servo drive, the definition of each signal and standard wiring diagram.

## 3.1 Connection between Peripheral Devices and Main Power Circuit

### 3.1.1 Wiring Diagram of Peripheral Devices







**NOTE**

## Installation Notes:

- 1) Check if the power and wiring among R, S, T and L1c, L2c are correct.
- 2) Check if the output terminal U, V, W of the servo motor is correctly wired. The incorrect wiring may disable the operation of the motor or cause the malfunction.
- 3) When applying to the external regenerative resistor, the contact between P ⊕ and D should be opened and the external regenerative resistor should connect to terminal P ⊕ and C. When applying to the internal regenerative resistor, the contact between P ⊕ and D should be closed and the contact between P ⊕ and C should be opened.
- 4) When an alarm occurs or the system is in emergency stop status, use ALARM or WARN to output and disconnect the power of magnetic contactor in order to disconnect the power of servo drive.

### 3.1.2 Connectors and Terminals of the Servo Drive

Terminal Signal	Name	Description		
L1c, L2c	Power input of the control circuit	Connect to single-phase AC power (select the appropriate voltage specification according to the product )		
R, S, T	Power input of the main circuit	Connect to three-phase AC power (select the appropriate voltage specification according to the product)		
U, V, W FG	Motor cable	Connect to the motor		
		Terminal Symbol	Wire Color	Description
		U	Red	Three-phase main power cable of the motor
		V	White	
		W	Black	
FG	Green	Connect to the grounding  of the servo drive.		
P <sup>+</sup> , D, C, P <sup>-</sup>	Regenerative resistor terminal or brake unit	Use internal resistor	The contact between P <sup>+</sup> and D end should be closed; contact between P <sup>+</sup> and C end should be opened.	
		Use external resistor	Connect P <sup>+</sup> , C ends to the resistor and the contact between P <sup>+</sup> and D end should be opened.	
		Use external braking unit	P <sup>+</sup> and P <sup>-</sup> of the brake unit should connect to P <sup>+</sup> and P <sup>-</sup> respectively. The contact between P <sup>+</sup> and D and P <sup>+</sup> and C should be opened.	
	Ground terminal	Connect to the ground wire of the power and the servo motor		
CN1	I/O connector (option)	Connect to the host controller, please refer to Section 3.3		
CN2	Connector (option)	Connect to the encoder of the motor, please refer to Section 3.4		
CN3	Connector (option)	Connect to RS-485 or RS-232, please refer to Section 3.5		
CN4	USB connector (Type B) (option)	Connect to personal computer (PC or NOTEBOOK), please refer to Section 3.6		
CN5	Connector (option)	Connect to the linear scale or encoder to constitute a full-closed loop, please refer to Section 3.7		
CN6	CANopen connector (option)	RJ45 connector, please refer to Section 3.8		

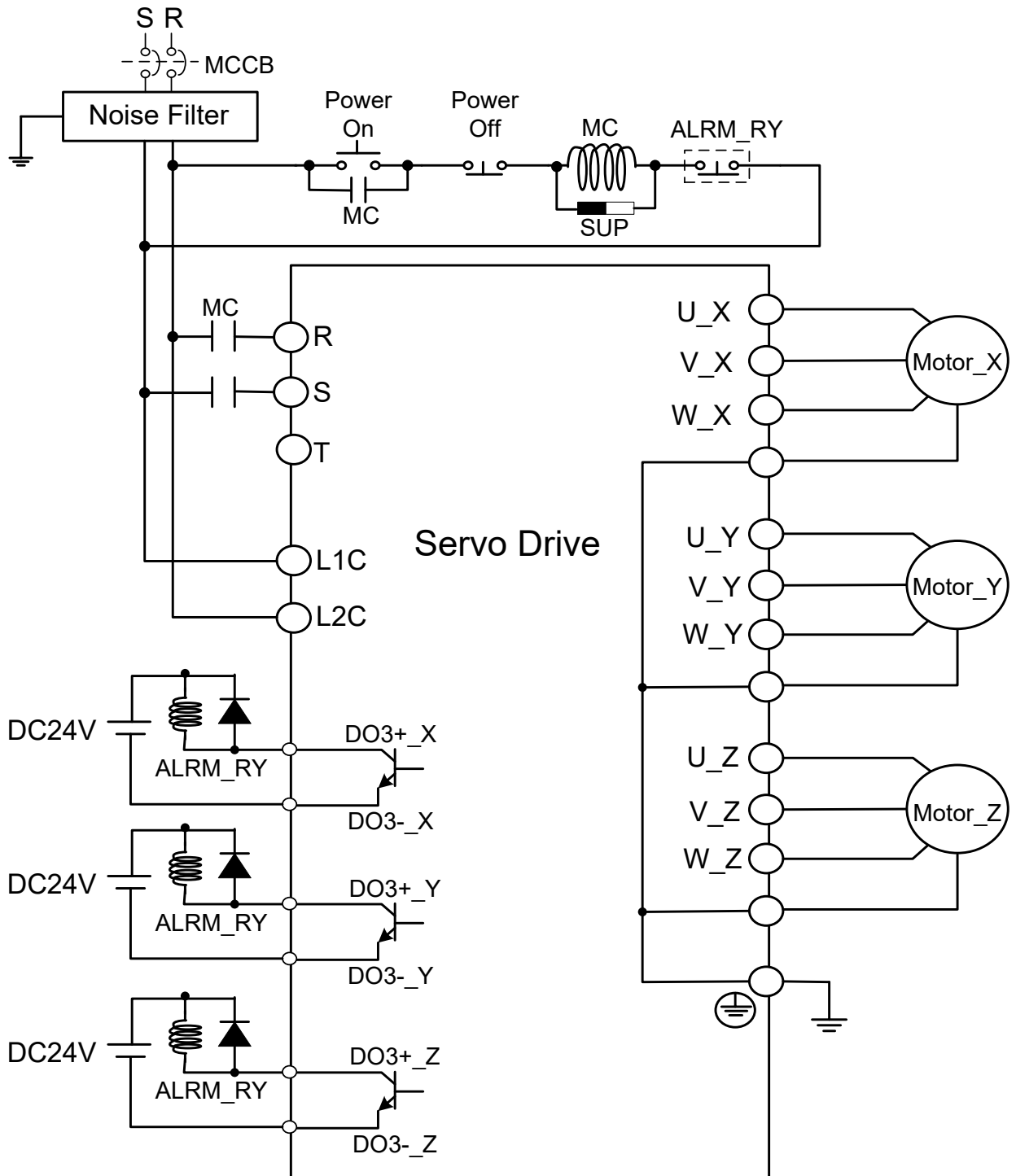
Pay special attention to the followings when wiring:

- 1) When the power is cutoff, do not touch R, S, T and U, V, W since the capacitance inside the servo drive still contains huge amount of electric charge. Wait until the charging light is off.
- 2) Separate R, S, T and U, V, W from the other wires. The interval should be at least 30 cm (11.8 inches).
- 3) If the wire of encoder CN2 or CN5 connector is not long enough, please use shielded twisted-pair cable which cannot exceed 20 meters (65.62 feet). If it exceeds 20 meters, please choose the bigger wire diameter of signal cable to ensure it will not cause signal fading. As for the encoder wiring specification of 20-meter-long cable, please use AWG26 of wire size and Metal braided shield twisted-pair cable which complies with the standard of UL 2464.
- 4) When using CANopen, please use the standard shielded twisted-pair cables to ensure the communication quality.
- 5) When selecting the wire rod, please refer to Section 3.1.6.

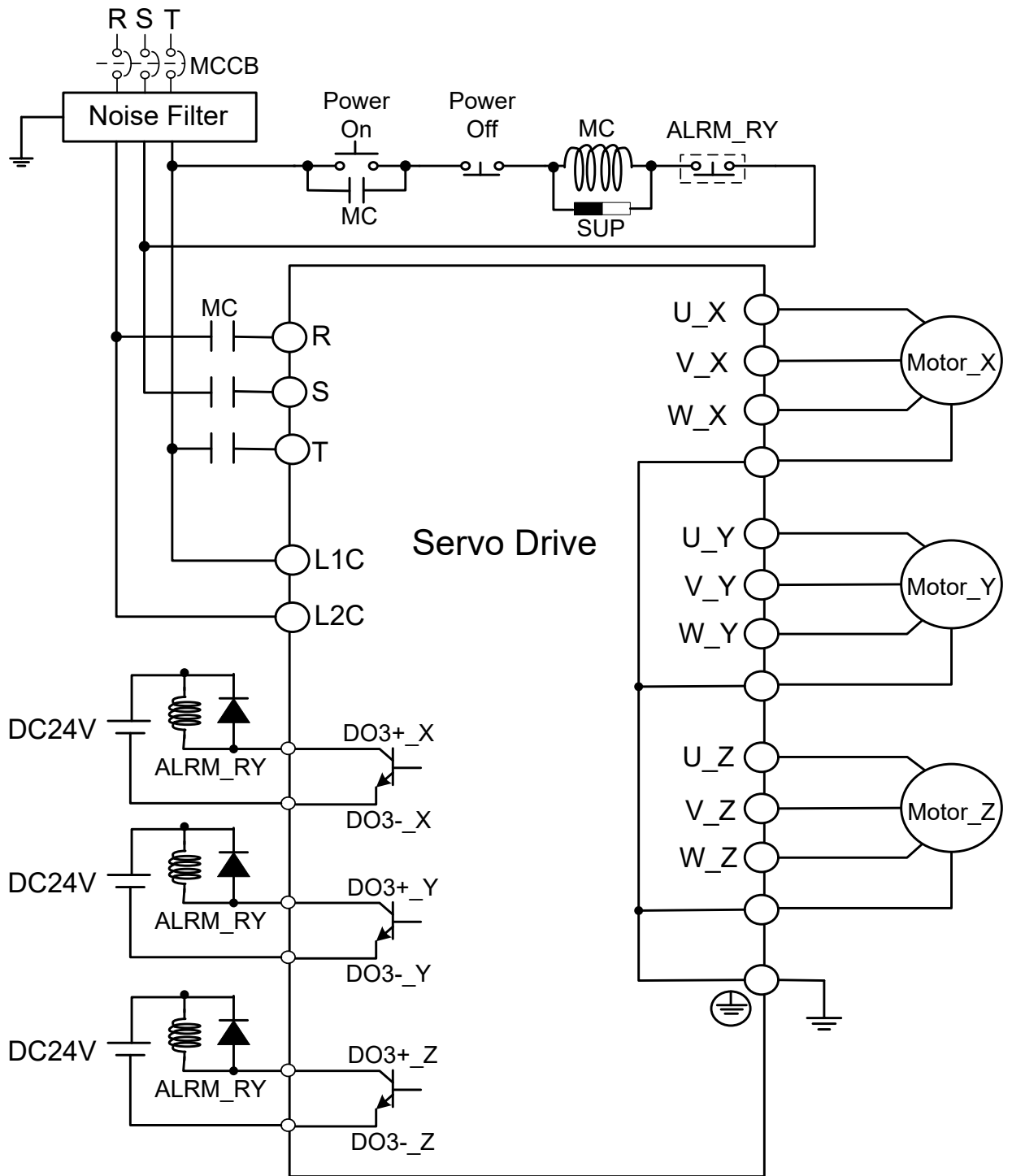
### 3.1.3 Wiring Method

The wiring method of ASDA-M servo drive is divided into single-phase and three-phase. In the diagram below, Power On is contact **a**, Power Off and ALRM\_RY are contact **b**. MC is the coil of magnetic contactor and self-retaining power and is the contact of main power circuit.

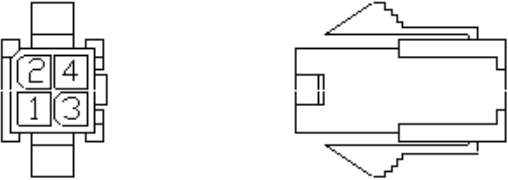
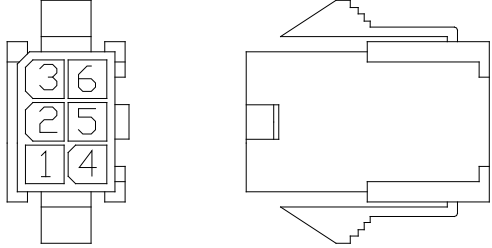
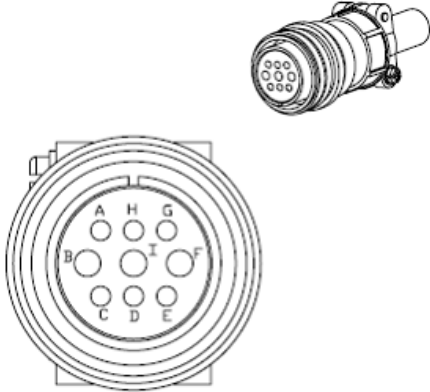
- Wiring Method of Single-phase Power Supply ( suitable for all series)



■ Wiring Method of Three-phase Power Supply ( suitable for all series)



### 3.1.4 Specification of Motor U, V, W Power Cable

Motor Model	U · V · W / Connector of Mechanical Brake	Terminal Definition
ECMA-C1040F□S (50W) ECMA-C△0401□S (100W) ECMA-C△0602□S (200W) ECMA-C△0604□S (400W) ECMA-C△0604□H (400W) ECMA-C△0804□7 (400W) ECMA-C△0807□S (750W) ECMA-C△0807□H (750W) ECMA-C△0907□S (750W) ECMA-C△0910□S (1000W)	 <p>HOUSING: JOWLE (C4201H00-2*2PA)</p>	A
ECMA-C1040F□S (50W) ECMA-C△0401□S (100W) ECMA-C△0602□S (200W) ECMA-C△0604□S (400W) ECMA-C△0604□H (400W) ECMA-C△0804□7 (400W) ECMA-C△0807□S (750W) ECMA-C△0807□H (750W) ECMA-C△0907□S (750W) ECMA-C△0910□S (1000W)	 <p>HOUSING : JOWLE (C4201H00-2*3PA)</p>	B
ECMA-G△1303□S (300W) ECMA-E△1305□S (500W) ECMA-G△1306□S (600W) ECMA-F△1308□S (850W) ECMA-G△1309□S (900W) ECMA-C△1010□S (1000W) ECMA-E△1310□S (1000W) ECMA-E△1315□S (1500W)	 <p>3106A-20-18S</p>	C

\*□ : with brake

Wiring Name	U (Red)	V (White)	W (Black)	CASE GROUND (Yellow Green)	BRAKE1 (Note <sup>3</sup> )	BRAKE2 (Note <sup>3</sup> )
Terminal Definition A	1	2	3	4	-	-
Terminal Definition B	1	2	4	5	3	6
Terminal Definition C	F	I	B	E	G	H
Terminal Definition D	D	E	F	G	A	B

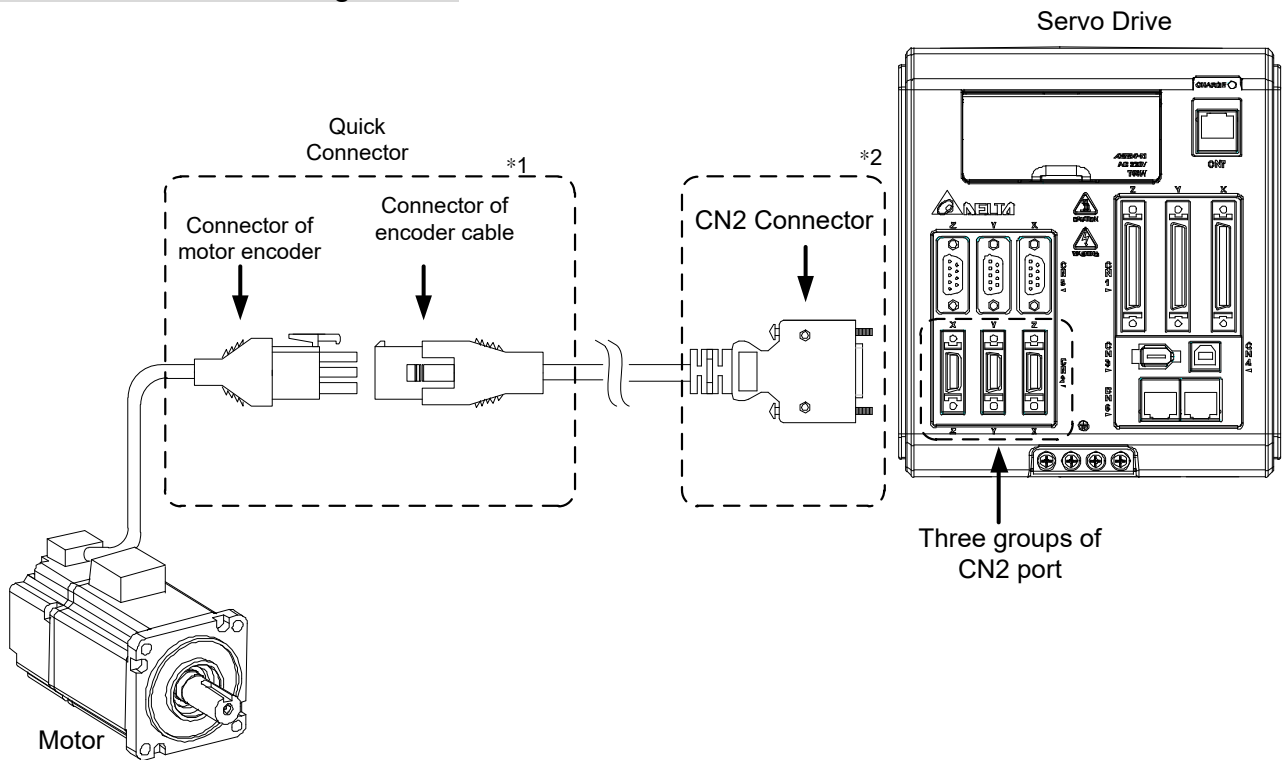
When selecting the wire rod, please choose 600 V PVC cable and the length should not longer than 30 m. If the length exceeds 30 m, please take the received voltage into consideration when selecting the wire size. Please refer to Section 3.1.6 for wire rod selection.

**NOTE**

- 1) Box, (□) in servo motor model represents brake or keyway / oil seal.
- 2) Triangle, (△) in servo motor model represents encoder type. △ = 1: incremental, 20-bit; △ = 2: incremental, 17-bit; △ = 3: 2500 ppr; △ = A: absolute.
- 3) Color of brake cable F40 ~ F86: brown, blue; color of brake cable for F100 or above: yellow, blue.

### 3.1.5 Specification of Connector of Encoder Cable

Encoder connection diagram 1:



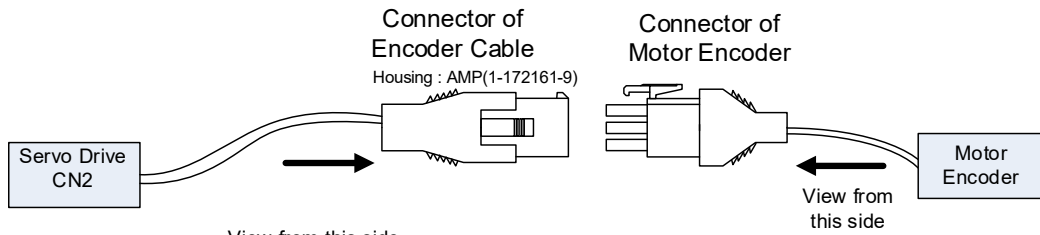
**NOTE** This diagram shows the connection between the servo drive and the motor encoder. It is not drawn to practical scale and specifications will vary according to the selected servo drive and motor model.

- 1) Please refer to the Section of Specification and Definition of Encoder Connector.
- 2) Please refer to Section 3.4 CN2 Connector.

Motor Model	Connector of Encoder Cable
ECMA-C1040F□S (50W) ECMA-C△0401□S (100W) ECMA-C△0602□S (200W) ECMA-C△0604□S (400W) ECMA-C△0604□H (400W) ECMA-C△0804□7 (400W) ECMA-C△0807□S (750W) ECMA-C△0807□H (750W) ECMA-C△0907□S (750W) ECMA-C△0910□S (1000W)	<p>View from this side →      ← View from this side</p> <p>HOUSING : AMP (1-172161-9)</p>



Specification and Definition of Encoder Connector:



View from this side

<b>1</b> Blue T+	<b>2</b> Reserved	<b>3</b> Reserved
<b>4</b> Blue/Black T-	<b>5</b> Reserved	<b>6</b> Reserved
<b>7</b> Red/Red & white DC+5V	<b>8</b> Black/Black & white GND	<b>9</b> Shield

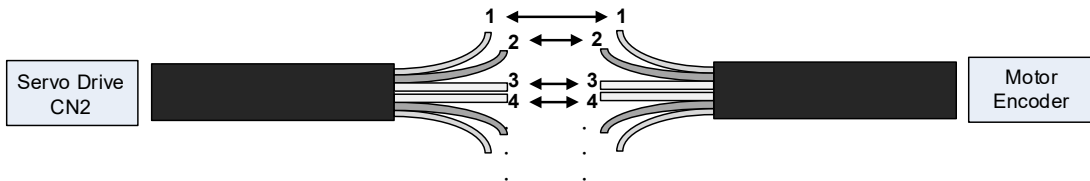
The wire color of the servo drive is for reference only. Please refer to the real object.

(Encoder type is 17bit , 20bit):

<b>3</b> Reserved	<b>2</b> -	<b>1</b> White T+
<b>6</b> Reserved	<b>5</b> -	<b>4</b> White/Red T-
<b>9</b> Shield	<b>8</b> Blue GND	<b>7</b> Brown DC+5V

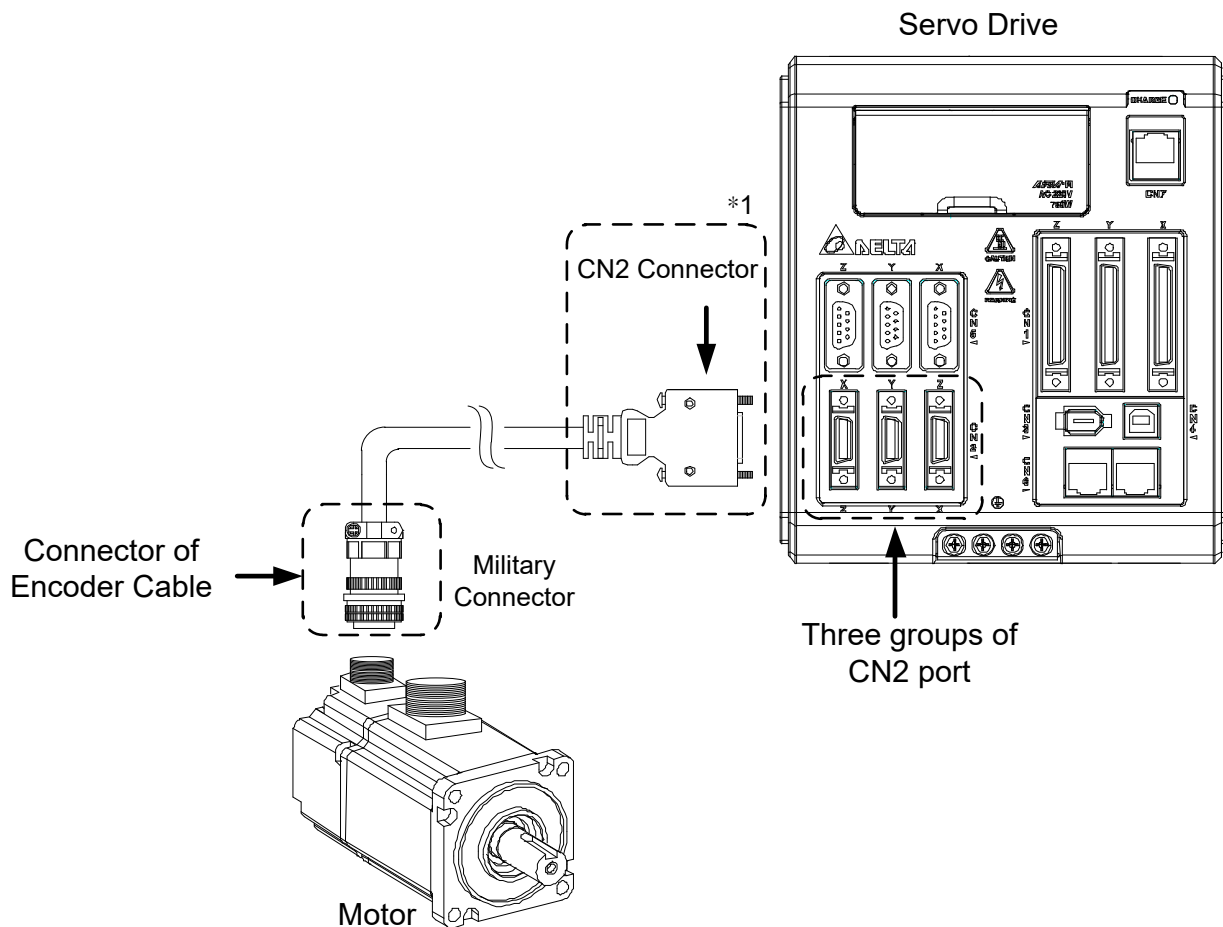
(Encoder type is 2500ppr, 33bit):

<b>3</b> Reserved	<b>2</b> Reserved	<b>1</b> White T+
<b>6</b> Reserved	<b>5</b> Reserved	<b>4</b> White/Red T-
<b>9</b> Shield	<b>8</b> Blue GND	<b>7</b> Brown DC+5V



If not using housing and directly wire the cores, please follow the corresponding core number for wiring. For example, core number 1 from the servo drive CN2 should connect to core number 1 from the motor encoder; core number 2 from the servo drive CN2 should connect to core number 2 from the motor encoder and so on. Please number the cores from the servo drive in order and then connect it to the encoder.

Encoder connection diagram 2:



**NOTE** This diagram shows the connection between the servo drive and the motor encoder. It is not drawn to practical scale and specifications will be different according to the selected servo drive and motor model.

1) Please refer to Section 3.4, CN2 Connector.

Motor Model	Connector of Encoder Cable			
ECMA-G△1303□S (300W) ECMA-E△1305□S (500W) ECMA-G△1306□S (600W) ECMA-F△1308□S (850W) ECMA-G△1309□S (900W) ECMA-C△1010□S (1000W) ECMA-E△1310□S (1000W) ECMA-F△1313□S (1300W) ECMA-E△1315□S (1500W)	<p>3106A-20-29S Military Connector</p>	Pin No.	Terminal Symbol	Wire Color
			T+	Blue
		B	T-	Blue & Black
		S	DC+5 V	Red / Red & White
		R	GND	Black / Black & White
		L	BRAID SHIELD	-

Please select shielded multi-core and the shielded cable should connect to the SHIELD end. Please refer to the description of Section 3.1.6.

**NOTE**

- 1) Box, (□) in servo motor model represents brake or keyway / oil seal.
- 2) Triangle, (△) in servo motor model represents encoder type. △ = 1: incremental, 20-bit; △ = 2: incremental, 17-bit; △ = 3: 2500 ppr; △ = A: absolute.

### 3.1.6 Selection of Wire Rod

The recommended wire rods are shown as the following table.

Servo Drive and corresponding Motor Model		Power Wiring - Wire Diameter mm <sup>2</sup> (AWG)			
		L1c, L2c	R, S, T	U, V, W	P <sup>+</sup> , C
ASD-M-0721-□	ECMA-C1040F□S	1.3 ( AWG16 )	2.1 ( AWG14 )	0.82 ( AWG18 )	2.1 ( AWG14 )
	ECMA-C△0401□S				
	ECMA-C△0602□S				
	ECMA-C△0604□S				
	ECMA-C△0604□H				
	ECMA-C△0804□7				
	ECMA-C△0807□S				
	ECMA-C△0807□H				
	ECMA-C△0907□S				
	ECMA-E△1305□S				
	ECMA-G△1303□S				
	ECMA-G△1306□S				
ASD-M-1521-□	ECMA-C△0910□S	1.3 ( AWG16 )	3.3 ( AWG12 )	1.3 ( AWG16 )	3.3 ( AWG12 )
	ECMA-C△1010□S				
	ECMA-E△1310□S				
	ECMA-E△1315□S				
	ECMA-F△1308□S				
	ECMA-G△1309□S				
	ECMA-C△0807□S				
ECMA-C△0907□S					

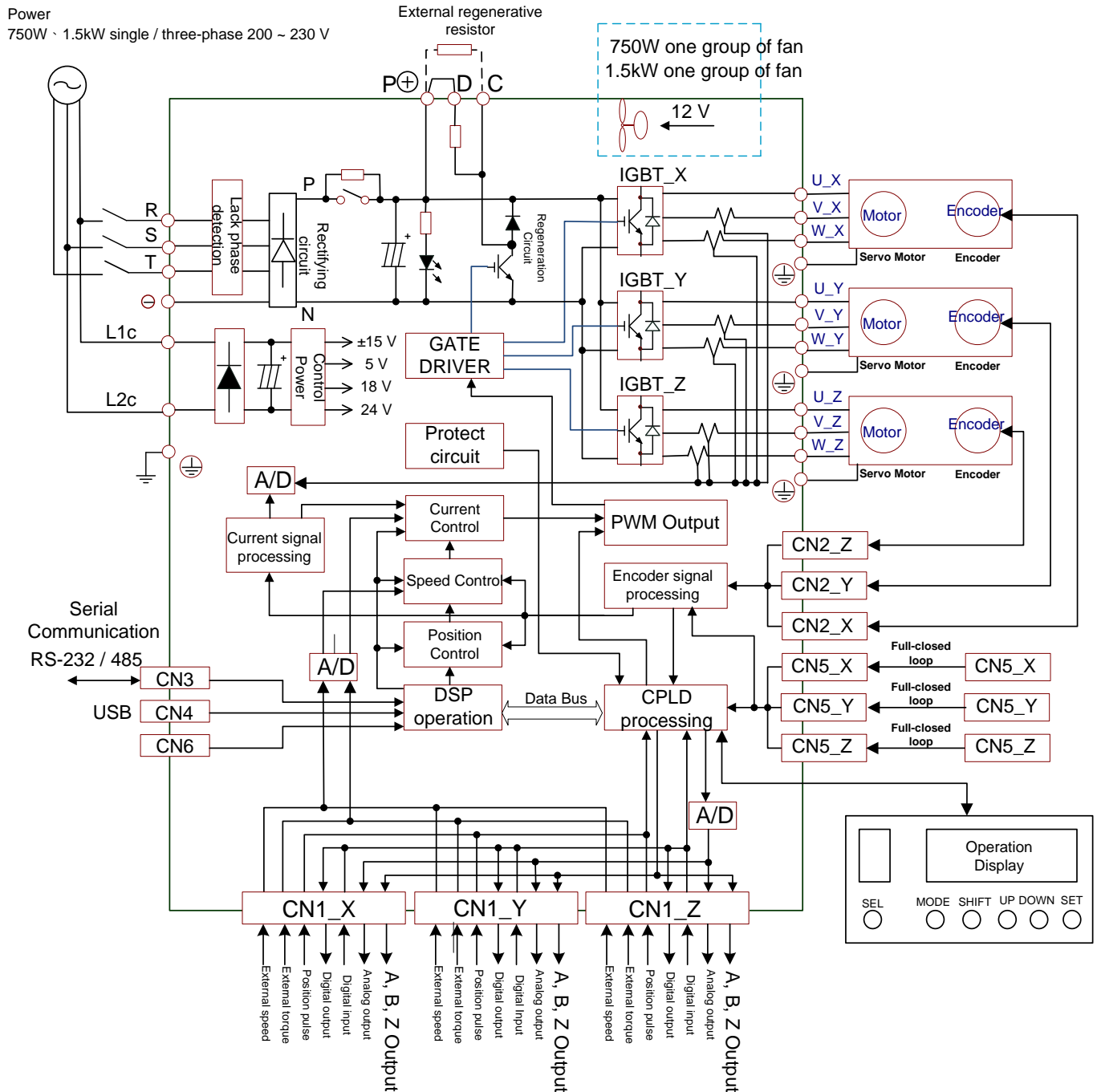
Servo Drive Model	Encoder Wiring —Wire Diameter mm <sup>2</sup> (AWG)			
	Size	Number	Specification	Standard Length
ASD-M-0721-□	0.13 ( AWG26 )	10 cores ( 4 pairs )	UL2464	3 mm (9.84 inches)
ASD-M-1521-□	0.13 ( AWG26 )	10 cores ( 4 pairs )	UL2464	3 mm (9.84 inches)

**NOTE**

- 1) Please use shielded twisted-pair cable for encoder wiring so as to reduce the interference of the noise.
- 2) The shield should connect to the  $\ominus$  phase of SHIELD.
- 3) Please follow the Selection of Wire Rod when wiring in order to avoid the danger it may occur.
- 4) Box, (□) at the end of the servo drive model represents the model code of ASDA-M. Please refer to the model information of the product you purchased.
- 5) Triangle, (□) in servo motor model represents brake or keyway / oil seal.
- 6) Box, (△) in servo motor model represents encoder type. △ = 1: incremental, 20-bit; △ = 2: incremental, 17-bit; △ = 3: 2500 ppr; △ = A: absolute.

### 3.2 Schematic Diagram of Servo System

#### 750W ~ 1.5kW Model (Built-in Regenerative Resistor and Fan)

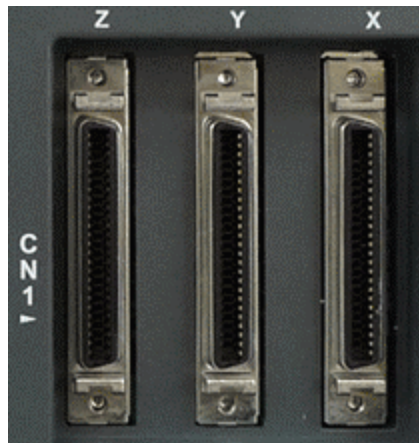


- NOTE**
- 1) The extension socket CN6 of ASD-M-0721-M model and ASD-M-1521-M is the function of CANopen.
  - 2) The extension socket CN6 of ASD-M-0721-F model and ASD-M-1521-F is the function of DMCNET.
  - 3) ASD-M-0721-L model and ASD-M-1521-L model have no extension socket CN6.

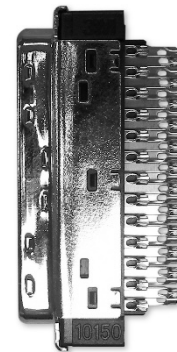
### 3.3 I/O Signal (CN1) Connection

#### 3.3.1 I/O Signal (CN1) Connector Terminal Layout

In order to have a more flexible communication with the master, 9 programmable Digital Outputs (DO) and 18 programmable Digital Inputs (DI) are provided. The setting of 6 digital inputs and 3 digital outputs of each axis provided by ASDA-M, which are parameter P2-10 ~ P2-15 and parameter P2-18 ~ P2-20 respectively. In addition, the differential output encoder signal, A+, A-, B+, B-, Z+ and Z-, input of analog torque command, analog speed / position command and pulse position command are also provided. The followings are the pin diagrams.



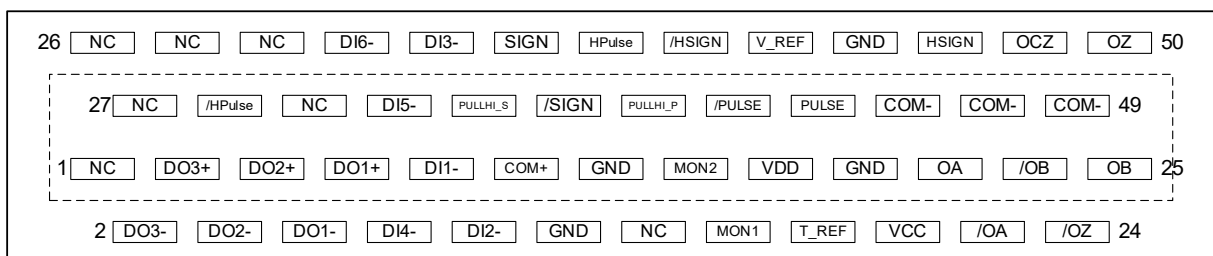
CN1 Connector (female)



Side view



Rear view



The rear wiring terminal of CN1 connector

2	DO3-	Digital output	1	NC	Reserved	27	NC	Reserved	26	NC	Reserved
			3	DO3+	Digital output			High-speed position command pulse ( - )	28	NC	Reserved
4	DO2-	Digital output	5	DO2+	Digital output	29	/HPULSE		30	NC	Reserved
6	DO1-	Digital output	7	DO1+	Digital output	31	NC	Reserved	32	DI6-	Digital input
8	DI4-	Digital input	9	DI1-	Digital input	33	DI5-	Digital input	34	DI3-	Digital input
10	DI2-	Digital input	11	COM+	Power input ( 12~24V )	35	PULL HI_S (Sign)	Pull-high voltage of sign	36	SIGN	Position command signal (+)
12	GND	Analog input signal ground	13	GND	Analog input signal ground	37	/SIGN	Position command signal ( - )	38	HPULSE	High-speed position command pulse ( + )
14	NC	No connection	15	MON2	Analog monitor output 2	39	PULL HI_P (Pulse)	Pull-high voltage of pulse	40	/HSIGN	High-speed position command ( - )
16	MON1	Analog monitor output 1	17	VDD	+24V power output (for external I/O)	41	/PULSE	Position command pulse ( - )	42	V_REF	Speed analog command input ( + )
18	T_REF	Torque analog command input	19	GND	Analog input signal ground	43	PULSE	Position command pulse ( + )	44	GND	Analog input signal ground
20	VCC	+12 power output (for analog command)	21	OA	Encoder/ A pulse output	45	COM-	VDD ( 24 V ) power ground	46	HSIGN	High-speed position command ( + )
22	/OA	Encoder/ A pulse output	23	/OB	Encoder/ B pulse output	47	COM-	VDD ( 24 V ) power ground	48	OCZ	Encoder Z pulse open-collector output
24	/OZ	Encoder/ Z pulse output	25	OB	Encoder/ B pulse output	49	COM-	VDD ( 24V ) power ground	50	OZ	Encoder Z pulse differential output



- 1) NC means NO CONNECTION. This terminal is for internal use only. Do not connect it, or it may damage the servo drive.
- 2) CN1 of the three axes all have MON1 and MON2 output; however, the internal circuit is parallel-connected (please refer to Chapter 3.3 Basic Wiring); the three axes share the same set of MON1 and MON2. Thus, when the external circuit connects to any of the axis' MON1 and MON2, the final output will be the same. In addition, monitoring item of analog output is determined by the setting of P0-03.

### 3.3.2 Explanation of I/O (CN1) Connector Signal

The following details the signals listed in previous section:

#### General Signals

Signal Name		Pin No	Function	Wiring Method (Refer to 3.3.3)
Analog Command (input)	V_REF	42	(1) The speed command of the motor is -10 V ~ +10 V which means the speed command is -3000 ~ +3000 r / min (default). It can change the corresponding range via parameters. (2) The position command of the motor is -10 V ~ +10 V which means the position command is -3 cycles ~ +3 cycles (default).	C1
	T_REF	18	The torque command of the motor is -10 V ~ +10 V which means the rated torque command of -100 % ~ +100 %.	C1
Analog Monitor (output)	MON1 MON2	16 15	The operating state of the motor can be shown by analog voltage, such as speed and current. This drive provides two channel outputs. Users can select the desired monitoring data via parameter P0-03. This signal is based on the power ground. The internal circuit is parallel-connected (please refer to Chapter 3.3 Basic Wiring); three axes share the same set of MON1 and MON2. Thus, when the external circuit connects to any of the axis' MON1 and MON2, the final output will be the same.	C2

Signal Name		Pin No	Function	Wiring Method (Refer to 3.3.3)
Position Pulse (input)	PULSE	43	Position pulse can be inputted by Line Driver (single phase max. frequency 500 KHz) or open-collector (single phase max. frequency 200 KHz). Three kinds of command type can be selected via P1-00, CW pulse + CCW pulse, pulse + direction, A pulse + B pulse. When position pulse uses open-collector, the terminal should be connected to an external applied power in order to pull high.	C3 / C4
	/ PULSE	41		
	SIGN	36		
	/ SIGN	37		
PULL HI_P	39	35	When position pulse uses open-collector, the terminal should be connected to an external applied power in order to pull high.	C3 / C4
PULL HI_S	35			
High-speed position pulse (input)	HPULSE	38	High-speed position pulse only accepts Line Drive (+5 V) as the input type. The max. frequency of single phase is 4MHz. There are three kinds of command types, A pulse + B pulse, CW pulse + CCW pulse and pulse + direction. Please refer to parameter P1-00.	C4-2
/HPULSE	29			
HSIGN	46			
/HSIGN	40			
Position pulse (output)	OA	21	Encoder signal output A, B, Z (Line Drive output)	C13 / C14
	/ OA	22		
	OB	25		
	/ OB	23		
OZ	50	48	Encoder signal output Z (Open-collector output)	-
/ OZ	24			
Power	VDD	17	VDD is the +24 V power provided by the drive and is for Digital Input (DI) and Digital Output (DO) signal. The maximum current is 500 mA.	-
	COM+ COM-	11 45 47 49	COM+ is the common input of Digital Input (DI) and Digital Output (DO) voltage. When using VDD, VDD should be connected to COM+. If not using, it needs to apply the external power (+12 V ~ +24 V). Its positive end should connect to COM+ and the negative end should connect to COM-.	



Signal Name		Pin No	Function	Wiring Method (Refer to 3.3.3)
	VCC	20	VCC is the +12 V power provided by the drive. It is used for providing the simple analog command (speed or torque command). The maximum current is 100 mA.	
	GND	12,13, 19,44	VCC voltage is based on GND.	
Other	NC	14	NO CONNECTION. This terminal is for internal use only. Do not connect it, or it may damage the servo drive.	

There are numerous operation mode of this servo drive (please refer to Chapter 6.1). Each operation mode needs different I/O signal. In order to use the terminal in a more efficient way, the selection of I/O signal has to be programmable. That is to say, users can choose the desired DI/DO signal to meet the demand. Basically, the default setting of DI/DO signal has already have the appropriate function which can satisfy the demand of normal application.

Users have to select the operation mode based on the needs first (please refer to Chapter 6.1 for the introduction of each mode) and refer to the following DI/DO table to know the corresponding default setting of DI/DO signal and Pin No of the selected mode in order to conduct the wiring.

The table below lists the default setting of DI/DO signal function and pin No:

**The explanation of DO signal default setting is as the followings.**

DO Signal Name	Operation Mode	Pin No		Function	Wiring Method (Refer to 3.3.3)
		+	-		
SRDY	ALL	7	6	When the servo drive applies to the power and no alarm (ALRM) occurs in control circuit and motor power circuit, this DO is ON.	C5 / C6 / C7 / C8
SON	N/A	-	-	When the DI.SON is ON and the motor servo circuit can operate smoothly, this DO is ON.	
ZSPD	ALL	5	4	When the motor speed is slower than the setting value of parameter P1-38, this DO is ON.	

DO Signal Name	Operation Mode	Pin No		Function	Wiring Method (Refer to 3.3.3)
		+	-		
TSPD	ALL (except PT, PR)	-	-	When the motor actual speed (r / min) is faster than the setting value of parameter P1-39, this DO is ON.	
TPOS	PT, PR, PT-S, PT-T, PR-S, PR-T	1	26	When the deviation between the motor command and actual position (PULSE) is smaller than the setting value of parameter P1-54, this DO is ON.	
TQL	N/A	-	-	When torque is limiting, this DO is ON.	C5 / C6 / C7 / C8
ALRM	ALL	28	27	When the alarm occurs (except forward / reverse limit, emergency stop, communication error, under voltage), this DO is ON.	
BRKR	ALL	-	-	Control contact of mechanical brake	
HOME	ALL	3	2	When homing is completed, this DO is ON.	
OLW	ALL	-	-	When the overload level is reached, this DO is ON.	C5 / C6 / C7 / C8
WARN	ALL	-	-	A warning occurs. When it is in the status of forward / reverse limit, emergency stop, communication error, under voltage, this DO is ON.	
OVF	ALL	-	-	Position command overflows	
SNL(SCWL)	PR	-	-	Reverse software limit	
SPL(SCCWL)	PR	-	-	Forward software limit	
Cmd_OK	PR	-	-	The output of internal position command is completed.	
CAP_OK	PR	-	-	CAPTURE procedure is completed.	
MC_OK	PR	-	-	When DO.Cmd_OK and TPOS are ON, this DO is ON.	
CAM_AREA	PR	-	-	The Master position of E-CAM is inside the setting area.	

DO Signal Name	Operation Mode	Pin No		Function	Wiring Method (Refer to 3.3.3)
		+	-		
S_CMP	S, Sz	-	-	When the deviation between the speed command and the feedback speed of the motor is smaller than the setting value of parameter P1-47, this DO is ON.	
SDO_0	ALL	-	-	Output the status of bit00 of P4-06	
SDO_1	ALL	-	-	Output the status of bit01 of P4-06	
SDO_2	ALL	-	-	Output the status of bit02 of P4-06	
SDO_3	ALL	-	-	Output the status of bit03 of P4-06	
SDO_4	ALL	-	-	Output the status of bit04 of P4-06	
SDO_5	ALL	-	-	Output the status of bit05 of P4-06	
SDO_6	ALL	-	-	Output the status of bit06 of P4-06	
SDO_7	ALL	-	-	Output the status of bit07 of P4-06	
SDO_8	ALL	-	-	Output the status of bit08 of P4-06	
SDO_9	ALL	-	-	Output the status of bit09 of P4-06	
SDO_A	ALL	-	-	Output the status of bit10 of P4-06	
SDO_B	ALL	-	-	Output the status of bit11 of P4-06	
SDO_C	ALL	-	-	Output the status of bit12 of P4-06	
SDO_D	ALL	-	-	Output the status of bit13 of P4-06	
SDO_E	ALL	-	-	Output the status of bit14 of P4-06	
SDO_F	ALL	-	-	Output the status of bit15 of P4-06	C5 / C6 / C7 / C8



- 1) For example, if the user selects PR mode, pin 3 and 2 are HOME. If the user selects S mode, pin 3 and 2 are TSPD.
- 2) The unlisted Pin No means the signal is not the preset one. If users want to use it, parameters need to be changed and set as the desired ones. Please refer to Section 3.3.4 for further details.

The explanation of DI signal default setting is as the followings.

DI Signal Name	Operation Mode	Pin No	Function	Wiring Method (Refer to 3.3.3)																																																																								
SON	ALL	9	When DI is ON, the servo circuit will be activated and the motor coil will generate current.	C9 / C10 C11 / C12																																																																								
ARST	ALL	33	When the alarm (ALRM) occurs, this signal is used to reset the servo drive and output the signal, Ready (SRDY) again.																																																																									
GAINUP	ALL	-	It is for switching the controller gain.																																																																									
CCLR	PT, PR	10	It is for clearing the deviation counter.																																																																									
ZCLAMP	ALL	-	When this DI is ON and the motor speed is slower than the setting of P1-38, the motor position will be locked when the signal is triggered.																																																																									
CMDINV	PR, T, S	-	When this DI is ON, the motor will operate in the opposite direction.																																																																									
CTRG	PR, PR-S, PR-T	10	In PR mode, the moment CTRG is ON (rising edge), save the position command selected by POS0 ~ 5 into the controller and then trigger the command.																																																																									
TRQLM	S,Sz	10	ON means the torque limit command is effective.																																																																									
SPDLM	T, Tz	10	ON means the speed limit command is effective.																																																																									
POS0	P, PR-S, PR-T	34	In PR mode, the source of position command:																																																																									
POS1		8	<table border="1"> <thead> <tr> <th>Position command</th> <th>POS5</th> <th>POS4</th> <th>POS3</th> <th>POS2</th> <th>POS1</th> <th>POS0</th> <th>CTRG</th> <th>Corresponded parameter</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>↑</td> <td>P6-00 P6-01</td> </tr> <tr> <td>P2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>↑</td> <td>P6-02 P6-03</td> </tr> <tr> <td>~</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> </tr> <tr> <td>P50</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>↑</td> <td>P6-98 P6-99</td> </tr> <tr> <td>P51</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>↑</td> <td>P7-00 P7-01</td> </tr> <tr> <td>~</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> </tr> <tr> <td>P64</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>↑</td> <td>P7-26 P7-27</td> </tr> </tbody> </table>		Position command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponded parameter	P1	0	0	0	0	0	0	↑	P6-00 P6-01	P2	0	0	0	0	0	1	↑	P6-02 P6-03	~								~	P50	1	1	0	0	1	0	↑	P6-98 P6-99	P51	1	1	0	0	1	1	↑	P7-00 P7-01	~								~	P64	1	1	1	1	1	1	↑	P7-26 P7-27
Position command		POS5	POS4		POS3	POS2	POS1	POS0	CTRG	Corresponded parameter																																																																		
P1		0	0		0	0	0	0	↑	P6-00 P6-01																																																																		
P2		0	0		0	0	0	1	↑	P6-02 P6-03																																																																		
~										~																																																																		
P50		1	1	0	0	1	0	↑	P6-98 P6-99																																																																			
P51		1	1	0	0	1	1	↑	P7-00 P7-01																																																																			
~								~																																																																				
P64	1	1	1	1	1	1	↑	P7-26 P7-27																																																																				
POS2	-																																																																											
POS3	-																																																																											
POS4	-																																																																											
POS5	-																																																																											
STOP	-	-	Stop																																																																									
SPD0	S, Sz, PT-S, PR-S, S-T	34	The source of selecting speed command:																																																																									
SPD1		8	<table border="1"> <thead> <tr> <th>SPD1</th> <th>SPD0</th> <th>Command Source</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>S mode is analog input while Sz mode is 0.</td> </tr> <tr> <td>0</td> <td>1</td> <td>P1-09</td> </tr> <tr> <td>1</td> <td>0</td> <td>P1-10</td> </tr> <tr> <td>1</td> <td>1</td> <td>P1-11</td> </tr> </tbody> </table>	SPD1	SPD0	Command Source	0	0	S mode is analog input while Sz mode is 0.	0	1	P1-09	1	0	P1-10	1	1	P1-11																																																										
		SPD1	SPD0	Command Source																																																																								
		0	0	S mode is analog input while Sz mode is 0.																																																																								
0	1	P1-09																																																																										
1	0	P1-10																																																																										
1	1	P1-11																																																																										

DI Signal Name	Operation Mode	Pin No	Function	Wiring Method (Refer to 3.3.3)															
TCM0	PT, T, Tz, PT-T	34	The source of selecting torque command: <table border="1"> <thead> <tr> <th>TCM1</th> <th>TCM0</th> <th>Command Source</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>T mode is analog input while Tz mode is 0.</td> </tr> <tr> <td>0</td> <td>1</td> <td>P1-12</td> </tr> <tr> <td>1</td> <td>0</td> <td>P1-13</td> </tr> <tr> <td>1</td> <td>1</td> <td>P1-14</td> </tr> </tbody> </table>	TCM1	TCM0	Command Source	0	0	T mode is analog input while Tz mode is 0.	0	1	P1-12	1	0	P1-13	1	1	P1-14	C9 / C10 C11 / C12
TCM1	TCM0	Command Source																	
0	0	T mode is analog input while Tz mode is 0.																	
0	1	P1-12																	
1	0	P1-13																	
1	1	P1-14																	
TCM1	PR-T, S-T	8																	
S-P	PT-S, PR-S	31	Mode switching. OFF: Speed; ON: Position																
S-T	S-T	31	Mode switching. OFF: Speed; ON: Torque																
T-P	PT-T, PR-T	31	Mode switching. OFF: Torque; ON: Position																
PT-PR	PT, PR	-	When selecting PT-PR mode or the multi-mode, PT-PR-S, users can select the source via this DI. When this DI is OFF, it is in PT mode. When this DI is ON, it is in PR mode.																
PTAS	-	-	In position PT mode, when the DI is OFF, the external command source is external pulse. When the signal is ON, then the source is external analog voltage.																
PTCMS	-	-	In position PT mode, when the DI is OFF, the source of external command pulse is low-speed pulse (PULSE, / PULSE, SIGN, / SIGN Pin). When the DI is ON, the source will be high-speed pulse. This function can go with handwheel. This DI can be used to switch the source of command pulse.																
EMGS	ALL	30	It is contact <b>B</b> and has to be ON frequently; otherwise the alarm (ALRM) will occur.																
NL (CWL)	PT, PR, S, T, Sz, Tz	32	Reverse inhibit limit (contact <b>B</b> ) and has to be ON frequently; or the alarm (ALRM) will occur.																
PL (CCWL)	PT, PR, S, T, Sz, Tz	31	Forward inhibit limit (contact <b>B</b> ) and has to be ON frequently; or the alarm (ALRM) will occur.																
ORGP	PR	-	When DI is ON, the drive will start homing.																
SHOM	PR	-	In PR mode, it needs to search the origin. When this DI is ON, the origin searching function is activated. (Please refer to the setting of parameter P1-47.)																
CAM	PR	-	E-cam engaging control (please refer to the setting of value U and Z of P5-88.)																
JOGU	ALL	-	When this DI is ON, the motor JOG operates in forward direction.																

DI Signal Name	Operation Mode	Pin No	Function	Wiring Method (Refer to 3.3.3)
JOGD	ALL	-	When this DI is ON, the motor JOG operates in reverse direction.	
EV1	PR	-	Event trigger PR command	
EV2	PR	-	Event trigger PR command	
GNUM0	PT, PR, PT-S, PR-S	-	Electronic gear ratio (numerator) selection 0 (Please refer to P2-60 ~ P2-62 for gear ratio selection (numerator).)	C9 / C10 C11 / C12
GNUM1	PT, PR, PT-S, PR-S	-	Electronic gear ratio (numerator) selection 1 (Please refer to P2-60 ~ P2-62 for gear ratio selection (numerator).)	
INHP	PT, PT-S	-	In position mode, when this DI is ON, the external pulse input command is not working.	

The default setting of DI and DO in each operation mode is shown as the followings. Please note that the following table neither detail the information as the previous one nor show the Pin number of each signal. However, each operation mode is separated in different columns in order to avoid the confusion.

**Table 3.1 Default Value of DI Input Function**

Symbol	DI Code	Input Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
SON	0x01	Servo on	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1
ARST	0x02	Alarm reset	DI5	DI5	DI5	DI5	DI5	DI5					
GAINUP	0x03	Gain switch											
CCLR	0x04	Pulse clear	DI2						DI2	DI2			
ZCLAMP	0x05	Zero speed clamp											
CMDINV	0x06	The input command will be in reverse direction.											
Reserved	0x07	Reserved											
CTRG	0x08	Internal position command triggered		DI2							DI2	DI2	
TRQLM	0x09	Torque limit			DI2		DI2						
SPDLM	0x10	Speed limit				DI2		DI2					
POS0	0x11	Internal position command selection 0		DI3							DI3	DI3	
POS1	0x12	Internal position command selection 1		DI4									
POS2	0x13	Internal position command selection 2											
POS3	0x1A	Internal position command selection 3											
POS4	0x1B	Internal position command selection 4											
POS5	0x1C	Internal position command selection 5											

Symbol	DI Code	Input Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
STOP	0x46	Motor stops											
SPD0	0x14	Speed command selection 0			DI3		DI3		DI3		DI4		DI3
SPD1	0x15	Speed command selection 1			DI4		DI4		DI4				
TCM0	0x16	Torque command selection 0	DI3			DI3		DI3		DI3		DI4	DI4
TCM1	0x17	Torque command selection 1	DI4			DI4		DI4		DI4			
S-P	0x18	Mode switch between speed and position command							DI5		DI5		
S-T	0x19	Mode switch between speed and torque command											DI5
T-P	0x20	Mode switch between torque and position command								DI5		DI5	
PT-PR	0x2B	Switch between PT and PR command											
PTAS	0x2C	In PT mode, the switch between command pulse and analog											
PTCMS	0x2D	In PT mode, the switch between low-speed and high-speed command											
EMGS	0x21	Emergency stop	DI6	DI6	DI6	DI6	DI6	DI6	DI6	DI6	DI6	DI6	DI6
NL(CWL)	0x22	Reverse inhibit limit											
PL(CCWL)	0x23	Forward inhibit limit											



Symbol	DI Code	Input Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
ORGP	0x24	Original point of homing											
SHOM	0x27	Homing is activated											
CAM	0x36	E-Cam engaged											
JOGU	0x37	Forward JOG input											
JOGD	0x38	Reverse JOG input											
EV1	0x39	Event trigger PR command #1 (refer to the setting of P5-98, P5-99)											
EV2	0x3A	Event trigger PR command #2 (refer to the setting of P5-98, P5-99)											
EV3	0x3B	Event trigger PR command #3 firmware V1.008 sub04 will be provided afterwards)											
EV4	0x3C	Event trigger PR command #4 (firmware V1.008 sub04 will be provided afterwards)											
GNUM0	0x43	Electronic gear ratio (numerator) selection 0											
GNUM1	0x44	Electronic gear ratio (numerator) selection 1											
INHP	0x45	Pulse input inhibit											

**NOTE**

Please refer to Section 3.3.1 for corresponding pin from DI1 ~ 6.

**Table 3.2 Default Value of DO Output Function**

Symbol	DO Code	Output Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
SRDY	0x01	Servo is ready.	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
SON	0x02	Servo is on.											
ZSPD	0x03	Zero-speed reached	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
TSPD	0x04	Reach the target speed											
TPOS	0x05	Reach the target position											
TQL	0x06	Torque limit											
ALRM	0x07	Servo alarm	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3
BRKR	0x08	Mechanical brake											
HOME	0x09	Homing complete											
OLW	0x10	Early warning for overload											
WARN	0x11	Servo warning											
OVF	0x12	Position command overflows											
SNL(SCWL)	0x13	Reverse software limit											
SPL(SCCWL)	0x14	Forward software limit											
Cmd_OK	0x15	Internal position command is completed											
CAP_OK	0x16	Capture procedure is completed											

Symbol	DO Code	Output Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
MC_OK	0x17	Servo procedure is completed											
CAM_AREA	0x18	Master position area of E-CAM											
SP_OK	0x19	Target speed reached											
SDO_0	0x30	Output the status of bit00 of P4-06											
SDO_1	0x31	Output the status of bit01 of P4-06											
SDO_2	0x32	Output the status of bit02 of P4-06											
SDO_3	0x33	Output the status of bit03 of P4-06											
SDO_4	0x34	Output the status of bit04 of P4-06											
SDO_5	0x35	Output the status of bit05 of P4-06											
SDO_6	0x36	Output the status of bit06 of P4-06											
SDO_7	0x37	Output the status of bit07 of P4-06											
SDO_8	0x38	Output the status of bit08 of P4-06											
SDO_9	0x39	Output the status of bit09 of P4-06											

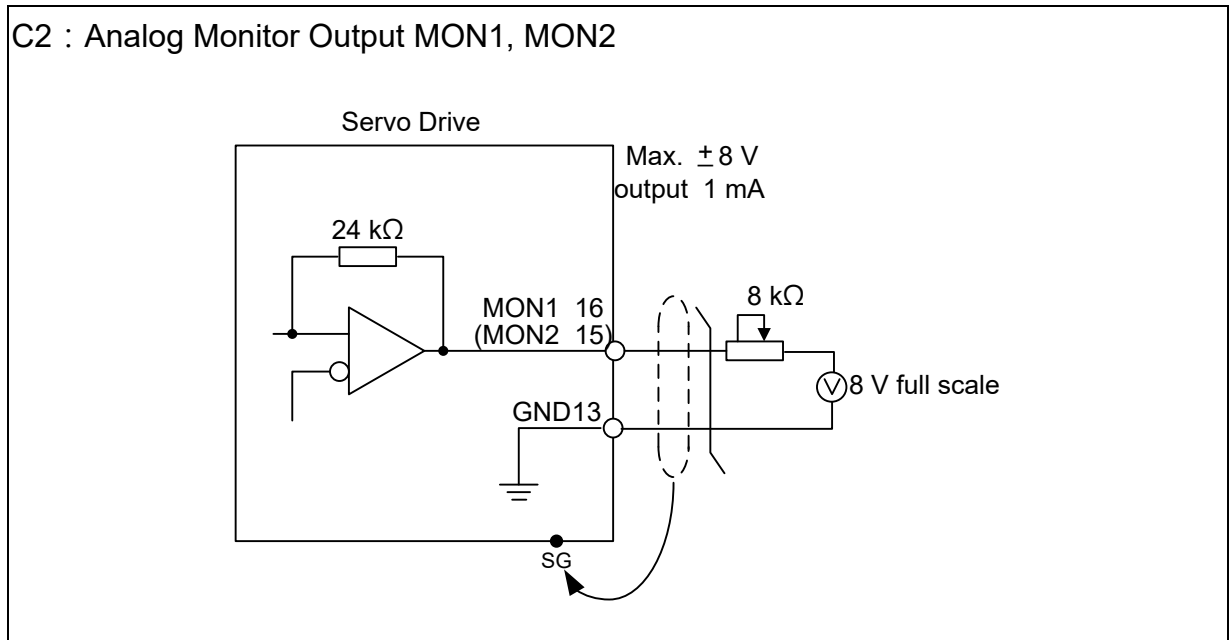
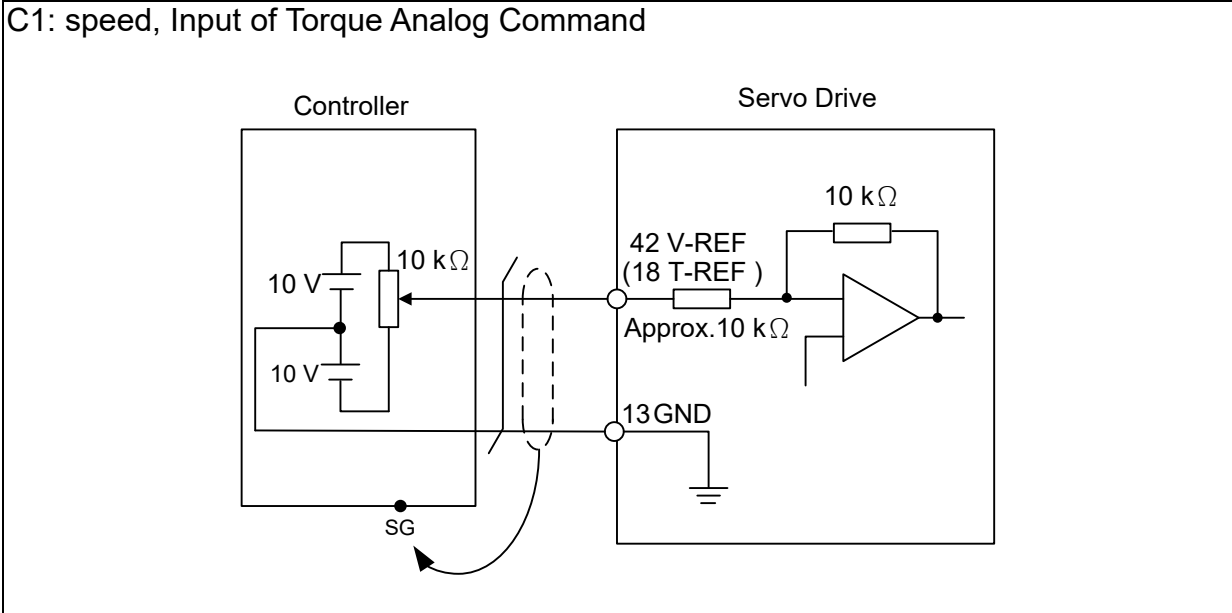
Symbol	DO Code	Output Function	PT	PR	S	T	Sz	Tz	PT S	PT T	PR S	PR T	S T
SDO_A	0x3A	Output the status of bit10 of P4-06											
SDO_B	0x3B	Output the status of bit11 of P4-06											
SDO_C	0x3C	Output the status of bit12 of P4-06											
SDO_D	0x3D	Output the status of bit13 of P4-06											
SDO_E	0x3E	Output the status of bit14 of P4-06											
SDO_F	0x3F	Output the status of bit15 of P4-06											

**NOTE**

Please refer to Section 3.3.1 for corresponding pin from DO1 to 3.

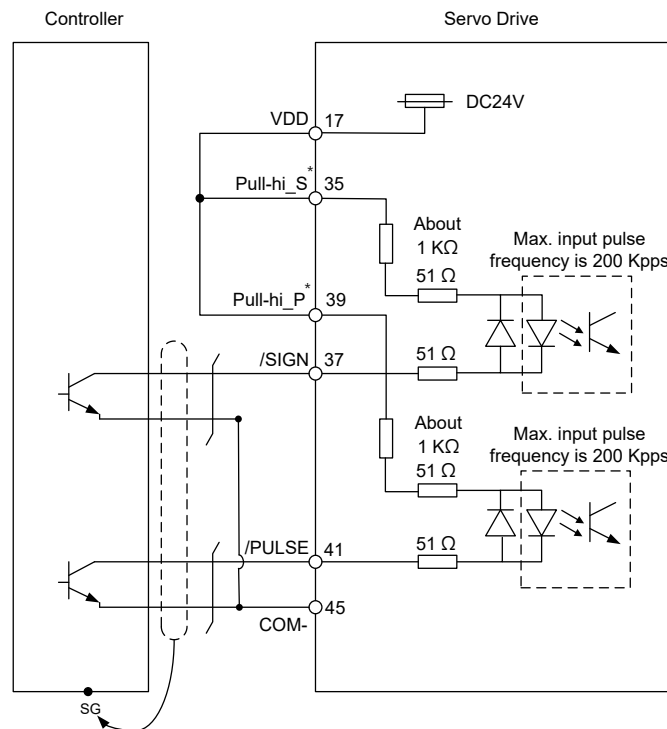
### 3.3.3 Wiring Diagram (CN1)

The valid voltage of speed analog command and torque analog command is between -10 V and +10 V. The command value can be set via relevant parameters. The input impedance is 10 K $\Omega$ .

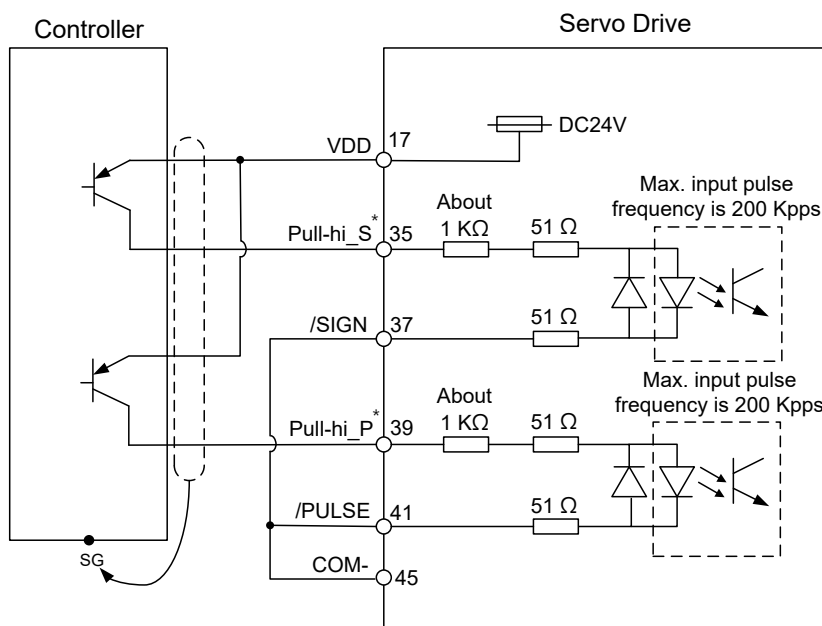


Pulse command can be input by the way of open-collector or Line driver. The maximum input pulse of Line driver is 500 kpps and 200 kpps for open-collector.

C3-1: The source of pulse input is open-collector NPN equipment which applies the internal power of the servo drive.



C3-1: The source of pulse input is open-collector PNP equipment which applies the internal power of the servo drive.

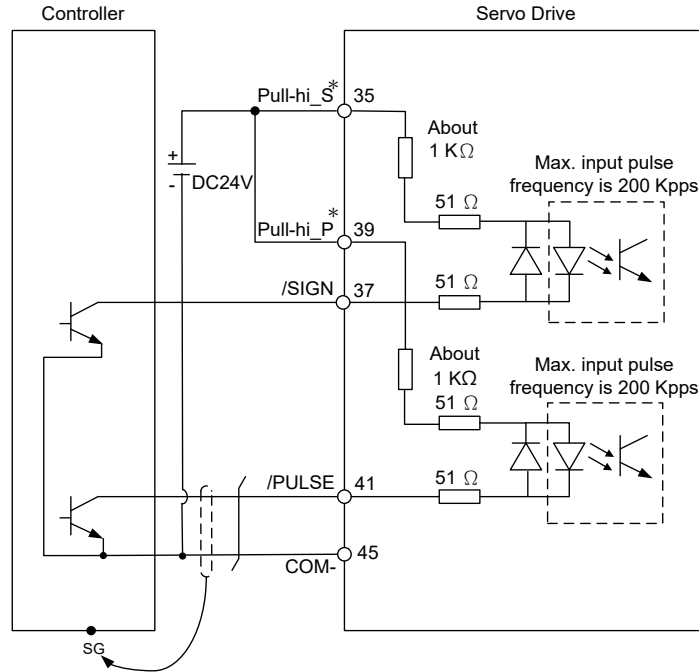


The wiring method of Pull-hi\_S and Pull-hi\_P is different from ASDA-A2 series. The aim is for connecting to PNP.



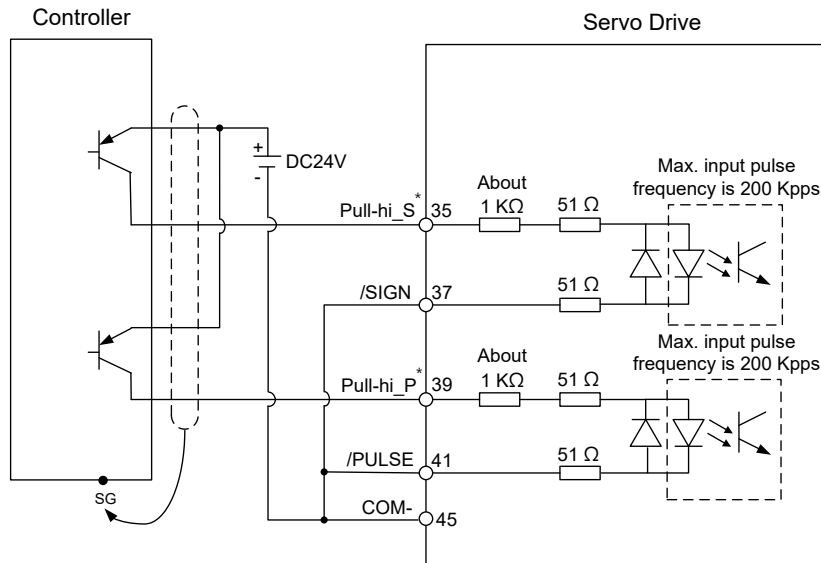
➤ **Caution: Do not apply to dual power or it may damage the servo drive.**

C3-2: The source of pulse input is open-collector NPN equipment and applies the external power.



➤ **Caution: Do not apply to dual power or it may damage the servo drive.**

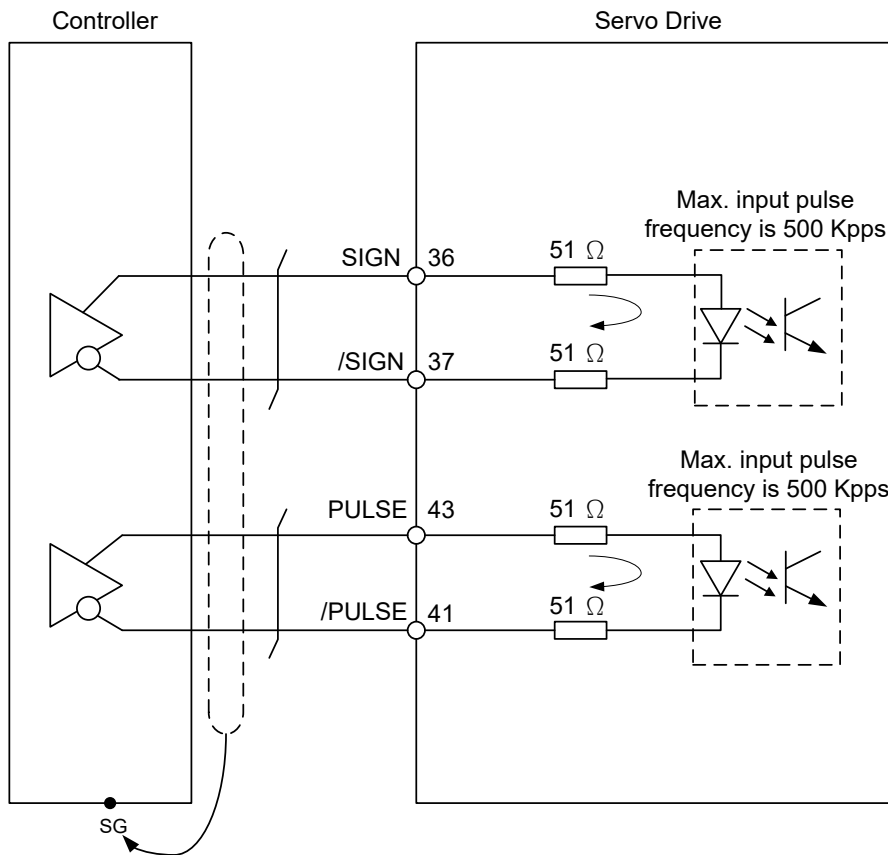
C3-2: The source of pulse input is open-collector PNP equipment and applies the external power.



**NOTE**

The wiring method of Pull-hi\_S and Pull-hi\_P is different from ASDA-A2 series. The aim is for connecting to PNP.

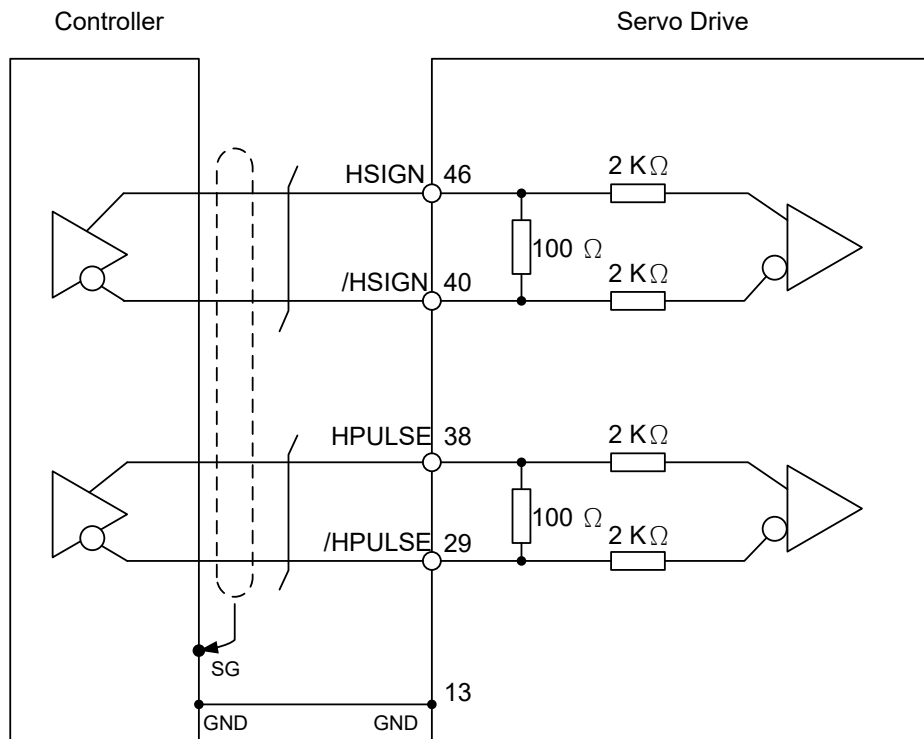
C4-1: Pulse input (Line driver) can only apply to 5 V power. Do not apply to 24 V power.



➤ ***This opto-isolator is one-way input, please be ensured the direction of current of pulse input is correct.***



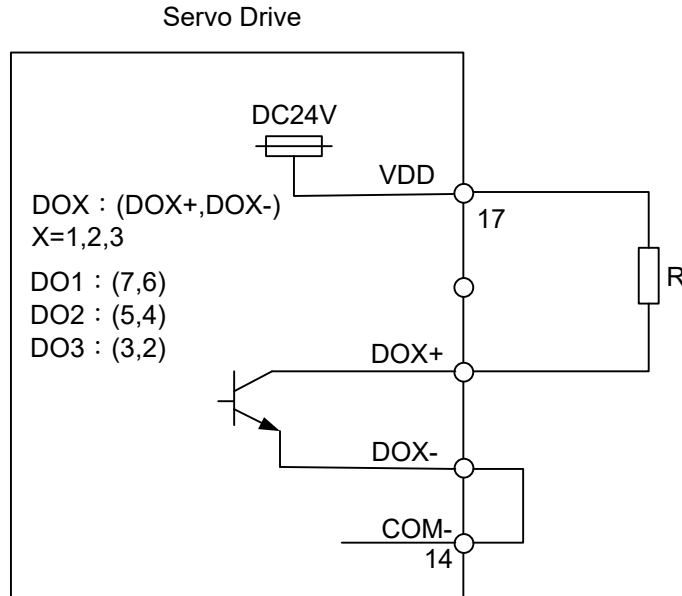
C4-2: High-speed pulse input (Line driver) can only apply to 5 V power. Do not apply to 24 V power.



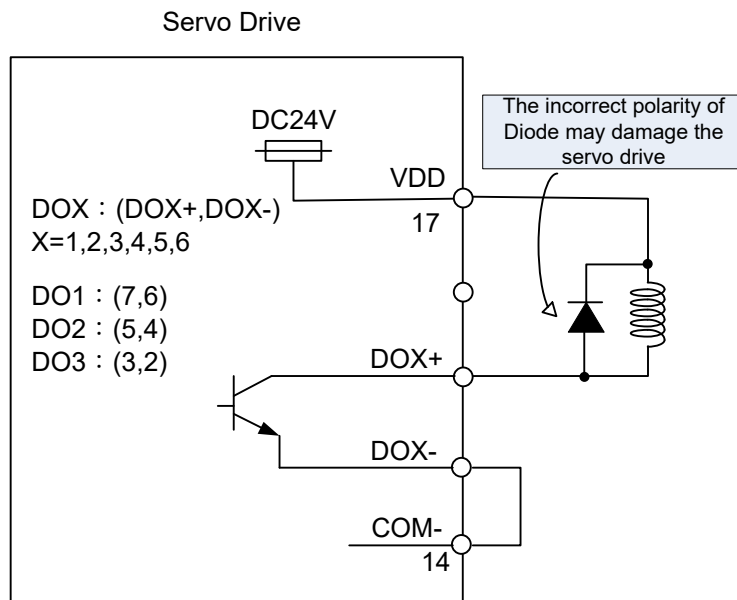
- ***The high-speed pulse input interface of the servo drive is not the isolated interface. In order to reduce the interference of the noise, it is suggested that the terminal ground of the controller and the servo drive should be connected to each other.***

When the drive connects to inductive load, the diode has to be installed. (The permissible current is under 40 mA. The surge current is under 100 mA.)

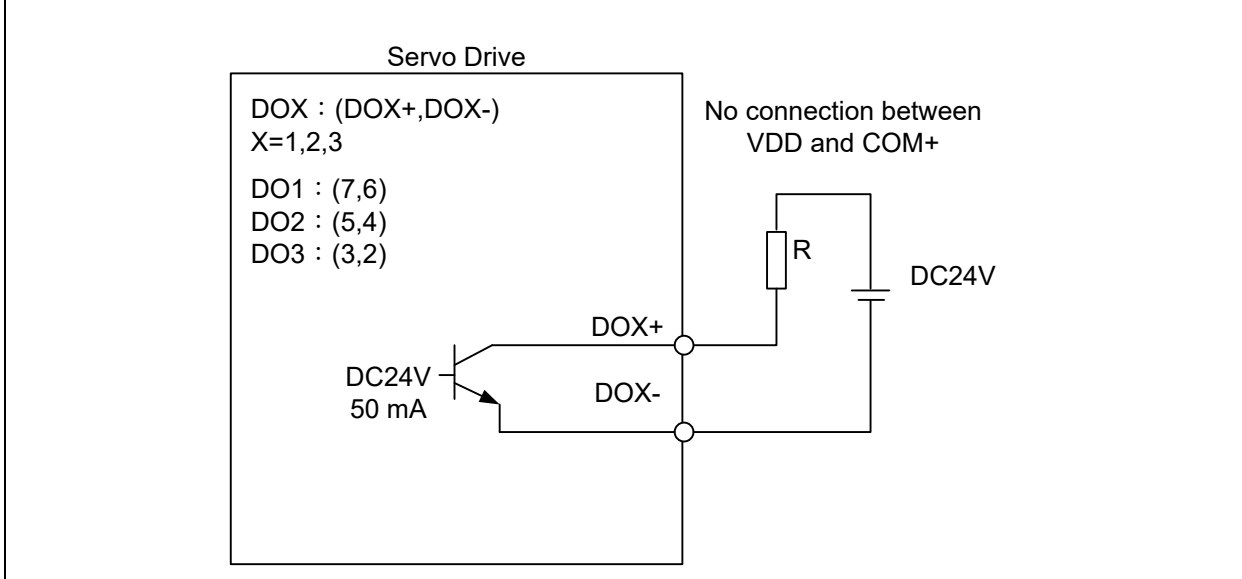
C5: Wiring of DO signal. The servo drive applies to the internal power and the resistor is general load.



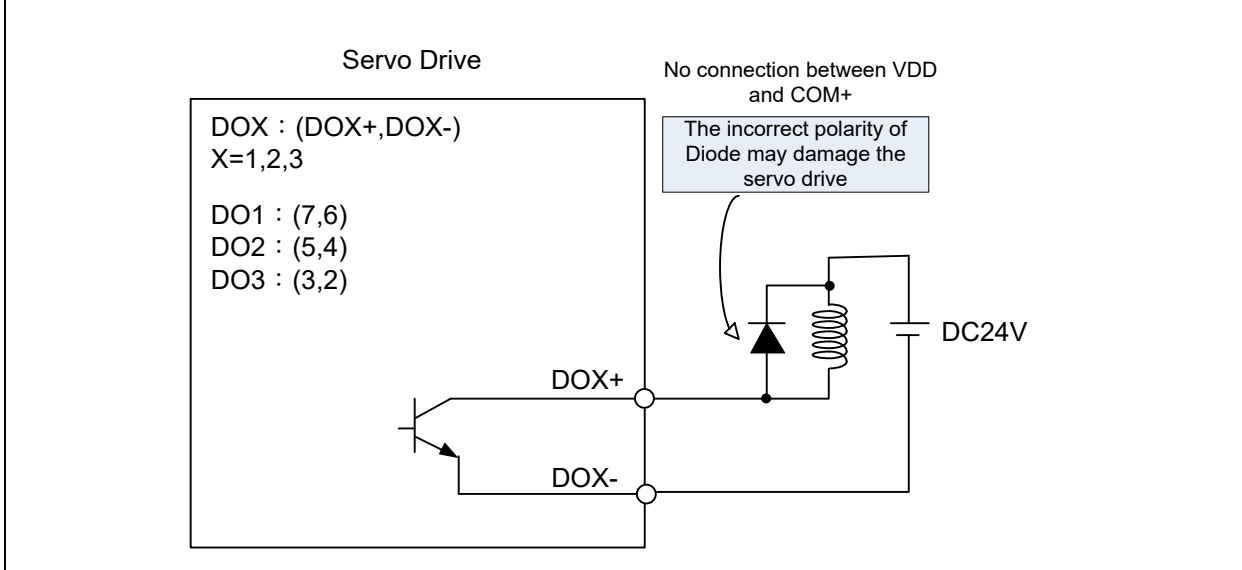
C6: Wiring of DO signal. The servo drive applies to the internal power and the resistor is inductive load.



C7: Wiring of DO signal. The servo drive applies to the external power and the resistor is general load.



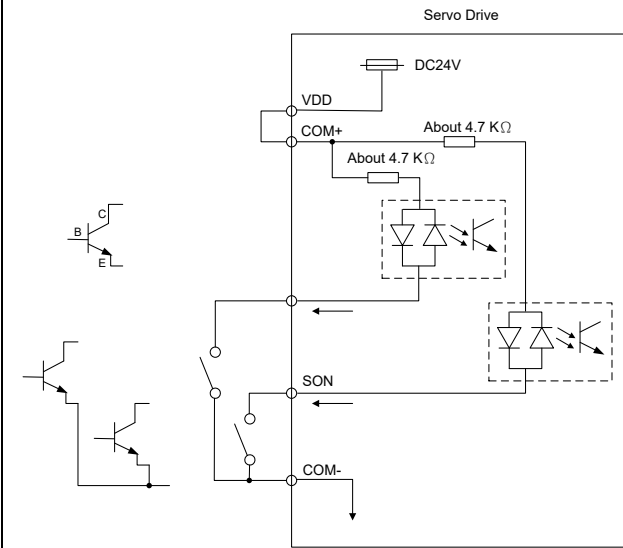
C8: Wiring of DO signal. The servo drive applies to the external power and the resistor is inductive load.



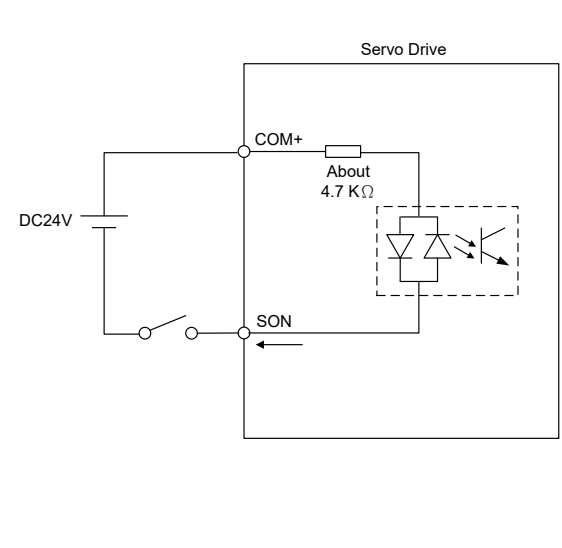
Input signal via relay or open-collector transistor

**NPN** transistor, common emitter (E) mode (**SINK** mode)

C9: The wiring of DI. The servo drive applies to the internal power.

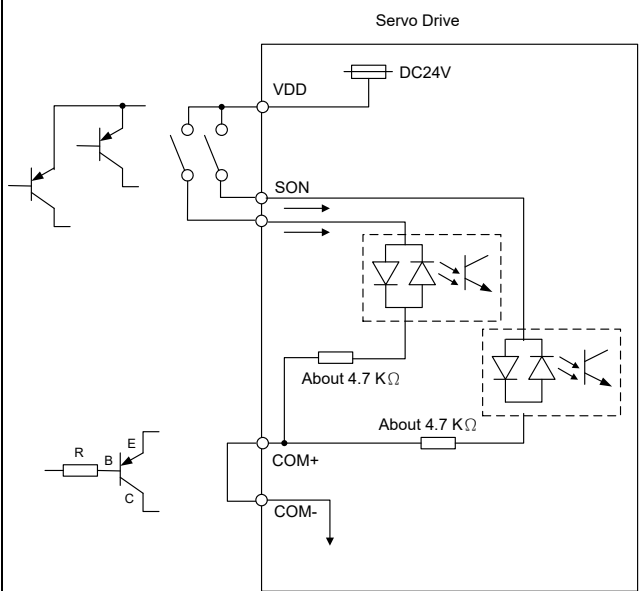


C10: The wiring of DI. The servo drive applies to the external power.

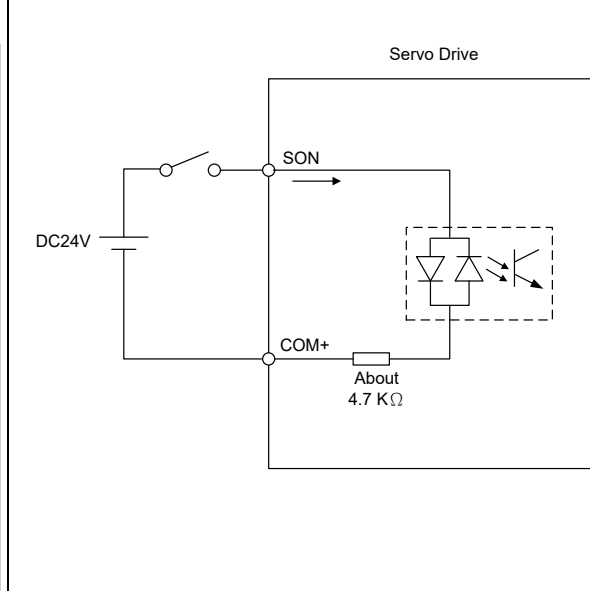


**PNP** transistor, common emitter (E) mode (**SOURCE** mode)

C11: The wiring of DI. The servo drive applies to the internal power.

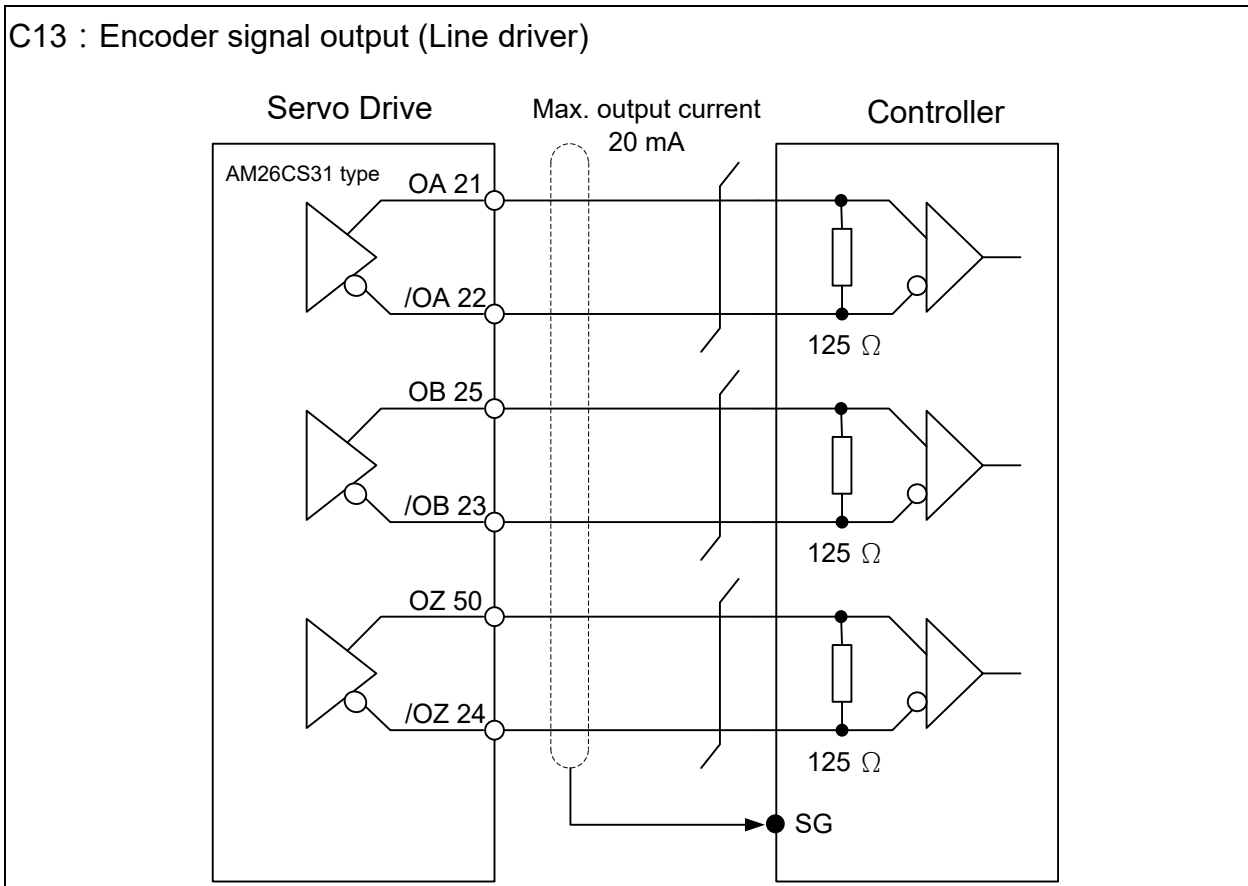


C12: The wiring of DI. The servo drive applies to the external power.

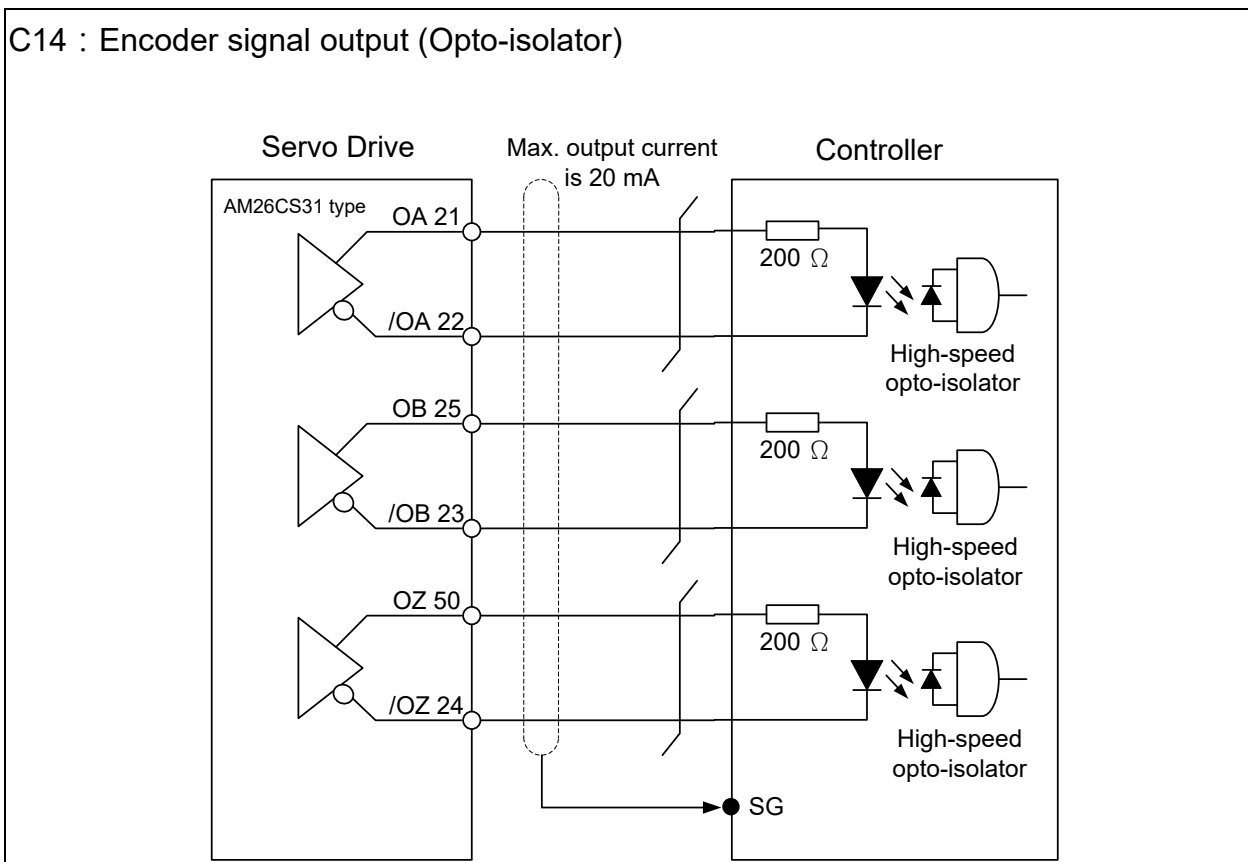


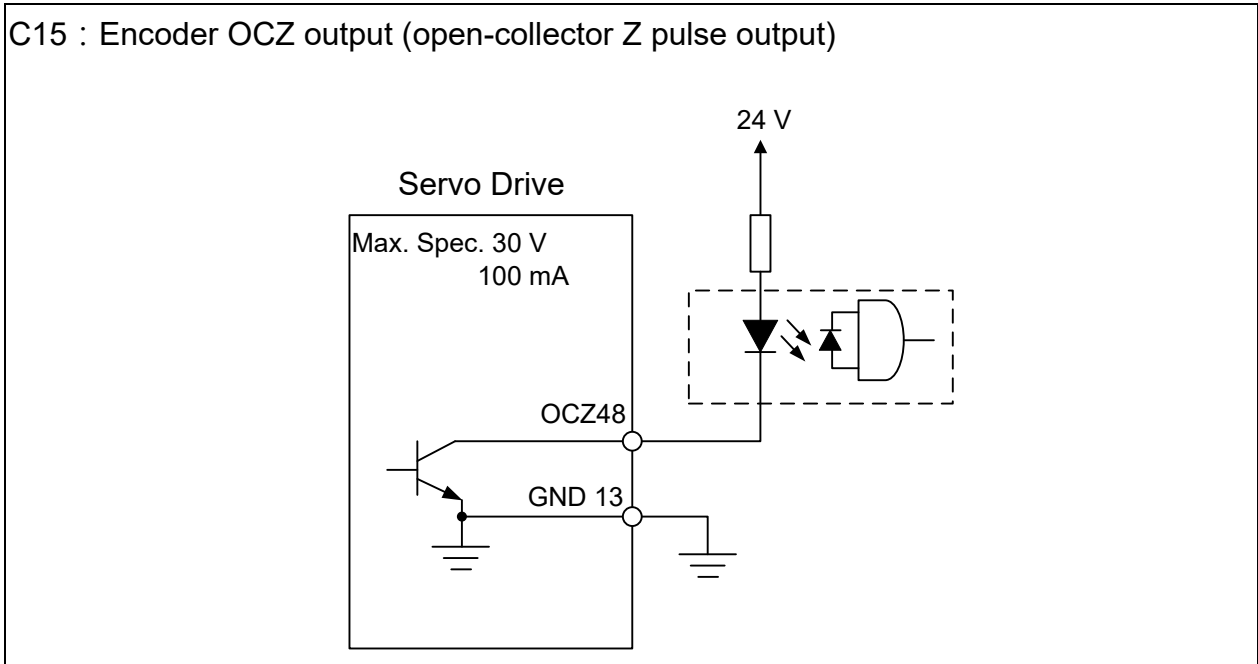
 **Caution: Do not apply to dual power or it may damage the servo drive.**

C13 : Encoder signal output (Line driver)



C14 : Encoder signal output (Opto-isolator)





### 3.3.4 The DI and DO Signal Specified by the User

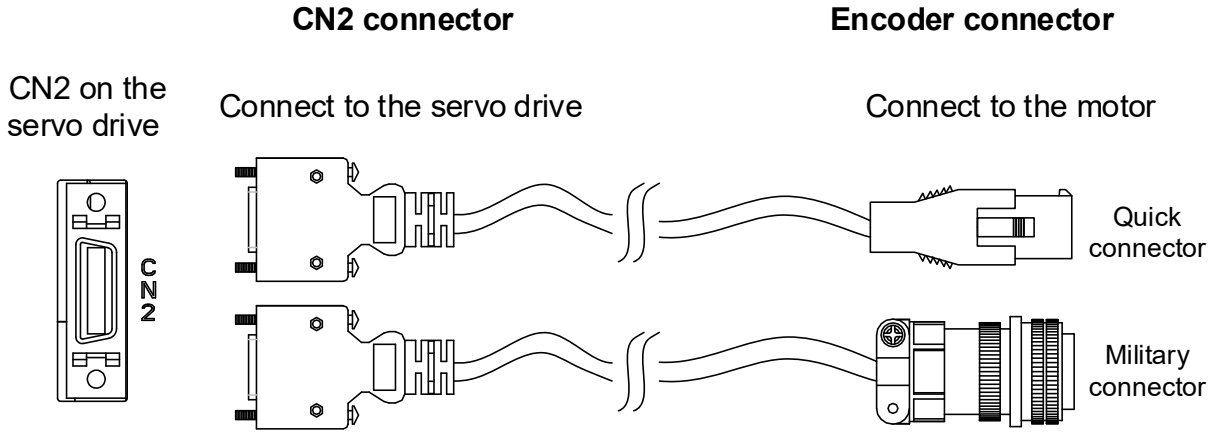
If the default setting of DI/DO signal cannot satisfy the need, self-set the DI/DO signal will do and easy. The signal function of DI1 ~ 6 and DO1 ~ 3 is determined by parameter P2-10 ~ P2-15 and parameter P2-18 ~ P2-20 respectively. Please refer to Chapter 7.2, which shown as the following table. Enter DI or DO code in the corresponding parameter to setup DI/DO.

Signal Name	Pin No	Corresponding Parameter
Standard DI	DI1- CN1-9	P2-10
	DI2- CN1-10	P2-11
	DI3- CN1-34	P2-12
	DI4- CN1-8	P2-13
	DI5- CN1-33	P2-14
	DI6- CN1-32	P2-15

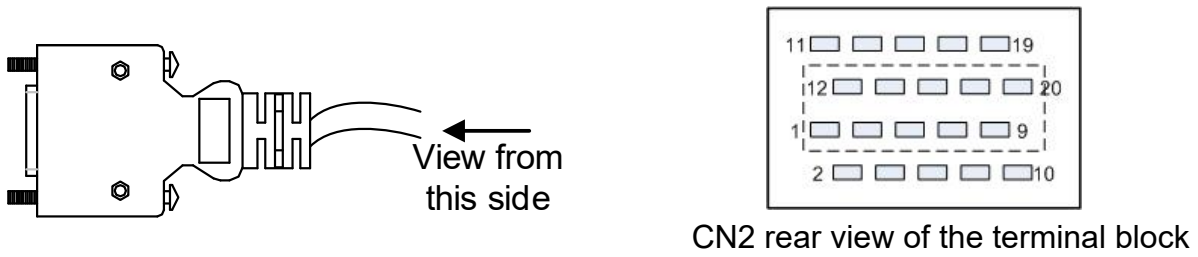
Signal Name	Pin No	Corresponding Parameter
Standard DO	DO1+ CN1-7	P2-18
	DO1- CN1-6	
	DO2+ CN1-5	P2-19
	DO2- CN1-4	
	DO3+ CN1-3	P2-20
	DO3- CN1-2	

### 3.4 CN2 Connector

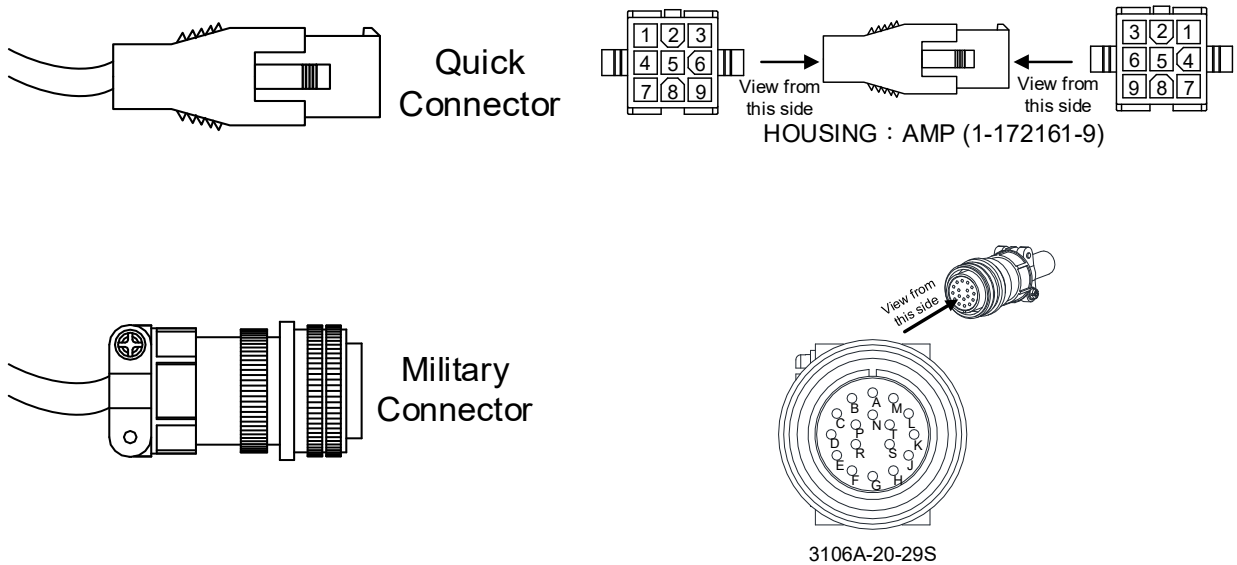
CN2 encoder connector can be connected in two ways:



(A) CN2 Connector:



(B) Encoder Connector



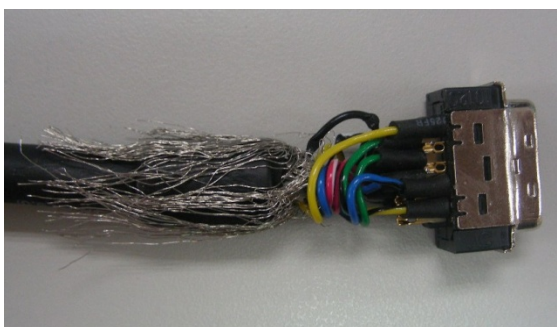
The definition of each signal is as follows:

Drive Connector			Encoder Connector		
Pin No	Terminal Symbol	Function and Description	Military connector	Quick connector	Color
5	T+	Serial communication signal input / output (+)	A	1	Blue
4	T-	Serial communication signal input / output (-)	B	4	Blue & Black
-	-	Reserved	-	-	-
-	-	Reserved	-	-	-
14,16	+5 V	Power +5 V	S	7	Red / Red & white
13,15	GND	Power ground	R	8	Black / Black & white
Shell	Shielding	Shielding	L	9	-

The shielding procedures of CN2 encoder connector are as the followings:

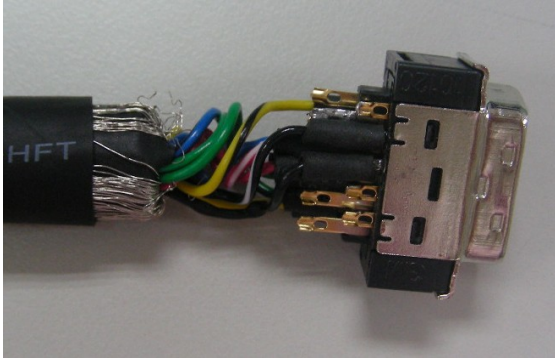


- (1) Cut through the cable and expose the core wire which covers the metal core wires with shielding. The length of the reserved core wire should be 20 ~ 30 mm. Then, cover a 45 mm long heat shrink tube on the cable.

