Automation for a Changing World

Delta High Performance Compact Drive MH300 Series

www.deltaww.com

DELTA

Smarter. Greener. Together.

Compact and Intelligent

The new standard for micro drives

The automation industry today continues to face challenges such as increasing competition and rising costs. In addition to improving productivity and reducing labor, the driving force for automation is the shift to higher efficiency, optimal quality, and most importantly, flexibility and compatibility for a wide range of applications.

The MH300 series is the new generation high performance compact vector control drive that inherits Delta's drive technology with more advanced functions included for higher application flexibility -- all in a compact drive that has been reduced 71% in size.

A variety of essential functions are built-in as standard, including: PLC capacity for simple programming needs, communication slots for various communication cards, and a USB port to make data uploads and downloads fast and easy. This saves the need for additional hardware, while providing more installation space for the power cabinet. Other key features include: support for both IM and PM motor control for application flexibility, an STO function to ensure worry-free operation while protecting facilities from damage, and a simplified wiring process with a new screwless wiring design of terminal blocks for quick installation.

Saving space, reducing setup and wiring time, and providing high efficiency and a highly stable system, the MH300 is your key to improving market competitiveness and ensuring success.

Models Overview

Standard Models

115V single-phase

Applicable Motor Output (kW)	0.2	0.4	0.75	
Applicable Motor Output (HP)	0.25	0.5	1	
Frame Size	A		C	

230V single-phase

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.25	0.5	1	2	3
Frame Size	A		B	C	

230V single-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.25	0.5	1	2	3
Frame Size	B			C	

230V 3-phase

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22	30	37
Applicable Motor Output (HP)	0.25	0.5	1	2	3	5	7.5	10	15	20	25	30	40	50
Frame Size	A			B	C		D	E		F	G		I	

460V 3-phase

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
Frame Size	A		B	C		D		E		F		G	H		I	

460V 3-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
Frame Size	B			C		D		E		F		G	H		I	

Exterior Design

Compact design and user-friendly interface

Removable Keypad

Press to remove; supports remote operation away from drive

5 digits 16 segments LCD display, quick setting wheel dial, left-shift function key

Built-in USB Port

Easy and fast programming setting, update and real-time monitoring and tuning

Label with Product Details

Including input / output currents, voltage and protection level

Screwless Top Cover Design

Press on both side tabs to remove the cover

Removable Fan

Easy to replace and maintain for a longer lifetime

Removable RFI Jumper

Applicable for different application needs

Option Cards

A wide selection of option cards for highly flexible applications

PG Cards

EMM-PG01L
ABZ Signal
Line driver

EMM-PG01O
ABZ Signal
Open collector

EMM-PG01R
Resolver
Suitable for PM motors

I/O Cards

EMM-D33A
I/O

EMM-A22A
Analog

Relay Cards

EMM-R3AA
Form A *3

EMM-R2CA
Form C *2

External Power Supply Card (DC 24V)

EMM-BPS02

Communication Cards

PROFIBUS DP
CMM-PD02

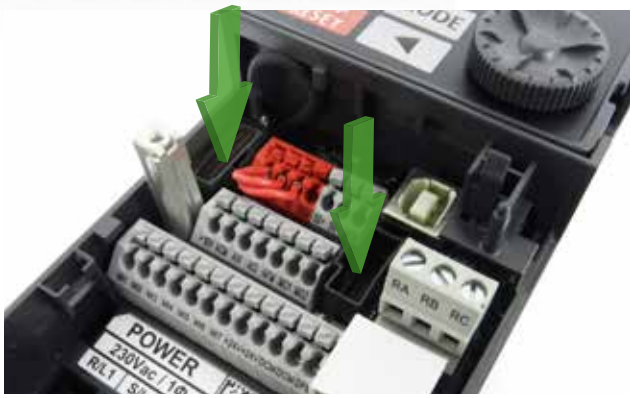
DeviceNet
CMM-DN02

EtherNet/IP
Modbus TCP
CMM-EIP02

EtherNet/IP
Modbus TCP
CMM-EIP03

EtherCAT
CMM-EC02

Built-in 2 Option Slots



Optimized Space Utilization

Compact Design

Provides more powerful features in smaller sizes with reduction up to 71% that effectively optimizes the installation space

Note: VFD32AMH43ANSAA versus VFD150B43A

Side-by-Side Installation

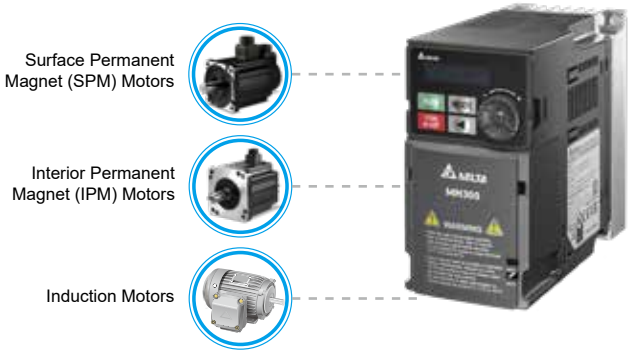
Supports side-by-side installation with operating temperatures of -20˚C~40˚C; enables highly flexible and highly efficient installation

Substantial savings in space!

Outstanding Drive Performance

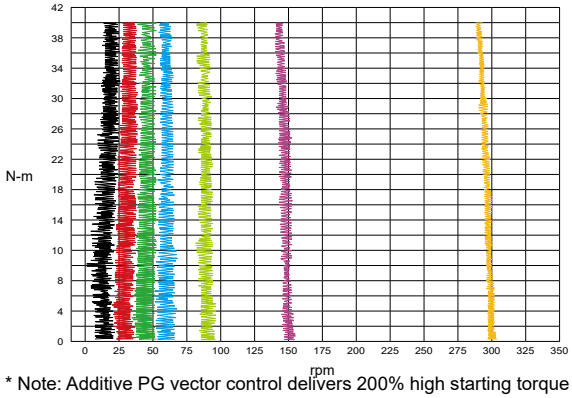
Supports IM and PM Motors

Built-in 4 independent induction motor control parameter sets and supports up to 8 independent induction motor control parameter sets



High Starting Torque

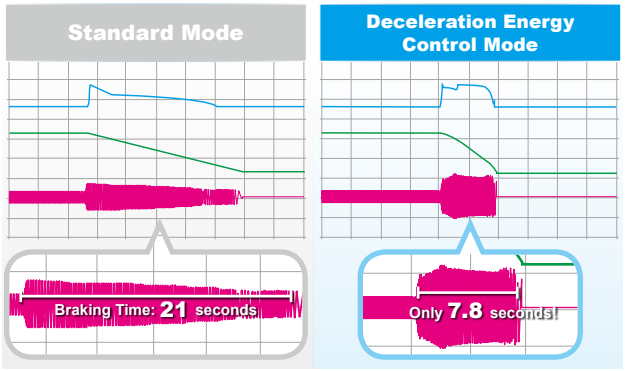
Delivers 200% high starting torque with a low speed control of 0.5 Hz (sensor-less vector control)* and provides outstanding machine stability; suitable for dynamic loading applications



* Note: Additive PG vector control delivers 200% high starting torque with a speed control of 0 Hz

Enhanced Braking Capability

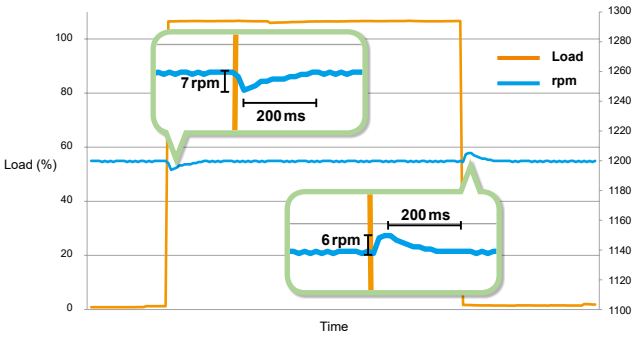
Provides Deceleration Energy Control Mode to shorten braking time by adjusting the motor speed and current, replacing break resistors



* Actual deceleration performance would depends on different system loads

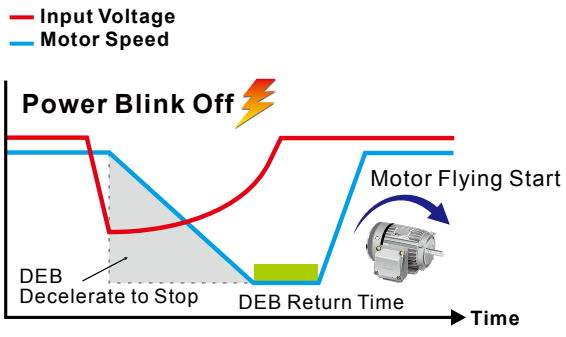
Fast Response to Load Impact

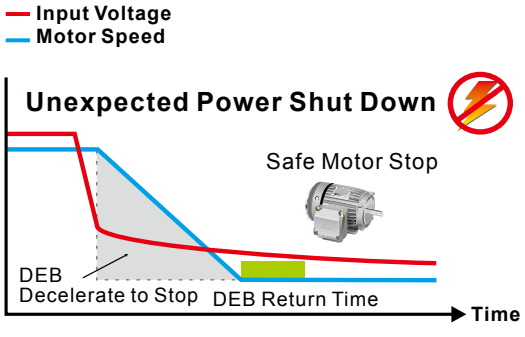
Fast response to sudden load impact at speeds to ensure stable operation and high quality output



Deceleration Energy Backup (DEB)

Controls the motor deceleration to a stop when an unexpected power shut-down occurs to prevent mechanical damage; the motor will accelerate to its previous speed when power resumes

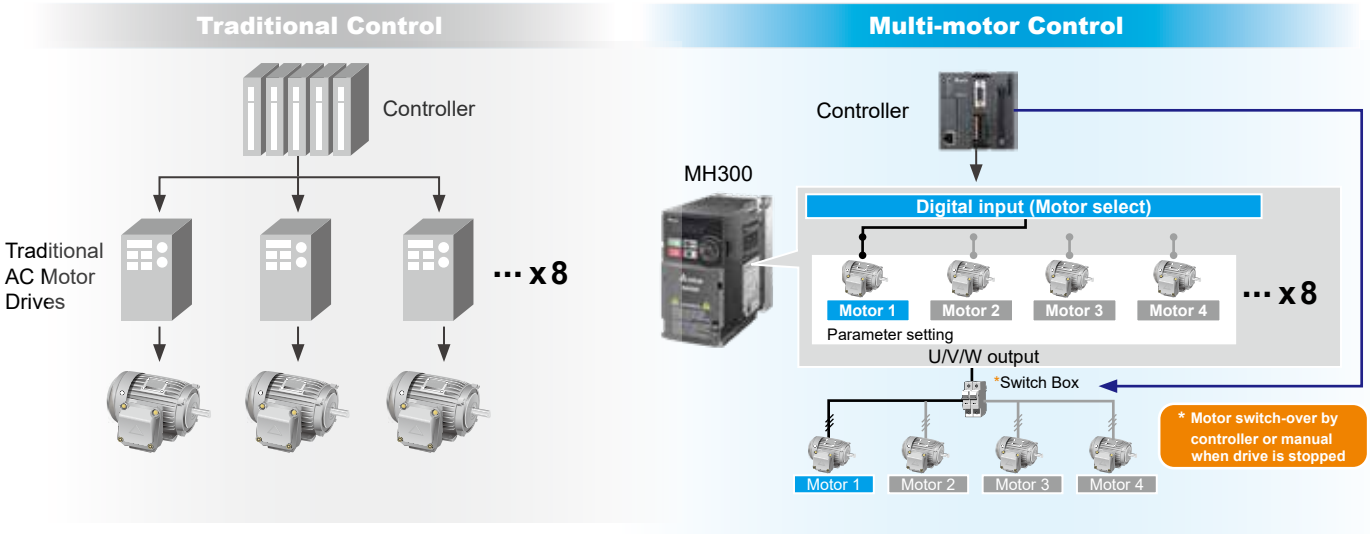




Strong System Support

Multi-motor Control

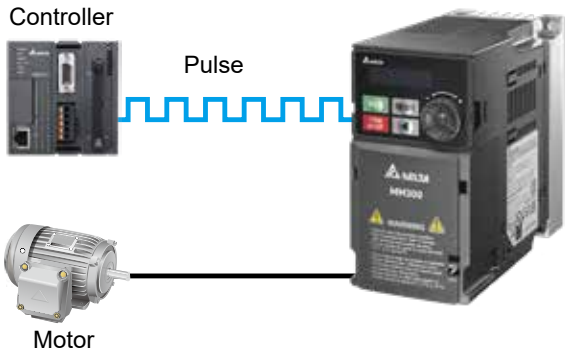
Switching control of 8 induction motors



Note: MH300 features 4 built-in independent parameters sets and through the built-in PLC program, it supports up to 8 independent parameters sets

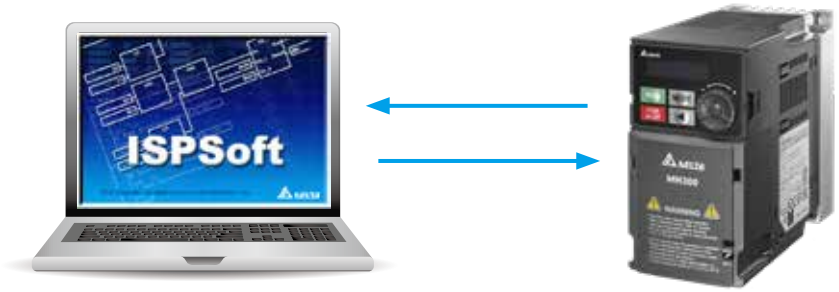
Pulse Input

Supports a dual pulse input signal from controller or a feedback signal from encoder without an additional PG card to achieve simple closed-loop control. Terminal MI7 supports single pulse signal input as a frequency command



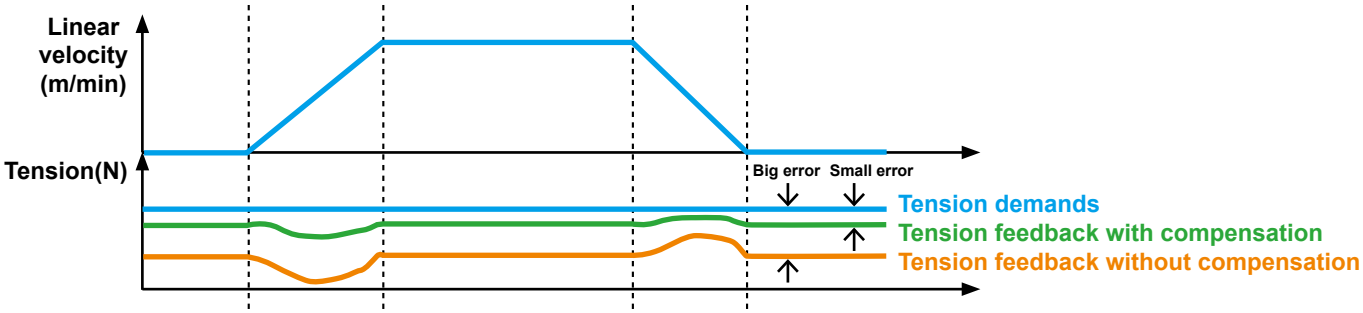
Built-in PLC

Built-in PLC capacity (5k steps) provides distributed control and independent operation via network connection



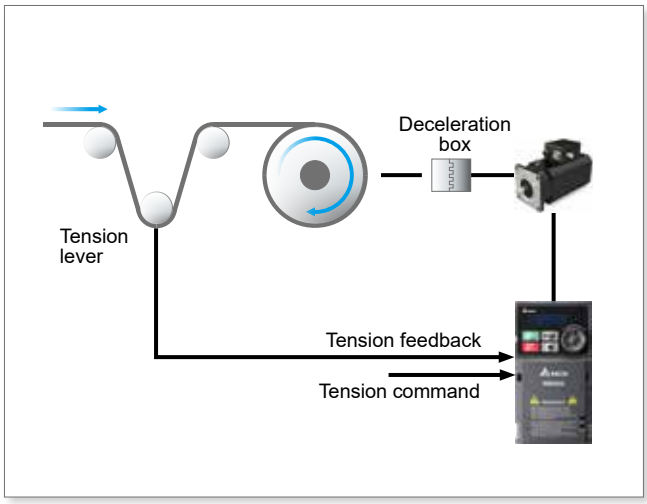
Tension Control

- Built-in coil diameter calculation: through linear velocity, material thickness, and range finder
- 2 PID parameter settings: supports linear adjustment to control tension at the start, between sizes and different linear velocities
- Tensile taper calculation: automatically adjust tension while wrapup to avoid crease folding or deformation
- Auto lap changing: on-power refueling with external signal
- Friction and inertia compensation during torque control: automatically compensate friction and inertia of rewinding and unwinding reels to maintain steady tensions

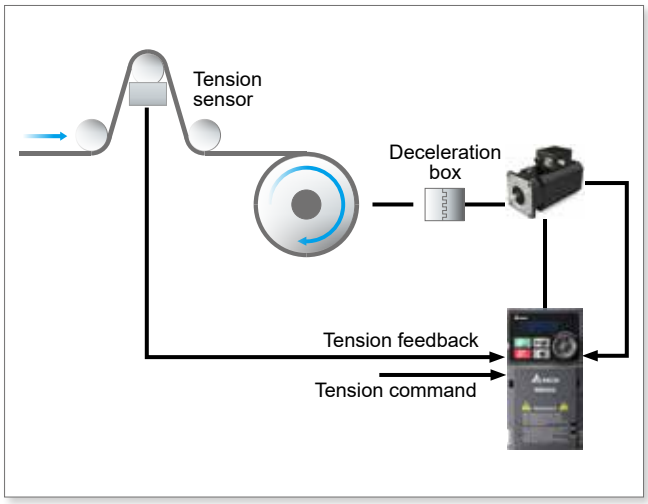


- Supports open / closed-loop, torque and speed tension controls

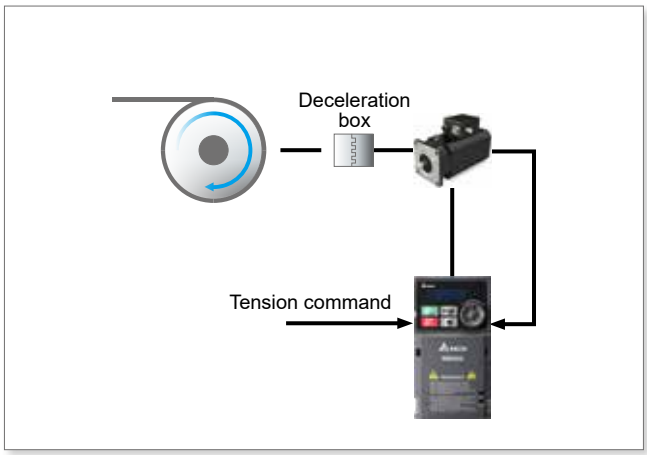
• Closed-loop tension, speed control



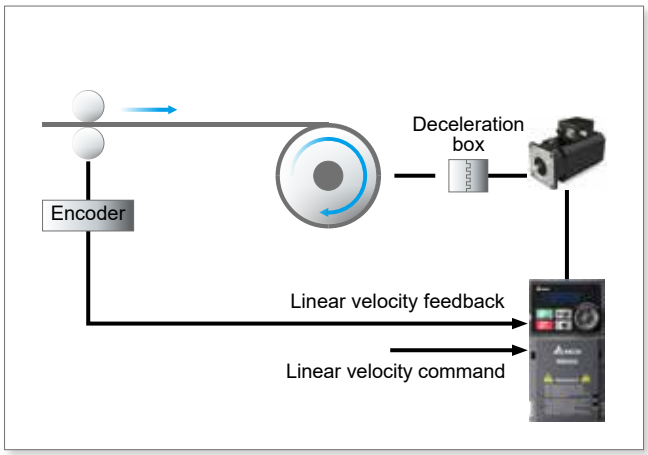
• Closed-loop tension, torque control



• Open-loop tension, torque control

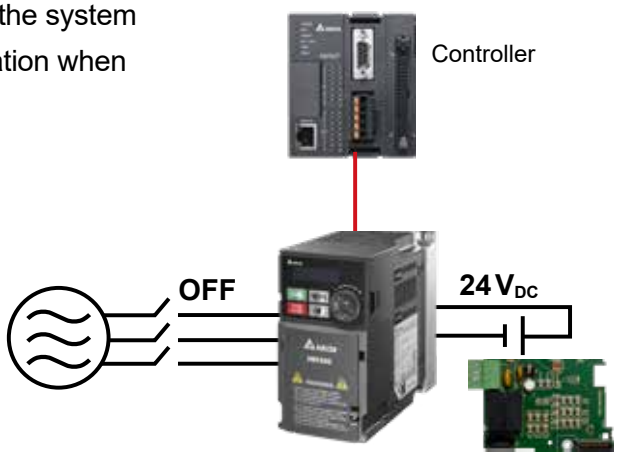


• Steady linear velocity control



DC 24V External Power

External power supply card is available for external power connection to protect the system and ensure uninterrupted communication when mains power failure occurs



High Overload Capability

- Normal duty: rated current 120% for 60 seconds; 150% for 3 seconds
- Heavy duty: rated current 150% for 60 seconds; 200% for 3 seconds

Built-in Braking Chopper

Larger braking torque capability is provided when using an additional braking resistor

Closed-Loop Control

Optional PG card is available to support closed-loop control function and to provide higher precision of motor speed control

Various Communications

Built-in RS-485 (Modbus) and CANopen communication; other communication options are available upon selection

Communication	
Modbus	**Built-in**
PROFIBUS DP	Optional
DeviceNet	Optional
Modbus TCP	Optional
EtherNet/IP	Optional
CANopen	**Built-in**
EtherCAT	Optional

Wide Range of Applications

Rewinding Machines

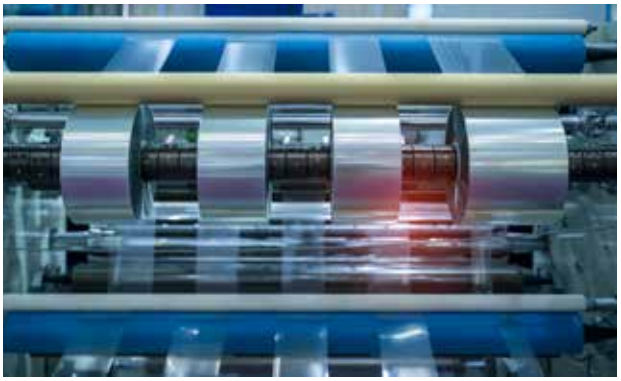
Features and Benefits

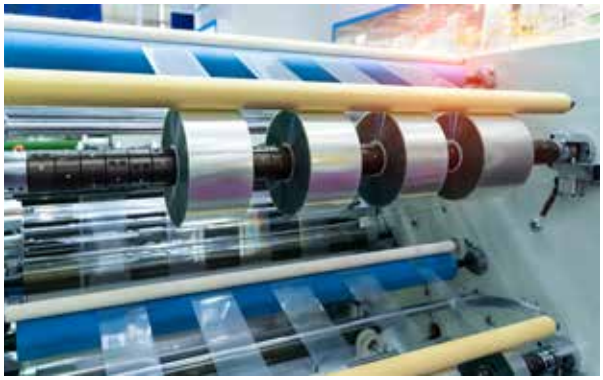
- Built-in tension control features for timely response compared to the external controller (ex. PLC); stable tension with coil diameter calculation
- Built-in 2 PID parameter settings for stable tension through the whole production
- Built-in tensile taper calculation to automatically adjust tension while wrapup to avoid crease folding or deformation
- Supports common DC bus to decrease electricity consumption by recovering rewinding energy for unwinding

Slitter Machines

Features and Benefits

- Control by inverters overcomes the drawbacks of a magnetic powder clutch, such as low operating speed, high temperature, and short lifetime
- Timely acceleration/deceleration control improves machinery operation efficiency and supports weak magnetic control to increase slitter speed and save energy
- Automatically compensates friction and inertia of rewinding and unwinding reels to maintain steady tensions
- Supports both induction motors and PM motors





Printing Machines

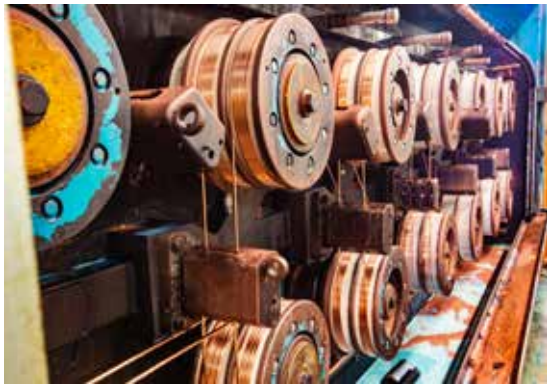
Features and Benefits

- Built-in 2 PID parameter settings and coil diameter calculation for stable tension with big/small reels, and high/low linear velocity
- Built-in tensile taper calculation to automatically adjust tension while wrapup to avoid crease folding or deformation
- Auto lap changing for on-power refueling with external signal
- Supports common DC bus to decrease electricity consumption by recovering rewinding energy for unwinding