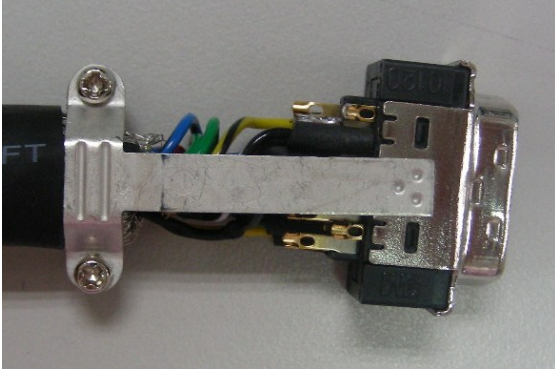


- (2) Spread the metal core wires with shielding and turn it upside down in downward direction. Ensure to follow the pin definition from the above table to connect the pins one by one.

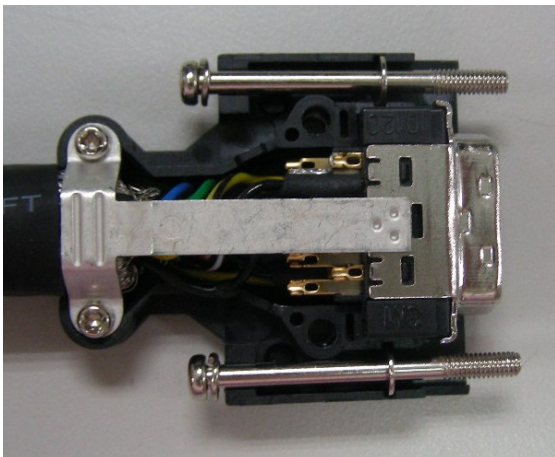




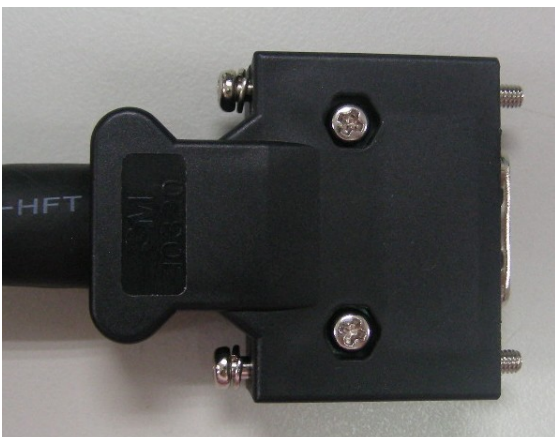
(3) Leave a length of 5 ~ 10 mm metal core wires with shielding outside the cable. The length is about the width of the metal saddle. The other unexposed wires of the cable should be protected by the heat shrink tube for good ground contact.



(4) Install a metal saddle to fix the exposed metal core wires. The metal saddle must completely cover all the exposed metal core wires. The extended sheet metal should be connected to the metal part of the connector.



(5) Install the connector into the plastic case as shown in the figure.

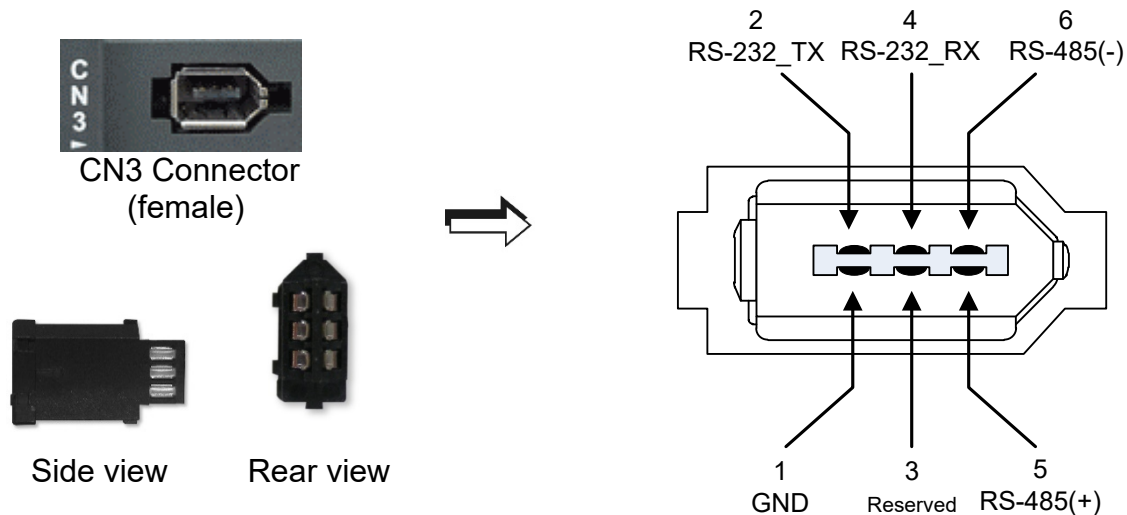


(6) Tighten the screws to complete a shielded CN2 connector.

### 3.5 Wiring of CN3 Connector

#### 3.5.1 Layout of CN3 Connector

The servo drive connects to the personal computer via communication connector. The user can operate the servo drive via MODBUS, PLC or HMI. There are two common communication interfaces, RS-232 and RS-485. Both can be set via parameter P3-05. Among them, RS-232 is more common. Its communication distance is about 15 meter. If the user selects RS-485, its transmission distance is longer and supports more than one servo drives for connection.



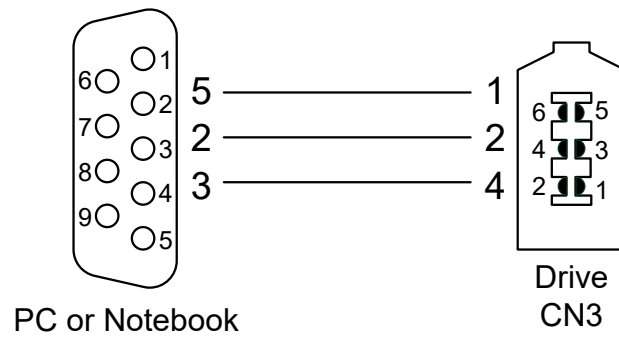
Pin No	Signal Name	Terminal Symbol	Function and Description
1	Signal grounding	GND	+5 V connects to the signal terminal
2	RS-232 data transmission	RS-232_TX	The drive transmits the data The connector connects to RS-232_RX of PC
3	-	-	Reserved
4	RS-232 data receiving	RS-232_RX	The drive receives the data The connector connects to RS-232_TX of PC
5	RS-485 data transmission	RS-485(+)	The drive transmits the date to differential terminal (+)
6	RS-485 data transmission	RS-485(-)	The drive transmits the date to differential terminal (-)



**NOTE**

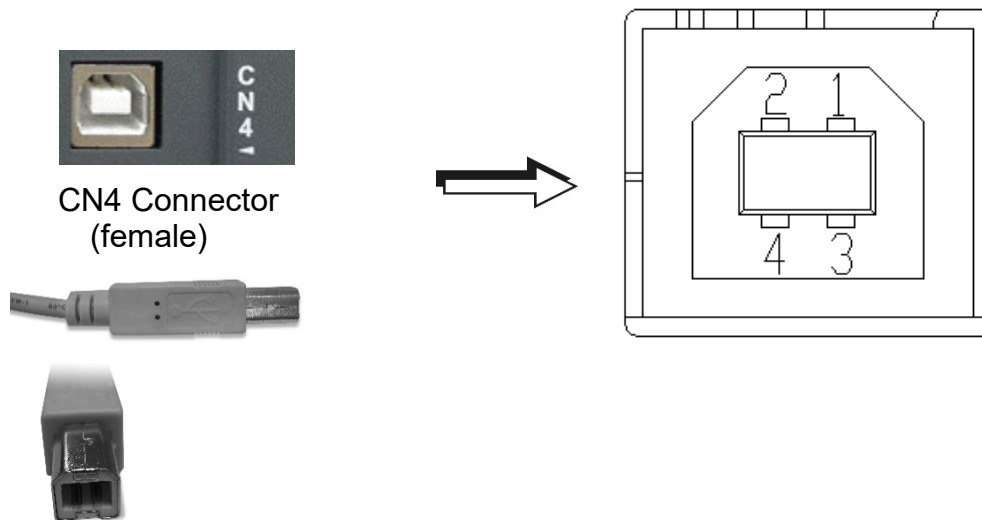
- 1) Please refer to Chapter 9, page 2 for the wiring of RS-485.
- 2) Two kinds of communication wire of IEEE1394 are commercially available. One of the internal ground terminals (Pin 1) will short circuit with the shielding and will damage the drive. Do not connect GND to the shielding.

### 3.5.2 Connection between CN3 Connector and Personal Computer



### 3.6 CN4 Serial Connector (USB)

CN4 is a serial connector which used to connect PC software and enhance the efficiency. The transmission speed of USB can up to 1 MB, that is to say PC Data Scope can obtain the correct data in time.



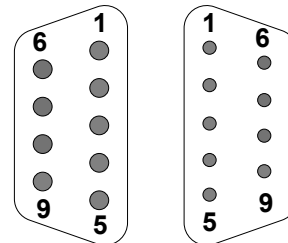
Pin No	Signal Name	Function and Description
1	V bus	DC +5 V (external power supply)
2	D-	Data-
3	D+	Data+
4	GND	Ground

### 3.7 CN5 Connector (Full-closed Loop)

Connect to the external linear scale or encoder (A, B, Z) and form a full-closed loop with the servo. In position mode, the pulse position command issued by the controller is based on the control loop of the external linear scale. Please refer to Chapter 6.



CN5 Connector (female)



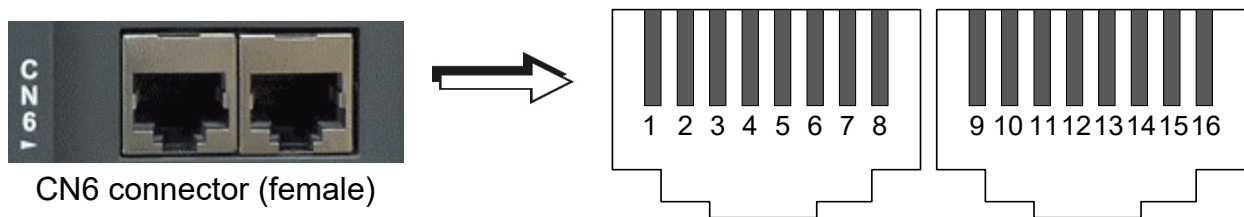
Front View Rear View  
Wring Terminal Connector (male)

Pin No	Signal Name	Terminal Symbol	Function and Description
1	/Z phase input	Opt_/Z	Linear scale /Z phase output
2	/B phase input	Opt_/B	Linear scale /B phase output
3	B phase input	Opt_B	Linear scale B phase output
4	A phase input	Opt_A	Linear scale A phase output
5	/A phase input	Opt_/A	Linear scale /A phase output
6	Encoder grounding	GND	Ground
7	Encoder grounding	GND	Ground
8	Encoder power	+5 V	Linear scale +5 V power
9	Z phase input	Opt_Z	Linear scale Z phase output

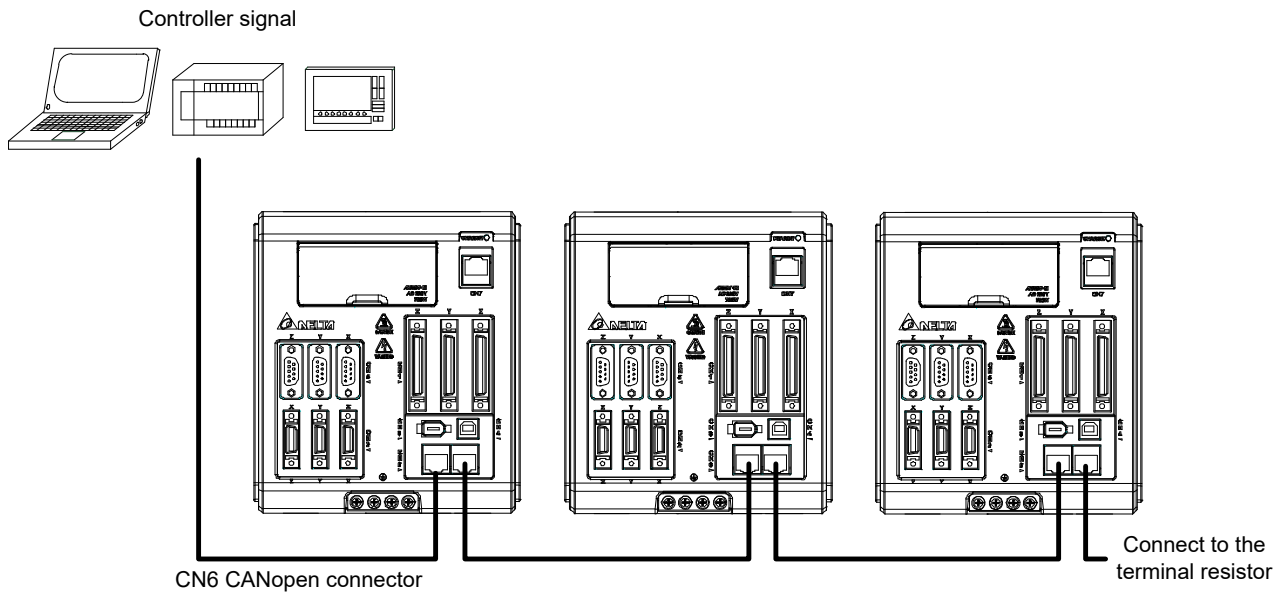
### 3.8 CN6 Connector (CANopen)

Based on the standard of CANopen DS301 and DS402, CN6 uses the standard CAN interface to implement position, torque and speed mode. It also can read or monitor the drive status.

The station number of CANopen is the same as RS-232 / RS-485. All are set via parameter P3-00 and the transmission rate can up to 1 Mbps. It provides two sets of communication connectors, one is for receiving and another one is for transmission, in order to connect more than one drives. The last servo drive connects to termination resistor.

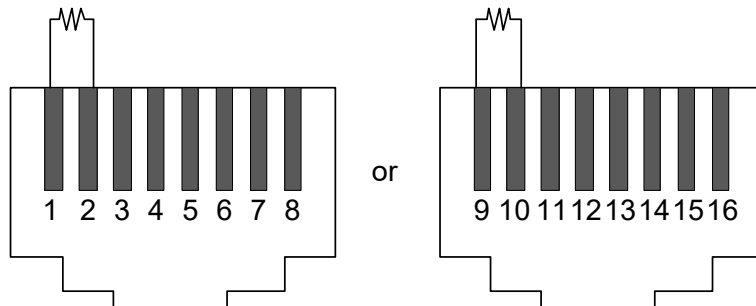


Pin No	Signal Name	Function and Description
1, 9	CAN_H	CAN_H bus line (dominant high)
2, 10	CAN_L	CAN_H bus line (dominant low)
3, 11	CAN_GND	Ground / 0 V / V -
4, 12	-	Reserved
5, 13	-	Reserved
6, 14	-	Reserved
7, 15	CAN_GND	Ground / 0 V / V -
8, 16	-	Reserved



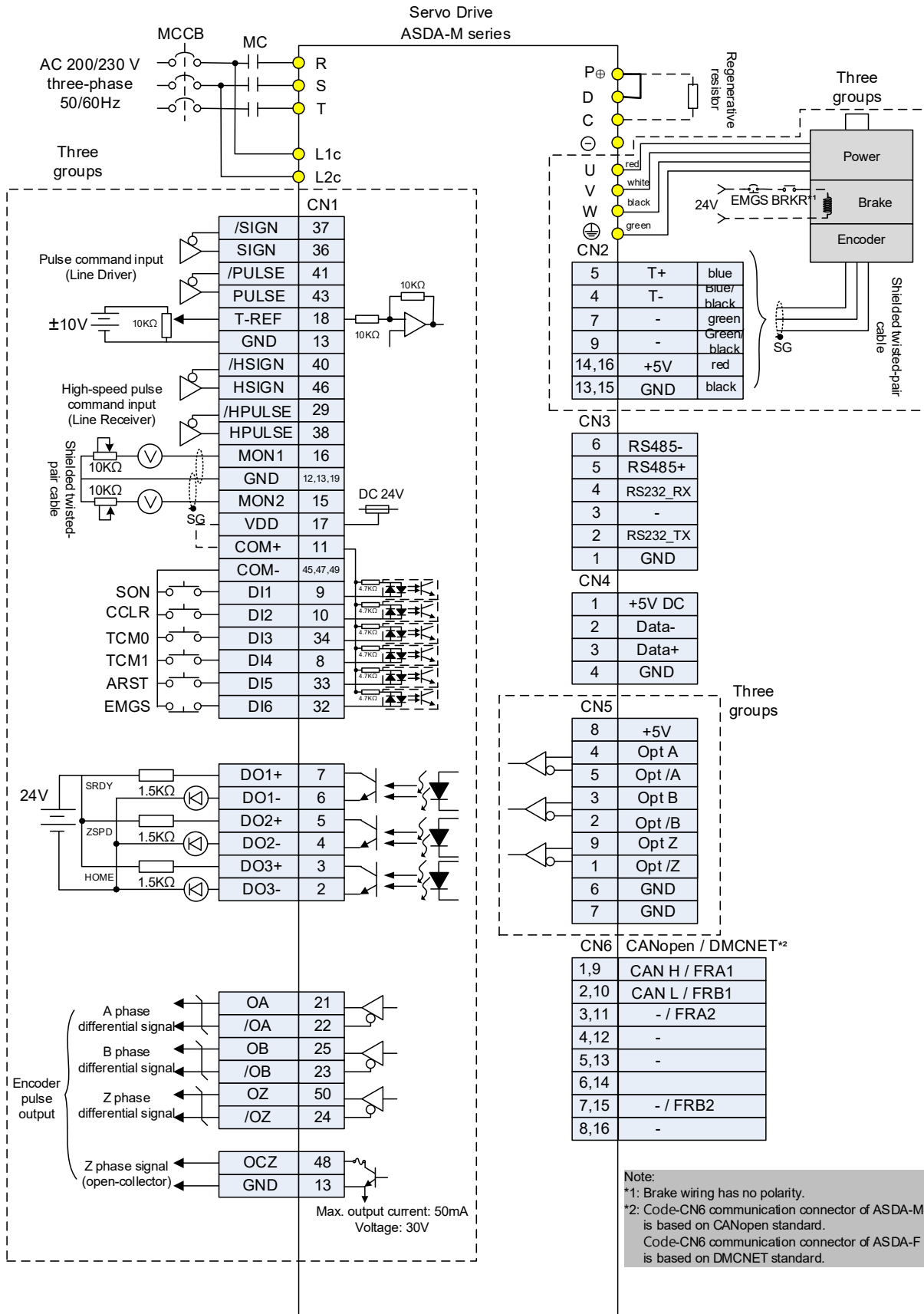
**NOTE**

- 1) The termination resistor is suggested to use 120 Ω (Ohm) 0.25W or above.
- 2) The wiring method of concatenate more than one drives is based on two terminals of CANopen. One is for receiving and another one is for transmission. And the servo drive connects to the termination resistor. The wiring diagram of the termination resistor is shown as the followings:

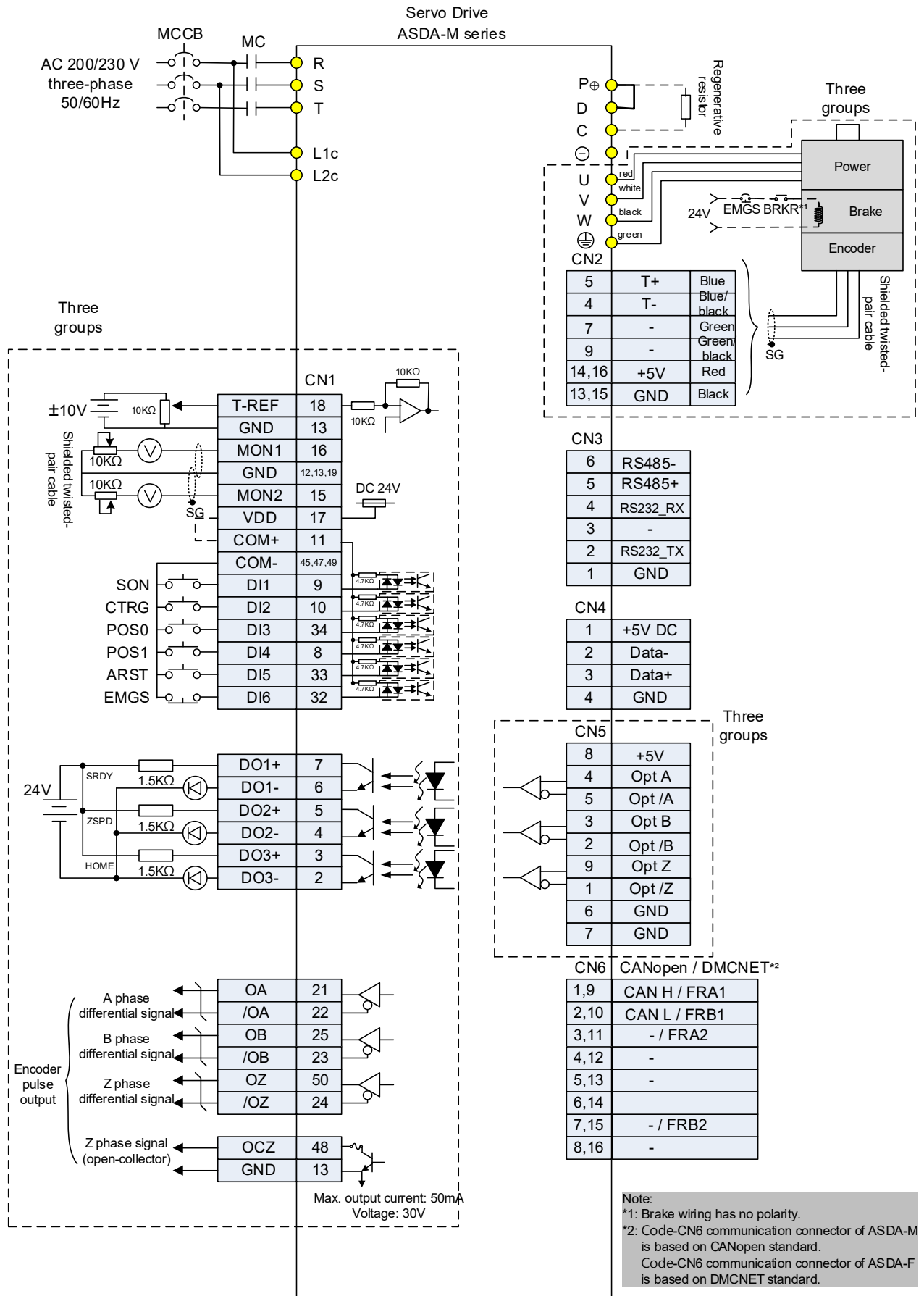


### 3.9 Standard Wiring Method

#### 3.9.1 Position (PT) Mode Standard Wiring

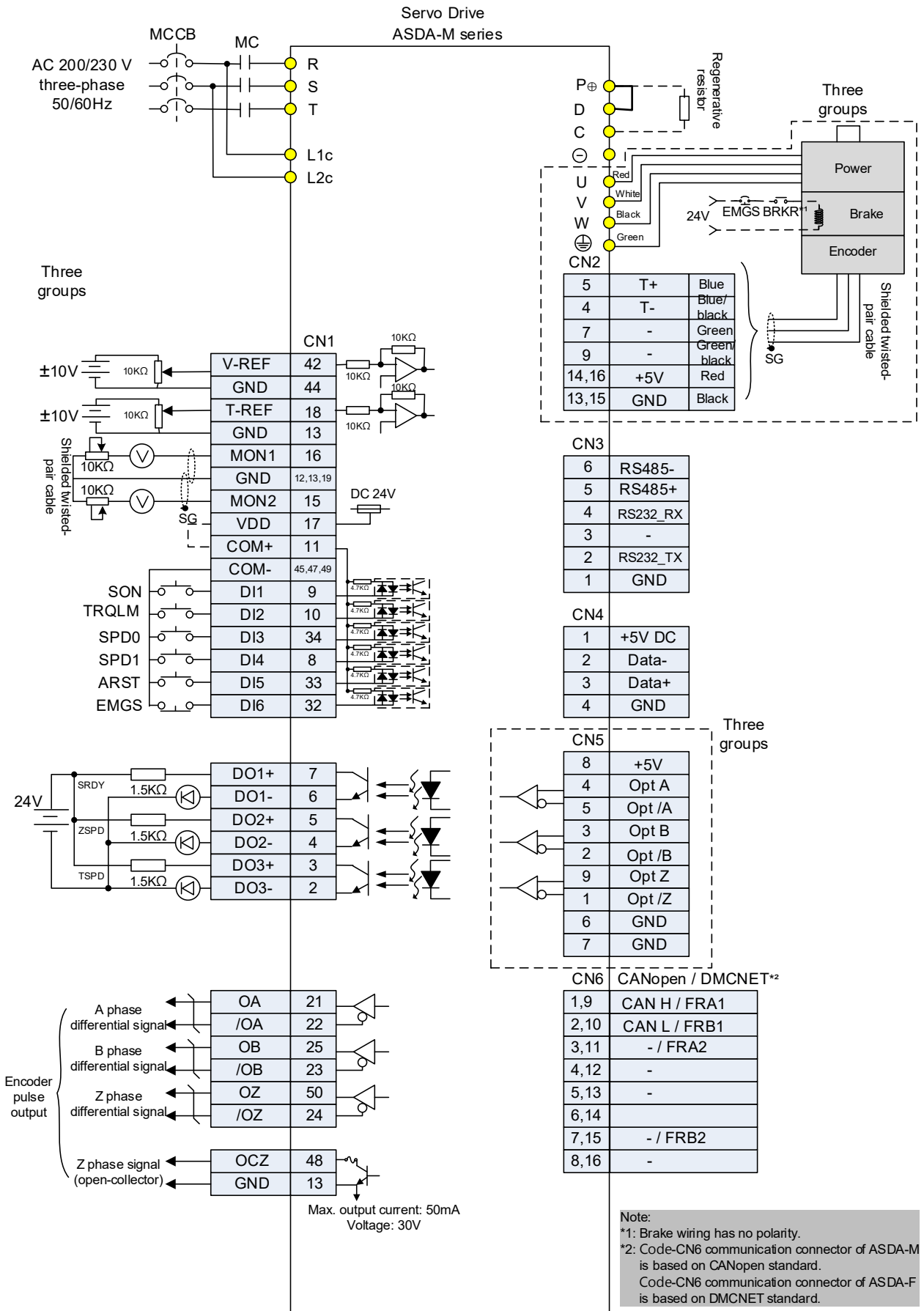


### 3.9.2 Position (PR) Mode Standard Wiring

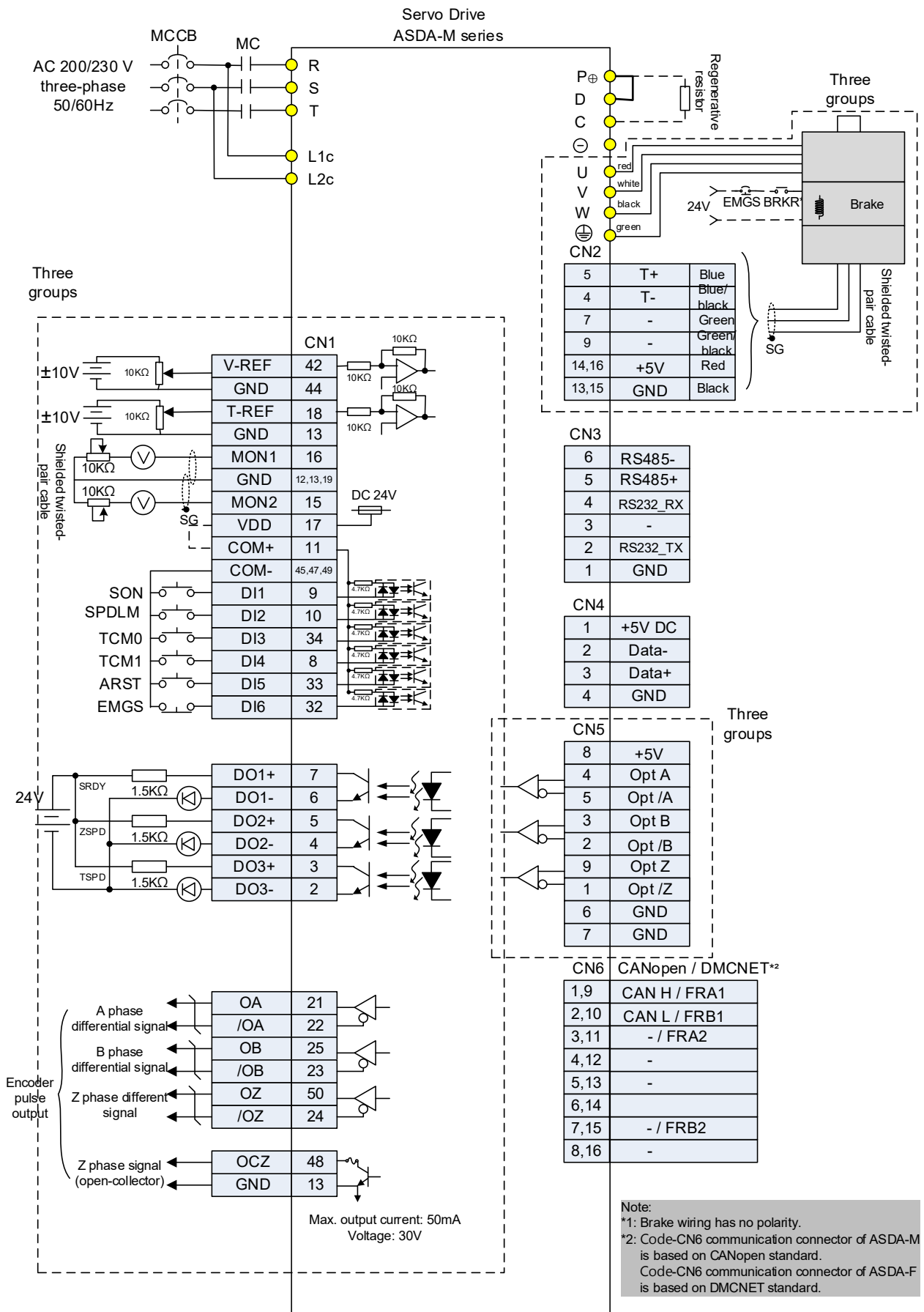




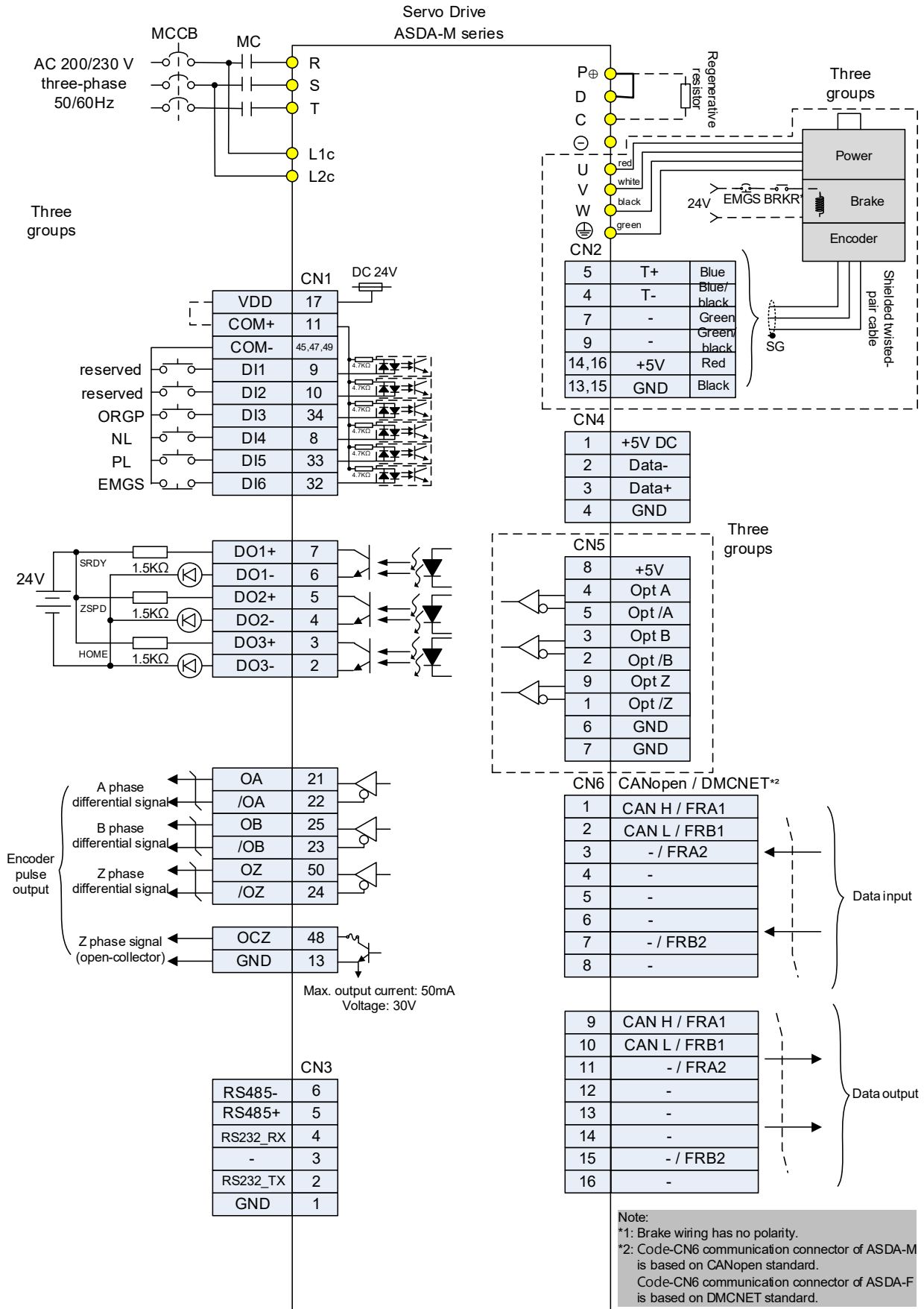
### 3.9.3 Speed Mode Standard Wiring



### 3.9.4 Torque Mode Standard Wiring



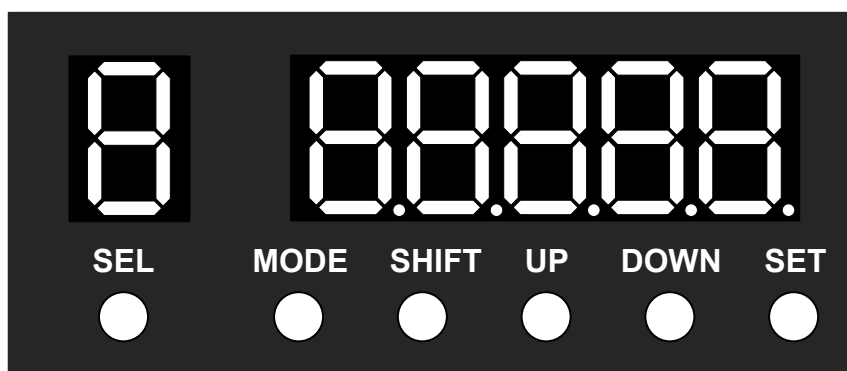
### 3.9.5 CANopen Mode Standard Wiring



# Chapter 4 Panel Display and Operation

This chapter details the panel status and operation of ADSA-M series servo drive.

## 4.1 Panel Description



Name	Function
Display	The single-group of seven-segment display is for displaying the selected axis. The five-group of seven-segment display is for displaying the monitoring values, parameter values and setting values.
SEL Key	Axis selection
MODE Key	Switch to Monitor Mode / Parameter Mode / Alarm Display. When in Editing Mode, press the MODE Key can switch to the Parameter Mode.
SHIFT Key	The group code can be changed in Parameter Mode. When in Editing Mode, moving the blinking bit to the left can adjust the higher setting bit. The display of high/low digit can be switched in Monitor Mode.
UP Key	Change monitoring codes, parameter codes or setting values
DOWN Key	Change monitoring codes, parameter codes or setting values
SET Key	Display and save the setting value. It can switch the decimal or hexadecimal format display in Monitor Mode. In Parameter Mode, press the SET Key can enter Editing Mode.

## 4.2 Parameter Setting Procedure

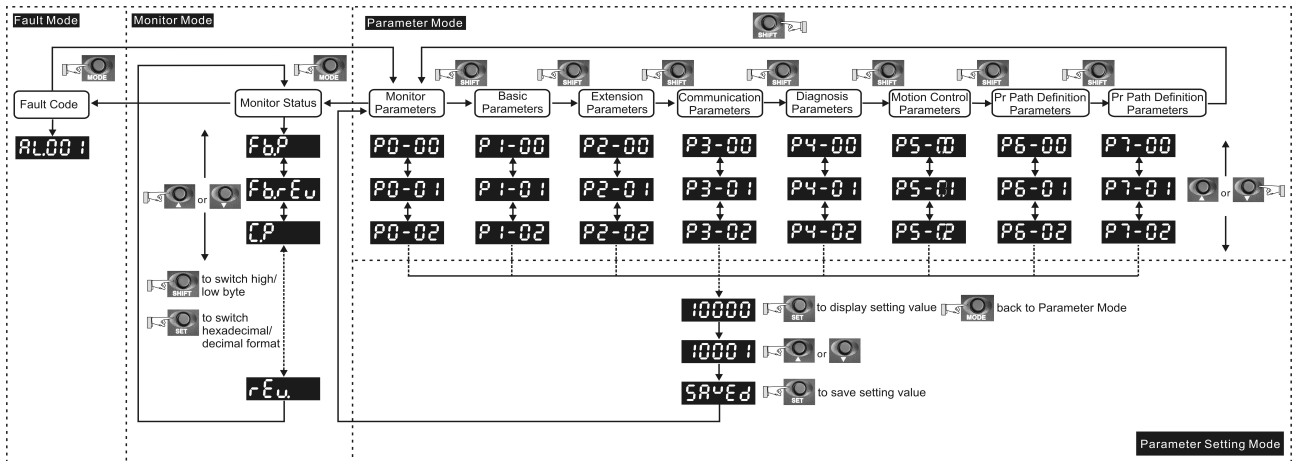
### 4.2.1 Axis Switching Procedure

- (1) When the servo drive connects to the power, the display will show the monitor variable for about one second, and then enter into the Monitor Mode.
- (2) The single-group of seven-segment display shows the current selected axis. After connecting to the power, if the servo drive displays 1, it means the current selected axis is the first axis (X axis).
- (3) SEL Key can be used to select the axis. The number increases every time the user presses the SEL Key. The order is like a cycle: 1(X axis) → 2(Y axis) → 3(Z axis) → 1(X axis).
- (4) After setting the axis, it will enter the corresponding setting procedure of parameters.
- (5) The setting of parameter corresponds to each axis respectively.

**NOTE**

When there is an alarm, the display will stay at the axis which has error and show the alarm code. SEL Key has no function at the moment. Not until pressing the MODE Key to switch to the other modes, can the SEL Key be used to select the axis. If there is no Key to be pressed for 20 seconds, it will return to the Alarm Mode automatically.

## 4.2.2 Parameter Setting Procedure of Each Axis





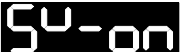



- (1) Select and set the axis first.
- (2) Press the MODE Key to switch Parameter Mode → Monitor Mode → Alarm Mode. If there is no alarm, then it will skip the Alarm Mode.
- (3) When there is a new alarm, it will switch to Alarm Display Mode in any conditions. Pressing the MODE Key can switch to the other modes. If there is no Key to be selected for 20 seconds, it will return to the Alarm Mode automatically.
- (4) In Monitor Mode, press UP or DOWN Key can switch the monitor variable. The monitor variable will be displayed for a second.
- (5) In Parameter Mode, pressing the SHIFT Key can switch the group code. The UP / DOWN Key can change parameter code of two bytes.
- (6) In Parameter Mode, press the SET Key, the system will immediately enter into Editing Setting Mode. The display will show the corresponded setting value of the parameter. The UP / DOWN Key can be used to change the parameter value or press the MODE Key to skip Editing Setting Mode and return to Parameter Mode.
- (7) In Editing Setting Mode, pressing the SHIFT Key can move the blinking bit to the left. And use the UP / DOWN Key to adjust the higher setting byte value.
- (8) After adjusting the setting value, press the SET Key. It can save the parameter or execute the command.
- (9) After finish parameter setting, the display will show the end code 「SAVED」 and return to the Parameter Mode automatically.


## 4.3 Status Display

### 4.3.1 Setting Saved Display


When finishing editing parameter, press the SET Key to save the setting. The panel will display the setting status according to the setting for a second.

Displayed Symbol	Description
	The setting value is saved correctly. (Saved)
	Read-only parameter. Write-protected. (Read-Only)
	Enter the wrong password or no password has been entered. (Locked)
	Incorrect setting value or enter the reserved setting value. (Out of Range)
	No entering is allowed when it is Servo ON. (Servo On)
	Parameter will be effective after the drive is repower on. (Power On)



### 4.3.2 Decimal Point

Displayed Symbol	Description
 ↓ Low Byte ↓ High Byte ↓ No Function ↓ Negative Sign	High byte / low byte indication: When the data is displayed in decimal 32 bits, it is for indicating the current high or low byte. Negative sign: When the data is displayed in decimal format, the two decimal points in the left represents the negative sign, no matter it is showed in 16 or 32 bits. When it is showed in hexadecimal format, it only shows positive sign.

### 4.3.3 Alarm Message










Displayed Symbol	Description
	When there is an error of the drive, it will show 'AL' as the alarm sign and 'nnn' as the alarm code. For further explanation, please refer to Chapter 8, P0-01, parameter description, or the chapter of troubleshooting.

### 4.3.4 Positive and Negative Sign Setting










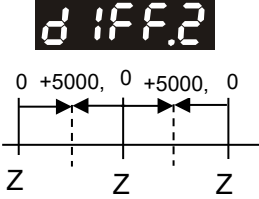






Displayed Symbol	Description
	When entering into the Editing Setting Mode, pressing UP / DOWN Key can increase or decrease the displayed content. The SHIFT Key can change the desired adjusted carry value. (The carry value is blinking at the moment.)
	Pressing the SHIFT Key for two seconds can switch the positive (+) and negative (-) sign. If the parameter is over the range after switching the positive or negative sign, then it cannot be switched.



### 4.3.5 Monitor Display








When the drive is applied to the power, the display will show the monitor displayed symbol for a second, and then enter into the Monitor Mode. In Monitor Mode, SEL Key can select the desired monitor axis. The UP / DOWN Key can change the desired monitor variable. Or, the user can directly change parameter P0-02 to set the monitor code. When applying to the power, the system will pre-set the monitor code according to the setting value of P0-02. For example, the setting value of P0-02 is 4. Every time when applying to the power, it will display C-PLS monitor sign first, and then shows the input pulse number of pulse command.

P0-02 Setting Value	Monitor Displayed Symbol	Description	Unit
0		Motor feedback pulse number (after the scaling of electronic gear ratio) (User unit)	[user unit]
1		Input pulse number of pulse command (after the scaling of electronic gear ratio) (User unit)	[user unit]
2		The difference of error pulse number between control command pulse and feedback pulse number (User unit)	[user unit]
3		Motor feedback pulse number (encoder unit) (1.28 millions Pulse / rev)	[pulse]
4		Input pulse number of pulse command (before the scaling of electronic gear ratio) (encoder unit)	[pulse]
5		Error pulse number (after the scaling of electronic gear ratio) (encoder unit)	[pulse]
6		Input frequency of pulse command	[Kpps]
7		Motor speed	[r / min]
8		Speed input command	[Volt]



P0-02 Setting Value	Monitor Displayed Symbol	Description	Unit
9		Speed input command	[r / min]
10		Torque input command	[Volt]
11		Torque input command	[%]
12		Average torque	[%]
13		Peak torque	[%]
14		Main circuit voltage	[Volt]
15		Ratio of load / motor inertia (note: If the panel shows 13.0, the inertia ratio is 13.)	[1times]
16		IGBT temperature	[°C]
17		Resonance frequency (Low byte is the first resonance and high byte is the second one).	[Hz]
18		The absolute pulse number of encoder Z phase equals to the homing value, 0. It will be + 5000 or - 5000 pulse when rotating in forward or reverse direction.	-
19		Mapping parameter #1: shows the content of parameter P0-25 (specify the mapping target by P0-35)	-
20		Mapping parameter #2: shows the content of parameter P0-26 (specify the mapping target by P0-36)	-
21		Mapping parameter #3: shows the content of parameter P0-27 (specify the mapping target by P0-37)	-
22		Mapping parameter #4: shows the content of parameter P0-28 (specify the mapping target by P0-38)	-
23		Monitor variable #1: shows the content of parameter P0-09 (specify the monitor variable code by P0-17)	-
24		Monitor variable #2: shows the content of parameter P0-10 (specify the monitor variable code by P0-18)	-

P0-02 Setting Value	Monitor Displayed Symbol	Description	Unit
25		Monitor variable #3: shows the content of parameter P0-11 (specify the monitor variable code by P0-19)	-
26		Monitor variable #4: shows the content of parameter P0-12 (specify the monitor variable code by P0-20)	-

Example of the displayed value	Status Description	
 (Dec)	16 bits	If the value is 1234, it displays 01234 (shows in decimal format).
 (Hex)		If the value is 0x1234, it displays 1234 (shows in hexadecimal format; the first digit does not show any).
 (Dec high)  (Dec low)	32 bits	If the value is 1234567890, the display of the high byte is 1234.5 and displays 67890 as the low byte (shows in decimal format).
 (Hex high)  (Hex low)		If the value is 0x12345678, the display of the high byte is h1234 and displays L5678 as the low byte (shows in hexadecimal format).
	Negative display. If the value is -12345, it displays 1.2.345 (only shows in decimal format; there is no positive or negative sign for hexadecimal format display).	



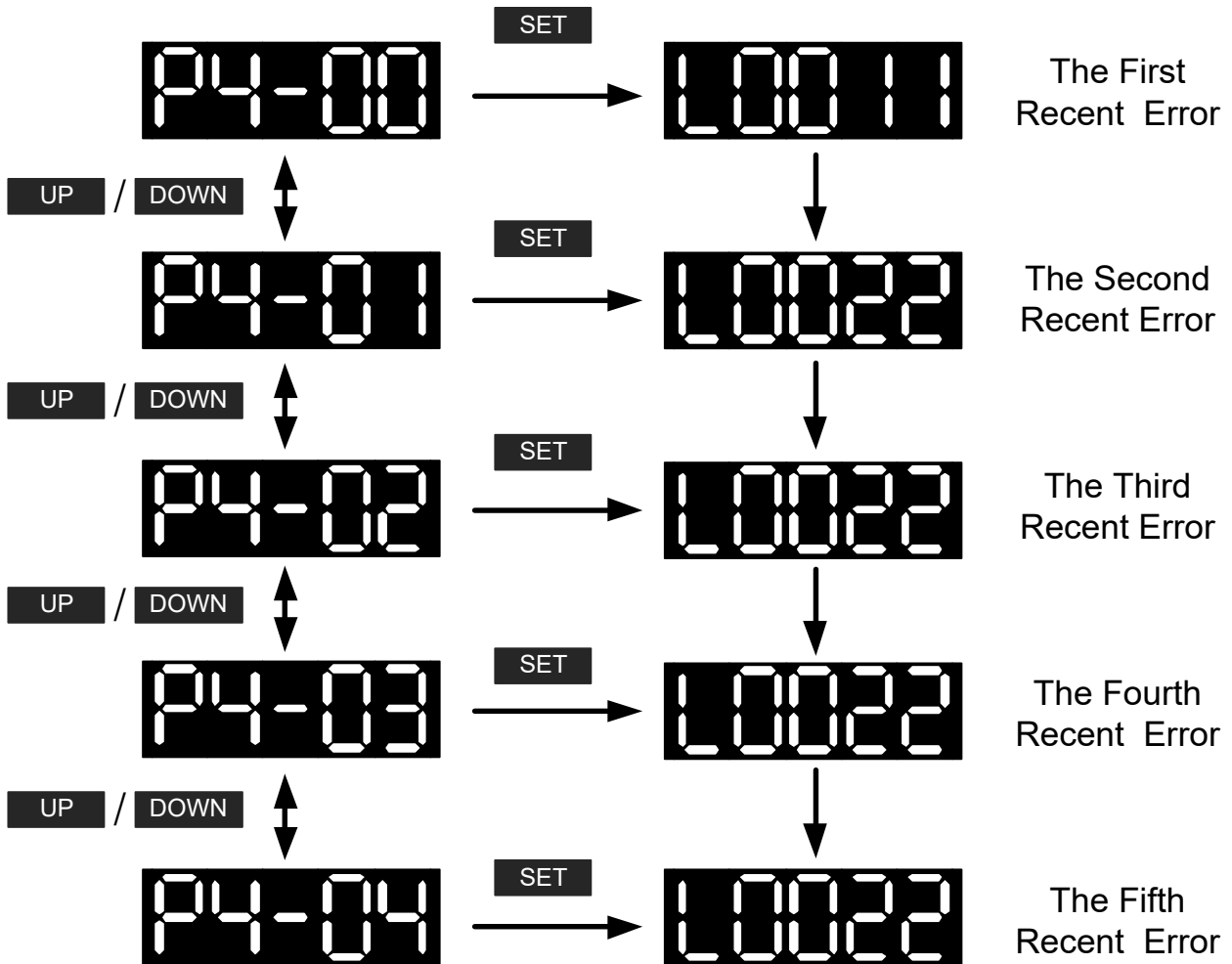
**NOTE**

- 1 ) Dec means it is displayed in decimal format. Hex means it is displayed in hexadecimal format.
- 2 ) The above display methods can be applied in Monitor Mode and Editing Setting Mode.
- 3 ) When all monitor variable is 32 bits, high / low bit and the display (Dec / Hex) can be switched. According to the definition in Chapter 8, each parameter only supports one displaying method and cannot be switched.

## 4.4 General Function

### 4.4.1 Operation of Fault Record Display

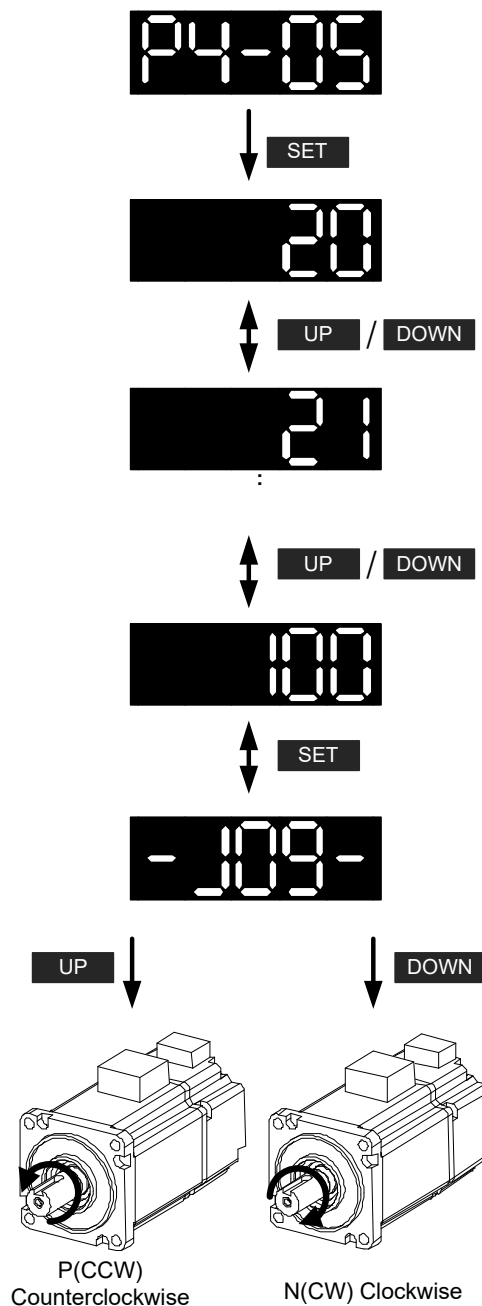
When it is in Parameter Mode, select the parameter which is in error status first. Then select P4-00 ~ P4-04. Press the SET Key, the corresponding fault record will shown.



### 4.4.2 JOG Mode

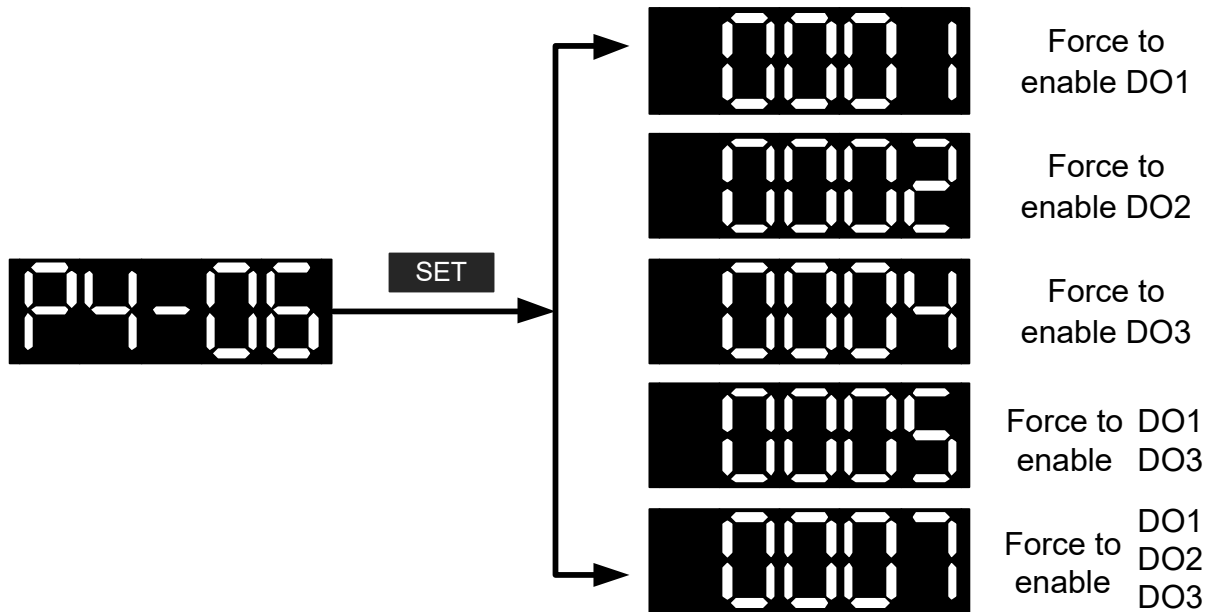
When it is in Parameter Mode, select the parameter of JOG first. Then select P4-05. And enter into JOG Mode by the following settings:

- (1) Press the SET Key to display the speed value of JOG. The default value is 20 r / min.
- (2) Press UP or DOWN Key to adjust the desired speed value of JOG. It is adjusted to 100 r / min in the example.
- (3) Press the SET Key to display JOG and enter JOG mode.
- (4) When it is in JOG Mode, press UP or DOWN Key to enable the servo motor in forward or reverse direction. The servo motor stops running as soon as the user stops pressing the key. JOG operation is working only when it is Servo ON.



### 4.4.3 Force DO Output

Enter into the Output Diagnosis Mode by the following settings. First, select the desired output axis to switch the parameter. Set P2-08 to 406 and enable the function of force DO output. Then, set the force DO output by binary method via P4-06. When the setting value is 2, DO2 will be forced to enable. When the setting value is 5, DO1 and DO3 will be forced to enable. No data is retained in this mode. It returns to the normal DO mode when re-power on the drive or set P2-08 to 400.



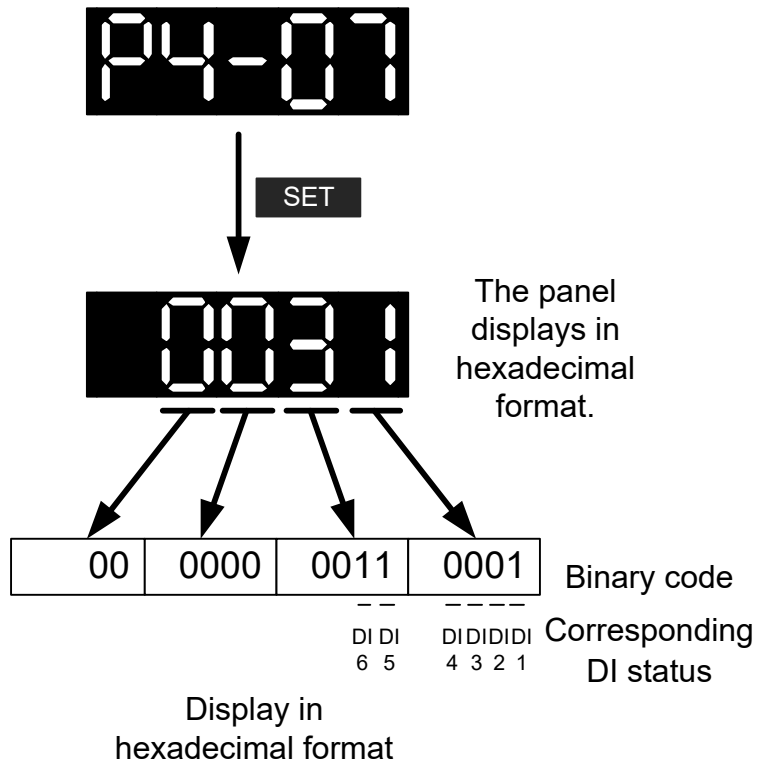
#### NOTE

P4-06 is displayed in hexadecimal format. Therefore, it will not show the fifth 0.

### 4.4.4 Digital Input Diagnosis Operation

Enter into the Digital Input Diagnosis Mode by the following setting methods. When the external output signal DI1 ~ DI6 is ON, the corresponding signal will be shown on the panel. It is displayed by bit. When it shows bit, it means it is ON.

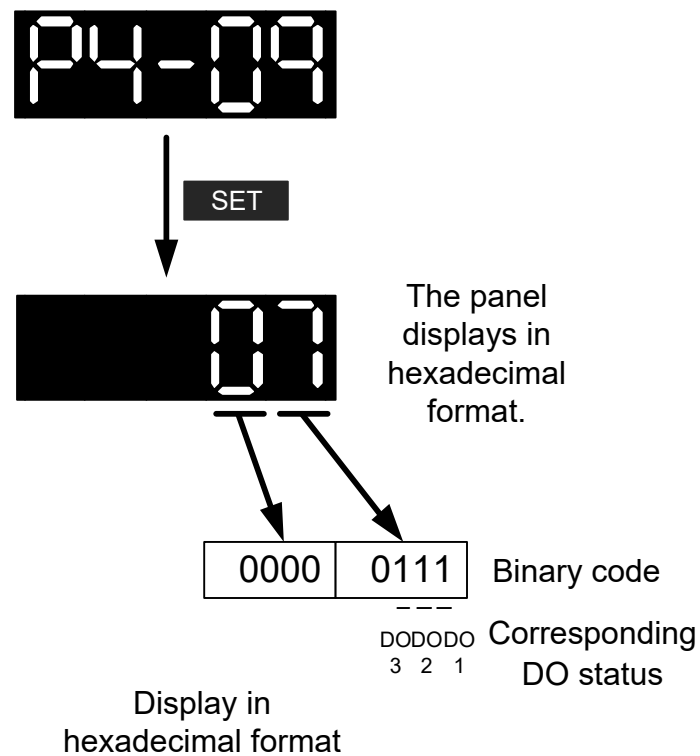
For example, if it shows **0031**, **3** is in hexadecimal format, it will be **0011** when it transfers to binary format. Then, DI5 ~ DI6 is ON.



### 4.4.5 Digital Output Diagnosis Operation

Enter into the Digital Output Diagnosis Mode by the following setting methods. The output signal DO1 ~ DO3 is ON and the corresponding signal will be shown on the panel. It is displayed by bit. When it shows bit, it means it is ON.

For example, if it shows **07**, 7 is in hexadecimal format, it will be **0111** when it transfers to binary format. Then, DO1 ~ DO3 is ON.



# Chapter 5 Trial Operation and Tuning

This chapter is divided into two parts to describe the trial operation. The first one is the inspection without load and another one is the inspection with load. For safety reasons, please conduct the first inspection.

## 5.1 Inspection without Load

Please remove the load of the servo motor, including coupling on the shaft and accessories so as to avoid any damage on servo drive or mechanism. This is aiming to avoid the falling off of the disassembled parts of the motor shaft and indirectly causing the personnel injury or equipment damage during operation. Running the motor without load, if the servo motor can run during normal operation, then it can connect to load for operation.

**Caution: Please operate the servo motor without load first. If the servo motor runs normally, connect the load afterwards in order to avoid any danger.**

Please check the following items before operation.

### Inspection before operation (has not applied to the power yet)

- Check if there is any obvious damage shown on its appearance.
- The splicing parts of the wiring terminal should be isolated.
- Make sure the wiring is correct so as to avoid the damage or any abnormality.
- Check if the electric conductivity objects including sheetmetal (such as screws) or inflammable objects are not inside the servo drive.
- Check if the control switch is in OFF status.
- Do not place the servo drive or external regenerative resistor on inflammable objects.
- To avoid the electromagnetic brake losing efficacy, please check if stop function and circuit break function can work normally.
- If the peripheral devices are interfered by the electronic instruments, please reduce electromagnetic interference with devices.
- Please make sure the external voltage level of the servo drive is correct.

### Inspection before running the servo drive (has already applied to the power)

- The encoder cable should avoid excessive stress. When the motor is running, make sure the cable is not frayed or over extended.



- Please contact with Delta if there is any vibration of the servo motor or unusual noise during the operation.
- Make sure the setting of the parameters is correct. Different machinery has different characteristic, please adjust the parameter according to the characteristic of each machinery.
- Please reset the parameter when the servo drive is in SERVO OFF status, or it may cause malfunction.
- When the relay is operating, make sure it can work properly.
- Check if the power indicator and LED display works normally.
- PWM is used to control 7.5kW. Thus, when the temperature is lower than 40°C, the fan does not work.

## 5.2 Apply Power to the Servo Drive

Please follow the instructions below.

**A.** Make sure the wiring between the motor and servo drive is correct.

- 1) U, V, W and FG have to connect to cable red, white, black and green respectively. If the wiring is incorrect, the motor cannot work normally. The ground wire FG of the motor must be connected to the ground terminal of the servo drive. Please refer to Chapter 3.1 for wiring.
- 2) The encoder cable of the motor has correctly connected to CN2: If users only desire to execute JOG function, it is unnecessary to connect CN1 and CN3 (Please refer to Chapter 5.3). Refer to Chapter 3.1 and 3.4 for the wiring of CN2.

**Caution: Do not connect the power terminal (R, S, T) to the output terminal (U, V, W) of the servo drive. Or it might damage the servo drive.**

**B.** Power circuit of the servo drive:

Apply power to the servo drive. Please refer to Chapter 3.1.3 for power wiring.

**C. Power on:**

Power of the servo drive: including control circuit (L1c, L2c) and main circuit (R, S, T) power.

When the power is on, the display of the servo drive will be:

The digital input (DI6) of the default value is the signal of emergency stop (EMGS), if DI6 is not using, adjusting the setting of P2-15 is a must. P2-15 can be set to 0 (disable this DI function) or modified to another function.

From the last setting · the servo drive status displays parameter P0-02 setting as the motor speed (07), then the screen display will be:



When the screen displays no text, please check if the power of control circuit is under voltage.

1) When the screen displays



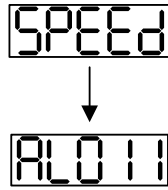
Warning of overvoltage:

It means the voltage input by the main circuit is higher than the rated voltage or power input error (incorrect power system).

Corrective action:

- Use the voltmeter to measure if the input voltage from the main circuit is within the range of rated voltage value.
- Use the voltmeter to measure if the power system complies with the specification.

2) When the screen displays



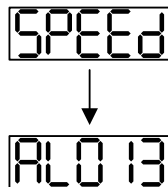
Warning of encoder error:

Check if the motor encoder is securely connected or the wiring is correct.

Corrective action:

- Check if the wiring is the same as the instruction of the user manual.
- Check the encoder connector.
- Check if the wiring is loose.
- Encoder is damaged.

3) When the screen displays:



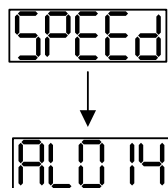
Warning of emergency stop:

Please check if any of the digital input DI1 ~ DI6 is set to emergency stop (EMGS).

Corrective action:

- If not desire to set emergency stop (EMGS) as one of the digital input, make sure no digital input is set to emergency stop (EMGS) among DI1 ~ DI6. (That is to say none of the parameters, P2-10 ~ P2-15 is set to 21.)
- If the function of emergency stop (EMGS) is needed and this DI is set as normally close (function code: 0x0021), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0121).

4) When the screen displays:



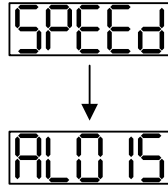
Warning of negative limit error:

Please check if any of the digital input DI1 ~ DI6 is set to negative limit (NL) and that DI is ON.

Corrective action:

- If not desire to set negative limit (NL) as one of the digital input, make sure no digital input is set to negative limit (NL) among DI1 ~ DI6. (That is to say none of the parameters, P2-10 ~ P2-15 is set to 22.)
- If the function of negative limit (NL) is needed and this DI is set as normally close (function code: 0x0022), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0122).

5) When the screen displays:



SPEED  
↓  
AL015

Warning of positive limit error:

Please check if any of the digital input DI1 ~ DI6 is set positive limit (PL) and that DI is ON.

Corrective action:

- If not desire to set positive limit (PL) as one of the digital input, make sure no digital input is set to positive limit (PL) among DI1~DI6. (That is to say none of the parameters, P2-10 ~ P2-15 is set to 23.)
- If the function of positive limit (PL) is needed and this DI is set as normally close (function code: 0x0023), please make sure this DI is always normally close. If not, please set this DI as normally open (function code: 0x0123).

6) When the screen displays



AL001

Warning of overcurrent:

Corrective action:

- Check the connection between the motor and servo drive.
- Check if the conducting wire is short circuited.

Exclude short circuit and avoid metal conductors being exposed.

7) When the screen displays



AL003

Warning of under voltage:

Corrective action:

- Check if the wiring of main circuit input voltage is correct.
- Use voltmeter to measure if the main circuit voltage is normal.
- Use voltmeter to measure if the power system complies with the specification.

Note: During the process of power on or servo on, if an alarm occurs or shows any abnormal display, please contact the distributors.

### 5.3 JOG Trial Run without Load

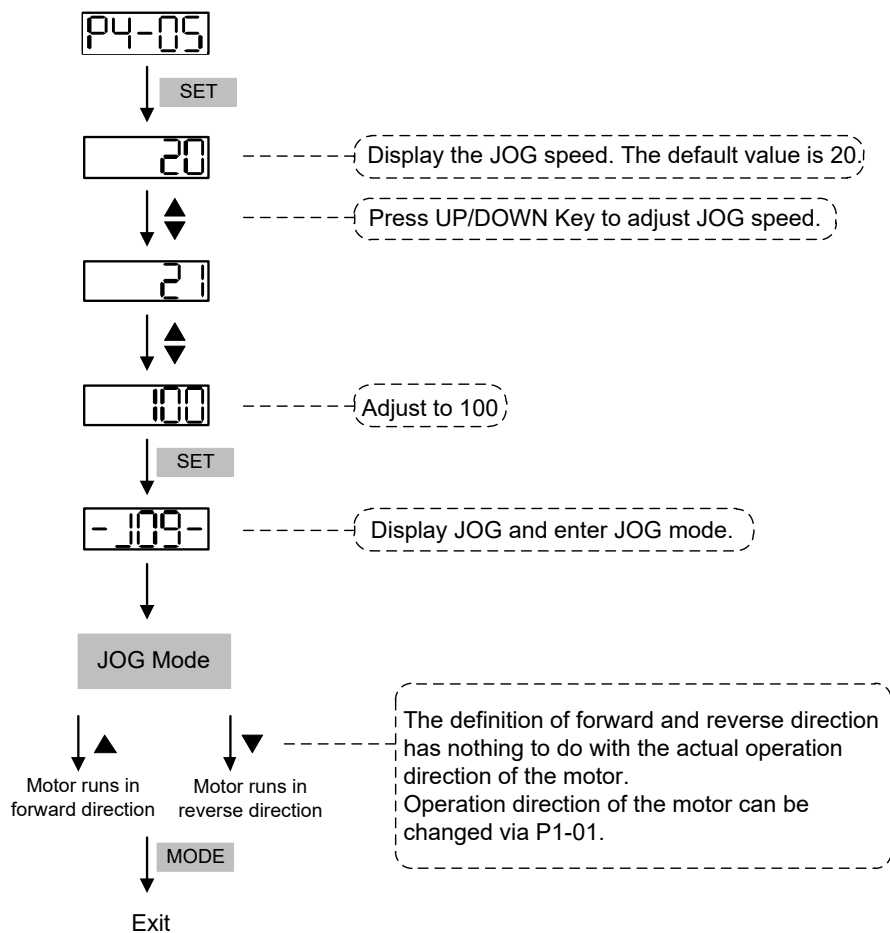
It is very convenient to test the motor and servo drive with the method of JOG trial run without load since the extra wiring is unnecessary. For safety reasons, it is recommended to set JOG at low speed. Please see the following descriptions.

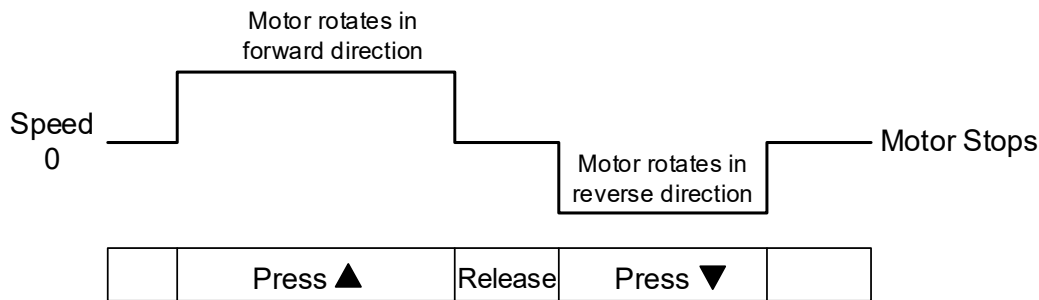
**STEP 1:** Use software setting to Servo ON. Select the desired JOG axis and set parameter P2-30 to 1. This setting is to force the servo ON through software.

**STEP 2:** Set P4-05 as JOG speed (unit: r / min). After setting the desired JOG speed, press the **SET** Key, the servo drive will enter JOG mode.

**STEP 3:** Press the **MODE** Key to exit JOG mode.

In this example, the JOG speed is adjusted from 20 r / min to 100 r / min.





If the servo motor does not rotate, please make sure the wiring of U, V, W terminals and encoder is correct

If the servo motor does not rotate properly, please make sure the phase of U, V, W cables is connected correctly.

## 5.4 Trial Run without Load (Speed Mode)

Before the trial run without load, firmly secure the motor base so as to avoid the danger cause by the reaction of motor operation.

### STEP 1:

Set the control mode of the servo drive to speed mode. Firstly select the desired axis for speed test, and set P1-01 to 2. Then, re-power on the servo drive.

### STEP 2:

In speed control mode, the digital input settings of trial run are as follows:

Digital Input	Parameter Setting Value	Symbol	Function Description	CN1 Pin No
DI1	P2-10 = 101	SON	Servo ON	DI1- = 9
DI2	P2-11 = 109	TRQLM	Torque limit	DI2- = 10
DI3	P2-12 = 114	SPD0	Speed command selection	DI3- = 34
DI4	P2-13 = 115	SPD1	Speed command selection	DI4- = 8
DI5	P2-14 = 102	ARST	Alarm reset	DI5- = 33
DI6	P2-15 = 0	Disabled	Invalid DI function	-

The above table disables the function of emergency stop (DI6) (the default setting), thus, set P2-15 to 0 (Disabled). The digital input of Delta' s servo drive can be programmed by users. When programming digital input, please refer to the description of DI code.

The default setting includes the function of negative limit, positive limit and emergency stop, therefore, after the setting is completed, if there is any alarm occurs, please re-power on the servo drive or switch ON DI5 to clear the alarm. Please refer to Chapter 5.2.

The speed command selection is determined by SPD0 and SPD1. See the table below.

Speed Command No.	DI signal of CN1		Command Source	Content	Range
	SPD1	SPD0			
S1	0	0	External analog command	Voltage deviation between V-REF and GND	-10 V ~ +10 V
S2	0	1	Register parameter	P1-09	-60000 ~ 60000
S3	1	0		P1-10	-60000 ~ 60000
S4	1	1		P1-11	-60000 ~ 60000

0: means DI is OFF

1: means DI is ON

The setting range of register parameter is from -60000 to 60000. Setting value = setting range x unit (0.1r / min).

For example, P1-09 = +30000; Setting value = +30000 x 0.1 r / min = +3000 r / min

Command setting of speed register

Set parameter P1-09 to 30000.

Set parameter P1-10 to 1000.

Set parameter P1-11 to -30000.

Input command	Rotation direction
+	CCW
-	CW

### STEP 3:

- (1) Users switch ON DI1 and Servo ON.
- (2) Both DI3 (SPD0) and DI4 (SPD1), the speed command, are OFF, which means it currently executes S1 command. The motor rotates according to analog voltage command.
- (3) When DI3 (SPD0) is ON, it means it currently executes S2 command (3000 r / min). The rotation speed is 3000 r / min at the moment.
- (4) When DI4 (SPD1) is ON, it means it currently executes S3 command (100 r / min). The rotation speed is 100 r / min.
- (5) When both DI3 (SPD0) and DI4 (SPD1) are ON, it means S4 command (-3000 r / min) is executed at the moment. The rotation speed is -3000 r / min.
- (6) Step (3), (4) and (5) can be repeatedly executed.
- (7) If users desire to stop the motor, switch OFF DI1 (Servo OFF).

## 5.5 Trial Run without Load (Position Mode)

Before the trial run without load, firmly secure the motor base so as to avoid the danger cause by the reaction of motor operation.

### STEP 1:

Set the control mode of the servo drive to position mode.

Firstly select the desired axis for speed test, and set parameter P1-01 to 1. Then, re-power on the servo drive.

**STEP 2:** In position mode, the digital input settings of trial run are as follows:

Digital Input	Parameter Setting Value	Symbol	Function Description	CN1 Pin No
DI1	P2-10 = 101	SON	Servo ON	DI1- = 9
DI2	P2-11 = 108	CTRG	Torque limit	DI2- = 10
DI3	P2-12 = 111	POS0	Position command selection	DI3- = 34
DI4	P2-13 = 112	POS1	Position command selection	DI4- = 8
DI5	P2-14 = 102	ARST	Alarm reset	DI5- = 33
DI6	P2-15 = 0	Disabled	Invalid DI function	-

The above table disables the function of emergency stop (DI6) (the default setting), thus, set P2-15 to 0 (Disabled). The digital input of Delta' s servo drive can be programmed by users. When programming digital input, please refer to the description of DI code.

The default setting includes the function of negative limit, positive limit and emergency stop, therefore, after the setting is completed, if there is any alarm occurs, please re-power on the servo drive or switch ON DI5 to clear the alarm. Please refer to Chapter 5.2.



Please refer to Chapter 3.9.2, Position (PR) Mode Standard Wiring for wiring diagram. However, since POS2 is not the default digital input, set P2-14 to 113. Please refer to the table below for 64 sets of register command, POS0 ~ POS5 and the relative parameters.

Position Command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding Parameter
P1	0	0	0	0	0	0	↑	P6-00
								P6-01
P2	0	0	0	0	0	1	↑	P6-02
								P6-03
~								~
P50	1	1	0	0	1	0	↑	P6-98
								P6-99
P51	1	1	0	0	1	1	↑	P7-00
								P7-01
~								~
P64	1	1	1	1	1	1	↑	P7-26
								P7-27

0: means DI is OFF

1: means DI is ON

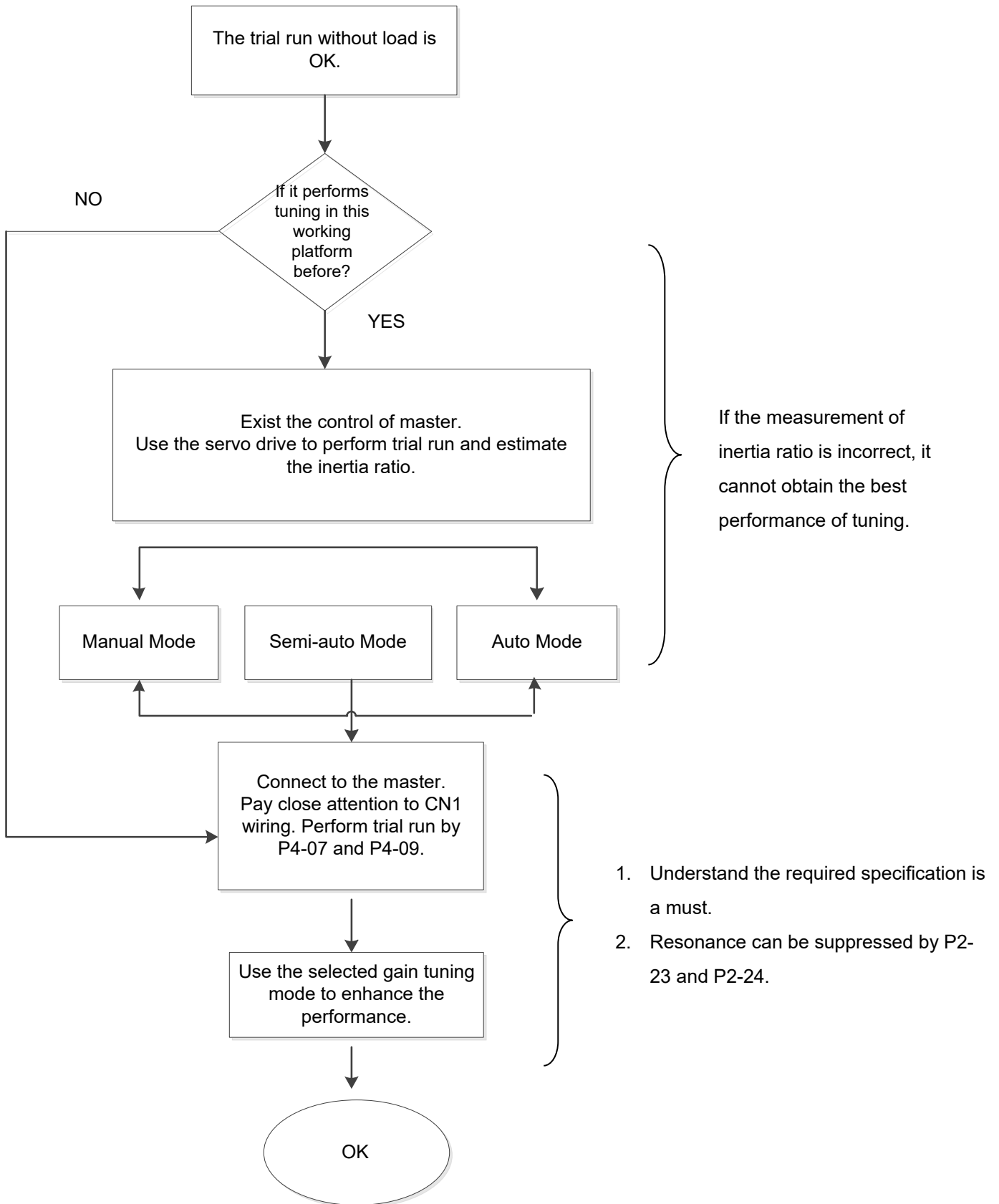
Users can set the 64-set of command value (P6-00 ~ P7-27). The value can be set as the absolute position command.

## 5.6 Tuning Procedure

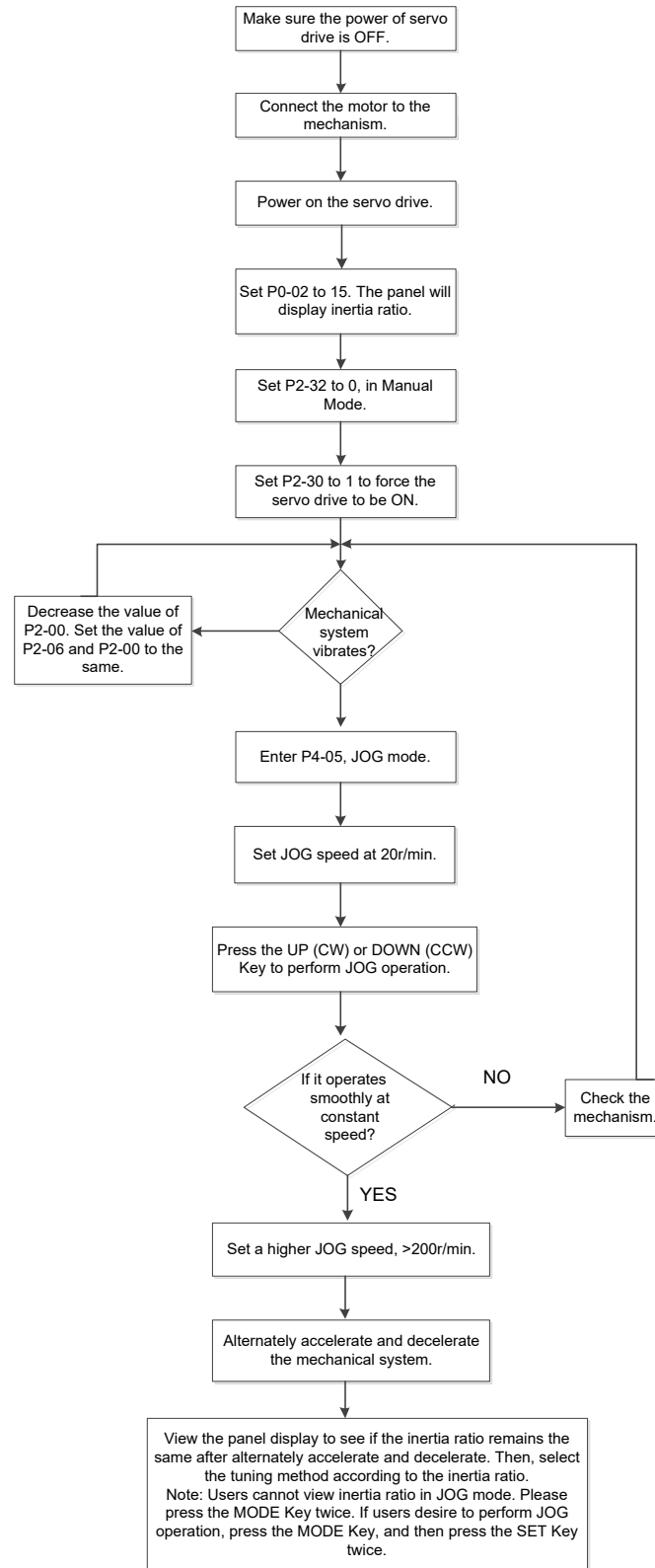
Estimate the inertia ratio----- JOG mode

1. After completing wiring, when applying to the power, the servo drive will display:	<b>AL013</b>
2. Press the <b>MODE</b> Key to select the mode of parameter function.	<b>P0-00</b>
3. Press the <b>SHIFT</b> Key twice to select the mode of parameter group.	<b>P2-00</b>
4. Press the <b>UP</b> Key to select parameter P2-15.	<b>P2-15</b>
5. Press the <b>SET</b> Key to display parameter value, which is shown as the content on the right.	<b>21</b>
6. Press the <b>SHIFT</b> Key twice, then press the <b>UP</b> Key, the panel will display <b>121</b> . Press the <b>SET</b> Key.	<b>121</b>
7. Press the <b>UP</b> Key to select parameter P2-30.	<b>P2-30</b>
8. Press the <b>SET</b> Key to display the parameter value. (See the figure on the right.)	<b>0</b>
9. Press the <b>UP</b> Key and select the parameter value 1. Then, press the <b>SET</b> Key. The servo drive is in Servo ON status at the moment.	<b>1</b>
10. The panel will display 0 as shown on the right.	<b>0</b>
11. Press the <b>MODE</b> Key first, and press the <b>DOWN</b> Key for 12 times to select the value of inertia ratio.	<b>JL</b>
12. The panel displays the current value of inertia ratio (default value).	<b>1.0</b>
13. Press the <b>MODE</b> Key to select the mode of parameter function.	<b>P2-30</b>
14. Press the <b>SHIFT</b> Key twice to select the mode of parameter group.	<b>P4-00</b>
15. Press the <b>UP</b> Key to select parameter P4-05.	<b>P4-05</b>
16. Press the <b>SET</b> Key to show the content, which is 20 r / min at JOG speed. Press the <b>UP</b> or <b>DOWN</b> Key to increase or decrease the JOG speed. Press the <b>SHIFT</b> Key to move to the next digit of the left.	<b>20</b> ↓ <b>200</b>
17. Set the desired JOG speed and press the <b>SET</b> Key which is shown as the figure on the right.	<b>-Jog-</b>
18. Press the <b>UP</b> Key to rotate the motor in forward direction while press the <b>DOWN</b> Key the motor will rotate in reverse direction.	
19. Execute JOG operation at low speed first. With the constant speed, if the motor operates smoothly in forward and reverse direction, users can execute JOG operation at higher speed.	
20. In P4-05, the servo drive cannot display inertia ratio. Please press the <b>MODE</b> Key twice to view the value of inertia ratio. If users desire to execute JOG operation again, press the <b>MODE</b> Key, and then press the <b>SET</b> Key twice. Observe the panel display to see if the load inertia ratio remains at the same value after acceleration and deceleration.	

### 5.6.1 Flowchart of Tuning Procedure



### 5.6.2 Inertia Estimation Flowchart (with Mechanism)



### 5.6.3 Flowchart of Auto Tuning

Set P2-32 to 1 (auto mode, continuous tuning)

Continue to estimate the system inertia. Automatically save the value in P1-37 every 30 minutes and refer the stiffness and bandwidth setting of P2-31.

P2-31 Stiffness setting in auto tuning mode (The default value is 40)

In auto and semi-auto mode, the bandwidth setting of speed circuit is:

1 ~ 50 Hz: low-stiffness, low-response

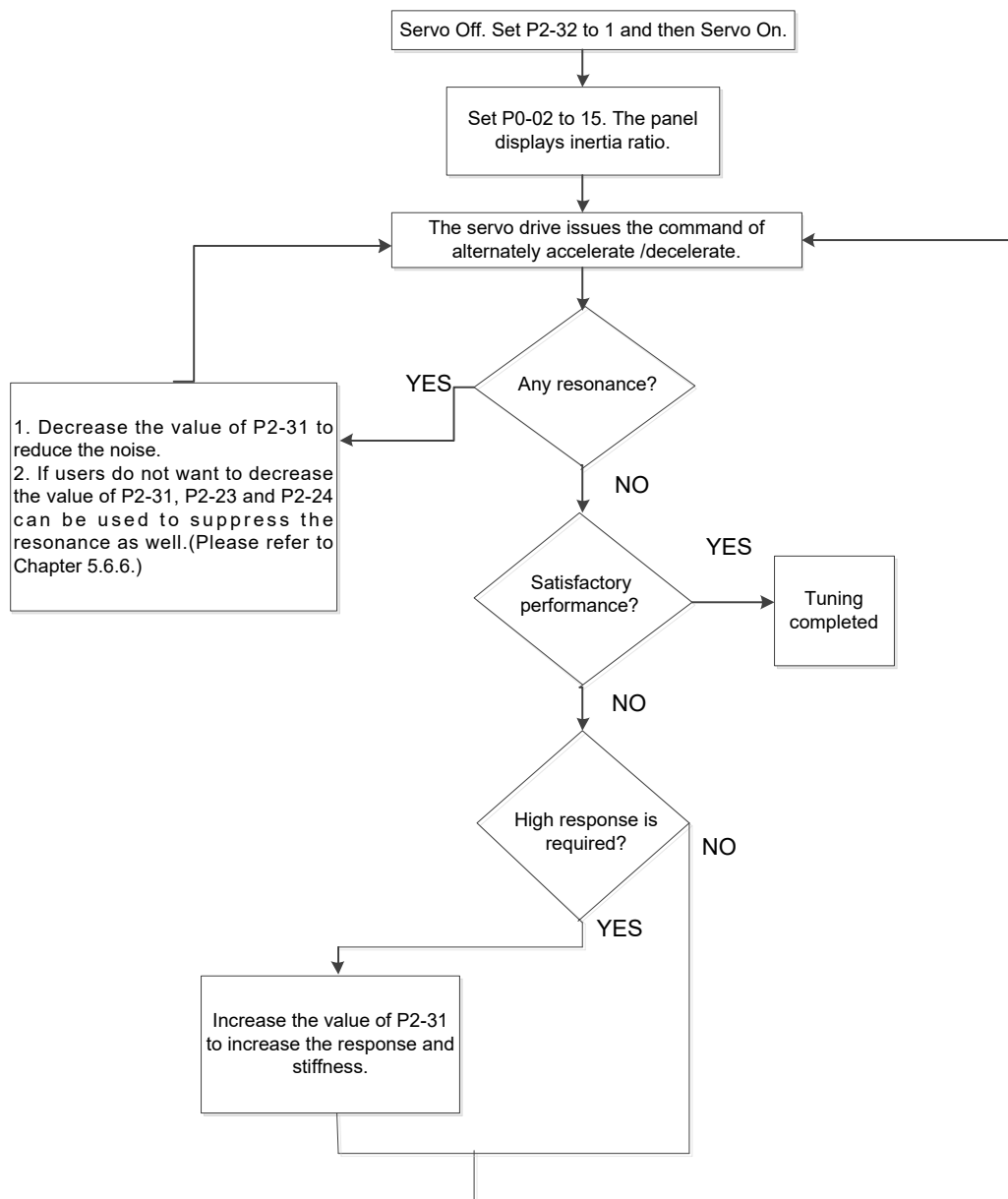
51 ~ 250 Hz: medium-stiffness, medium-response

251 ~ 850 Hz: high-stiffness, high-response

851 ~ 1000 Hz: extremely high-stiffness, extremely high-response

Stiffness setting in auto tuning mode: the bigger the value is, the stronger the stiffness will be.

Adjust the value of P2-31: Increase the value of P2-31 to increase stiffness or decrease to reduce the noise. Continue to tune until the performance is satisfied. Then, tuning is completed.



### 5.6.4 Flowchart of Semi-auto Tuning

Set P2-32 to 2 (semi-auto mode, non-continuous tuning)

After tuning for a while and wait until the system inertia is stable, it stops estimating. The estimated inertia ratio will be saved to P1-37. When switching mode from manual or auto to semi auto, the system starts tuning again. During the process of estimation, the system will refer the stiffness and bandwidth setting of P2-31.

P2-31 Response setting in auto mode (The default value is 40)

In auto and semi-auto mode, the bandwidth setting of speed circuit is:

1 ~ 50 Hz: low-stiffness, low-response

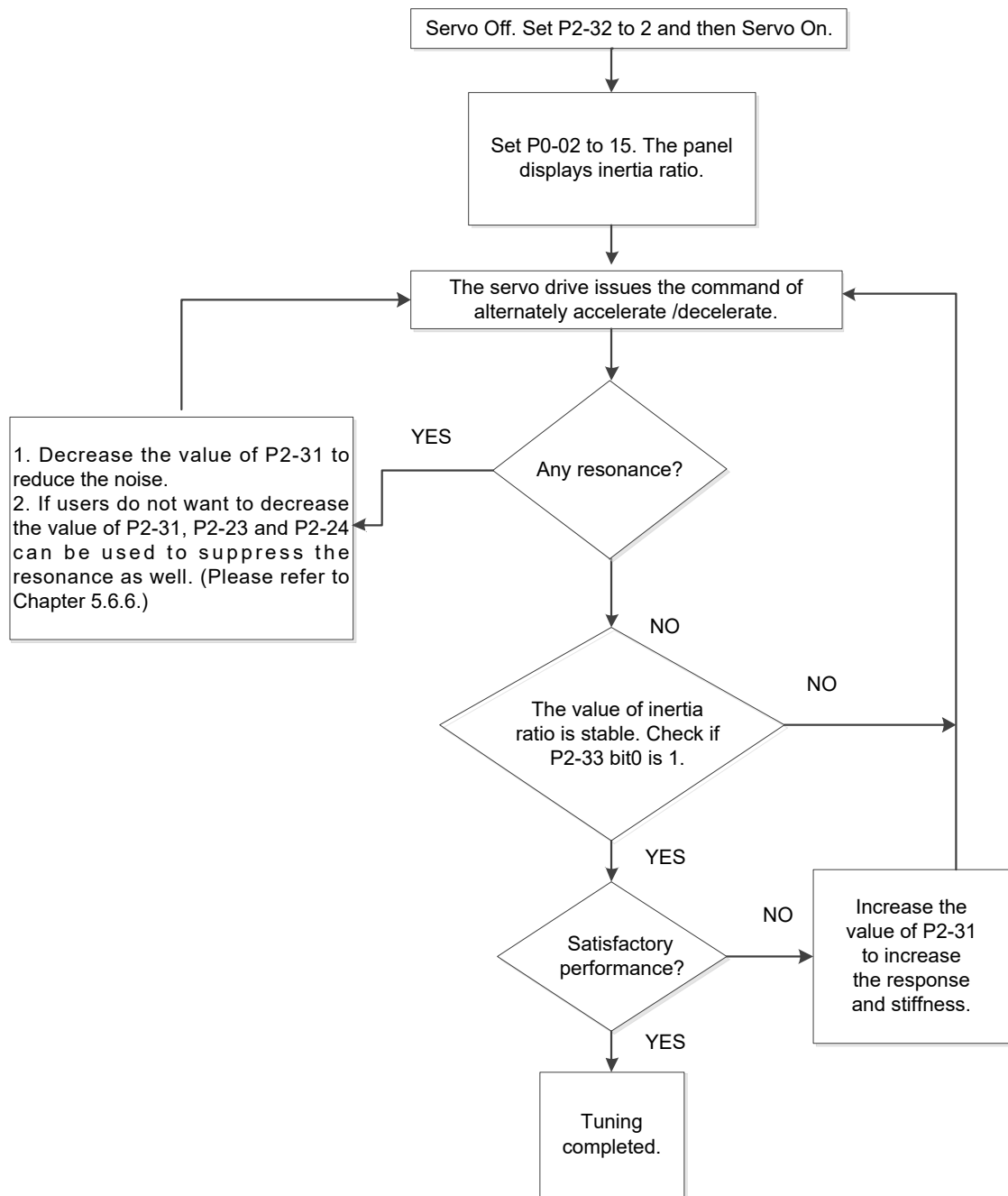
51 ~ 250 Hz: medium-stiffness, medium-response

251 ~ 850 Hz: high-stiffness, high-response

851 ~ 1000 Hz: extremely high-stiffness, extremely high-response

Response setting in semi-auto tuning mode: the bigger the value is, the better the response will be.

Adjust the value of P2-31: Increase the value of P2-31 to increase the response or decrease to reduce the noise. Continue to tune until the performance is satisfied. Then, tuning is completed.



Note:

1. If P2-33 bit 0 is set to 1, it means the inertia estimation in semi-auto mode is completed. The result can be accessed by P1-37.
2. If the value of P2-33 bit 0 is cleared to 0, the system will start to estimate again.

### 5.6.5 Limit of Load Inertia Estimation

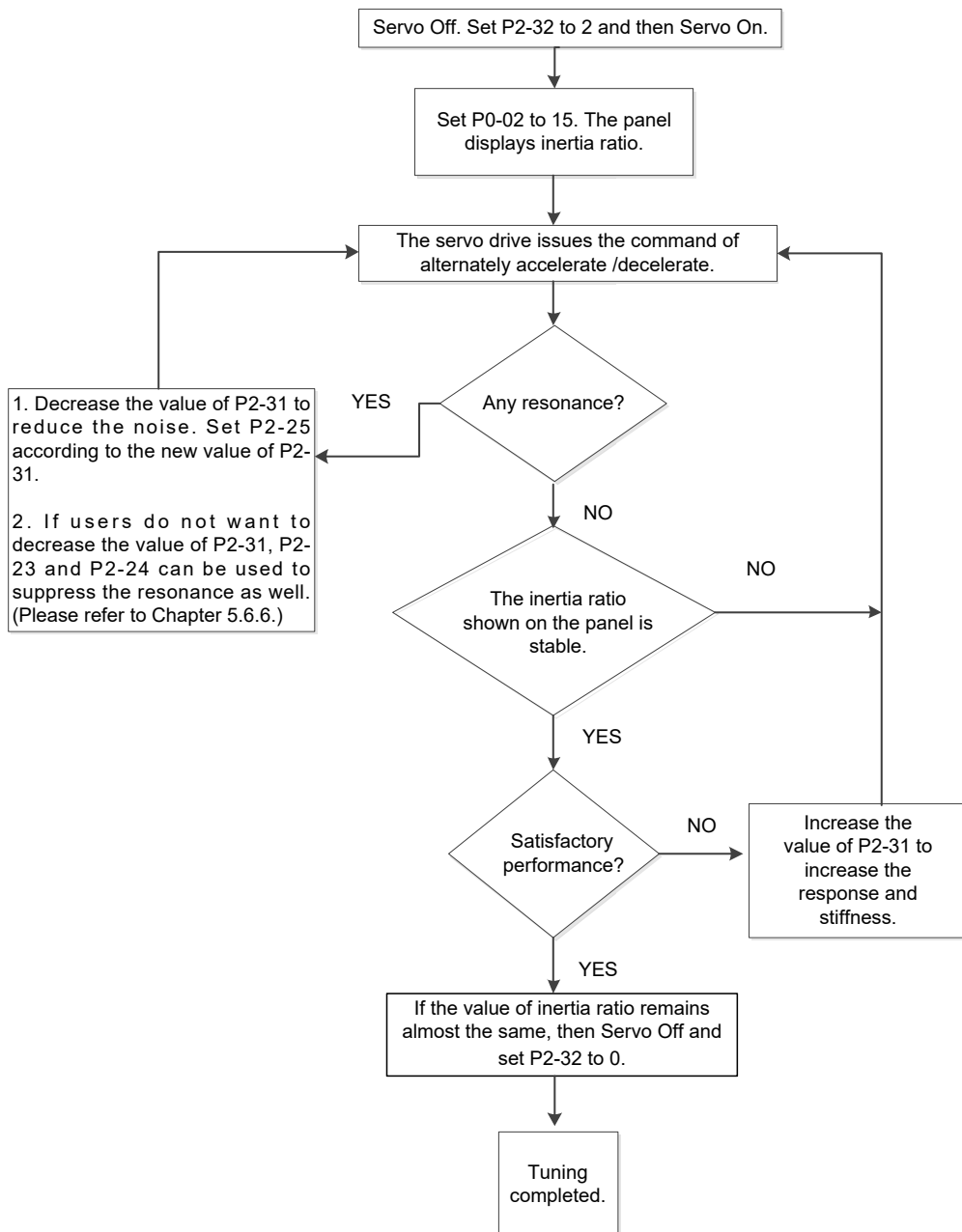
Acceleration / Deceleration time of reaching 2000 r / min should be less than 1 second.

The speed in forward and reverse direction should be higher than 200 r / min.

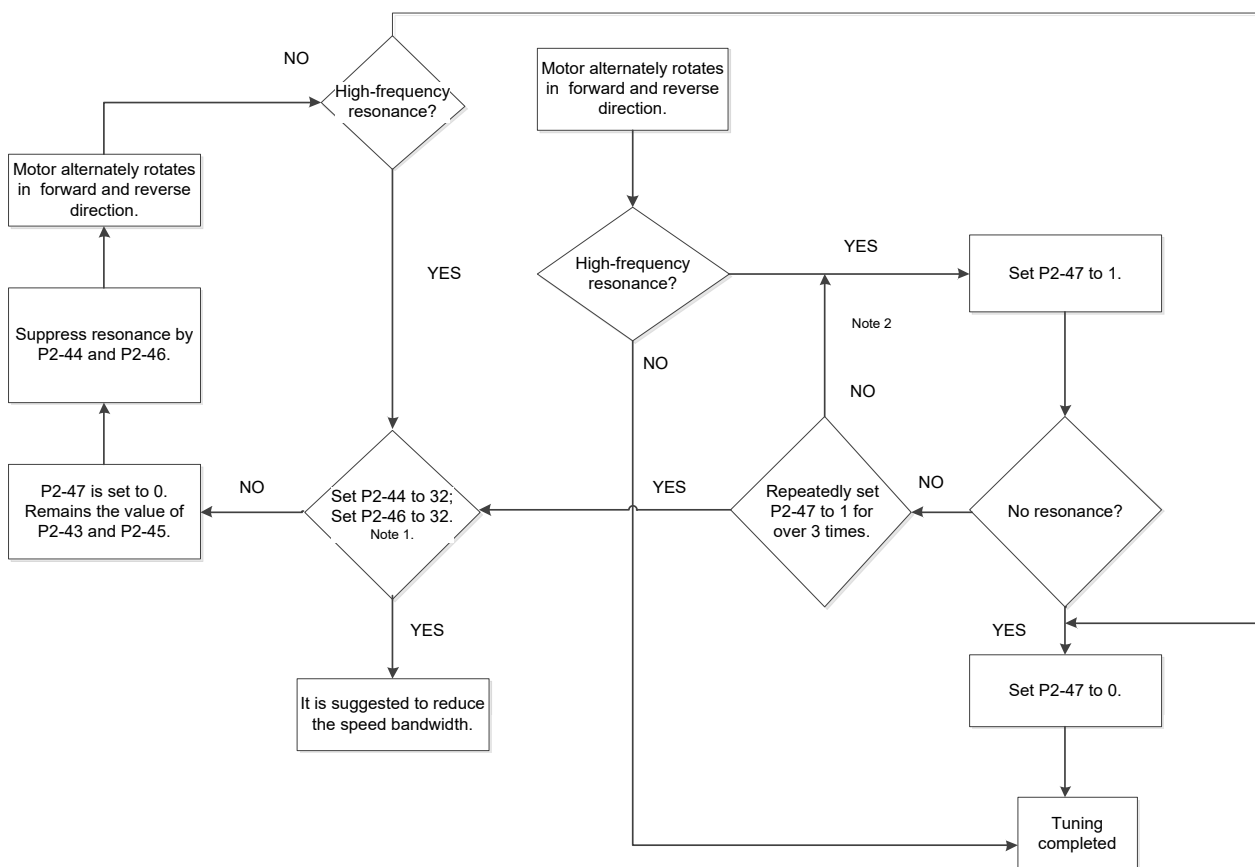
The load inertia should be under 100 times of motor inertia.

The change of external force of inertia ratio cannot be too severe.

In auto mode, the inertia value will be saved to P1-37 every 30 minutes; while in semi-auto mode, the inertia value will be saved to P1-37 only until the system inertia is stable and stops the estimation of load inertia.







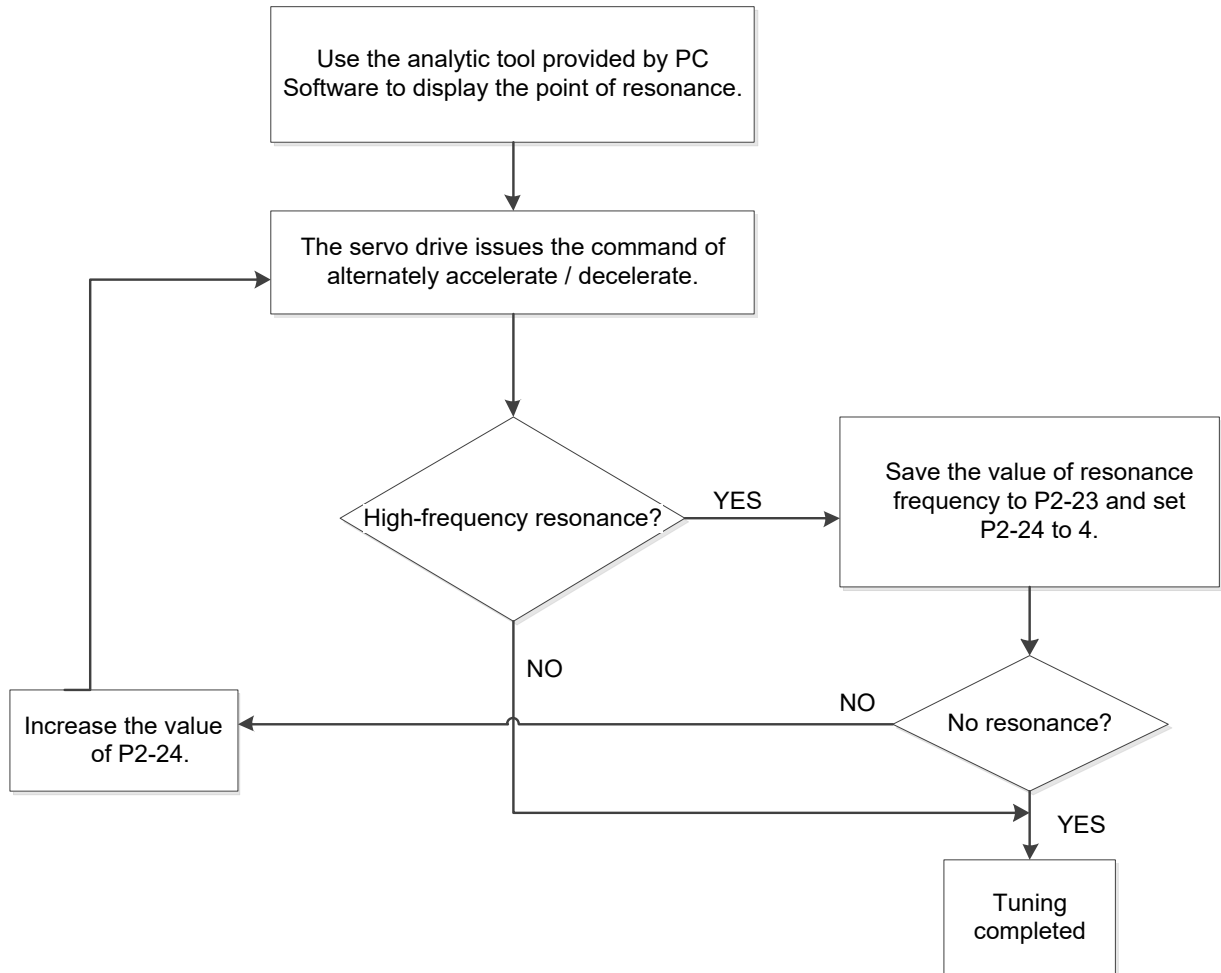
**Note:**

1. Parameter P2-44 and P2-46 are the setting value of resonance suppression. If the value has been set to the maximum (32 dB), and still cannot suppress the resonance, please reduce the speed bandwidth. After setting P2-47, users can check the value of P2-44 and P2-46. If the value of P2-44 is not 0, it means the resonance frequency exists in the system. Then, users can access P2-43 to see the resonance frequency (Hz). When there is another resonance frequency, the information will be shown in P2-45 and p2-46.
2. If resonance still exists, repeatedly set P2-47 to 1 for 3 times and manually adjust the setting of resonance.