Drawing Machines

Features and Benefits

- Built-in master and sub-carrier frequency control with PID control enables quick response and stable tension to avoid line disconnection
- Low-frequency heavy torque fulfills the torque requirement during low speed and quickly complete threading
- 100% PCB coating to enhances the durability for humid, corrosive, and dusty environments



Coil Cutting Tool

Features and Benefits

- Easy and handy PID control fulfills the requirement of steady tension during high / low linear velocity and avoids belt or cable damages
- Features smart start control to avoid belt damage caused by excessive instantaneous tension during the start
- Built-in brake chopper saves system implementation cost
- Compact design for optimized space efficiency

Machine Tools

Features and Benefits

- Supports PG cards for closed-loop control; suitable for complex and high precision processing applications
- Timely acceleration / deceleration control improves machinery operation efficiency
- Built-in brake chopper saves on purchasing cost
- Built-in PLC capacity for flexible application needs
- Built-in STO function ensures operator safety and effectively reduces accident risk
- Provides deceleration-to-stop function

Woodworking Machines

Features and Benefits

- Timely acceleration / deceleration control improves machinery operation efficiency
- Built-in STO function ensures operator safety and effectively reduces accident risk
- Built-in PLC capacity saves on purchasing cost
- Built-in EMC filter effectively reduces electromagnetic interference
- Compact in size and weight, easy to install and maintain

Textile Machines

Features and Benefits

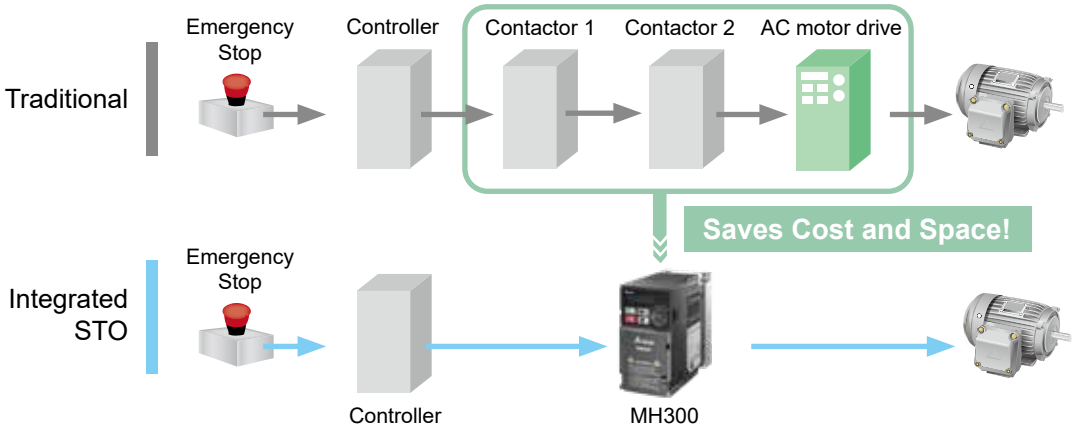
- IP40 models provide excellent protection from a high dust, fiber or moisture environment
- Improved heatsink design prevents fiber clogging the air way; modular design of fan is easy to clean and provides longer lifetime
- Improved braking capability shortens the deceleration-to-stop time and is suitable for sudden stop requirements
- Built-in STO function ensures operator safety and effectively reduces accident rate
- Supports both induction motors and PM motors
- Provides deceleration-to-stop function to protect the equipment from damage when sudden power failure occurs

Stable, Safe and Reliable

Safety Standard

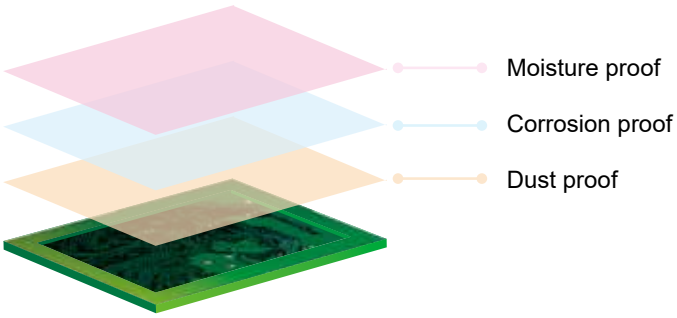
Integrated Sate Torque Off (STO), compliance with:

- ► ISO 13849-1: 2015 Category 3 PL d
- ► EN 61508 SIL2
- ► EN 60204-1 Category 0
- ► EN 62061 SIL CL 2



PCB Coating

100% PCB coating (IEC 60721-3-3 class 3C2 standard) ensures drive operation stability and safety in critical environments

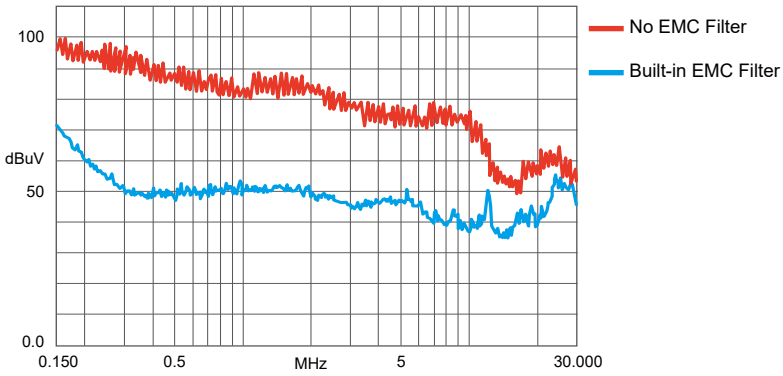


IP 40 Models

Strengthened fan coating and concealed air vent prevent dust and other particles from entering the drive, suitable for critical environment applications

Built-in EMC Filter

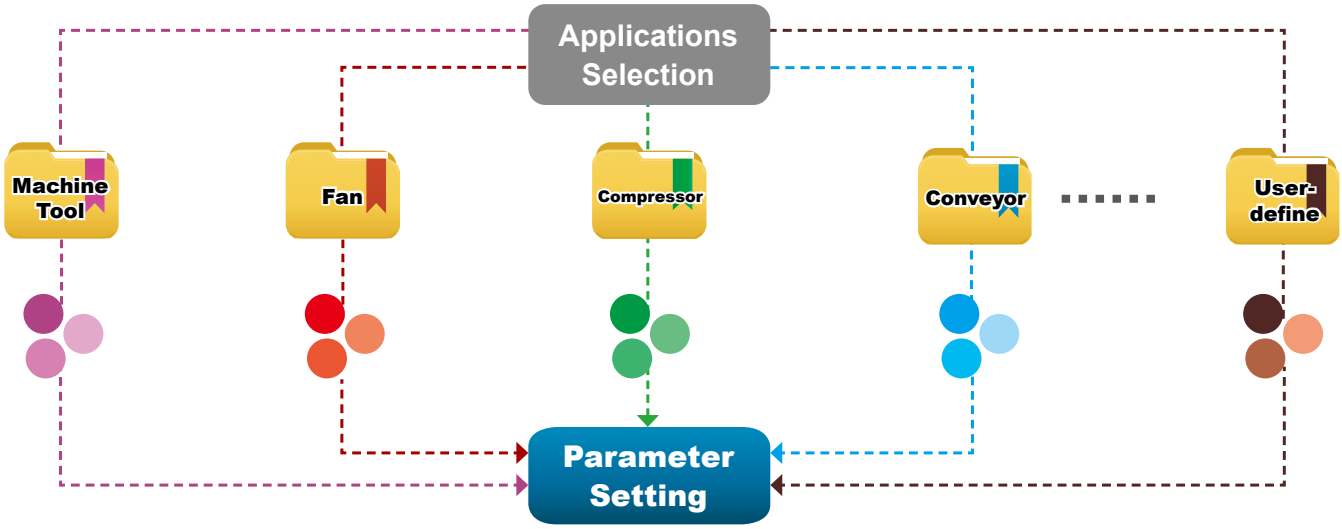
Built-in Class A (C2) standard EMC filter; saves on additional procurement cost and wiring time, and provides more cabinet space for other devices to use



Easy to Install

Application Groups (Macro)

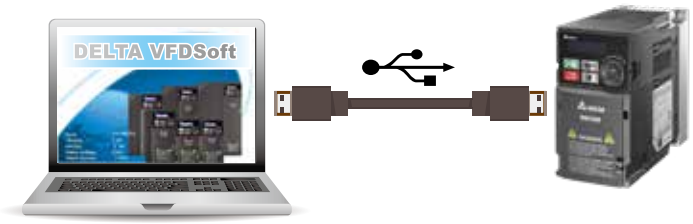
Simplifies the parameter setting process by grouping the parameters for different applications to use



Built-in USB Port

Built-in USB port facilitates the drive setting, updating, real-time monitoring and system tuning process

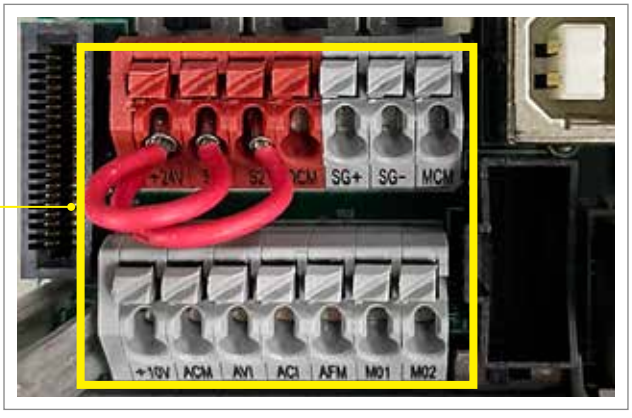
- No need of USB or RS-485 connectors
- Supports offline (drive power off) parameter setting/copying and system update



Screwless Wiring of Control Terminal

Spring clamp terminal blocks provide fast and easy wiring

No need for special tools and saves wiring time



Specifications

Single-phase 115V

Models w/o Built-in EMC Filter					
Frame			A		C
Applicable Motor Output (kW)			0.2	0.4	0.75
Applicable Motor Output (HP)			1/4	1/2	1
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.5	5
	Normal Duty	Rated Output Current (A)	1.8	2.7	5.5
Input	Rated Voltage / Frequency		1-Phase AC 100 V ~ 120 V (-15% ~ +10%), 50 / 60 Hz		
	Mains Input Voltage Range		85 ~ 132 V		
	Mains Frequency Range		47 ~ 63 Hz		
Carrier Frequency (kHz)			2 ~ 15 (default 4)		
Brake Chopper			Built-in		
DC Reactor			Optional		
AC Reactor			Optional		
Cooling Method			Natural air cooling		Fan cooling
Size: W×H (mm)			68×128		87×157
Size: D (mm)			130	144	167

Single-phase 230V

Models with Built-in EMC Filter							
Frame			B			C	
Applicable Motor Output (kW)			0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)			1/4	1/2	1	2	3
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.8	5	7.5	11
	Normal Duty	Rated Output Current (A)	1.8	3.2	5.2	8.5	12.5
Input	Rated Voltage / Frequency		1-Phase AC 200 V ~ 240 V (-15% ~ +10%), 50 / 60 Hz				
	Mains Input Voltage Range		170 ~ 265 V				
	Mains Frequency Range		47 ~ 63 Hz				
Carrier Frequency (kHz)			2 ~ 15 (default 4)				
Brake Chopper			Built-in				
DC Reactor			Optional				
AC Reactor			Optional				
Cooling Method			Natural air cooling	Fan cooling			
Size: WxH (mm)			72x142			87x157	
Size: D (mm)			174			194	

Models w/o an EMC Filter						
Frame			A		B	C
Cooling Method			Natural air cooling			Fan cooling
Size: W×H (mm)			68×128	68×128	72×142	87×157
Size: D (mm)			130	144	162	167