### 5.6.6 Mechanical Resonance Suppression Method

Three groups of Notch filter are provided to suppress mechanical resonance. Two of them can be set to the auto resonance suppression and manual adjustment.

The procedure of manually suppress the resonance is as the followings:



### 5.6.7 Tuning Mode and Parameters

Tuning mode	P2-32	Auto-set parameters	User-defined parameters	Inertia adjustment
Manual mode	0 (default setting)	N / A	P1-37 (Inertia ratio of the motor) P2-00 (Position control gain) P2-04 (Speed control gain) P2-06 (Speed integral compensation) P2-25 (Low-pass filter of resonance suppression) P2-26 (Anti-interference gain)	The value remains
Auto mode (continuous estimation)	1	P1-37 P2-00 P2-04 P2-06 P2-25 P2-26 P2-49	P2-31 Frequency response of speed loop setting in auto mode (response level)	Continuous tuning (update the inertia every 30 minutes)
Semi-auto mode (non-continuous estimation)	2	P1-37 P2-00 P2-04 P2-06 P2-25 P2-26 P2-49	P2-31 Frequency response of speed loop setting in semi-auto mode (response level)	Non-continuous tuning (stop updating the inertia after operating for a while)

When switching mode from auto mode 1 to manual mode 0, the value of P1-37, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the one in auto mode.

When switching mode from semi-auto mode 2 to manual mode 0, the value of P1-37, P2-00, P2-04, P2-06, P2-25, P2-26 and P2-49 will be modified to the one in semi-auto mode.

### 5.6.8 Tuning in Manual Mode

The selection of position / speed response frequency should be determined by the machinery stiffness and application. General speaking, the high-frequency machinery or the one requires precise processing needs the higher response frequency. However, it might easily cause the resonance. And the stronger stiffness machinery is needed to avoid the resonance. When using the unknown response frequency machinery, users could gradually increase the gain setting value to increase the response frequency. Then, decrease the gain setting value until the resonance exists. The followings are the related descriptions of gain adjustment.

- Position control gain (KPP, parameter P2-00)

This parameter determines the response of position loop. The bigger KPP value will cause the higher response frequency of position loop. And it will cause better following error, smaller position error, and shorter settling time. However, if the value is set too big, the machinery will vibrate or overshoot when positioning. The calculation of position loop frequency response is as the following:

$$\text{Position Loop Frequency Response (Hz)} = \frac{KPP}{2\pi}$$

- Speed control gain (KVP, parameter P2-04)

This parameter determines the response of speed loop. The bigger KVP value will cause the higher response frequency of speed loop and better following error. However, if the value is set too big, it would easily cause machinery resonance. The response frequency of speed loop must be 4 ~ 6 times higher than the response frequency of position loop. Otherwise, the machinery might vibrate or overshoot when positioning. The calculation of speed loop frequency response is as the following:

$$\text{Speed Loop Frequency Response } f_v = \left( \frac{KVP}{2\pi} \right) \times \left[ \frac{(1+P1-37/10)}{(1+JL/JM)} \right] \text{Hz}$$

JM: motor inertia  
JL: load inertia  
P1-37: 0.1 times

When P1-37 (estimation or setting) equals the real inertia ratio (JL / JM), the real speed loop frequency response will be:

$$f_v = \frac{KVP}{2\pi} \text{ Hz}$$

- Speed integral compensation (KVI, parameter P2-06)

The higher the KVI value is, the better capability of eliminating the deviation will be. However, if the value is set too big, it might easily cause the vibration of machinery. It is suggested to set the value as the following:

$$KVI (\text{Parameter P2-06}) \leq 1.5 \times \text{Speed Loop Frequency Response}$$

- Low-pass filter of resonance suppression (NLP, parameter P2-25)

The high value of inertia ratio will reduce the frequency response of speed loop. Therefore, the KVP value must be increased to maintain the response frequency. During the process of increasing KVP value, it might cause machinery resonance. Please use this parameter to eliminate the noise of resonance. The bigger the value is, the better the capability of improving high-frequency noise will be. However, if the value is set too big, it would cause the instability of speed loop and overshoot. It is suggested to set the value as the following:

$$\text{NLP (Parameter P2-25)} \leq \frac{1000}{6 \times \text{Speed Loop Frequency Response (Hz)}}$$

- Anti-interference gain (DST, parameter P2-26)

This parameter is used to strengthen the ability of resisting external force and gradually eliminate overshoot during acceleration / deceleration. Its default value is 0. It is suggested not to adjust the value in manual mode, unless it is for fine-tuning.

- Position feed forward gain (PFG, parameter P2-02)

It can reduce the position error and shorten the settling time. However, if the value is set too big, it might cause overshoot. If the setting of e-gear ratio is bigger than 10, it might cause the noise as well.

# Chapter 6 Control Mode of Operation

## 6.1 Selection of Operation Mode

Three basic operation modes are provided in this servo drive, position, speed and torque. Users can use single mode (only in one-mode control) and dual mode to control. The following table lists all operation mode and description.

Mode Name		Short Name	Setting Code	Description
Single Mode	Position mode (Terminal input)	PT	00	The servo drive receives position command and commands the motor to the target position. The position command is input via terminal block and receives pulse signal.
	Position mode (Register input)	PR	01	The servo drive receives position command and commands the motor to the target position. The position command is issued by register (64 sets of register in total) and uses DI signal to select the register.
	Speed mode	S	02	The servo drive receives speed command and commands the motor to the target speed. The speed command can be issued by register (3 sets of registers in total) or the external analog voltage (-10 V ~ +10 V). DI signal is used to select the command source.
	Speed mode (No analog input)	Sz	04	The servo drive receives speed command and commands the motor to the target speed. The speed command is issued by register (3 sets of registers in total) and cannot be issued by the external terminal block. DI signal is used to select the command source.

Mode Name		Short Name	Setting Code	Description
	Torque mode	T	03	The servo drive receives torque command and commands the motor to the target torque. The torque command can be issued by register (3 sets of registers in total) or the external analog voltage (-10 V ~ +10 V). DI signal is used to select the command source.
	Torque mode (No analog input)	Tz	05	The servo drive receives torque command and commands the motor to the target torque. The torque command can be issued by register (3 sets of registers in total) and cannot be issued by the external terminal block. DI signal is used to select the command source.
Dual mode		PT-S	06	Switch the mode of PT and S via DI signal.
		PT-T	07	Switch the mode of PT and T via DI signal.
		PR-S	08	Switch the mode of PR and S via DI signal.
		PR-T	09	Switch the mode of PR and T via DI signal.
		S-T	0A	Switch the mode of S and T via DI signal.
		CANopen	0B	Control by the master
		Reserved	0C	Reserved
Multi mode		PT-PR-S	0E	Switch the mode of PT, PR and S via DI signal.
		PT-PR-T	0F	Switch the mode of PT, PR and T via DI signal.

Steps of switching mode:

1. Servo Off the servo drive first. It can be done by switching OFF SON signal.
2. Select the axis of desired changing mode first. Then, fill in the setting code in control mode setting of parameter P1-01. Please refer to the description of Chapter 8.
3. After the setting is completed, turn off the servo drive and then re-power on will do.

The followings will introduce the operation of each mode, including the mode structure, command source and selection, command processing and gain adjustment, etc.

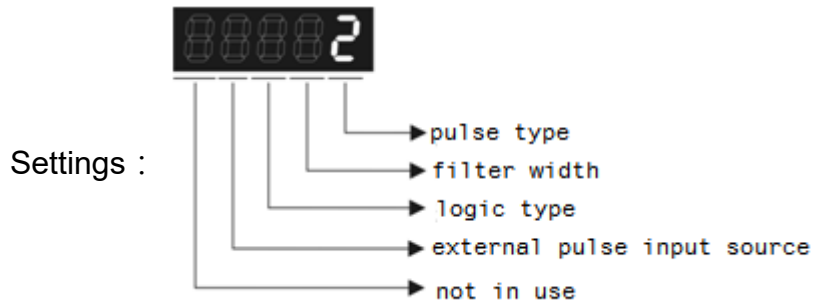
## 6.2 Position Mode

The followings describe the related information and settings of position mode.

### 6.2.1 Position Command of PT Mode

PT, position command is the pulse input from terminal block. There are three types of pulse and each type has positive / negative logic which can be set in parameter P1-00. See as the followings.

<b>P1-00▲</b>	<b>PTT</b>	<b>External Pulse Input Type</b>		<b>Address: 0100H 0101H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.1
	Operational Interface :	Panel / Software	Communication	
	Default :	0x2		
	Control Mode :	PT		
	Unit :	-		
	Range :	0 ~ 1132		
	Data Size :	16bit		
	Format :	HEX		



- Pulse Type
  - 0: AB phase pulse (4x)
  - 1: Clockwise (CW) and Counterclockwise (CCW) pulse
  - 2: Pulse + symbol
  - Other settings: reserved



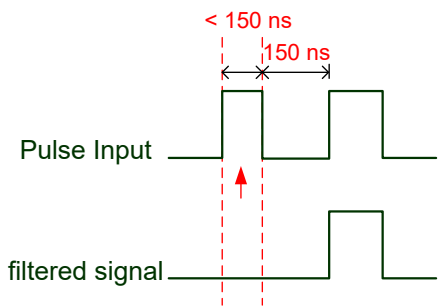
● Filter Width

If the received frequency is much higher than the setting, it will be regarded as the noise and filtered out.

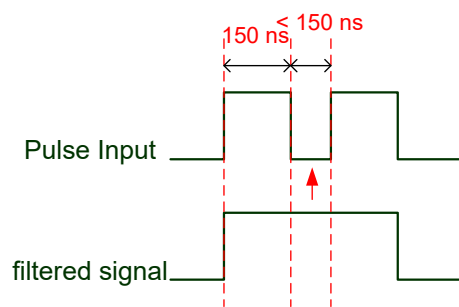
Setting Value	Min. pulse width (Low speed filter frequency*note1)	Setting Value	Min. pulse width (High speed filter frequency*note1)
0	600 ns (0.83 Mpps)	0	150 ns (3.33 Mpps)
1	2.4 us (208 Kpps)	1	600 ns (0.83 Mpps)
2	4.8 us (104 Kpps)	2	1.2 us (416 Kpps)
3	9.6 us (52 Kpps)	3	2.4 us (208 Kpps)
4	No filter function	4	No filter function



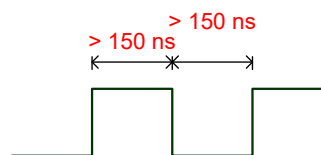
1) When the source of external pulse is from the high-speed differential signal and the setting value is 0 (the high-speed filter frequency is 3.33 Mpps at the moment), then:



When this pulse width is shorter than 150 ns, it will be seen as low level. Two input pulse will be seen as one.



When this pulse width is shorter than 150 ns, it will be seen as high level. Two input pulse will be seen as one.

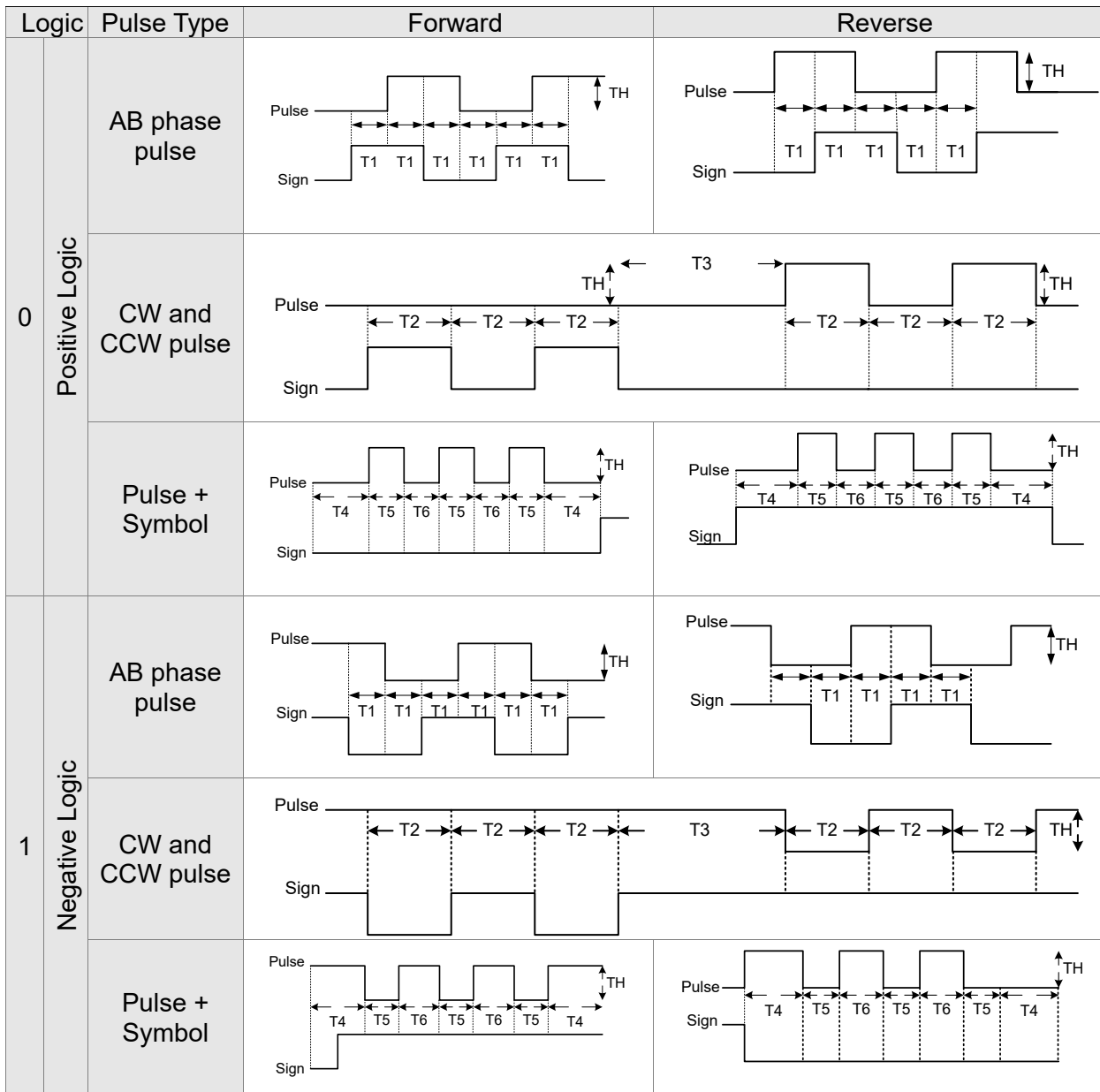


When High, Low duty of the pulse width are longer than 150 ns, it can ensure the pulse command will not be filtered.

If the user uses 2 ~ 4 MHz input pulse, it is suggested to set the filter value to 4.

Note: When the signal is the high-speed pulse specification of 4 Mpps and the settings value of the filter is 4, then the pulse will not be filtered.

● Logic Type



Pulse Specification		Max. Input Frequency	Minimum time width					
			T1	T2	T3	T4	T5	T6
High-speed pulse	Differential Signal	4 Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns
Low-speed pulse	Differential Signal	500 Kpps	0.5µs	1µs	2µs	2µs	1µs	1µs
	Open-collector	200 Kpps	1.25µs	2.5µs	5µs	5µs	2.5µs	2.5µs

Pulse Specification		Max. Input Frequency	Voltage Specification	Forward Current
High-speed pulse	Differential Signal	4 Mpps	5 V	< 25 mA
Low-speed pulse	Differential Signal	500 Kpps	2.8 V ~ 3.7 V	< 25 mA
	Open-collector	200 Kpps	24 V (Max.)	< 25 mA

- The Source of External Pulse:
  - 0: Low-speed optical coupler (CN1 Pin: PULSE, SIGN)
  - 1: High-speed differential (CN1 Pin: HPULSE, HSIGN)

Position pulse can be input from CN1 terminal, PULSE (43), / PULSE (41), HPULSE (38), / HPULSE (29) and SIGN (36), / SIGN (37), HSIGN (46), / HSIGN (40). It could be open-collector or Line Driver. Please refer to Chapter 3.9.1 for wiring method.

## 6.2.2 Position Command in PR Mode

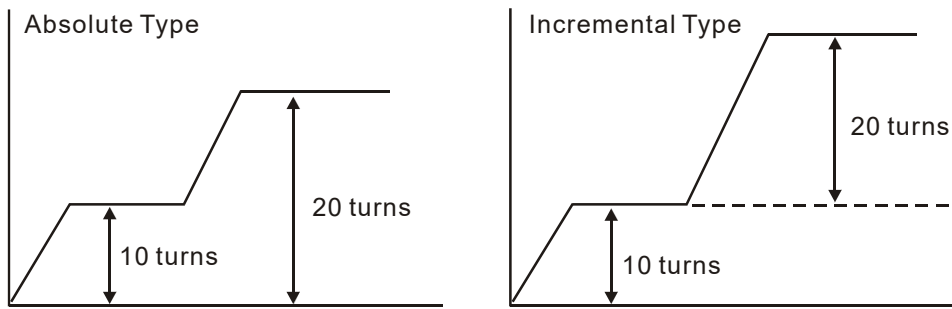
PR position command source of each axis is from the 99-set of register which constituted by parameters (P6-00, P6-01) ~ (P7-26, P7-99). Through communication, one of the 99-set of register can be used as the position command. When going with the external DI/DO (CN1, POS0 ~ POS5 and CTRG), one of the previous 64 sets of register can be selected as the position command. See as the following table:

Position command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding parameter
P0	0	0	0	0	0	0	↑	P6-00
								P6-01
P1	0	0	0	0	0	1	↑	P6-02
								P6-03
~								~
P50	1	1	0	0	1	0	↑	P6-98
								P6-99
P51	1	1	0	0	1	1	↑	P7-00
								P7-01
~								~
P63	1	1	1	1	1	1	↑	P7-26
								P7-27

Status of POS0 ~ POS5: 0 means the DI is OFF; 1 means the DI is ON.

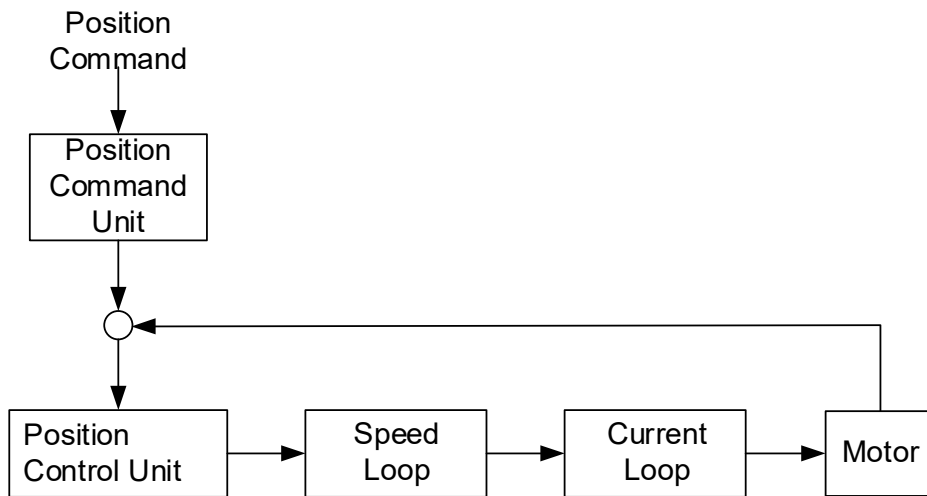
CTRG↑: the moment DI is OFF to ON.

The application of absolute type and incremental type register is rather extensive. It is more like a simple procedure control. Users can complete the cyclic operation by referring to the above table. For example, position command P1 is 10 turns and P2 is 20 turns. P1 is issued first and P2 comes after. The following diagram shows the difference of both.

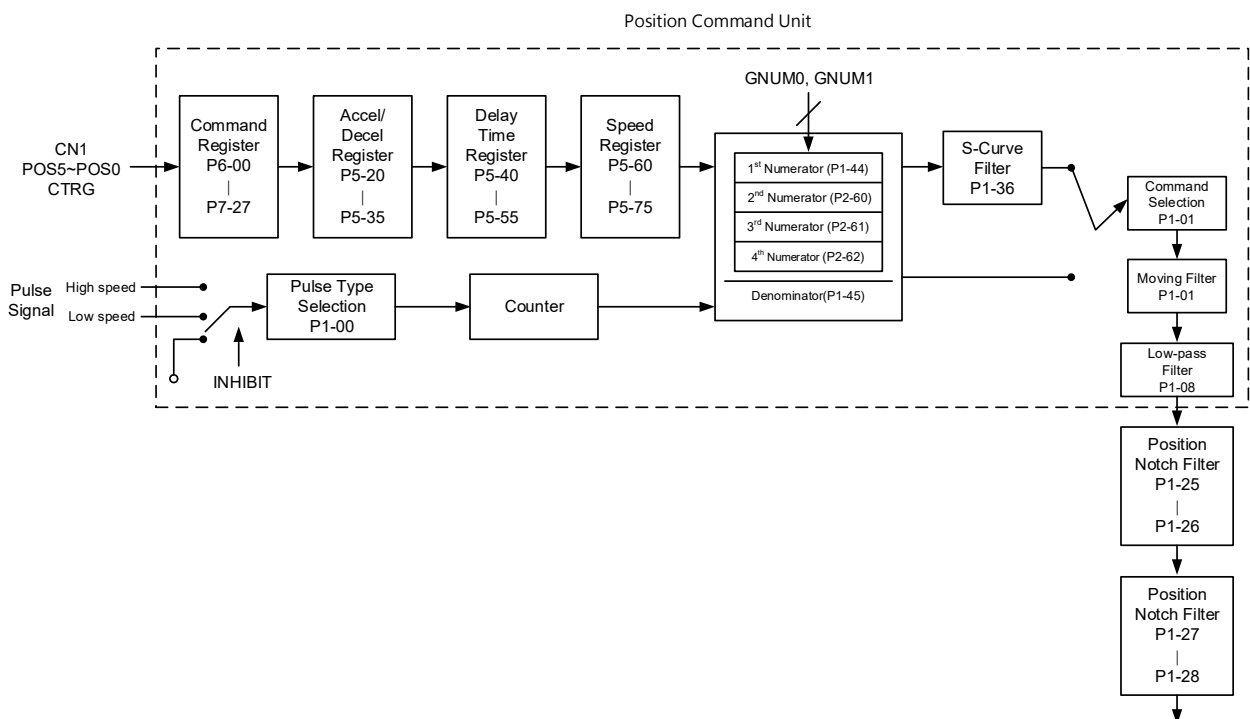


### 6.2.3 Control Structure of Position Mode

The basic control structure is as the following diagram:



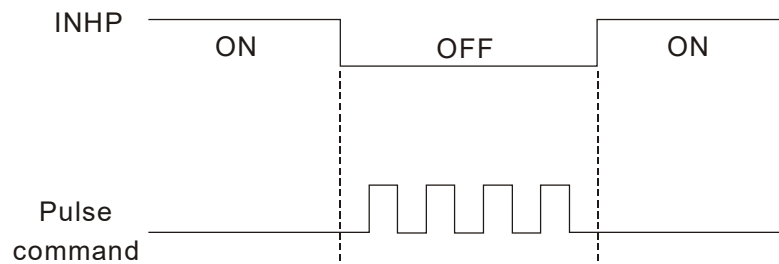
For a better control, the pulse signal should be processed and modified through position command unit. Structure is shown as the diagram below.



The upper path of the above diagram is PR mode and the lower one is PT mode which could be selected via P1-01. Both modes can set E-gear ratio for the proper position resolution. Moreover, either S-curve filter or low-pass filter can be used to smooth the command. See the description in later parts.

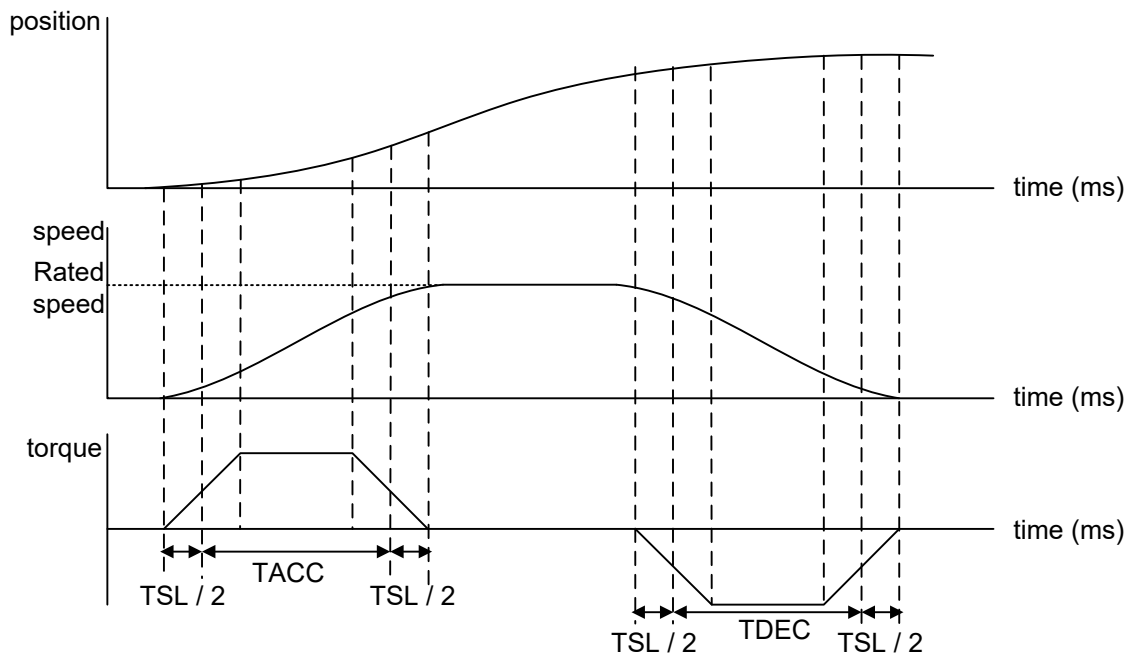
### Pulse Command Inhibit Function (INHP)

Use DI to select INHP (Refer to P2-10 ~ 15 and table 8.1 INHP (45)) before using this function. If not, this function will be unable to use. When DI (INHP) is ON, the pulse command will be cleared in position control mode and the motor will stop running. (Only DI 6 supports this function.)

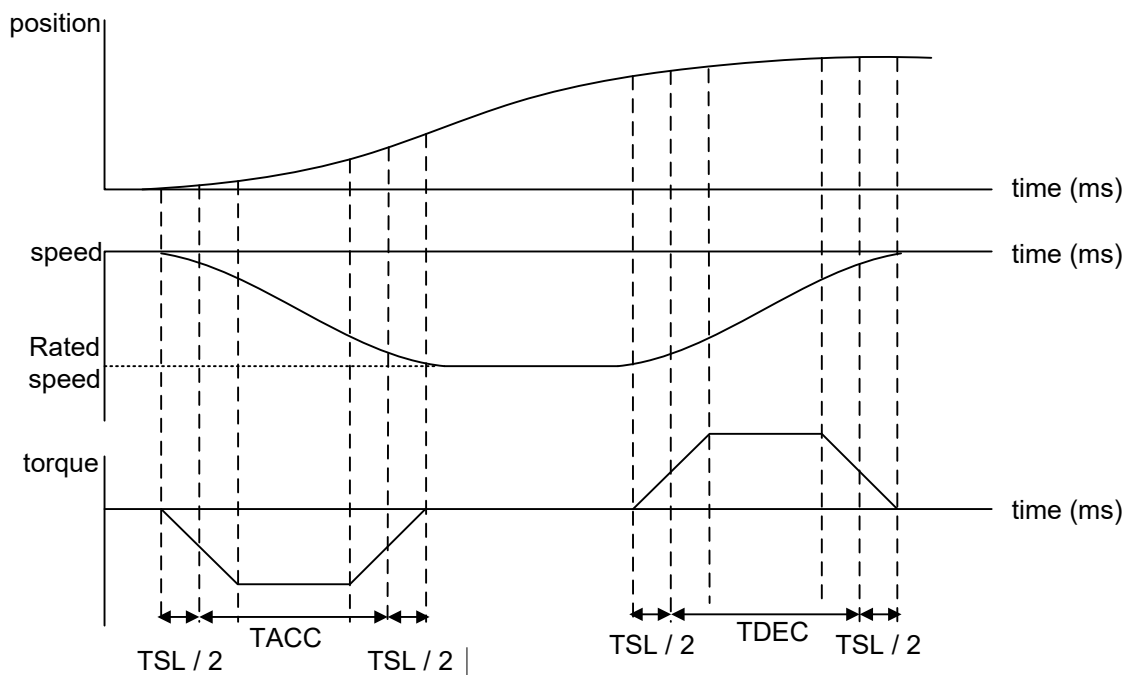


#### 6.2.4 S-curve Filter (Position)

S-curve filter smoothes the motion command. With S-curve filter, the process of acceleration becomes more continuous and the jerk will be smaller. It not only improves the performance when motor accelerates / decelerates, but also smoothes the operation of mechanical structure. When the load inertia increases, the operation of the motor will be influenced by friction and inertia during the time of activation and stop. However, the situation can be improved by increasing the value of Acceleration / Deceleration Constant of S-Curve (TSL), Acceleration Constant of S-Curve (TACC) and Deceleration Constant of S-Curve (TDEC). When the position command source is pulse, its speed and angular acceleration is continuous, thus, S-curve filter is not a must.



Position and speed S-curve and time setting  
(acceleration for position command)



Position and speed S-curve and time setting  
(deceleration for position command)

Related parameters:

P1-34	TACC	Acceleration Constant of S-Curve	Address: 0144H 0145H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	200		
Control Mode :	S		
Unit :	ms		
Range :	1 ~ 65500		
Data Size :	16bit		
Format :	DEC		

Acceleration Constant:

Settings : P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



**NOTE**

- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
- 2) When the source of speed command is analog, the max. range of P1-34 will be set within 20000 automatically.

P1-35	TDEC	Deceleration Constant of S-Curve	Address: 0146H 0147H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	200		
Control Mode :	S		
Unit :	ms		
Range :	1 ~ 65500		
Data Size :	16bit		
Format :	DEC		

Deceleration Constant:

Settings : P1-34, P1-35 and P1-36, the deceleration time of speed command from the rated speed to zero, all can be set individually.

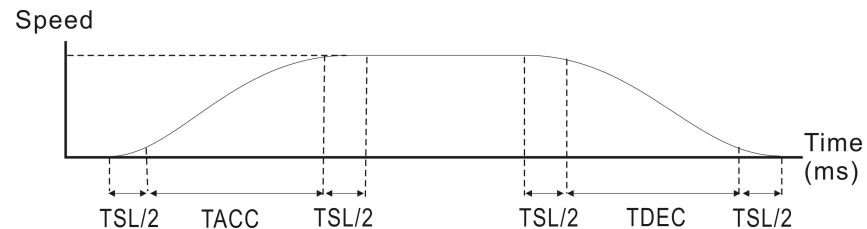
Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



- NOTE**
- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
  - 2) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.

<b>P1-36</b>	<b>TSL</b>	<b>Acceleration / Deceleration Constant of S-Curve</b>		<b>Address: 0148H 0149H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	S · PR		
	Unit :	ms		
	Range :	0 ~ 65500 (0: disable this function)		
	Data Size :	16bit		
	Format :	DEC		

Acceleration / Deceleration Constant of S-Curve:



Settings : P1-34: Set the acceleration time of acceleration / deceleration of trapezoid-curve

P1-35: Set the deceleration time of acceleration / deceleration of trapezoid-curve

P1-36: Set the smoothing time of S-curve acceleration and deceleration

P1-34, P1-35 and P1-36 can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



- NOTE**
- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
  - 2) When the source of speed command is analog, the max. range of P1-36 will be set within 10000 automatically.



## 6.2.5 Electronic Gear Ratio

Related parameters:

P1-44 ▲	GR1	Gear Ratio (Numerator) (N1)	Address: 0158H 0159H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	128	
	Control Mode :	PT / PR	
	Unit :	Pulse	
	Range :	1 ~ (2 <sup>29</sup> -1)	
	Data Size :	32bit	
	Format :	DEC	

Settings : Please refer to P2-60 ~ P2-62 for the setting of multiple gear ratio (numerator).



### NOTE

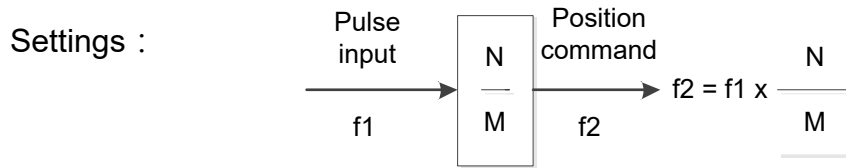
- 1) In PT mode, the setting value can be changed when Servo ON.
- 2) In PR mode, the setting value can be changed when Servo OFF.

P1-45	GR2	Gear Ratio (Denominator) (M)	Address: 015AH 015BH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	10	
	Control Mode :	PT / PR	
	Unit :	Pulse	
	Range :	1 ~ (2 <sup>31</sup> -1)	
	Data Size :	32bit	
	Format :	DEC	

If the setting is wrong, the servo motor will easily have sudden unintended acceleration.

Please follow the rules for setting:

The setting of pulse input:



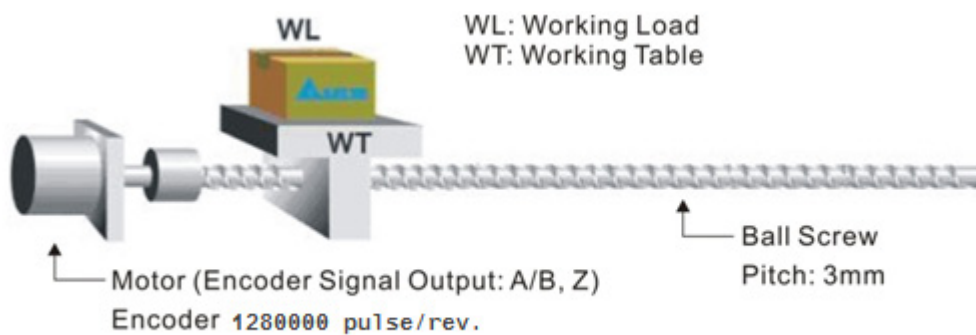
Range of command pulse input :  $1 / 50 < N \times / M < 25600$

**NOTE** 1) The setting value cannot be changed when Servo ON neither in PT nor in PR mode.

E-Gear ratio  $= \left(\frac{N}{M}\right) = \frac{P1-44}{P1-45}$ , has to match  $\frac{1}{50} \leq \left(\frac{N}{M}\right) \leq 5000$

Electronic gear provides simple ratio change of travel distance. The high electronic gear ratio would cause the position command to be the stepped command. S-curve or low-pass filter can be used to improve the situation. When electronic gear ratio is set to 1, the motor will turn one cycle for every 1280000 PUU. When electronic gear ratio is changed to 0.5, then every two pulses from the command will refer to one PUU of motor encoder.

For example: after setting the electronic gear ratio properly, the moving distance of the object is  $1 \mu\text{m}$  / pulse, which is easier to use.



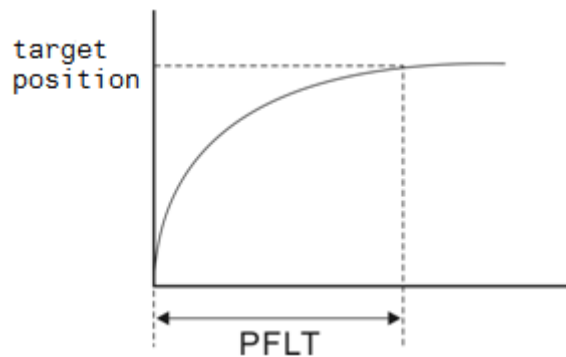
	Gear Ratio	Moving distance of each pulse command
Electronic gear is unapplied.	$= \frac{1}{1}$	$= \frac{3 \times 1000}{4 \times 2500} = \frac{3000}{10000} = \mu\text{m}$
Electronic gear is applied.	$= \frac{10000}{3000}$	$= 1 \mu\text{m}$

### 6.2.6 Low-pass Filter

Related parameters:

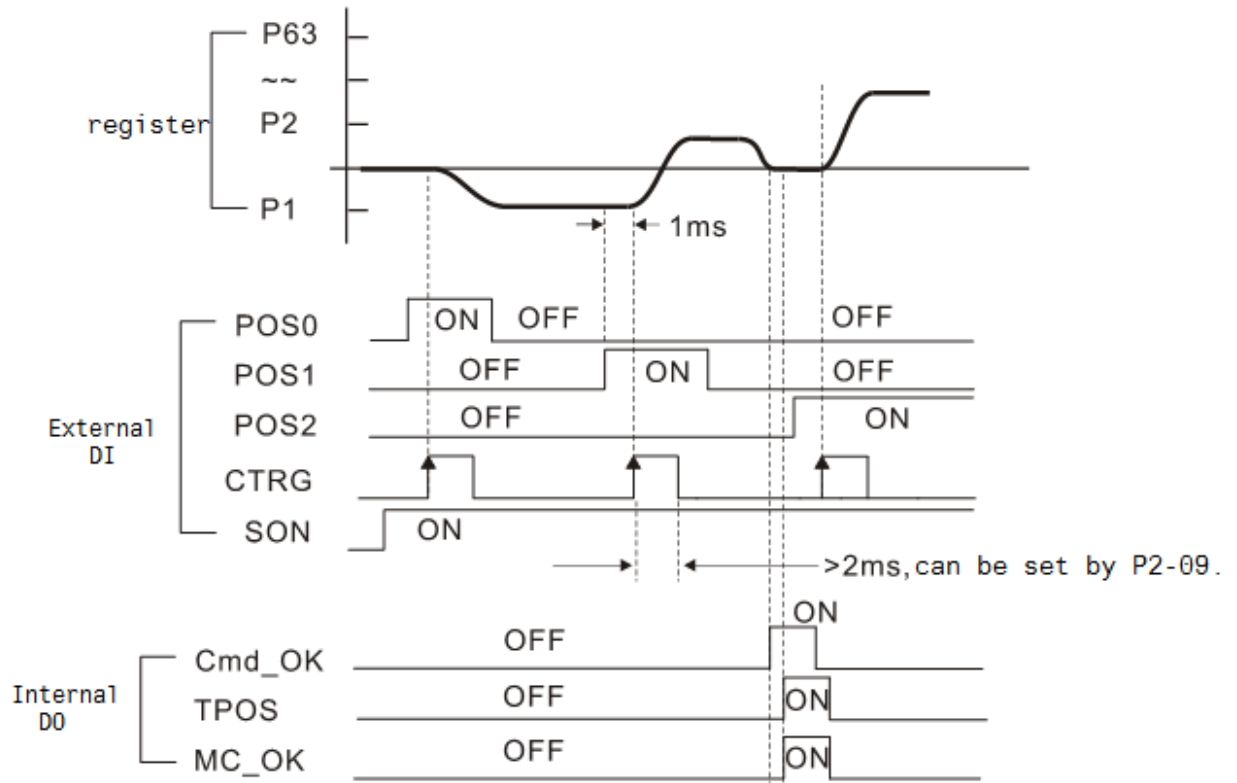
<b>P1-08</b>	<b>PFLT</b>	<b>Smooth Constant of Position Command (Low-pass Filter)</b>		<b>Address: 0110H 0111H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.6
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PT / PR		
	Unit :	10 ms		
	Range :	0 ~ 1000		
	Data Size :	16bit		
	Format :	DEC		
	Example :	11 = 110 ms		

Settings : 0: Disabled



### 6.2.7 Timing Diagram in Position Mode (PR)

In PR mode, the position command is selected by either DI signal (POS0 ~ POS5 and CTRG) of CN1 or communication. Please refer to Section 6.2.2 for the information about DI signal and its selected register. Followings are the timing diagrams.



Cmd\_OK: will be output after PR command is completed.  
 TPOS: will be output when the motor speed is slower than P1-38 setting value.  
 MC\_OK: will be output when Cmd\_OK and TPOS are output.

## 6.2.8 Gain Adjustment of Position Loop

Before setting the position control unit, users have to manually (P2-32) complete the setting of speed control unit since the speed loop is included in position loop. Then, set the proportional gain (parameter P2-00) and feed forward gain (parameter P2-02) of position loop. Users also can use the auto mode to set the gain of speed and position control unit automatically.

- 1) Proportional gain: Increase the gain so as to enhance the response bandwidth of position loop.
- 2) Feed forward gain: Minimize the deviation of phase delay

The position loop bandwidth cannot exceed the speed loop bandwidth. It is suggested that  $f_p \leq \frac{f_v}{4}$ .

$f_v$ : response bandwidth of speed loop (Hz).

$$KPP = 2 \times \pi \times f_p.$$

$f_p$ : response bandwidth of position loop (Hz).

For example, the desired position bandwidth is 20 Hz  $\rightarrow KPP = 2 \times \pi \times 20 = 125$ .

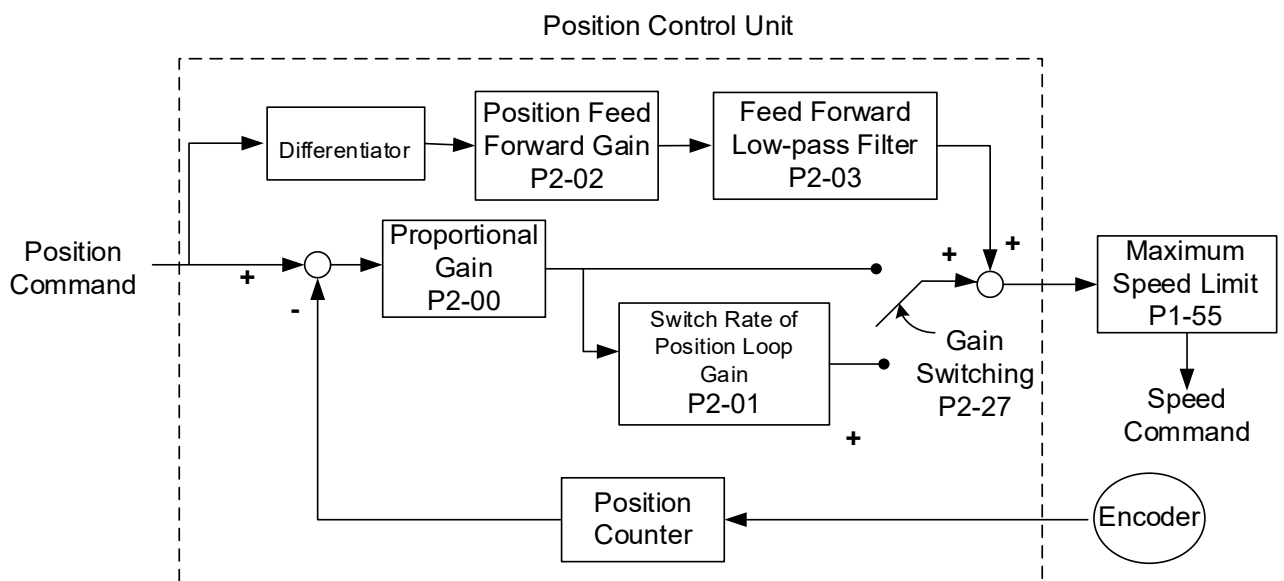
Related parameters:

P2-01	PPR	Switching Rate of Position Loop Gain		Address: 0202H 0203H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 6.2.8
Operational Interface :	Panel / Software	Communication		
Default :	100			
Control Mode :	PT / PR			
Unit :	%			
Range :	10 ~ 500			
Data Size :	16bit			
Format :	DEC			

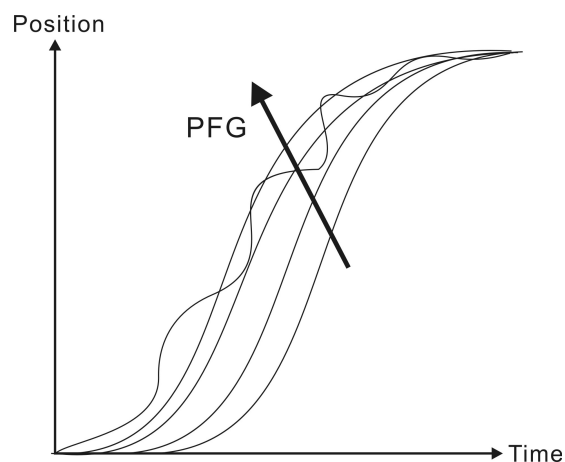
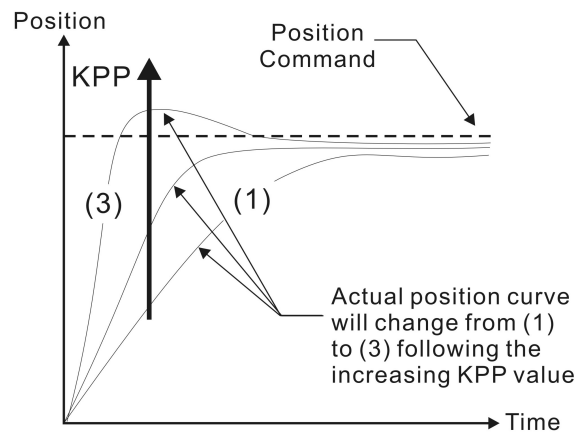
Settings : Switch the changing rate of position loop gain according to the gain-switching condition.

<b>P2-02</b>	<b>PFG</b>	<b>Position Feed Forward Gain</b>		<b>Address: 0204H 0205H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.8
	Operational Interface :	Panel / Software	Communication	
	Default :	50		
	Control Mode :	PT / PR		
	Unit :	%		
	Range :	0 ~ 100		
	Data Size :	16bit		
	Format :	DEC		

Settings : If the position command is changed smoothly, increase the gain value can reduce the position error. If the position command is not changed smoothly, decreasing the gain value can reduce the vibration of the mechanism.



When the value of proportional gain, KPP is set too big, the response bandwidth of position loop will be increased and diminish the phase margin. And the motor rotor rotates vibrantly in forward and reverse direction at the moment. Thus, KPP has to be decreased until the rotor stops vibrating. When the external torque interrupts, the over-low KPP cannot meet the demand of position deviation. In this situation, parameter P2-02 can effectively reduce the position error.



### 6.2.9 Low-frequency Vibration Suppression in Position Mode

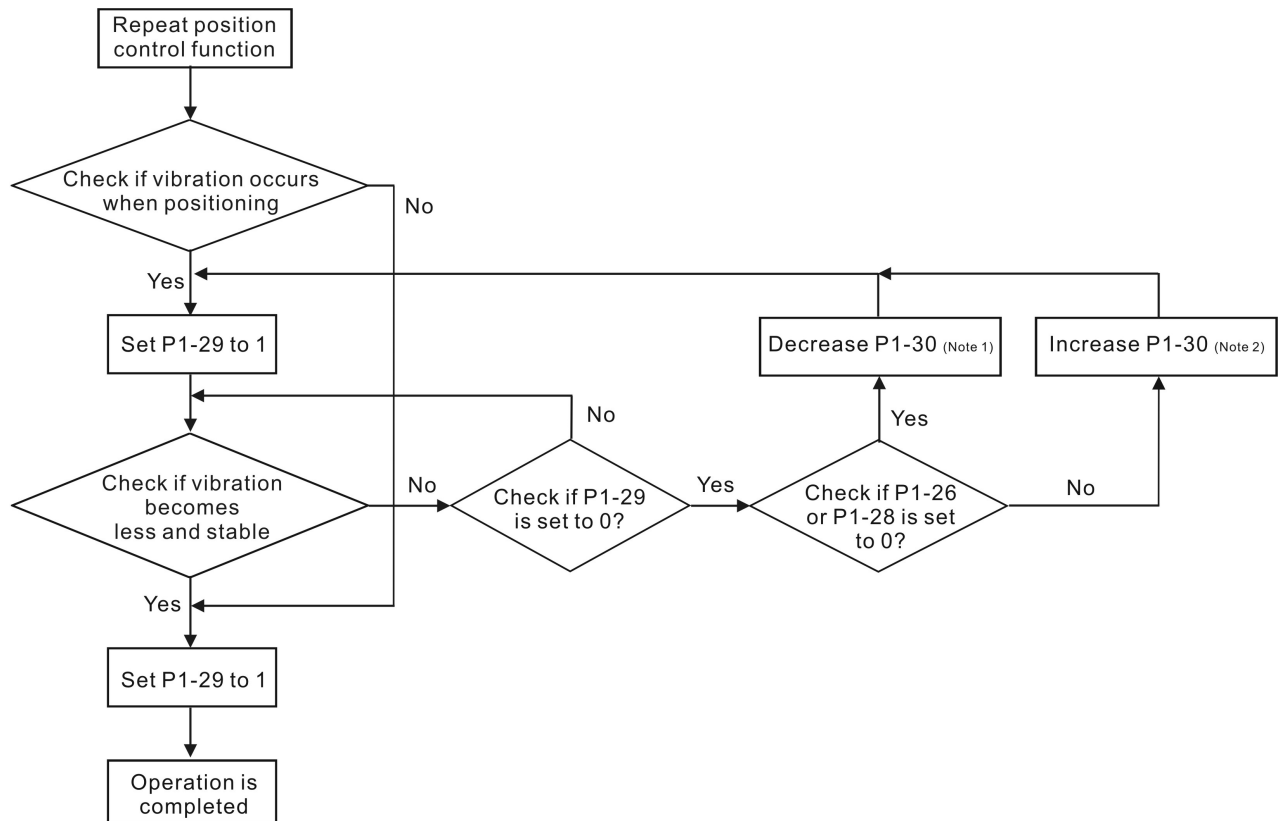
If the stiffness is not enough, the mechanical transmission will continue to vibrate even when the motor stops after completing the positioning command. The function of low-frequency vibration suppression can eliminate the vibration of mechanical transmission. The range is between 1.0 Hz and 100.0 HZ. Both manual setting and auto setting are provided.

Auto setting:

If the frequency is hard to find, it can enable the function of auto low-frequency vibration suppression. This function automatically searches the frequency of low-frequency vibration. If P1-29 is set to 1, the system will disable the function of low-frequency vibration suppression automatically and starts to search the vibration frequency. When the detected frequency remains at the same level, P1-29 will be set to 0 automatically and set the first frequency in P1-25 and set P1-26 to 1. The second frequency will be set in P1-27 and then set P1-28 to 1. If P1-29 is automatically set back to 0 and still has low-frequency vibration, please check if the function of P1-26 or P1-28 is enabled. If the

value of P1-26 and P1-28 is 0, it means no frequency has been detected. Please decrease the value of P1-30 and set P1-29 to 1 so as to search the vibration frequency again. Please note that when the detection level is set too small, the noise will be regarded as the low-frequency.

Flowchart of auto low-frequency vibration suppression:



Note 1: When the value of P1-26 and P1-28 is 0, it means it is unable to search the frequency. It is probably because the detection level is set too high and is unable to detect the low-frequency vibration.

Note 2: When the value of P1-26 or P1-28 is not set to 0 and still cannot eliminate the vibration, it is probably because the detection level is set too low, the system regards the noise or other non-primary frequency as the low-frequency vibration.

Note 3: When the process of auto vibration suppression is completed and the vibration still cannot be diminished, P1-25 or P1-27 can be manually set to suppress the vibration if the frequency (Hz) of the low-frequency is identified.



The related parameters of auto vibration suppression:

P1-29	AVSM	Auto Low-frequency Vibration Supression Setting	Address: 013AH 013BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PT / PR		
Unit :	-		
Range :	0 ~ 1		
Data Size :	16bit		
Format :	DEC		

0: The function is disabled.

1: The value will set back to 0 after vibration suppression.

Description of Auto Mode Setting:

Settings : When the parameter is set to 1, it is in auto suppression. When the vibration frequency is not being detected or the value of searched frequency is stable, the parameter will set to 0 and save the low-frequency vibration suppression to P1-25 automatically.

P1-30	VCL	Low-frequency Vibration Detection	Address: 013CH 013DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	500		
Control Mode :	PT / PR		
Unit :	Pulse		
Range :	1 ~ 8000		
Data Size :	16bit		
Format :	DEC		

Settings : When enabling the auto suppression (P1-29 = 1), it will automatically search the detection level. The lower the value is, the more sensitive of the detection will be. However, it is easy to misjudge the noise or regard the other low-frequency vibration as the suppression frequency. If the value is bigger, the system will make more precise judgment. However, if the vibration of the mechanism is smaller, it might not detect the frequency of low-frequency vibration.

P1-30 is to set the range to detect the magnitude of low-frequency vibration. When the frequency is not being detected, it is probably because the value of P1-30 is set too big which exceeds the range of vibration. It is suggested to decrease the value of P1-30. Please note that if the value is too small, the system might regard the noise as the vibration frequency. If the SCOPE is available, it can be used to observe the range of position error (pulse) between upper and lower magnitude of the curve and set up the appropriate value of P1-30.

#### Manual Setting:

There are two sets of low-frequency vibration suppression. One is parameter P1-25 ~ P1-26 and another one is parameter P1-27 ~ P1-28. These two sets of low-frequency vibration suppression can be used to eliminate two different frequency vibration. Parameter P1-25 and P1-27 are used to suppress the low-frequency vibration. The function is working only when the parameter setting value of low-frequency vibration close to the real vibration frequency. Parameter P1-26 and P1-28 are used to set the response after filter. The bigger the setting value of P1-26 and P1-28 is, the better response will be. However, if the value is set too big, the motor might not operate smoothly. The default value of parameter P1-26 and P1-28 is 0, which means the function is disabled. Followings are the related parameters:

P1-25	VSF1	Low-frequency Vibration Suppression (1)	Address: 0132H 0133H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	PT / PR		
Unit :	0.1 Hz		
Range :	10 ~ 1000		
Data Size :	16bit		
Format :	DEC		
Example :	150 = 15 Hz		

The setting value of the first low-frequency vibration suppression.  
 Settings : If P1-26 is set to 0, then it will disable the first low-frequency filter.

P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	Address: 0134H 0135H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PT / PR		
Unit :	-		
Range :	0 ~ 9 (0: Disable the first low-frequency filter)		
Data Size :	16bit		
Format :	DEC		

The first low-frequency vibration suppression gain. The bigger the value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to operate smoothly. It is suggested to set the value to 1.

P1-27	VSF2	Low-frequency Vibration Suppression (2)	Address: 0136H 0137H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	PT / PR		
Unit :	0.1 Hz		
Range :	10 ~ 1000		
Data Size :	16bit		
Format :	DEC		
Example :	150 = 15 Hz		

Settings : The setting value of the second low-frequency vibration suppression. If P1-28 is set to 0, then it will disable the second low-frequency filter.

P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	Address: 0138H 0139H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PT / PR		
Unit :	-		
Range :	0 ~ 9 (0: Disable the second low-frequency filter)		
Data Size :	16bit		
Format :	DEC		

Settings : The second low-frequency vibration suppression gain. The bigger the value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to operate smoothly. It is suggested to set the value to 1.

## 6.3 Speed Mode

Speed control mode (S or Sz) is applicable in precision speed control, such as CNC machine tools. This servo drive includes two types of command input, analog and register. Analog command input can use external voltage to control the motor speed. There are two methods in register input. One is used before operation. Users set different value of speed command in three registers, and then use SPD0, SPD1 of CN1 DI signal for switching. Another method is to change the value of register by communication. In order to deal with the problem of non-continuous speed command when switching register, a complete S-curve program is provided. In close-loop system, this servo drive adopts gain adjustment and integrated PI controller and two modes (manual and auto) for selection.

Users can set all parameters and all auto or auxiliary function will be disabled in manual mode. While in auto mode, it provides the function of load inertia estimation and parameter adjustment. In auto mode, parameters which set by users will be regarded as the default value.

### 6.3.1 Selection of Speed Command

There are two types of speed command source, analog voltage and internal parameters. The selection is determined by CN1 DI signal. See as the followings.

Speed Command No.	CN1 DI Signal		Command Source		Content	Range
	SPD1	SPD0				
S1	0	0	Mode	S	Voltage deviation between V-REF and GND	-10 V ~ +10 V
				Sz	N/A	Speed command is 0
S2	0	1	Register parameters		P1-09	-60000 ~ 60000
S3	1	0			P1-10	-60000 ~ 60000
S4	1	1			P1-11	-60000 ~ 60000

- Status of SPD0 ~ SPD1: 0 means DI OFF, 1 means DI ON.
- When both SPD0 and SPD1 are 0, if it is in Sz mode, the command will be 0. Thus, if there is no need to use analog voltage as the speed command, Sz mode can be applied to tackle the problem of zero-drift. If it is in S mode, the command will be the voltage deviation between V-REF and GND. The range of input voltage is between -10 V and +10 V and its corresponding speed is adjustable (P1-40).
- When one of SPD0 and SPD1 is not 0, the speed command is from the internal parameter. The command is activated after changing the status of SPD0 ~ SPD1.

There is no need to use CTRG for triggering.

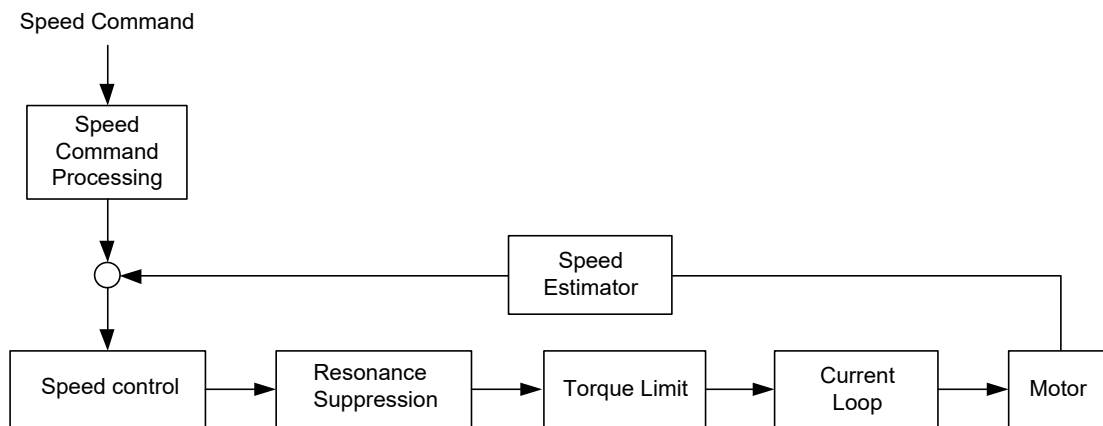
- The setting range of internal parameters is between -60000 and 60000. Setting value = setting range x unit (0.1 r / min).

For example: P1-09 = +30000, setting value = +30000 x 0.1 r / min = +3000 r / min

The speed command not only can be issued in speed mode (S or Sz), but also in torque mode (T or Tz) as the speed limit.

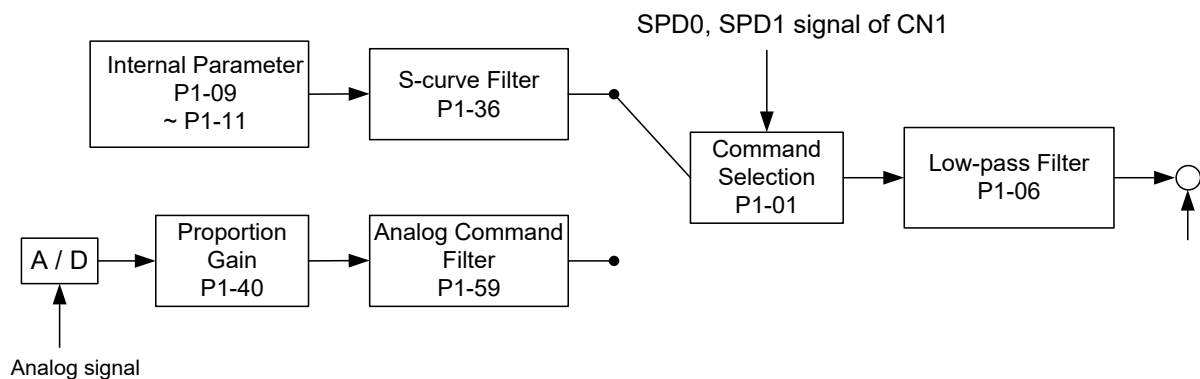
### 6.3.2 Control Structure of Speed Mode

The basic control structure is shown as the following diagram:



The speed command unit is to select speed command source according to Section 6.3.1, including the scaling (P1-40) setting and S-curve setting. The speed control unit manages the gain parameters of the servo drive and calculates the current command for servo motor in time. The resonance suppression unit is to suppress the resonance of mechanism. Detailed descriptions are shown as the following:

Here firstly introduces the function of speed command unit. Its structure is as the following diagram.

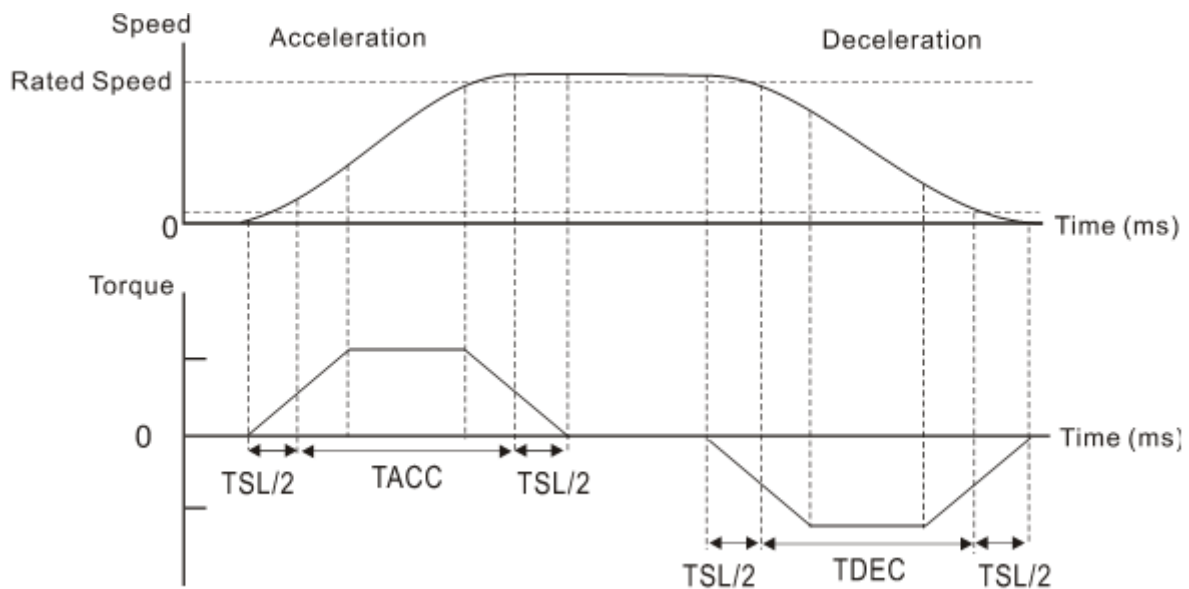


The upper path is the command from register while the lower one is external analog command. The command is selected according to the status of SPD0, SPD1 and P1-01(S or Sz). Usually, S-curve and low-pass filter are applied for having a smooth resonance of command.

### 6.3.3 Smooth Speed Command

#### S-curve Filter

During the process of acceleration or deceleration, S-curve filter applies the program of three-stage acceleration curve for smoothing the motion command, which generates the continuous acceleration. It is for avoiding the jerk (the differentiation of acceleration) came from the sudden command change and indirectly causes the resonance and noise. Users can use acceleration constant of S-curve (TACC) to adjust the slope changed by acceleration, deceleration constant of S-curve (TDEC) to adjust the slope changed by deceleration and acceleration / deceleration constant of S-curve (TSL) to improve the status of motor activation and stop. The calculation of the time to complete the command is provided.



The relation between S-curve and time setting

Related parameters:

P1-34	TACC	Acceleration Constant of S-Curve	Address: 0144H 0145H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	200		
Control Mode :	S		
Unit :	ms		
Range :	1 ~ 65500		
Data Size :	16bit		
Format :	DEC		

Acceleration Constant:

Settings : P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



**NOTE**

- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
- 2) When the source of speed command is analog, the max. range of P1-34 will be set within 20000 automatically.




<b>P1-35</b>	<b>TDEC</b>	<b>Deceleration Constant of S-Curve</b>		<b>Address: 0146H 0147H</b>
	Parameter Attribute :	Parameter for individual axis		Related Sections: Section 6.3.3
	Operational Interface :	Panel / Software	Communication	
	Default :	200		
	Control Mode :	S		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		

Deceleration Constant:

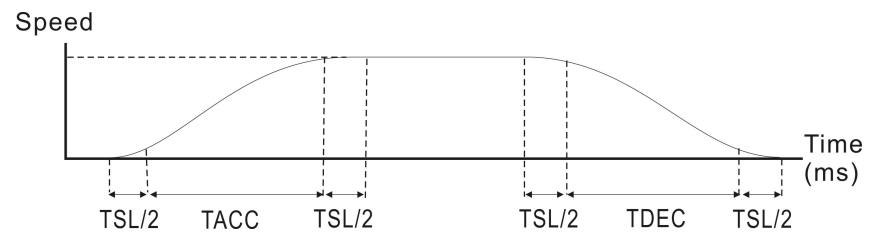
P1-34, P1-35 and P1-36, the deceleration time of speed

Settings : command from the rated speed to zero, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.

-  **NOTE**
- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
  - 2) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.

<b>P1-36</b>	<b>TSL</b>	<b>Acceleration / Deceleration Constant of S-Curve</b>		<b>Address: 0148H 0149H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	S · PR		
	Unit :	ms		
	Range :	0 ~ 65500 (0 : disable this function)		
	Data Size :	16bit		
	Format :	DEC		

Acceleration / Deceleration Constant of S-Curve:




Settings : P1-34: Set the acceleration time of acceleration / deceleration of trapezoid-curve

P1-35: Set the deceleration time of acceleration / deceleration of trapezoid-curve

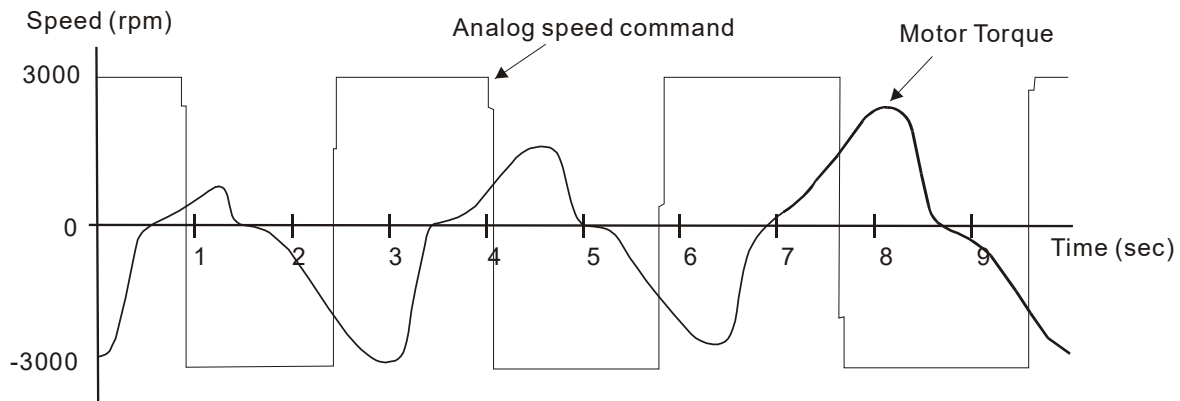
P1-36: Set the smoothing time of S-curve acceleration and deceleration

P1-34, P1-35 and P1-36 can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.

-  **NOTE**
- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
  - 2) When the source of speed command is analog, the max. range of P1-36 will be set within 10000 automatically.

## Analog Speed Command Filter

Analog speed command filter is provided especially for ASDA-M series users. It mainly helps with buffer when the analog input signal changes too fast.



Analog speed command filter smooths the analog input command. Its time program is the same as S-curve filter in normal speed. Also, the speed curve and the acceleration curve are both continuous. The above is the diagram of analog speed command filter. The slope of speed command in acceleration and deceleration is different. Users could adjust the time setting (P1-34, P1-35 and P1-36) according to the actual situation to improve the performance.

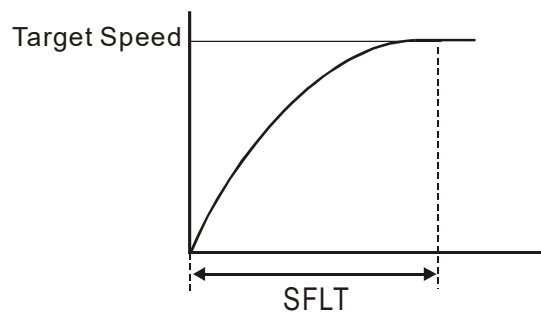
### Command end low-pass filter

It is usually used to eliminate the unwanted high-frequency response or noise. It also can smooth the command.

Related parameters:

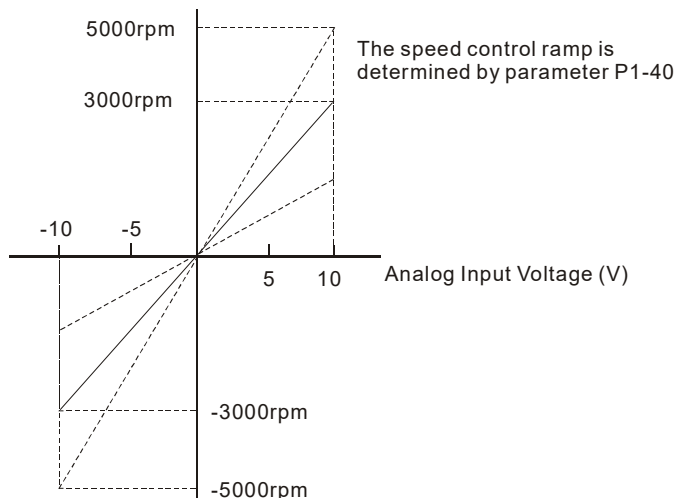
P1-06	SFLT	Analog Speed Command (Low-pass Filter)	Address: 010CH 010DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	S		
Unit :	ms		
Range :	0 ~ 1000 (0: disable this function)		
Data Size :	16bit		
Format :	DEC		

Settings : 0: Disabled



### 6.3.4 The Scaling of Analog Command

The motor speed command is controlled by the analog voltage deviation between V\_REF and VGND. Use parameter P1-40 to adjust the speed-control slope and its range.



Related parameters:

For example: Set P1-40 to 2000, the input voltage 10 V corresponds to 2000 r / min, speed command.

<b>P1-40 ▲</b>	<b>VCM</b>	<b>Maximum Speed of Analog Speed Command</b>		<b>Address: 0150H 0151H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.4
	Operational Interface :	Panel / Software	Communication	
	Default :	Same as the rated speed of each model		
	Control Mode :	S / T		
	Unit :	r / min		
	Range :	0 ~ 10000		
	Data Size :	16bit		
	Format :	DEC		

Maximum Speed of Analog Speed Command:

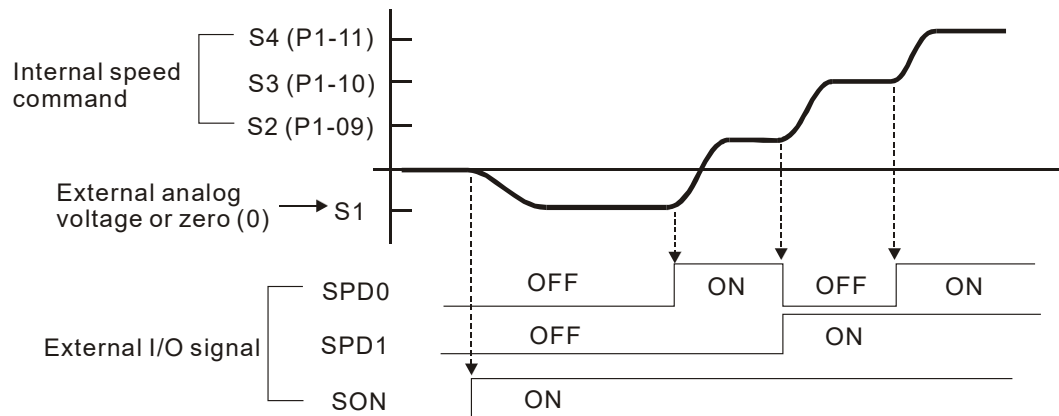
Settings : In speed mode, the analog speed command inputs the swing speed setting of the max. voltage (10 V). For example, if the setting is 3000, when the external voltage inputs 10 V, it means the speed control command is 3000 r / min. If the external voltage input is 5 V, then the speed control command is 1500 r / min.

$$\text{Speed control command} = \text{input voltage value} \times \text{setting value} / 10$$

In position or torque mode, analog speed limit inputs the swing speed limit setting of the max. voltage (10 V).

Speed limit command = input voltage value x setting value / 10

### 6.3.5 The Timing Diagram in Speed Mode

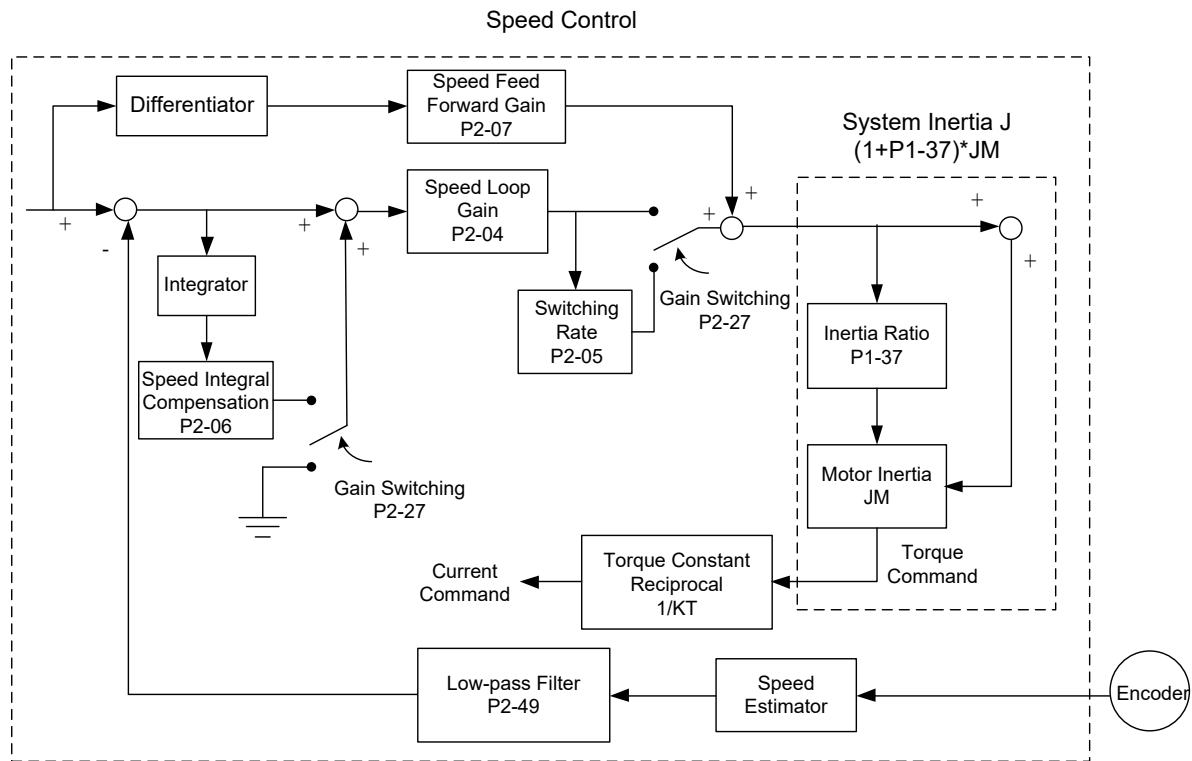


#### NOTE

- 1) OFF means the contact point is open while ON means the contact point is close.
- 2) When it is in Sz mode, the speed command S1 = 0; When it is in S mode, the speed command S1 is the external analog voltage input.
- 3) When the servo drive is On, please select the command according to SPD0 ~ SPD1 status.

### 6.3.6 Gain Adjustment of Speed Loop

Here introduces the function of speed control unit. The following shows its structure.



Many kinds of gain in speed control unit are adjustable. Two ways, manual and auto, are provided for selection.

Manual: All parameters are set by users and the auto or auxiliary function J will be disabled in this mode.

Auto: General load inertia estimation is provided. It adjusts the parameter automatically. Its framework is divided into PI auto gain adjustment and PDFF auto gain adjustment.

Parameter P2-32 can be used to adjust the gain.

P2-32 ▲	AUT2	Tuning Mode Selection	Address: 0240H 0241H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 5.6 Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x2		
Data Size :	16bit		
Format :	HEX		

0: manual mode

Settings : 1: auto mode (continuous adjustment)

2: semi-auto mode (non- continuous adjustment)

Relevant description of manual mode setting:

When P2-32 is set to 0, parameters related to gain control, such as P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26, all can be set by the user.

When switching mode from auto or semi-auto to manual, parameters about gain will be updated automatically.

Relevant description of auto mode setting:

Continue to estimate the system inertia, save the inertia ratio to P1-37 every 30 minutes automatically and refer to the stiffness and bandwidth setting of P2-31.

1. Set the system to manual mode 0 from auto 1 or semi-auto 2, the system will save the estimated inertia value to P1-37 automatically and set the corresponding parameters.
2. Set the system to auto mode 1 or semi-auto mode 2 from manual mode 0, please enter the appropriate value in P1-37.
3. Set the system to manual mode 0 from auto mode 1, P2-00, P2-04 and P2-06 will be modified to the corresponding parameters of auto mode.
4. Set the system to manual mode 0 from semi-auto mode 2, P2-00, P2-04, P2-06, P2-25 and P2-26 will be modified to the corresponding parameters of semi-auto mode.



Relevant description of semi-auto mode setting:

1. When the system inertia is stable, the value of P2-33 will be 1 and the system stops estimating. The inertia value will be saved to P1-37 automatically. When switching mode to semi-auto mode (from manual or auto mode), the system starts to estimate again.
2. When the system inertia is over the range, the value of P2-33 will be 0 and the system starts to estimate and adjust again.

## Manual Mode

When P2-32 is set to 0, users can define Speed Loop Gain (P2-04), Speed Integral Compensation (P2-06) and Speed Feed Forward Gain (P2-07). Influence of each parameter is as the followings.

Proportional gain: To increase proportional gain can enhance the response frequency of speed loop.

Integral gain: To increase the integral gain could increase the low-frequency stiffness of speed loop, reduce the steady-state error and sacrifice the phase margin. The over high integral gain will cause the instability of the system.

Feed forward gain: Diminish the deviation of phase delay.

Related parameters:

P2-04	KVP	Speed Loop Gain	Address: 0208H 0209H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	500		
Control Mode :	ALL		
Unit :	rad / s		
Range :	0 ~ 8191		
Data Size :	16bit		
Format :	DEC		

Settings : Increasing the value of speed loop gain can enhance the speed response. However, if the value is set too big, it would easily cause resonance and noise.

P2-06	KVI	Speed Integral Compensation	Address: 020CH 020DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	rad / s		
Range :	0 ~ 1023		
Data Size :	16bit		
Format :	DEC		

Settings : Increasing the value of speed integral compensation can enhance speed response and diminish the deviation of speed control. However, if the value is set too big, it would easily cause resonance and noise.

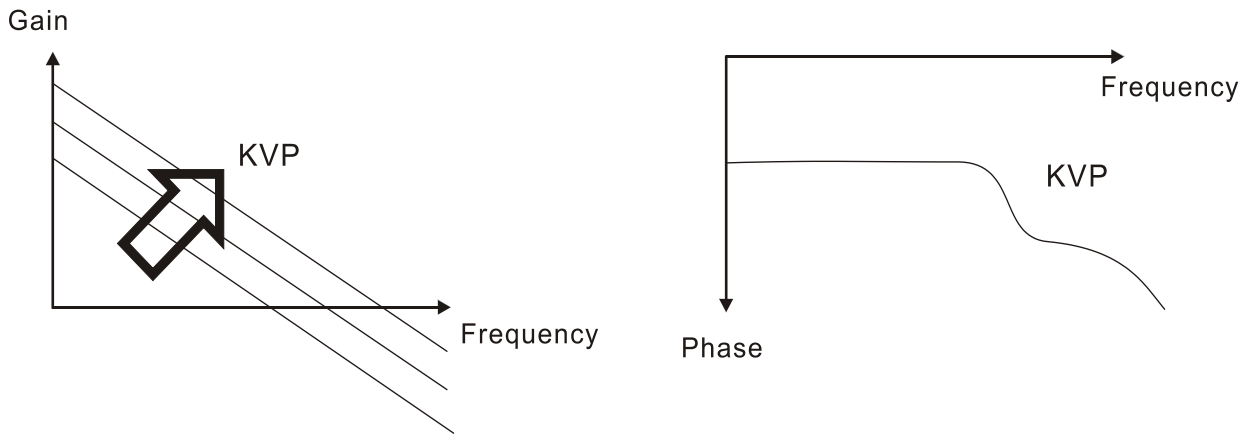
P2-07	KVF	Speed Feed Forward Gain	Address: 020EH 020FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	%		
Range :	0 ~ 100		
Data Size :	16bit		
Format :	DEC		

Settings : When the speed control command runs smoothly, increasing the gain value can reduce the speed command error. If the command does not run smoothly, reducing the gain value can reduce the mechanical vibration during operation.

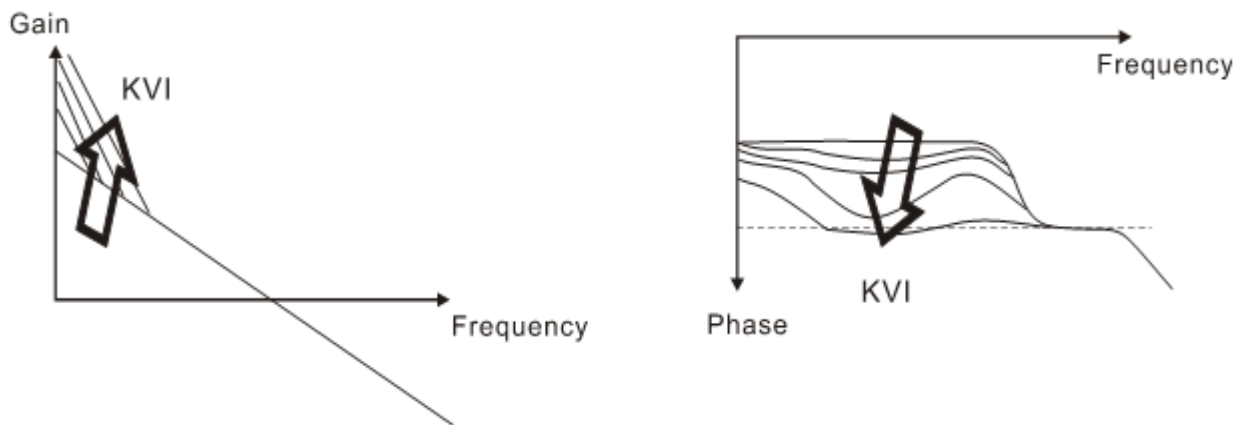
Theoretically, stepping response can be used to explain proportional gain (KVP), integral gain (KVI) and feed forward gain (KVF). Here, the frequency domain and time domain are used to illustrate the basic principle.

### Frequency Domain

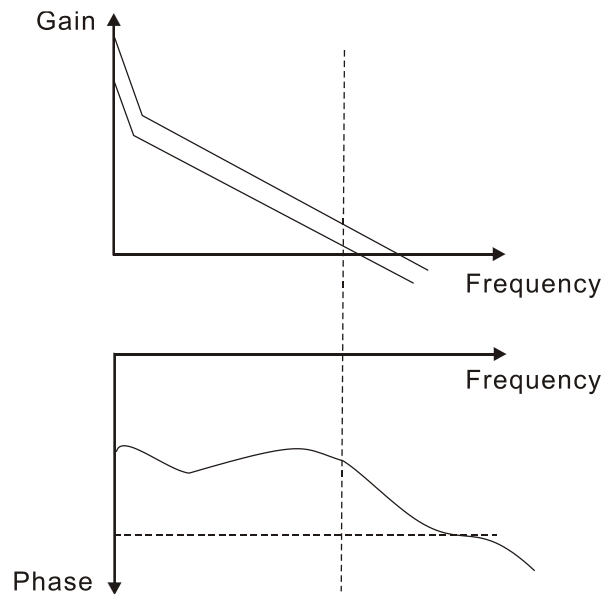
STEP 1: Set the value of  $KVI=0$ , the value of  $KVF=0$  and adjust the value of  $KVP$ .



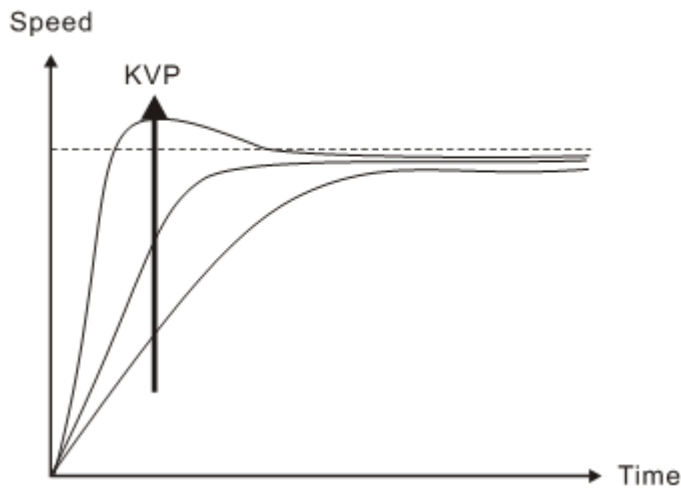
STEP 2 : The value of  $KVP$  remains and adjust the value of  $KVI$ .



STEP 3 : Select the value of  $KVI$ , if the value of phase margin is too small, re-adjust the value of  $KVP$  again to obtain the value, 45deg of phase margin.

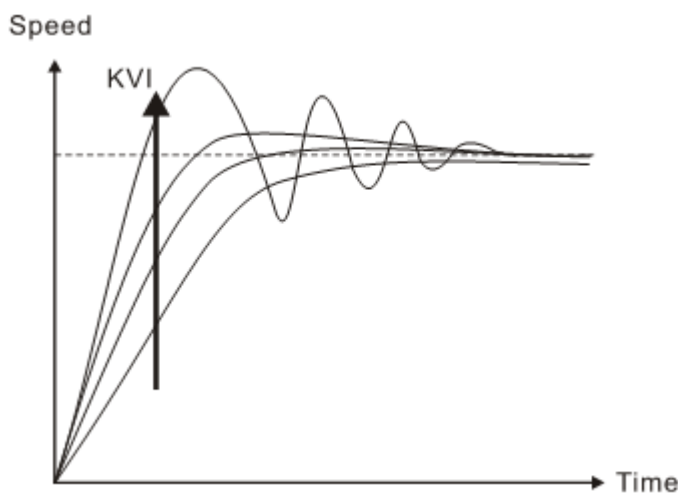


Time Domain



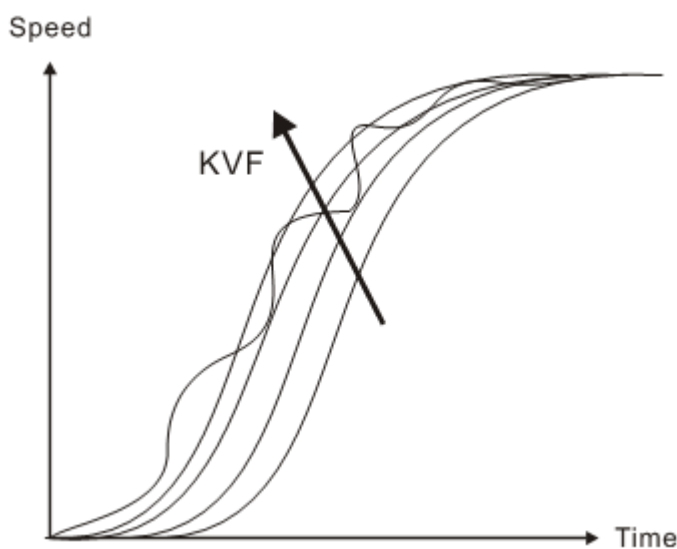
The bigger KVP value cause higher bandwidth and shorten the rising time. However, if the value is set too big, the phase margin will be too small.

To steady-state error, the result is not as good as KVI. But it helps to reduce the dynamic following error.



The bigger KVI value cause greater low-frequency gain and shorten the time the steady-state error returns to zero. However, the phase margin will dramatically decrease as well.

To steady-state error, it is very helpful but shows no benefit to dynamic following error.



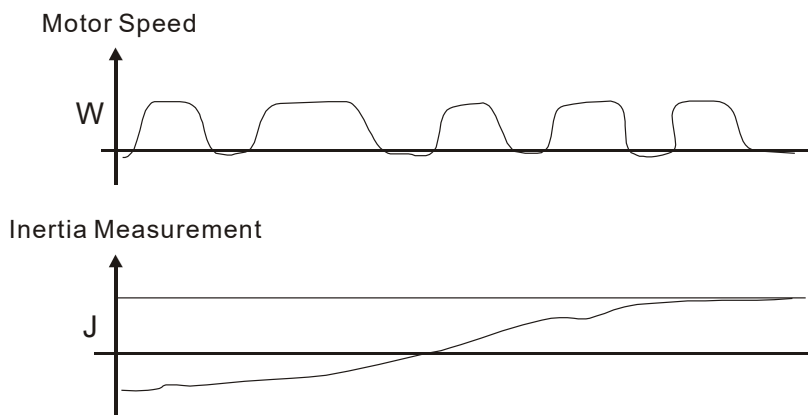
If the KVF value closes to 1, the feed forward compensation will be more complete and the dynamic following error will become smaller. However, if the KVF value is set too big, it would cause vibration.

Generally, instrument is needed when applying frequency domain for measurement. Users are required to adopt the measurement techniques; while time domain only needs a scope and goes with the analog input / output terminal provided by the servo drive. Thus, time domain is frequently used to adjust PI controller. The abilities of PI controller to deal with the resistance of torque load and the following command are the same.

That is to say, the following command and resistance of torque load have the same performance in frequency domain and time domain. Users can reduce the bandwidth by setting the low-pass filter in command end.

### Auto Mode

Auto mode adopts adaptive principle. The servo drive automatically adjusts the parameters according to the external load. Since the adaptive principle takes longer time, it will be unsuitable if the load changes too fast. It would be better to wait until the load inertia is steady or changes slowly. Depending on the speed of signal input, the adaptive time will be different from one another.



### 6.3.7 Resonance Suppression

When resonance occurs, it is probably because the stiffness of the control system is too strong or the response is too fast. Eliminating these two factors might improve the situation. In addition, low-pass filter (parameter P2-25) and notch filter (parameter P2-23 and P2-24) are provided to suppress the resonance if not changing the control parameters.

Related parameters:

P2-23	NCF1	Resonance Suppression (Notch filter) (1)	Address: 022EH 022FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	ALL		
Unit :	Hz		
Range :	50 ~ 1000		
Data Size :	16bit		
Format :	DEC		

Settings : The first setting value of resonance frequency. If P2-24 is set to 0, this function is disabled. P2-43 and P2-44 are the second Notch filter.

P2-24	DPH1	Resonance Suppression (Notch filter) Attenuation Rate (1)	Address: 0230H 0231H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32 (0: disable the function of Notch filter)		
Data Size :	16bit		
Format :	DEC		

The first resonance suppression (notch filter) attenuation rate.  
 Settings : When this parameter is set to 0, the function of Notch filter is disabled.

P2-43	NCF2	Resonance Suppression (Notch filter) (2)	Address: 0256H 0257H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	ALL		
Unit :	Hz		
Range :	50 ~ 2000		
Data Size :	16bit		
Format :	DEC		

The second setting value of resonance frequency. If P2-44 is set to 0, this function is disabled. P2-23 and P2-24 are the first Notch filter.  
 Settings :

P2-44	DPH2	Resonance Suppression (Notch filter) Attenuation Rate (2)	Address: 0258H 0259H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32 (0: disable Notch filter)		
Data Size :	16bit		
Format :	DEC		

The second resonance suppression (notch filter) attenuation rate.  
 Settings : When this parameter is set to 0, the function of Notch filter is disabled.

P2-45	NCF3	Resonance Suppression (Notch filter) (3)	Address: 025AH 025BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	ALL		
Unit :	Hz		
Range :	50 ~ 2000		
Data Size :	16bit		
Format :	DEC		

Settings : The third group of mechanism resonance frequency setting value. If set P2-46 to 0, this function will be disabled. P2-23 and P2-24 are the first group of resonance suppression (Notch filter).

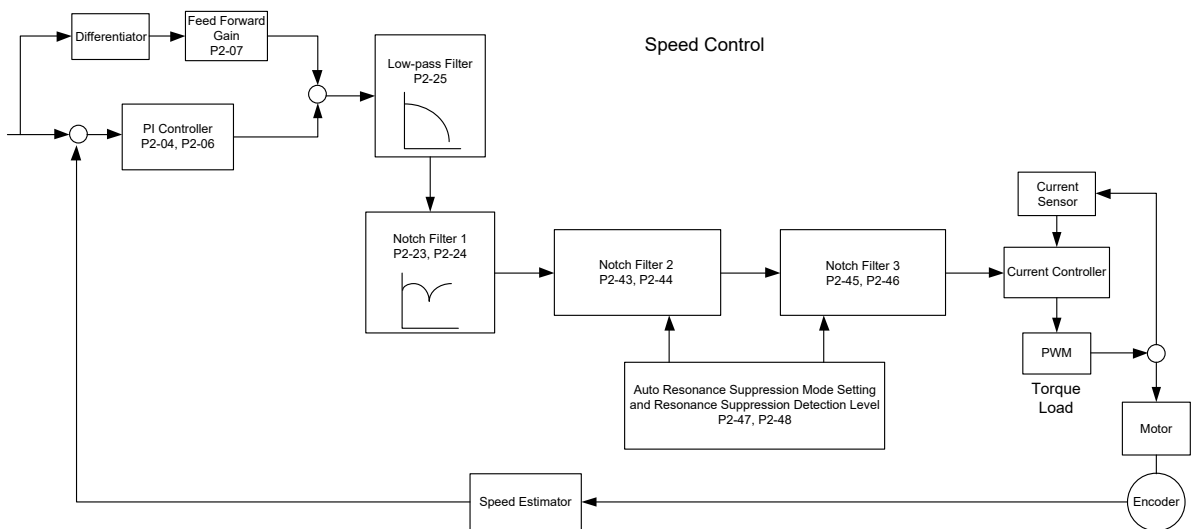
P2-46	DPH3	Resonance Suppression (Notch filter) Attenuation Rate (3)	Address: 025CH 025DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32		
Data Size :	16bit		
Format :	DEC		

Settings : The third group of resonance suppression (Notch filter) attenuation rate. Set the value to 0 to disable the function of Notch filter.



P2-25	NLP	Low-pass Filter of Resonance Suppression	Address: 0232H 0233H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0.2 (under 1kW) or 0.5 (other model)	2 (under 1kW) or 5 (other model)	
Control Mode :	ALL		
Unit :	1 ms	0.1 ms	
Range :	0.0 ~ 100.0	0 ~ 1000	
Data Size :	16bit		
Format :	One decimal	DEC	
Example :	1.5 = 1.5 ms	15 = 1.5 ms	

Settings : Set the low-pass filter of resonance suppression. When the value is set to 0, the function of low-pass filter is disabled.



There are two sets of auto resonance suppression, one is P2-43 and P2-44 and another one is P2-45 and P2-46. When the resonance occurs, set P2-47 to 1 or 2 (enable the function of resonance suppression), the servo drive searches the point of resonance frequency and suppresses the resonance automatically. Write the point of frequency into P2-43 and P2-45 and write the attenuation rate into P2-44 and P2-46. When P2-47 is set to 1, the system will set P2-47 to 0 (disable the function of auto suppression) automatically after completing resonance suppression and the system is stable for 20 minutes. When P2-47 is set to 2, the system will keep searching the point of resonance.

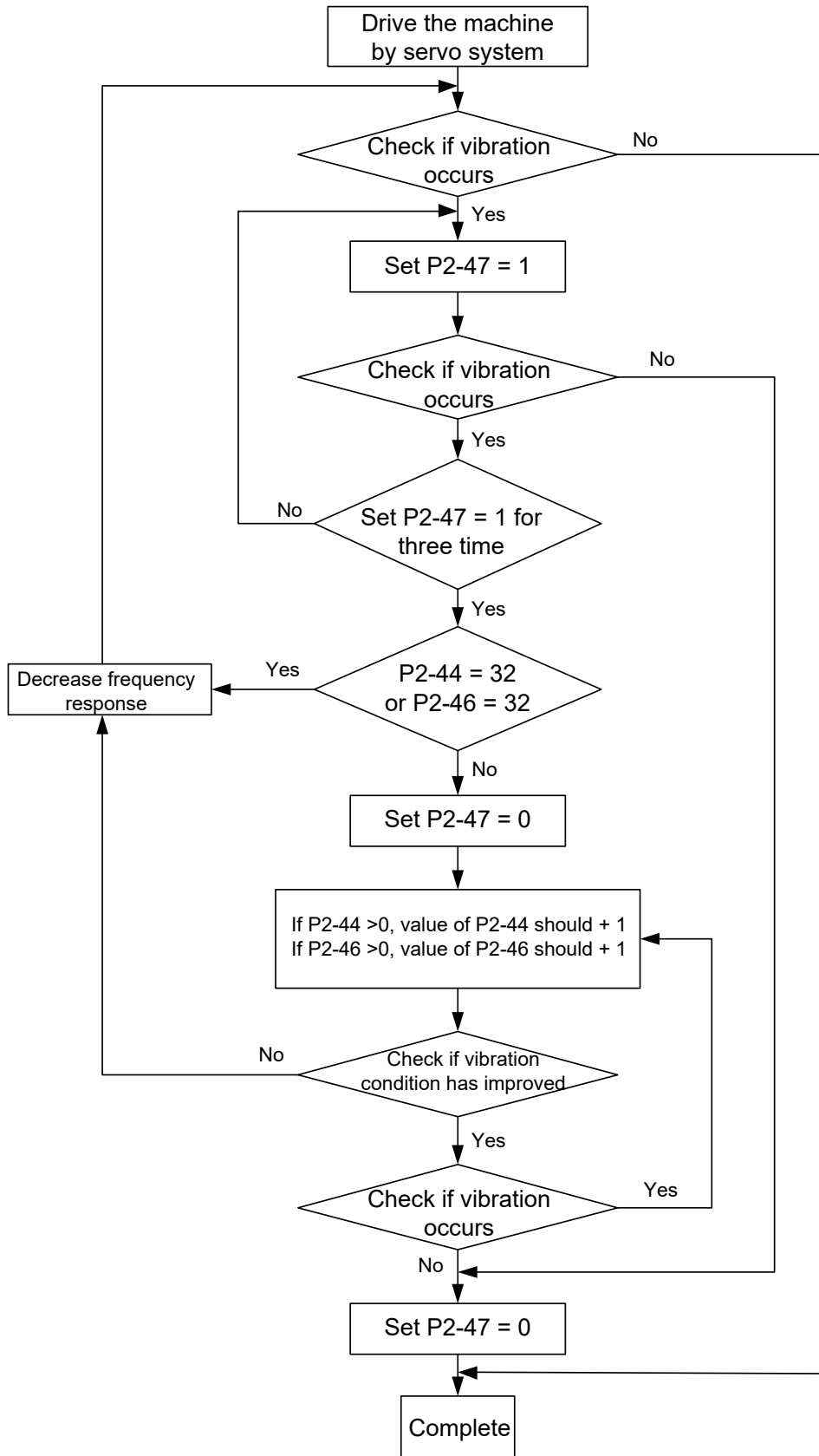
When P2-47 is set to 1 or 2, but resonance still exists, please confirm the value of parameter P2-44 and P2-46. If one of them is 32, it is suggested to reduce the speed

bandwidth first and then start to estimate again. If the value of both is smaller than 32 and resonance still exists, please set P2-47 to 0 first and then manually increase the value of P2-44 and P2-46. It is suggested to reduce the bandwidth if the resonance has not been improved. Then use the function of auto resonance suppression.

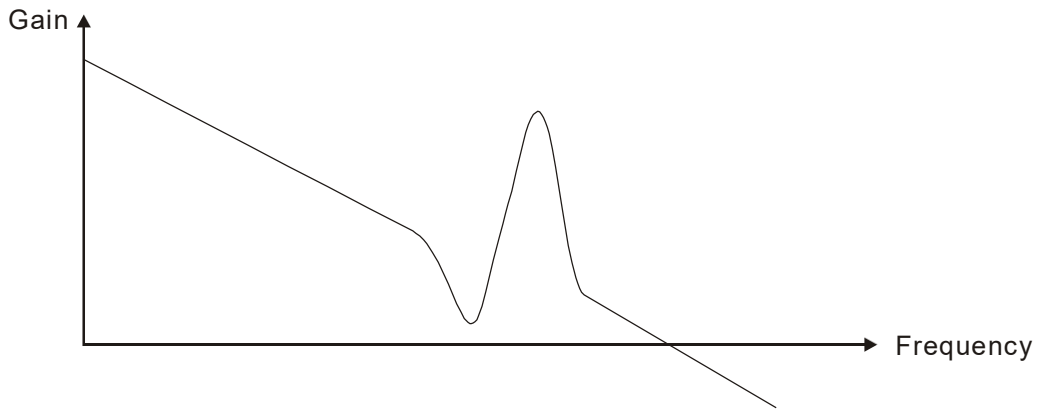
When manually increase the value of P2-44 and P2-46, please check if the value of both is bigger than 0. If yes, it means the frequency point of P2-43 and P2-45 is the one searched by auto resonance suppression. If the value of both is 0, it means the default, 1000 of P2-43 and P2-45 is not the one searched by auto resonance suppression. Deepen the resonance suppression attenuation rate might worsen the situation.

P2-47 Function Table		
P2-47 Current value	P2-47 Desired value	Function
0	1	Clear the value of P2-43 ~ P2-46 and enable the function of auto resonance suppression.
0	2	Clear the value of P2-43 ~ P2-46 and enable the function of auto resonance suppression.
1	0	Save the current value of P2-43 ~ P2-46 and disable the function of auto resonance suppression.
1	1	Clear the value of P2-43 ~ P2-46 and enable the function of auto resonance suppression.
1	2	Not clear the value of P2-43 ~ P2-46 and continue to enable the function of auto resonance suppression.
2	0	Save the current value of P2-43 ~ P2-46 and disable the function of auto resonance suppression.
2	1	Clear the value of P2-43 ~ P2-46 and enable the function of auto resonance suppression.
2	2	Not clear the value of P2-43 ~ P2-46 and continue to enable the function of auto resonance suppression.

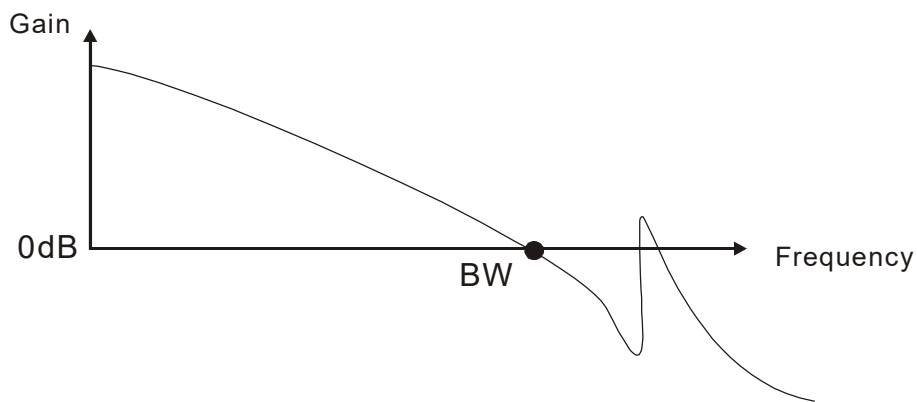
Flowchart of Auto Resonance Suppression:



Here illustrates the effect via low-pass filter (parameter P2-25). The following diagram is the system open-loop gain with resonance.



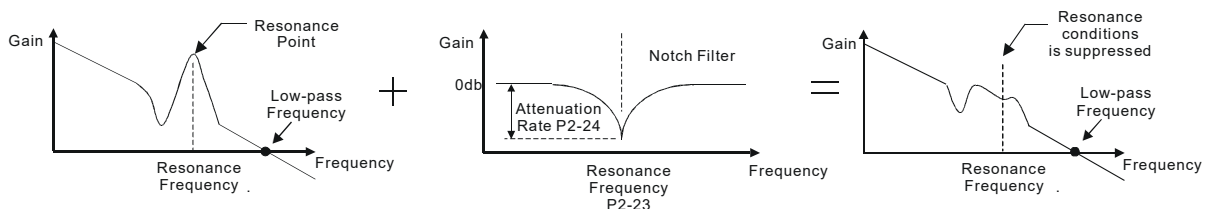
When the value of P2-25 is increased from 0, BW becomes smaller (See as the following diagram). Although it solves the problem of resonance frequency, the response bandwidth and phase margin is reduced.



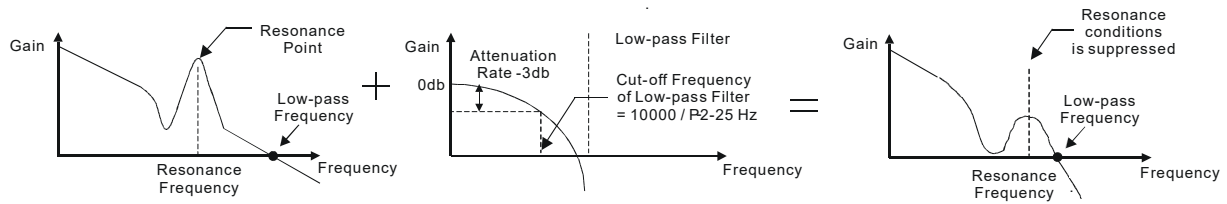
If users know the resonance frequency, notch filter (parameter P2-23 and P2-24) can directly eliminate the resonance. The frequency setting range of notch filter is merely from 50 to 1000 Hz. The suppression strength is from 0 to 32dB. If the resonance frequency is not within the range, it is suggested to use low-pass filter (parameter P2-25).

Here firstly illustrates the influence brought by notch filter (P2-23 and P2-24) and low-pass filter (P2-25). The following diagrams are the system of open-loop gain with resonance.

Resonance suppression with notch filter



## Resonance suppression with low-pass filter



When the value of P2-25 is increased from 0, BW becomes smaller. Although it solves the problem of resonance frequency, the response bandwidth and phase margin is reduced. Also, the system becomes unstable.

If users know the resonance frequency, notch filter (parameter P2-23 and P2-24) can directly eliminate the resonance. In this case, notch filter will be more helpful than low-pass filter. However, if the resonance frequency drifts because of time or other factors, notch filter will not do.

## 6.4 Torque Mode

Torque control mode (T or Tz) is appropriate in torque control application, such as printing machine, winding machine, etc. There are two kinds of command source, analog input and register. Analog command input uses external voltage to control the torque of the motor while register uses the internal parameters (P1-12 ~ P1-14) as the torque command.

### 6.4.1 Selection of Torque Command

Torque command source are external analog voltage and parameters. It uses CN1 DI signal for selection. See as below.

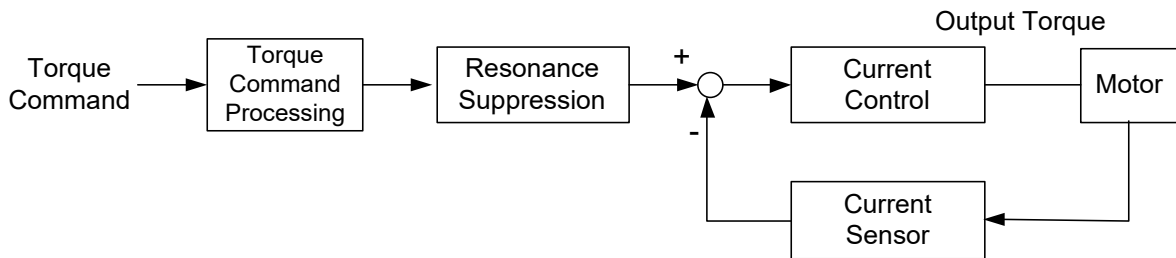
Torque command No.	CN1 DI signal		Command Source		Content	Range
	TCM1	TCM0				
T1	0	0	Mode	T	Voltage deviation between T-REF and GND	-10 V ~ +10 V
				Tz	N / A	Torque command is 0
T2	0	1	Parameters		P1-12	-300% ~ 300%
T3	1	0			P1-13	-300% ~ 300%
T4	1	1			P1-14	-300% ~ 300%

- The status of TCM0 ~ TCM1: 0 means DI OFF and 1 means DI ON.
- When TCM0 = TCM1 = 0, if it is in Tz mode, then the command is 0. Thus, if there is no need to use analog voltage as torque command, Tz mode is applicable and can avoid the problem of zero drift. If it is in T mode, the command will be the voltage deviation between T-REF and GND. Its input voltage range is -10 V ~ +10 V, which means the corresponding torque is adjustable (P1-41).
- When neither TCM0 nor TCM1 is 0, parameters become the source of torque command. The command will be executed after TCM0 ~ TCM1 are changed. There is no need to use CTRG for triggering.

The torque command can be used in torque mode (T or Tz) and speed mode (S or Sz). When it is in speed mode, it can be regarded as the command input of torque limit.

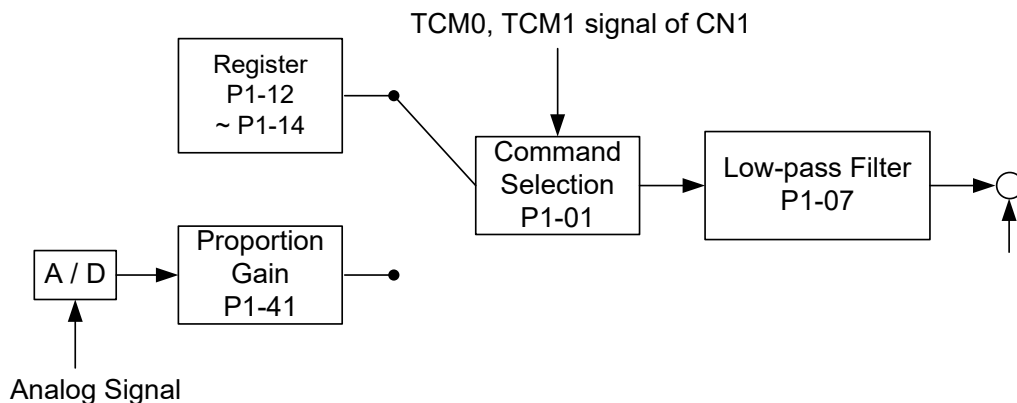
## 6.4.2 Control Structure of Torque Mode

The basic control structure is as the following diagram:



The torque command unit is to select torque command source according to Section 6.4.1, including the scaling (P1-40) setting and S-curve setting. The current control unit manages the gain parameters of the servo drive and calculates the current for servo motor in time. Since the current control unit is very complicated, and is not relevant to the application. There is no need to adjust parameters. Only command end setting is provided.

The structure of torque command unit is as the following diagram.



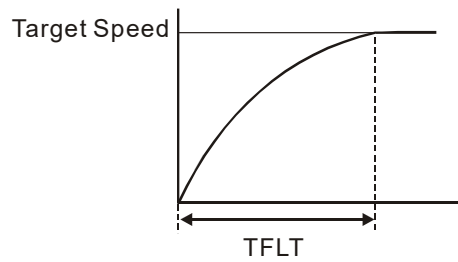
The upper path is the command from register while the lower one is external analog command. The command is selected according to the status of TCM0, TCM1 and P1-01 (T or Tz). The torque represented by analog voltage command can be adjusted via the scaling and can obtain a smoother response via low-pass filter.

### 6.4.3 Smooth Torque Command

Related parameter:

<b>P1-07</b>	<b>TFLT</b>	<b>Analog Torque Command (Low-pass Filter)</b>		<b>Address: 010EH 010FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.3
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	T		
	Unit :	ms		
	Range :	0 ~ 1000 (0: disable this function)		
	Data Size :	16bit		
	Format :	DEC		

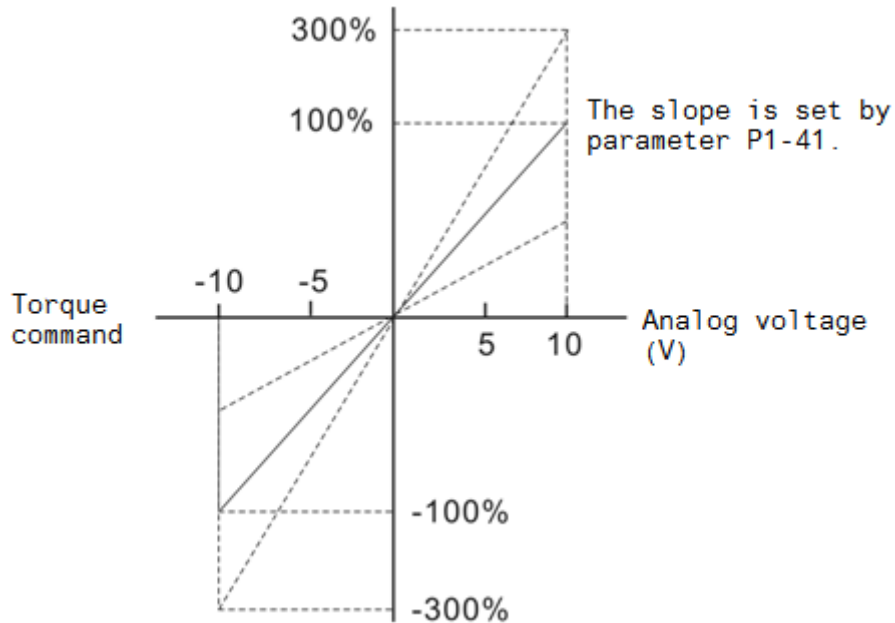
Settings : 0: Disabled





### 6.4.4 The Scaling of Analog Command

The motor torque command is controlled by the analog voltage deviation between T\_REF and GND and goes with parameter P1-41 to adjust the torque slope and its range.



Related parameter:

P1-41 ▲	TCM	Maximum Output of Analog Torque Speed	Address: 0152H 0153H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.4
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	%		
Range :	0 ~ 1000		
Data Size :	16bit		
Format :	DEC		

### Maximum Output of Analog Torque Speed:

In torque mode, the analog torque command inputs the torque setting of the max. voltage (10 V). When the default setting is 100, if the external voltage inputs 10 V, it means the torque control command is 100% rated torque. If the external voltage inputs 5 V, then the torque control command is 50% rated torque.

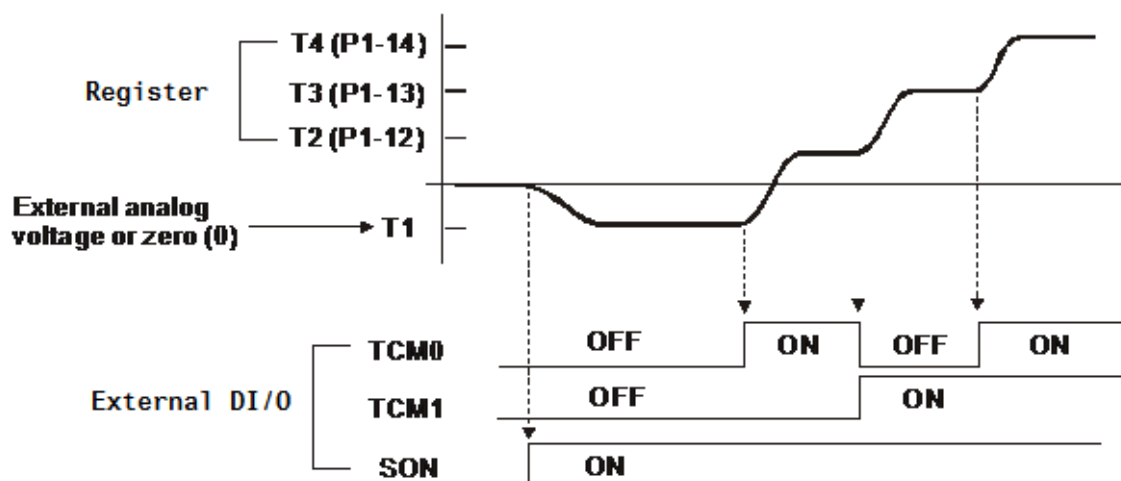
$$\text{Torque control command} = \text{input voltage value} \times \text{setting value} / 10 (\%)$$

In speed, PT and PR mode, the analog torque limit inputs the torque limit setting of the max. voltage (10 V).

$$\text{Torque limit command} = \text{input voltage value} \times \text{setting value} / 10 (\%)$$

For example: Set P1-41 to 100, the input voltage 10 V corresponds to 100% rated torque.

### 6.4.5 The Timing Diagram in Torque Mode



#### NOTE

- 1) OFF means the contact point is open while ON means the contact point is close.
- 2) When it is in Tz mode, the torque command T1 = 0; When it is in T mode, the torque command T1 is the external analog voltage input.
- 3) When the servo drive is Servo On, please select the command according to TCM0 ~ TCM1 status.

## 6.5 Dual Mode

Apart from single mode, dual mode is also provided for operation. According to Section 6.1, dual modes are as followings:

1. Speed / position dual mode (PT-S, PR-S, PT-PR)
2. Speed / torque dual mode (S-T)
3. Torque / position dual mode (PT-T, PR-T)
4. Position speed multi mode (PT-PR-S)
5. Position torque multi mode (PT-PR-T)

Mode Name	Short Name	Setting Code	Description
Dual Mode	<b>PT-S</b>	<b>06</b>	<b>PT</b> and <b>S</b> can be switched via <b>DI</b> signal, <b>S_P</b> .
	<b>PT-T</b>	<b>07</b>	<b>PT</b> and <b>T</b> can be switched via <b>DI</b> signal, <b>T_P</b> .
	<b>PR-S</b>	<b>08</b>	<b>PR</b> and <b>S</b> can be switched via <b>DI</b> signal, <b>S_P</b> .
	<b>PR-T</b>	<b>09</b>	<b>PR</b> and <b>T</b> can be switched via <b>DI</b> signal, <b>T_P</b> .
	<b>S-T</b>	<b>0A</b>	<b>S</b> and <b>T</b> can be switched via <b>DI</b> signal, <b>S_T</b> .
	<b>PT-PR</b>	<b>0D</b>	<b>PT</b> and <b>PR</b> can be switched via <b>DI</b> signal, <b>PT_PR</b> .
Multi Mode	<b>PT-PR-S</b>	<b>0E</b>	<b>PT</b> , <b>PR</b> and <b>S</b> can be switched via <b>DI</b> signal, <b>S_P</b> and <b>PT_PR</b> .
	<b>PT-PR-T</b>	<b>0F</b>	<b>PT</b> , <b>PR</b> and <b>T</b> can be switched via <b>DI</b> signal, <b>T_P</b> and <b>PT_PR</b> .

Sz and Tz dual mode is not provided here. For avoiding occupying too many digital inputs in dual mode, speed and torque mode can use external analog voltage as the command source so as to reduce digital input (SPD0, SPD1 or TCM0, TCM1). Please refer to Chapter 3.3.2, table 3.1, Default Value of DI Input Function and table 3.2, Default Value of DO Output Function for the default DI/DO of each mode.

The relationship between DI/DO signals and PIN define are set after the mode is selected. If users desire to change the setting, please refer to Chapter 3.3.4.

### 6.5.1 Speed / Position Dual Mode

There are PT-S and PR-S in speed / position dual mode. The command source of the former one comes from external pulse while the latter one comes from internal parameters (P6-00 ~ P7-27). Speed command could be issued by external analog voltage or internal parameters (P1-09 ~ P1-11). The switch of speed / position mode is controlled by S-P signal and the switch of PR-S mode is controlled by DI signal, which is more complicated. The timing diagram is shown as below.

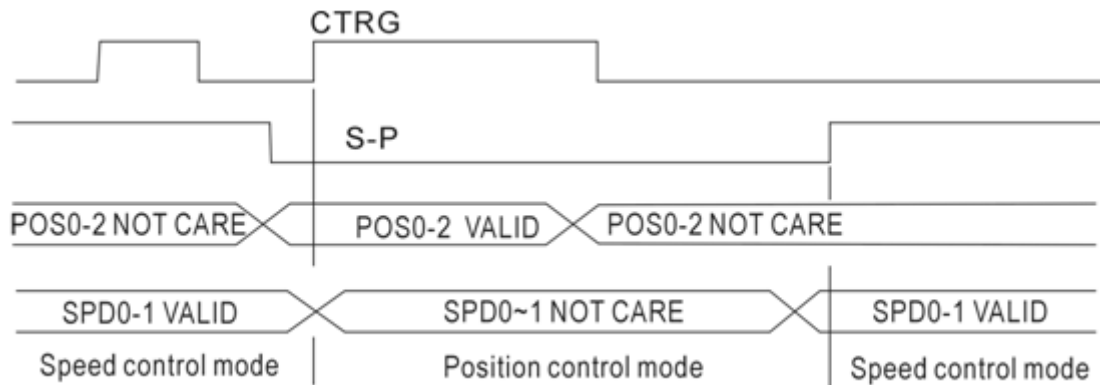


Diagram 1: Dual control mode of speed and position

In speed mode (S-P is ON), the speed command is selected via SPD0 and SPD1. CTRG is not working at the moment. When switching to position mode (S-P is OFF), since position command has not been issued (needs to wait the rising edge of CTRG), the motor stops. The position command is determined by POS0 ~ POS5 and triggered by rising edge of CTRG. When S-P is ON, it goes back to speed mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

### 6.5.2 Speed/Torque Dual Mode

S-T is the only mode. The speed command comes from the external analog voltage and internal parameters (P1-09 ~ P1-11), which is selected via SPD0 ~ SPD1. Similarly, the source of torque command could be external analog voltage and internal parameters (P1-12 ~ P1-14) and is selected via TCM0 ~ TCM1. The switch of speed / torque mode is controlled by S-T signal. The timing diagram is shown as below.

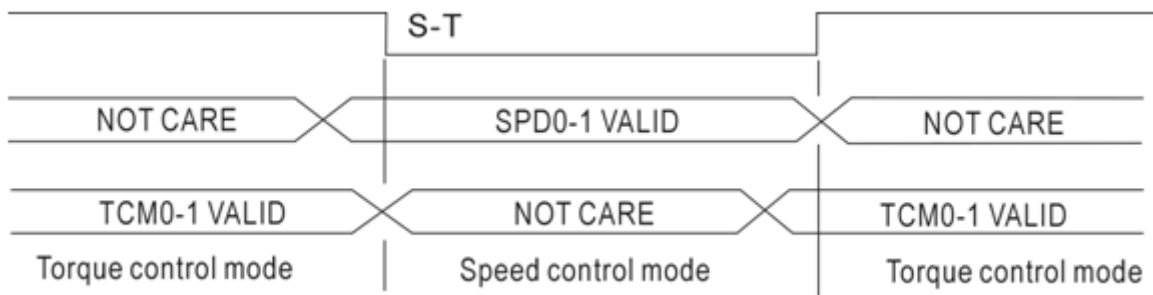


Diagram 2: Dual control mode of speed and torque

In torque mode (S-T is ON), the torque command is selected via TCM0 and TCM1. When switching to speed mode (S-T is OFF), the torque command is selected via SPD0 and SPD 1. The motor operates according to the speed command. When S-T is ON, it goes back to the torque mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

### 6.5.3 Torque / Position Dual Mode

There are PT-T and PR-T in speed / position dual mode. The command source of the former one comes from external pulse while the latter one comes from internal parameters (P6-00 ~ P7-27). Torque command could be issued by external analog voltage or internal parameters (P1-12 ~ P1-14). The switch of torque / position mode is controlled by T-P signal and the switch of PR-T mode is controlled by DI signal, which is more complicated. The timing diagram is shown as below.

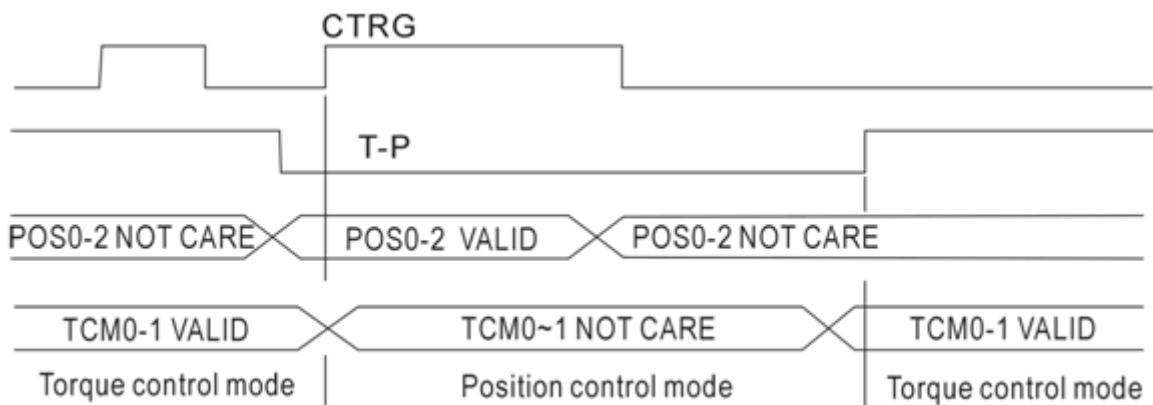


Diagram 3: Dual control mode of torque and position

In torque mode (T-P is ON), the torque command is selected via TCM0 and TCM1. CTRG is not working at the moment. When switching to position mode (T-P is OFF), since position command has not been issued (needs to wait the rising edge of CTRG), the motor stops. The position command is determined by POS0 ~ POS5 and triggered by rising edge of CTRG. When T-P is ON, it goes back to torque mode again. Please refer to the introduction of single mode for DI signal and the selected command of each mode.

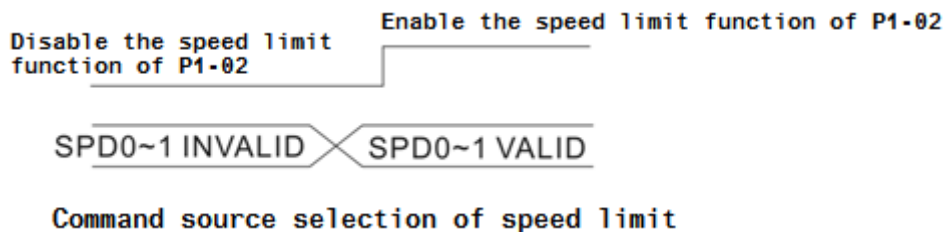
## 6.6 Others

### 6.6.1 The Use of Speed Limit

The maximum speed in each mode is limited by internal parameters (P1-55), not matter it is in position, speed or torque mode.

The issuing method of speed limit command and speed command is the same. The command source could be external analog voltage or internal parameter (P1-09 ~ P1-11). Please refer to Section 6.3.1 for descriptions.

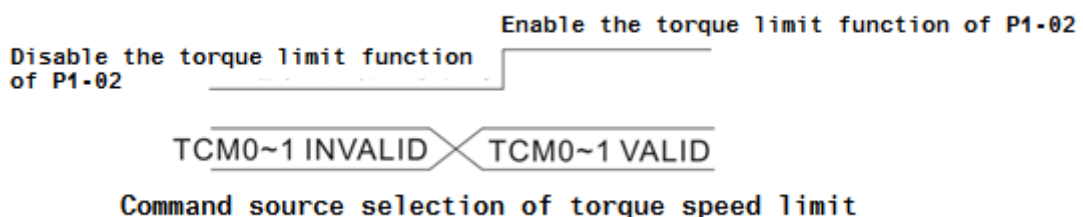
Speed limit can be used in torque mode (T) only. It is used for limiting the motor speed. When the command in torque mode is issued by external analog voltage, DI signal is enough and can be regarded as SPD0 ~ SPD1 which is used to determine the speed limit command (internal parameters). If the DI signal is not enough, speed limit command can be issued by analog voltage. When the function of disable / enable limit function in P1-02 is set to 1, the speed limit function is enabled. See the timing diagram as below.



### 6.6.2 The Use of Torque Limit

The issuing method of torque limit command and torque command is the same. The command source could be external analog voltage or internal parameter (P1-12 ~ P1-14). Please refer to Chapter 6.4.1 for descriptions.

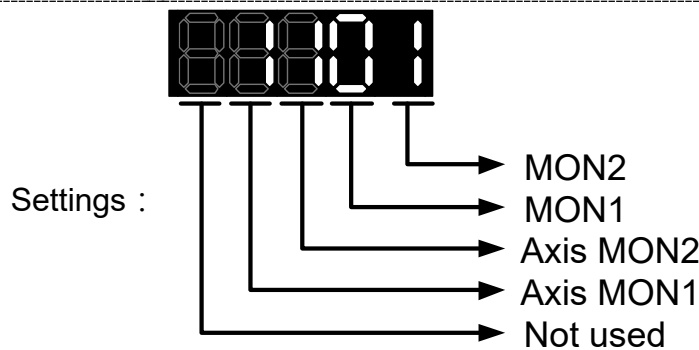
Torque limit can be used in position mode (PT, PR) or speed mode (S). It is used for limiting the motor torque output. When the command in position mode is issued by external analog voltage, DI signal is enough and can be regarded as TCM0 ~ TCM1, which is used to determine torque limit command (internal parameters). If the DI signal is not enough, torque limit command can be issued by analog voltage. When the function of disable / enable torque limit function in P1-02 is set to 1, the torque limit function is enabled. See the timing diagram as below.



### 6.6.3 Analog Monitor

Users could observe the needed voltage signal via analog monitor. Two analog channels are provided by the servo drive and locate in terminal 15 and 16 of CN1. The related parameter settings are as the followings.


<b>P0-03</b>	<b>MON</b>	<b>Analog Output Monitor</b>		<b>Address: 0006H 0007H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	01		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x0000 ~ 0x3377		
	Data Size :	16bit		
	Format :	HEX		



MON1, MON2 Setting Value	Description
0	Motor speed (+ / -8 Volts / Max. speed)
1	Motor torque (+ / -8 Volts / Max. torque)
2	Pulse command frequency (+8 Volts / 4.5 Mpps)
3	Speed command (+ / -8 Volts / Max. speed command)
4	Torque command (+ / -8 Volts / Max. torque command)
5	VBUS voltage (+ / -8 Volts / 450 V)
6	Reserved
7	Reserved

MON1 axis selection	Description
1	MON1 is from X axis
2	MON1 is from Y axis
3	MON1 is from Z axis

MON2 axis selection	Description
1	MON2 is from X axis
2	MON2 is from Y axis
3	MON2 is from Z axis

 **NOTE** Please refer to parameter P1-04, P1-05 for proportional setting of analog output voltage.

For example:

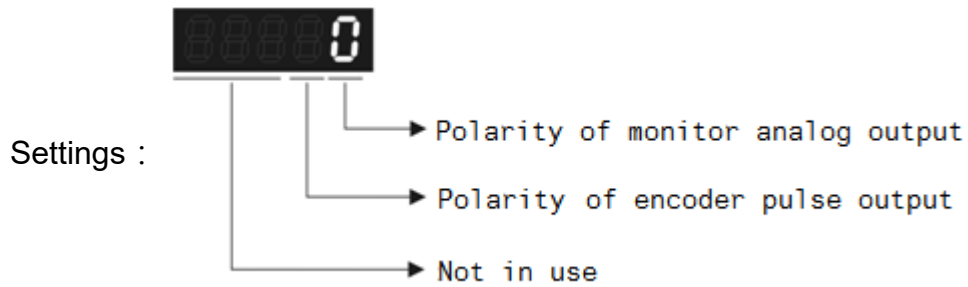
P0-03 = 1101 (MON1 is the analog output of motor speed in X axis; MON2 is the analog output of motor torque in X axis.)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{(\text{Max. speed} \times \frac{P1-04}{100})} \text{ (unit: Volts)}$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{(\text{Max. torque} \times \frac{P1-05}{100})} \text{ (unit: Volts)}$$

<b>P1-03</b>	<b>AOUT</b>	<b>Polarity Setting of Encoder Pulse Output</b>		<b>Address: 0106H 0107H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x13		
	Data Size :	16bit		
	Format :	HEX		





**Polarity of Monitor Analog Output**

- 0: MON1(+), MON2(+)
- 1: MON1(+), MON2(-)
- 2: MON1(-), MON2(+)
- 3: MON1(-), MON2(-)

- **Polarity of encoder pulse output**
  - 0: Forward output
  - 1: Reverse output

P1-04	MON1	MON1 Analog Monitor Output Proportion	Address: 0108H 0109H
Parameter Attribute :	Parameter for individual axis		Related Section Section 6.6.3
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	% (full scale)		
Range :	0 ~ 100		
Data Size :	16bit		
Format :	DEC		

Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = 0x1110 (Ch1 is the speed analog output of the first axis)

Settings : When the output voltage value of CH1 is V1, the motor speed will be:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V1}{8} \times \frac{\text{X axis P1 - 04}}{100}$$

P1-05	MON2	MON2 Analog Monitor Output Proportion	Address: 0108H 0109H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.3
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	% (full scale)		
Range :	0 ~ 100		
Data Size :	16bit		
Format :	DEC		

Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = 0x1101 (Ch2 is the speed analog output of the first axis)

Settings : When the output voltage value of CH2 is V2, the motor speed will be:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V2}{8} \times \frac{\text{X axis P1 - 05}}{100}$$

P4-20	DOF1	Offset Adjustment Value of Analog Monitor Output (Ch1)	Address: 0428H 0429H
Parameter Attribute :	Parameter for three axes		Related Section: Section 6.6.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	mV		
Range :	-800 ~ 800		
Data Size :	16bit		
Format :	DEC		

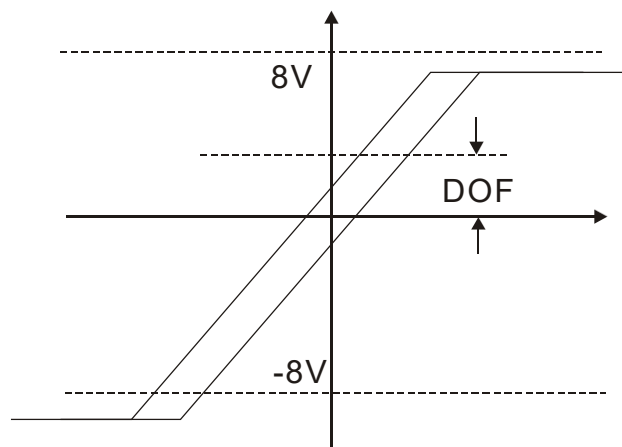
Settings : Offset adjustment value (cannot reset)

P4-21	DOF2	Offset Adjustment Value of Analog Monitor Output (Ch2)	Address: 042AH 042BH
Parameter Attribute :	Parameter for three axes		Related Section: Section 6.6.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	mV		
Range :	-800 ~ 800		
Data Size :	16bit		
Format :	DEC		

Settings : Offset adjustment value (cannot reset)

For example, if users desire to observe the voltage signal in channel 1 and set this channel for observing the pulse command frequency, when the pulse command frequency 2.25 M corresponds to 8 V output voltage, users need to adjust the monitor output proportion of P1-04 to 50 (= 2.25 M / Max. input frequency). Other related settings include P0-03 (X = 3) and P1-03 (The polarity setting range of monitor analog output is between 0 and 3, and it can set positive / negative polarity output). Generally speaking, the output voltage of Ch1 is  $V_1$ , the pulse command frequency is  $(\text{Max. input frequency} \times V_1 / 8) \times P1-04 / 100$ .

Because of the offset value, the zero voltage level of analog monitor output does not match to the zero point of the setting. This can be improved via the setting of offset adjustment value of analog monitor output, DOF1 (4-20) and DOF2 (P4-21). The voltage level of analog monitor output is  $\pm 8$  V, if the output voltage exceeds the range, it will be limited within  $\pm 8$  V. The provided resolution is about 10bits, which equals to 13 mV / LSB.

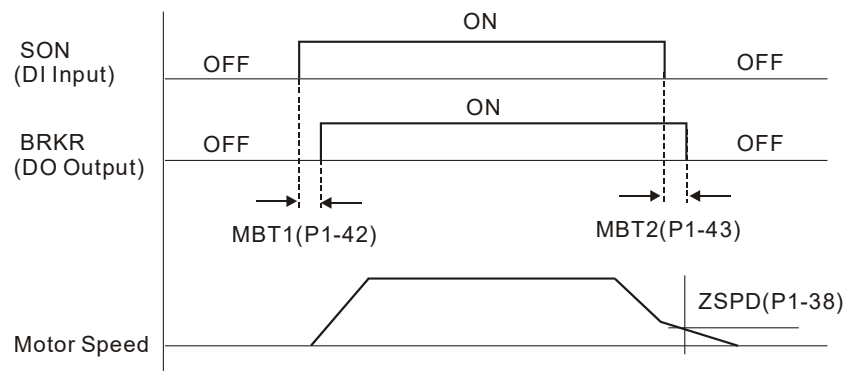


### 6.6.4 The Use of Mechanical Brake

When operating mechanical brake via servo drive, if the DO signal, BRKR is set to OFF, it means the mechanical brake is not working and the motor will be locked. If BRKR is set to ON, it means the mechanical brake is working and the motor can operate. The operation of mechanical brake has two kinds. Users can set the relevant delay via register MBT1 (P1-42) and MBT2 (P1-43). It is usually applied in Z axis in order to reduce the heat generated when servo motor puts up resistance and shorten its lifetime. In order to avoid the error of mechanical brake, it must be worked when the servo drive is off. To operate the mechanical brake, the brake has to be activated before the motor stops running (Servo OFF). The brake has to be released after Servo ON. Otherwise, it would become the loading of the motor and might damage the brake.

If it works during the process of acceleration or constant speed, the servo drive needs to generate more current to resist the brakeforce of mechanical brake and it might cause the alarm of overload warning.

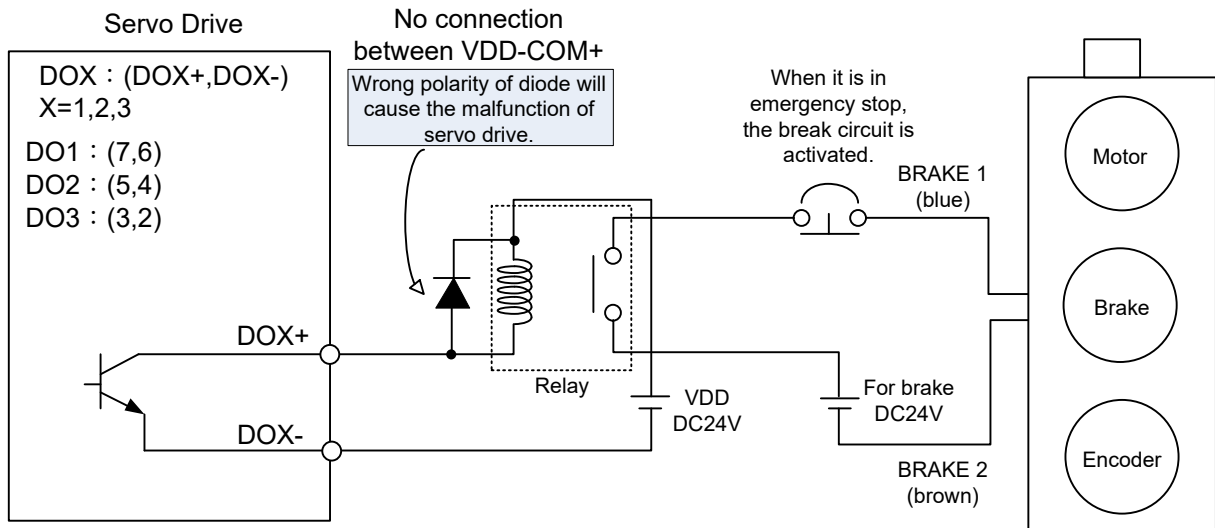
Timing diagram of mechanical brake control:



The output timing of BRKR:

1. When Servo OFF, go through the time set by P1-43 and the motor speed is faster than the setting in P1-38, DO.BRKR is OFF (mechanical brake is locked).
2. When Servo OFF, has not reached the time set by P1-43 but the motor speed is slower than the setting in P1-38, DO.BRKR is OFF (mechanical brake is locked).

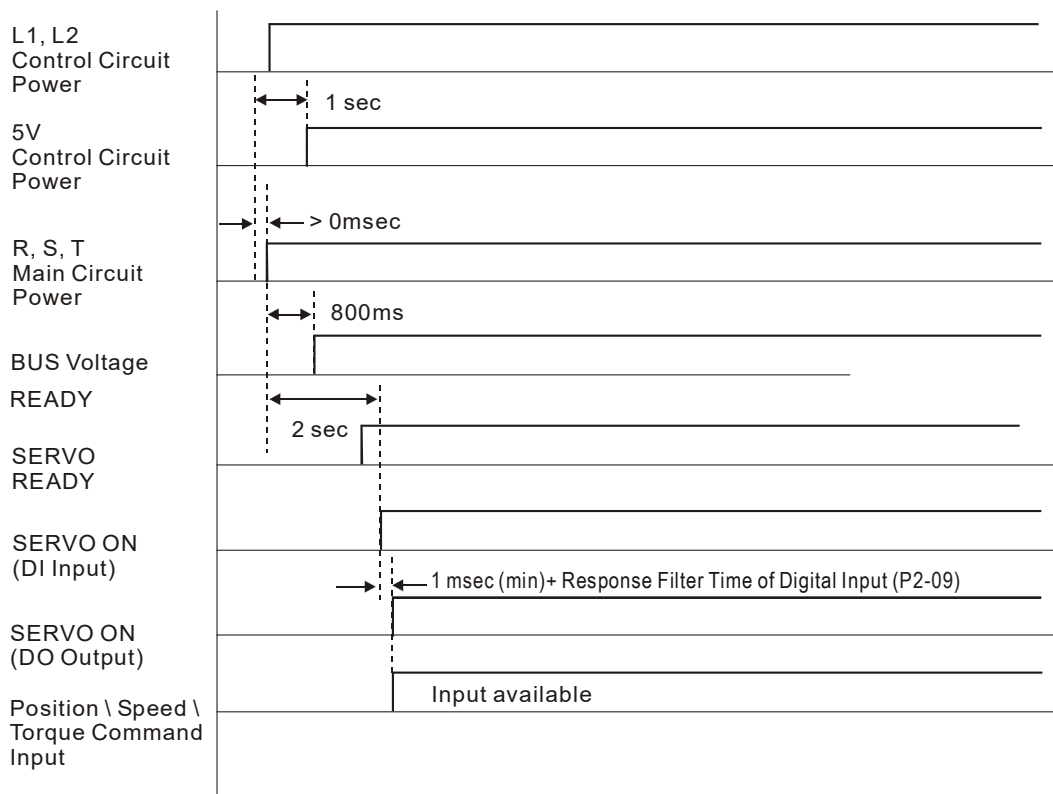
The wiring diagram of using mechanical brake:



**NOTE**

- 1) Please refer to Chapter 3, Wiring.
- 2) The brake signal controls the solenoid valve, provides power to the brake and enables the brake.
- 3) Please note that there is no polarity in coil brake.
- 4) Do not use brake power and control power (VDD) at the same time.

Timing diagram of control power and main power:



# Chapter 7 Motion Control

## 7.1 Motion Control Functions of ASDA-M

- 1) Single-axis motion controller of PR (Procedure) control
- 2) Function of CAPTURE (data capture) / COMPARE (data compare)
- 3) Function of E-Cam

## 7.2 Information of the Servo Drive

The information of this servo drive can be divided into three parts: System parameters, Monitor variables and Data array.

Descriptions are as follows:

	System Parameters	Monitor Variables
Functional Description	It is used to be the reference mode, important data or operation condition when the servo drive is operating, e.g. Control Mode, Servo Loop Gain, etc.	The status of the servo drive or motor, e.g. motor position, speed, electric current, etc.
Display Format	Panel displays PX-XX. Pressing the <b>SET</b> Key to display parameters and start setting. Please refer to Chapter 4 for Panel Display and Operation.	Set P0-02 to Monitor variables code and enter into Monitor Mode. The panel will display the value of the variable. Or pressing the <b>MODE</b> Key on the panel to switch to Monitor Mode. Please refer to Chapter 4 for Panel Display and Operation.
Access Method	Readable and writable (depends on parameters)	Read-only
Data Size	16-bit or 32-bit (depends on parameters)	32-bit integers only

	System Parameters	Monitor Variables
Communication	Access via MODBUS / CANopen / USB Each parameter occupies two MODBUS addresses	<ul style="list-style-type: none"> <li>● It only can be monitored via PC software by connecting USB.</li> <li>● It does not directly support MODBUS / CANopen access, unless mapping is for corresponding the specified monitor variables to system parameters.</li> </ul>
Mapping Support	8 groups of parameter, P0-25 ~ P0-32 (set by P0-35 ~ P0-42)	5 groups of parameter, P0-09 ~ P0-13 (set by P0-17 ~ P0-21)
Note		In Monitor Mode, pressing <b>UP / DOWN</b> Key on the panel to switch the commonly used monitor variables (code 0 ~ 26); however, it cannot display all (about 150 in total)

## 7.2.1 Description of Monitor Variables

Description of Monitor Variables:

Item	Descriptions
Variable Code	Each monitor variable has a code. Set the code via P0-02 so that the users can monitor the variable.
Format	Every monitor variable is saved with the format of 32-bit (long integer) in the servo drive.
Classification	It is divided into basic variables and extension variables: 1. Basic variables: Use the Monitor Mode on the panel to find the variable (variables in the cycle) by pressing <b>UP</b> / <b>DOWN</b> Key (P0-02 = 0 ~ 26) 2. Extension variables: Variables other than the basic ones (P0-02 = 27 ~ 127)
Monitor Method	Two methods, Panel display and Mapping: : 1. Panel display: View through the panel directly 2. Mapping: Correspond the variables to the system parameters and view the variables via parameters.
Panel Display	1. Switch to the desired monitoring axis by pressing the <b>SEL</b> Key. 2. Switch to the Monitor Mode by pressing the <b>MODE</b> Key and select the desired monitoring variables via <b>UP</b> / <b>DOWN</b> Key. 3. Directly enter the desired monitoring code via P0-02 for viewing. Pressing the <b>SHF</b> Key on the panel can switch the display of high / low word; Pressing the <b>SET</b> Key on the panel can switch the display of decimal / hexadecimal format.
Mapping	1. Mapping parameters that support monitor variable are P0-09 ~ P0-13. Please refer to Chapter 8, Parameters for operation. 2. Monitor variables can be read via communication by mapping parameters. 3. The value of mapping parameters (P0-09 ~ P0-13) is the content of basic variables (17h, 18h, 19h, 1Ah). The setting value which is set by P0-17 should be monitored via p0-09 (refer to p0-02). When accessing data via communication, the value of P0-17 can be read or monitored via panel (Set P0-02 to 23). When the panel shows 「VAR-1」, it means it is the value of P0-09.



The descriptions of monitor variables attribute are as the following.

Attribute	Descriptions
<b>B</b>	BASE: basic variables. Variables that can be viewed by <b>UP</b> / <b>DOWN</b> Key on the panel.
<b>Dn</b>	When the panel displays, the position of the decimal point will be <b>D1</b> which means it only shows one decimal point; <b>D2</b> means it shows two decimal points.
<b>Dec</b>	When the panel displays, the information only can be shown in decimal format. Pressing the <b>SET</b> Key on the panel cannot switch it to hexadecimal format.
<b>Hex</b>	When the panel displays, the information only can be shown in hexadecimal format. Pressing the <b>SET</b> Key on the panel cannot switch it to decimal format.

Descriptions of monitor variables in order of code are as the following.

Code	Name of Variables / Attribute	Descriptions
000 (00h)	Feedback position (PUU) <b>B</b>	The current feedback position of the motor encoder. The unit is PUU (user unit).
001 (01h)	Position command (PUU) <b>B</b>	The current coordinate of position command. The unit is PUU (user unit). PT mode: it represents the pulse number the servo drive received. PR mode: the value of absolute coordinate from position command Equals to the pulse number sent by the controller.
002 (02h)	Position deviation (PUU) <b>B</b>	The deviation between the position command and feedback position. The unit is PUU (user unit).
003 (03h)	Feedback position (pulse) <b>B</b>	Current feedback position of the motor encoder. The unit is pulse (encoder unit).
004 (04h)	Position command (pulse) <b>B</b>	The current coordinate of the position command. The unit is pulse (encoder unit). The command that had gone through E-gear.
005 (05h)	Position deviation (pulse) <b>B</b>	The deviation between the position command and feedback position. The unit is pulse (encoder unit).
006 (06h)	Pulse command frequency <b>B</b>	Frequency of pulse command received by the servo drive. The unit is Kpps. It is suitable in PT / PR mode.

Code	Name of Variables / Attribute	Descriptions
007 (07h)	Speed feedback <b>B D1 Dec</b>	Current speed of the motor. The unit is 0.1 r / min. The value is more stable since it has been though low-pass filter.
008 (08h)	Speed command (analog) <b>B D2 Dec</b>	The speed command is issued by analog. The unit is 0.01 Volt.
009 (09h)	Speed command (processed) <b>B</b>	The processed speed command. The unit is 1 r / min. The source might be analog, register or from position loop.
010 (0Ah)	Torque command (analog) <b>B D2 Dec</b>	The torque command is issued by analog. The unit is 0.01 Volt.
011 (0Bh)	Torque command (processed) <b>B</b>	The processed torque command. The unit is Percentage (%). The source might be analog, register or from speed loop.
012 (0Ch)	Average load <b>B</b>	The average load output by the servo drive. The unit is Percentage (%).
013 (0Dh)	Peak load <b>B</b>	The maximum load output by the servo drive. The unit is Percentage (%).
014 (0Eh)	DC Bus voltage <b>B</b>	Capacitor voltage after rectification. The unit is Volt.
015 (0Fh)	Inertia ratio <b>B D1 Dec</b>	Ratio of load inertia and motor inertia. The unit is 0.1 times.
016 (10h)	IGBT temperature <b>B</b>	The temperature of IGBT. The unit is °C.
017 (11h)	Resonance frequency <b>B Dec</b>	Resonance frequency of the system, including 2 groups of frequency, F1 and F2. When monitoring via panel, pressing <b>SHF</b> can switch the display of both: F2 shows no decimal point while F1 shows one. When reading through communication (mapping parameter): Low-16 Bit (Low WORD) returns frequency F2. High-16 Bit (High WORD) returns frequency F1.
018 (12h)	Z phase offset <b>B Dec</b>	The offset between the motor position and Z phase. The range is from -5000 to +5000. If the position is the same as Z phase, its value is 0. The bigger the value is, the more the offset will be.

Code	Name of Variables / Attribute	Descriptions
019 (13h)	Mapping parameter # 1 <b>B</b>	Return the value of parameter P0-25 which is mapped by P0-35
020 (14h)	Mapping parameter # 2 <b>B</b>	Return the value of parameter P0-26 which is mapped by P0-36
021 (15h)	Mapping parameter # 3 <b>B</b>	Return the value of parameter P0-27 which is mapped by P0-37
022 (16h)	Mapping parameter # 4 <b>B</b>	Return the value of parameter P0-28 which is mapped by P0-38
023 (17h)	Mapping monitor variable # 1 <b>B</b>	Return the value of parameter P0-09 which is the monitor variables mapped by P0-17
024 (18h)	Mapping monitor variable # 2 <b>B</b>	Return the value of parameter P0-20 which is the monitor variables mapped by P0-18
025 (19h)	Mapping monitor variable # 3 <b>B</b>	Return the value of parameter P0-11 which is the monitor variables mapped by P0-19
026 (1Ah)	Mapping monitor variable # 4 <b>B</b>	Return the value of parameter P0-12 which is the monitor variables mapped by P0-20
039 (27h)	DI status (processed) <b>Hex</b>	The processed DI status of the servo drive. Each bit corresponds to one DI channel. The source includes hardware channel / software P4-07 which is determined by P3-06.
040 (28h)	DO status (hardware) <b>Hex</b>	The real status of Digital Output hardware. Each bit corresponds to one DI channel.
041 (29h)	Drive status	Return the value of P0-46. Please refer to the description of the parameter.
043 (2Bh)	CAP, data capturing	The Data captured by CAP hardware from the latest time Note: CAP could continuously capture many points.
048 (30h)	Auxiliary encoder CNT	The value of pulse counter from auxiliary encoder (CN5)
049 (31h)	Pulse command CNT	The value of pulse counter from pulse command (CN1)
050 (32h)	Speed command (processed) <b>D1 Dec</b>	The processed speed command. The unit is 0.1 r / min. The source might be analog, register or position loop.
051 (33h)	Speed feedback (immediate) <b>D1 Dec</b>	Current actual speed of the motor. The unit is 0.1 r / min.
052 (34h)	Speed feedback (filter) <b>D1 Dec</b>	Current actual speed of the motor. The unit is 0.1 r / min (has been through the low-pass filter).

Code	Name of Variables / Attribute	Descriptions
053 (35h)	Torque command (processed) <b>D1 Dec</b>	The processed torque command. The unit is 0.1 Percent (%). The source might be analog, register or speed loop.
054 (36h)	Torque feedback <b>D1 Dec</b>	Current actual torque of the motor. The unit is 0.1 Percent (%).
055 (37h)	Electric current feedback <b>D2 Dec</b>	Current actual electric current of the motor. The unit is 0.01 ampere (Amp).
056 (38h)	DC Bus voltage <b>D1 Dec</b>	Capacitor voltage after rectification. The unit is 0.1 volt.
059 (3Bh)	Pulse from ECAM master axis (accumulation)	The accumulative pulse number of E-Cam master axis. It is the same as P5-86.
060 (3Ch)	Pulse from ECAM master axis (increment)	The incremental pulse number from master axis. The unit is pulse number per msec.
061 (3Dh)	Pulse from ECAM mast axis (lead pulse)	The lead pulse of E-Cam master axis which is used to judge the engaging condition. When it is disengaging: lead pulse = P5-87 or P5-92. When the value is 0, it will be engaged. When it is engaging: lead pulse = P5-89. When the value is 0, it will be disengaged.
062 (3Eh)	The position of ECAM axis	The position of ECAM axis. Unit: The pulse is from the master axis. When the incremental pulse from master axis is P, the axis rotates M cycle (P5-83 = M, P5-84 = P).
063 (3Fh)	Position of ECAM slave axis	The position of E-Cam slave axis. Unit: PUU
064 (40h)	Terminal register of PR command	In PR mode, the termination of position command (Cmd_E)
065 (41h)	Output register of PR command	In PR mode, the accumulative output of position command
067 (43h)	PR target speed	The target speed of path command in PR mode. The unit is PPS (Pulse Per Second)
068 (44h)	S-curve filter (input)	The input command of S-curve filter which is used to smooth the input command. It is effective in PR mode, ECAM and speed command.

Code	Name of Variables / Attribute	Descriptions
069 (45h)	S-curve filter (output)	The output command of S-curve filter which is used to smooth the output command. It is effective in PR mode, ECAM and speed command.
076 (4Ch)	Speed command of PR contour	In PR mode, the programmed trapezoid speed curve is determined by the target speed, acceleration, deceleration and moving distance (before S-curve filter). The unit is PPS (Pulse Per Second).
081 (51h)	Synchronous capture axis Incremental input pulse	When synchronous capture axis is enabled, the received pulse number between two captures can be used to measure the real distance of Mark.
084 (54h)	Synchronous capture axis Deviation pulse number	The deviation between the real output pulse and the target pulse when synchronous capture axis is enabled. If it reaches the synchronization, the value will close to 0.
096 (60h)	Firmware version <b>Dec</b>	It includes two versions, DSP and CPLD. When monitoring via panel, pressing the <b>SHF</b> Key can switch the display of both: DSP shows no decimal point while CPLD shows one. When reading through communication (parameter mapping): Low-16 Bit (Low WORD) returns DSP version number. High-16 Bit (High WORD) returns CPLD version number.
098 (62h)	PLC scan time	The update time of DI / DO. The unit is 0.5 msec.
109 (6Dh)	The amount of data array	Returns the amount of data array. The unit is DWORD (32 Bits)
111 (6Fh)	Error code of the servo drive	Error code of the servo drive: only for the control loop, not including the motion controller.
112 (70h)	CANopen SYNC TS (hasn' t been through the filter)	The time the servo drive receives SYNC signal (TimeStamp) The unit is usec.
113 (71h)	CANopen SYNC TS (has been through the filter)	The time the servo drive receives SYNC signal and has been through the filter The unit is usec.

Code	Name of Variables / Attribute	Descriptions
114 (72h)	CANopen timing synchronization	To synchronize the device timing with the controller during the operation. The unit is usec.
123 (7Bh)	The returned value when monitoring via panel	The returned value when monitoring via panel

## 7.2.2 Description of Data Array

Many functions of motion control are added in ASDA-M, e.g. CAPTURE, COMPARE and E-Cam, and those are the data that needs to be saved in large amount memory space, therefore, the servo drive reserves a continuous internal space to satisfy the need. The main feature of the data array is as the followings:

Feature Introduction of Data Array	
Usage	<ul style="list-style-type: none"> <li>● Save the captured data of CAPTURE</li> <li>● Save the compared value of COMPARE</li> <li>● Save the contour table of E-Cam</li> </ul> <p>Note: The system does not partition off the data array into the individual space of CAP, CMP and ECAM. The user could program it according to the demand. Therefore, the space might be overlapped. Please pay close attention to it when using.</p>
Size of Data Array	<ul style="list-style-type: none"> <li>● 32-bit integer x 1500 (refer to P5-10)</li> <li>● Each data has its corresponding address. Specify the address is a must when reading or writing the data.</li> <li>● The 1500 data is from 0 to 1499.</li> </ul>
Data Retained	<ul style="list-style-type: none"> <li>● Manually set up the saving (P2-08 = 30, 35) is a must and the data should be saved in EEPROM of the servo drive.</li> <li>● Save the data when it is Servo Off.</li> <li>● The data will be loaded into data array automatically when it is Servo On.</li> </ul>
Accessing Window	<ul style="list-style-type: none"> <li>● Should be access via parameter P5-10 ~ P5-13.</li> </ul>

The content of data array cannot be read or wrote directly, reading or writing the data must via parameter P5-10 ~ P5-13. The description of the parameters is as the followings:

Description of Related Parameter about Data Array		
Parameter	Name	Description
P5-10	Size of data array	Return the size of data array (read-only)
P5-11	Reading / writing address	Set the desired address of reading and writing
P5-12	Reading / writing window #1	<p>Read via panel: After reading the content of P5-11, the value of P5-11 will not change.</p> <p>Write via panel: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.</p> <p>-----</p> <p>Read via communication: After reading the content of P5-11, the value of P5-11 will increase 1 automatically.</p> <p>Write via communication: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.</p>
P5-13	Reading / writing window #2	<p>Read via panel: After reading the content of P5-11, the value of P5-11 will increase 1 automatically.</p> <p>Write via panel: It cannot be written via panel.</p> <p>-----</p> <p>Read via communication: After reading the content of P5-11, the value of P5-11 will increase 1 automatically.</p> <p>Write via communication: After writing the content of P5-11, the value of P5-11 will increase 1 automatically.</p>

Set the desired reading / writing address via P5-11 first. Then, read / write P5-12 or P5-13 in order to access the content of data array. If users desire to continuously write 3 data, 100, 200, 300 into the address of data array, 11, 12 and 13, the operation step is as follows:

**A.** Write via panel: Use P5-12 (reading / writing window #1), since P5-13 does not support writing via panel:

1. Set address: Set P5-11 to 11 (The first written address)
2. Write into data: Set P5-12 to 100 (After writing 100 into address 11 in data array, the value of P5-11 will increase 1 automatically.)  
Set P5-12 to 200 (After writing 200 into address 12 in data array, the value of P5-11 will increase 1 automatically.)

Set P5-12 to 300 (After writing 300 into address 13 in data array, the value of P5-11 will increase 1 automatically.)

The last step is to read address 11, 12 and 13 and check if the content is the value that just wrote into.

**B. Read via panel:** Use P5-13 (reading / writing window #2) so as to continuously read the content.

1. Set address: Set P5-11 to 11 (The first read address)

2. Read the data: When the panel displays P5-13,

Press the **SET** Key for the first time and show the content of address 11. Then, press the **MODE** Key to exit.

Press the **SET** Key for the second time and show the content of address 12. Then, press the **MODE** Key to exit.

Press the **SET** Key for the second time and show the content of address 13. Then, press the **MODE** Key to exit.

Note: Every time when reading the data via P5-13, the value of P5-11 will increase 1 automatically. Thus the user could continuously read the data.

If reading the data via P5-12, then the value of P5-11 will not change. The user is unable to read the next data automatically.

If users desire to read / write the data array via communication, the operation procedure is similar to panel. Moreover, the function of P5-12 and P5-13 is the same. If users desire to write 6 data, 100, 200, 300, 400, 500 and 600 into the address of data array via Modbus communication command 0x10 (continuous writing), the content of the issued command is as the followings:

Content of Communication Command: Write into Data Array									
No.	Command	Start Add.	Written Amount	P5-11		P5-12		P5-13	
				Low Word	High Word	Low Word	High Word	Low Word	High Word
1	0x10	P5-1 1	6 (Word)	11	0	100	0	200	0
				The first address		The first data		The second data	
2	0x10	P5-1 1	6 (Word)	13	0	300	0	400	0
				The third address		The third data		The fourth data	
3	0x10	P5-1 1	6 (Word)	15	0	500	0	600	0
				The fifth address		The fifth data		The sixth data	





**NOTE** Each axis has its own station number. If the controller desires to communicate with different axis, it should switch the station number which is set by P3-00 through communication.

If users desire to read the value of data array in order to check the previous written content, users can write the desired reading start address into P5-11 via MODBUS communication command 0x06 (write 1 data). The issuing communication command is as the following:

Content of Communication Command: Set the Reading Address of Data Array			
No.	Command	Start Add.	Written Data
4	0x06	P5-11	11

Then, read the content of specified address by communication command 0x03 (continuous reading). The issuing communication command is as follows:

Content of Communication Command: Read Data Array				Return Data					
No.	Command	Start Add.	Read Amount	P5-11		P5-12		P5-13	
				Low Word	High Word	Low Word	High Word	Low Word	High Word
5	0x03	P5-1 1	6 (Word)	11	0	100	0	200	0
				Read address		Data of address 11		Data of address 12	
6	0x03	P5-1 1	6 (Word)	13	0	300	0	400	0
				Read address		Data of address 13		Data of address 14	
7	0x03	P5-1 1	6 (Word)	15	0	500	0	600	0
				Read address		Data of address 15		Data of address 16	

The return value on the right-hand side of the above table represents the read parameter, P5-11, P5-12 and P5-13, which is also the content of address 11 ~ 16 in data array.



**NOTE** Each axis has its own station number. If the controller desires to communicate with different axis, it should switch the station number which is set by P3-00 through communication.

## 7.3 Description of Motion Axes

The motion axis is an internal counter of the servo drive. It is used for counting the absolute position of the axis (32-bit integer). The following motion axes are included in this servo drive:

Name of the Axis	Description	Access	Attribute
1. Main Encoder (P5-16)	It represents the absolute feedback position of the motor. The unit is PUU (user unit).	R	Physical Axis
2. Auxiliary Encoder (P5-17)	It is counted by the pulse signal from CN5 and usually connects to the second encoder or linear scale. Its pulse is A/B TYPE.	R / W	Physical Axis
3. Pulse Command (P5-18)	It is counted by the pulse signal from CN1 and usually connects to the pulse command of the controller. The pulse type could be set by P1-00.	R / W	Physical Axis
4. Capture Axis (P5-37)	It is the axis which has CAP function. Its command source could be the above mentioned axis 1 ~ 3, which can write the new value into it and has an offset from the physical axis. Moreover, after capturing the first point, the axis position can be redefined.	R / W	Functional Axis
5. Compare Axis (P5-57)	It is the axis which has CMP function. Its command source could be the above mentioned axis 1 ~ 4, which can write the new value into it and has an offset from the physical axis.	R / W	Functional Axis
6. Master Axis (P5-86)	It is the master axis of E-Cam. Its command source could be the above mentioned axis 2, 3, 4 and 7, which can write the new value into it and has an offset from the physical axis.	R / W	Functional Axis
7. Command Axis in PR Mode	The command position is from the path generator in PR mode.	R	Virtual Axis
8. Internal Time Axis	It is the internal accumulative time counter of the servo drive. The value increases 1 every 1 ms.	R	Virtual Axis
9. Synchronous Capture Axis (P5-77)	It is similar to Capture Axis (P5-37); however, it automatically adjusts the incremental pulse between two CAPs to the setting value of P5-78.	R / W	Virtual Axis
<p>Note: Physical Axis: The position value is counted from the actual hardware signal.            Functional Axis: It is the virtual axis which has been processed by the physical. The value might not be the same as the source of physical axis. However, the incremental value is the same as the one in physical axis.</p>			

Name of the Axis	Description	Access	Attribute
	Virtual Axis: The axis position comes from the internal firmware of the servo drive. The command axis of PR mode is not instantaneous; therefore, it cannot be the command source axis of CAP and CMP function. However, it could be the command source of master axis of E-Cam.		

## 7.4 Description of PR Mode

PR Procedure: It is the smallest unit of command. Command could be one or many procedures to constitute.

Procedure is triggered by DI.CTRG. POS0 ~ POS5 is used to specify the triggered procedure number.

Procedure is triggered by communication: The triggered procedure number is set by P5-07.

The triggered procedure is completed and will trigger the next one automatically. The procedure number can be set and the delay time between procedures as well.

The E-Cam function is provided in PR mode. It can be enabled via PR procedure. After it is disabled, it can return to the specified PR procedure.

## 7.5 The Position Unit of PR Mode

The position data of PR mode is represented by PUU (Pulse of User Unit). It is also the proportion between the controller position unit and the internal position unit of the servo drive, which is the so-called electronic gear ratio of the servo drive.

1. The position unit of the servo drive (pulse): Encoder unit.  
It has 1280000 pulses every revolution (pulse / rev) and is unchangeable.
2. User unit (PUU): The unit of the controller.  
If it has P pulse every revolution (PUU / rev), then the gear ratio should be set as:  
$$\text{GEAR\_NUM (P1-44) / GEAR\_DEN(P1-45) = 1280000 / P}$$

## 7.6 Description of Register in PR Mode

1. Position register of PR mode: All is represented in PUU (Pulse of User Unit).
2. Command register (monitor variable 064): Command termination register Cmd\_E. It represents the absolute terminal coordinate of position command.
3. Command output register (monitor variable001): Cmd\_O; it represents the absolute coordinate from the current output command.
4. Feedback register (monitor variable000): Fb\_PUU; it shows the absolute feedback position of the motor.
5. Deviation register (monitor variable002): Err\_PUU; it is the deviation between the register from command output and feedback register.
6. In PR mode, either in operation or stop status, it satisfies the condition of  $Err\_PUU = Cmd\_O - Fb\_PUU$ .

Influence brought by position command:

Type of Command	When issuing the command = >	= > When command is executing = >	= > Command is completed
Absolute Positioning Command	Cmd_E = command data (absolute) Cmd_O does not change. DO.CMD_OK is OFF	Cmd_E does not change. Cmd_O continuously output ...	Cmd_E does not change. Cmd_O = Cmd_E DO.CMD_OK is ON
Incremental Positioning Command	Cmd_E+ = command data (incremental) Cmd_O does not change. DO.CMD_OK is OFF	Cmd_E does not change. Cmd_O continuously output ...	Cmd_E does not change. Cmd_O = Cmd_E DO.CMD_OK is ON
Issue the command of DI : STP to stop the command anytime	Cmd_E does not change. Cmd_O continuously output DO.CMD_OK is unchangeable	Cmd_E does not change. Cmd_O stops according to the deceleration curve	Cmd_E does not change. Cmd_O = position after stop DO.CMD_OK is ON
Homing Command	Cmd_E does not change. Cmd_O does not change. DO.CMD_OK is OFF DO.HOME is OFF	Cmd_E continuously output Cmd_O continuously output ... ...	Cmd_E = the absolute position of Z Cmd_O = position after stop DO.CMD_OK is ON DO.HOME is ON

Type of Command	When issuing the command = >	= > When command is executing = >	= > Command is completed
Speed Command	Cmd_E continuously output. Cmd_O continuously output. When the speed command is completed, it means the speed reaches the setting value and does not stop. DO.CMD_OK is OFF		
Enter PR (Servo Off-> On or switch the mode and enter into PR mode)		Cmd_O = Cmd_E = current feedback position	
Note: The incremental positioning command is accumulated by command termination Cmd_E. It is neither related to the current position of the motor nor the command time.			

## 7.7 Description of Homing in PR Mode

The aim of homing is to connect the Z pulse position of the motor encoder to the internal coordinate of the servo drive. The coordinate value of Z pulse can be set by P6-01. After homing, the stop point will not locate at Z pulse position. It is because the motor has to decelerate to stop, the deceleration curve will slightly exceed Z pulse. However, the coordination of Z has been correctly set and will not influence the accuracy of positioning. For example, the coordinate value corresponded by Z pulse is 100, Cmd\_O = 300 after homing, which means the deceleration distance is  $300 - 100 = 200$  (PUU). Since Cmd\_E = 100 (The absolute position of Z), if desiring to return to Z pulse position, issue the absolute command 100 or incremental command 0 will do. After homing, it can execute PR path automatically so as to move the desired distance. When it is executing homing, the software limit cannot work.

## 7.8 DI/DO Provided by PR Mode and Diagrams

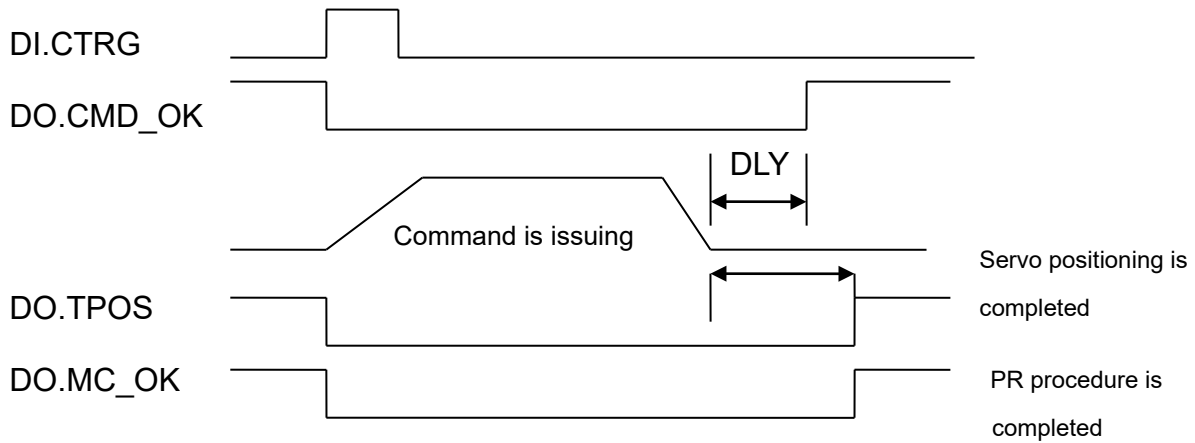
DI signal:

CTRG, SHOM, STP, POS 0 ~ 5, ORG, PL, NL, EV1 ~ 4

DO signal:

CMD OK, MC\_OK, TPOS, ALM, CAP\_OK, CAM\_AREA

System frame:



Description of command triggered method in PR mode:

99 command procedures are in each axis of PR mode. Procedure #0 is homing and the others are the procedures that users can self-define. The command triggered method is concluded as the followings:

	Command Source	Description
Standard trigger	DI.CTRG + POS0 ~ 5	Use DI.POS0 ~ 5 to trigger the desired procedure number. Then, use the rising edge of DI.CTRG to trigger PR command. Application: PC or PLC that issues command via DI Note: It only can trigger the first 64 sets of command procedure.
Functional trigger	DI.STP, SHM	When DI.STP is from OFF → ON, the command stops in half way. When DI.SHM is from OFF → ON, it starts homing.
Event trigger	DI.EV1 ~ 4	The change status of DI.EV1 ~ 4 can be the triggered event. Set the triggered procedure number from OFF → ON by parameter P5-98. Set the triggered procedure number from ON → OFF by parameter P5-99. Application: connect to the sensor and trigger the preset procedure.
Software trigger	P5-07	Directly write the procedure number into P5-07 and trigger command. Both panel and communication (RS-232 / 485 / CANopen) can do. Application: PC or PLC that issues command via communication.
Other	CAP trigger E-CAM disengage trigger	After the capture is completed, procedure #50 can be triggered and activated by the setting value Bit3 of P5-39 X. When E-cam is disengaged and returns to PR mode, the procedure specified by P5-88 BA setting value can be triggered.

## 7.9 Parameter Settings in PR Mode

1) Target speed: P5-60 ~ P5-75, 16 PR in total

	15 ~ 0 BIT
W0	TARGET_SPEED: 0.1 ~ 6000.0 (r / min)

2) Acceleration / Deceleration time: P5-20 ~ P5-35, 16 PR in total

	15 ~ 0 BIT
W0	T_ACC / T_DEC : 1 ~ 65500 (msec)

3) Pause time: P5-40 ~ P5-55, 16 PR in total

	15 ~ 0 BIT
W0	IDLE: 0 ~ 32767 (msec)

4) PR parameter: P5-00 ~ P5-09, P6-00 ~ P6-01, 12 DWORD in total.

	32 BIT
P5-00	Reserved
P5-01	Reserved (It is for testing only, do not use)
P5-02	Reserved (It is for testing only, do not use)
P5-03	Deceleration time of auto protection
P5-04	Homing mode
P5-05	1 <sup>st</sup> Speed setting of high speed homing
P5-06	2 <sup>nd</sup> Speed setting of high speed homing
P5-07	PR command register
P5-08	Forward software limit
P5-09	Reverse software limit
P6-00	Homing setting
P6-01	Origin definition

Note: Path (procedure)

5) PR definition: P6-02 ~ P7-99, (64 BIT), 99 sets of PR in total

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	...	...	...	...	...	...	...	TYPE
DW1	DATA (32 bit)							

Each PR has two parameters, the PR function is determined by TYPE. DATA represents position or speed data while the others are the additional information.



## 6) SPEED, Constant speed control: TYPE = 1

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	-	-	DLY	-	DEC	ACC	OPT	1
DW1	DATA (32 bit): Target Speed ; Unit is defined by OPT.UNIT							

When this command is executing, the motor accelerates or decelerates from the current speed until it reaches the target speed. After the command is completed, the motor will remain at the same speed and never stop.

## OPT:

OPT selection			
7	6	5	4 BIT
-	UNIT	AUTO	INS

※DI.STP stop and software limit are acceptable.

INS: When this PR is executing, it will interrupt the previous PR.

AUTO: When the speed reaches the constant speed area, the next PR will be loaded automatically.

UNIT: 0 unit is 0.1 r / min; 1 unit is PPS (Pulse Per Second)

ACC / DEC: 0 ~ F, acceleration / deceleration number (4 BIT)

ACC / DEC (4)
---------------

Index P5-20 ~ P5-35

SPD: 0 ~ F, target speed number (4 BIT)

SPD (4)
---------

Index P5-60 ~ P5-75

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)
---------

Index P5-40 ~ P5-55

7) PPSITION, Positioning control: (TYPE = 2, PR is completed and stopped), (TYPE = 3, the next PR is executed automatically after the PR is completed)

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	-	-	DLY	SPD	DEC	ACC	OPT	2 or 3
DW1	DATA (32 bit): target position, Unit: Pulse of User Unit							

OPT:

OPT Selection				Description
7	6	5	4 BIT	
CMD		OVLP	IINS	
0	0			Absolute positioning command: Cmd_E = DATA (Note 1)
1	0			Incremental positioning command: Cmd_E = Cmd_E + DATA (Note 2)
0	1	-	-	Relative positioning command: Cmd_E = current feedback +DATA (Note 3)
1	1			CAP positioning command: Cmd_E = CAP position +DATA (Note 4)

※DI.STP stop and software limit are acceptable.

INS: When this PR is executing, it will interrupt the previous PR

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

CMD: The calculation of the position terminal command (Cmd\_E) is as the followings:

Note 1: Position terminal command is determined by DATA.

Note 2: Position terminal command is determined by the previous terminal command (Monitor variable 40h) plus DATA.

Note 3: Position terminal command is determined by the current feedback position (Monitor variable 00h) plus DATA.

Note 4: Position terminal command is determined by the position latched by CAP (Monitor variable 2Bh) plus DATA.

8) Multi-axis linear interpolation: TYPE = 4, execute the function of multi-axis linear interpolation.

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	SEL	OVLP	DLY	VSPD	VDEC	VACC	OPT	4
DW1	DATA (32 bit): Target position, Unit: Pulse of User Unit							

OPT:

OPT Selection				
7	6	5	4 BIT	Description
CMD		OVLP	AUTO	
0	0			Absolute positioning command: Cmd_E = DATA (Note 5)
1	0			Incremental positioning command: Cmd_E = Cmd_E + DATA (Note 6)
0	1	-	-	Relative positioning command: Cmd_E = current feedback + DATA (Note 7)
-	-			Reserved

※DI.STP stop and software limit are acceptable.

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

AUTO: Position reached and the next PR is loaded automatically.

CMD: The calculation of the position command termination (Cmd\_E) is as follows:

Note 5: Position terminal command is determined by DATA.

Note 6: Position terminal command is determined by the previous terminal command (Monitor variable 40h) plus DATA.

Note 7: Position terminal command is determined by the current feedback position (Monitor variable 00h) plus DATA.

VACC / VDEC: 0 ~ F, the number of vector acceleration / deceleration (4 BIT)

VACC / VDEC (4)

Index P5-20 ~ P5-35

VSPD: 0 ~ F, the number of target vector speed (4 BIT)

VSPD (4)

Index P5-60 ~ P5-75

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)

Index P5-40 ~ P5-55

OVLP: 0 ~ F, overlap percentage selection (4 BIT) and the overlap percentage selection of the next PR

Grade	7	6	5	4	3	2	1	0
Percentage	45%	40%	35%	30%	25%	20%	10%	0%
Grade	F	E	D	C	B	A	9	8
Percentage	100%	90%	80%	75%	70%	65%	55%	50%

SEL: 0 ~ 3, axis selection

SELECT				
Code	3	2	1	0
Axis selection	ZX	ZY	YX	ZYX

- 0: Multi-axis linear interpolation
- 1: XY two-axis linear interpolation
- 2: YZ two-axis linear interpolation
- 3: XZ two-axis linear interpolation

Command source: P6-02 ~ P7-99 of the first axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

Command source: P6-02 ~ P7-99 of the second axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

Command source: P6-02 ~ P7-99 of the third axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

- Note:
1. When the first axis is triggered, the servo drive will conduct linear interpolation according to DW0 of the first axis; when the second axis is triggered, the servo drive will refer to DW0 of the second axis, and so on.
  2. Take XY two-axis linear interpolation as example, the common setting is that settings of SEL, OVLP, DLY, VSPD, VDEC, VACC, OPT, and TYPE of X and Y-axis are identical. DW1 of X-axis is set to position command of X-axis and DW1 of Y-axis is set to position command of Y-axis. After setting is completed, PR of X-axis and PR of Y-axis can be triggered to conduct linear interpolation.
  3. For more flexible applications, users can define the value of DW0 of each axis. Take XY two-axis linear interpolation for example:  
To instantly move any of the axes (such as X-axis) when linear interpolation, by setting the incremental position of Y-axis to 0 and triggering X-axis to conduct linear interpolation, X-axis will move according to the settings of OVLP, DLY, VSPD, VDEC, VACC, OPT of X-axis (because incremental position of Y-axis is set to 0. Even though it is part of the interpolation, position of Y-axis remains the same.)  
In this condition, users have to know which axis' setting (including OVLP, DLY, VSPD, VDEC, VACC, OPT) is applied to conduct the interpolation and synchronous motion. When PR of X-axis is triggered, the servo drive will conduct interpolation by using the setting of DW0 of X-axis. If PR of Y-axis is triggered, DW0 of Y-axis will be applied to conduct interpolation.

9) FEED RATE setting: TYPE = 5, Feed Rate setting during the process of modifying the motion.

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	-	-	DLY	-	VDEC	VACC	OPT	5
DW1	DATA (32 BIT): FEED RATE, Unit: PPS (Pulse Per Second)							

When executing this command, the Feed Rate of motion vector will be dynamically changed. If the motion vector is processing, the updated vector speed and acceleration / deceleration time will be effective immediately.

OPT:

OPT selection			
7	6	5	4 BIT
-	-	AUTO	-

AUTO: When the speed reaches the constant speed area, the next PR will be loaded automatically.

VACC / VDEC: 0 ~ F, the number of vector acceleration / deceleration (4 BIT)

VACC / VDEC (4)	Index P5-20 ~ P5-35
-----------------	---------------------

VSPD: 0 ~ F, the number of target vector speed (4 BIT)

VSPD (4)	Index P5-60 ~ P5-75
----------	---------------------

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)	Index P5-40 ~ P5-55
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10) Special code: TYPE = 7, jump to the specified PR

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	-	-	DLY	-	FUNC_CODE	-	OPT	7
DW1	PATH_NO (0 ~ 63)							

OPT:

OPT selection			
7	6	5	4 BIT
-	-	-	INS

PATH\_NO: The jump target procedure number

FUNC\_CODE: Reserved

DLY: The delay time after jump

11) Special code: TYPE = 8, write the specified parameter

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	-	-	DLY	P_Grp	P_Idx		OPT	8
DW1	Para_Data							

P\_Grp, P\_Idx: groups and number of the specified parameter

DLY: The delay time after write

OPT:

OPT Selection			
7	6	5	4 BIT
-	-	AUTO	INS

Para\_Data: the written data

Note: 1. Even when the written parameter is retained, the new value will not be written into EEPROM. Too frequent written will not shorten the lifetime of EEPROM.

Note: The aim of writing parameters via PR procedure is for turning ON / OFF or adjusting some functions. (e.g. according to different positioning command to adjust P2-00, Position Loop Gain.) This procedure will continuously repeat during the operation. If the data is all written into EEPROM, it will shorten the lifetime of EEPROM. In addition, if P2-30 is set to 5, the modified parameters (either from panel or communication) will not be saved and is inconvenient to use. Thus, this new function is added.

2. If writing parameters fails, alarm AL213 ~ 219 will occur (Refer to Chapter 11 of the manual) and the next PR which is enabled by AUTO function will not be executed.

12) Multi-axis helical interpolation: TYPE = E, execute the function of multi-axis helical interpolation.

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	SEL	OVLP	DLY	VSPD	VDEC	VACC	OPT	E
DW1	DATA (32 bit): determined by different axis							

OPT:

OPT Selection				Description
7	6	5	4 BIT	
CMD		OVLP	AUTO	
0	0	-	-	Angle command: starting angle and moving angle (Note 8)
1	0			Reserved
0	1			Reserved
-	-			Reserved

※DI.STP stop and software limit are acceptable.

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

AUTO: Position reached and the next PR is loaded automatically.

CMD: The calculation of the position command termination (Cmd\_E) is as follows:

Note 8: angle command – need to enter the starting angle and moving angle

VACC / VDEC: 0 ~ F, the number of vector acceleration / deceleration (4 BIT)

VACC / VDEC (4)

Index P5-20 ~ P5-35

VSPD: 0 ~ F, the number of target vector speed (4 BIT)

VSPD (4)

Index P5-60 ~ P5-75

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)

Index P5-40 ~ P5-55

OVLP: 0 ~ F, overlap percentage selection (4 BIT) and the overlap percentage selection of the next PR

Grade	7	6	5	4	3	2	1	0
Percentage	45%	40%	35%	30%	25%	20%	10%	0%
Grade	F	E	D	C	B	A	9	8
Percentage	100%	90%	80%	75%	70%	65%	55%	50%

SEL: 0 ~ 2, axis selection

SELECT			
Code	2	1	0
Axis selection	ZX	ZY	YX

0: XY two-axis circular interpolation, Z axis is the height of helix.

1: YZ two-axis circular interpolation, X axis is the height of helix.

2: XZ two-axis circular interpolation, Y axis is the height of helix.

Command source: P6-02 ~ P7-99 of the first axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

The source of X command is the radius of arc interpolation. Unit: User unit (Pulse of User Unit)

Command source: P6-02 ~ P7-99 of the second axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 16 BIT	15 ~ 0 BIT
DW1	DATA2 (16 bit )	DATA1 (16 bit )

The source of Y command is the starting angle of arc and moving angle of arc. Unit: 0.5 degrees. (Note 9)

DATA1 is the setting of arc starting angle. DATA2 is the setting of arc moving angle.

Note 9: The unit of angle is 0.5 degrees, which means the input value is two times of the setting value. For example, if it is set to 90 degrees, the input value will be 180.

Command source: P6-02 ~ P7-99 of the third axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit )

The source of X command is the setting of the height of helix. Unit: user unit (Pulse of User Unit)



13) Two-axis circular interpolation: TYPE = F, execute the function of two-axis circular interpolation

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	SEL	OVLP	DLY	VSPD	VDEC	VACC	OPT	F
DW1	DATA (32 bit ): the setting is determined by different axis							

OPT:

OPT Selection				Description
7	6	5	4 BIT	
CMD		OVLP	AUTO	
0	0	-	-	Angle command: starting angle and moving angle (Note 10)
1	0			Reserved
0	1			Reserved
-	-			Reserved

※DI.STP stop and software limit are acceptable.

OVLP: It is allowed to overlap the next PR. When overlapping, please set DLY to 0.

AUTO: Position reached and the next PR is loaded automatically.

CMD: The calculation of the position command termination (Cmd\_E) is as follows:

Note 10: angle command – need to enter the starting angle and moving angle

VACC / VDEC: 0 ~ F, the number of vector acceleration / deceleration (4 BIT)

VACC / VDEC (4)

Index P5-20 ~ P5-35

VSPD: 0 ~ F, the number of target vector speed (4 BIT)

VSPD (4)

Index P5-60 ~ P5-75

DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)

Index P5-40 ~ P5-55

OVLP: 0 ~ F, overlap percentage selection (4 BIT) and the overlap percentage selection of the next PR

Grade	7	6	5	4	3	2	1	0
Percentage	45%	40%	35%	30%	25%	20%	10%	0%
Grade	F	E	D	C	B	A	9	8
Percentage	100%	90%	80%	75%	70%	65%	55%	50%

SEL: 0 ~ 2, axis selection

SELECT			
Code	2	1	0
Axis selection	ZX	ZY	YX

0: XY, two-axis circular interpolation

1: YZ, two-axis circular interpolation

2: XZ, two-axis circular interpolation

Command source: P6-02 ~ P7-99 of the first axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

The source of X command is the radius of arc interpolation. Unit: User unit (Pulse of User Unit)

Command source: P6-02 ~ P7-99 of the second axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

The source of Y command is the starting angle of arc. Unit is 0.5 degrees (Note 11)

Command source: P6-02~P7-99 of the third axis, parameter DW1 (DATA-32 BIT), 99 PR in total.

	31 ~ 0 BIT
DW1	DATA (32 bit)

The source of Z command is the moving angle of arc. Unit is 0.5 degrees (Note 11)

Note 11: The unit of angle is 0.5 degrees, which means the input value is two times of the setting value. For example, if it is set to 90 degrees, the input value will be 180.

14) Homing setting: P6-00 ~ P6-01, (64 BIT) one set of PR.

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	BOOT	-	DLY	DEC2	DEC1	ACC	PATH	
DW1	ORG_DEF (32 bit)							

PATH: 0 ~ 0x63, (6 BIT)

00 (Stop): Homing completed and stops

01 ~ 0x63 (Auto): Homing completed and executes the specified PR: 1 ~ 99

Note: PATH (procedure)

ACC: Acceleration time

DEC1 / DEC2: The first / second deceleration time

DLY: Delay time

BOOT: Activation mode. When the POWER is ON:

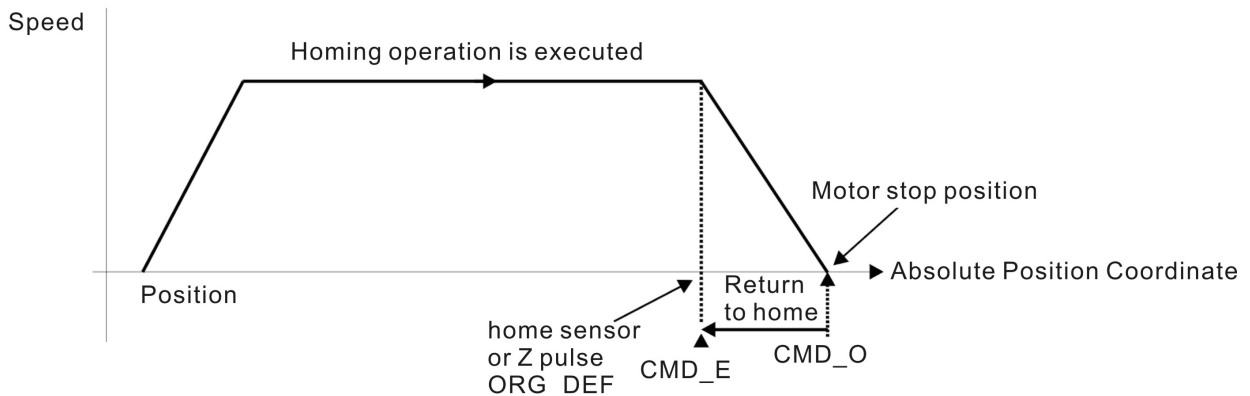
0: will not do homing

1: start homing (Servo ON for the first time)

ORG\_DEF: the coordinate value of the origin definition which might not be 0

A. If the motor moves to the origin after completing homing

After finding the origin (Sensor or Z), the motor has to decelerate to stop. The stop position will slightly exceed the origin:



If the motor moves to the origin, then set PATH to the PR with absolute position command and set the DATA of the PR to ORG\_DEF.

CMD\_O: Command Output Position

CMD\_E: Command End Position

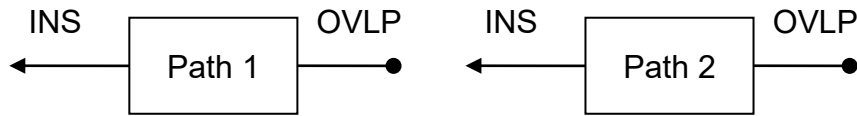
B. Homing does not define the offset value but uses PATH to specify a path as the offset value.

After finding the origin, if the user desires to move a short distance of offset S (the related home Sensor or Z) and set the coordinate to P after moving:

Then do not set PATH to 0, but set ORG\_DEF to P-S and the PR absolute position command to P (set incremental position command to S will do as well)

### 7.9.1 The Relation between the Previous Path and the Next Path

1) Interrupt (the previous path) and overlap (the next path) can be set in every path



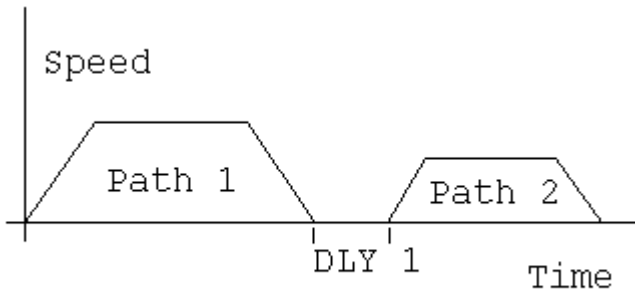
Note: Path (procedure)

2) The priority of interrupt command is higher than overlap

PATH 1	PATH 2	Relation	Output	Note
OVLP = 0	INS = 0	In sequence	DLY 1	PATH 1 / 2 which could be the combination of speed / position
OVLP = 1	INS = 0	Overlap	NO DLY	PATH 2 is SPEED and does not support overlap
OVLP = 0	INS = 1	Interrupt	N / A	PATH 1 / 2 which could be the combination of speed / position
OVLP = 1				

### 7.9.2 Programming the Path in PR Mode

#### 1) Sequence command

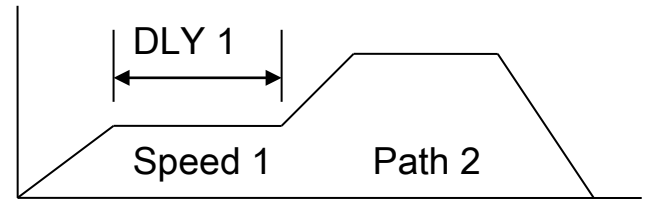


Path 1: is AUTO and has set DLY  
 Path 2: does not set INS

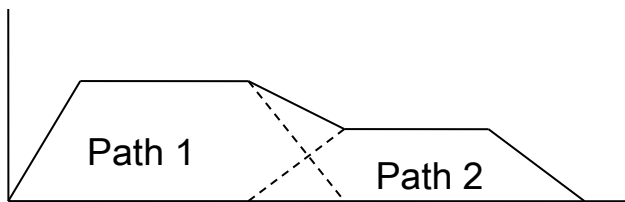
(DLY starts to count after completing the command)

Path 1: speed command and has set DLY  
 Path 2: position command

(DLY starts to count after completing the command)

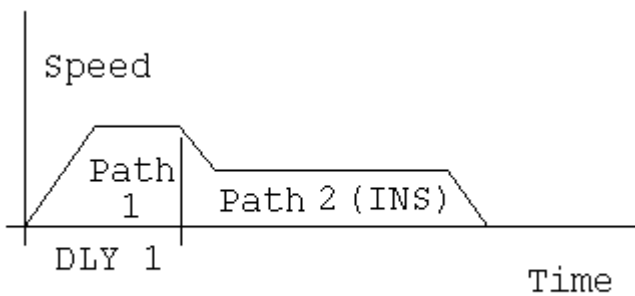


#### 2) Overlap



Path 1: has set OVLP but cannot set DLY  
 Path 2: does not set INS

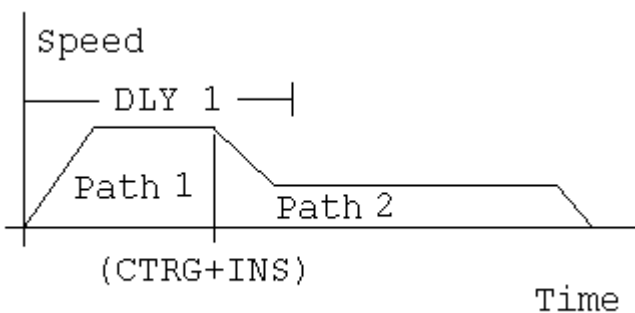
#### 3) Internal interrupt



Path 1: AUTO and has set DLY  
 Path 2: has set INS  
 (DLY is effective to the internal interrupt)

It can be used to pre-constitute complicated Profile

#### 4) External interrupt



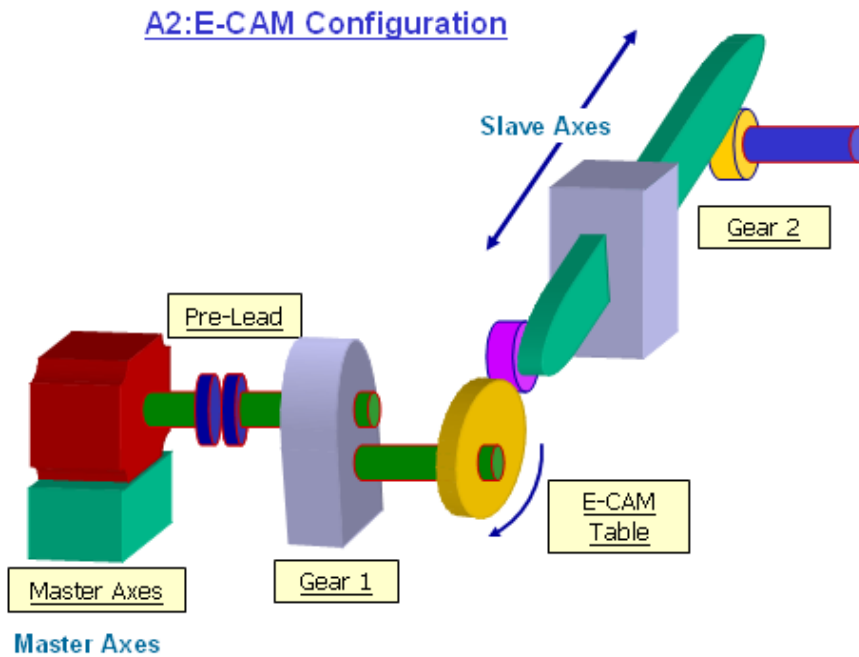
Path 1: AUTO or SINGLE  
 Regardless the setting of DLY  
 Path 2: has set INS

(DLY is ineffective to the external interrupt)

Profile can be changed from external any time

## 7.10 The Description of E-Cam Function

E-Cam is a virtual cam which is implemented by software. It includes Master axis and Slave axis. The illustration is as the following:



In PT mode, the position command (slave) is issued by the external pulse input (master). The two is merely the linear scaling relation (its scaling equals to e-gear ratio). However, instead of linear scaling, E-Cam is defined by cyclic curve profile, just like the cam shape. In physical machine cam, slave axis can operate as variable speed motion, alternating motion, intermittent motion, etc by master axis with the constant speed motion. It is very extensive in application. Using E-Cam could have similar effect. The following table describes the differences between E-Cam and Machine Cam.

	Machine Cam	E-Cam
Structure	Return to the original position after rotating a cycle.	It might not return to the original position after rotating a cycle. The structure could be in spiral shape like mosquito coil incense.
Smooth Performance	It is determined by the fineness of the real process.	It is interpolated by cubic curve via software
Position Accuracy	Very precise (when it has no vibration)	The command is very precise, but the actual position might have deviation due to the servo delay.
Long Distance Motion	The longer the slave axis is, the bigger the cam will be. It is not easy to make.	Change the value of the table will do. It is easy to realize.

	Machine Cam	E-Cam
The Necessity of Master Axis	The master axis is necessary.	The master axis is unnecessary when it is applied to constant speed motion. It will do by using the internal signal of the servo drive.
Flexibility	It is inconvenient to change and modify and it is expensive as well.	It will do by re-setting the parameter.
Maintenance	Machine will wear and the maintenance is necessary.	No need to maintain.
Others	The master axis needs space and it consumes energy as well.	Save the space and energy which protects the environment.

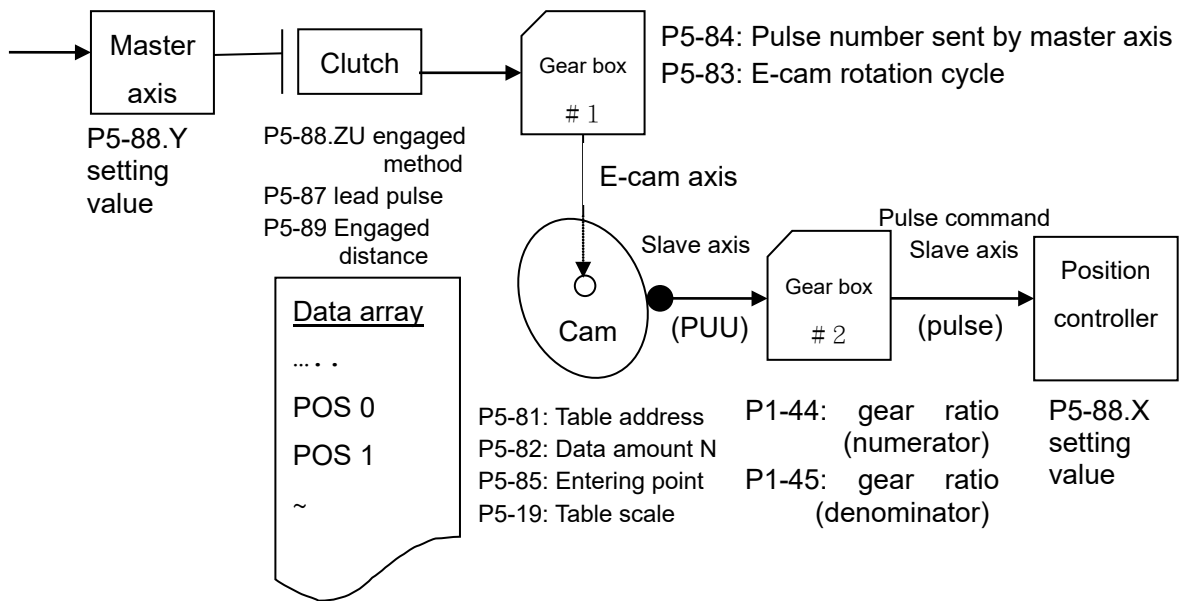
The main feature of E-Cam is as the followings:

Features of E-Cam	
Operation	Operate the E-cam in PR mode only.
Active the E-Cam Function P5-88.X	0: disable E-cam function and force to disengage (default). 1: enable E-cam function and starts to judge the engaged condition.
E-cam Status	<b>Stop / Pre-engage / Engage</b>
Source of Master Axis	<ul style="list-style-type: none"> <li>● Auxiliary encoder (linear scale)</li> <li>● Pulse command</li> <li>● CAP axis (defined by CAP function)</li> <li>● PR command</li> <li>● Time axis</li> <li>● Synchronous capture axis</li> </ul>
Motion Command of the Servo Drive	<p>The overlap motion command issued by PR and E-Cam  Command of the Servo Drive = E-Cam command + PR command</p> <ul style="list-style-type: none"> <li>● The command will be issued only in Engaged status</li> <li>● PR command is effective regardless to the E-Cam status. Except when E-cam is engaging and the source of master axis is PR command, PR command is 0.</li> </ul> <p>When E-Cam is operating, its position still can be adjusted by PR command (incremental command in general).</p>

Features of E-Cam	
Data Storage Address of E-Cam table	<ul style="list-style-type: none"> <li>● It is stored in Data array and the start address is set by P5-81.</li> </ul>
Data Size of E-Cam table	<ul style="list-style-type: none"> <li>● It is set by P5-82. 720 points is the maximum and 5 points is the minimum.</li> </ul>
Data Format of E-Cam table	<ul style="list-style-type: none"> <li>● 32-bit signed value.</li> </ul>
Data Content of E-Cam table	<ul style="list-style-type: none"> <li>● Save the position of slave axis (User unit, PUU)</li> </ul>
The operation of E-Cam position	<ul style="list-style-type: none"> <li>● The master axis operates by incremental command input.</li> <li>● The slave axis issues position command incrementally.</li> <li>● The start and the end of E-Cam curve profile could not always be the same. It depends on the value of E-Cam table.</li> <li>● The command is interpolated by cubic curve. The torque on each point will be smoothly connected because of quadratic differential operation.</li> </ul>
DO.CAM_AREA (DO no.= 0x18)	<ul style="list-style-type: none"> <li>● Digital Output (DO): CAM_AREA. If this DO is ON, it means the E-Cam axis is in the setting area.</li> </ul>



E-Cam provided by this servo drive and below is its functional diagram:

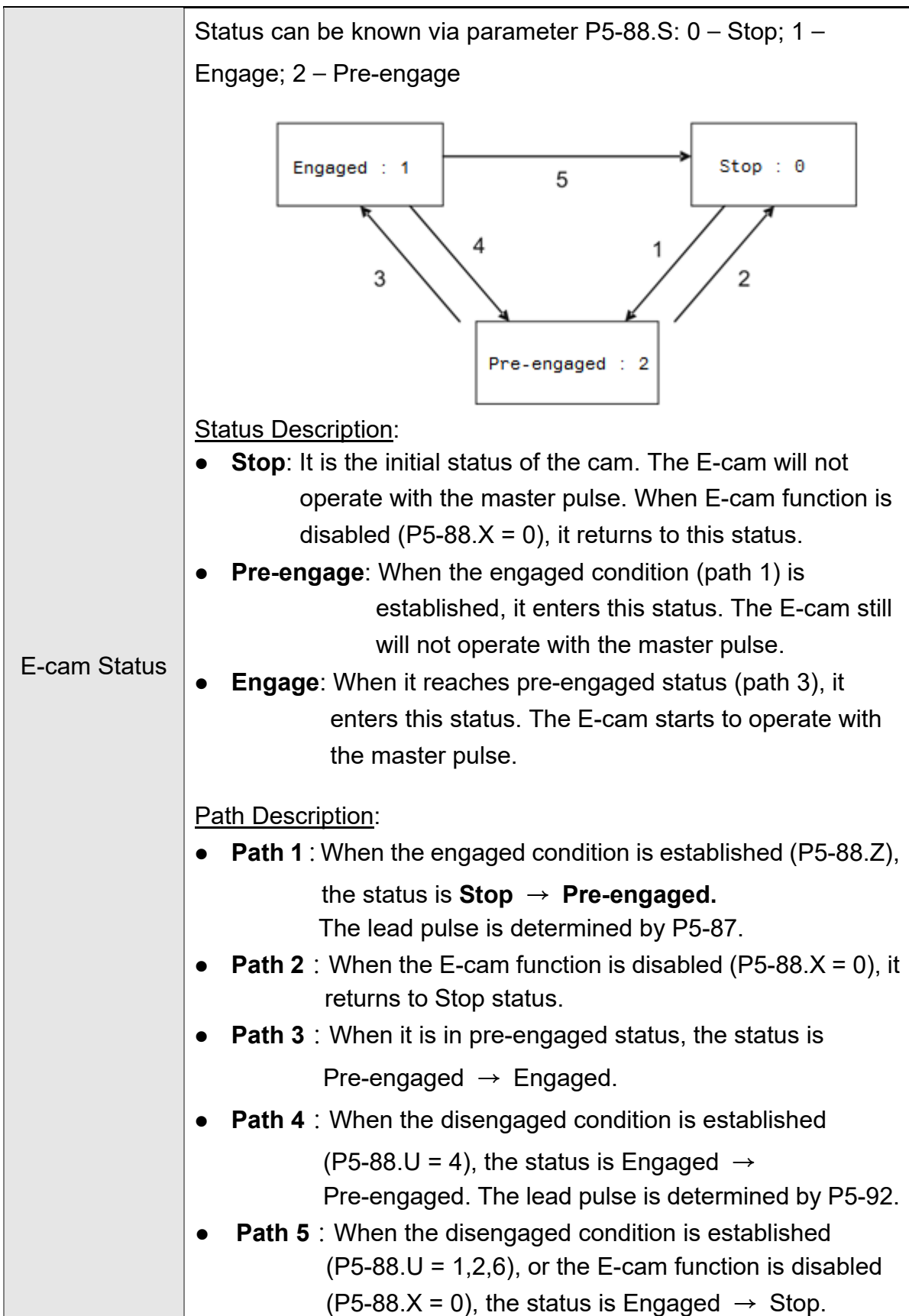


■ Master Axis, the description is as follows:

Function	The moving distance of the master axis is the source which could drive the E-Cam
Source of Master Axis The Setting Value of P5-88 Y	Source selected by P5-88.Y: <ul style="list-style-type: none"> <li>● Auxiliary encoder (linear scale)</li> <li>● Pulse command</li> <li>● PR command</li> <li>● Time axis</li> <li>● Synchronous capture axis</li> <li>● CAP axis (defined by CAP function)</li> </ul>
Position of Master Axis P5-86	The position of master axis can be monitored via P5-86. It also can be written before the E-cam engaged. To change this parameter will not influence the position of the slave. It is because the moving distance of master axis remains.

■ Clutch, the description is as follows:

Function	It is used to determine the status of engaged / disengaged between the master axis and gear box # 1. The moving distance of the master axis can drive the E-Cam not until the cam is engaged.
Activate E-cam function P5-88.X	0: disable E-cam function (default value). If the cam is engaged, the cam will be forced to disengage. 1: enable E-cam function and starts to judge the engaged condition



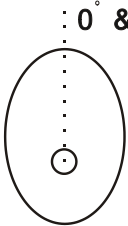
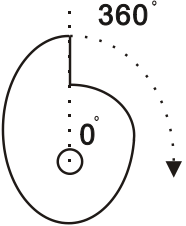
<p>Engage Condition P5-88.Z</p>	<p>When the E-cam is in Stop status, the method of determine engaged (path 1) is as the following:                  0: Engaged immediately. If P5-88.X is set to 1, the engaged condition is established.                  1: When DI.CAM is ON, the E-cam engaged.                  2: From CAP to engaged: the E-cam engaged when CAP function is enabled. After engaged, it starts to count the moving distance. Since the CAP position is captured by hardware, it has good instantaneity and no software delay, which is suitable for the operating master axis before engaged.</p>												
<p>Lead Pulse Monitor Variables (061)</p>	<ul style="list-style-type: none"> <li>● In pre-engaged status, the lead pulse is the moving distance of master axis before the E-cam is engaged (path 3). Its value decreases when input the master pulse. When the value is 0, it enters Engaged status.</li> <li>● Enter Pre-engaged status via path 1, the lead pulse is determined by the value of P5-87.</li> <li>● Enter Pre-engaged status via path 4, the lead pulse is determined by the value of P5-92.</li> <li>● If the setting is 0, it means no lead pulse and will enter Engaged status immediately.</li> </ul> <p>Symbol + / - represents the direction of lead pulse. Please note that the E-cam will be unable to engage if setting the wrong direction.</p> <p>If setting the wrong direction, the value of monitor variable (061) will increase, which is far from 0 and causes overflow at the end. If it overflows, the E-cam function will be disabled (P5-88.X = 0) and the E-cam will be forced to return to Stop status.</p>												
<p>Disengage Condition P5-88.U</p>	<p>When the E-cam is in Engaged status, the method of determine disengaged is as the following:                  Note: 2, 4 and 6 cannot be selected at the same time</p> <table border="1" data-bbox="475 1637 1393 2065"> <thead> <tr> <th>U</th> <th>Disengage Condition</th> <th>After Disengaged</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Never disengaged. It will be forced to disengage until P5-88.X is set to 0.</td> <td><b>(Path 5)</b> Enter <b>Stop</b> Status</td> </tr> <tr> <td>1</td> <td>DI.CAM is OFF</td> <td><b>(Path 5)</b> Enter <b>Stop</b> Status</td> </tr> <tr> <td>2</td> <td>Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)</td> <td><b>(Path 5)</b> Enter <b>Stop</b> Status</td> </tr> </tbody> </table>	U	Disengage Condition	After Disengaged	0	Never disengaged. It will be forced to disengage until P5-88.X is set to 0.	<b>(Path 5)</b> Enter <b>Stop</b> Status	1	DI.CAM is OFF	<b>(Path 5)</b> Enter <b>Stop</b> Status	2	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	<b>(Path 5)</b> Enter <b>Stop</b> Status
U	Disengage Condition	After Disengaged											
0	Never disengaged. It will be forced to disengage until P5-88.X is set to 0.	<b>(Path 5)</b> Enter <b>Stop</b> Status											
1	DI.CAM is OFF	<b>(Path 5)</b> Enter <b>Stop</b> Status											
2	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	<b>(Path 5)</b> Enter <b>Stop</b> Status											

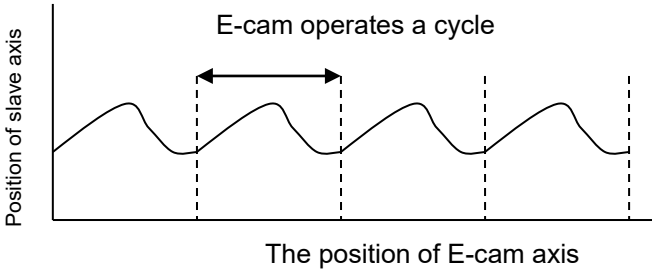
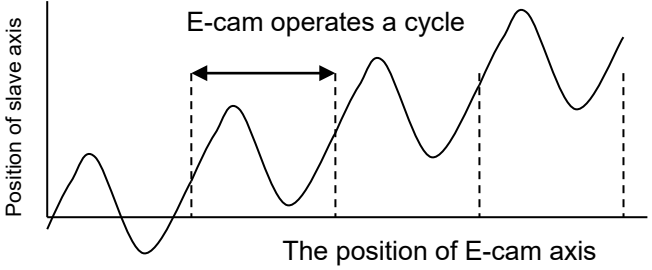
	6	Same as 2, the E-cam starts to decelerate when disengaging. It is suitable for the application of calling the next PR position command right after disengaged.	
	4	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	<b>(Path 4)</b> Returns to <b>Pre-engage Status</b> The lead pulse is P5-92
	8	Disable the E-cam after disengaging	Set P5-88.X = 0
Auxiliary Selection P5-88.BA	When the E-cam disengaged, if it is in the setting distance (P5-88.U = 2), it returns to Stop status and can determine the execution PR number.		