Product Specifications

3-phase 230 V

Models w/o Built-in EMC Filter												
Frame			A				B	C		D	E		F
Applicable Motor Output (kW)			0.2	0.4	0.75	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15
Applicable Motor Output (HP)			1/4	1/2	1	1	2	3	5	7.5	10	15	20
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.8	5	5	7.5	11	17	25	33	49	65
	Normal Duty	Rated Output Current (A)	1.8	3.2	5.2	5.2	8	12.5	19.5	27	36	51	69
Input	Rated Voltage/Frequency		3-Phase AC 200 V ~ 240 V (-15% ~ +10%), 50 / 60 Hz										
	Mains Input Voltage Range		170~265 V										
	Mains Frequency Range		47~63 Hz										
Carrier Frequency (kHz)			2~15 kHz (default 4 kHz)										
Brake Chopper			Built-in										
DC Reactor			Optional										
AC Reactor			Optional										
Cooling Method			Natural air cooling				Fan cooling						
Size: W×H (mm)			68x128				72x142	87x157		109x207	130x250		175x300
Size: D (mm)			144	144	162	150	158	167		169	200		207

Models w/o an EMC Filter						
Frame			G		I	
Applicable Motor Output (kW)			18.5	22	30	37 (45) (Note)
Applicable Motor Output (HP)			25	30	40	50 (60) (Note)
Inverter Output	Heavy Duty	Rated Output Current (A)	75	90	120	146
	Normal Duty	Rated Output Current (A)	81	102	134	160
Input	Rated Voltage/Frequency		3-Phase AC 200 V ~ 240 V (-15% ~ +10%), 50 / 60 Hz			
	Mains Input Voltage Range		170~265 V			
	Mains Frequency Range		47~63 Hz			
Carrier Frequency (kHz)			2~15 kHz (default 4 kHz)			
Brake Chopper			Built-in		Optional	
DC Reactor			Optional		Built-in	
AC Reactor			Optional			
Cooling Method			Fan cooling			
Size: W×H (mm)			250x400		330x550	
Size: D (mm)			225		300	

Note: Values in the brackets are the applicable motor output under normal duty

3-phase 460 V

Models with Built-in EMC Filter													
Frame			B				C		D		E		F	
Applicable Motor Output (kW)			0.4	0.75	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)			1/2	1	1	2	3	5	7.5	10	15	20	25	30
Inverter Output	Heavy Duty	Rated Output Current (A)	1.5	3	3	4.2	5.7	9	13	17.5	25	32	38	45
	Normal Duty	Rated Output Current (A)	1.8	3.3	3.3	4.6	6.5	10.5	14.5	19.8	28	36	41.5	49
Input	Rated Voltage / Frequency		3-Phase AC 380 V ~ 480 V (-15% ~ +10%), 50/60 Hz											
	Mains Input Voltage Range		323 ~ 528 V											
	Mains Frequency Range		47 ~ 63 Hz											
Carrier Frequency (kHz)			2 ~ 15 kHz (default 4 kHz)											
Brake Chopper			Built-in											
DC Reactor			Optional											
AC Reactor			Optional											
Cooling Method			Fan cooling											
Size: W×H (mm)			72 x 142				87 x 157		109 x 207		130 x 250		175 x 300	
Size: D (mm)			174				194		202		234		259	

Models w/o an EMC Filter													
Frame			A			B		C		D		E		F	
Cooling Method			Natural air cooling			Fan cooling									
Size: W×H (mm)			68 x 128			72 x 142		87 x 157		109 x 207		130 x 250		175 x 300	
Size: D (mm)			144	162	150	158		167		169		200		207	

3-phase 460 V

Models with Built-in EMC Filter										
Frame			G		H			I		
Applicable Motor Output (kW)			30		37		45	55		75
Applicable Motor Output (HP)			40		50		60	75		100
Inverter Output	Heavy Duty	Rated Output Current (A)	60		75		91	112		150
	Normal Duty	Rated Output Current (A)	69		85		108	128		180
Input	Rated Voltage / Frequency		3-Phase AC 380 V ~ 480 V (-15% ~ +10%), 50/60 Hz							
	Mains Input Voltage Range		323 ~ 528 V							
	Mains Frequency Range		47 ~ 63 Hz							
Carrier Frequency (kHz)			2 ~ 15 kHz (default 4 kHz)							
Brake Chopper			Built-in		Optional					
DC Reactor			Optional		Built-in					
AC Reactor			Optional							
Cooling Method			Fan cooling							
Size: W×H (mm)			250 x 400		280 x 500			330 x 550		
Size: D (mm)			225		280			300		

Models w/o an EMC Filter					
Frame			G	H	I
Cooling Method			Fan cooling		
Size: W×H (mm)			250 x 400	280 x 500	330 x 550
Size: D (mm)			225	280	300

General Specifications and Accessories

Control Functions	Control Methods	V/F, SVC, FOC, V/F+PG, FOC+PG, TQC+PG	
	Applicant Motors	Induction motors (IM), Interior Permanent Magnet (IPM) motors, and Surface Permanent Magnet (SPM) motors	
	Max. Output Frequency	599 Hz	
	Starting Torque*	150% / 3 Hz 200% / 0.5 Hz 200% / 0 Hz 100% / (1/20 of motor rated frequency) 150% / 0 Hz 200% / 0 Hz	(V/f, SVC, V/F+PG control for IM, Heavy duty) (FOC control for IM, Heavy duty) (FOC+PG control for IM, Heavy duty) (SVC control for PM, Heavy duty) (FOC control for PM, Heavy duty) (Closed-loop vector control w / PG for PM, Heavy duty)
	Speed Control Range*	1 : 50 (V/f, SVC, V/F+PG control for IM, Heavy duty) 1 : 100 (FOC control for IM, Heavy duty) 1 : 1000 (FOC+PG control for IM, Heavy duty)	1 : 20 (SVC control for PM, Heavy duty) 1 : 100 (FOC control for PM, Heavy duty) 1 : 1000 (Closed-loop vector control w / PG for PM, Heavy duty)
	Overload Tolerance	Normal Duty (ND): 120% of rated output current for 60 seconds; 150% of rated output current for 3 seconds Heavy Duty (HD): 150% of rated output current for 60 seconds; 200% of rated output current for 3 seconds	
	Frequency Setting Signal	0 ~ +10 V / -10 V ~ +10 V, 4 ~ 20 mA / 0 ~ +10 V, 2 Pulse input (33 kHz), 1 Pulse output (33 kHz)	
	Main Control Functions	multi-motor control motor switches (max. 8 independent motor parameter settings), fast startup, Deceleration Energy Back (DEB) function, wobble frequency function, fast deceleration function, master and auxiliary frequency source selectable, momentary power loss ride thru, speed search, over-torque detection, torque limit, 16-step speed (max.), accel/decel time switch, S-curve accel/decel, 3-wire sequence, JOG frequency, upper/lower limits for frequency reference, DC injection braking at start and stop, PID control, built-in PLC (5 K steps), positioning function, tension control, Modbus and CANopen integrated as standard	
Protection Functions	Motor Protection	overcurrent protection, overvoltage protection, over-temperature protection, phase failure protection, overload protection, output grounding protection	
	Stall Prevention	stall prevention during acceleration, deceleration and running independently	
Accessories	Communication Cards	PROFIBUS DP, DeviceNet, Modbus TCP, EtherNet/IP, EtherCAT	
	PG Cards	EMM-PG01L (ABZ, line driver) EMM-PG01O (ABZ, open collector)	EMM-PG01R (resolver)
	I/O Expansion Cards	EMM-D33A (digital card - 3 in / 3 out) EMM-A22A (analog card - 2 in / 2 out)	EMM-R2CA (relay card (output: A *3)) EMM-R3AA (relay card (output: A *3))
	External DC Power Supply	EMM-BPS02 (DC 24V power supply card)	
Digital Controller		A removable keypad as standard	
Certifications		CE, RCM, REACH, RoHS, TUV, UL	

***Control accuracy may vary depending on the environment, application conditions, different motors or encoder. For details, please contact our company or your local distributor.**

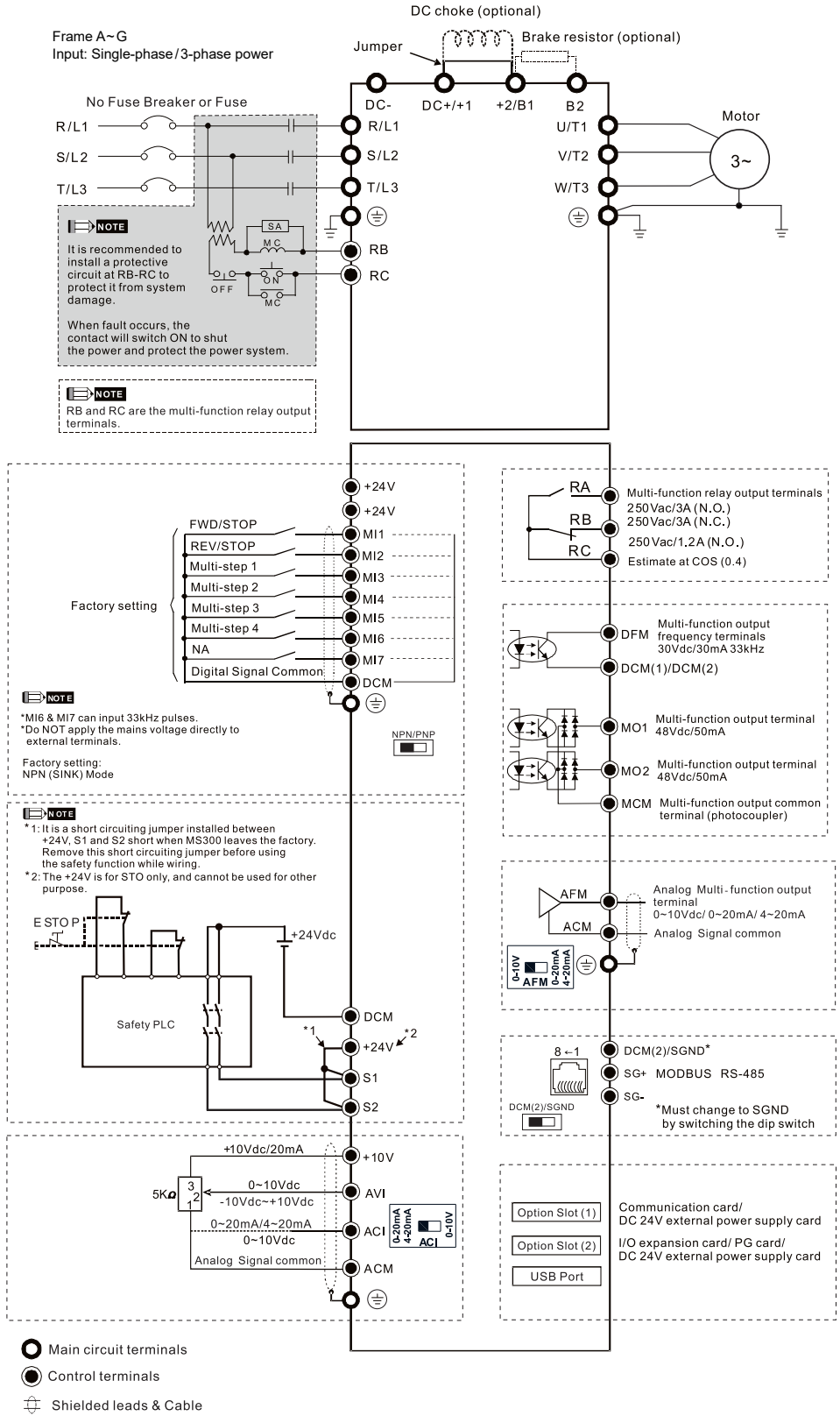
Operating Environment

Operating Environment	Installation Location	IEC60364-1 / IEC60664-1 Pollution degree 2, Indoor use only		
	Ambient Temperature	Operation	IP20 / UL Open Type	-20 to 50 °C -20 to 60 °C (needs derating)
			IP40 / NEMA 1 / UL Type 1	-20 to 40 °C -20 to 50 °C (needs derating)
			Zero stacking Installation	
		Storage		-40 to 85 °C
		Transportation		-20 to 70 °C
	Rated Humidity	Operation		Max. 90%
		Storage / Transportation		Max. 95%
	Air Pressure	Operation		86 ~ 106 kPa
		Storage / Transportation		70 ~ 106 kPa
	Pollution Level	Compliance to IEC60721-3-3, 3C2		
	Altitude	An altitude of 0 ~ 1000 m for normal operation (derating is required for installation at an altitude above 1000 m)		
Vibration		Compliance to IEC 60068-2-6		
Shock		Compliance to IEC/EN 60068-2-27		

Please refer to MH300 user manual for more details.