■ Gear # 1, the description is as follows:

Function	<ul style="list-style-type: none"> <li>● Set the relativity of master axis and E-cam axis. e.g. The master axis operates one cycle, the E-cam axis is no need to operates one cycle.</li> </ul>
Description	<ul style="list-style-type: none"> <li>● E-cam axis is a virtual axis.</li> <li>● The E-cam axis operates one cycle (360 degrees) means the cam operates one cycle and the slave axis operates one cycle.</li> <li>● The pulse number is the unit of moving distance of the master axis. Its resolution is determined by the source.</li> </ul>
Setting Method P5-83: M P5-84: P	<ul style="list-style-type: none"> <li>● If the pulse number of master axis is P, the E-cam axis operates M cycle. Then, the setting of gear ratio is <math>P5-83 = M</math>, <math>P5-84 = P</math></li> </ul>

■ Cam, the description is as follows:

<p>Function</p>	<ul style="list-style-type: none"> <li>● Set the relation between E-cam axis and slave axis and define it in the E-cam table. E-cam axis operates one cycle and the slave axis operates one cycle.</li> </ul>
<p>Data Storage Address of E-Cam table</p>	<ul style="list-style-type: none"> <li>● Data array, the start address is set by P5-81</li> </ul>
<p>Data Format</p>	<ul style="list-style-type: none"> <li>● 32-bit (It has positive and negative, user unit: PUU)</li> </ul>
<p>E-Cam Curve Scaling P5-19 0 ~ + / -32.700</p>	<ul style="list-style-type: none"> <li>● It is used to magnify (minify) the E-cam shape.</li> <li>● It equals to the value of data multiplies P5-19.</li> <li>● Switch the symbol, + / - will change the operation direction of slave axis.</li> <li>● If P5-19 is set to 0, the E-cam command will not be output (the setting will be 0 for good).</li> </ul>
<p>Data Size</p>	<ul style="list-style-type: none"> <li>● It is divided into N parts via P5-82 (<math>\geq 5</math>) and does not exceed the limit of data array. It means 360 degrees a cycle of E-cam are divided into N areas. Each area is <math>(360 / N)</math> degrees.</li> </ul>
<p>Data Content</p>	<ul style="list-style-type: none"> <li>● The position data of slave axis is saved in E-cam table. (User unit: PUU).</li> <li>● If E-cam is divided into N areas, the position of each area must be included in the table. It must set N + 1 points in total. It is because the position of the first point (0 degree) and the final point (360 degree) might not be the same.</li> </ul> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>The data of 1.0° and 360° is the same.</p>  </div> <div style="text-align: center;"> <p>The data of 2.0° and 360° is different.</p>  </div> </div> <ul style="list-style-type: none"> <li>● If:             <ol style="list-style-type: none"> <li>1. The start and final position is the same, it means after the E-cam operating a cycle, the slave axis returns to the origin position.</li> </ol> </li> </ul>

	 <p style="text-align: center;">E-cam operates a cycle</p> <p style="text-align: center;">Position of slave axis</p> <p style="text-align: center;">The position of E-cam axis</p> <p>2. The start and final position is different, it means after the E-cam operating a cycle, the slave axis does not return to the origin position.</p>  <p style="text-align: center;">E-cam operates a cycle</p> <p style="text-align: center;">Position of slave axis</p> <p style="text-align: center;">The position of E-cam axis</p>
<p style="text-align: center;">Operation Description</p>	<ul style="list-style-type: none"> <li>● The slave axis is a virtual axis and the unit of slave position is PUU.</li> <li>● After the E-cam is engaged, the position of the master is the entering point of P5-85. The position of the slave axis is in the corresponding point to the P5-85 in E-cam table.</li> <li>● After engaging, if the master does not operate, the slave axis will not operate. If the master operates, the slave will travel according to the E-cam table.</li> <li>● For one cycle of the chart, the slave axis operates a cycle.</li> <li>● E-cam axis can operate in forward / reverse direction.</li> <li>● If the E-cam position is between two points of the E-cam table, the position of the slave axis will be interpolated with cubic curve function. The adjacent curve remains quadratic differential at the point in order to smooth torque. The point amount of the table will not influence the smoothing operation of E-cam.</li> </ul>

- Gear #2, the description is as follows:

Function	<ul style="list-style-type: none"> <li>● Set the relation between slave axis and pulse command</li> <li>● The slave axis operates a cycle, but the pulse command might not operate a cycle.</li> </ul>
Description	<ul style="list-style-type: none"> <li>● The slave axis is a virtual axis and the unit of slave position is PUU.</li> <li>● The pulse command is the encoder unit (pulse). The resolution is 1280000 pulse / rev.</li> <li>● For one cycle of the chart, the slave axis operates a cycle.</li> </ul>
Setting Method P1-44: numerator P1-45: denominator	<ul style="list-style-type: none"> <li>● If the pulse number of slave axis is L, the motor axis operates M cycle. Then, the setting of gear ratio is <math>P1-44 / P1-45 = 1280000 \times R / L</math></li> <li>● The gear ratio of PT and PR is the same.</li> </ul>

- Digital Output of E-cam, the description is as follows:

DO Name and Number	<ul style="list-style-type: none"> <li>● DO.CAM_AREA (DO no.= 0x18)</li> </ul>
Function	<ul style="list-style-type: none"> <li>● If DO.CAM_AREA is ON, it means the position of E-cam axis is in the setting range.</li> </ul>
When the E-cam is engaging	<ul style="list-style-type: none"> <li>● Set the angle range of DO ON by P5-90 and P5-91.</li> <li>● Please refer to table 1 and 2 below</li> </ul>
When the E-cam is disengaging	<ul style="list-style-type: none"> <li>● DO.CAM_AREA is OFF.</li> </ul>

Table 1 P5-90 ≤ P5-91:

E-Cam angle	0°	~	P5-90	~	P5-91	~	360°
DO:CAM_AREA	OFF	OFF	ON	ON	ON	OFF	OFF

Table 2 P5-90 &gt; P5-91:

E-Cam angle	0°	~	P5-91	~	P5-90	~	360°
DO:CAM_AREA	ON	ON	OFF	OFF	OFF	ON	ON

### 7.10.1 Function Description of CAPTURE (Data Capture)

The concept of CAPTURE is to capture the position of motion axis instantaneously by using the external trigger signal DI5. Then save it in data array so as to be used for motion control afterwards. Since CAPTURE is finished by hardware, there is no problem of software delay. It also can accurately capture the high-speed motion axis. The CAPTURE features provided by this servo drive is as follows.

CAPTURE Features	
Pulse Source	<ul style="list-style-type: none"> <li>● Main encoder of the motor</li> <li>● Auxiliary encoder (linear scale)</li> <li>● Pulse command</li> </ul> <p>The selected axis will be displayed in P5-37, the default value can be written in before capture.</p> <p>Note: When the source of COMPARE is CAP axis, the CAP source cannot be changed.</p>
Trigger signal	<ul style="list-style-type: none"> <li>● Triggered by DI5, the response time is 5 usec.</li> </ul> <p>Note: DI5 directly connects to CAPTURE hardware. Thus, regardless the setting value of P2-14 (DI Code), CAPTURE can work. When using CAPTURE, in order to avoid DI error, system will force to disable DI function, which means the setting will be P2-14 = 0x0100 automatically. Since the value is not written into EEPROM, P2-14 will return to the default value after re-power on.</p>
Trigger method	<ul style="list-style-type: none"> <li>● Edge trigger can select contact A / B</li> <li>● It is capable to continuously capture more than one point.</li> <li>● It can set the trigger interval. (The interval between this trigger and the next one.)</li> </ul>
Data storage position	<ul style="list-style-type: none"> <li>● Data array. The start address is set by P5-36.</li> </ul>
Capture number	<ul style="list-style-type: none"> <li>● It is set via P5-38 and will not exceed the limit of data array.</li> </ul>
Capture format	<ul style="list-style-type: none"> <li>● 32-bit (It has positive and negative.)</li> </ul>
Auxiliary selection	<ul style="list-style-type: none"> <li>● After capturing the first data, the CAP axis coordinate system will be set to the value the same as P5-76.</li> <li>● After capturing the first data, the COMPARE function is enabled automatically.</li> <li>● After capturing all points, PR procedure # 50 is triggered automatically.</li> </ul>



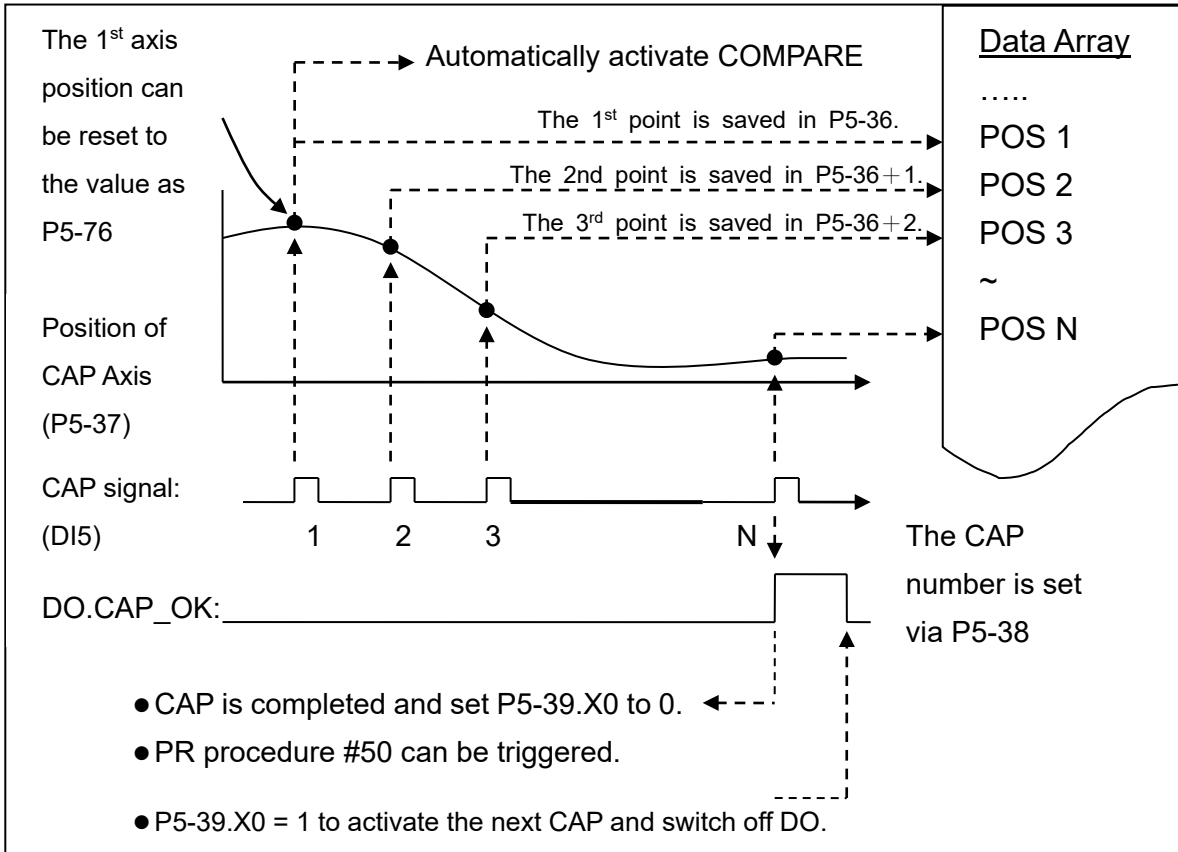
CAPTURE Features	
DO.CAP_OK	<ul style="list-style-type: none"> <li>● The default value is OFF.</li> <li>● After capturing the last point, this DO is ON.</li> <li>● Set P5-39.X0 to 1 so as to activate CAPTURE function and this DO is OFF.</li> </ul>
Note	<ul style="list-style-type: none"> <li>● If P5-38 = 0, set the value of P5-39 X, Bit0 to 1 will disable the CAPTURE function. Clear the setting value of P5-39 X, Bit0 to 0 and set DO.CAP_OK to OFF.</li> <li>● Since the capture axis is 32-bit wide, the accumulation will cause overflow. Please avoid this.</li> </ul>

The CAP data is saved in data array and the first CAP data locates in P5-36. The CAP number has no limit, thus it can be set via P5-38. The last CAP data is saved in P5-36 + P5-38 - 1. Set the value of P5-39 X, Bit0 to 1 so as to activate CAP function. Every time when DI5 is triggered, one data will be captured and saved in data array. Then, the value of P5-38 will decrease one automatically until the CAP number reaches the setting value (P5-38 = 0). The CAP procedure is completed, the setting value of P5-39 X, Bit0 will be cleared to 0 and DO.CAP\_OK is ON.

When capturing the first data, the position of CAP axis can be reset. The first CAP value will be the value set by P5-76. And the value of the second CAP data will be the incremental value from the first data. This method is called Relative Capture. If not selecting the first data reset, it is called Absolute Capture.

When capturing the first data, it automatically activates COMPARE function, which means the COMPARE function is activated via DI5.

The diagram of CAP:



### 7.10.2 Function Description of COMPARE (Data Compare)

The concept of COMPARE is to compare the instant position of motion axis with the value which is saved in data array. Then output DO3 after the COMPARE condition is established for motion control. Since COMPARE is finished by hardware, there is no problem of software delay. It also can accurately compare the high-speed motion axis. The COMPARE features provided by this servo drive is as follows.

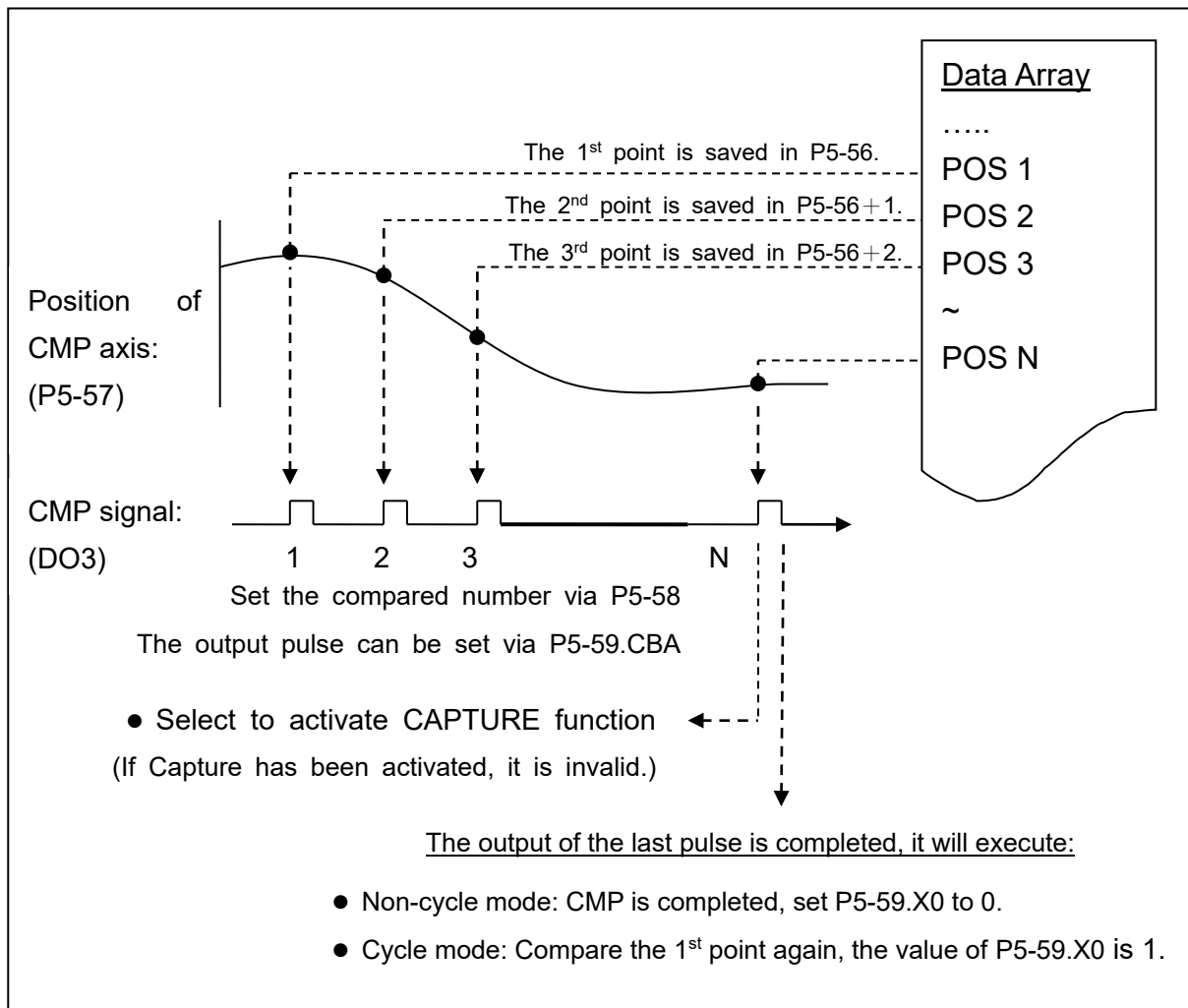
COMPARE Features	
Pulse Source	<ul style="list-style-type: none"> <li>● Main Encoder of the Motor</li> <li>● Auxiliary Encoder (linear scale)</li> <li>● Pulse Command</li> <li>● CAP Axis (set by CAPTURE). When selecting this axis, CAP source cannot be changed.</li> </ul> <p>The selected axis is displayed in P5-57. Before compare, the default value can be written in.</p>
Output signal	<ul style="list-style-type: none"> <li>● Output by DO3 and the response time is 5 usec.</li> </ul> <p>Note: DO3 directly connects to COMPARE hardware, thus, regardless the setting value of P2-20 (DO Code), the function can work. When using COMPARE, in order to avoid DO error, the system will force to disable DO function, which means the setting will be P2-20 = 0 x 0100 automatically. Since the value is not written into EEPROM, P2-20 will return to the default value after re-power on.</p>
Output Method	<ul style="list-style-type: none"> <li>● Pulse output can select contact A / B.</li> <li>● It is capable to continuously output more than one point.</li> <li>● It can set the pulse output time.</li> </ul>
Data storage position	<ul style="list-style-type: none"> <li>● Data array. The start address is set by P5-56.</li> </ul>
Compare number	<ul style="list-style-type: none"> <li>● It is set via P5-58 and will not exceed the limit of data array.</li> </ul>
Compare format	<ul style="list-style-type: none"> <li>● 32-bit (It has positive and negative.)</li> </ul>
Compare condition	<ul style="list-style-type: none"> <li>● It will be triggered when the source of compare axis pass through the compare value.</li> </ul>
Auxiliary selection	<ul style="list-style-type: none"> <li>● Cycle mode: When comparing to the last point, it automatically returns to the first point and starts to compare.</li> <li>● When the last compare is completed, the CAPTURE function is activated automatically.</li> </ul>

COMPARE Features	
Note	<ul style="list-style-type: none"> <li>● If P5-58 is set to 0, set the value of P5-59 X, Bit0 to 1 will be unable to compare. Set the value of P5-59 X, Bit0 to 0.</li> <li>● Since the capture axis is 32-bit wide, the accumulation will cause overflow. Please avoid this.</li> </ul>

The value of COMPARE is saved in data array and the first compare data locates in P5-56. The CMP number has no limit, thus it can be set via P5-58. The last CMP data is saved in  $P5-56 + P5-58 - 1$ . Set the value of P5-59 X, Bit0 to 1 so as to activate CMP function and start to compare the first data of data array. Every time when a position saved in data array is compared, the compare DO will be output. Then, the value of P5-58 will decrease one automatically and compare the next value until the CMP number reaches the setting value ( $P5-58 = 0$ ). When the CMP procedure is completed, the setting value of P5-59 X, Bit0 will be cleared to 0.

When comparing to the last point, it can select if it returns to the first data for comparing. This is called cycle mode. Or it can activate CAPTURE function and wait DI5 for triggering CAP / CMP procedure.

The diagram of COMPARE:



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# Chapter 8 Parameters

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## 8.1 Parameter Definition

Parameters are divided into eight groups which are shown as follows. The first character after the start code P is the group character and the second character is the parameter character.

As for the communication address, it is the combination of group number along with two digit number in hexadecimal. The definition of parameter groups is as the followings:

Group 0: Monitor Parameters	(e.g.: P0-xx)
Group 1: Basic Parameters	(e.g.: P1-xx)
Group 2: Extension Parameters	(e.g.: P2-xx)
Group 3: Communication Parameters	(e.g.: P3-xx)
Group 4: Diagnosis Parameters	(e.g.: P4-xx)
Group 5: Motion Setting Parameters	(e.g.: P5-xx)
Group 6: PR Parameters	(e.g.: P6-xx)
Group 7: PR Parameters	(e.g.: P7-xx)

### Control Mode Description:

PT is position control mode. (Input the position command via the terminal block)

PR is position control mode. (The internal register issues the position command)

S is speed control mode.

T is torque control mode.

### Special Symbol Description:

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-power on or off the servo drive, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

## 8.2 Parameters

Monitor and General Output Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P0-00★	VER	Firmware Version	Factory Setting	N/A	O	O	O	O	-
P0-01■	ALE	Alarm Code Display of Drive (Seven-segment Display)	N/A	N/A	O	O	O	O	10.1 10.2 10.3
P0-02	STS	Drive Status	01	N/A	O	O	O	O	7.2
P0-03	MON	Analog Output Monitor	1100	N/A	O	O	O	O	6.6.3
P0-08★	TSON	Servo on Time	0	Hour					-
P0-09★	CM1	Status Monitor Register 1	N/A	N/A	O	O	O	O	4.3.5
P0-10★	CM2	Status Monitor Register 2	N/A	N/A	O	O	O	O	4.3.5
P0-11★	CM3	Status Monitor Register 3	N/A	N/A	O	O	O	O	4.3.5
P0-12★	CM4	Status Monitor Register 4	N/A	N/A	O	O	O	O	4.3.5
P0-13★	CM5	Status Monitor Register 5	N/A	N/A	O	O	O	O	4.3.5
P0-17	CM1A	Status Monitor Register Selection 1	0	N/A					-
P0-18	CM2A	Status Monitor Register Selection 2	0	N/A					-
P0-19	CM3A	Status Monitor Register Selection 3	0	N/A					-
P0-20	CM4A	Status Monitor Register Selection 4	0	N/A					-
P0-21	CM5A	Status Monitor Register Selection 5	0	N/A					-
P0-25	MAP1	Mapping Parameter # 1	No need to initialize	N/A	O	O	O	O	4.3.5
P0-26	MAP2	Mapping Parameter # 2	No need to initialize	N/A	O	O	O	O	4.3.5
P0-27	MAP3	Mapping Parameter # 3	No need to initialize	N/A	O	O	O	O	4.3.5
P0-28	MAP4	Mapping Parameter # 4	No need to initialize	N/A	O	O	O	O	4.3.5
P0-29	MAP5	Mapping Parameter # 5	No need to initialize	N/A	O	O	O	O	4.3.5

Monitor and General Output Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P0-30	MAP6	Mapping Parameter # 6	No need to initialize	N/A	O	O	O	O	4.3.5
P0-31	MAP7	Mapping Parameter # 7	No need to initialize	N/A	O	O	O	O	4.3.5
P0-32	MAP8	Mapping Parameter # 8	No need to initialize	N/A	O	O	O	O	4.3.5
P0-35	MAP1A	Target Setting of Mapping Parameter P0-25	0x0	N/A	O	O	O	O	4.3.5
P0-36	MAP2A	Target Setting of Mapping Parameter P0-26	0x0	N/A	O	O	O	O	4.3.5
P0-37	MAP3A	Target Setting of Mapping Parameter P0-27	0x0	N/A	O	O	O	O	4.3.5
P0-38	MAP4A	Target Setting of Mapping Parameter P0-28	0x0	N/A	O	O	O	O	4.3.5
P0-39	MAP5A	Target Setting of Mapping Parameter P0-29	0x0	N/A	O	O	O	O	4.3.5
P0-40	MAP6A	Target Setting of Mapping Parameter P0-30	0x0	N/A	O	O	O	O	4.3.5
P0-41	MAP7A	Target Setting of Mapping Parameter P0-31	0x0	N/A	O	O	O	O	4.3.5
P0-42	MAP8A	Target Setting of Mapping Parameter P0-32	0x0	N/A	O	O	O	O	4.3.5
P0-46★	SVSTS	Servo Digital Output Status Display	0	N/A	O	O	O	O	-
P1-04	MON1	MON1 Analog Monitor Output Proportion	100	%(full scale)	O	O	O	O	6.6.3
P1-05	MON2	MON2 Analog Monitor Output Proportion	100	%(full scale)	O	O	O	O	6.6.3

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.



Filter and Resonance Suppression Parameter										
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section	
					PT	PR	S	T		
P1-06	SFLT	Analog Speed Command (Low-pass Filter)	0	ms			O		6.3.3	
P1-07	TFLT	Analog Torque Command (Low-pass Filter)	0	ms				O	6.4.3	
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	10 ms	O	O			6.2.6	
P1-25	VSF1	Low-frequency Vibration Suppression (1)	1000	0.1Hz	O	O			6.2.9	
P1-26	VSG1	Low-frequency Vibration Suppression Gain (1)	0	N/A	O	O			6.2.9	
P1-27	VSF2	Low-frequency Vibration Suppression (2)	1000	0.1Hz	O	O			6.2.9	
P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	0	N/A	O	O			6.2.9	
P1-29	AVSM	Auto Low-frequency Vibration Supression Setting	0	N/A	O	O			6.2.9	
P1-30	VCL	Low-frequency Vibration Detection	500	Pulse	O	O			6.2.9	
P1-34	TACC	Acceleration Constant of S-Curve	200	ms			O		6.3.3	
P1-35	TDEC	Deceleration Constant of S-Curve	200	ms			O		6.3.3	
P1-36	TSL	Acceleration / Deceleration Constant of S-Curve	0	ms		O	O		6.3.3	
P1-59	MFLT	Analog Speed Command (Moving Filter)	0	1ms			O		-	
P1-68	PFLT2	Position Command Moving Filter	4	ms	O	O			-	
P2-23	NCF1	Resonance suppression (Notch filter) (1)	1000	Hz	O	O	O	O	6.3.7	
P2-24	DPH1	Resonance Suppression (Notch filter) Attenuation Rate (1)	0	dB	O	O	O	O	6.3.7	
P2-43	NCF2	Resonance Suppression (Notch filter) (2)	1000	Hz	O	O	O	O	6.3.7	
P2-44	DPH2	Resonance Suppression (Notch filter) Attenuation Rate (2)	0	dB	O	O	O	O	6.3.7	
P2-45	NCF3	Resonance Suppression (Notch filter) (3)	1000	Hz	O	O	O	O	6.3.7	
P2-46	DPH3	Resonance Suppression (Notch filter) Attenuation Rate (3)	0	dB	O	O	O	O	6.3.7	

P2-47	ANCF	Auto Resonance Suppression Mode Setting	1	N/A	0	0	0	0	-
P2-48	ANCL	Resonance Suppression Detection Level	100	N/A	0	0	0	0	-
P2-25	NLP	Low-pass Filter of Resonance Suppression	0.2 or 0.5	1ms	0	0	0	0	6.3.7
P2-49	SJIT	Speed Detection Filter	0	N/A	0	0	0	0	-

(★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.

(▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

(●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.

(■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

### Gain and Switch Parameter

Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-00	KPP	Position Loop Gain	35	rad/s	0	0			6.2.8
P2-01	PPR	Switching Rate of Position Loop Gain	100	%	0	0			6.2.8
P2-02	PFG	Position Feed Forward Gain	50	%	0	0			6.2.8
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	0	0			-
P2-04	KVP	Speed Loop Gain	500	rad/s	0	0	0	0	6.3.6
P2-05	SPR	Switching Rate of Speed Loop Gain	100	%	0	0	0	0	-
P2-06	KVI	Speed Integral Compensation	100	rad/s	0	0	0	0	6.3.6
P2-07	KVF	Speed Feed Forward Gain	0	%	0	0	0	0	6.3.6
P2-26	DST	Anti-interference Gain	0	1	0	0	0	0	-
P2-27	GCC	Gain Switching and Switching Selection	0	N/A	0	0	0	0	-
P2-28	GUT	Gain Switching Time Constant	10	10 ms	0	0	0	0	-
P2-29	GPE	Gain Switching	1280000	Pulse Kpps r/min	0	0	0	0	-
P2-31■	AUT1	Speed Loop Frequency Response Setting in Auto and Semi-auto Mode	80	Hz	0	0	0	0	5.6 6.3.6
P2-32▲	AUT2	Tuning Mode Selection	0	N/A	0	0	0	0	5.6 6.3.6

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

Position Control Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-01●	CTL	Input Setting of Control Mode and Control Command	0	Pulse r/min N-M	O	O	O	O	6.1
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	O	O	O	O	6.6
P1-12 ~ P1-14	TQ1 ~ 3	Torque Command 1 ~ 3 ; Torque Limit 1 ~ 3	100	%	O	O	O	O	6.4.1
P1-46▲	GR3	Pulse Number of Encoder Output	2500	Pulse	O	O	O	O	-
P1-55	MSPD	Maximum Speed Setting	rated	r/min	O	O	O	O	-
P2-50	DCLR	Pulse Clear Mode	0	N/A	O	O			-
External Pulse Command (PT mode)									
P1-00▲	PTT	External Pulse Input Type	0x2	N/A	O				6.2.1
P1-44▲	GR1	Gear Ratio (Numerator) (N1)	128	Pulse	O	O			6.2.5
P1-45▲	GR2	Gear Ratio (Denominator) (M)	10	Pulse	O	O			6.2.5
P2-60▲	GR4	Gear Ratio (Numerator) (N2)	128	Pulse	O	O			-
P2-61▲	GR5	Gear Ratio (Numerator) (N3)	128	Pulse	O	O			-
P2-62▲	GR6	Gear Ratio (Numerator) (N4)	128	Pulse	O	O			-
Register Control Command (PR mode)									
P6-02 ~ P7-99	PATH#1 ~ PATH#99	Internal Position Command 1 ~ 99	0	N/A		O			7.10
P5-60 ~ P5-75	POV0 ~ POV15	Target Speed Setting #0 ~ 15	20.0 ~ 3000.0	1 r/min		O			7.10
P5-03	PDEC	Deceleration Time of Auto Protection	0XE0EF EEEF	N/A	O	O	O	O	-
P5-04	HMOV	Homing Mode	0	N/A		O			-
P5-05	HSPD1	1 <sup>st</sup> Speed Setting of High Speed Homing	100.0	1 r/min	O	O	O	O	-
P5-06	HSPD2	2 <sup>nd</sup> Speed Setting of Low Speed Homing	20.0	1 r/min	O	O	O	O	-

Position Control Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P5-07	PRCM	Trigger Position Command (PR mode only)	0	N/A		O			-
P5-20 ~ P5-35	AC0 ~ AC15	Acceleration/Deceleration Time (Number #0 ~ 15)	200 ~ 30	ms		O			7.10
P5-40 ~ P5-55	DLY0 ~ DLY15	Delay Time after Position Completed (Number #0 ~ 15)	0 ~ 5500	ms		O			7.10
P5-98	EVON	Position Command of Event Rising-edge Trigger	0	N/A		O			-
P5-99	EVOF	Position Command of Event Falling-edge Trigger	0	N/A		O			-
P5-15■	PMEM	PATH#1 ~ PATH#2 No Data Retained Setting	0x0	N/A	O	O	O	O	-
P5-16■	AXEN	Axis Position - Motor Encoder	0	PUU	O	O	O	O	7.3
P5-17	AXPC	Axis Position - Auxiliary Encoder	N/A	Pulse No.	O	O	O	O	7.3
P5-18	AXAU	Axis Position - Pulse Command	N/A	Pulse No.	O	O	O	O	7.3
P5-08	SWLP	Forward Software Limit	+2 <sup>31</sup>	PUU		O	O		-
P5-09	SWLN	Reverse Software Limit	-2 <sup>31</sup>	PUU		O	O		-

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

Speed Control Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P1-01●	CTL	Input Setting of Control Mode and Control Command	0	Pulse r/min N-M	O	O	O	O	6.1
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	O	O	O	O	6.6
P1-46▲	GR3	Output Pulse Counts Per One Motor Revolution	2500	Pulse	O	O	O	O	-
P1-55	MSPD	Maximum Speed Limit	rated	r/min	O	O	O	O	-

P1-09 ~ P1-11	SP1 ~ 3	Internal Speed Command 1 ~ 3 ; Internal Speed Limit 1 ~ 3	1000 ~ 3000	0.1 r/min				O	O	6.3.1	
P1-12 ~ P1-14	TQ1 ~ 3	Internal Torque Command 1 ~ 3 ; Internal Torque Limit 1 ~ 3	100	%			O	O	O	O	6.6.2
P1-40▲	VCM	Maximum Speed of Analog Speed Command	rated	r/min				O	O	6.3.4	
P1-41▲	TCM	Maximum Output of Analog Torque Speed	100	%			O	O	O	O	-
P1-76	AMSPD	Maximum Rotation Setting of Encoder Setting (OA, OB)	5500	r/min			O	O	O	O	-

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

### Torque Control Parameter

Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section	
					PT	PR	S	T		
P1-01●	CTL	Input Setting of Control Mode and Control Command	0	Pulse r/min N-M	O	O	O	O	6.1	
P1-02▲	PSTL	Speed and Torque Limit Setting	0	N/A	O	O	O	O	6.6	
P1-46▲	GR3	Output Pulse Counts Per One Motor Revolution	2500	Pulse	O	O	O	O	-	
P1-55	MSPD	Maximum Speed Limit	rated	r/min	O	O	O	O	-	
P1-09 ~ P1-11	SP1~3	Internal Speed Command 1 ~ 3 ; Internal Speed Limit 1 ~ 3	100 ~ 300	r/min				O	O	6.6.1
P1-12 ~ P1-14	TQ1~3	Internal Torque Command 1 ~ 3 ; Internal Torque Limit 1 ~ 3	100	%	O	O	O	O	O	6.4.1
P1-40▲	VCM	Maximum Speed of Analog Speed Command	rated	r/min				O	O	-
P1-41▲	TCM	Maximum Output of Analog Torque Limit	100	%	O	O	O	O	O	6.4.4

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.

- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

### Planning of Digital Input / Output Pin and Output Setting Parameter

Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P2-09	DRT	DI Debouncing Time	2	2ms	O	O	O	O	-
P2-10	DI1	DI1 Functional Planning	N101	N/A	O	O	O	O	Table 8.1
P2-11	DI2	DI2 Functional Planning	N104	N/A	O	O	O	O	Table 8.1
P2-12	DI3	DI3 Functional Planning	N116	N/A	O	O	O	O	Table 8.1
P2-13	DI4	DI4 Functional Planning	N117	N/A	O	O	O	O	Table 8.1
P2-14	DI5	DI5 Functional Planning	N102	N/A	O	O	O	O	Table 8.1
P2-15	DI6	DI6 Functional Planning	N021	N/A	O	O	O	O	Table 8.1
P2-18	DO1	DO1 Functional Planning	N101	N/A	O	O	O	O	Table 8.2
P2-19	DO2	DO2 Functional Planning	N103	N/A	O	O	O	O	Table 8.2
P2-20	DO3	DO3 Functional Planning	N007	N/A	O	O	O	O	Table 8.2
P1-38	ZSPD	Zero Speed Range Setting	10.0	1 r/min	O	O	O	O	Table 8.2
P1-39	SSPD	Target Motor Detection Level	3000	r/min	O	O	O	O	Table 8.2
P1-42	MBT1	Enable Delay Time of Mechancial Brake	0	ms	O	O	O	O	6.5.5
P1-43	MBT2	Disable Delay Time of Mechancial Brake	0	ms	O	O	O	O	6.5.5
P1-47	SPOK	Speed Reached (DO.SP_OK) Range	10	r/min			O		-
P1-54	PER	Position Completed Range	12800	Pulse	O	O			-
P1-56	OVW	Output Overload Warning Level	120	%	O	O	O	O	-

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.

- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.
- (N) Axial code: Symbol N in default setting is 1~3 which means the value is in accordance with the displayed default value. For example, the display of P2-10 will show 1101 when selecting X axis, 2101 when selecting Y axis and 3101 when selecting Z.

### Communication Parameter

Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P3-00●	ADR	Address Setting	0x7C	N/A	O	O	O	O	9.2
P3-01	BRT	Transmission Speed	0x0203	bps	O	O	O	O	9.2
P3-02	PTL	Communication Protocol	6	N/A	O	O	O	O	9.2
P3-03	FLT	Communication Error Disposal	0	N/A	O	O	O	O	9.2
P3-04	CWD	Communication Timeout	0	sec	O	O	O	O	9.2
P3-05	CMM	Communication Mechanism	0	N/A	O	O	O	O	9.2
P3-06■	SDI	Control Switch of Digital Input (DI)	0	N/A	O	O	O	O	9.2
P3-07	CDT	Communication Response Delay Time	0	1ms	O	O	O	O	9.2
P3-08■	MNS	Monitor Mode	0000	N/A	O	O	O	O	9.2
P3-09	SYC	CANopen Synchronize Setting	0x57A1	N/A	O	O	O	O	9.2

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.

### Diagnosis Parameter

Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P4-00★	ASH1	Fault Record (N)	0	N/A	O	O	O	O	4.4.1
P4-01★	ASH2	Fault Record (N-1)	0	N/A	O	O	O	O	4.4.1
P4-02★	ASH3	Fault Record (N-2)	0	N/A	O	O	O	O	4.4.1
P4-03★	ASH4	Fault Record (N-3)	0	N/A	O	O	O	O	4.4.1
P4-04★	ASH5	Fault Record (N-4)	0	N/A	O	O	O	O	4.4.1
P4-05	JOG	Servo Motor Jog Control	20	r/min	O	O	O	O	4.4.2

Diagnosis Parameter									
Parameter	Abbr.	Function	Default	Unit	Control Mode				Related Section
					PT	PR	S	T	
P4-06▲■	FOT	Digital Output Register (Readable and Writable)	0	N/A	○	○	○	○	4.4.3
P4-07	ITST	Multi-function of Digital Input	0	N/A	○	○	○	○	4.4.4
P4-08★	PKEY	Input Status of the Drive Keypad (Read-only)	N/A	N/A	○	○	○	○	-
P4-09★	MOT	Digital Output Status (Read-only)	N/A	N/A	○	○	○	○	4.4.5
P4-10■	CEN	Adjustment Selection	0	N/A	○	○	○	○	-
P4-11	SOF1	Analog Speed Input Offset Adjustment 1	Factory Setting	N/A	○	○	○	○	-
P4-12	SOF2	Analog Speed Input Offset Adjustment 2	Factory Setting	N/A	○	○	○	○	-
P4-13	TOF1	Analog Torque Input Offset Adjustment 1	Factory Setting	N/A	○	○	○	○	-
P4-14	TOF2	Analog Torque Input Offset Adjustment 2	Factory Setting	N/A	○	○	○	○	-
P4-15	COF1	Current Detector (V1 Phase) Offset Adjustment	Factory Setting	N/A	○	○	○	○	-
P4-16	COF2	Current Detector (V2 Phase) Offset Adjustment	Factory Setting	N/A	○	○	○	○	-
P4-17	COF3	Current Detector (W1 Phase) Offset Adjustment	Factory Setting	N/A	○	○	○	○	-
P4-18	COF4	Current Detector (W2 Phase) Offset Adjustment	Factory Setting	N/A	○	○	○	○	-
P4-19	TIGB	IGBT NTC Adjustment Detection Level (cannot reset)	Factory Setting	N/A	○	○	○	○	-
P4-20	DOF1	Offset Adjustment Value of Analog Monitor Output (Ch1)	0	mV	○	○	○	○	6.6.3
P4-21	DOF2	Offset Adjustment Value of Analog Monitor Output (Ch2)	0	mV	○	○	○	○	6.6.3
P4-22	SAO	Analog Speed Input OFFSET	0	mV			○		-
P4-23	TAO	Analog Torque Input OFFSET	0	mV				○	-

- (★) Read-only register, can only read the status. For example: parameter P0-00, P0-10 and P4-00, etc.
- (▲) Setting is unable when Servo On, e.g. parameter P1-00, P1-46 and P2-33, etc.
- (●) Not effective until re-turning on or off, e.g. parameter P1-01 and P3-00.
- (■) Parameters of no data retained setting, e.g. parameter P2-30 and P3-06.



## 8.3 Parameter Description

### P0-xx Monitor Parameters

P0-00★	VER	Firmware Version	Address: 0000H 0001H
Parameter Attribute :	Parameter for three axes		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	Factory Setting		
Control Mode :	ALL		
Unit :	-		
Range :	-		
Data Size :	16bit		
Format :	DEC		

Settings : This parameter shows the firmware version of the servo drive.

P0-01■	ALE	Alarm Code Display of Drive (Seven-segment Display)	Address: 0002H 0003H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 10.1 Section 10.2 Section 10.3
Operational Interface :	Panel / Software	Communication	
Default :	-		
Control Mode :	ALL		
Unit :	-		
Range :	It only can be set to 0 to clear the alarm (Same as DI.ARST).		
Data Size :	16bit		
Format :	HEX		

Settings : Hexadecimal format: displays the alarm code

## Alarm of Servo Drive

001 : Over current

002 : Over voltage

003 : Under voltage (In default setting, the alarm occurs only when the voltage is not enough in Servo ON status; In Servo ON status, when it applies to power R, S, T, the alarm still will not be cleared. Please refer to P2-66.)

004 : Motor combination error (The drive corresponds to the wrong motor)

005 : Regeneration error

006 : Over load

007 : Over speed

- 008 : Abnormal pulse command
- 009 : Excessive deviation of position command
- 011 : Encoder error (The servo drive cannot connect to the encoder because of disconnection or abnormal wiring)
- 012 : Adjustment error
- 013 : Emergency stop
- 014 : Reverse limit error
- 015 : Forward limit error
- 016 : IGBT overheat
- 017 : Abnormal EEPROM
- 018 : Abnormal signal output
- 019 : Serial communication error
- 020 : Serial communication time out
- 021 : Reserved
- 022 : Main circuit power lack phase
- 023 : Early warning for overload
- 024 : Encoder initial magnetic field error (The magnetic field of the encoder U,V, W signal is in error)
- 025 : The internal of the encoder is in error. (The internal memory of the encoder and the internal counter are in error)
- 026 : Unreliable internal data of the encoder
- 027 : Encoder reset error
- 028 : The internal of the motor is in error
- 029 : The internal of the motor is in error
- 030 : Motor crash error
- 031 : Incorrect wiring of the motor power line U, V, W (Incorrect wiring of the motor power line U, V, W, GND)
- 040 : Excessive deviation of full closed-loop position control
- 041 : Communication of linear scale is breakdown
- 081 : Excessive deviation between two axes of the gantry
- 082 : Abnormal gantry selection
- 099 : DSP firmware upgrade

## Alarm of CANopen Communication

- 111 : CANopen SDO receives buffer overflow
- 112 : CANopen PDO receives buffer overflow
- 121 : Index error occurs when accessing CANopen PDO
- 122 : Sub-Index error occurs when accessing CANopen PDO
- 123 : Data size error occurs when accessing CANopen PDO
- 124 : Data range error occurs when accessing CANopen PDO
- 125 : CANopen PDO mapping object is read-only and write-protected.
- 126 : CANopen PDO mapping object is not allowed in PDO
- 127 : CANopen PDO mapping object is write-protected when Servo ON
- 128 : Error occurs when reading CANopen PDO mapping object via EEPROM
- 129 : Error occurs when writing CANopen PDO mapping object via EEPROM
- 130 : The accessing address of EEPROM is out of range when using CANopen PDO mapping object
- 131 : CRC of EEPROM calculation error occurs when using CANopen PDO mapping object
- 132 : Enter the incorrect password when using CANopen PDO mapping object
- 185 : Abnormal CAN Bus hardware

## Alarm of Motion Control

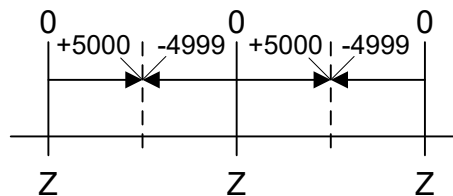
- 201 : An error occurs when loading CANopen data
- 213 ~ 219 : An error occurs when writing parameter via PR procedure. Please refer to Chapter 10 of the manual for further information.
- 235 : PR command overflows
- 245 : PR positioning is over time

- 249 : The number of PR command exceeds the range
- 261 : Index error occurs when accessing CANopen object
- 263 : Sub-Index error occurs when accessing CANopen object
- 265 : Data size error occurs when accessing CANopen object
- 267 : Data range error occurs when accessing CANopen
- 269 : CANopen object is read-only and write-protected
- 26b : CANopen object is not allowed in PDO
- 26d : CANopen object is write-protected when Servo ON
- 26F : Error occurs when reading CANopen object via EEPROM
- 271 : Error occurs when writing CANopen object via EEPROM
- 273 : The accessing address of EEPROM is out of range when using CANopen object
- 275 : CRC of EEPROM calculation error occurs when using CANopen object
- 277 : Enter the incorrect password when using CANopen object
- 283 : Forward software limit
- 285 : Reverse software limit
- 289 : Feedback position counter overflows
- 301 : CANopen fails to synchronize
- 302 : The synchronized signal of CANopen is sent too fast
- 303 : The synchronized signal of CANopen is sent too slow
- 304 : CANopen IP command is failed
- 305 : SYNC Period is in error
- 380 : Position Deviation Alarm of DO.MC\_OK. Please refer to parameter P1-48.

P0-02	STS	Drive Status	Address: 0004H 0005H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.2
Operational Interface :	Panel / Software	Communication	
Default :	01		
Control Mode :	ALL		
Unit :	-		
Range :	00 ~ 127		

Data Size :	16bit
Format :	DEC

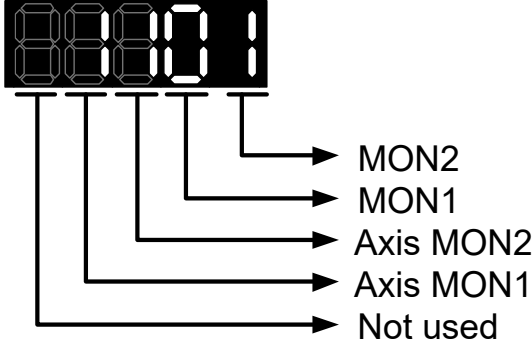
- Settings :
- 00 : Motor feedback pulse number (after the scaling of electronic gear ratio) [PUU]
  - 01 : Input pulse number of pulse command (after the scaling of electronic gear ratio) [PUU]
  - 02 : Deviation between control command pulse and feedback pulse number[PUU]
  - 03 : The number of motor feedback pulse [Encoder unit, 1,280,000 Pulse/rev]
  - 04 : Input pulse number of pulse command (before the scaling of electronic gear ratio) [Encoder unit, 1,280,000 Pulse/rev]
  - 05 : Deviation pulse number (before the scaling of electronic gear ratio) [Encoder unit, 1,280,000 Pulse/rev]
  - 06 : The frequency of pulse command input [Kpps]
  - 07 : Motor speed [r/min]
  - 08 : Speed command input [Volt]
  - 09 : Speed command input [r/min]
  - 10 : Torque command input [Volt]
  - 11 : Torque command input [%]
  - 12 : Average torque [%]
  - 13 : Peak torque [%]
  - 14 : Main circuit voltage (BUS voltage)[Volt]
  - 15 : Load/motor inertia ratio [0.1times]
  - 16 : IGBT temperature
  - 17 : The frequency of resonance suppression
  - 18 : The distance from the current position to Z. The range of the value is between -5000 and +5000.



The interval of the two Z-phase pulse command if 10000 Pulse.

- 19 : Mapping Parameter #1 : P0-25
- 20 : Mapping Parameter #2 : P0-26
- 21 : Mapping Parameter #3 : P0-27

- 22 : Mapping Parameter #4 : P0-28
- 23 : Monitor Variable #1 : P0-09
- 24 : Monitor Variable #2 : P0-10
- 25 : Monitor Variable #3 : P0-11
- 26 : Monitor Variable #4 : P0-12

<b>P0-03</b>	<b>MON</b>	<b>Analog Output Monitor</b>		<b>Address: 0006H 0007H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	1100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x0000 ~ 0x3377		
	Data Size :	16bit		
	Format :	HEX		
	Settings :			


MON1, MON2 Setting Value	Description
0	Motor speed (+/-8 Volts/Max. speed)
1	Motor torque (+/-8 Volts/Max. torque)
2	Pulse command frequency (+8 Volts / 4.5Mpps)
3	Speed command (+/-8 Volts/Max. speed command)
4	Torque command (+/-8 Volts/Max. torque command)
5	VBUS voltage (+/-8 Volts / 450V)
6	Reserved
7	Reserved

MON1 axis selection	Description
1	MON1 is from X axis
2	MON1 is from Y axis
3	MON1 is from Z axis

MON2 axis selection	Description
1	MON2 is from X axis
2	MON2 is from Y axis
3	MON2 is from Y axis

 **NOTE** Please refer to parameter P1-04, P1-05 for proportional setting of analog output voltage.

For example: P0-03 = 1101 (MON1 is the analog output of motor speed in X axis; MON2 is the analog output of motor torque in X axis.)

$$\text{MON1 output voltage} = 8 \times \frac{\text{Motor speed}}{(\text{Max. speed} \times \frac{P1-04}{100})} \text{ (unit: Volts)}$$

$$\text{MON2 output voltage} = 8 \times \frac{\text{Motor torque}}{(\text{Max. torque} \times \frac{P1-05}{100})} \text{ (unit: Volts)}$$

**P0-04**

Reserved

Address: 0008H  
0009H



<b>P0-05■</b>	Reserved	Address: 000AH 000BH
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<b>P0-06■</b>	Reserved	Address: 000CH 000DH
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<b>P0-07■</b>	Reserved	Address: 000EH 000FH
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<b>P0-08★</b>	<b>TS0N</b>	<b>Power On Time</b>	Address: 0010H 0011H
	Parameter Attribute :	Parameter for three axes	
	Operational Interface :	Panel / Software	Communicaiton
	Default :	0	
	Control Mode :	-	
	Unit :	Hour	
	Range :	0 ~ 65535	
	Data Size :	16bit	
	Format :	DEC	

Settings : It shows the total startup time of the servo drive.

<b>P0-09★</b>	<b>CM1</b>	<b>Status Monitor Register 1</b>	Address: 0012H 0013H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communicaiton
	Default :	-	
	Control Mode :	ALL	
	Unit :	-	
	Range :	-	
	Data Size :	32bit	
	Format :	DEC	

Settings : The setting value which is set by P0-17 should be monitored via P0-09. (Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.)

For example, if P0-17 is set to 3, when accessing P0-09, it obtains the total feedback pulse number of motor encoder. For MODBUS communication, two 16bit data, 0012H and 0013H will be read as a 32bit data; (0013H : 0012H) = (Hi-word : Low-word).

Set P0-02 to 23, the panel displays **VAR-1** first, and then shows the content of P0-09.

P0-10★	CM2	Status Monitor Register 2	Address: 0014H 0015H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communicaiton	
Default :	-		
Control Mode :	ALL		
Unit :	-		
Range :	-		
Date Size :	32bit		
Format :	DEC		

Settings : The setting value which is set by P0-18 should be monitored via P0-10. (Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.) Set P0-02 to 24, the panel displays **VAR-2** first, and then shows the content of P0-10.

P0-11★	CM3	Status Monitor Register 3	Address: 0016H 0017H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communicaiton	
Default :	-		
Control Mode :	ALL		

Unit :	-
Range :	-
Data Size :	32bit
Format :	DEC

Settings : The setting value which is set by P0-19 should be monitored via P0-11. (Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.) Set P0-02 to 25, the panel displays **VAR-3** first, and then shows the content of P0-11.

<b>P0-12★</b>	<b>CM4</b>	<b>Status Monitor Register 4</b>		<b>Address: 0018H 0019H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	-		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-		
	Data Size :	32bit		
	Format :	DEC		

Settings : The setting value which is set by P0-20 should be monitored via P0-12. (Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.) Set P0-02 to 26, the panel displays **VAR-4** first, and then shows the content of P0-12.

<b>P0-13★</b>	<b>CM5</b>	<b>Status Monitor Register 5</b>		<b>Address: 001AH 001BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	-		
	Control Mode :	ALL		
	Unit :	-		

Range :	-
Data Size :	32bit
Format :	DEC

Settings : The setting value which is set by P0-21 should be monitored via P0-13. (Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.)

<b>P0-14</b>	Reserved	Address: 001CH 001DH
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<b>P0-15</b>	Reserved	Address: 001EH 001FH
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<b>P0-16</b>	Reserved	Address: 0020H 0021H
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<b>P0-17</b>	<b>CM1A</b>	<b>Status Monitor Register 1 Selection</b>		Address: 0022H 0023H  Related Section: -
	Parameter Attribute :	Parameter for individual axis		
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	-		
	Unit :	-		
	Range :	0 ~ 127		
	Data Size :	16bit		
	Format :	DEC		

Settings : Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.

For example:

If P0-17 is set to 07, then reading P0-09 means reading 「 Motor speed (r/min) 」 .

P0-18	CM2A	Status Monitor Register 2 Selection	Address: 0024H 0025H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	-		
Unit :	-		
Range :	0 ~ 127		
Data Size :	16bit		
Format :	DEC		
Settings :	Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.		

P0-19	CM3A	Status Monitor Register 3 Selection	Address: 0026H 0027H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	-		
Unit :	-		
Range :	0 ~ 127		
Data Size :	16bit		
Format :	DEC		
Settings :	Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.		

P0-20	CM4A	Status Monitor Register 4 Selection	Address: 0028H 0029H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	-
Unit :	-
Range :	0 ~ 127
Data Size :	16bit
Format :	DEC

Settings : Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.

<b>P0-21</b>	<b>CM5A</b>	<b>Status Monitor Register 5 Selection</b>		<b>Address: 002AH 002BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	-		
	Unit :	-		
	Range :	0 ~ 127		
	Data Size :	16bit		
	Format :	DEC		

Settings : Please refer to Chapter 7.2.1, Description of Monitor Variable for the setting value.

<b>P0-22</b>	<b>Reserved</b>	<b>Address: 002CH 002DH</b>
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<b>P0-23</b>	<b>Reserved</b>	<b>Address: 002EH 002FH</b>
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<b>P0-24</b>	<b>Reserved</b>	<b>Address: 0030H 0031H</b>
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P0-25	MAP1	Mapping Parameter # 1	Address: 0032H 0033H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-35		
Data Size :	32bit		
Format :	HEX		

Settings : Users can rapidly continuously read and write parameters that are not in the same group. The content of parameter that is specified by P0-35 will be shown in P0-25.

Please refer to the description of P0-35 for parameter setting.

P0-26	MAP2	Mapping Parameter # 2	Address: 0034H 0035H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-36		
Data Size :	32bit		
Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-36.

P0-27	MAP3	Mapping Parameter # 3	Address: 0036H 0037H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-37		
Data Size :	32bit		
Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-37.

P0-28	MAP4	Mapping Parameter # 4	Address: 0038H 0039H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-38		
Date Size :	32bit		
Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-38.



P0-29	MAP5	Mapping Parameter # 5	Address: 003AH 003BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-39		
Data Size :	32bit		
Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-39.

P0-30	MAP6	Mapping Parameter # 6	Address: 003CH 003DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	No need to initialize		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the corresponding parameter of P0-40		
Data Size :	32bit		
Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-40.

<b>P0-31</b>	<b>MAP7</b>	<b>Mapping Parameter # 7</b>		<b>Address: 003EH 003FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	No need to initialize		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the corresponding parameter of P0-41		
	Data Size :	32bit		
	Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-41.

<b>P0-32</b>	<b>MAP8</b>	<b>Mapping Parameter # 8</b>		<b>Address: 0040H 0041H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	No need to initialize		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the corresponding parameter of P0-42		
	Data Size :	32bit		
	Format :	HEX		

Settings : The using method is the same as P0-25. The mapping target is set by parameter P0-42.

<b>P0-33</b>	<b>Reserved</b>	<b>Address: 0042H 0043H</b>
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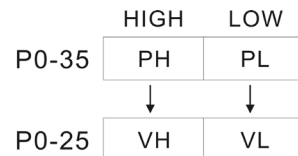
<b>P0-34</b>	<b>Reserved</b>	<b>Address: 0044H 0045H</b>
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<b>P0-35</b>	<b>MAP1A</b>	<b>Target Setting of Mapping Parameter P0-25</b>		<b>Address: 0046H 0047H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32bit		
	Format :	HEX		

Settings : Select the data block to access the parameter corresponded by register 1.

The mapping content is 32 bits wide and can map to two 16-bit parameters or one 32-bit parameter.

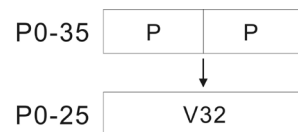
P0-35:



Mapping parameter: P0-35; Mapping content: P0-25.

When PH≠PL, it means the content of P0-25 includes two 16-bit parameters.

$$VH=*(PH) \cdot VL=*(PL)$$

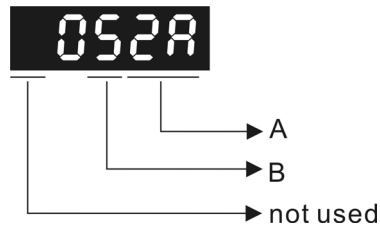


Mapping parameter: P0-35; Mapping content: P0-25.

When PH=PL=P, it means the content of P0-25 includes one 32-bit parameter.

If P=060Ah (parameter P6-10), then V32 is P6-10.

The setting format of PH, PL is:



A: The hexadecimal of parameter indexing

B: The hexadecimal of parameter group

For example:

If the mapping target is P2-06, set P0-35 to 0206.

If the mapping target is P5-42, set P0-35 to 052A.

For example:

If users desire to read / write P1-44 (32bit) through P0-25, set P0-35 to 0x012C012C via panel or communication. Then, when reading / writing P0-25, it also reads / writes P1-44.

Moreover, users can also access the value of P2-02 and P2-04 through P0-25.

P2-02 Position feed forward gain (16bit)

P2-04 Speed control gain (16bit)

Users only need to set P0-35 to 0x02040202. Then, when reading / writing P0-25, it also reads / writes the value of P2-02 and P2-04.

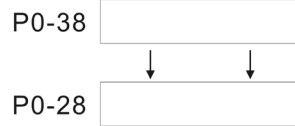
P0-36	MAP2A	Target Setting of Mapping Parameter P0-26	Address: 0048H 0049H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
Operational Interface :	Panel / Software	Communication	
Default :	0x0		
Control Mode :	ALL		
Unit :	-		
Range :	determined by the communication address of the parameter group		
Data Size :	32bit		

Format :	HEX
Settings :	Same as parameter P0-35
	P0-36 <input type="text"/>
	↓            ↓
	P0-26 <input type="text"/>

<b>P0-37</b>	<b>MAP3A</b>	<b>Target Setting of Mapping Parameter P0-27</b>		<b>Address: 004AH 004BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32bit		
	Format :	HEX		
Settings :	Same as parameter P0-35			
		P0-37 <input type="text"/>		
		↓            ↓		
		P0-27 <input type="text"/>		

<b>P0-38</b>	<b>MAP4A</b>	<b>Target Setting of Mapping Parameter P0-28</b>		<b>Address: 004CH 004DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32bit		
	Format :	HEX		

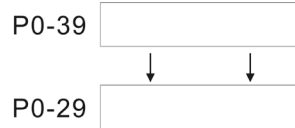
Settings : Same as parameter P0-35



<b>P0-39</b>	<b>MAP5A</b>	<b>Target Setting of Mapping Parameter P0-29</b>	<b>Address: 004EH 004FH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	determined by the communication address of the parameter group	
	Data Size :	32bit	
Format :	HEX		

Related Section:  
Section 4.3.5

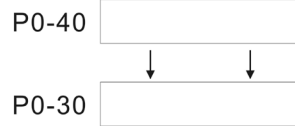
Settings : Same as parameter P0-35



<b>P0-40</b>	<b>MAP6A</b>	<b>Target Setting of Mapping Parameter P0-30</b>	<b>Address: 0050H 0051H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	determined by the communication address of the parameter group	
	Data Size :	32bit	
Format :	HEX		

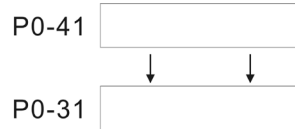
Related Section:  
Section 4.3.5

Settings : Same as parameter P0-35



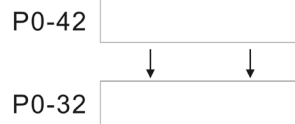
<b>P0-41</b>	<b>MAP7A</b>	<b>Target Setting of Mapping Parameter P0-31</b>		<b>Address: 0052H 0053H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32bit		
	Format :	HEX		

Settings : Same as parameter P0-35



<b>P0-42</b>	<b>MAP8A</b>	<b>Target Setting of Mapping Parameter P0-32</b>		<b>Address: 0054H 0055H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.3.5
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	determined by the communication address of the parameter group		
	Data Size :	32bit		
	Format :	HEX		

Settings : Same as parameter P0-35



<b>P0-43</b>	<b>Reserved</b>	<b>Address: 0056H 0057H</b>
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<b>P0-44★</b>	<b>PCMN</b>	<b>Status Monitor Register (for PC software)</b>	<b>Address: 0058H 0059H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x0	
	Control Mode :	ALL	
	Unite :	-	
	Range :	determined by the communication address of the parameter group	
	Data Size :	32bit	
	Format :	DEC	

Settings : Same as parameter P0-09

<b>P0-45■</b>	<b>PCMNA</b>	<b>Status Monitor Register Selection (for PC software)</b>	<b>Address: 005AH 005BH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0~127	
	Data Size :	16bit	
	Format :	DEC	



Settings : Same as parameter P0-17

<b>P0-46★</b>	<b>SVSTS</b>	<b>Servo Digital Output Status Display</b>		<b>Address: 005CH 005DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x00 ~ 0xFF		
	Data Size :	16bit		
	Format :	HEX		

Settings :

- Bit0: SRDY (Servo is ready)
- Bit1: SON (Servo ON)
- Bit2: ZSPD (Zero speed detection)
- Bit3: TSPD (Target speed reached)
- Bit4: TPOS (Target position reached)
- Bit5: TQL (Torque limit)
- Bit6: ALRM (Servo alarm)
- Bit7: BRKR (Mechanical control output)
- Bit8: HOME (Homing finished)
- Bit9: OLW (Early warning for overload)
- Bit10: WARN (When Servo warning, EMGS, under voltage, communication error, etc, occurs, DO is ON)
- Bit11: Reserved
- Bit12: Reserved
- Bit13: Reserved
- Bit14: Reserved
- Bit15: Reserved

<b>P0-47</b>	<b>Reserved</b>	<b>Address: 005EH 005FH</b>
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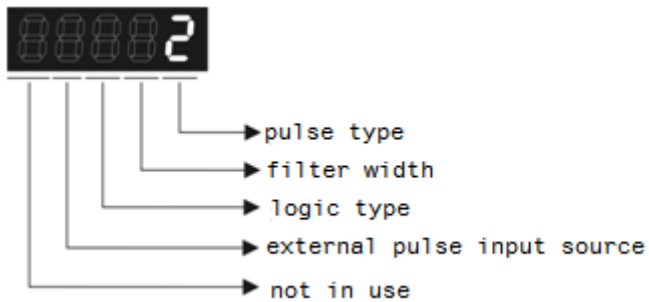
<b>P0-48</b>	<b>Reserved</b>	<b>Address: 0060H 0061H</b>
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<b>P0-49</b>	Reserved	Address: 0062H 0063H
<b>P0-50</b>	Reserved	Address: 0064H 0065H
<b>P0-51</b>	Reserved	Address: 0066H 0067H
<b>P0-52</b>	Reserved	Address: 0068H 0069H
<b>P0-53</b>	Reserved	Address: 006AH 006BH
<b>P0-54</b>	Reserved	Address: 006CH 006DH
<b>P0-55</b>	Reserved	Address: 006EH 006FH
<b>P0-56</b>	Reserved	Address: 0070H 0071H
<b>P0-57</b>	Reserved	Address: 0072H 0073H

## P1-xx Basic Parameters

<b>P1-00▲</b>	<b>PTT</b>	<b>The Type of External Pulse Input</b>		<b>Address: 0100H 0101H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.1
	Operational Interface :	Panel / Software	Communication	
	Default :	0x2		
	Control Mode :	PT		
	Unit :	-		
	Range :	0 ~ 0x1142		
	Data Size :	16bit		
	Format :	HEX		

Settings :



- Pulse Type
  - 0: AB phase pulse (4x)
  - 1: Clockwise (CW) and Counterclockwise (CCW) pulse
  - 2: Pulse + symbol
  - Other setting: reserved

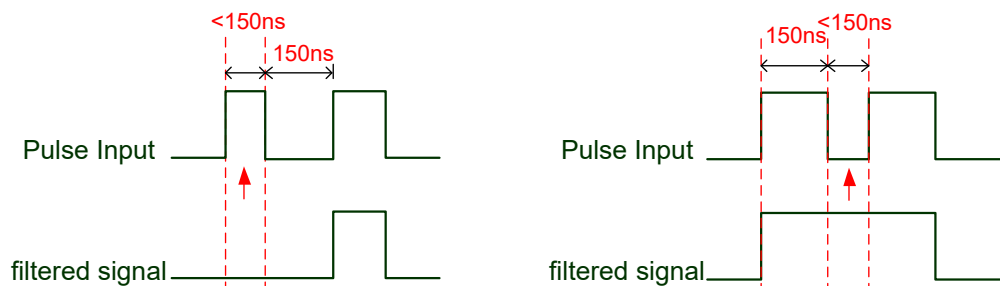
- Filter Width

If the received frequency is much higher than the setting, it will be regarded as the noise and filtered out.

Setting Value	Min. pulse width (Low-speed filter frequency* <sub>note1</sub> )	Setting Value	Min. pulse width (High-speed filter frequency* <sub>note1</sub> )
0	600 ns (0.83Mpps)	0	150 ns (3.33Mpps)
1	2.4 us (208Kpps)	1	600 ns (0.83Mpps)
2	4.8 us (104Kpps)	2	1.2 us (416Kpps)
3	9.6 us (52Kpps)	3	2.4 us (208Kpps)
4	No filter function	4	No filter function

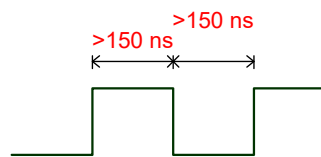
**NOTE**

When the source of external pulse is from the high-speed differential signal and the setting value is 0 (the high-speed filter frequency is 3.33Mpps at the moment), then:



When this pulse width is shorter than 150 ns, it will be seen as low level. Two input pulse will be seen as one.

When this pulse width is shorter than 150 ns, it will be seen as high level. Two input pulse will be seen as one.

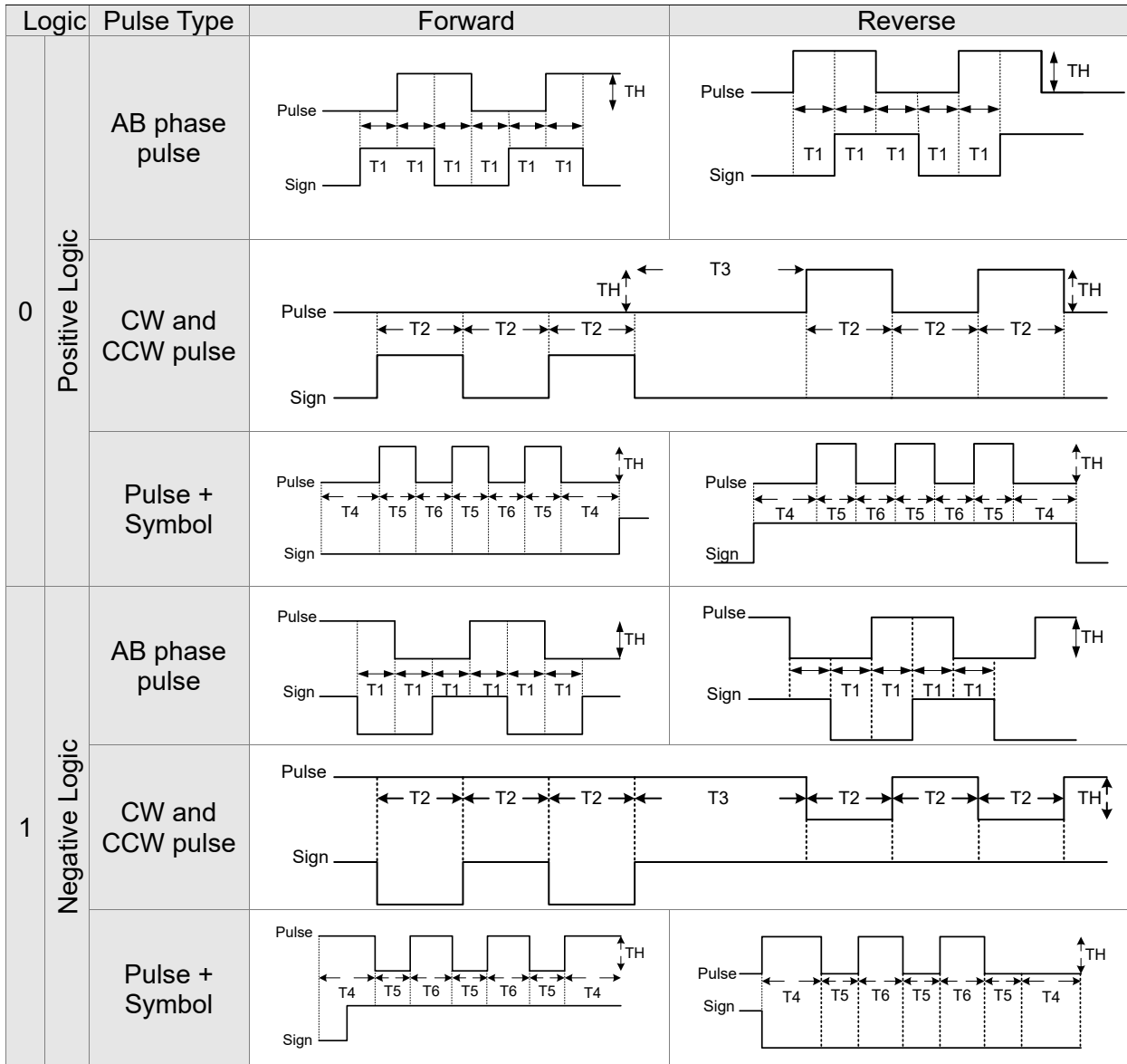


When High, Low duty of the pulse width are longer than 150 ns, it can ensure the pulse command will not be filtered.

If the user uses 2~4MHz input pulse, it is suggested to set the filter value to 4.

Note: When the signal is the high-speed pulse specification of 4 Mpps and the settings value of the filter is 4, then pulse will not be filtered.

● Logic Type



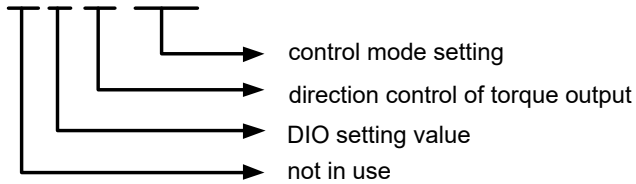
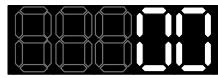
Pulse Specification		Max. Input Frequency	Minimum time width					
			T1	T2	T3	T4	T5	T6
High-speed pulse	Differential Signal	4Mpps	62.5ns	125ns	250ns	200ns	125ns	125ns
Low-speed pulse	Differential Signal	500Kpps	0.5μs	1μs	2μs	2μs	1μs	1μs
	Open-collector	200Kpps	1.25μs	2.5μs	5μs	5μs	2.5μs	2.5μs

Pulse Specification		Max. Input Frequency	Voltage Specification	Forward Current
High-speed pulse	Differential Signal	4Mpps	5V	< 25mA
Low-speed pulse	Differential Signal	500Kpps	2.8V ~ 3.7V	< 25mA
	Open-collector	200Kpps	24V (Max.)	< 25mA

- The Source of External Pulse:
  - 0: Low-speed optical coupler (CN1 Pin: PULSE, SIGN)
  - 1: High-speed differential (CN1 Pin: HPULSE, HSIGN)

P1-01●	CTL	Input Setting of Control Mode and Control Command	Address: 0102H 0103H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.1 Table 8.1
Operational interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	P (Pulse); S (r/min); T (N-M)		
Range :	00 ~ 0x110F		
Data Size :	16bit		
Format :	HEX		

Settings :



- Control Mode Settings

Mode	PT	PR	S	T	Sz	Tz
Single Mode						
00	▲					
01		▲				
02			▲			
03				▲		
04					▲	
05						▲
Dual Mode						
06	▲		▲			
07	▲			▲		
08		▲	▲			
09		▲		▲		
.0A			▲	▲		
0B	CANopen Mode					
0C	Reserved					
.0D	▲	▲				
Multiple Mode						
0E	▲	▲	▲			
0F	▲	▲		▲		

PT: Position Control Mode (The command source is external pulse and analog voltage which can be selected via DI. PTAS. Analog voltage can be used soon.)

PR: Position Control Mode (The command source is internal signal which provides 99 positions and can be selected via DI.POS0~POS5.It also provides various ways of Homing.)

S: Speed Control Mode (The command source is the external analog voltage and register. It can be selected via DI. SPD0, SPD1.)

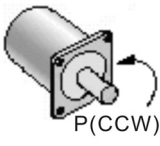
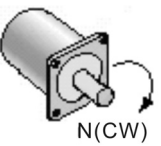
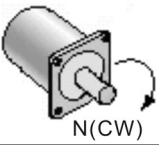
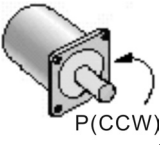
T: Torque Control Mode (The command source is the external analog voltage and register. It can be selected via DI. TCM0, TCM1.)

Sz: Zero Speed / Internal Speed Command

Tz: Zero Torque / Internal Torque Command

- Dual Mode: It can switch mode via the external Digital Input (DI). For example, if it is set to the dual mode of PT/S (Control mode setting: 06), the mode can be switched via DI. S-P (Please refer to table 8.1).
- Multiple Mode: It can switch mode via the external Digital Input (DI). For example, if it is set to multiple mode of PT/PR/S (Control Mode Setting: 14), the mode can be switched via DI. S-P, PT-PR (Please refer to table 8.1).

- Torque Output Direction Settings

	0	1
Forward		
Reverse		

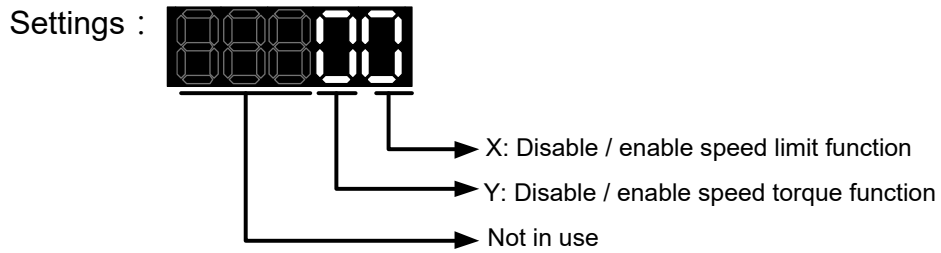
- Digital Input / Digital Output (DIO) Setting

0: When switching mode, DIO (P2-10 ~ P2-15, P2-18 ~ P2-20) remains the original setting value and will not be changed.

1: When switching mode, DIO (P2-10 ~ P2-15, P2-18 ~ P2-20) can be reset to the default value of each operational mode automatically.

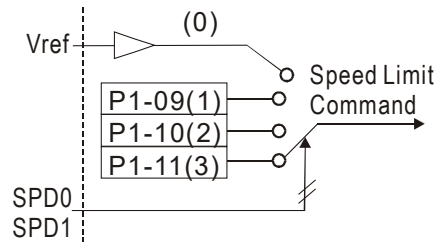
P1-02 ▲	PSTL	Speed and Torque Limit Setting	Address: 0104H 0105H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6 Table 8.1
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	00 ~ 0x11		
Data Size :	16bit		
Format :	HEX		





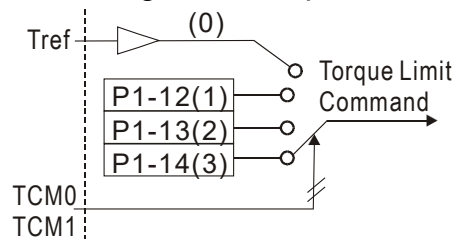
- X: Disable / enable speed limit function  
 0: Disable speed limit function  
 1: Enable speed limit function (it is effective in T mode only)  
 Other: Reserved

Block diagram of speed limit setting:



- Y: Disable / enable torque limit function  
 0: Disable torque limit function  
 1: Enable torque limit function (it is effective in PT / PR / S mode)  
 Other: Reserved

Block diagram of torque limit setting:

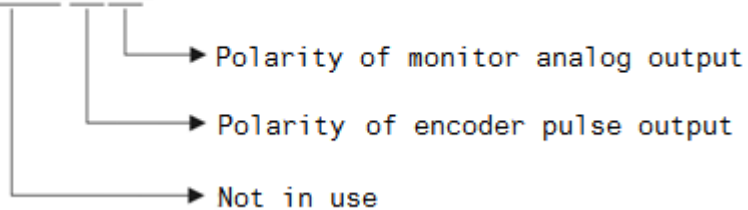


When desiring to use torque limit function, users could use parameter to set  $Y = 1$  and limit the torque for good. Thus, the user can save one DI setting. Also, users could enable or disable the limit function via DI.TRQLM, which is a more flexible way but would need to take one DI setting. Torque limit can be enabled by P1-02 or DI.

DI.TCM0 and DI.TCM1 are for selecting the limiting source.

<b>P1-03</b>	<b>AOUT</b>	<b>Polarity Setting of Encoder Pulse Output</b>		<b>Address: 0106H 0107H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x13		
	Data Size :	16bit		
	Format :	HEX		

Settings :



- Polarity of monitor analog output
  - 0: MON1(+), MON2(+)
  - 1: MON1(+), MON2(-)
  - 2: MON1(-), MON2(+)
  - 3: MON1(-), MON2(-)
- Polarity of encoder pulse output
  - 0: Forward output
  - 1: Reverse output

<b>P1-04</b>	<b>MON1</b>	<b>MON1 Analog Monitor Output Proportion</b>		<b>Address: 0108H 0109H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	% (full scale)		

Range :	0 ~ 100
Data Size :	16bit
Format :	DEC

Settings : Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = 0x1101 (MON1 is the motor speed analog output of X axis)

When the output voltage value of MON1 is V1:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V1}{8} \times \frac{\text{X axis P1} - 04}{100}$$

<b>P1-05</b>	<b>MON2</b>	<b>MON2 Analog Monitor Output Proportion</b>		<b>Address: 0108H 0109H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.3
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	% (full scale)		
	Range :	0 ~ 100		
	Data Size :	16bit		
	Format :	DEC		

Settings : Please refer to parameter P0-03 for the setting of analog output selection.

For example:

P0-03 = 0x 1110 (MON2 is the motor speed analog output of X axis)

When the output voltage value of MON2 is V2:

$$\text{Motor speed} = \text{Max. speed} \times \frac{V2}{8} \times \frac{\text{X axis P1} - 05}{100}$$

P1-06	SFLT	Analog Speed Command (Low-pass Filter)	Address: 010CH 010DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	S		
Unit :	ms		
Range :	0 ~ 1000 (0: disable this function)		
Data Size :	16bit		
Format :	DEC		

Settings : 0: Disabled

P1-07	TFLT	Analog Torque Command (Low-pass Filter)	Address: 010EH 010FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	T		
Unit :	ms		
Range :	0 ~ 1000 (0: disable this function)		
Data Size :	16bit		
Format :	DEC		

Settings : 0: Disabled

P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	Address: 0110H 0111H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.6
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	PT / PR
Unit :	10 ms
Range :	0 ~ 1000
Data Size :	16bit
Format :	DEC
Example :	11 = 110 ms

Settings : 0: Disabled

<b>P1-09</b>	<b>SP1</b>	<b>Internal Speed Command 1 / Internal Speed Limit 1</b>		<b>Address: 0112H 0113H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.1
	Operational Interface :	Panel / Software	Communication	
	Default :	1000		
	Control Mode :	S / T		
	Unit :	0.1r/min		
	Range :	-60000 ~ +60000		
	Data Size :	32bit		
	Format :	DEC		
	Example :	Internal Speed Command: 120 = 12 r/min Internal Speed Limit: Positive value and negative value is the same. Please refer to the following description.		

Settings : Internal Speed Command 1: The setting of the first internal speed command

Internal Speed Limit 1: The setting of the first internal speed limit

Example of inputting internal speed limit:

Speed limit setting value of P1-09	Allowable Speed Range	Forward Speed Limit	Reverse Speed Limit
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

<b>P1-10</b>	<b>SP2</b>	<b>Internal Speed Command 2 / Internal Speed Limit 2</b>		<b>Address: 0114H 0115H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.1
	Operational Interface :	Panel / Software	Communication	
	Default :	2000		
	Control Mode :	S / T		
	Unit :	0.1r/min		
	Range :	-60000 ~ +60000		
	Data Size :	32bit		
	Format :	DEC		
	Example :	Internal Speed Command: 120 = 12 r/min Internal Speed Limit: Positive value and negative value is the same. Please refer to the following description.		

Settings : Internal Speed Command 2: The setting of the second internal speed command

Internal Speed Limit 2: The setting of the second internal speed limit

Example of inputting internal speed limit:

Speed limit setting value of P1-10	Allowable Speed Range	Forward Speed Limit	Reverse Speed Limit
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

<b>P1-11</b>	<b>SP3</b>	<b>Internal Speed Command 3 / Internal Speed Limit 3</b>		<b>Address: 0116H 0117H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.1
	Operational Interface :	Panel / Software	Communication	
	Default :	3000		
	Control Mode :	S / T		
	Unit :	0.1r/min		

Range :	-60000 ~ +60000
Data Size :	32bit
Format :	DEC
Example :	Internal Speed Command: 120 = 12 r/min Internal Speed limit: Positive value and negative value is the same. Please refer to the following description.

Settings : Internal Speed Command 3: The setting of the third internal speed command

Internal Speed Limit 3: The setting of the third internal speed limit

Example of inputting internal speed limit:

Speed limit setting value of P1-11	Allowable Speed Range	Forward Speed Limit	Reverse Speed Limit
1000	-100 ~ 100 r/min	100 r/min	-100 r/min
-1000			

<b>P1-12</b>	<b>TQ1</b>	<b>Internal Torque Command 1 / Internal Torque Limit 1</b>		<b>Address: 0118H 0119H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	%		
	Range :	-300 ~ +300		
	Data Size :	16bit		
	Format :	DEC		
	Example :	Internal Torque Command: 30 = 30 % Internal Torque Limit: Positive value and negative value is the same. Please refer to the following description.		

Settings : Internal Torque Command 1: The setting of the first internal torque command

Internal Torque Limit 1: The setting of the first internal torque limit

Example of inputting internal torque limit:

Torque limit setting value of P1-12	Allowable Torque Range	Forward Torque Limit	Reverse Torque Limit
30	-30 ~ 30 %	30 %	-30 %
-30			

<b>P1-13</b>	<b>TQ2</b>	<b>Internal Torque Command 2 / Internal Torque Limit 2</b>		<b>Address: 011AH 011BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section Section 6.4.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	%		
	Range :	-300 ~ +300		
	Data Size :	16bit		
	Format :	DEC		
Example :	Internal Torque Command: 30 = 30 % Internal Torque Limit: Positive value and negative value is the same. Please refer to the following description.			

Settings : Internal Torque Command 2: The setting of the second internal torque command

Internal Torque Limit 2: The setting of the second internal torque limit

Example of inputting internal torque limit:

Torque limit setting value of P1-13	Allowable Torque Range	Forward Torque Limit	Reverse Torque Limit
30	-30 ~ 30 %	30 %	-30 %
-30			



<b>P1-14</b>	<b>TQ3</b>	<b>Internal Torque Command 3 / Internal Torque Limit 3</b>		<b>Address: 011CH 011DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	%		
	Range :	-300 ~ +300		
	Data Size :	16bit		
	Format :	DEC		
	Example :	Internal Torque Command: 30 = 30 % Internal Torque Limit: Positive value and negative value is the same. Please refer to the following description.		

Settings : Internal Torque Command 3: The setting of the third internal torque command

Internal Torque Limit 3: The setting of the third internal torque limit

Example of inputting internal torque limit:

Torque limit setting value of P1-14	Allowable Torque Range	Forward Torque Limit	Reverse Torque Limit
30	-30 ~ 30 %	30 %	-30 %
-30			

<b>P1-15</b>	Reserved	<b>Address: 011EH 011FH</b>
<b>P1-16</b>	Reserved	<b>Address: 0120H 0121H</b>
<b>P1-17</b>	Reserved	<b>Address: 0122H 0123H</b>
<b>P1-18</b>	Reserved	<b>Address: 0124H 0125H</b>
<b>P1-19</b>	Reserved	<b>Address: 0126H 0127H</b>

<b>P1-20</b>	Reserved	<b>Address: 0128H 0129H</b>
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<b>P1-21</b>	Reserved	<b>Address: 012AH 012BH</b>
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<b>P1-22</b>	Reserved	<b>Address: 012CH 012DH</b>
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<b>P1-23</b>	Reserved	<b>Address: 012EH 012FH</b>
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<b>P1-24</b>	Reserved	<b>Address: 0130H 0131H</b>
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<b>P1-25</b>	<b>VSF1</b>	<b>Low-frequency Vibration Suppression (1)</b>	<b>Address: 0132H 0133H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	1000	
	Control Mode :	PT / PR	
	Unit :	0.1 Hz	
	Range :	10 ~ 1000	
	Data Size :	16bit	
	Format :	DEC	
	Example :	150= 15 Hz	

Settings : The setting value of the first low-frequency vibration suppression.  
If P1-26 is set to 0, then it will disable the first low-frequency filter.

<b>P1-26</b>	<b>VSG1</b>	<b>Low-frequency Vibration Suppression Gain (1)</b>	<b>Address: 0134H 0135H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PT / PR	

Unit :	-
Range :	0 ~ 9 (0: Disable the first low-frequency filter)
Data Size :	16bit
Format :	DEC

Settings : The first low-frequency vibration suppression gain. The bigger value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to smoothly operate. It is suggested to set the value to 1.

P1-27	VSF2	Low-frequency Vibration Suppression (2)	Address: 0136H 0137H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	PT / PR		
Unit :	0.1 Hz		
Range :	10 ~ 1000		
Data Size :	16bit		
Format :	DEC		
Example :	150 = 15 Hz		

Settings : The setting value of the second low-frequency vibration suppression. If P1-28 is set to 0, then it will disable the second low-frequency filter.

P1-28	VSG2	Low-frequency Vibration Suppression Gain (2)	Address: 0138H 0139H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.9
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PT / PR		
Unit :	-		

Range :	0 ~ 9 (0: Disable the second low-frequency filter)
Data Size :	16bit
Format :	DEC

Settings : The second low-frequency vibration suppression gain. The bigger value it is, the better the position response will be. However, if the value is set too big, the motor will not be able to smoothly operate. It is suggested to set the value to 1.

<b>P1-29</b>	<b>AVSM</b>	<b>Auto Low-frequency Vibration Supression Setting</b>	<b>Address: 013AH 013BH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PT / PR	
	Unit :	-	
	Range :	0 ~ 1	
	Data Size :	16bit	
	Format :	DEC	

Related Section:  
Section 6.2.9

Settings : 0: The function is disabled.  
1: The value will set back to 0 after vibration suppression.

Description of Auto Mode Setting:

When the parameter is set to 1, it is in auto suppression. When the vibration frequency is not being detected or the value of searched frequency is stable, the parameter will set to 0 and save the low-frequency vibration suppression to P1-25 automatically.

<b>P1-30</b>	<b>VCL</b>	<b>Low-frequency Vibration Detection</b>	<b>Address: 013CH 013DH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	500	
	Control Mode :	PT / PR	

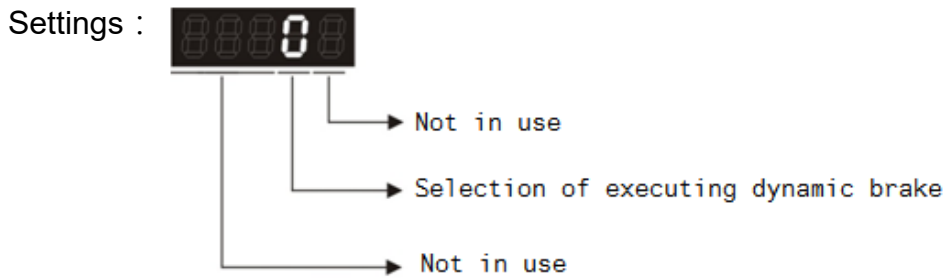
Related Section:  
Section 6.2.9

Unit :	Pulse
Range :	1 ~ 8000
Data Size :	16bit
Format :	DEC

Settings : When enabling the auto suppression (P1-29 = 1), it will automatically search the detection level. The lower the value is, the more sensitive the detection will be. However, it is easy to misjudge the noise or regard the other low-frequency vibration as the suppression frequency. If the value is bigger, it will make more precise judgment. However, if the vibration of the mechanism is smaller, it might not detect the frequency of low-frequency vibration.

<b>P1-31</b>	<b>Reserved</b>	<b>Address: 013EH 013FH</b>
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<b>P1-32</b>	<b>LSTP</b>	<b>Motor Stop Mode</b>	<b>Address: 0140H 0141H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x20		
Data Size :	16bit		
Format :	HEX		



- Selection of executing dynamic brake: Stop Mode when Servo Off or Alarm (including EMGS) occurs.

0: Execute dynamic brake

1: Motor free run

2: Execute dynamic brake first, then execute free run until it stops (The motor speed is slower than P1-38).

When PI and NL occur, please refer to event time setting value of P5-03 for determining the deceleration time. If the setting is 1 ms, it can stop instantaneously.

<b>P1-33</b>	<b>Reserved</b>	<b>Address: 0142H 0143H</b>
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<b>P1-34</b>	<b>TACC</b>	<b>Acceleration Constant of S-Curve</b>	<b>Address: 0144H 0145H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	200		
Control Mode :	S		
Unit :	ms		
Range :	1 ~ 65500		
Data Size :	16bit		
Format :	DEC		

Settings : Acceleration Constant:

P1-34, P1-35 and P1-36, the acceleration time of speed command from zero to the rated speed, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.

**NOTE**

- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
- 2) When the source of speed command is analog, the max. range of P1-34 will be set within 20000 automatically.

P1-35	TDEC	Deceleration Constant of S-Curve	Address: 0146H 0147H
Parameter Attribute :	Parameter for individual axis		Related Sections: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	200		
Control Mode :	S		
Unit :	ms		
Range :	1 ~ 65500		
Data Size :	16bit		
Format :	DEC		

Settings : Deceleration Constant:

P1-34, P1-35 and P1-36, the deceleration time of speed command from the rated speed to zero, all can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.

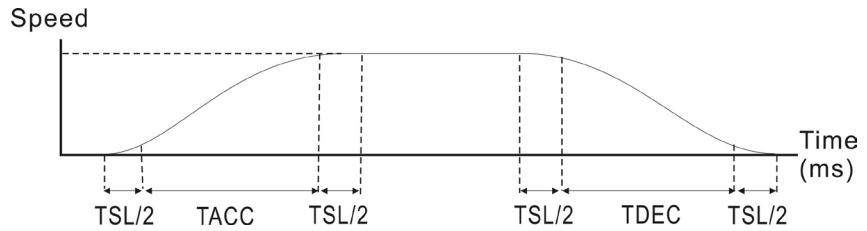
**NOTE**

- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
- 2) When the source of speed command is analog, the max. range of P1-35 will be set within 20000 automatically.

P1-36	TSL	Acceleration / Deceleration Constant of S-Curve	Address: 0148H 0149H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	S · PR		
Unit :	ms		
Range :	0 ~ 65500 (0 : disable this function)		

Data Size :	16bit
Format :	DEC

Settings : Acceleration / Deceleration Constant of S-Curve:



P1-34: Set the acceleration time of acceleration / deceleration of trapezoid-curve

P1-35: Set the deceleration time of acceleration / deceleration of trapezoid-curve

P1-36: Set the smoothing time of S-curve acceleration and deceleration

P1-34, P1-35 and P1-36 can be set individually. Even when P1-36 is set to 0, it still has acceleration / deceleration of trapezoid-curve.



**NOTE**

- 1) When the source of speed command is analog, and P1-36 is set to 0, it will disable S-curve function.
- 2) When the source of speed command is analog, the max. range of P1-36 will be set within 10000 automatically.

<b>P1-37</b>	<b>GDR</b>	<b>Inertia Ratio and Load Weight Ratio to Servo Motor</b>		<b>Address: 014AH 014BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	1.0	10	
	Control Mode :	ALL		
	Unit :	1 times	0.1 times	
	Range :	0.0 ~ 200.0	0 ~ 2000	
	Data Size :	16bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 times	15 = 1.5 times	



Settings : Inertia ratio to servo motor (rotary motor):

$$(J\_load / J\_motor)$$

Among them:

J\_motor: rotor inertia of the servo motor

J\_load: Total equivalent of inertia of external mechanical load.

Load weight ratio to servo motor (linear motor) (\*it will be available soon):

$$(M\_load / M\_motor)$$

Among them:

M\_motor: the weight of the servo motor

M\_load: Total equivalent weight of mechanical loading

<b>P1-38</b>	<b>ZSPD</b>	<b>Zero Speed Range Setting</b>		<b>Address: 014CH 014DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
	Operational Interface :	Panel / Software	Communication	
	Default :	10.0	100	
	Control Mode :	ALL		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.0 ~ 200.0	0 ~ 2000	
	Data Size :	16bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 r/min	15 = 1.5 r/min	

Settings : Setting the output range of zero-speed signal (ZSPD). When the forward / reverse speed of the motor is slower than the setting value, the digital output will be enabled.

<b>P1-39</b>	<b>SSPD</b>	<b>Target Motor Detection Level</b>		<b>Address: 014EH 014FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
	Operational Interface :	Panel / Software	Communication	
	Default :	3000		

Control Mode :	ALL
Unit :	r/min
Range :	0 ~ 5000
Data Size :	16bit
Format :	DEC

Settings : When the target speed is reached, DO (TSPD) is enabled. It means when the motor speed in forward / reverse direction is higher than the setting value, the target speed is reached and enables DO.

**P1-40 ▲**

<b>VCM</b>	<b>Maximum Speed of Analog Speed Command</b>	<b>Address: 0150H 0151H</b>
Parameter Attribute :	Parameter for individual axis	
Operational Interface :	Panel / Software	Communication
Default :	Same as the rated speed of each model	
Control Mode :	S / T	
Unit :	r/min	
Range :	0 ~ 50000	
Data Size :	16bit	
Format :	DEC	

Settings : Maximum Speed of Analog Speed Command:

In speed mode, the analog speed command inputs the swing speed setting of the max. voltage (10V). For example, if the setting is 3000, when the external voltage input is 10V, it means the speed control command is 3000r/min. If the external voltage input is 5V, then the speed control command is 1500r/min.

Speed control command = input voltage value x setting value / 10

In position or torque mode, analog speed limit inputs the swing speed limit setting of the max. voltage (10V).

Speed limit command = input voltage value x setting value / 10

P1-41 ▲	TCM	Maximum Output of Analog Torque Speed	Address: 0152H 0153H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.4.4
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	%		
Range :	0 ~ 1000		
Data Size :	16bit		
Format :	DEC		

Settings : Maximum Output of Analog Torque Speed:

In torque mode, the analog torque command inputs the torque setting of the max. voltage (10V). When the default setting is 100, if the external voltage inputs 10V, it means the torque control command is 100% rated torque. If the external voltage inputs 5V, then the torque control command is 50% rated torque.

Torque control command = input voltage value x setting value / 10 (%)

In speed, PT and PR mode, the analog torque limit inputs the torque limit setting of the max. voltage (10V).

Torque limit command = input voltage value x setting value / 10 (%)

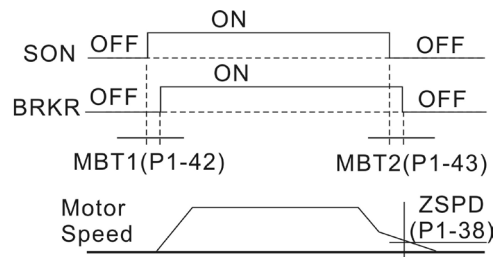
P1-42	MBT1	Enable Delay Time of Mechanical Brake	Address: 0154H 0155H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.4
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	ms		
Range :	0 ~ 1000		
Data Size :	16bit		

Format :	DEC
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Settings : Set the delay time from servo ON to activate the signal of mechanical brake (BRKR).

<b>P1-43</b>	<b>MBT2</b>	<b>Disable Delay Time of Mechanical Brake</b>		<b>Address: 0156H 0157H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.6.4
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	ms		
	Range :	-1000 ~ 1000		
	Data Size :	16bit		
	Format :	DEC		

Settings : Set the delay time from servo OFF to switch off the signal of mechanical brake (BRKR).



**NOTE**

- 1) If the delay time of P1-43 has not finished yet and the motor speed is slower than P1-38, the signal of mechanical brake (BRKR) will be disabled.
- 2) If the delay time of P1-43 is up and the motor speed is higher than P1-38, the signal of mechanical brake (BRKR) will be disabled.
- 3) When Servo OFF due to Alarm (except AL022) or emergency, the setting of P1-43 is equivalent to 0 if P1-43 is set to a negative value.

P1-44 ▲	GR1	Gear Ratio (Numerator) (N1)	Address: 0158H 0159H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.5
Operational Interface :	Panel / Software	Communication	
Default :	128		
Control Mode :	PT / PR		
Unit :	Pulse		
Range :	1 ~ ( 2 <sup>29</sup> -1 )		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to P2-60~P2-62 for the setting of multiple gear ratio (numerator).

**NOTE**

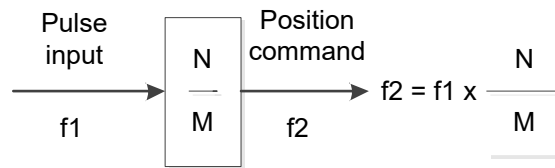
- 1) In PT mode, the setting value can be changed when Servo ON.
- 2) In PR mode, the setting value can be changed when Servo OFF.

P1-45	GR2	Gear Ratio (Denominator) (M)	Address: 015AH 015BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.5
Operational Interface :	Panel / Software	Communication	
Default :	10		
Control Mode :	PT / PR		
Unit :	Pulse		
Range :	1 ~ ( 2 <sup>31</sup> -1 )		
Data Size :	32bit		
Format :	DEC		

Settings : If the setting is wrong, the servo motor will easily have sudden unintended acceleration.

Please follow the rules for setting:

The setting of pulse input:



Range of command pulse input :  $1 / 50 < Nx / M < 25600$



**NOTE** 1) The setting value cannot be changed when Servo ON neither in PT nor in PR mode.

<b>P1-46 ▲</b>	<b>GR3</b>	<b>Pulse Number of Encoder Output</b>	<b>Address: 015CH 015DH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	2500	
	Control Mode :	ALL	
	Unit :	Pulse	
	Range :	20 ~ 320000	
	Data Size :	32bit	
	Format :	DEC	

Settings : The number of pulse output per revolution.



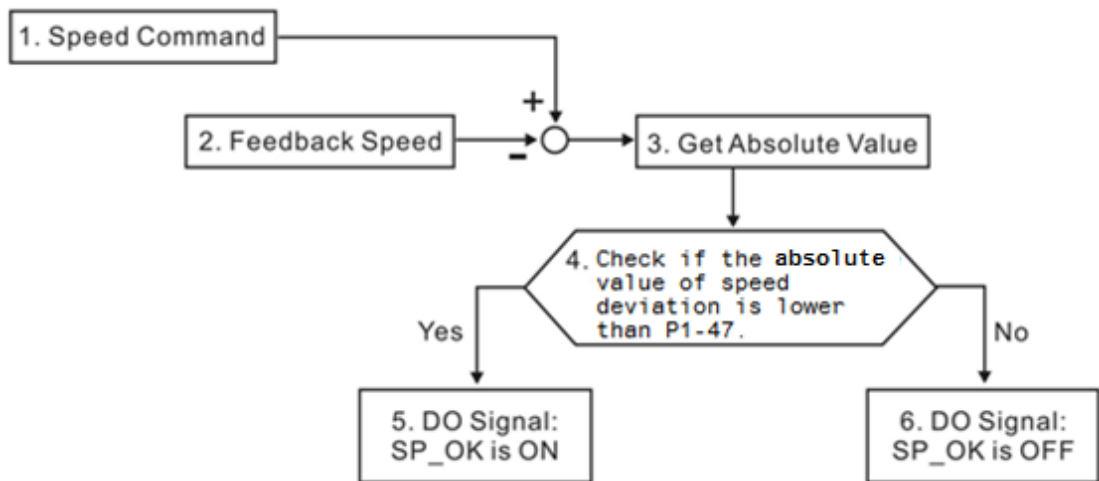
**NOTE** The following circumstances might exceed the max. allowable input pulse frequency and occurs AL018:

1. Abnormal encoder
2. The motor speed is faster than the setting of P1-76.
3.  $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 > 19.8 \times 10^6$

P1-47	SPOK	Speed Reached (DO : SP_OK) Range	Address: 015EH 015FH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	10		
Control Mode :	S / Sz		
Unit :	r/min		
Range :	0 ~ 300		
Data Size :	16bit		
Format :	DEC		

Settings : When the deviation between speed command and motor feedback speed is smaller than this parameter, then the digital output DO.SP\_OK ( DO code is 0x19 ) is ON.

Block diagram:



1. Speed command: It is the command issued by the user (without acceleration / deceleration), not the one of front end speed circuit.  
Source: Analog voltage and register
2. Feedback speed: The actual speed of the motor and have gone through the filter.
3. Obtain the absolute value.
4. DO.SP\_OK will be ON when the absolute value of speed error is smaller than P1-47, or it will be OFF. If P1-47 is 0, DO.SP\_OK is always OFF.

<b>P1-48</b>	<b>MCOK</b>	<b>Operation Selection of Motion Reached (DO : MC_OK)</b>		<b>Address: 0160H 0161H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x0000 ~ 0x0011		
	Data Size :	16bit		
	Format :	HEX		

Settings : Control selection of digital output DO.MC\_OK (DO code is 0x17).  
The format of this parameter: 00YX

X = 0: It will not remain the digital output status

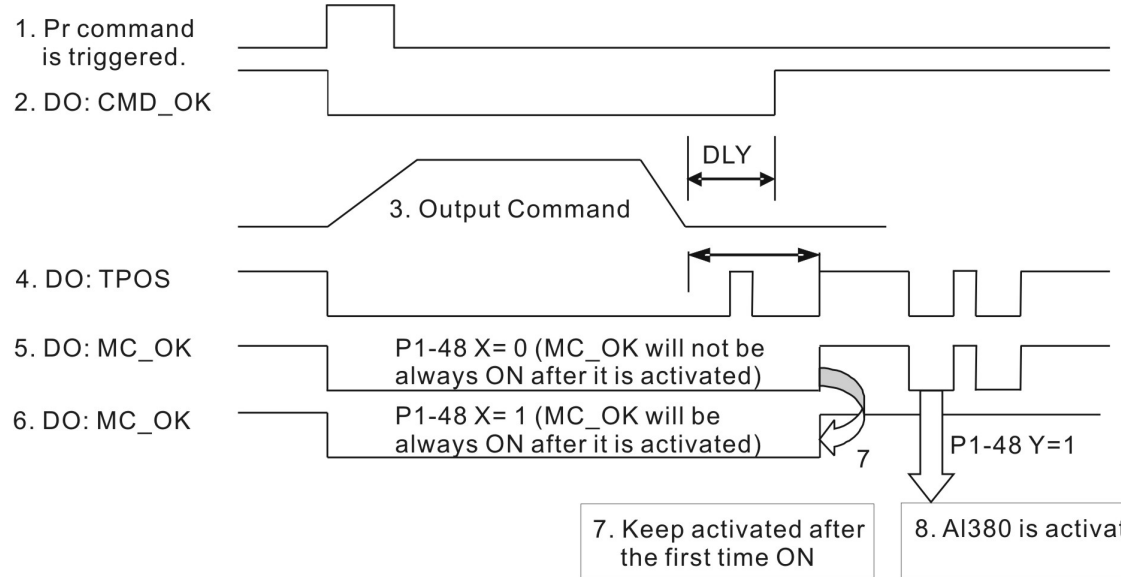
1: It will remain the digital output status

Y = 0: Alarm, AL380 (position deviation) is not working

1: Alarm, AL380 (position deviation) is working



Block diagram:



Description:

1. Command triggered: It means the new PR command is effective. Position command starts to output and clear signal 2, 4, 5, 6 at the same time.
2. CMD\_OK: It means the position command is completely outputted and can set the delay time (DLY).
3. Command output: Output the profile of position command according to the setting acceleration / deceleration.
4. TPOS: It means the position error of the servo drive is smaller than the value of P1-54.
5. MC\_OK: It means the position command is completely outputted and the position error of the servo drive is smaller than P1-54.  
 MC\_OK (remains the digital output status): It is the same as 5. However, once this DO is ON, its status will be remained regardless signal 4 is OFF or not.
7. The output profile is determined by parameter P1-48.X.
8. Position Deviation: When number 7 happens, if 4 (or 5) is OFF, it means the position is deviated and AL380 can be triggered.

Set this alarm via parameter P1-48.Y.

<b>P1-49</b>	<b>SPOKWT Accumulated Time of Speed Reached</b>		<b>Address:0162H 0163H</b>
	Parameter Attribute :	Panel / Software	Communication
	Default :	0	
	Control Mode :	S/Sz	
	Unit :	ms	

Range :	0 ~ 65535
Data Size :	16bit
Format :	DEC

Settings : In speed mode, when the deviation between the speed feedback and the command is smaller than the setting value of P1-47 and exceed the setting time of P1-49, DO: SP\_OK is ON. Whenever the deviation exceeds the setting range of P1-47, the time count will be reset.