Wiring

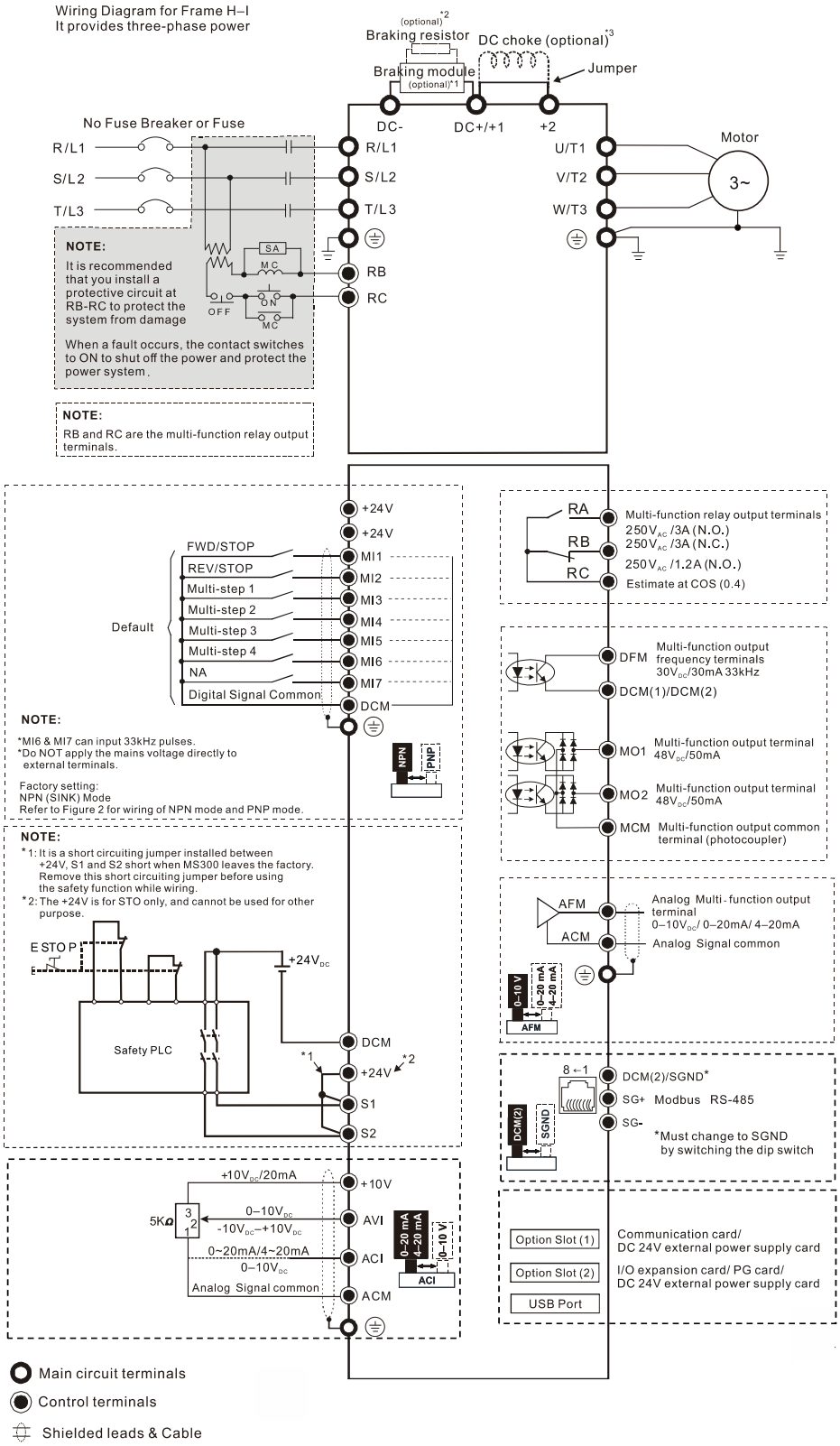
Input: Single-phase / 3-phase power



Note 1: please refer to MH300 user manual (chapter 7-4) for more details of DC choke
Note 2: please refer to MH300 user manual (chapter 7-1) for more details of brake resistor

Wiring

Input: Single-phase / 3-phase power



Main circuit terminals

Control terminals

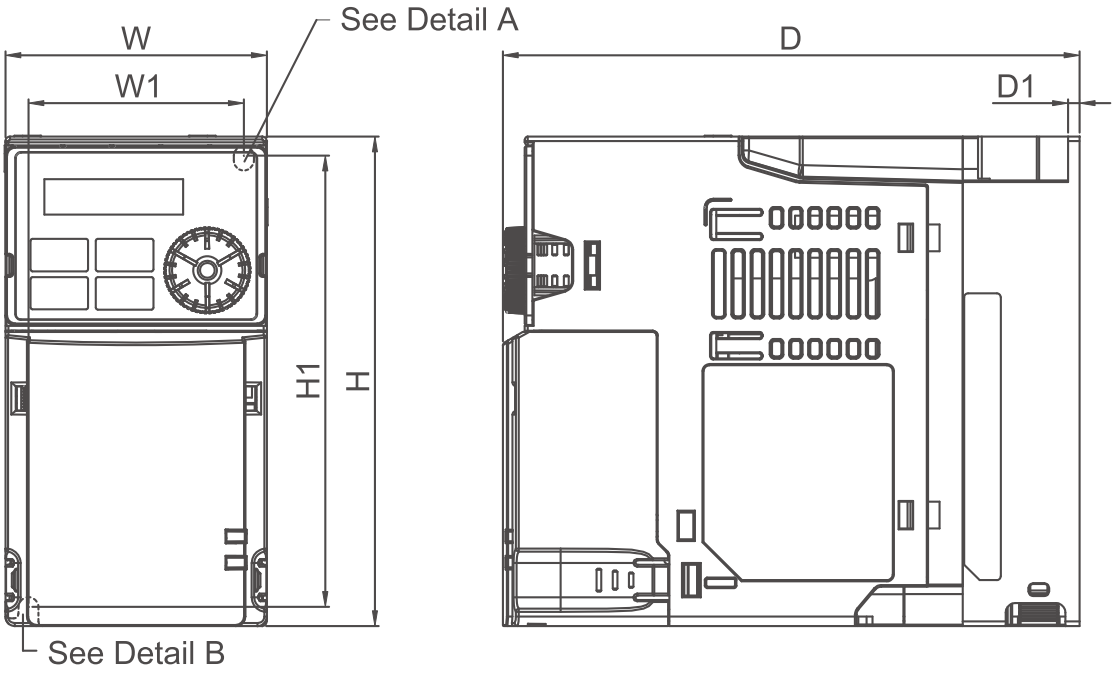
Shielded leads & Cable

*1 & *2 Refer to Section 7-1 in the user manual for brake units and resistor selection.

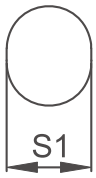
*3 Refer to Section 7-4 in the user manual for DC reactor selection.

Dimensions

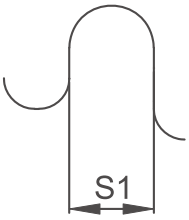
Frame A



Detail A (Mounting Hole)



Detail B (Mounting Hole)

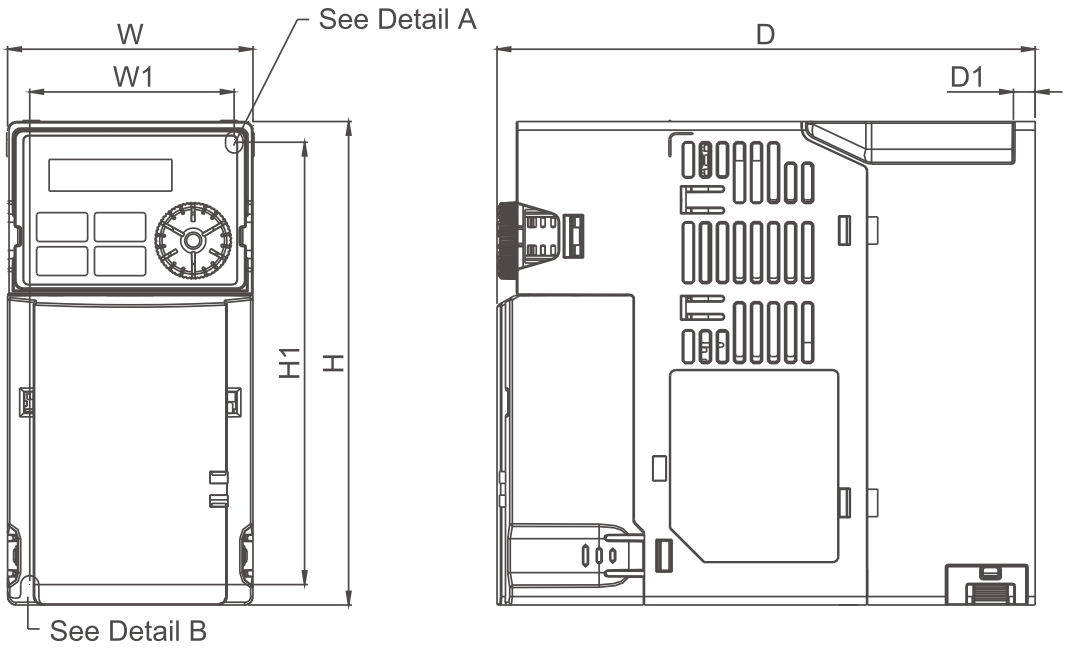


MODEL FRAME A1	FRAME A2		FRAME A3	FRAME A4
VFD1A6MH11ANSAA	VFD2A5MH11ANSAA	VFD2A5MH11ENSAA	VFD5A0MH23ANSAA	VFD5A0MH23ANSNA
VFD1A6MH11ENSAA	VFD2A8MH21ANSAA	VFD2A8MH21ENSAA	VFD5A0MH23ENSAA	VFD5A0MH23ENSNA
VFD1A6MH21ANSAA	VFD1A6MH23ANSAA	VFD1A6MH23ENSAA	VFD3A0MH43ANSAA	VFD3A0MH43ANSNA
VFD1A6MH21ENSAA	VFD2A8MH23ANSAA	VFD2A8MH23ENSAA	VFD3A0MH43ENSAA	VFD3A0MH43ENSNA
	VFD1A5MH43ANSAA	VFD1A5MH43ENSAA		

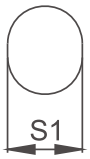
Frame		W	H	D	W1	H1	D1	S1
A1	mm	68.0	128.0	130.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	5.12	2.20	4.65	0.12	0.20
Frame		W	H	D	W1	H1	D1	S1
A2	mm	68.0	128.0	144.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	5.67	2.20	4.65	0.12	0.20

Frame		W	H	D	W1	H1	D1	S1
A3	mm	68.0	128.0	150.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	5.91	2.20	4.65	0.12	0.20
Frame		W	H	D	W1	H1	D1	S1
A4	mm	68.0	128.0	162.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	6.38	2.20	4.65	0.12	0.20

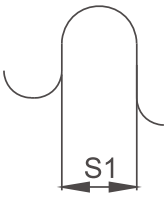
Frame B



Detail A (Mounting Hole)



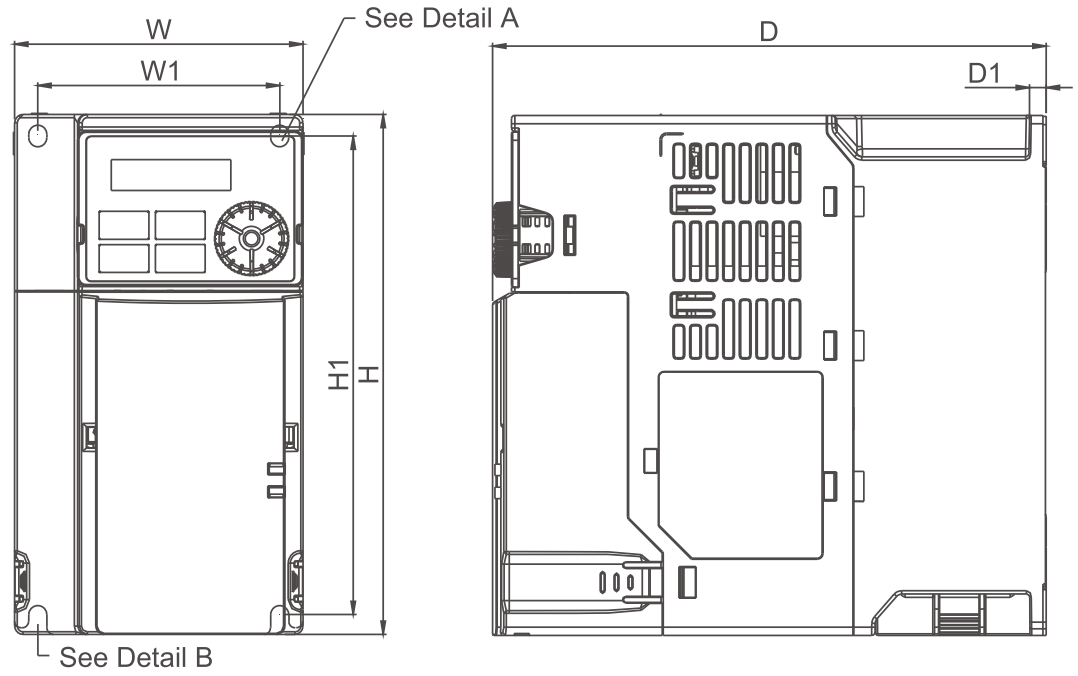
Detail B (Mounting Hole)



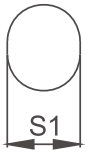
MODEL FRAME B1	FRAME B2	FRAME B3
VFD7A5MH23ANSAA VFD7A5MH23ENSAA VFD4A2MH43ANSAA VFD4A2MH43ENSAA	Standard Models: VFD5A0MH21ANSAA VFD5A0MH21ENSAA	VFD1A6MH21AFSAA VFD2A8MH21AFSAA VFD5A0MH21AFSAA VFD3A0MH43AFSAA VFD4A2MH43AFSAA

Frame		W	H	D	W1	H1	D1	S1
B1	mm	72.0	142.0	158.0	60.0	130.0	6.4	5.2
	inch	2.83	5.59	6.22	2.36	5.12	0.25	0.20
Frame		W	H	D	W1	H1	D1	S1
B2	mm	72.0	**142.0**	162.0	60.0	130.0	3.0	5.2
	inch	2.83	5.59	6.38	2.36	5.12	0.12	0.20
Frame		W	H	D	W1	H1	D1	S1
B3	mm	72.0	142.0	174.0	60.0	130.0	4.3	5.2
	inch	2.83	5.59	6.85	2.36	5.12	0.17	0.20

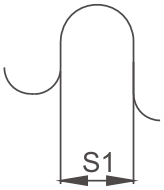
Frame C



Detail A (Mounting Hole)



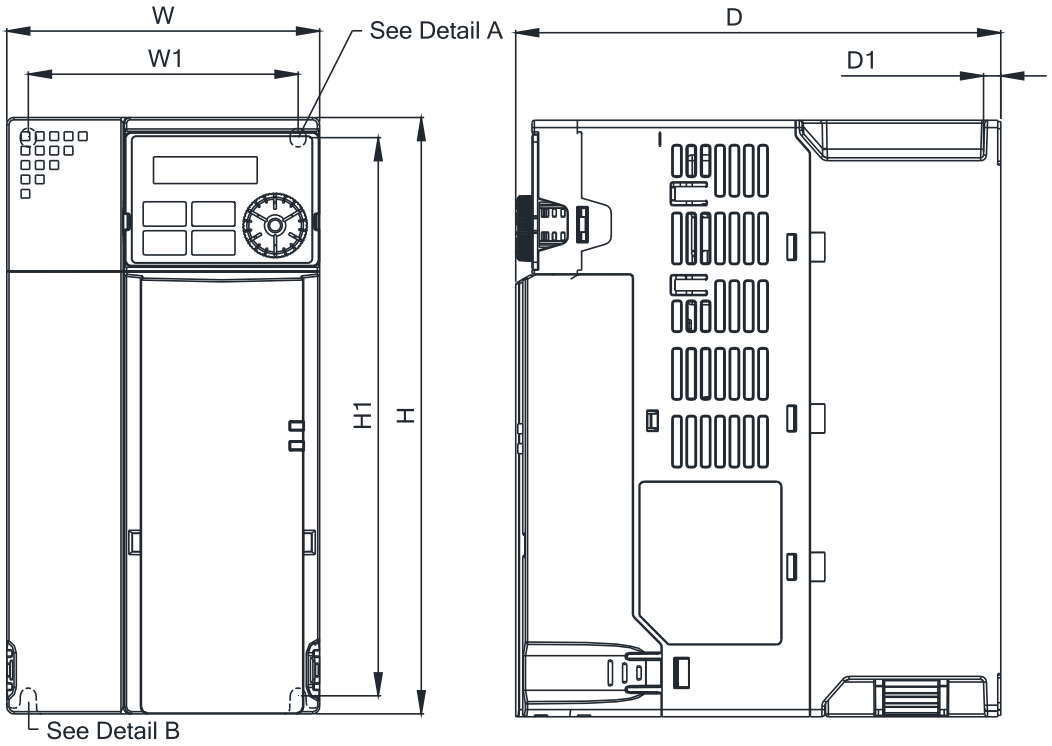
Detail B (Mounting Hole)



MODEL FRAME C1		FRAME C2
VFD5A0MH11ANSAA	VFD5A0MH11ENSAA	VFD7A5MH21AFSAA
VFD7A5MH21ANSAA	VFD7A5MH21ENSAA	VFD11AMH21AFSAA
VFD11AMH21ANSAA	VFD11AMH21ENSAA	VFD5A7MH43AFSAA
VFD11AMH23ANSAA	VFD11AMH23ENSAA	VFD9A0MH43AFSAA
VFD17AMH23ANSAA	VFD17AMH23ENSAA	
VFD5A7MH43ANSAA	VFD5A7MH43ENSAA	
VFD9A0MH43ANSAA	VFD9A0MH43ENSAA	

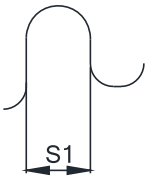
Frame		W	H	D	W1	H1	D1	S1
C1	mm	87.0	157.0	167.0	73.0	144.5	5.0	5.5
	inch	3.43	6.18	6.57	2.87	5.69	0.20	0.22
Frame		W	H	D	W1	H1	D1	S1
C2	mm	87.0	157.0	194.0	73.0	144.5	5.0	5.5
	inch	3.43	6.18	7.64	2.87	5.69	0.20	0.22

Frame D



Detail A (Mounting Hole)

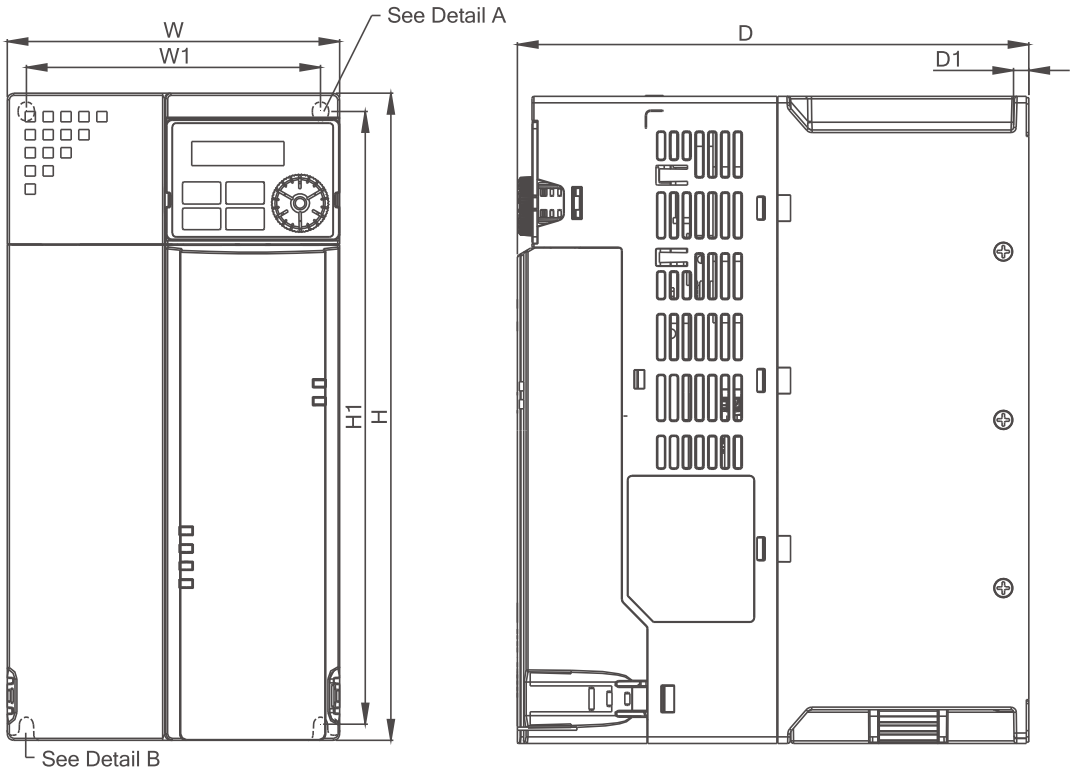
Detail B (Mounting Hole)



MODEL FRAME D1	FRAME D2
VFD25AMH23ANSAA	VFD13AMH43AFSAA
VFD25AMH23ENSAA	VFD17AMH43AFSAA
VFD13AMH43ANSAA	
VFD13AMH43ENSAA	
VFD17AMH43ANSAA	
VFD17AMH43ENSAA	

Frame		W	H	D	W1	H1	D1	S1
D1	mm	109.0	207.0	169.0	94.0	193.8	6.0	5.5
	inch	4.29	8.15	6.65	3.70	7.63	0.24	0.22
Frame		W	H	D	W1	H1	D1	S1
D2	mm	109.0	207.0	202.0	94.0	193.8	6.0	5.5
	inch	4.29	8.15	7.95	3.70	7.63	0.24	0.22

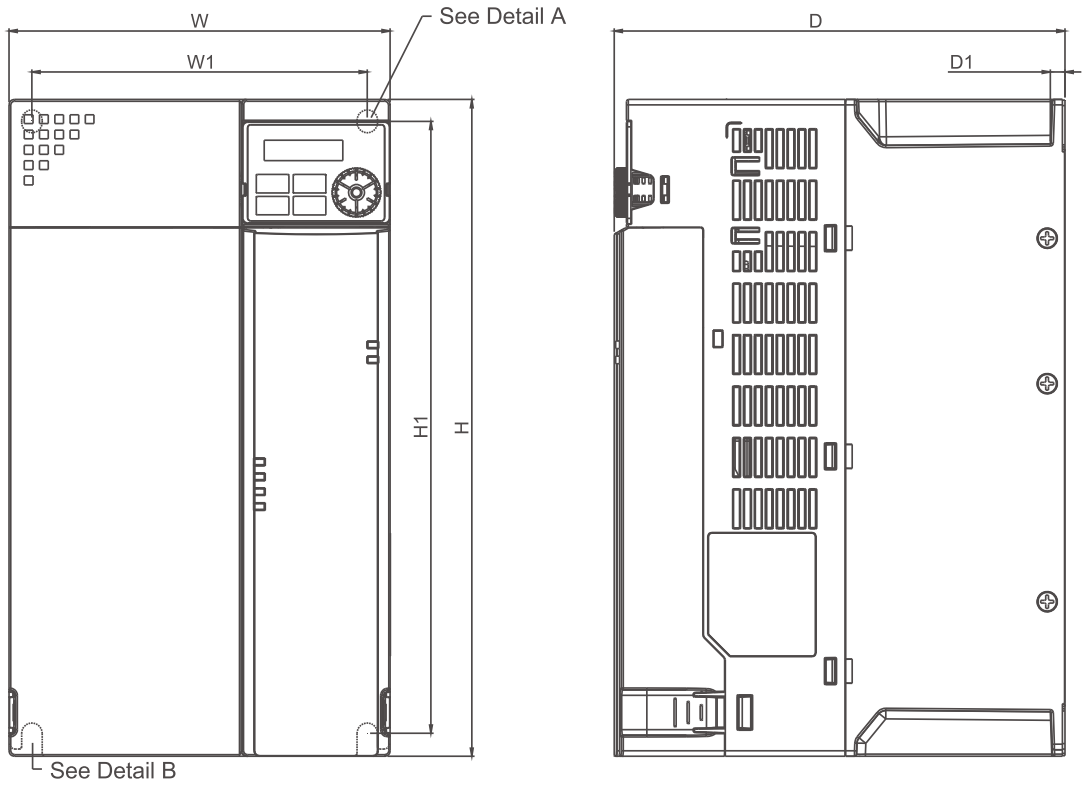
Frame E



MODEL FRAME E1	FRAME E2
VFD33AMH23ANSAA	VFD25AMH43AFSAA
VFD33AMH23ENSAA	VFD32AMH43AFSAA
VFD49AMH23ANSAA	
VFD49AMH23ENSAA	
VFD25AMH43ANSAA	
VFD25AMH43ENSAA	
VFD32AMH43ANSAA	
VFD32AMH43ENSAA	