<b>P1-50</b>	<b>Reserved</b>	<b>Address: 0164H 0165H</b>
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<b>P1-51</b>	<b>Reserved</b>	<b>Address: 0166H 0167H</b>
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<b>P1-52</b>	<b>RES1</b>	<b>Regenerative Resistor Value</b>	<b>Address: 0168H 0169H</b>
Parameter Attribute :	Parameter for three axes		Related Section: Section 2.7
Operational Interface :	Panel / Software	Communication	
Default :	Determined by the model. Please refer to the following table.		
Control Mode :	ALL		
Unit :	Ohm		
Range :	10 ~ 750		
Data Size :	16bit		
Format :	DEC		

Settings :

Model	Default
1.5kW (included) or below	40 Ω

P1-53	RES2	Regenerative Resistor Capacity	Address: 016AH 016BH
Parameter Attribute :	Parameter for three axes		Related Section: Section 2.7
Operational Interface :	Panel / Software	Communication	
Default :	Determined by the model. Please refer to the following table.		
Control Mode :	ALL		
Unit :	Watt		
Range :	0 ~ 3000		
Data Size :	16bit		
Format :	DEC		
Settings :	Model	Default	
	1.5kW (included) or below	60 W	

P1-54	PER	Position Completed Range	Address: 016CH 016DH
Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
Operational Interface :	Panel / Software	Communication	
Default :	12800		
Control Mode :	PT / PR		
Unit :	Pulse		
Range :	0 ~ 1280000		
Data Size :	32bit		
Format :	DEC		
Settings :	In position mode (PT), if the deviation pulse number is smaller than the setting range (the setting value of parameter P1-54), DO.TPOS is ON.		
	In position register (PR) mode, if the deviation between the target position and the actual motor position is smaller than the setting range (the setting value of parameter P1-54), DO.TPOS is ON.		

P1-55	MSPD	Maximum Speed Limit	Address: 016EH 016FH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	Same as the rated speed of each model	
	Control Mode :	ALL	
	Unit :	r/min	
	Range :	0 ~ max. speed	
	Data Size :	16bit	
	Format :	DEC	
	Settings :	The default of the max. speed of servo motor is set to the rated speed.	

P1-56	OVW	Output Overload Warning Level	Address: 0170H 0171H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	120	
	Control Mode :	ALL	
	Unit :	%	
	Range :	0 ~ 120	
	Data Size :	16bit	
	Format :	DEC	
	Settings :	The setting value is 0 ~ 100, if the servo motor continuously outputs the load and is higher than the setting proportion (P1-56), the early warning for overload (DO is set to 10, OLW) will occur. If the setting value is over 100, it will disable this function.	

P1-57	Reserved	Address: 0172H 0173H

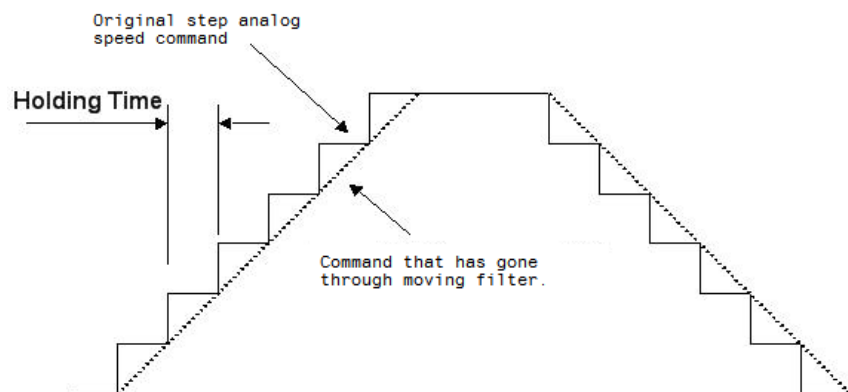
P1-58	Reserved	Address: 0174H 0175H

<b>P1-59</b>	<b>MFLT</b>	<b>Analog Speed Command</b>		<b>Address: 0176H 0177H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0.0	0	
	Control Mode :	S		
	Unit :	1 ms	0.1 ms	
	Range :	0.0 ~ 4.0	0 ~ 40	
	Data Size :	16bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 ms	15 = 1.5 ms	

Settings : (Moving Filter)  
0: Disabled

P1-06 is low-pass filter and P1-59 is moving filter. The difference between both is that moving filter can smooth the command in the beginning and end of the step command; while the low-pass filter brings better smooth effect to command end.

Therefore, it is suggested that if the speed loop receives the command from the controller for forming the position control loop, then low-pass filter can be used. If it is only for the speed control, then it should use Moving Filter for better smoothing.



<b>P1-60</b>	<b>Reserved</b>	<b>Address: 0178H 0179H</b>
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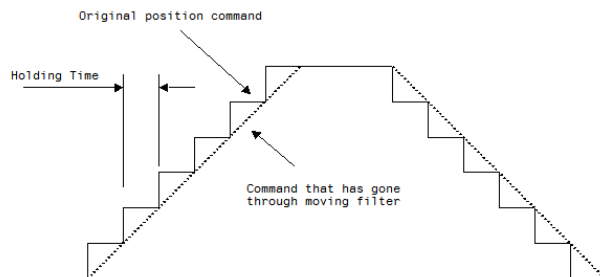
<b>P1-61</b>	<b>Reserved</b>	<b>Address: 017AH 017BH</b>
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<b>P1-62</b>	Reserved	Address: 017CH 017DH
<b>P1-63</b>	Reserved	Address: 017EH 017FH
<b>P1-64</b>	Reserved	Address: 0180H 0181H
<b>P1-65</b>	Reserved	Address: 0182H 0183H
<b>P1-66</b>	Reserved	Address: 0184H 0185H
<b>P1-67</b>	Reserved	Address: 0186H 0187H

<b>P1-68</b>	<b>PFLT2</b>	<b>Position Command Moving Filter</b>	<b>Address: 0188H 0189H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	4	
	Control Mode :	PT / PR	
	Unit :	ms	
	Range :	0 ~ 100	
	Data Size :	16bit	
	Format :	DEC	

Settings : 0: Disabled

Moving Filter can activate smooth function in the beginning and the end of step command, but will delay the command.



<b>P1-69</b>	Reserved		<b>Address: 018AH 018BH</b>
<b>P1-70</b>	Reserved		<b>Address: 018CH 018DH</b>
<b>P1-71</b>	Reserved		<b>Address: 018EH 018FH</b>
<b>P1-72</b>	Reserved		<b>Address: 0190H 0191H</b>
<b>P1-73</b>	Reserved		<b>Address: 0192H 0193H</b>
<b>P1-74</b>	Reserved		<b>Address: 0194H 0195H</b>
<b>P1-75</b>	Reserved		<b>Address: 0196H 0197H</b>
<b>P1-76</b>	<b>AMSPD</b>	<b>Maximum Rotation of Encoder Output Setting (OA, OB)</b>	
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	5500	
	Control Mode :	ALL	
	Unit :	r/min	
	Range :	0 ~ 6000	
	Data Size :	16bit	
	Format :	DEC	
	Settings :	According to the real application, this parameter is set for the maximum speed and the servo drive will generate smooth function automatically for encoder output signals. When the value is set to 0, the function is disabled.	
<b>P1-77</b>	Reserved		<b>Address: 019AH 019BH</b>

<b>P1-78</b>	<b>OVLPS</b>	<b>The Setting of PR Path Overlap</b>		<b>Address: 019CH 019DH</b>
Parameter Attribute :	Parameter for three axes			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	0 ~ 0x0001			
Data Size :	16bit			
Format :	HEX			



## Settings :

The setting of overlap PR path:

0: Disable the function of PR path overlap

1: Enable the function of PR path overlap:

(When enabling the function, follow OVLP of PR multi-axis interpolation command (note) and index to the percentage selection of overlap area)

Note: PR command of multi-axis interpolation

	31 ~28	27 ~24	23 ~20	19 ~16	15 ~12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DW0	SEL	OVLP	DLY	VSPD	VDEC	VACC	OPT	4
DW1	DATA(32bit): Target Position; Unit: Pulse of User Unit							

OVLP: When enabling the function of PR path overlap, the meaning is as the following:

0~A: Fixed overlap distance

The overlap distance should be: the whole path x (Corresponding grade of 0~A Index, which is 1% ~20%).

B: Refer to the setting of P1-79. The overlap distance should be: the whole path x (P1-79)%

C: Refer to the setting of P1-80. The overlap distance should be the value of P1-80.

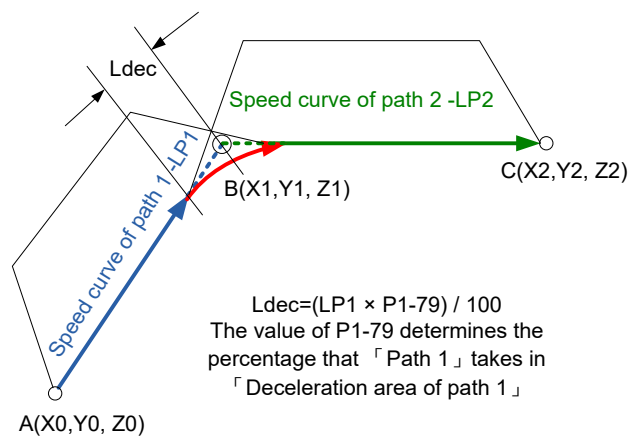
The value of P1-79 is for setting the percentage of deceleration area of previous path in the whole path during the PR path overlap.

The value of P1-80 is for setting the deceleration area of previous path during the PR path overlap.

<b>Grade</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
Percentage	14%	12%	10%	8%	6%	4%	2%	1%
<b>Grade</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>
Percentage	Reserved	Reserved	Reserved	Refer to P1-80	Refer to P1-79	20%	18%	16%

<b>P1-79</b>	<b>OVLPP</b>	<b>The setting of the percentage of the overlap PR path</b>		<b>Address: 019EH 019FH</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	10		
	Control Mode :	PR		
	Unit :	% (percentage)		
	Range :	1 ~ 30		
	Data Size :	32bit		
	Format :	DEC		

Settings : This parameter is for setting the percentage of deceleration area of previous path in the whole path during the PR path overlap.



P1-80	OVLPL	The setting of the overlap PR path		Address: 01A0H 01A1H
Parameter Attribute :	Parameter for three axes			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	100000			
Control Mode :	PR			
Unit :	-			
Range :	1000 ~ 2147483647			
Data Size :	32bit			
Format :	DEC			

Settings : This parameter is for setting the deceleration area of previous path during the PR path overlap.

## P2-xx Extension Parameters

P2-00	KPP	Position Loop Gain	Address: 0200H 0201H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.8
Operational Interface :	Panel / Software	Communication	
Default :	35		
Control Mode :	PT / PR		
Unit :	rad/s		
Range :	0 ~ 2047		
Data Size :	16bit		
Format :	DEC		

Settings : When the value of position loop gain is increased, the position response can be enhanced and the position error can be reduced. If the value is set too big, it may easily cause vibration and noise.

P2-01	PPR	Switching Rate of Position Loop Gain	Address: 0202H 0203H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.8
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	PT / PR		
Unit :	%		
Range :	10 ~ 500		
Data Size :	16bit		
Format :	DEC		

Settings : Switch the changing rate of position loop gain according to the gain-switching condition.

P2-02	PFG	Position Feed Forward Gain	Address: 0204H 0205H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.2.8
Operational Interface :	Panel / Software	Communication	
Default :	50		
Control Mode :	PT / PR		
Unit :	%		
Range :	0 ~ 100		
Data Size :	16bit		
Format :	DEC		

Settings : If the position command is changed smoothly, increasing the gain value can reduce the position error.  
If the position command is not changed smoothly, decreasing the gain value can tackle the problem of mechanical vibration.

P2-03	PFF	Smooth Constant of Position Feed Forward Gain	Address: 0206H 0207H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	5		
Control Mode :	PT / PR		
Unit :	ms		
Range :	2 ~ 100		
Data Size :	16bit		
Format :	DEC		

Settings : If the position command is changed smoothly, decreasing the value can reduce the position error. If the position command is not changed smoothly, increasing the value can tackle the problem of mechanical vibration.

P2-04	KVP	Speed Loop Gain	Address: 0208H 0209H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	500		
Control Mode :	ALL		
Unit :	rad/s		
Range :	0 ~ 8191		
Data Size :	16bit		
Format :	DEC		

Settings : Increase the value of speed loop gain can enhance the speed response. However, if the value is set too big, it would easily cause resonance and noise.

P2-05	SPR	Switching Rate of Speed Loop Gain	Address: 020AH 020BH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	%		
Range :	10 ~ 500		
Data Size :	16bit		
Format :	DEC		

Settings : Switch the changing rate of speed loop gain according to the gain switching condition.

P2-06	KVI	Speed Integral Compensation	Address: 020CH 020DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	rad/s		
Range :	0 ~ 1023		
Data Size :	16bit		
Format :	DEC		

Settings : Increasing the value of speed integral compensation can enhance speed response and diminish the deviation of speed control. However, if the value is set too big, it would easily cause resonance and noise.

P2-07	KVF	Speed Feed Forward Gain	Address: 020EH 020FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	%		
Range :	0 ~ 100		
Data Size :	16bit		
Format :	DEC		

Settings : When the speed control command runs smoothly, increasing the gain value can reduce the speed command error. If the command does not run smoothly, decreasing the gain value can reduce the mechanical vibration during operation.

<b>P2-08</b>	<b>PCTL</b>	<b>Special Parameter Write-in</b>		<b>Address: 0210H 0211H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 65535		
	Data Size :	16bit		
	Format :	DEC		

Settings : Special parameter write-in:

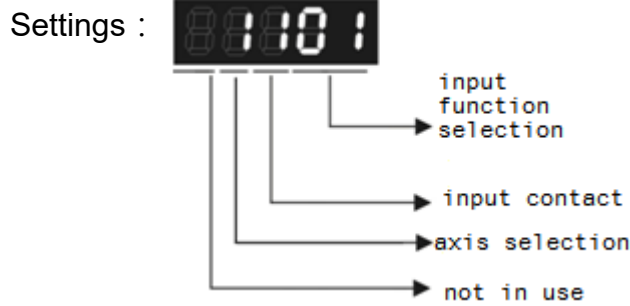
Parameter code	Function
10	Reset the parameter for individual axis (Apply to the power again after reset)
11	Reset the parameter for three axes (Apply to the power again after reset)
20	P4-10 is writable
22	P4-11~P4-19 are writable
30,35	Save the data of COMPARE, CAPTURE, E-Cam



<b>P2-09</b>	<b>DRT</b>	<b>DI Debouncing Time</b>		<b>Address: 0212H 0213H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	2		
	Control Mode :	ALL		
	Unit :	2ms		
	Range :	0 ~ 20		
	Data Size :	16bit		
	Format :	DEC		
	Example :	4 = 8 ms		

Settings : When the environmental noise is big, increasing the setting value can enhance the control stability. However, if the value is set too big, the response time will be influenced.

<b>P2-10</b>	<b>DI1</b>	<b>DI1 Functional Planning</b>		<b>Address: 0214H 0215H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	101		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x315F (the last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		



- Input function selection: Please refer to table 8.1
- Input contact: **a** or **b** contact
  - 0: Set the input contact as normally closed (**b** contact)
  - 1: Set the input contact as normally open (**a** contact)
- Axis selection: select the corresponding axis of DI
  - 0: Set the axis to 0, this DI function is shared by three axes.
  - 1: Set the axis to 1, this DI function is for X axis.
  - 2: Set the axis to 2, this DI function is for Y axis.
  - 3: Set the axis to 3, this DI function is for Z axis.

When parameters are modified, please re-start the servo drive to ensure it can work normally.

Note: Parameter P3-06 is used to set how digital inputs (DI) accepts commands, through external terminal or the communication which determined by P4-07.



**NOTE**

- 1) DI shared by three axes provides three functions:
  - a. SON-Servo On. The setting value is 0101 for **a** contact and 0001 for **b** contact.
  - b. ARST-Alarm reset. The setting value is 0102 for **a** contact and 0002 for **b** contact.
  - c. EMGS-Emergency stop. The setting value is 0103 for **a** contact and 0003 for **b** contact. This DI function is shared by three axes.
- 2) When switching mode, if resetting the setting value of DI /DO, the axis selection will return to its default.

<b>P2-11</b>	<b>DI2</b>	<b>DI2 Functional Planning</b>		<b>Address: 0216H 0217H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	104		

Control Mode :	ALL
Unit :	-
Range :	0 ~ 0x015F (the last two codes are DI code)
Data Size :	16bit
Format :	HEX

Settings : Please refer to the description of P2-10

P2-12	DI3	DI3 Functional Planning	Address: 0218H 0219H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	116	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 0x015F (the last two codes are DI code)	
	Data Size :	16bit	
	Format :	HEX	

Related Section:  
Table 8.1

Settings : Please refer to the description of P2-10

P2-13	DI4	DI4 Functional Planning	Address: 021AH 021BH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	117	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 0x015F (the last two codes are DI code)	
	Data Size :	16bit	

Related Section:  
Table 8.1

Format :	HEX
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Settings : Please refer to the description of P2-10

P2-14	DI5	DI5 Functional Planning	Address: 021CH 021DH
Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
Operational Interface :	Panel / Software	Communication	
Default :	102		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x015F (the last two codes are DI code)		
Data Size :	16bit		
Format :	HEX		

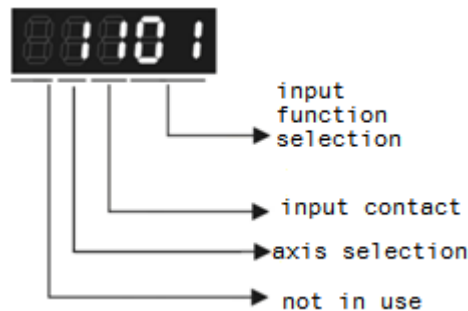
Settings : Please refer to the description of P2-10

P2-15	DI6	DI6 Functional Planning	Address: 021EH 021FH
Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
Operational Interface :	Panel / Software	Communication	
Default :	21		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x015F (the last two codes are DI code)		
Data Size :	16bit		
Format :	HEX		

Settings : Please refer to the description of P2-10

<b>P2-16</b>	<b>EDI7</b>	<b>ED17 Functional Planning</b>		<b>Address: 0220H 0221H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings :



- Input function selection: Please refer to table 8.1
  - Input contact: **a** or **b** contact
    - 0 : Set the input contact as normally closed (**b** contact)
    - 1 : Set the input contact as normally open (**a** contact)
  - Axis selection: Select the corresponding axis of DI 0: Set the axis to 0, this DI function is shared by three axes.
    - 1: Set the axis to 1, this DI function is for X axis.
    - 2: Set the axis to 2, this DI function is for Y axis.
    - 3: Set the axis to 3, this DI function is for Z axis.
- When parameters are modified, please re-start the servo drive to ensure it can work normally.



**NOTE**

- 1 ) DI shared by three axes provides three functions:
  - a. SON-Servo On. The setting value is 0101 for **a** contact and 0001 for **b** contact.
  - b. ARST-Alarm reset. The setting value is 0102 for **a** contact and 0002 for **b** contact.
  - c. EMGS-Emergency stop. The setting value is 0103 for **a** contact and 0003 for **b** contact. This DI function is shared by three axes.
- 2 ) When switching mode, if resetting the setting value of DI /DO, the axis selection will return to its default.

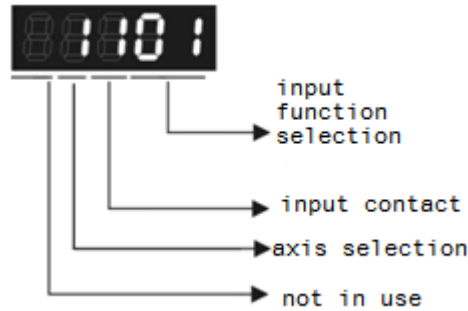
<b>P2-17</b>	<b>ED18</b>	<b>ED18 Functional Planning</b>		<b>Address: 0222H 0223H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16.

<b>P2-18</b>	<b>DO1</b>	<b>DO1 Functional Planning</b>		<b>Address: 0224H 0225H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
	Operational Interface :	Panel / Software	Communication	
	Default :	101		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x313F (the last two codes are DO code)		
	Data Size :	16bit		

Format : HEX

Settings :



- Output function selection: Please refer to table 8.2
- Output contact: **a** or **b** contact
  - 0: Set the output contact as normally closed (**b** contact)
  - 1: Set the output contact as normally open (**a** contact)
- Axis selection: select the corresponding axis of DO
  - 1: Set the axis to 1, this DO function is for X axis.
  - 2: Set the axis to 2, this DO function is for Y axis.
  - 3: Set the axis to 3, this DO function is for Z axis.

When parameters are modified, please re-start the servo drive to ensure it can work normally.



**NOTE**

1. When switching mode, if resetting the setting value of DI /DO, the axis selection will return to its default.

P2-19	DO2	DO2 Functional Planning	Address: 0226H 0227H
Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
Operational Interface :	Panel / Software	Communication	
Default :	103		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x013F (the last two codes are DO code)		
Data Size :	16bit		
Format :	HEX		

Settings : Please refer to the description of P2-18

<b>P2-20</b>	<b>DO3</b>	<b>DO3 Functional Planning</b>		<b>Address: 0228H 0229H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.2
	Operational Interface :	Panel / Software	Communication	
	Default :	7		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x013F (the last two codes are DO code)		
	Data Size :	16bit		
Format :	HEX			

Settings : Please refer to the description of P2-18

<b>P2-21</b>	<b>Reserved</b>	<b>Address: 022AH 022BH</b>
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<b>P2-22</b>	<b>Reserved</b>	<b>Address: 022CH 022DH</b>
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<b>P2-23</b>	<b>NCF1</b>	<b>Resonance Suppression (Notch filter) (1)</b>		<b>Address: 022EH 022FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
	Operational Interface :	Panel / Software	Communication	
	Default :	1000		
	Control Mode :	ALL		
	Unit :	Hz		
	Range :	50 ~ 1000		
	Data Size :	16bit		
Format :	DEC			

Settings : The first setting value of resonance frequency. If P2-24 is set to 0, this function is disabled. P2-43 and P2-44 are the second Notch filter.



P2-24	DPH1	Resonance Suppression (Notch filter) Attenuation Rate (1)	Address: 0230H 0231H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32 (0: disable the function of Notch filter)		
Data Size :	16bit		
Format :	DEC		

Settings : The first resonance suppression (notch filter) attenuation rate. When this parameter is set to 0, the function of Notch filter is disabled.

P2-25	NLP	Low-pass Filter of Resonance Suppression	Address: 0232H 0233H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0.2 (under 1kW) or 0.5 (other model)	2 (under 1kW) or 5 (other model)	
Control Mode :	ALL		
Unit :	1 ms	0.1 ms	
Range :	0.0 ~ 100.0	0 ~ 1000	
Data Size :	16bit		
Format :	One decimal	DEC	
Example :	1.5 = 1.5 ms	15 = 1.5 ms	

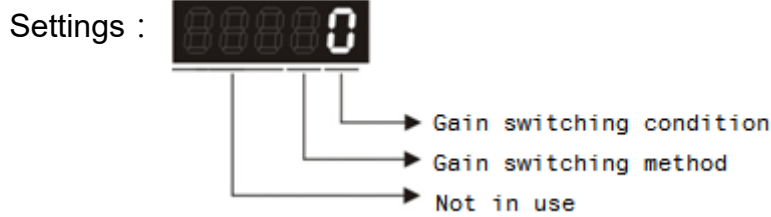
Settings : Set the low-pass filter of resonance suppression. When the value is set to 0, the function of low-pass filter is disabled.

P2-26	DST	Anti-interference Gain	Address: 0234H 0235H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	1		
Range :	0 ~ 1023 (0: disable this function)		
Data Size :	16bit		
Format :	DEC		

Settings : Increasing the value of this parameter can increase the damping of speed loop. It is suggested to set P2-26 equals to the value of P2-06. If users desire to adjust P2-26, please follow the rules below.

1. In speed mode, increase the value of this parameter can reduce speed overshoot.
2. In position mode, decrease the value of this parameter can reduce position overshoot.

P2-27	GCC	Gain Switching and Switching Selection	Address: 0236H 0237H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x4		
Data Size :	16bit		
Format :	HEX		



- Gain switching condition:
  - 0: Disable gain switching function.
  - 1: The signal of gain switching (GAINUP) is ON.
  - 2: In position control mode, the position error is bigger than the value of P2-29.
  - 3: The frequency of position command is bigger than the value of P2-29.
  - 4: When the speed of servo motor is faster than the value of P2-29.
  - 5: The signal of gain switching (GAINUP) is OFF.
  - 6: In position control mode, the position error is smaller than the value of P2-29.
  - 7: When the frequency of position command is smaller than the value of P2-29.
  - 8: When the speed of servo motor is slower than the value of P2-29.
- Gain switching method:
  - 0: Gain switching
  - 1: Integrator switching, P -> PI

Setting Value	Control Mode P	Control Mode S	
0	P2-00 x 100% P2-04 x 100%	P2-04 x 100%	Before switching
	P2-00 x P2-01 P2-04 x P2-05	P2-04 x P2-05	After switching
1	P2-06 x 0% P2-26 x 0%		Before switching
	P2-06 x 100% P2-26 x 100%		After switching

<b>P2-28</b>	<b>GUT</b>	<b>Gain Switching Time Constant</b>		<b>Address: 0238H 0239H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	10		

Control Mode :	ALL
Unit :	10ms
Range :	0 ~ 1000
Data Size :	16bit
Format :	DEC
Example :	15 = 150 ms

Settings : It is for switching the smooth gain. (0: disable this function)

<b>P2-29</b>	<b>GPE</b>	<b>Gain Switching</b>		<b>Address: 023AH 023BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	1280000		
	Control Mode :	ALL		
	Unit :	Pulse, Kpps, r/min		
	Range :	0 ~ 3840000		
	Data Size :	32bit		
	Format :	DEC		

Settings : The setting of gain switching (Pulse error, Kpps, r/min) is determined by the selection of gain switching (P2-27).

<b>P2-30</b>	<b>INH</b>	<b>Auxiliary Function</b>		<b>Address: 023CH 023DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-8 ~ +8		
	Data Size :	16bit		

Format :	DEC
Settings :	<p>0: Disable all functions described below</p> <p>1: Force to Servo On the software</p> <p>2~4: (reserved)</p> <p>5: This setting allows the written parameters not retain after the power off. When the data is no need to save, it can avoid the parameters continuously writing into the EEPROM and shortening the lifetime of EEPROM. Setting this parameter is a must when using communication control.</p> <p>6: In simulation mode (command simulation), the external Servo On signal cannot work and DSP Error (variable 0x6F) is regarded as 0. Parameter P0-01 only shows the external Error (positive/negative limit, emergency stop, etc) In this status, DO.SRDY is ON. Command is accepted in each mode and can be observed via scope software. However, the motor will not operate. The aim is to examine the command accuracy.</p> <p>7: High-speed oscilloscope, disable Time-Out function (It is for PC software)</p> <p>8: Back up all parameters (current value) and save in EEPROM. The value still exists when re-power on. The panel displays 'to.rom' during execution. (It can be executed when Servo ON.)</p>

-1,-5,-6,-7: Individually disable the function of 1,5,6,7

-2~-4, -8: (reserved)



**NOTE** 1) Please set the value to 0 in normal operation. The value returns to 0 automatically after re-power on.

P2-31	AUT1	Speed Loop Frequency Response Setting in Auto and Semi-auto Mode	Address: 023EH 023FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 5.6 Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	80		
Control Mode :	ALL		
Unit :	Hz		
Range :	1 ~ 0x1000		
Data Size :	16bit		

Format :	HEX
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Settings : 1~50Hz: Low stiffness, low response  
 51~250Hz: Medium stiffness, medium response  
 251~850Hz: High stiffness, high response  
 851~1000Hz: Extremely high stiffness, extremely high response



- NOTE**
- 1) According to the speed loop setting of P2-31, the servo drive sets the position loop response automatically.
  - 2) The function is enabled via parameter P2-32. Please refer to Chapter 5.6 for corresponding bandwidth size of the setting value.

P2-32 ▲	AUT2	Tuning Mode Selection	Address: 0240H 0241H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 5.6 Section 6.3.6
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x2		
Data Size :	16bit		
Format :	HEX		

Settings : 0: Manual Mode  
 1: Auto Mode (continuous adjustment)  
 2: Semi-auto Mode (non- continuous adjustment)

Relevant description of manual mode setting:  
 When P2-32 is set to 0, parameters related to gain control, such as P2-00, P2-02, P2-04, P2-06, P2-07, P2-25 and P2-26, all can be set by the user.  
 When switching mode from auto or semi-auto to manual, parameters about gain will be updated automatically.

Relevant description of auto mode setting:  
 Continue to estimate the system inertia, save the inertia ratio to P1-37 every 30 minutes automatically and refer to the stiffness and bandwidth setting of P2-31.

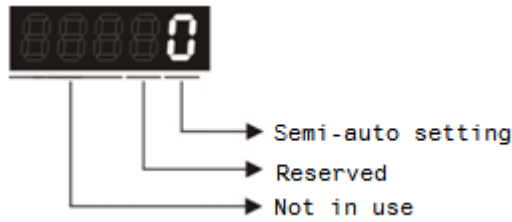
1. Set the system to manual mode 0 from auto 1 or semi-auto 2, the system will save the estimated inertia value to P1-37 automatically and set the corresponding parameters.
2. Set the system to auto mode 1 or semi-auto mode 2 from manual mode 0, please set P1-37 to the appropriate value.
3. Set the system to manual mode 0 from auto mode 1, P2-00, P2-04 and P2-06 will be modified to the corresponding parameters of auto mode.
4. Set the system to manual mode 0 from semi-auto mode 2, P2-00, P2-04, P2-06, P2-25 and P2-26 will be modified to the corresponding parameters of semi-auto mode.

Relevant description of semi-auto mode setting:

1. When the system inertia is stable, the value of P2-33 will be 1 and the system stops estimating. The inertia value will be saved to P1-37 automatically. When switching mode to semi-auto mode (from manual or auto mode), the system starts to estimate again.
2. When the system inertia is over the range, the value of P2-33 will be 0 and the system starts to estimate and adjust again.

P2-33 ▲	AUT3	Semi-auto Inertia Adjustment		Address: 0242H 0243H
Parameter Attribute :	Parameter for individual axis			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	ALL			
Unit :	-			
Range :	0 ~ 1			
Data Size :	16bit			
Format :	DEC			

Settings :



- Semi-auto Setting:
  - 1: It means the inertia estimation in semi-auto mode is completed. The inertia value can be accessed via P1-37.
  - 0: 1. When the display is 0, it means the inertia adjustment is not completed and is adjusting.  
2. When the setting is 0, it means the inertia adjustment is not completed and is adjusting.

<b>P2-34</b>	<b>SDEV</b>	<b>The Condition of Overspeed Warning</b>		<b>Address: 0244H 0245H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	5000		
	Control Mode :	S		
	Unit :	r/min		
	Range :	1 ~ 5000		
	Data Size :	16bit		
	Format :	DEC		

Settings : The setting of over speed warning in servo drive erro display (P0-01)

<b>P2-35</b>	<b>PDEV</b>	<b>Condition of Excessive Position Control Deviation Warning</b>		<b>Address: 0246H 0247H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	3840000		
	Control Mode :	PT / PR		
	Unit :	Pulse		



Range :	1 ~ 128000000
Data Size :	32bit
Format :	DEC

Settings : The setting of excessive position control deviation warning in servo drive erro display (P0-01)

<b>P2-36</b>	<b>EDI9</b>	<b>EDI9 Functional Planning</b>		<b>Address: 0248H 0249H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16

<b>P2-37</b>	<b>EDI10</b>	<b>EDI10 Functional Planning</b>		<b>Address: 024AH 024BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16

<b>P2-38</b>	<b>EDI11</b>	<b>EDI11 Functional Planning</b>		<b>Address: 024CH 024DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16

<b>P2-39</b>	<b>EDI12</b>	<b>EDI12 Functional Planning</b>		<b>Address: 024EH 024FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16

<b>P2-40</b>	<b>EDI13</b>	<b>EDI13 Functional Planning</b>		<b>Address: 0250H 0251H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
Default :	100			

Control Mode :	ALL
Unit :	-
Range :	0 ~ 315Fh (The last two codes are DI code)
Data Size :	16bit
Format :	HEX

Settings : Please refer to the description of P2-16

<b>P2-41</b>	<b>EDI14</b>	<b>EDI14 Functional Planning</b>		<b>Address: 0252H 0253H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Table 8.1
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 315Fh (The last two codes are DI code)		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to the description of P2-16

<b>P2-42</b>	<b>Reserved</b>	<b>Address: 0254H 0255H</b>
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<b>P2-43</b>	<b>NCF2</b>	<b>Resonance Suppression (Notch filter) (2)</b>	<b>Address: 0256H 0257H</b>	
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
	Operational Interface :	Panel / Software	Communication	
	Default :	1000		
	Control Mode :	ALL		
	Unit :	Hz		
	Range :	50 ~ 2000		

Data Size :	16bit
Format :	DEC

Settings : The second setting value of resonance frequency. If P2-44 is set to 0, this function is disabled. P2-23 and P2-24 are the first Notch filter.

P2-44	DPH2	Resonance Suppression (Notch filter) Attenuation Rate (2)	Address: 0258H 0259H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32 (0: disable Notch filter)		
Data Size :	16bit		
Format :	DEC		

Settings : The second resonance suppression (notch filter) attenuation rate. When this parameter is set to 0, the function of Notch filter is disabled.

P2-45	NCF3	Resonance Suppression (Notch filter) (3)	Address: 025AH 025BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	1000		
Control Mode :	ALL		
Unit :	Hz		
Range :	50 ~ 2000		
Data Size :	16bit		
Format :	DEC		

Settings : The third group of mechanism resonance frequency setting value. If P2-46 is set to 0, this function will be disabled. P2-23 and P2-24 are the first group of resonance suppression (Notch filter).

P2-46	DPH3	Resonance Suppression (Notch filter) Attenuation Rate (3)	Address: 025CH 025DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.7
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	dB		
Range :	0 ~ 32		
Data Size :	16bit		
Format :	DEC		

Settings : The third group of resonance suppression (Notch filter) attenuation rate. Set the value to 0 to disable the function of Notch filter.

P2-47	ANCF	Auto Resonance Suppression Mode Setting	Address: 025EH 025FH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	1		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 2		
Data Size :	16bit		
Format :	DEC		

Settings : 0: The value of P2-43, P2-44 and P2-45, P2-46 will retain.  
1: The value of P2-43, P2-44 and P2-45, P2-46 will retain after resonance suppression.  
2: Continuous resonance suppression

## Description of Auto Mode Setting:

When it is set to 1: Auto resonance, the value returns to 0 automatically and saves the point of resonance suppression when it is stable. If it is unstable, re-power on or set back to 1 for re-estimation again.

When it is set to 2: Continuous suppression automatically. When it is stable, the point of resonance suppression will be saved. If it is unstable, re-power on for re-estimation.

When switching to mode 0 from mode 2 or 1, the setting of P2-43, P2-44, P2-45 and P2-46 will be saved automatically.

P2-48	ANCL	Resonance Suppression Detection Level		Address: 0260H 0261H
Parameter Attribute :	Parameter for individual axis			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	100			
Control Mode :	ALL			
Unit :	-			
Range :	1 ~ 300%			
Data Size :	16bit			
Format :	DEC			

Settings : (The smaller the setting value is, the more sensitive the resonance will be.)

P2-48 ↑, resonance sensitiveness ↓

P2-48 ↓, resonance sensitiveness ↑

<b>P2-49</b>	<b>SJIT</b>	<b>Speed Detection Filter</b>		<b>Address: 0262H 0263H</b>
Parameter Attribute :	Parameter for individual axis			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	ALL			
Unit :	-			
Range :	0x0 ~ 0x1F			
Data Size :	16bit			
Format :	HEX			

Settings : The filter of speed estimation

Setting Value	Speed estimation bandwidth (Hz)
00	2500
01	2250
02	2100
03	2000
04	1800
05	1600
06	1500
07	1400
08	1300
09	1200
0A	1100
0B	1000
0C	950
0D	900
0E	850
0F	800
10	750
11	700
12	650
13	600
14	550
15	500
16	450
17	400
18	350
19	300
1A	250
1B	200
1C	175
1D	150
1E	125
1F	100



<b>P2-50</b>	<b>DCLR</b>	<b>Pulse Clear Mode</b>		<b>Address: 0264H 0265H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PT / PR		
	Unit :	-		
	Range :	0 ~ 0x2		
	Data Size :	16bit		
	Format :	HEX		

Settings : Please refer to table 8.1 for digital input setting.

When set digital input (DI) as CCLR, the function of pulse clear is effective. Clear the position error (It is applicable in PT, PR mode). If this DI is ON, the accumulative position error will be cleared to 0.

0: The triggering method of CCLR is rising-edge.

1: The triggering method of CCLR is level.

<b>P2-51</b>	<b>Reserved</b>	<b>Address: 0266H 0267H</b>
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<b>P2-52</b>	<b>Reserved</b>	<b>Address: 0268H 0269H</b>
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<b>P2-53</b>	<b>KPI</b>	<b>Position Integral Compensation</b>		<b>Address: 026AH 026BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 6.3.6
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	rad/s		
	Range :	0 ~ 1023		
	Data Size :	16bit		
	Format :	DEC		

Settings : When increasing the value of position control integral, reducing the position steady-state error, it may easily cause position overshoot and noise if the value is set too big.

P2-54	SVP	The Gain of Synchronous Speed Control	Address: 026CH 026DH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	rad/s		
Range :	0 ~ 8191		
Data Size :	16bit		
Format :	DEC		

Settings : When increasing the value of synchronous speed control, it can enhance the speed following of two motors. However, if the value is set too big, it may easily cause vibration and noise.  
(Firmware, V1.005 sub00 will be provided soon)

P2-55	SVI	Integral Compensation to Synchronous Speed	Address: 026EH 026FH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	rad/s		
Range :	0 ~ 1023		
Data Size :	16bit		
Format :	DEC		

Settings : When increasing integral compensation to synchronous speed, two motors speed following can be enhanced and the speed error between two motors can be reduced. However, if the value is set too big, it may easily cause vibration and noise.

(Firmware, V1.005 sub00 will be provided soon)

P2-56	SPI	Integral Compensation to Synchronous Position	Address: 0270H 0271H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	rad		
Range :	0 ~ 1023		
Data Size :	16bit		
Format :	DEC		

Settings : When increasing integral compensation to synchronous position, two motors speed following can be enhanced and the speed error between two motors can be reduced. However, if the value is set too big, it may easily cause vibration and noise It is suggested to set the value the same as P2-06.

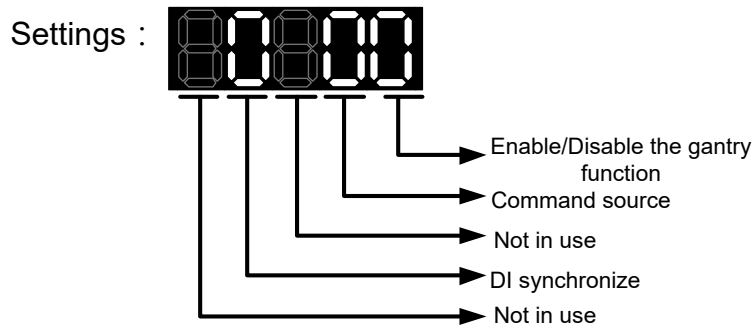
(Firmware, V1.005 sub00 will be provided soon)

P2-57	SBW	The Bandwidth of Synchronous Control	Address: 0272H 0273H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	Hz		
Range :	0 ~ 1023		
Data Size :	16bit		
Format :	DEC		

Settings : If users do not know how to set P2-54~P2-56, setting the bandwidth of synchronous control value will do since the value will correspond to P2-54~P2-56. The bigger the bandwidth of synchronous control value is, the better the synchronous effect will be. When increasing the bandwidth of speed loop and synchronous control, pay special attention to the response of P2-25 which should be faster than the setting of the both bandwidth.

(Firmware, V1.005 sub00 will be provided soon)

P2-58	GTRY	Gantry Function		Address: 0274H 0275H
Parameter Attribute :	Parameter for individual axis			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	X Axis: 0000h Y Axis: 0010h Z Axis: 0020h			
Control Mode :	ALL			
Unit :	-			
Range :	0000h ~ 0x1021			
Data Size :	16bit			
Format :	HEX			



(Firmware, V1.005 sub00 will be provided soon)

- The switch of gantry function
  - 0: Gantry function is not used
 

Disable the gantry function including command source selection and gantry compensation. Excessive synchronous deviation disables the function.
  - 1: Gantry function is used
 

Enable the gantry function including command source selection and gantry compensation. Excessive synchronous deviation enables the function.
- Command source
  - 0: comes from X axis
 

When it is in position mode, the position command comes from the position command of X axis.

When it is in speed mode, the speed command comes from the speed command of X axis.

When it is in torque mode, the torque command comes from the torque command of X axis.
  - 1: comes from Y axis
 

When it is in position mode, the position command comes from the position command of Y axis.

When it is in speed mode, the speed command comes from the speed command of Y axis.

When it is in torque mode, the torque command comes from the torque command of Y axis.
  - 2: comes from Z axis
 

When it is in position mode, the position command comes from the position command of Z axis.

When it is in speed mode, the speed command comes from the speed command of Z axis.

When it is in torque mode, the torque command comes from the torque command of Z axis.

- DI synchronization
  - 0: DI synchronization is used
  - DI status of the two axes of the gantry is the same
  - 1: DI synchronization is not used
  - The DI status of two axis of the gantry is not synchronous.

P2-59	SERR	The Setting Value for Signaling Exceeding Deviation Error Between Two Axes	Address: 0276H 0277H
Parameter Attribute :	Parameter for three axes		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	1280000		
Control Mode :	ALL		
Unit :	Pulse (based on the feedback of full-closed loop)		
Range :	1 ~ (2 <sup>29</sup> -1)		
Data Size :	32bit		
Format :	DEC		

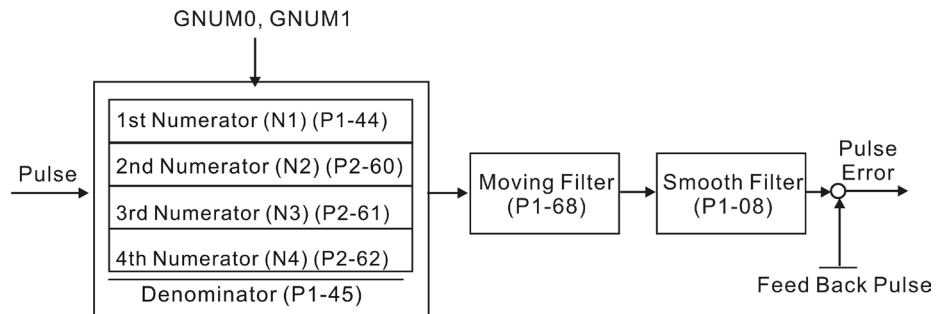
Settings : Set it as the two axes of gantry motion, if the feedback deviation between two axes exceeds the setting value, two axes will stop operating and show the alarm, AL081.

(Firmware, V1.005 sub00 will be provided soon)

P2-60	GR4	Gear Ratio (Numerator) (N2)	Address: 0278H 0279H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	128		
Control Mode :	PT		
Unit :	Pulse		

Range :	1 ~ (2 <sup>29</sup> -1)
Data Size :	32bit
Format :	DEC

Settings : The numerator of electronic gear ratio can be selected via DI.GNUM0 and DI.GNUM1 (Please refer to table 8.1). If DI.GNUM0 and DI.GNUM1 are not set, P1-44 will automatically be the numerator of electronic gear ratio. Please switch GNUM0 and GNUM1 in stop status to avoid the mechanical vibration.



<b>P2-61</b>	<b>GR5</b>	<b>Gear Ratio (Numerator) (N3)</b>		<b>Address: 027AH 027BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	128		
	Control Mode :	PT		
	Unit :	Pulse		
	Range :	1 ~ (2 <sup>29</sup> -1)		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P2-60.

P2-62	GR6	Gear Ratio (Numerator) (N4)	Address: 027CH 027DH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	128	
	Control Mode :	PT	
	Unit :	Pulse	
	Range :	1 ~ (2 <sup>29</sup> -1)	
	Data Size :	32bit	
	Format :	DEC	

Settings : Please refer to the description of P2-60.

P2-63	Reserved	Address: 027EH 027FH

P2-64	Reserved	Address: 0280H 0281H

P2-65	GBIT	Special-bit Register	Address: 0282H 0283H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PT / PR / S	
	Unit :	-	
	Range :	0 ~ 0xFFFF	
	Data Size :	-	
	Format :	-	



Settings : Special-bit Register:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
------	------	------	------	------	------	------	------

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-------	-------	-------	-------	-------	-------	------	------

- Bit0 ~ Bit5: reserved, please set to 0
- Bit6: In PT mode, the switch of pulse error protection function (pulse frequency is over high)  
 Bit6 = 0: Normally use the function of pulse error protection  
 Bit6 = 1: Disable the function of pulse error protection
- Bit7 ~ Bit15: reserved, please set to 0

<b>P2-66</b>	<b>GBIT2</b>	<b>Special-bit Register 2</b>		<b>Address: 0284H 0285H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PT / PR / S		
	Unit :	-		
	Range :	0 ~ 0x000F		
	Data Size :	16bit		
	Format :	HEX		

Settings : Special-bit Register 2 :

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	-

- Bit0 ~ Bit1: reserved, please set to 0
- Bit2: Cancel the latch of low-voltage error  
 Bit2 = 0: The latch of low-voltage error: Low-voltage error will not be cleared automatically.  
 Bit2 = 1: Cancel the latch of low-voltage error: Low-voltage error will not be cleared automatically.
- Bit3 ~ Bit7: reserved, please set to 0

<b>P2-67</b>	<b>JSL</b>	<b>The Stable Level of Inertia Estimation</b>		<b>Address: 0286H 0287H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	1.5	15	
	Control Mode :	ALL		
	Unit :	1 times	0.1 times	
	Range :	0 ~ 200.0	0 ~ 2000	
	Data Size :	16bit		
	Format :	One decimal	DEC	
	Example :	1.5 = 1.5 times	15 = 1.5 times	

Settings : In semi-auto mode, if the value of inertia estimation is smaller than P2-67 and the status remains for a while, the system will regard the inertia estimation as completed.

<b>P2-68</b>	<b>Reserved</b>	<b>Address: 0288H 0289H</b>
<b>P2-69</b>	<b>Reserved</b>	<b>Address: 028AH 028BH</b>
<b>P2-70</b>	<b>Reserved</b>	<b>Address: 028CH 028DH</b>
<b>P2-71</b>	<b>Reserved</b>	<b>Address: 028EH 028FH</b>

## P3-xx Communication Parameters

<b>P3-00</b>	<b>ADR</b>	<b>Address Setting</b>		<b>Address: 0300H 0301H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0x7C		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x01 ~ 0x7F		
	Data Size :	16bit		
	Format :	HEX		

Settings : The communication address setting is divided into Y, X (hexadecimal):

	0	0	Y	X
Range	-	-	0 ~ 7	0 ~ F

When using RS-232/RS-485 to communicate, one servo drive can only set one address. The duplicate address setting will cause abnormal communication.

In this servo drive, the 3-axis address setting should be unique. The duplicate address will cause abnormal communication.

This address represents the absolute address of the servo drive in communication network. It is also applicable to RS-232/485 and CAN bus.

When the communication address setting of MODBUS is set to 0xFF, the servo drive will automatically reply and receive data regardless of the address. However, P3-00 cannot be set to 0xFF.

<b>P3-01</b>	<b>BRT</b>	<b>Transmission Speed</b>		<b>Address: 0302H 0303H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
Default :	0x0203			

Control Mode :	ALL
Unit :	bps
Range :	0x0000 ~ 0x0405
Data Size :	16bit
Format :	HEX

Settings : The setting of transmission speed is divided into Z, Y, X (hexadecimal):

	0	Z	Y	X
Communication port	-	CAN	-	RS-232/485
Range	0	0~4	0	0~5

- Definition of X setting value
  - 0: 4800
  - 1: 9600
  - 2: 19200
  - 3: 38400
  - 4: 57600
  - 5: 115200
- Definition of Z setting value
  - 0: 125 Kbit/s
  - 1: 250 Kbit/s
  - 2: 500 Kbit/s
  - 3: 750 Kbit/s
  - 4: 1.0 Mbit/s



**NOTE**

- 1) If this parameter is set via CAN, only Z can be set and the others remain.
- 2) The communication speed of USB is 1.0 Mbit/s only and is unchangeable.

<b>P3-02</b>	<b>PTL</b>	<b>Communication Protocol</b>		<b>Address: 0304H 0305H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	6		
	Control Mode :	ALL		

Unit :	-
Range :	0 ~ 0x8
Data Size :	16bit
Format :	HEX

Settings : The definition of the setting value is as the followings:  
 0: 7, N, 2 (MODBUS, ASCII)  
 1: 7, E, 1 (MODBUS, ASCII)  
 2: 7, O, 1 (MODBUS, ASCII)  
 3: 8, N, 2 (MODBUS, ASCII)  
 4: 8, E, 1 (MODBUS, ASCII)  
 5: 8, O, 1 (MODBUS, ASCII)  
 6: 8, N, 2 (MODBUS, RTU)  
 7: 8, E, 1 (MODBUS, RTU)  
 8: 8, O, 1 (MODBUS, RTU)

<b>P3-03</b>	<b>FLT</b>	<b>Communication Error Disposal</b>		<b>Address: 0306H 0307H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x1		
	Data Size :	16bit		
	Format :	HEX		

Settings : The definition of the setting value is as the following:  
 0: Warning and keeps running  
 1: Warning and stops deceleration (The deceleration time is set to parameter P5-03.B)

P3-04	CWD	Communication Timeout	Address: 0308H 0309H
Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	sec		
Range :	0 ~ 20		
Data Size :	16bit		
Format :	DEC		

Settings : If the setting value is not 0, enable communication timeout immediately. If it is set to 0, disable the function.

P3-05	CMM	Communication Mechanism	Address: 030AH 030BH
Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0x00 ~ 0x01		
Data Size :	16bit		
Format :	HEX		

Settings : Communication port can select one or more than one communications.

- Communication Interface
  - 0: RS232
  - 1: RS485

P3-06	SDI	Control Switch of Digital Input (DI)	Address: 030CH 030DH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0x0000 ~ 0x3FFF		
Data Size :	16bit		
Format :	HEX		

Settings : The source of DI controls the switch.  
 Each bit of this parameter decides one input source of DI signal:  
 Bit0 ~ Bit5 correspond to DI1 ~ DI6.  
 Bit6 ~ Bit13 correspond to EDI7 ~ EDI14  
 The setting of bit is as the followings:  
 0: The input status is controlled by the external hardware.  
 1: The input status is controlled by P4-07.  
 For the functional planning of digital input, please refer to:  
 DI1 ~ DI6: P2-10 ~ P2-15  
 EDI7 ~ EDI14 : P2-16, P2-17, and P2-36 ~ P2-41

P3-07	CDT	Communication Response Delay Time	Address: 030EH 030FH
Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	1ms		
Range :	0 ~ 1000		
Data Size :	16bit		
Format :	DEC		

Settings : Delay the time of communication response from servo drive to controller

<b>P3-08</b>	<b>MNS</b>	<b>Monitor Mode</b>		<b>Address: 0310H 0311H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0000		
	Control Mode :	ALL		
	Unit :	-		
	Range :	Shown as below		
	Data Size :	16bit		
	Format :	HEX		

Settings : The setting of monitor mode is divided into L and H. (hexadecimal):

Item	-	-	L	H
Function	-	-	Low-speed monitoring time	Monitor Mode
Range	0	0	0 ~ F	0 ~ 4

The status of this axis or multi-axis can be monitored by USB. The definition of setting value is as follows:

- The definition of H setting value
  - 4: USB is high-speed monitor. The sampling frequency is 4K and can monitor 8CH.
  - 3: USB is high-speed monitor. The sampling frequency is 16K and can only monitor 2CH.
  - 2: USB is high-speed monitor. The sampling frequency is 8K and can monitor 4CH.
  - 1: USB is low-speed monitor. The sampling time is set by L and can monitor 4CH.
  - 0: disable the monitor function
- L: the sampling time of USB low-speed monitor. Its unit is ms. It means the axial status will be set via USB every L ms. So the controller can monitor the axial status. Each monitoring message includes 4 CH data (16 bit x 4). If L is set to 0, this function is disabled. L is enabled when H is set to 1.



<b>P3-09</b>	<b>SYC</b>	<b>CANopen Synchronize Setting</b>		<b>Address: 0312H 0313H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x57A1		
	Control Mode :	CANopen		
	Unit :	-		
	Range :	Shown as below		
	Data Size :	16bit		
	Format :	HEX		

Settings : The synchronous setting of CANopen is divided into E, T, D and M (hexadecimal):

Item	E	T	D	M
Function	Range of Synchronous error	Target value	Deadband	Adjusting amount
Range	1 ~ 9	0 ~ 9	0 ~ F	1 ~ F

The slave of CANopen synchronizes with the master via SYNC. See as the followings:

M: If the slave needs to synchronize with the master, correct the clock is a must. This parameter sets the maximum correction value per time. (Unit: usec)

D: Set the size of deadband (Unit: usec). If the deviation between the SYNC reaching time and the target value does not exceed the deadband, correction is no need.

T: SYNC arrival time. The standard value is 500usec but it might be different from the target value. Thus, the buffer is necessary.

$$\text{Target value} = 400 + 10 \times T.$$

For instance, if T=5, the target value will be 450.

E: If the deviation between SYNC reaching time and the target value is smaller than the range, it means the synchronization is successful. (Unit: 10 usec)

<b>P3-10</b>	<b>Reserved</b>	<b>Address: 0314H 0315H</b>
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<b>P3-11</b>	<b>CANOP</b>	<b>CANopen Selection</b>		<b>Address: 0316H 0317H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0000		
	Control Mode :	CANopen		
	Unit :	-		
	Range :	Shown as below		
	Data Size:	16bit		
	Format :	HEX		

Settings : Synchronous setting of CANopen is divided into X, Y, Z and U (hexadecimal):

Item	U	Z	Y	X
Function	undefined	undefined	undefined	Whether the parameter is saved into EEPROM
Range	-	-	-	0 ~ 1

The definition is as follows:

X=1: When writing parameters via PDO, parameters will be saved in EEPROM.

X=0: When writing parameters via PDO, parameters will not be saved in EEPROM.

Y: undefined

Z: undefined

U: undefined

 **NOTE** This parameter is effective in the model of ASDA-M-M/F.

If X is set to 1 and write parameters by PDO continuously, it will shorten the lifetime of EEPROM.

<b>P3-12</b>	<b>QSTPO</b>	<b>CANopen Support Setting</b>		<b>Address: 0318H 0319H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0000		
	Control Mode :	CANopen		
	Unit :	-		
	Range :	Shown as below		
	Data Size :	16bit		
	Format :	HEX		

Settings : The supporting setting of CANopen is divided into X, Y, Z and U (hexadecimal):

Item	U	Z	Y	X
Function	undefined	CANopen value will be loaded in	undefined	undefined
Range	-	0~1	-	-

The definition is as the followings:

X, Y, U: undefined

Z=0: After re-power on or reset the communication, CANopen default value will be loaded in.

Z=1: After re-power on or reset the communication, parameter value will not be changed.

## P4-xx Diagnosis Parameters

P4-00★	ASH1	Fault Record (N)	Address: 0400H 0401H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	-	
	Data Size :	32bit	
	Format :	HEX	

Settings : The last abnormal status record  
 Low word: LXXXX: display ALM number  
 High word: hYYYY: display the error code corresponds to CANopen

P4-01★	ASH2	Fault Record (N-1)	Address: 0402H 0403H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	-	
	Data Size :	32bit	
	Format :	HEX	

Settings : The last second abnormal status record  
 Low word: LXXXX: display ALM number  
 High word word: hYYYY: display the error code corresponds to CANopen

P4-02★	ASH3	Fault Record (N-2)	Address: 0404H 0405H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.1
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	-		
Data Size :	32bit		
Format :	HEX		
Settings :	The last third abnormal status record Low word: LXXXX: display ALM number High word: hYYYY: display the error code corresponds to CANopen		

P4-03★	ASH4	Fault Record (N-3)	Address: 0406H 0407H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.1
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	-		
Data Size :	32bit		
Format :	HEX		
Settings :	The last fourth abnormal status record Low word: LXXXX: display ALM number High word: hYYYY: display the error code corresponds to CANopen		

P4-04★	ASH5	Fault Record (N-4)	Address: 0408H 0409H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.1
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	-		
Data Size :	32bit		
Format :	HEX		
Settings :	The last fifth abnormal status record Low word: LXXXX: display ALM number High word: hYYYY: display the error code corresponds to CANopen		

P4-05	JOG	Servo Motor Jog Control	Address: 040AH 040BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.2
Operational Interface :	Panel / Software	Communication	
Default :	20		
Control Mode :	ALL		
Unit :	r/min		
Range :	0 ~ 5000		
Data Size :	16bit		
Format :	DEC		

Settings : Three control methods are as follows:

1. Operation test

After the JOG speed is set by P4-05 via panel, the panel will display the symbol of JOG. Pressing the UP Key can control JOG operation in positive direction, pressing the DOWN Key can control negative direction. Stop pressing to stop the JOG operation. If there is any error in this setting, then the motor cannot operate. The maximum JOG speed is the maximum speed of the servo motor.

2. DI control

If the DI is set to JOGU and JOGD (refer to table 8.1), then the JOG operation in positive or negative direction can be controlled via this DI.

3. Communication control

1 ~ 5000: JOG speed

4998: JOG operation in positive direction

4999: JOG operation in negative direction

0: Stop operation



**NOTE**

When writing via communication, if the frequency is high, please set P2-30 to 5.

**P4-06 ▲**



FOT	Digital Output Register (Readable and Writable)		Address: 040CH 040DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x31FF		
Data Size :	16bit		
Format :	HEX		

Settings :

- bit 00: correspond to DO code=0x30
- bit 01: correspond to DO code=0x31
- bit 02: correspond to DO code=0x32
- bit 03: correspond to DO code=0x33
- bit 04: correspond to DO code=0x34
- bit 05: correspond to DO code=0x35
- bit 06: correspond to DO code=0x36
- bit 07: correspond to DO code=0x37
- bit 08: correspond to DO code=0x38
- bit 09: correspond to DO code=0x39
- bit 10: correspond to DO code=0x3A
- bit 11: correspond to DO code=0x3B
- bit 12: correspond to DO code=0x3C
- bit 13: correspond to DO code=0x3D
- bit 14: correspond to DO code=0x3E
- bit 15: correspond to DO code=0x3F

When setting the DO number of each axis, please add the axial parameter.

For example:

Each axis is used individually:

P2-18 of X axis is set to 0x1130, then the DO#1 of X axis is bit 0 status of P4-06 of X axis.

P2-18 of Y axis is set to 0x2130, then the DO#1 of Y axis is bit 0 status of P4-06 of Y axis.

P2-18 of Z axis is set to 0x3130, then the DO#1 of Z axis is bit 0 status of P4-06 of Z axis.

Each axis can be used one another: The DO status can be output through P4-06 from other axes.

P2-18 of X axis is set to 0x2130, then the DO#1 of X axis is bit 0 status of P4-06 of Y axis.

P2-18 of Y axis is set to 0x3130, then the DO#1 of Y axis is bit 0 status of P4-06 of Z axis.

P2-18 of Z axis is set to 0x1130, then the DO#1 of Z axis is bit 0 status of P4-06 of X axis.

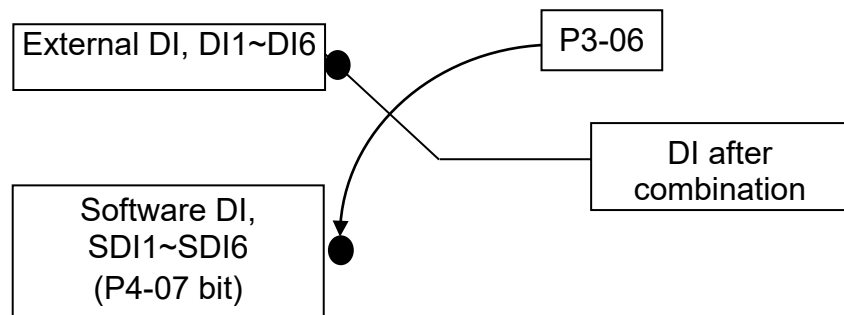
DO Code (0x30~0x3F) can be set via communication DO, and then write into P4-06.



**P4-07**

ITST	Multi-function of Digital Input		Address: 040EH 040FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 4.4.4
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 0x3FFF		
Data Size :	16bit		
Format :	HEX		

Settings : The DI input signal can come from external terminal (DI1~DI6) or software SDI1~SDI6 (Bit 0~5 of corresponding parameter P4-07) and is determined by P3-06. The corresponding bit of P3-06 is 1, which means the source is software SDI (P4-07). If the corresponding bit is 0, then the source is hardware DI. See the following graph:



Read parameters: shows the DI status after combination

Write parameters: writes the software SDI status

For example:

The value of reading P4-07 is 0x0011, which means DI1 and DI5 is ON after combination.

The value of writing P4-07 is 0x0011, which means software SDI1 and SDI5 is ON.

Please refer to P2-10~P2-15 for the function programme of digital input pin DI (DI1~DI6)

Please refer to P2-16, P2-17, and P2-36~P2-41 for the function programme of digital input pin DI

P4-08★	PKEY	Input Status of the Drive Keypad (Read-only)	Address: 0410H 0411H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	-	
	Control Mode :	ALL	
	Unit :	-	
	Range :	(Read-only)	
	Data Size :	16bit	
	Format :	HEX	

Settings : The aim is to check if the five Keys, MODE, UP, DOWN, SHIFT and SET can work normally. This parameter is also used to check if the Keys are all functional when producing servo drives.

P4-09★	MOT	Digital Output Status (Read-only)	Address: 0412H 0413H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	-	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 0x1F	
	Data Size :	16bit	
	Format :	HEX	

Settings : Note: There is no difference whether read by panel or communication.

P4-10	CEN	Adjustment Selection	Address: 0414H 0415H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 6		
Data Size :	16bit		
Format :	DEC		

- Settings :
- 0: reserved
  - 1: Execute the adjustment of analog speed input offset
  - 2: Execute the adjustment of analog torque input offset
  - 3: Execute the adjustment of current detector (V phase) offset
  - 4: Execute the adjustment of current detector (W phase) hardware offset
  - 5: Execute the adjustment of 1~4 hardware offset
  - 6: Execute the adjustment of IGBT ADC



**NOTE** The adjustment function needs to be enabled by the setting of parameter P2-08. When adjusting, the external wiring which connects to analog speed or torque needs to be removed completely and must be in Servo Off status.

P4-11	SOF1	Analog Speed Input Offset Adjustment 1	Address: 0416H 0417H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	Factory default		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ 32767		
Data Size :	16bit		
Format :	DEC		

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

<b>P4-12</b>	<b>SOF2</b>	<b>Analog Speed Input Offset Adjustment 2</b>		<b>Address: 0418H 0419H</b>	
	Parameter Attribute :	Parameter for individual axis			Related Section: -
	Operational Interface :	Panel / Software	Communication		
	Default :	Factory default			
	Control Mode :	ALL			
	Unit :	-			
	Range :	0 ~ 32767			
	Data Size :	16bit			
	Format :	DEC			

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

<b>P4-13</b>	<b>TOF1</b>	<b>Analog Torque Input Offset Adjustment 1</b>		<b>Address: 041AH 041BH</b>	
	Parameter Attribute :	Parameter for individual axis			Related Section: -
	Operational Interface :	Panel / Software	Communication		
	Default :	Factory default			
	Control Mode :	ALL			
	Unit :	-			
	Range :	0 ~ 32767			
	Data Size :	16bit			
	Format :	DEC			

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

<b>P4-14</b>	<b>TOF2</b>	<b>Analog Torque Input Offset Adjustment 2</b>		<b>Address: 041CH 041DH</b>	
	Parameter Attribute :	Parameter for individual axis			Related Section: -
	Operational Interface :	Panel / Software	Communication		
	Default :	Factory default			
	Control Mode :	ALL			
	Unit :	-			
	Range :	0 ~ 32767			
	Data Size :	16bit			
	Format :	DEC			

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

<b>P4-15</b>	<b>COF1</b>	<b>Current Detector (V1 Phase) Offset Adjustment</b>		<b>Address: 041EH 041FH</b>	
	Parameter Attribute :	Parameter for individual axis			Related Section: -
	Operational Interface :	Panel / Software	Communication		
	Default :	Factory default			
	Control Mode :	ALL			
	Unit :	-			
	Range :	0 ~ 32767			
	Data Size :	16bit			
	Format :	DEC			

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-16	COF2	Current Detector (V2 Phase) Offset Adjustment	Address: 0420H 0421H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	Factory default	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 32767	
	Data Size :	16bit	
	Format :	DEC	

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-17	COF3	Current Detector (W1 Phase) Offset Adjustment	Address: 0422H 0423H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	Factory default	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 32767	
	Data Size :	16bit	
	Format :	DEC	

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-18	COF4	Current Detector (W2 Phase) Offset Adjustment	Address: 0424H 0425H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	Factory default	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 32767	
	Data Size :	16bit	
	Format :	DEC	

Settings : Manually adjust the hardware offset. The adjustment function needs to be enabled by the setting of parameter P2-08. It is not suggested to adjust the auxiliary adjustment. This parameter cannot be reset.

P4-19	TIGB	IGBT NTC Adjustment Detection Level (cannot reset)	Address: 0426H 0427H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	Factory default	
	Control Mode :	ALL	
	Unit :	-	
	Range :	1 ~ 4	
	Data Size :	16bit	
	Format :	DEC	

Settings : Please cool down the drive to 25 Celsius degree when adjusting

P4-20	DOF1	Offset Adjustment Value of Analog Monitor Output (Ch1)	Address: 0428H 0429H
	Parameter Attribute :	Parameter for three axes	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	ALL	
	Unit :	mV	
	Range :	-800 ~ 800	
	Data Size :	16bit	
	Format :	DEC	
	Settings :	Offset adjustment value (cannot reset)	

P4-21	DOF2	Offset Adjustment Value of Analog Monitor Output (Ch2)	Address: 042AH 042BH
	Parameter Attribute :	Parameter for three axes	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	ALL	
	Unit :	mV	
	Range :	-800 ~ 800	
	Data Size :	16bit	
	Format :	DEC	
	Settings :	Offset adjustment value (cannot reset)	

P4-22	SAO	Analog Speed Input OFFSET	Address: 042CH 042DH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	



Control Mode :	S
Unit :	mV
Range :	-5000 ~ 5000
Data Size :	16bit
Format :	DEC

Settings : Users manually adjust the OFFSET

<b>P4-23</b>	<b>TAO</b>	<b>Analog Torque Input OFFSET</b>		<b>Address: 042EH 042FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	T		
	Unit :	mV		
	Range :	-5000 ~ 5000		
	Data Size :	16bit		
	Format :	DEC		

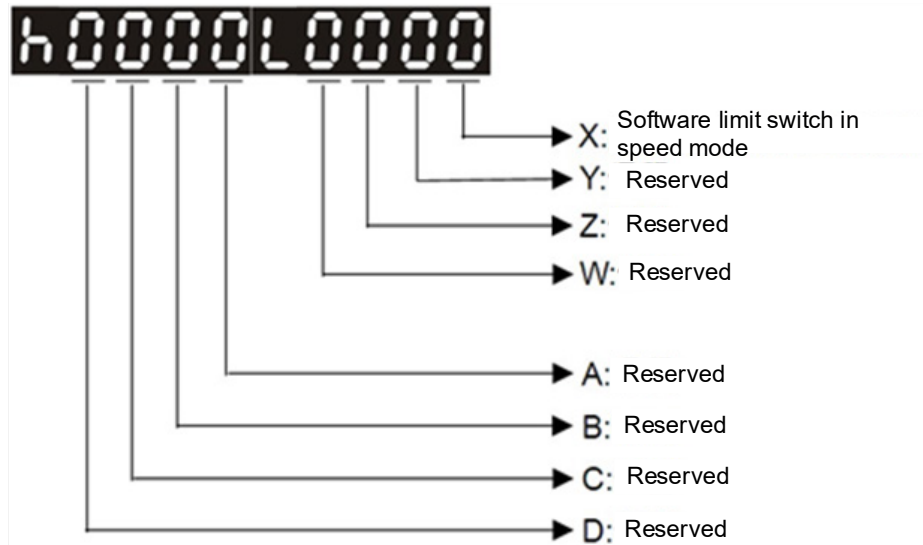
Settings : Users manually adjust the OFFSET

<b>P4-24</b>	<b>LVL</b>	<b>Level of Undervoltage Error</b>		<b>Address: 0430H 0431H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	160		
	Control Mode :	ALL		
	Unit :	V ( rms )		
	Range :	140~190		
	Data Size :	16bit		
	Format :	DEC		

Settings : When the voltage of DC BUS is lower than  $P4-24 * \sqrt{2}$  , the undervoltage alarm occurs.

<b>P4-25</b>	<b>SFSW</b>	<b>Special Function Switch</b>		<b>Address: 0432H 0433H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x00000000 ~ 0x00000001		
	Data Size :	32bit		
	Format :	HEX		

Settings :



**Software limit switch in speed mode**

0: In speed mode, disable software limit protection and show alarms only

1: In speed mode, enable software limit protection and show alarms

## P5-xx Motion Setting Parameters

<b>P5-00</b>	Reserved	Address: 0500H 0501H
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<b>P5-01</b>	Reserved	Address: 0502H 0503H
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<b>P5-02</b>	Reserved	Address: 0504H 0505H
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<b>P5-03</b>	<b>PDEC</b>	<b>Deceleration Time of Auto Protection</b>		<b>Address: 0506H 0507H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0XE0EFEEFF		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x00000000 ~ 0xF0FFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : The parameter setting is divided into D, C, B, A, W, Z, Y, X (hexadecimal), including:

1. The deceleration time when activating the auto-protection function: OVF, CTO (communication timeout AL020), SPL, SNL, PL, NL
2. Deceleration time of Stop Command: STP

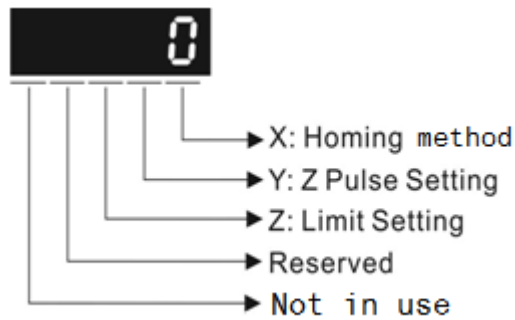
Item	D	C	B	A	W	Z	Y	X
Function	STP	Reserved	CTO	OVF	SNL	SPL	NL	PL
Range	0 ~ F	-	0 ~ F	0 ~ F	0 ~ F	0 ~ F	0 ~ F	0 ~ F

0 ~ F is used to indexing the deceleration time of P5-20~P5-35.

For example: If X is set to A, then the deceleration time of PL is determined by P5-30.

<b>P5-04</b>	<b>HMOV</b>	<b>Homing Mode</b>		<b>Address: 0508H 0509H</b>
	Parameter Attribute :	Parameter for individual axis		
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	0 ~ 0x128		
	Data Size :	16bit		
	Format :	HEX		

Settings :

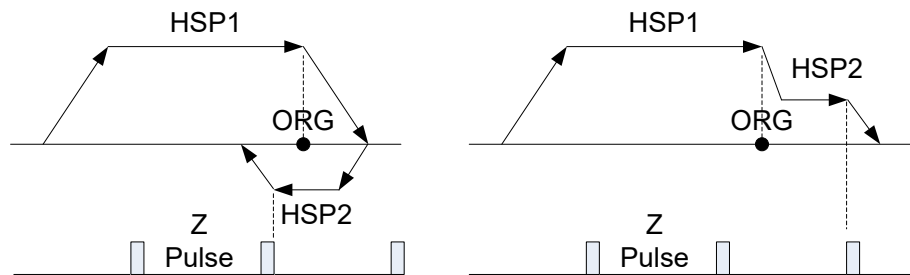


The definition of the setting value is as the followings:

W	Z	Y	X
Reserved	Limit Setting	Z pulse Setting	Homing Method
-	0 ~ 1	0 ~ 2	0 ~ 8
When encounter limit: Z=0: shows error Z=1: rotates backwards		Y=0: Stop and return to Z pulse	X=0: Homing in forward direction and regard PL as the homing origin.
		Y=1: Go forward to Z pulse Y=2: Do not look for Z pulse	X=1: Homing in reverse direction and regard NL as the homing direction.
			X=2: Homing in forward direction ORGP: OFF → ON, as the homing origin
			X=3: Homing in reverse direction ORGP: OFF → ON, as the homing origin
			X=4: Look for Z pulse in forward direction and regard it as the homing origin
			X=5: Look for Z pulse in reverse direction and regard it as the homing origin
		Y=0: Stop and return to Z pulse Y=1: Go forward to Z pulse Y=2: Do not look for Z pulse	X=6: Homing in forward direction ORGP: ON → OFF, as the homing origin
			X=7: Homing in reverse direction ORGP: ON → OFF, as the homing origin
			X=8: directly define the current position as the origin

<b>P5-05</b>	<b>HSPD1</b>	<b>1<sup>st</sup> Speed Setting of High Speed Homing</b>		<b>Address: 050AH 050BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	100.0	1000	
	Control Mode :	ALL		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 2000.0	1 ~ 20000	
	Data Size :	16bit		
	Format :	DEC		
	Example :	1.5 = 1.5 r/min	15 = 1.5 r/min	

Settings : The 1<sup>st</sup> speed of high speed homing



<b>P5-06</b>	<b>HSPD2</b>	<b>2<sup>nd</sup> Speed Setting of Low Speed Homing</b>		<b>Address: 050CH 050DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	20.0	200	
	Control Mode :	ALL		
	Unit :	1 r/min	0.1 r/min	
	Range :	1 ~ 500.0	10 ~ 5000	
	Data Size :	16bit		
	Format :	DEC		
	Example :	15 = 15 r/min	150 = 15 r/min	

Settings : The 2<sup>nd</sup> speed setting of low speed homing

P5-07	PRCM	Trigger Position Command (PR mode only)	Address: 050EH 050FH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	0 ~ 1000		
Data Size :	16bit		
Format :	DEC		

Settings : Set P5-07 to 0 to start homing

Set P5-07 to 1~99 to execute PR procedure which is the same as DI.CTRG+POS<sub>n</sub>

It is prohibited to set P5-07 to 100 ~ 9999 (The value exceeds the valid range)

Set P5-07 to 1000 to execute Stop Command which is the same as DI.STOP

When reading P5-07:

If the command is incompleted, the drive will read the current command.

If the command is completed, the drive will read the current command + 10000.

If the command is completed and DO.TPOS is ON, reach the motor position, the drive will read the current command +20000.

When PR is triggered by DI, the reading value is the same

For example:

Set P5-07 to 3, PR#3 will be triggered.

If the reading value is 3, it means PR #3 is incompleted.

If the reading value is 10003, it means PR#3 is issued completed, but the motor has not reached the target position yet.

If the reading value is 20003, it means PR#3 is issued completed and the motor has reached the target position.

P5-08	SWLP	Forward Software Limit	Address: 0510H 0511H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	2147483647		
Control Mode :	PR		
Unit :	PUU		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : In PR mode, if the motor rotates in forward direction and its command position exceeds the setting value of P5-08, it will trigger AL283.

P5-09	SWLN	Reverse Software Limit	Address: 0512H 0513H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	-2147483648		
Control Mode :	PR		
Unit :	PUU		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : In PR mode, if the motor rotates in reverse direction and its command position exceeds the setting value of P5-09, it will trigger AL285.



P5-10★	AYSZ	Data Array - Data Size	Address: 0514H 0515H
Parameter Attribute :	Parameter for three axes		Related Section: Section 7.2.2
Operational Interface :	Panel / Software	Communication	
Default :	-		
Control Mode :	ALL		
Unit :	-		
Range :	Read-only		
Data Size :	16bit		
Format :	DEC		
Settings :	Data size (N x 32 bits) means size N of data array		

P5-11■	AYID	Data Array - Address of Reading / Writing	Address: 0516H 0517H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.2.2
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	0 ~ (value set by P5-10 minus 1)		
Data Size :	16bit		
Format :	DEC		
Settings :	The address of specified data when reading or writing data array.		

P5-12■	AYD0	Data Array - Window #1 for Reading / Writing	Address: 0518H 0519H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.2.2
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	ALL
Unit :	-
Range :	-2147483648 ~ +2147483647
Data Size :	32bit
Format :	DEC

Settings : Window #1 (Array[P5-11++])  
When reading the parameter via panel, the value set by P5-11 will not add 1, but the others will.

<b>P5-13</b>	<b>AYD1</b>	<b>Data Array - Window #2 for Reading / Writing</b>		<b>Address: 051AH 051BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.2.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Window #2 ( Array[P5-11++] )  
When reading and writing the parameter via panel or communication, the value set by P5-11 will add 1. Panel is write-protected.

<b>P5-14</b>	<b>Reserved</b>	<b>Address: 051CH 051DH</b>
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<b>P5-15</b>	<b>PMEM</b>	<b>PATH#1 ~ PATH#2 No Data Retained Setting</b>		<b>Address: 051EH 051FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0		

Control Mode :	ALL
Unit :	-
Range :	0x0 ~ 0x0011
Data Size :	16bit
Format :	HEX

Settings : The parameter is divided into 00YX:

X=0: PATH#1 Data retained

X=1: PATH#1 No data retained

Y=0: PATH#2 Data retained

Y=1: PATH#2 No data retained

Others are reserved

Users can continuously write the new position into the drive through communication by P5-05.

**P5-16**

<b>AXEN</b>	<b>Axis Position - Motor Encoder</b>		<b>Address: 0520H 0521H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.3
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	PUU (User position unit)		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Read: The feedback position of the motor encoder, which is the monitor various V000 + the offset value.

Write: Any value can be written into the parameter and will neither change V000 nor influence the positioning coordinate system. It is only for observation when adjusting the offset value.

P5-17	AXAU	Axis Position - Auxiliary Encoder	Address: 0522H 0523H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.3
Operational Interface :	Panel / Software	Communication	
Default :	-		
Control Mode :	ALL		
Unit :	Pulse number		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Sends back: pulse counts of the auxiliary encoder (linear scale)		

P5-18	AXPC	Axis Position - Pulse Command	Address: 0524H 0525H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.3
Operational Interface :	Panel / Software	Communication	
Default :	-		
Control Mode :	ALL		
Unit :	Pulse number		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Sends back: pulse counts of pulse command		

P5-19	TBS	E-Cam Curve Scaling	Address: 0526H 0527H
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	1.000000		

Control Mode :	PR
Unit :	0.000001 times which is 1 / (10 <sup>6</sup> )
Range :	-2147.000000 ~ +2147.000000
Data Size :	32 bit
Format :	DEC
Example :	1100000 = 1.1 times

Settings : This parameter is used to magnify or minify the E-Cam table without changing its setting value.

For example, the data in the table is 0,10,20,30,40,20, magnification x 2.000000 equals to the data in the table: 0,20,40,60,80,40, magnification x 1.000000.

Enable the operation of E-Cam by using the same pulse frequency of the master axis. Magnify the magnification will enlarge the route of E-Cam operation. The speed will be magnified as well.

**NOTE**

1) This parameter can be set anytime, but will be effective only when pre-engaged → engaged.

P5-20	AC0	Acceleration/Deceleration (Number #0)	Time	Address: 0528H 0529H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	200		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		

Settings : The setting time of acceleration/deceleration in PR mode, which is the time it needs when accelerating from 0 to 3000r/min

<b>P5-21</b>	<b>AC1</b>	<b>Acceleration/Deceleration (Number #1)</b>	<b>Time</b>	<b>Address: 052AH 052BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	300		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		
Settings :	Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.			

<b>P5-22</b>	<b>AC2</b>	<b>Acceleration/Deceleration (Number #2)</b>	<b>Time</b>	<b>Address: 052CH 052DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	500		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		
Settings :	Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.			

<b>P5-23</b>	<b>AC3</b>	<b>Acceleration/Deceleration (Number #3)</b>	<b>Time</b>	<b>Address: 052EH 052FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	

Default :	600
Control Mode :	PR
Unit :	ms
Range :	1 ~ 65500
Data Size :	16bit
Format :	DEC

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-24	AC4	Acceleration/Deceleration (Number #4)	Time	Address: 0530H 0531H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	800		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-25	AC5	Acceleration/Deceleration (Number #5)	Time	Address: 0532H 0533H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	900		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		

Data Size :	16bit
Format :	DEC

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-26	AC6	Acceleration/Deceleration (Number #6)	Time	Address: 0534H 0535H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	1000			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-27	AC7	Acceleration/Deceleration (Number #7)	Time	Address: 0536H 0537H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	1200			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.



P5-28	AC8	Acceleration/Deceleration (Number #8)	Time	Address: 0538H 0539H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	1500			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-29	AC9	Acceleration/Deceleration (Number #9)	Time	Address: 053AH 053BH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	2000			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-30	AC10	Acceleration/Deceleration (Number #10)	Time	Address: 053CH 053DH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		

Default :	2500
Control Mode :	PR
Unit :	ms
Range :	1 ~ 65500
Data Size :	16bit
Format :	DEC

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-31	AC11	Acceleration/Deceleration (Number #11)	Time	Address: 053EH 053FH
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	3000		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-32	AC12	Acceleration/Deceleration (Number #12)	Time	Address: 0540H 0541H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	5000		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		

Data Size :	16bit
Format :	DEC

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-33	AC13	Acceleration/Deceleration (Number #13)	Time	Address: 0542H 0543H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	8000			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : Please refer to P5-20 for the setting of acceleration/deceleration time in PR mode.

P5-34	AC14	Acceleration/Deceleration (Number #14)	Time	Address: 0544H 0545H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	50			
Control Mode :	PR			
Unit :	ms			
Range :	1 ~ 65500			
Data Size :	16bit			
Format :	DEC			

Settings : The default value of this parameter is smaller (short deceleration time) and it is used for deceleration time setting of auto protection.

P5-35	AC15	Acceleration/Deceleration (Number #15)	Time	Address: 0546H 0547H
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	30		
	Control Mode :	PR		
	Unit :	ms		
	Range :	1 ~ 65500		
	Data Size :	16bit		
	Format :	DEC		

Settings : The default value of this parameter is smaller (short deceleration time) and it is used for short deceleration time and stops promptly of auto protection.

P5-36	CAST	CAPTURE - Start Address of Data Array	Address: 0548H 0549H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ (value set by P5-10 minus 1)	
	Data Size :	16bit	
	Format :	DEC	

Settings : The first data CAPTURE obtained should be saved in the address of data array.

**NOTE**

It is writable only when COMPARE stops (please refer to P5-39)

<b>P5-37</b>	<b>CAAX</b>	<b>CAPTURE - Axis Position CNT</b>		<b>Address: 054AH 054BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.1
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		


Settings : Shows the axis position of CAPTURE pulse source



- NOTE** 1) It is writable only when COMPARE stops (please refer to P5-39)
- 2) If the source is the main encoder, this parameter is write-protected and the content is the feedback position of the motor (monitor variable 00h).

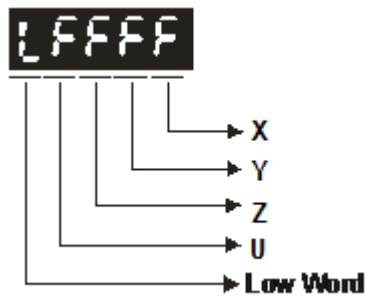
<b>P5-38</b>	<b>CANO</b>	<b>CAPTURE - The Number of Capturing Times</b>		<b>Address: 054CH 054DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.1
	Operational Interface :	Panel / Software	Communication	
	Default :	1		
	Control Mode :	ALL		
	Unit :	-		
	Range :	1 ~ (the value set by P5-10 minus the value set by P5-36)		
	Data Size :	16bit		
	Format :	DEC		

Settings : When CAP stops, it means the number of data that expect to capture (readable and writable)  
 When CAP activates, it means the number of data that has not been captured (read-only); Every time, when it captures one data, the value of P5-38 will minus one. When the value is 0, it means the capturing is completed.

 **NOTE** The number of data which is used by COMPARE, CAPTURE and E-Cam cannot exceed 1500.

<b>P5-39</b>	<b>CACT</b>	<b>CAPTURE - Activate CAP Control</b>		<b>Address: 054EH 054FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.1
	Operational Interface :	Panel / Software	Communication	
	Default :	0x2010		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x0000 ~ 0xF13F		
	Data Size :	16bit		
	Format :	HEX		

Settings :



X : See the following table

Y : 0 - CAPTURE is not working

1 - AUX ENC (linear scale) is set as the source

2 - PULSE Cmd

3 - Main ENC (main encoder)

When the source of CMP is CAP axis, the source Y of CAP cannot be changed.

Z : 0 - NO · 1 - NC ·

U : trigger the minimum interval (Unit: ms)

Bit	3	2	1	0
X function	Execute PR when finishing capturing	After capturing the first data, CMP is activated.	Reset the position of the first data	Activate CAP
Description	Execute PR #50 after finishing CAP	It is invalid when CMP is activated	After capturing the first data, reset the position coordinate	Starts to capture when it is set to 1. After finishing capturing, this bit becomes 0 automatically.

bit 0: When the value set by P5-38 is bigger than 0, set bit 0 to 1 will activate CAP function and DO.CAP\_OK is OFF. Every time, when a data is captured, the value of P5-38 will minus one. When the P5-38 is 0, it means the capture function is completed, DO.CAP\_OK is ON and bit 0 will be reset to 0 automatically. If P5-38 equals to 0, set bit 0 to 1 will not activate CAP function. DO.CAP\_OK is OFF and bit 0 will automatically be set to 0. If CAP function is activated, it cannot set 1 to bit 0. It only can be written 0 to disable CAP function.

bit 1: If this bit is 1, when capturing the first data, the current position of CAP axis will be set to the value of P5-76.

bit 2: If this bit is 1, when capturing the first data, CMP will be activated. (When bit 0 of P5-59 is set to 1 and P5-58 is set to the previous value.) If CMP has been activated, then this function is invalid.

bit 3: If this bit is 1, as soon as the CAP finished, PR procedure #50 will be triggered automatically.

P5-40	DLY0	Delay Time After Position Completed (Number #0)	Address: 0550H 0551H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	ms		
Range :	0 ~ 32767		
Data Size :	16bit		
Format :	DEC		

Settings : The 1<sup>st</sup> Delay Time of PR mode

P5-41	DLY1	Delay Time After Position Completed (Number #1)	Address: 0552H 0553H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	PR		
Unit :	ms		
Range :	0 ~ 32767		
Data Size :	16bit		
Format :	DEC		



Settings : The 2<sup>nd</sup> Delay Time of PR mode

<b>P5-42</b>	<b>DLY2</b>	<b>Delay Time After Position Completed (Number #2)</b>		<b>Address: 0554H 0555H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	200		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 3<sup>rd</sup> Delay Time of PR mode

<b>P5-43</b>	<b>DLY3</b>	<b>Delay Time After Position Completed (Number #3)</b>		<b>Address: 0556H 0557H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	400		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 4<sup>th</sup> Delay Time of PR mode

P5-44	DLY4	Delay Time After Position Completed (Number #4)	Address: 0558H 0559H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	500		
Control Mode :	PR		
Unit :	ms		
Range :	0 ~ 32767		
Data Size :	16bit		
Format :	DEC		

Settings : The 5<sup>th</sup> Delay Time of PR mode

P5-45	DLY5	Delay Time After Position Completed (Number #5)	Address: 055AH 055BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	800		
Control Mode :	PR		
Unit :	ms		
Range :	0 ~ 32767		
Data Size :	16bit		
Format :	DEC		

Settings : The 6<sup>th</sup> Delay Time of PR mode

P5-46	DLY6	Delay Time After Position Completed (Number #6)	Address: 055CH 055DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	1000		

Control Mode :	PR
Unit :	ms
Range :	0 ~ 32767
Data Size :	16bit
Format :	DEC

Settings : The 7<sup>th</sup> Delay Time of PR mode

<b>P5-47</b>	<b>DLY7</b>	<b>Delay Time After Position Completed (Number #7)</b>	<b>Address: 055EH 055FH</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	1500	
	Control Mode :	PR	
	Unit :	ms	
	Range :	0 ~ 32767	
	Data Size :	16bit	
	Format :	DEC	

Settings : The 8<sup>th</sup> Delay Time of PR mode

<b>P5-48</b>	<b>DLY8</b>	<b>Delay Time After Position Completed (Number #8)</b>	<b>Address: 0560H 0561H</b>
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	2000	
	Control Mode :	PR	
	Unit :	ms	
	Range :	0 ~ 32767	
	Data Size :	16bit	
	Format :	DEC	

Settings : The 9<sup>th</sup> Delay Time of PR mode

<b>P5-49</b>	<b>DLY9</b>	<b>Delay Time After Position Completed (Number #9)</b>		<b>Address: 0562H 0563H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	2500		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 10<sup>th</sup> Delay Time of PR mode

<b>P5-50</b>	<b>DLY10</b>	<b>Delay Time After Position Completed (Number #10)</b>		<b>Address: 0564H 0565H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	3000		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 11<sup>th</sup> Delay Time of PR mode

<b>P5-51</b>	<b>DLY11</b>	<b>Delay Time After Position Completed (Number #11)</b>		<b>Address: 0566H 0567H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	

Default :	3500
Control Mode :	PR
Unit :	ms
Range :	0 ~ 32767
Data Size :	16bit
Format :	DEC

Settings : The 12<sup>th</sup> Delay Time of PR mode

<b>P5-52</b>	<b>DLY12</b>	<b>Delay Time After Position Completed (Number #12)</b>		<b>Address: 0568H 0569H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	4000		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 13<sup>th</sup> Delay time of PR mode

<b>P5-53</b>	<b>DLY13</b>	<b>Delay Time After Position Completed (Number #13)</b>		<b>Address: 056AH 056BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	4500		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		

Format :	DEC
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Settings : The 14<sup>th</sup> Delay time of PR mode

<b>P5-54</b>	<b>DLY14</b>	<b>Delay Time After Position Completed (Number #14)</b>		<b>Address: 056CH 056DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	5000		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 15<sup>th</sup> Delay time of PR mode

<b>P5-55</b>	<b>DLY15</b>	<b>Delay Time After Position Completed (Number #15)</b>		<b>Address: 056EH 056FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	5500		
	Control Mode :	PR		
	Unit :	ms		
	Range :	0 ~ 32767		
	Data Size :	16bit		
	Format :	DEC		

Settings : The 16<sup>th</sup> Delay Time of PR mode

<b>P5-56</b>	<b>CMST</b>	<b>COMPARE - Start Address of Data Array</b>		<b>Address: 0570H 0571H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ (The value of P5-10 minus 1)		
	Data Size :	16bit		
	Format :	DEC		

Settings : The first COMPARE data is saved in the address of data array.



**NOTE** It is writable only when COMPARE stops (please refer to P5-59)

<b>P5-57</b>	<b>CMAx</b>	<b>COMPARE - Axis Position</b>		<b>Address: 0572H 0573H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : The axis position of COMPARE pulse source is displayed here.  
It is writable only when COMPARE stops (please refer to P5-59)



**NOTE**

- 1) It is write-protected when the source is Capture axis.
- 2) When the source is the main encoder, P5-57 is also write-protected. The pulse revolution is determined by parameter P1-46. When P5-59.Y is set to the main encoder, this parameter is set to the motor feedback position (monitor variable 00h). If this parameter is not the same as the motor feedback position due to homing or reset by CAP function, the user can set P5-59.Y = 0 and then P5-59.Y = 3. In this way, this parameter will be reset to the motor feedback position.

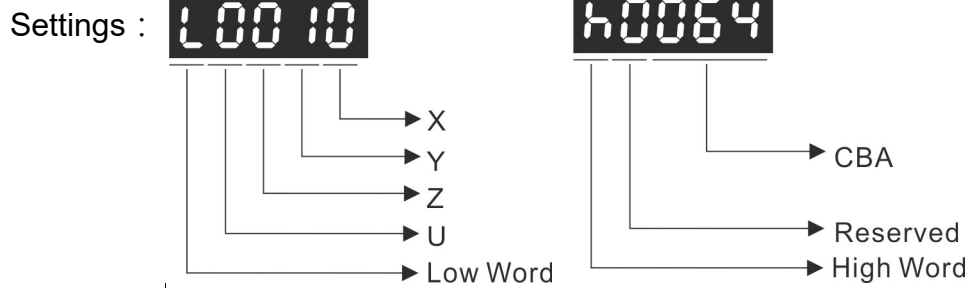
<b>P5-58</b>	<b>CMNO</b>	<b>COMPARE - Compare Amount</b>		<b>Address: 0574H 0575H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.2
	Operational Interface :	Panel / Software	Communication	
	Default :	1		
	Control Mode :	ALL		
	Unit :	-		
	Range :	1 ~ (the value set by P5-10 minus the value set by P5-56)		
	Data Size :	16bit		
	Format :	DEC		

Settings : When COMPARE stops, it means the number of data that expect to compare (readable and writable)  
 When COMPARE activates, it means the number of data that has not been compared (read-only); Every time, when it compares one data, the value of P5-38 will minus one. When the value is 0, it means the comparing is completed.

<b>P5-59</b>	<b>CMCT</b>	<b>COMPARE - Activate CMP Control</b>		<b>Address: 0576H 0577H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11.2
	Operational Interface :	Panel / Software	Communication	
	Default :	00640010h		
	Control Mode :	ALL		



Unit :	-
Range :	00010000h ~0x 0FFF313F
Data Size :	32bit
Format :	HEX



X: See the following table

Y: 0 - When selecting CAPTURE AXES, the source of CAP cannot be changed.

- 1 - AUX ENC (linear scale) is set as the source
- 2 - PULSE Cmd
- 3 - Main ENC (main encoder)

Z: 0 - NO, 1 - NC outputs the polarity

U: See table U below

CBA: Output the Pulse length; Unit: 1ms

bit	3	2	1	0
X function	After finishing comparing, the counter returns to 0.	When finishing comparing, CAP is activated	Cycle mode	CMP is activated
Description	As soon as the last data is compared, P5-57 is set to 0.	It is invalid when CAP is activated	Never end	Starts to compare when this bit is set to 1. It returns to 0 when finishing comparing.

bit 0: When the value of P5-58 is more than 0, set bit to 1 will activate CMP. When comparing one data, the value of P5-58 will minus 1. When P5-58 is set to 0, the comparing is completed and returns to 0. If P5-58 is 0, set bit 0 to 1 will not do any comparing and return to 0 automatically. If bit 0 has already been set to 1, it is not allowed to write 1 as the new value into the parameter. But it is ok to write 0 to disable CMP.

bit 1: If this bit is 1, P5-58 will be reset after comparing the last data. Then, start from the first data again. The cycle will never end and bit 0 is always 1.

bit 2: If this bit is 1, CAP will be activated after comparing the last data. (Set bit 0 of P5-39 to 1 and reset P5-38 to the previous value) If CAP has already been activated, this function is invalid.

bit 3: If this bit is 1, set the counter (P5-57) to 0 after comparing the last data. For example, if the comparing data is set to 3000 (one data in total), the default value of the counter (P5-57) is 0. It is expected to input 4000 pulse. When it reaches the 3000<sup>th</sup> pulse, the CMP is completed and P5-57 returns to 0. When the pulse reaches 4000, P5-57=1000. (No accumulative error)

The definition of each bit of is as follows:

bit	15	14	13	12
U function	-	-	Follow CAP	-
Description	-	-	CMP data is set by CAP	-

P5-60	POV0	Target Speed Setting #0		Address: 0578H 0579H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	20.0	200		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	15 = 15 r/min	150 = 15 r/min		

Settings : The 1<sup>st</sup> target speed of PR mode

P5-61	POV1	Target Speed Setting #1		Address: 057AH 057BH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	50.0	500		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 2<sup>nd</sup> target speed of PR mode

P5-62	POV2	Target Speed Setting #2		Address: 057CH 057DH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	100.0	1000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 3<sup>rd</sup> target speed of PR mode

P5-63	POV3	Target Speed Setting #3		Address: 057EH 057FH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	200.0	2000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 4<sup>th</sup> target speed of PR mode

<b>P5-64</b>	<b>POV5</b>	<b>Target Speed Setting #4</b>		<b>Address: 0582H 0583H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	300.0	3000	
	Control Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16bit		
	Format :	DEC		
	Example :	1 = 1 r/min	10 = 1 r/min	

Settings : The 5<sup>th</sup> target speed of PR mode

<b>P5-65</b>	<b>POV5</b>	<b>Target Speed Setting #5</b>		<b>Address: 0582H 0583H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	500.0	5000	
	Control Mode :	PR		
	Unit :	1 r/min	0.1 r/min	
	Range :	0.1 ~ 6000.0	1 ~ 60000	
	Data Size :	16bit		
	Format :	DEC		
	Example :	1 = 1 r/min	10 = 1 r/min	

Settings : The 6<sup>th</sup> target speed of PR mode

P5-66	POV6	Target Speed Setting #6		Address: 0584H 0585H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	600.0	6000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 7<sup>th</sup> target speed of PR mode

P5-67	POV7	Target Speed Setting #7		Address: 0586H 0587H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	800.0	8000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 8<sup>th</sup> target speed of PR mode

P5-68	POV8	Target Speed Setting #8	Address: 0588H 0589H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	1000.0	10000	
Control Mode :	PR		
Unit :	1 r/min	0.1 r/min	
Range :	0.1 ~ 6000.0	1 ~ 60000	
Data Size :	16bit		
Format :	DEC		
Example :	1 = 1 r/min	10 = 1 r/min	

Settings : The 9<sup>th</sup> target speed of PR mode

P5-69	POV9	Target Speed Setting #9	Address: 058AH 058BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	1300.0	13000	
Control Mode :	PR		
Unit :	1 r/min	0.1 r/min	
Range :	0.1 ~ 6000.0	1 ~ 60000	
Data Size :	16bit		
Format :	DEC		
Example :	1 = 1 r/min	10 = 1 r/min	

Settings : The 10<sup>th</sup> target speed of PR mode

P5-70	POV10	Target Speed Setting #10		Address: 058CH 058DH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	1500.0	15000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 11<sup>th</sup> target speed of PR mode

P5-71	POV11	Target Speed Setting #11		Address: 058EH 058FH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	1800.0	18000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 12<sup>th</sup> target speed of PR mode



P5-72	POV12	Target Speed Setting #12		Address: 0590H 0591H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	2000.0	20000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 13<sup>th</sup> target speed of PR mode

P5-73	POV13	Target Speed Setting #13		Address: 0592H 0593H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	2300.0	23000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 14<sup>th</sup> target speed of PR mode

P5-74	POV14	Target Speed Setting #14		Address: 0594H 0595H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	2500.0	25000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 15<sup>th</sup> target speed of PR mode

P5-75	POV15	Target Speed Setting #15		Address: 0596H 0597H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	3000.0	30000		
Control Mode :	PR			
Unit :	1 r/min	0.1 r/min		
Range :	0.1 ~ 6000.0	1 ~ 60000		
Data Size :	16bit			
Format :	DEC			
Example :	1 = 1 r/min	10 = 1 r/min		

Settings : The 16<sup>th</sup> target speed of PR mode

P5-76★	CPRS	CAPTURE - First Position Reset Data	Address: 0598H 0599H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	-1073741824 ~ +1073741823		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P5-39 X 1

P5-77■	CSAX	The Position of Synchronous Capture Axis (CAP SYNC AXES)	Address: 059AH 059BH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : The position of this axis will synchronize with CAP signal. That is to say, when activating CAP every two times, the motor moving distance of this axis is the value of P5-78. (There is no accumulative error and only in single-way operation) The synchronous capture axis can be the source of Master.

P5-78	CSDS	The Interval Pulse Number between Each Synchronous Capture Axis	Address: 059CH 059DH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	100		
Control Mode :	ALL		
Unit :	Pulse		
Range :	10 ~ +100000000		
Data Size :	32bit		
Format :	DEC		

Settings : It is the moving distance of synchronous capture axis between two CAP actions.

The new value can be written into the parameter not until CAP is disabled (P5-39, X0=0).

P5-79	CSDS	Error Pulse Number of Synchronous Capture Axis	Address: 059EH 059FH
Parameter Attribute :	Parameter for individual axis		Related Section: -
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	ALL		
Unit :	Pulse		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : When synchronous capture axis is operating, the synchronous error should be 0. This parameter shows this error value. The followings are its concept:

$$\begin{aligned} \text{Synchronous Error} &= \text{Output value of synchronous axis} - \\ &\quad \text{Setting value of synchronous axis} \\ &= \text{the accumulative amount of P5-77} - \\ &\quad (\text{P5-78} \times \text{Capturing number of times}) \end{aligned}$$

When capturing the data, the synchronous axis works normally. This parameter updates once.

This parameter can be written into as well. It indicates the offset of synchronous master. When the synchronous capture axis is regarded as the master of flying shear, modify this parameter can deviate the cutting position to the left/right.

P5-80	CSDS		Max. Correction Rate of Synchronous Capture Axis	Address: 05A0H 05A1H
Parameter Attribute :	Parameter for individual axis		Related Section: -	
Operational Interface :	Panel / Software	Communication		
Default :	10			
Control Mode :	ALL			
Unit :	%			
Range :	0 ~ 90			
Data Size :	16bit			
Format :	DEC			

Settings : This parameter limits the percentage (%) of synchronous adjustment.

Correction rate

$$= \frac{\text{pulse number output by synchronous axis}}{\text{pulse number input by synchronous axis}} (100 - P5 - 80)\% < \text{correctionrate} < (100 + P5 - 80)\%$$

The bigger correction rate, the faster the synchronous error becomes 0. However, the speed changing will be more severe.

The smaller correction rate, the slower the synchronous error becomes 0. However, the speed changing will be more smooth.

In the application of flying shear, after adjusting the synchronous error, P5-79: the bigger parameter value will reduce the time the slave axis goes to the desired position. However, the speed is not synchronized.

P5-81	ECHD	E-CAM: Start Address of Data Array		Address: 05A2H 05A3H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication		
Default :	100			
Control Mode :	PR			
Unit :	-			
Range :	0 ~ ( 800 - P5-82 )			
Data Size :	16bit			
Format :	DEC			

Settings : The first data of E-Cam table is saved in the address of data array.



**NOTE**

This parameter can be set anytime, but will be effective only when pre-engaged → engaged.

P5-82	ECMN	E-CAM: Area Number N (at least $\geq 5$ )	Address: 05A4H 05A5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	5		
Control Mode :	PR		
Unit :	-		
Range :	5 ~ 720, must $\leq$ (P5-10 - P5-81) And P5-82 x P5-84 $\leq$ 2147483647		
Data Size :	16bit		
Format :	DEC		

Settings : It means the E-Cam curve is divided into N zone, and the table should include N+1 data.



**NOTE** This parameter can be wrote when E-Cam stops (Please refer to P5-88, X=0).

P5-83	ECMM	E-CAM: Master Gear Ratio Setting M	Address: 05A6H 05A7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	1		
Control Mode :	PR		
Unit :	-		
Range :	1 ~ 32767		
Data Size :	16bit		
Format :	DEC		

Settings : When receiving pulse number P of the Master, E-Cam will rotate M circle, which means the M cycle of the cam table.



**NOTE** This parameter can be wrote when E-Cam stops (Please refer to P5-88, X=0).

P5-84	ECMP	E-CAM: Master Gear Ratio Setting P	Address: 05A8H 05A9H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	3600		
Control Mode :	PR		
Unit :	-		
Range :	10 ~ 1073741823, and P5-82 x P5-83 < = P5-84 and P5-82 x P5-84 < = 2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : When receiving pulse number P of the Master, E-Cam will rotate M circle, which means the M cycle of the cam table.

**NOTE**

This parameter can be modified anytime, and has no limit that mentioned above.

P5-85	ECME	E-CAM: Number of Area	Address: 05AAH 05ABH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	0 ~ ( P5-82 - 1 )		
Data Size :	16bit		
Format :	DEC		

Settings : The area number of E-cam when E-cam engaged.



P5-86	ECAX	E-CAM: Master Axis Position	Address: 05ACH 05ADH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : The position counter of the E-Cam Master



**NOTE** This parameter can be wrote when E-Cam stops (Please refer to P5-88, X=0).

P5-87	PLED	E-CAM: Lead Pulse	Address: 05AEH 05AFH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-1073741824 ~ +1073741823		
Data Size :	32bit		
Format :	DEC		

Settings : When the engaging condition (P5-88.Z) of E-cam is satisfied, the pulse number from the master has to exceed the setting value of this parameter, so that E-cam is fully engaged.

In other words, E-cam engages after neglecting the lead pulse specified by this parameter.

If the symbol of this parameter is + , it means the received forward pulse is regarded as the lead pulse

If the symbol of this parameter is - , it means the received reverse pulse is regarded as the lead pulse

P5-88	ECON	E-CAM: Activate E-Cam Control		Address: 05B0H 05B1H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication		
Default :	00000000h			
Control Mode :	PR			
Unit :	-			
Range :	0 ~ 0x206FF251			
Data Size :	32bit			
Format :	HEX			

Settings : The format of this parameter: (High word h) S0BA : (Low word L)  
UZYX

Definition of each column is as follows:

- X: E-Cam command
  - 0: Disable
  - 1: Activate (When E-Cam mode is activated, the content of the other column cannot be changed.)
- Y: Command source
  - 0: CAP axis
  - 1: AUX ENC
  - 2: Pulse Cmd
  - 3: PR command
  - 4: Time Axis (1ms)
  - 5: Synchronous Capture Axis (P5-77)
- Z: Engaging Time (No multiple choice)
  - 0: Immediately
  - 1: DI.CAM ON
  - 2: Any one of the Capture

- U: Disengaging Condition (2, 4 and 6 cannot be selected at the same time)

U	Disengaged Condition	Action after disengaged
0	Never disengaged	-
1	DI : CAM OFF	In STOP status
2	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	In STOP status
6	Same as 2, the E-cam starts to decelerate when disengaging. It is suitable for the application of calling the next PR position command right after disengaged.	
4	Master axis receives the pulse number which is set by P5-89 and stops immediately. (The symbol represents the direction)	Back to the pre-engage status The lead pulse is P5-92
8	Disable E-cam after disengaging	Set X to 0



**NOTE**

The servo is Off, when ALM or forward/reverse limit occur or PR is doing homing procedure, it disengages (P5-88, X = 0)

- BA: When disengaging condition is satisfied (P5-88, U = 2, 4, 6), a PR 00~63 (hexadecimal; 00 means no action) will automatically be executed.
- S: Shows the engage status (Read-only, the setting is invalid)
  - 0: Stop
  - 1: Engage status
  - 2: Pre-engage status

<b>P5-89</b>	<b>ECRD</b>	<b>E-CAM: Information of Disengaging Time</b>		<b>Address: 05B2H 05B3H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-1073741824 ~ +1073741823		
	Data Size :	32bit		
	Format :	DEC		

Settings : (Please refer to the definition of P5-88 U setting value 2)

<b>P5-90</b>	<b>CMAP</b>	<b>E-CAM: AREA No. + The Point of DO ON</b>		<b>Address: 05B4H 05B5H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	Angle (It was changed after firmware V1.009)		
	Range :	0 ~ 360		
	Data Size :	16bit		
	Format :	DEC		

Settings : When E-cam is engaged, set the start angle of DO output (DO. CAM\_AREA).

<b>P5-91</b>	<b>CMAN</b>	<b>E-CAM: AREA No. - The Point of DO OFF</b>		<b>Address: 05B6H 05B7H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.11
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	Angle (It was changed after firmware V1.009)		
	Range :	0 ~ 360		
	Data Size :	16bit		
	Format :	DEC		

Settings : When E-cam is engaged, set the end angle of DO output (DO. CAM\_AREA).

P5-92	PLED	E-CAM: Pre-engaged Time of Each Cycle		Address: 05B8H 05B9H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.11
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-100000000 ~ +100000000			
Data Size :	32bit			
Format :	DEC			

Settings : This parameter goes with the selection of P5-88, U=4 (E-cam will disengage if it exceeds the moving distance):

After disengaging, it does not enter the Stop status but pre-engaged status. The lead pulse is determined by this parameter.

The pulse number sent by the Master must exceed the setting value of this parameter so that E-cam will engage again.

In other words, E-cam will engage not until the lead pulse is ignored.

If the symbol of this parameter is + , it means the received positive pulse will be regarded as the lead pulse.

If the symbol of this parameter is - , it means the received negative pulse will be regarded as the lead pulse.

P5-93	CSDS	Motion Control Macro Command: Command Parameter # 4		Address: 05BAH 05BBH
Parameter Attribute :	Parameter for three axes			Related Section: -
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	ALL			
Unit :	-			
Range :	-2147483648 ~ +2147483647			

Data Size :	32bit
Format :	DEC

Settings : Before issuing the macro command, the relevant parameters # 4 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

<b>P5-94</b>	<b>CSDS</b>	<b>Motion Control Macro Command: Command Parameter # 3</b>		<b>Address: 05BCH 05BDH</b>
	Parameter Attribute :	Parameter for three axes		
	Operational Interface :	Panel / Software	Communication	Related Section: -
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Before issuing the macro command, the relevant parameters # 3 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

<b>P5-95</b>	<b>CSDS</b>	<b>Motion Control Macro Command: Command Parameter # 2</b>		<b>Address: 05BEH 05BFH</b>
	Parameter Interface :	Parameter for three axes		
	Operational Interface :	Panel / Software	Communication	Related Section: -
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		

Data Size :	32bit
Format :	DEC

Settings : Before issuing the macro command, the relevant parameters # 2 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

<b>P5-96</b>	<b>CSDS</b>	<b>Motion Control Macro Command: Command Parameter # 1</b>		<b>Address: 05C0H 05C1H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Before issuing the macro command, the relevant parameters # 1 must be set in advance.

The function of the parameter is determined by the macro command. Not every macro command has its relevant parameters.

<b>P5-97</b>	<b>CSDS</b>	<b>Motion Control Macro Command: Issue Command / Executing Result</b>		<b>Address: 05C2H 05C3H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	100		
	Control Mode :	ALL		
	Unit :	pulse		
	Range :	0 ~ 0x0999		

Data Size :	16 bit
Format :	HEX

Settings : Write-in: It is used to issue the macro command (0CBAh)  
 Read: It is used to examine the execution result of macro command (If success, the result will be sent back to 1CBAh).

If the command issues 0001, 1001h will be sent back when success; and Fxxh when failed (depending on the command description).

If issuing the command that is not supported, the failure code F001h will be sent back.

The provided command code is as the followings.

Command code 0003h	Motion parameter protection: password setting, protection activation
Macro parameters	P5-94= Protection level of data array (0~7) P5-95= Set new password (1~16777215) P5-96= Confirm new password (1~16777215) Among them: For success setting, the setting of P5-95 must equal to P5-96 and the password must be set within the allowable range.
This function can be executed before activating the function of parameter protection. If the protection function is activated, when repeatedly execute this function, the failure code will be sent back.	
Failure code F031h	Protection function has been activated and cannot be set repeatedly.
Failure code F032h	Wrong password setting: P5-95 not equals to P5-96.
Failure code F033h	Password setting exceeds the allowable range (1~16777215).
Failure code F034h	The protection level, P5-94 exceeds the allowable range (0~7).
Success code: 1003h	



Command code 0004h	Motion parameter protection: unlock the protection
Macro parameters	P5-96= enter the password (1~16777215)
<p>This function can be executed when activating the function of parameter protection.</p> <p>If the protection function is unlocked, repeatedly execute this function will sent back the failure code.</p> <p>If enter the wrong password, failure code Ennn will be sent back. nnn means the rest decode number. It will be minused one number after one failure.</p> <p>When the number is 0, it will be locked for good.</p>	
Failure code F041h	Protection function is unlocked and it cannot be repeatedly unlocked.
Failure code F043h	The password setting exceed the allowable range (1~16777215).
Failure code F044h	<p>The number of times of entering wrong password exceeds the limit: Lock for good.</p> <p>Reset the parameter (P2-08=10) to unlock it is the only method. However, all parameter will return to the default value.</p>
Failure code Ennnh	<p>Incorrect password setting: Failed to unlock.</p> <p>nnn: the rest decode number. It will be minused one number after one failure. When the number is 0, it will be locked for good.</p>
Success code: 1004h	

<b>P5-98</b>	<b>EVON</b>	<b>PR# Triggered by Event Rising-Edge</b>		<b>Address: 05C4H 05C5H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section:-
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	0000 ~ 0xDDDD		

Data Size :	16bit	
Format :	HEX	

Settings : Four items: UZYX  
 When EVx is set to ON, the PR# which will be executed  
 X=0: When EV1 is ON, PR will not be triggered.  
 X=1~D: When EV1 is ON, execute PR # 51~63.  
 Y=0: When EV2 is ON, PR will not be triggered.  
 Y=1~D: When EV2 is ON, execute PR # 51~63.  
 Note: EV3 and EV4 are supported after firmware V1.009.  
 Z=0: When EV3 is ON, PR will not be triggered.  
 Z=1~D: When EV3 is ON, execute PR # 51~63.  
 U=0: When EV3 is ON, PR will not be triggered.  
 U=1~D: When EV4 is ON, execute PR # 51~63.

<b>P5-99</b>	<b>EVOF</b>	<b>PR# Triggered by Event Falling-Edge</b>		<b>Address: 05C6H 05C7H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: -
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	0000 ~ 0xDDDD		
	Data Size :	16bit		
	Format :	HEX		

Settings : Four items: UZYX  
 When EVx is set to OFF, the PR# which will be executed  
 X=0: When EV1 is OFF, PR will not be triggered.  
 X=1~D: When EV1 is OFF, execute PR # 51~63.  
 Y=0: When EV2 is OFF, PR will not be triggered.  
 Y=1~D: When EV2 is OFF, execute PR # 51~63.  
 Note: EV3 and EV4 are supported after firmware V1.009.  
 Z=0: When EV3 is OFF, PR will not be triggered.  
 Z=1~D: When EV3 is OFF, execute PR # 51~63.  
 U=0: When EV4 is OFF, PR will not be triggered.  
 U=1~D: When EV4 is OFF, execute PR # 51~63.

**P6-xx PR Parameters (Please refer to Chapter 7 for detailed setting)**

<b>P6-00</b>	<b>ODEF</b>	<b>Homing Definition</b>		<b>Address: 0600H 0601H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0x10FFFF6F		
	Data Size :	32bit		
	Format :	HEX		

Settings : Homing definition:

31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
BOOT	-	DLY	DEC2	DEC1	ACC	PATH	

- PATH: Path type (4 BIT)
  - 0: Stop: Homing complete and stop.
  - 1 ~ 99: Auto: Homing complete and execute the specified path.
- ACC: Select 0~F for acceleration time and corresponds to P5-20~P5-35.
- DEC1/DEC2: The deceleration time selection of 1<sup>st</sup> / 2<sup>nd</sup> homing, the setting value of DEC is 0~F and corresponds to P5-20~ P5-35.
- DLY: Select 0~F for the delay time and corresponds to P5-40 ~P5-55.
- BOOT: When the servo drive applies to the power, if searching the origin will be executed.
  - 0: Do not do homing
  - 1: Execute homing automatically (SRV ON for the first time after applying to power)

- Apart from the above mentioned definition, the related setting of homing also includes:
  1. P5-04 Homing mode
  2. P5-05~P5-06 Speed setting of searching the origin
  3. P6-01: ORG\_DEF is the location of the origin. It may not be 0. This function is the offset of coordinate system.
    - A. After the origin is found (Sensor or Z), it has to decelerate to stop. The stop position will exceed the origin for a short distance.  
If it does not return to the origin, set PATH to 0.  
If it needs to return to the origin, set PATH to non-zero value and set PABS = ORG\_DEF.
    - B. If the origin is found (Sensor or Z), desire to move an offset S and define the coordinate as P after moving, then PATH = non-zero and set ORG\_DEF = P-S. The absolute position command = P.

<b>P6-01</b>	<b>ODAT</b>	<b>Origin Definition</b>		<b>Address: 0602H 0603H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Value of origin definition:

31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
ORG_DEF (32 bit)							

<b>P6-02</b>	<b>PDEF1</b>	<b>PATH#1 Definition</b>		<b>Address: 0604H 0605H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Properties of PATH# 1:

	31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
P6-02	-	-	DLY	-	-	-	OPT	TYPE
P6-03	DATA (32 bit)							

● TYPE, OPT:

OPT				TYPE
7	6	5	4 BIT	3 ~ 0 BIT
-	UNIT	AUTO	INS	1: SPEED, Speed setting control
CMD		OVL	INS	2: SINGLE, Positioning control. It will stop when finished.
			AUTO	3: AUTO positioning control. It will load in the next path when finished.
-	-	AUTO	-	4: Multi-axis linear interpolation
-	-	-	INS	5: FEED RATE setting
-	-	-	INS	7: JUMP to the specified path
-	-	AUTO	INS	8: Write the specified parameter to the specified path
CMD		OVL	AUTO	E: Three-axis helical interpolation
				F: Two-axis circular interpolation

- TYPE: 1 ~ 4 and E ~ F accept DO.STP stop and software limit.
- INS: When executing this PR, it interrupts the previous one.
- OVLP: Allow the overlap of the next path. The overlap is not allowed in speed mode. When overlap happens in position mode, DLY has no function.
- AUTO: When PR procedure completes, the next procedure will be loaded in automatically.
- CMD: Refer to Chapter 7 for PR command description.
- DLY: 0 ~ F, delay time number (4 BIT). The delay after executing this PR. The external INS is invalid.

DLY (4)

 Index P5-40 ~ P5-55

<b>P6-03</b>	<b>PDAT1</b>	<b>PATH#1 Data</b>	<b>Address: 0606H 0607H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : PATH# 1 Data

31 ~ 28	27 ~ 24	23 ~ 20	19 ~ 16	15 ~ 12	11 ~ 8	7 ~ 4	3 ~ 0 BIT
DATA (32 bit)							

Property of P6-02; P6-03 corresponds to the target position of P6-02 or jump to PATH\_NO.



**NOTE** PATH (procedure)

P6-04	PDEF2	PATH#2 Definition	Address: 0608H 0609H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-05	PDAT2	PATH#2 Data	Address: 060AH 060BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-06	PDEF3	PATH#3 Definition	Address: 060CH 060DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		

Control Mode :	PR
Unit :	-
Range :	0x00000000 ~ 0xFFFFFFFF
Data Size :	32bit
Format :	HEX

Settings : Please refer to the description of P6-02

<b>P6-07</b>	<b>PDAT3</b>	<b>PATH#3 Data</b>		<b>Address: 060EH 060FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-08</b>	<b>PDEF4</b>	<b>PATH#4 Definition</b>		<b>Address: 0610H 0611H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		



Settings : Please refer to the description of P6-02

P6-09	PDATA	PATH#4 Data	Address: 0612H 0613H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-10	PDEF5	PATH#5 Definition	Address: 0614H 0615H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-11	PDAT5	PATH#5 Data	Address: 0616H 0617H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-12	PDEF6	PATH#6 Definition	Address: 0618H 0619H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-13	PDAT6	PATH#6 Data	Address: 061AH 061BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-14	PDEF7	PATH#7 Definition	Address: 061CH 061DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-15	PDAT7	PATH#7 Data	Address: 061EH 061FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-16	PDEF8	PATH#8 Definition	Address: 0620H 0621H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-17	PDAT8	PATH#8 Data	Address: 0622H 0623H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-18	PDEF9	PATH#9 Definition	Address: 0624H 0625H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-19	PDAT9	PATH#9 Data	Address: 0626H 0627H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	PR
Unit :	-
Range :	-2147483648 ~ +2147483647
Data Size :	32bit
Format :	DEC

Settings : Please refer to the description of P6-03

<b>P6-20</b>	<b>PDEF10</b>	<b>PATH#10 Definition</b>		<b>Address: 0628H 0629H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

<b>P6-21</b>	<b>PDAT10</b>	<b>PATH#10 Date</b>		<b>Address: 062AH 062BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section: 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-22</b>	<b>PDEF11</b>	<b>PATH#11 Definition</b>		<b>Address: 062CH 062DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

<b>P6-23</b>	<b>PDAT11</b>	<b>PATH#11 Data</b>		<b>Address: 062EH 062FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-24</b>	<b>PDEF12</b>	<b>PATH#12 Definition</b>		<b>Address: 0630H 0631H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		
	Settings : Please refer to the description of P6-02			

<b>P6-25</b>	<b>PDAT12</b>	<b>PATH#12 Data</b>		<b>Address: 0632H 0633H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		
	Settings : Please refer to the description of P6-03			



P6-26	PDEF13	PATH#13 Definition	Address: 0634H 0635H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-27	PDAT13	PATH#13 Data	Address: 0636H 0637H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-28	PDEF14	PATH#14 Definition	Address: 0638H 0639H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-29	PDAT14	PATH#14 Data	Address: 063AH 063BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-30	PDEF15	PATH#15 Definition	Address: 063CH 063DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-31	PDAT15	PATH#15 Data	Address: 063EH 063FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-32	PDEF16	PATH#16 Definition	Address: 0640H 0641H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-33	PDAT16	PATH#16 Data	Address: 0642H 0643H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-34	PDEF17	PATH#17 Definition	Address: 0644H 0645H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		

Control Mode :	PR
Unit :	-
Range :	0x00000000 ~ 0xFFFFFFFF
Data Size :	32bit
Format :	HEX

Settings : Please refer to the description of P6-02

<b>P6-35</b>	<b>PDAT17</b>	<b>PATH#17 Data</b>		<b>Address: 0646H 0647H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-36</b>	<b>PDEF18</b>	<b>PATH#18 Definition</b>		<b>Address: 0648H 0649H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

P6-37	PDAT18	PATH#18 Data	Address: 064AH 064BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-38	PDEF19	PATH#19 Definition	Address: 064CH 064DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-39	PDAT19	PATH#19 Data	Address: 064EH 064FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-40	PDEF20	PATH#20 Definition	Address: 0650H 0651H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-41	PDAT20	PATH#20 Data	Address: 0652H 0653H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	PR
Unit :	-
Range :	-2147483648 ~ +2147483647
Data Size :	32bit
Format :	DEC

Settings : Please refer to the description of P6-03

**P6-42**

<b>PDEF21</b>	<b>PATH#21 Definition</b>		<b>Address: 0654H 0655H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

**P6-43**

<b>PDAT21</b>	<b>PATH#21 Data</b>		<b>Address: 0656H 0657H</b>
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		



Settings : Please refer to the description of P6-03

P6-44	PDEF22	PATH#22 Definition	Address: 0658H 0659H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	

Settings : Please refer to the description of P6-02

P6-45	PDAT22	PATH#22 Data	Address: 065AH 065BH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	

Settings : Please refer to the description of P6-03

P6-46	PDEF23	PATH#23 Definition	Address: 065CH 065DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-47	PDAT23	PATH#23 Data	Address: 065EH 065FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-48	PDEF24	PATH#24 Definition	Address: 0660H 0661H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-49	PDAT24	PATH#24 Data	Address: 0662H 0663H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-50</b>	<b>PDEF25</b>	<b>PATH#25 Definition</b>		<b>Address: 0664H 0665H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

<b>P6-51</b>	<b>PDAT25</b>	<b>PATH#25 Data</b>		<b>Address: 0666H 0667H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

P6-52	PDEF26	PATH#26 Definition	Address: 0668H 0669H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-53	PDAT26	PATH#26 Data	Address: 066AH 066BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-54	PDEF27	PATH#27 Definition	Address: 066CH 066DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-55	PDAT27	PATH#27 Data	Address: 066EH 066FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-56	PDEF28	PATH#28 Definition	Address: 0670H 0671H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-57	PDAT28	PATH#28 Data	Address: 0672H 0673H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-58	PDEF29	PATH#29 Definition		Address: 0674H 0675H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0x00000000			
Control Mode :	PR			
Unit :	-			
Range :	0x00000000 ~ 0xFFFFFFFF			
Data Size :	32bit			
Format :	HEX			

Settings : Please refer to the description of P6-02

P6-59	PDAT29	PATH#29 Data		Address: 0676H 0677H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-2147483648 ~ +2147483647			
Data Size :	32bit			
Format :	DEC			

Settings : Please refer to the description of P6-03



P6-60	PDEF30	PATH#30 Definition	Address: 0678H 0679H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-61	PDAT30	PATH#30 Data	Address: 067AH 067BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-62	PDEF31	PATH#31 Definition	Address: 067CH 067DH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P6-63	PDAT31	PATH#31 Data	Address: 067EH 067FH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P6-64	PDEF32	PATH#32 Definition	Address: 0680H 0681H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-65	PDAT32	PATH#32 Data	Address: 0682H 0683H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-66	PDEF33	PATH#33 Definition	Address: 0684H 0685H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		

Control Mode :	PR
Unit :	-
Range :	0x00000000 ~ 0xFFFFFFFF
Data Size :	32bit
Format :	HEX

Settings : Please refer to the description of P6-02

<b>P6-67</b>	<b>PDAT33</b>	<b>PATH#33 Data</b>		<b>Address: 0686H 0687H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-68</b>	<b>PDEF34</b>	<b>PATH#34 Definition</b>		<b>Address: 0688H 0689H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

<b>P6-69</b>	<b>PDAT34</b>	<b>PATH#34 Data</b>		<b>Address: 068AH 068BH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P6-70</b>	<b>PDEF35</b>	<b>PATH#35 Definition</b>		<b>Address: 068CH 068DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

P6-71	PDAT35	PATH#35 Data	Address: 068EH 068FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-72	PDEF36	PATH#36 Definition	Address: 0690H 0691H
Operational Interface :	Panel / Software	Communication	Related Section: Section 7.10
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-73	PDAT36	PATH#36 Data	Address: 0692H 0693H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-74	PDEF37	PATH#37 Definition	Address: 0694H 0695H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-75	PDAT37	PATH#37 Data	Address: 0696H 0697H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-76	PDEF38	PATH#38 Definition	Address: 0698H 0699H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02



P6-77	PDAT38	PATH#38 Data	Address: 069AH 069BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-78	PDEF39	PATH#39 Definition	Address: 069CH 069DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-79	PDAT39	PATH#39 Data	Address: 069EH 069FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		

Control Mode :	PR
Unit :	-
Range :	-2147483648 ~ +2147483647
Data Size :	32bit
Format :	DEC

Settings : Please refer to the description of P6-03

<b>P6-80</b>	<b>PDEF40</b>	<b>PATH#40 Definition</b>		<b>Address: 06A0H 06A1H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

P6-81	P DAT40	PATH#40 Data	Address: 06A2H 06A3H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-82	P DEF41	PATH#41 Data	Address: 06A4H 06A5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-83	PDAT41	PATH#41 Data	Address: 06A6H 06A7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-84	PDEF42	PATH # 42 Definition	Address: 06A8H 06A9H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-85	PDAT42	PATH#42 Data	Address: 06AAH 06ABH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-86	PDEF43	PATH#43 Definition	Address: 06ACH 06ADH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-87	PDAT43	PATH#43 Data	Address: 06AEH 06AFH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-88	PDEF44	PATH#44 Definition	Address: 06B0H 06B1H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-89	PDAT44	PATH#44 Data	Address: 06B2H 06B3H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-90	PDEF45	PATH#45 Definition	Address: 06B4H 06B5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-91	PDAT45	PATH#45 Data	Address: 06B6H 06B7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-92	PDEF46	PATH#46 Definition	Address: 06B8H 06B9H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02



P6-93	PDAT46	PATH#46 Data	Address: 06BAH 06BBH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-94	PDEF47	PATH#47 Definition	Address: 06BCH 06BDH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-95	PDAT47	PATH#47 Data	Address: 06BEH 06BFH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P6-96	PDEF48	PATH#48 Definition	Address: 06C0H 06C1H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P6-97	PDAT48	PATH#48 Data	Address: 06C2H 06C3H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P6-98	PDEF49	PATH#49 Definition	Address: 06C4H 06C5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P6-99	PDAT49	PATH#49 Data		Address: 06C6H 06C7H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-2147483648 ~ +2147483647			
Data Size :	32bit			
Format :	DEC			
Settings :	Please refer to the description of P6-03			

**P7-xx PR Parameters (Please refer to Chapter 7 for detailed setting)**

P7-00	PDEF50	PATH#50 Definition	Address: 0700H 0701H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	

Settings : Please refer to the description of P6-02



**NOTE** PATH (procedure)

P7-01	PDAT50	PATH#50 Data	Address: 0702H 0703H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	

Settings : Please refer to the description of P6-03

P7-02	PDEF51	PATH#51 Definition	Address: 0704H 0705H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-03	PDAT51	PATH#51 Data	Address: 0706H 0707H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-04	PDEF52	PATH#52 Definition	Address: 0708H 0709H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-05	PDAT52	PATH#52 Data	Address: 070AH 070BH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-06	PDEF53	PATH#53 Definition	Address: 070CH 070DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-07	PDAT53	PATH#53 Data	Address 070EH 070FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03



P7-08	PDEF54	PATH#54 Definition	Address: 0710H 0711H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-09	PDAT54	PATH#54 Data	Address: 0712H 0713H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-10	PDEF55	PATH#55 Definition	Address: 0714H 0715H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-11	PDAT55	PATH#55 Data	Address: 0716H 0717H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P7-12	PDEF56	PATH#56 Definition	Address: 0718H 0719H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-13	PDAT56	PATH#56 Data	Address: 071EH 071FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-14	PDEF57	PATH#57 Definition	Address: 071CH 071DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-15	PDAT57	PATH#57 Data	Address: 071EH 071FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-16	PDEF58	PATH#58 Definition	Address: 0720H 0721H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-17	PDAT58	PATH#58 Data	Address: 0722H 0723H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-18	PDEF59	PATH#59 Definition	Address: 0724H 0725H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-19	PDAT59	PATH#59 Data	Address: 0726H 0727H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-20	PDEF60	PATH#60 Definition	Address: 0728H 0729H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-21	PDAT60	PATH#60 Data	Address: 072AH 072BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-22	PDEF61	PATH#61 Definition		Address: 072CH 072DH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0x00000000			
Control Mode :	PR			
Unit :	-			
Range :	0x00000000 ~ 0xFFFFFFFF			
Data Size :	32bit			
Format :	HEX			
Settings :	Please refer to the description of P6-02			

P7-23	PDAT61	PATH#61 Data		Address: 072EH 072FH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-2147483648 ~ +2147483647			
Data Size :	32bit			
Format :	DEC			
Settings :	Please refer to the description of P6-03			



P7-24	PDEF62	PATH#62 Definition	Address: 0730H 0731H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-25	PDAT62	PATH#62 Data	Address: 0732H 0733H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-26	PDEF63	PATH#63 Definition	Address: 0734H 0735H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-27	PDAT63	PATH#63 Data	Address: 0736H 0737H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-28	PDEF64	PATH#64 Definition	Address: 0738H 0739H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-29	PDAT64	PATH#64 Data	Address: 073AH 073BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-30	PDEF65	PATH#65 Definition	Address: 073CH 073DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-31	PDAT65	PATH#65 Data	Address: 073EH 073FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-32	PDEF66	PATH#66 Definition	Address: 0740H 0741H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-33	PDAT66	PATH#66 Data	Address: 0742H 0743H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-34	PDEF67	PATH#67 Definition	Address: 0744H 0745H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-35	PDAT67	PATH#67 Data	Address: 0746H 0747H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-36	PDEF68	PATH#68 Definition	Address: 0748H 0749H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-37	PDAT68	PATH#68 Data	Address: 074AH 074BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-38	PDEF69	PATH#69 Definition	Address: 074CH 074DH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-39	PDEF70	PATH#69 Data	Address: 0750H 0751H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	



P7-40	PDEF70	PATH#70 Definition	Address: 0750H 0751H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-41	PDAT70	PATH#70 Data	Address: 0752H 0753H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-42	PDEF71	PATH#71 Definition	Address: 0754H 0755H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-43	PDAT71	PATH#71 Data	Address: 0756H 0757H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-44	PDEF72	PATH#72 Definition	Address: 0758H 0759H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-45	PDAT72	PATH#72 Data	Address: 075AH 075BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P7-46	PDEF73	PATH#73 Definition	Address: 075CH 075DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-47	PDAT73	PATH#73 Data	Address: 075EH 075FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-48	PDEF74	PATH#74 Definition	Address: 0760H 0761H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-49	PDAT74	PATH#74 Data	Address: 0762H 0763H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-50	PDEF75	PATH#75 Definition	Address: 0764H 0765H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-51	PDAT75	PATH#75 Data	Address: 0766H 0767H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-52	PDEF76	PATH#76 Definition	Address: 0768H 0769H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-53	PDAT76	PATH#76 Data	Address: 076AH 076BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-54	PDEF77	PATH#77 Definition	Address: 076CH 076DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-55	PDAT77	PATH#77 Data	Address: 076EH 076FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		



P7-56	PDEF78	PATH#78 Definition	Address: 0770H 0771H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-57	PDAT78	PATH#78 Data	Address: 0772H 0773H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-58	PDEF79	PATH#79 Definition	Address: 0774H 0775H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-59	PDAT79	PATH#79 Data	Address: 0776H 0777H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P7-60	PDEF80	PATH#80 Definition	Address: 0778H 0779H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-61	PDAT80	PATH#80 Data	Address: 077AH 077BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

<b>P7-62</b>	<b>PDEF81</b>	<b>PATH#81 Definition</b>		<b>Address: 077CH 077DH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		

Settings : Please refer to the description of P6-02

<b>P7-63</b>	<b>PDAT81</b>	<b>PATH#81 Data</b>		<b>Address: 077EH 077FH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		

Settings : Please refer to the description of P6-03

P7-64	PDEF82	PATH#82 Definition	Address: 0780H 0781H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-65	PDAT82	PATH#82 Data	Address: 0782H 0783H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-66	PDEF83	PATH#83 Definition	Address: 0784H 0785H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-67	PDAT83	PATH#83 Data	Address: 0786H 0787H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

P7-68	PDEF84	PATH#84 Definition	Address: 0788H 0789H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-69	PDAT84	PATH#84 Data	Address: 078AH 078BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-70	PDEF85	PATH#85 Definition	Address: 078CH 078DH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-71	PDAT85	PATH#85 Data	Address: 078EH 078FH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		



P7-72	PDEF86	PATH#86 Definition	Address: 0790H 0791H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-73	PDAT86	PATH#86 Data	Address: 0792H 0793H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-74	PDEF87	PATH#87 Definition		Address: 0794H 0795H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10	
Operational Interface :	Panel / Software	Communication		
Default :	0x00000000			
Control Mode :	PR			
Unit :	-			
Range :	0x00000000 ~ 0xFFFFFFFF			
Data Size :	32bit			
Format :	HEX			
Settings : Please refer to the description of P6-02				

P7-75	PDAT87	PATH#87 Data		Address: 0796H 0797H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10	
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-2147483648 ~ +2147483647			
Data Size :	32bit			
Format :	DEC			
Settings : Please refer to the description of P6-03				

P7-76	PDEF88	PATH#88 Definition	Address: 0798H 0799H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-77	PDAT88	PATH#88 Data	Address: 079AH 079BH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-78	PDEF89	PATH#89 Definition		Address: 079CH 079DH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0x00000000			
Control Mode :	PR			
Unit :	-			
Range :	0x00000000 ~ 0xFFFFFFFF			
Data Size :	32bit			
Format :	HEX			
Settings :	Please refer to the description of P6-02			

P7-79	PDAT89	PATH#89 Data		Address: 079EH 079FH
Parameter Attribute :	Parameter for individual axis			Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication		
Default :	0			
Control Mode :	PR			
Unit :	-			
Range :	-2147483648 ~ +2147483647			
Data Size :	32bit			
Format :	DEC			
Settings :	Please refer to the description of P6-03			

P7-80	PDEF90	PATH#90 Definition	Address: 07A0H 07A1H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-81	PDAT90	PATH#90 Data	Address: 07A2H 07A3H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-82	PDEF91	PATH#91 Definition	Address: 07A4H 07A5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-83	PDAT91	PATH#91 Data	Address: 07A6H 07A7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-84	PDEF92	PATH#92 Definition	Address: 07A8H 07A9H
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0x00000000	
	Control Mode :	PR	
	Unit :	-	
	Range :	0x00000000 ~ 0xFFFFFFFF	
	Data Size :	32bit	
	Format :	HEX	
	Settings :	Please refer to the description of P6-02	

P7-85	PDAT92	PATH#92 Data	Address: 07AAH 07ABH
	Parameter Attribute :	Parameter for individual axis	
	Operational Interface :	Panel / Software	Communication
	Default :	0	
	Control Mode :	PR	
	Unit :	-	
	Range :	-2147483648 ~ +2147483647	
	Data Size :	32bit	
	Format :	DEC	
	Settings :	Please refer to the description of P6-03	

P7-86	PDEF93	PATH#93 Definition	Address: 07ACH 07ADH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-87	PDAT93	PATH#93 Data	Address: 07AEH 07AFH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		



P7-88	PDEF94	PATH#94 Definition	Address: 07B0H 07B1H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-89	PDAT94	PATH#94 Data	Address: 07B2H 07B3H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-90	PDEF95	PATH#95 Definition	Address: 07B4H 07B5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		

Settings : Please refer to the description of P6-02

P7-91	PDAT95	PATH#95 Data	Address: 07B6H 07B7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		

Settings : Please refer to the description of P6-03

<b>P7-92</b>	<b>PDEF96</b>	<b>PATH#96 Definition</b>		<b>Address: 07B8H 07B9H</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0x00000000		
	Control Mode :	PR		
	Unit :	-		
	Range :	0x00000000 ~ 0xFFFFFFFF		
	Data Size :	32bit		
	Format :	HEX		
	Settings : Please refer to the description of P6-02			

<b>P7-93</b>	<b>PDAT96</b>	<b>PATH#96 Data</b>		<b>Address: 07BAH 07BBH</b>
	Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	PR		
	Unit :	-		
	Range :	-2147483648 ~ +2147483647		
	Data Size :	32bit		
	Format :	DEC		
	Settings : Please refer to the description of P6-03			

P7-94	PDEF97	PATH#97 Definition	Address: 07BCH 07BDH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-95	PDAT97	PATH#97 Data	Address: 07BEH 07BFH
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-96	PDEF98	PATH#98 Definition	Address: 07C0H 07C1H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-97	PDAT98	PATH#98 Data	Address: 07C2H 07C3H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

P7-98	PDEF99	PATH#99 Definition	Address: 07C4H 07C5H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0x00000000		
Control Mode :	PR		
Unit :	-		
Range :	0x00000000 ~ 0xFFFFFFFF		
Data Size :	32bit		
Format :	HEX		
Settings :	Please refer to the description of P6-02		

P7-99	PDAT99	PATH#99 Data	Address: 07C6H 07C7H
Parameter Attribute :	Parameter for individual axis		Related Section: Section 7.10
Operational Interface :	Panel / Software	Communication	
Default :	0		
Control Mode :	PR		
Unit :	-		
Range :	-2147483648 ~ +2147483647		
Data Size :	32bit		
Format :	DEC		
Settings :	Please refer to the description of P6-03		

Table 8.1 Function Description of Digital Input (DI)

Setting Value: 0x01			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
SON	When this DI is ON, servo is activated (Servo On).	Level triggered	ALL

Setting Value: 0x02			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
ARST	After the alarm has been cleared, when the DI is ON the drive will show that the alarm has been cleared.	Rising edge triggered	ALL

Setting Value: 0x03			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
GAINUP	In speed and position mode, when the DI is ON (P2-27 should be set to 1), the gain switched to the one multiplies the switching rate.	Level triggered	PT, PR, S

Setting Value: 0x04			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
CCLR	Clear the pulse counter and the setting of parameter P2-50. 0: clear the position pulse deviation (It is suitable in PT mode). When DI is ON, the accumulative pulse deviation of the drive will be cleared to 0.	Rising edge triggered, Level triggered	PT, PR

Setting Value: 0x05			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
ZCLAMP	When the speed is slower than the setting of zero speed (P1-38), if the DI is ON, the motor stops running.	Level triggered	S

The diagram illustrates the ZCLAMP function's behavior. It consists of three vertically aligned waveforms sharing a common time axis. The top waveform, 'Speed Command', shows two trapezoidal pulses. A horizontal dashed line indicates the 'Setting value of P1-38 (Zero speed)'. The middle waveform, 'ZCLAMP input signal', is initially 'OFF'. When the second speed pulse begins, the signal turns 'ON' and remains 'ON' until the end of the pulse. The bottom waveform, 'Motor Speed', shows that during the first speed pulse, the motor speed reaches a peak and then decays to a level above the zero speed setting. When the second speed pulse begins and ZCLAMP is ON, the motor speed decays to zero before reaching the zero speed setting level. Vertical dashed lines connect the start and end of the ZCLAMP ON period to the corresponding points on the other two waveforms.

**Setting Value: 0x06**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
CMDINV	In PT and speed mode, when the DI is ON, the input command will be in reverse direction.	Level triggered	S, T

**Setting Value: 0x07**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
Reserved			

**Setting Value: 0x08**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
CTRG	In PR mode, after selecting the PR command (POS0 ~ 5), when the DI is ON, the motor will rotate according to the command issued by the register.	Rising edge triggered	PR

**Setting Value: 0x09**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
TRQLM	In speed and position mode, when the DI is ON, the motor torque will be limited, and the limited torque command will be internal register (P1-12~P1-14) or analog voltage command.	Level triggered	PT, PR, S

**Setting Value: 0x0A**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
GTRY	After activating the gantry function (Refer to the setting of P2-58), this DI is ON and will disable the gantry function so as to enable the users to issue the command and the two-axis will be triggered to move individually. (Firmware V1.005 sub00 will be available afterwards)	Level triggered	PT, PR

**Setting Value: 0x10**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
SPDLM	In torque mode, when the DI is ON, the motor speed will be limited, the limited speed command will be internal register or analog voltage command.	Level triggered	T



**Setting Value: 0x11, 0x12, 0x13, 0x1A, 0x1B, 0x1C**

DI Name	Function Description of Digital Input (DI)									Trigger Method	Control Mode
POS0	PR Command Selection (1~64)									Level triggered	PR
POS1	Position command	POS5	POS4	POS3	POS2	POS1	POS0	CTRG	Corresponding parameter		
POS2	Homing	0	0	0	0	0	0	↑	P6-00		
POS3	Procedure 1	0	0	0	0	0	1	↑	P6-01		
POS4									P6-02		
POS5	~								P6-03		
	Procedure 50	1	1	0	0	1	0	↑	P6-98		
									P6-99		
	Procedure 51	1	1	0	0	1	1	↑	P7-00		
									P7-01		
	~										
	Procedure 63	1	1	1	1	1	1	↑	P7-26		
									P7-27		

**Setting Value: 0x14, 0x15**

DI Name	Function Description of Digital Input (DI)							Trigger Method	Control Mode	
SPD0	Internal Speed Command Selection (1~4)							Level triggered	S	
SPD1	Speed command number	DI signal of CN1		Command Source	Content	Range				
		SPD1	SPD0							
	S1	0	0	Mode	S	External analog command	Voltage deviation between V-REF and GND			+/-10 V
					Sz	N/A	Speed command is 0			0
	S2	0	1	Register parameter		P1-09	+/-5000 r/min			
	S3	1	0			P1-10	+/-5000 r/min			
	S4	1	1			P1-11	+/-5000 r/min			

**Setting Value: 0x16, 0x17**

DI Name	Function Description of Digital Input (DI)						Trigger Method	Control Mode		
TCM0 TCM1	Internal Torque Command Selection (1~4)						Level triggered	T		
	Torque command number	DI signal of CN1		Command Source	Content	Range				
		TCM1	TCM0							
	T1	0	0	Mode	T	Analog command			Voltage deviation between T-REF and GND	+/- 10 V
					Tz	N/A			Torque command is 0	0
	T2	0	1	Register parameter		P1-12			+/- 300 %	
	T3	1	0			P1-13			+/- 300 %	
T4	1	1	P1-14			+/- 300 %				

**Setting Value: 0x18**

DI Name	Function Description of Digital Input (DI)		Trigger Method	Control Mode
S-P	In position and speed mode, if the DI is OFF, it is in speed mode. And it is in position mode when the DI is ON. (P selects PT or PR via DI.PT-PR (0x2B).)		Level triggered	Dual Mode

**Setting Value: 0x19**

DI Name	Function Description of Digital Input (DI)		Trigger Method	Control Mode
S-T	In speed and torque mode, if the DI is OFF, it is in speed mode. And it is in torque mode when the DI is ON.		Level triggered	Dual Mode

**Setting Value: 0x20**

DI Name	Function Description of Digital Input (DI)		Trigger Method	Control Mode
T-P	In position and torque mode, if the DI is OFF, it is in torque mode; if the DI is ON, then it is in position mode.		Level triggered	Dual Mode

**Setting Value: 0x21**

DI Name	Function Description of Digital Input (DI)		Trigger Method	Control Mode
EMGS	When this DI is ON, the motor stops urgently.		Level triggered	ALL

**Setting Value: 0x22**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
NL	Reverse inhibit limit (contact b)	Level triggered	ALL

**Setting Value: 0x23**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
PL	Forward inhibit limit (contact b)	Level triggered	ALL

**Setting Value: 0x24**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
ORGP	In PR mode, during the process of homing if the DI is ON ← → OFF, the servo will regard this position as the homing origin. (Please refer to the setting of parameter P5-04)	Rising /Falling edge triggered	PR

**Setting Value: 0x27**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
SHOM	In PR mode, when searching the origin is needed, it will activate the function of searching the origin when the DI is ON. (Please refer to the setting of parameter P5-04)	Rising edge triggered	PR

**Setting Value: 0x2B**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
PT-PR	When selecting PT-PR dual mode or PT-PR-S multiple mode, source can be selected via this DI. If this DI is OFF, it is in PT mode; If the DI is ON, it is in PR mode.	Level triggered	Dual Mode

**Setting Value: 0x36**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
CAM	E-Cam engaging control (Please refer to the setting of P5-88 U, Z value)	Rising /Falling edge triggered	PR

**Setting Value: 0x37**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
JOGU	When this DI is ON, the motor will JOG in forward direction.	Level triggered	ALL

Setting Value: 0x38			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
JOGD	When this DI is on, the motor will JOG in reverse direction.	Level triggered	ALL

Setting Value: 0x39			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
EV1	Event trigger command #1 (Refer to the setting of P5-98, P5-99)	Rising /Falling edge triggered	PR

Setting Value: 0x3A			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
EV2	Event trigger command #2 (Refer to the setting of P5-98, P5-99)	Rising /Falling edge triggered	PR

Setting Value: 0x3B			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
EV3	Event trigger command #3	Rising /Falling edge triggered	PR

Setting Value: 0x3C			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
EV4	Event trigger command #4	Rising /Falling edge triggered	PR

Setting Value: 0x43, 0x44			
DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
GNUM0 GNUM1	Gear Ratio Selection 0 (Numerator) Gear Ratio Selection 1 (Numerator) GNUM0, GNUM1 	Level triggered	PT

**Setting Value: 0x45**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
INHP	In position mode, when this DI is ON, the external pulse input command is not working. (Note: The function has to be set to DI6 so as to ignore the pulse command)	Level triggered	PT

**Setting Value: 0x46**

DI Name	Function Description of Digital Input (DI)	Trigger Method	Control Mode
STOP	Motor stops	Rising edge triggered	PR

**NOTE**

- 1) 11~17 Single control mode; 18~20 Dual control mode.
- 2) When P2-10 ~ P2-17 is set to 0, DI has no function.

**Table 8.2 Function Description of Digital Output (DO)**

<b>Setting Value: 0x01</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SRDY	When the controlled and main circuit power is applied to the drive, this DO is ON if there is no alarm occurs.	Level triggered	ALL

<b>Setting Value: 0x02</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SON	When the servo is ON, this DO is ON if no alarm occurs.	Level triggered	ALL

<b>Setting Value: 0x03</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
ZSPD	When the motor speed is slower than the setting speed of zero speed (P1-38), this DO is ON.	Level triggered	ALL

<b>Setting Value: 0x04</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
TSPD	When the motor speed is faster than the target speed (P1-39), this DO is ON.	Level triggered	ALL

<b>Setting Value: 0x05</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
TPOS	In position mode, when the deviation pulse number is smaller than the position range (the setting value of P1-54), this DO is ON.	Level triggered	PT, PR

<b>Setting Value: 0x06</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
TQL	When it is in torque limit, this DO is ON.	Level triggered	ALL, except T, Tz

<b>Setting Value: 0x07</b>			
DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
ALRM	When the alarm occurs, this DO is ON. (Except forward / reverse limit, communication error, undervoltage, abnormal fan)	Level triggered	ALL

**Setting Value: 0x08**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
BRKR	<p>When the signal of mechanical brake control is output, adjust the setting of parameter P1-42 and P1-43.</p> <p>The diagram illustrates the relationship between digital signals and motor speed. SON (SON) and BRKR (BRKR) are digital outputs. SON transitions from OFF to ON at MBT1 (P1-42) and returns to OFF at MBT2 (P1-43). BRKR transitions from OFF to ON at MBT1 (P1-42) and returns to OFF at MBT2 (P1-43). Motor Speed ramps up to a constant level and then ramps down to zero at ZSPD (P1-38).</p>	Level triggered	ALL

**Setting Value: 0x09**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
HOME	<p>When homing is completed, it means the position coordinates system is available and this DO is ON.</p> <p>When applying to the power, this DO is OFF. When homing is completed, this DO is ON. During the operation, this DO is ON until the counter overflows (including command or feedback) and the DO becomes OFF.</p> <p>When PR triggers homing command, this DO becomes OFF. After homing, this DO becomes ON.</p>	Level triggered	PR

**Setting Value: 0x0B**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
GTRY	<p>After the gantry function is activated (please refer to the setting of P2-58), this DO is ON, which means the gantry function is enabled. When this DI is OFF, the gantry function is disabled.</p> <p>(Firmware V1.005 sub00 will be available afterwards)</p>	Level triggered	PT · PR

**Setting Value: 0x10**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
OLW	<p>When reaching the overload setting, this DO is ON.</p> <p><math>t_{OL}</math> = Overload allowable time of the servo x Setting value of P1-56, when the overload accumulative time exceeds <math>t_{OL}</math>, it will output pre-overload warning (OLW). However, if the overload accumulative time exceeds the overload allowable time of the servo, it will output pre-overload error (ALRM).</p> <p>For example: The setting value of pre-overload warning is 60% (P1-56=60). When the output average load of the servo drive is 200%, if the output time exceeds 8 seconds, the servo drive will show the overload alarm (ALE06).</p> <p><math>t_{OL}</math> = The output average load of the servo exceeds 200% for 8 seconds x parameter setting value = 8sec x 60% = 4.8sec</p> <p>Result: When the output average load of the servo drive exceeds 200% for 4.8 seconds, this DO is ON. If it exceeds for 8 seconds, then, DO, ALRM is ON.</p>	Level triggered	ALL

**Setting Value: 0x11**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
WARN	Warning output (Forward / reverse limit, communication error, undervoltage, abnormal fan)	Level triggered	ALL

**Setting Value: 0x12**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
OVF	Position Command Overflows	Level triggered	PR

**Setting Value: 0x13**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SNL	Software limit (Reverse limit)	Level triggered	ALL

**Setting Value: 0x14**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SPL	Software limit (Forward limit)	Level triggered	ALL



**Setting Value: 0x15**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
Cmd_OK	Complete PR command and enter into PR mode, this DO is ON. When PR command is executing, this DO is OFF. After completing the command, this DO is ON. When the DO is ON, it means the command is completed, but not finishing motor positioning. Please refer to DO.TPOS.	Level triggered	PR

**Setting Value: 0x16**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
CAP_OK	CAP procedure completed	Level triggered	ALL

**Setting Value: 0x17**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
MC_OK	When DO.Cmd_OK and TPOS are both ON, this DO is ON. Refer to P1-48.	Level triggered	PR

**Setting Value: 0x18**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
CAM_AREA	Master of E-Cam locates in setting area.	Level triggered	PR

**Setting Value: 0x19**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SP_OK	In speed mode, when the deviation between the speed feedback and the command is smaller than the setting value of P1-47 and exceed the setting time of P1-49, this DO is ON. Whenever the deviation exceeds the setting range of P1-47, the time count will be reset.	Level triggered	S / Sz

**Setting Value: 0x30**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_0	Ouput the status of bit 00 of P4-06	Level triggered	ALL

**Setting Value: 0x31**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_1	Ouput the status of bit 01 of P4-06	Level triggered	ALL

**Setting Value: 0x32**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_2	Ouput the status of bit 02 of P4-06	Level triggered	ALL

**Setting Value: 0x33**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_3	Ouput the status of bit 03 of P4-06	Level triggered	ALL

**Setting Value: 0x34**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_4	Ouput the status of bit 04 of P4-06	Level triggered	ALL

**Setting Value: 0x35**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_5	Ouput the status of bit 05 of P4-06	Level triggered	ALL

**Setting Value: 0x36**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_6	Ouput the status of bit 06 of P4-06	Level triggered	ALL

**Setting Value: 0x37**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_7	Ouput the status of bit 07 of P4-06	Level triggered	ALL

**Setting Value: 0x38**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_8	Ouput the status of bit 08 of P4-06	Level triggered	ALL

**Setting Value: 0x39**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_9	Ouput the status of bit 09 of P4-06	Level triggered	ALL

**Setting Value: 0x3A**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_A	Ouput the status of bit 10 of P4-06	Level triggered	ALL

**Setting Value: 0x3B**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_B	Ouput the status of bit 11 of P4-06	Level triggered	ALL

**Setting Value: 0x3C**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_C	Ouput the status of bit 12 of P4-06	Level triggered	ALL

**Setting Value: 0x3D**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_D	Ouput the status of bit 13 of P4-06	Level triggered	ALL

**Setting Value: 0x3E**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_E	Ouput the status of bit 14 of P4-06	Level triggered	ALL

**Setting Value: 0x3F**

DO Name	Function Description of Digital Output (DO)	Trigger Method	Control Mode
SDO_F	Ouput the status of bit 15 of P4-06	Level triggered	ALL

**NOTE**

- 1) When P2-18 ~ P2-22 is set to 0, DO has no function.

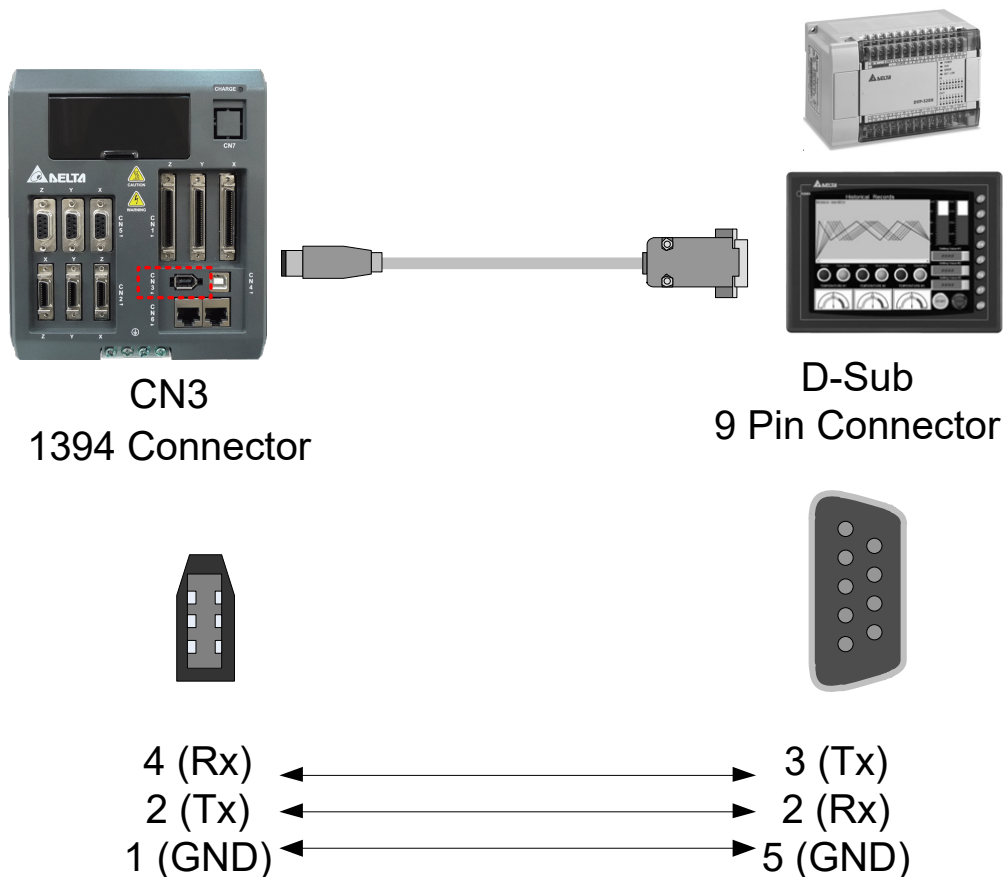
# Chapter 9 Communication

## 9.1 RS-485 / RS-232 Communication Hardware Interface

This servo drive supports the serial communication of RS-485 and RS-232. Communication function enables the servo drive to access and change parameters inside the system. However, RS-485 and RS-232 cannot be used at the same time. Parameter P3-05 can use RS-485 and RS-232 as the communication protocol. Followings are the wiring description.

### RS-232

#### ■ Configuration

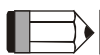
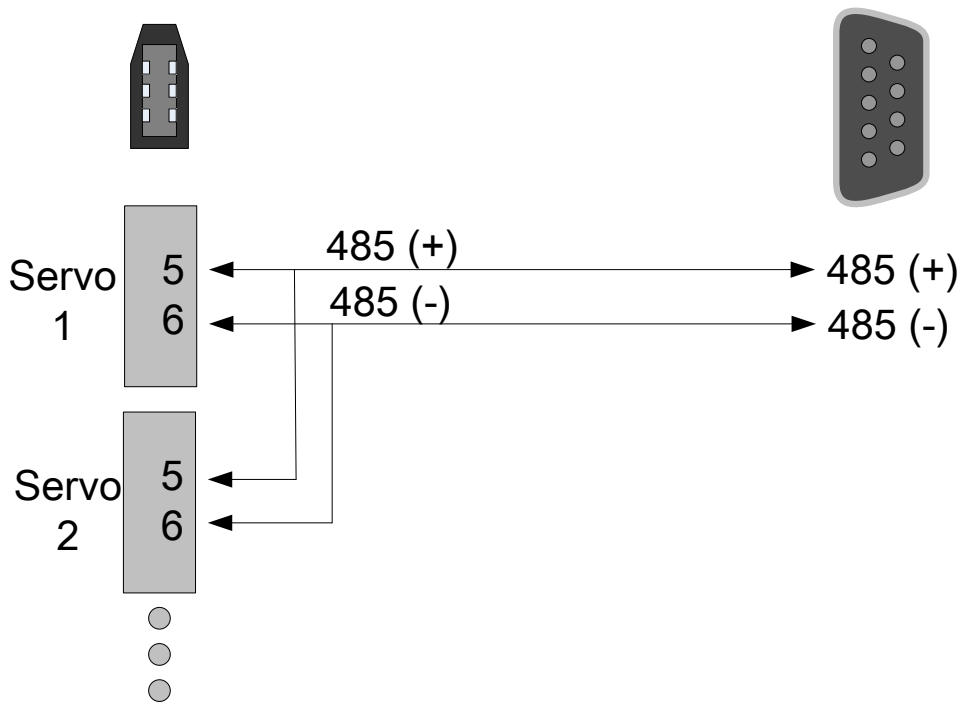
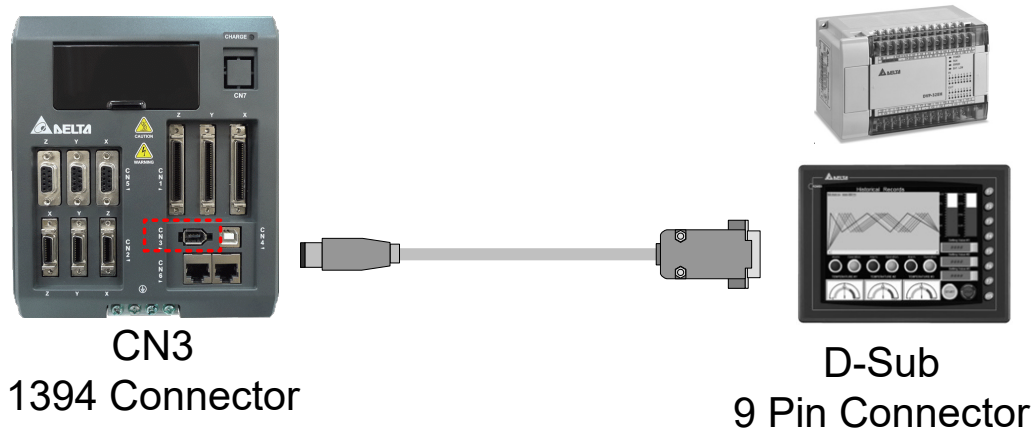


#### NOTE

- 1) 15-meter communication cable is suitable for less interference environment. If the transmission speed is over 38400 bps, the length of communication cable should be shorter than 3 meters so as to ensure the accuracy of transmission.
- 2) Numbers shown in the above diagram represent the pin number of each connector.

RS-485

■ Configuration



**NOTE**

- 1) 100 meters of communication cable is suitable for less interference environment. If the transmission speed is over 38400 bps, the length of communication cable should not longer than 15 meters so as to ensure the accuracy of transmission.
- 2) Numbers shown in the above diagram represent the pin number of each connector.
- 3) Please use the power supply unit whose direct current is over 12 volt.

- 4) Using RS-485 can connect up to 32 servo drives at the same time. REPEATER can be used to connect more servo drives. 127 is the maximum.
- 5) Please refer to Chapter 3.5 for CN3 Pin Definition.

## 9.2 RS-485 / RS-232 Communication Parameters Setting

The following four parameters, P3-00 (Address Setting), P3-01 (Transmission Speed), P3-02 (Communication Protocol) and P3-05 (Communication Mechanism), are essential and must be set for the communication of the servo drive. The rest, such as P3-03 (Communication Error Disposal), P3-04 (Communication Timeout), P3-06 (Control Switch of Digital Input), P3-07 (Communication Response Delay Time) and P3-08 (Monitor Mode) is optional. Please refer to Chapter 8 of this user manual.

Followings are the content of P3-00 and its corresponding address is in the column at rightmost, 0300H ~ 0301H.

P3-00●	ADR	Address Setting		Address: 0300H 0301H
Parameter Attribute :	Parameter for individual axis			Related Section: Section 9.2
Operational Interface :	Panel / Software	Communication		
Default :	0x7C			
Control Mode :	ALL			
Unit :	-			
Range :	0x01 ~ 0x7F			
Data Size :	16 bit			
Format :	HEX			

Settings : The communication address setting is divided into Y, X (hexadecimal):

	0	0	Y	X
Range	-	-	0 ~ 7	0 ~ F

When using RS-232 / RS-485 to communicate, one set of servo drives can only set one address. The duplicate address setting will cause abnormal communication.

In this servo drive, the 3-axis address setting should be unique. The duplicate address will cause abnormal communication.

This address represents the absolute address of the servo drive in communication network. It is also applicable to RS-232 / 485 and CAN bus.

When the communication address setting of MODBUS is set to 0xFF, the servo drive will automatically reply and receive data regardless of the address. However, P3-00 cannot be set to 0xFF.

<b>P3-01</b>	<b>BRT</b>	<b>Transmission Speed</b>		<b>Address: 0302H 0303H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0x0203		
	Control Mode :	ALL		
	Unit :	bps		
	Range :	0x0000 ~ 0x0405		
	Data Size :	16 bit		
	Format :	HEX		

Settings : The setting of transmission speed is divided into Z, Y, X (hexadecimal):

	0	Z	Y	X
Communication port	-	CAN	-	RS-232 / 485
Range	0	0 ~ 4	0	0 ~ 5



- Definition of X setting value
  - 0: 4800
  - 1: 9600
  - 2: 19200
  - 3: 38400
  - 4: 57600
  - 5: 115200
- Definition of Z setting value
  - 0: 125 Kbit / s
  - 1: 250 Kbit / s
  - 2: 500 Kbit / s
  - 3: 750 Kbit / s
  - 4: 1.0 Mbit / s

**NOTE**

- 1) If this parameter is set via CAN, only digit Z can be set and the others remain.
- 2) The communication speed of USB is 1.0 Mbit / s only and is unchangeable.

P3-02	PTL	Communication Protocol	Address: 0304H 0305H
	Parameter Attribute :	Parameter for three axes	
	Operational Interface :	Panel / Software	Communication
	Default :	6	
	Control Mode :	ALL	
	Unit :	-	
	Range :	0 ~ 0x8	
	Data Size :	16 bit	
	Format :	HEX	

Related Section:  
Section 9.2

Settings : The definition of the setting value is as the followings:

- 0: 7, N, 2 (MODBUS, ASCII)
- 1: 7, E, 1 (MODBUS, ASCII)
- 2: 7, O, 1 (MODBUS, ASCII)
- 3: 8, N, 2 (MODBUS, ASCII)
- 4: 8, E, 1 (MODBUS, ASCII)
- 5: 8, O, 1 (MODBUS, ASCII)
- 6: 8, N, 2 (MODBUS, RTU)
- 7: 8, E, 1 (MODBUS, RTU)
- 8: 8, O, 1 (MODBUS, RTU)

<b>P3-03</b>	<b>FLT</b>	<b>Communication Error Disposal</b>		<b>Address: 0306H 0307H</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0 ~ 0x1		
	Data Size :	16 bit		
	Format :	HEX		

Settings : The definition of setting value is as the followings:  
 0: Warning and keeps running  
 1: Warning and decelerates to stop (The deceleration time is set to parameter P5-03.B)

<b>P3-05</b>	<b>CMM</b>	<b>Communication Mechanism</b>		<b>Address: 030AH 030BH</b>
	Parameter Attribute :	Parameter for three axes		Related Section: Section 9.2
	Operational Interface :	Panel / Software	Communication	
	Default :	0		
	Control Mode :	ALL		
	Unit :	-		
	Range :	0x00 ~ 0x01		
	Data Size :	16 bit		
	Format :	HEX		

Settings : Communication port can select one or more than one communications.

- Communication Interface
  - 0: RS232
  - 1: RS485

## 9.3 MODBUS Communication Protocol

There are two modes of MODBUS networks communication, ASCII (American Standard Code for Information Interchange) mode and RTU (Remote Terminal Unit) mode. Users could set the needed communication protocol via parameter P3-02. Apart from these two communication modes, this servo drive also supports function of 03H to access more than one data, 06H to write one character and 10H to write multiple characters. Please refer to the following descriptions.

### ■ Code Description

#### ASCII Mode:

The so-called ASCII mode is using American Standard Code for Information Interchange (ASCII) to transmit the data. Between two stations (Master and Slave) to transmit data 64H, the master will send '6' which represented by 36H of ASCII code and '4' represented by 34H of ASCII code.

ASCII code of digit 0 to 9 and characters A to F is as follows:

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

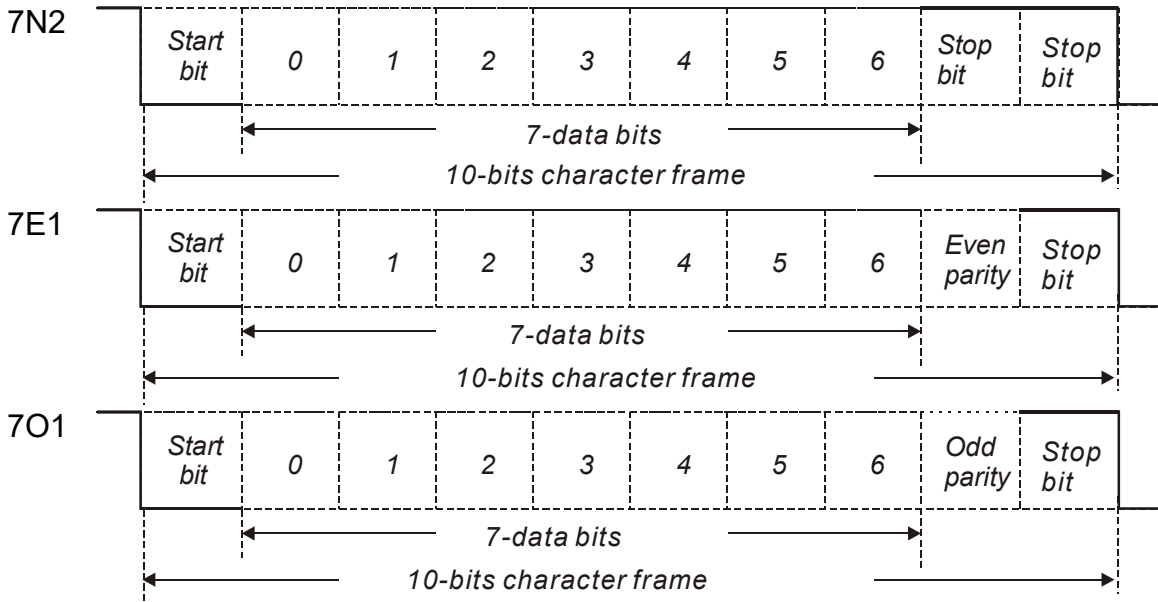
#### RTU Mode:

Every 8-bits of data is constituted by two 4-bits hexadecimal characters. If data 64H is transmitted between two stations, it will be transmitted directly, which is more efficient than ASCII mode.

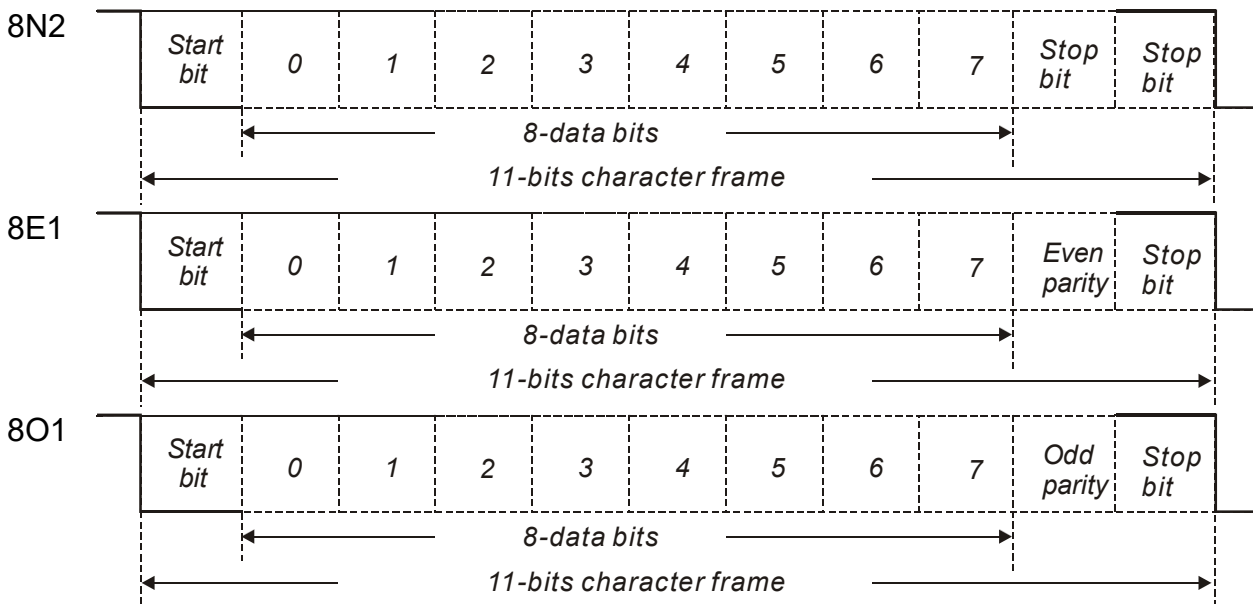
### ■ Character Structure

Characters will be encoded into the following framing and transmitted in serial. The checking method of different bit is as the following.

10 bits character frame (for 7-bits character)



11 bits character frame (for 8-bits character)



## ■ Communication Data Structure

The Data Frame in two different communication modes:

### ASCII mode:

Start	Start character ' : ' (3AH)
Slave Address	Communication address : 1-byte includes 2 ASCII codes
Function	Function code : 1-byte includes 2 ASCII codes
Data (n-1)	Data content : n-word = 2n-byte includes 4n of ASCII code, n<=10
.....	
Data (0)	
LRC	Error checking : 1-byte includes 2 ASCII codes
End 1	End code 1 : (0DH) (CR)
End 0	End code 0 : (0AH) (LF)

The start character of communication in ASCII mode is colon ' : '(ASCII is 3AH) · ADR is the ASCII code of two characters. The end code is CR (Carriage Return) and LF (Line Feed). And the communication address, function code, data content, error checking LRC (Longitudinal Redundancy Check), etc are between the start character and end code.

### RTU mode:

Start	A silent interval which is longer than 10 ms
Slave Address	Communication address : 1-byte
Function	Function code : 1-byte
Data (n-1)	Data content : n-word = 2n-byte, n<=10
.....	
Data (0)	
CRC	Error checking : 1-byte
End 1	A silent interval which is longer than 10 ms

The start of communication in RTU (Remote Terminal Unit) mode is a silent interval. The end of it is another silent interval. The communication address, function code, data content, error checking CRC (Cyclical Redundancy Check), etc are between the start and the end.

**Example 1: function code 03H, access multiple words:**

The Master issues the command to the 1<sup>st</sup> Slave and reads the continuous 2 words starting from the start address 0200H. In response message from the Slave, the content of starting address 0200H is 00B1H and the content of the 2<sup>nd</sup> data address 0201H is 1F40H. The maximum allowable data in one single access is 10. The calculation of LRC and CRC will be described in next chapter.

**ASCII mode:****Command message from the Master:**

Start	':'
Slave Address	'0'
	'1'
Function	'0'
	'3'
Starting data address	'0'
	'2'
	'0'
	'0'
Number of data (In Word)	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'8'
End 1	(0DH) (CR)
End 0	(0AH) (LF)

**Response message from the Slave:**

Start	':'
Slave Address	'0'
	'1'
Function	'0'
	'3'
Number of data (In Byte)	'0'
	'4'
The content of starting address 0200H	'0'
	'0'
	'B'
The content of the 2 <sup>nd</sup> data address 0201H	'1'
	'F'
	'4'
	'0'
LRC Check	'E'
	'8'
End 1	(0DH) (CR)
End 0	(0AH) (LF)

**RTU mode:****Command message from the Master:**

Slave Address	01H
Function	03H
Starting data address	02H (High word)
	00H (High word)
Number of data (In Word)	00H
	02H
CRC Check Low	C5H (Low word)
CRC Check High	B3H (High word)

**Response message from the Slave:**

Slave Address	01H
Function	03H
Number of data (In Byte)	04H
The content of starting address 0200H	00H (High word)
	B1H (Low word)
The content of the 2 <sup>nd</sup> data address 0201H	1FH (High word)
	40H (Low word)
CRC Check Low	A3H (Low word)
CRC Check High	D4H (High word)

Note: Before and after the transmission in RTU mode, 10 ms of silent interval is needed.

**Example 2, function code 06H, write single word:**

The Master issues command to the 1<sup>st</sup> Slave and writes data 0064H to address 0200H. The Slave sends the response message to the Master after the writing is completed. The calculation of LRC and CRC will be described in next chapter.

**ASCII mode:****Command message from the Master:**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘6’
Starting data address	‘0’
	‘2’
	‘0’
Data content	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH) (CR)
End 0	(0AH) (LF)

**Response message from the Slave:**

Start	‘.’
Slave Address	‘0’
	‘1’
Function	‘0’
	‘6’
Starting data address	‘0’
	‘2’
	‘0’
Data content	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH) (CR)
End 0	(0AH) (LF)

**RTU mode:****Command message from the Master:**

Address	01H
Slave Function	06H
Starting data address	02H (High word)
	00H (Low word)
Data content	00H (High word)
	64H (Low word)
CRC Check Low	89H (Low word)
CRC Check High	99H (High word)

**Response message from the Slave:**

Address	01H
Slave Function	06H
Starting data address	02H (High word)
	00H (Low word)
Data content	00H (High word)
	64H (Low word)
CRC Check Low	89H (Low word)
CRC Check High	99H (High word)

Note: Before and after the transmission in RTU mode, 10 ms of silent interval is needed.

**Example 3, function code 10H, write multiple words:**

The Master issues command to the 1<sup>st</sup> Slave and writes 0BB8H and 0000H to the starting address 0112H. That is to say, 0112H is written into 0BB8H and 0113H is written into 0000H. The maximum allowable data in one single access is 10. The Slave sends the response message to the Master after the writing is completed. The calculation of LRC and CRC will be described in next chapter.



**ASCII mode:**

**Command message from the Master:**

Start	‘:’
Slave Address	‘0’
	‘1’
Function	‘1’
	‘0’
Starting data address	‘0’
	‘1’
	‘1’
	‘2’
Number of data (In Word)	‘0’
	‘0’
	‘0’
	‘2’
Number of data (In Byte)	‘0’
	‘4’
The 1 <sup>st</sup> data content	‘0’
	‘B’
	‘B’
The 2 <sup>nd</sup> data content	‘8’
	‘0’
	‘0’
	‘0’
LRC Check	‘1’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

**Response message from the Slave:**

Start	‘:’
Slave Address	‘0’
	‘1’
Function	‘1’
	‘0’
Starting data address	‘0’
	‘1’
	‘1’
	‘2’
Number of data	‘0’
	‘0’
	‘0’
	‘2’
LRC Check	‘D’
	‘A’
End 1	(0DH) (CR)
End 0	(0AH) (LF)

**RTU mode:****Command message from the Master:**

Slave Address	01H
Function	10H
Starting data address	01H (High word)
	12H (Low word)
Number of data (In Word)	00H (High word)
	02H (Low word)
Number of data (In Byte)	04H
The 1 <sup>st</sup> data content	0BH (High word)
	B8H (Low word)
The 2 <sup>nd</sup> data content	00H (High word)
	00H (Low word)
CRC Check Low	FCH (Low word)
CRC Check High	EBH (High word)

**Response message from the Slave:**

Slave Address	01H
Function	10H
Starting data address	01H (High word)
	12H (Low word)
Number of data (In Word)	00H (High word)
	02H (Low word)
CRC Check Low	E0H (Low word)
CRC Check High	31H (High word)

Note: Before and after the transmission in RTU mode, 10 ms of silent interval is needed.

### ■ LRC and CRC transmission error checking

The error checking in ASCII communication mode is LRC (Longitudinal Redundancy Check); CRC (Cyclical Redundancy Check) is for RTU communication mode. The algorithm of both is as the following.

#### LRC (ASCII mode):

Start	'7'
Slave Address	'F'
	'0'
Function	'3'
	'0'
Starting data address	'5'
	'C'
	'4'
	'0'
Number of data	'0'
	'0'
	'1'
	'0'
LRC Check	'B'
	'4'
End 1	(0DH) (CR)
End 0	(0AH) (LF)

The LRC algorithm is: add all byte, round down the carry and take 2' s complement. For example, 7FH + 03H + 05H + C4H + 00H + 01H = 14CH, round down carry 1 and take 4CH.

2's complement of 4CH is B4H.

**CRC (RTU mode):**

**The description of CRC is as the followings:**

Step 1: Load a 16-bits register of FFFFH, which is called **CRC** register.

Step 2: (The low byte of CRC register) XOR (The first byte of command), and save the result in CRC register.

Step 3: Right move one bit. Check the least significant bit (LSB) of CRC register. If the bit is 1, then (CRC register) XOR (A001H).

Step 4: Return to Step 3 until Step 3 has been executed for 8 times. Go to Step 5.

Step 5: Repeat the procedure from Step 2 to Step 4 until all byte is processing. Get the result of CRC value.

**Description: After calculating CRC value, fill in the low word of CRC first in command message, and then fill in the high word of CRC. For example, if the result of CRC algorithm is 3794H, fill in 94H in low word and then 37H in high word.**

ARD	01H
CMD	03H
Starting data address	01H (High word)
	01H (Low word)
Number of data (In Word)	00H (High word)
	02H (Low word)
CRC Check Low	94H (Low word)
CRC Check High	37H (High word)

**Example of CRC program:**

Produce CRC in C language. This function needs two parameters:

```

unsigned char* data;
unsigned char length
This function returns CRC of unsigned integer.
unsigned int crc_chk(unsigned char* data, unsigned char length) {
    int j;
    unsigned int reg_crc=0xFFFF;

    while( length-- ) {
        reg_crc^= *data++;
        for (j=0; j<8; j++ ) {
            if( reg_crc & 0x01 ) { /*LSB(bit 0 ) = 1 */
                reg_crc = (reg_crc >> 1)^0xA001;
            } else {
                reg_crc = (reg_crc>>1);
            }
        }
    }
    return reg_crc;
}

```

Example of personal computer procedure:

```

#include<stdio.h>
#include<dos.h>
#include<conio.h>
#include<process.h>
#define PORT 0x03F8/* the address of COM 1 */
#define THR 0x0000
#define RDR 0x0000
#define BRDL 0x0000
#define IER 0x0001
#define BRDH 0x0001
#define LCR 0x0003
#define MCR 0x0004
#define LSR 0x0005
#define MSR 0x0006
unsigned char rdat[60];
/* read 2 data from address 0200H of ASD with address 1 */
unsigned char tdat[60]={':', '0', '1', '0', '3', '0', '2', '0', '0', '0', '0', '0', '2', 'F', '8', '\r', '\n'};
void main() {
    int i;
    outportb(PORT+MCR,0x08); /* interrupt enable */
    outportb(PORT+IER,0x01); /* interrupt as data in */
    outportb(PORT+LCR,( inportb(PORT+LCR) | 0x80 ) );
    /* the BRDL/BRDH can be access as LCR.b7 == 1 */
    outportb(PORT+BRDL,12);
    outportb(PORT+BRDH,0x00);
    outportb(PORT+LCR,0x06); /* set prorocol
                                <7,E,1> = 1AH, <7,O,1> = 0AH
                                <8,N,2> = 07H <8,E,1> = 1BH

```

```
                <8,O,1> = 0BH                                */
for( I = 0; I<=16; I++ ) {
    while( !(inportb(PORT+LSR) & 0x20) ); /* wait until THR empty */
    outportb(PORT+THR,tdat[I]);          /* send data to THR */
}
I = 0;
while( !kbhit() ) {
    if( inportb(PORT+LSR)&0x01 ) { /* b0==1, read data ready */
        rdat[I++] = inportb(PORT+RDR); /* read data from RDR */
    }
}
}
```

## 9.4 Write-in and Read-out in Communication Parameters

Please refer to Chapter 8, Parameters for all parameter details. And the descriptions of parameters which can be wrote or read through communication are as follows.

Parameters are divided into 8 groups, Group 0: Monitor Parameters, Group 1: Basic Parameters, Group 2: Extension Parameters, Group 3: Communication Parameters, Group 4: Diagnosis Parameters, Group 5: Motion Setting, Group 6: PR Definition and Group 7: PR Definition.

### Write parameters via communication:

Parameters which can be written through communication include:

Group 0, except (P0-00 ~ P0-01), (P0-08 ~ P0-13) and (P0-46)

Group 1 (P1-00 ~ P1-76)

Group 2 (P2-00 ~ P2-67)

Group 3 (P3-00 ~ P3-11)

Group 4, except (P4-00 ~ P4-04) and (P4-08 ~ P4-09)

Group 5 (P5-00 ~ P5-99), except P5-10, P5-16 and P5-76

Group 6 (P6-00 ~ P6-99)

Group 7 (P7-00 ~ P7-27)

### Please note that:

- (P3-01) When change to a new communication speed, the next data will be written in a new transmission speed after setting the new value.
- (P3-02) When change to the new communication protocol, the next data will be written with the new communication protocol after setting the new value.
- (P4-05) JOG controls parameters of the servo. Please refer to Chapter 8, Parameters for the description.
- (P4-06) Force to control output contact. This parameter is for DO (Digital Output) testing. Users can write 1, 2, 4, 8 and 16 to test DO1, DO2 and DO3 respectively. Please write 0 after the test so as to inform the servo drive that the test has been completed.
- (P4-10) Adjustment function selection. Write 20 (= 14H in hexadecimal format) in parameter P2-08 first to enable the adjustment so as to change the value of P4-10.
- (P4-11 ~ P4-21) This parameter is Offset Adjustment. Do not change the setting unless it is necessary. If it is necessary, please write 22 (= 16H, in hexadecimal format) in parameter P2-08 first to enable the function so as to change the value of (P4-11 ~ P4-21)

**Read parameters through communication:**

Parameters can be read through communication include:

Group 0 (P0-00 ~ P0-46)

Group 4 (P4-00 ~ P4-23)

Group 1 (P1-00 ~ P1-76)

Group 5 (P5-00 ~ P5-99)

Group 2 (P2-00 ~ P2-67)

Group 6 (P6-00 ~ P6-99)

Group 3 (P3-00 ~ P3-11)

Group 7 (P7-00 ~ P7-27)



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# Chapter 10 Troubleshooting

## 10.1 Alarm of Servo Drive

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
<b>AL001</b>	Overcurrent	The current of the main circuit is 1.5 times more than the instantaneous current of the motor.	ALM	Servo Off
<b>AL002</b>	Overvoltage	The voltage of the main circuit is higher than the standard voltage.	ALM	Servo Off
<b>AL003</b>	Undervoltage	The voltage of the main circuit is lower than the standard voltage.	WARN	Servo Off
<b>AL004</b>	Motor Combination Error	The drive corresponds to the wrong motor.	ALM	Servo Off
<b>AL005</b>	Regeneration Error	Regeneration control is in error.	ALM	Servo Off
<b>AL006</b>	Overload	The motor and the drive is overload.	ALM	Servo Off
<b>AL007</b>	Overspeed	The control speed of the motor exceeds the normal speed.	ALM	Servo Off
<b>AL008</b>	Abnormal Pulse Command	The input frequency of the pulse command is over the allowable value of the hardware interface.	ALM	Servo Off
<b>AL009</b>	Excessive Deviation of Position Command	The deviation of position command exceeds the allowable setting value.	ALM	Servo Off
<b>AL011</b>	Encoder Error	The encoder produces abnormal pulse.	ALM	Servo Off
<b>AL012</b>	Adjustment Error	When executing electrical adjustment, the adjusted value exceeds the allowable value.	ALM	Servo Off
<b>AL013</b>	Emergency Stop	Press the emergency stop button.	WARN	Servo Off
<b>AL014</b>	Reverse Limit Error	Activate the reverse limit switch.	WARN	Servo On
<b>AL015</b>	Forward Limit Error	Activate the forward limit switch.	WARN	Servo On
<b>AL016</b>	IGBT Overheat	The temperature of IGBT is over high.	ALM	Servo Off

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
<b>AL017</b>	Abnormal EEPROM	It is in error when DSP accesses EEPROM.	ALM	Servo Off
<b>AL018</b>	Abnormal signal output	The encoder output exceeds the rated output frequency.	ALM	Servo Off
<b>AL019</b>	Serial Communication Error	RS-232 / 485 communication is in error.	ALM	Servo Off
<b>AL020</b>	Serial Communication Time Out	RS-232 / 485 communication time out	WARN	Servo On
<b>AL021</b>	Reserved	Reserved		
<b>AL022</b>	Main Circuit Power Lack Phase	Only one single phase is inputted in the main circuit power.	WARN	Servo Off
<b>AL023</b>	Early Warning for Overload	Early warning for overload	WARN	Servo On
<b>AL024</b>	Encoder initial magnetic field error	The magnetic field of the encoder U, V, W signal is in error.	ALM	Servo Off
<b>AL025</b>	The Internal of the Encoder is in Error	The internal memory of the encoder and the internal counter are in error.	ALM	Servo Off
<b>AL026</b>	Unreliable internal data of the encoder	The error of the internal data has been detected for three times continuously.	ALM	Servo Off
<b>AL027</b>	The Internal of the Encoder is in Error	The internal reset of the encoder is in error.	ALM	Servo On
<b>AL028</b>	Encoder Voltage Error or the Internal of the Encoder is in Error	The charging circuit is not removed in the servo drive so the battery voltage becomes higher than the specification ( > 3.8 V) or encoder signal is in error.	ALM	Servo On
<b>AL029</b>	Gray Code Error	The internal address of the encoder is in error.	ALM	Servo On
<b>AL030</b>	Motor Crash Error	The motor crashes the equipment, reaches the torque of P1-57 and exceeds the time set by P1-58.	ALM	Servo Off

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
<b>AL031</b>	Incorrect wiring or disconnection of the motor power line U, V, W	Incorrect wiring or disconnection of the motor power line U, V, W, GND	ALM	Servo Off
<b>AL040</b>	Excessive Deviation of Full Closed-loop Position Control	Excessive deviation of full closed-loop position control	ALM	Servo Off
<b>AL041</b>	Communication of Linear Scale is Breakdown	The communication of linear scale is breakdown.	ALM	Servo Off
<b>AL044</b>	Warning of Servo Drive Function Overload	Warning of servo drive function overload	WARN	Servo On
<b>AL060</b>	The absolute position is lost	Due to battery under voltage or the failure of power supply, the encoder lost the internal record.	WARN	Servo On
<b>AL061</b>	Encoder Under Voltage	The voltage of the absolute encoder is lower than the specification.	WARN	Servo On
<b>AL062</b>	The multi-turn of absolute encoder overflow	The multi-turn of absolute encoder exceeds the maximum range: - 32768 ~ + 32767.	WARN	Servo On
<b>AL067</b>	Encoder Temperature Warning	Encoder temperature exceeds the warning level. (But it is still within the protective range.)	WARN	N / A
<b>AL069</b>	Wrong Motor Type	Incremental motor is not allowed to activate the absolute function.	ALM	Servo Off
<b>AL070</b>	Encoder does not Complete the Command which is Issued by Servo Drive	Servo drive has not completed writing barcode into encoder or the encoder does not complete the command issued by the servo drive.	WARN	Servo Off
<b>AL081</b>	Excessive Deviation between Two Axes of the Gantry	The deviation between the two selected axes of the gantry exceeds the setting value of P2-59.	ALM	Servo Off
<b>AL082</b>	Abnormal Gantry Selection	When enabling gantry function, not select any two axes as gantry operational axes.	ALM	Servo Off

Display	Alarm Name	Alarm Description	Corresponding DO	Servo Status
<b>AL099</b>	DSP Firmware Upgrade	EEPROM has not been reset after upgrading the firmware. The fault can be cleared when firstly set P2-08 to 30. Then set P2-08 to 28. And re-power on the drive.	ALM	Servo Off

## 10.2 Alarm of CANopen Communication

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL111</b>	CANopen SDO receives buffer overflow	SDO Rx Buffer overflow (receives more than two SDOs within 1 millisecond)	NMT: Reset node or 0x6040.Fault Reset	ALM	Servo On
<b>AL112</b>	CANopen PDO receives buffer overflow	PDO Rx Buffer overflow (receives more than two same PDOs of the COBID within 1 millisecond)	Same as above	ALM	Servo On
<b>AL121</b>	Index error occurs when accessing CANopen PDO	The specified Index in the message does not exist.	Same as above	ALM	Servo On
<b>AL122</b>	Sub-Index error occurs when accessing CANopen PDO	The specified Sub-Index in the message does not exist.	Same as above	ALM	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL123</b>	Data Size error occurs when accessing CANopen PDO	The data length in the message does not match to the specified object.	Same as above	ALM	Servo On
<b>AL124</b>	Data range error occurs when accessing CANopen PDO	The data value in the message is over the range of the specified object.	Same as above	ALM	Servo On
<b>AL125</b>	CANopen PDO object is read-only and write-protected	The specified object in the message is write-protected.	Same as above	ALM	Servo On
<b>AL126</b>	CANopen PDO object is not allowed in PDO	The specified object in the message does not support PDO.	Same as above	ALM	Servo On
<b>AL127</b>	CANopen PDO object is write-protected when Servo On	The specified object in the message is write-protected when Servo ON.	Same as above	ALM	Servo On
<b>AL128</b>	Error occurs when reading CANopen PDO object via EEPROM	An error occurs when loading the default value via ROM at start-up. All objects of CAN returns to the default value automatically.	Same as above	ALM	Servo On
<b>AL129</b>	Error occurs when writing CANopen PDO object via EEPROM	An error occurs when saving the current value into ROM.	Same as above	ALM	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL130</b>	The accessing address of EEPROM is out of range when using CANopen PDO object	The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Same as above	ALM	Servo On
<b>AL131</b>	CRC of EEPROM calculation error occurs when using CANopen PDO object	It indicates that the data stored in ROM has been damaged. All objects of CAN will return to the default setting automatically.	Same as above	ALM	Servo On
<b>AL132</b>	Enter the incorrect password when using CANopen PDO object	When entering parameters via CAN, the parameters are password-protected. Users have to decode the password first.	Same as above	ALM	Servo On
<b>AL185</b>	Abnormal CAN Bus hardware	The communication of CAN Bus is breakdown or Error Rx / Tx Counter is over 128.	NMT: Reset node or re-servo on	ALM	Servo On

### 10.3 Alarm of Motion Control

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL201</b>	An error occurs when loading CANopen data	An error occurs when loading data via EEPROM.	DI: ARST, CANopen 0x1011 Restore default parameter	WARN	Servo On
<b>AL207</b>	Parameter group of PR#8 is out of range	The group of PR#8 command source P_Grp exceeds the range.	DI: ARST · CANopen 0x1011 Restore default parameter	WARN	Servo On
<b>AL209</b>	The parameter number of PR#8 is out of range	Parameter number P_Idx of PR#8 command exceeds the range.	DI: ARST · CANopen 0x1011 Restore default parameter	WARN	Servo On
<b>AL213</b>	Write parameters: exceeds the range	Write parameters via PR procedure: the value is over the range.	DI: Alm Reset or P0-01 = 0	WARN	Servo On
<b>AL215</b>	Write parameters: read-only	Write parameters via PR procedure: the parameter is read-only.	DI: Alm Reset or P0-01 = 0	WARN	Servo On
<b>AL217</b>	Write parameters: parameter locked	Write parameters via PR procedure: it is write-protected when the servo is ON or the input data is unreasonable.	Correct the PR command and parameter	WARN	Servo On



Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL219</b>	Write parameters: parameter locked	Write parameters via PR procedure: it is write-protected when the servo is ON or the input data is unreasonable.	Correct the PR command and parameter	WARN	Servo On
<b>AL231</b>	The setting of monitoring item of PR#8 is out of range	The setting of monitoring item of PR#8 Sys_Var exceeds the range.	DI: ARST CANopen 0x1011 Restore default parameter	WARN	Servo On
<b>AL235</b>	PR command overflows	Feedback position counter overflows and executes the absolute positioning command.	NMT: Reset node or 0x6040.Fault Reset	WARN	Servo On
<b>AL245</b>	PR positioning is over time	The execution of positioning command exceeds the time limit.	Same as above	WARN	Servo On
<b>AL249</b>	The number of PR command exceeds the range	The range of PR command is between 0 and 63, or it will exceed the limit.	Same as above	WARN	Servo On
<b>AL261</b>	Index error occurs when accessing CANopen object	The specified Index in the message does not exist.	DI: ARST NMT: Reset node or 0x6040.Fault Reset	WARN	Servo On
<b>AL263</b>	Sub-Index error occurs when accessing CANopen object	The specified Sub-Index in the message does not exist.	Same as above	WARN	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL265</b>	Data Size error occurs when accessing CANopen object	The data length in the message does not match to the specified object.	Same as above	WARN	Servo On
<b>AL267</b>	Data range error occurs when accessing CAN.	The data value in the message is over the range of the specified object.	Same as above	WARN	Servo On
<b>AL269</b>	CANopen object is read-only and write-protected	The specified object in the message is write-protected.	Same as above	WARN	Servo On
<b>AL26b</b>	PDO is not allowed in CANopen object	The specified object in the message does not support PDO.	Same as above	WARN	Servo On
<b>AL26d</b>	CANopen object is write-protected when Servo On	The specified object in the message is write-protected when Servo ON.	Same as above	WARN	Servo On
<b>AL26F</b>	Error occurs when reading CANopen object via EEPROM	An error occurs when loading the default value via ROM at start-up. All objects of CAN returns to the default value automatically.	Same as above	WARN	Servo On
<b>AL271</b>	Error occurs when writing CANopen object via EEPROM	An error occurs when saving the current value into ROM.	Same as above	WARN	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL273</b>	The accessing address of EEPROM is out of range when using CANopen object	The quantity in the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Same as above	WARN	Servo On
<b>AL275</b>	CRC of EEPROM calculation error occurs when using CANopen object	It indicates that the data stored in ROM has been damaged. All CANopen objects will return to the default setting automatically.	Same as above	WARN	Servo On
<b>AL277</b>	Enter the incorrect password when using CANopen object	When entering parameters via CAN, the parameters are password-protected. Users have to decode the password first.	Same as above	WARN	Servo On
<b>AL283</b>	Forward Software Limit	The value of position command is bigger than forward software limit (P5-08).	The fault will be cleared automatically when the motor operates backwards.	WARN	Servo On
<b>AL285</b>	Reverse Software Limit	The value of position command is smaller than reverse software limit (P5-09).	The fault will be cleared automatically when the motor operates backwards.	WARN	Servo On

Display	Alarm Name	Alarm Description	Corrective Actions	Corresponding DO	Servo Status
<b>AL289</b>	Feedback position counter overflows	Feedback position counter overflows.	NMT: Reset node or 0x6040.Fault Reset	WARN	Servo On
<b>AL291</b>	Servo OFF error	Servo OFF when motion command is not completed.	Same as above	WARN	Servo On
<b>AL301</b>	CANopen fails to synchronize	CANopen IP mode fails to synchronize with the controller.	Same as above	WARN	Servo On
<b>AL302</b>	The synchronized signal of CANopen is sent too fast	The synchronized signal, SYNC of CANopen is sent too fast.	Same as above	WARN	Servo On
<b>AL303</b>	The synchronized signal of CANopen is sent too slow	The synchronized signal, SYNC of CANopen has not been received in time.	Same as above	WARN	Servo On
<b>AL304</b>	CANopen IP command is failed	Command cannot be issued in CANopen IP mode.	Same as above	WARN	Servo On
<b>AL305</b>	SYNC Period is in error	CANopen 301 Object 0x1006 Data Error!	Same as above	WARN	Servo On
<b>AL380</b>	Position Deviation Alarm	Please refer to the description of parameter P1-48. After DO.MC_OK ON, DO.MC_OK becomes OFF because DO. TPOS turns OFF.	DI: Alm Reset or P0-01 = 0	WARN	Servo On
<b>AL555</b>	System Failure	DSP processing error		N / A	Do not Switch

**NOTE**

If the alarm occurs and is different from the alarm showed in **Alarm of Servo Drive, Alarm of CANopen Communication** and **Alarm of Motion Control**, please contact with distributors or technical personnel.

## 10.4 Causes and Corrective Actions

### Alarm Display

#### AL001: Overcurrent

Causes	Checking Method	Corrective Actions
The drive output is short-circuit	Check if the wiring between the motor and the drive is correct and see if the wire is short-circuited.	Eliminate short-circuit and avoid metal conductor being exposed.
The motor wiring is in error.	Check if the wiring steps are correct when connecting the motor to the drive.	Rewiring by following the wiring description from the user manual.
IGBT is abnormal.	The temperature of the heat sink is abnormal.	Send the drive back to the distributors or contact with Delta.
The control parameter setting is in error.	Check if the setting value exceeds the default setting.	Setting back to the default setting and then gradually adjust the value.
Unreasonable command	Check if the command doing reasonable acceleration time.	Less steep command used or filter applying to smooth command.

#### AL002: Overvoltage

Causes	Checking Method	Corrective Actions
The input voltage of the main circuit is higher than the rated allowable voltage.	Use the voltmeter to see if the input voltage of the main circuit is within the rated allowable voltage value. (please refer to Chapter 12.1)	Apply to the correct power supply or serial voltage regulator.
Wrong power input (incorrect power system)	Use the voltmeter to see if the power system matches the specification.	Apply to the correct power supply or serial adaptor.
The hardware of the servo drive is damaged.	Use the voltmeter to see if the input voltage of the main circuit is within the rated allowable voltage value but still shows the error.	Send the drive back to the distributors or contact with Delta.

**AL003: Undervoltage**

Causes	Checking Method	Corrective Actions
The input voltage of the main circuit is lower than the rated allowable voltage.	Check if the input voltage wiring of the main circuit is normal.	Re-confirm the voltage wiring.
No power supply for the main circuit.	Use the voltmeter to see if the voltage of the main circuit is normal.	Check the power switch.
Wrong power input (incorrect power system)	Use the voltmeter to see if the power system matches the specification.	Apply to the correct power supply or serial adaptor.

**AL004: Motor Combination Error**

Causes	Checking Method	Corrective Actions
The encoder is damaged.	The encoder is abnormal.	Change the motor.
The encoder is loose.	Check the encoder connector.	Install the motor again.
Motor Combination Error	Connect to the right motor.	Change the motor.

**AL005: Regeneration Error**

Causes	Checking Method	Corrective Actions
Wrong selection of regenerative resistor or the external regenerative resistor is unconnected.	Check the connection of regenerative resistor.	Reconnect the regenerative resistor or calculate the regenerative resistor value. If the alarm does not go off, please send the drive back to the distributor or contact with Delta.
Parameter P1-53 is not set to zero when the regenerative resistor is not in use.	Check if parameter P1-53 of regenerative resistor is set to zero.	Set parameter P1-53 of regenerative resistor to zero when it is not applying.
Wrong parameter setting	Check the setting value of parameter P1-52 and P1-53.	Correctly reset the value of P1-52 and P1-53.

**AL006: Overload**

Causes	Checking Method	Corrective Actions
Over the rated loading of the drive and continuously excessive using	Set parameter P0-02 to 11 and see if the average torque [%] is over 100 % all the time.	Increase the motor capacity or reduce the load.
The setting of the control system parameter is inappropriate.	<ol style="list-style-type: none"> <li>1. Check if there is any mechanical vibration.</li> <li>2. Check if the acceleration / deceleration constant is set too fast.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the gain value of the control circuit.</li> <li>2. Slow down the acceleration / deceleration setting time.</li> </ol>
Wrong wiring of the motor and the encoder.	Check the wiring of U, V, W and the encoder.	Correct wiring
The encoder of the motor is defective.	Send the drive back to the distributors or contact with Delta.	

**AL007: Overspeed**

Causes	Checking Method	Corrective Actions
Unreasonable command	Use the scope to check if the signal of analog voltage is abnormal.	Less steep command used or filter applying to smooth command.
Inappropriate parameter setting	Check if the setting of parameter P2-34 is too small (the condition of over-speed warning).	Correctly set parameter P2-34 (the condition of over-speed warning).

**AL008: Abnormal Pulse Command**

Causes	Checking Method	Corrective Actions
The pulse command frequency is higher than the rated input frequency.	Use the scope to check if the input frequency is over the rated input frequency.	Correctly set the input pulse frequency.

**AL009: Excessive Deviation of Position Command**

Causes	Checking Method	Corrective Actions
Parameter P2-35 is set too small.	Check the setting value of parameter P2-35 (The warning condition of excessive position deviation).	Increase the setting value of P2-35. (The warning condition of excessive position deviation)
The setting of the gain value is too small.	Check if the setting value is appropriate.	Correctly adjust the gain value.
The torque limit is too low.	Check the torque limit value.	Correctly adjust the torque limit value.
Excessive external load	Check the external load.	Reduce the external load or evaluate the motor capacity again.

**AL011: Encoder Error**

Causes	Checking Method	Corrective Actions
Wrong wiring of the encoder	Check if the wiring follows the suggested wiring of the user manual.	Correct wiring.
The encoder is loose.	Check the drive connector of CN2 and encoder.	Install the encoder again.
Bad connection of the encoder	Check if the connection between CN2 of the drive and the encoder of the servo motor is loose.	Reconnect the wiring.
The encoder is damaged.	Check if the motor is damaged.	Change the motor.

**AL012: Adjustment Error**

Causes	Checking Method	Corrective Actions
The analog input contact is incorrectly set back to zero.	Measure if the voltage of the analog input contact is the same as the ground voltage.	Correctly ground the analog input contact.
The detection device is damaged.	Reset the power supply.	If the error still occurs after reset, send the drive back to the distributors or contact with Delta.



**AL013: Emergency Stop**

Causes	Checking Method	Corrective Actions
Press the emergency stop button.	Check if the emergency stop button is enabled.	Activate emergency stop.

**AL014: Reverse Limit Error**

Causes	Checking Method	Corrective Actions
Reverse limit switch is activated.	Check if the limit switch is enabled.	Enable the reverse limit switch.
The servo system is unstable.	Check the control parameter and inertia ratio.	Re-adjust the parameter or evaluate the motor capacity.

**AL015: Forward Limit Error**

Causes	Checking Method	Corrective Actions
Forward limit switch is activated.	Check if the limit switch is enabled.	Enable the forward limit switch.
The servo system is unstable.	Check the control parameter and inertia ratio.	Re-adjust the parameter or evaluate the motor capacity.

**AL016: IGBT Overheat**

Causes	Checking Method	Corrective Actions
Over the rated loading of the drive and continuously excessive using	Check if it is overloading or the motor current is too high.	Increase the motor capacity or reduce the load.
The drive output is short-circuit.	Check the drive output wiring.	Correct the wiring.

**AL017: Abnormal EEPROM**

Causes	Checking Method	Corrective Actions
It is in error when DSP accesses EEPROM.	Press the SHIFT Key on the panel and it shows EXGAB. X = 1, 2, 3 G = group code of the parameter AB = hexadecimal of the parameter If it shows E320A, it means it is parameter P2-10; If it shows E3610, it means it is parameter P6-16. Please check the parameter.	The fault occurs when applying to the power. It means one of the parameters is over the reasonable range. Please re-power on after adjusting.  The fault occurs in normal operation. It means it is in error when writing the parameter. The alarm can be cleared by DI.ARST.
Abnormal hidden parameter	Press the SHIFT Key on the panel and it shows E100X.	The fault occurs in parameter reset. The setting of the drive is wrong. Please set the correct type of the drive.
Data in ROM is damaged.	Press the SHIFT Key on the panel and it shows E0001.	The fault occurs when it is servo-on. Usually it is because the data in ROM is damaged or there is no data in ROM. Please send the drive back to the distributors or contact with Delta.

**AL018: Abnormal Signal Output**

Causes	Checking Method	Corrective Actions
The encoder is in error and cause the abnormal signal output.	Check the fault records (P4-00 ~ P4-05). See if the alarm exists with the encoder error (AL011, AL024, AL025, AL026).	Conduct the corrective actions of AL011, AL024, AL025, AL026.
The output pulse exceeds the hardware allowable range.	Check if the following conditions produce: P1-76 < Motor Speed or $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 > 19.8 \times 10^6$	Correctly set parameter P1-76 and P1-46: P1-76 > Motor Speed or $\frac{\text{Motor Speed}}{60} \times P1-46 \times 4 < 19.8 \times 10^6$

**AL019: Serial Communication Error**

Causes	Checking Method	Corrective Actions
Improper setting of the communication parameter	Check the setting value of communication parameter.	Correctly set the parameter value.
Incorrect communication address	Check the communication address.	Correctly set the communication address.
Incorrect communication value	Check the accessing value.	Correctly set the value.

**AL020: Serial Communication Time Out**

Causes	Checking Method	Corrective Actions
Improper setting of the time-out parameter	Check the parameter setting.	Correctly set the value.
The drive hasn't received the communication command for a long time.	Check if the communication cable is loose or broken.	Correct wiring.

**AL021: Reserved****AL022: Main circuit power leak phase**

Causes	Checking Method	Corrective Actions
The main circuit power is abnormal.	Check if the power cable is loose or there is one single phase input only.	Apply the three-phase power. If it is still abnormal, please send the drive back to the distributors or contact with Delta.

**AL023: Early warning for overload**

Causes	Checking Method	Corrective Actions
Early warning for overload	<ol style="list-style-type: none"> <li>1. Check if it is used in overload condition.</li> <li>2. Check if the value of parameter P1-56 is set to small.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please refer to the corrective actions of AL006.</li> <li>2. Please increase the setting value of parameter P1-56. Or set the value over 100 and deactivate the overload warning function.</li> </ol>

**AL024: Encoder initial magnetic field error**

Causes	Checking Method	Corrective Actions
The initial magnetic field of the encoder is in error (Signal U, V, W of the encoder magnetic field is in error.)	<ol style="list-style-type: none"> <li>1. Check if the servo is properly grounded.</li> <li>2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>3. Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	If the situation is not improving, please send the drive back to the distributors or contact with Delta.

**AL025: The internal of the encoder is in error**

Causes	Checking Method	Corrective Actions
The internal of the encoder is in error. (The internal memory and the internal counter are in error.)	<ol style="list-style-type: none"> <li>1. Check if the servo is properly grounded.</li> <li>2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>3. Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>2. Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>3. Please use shielding mesh.</li> <li>4. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

**AL026: Unreliable internal data of the encoder**

Causes	Checking Method	Corrective Actions
The encoder is in error. (Errors occur in the internal data for three times continuously.)	<ol style="list-style-type: none"> <li>1. Check if the servo is properly grounded.</li> <li>2. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>3. Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>2. Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>3. Please use shielding mesh.</li> <li>4. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

**AL027: The internal of the Encoder is in error**

Causes	Checking Method	Corrective Actions
The internal reset of the encoder is in error.	<ol style="list-style-type: none"> <li>1. Check if the encoder cable is properly connected.</li> <li>2. Check if the power supply is stable.</li> <li>3. Check if the operating temperature is over 95 °C.</li> </ol>	<ol style="list-style-type: none"> <li>1. Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>2. Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>3. Please use shielding mesh.</li> <li>4. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

**AL028: Encoder voltage error or the internal of the encoder is in error**

Causes	Checking Method	Corrective Actions
Battery voltage is too high.	<ol style="list-style-type: none"> <li>1. Check if the charging circuit exists in the servo drive.</li> <li>2. Check if the battery is correctly installed. ( Voltage &gt; 3.8 V).</li> </ol>	<p>Please do the check according to the procedure Over voltage. When corrective actions are done, AL028 will be cleared automatically.</p>
The internal encoder is in error.	<ol style="list-style-type: none"> <li>1. Check if it is the absolute type encoder.</li> <li>2. Check if the servo is properly grounded.</li> <li>3. Check if the encoder cable separates from the power supply or the high-current circuit to avoid the interference.</li> <li>4. Check if the shielding cables are used in the wiring of the encoder.</li> </ol>	<ol style="list-style-type: none"> <li>1. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> <li>2. Please connect the UVW connector (color green) to the heat sink of the servo drive.</li> <li>3. Please check if the encoder cable separates from the power supply or the high-current circuit.</li> <li>4. Please use shielding mesh. If the situation is not improving, please send the drive back to the distributors or contact with Delta.</li> </ol>

**AL029: Gray code error**

Causes	Checking Method	Corrective Actions
The internal address of the encoder is in error.	Re-power on to operate the motor and check if the alarm will occur again.	If the alarm occurs again, please change the encoder.

**AL030: Motor Crash Error**

Causes	Checking Method	Corrective Actions
Motor Crash Error	<ol style="list-style-type: none"> <li>1. Check if P1-57 is enabled.</li> <li>2. Check if P1-57 is set too small and the time of P1-58 is set too short.</li> </ol>	<ol style="list-style-type: none"> <li>1. If it is enabled by mistake, please set P1-57 to zero.</li> <li>2. According to the actual torque setting, if the value is set too small, the alarm will be triggered by mistake. However, if the value is set too big, it will lose the function of protection.</li> </ol>

**AL031: Incorrect wiring of the motor power line U, V, W, GND**

Causes	Checking Method	Corrective Actions
The wiring of U, V, W, of the motor is incorrectly connected or disconnected. ( The switch for cut-off detection is set by P2.065 Bit 9, which default is set to disable )	Check if U, V, W of the motor is incorrectly connected or disconnected.	Follow the user manual to correctly wire U, V, W and make sure it is grounded.

**AL040: Excessive deviation of full closed-loop position control**

Causes	Checking Method	Corrective Actions
Excessive deviation of full closed-loop position control	<ol style="list-style-type: none"> <li>1. Check if P1-73 is set too small.</li> <li>2. Check if the connector is loose or there is any connection problem of other mechanism.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the value of P1-73.</li> <li>2. Check if the connection is well connected.</li> </ol>

**AL041: Communication of linear scale is breakdown**

Causes	Checking Method	Corrective Actions
The communication of linear scale is breakdown.	Check the communication of linear scale.	Check the communication of linear scale again.

**AL044: Warning of Servo Drive function overload**

Causes	Checking Method	Corrective Actions
Warning of Servo Drive function overload	N / A	Set P2-66 Bit 4 to 1 can disable the display of this alarm.