Frame		W	H	D	W1	H1	D1	S1
E1	mm	130.0	250.0	200.0	115.0	236.8	6.0	5.5
	inch	5.12	9.84	7.87	4.53	9.32	0.24	0.22
Frame		W	H	D	W1	H1	D1	S1
E2	mm	130.0	250.0	234.0	115.0	236.8	6.0	5.5
	inch	5.12	9.84	9.21	4.53	9.32	0.24	0.22

Frame F



MODEL

FRAME F1

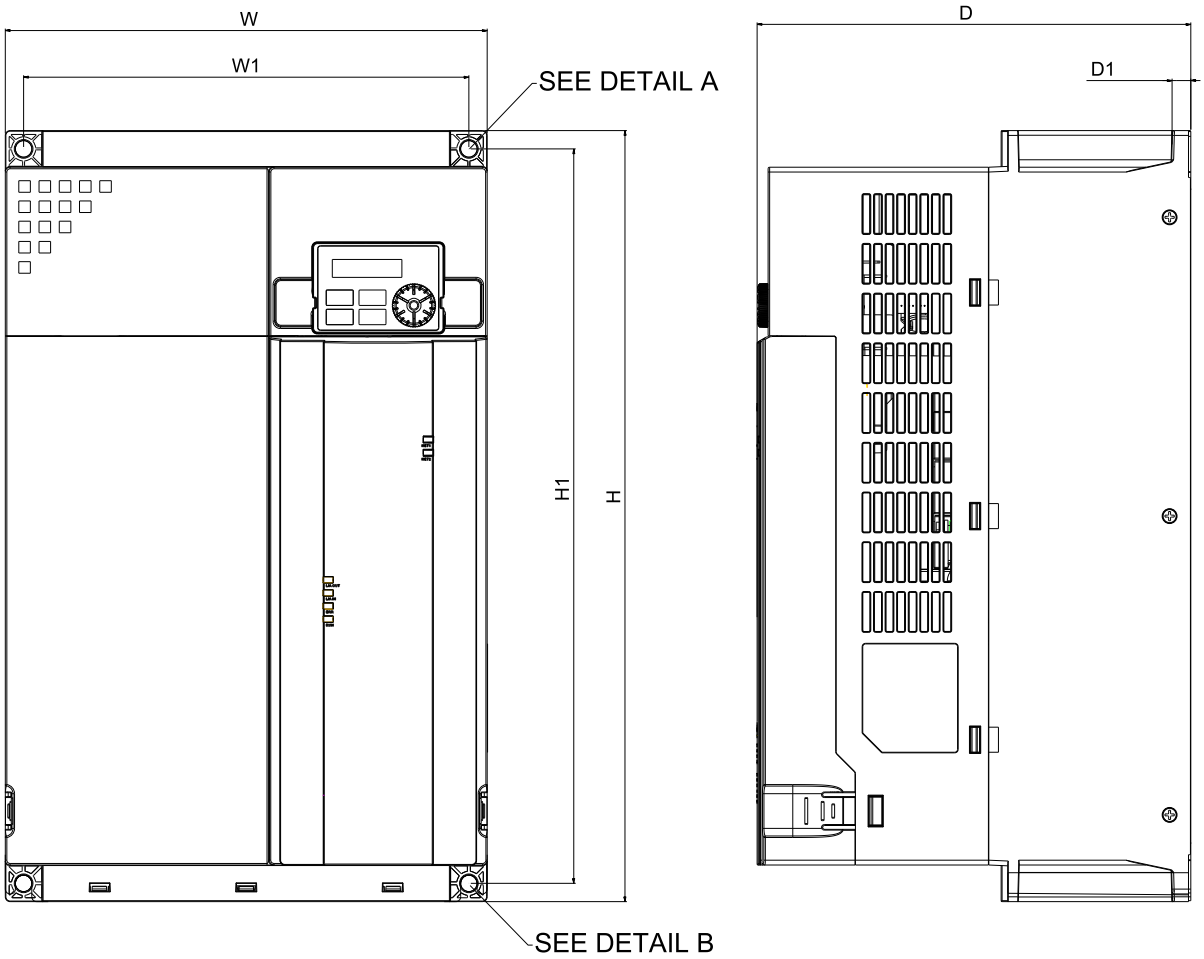
Standard Models:	High Speed Models:
VFD65AMH23ANSAA	VFD65AMH23ANSHA
VFD65AMH23ENSAA	VFD65AMH23ENSHA
VFD38AMH43ANSAA	VFD38AMH43ANSHA
VFD38AMH43ENSAA	VFD38AMH43ENSHA
VFD45AMH43ANSAA	VFD45AMH43ANSHA
VFD45AMH43ENSAA	VFD45AMH43ENSHA

FRAME F2

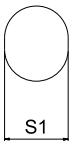
Standard Models:	High Speed Models:
VFD38AMH43AFSAA	VFD38AMH43AFSHA
VFD45AMH43AFSAA	VFD45AMH43AFSHA

Frame		W	H	D	W1	H1	D1	S1
F1	mm	175.0	300.0	207.0	154.0	279.5	6.5	8.4
	inch	6.89	11.81	8.15	6.06	11.00	0.26	0.33
Frame		W	H	D	W1	H1	D1	S1
F2	mm	175.0	300.0	259.0	154.0	279.5	6.5	8.4
	inch	6.89	11.81	10.20	6.06	11.00	0.26	0.33

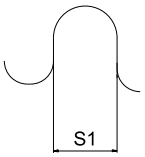
Frame G



Detail A (Mounting Hole)



Detail B (Mounting Hole)

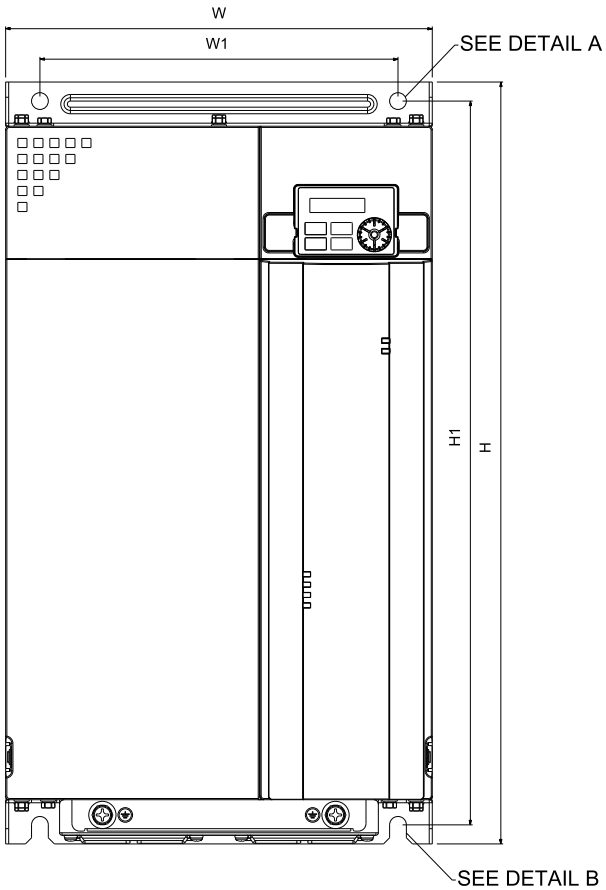


MODEL
FRAME G

VFD60AMH43AFSAA
VFD60AMH43ANSAA
VFD75AMH23ANSAA
VFD90AMH23ANSAA

Frame		W	H	D	W1	H1	D1	S1
G	mm	250.0	400.0	225.0	231.0	381.0	10.0	8.5
	inch	9.84	15.75	8.86	9.09	15.00	0.39	0.33

Frame H



DETAIL A
(MOUNTING
HOLE)

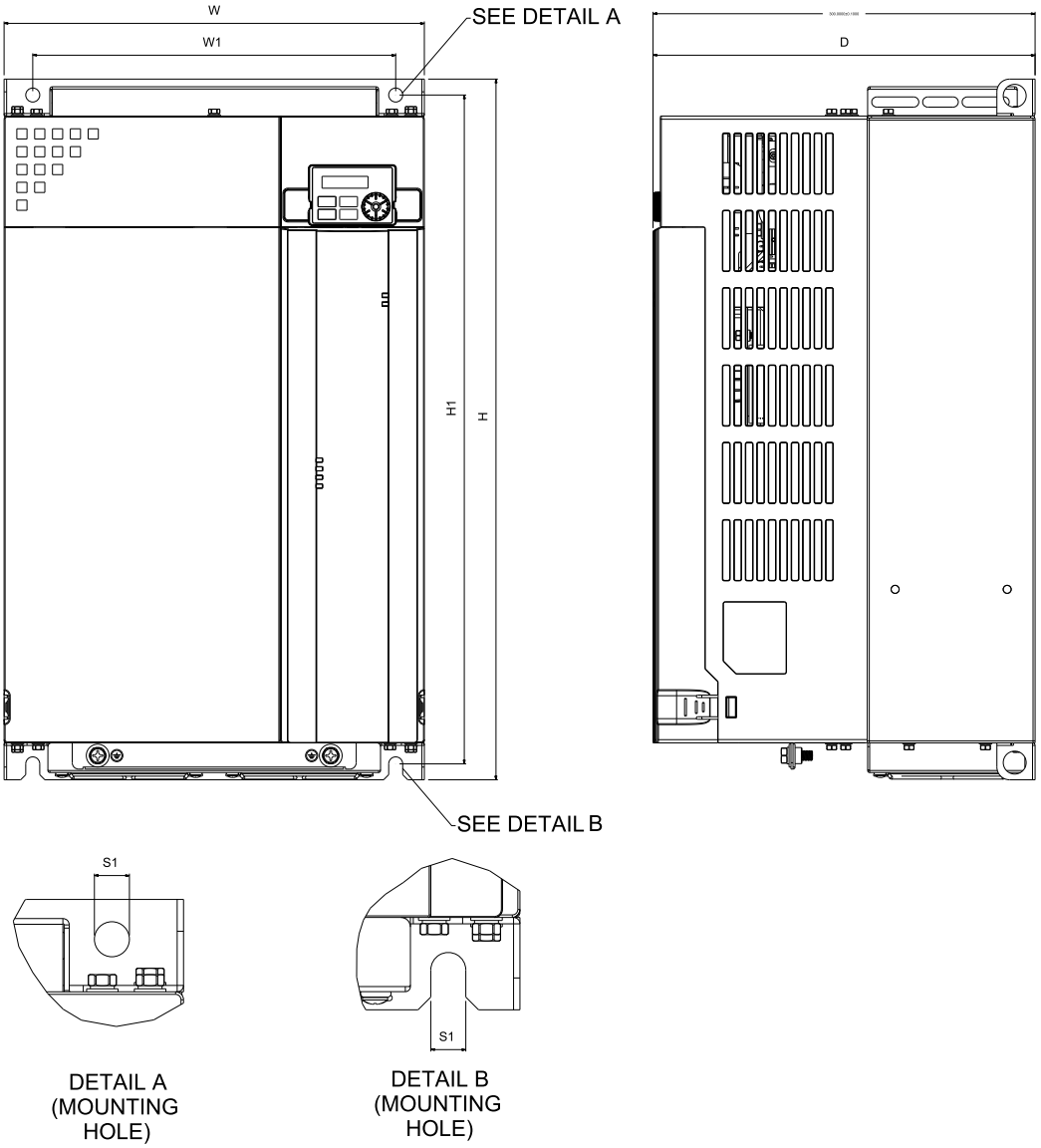
DETAIL B
(MOUNTING
HOLE)

MODEL
FRAME H

VFD75AMH43AFSAA
VFD75AMH43ANSAA
VFD91AMH43AFSAA
VFD91AMH43ANSAA

Frame		W	H	D	W1	H1	D1	S1
H	mm	280.0	500.0	280.0	235.0	475.0	11.0	8.4
	inch	11.02	19.69	11.02	9.25	18.70	0.43	0.33