**AL060: The absolute position is lost**

Causes	Checking Method	Corrective Actions
Battery undervoltage	Check if the voltage of battery is lower than 2.8 V.	After changing the battery, conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.
Change the battery when the power is OFF which is controlled by the servo drive.	Do not change or remove the battery power when the power is OFF which is controlled by the servo drive.	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.
After activating the absolute function, the absolute coordinate initialization has not been completed.	<ol style="list-style-type: none"> <li>1. Install the battery.</li> <li>2. Check the wiring between the battery pack and power cable of the servo drive.</li> <li>3. Check the wiring of the encoder.</li> </ol>	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.
Bad connection of the battery power circuit.	<ol style="list-style-type: none"> <li>1. Check the wiring of the encoder.</li> <li>2. Check the wiring between the battery pack and the power cable of the servo drive.</li> </ol>	Connect or repair the wiring of the battery so as to supply the power to the encoder. Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.

**AL061: Encoder under voltage**

Causes	Checking Method	Corrective Actions
The voltage of the absolute encoder is lower than the specification.	<ol style="list-style-type: none"> <li>1. Check if the voltage of the battery on the panel is lower than 3.1 V (tentative specification).</li> <li>2. Check if the voltage of the battery is lower than 3.1 V (tentative specification).</li> </ol>	Change the battery when power is ON which is controlled by the servo drive. After changing the battery, AL061 will be cleared automatically.



**AL062 : The multi-turn of absolute encoder overflows**

Causes	Checking Method	Corrective Actions
The multi-turn of absolute encoder exceeds the maximum range: -32768 ~ +32767.	Check if the operation distance exceeds the range, -32768 ~ +32767, the absolute encoder is able to record.	Conduct homing procedure again. Please refer to the description of absolute coordinate initialization in Chapter 12.

**AL067: Encoder temperature warning**

Causes	Checking Method	Corrective Actions
Encoder temperature exceeds the warning level. (But it is still within the protective range.)	Check if the ventilation devices are normal.	Lower the temperature of the encoder.

**AL069: Wrong motor type**

Causes	Checking Method	Corrective Actions
Incremental motor is not allowed to activate the absolute function.	<ol style="list-style-type: none"> <li>1. Check if the motor is incremental or absolute.</li> <li>2. Check the setting of P2-69.</li> </ol>	If users desire to use absolute function, please choose absolute motor. If not, please set parameter P2-69 to 0.

**AL070: Encoder does not complete the command which is issued by servo drive**

Causes	Checking Method	Corrective Actions
Servo drive has not completely written barcode into encoder or the encoder does not complete the command issued by servo drive.	Check if the wiring is correct or there is any loose connection.	Correct the wiring.

**AL081: Excessive deviation between two axes of the gantry**

Causes	Checking Method	Corrective Actions
The deviation of two selected axes of the gantry exceeds the setting value of P2-59 during operation.	<ol style="list-style-type: none"> <li>1. Check if the value of P2-59 is set too small.</li> <li>2. Check if the connection is loose or there is any connection problem of gantry mechanism.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the value of P2-59.</li> <li>2. Check if the connection is well connected.</li> </ol>

**AL082: Abnormal Gantry selection**

Causes	Checking Method	Corrective Actions
When enabling gantry function, not select any two axes as the operation axis. Then the error occurs.	Check if the value of P2-58 which can operate the two axes of the gantry is correct.	Check the setting of parameter P2-58 again.

**AL099: DSP firmware upgrade**

Causes	Checking Method	Corrective Actions
Upgrade DSP firmware.	Check if the firmware is upgraded.	Firstly set P2-08 to 30. Then set P2-08 to 28, the alarm will be cleared when re-power on.

**AL111: CANopen SDO receives overflow**

Causes	Checking Method	Corrective Actions
SDO Rx Buffer overflow (receives more than two SDOs within 1 ms).	Check if the servo drive receives (sends) more than one SDO within 1ms.	NMT: Reset node or 0x6040.Fault Reset

**AL112: CANopen PDO receives overflow**

Causes	Checking Method	Corrective Actions
PDO Rx Buffer overflow (receives more than two PDOs of COBID within one millisecond).	Check if the servo drive receives (sends) more than one PDO of COBID within 1 ms.	NMT: Reset node or 0x6040.Fault Reset

**AL121: Index error occurs when accessing CANopen PDO**

Causes	Checking Method	Corrective Actions
The specified Index in the message does not exist.	Check if the Entry Index of PDO Mapping is modified when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL122: Sub-Index error occurs when accessing CANopen PDO**

Causes	Checking Method	Corrective Actions
The specified Sub-Index in the message does not exist.	Check if the Entry Sub-index of PDO Mapping is modified when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL123: Data Size error occurs when accessing CANopen PDO**

Causes	Checking Method	Corrective Actions
The data length in the message does not match to the specified object.	Check if the data length of Entry of PDO Mapping is modified when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL124: Data range error occurs when accessing CANopen PDO**

Causes	Checking Method	Corrective Actions
The data value in the message is over the range of the specified object.	Check if the written range is wrong when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL125: CANopen PDO Object is read-only and write-protected**

Causes	Checking Method	Corrective Actions
The specified object in the message is write-protected.	Check if the specified object is read-only when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL126: CANopen PDO Object is not allowed in PDO**

Causes	Checking Method	Corrective Actions
The specified object in the message does not support PDO.	Check if the specified object allows PDO Mapping when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL127: CANopen PDO Object is write-protected when Servo On**

Causes	Checking Method	Corrective Actions
The specified object in the message is write-protected when Servo ON	Check that when PDO is receiving or sending, if the specified object is write-protected when Servo On.	NMT: Reset node or 0x6040.Fault Reset

**AL128: Error occurs when reading CANopen PDO object via EEPROM**

Causes	Checking Method	Corrective Actions
An error occurs when loading the default value via ROM at start-up. All objects of CAN returns to the default value automatically.	When PDO is receiving or sending, check if the error occurs because the specified object reads EEPROM.	NMT: Reset node or 0x6040.Fault Reset

**AL129: Error occurs when writing CANopen PDO into EEPROM**

Causes	Checking Method	Corrective Actions
An error occurs when saving the current value into ROM.	When PDO is receiving or sending, check if the error occurs because the specified object is wrote into EEPROM.	NMT: Reset node or 0x6040.Fault Reset

**AL130: The accessing address of EEPROM is out of range when using CANopen PDO object**

Causes	Checking Method	Corrective Actions
The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	Check that when PDO is receiving or sending, if the specified object enables EEPROM address exceeds the limit.	NMT: Reset node or 0x6040.Fault Reset

**AL131: CRC of EEPROM calculation error occurs when using CANopen PDO object**

Causes	Checking Method	Corrective Actions
It means the data stored in ROM is damaged. All CANopen objects automatically returns to the default value.	Check if the specified object would cause CRC calculation error in EEPROM when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL132: Enter the incorrect password when using CANopen PDO object**

Causes	Checking Method	Corrective Actions
When entering parameters via CAN, parameters are password-protected. Users have to decode the password first.	Check if the specified object enters the wrong password when PDO is receiving or sending.	NMT: Reset node or 0x6040.Fault Reset

**AL185: Abnormal CAN Bus hardware**

Causes	Checking Method	Corrective Actions
Abnormal CAN Bus hardware	<ol style="list-style-type: none"> <li>1. Check if the communication cable of CAN Bus is good.</li> <li>2. Check if the communication quality is good. (It is suggested to use common grounding and shielded cable.)</li> </ol>	NMT: Reset node or re-servo on.

**AL201: An error occurs when loading CANopen data**

Causes	Checking Method	Corrective Actions
An error occurs when loading CANopen data.	<ol style="list-style-type: none"> <li>1. If the alarm is cleared when re-servo on, it means the data error occurs instantaneously when accessing in the previous time.</li> <li>2. If the error still exists after re-servo on, it means the data in EEPROM is damaged. It has to enter the correct value again. The method is as the followings: <ol style="list-style-type: none"> <li>a. If the user desires to enter the default value, it can set P2-08 to 30, 28 or CANopen object as 0x1011.</li> <li>b. If the user desires to enter the current value, it can set CANopen object to 0x1010. (Please refer to CANopen description.)</li> </ol> </li> </ol>	DI: ARST · CANopen 0x1011 Restore default parameter

**AL207: Parameter group of PR#8 is out of range**

Causes	Checking Method	Corrective Actions
The group of PR#8 command source, P_Grp exceeds the range.	Writing parameter via PR procedure: The parameter group of command source exceeds the range.	DI: ARST, CANopen 0x1011 Restore default parameter.

**AL209: Parameter number is out of range**

Causes	Checking Method	Corrective Actions
Parameter number P_Idx of PR#8 command exceeds the range.	Writing parameter via PR procedure: The parameter number of command source exceeds the range.	DI: ARST, CANopen 0x1011 Restore default parameter.

**AL213 ~ AL219: An error occurs when writing parameter via PR**

Causes	Checking Method	Corrective Actions
PR commands TYPE 8 Error occurs when writing parameters.	AL213: parameter exceeds the range AL215: the parameter is read-only	DI: Alm Reset or P0-01 = 0
	AL217: Servo ON or invalid value AL219: Servo ON or invalid value	Re-adjust PR command and parameters.

**AL231: The setting of monitoring item of PR#8 is out of range**

Causes	Checking Method	Corrective Actions
The setting of monitoring item of PR#8, Sys_Var exceeds the range.	Writing parameter via PR procedure: The monitor item number of command source exceeds the range.	DI: ARST, CANopen 0x1011 Restore default parameter.

**AL235: PR command overflows**

Causes	Checking Method	Corrective Actions
PR command error	PR mode continuously operates in one direction and causes feedback register overflows. And the coordinate system cannot reflect the correct position. If issuing the absolute positioning command (except incremental) at this time, the error will occur.	NMT: Reset node or 0x6040.Fault Reset

**AL245: PR positioning is over time**

Causes	Checking Method	Corrective Actions
PR positioning is over time.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL249: The number of PR command exceeds the range**

Causes	Checking Method	Corrective Actions
The number of PR command exceeds the range.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL261: Index error occurs when accessing CANopen object**

Causes	Checking Method	Corrective Actions
The specified Index in the message does not exist.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL263: Sub-Index error occurs when accessing CANopen object**

Causes	Checking Method	Corrective Actions
The specified Sub-Index in the message does not exist.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL265: Data size error occurs when accessing CANopen object**

Causes	Checking Method	Corrective Actions
The data length in the message does not match to the specified object.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL267: Data range error occurs when accessing CANopen object**

Causes	Checking Method	Corrective Actions
The data in the message is over the range of the specified object.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL269: CANopen object is read-only and write-protected**

Causes	Checking Method	Corrective Actions
The specified object in the message is write-protected.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL26b: CANopen PDO Object is not allowed in PDO**

Causes	Checking Method	Corrective Actions
The specified object in the message does not support PDO.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset



**AL26d: CANopen object is write-protected when Servo On**

Causes	Checking Method	Corrective Actions
The specified object in the message is write-protected when Servo ON.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL26F: Error occurs when reading CANopen object via EEPROM**

Causes	Checking Method	Corrective Actions
An error occurs when loading the default value via ROM at start-up. All objects of CAN returns to the default value automatically.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL271: Error occurs when writing CANopen object via EEPROM**

Causes	Checking Method	Corrective Actions
An error occurs when saving the current value into ROM.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL273: The accessing address of EEPROM is out of range when using CANopen object**

Causes	Checking Method	Corrective Actions
The quantity of the data inside ROM is over the planned space. It is probably because the software has been updated. The data inside ROM is stored by the old version. Thus, it cannot be used.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL275: CRC of EEPROM calculation error occurs when using CANopen object**

Causes	Checking Method	Corrective Actions
It indicates that the data stored in ROM has been damaged. All objects of CAN will return to the default settings automatically.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL277: Enter the incorrect password when using CANopen object**

Causes	Checking Method	Corrective Actions
When entering parameters via CAN, the parameters are password-protected. Users have to decode the password first.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL283: Forward Software Limit**

Causes	Checking Method	Corrective Actions
Forward Software Limit	Forward Software Limit is determined by the position command, not the actual feedback position. It is because the command will arrive first and then the feedback. When the protection function is activated, the actual position might not over the limit. Therefore, setting an appropriate decelerating time could satisfy the demand. Please refer to the description of parameter P5-03.	NMT: Reset node or 0x6040.Fault Reset

**AL285: Reverse Software Limit**

Causes	Checking Method	Corrective Actions
Reverse Software Limit	Reverse Software Limit is determined by the position command, not the actual feedback position. It is because the command will arrive first and then the feedback. When the protection function is activated, the actual position might not over the limit. Therefore, setting an appropriate decelerating time could satisfy the demand. Please refer to the description of parameter P5-03.	NMT: Reset node or 0x6040.Fault Reset

**AL289: Feedback position counter overflows**

Causes	Checking Method	Corrective Actions
Feedback position counter overflows.	This alarm will not occur at the moment. If it does, please contact the distributors.	NMT: Reset node or 0x6040.Fault Reset

**AL291: Servo OFF Error**

Causes	Checking Method	Corrective Actions
Servo OFF error	<ol style="list-style-type: none"> <li>1. Check if the wiring if DI.SERVO ON is correct.</li> <li>2. Check if the controller servo on the drive too early.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

**AL301: CANopen fails to synchronize**

Causes	Checking Method	Corrective Actions
CANopen fails to synchronize.	<ol style="list-style-type: none"> <li>1. Check if the communication quality of the circuit is bad.</li> <li>2. Check if the controller sends SYNC signal successfully.</li> <li>3. Check if the setting of P3-09 is reasonable. (It is better to use the default value)</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

**AL302: The synchronized signal of CANopen is sent too fast**

Causes	Checking Method	Corrective Actions
The synchronized signal of CANopen is sent too fast.	<ol style="list-style-type: none"> <li>1. Check if synchronized cycle 0x1006 is the same as the setting of controller.</li> <li>2. Check if the setting of P3-09 is reasonable. (It is better to use the default value.)</li> <li>3. Check if the order of controller is incorrect.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

**AL303: The synchronized signal of CANopen is sent too slow**

Causes	Checking Method	Corrective Actions
The synchronized signal of CANopen is sent too slow.	<ol style="list-style-type: none"> <li>1. Check if the communication quality of the circuit is bad.</li> <li>2. Check if synchronized cycle 0x1006 is the same as the setting of controller.</li> <li>3. Check if the setting of P3-09 is reasonable. (It is better to use the default value.)</li> <li>4. Check if the order of controller is incorrect.</li> </ol>	NMT: Reset node or 0x6040.Fault Reset

**AL304: CANopen IP command fails**

Causes	Checking Method	Corrective Actions
CANopen IP command fails.	The calculating time of IP mode takes too long. Please disable USB monitoring function.	NMT: Reset node or 0x6040.Fault Reset

**AL305: SYNC Period is in error**

Causes	Checking Method	Corrective Actions
SYNC Period is in error.	Examine the content of 0x1006.If it is smaller than or equals to 0, the alarm will occur.	NMT: Reset node or 0x6040.Fault Reset

**AL380: Position Deviation Alarm**

Causes	Checking Method	Corrective Actions
DO.MC_OK is ON and becomes OFF.	Please refer to the description of parameter P1-48. After DO.MC_OK ON, DO.MC_OK becomes OFF because DO.TPOS turns OFF. The position of the motor might be deviated by the external force after positioning. This alarm can be cleared by P1-48.Y = 0.	DI : Alm Reset or P0-01 = 0

**AL555: System Failure**

Causes	Checking Method	Corrective Actions
DSP processing error	N / A	If AL555 occurs, please do not switch and send the drive back to the distributor or contact with Delta.

## 10.5 Corrective Actions after the Alarm Occurs

<b>AL001</b>	: Overcurrent	Turn DI.ARST on to clear the alarm.
<b>AL002</b>	: Overvoltage	Turn D.ARST on to clear the alarm.
<b>AL003</b>	: Undervoltage	The alarm can be cleared after the voltage returns to normal.
<b>AL004</b>	: The magnetic field of the motor is abnormal.	The alarm can be cleared after re-power on.
<b>AL005</b>	: Regeneration error	Turn DI.ARST on to clear the alarm.
<b>AL006</b>	: Overload	Turn DI.ARST on to clear the alarm.
<b>AL007</b>	: Excessive speed deviation	Turn DI.ARST on to clear the alarm.
<b>AL008</b>	: Abnormal pulse command	Turn DI.ARST on to clear the alarm.
<b>AL009</b>	: Excessive deviation of position control	Turn DI.ARST on to clear the alarm.
<b>AL011</b>	: Encoder error	The alarm can be cleared after re-power on.
<b>AL012</b>	: Adjustment error	The alarm can be cleared when removing CN1 wiring and execute auto adjustment.
<b>AL013</b>	: Emergency stop	The alarm can be cleared automatically after turning DI.EMGS off.
<b>AL014</b>	: Reverse Limit Error	Turn DI.ARST on or Servo Off to clear the alarm. The alarm also can be cleared when the motor operates backwards.
<b>AL015</b>	: Forward Limit Error	Turn DI.ARST on or Servo Off to clear the alarm. The alarm also can be cleared when the motor operates backwards.
<b>AL016</b>	: The temperature of IGBT is abnormal.	Turn DI.ARST on to clear the alarm.
<b>AL017</b>	: Abnormal EEPROM	If the alarm occurs, then parameter reset is a must. And re-servo on again. If it happens during the operation, please turn DI.ARST on to clear the alarm.
<b>AL018</b>	: Abnormal signal output	Turn DI.ARST on to clear the alarm.

<b>AL019</b>	: Serial Communication Error	Turn DI.ARST on to clear the alarm.
<b>AL020</b>	: Serial Communication Time Out	Turn DI.ARST on to clear the alarm.
<b>AL022</b>	: Main circuit power leak phase	Turn DI.ARST on to clear the alarm.
<b>AL023</b>	: Early warning for overload	Turn DI.ARST on to clear the alarm.
<b>AL024</b>	: Encoder initial magnetic field error	The alarm can be cleared after re-power on.
<b>AL025</b>	: The internal of the encoder is in error.	The alarm can be cleared after re-power on.
<b>AL026</b>	: The encoder is in error.	The alarm can be cleared after re-power on.
<b>AL030</b>	: Motor Crash Error	Turn DI.ARST on to clear the alarm.
<b>AL031</b>	: Incorrect wiring or disconnection of the motor power line U, V, W.	The alarm can be cleared after re-power on.
<b>AL040</b>	: Excessive deviation of full closed-loop position control	Turn DI.ARST on to clear the alarm.
<b>AL041</b>	: The communication of linear scale is breakdown.	Turn DI.ARST on to clear the alarm.
<b>AL081</b>	: Excessive deviation between two axes of the gantry	Turn DI.ARST on to clear the alarm.
<b>AL082</b>	: Gantry selection is in error.	Turn DI.ARST on to clear the alarm.
<b>AL099</b>	: DSP firmware upgrade	Firstly set P2-08 to 30. Then set it to 28. And the alarm will be cleared after re-power on.
<b>AL111</b>	: CANopen SDO receives buffer overflow.	NMT: Reset node or 0x6040.Fault Reset
<b>AL112</b>	: CANopen PDO receives buffer overflow.	NMT: Reset node or 0x6040.Fault Reset
<b>AL121</b>	: Index error occurs when accessing CANopen PDO.	NMT: Reset node or 0x6040.Fault Reset
<b>AL122</b>	: Sub-Index error occurs when accessing CANopen PDO.	NMT: Reset node or 0x6040.Fault Reset
<b>AL123</b>	: Data Size error occurs when accessing CANopen PDO.	NMT: Reset node or 0x6040.Fault Reset
<b>AL124</b>	: Data range error occurs when accessing CANopen PDO.	NMT: Reset node or 0x6040.Fault Reset
<b>AL125</b>	: CANopen PDO object is read-only and write-protected.	NMT: Reset node or 0x6040.Fault Reset

<b>AL126</b>	: CANopen PDO object is not allowed in PDO.	NMT: Reset node or 0x6040.Fault Reset
<b>AL127</b>	: CANopen PDO object is write-protected when Servo On.	NMT: Reset node or 0x6040.Fault Reset
<b>AL128</b>	: Error occurs when reading CANopen PDO object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
<b>AL129</b>	: Error occurs when writing CANopen PDO object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
<b>AL130</b>	: The accessing address of EEPROM is out of range when using CANopen PDO object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL131</b>	: CRC of EEPROM calculation error occurs when using CANopen PDO object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL132</b>	: Enter the incorrect password when using CANopen PDO object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL185</b>	: Abnormal CAN Bus hardware	NMT: Reset node or re-servo on
<b>AL201</b>	: An error occurs when loading CANopen data.	Turn DI.ARST on to clear the alarm. CANopen 0x1011 Restore default parameter
<b>AL213</b>	: An error occurs when writing parameter via PR : exceeds the range	DI.Alm Reset or P0-01 = 0
<b>AL215</b>	: An error occurs when writing parameter via PR : read-only	DI.Alm Reset or P0-01 = 0
<b>AL217</b>	: An error occurs when writing parameter via PR : parameter locked	Re-adjust PR command and parameter.
<b>AL219</b>	: An error occurs when writing parameter via PR : parameter locked	Re-adjust PR command and parameter.
<b>AL235</b>	: PR command overflows.	NMT: Reset node or 0x6040.Fault Reset
<b>AL245</b>	: PR positioning is over time.	NMT: Reset node or 0x6040.Fault Reset
<b>AL249</b>	: The number PR command exceeds the range.	NMT: Reset node or 0x6040.Fault Reset
<b>AL261</b>	: Index error occurs when accessing CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL263</b>	: Sub-Index error occurs when accessing CANopen object.	NMT: Reset node or 0x6040.Fault Reset



<b>AL265</b>	: Data Size error occurs when accessing CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL267</b>	: Data range error occurs when accessing CAN.	NMT: Reset node or 0x6040.Fault Reset
<b>AL269</b>	: CANopen object is read-only and write-protected.	NMT: Reset node or 0x6040.Fault Reset
<b>AL26b</b>	: PDO is not allowed in CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL26d</b>	: CANopen object is write-protected when Servo On.	NMT: Reset node or 0x6040.Fault Reset
<b>AL26F</b>	: Error occurs when reading CANopen object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
<b>AL271</b>	: Error occurs when writing CANopen object via EEPROM.	NMT: Reset node or 0x6040.Fault Reset
<b>AL273</b>	: The accessing address of EEPROM is out of range when using CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL275</b>	: CRC of EEPROM calculation error occurs when using CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL277</b>	: Enter the incorrect password when using CANopen object.	NMT: Reset node or 0x6040.Fault Reset
<b>AL283</b>	: Forward Software Limit	NMT: Reset node or 0x6040.Fault Reset
<b>AL285</b>	: Reverse Software Limit	NMT: Reset node or 0x6040.Fault Reset
<b>AL289</b>	: Feedback position counter overflows	NMT: Reset node or 0x6040.Fault Reset
<b>AL291</b>	: Servo Off error	NMT: Reset node or 0x6040.Fault Reset
<b>AL301</b>	: CANopen fails to synchronize.	NMT: Reset node or 0x6040.Fault Reset
<b>AL302</b>	: The synchronized signal of CANopen is sent too fast.	NMT: Reset node or 0x6040.Fault Reset

<b>AL303</b>	: The synchronized signal of CANopen is sent too slow.	NMT: Reset node or 0x6040.Fault Reset
<b>AL304</b>	: CANopen IP command is failed.	NMT: Reset node or 0x6040.Fault Reset
<b>AL305</b>	: SYNC Period is in error.	NMT: Reset node or 0x6040.Fault Reset
<b>AL380</b>	: Position Deviation Alarm	DI.Alm Reset or P0-01 = 0
<b>AL555</b>	: DSP processing error	N / A


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# Chapter 11 Specifications

## 11.1 Specifications of Servo Drive (ASDA-M Series)

ASD-M Series		750W	1.5KW
		07	15
Power	Phase / Voltage	Three phase or single phase 220 VAC	
	Permissible voltage	Single phase / Three phase: 200 ~ 230 VAC, -15 % ~ 10 %	
	Input Current (3PH) (Arms)	9.3	18.6
	Input Current (1PH) (Arms)	17.8	33.3
	Continuous output current (Arms)	5.1	8.3
Cooling method		Fan cooling	
Encoder resolution / Feedback resolution		20-bit (1280000 p / rev)	
Main circuit control		SVPWM Control	
Control mode		Manual / Auto	
Regenerative Resistor		Built-in	
Position control mode	Max. input pulse frequency	Transmitted by differential: 500 K / 4 Mpps, transmitted by open-collector: 200 Kpps	
	Pulse type	Pulse + symbol ; A phase + B phase; CCW pulse + CW pulse	
	Command source	External pulse / Register	
	Smoothing strategy	Low-pass and P-curve filter	
	E-gear ratio	E-gear ratio: N / M time, limitation: (1 / 50 < N / M < 25600) N: 1 ~ 32767 / M: 1 : 32767	
	Torque limit	Parameter settings	
	Feed forward compensation	Parameter settings	
Speed control mode	Analog command input	0 ~ ±10 VDC	0 ~ ±10 VDC
		10 KΩ	10 KΩ
		2.2 us	2.2 us
	Speed control range*1	1 : 5000	
	Command source	External analog command / Register	
	Smoothing strategy	Low-pass and S-curve filter	
	Torque limit	Via parameter setting or analog input	
	Bandwidth	Max. 1 kHz	
	Speed accuracy*2	The load fluctuation (0 ~ 100 %) is 0.01 % The power fluctuation (±10 %) is 0.01 % The ambient temperature fluctuation (0 ~ 50 °C) is 0.01 %	

ASD-M Series			750W	1.5W
			07	15
Torque control mode	Analog command input	Voltage range	0 ~ ±10 V <sub>DC</sub>	
		Input resistance	10 KΩ	
		Time constant	2.2 us	
	Command source		External analog command / Register	
	Smoothing strategy		Low-pass filter	
	Speed limit		Via parameter setting or analog input	
Analog monitor output			The monitor signal which can be set via parameters (Output voltage range: ±8 V)	
Digital Input / Output		Input	Servo on, Fault reset, Gain switch, Pulse clear, Zero clamp, Command input reverse control, Internal position command trigger, Torque limit, Speed limit, Internal position command selection, Motor stop, Speed command selection, Speed / position mode switching, Speed / torque mode switching, Torque / position mode switching, Pt / Pr command switching, Emergency stop, Positive / negative limit, Original point, Forward / reverse operation torque limit, Homing activated, E-CAM engage, Forward / reverse JOG input, Event trigger, E-gear N selection, Pulse input prohibition	
		Output	A, B, Z Line Driver output Servo on, Servo ready, Zero speed, Target speed reached, Target position reached, torque limiting, Servo alarm, Mechanical brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software negative limit, Software positive limit, Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-CAM	
Protective function			Over current, Overvoltage, Undervoltage, Overheat, Regeneration error, Overload, Excessive speed deviation, Excessive position deviation, Encoder error, Adjustment error, Emergency stop, Negative / positive limit error, Excessive deviation of full-closed loop control, Serial communication error, Rst leak phase, Serial communication timeout, Short-circuit protection of terminal U, V, W and CN1, CN2, CN3	
Communication interface			RS-232 / RS-485 / CANopen / USB	
Environment	Installation site		Indoors (avoid the direct sunlight), no corrosive fog (avoid fume, flammable gas and dust)	
	Altitude		Elevation under 1000 M	
	Atmospheric pressure		86 kPa ~ 106 kPa	
	Operating temperature		0 °C ~ 55 °C (If the temperature is over 45 °C, forced air circulation is needed.)	
	Storage temperature		-20 °C ~ 65 °C	
	Humidity		Under 0 ~ 90 % RH (non-condensing)	
	Vibrating		Under 20 Hz, 9.80665 m / s <sup>2</sup> (1 G), 20 ~ 50 Hz 5.88 m / s <sup>2</sup> (0.6 G)	
	IP rating		IP20	
Power system			TN system*3	

ASD-M Series		750W	1.5W
		07	15
	Approvals	IEC / EN 61800-5-1, UL 508C, C-tick 	


Note:

- \*1 When it is in rated load, the speed ratio is: the minimum speed (smooth operation) / rated speed.
- \*2 When the command is the rated speed, the velocity correction ratio is: (rotational speed with no load – rotational speed with full load) / rated speed.
- \*3 TN system: The neutral point of the power system connects to the ground directly. The exposed metal components connect to the ground via the protective earth conductor.

## 11.2 Specifications of Servo Motor (ECMA Series)

### Low inertia series

ECMA	C104	C△04	C△06		C△08		C△09		C△10
	0F	01	02	04□S	04	07	07	10	10
Rated power (kW)	0.05	0.1	0.2	0.4	0.4	0.75	0.75	1.0	1.0
Rated torque (N-m)*1	0.159	0.32	0.64	1.27	1.27	2.39	2.39	3.18	3.18
Max. torque (N-m)	0.477	0.96	1.92	3.82	3.82	7.16	7.14	8.78	9.54
Rated speed (r / min)	3000						3000		3000
Max. speed (r / min)	5000						3000		5000
Rated current (A)	0.69	0.90	1.55	2.60	2.60	5.10	3.66	4.25	7.30
Max. instantaneous current (A)	2.05	2.70	4.65	7.80	7.80	15.3	11	12.37	21.9
Max. power per second (kW / s)	12.27	27.7	22.4	57.6	24.0	50.4	29.6	38.6	38.1
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	0.0206	0.037	0.177	0.277	0.68	1.13	1.93	2.62	2.65
Mechanical constant (ms)	1.14	0.75	0.80	0.53	0.74	0.63	1.72	1.20	0.74
Torque constant – KT(N-m / A)	0.23	0.36	0.41	0.49	0.49	0.47	0.65	0.75	0.44
Voltage constant – KE (mV / (r / min))	9.8	13.6	16.0	17.4	18.5	17.2	24.2	27.5	16.8
Armature resistance (Ohm)	12.7	9.30	2.79	1.55	0.93	0.42	1.34	0.897	0.20
Armature inductance (mH)	26	24.0	12.07	6.71	7.39	3.53	7.55	5.7	1.81
Electric constant (ms)	2.05	2.58	4.30	4.30	7.96	8.36	5.66	6.35	9.30
Insulation class	Class A (UL), Class B (CE)								
Insulation resistance	> 100 MΩ · DC 500 V								
Insulation strength	1.8 k Vac, 1 sec								
Weight – without brake (kg)	0.42	0.5	1.2	1.6	2.1	3.0	2.9	3.8	4.3
Weight – with brake (kg)	--	0.8	1.5	2.0	2.9	3.8	3.69	5.5	4.7
Radial max. loading (N)	78.4	78.4	196	196	245	245	245	245	490
Axial max. loading (N)	39.2	39.2	68	68	98	98	98	98	98
Max. power per second (kW / s) (with brake)	--	25.6	21.3	53.8	22.1	48.4	29.3	37.9	30.4
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> ) (with brake)	--	0.04	0.19	0.30	0.73	1.18	1.95	2.67	3.33
Mechanical constant (ms) (with brake)	--	0.81	0.85	0.57	0.78	0.65	1.74	1.22	0.93
Brake holding torque [Nt-m (min)]*2	--	0.3	1.3	1.3	2.5	2.5	2.5	2.5	8.0
Brake power consumption (at 20 °C) [W]	--	7.3	6.5	6.5	8.2	8.2	8.2	8.2	18.7
Brake release time [ms (Max)]	--	5	10	10	10	10	10	10	10

ECMA	C104	C△04	C△06		C△08		C△09		C△10
	0F	01	02	04□S	04	07	07	10	10
Brake pull-in time [ms (Max)]	--	25	70	70	70	70	70	70	70
Vibration grade (μm)	15								
Operating temperature (°C)	0 °C ~ 40 °C								
Storage temperature (°C)	-10 °C ~ 80 °C								
Operating humidity	20 ~ 90 % RH (non-condensing)								
Storage humidity	20 ~ 90 % RH (non-condensing)								
Vibration capacity	2.5 G								
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)								
Approvals									


## Note:

- \*1 The rated torque is the continuous permissible torque between 0 ~ 40 °C operating temperature which is suitable for the following heat sink dimension.
- ECMA-\_\_ 04 / 06 / 08 : 250 mm x 250 mm x 6 mm
- ECMA-\_\_ 10 : 300 mm x 300 mm x 12 mm
- ECMA-\_\_ 13 : 400 mm x 400 mm x 20 mm
- Material: Aluminum – F40, F60, F80, F100, F130
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.



**Medium / High inertia series (ECMA-E1)**

ECMA	E $\Delta$ 13			G $\Delta$ 13			F $\Delta$ 13	
	05	10	15	03	06	09	08	13
Rated power (kW)	0.5	1.0	1.5	0.3	0.6	0.9	0.85	1.3
Rated torque (N-m)* <sup>1</sup>	2.39	4.77	7.16	2.86	5.73	8.59	5.41	8.34
Max. torque (N-m)	7.16	14.3	21.48	8.59	17.19	21.48	13.8	23.3
Rated speed (r / min)	2000			1000			1500	
Max. speed (r / min)	3000			2000			3000	
Rated current (A)	2.9	5.6	8.3	2.5	4.8	7.5	7.1	12.6
Max. instantaneous current (A)	8.7	16.8	24.9	7.5	14.4	22.5	19.4	38.6
Max. power per second (kW / s)	7.0	27.1	45.9	10.0	39.0	66.0	21.52	34.78
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	8.17	8.41	11.18	8.17	8.41	11.18	13.6	20
Mechanical constant (ms)	1.91	1.51	1.10	1.84	1.40	1.06	2.43	1.62
Torque constant – KT(N-m / A)	0.83	0.85	0.87	1.15	1.19	1.15	0.76	0.66
Voltage constant – KE (mV / (r / min))	30.9	31.9	31.8	42.5	43.8	41.6	29.2	24.2
Armature resistance (Ohm)	0.57	0.47	0.26	1.06	0.82	0.43	0.38	0.124
Armature inductance (mH)	7.39	5.99	4.01	14.29	11.12	6.97	4.77	1.7
Electric constant (ms)	12.96	12.88	15.31	13.55	13.50	16.06	12.55	13.71
Insulation class	Class A (UL), Class B (CE)							
Insulation resistance	> 100 M $\Omega$ , DC 500 V							
Insulation strength	1.8 k Vac,1 sec							
Weight – without brake (kg)	6.8	7.0	7.5	6.8	7.0	7.5	8.6	9.4
Weight – with brake (kg)	8.2	8.4	8.9	8.2	8.4	8.9	10.0	--
Radial max. loading (N)	490	490	490	490	490	490	490	490
Axial max. loading (N)	98	98	98	98	98	98	98	98
Max. power per second (kW / s) (with brake)	6.4	24.9	43.1	9.2	35.9	62.1	19.78	32.66
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> ) (with brake)	8.94	9.14	11.90	8.94	9.14	11.9	14.8	21.3
Mechanical constant (ms) (with brake)	2.07	1.64	1.19	2.0	1.51	1.13	2.65	1.73
Brake holding torque [Nt-m (min)]* <sup>2</sup>	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Brake power consumption (at 20 °C) [W]	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Brake release time [ms (Max)]	10	10	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	70	70	70	70	70	70	70	70


Vibration grade ( $\mu\text{m}$ )	15
Operating temperature ( $^{\circ}\text{C}$ )	0 $^{\circ}\text{C}$ ~ 40 $^{\circ}\text{C}$
Storage temperature ( $^{\circ}\text{C}$ )	-10 $^{\circ}\text{C}$ ~ 80 $^{\circ}\text{C}$
Operating humidity	20 ~ 90 % RH (non-condensing)
Storage humidity	20 ~ 90 % RH (non-condensing)
Vibration capacity	2.5 G
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)
Approvals	

## Note:

- \*1 The rated torque is the continuous permissible torque between 0 ~ 40  $^{\circ}\text{C}$  operating temperature which is suitable for the following heat sink dimension.
- ECMA-\_\_ 04 / 06 / 08 : 250 mm x 250 mm x 6 mm
- ECMA-\_\_ 10 : 300 mm x 300 mm x 12 mm
- ECMA-\_\_ 13 : 400 mm x 400 mm x 20 mm
- Material: Aluminum – F40, F60, F80, F100, F130
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.
- \*3 To have the motor reach the maximum torque 250 %, it is suggested to use the servo drive with higher watt.

## High inertia series

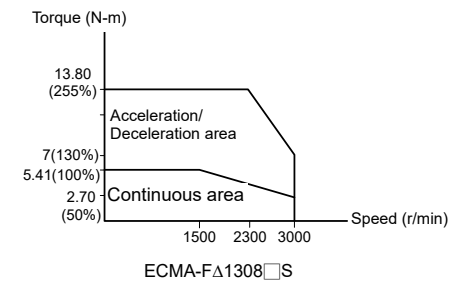
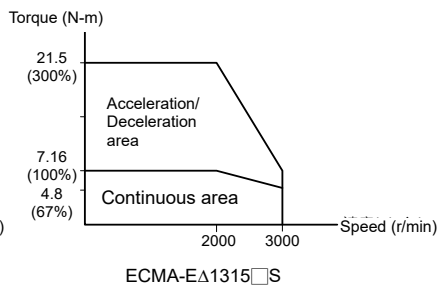
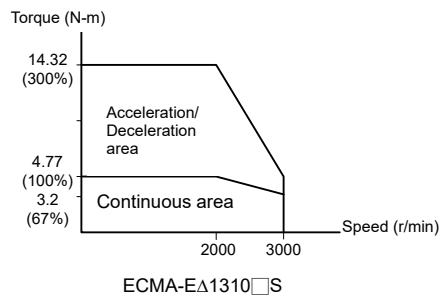
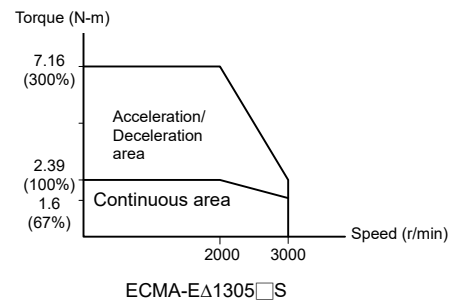
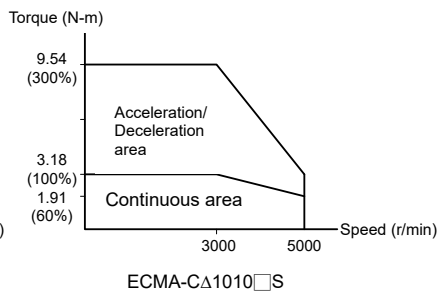
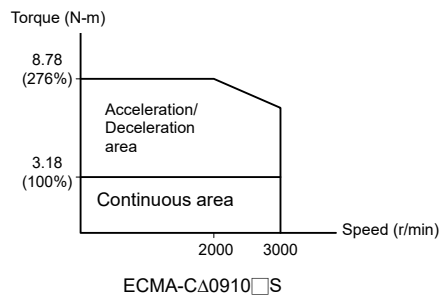
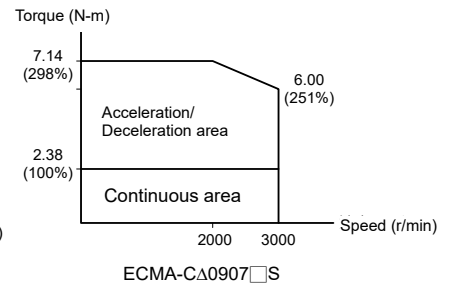
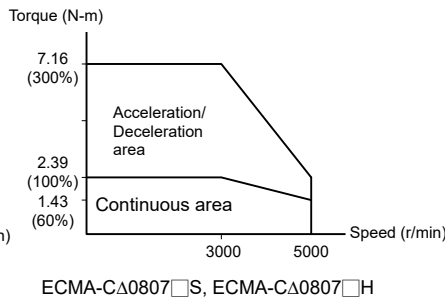
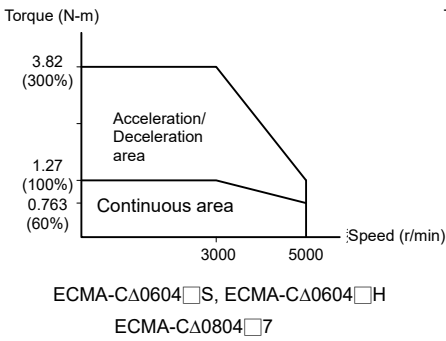
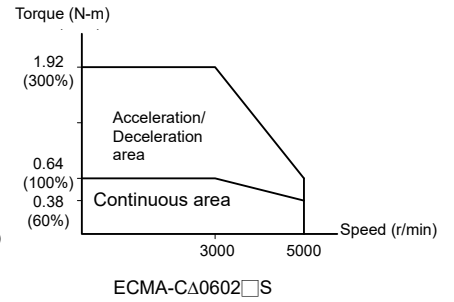
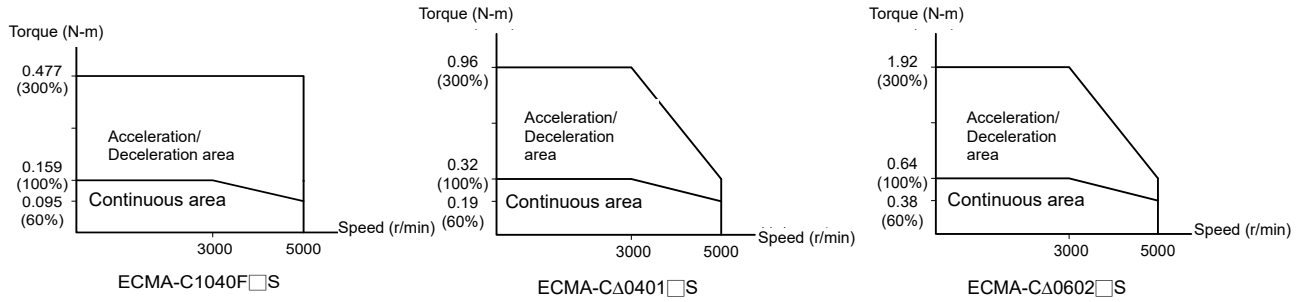
ECMA	C $\Delta$ 06	C $\Delta$ 08
	04□H	07□H
Rated power (kW)	0.4	0.75
Rated torque (N-m)**1	1.27	2.39
Max. torque (N-m)	3.82	7.16
Rated speed (r / min)	3000	3000
Max. speed (r / min)	5000	5000
Rated current (A)	2.6	5.1
Max. instantaneous current (A)	7.8	15.3
Max. power per second (kW / s)	21.7	19.63
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> )	0.743	2.91
Mechanical constant (ms)	1.42	1.6
Torque constant – KT(N-m / A)	0.49	0.47
Voltage constant – KE (mV / (r / min))	17.4	17.2
Armature resistance (Ohm)	1.55	0.42
Armature inductance (mH)	6.71	3.53
Electric constant (ms)	4.3	8.36
Insulation class	Class A (UL), Class B (CE)	
Insulation resistance	> 100 M $\Omega$ , DC 500 V	
Insulation strength	1.8 k Vac, 1 sec	
Weight – without brake (kg)	1.8	3.4
Weight – with brake (kg)	2.2	3.9
Radial max. loading (N)	196	245
Axial max. loading (N)	68	98
Max. power per second (kW / s) (with brake)	21.48	19.3
Rotor inertia ( $\times 10^{-4}$ kg.m <sup>2</sup> ) (with brake)	0.751	2.96
Mechanical constant (ms) (with brake)	1.43	1.62
Brake holding torque [Nt-m (min)] **2	1.3	1.3
Brake power consumption (at 20 °C) [W]	6.5	6.5
Brake release time [ms (Max)]	10	10
Brake pull-in time [ms (Max)]	70	70
Vibration grade ( $\mu$ m)	15	
Operating temperature (°C)	0 °C ~ 40 °C	

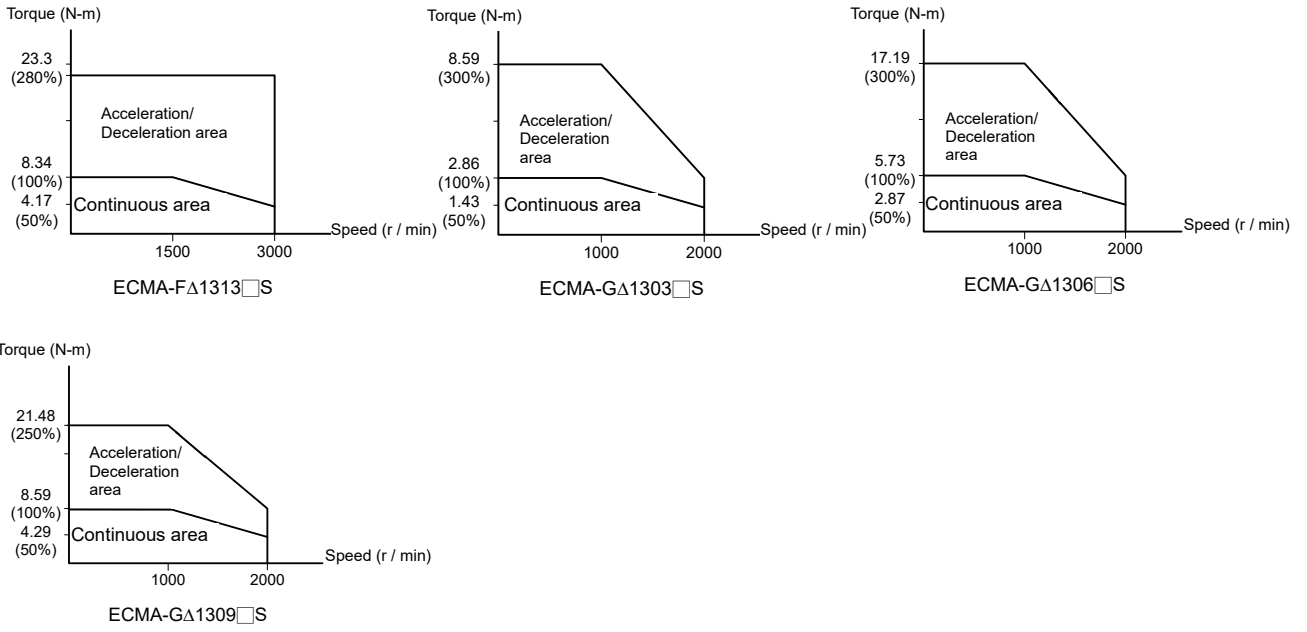
ECMA	C△06	C△08
	04□H	07□H
Storage temperature (°C)	-10 °C ~ 80 °C	
Operating humidity	20 ~ 90 % RH (non-condensing)	
Storage humidity	20 ~ 90 % RH (non-condensing)	
Vibration capacity	2.5 G	
IP Rating	IP65 (use the waterproof connector and shaft seal installation (or oil seal) model)	
Approvals		

## Note:

- \*1 The rated torque is the continuous permissible torque between 0 ~ 40 °C operating temperature which is suitable for the following heat sink dimension.  
ECMA-\_\_ 04 / 06 / 08 : 250 mm x 250 mm x 6 mm  
Material: Aluminum– F40, F60, F80
- \*2 The built-in brake of the servo motor is for remaining the item in stop status. Do not use it to decelerate or as the dynamic brake.
- 3 To have the motor reach the maximum torque 250 %, it is suggested to use the servo drive with higher watt.

### 11.3 Torque Features (T-N curve)





## 11.4 Overload Features

### The definition of overload protection

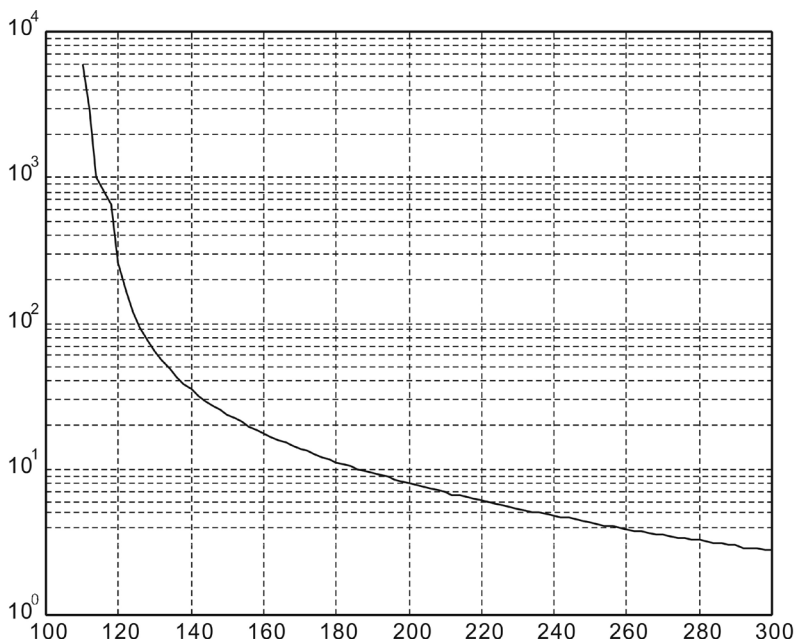
The overload protection is to prevent the motor in overheat status.

### The cause of overload

- 1) When the motor operates over the rated torque, the operation time is too long
- 2) The inertia ratio is set too big and frequently accelerate / decelerate
- 3) Connection error between the power cable and encoder wiring
- 4) Servo gain setting error and cause resonance of the motor
- 5) The motor with brake operates without releasing the brake

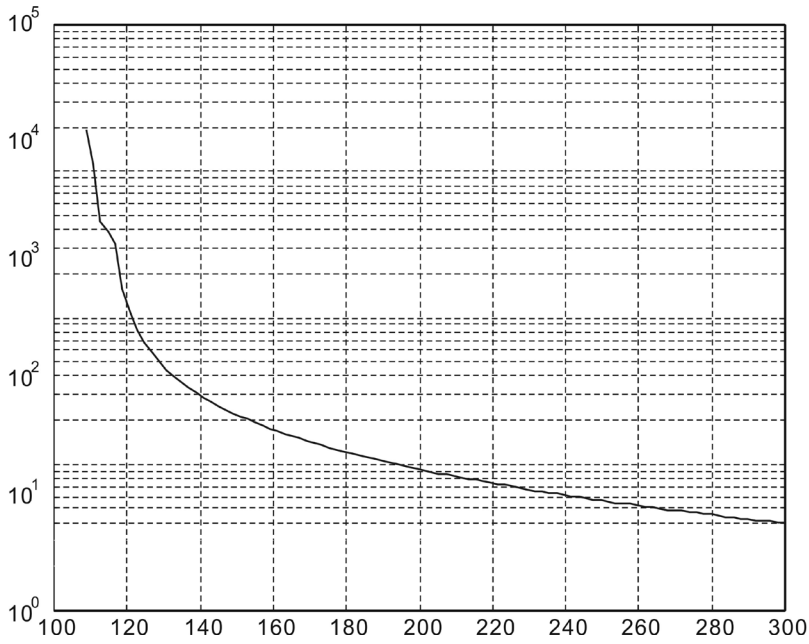
### The Graph of Load and Operating Time

#### Low inertia (ECMA C1, C2 Series)



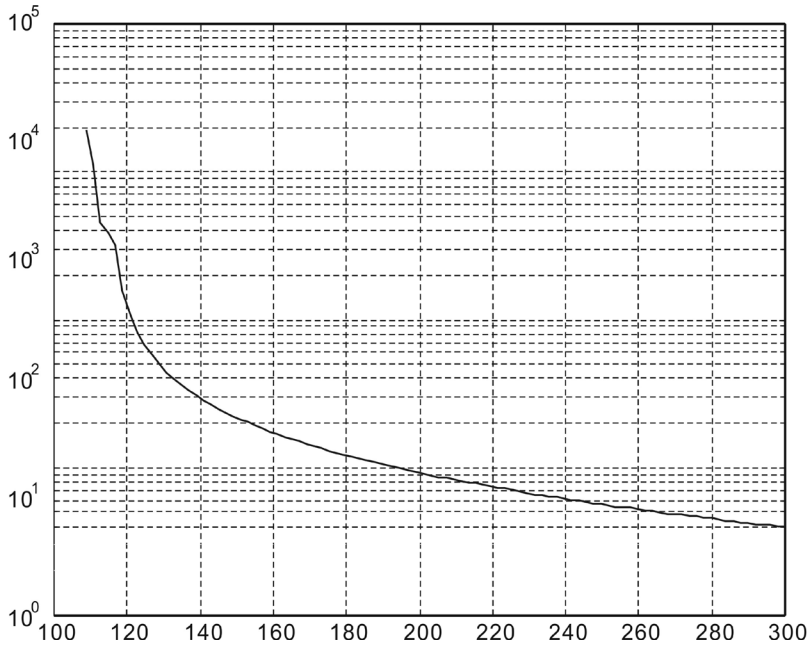
Load	Operating Time
120%	263.8s
140%	35.2s
160%	17.6s
180%	11.2s
200%	8s
220%	6.1s
240%	4.8s
260%	3.9s
280%	3.3s
300%	2.8s

### Medium and Medium-high inertia (ECMA E1, E2 Series)



Load	Operating Time
120%	527.6s
140%	70.4s
160%	35.2s
180%	22.4s
200%	16s
220%	12.2s
240%	9.6s
260%	7.8s
280%	6.6s
300%	5.6s

### High inertia (ECMA G1 Series)

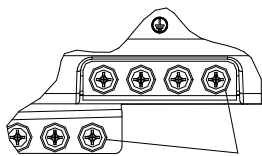
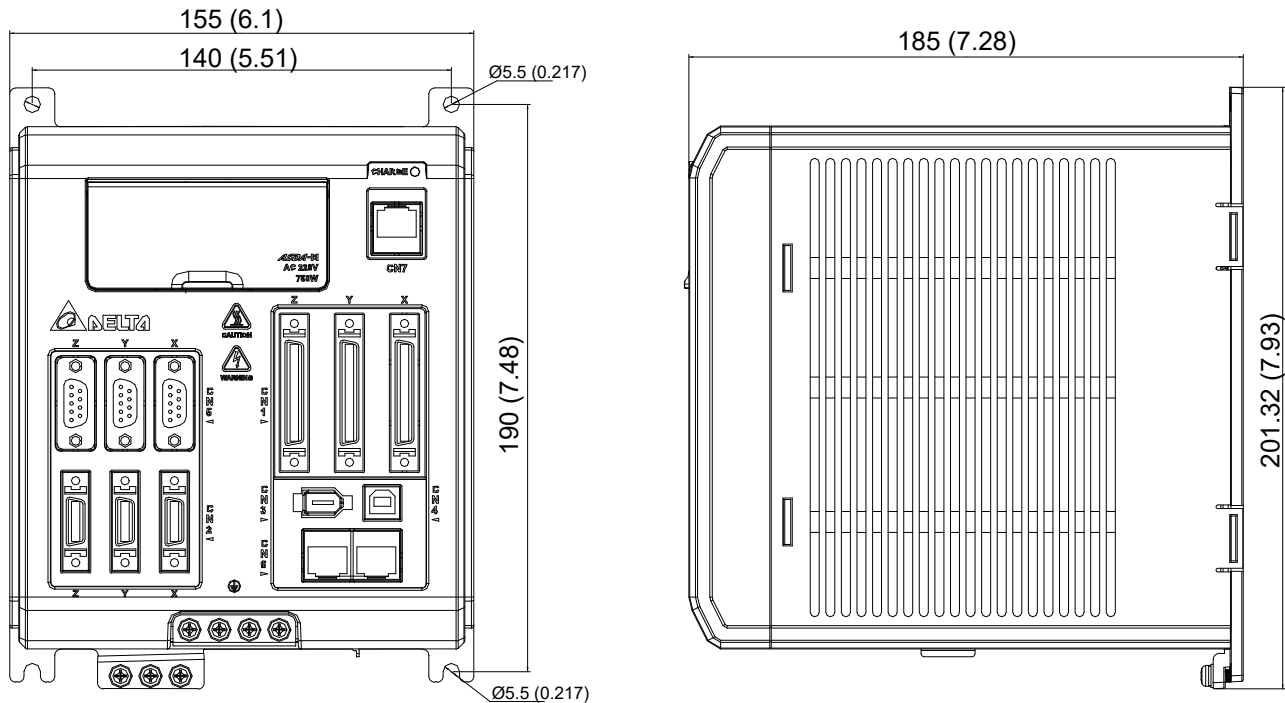


Load	Operating Time
120%	527.6s
140%	70.4s
160%	35.2s
180%	22.4s
200%	16s
220%	12.2s
240%	9.6s
260%	7.8s
280%	6.6s
300%	5.6s

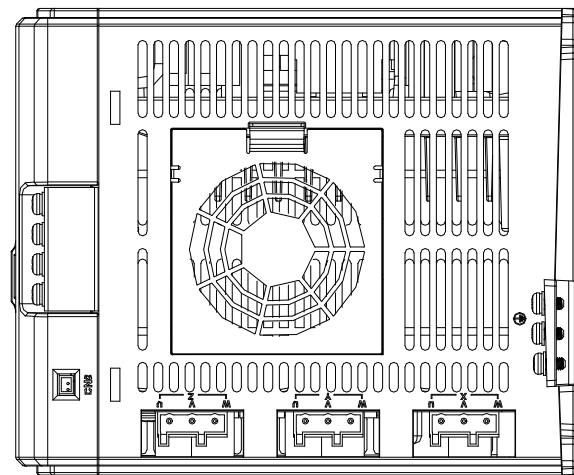


## 11.5 Dimensions of the Servo Drive

### ASD-M-0721 (750W)



Screw: M4 × 0.7  
Tightening torque: 14 (kgf-cm)



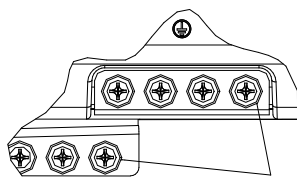
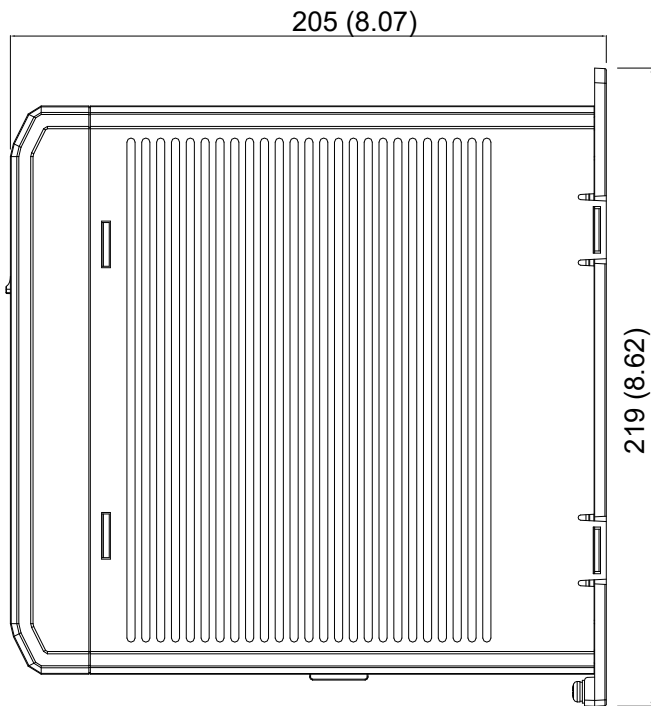
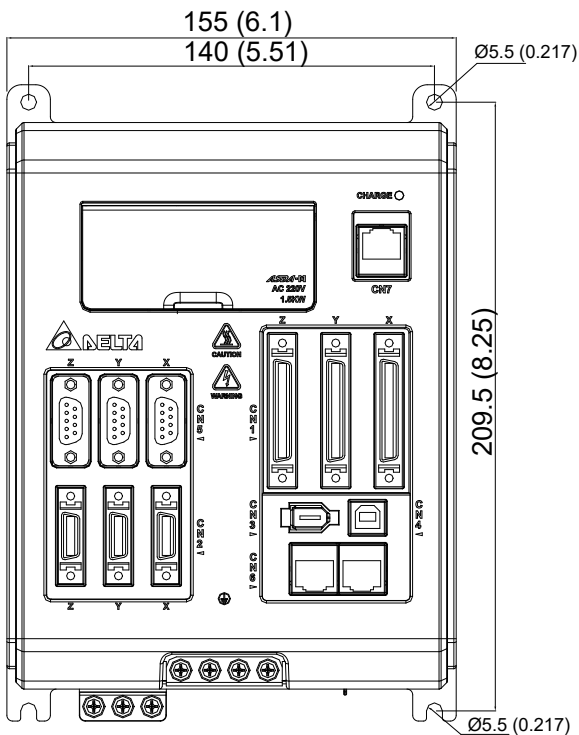
Weight 3.5 (7.7)



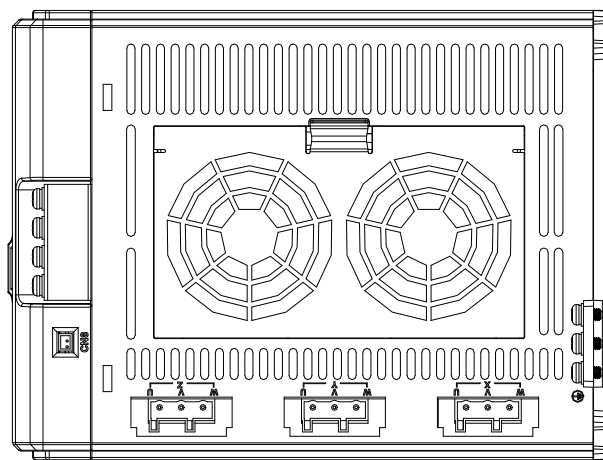
**NOTE**

- 1) Dimensions are in millimeters (inches); Weights are in kilograms (pounds).
- 2) Dimensions and weights might be revised without prior notice.

**ASD-M-1521 (1.5kW)**



Screw: M4 × 0.7  
Tightening torque: 14 (kgf-cm)



**Weight** 4.5 (9.9)

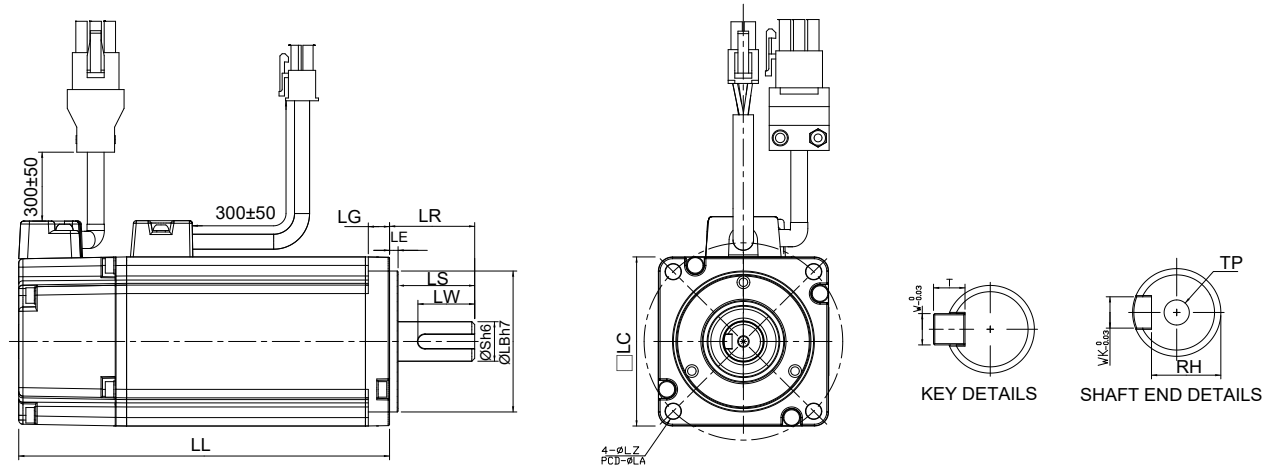


**NOTE**

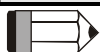
- 1) Dimensions are in millimeters (inches); Weights are in kilograms (pounds).
- 2) Dimensions and weights might be revised without prior notice.

## 11.6 Dimensions of the Servo Motor

### Motor Frame Size: 86 or below (Units: mm)



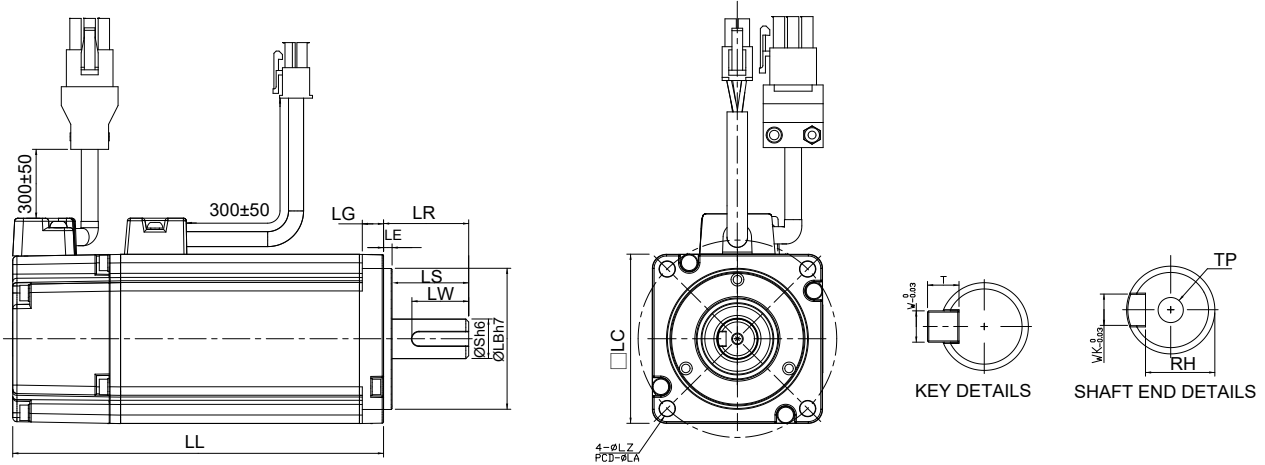
Model	C1040F□S	C△0401□S	C△0602□S	C△0604□S	C△0604□H
LC	40	40	60	60	60
LZ	4.5	4.5	5.5	5.5	5.5
LA	46	46	70	70	70
S	8 <sup>(+0/-0.009)</sup>	8 <sup>(+0/-0.009)</sup>	14 <sup>(+0/-0.011)</sup>	14 <sup>(+0/-0.011)</sup>	14 <sup>(+0/-0.011)</sup>
LB	30 <sup>(+0/-0.021)</sup>	30 <sup>(+0/-0.021)</sup>	50 <sup>(+0/-0.025)</sup>	50 <sup>(+0/-0.025)</sup>	50 <sup>(+0/-0.025)</sup>
LL (without brake)	79.1	100.6	105.5	130.7	145.8
LL (with brake)	--	136.6	141.6	166.8	176.37
LS	20	20	27	27	27
LR	25	25	30	30	30
LE	2.5	2.5	3	3	3
LG	5	5	7.5	7.5	7.5
LW	16	16	20	20	20
RH	6.2	6.2	11	11	11
WK	3	3	5	5	5
W	3	3	5	5	5
T	3	3	5	5	5
TP	--	M3 Depth 8	M4 Depth 15	M4 Depth 15	M4 Depth 15



#### NOTE

- 1) Dimensions are in millimeters.
- 2) Dimensions and weights might be revised without prior notice.
- 3) Box, (□) represents the shaft end / brake or the number of oil seal.
- 4) Triangle, (△) represents the type of encoder. Please refer to Chapter 1 for detail

**Motor Frame Size: 86 or below (Units: mm)**



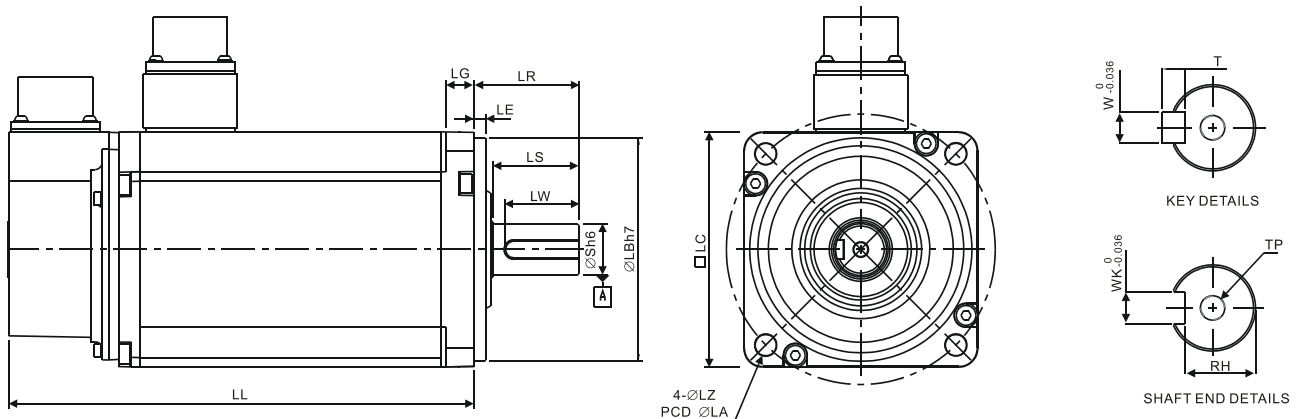
Model	C $\Delta$ 0804 $\square$ 7	C $\Delta$ 0807 $\square$ S	C $\Delta$ 0807 $\square$ H	C $\Delta$ 0907 $\square$ S	C $\Delta$ 0910 $\square$ S
LC	80	80	80	86	86
LZ	6.6	6.6	6.6	6.6	6.6
LA	90	90	90	100	100
S	14 <sup>(+0/-0.011)</sup>	19 <sup>(+0/-0.013)</sup>	19 <sup>(+0/-0.013)</sup>	16 <sup>(+0/-0.011)</sup>	16 <sup>(+0/-0.011)</sup>
LB	70 <sup>(+0/-0.030)</sup>	70 <sup>(+0/-0.030)</sup>	70 <sup>(+0/-0.030)</sup>	80 <sup>(+0/-0.030)</sup>	80 <sup>(+0/-0.030)</sup>
LL (without brake)	112.3	138.3	151.1	130.2	153.2
LL (with brake)	152.8	178	189	161.3	184.3
LS	27	32	32	30	30
LR	30	35	35	35	35
LE	3	3	3	3	3
LG	8	8	8	8	8
LW	20	25	25	20	20
RH	11	15.5	15.5	13	13
WK	5	6	6	5	5
W	5	6	6	5	5
T	5	6	6	5	5
TP	M4 Depth 15	M6 Depth 20	M6 Depth 20	M5 Depth 15	M5 Depth 15



**NOTE**

- 1) Dimensions are in millimeters.
- 2) Dimensions and weights might be revised without prior notice.
- 3) Box, ( $\square$ ) represents the shaft end / brake or the number of oil seal.
- 4) Triangle, ( $\Delta$ ) represents the type of encoder. Please refer to Chapter 1 for detail

Motor Frame Size: 100 ~ 130 (Units: mm)

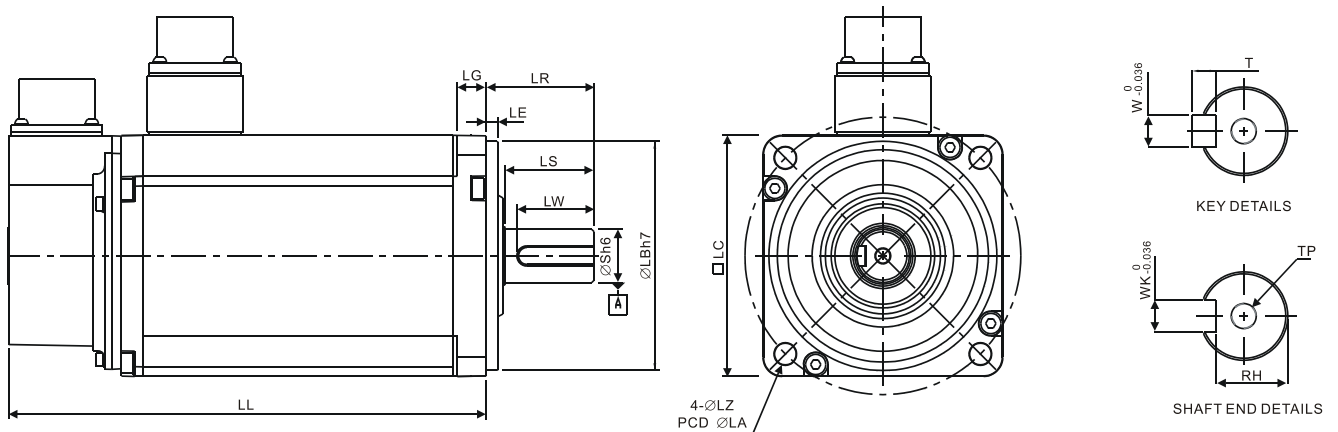


Model	C△1010□S	E△1305□S	E△1310□S	E△1315□S
LC	100	130	130	130
LZ	9	9	9	9
LA	115	145	145	145
S	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>	22 <sup>(+0/-0.013)</sup>
LB	95 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>	110 <sup>(+0/-0.035)</sup>
LL ( without brake )	153.3	147.5	147.5	167.5
LL ( with brake )	192.5	183.5	183.5	202
LS	37	47	47	47
LR	45	55	55	55
LE	5	6	6	6
LG	12	11.5	11.5	11.5
LW	32	36	36	36
RH	18	18	18	18
WK	8	8	8	8
W	8	8	8	8
T	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

**NOTE**

- 1) Dimensions are in millimeters.
- 2) Dimensions and weights might be revised without prior notice.
- 3) Box, (□) represents the shaft end / brake or the number of oil seal.
- 4) Triangle, (△) represents the type of encoder. Please refer to Chapter 1 for detail

Motor Frame Size: 100 ~ 130 (Units: mm)



Model	F $\Delta$ 1308□S	F $\Delta$ 1313□S	G $\Delta$ 1303□S	G $\Delta$ 1306□S	G $\Delta$ 1309□S
LC	130	130	130	130	130
LZ	9	9	9	9	9
LA	145	145	145	145	145
S	22 $^{+0}_{-0.013}$	22 $^{+0}_{-0.013}$	22 $^{+0}_{-0.013}$	22 $^{+0}_{-0.013}$	22 $^{+0}_{-0.013}$
LB	110 $^{+0}_{-0.035}$	110 $^{+0}_{-0.035}$	110 $^{+0}_{-0.035}$	110 $^{+0}_{-0.035}$	110 $^{+0}_{-0.035}$
LL ( without brake )	152.5	187.5	147.5	147.5	163.5
LL ( with brake )	181	--	183.5	183.5	198
LS	47	47	47	47	47
LR	55	55	55	55	55
LE	6	6	6	6	6
LG	11.5	11.5	11.5	11.5	11.5
LW	36	36	36	36	36
RH	18	18	18	18	18
WK	8	8	8	8	8
W	8	8	8	8	8
T	7	7	7	7	7
TP	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20	M6 Depth 20

**NOTE**

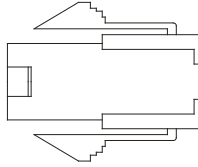
- 1) Dimensions are in millimeters.
- 2) Dimensions and weights might be revised without prior notice.
- 3) Box, (□) represents the shaft end / brake or the number of oil seal.
- 4) Triangle, ( $\Delta$ ) represents the type of encoder. Please refer to Chapter 1 for detail

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# Appendix A Accessories

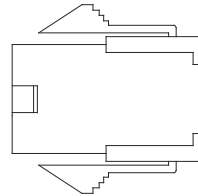
## ■ Power Connector

Delta Part Number: **ASDBCAPW0000**



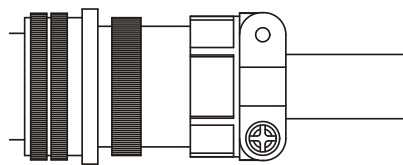
Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: **ASDBCAPW0100**



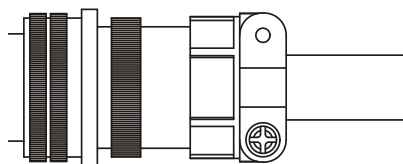
Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: **ASD-CAPW1000**



3106A-20-18S

Delta Part Number: **ASD-CAPW2000**

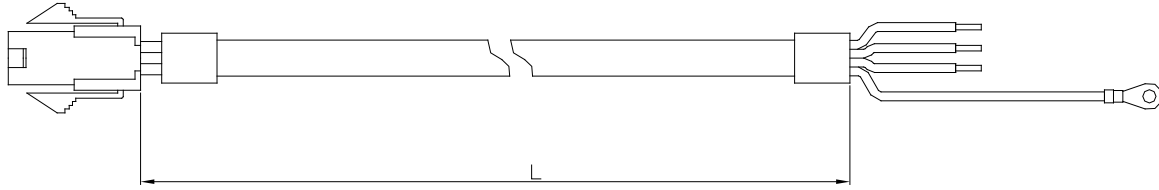


3106A-24-11S



## ■ Power Cable

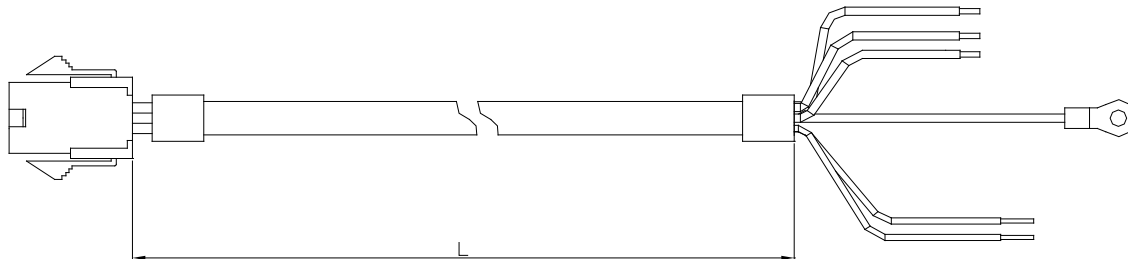
Delta Part Number: **ASD-ABPW0003, ASD-ABPW0005**



Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Title	Part No.	L	
		mm	inch
1	ASD-ABPW0003	3000 ± 100	118 ± 4
2	ASD-ABPW0005	5000 ± 100	197 ± 4

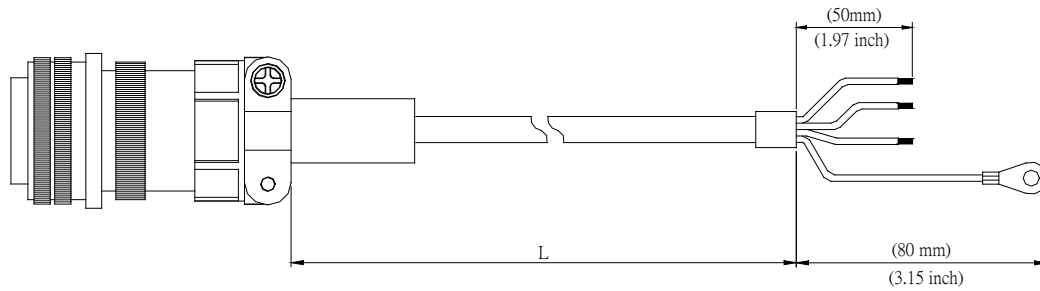
Delta Part Number: **ASD-ABPW0103, ASD-ABPW0105**



Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

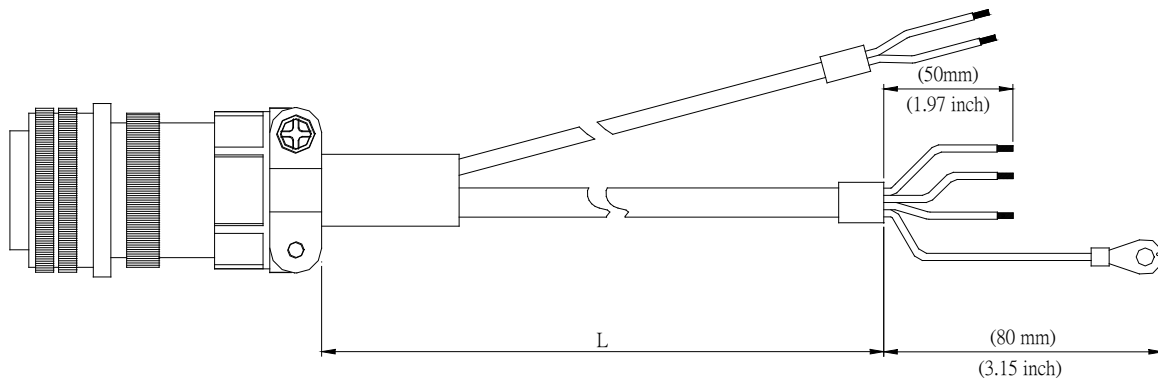
Title	Part No.	L	
		mm	inch
1	ASD-ABPW0103	3000 ± 100	118 ± 4
2	ASD-ABPW0105	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW1003, ASD-CAPW1005**



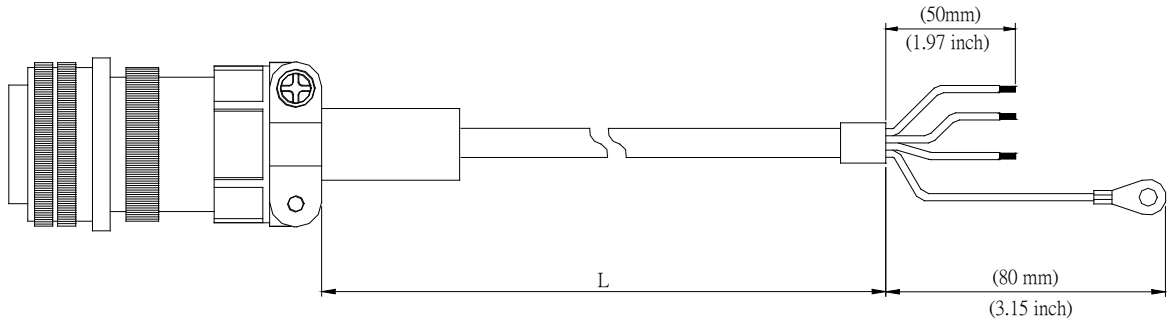
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1005	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW1103, ASD-CAPW1105**



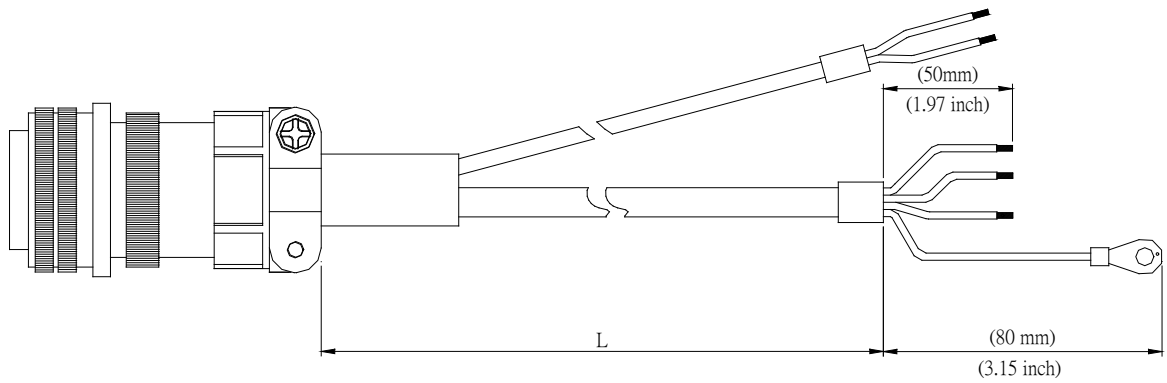
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-CAPW1105	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-A2PW1003, ASD-A2PW1005**



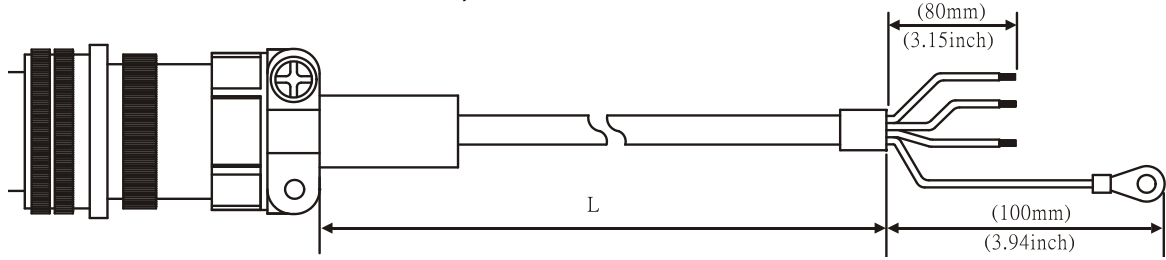
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1003	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1005	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-A2PW1103, ASD-A2PW1105**



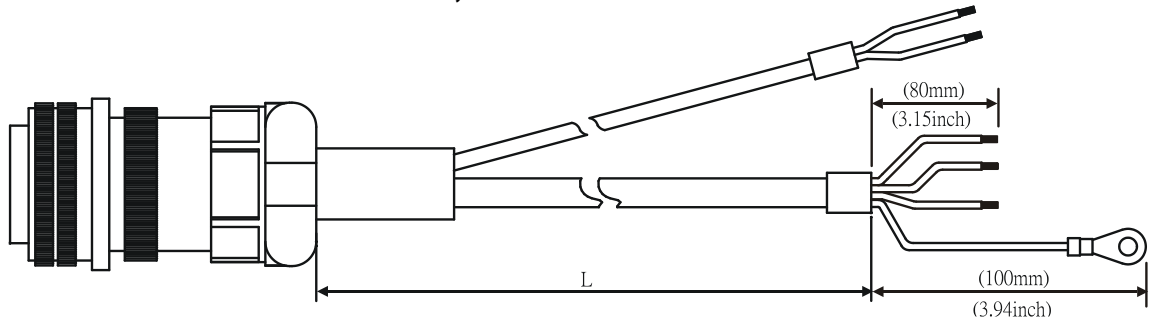
Title	Part No.	Straight	L	
			mm	inch
1	ASD-A2PW1103	3106A-20-18S	3000 ± 100	118 ± 4
2	ASD-A2PW1105	3106A-20-18S	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAPW2003, ASD-CAPW2005**



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2003	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2005	3106A-24-11S	5000 ± 100	197 ± 4

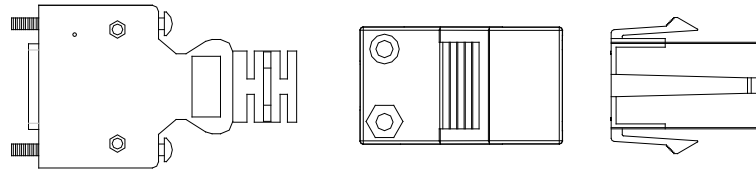
Delta Part Number: **ASD-CAPW2103, ASD-CAPW2105**



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2103	3106A-24-11S	3000 ± 100	118 ± 4
2	ASD-CAPW2105	3106A-24-11S	5000 ± 100	197 ± 4

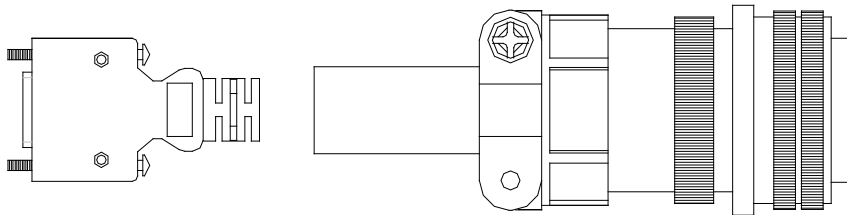
## Encoder Connector

Delta Part Number: **ASD-ABEN0000**



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

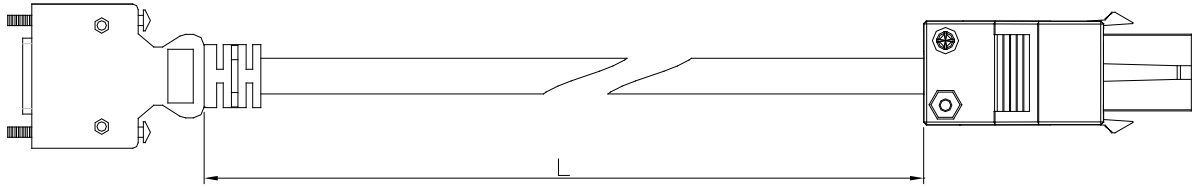
Delta Part Number: **ASD-CAEN1000**



Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

## Encoder Cable

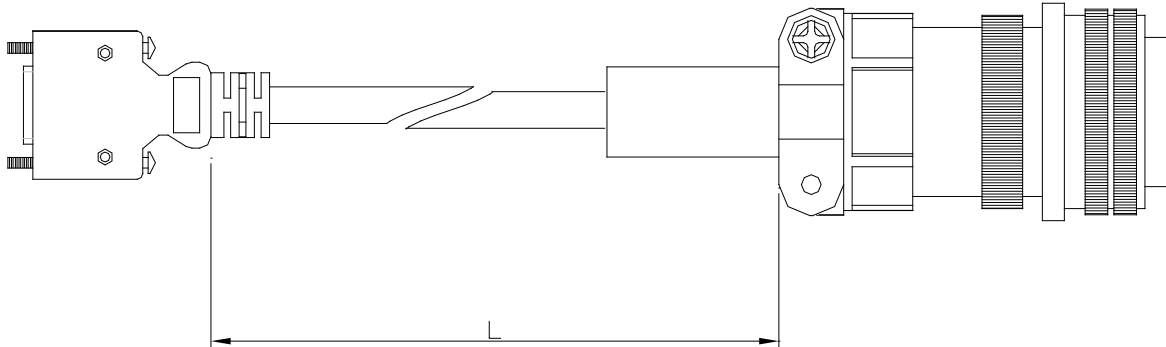
Delta Part Number: **ASD-ABEN0003, ASD-ABEN0005**



Title		Part No.	Manufacturer
MOTOR SIDE	Housing	AMP (1-172161-9)	AMP
	Terminal	AMP (170359-3)	AMP
	CLAMP	DELTA (34703237XX)	DELTA
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	L	
		mm	inch
1	ASD-ABEN0003	3000 ± 100	118 ± 4
2	ASD-ABEN0005	5000 ± 100	197 ± 4

Delta Part Number: **ASD-CAEN1003, ASD-CAEN1005**



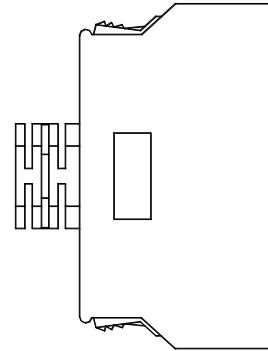
Title		Part No.	Manufacturer
MOTOR SIDE		3106A-20-29S	-
DRIVE SIDE	PLUG	3M 10120-3000PE	3M
	SHELL	3M 10320-52A0-008	3M

Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAEN1003	3106A-20-29S	3000 ± 100	118 ± 4
2	ASD-CAEN1005	3106A-20-29S	5000 ± 100	197 ± 4

### ■ I / O Connector

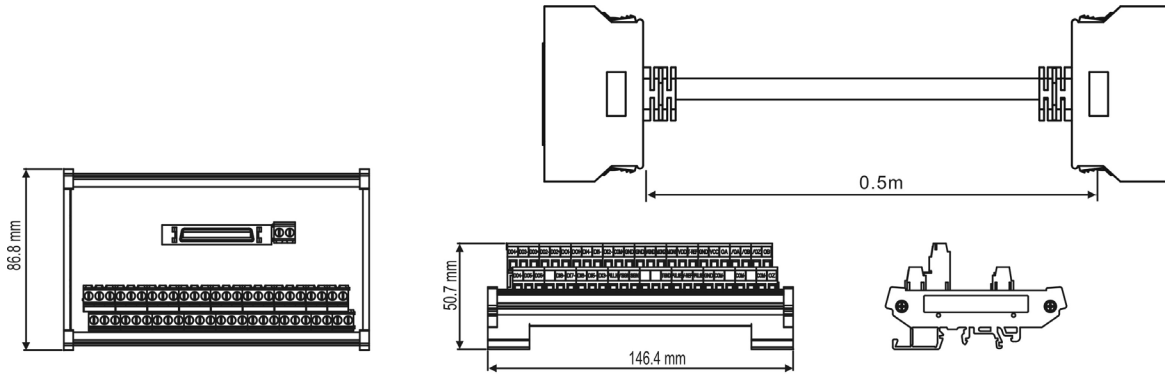
Delta Part Number: **ASD-CN5C0050**

Vendor Name	Vendor P / N
3M TAIWAN LTD	10150-3000PE
3M TAIWAN LTD	10350-52A0-008



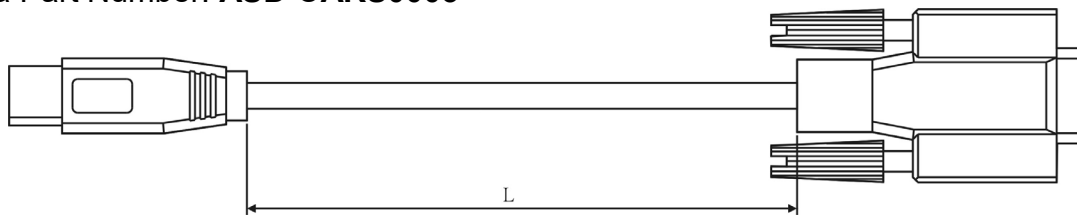
### ■ Terminal Block Module

Delta Part Number: **ASD-BM-50A**



### ■ RS-232 Communication Cable

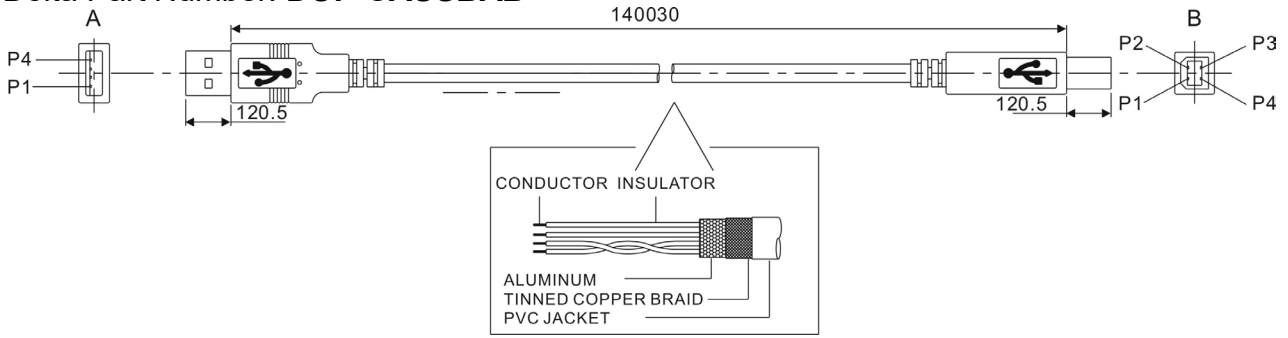
Delta Part Number: **ASD-CARS0003**



Title	Part No.	L	
		mm	inch
1	ASD-CARS0003	3000 ± 100	118 ± 4

### ■ Software Communication Cable

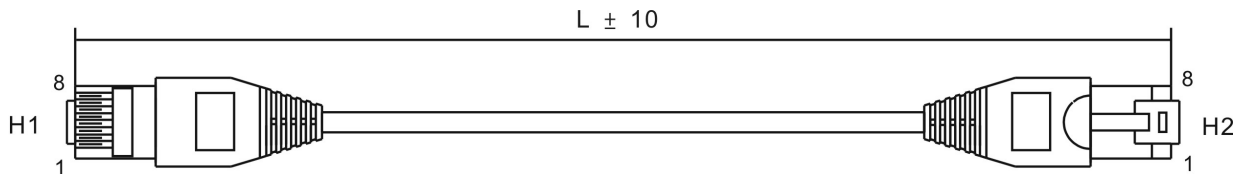
Delta Part Number: **DOP-CAUSBAB**



Title	Part No.	L	
		mm	inch
1	DOP-CAUSBAB	1400 ± 30	55 ± 1.2

### ■ CANopen Communication Connector

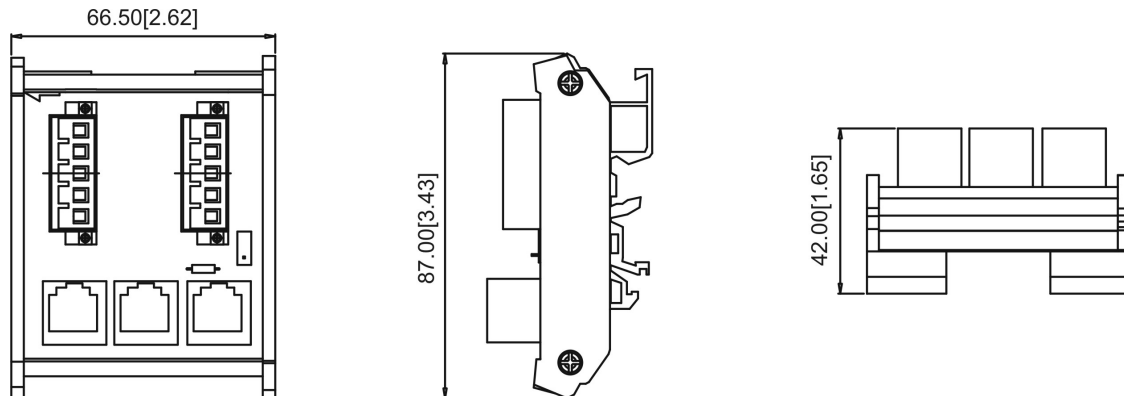
Delta Part Number: **TAP-CB03, TAP-CB05**



Title	Part No.	L	
		mm	inch
1	TAP-CB03	300 ± 10	19 ± 0.4
2	TAP-CB05	500 ± 10	39 ± 0.4

### ■ CANopen Distribution Box

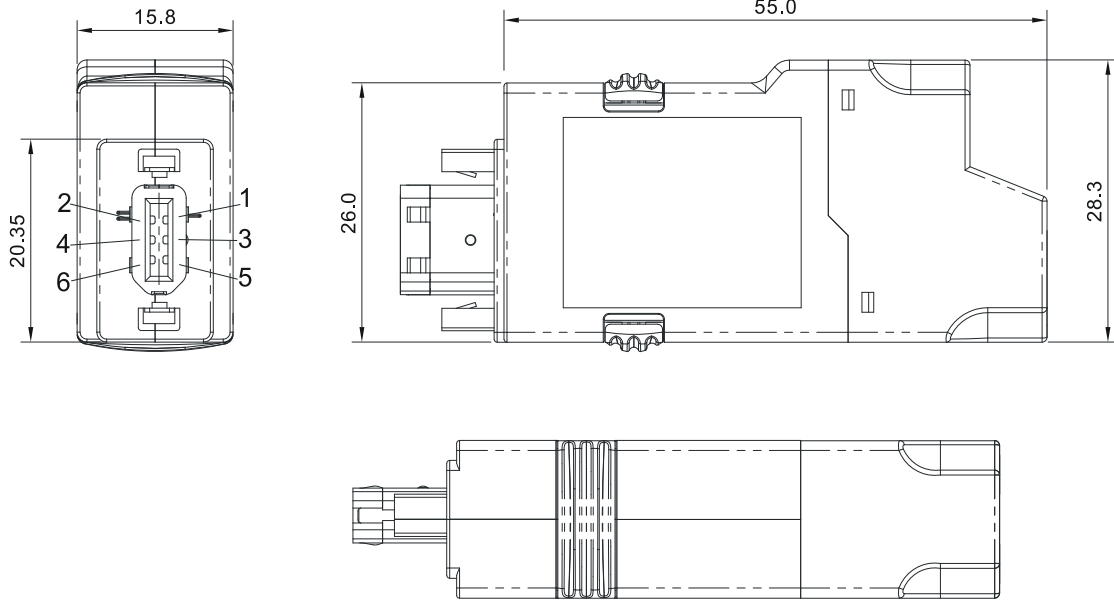
Delta Part Number: **TAP-CN03**





## ■ RS-485 Connector

Delta Part Number: **ASD-CNIE0B06**



## ■ Optional Accessories

### 750W servo drive and 50W low-inertia motor

Servo Drive	ASD-M-0721-□
Low-inertia Motor	ECMA-C1040F□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

### 750W servo drive and 100W low-inertia motor

Servo Drive	ASD-M-0721-□
Low-inertia Motor	ECMA-C△0401□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 200W low-inertia motor**

Servo Drive	ASD-M-0721-□
Low-inertia Motor	ECMA-C△0602□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 400W low-inertia motor**

Servo Drive	ASD-M-0721-□
Low-inertia Motor	ECMA-C△0604□S ECMA-C△0604□H ECMA-C△0804□7
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 500W medium-inertia motor**

Servo Drive	ASD-M-0721-□
Medium-inertia Motor	ECMA-E△1305□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 300W high-inertia motor**

Servo Drive	ASD-M-0721-□
High-inertia Motor	ECMA-G△1303□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 750W low-inertia motor**

Servo Drive	ASD-M-0721-□
Low-inertia Motor	ECMA-C△0807□S ECMA-C△0807□H ECMA-C△0907□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 600W high-inertia motor**

Servo Drive	ASD-M-0721-□
High-inertia Motor	ECMA-G△1306□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**750W servo drive and 850W medium-high-inertia motor**

Servo Drive	SD-M-1521-□
Medium-high-inertia Motor	ECMA-F△1308□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**1.5kW servo drive and 1kW low-inertia motor**

Servo Drive	ASD-M-1521-□
Low-inertia Motor	ECMA-C△1010□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**1.5kW servo drive and 1kW low-inertia motor**

Servo Drive	ASD-M-1521-□
Low-inertia Motor	ECMA-C△0910□S
Motor Power Cable (without brake)	ASD-ABPW000X
Power Connector (without brake)	ASDBCAPW0000
Motor Power Cable (with brake)	ASD-ABPW010X
Power Connector (with brake)	ASDBCAPW0100
Incremental Type Encoder Connector	ASD-ABEN000X
Absolute Type Encoder Connector	ASD-A2EB000X
Encoder Connector	ASD-ABEN0000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

**1.5kW servo drive and 1kW medium-inertia motor**

Servo Drive	ASD-M-1521-□
Medium-inertia Motor	ECMA-E△1310□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

### 1.5kW servo drive and 900W high-inertia motor

Servo Drive	ASD-M-1521-□
High-inertia Motor	ECMA-G△1309□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)

### 1.5kW servo drive and 1.5kW medium-inertia motor

Servo Drive	ASD-M-1521-□
Medium-inertia Motor	ECMA-E△1315□S
Motor Power Cable (without brake)	ASD-CAPW100X
Motor Power Cable (with brake)	ASD-CAPW110X
Power Connector	ASD-CAPW1000
Incremental Type Encoder Connector	ASD-CAEN100X
Absolute Type Encoder Connector	ASD-A2EB100X
Encoder Connector	ASD-CAEN1000

(X = 3 indicates that the cable length is 3 m; X = 5 indicates that the cable length is 5 m)



#### NOTE

- 1) Box, (□) at the end of the servo drive model names represents the product code of ASDA-M. Please refer to the actual situation of purchasing.
- 2) Box, (□) in the model name of the servo motor represents brake or keyway / oil seal.
- 3) Triangle, (△) represents the type of encoder. Please refer to Chapter 1 for detail



Other Accessories (suitable for the whole series of ASDA-M)	
Name	Product Number
50-pin I / O Connector (CN1)	ASD-CN5C0050
Terminal Block Module	ASD-BM-50A
RS-232 Communication Cable	ASD-CARS0003
Software Communication Cable	DOP-CAUSBAB
CANopen Communication Connector	TAP-CB03 / TAP-CB04
CANopen Distribution Box	TAP-CN03
RS-485 Connector	ASD-CNIE0B06
Regenerative Resistor 400W 40 $\Omega$	BR400W040
Regenerative Resistor 1kW 20 $\Omega$	BR1K0W020
Regenerative Resistor 1.5kW 5 $\Omega$	BR1K5W005

# Appendix B Maintenance and Inspection

## Basic Inspection

Item	Content
General inspection	Periodically check if the screws of the servo drive, the connection between the motor shaft and the mechanical system as well as the connection of terminal block and mechanical system are securely tightened.
	The gap of the control chamber and the installation of the cooling fan should free from oil, water or metallic particles. Also, shall the servo drive free from the cutting power of the power drill.
	If the control chamber is installed in the site which contains harmful gas or full of dust, please be ensured the servo drive is free from the harmful gas and dust.
	When making encoder cable or wire rods, please be ensured the wiring is correct. Otherwise, the motor may have sudden unintended acceleration or be burned.
Inspection before operation (has not applied to the power yet)	To avoid the electric shock, the ground terminal of the servo drive should firmly connect to the ground terminal of the control chamber. If the wiring is needed, wait at least 10 minutes after disconnecting the drive from the main supply power, or discharge electricity by discharge device. (Please wait until the power indicator is off.)
	The splicing parts of the wiring terminal should be isolated.
	Make sure the wiring is correct so as to avoid the damage or any abnormality.
	Check if the electric conductivity objects including sheetmetal (such as screws) or inflammable objects are not inside the servo drive.
	Check if the control switch is in OFF status.
	Do not place the servo drive of external regenerative resistor on inflammable objects.
	To avoid the electromagnetic brake losing efficacy, please check if

Item	Content
	<p>stop function and circuit break function can work normally.</p> <p>If the peripheral devices are interfered by the electronic instruments, please reduce electromagnetic interference with devices.</p> <p>Please make sure the external voltage level of the servo drive is correct.</p>
<p>Inspection before running the servo drive (has already applied to the power)</p>	<p>The encoder cable should avoid excessive stress. When the motor is running, please be ensured the cable is not frayed or over extended.</p> <p>Please contact with Delta if there is any vibration of the servo motor or unusual noise during the operation.</p> <p>Make sure the setting of the parameters is correct. Different machinery has different characteristic, please adjust the parameter according to the characteristic of each machinery.</p> <p>Please reset the parameter when the servo drive is in the status of SERVO OFF, or it may cause malfunction.</p> <p>When the relay is operating, make sure it can work properly.</p> <p>Check if the power indicator and LED display works normally.</p>

## Maintenance

- Please use and store the product in a proper site.
- Periodically clean the surface of the servo drive and servo motor so as to avoid the dust and dirt.
- Do not disassemble any mechanical part when in maintenance.
- Periodically clean the ventilation ports of the servo drive and do not use the product in a high-temperature site for a long time so as to avoid the malfunction.

## The lifetime of machinery parts

### ■ Dc Bus Capacitor

DC Bus Capacitor will be deteriorated by the affection of ripple current. Its lifetime is determined by the surrounding temperature and operating conditions. If it is operating in an air-conditioned site, its lifetime can up to 10 years.

### ■ Relay

The contact of switching power supply will wear and leads to poor contact. The lifetime of relay is influenced by the power supply capacity; thus, the accumulative time of switching power supply is about 100,000 times.

### ■ Cooling Fan

In continuous operation, the lifetime of the cooling fan is 2 to 3 years. However, if there is any unusual noise or vibration during inspection, place a new one is a must.

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