Frame I



MODEL
FRAME I

VFD112MH43AFSAA
VFD112MH43ANSAA
VFD120MH23ANSAA
VFD146MH23ANSAA
VFD150MH43AFSAA
VFD150MH43ANSAA

Frame		W	H	D	W1	H1	S1
I	mm	330.0	550.0	300.0	285.0	525.0	11.0
	inch	12.99	21.65	11.81	11.22	20.67	0.43

Accessories

▪ PG Cards: EMM-PG01L

Set by
Pr.10-00～10-02

Terminals		Description
PG1	VP	Output voltage for power: +5 V / +12 V ± 5% (use FSW3 to switch +5 V / +12 V, default +5V) Max. output current: 200 mA
	DCM	Common for power and signal
	A1, /A1 B1, /B1 Z1, /Z1	Encoder input signal (Line Driver or Open Collector) Open collector input: + 5 V ~ 24 V (Note 1) 1-phase or 2-phase input / Max. input frequency: 300 kHz
PG2	A2, /A2 B2, /B2	Pulse input signal (line driver or open collector) Open collector input: +5 V / +12 V (Note1) 1-phase or 2-phase input / Max. input frequency: 300 kHz
PG OUT	AO, /AO BO, /BO ZO, /ZO SG	PG card output signals / Division frequency function: 1～255 times Max. output voltage for line driver: 5 V_{DC} Max. output current: 15 mA / Max. output frequency: 300 kHz SG: The GND of PG card is the same as the host controller or PLC, and a common output signal is attained
Ground	PE	Earthing terminal to reduce noise; this terminal should also be grounded

▪ PG Cards: EMM-PG01O

Set by
Pr.10-00～10-02

Terminals		Description
PG1	VP	Output voltage for power: +5 V / +12 V ± 5% (use SSW320 to switch +5 V / +12 V, the default is +5 V) Max. output current: 200 mA
	DCM	Common for power and signal
	A1, /A1 B1, /B1 Z1, /Z1	Encoder input signal (line driver or open collector) Open collector input: +5 V～+12 V (Note1) 1-phase or 2-phase input / Max. input frequency: 300 kHz
PG2	A2, /A2 B2, /B2	Pulse input signal (line driver or open collector) Open collector input: +5 V～+12 V (Note1) 1-phase or 2-phase input / Max. input frequency: 300 kHz
PG OUT	V+	Needs external power source for PG OUT circuit. Input voltage of power: +7 V～+24 V
	V-	Negative power supply input
	/AO, /BO, /ZO SG	PG card output signals / Division frequency function: 1～255 times Add a pull-up resistor (1.8 KΩ / 1 W) to the open collector output signals to avoid signal interferences Max. Output current: 20 mA / Max output frequency: 300 kHz SG: The GND of PG card is the same as the host controller or PLC, and a common output signal is attained
Ground	PE	Earthing terminal to reduce noise; this terminal should also be grounded

▪ PG Cards: EMM-PG01R

Resolver

Set by
Pr.10-00～10-02

Terminals		Description
PG1	R1- R2	Resolver output power 7 Vrms, 10 kHz
	S1, S2, S3, S4	Resolver input signal 3.5 ± 0.175 Vrms, 10 kHz
PG2	A2, /A2 B2, /B2	Pulse input signal (line driver or open collector) Open collector input : +5 V～+12 V (Note1) 1-phase or 2-phase input / Max. input frequency: 300kHz
PG OUT	AO, /AO BO, /BO ZO, /ZO SG	PG card output signals / Division frequency function: 1～255 times Max. output voltage for line driver: 5 V_{DC} Max. output current: 50 mA / Max. output frequency: 300 kHz SG: The GND of PG card is the same as the host controller or PLC, and a common output signal is attained
Ground	PE	Earthing terminal to reduce noise; this terminal should also be grounded

▪ External Power Supply Card (DC 24V): EMM-BPS02

Terminals	Description
PE GND 24 V	When the AC motor drive power is off, the external power supply card provides external power to the network system, PLC function, and other functions to allow continued operations Input power: 24 V ± 5% Maximum input current: 0.5A Note: 1) Do not connect the control terminal +24 V (Digital control signal common: SOURCE) directly to the EMC-BPS02 input terminal 24 V 2) Do not connect control terminal GND directly to the EMC-BPS02 input terminal GND in order to achieve good isolation

Note 1: For the open collector, set input voltage to 5～15 mA and install a pull-up resistor
[5 V] Recommend pull-up resistor: 100～220 Ω, 1/2 W and above
[12 V] Recommend pull-up resistor: 510～1.35 KΩ, 1/2 W and above
[24 V] Recommend pull-up resistor: 1.8K～3.3 KΩ, 1/2 W and above

Accessories

▪ Digital I/O Card: EMM-D33A

Terminals	Description
24V, DCM	Output power: +24 V_{DC} ± 5% 200 mA, 5 W
MI10 ~ MI12	Refer to Pr. 02-26 ~ Pr. 02-28 to program the multi-function Choose SINK (NPN) / SOURCE (PNP) from SWW1 Internal power is supplied by terminal 24V: +24 V_{DC} ± 5% 200 mA, 5 W If external power is +24 V_{DC}, the max. voltage is 30 V_{DC} and the min. voltage is 19 V_{DC} ON: the activation current is 6.5 mA OFF: leakage current tolerance is 10 μA
MO10 ~ MO12	Refer to Pr. 02-36 ~ Pr. 02-38 to program the multi-function The motor drive releases various monitor signals, such as drive in operation, frequency attained and overload indication, via transistor (open collector) MO output signal: each MO terminal needs a pull-up resistor, the max. external power voltage is 48 V_{DC} / 50 mA
MCM	Common for multi-function output terminals MO10 ~ MO12 (photocoupler)
PE	Earthing terminal to reduce noise; this terminal should also be grounded

▪ Analog I/O Card: EMM-A22A

Terminals	Description
ACM	Common output signal and input signal terminals
AI10, AI11	Refer to Pr. 14-00 ~ Pr. 14-01 to program the multi-function Two AI ports: switch between J9, J19 for AVI or ACI AVI10 ~ AVI11: input 0 ~ 10.00 V ± 0.05 V ACI10 ~ ACI11: input 0 ~ 20.00 mA ± 0.05 mA
AO10, AO11	Refer to Pr. 14-12 ~ Pr. 14-13 to program the multi-function Two AO ports: switch between J2, J22 for AVO or ACO AVO10 ~ AVO11: output 0 ~ 10.00 V ± 0.05 V ACO10 ~ ACO11: output 0 ~ 20.00 mA ± 0.05 mA
PE	Earthing terminal to reduce noise; this terminal should also be grounded

▪ Relay Cards:

EMM-R2CA

Terminals	Description
RA10 ~ RA11 RB10 ~ RB11 RC10 ~ RC11	Refer to Pr. 02-36 ~ Pr. 02-37 to program the multi-function Resistive load: 5A (N.O.) / 240 V_{AC} Function: To output each monitor signal, such as drive is in operation, frequency attained or overload indication

EMM-R3AA

Terminals	Description
RA10 ~ RA12 RC10 ~ RC12	Refer to Pr. 02-36 ~ Pr. 02-38 to program the multi-function Resistive load: 6A (N.O.) / 250 V_{AC} Function: To output each monitor signal, such as drive is in operation, frequency attained or overload indication

▪ Screw Specification of Option Card Terminals

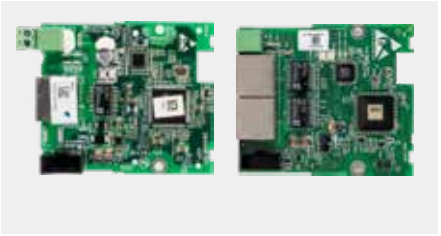
Screw Specification of Option Card Terminals	Wire Gauge	Torque
EMM-PG01L EMM-PG01O EMM-PG01R EMM-A22A EMM-D33A CMM-EIP02 CMM-EIP03 CMM-EC02 CMM-PD02 CMM-DN02	30 ~ 16 AWG (0.0509 ~ 1.31 mm^2)	2 Kg-cm [1.74 lb-in]

Screw Specification of Option Card Terminals	Wire Gauge	Torque
EMM-BPS02	30 ~ 16 AWG (0.0509 ~ 1.31 mm^2)	8 Kg-cm [6.94 lb-in]
EMM-R2CA EMM-R3AA	24 ~ 12 AWG (0.205 ~ 3.31 mm^2)	5 Kg-cm [4.34 lb-in]

Option cards require working with the cables models of CBM-CLxxA / CBM-CCxxA. For more details, please refer to the MH300 user manual.

▪ EtherNet/IP, Modbus TCP Option Card

CMM-EIP02 / CMM-EIP03



Features

- Supports max. 32 words input and 32 words output of I/O connection
- User-defined parameter mapping
- IP Filter, basic firewall function
- Supports DLR ring node
  * applied to CMM-EIP03

Network Interface

Network Protocol	DHCP、BOOTP、EtherNet/IP、Modbus TCP	Interface	RJ-45
Transmission Speed	10 / 100Mbps	Number of Ports	1 (CMM-EIP02) / 2 (CMM-EIP03)
Transmission Method	I/O connection / Explicit message	Transmission Cable	Category 5e shielding
Transmission Distance	100 m, extension is allowed via switch		

▪ DeviceNet Option Card

CMM-DN02

Features

- Supports Group 2 only connection method and cyclic I/O data exchange
- Provides EDS file to identify DeviceNet equipment information
- Supports max. 32 words input and 32 words output of parameter mapping and remote I/O function
- Node address and baud rate can be set in the AC motor drive

Network Interface

Network Protocol	DeviceNet	Interface	Terminal block
Transmission Speed	500k / 250k / 125k / 100k / 50k bps and extendable baud rate mode of 1M	Number of Ports	1
Transmission Method	Explicit message / Implicit message	Transmission Cable	Delta standard
Transmission Distance	25 m / 1Mbps		

▪ PROFIBUS DP Card

CMM-PD02

Features

- Supports PZD cyclic data exchange
- Supports PKW read/write to AC motor drive parameters
- Supports user diagnosis function
- Auto-detects baud rates; supports max. 12 Mbps
- Supports remote I/O function

Network Interface

Network Protocol	PROFIBUS DP	Interface	DB9
Transmission Speed	9.6k / 19.2k / 93.75k / 187.5k / 500k / 1.5M / 3M / 6M / 12Mbps	Number of Ports	1
Transmission Method	Cyclic / non-cyclic data exchange	Transmission Cable	Delta standard
Transmission Distance	100 m / 12Mbps		

Accessories

▪ EtherCAT Option Card

CMM-EC02

Features

- Supports Ethernet CAT protocol
- Supports standard CiA402 speed mode
- Supports SDO (Service Data Objects) function:
  Drive status reading and parameters editing
- Auto shutdown function for interruptions during data transmission
- Supports remote I/O function

Network Interface

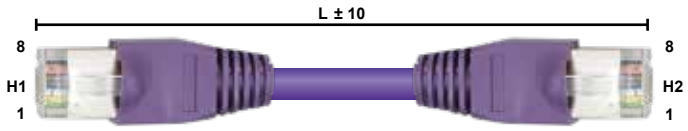
Interface	RJ-45	Transmission Cable	Category 5e shielding 100 M
Number of Ports	2	Transmission Speed	100 Mbps
Transmission Method	IEEE 802.3, IEEE 802.3u	Network Protocol	EtherCAT

▪ Standard Fieldbus Cables

Delta Cables	Part Number	Description	Length
CANopen Cable	UC-CmC003-01A	CANopen cable, RJ45 connector	0.3 m
	UC-CmC005-01A		0.5 m
	UC-CmC010-01A		1 m
	UC-CmC015-01A		1.5 m
	UC-CmC020-01A		2 m
	UC-CmC030-01A		3 m
	UC-CmC050-01A		5 m
	UC-CmC100-01A		10 m
	UC-CmC200-01A		20 m
DeviceNet Cable	UC-DN01Z-01A	DeviceNet cable	305 m
	UC-DN01Z-02A		305 m
EtherNet/EtherCAT Cable	UC-EmC003-02A	EtherNet/EtherCAT cable, Shielding	0.3 m
	UC-EmC005-02A		0.5 m
	UC-EmC010-02A		1 m
	UC-EmC020-02A		2 m
	UC-EmC050-02A		5 m
	UC-EmC100-02A		10 m
	UC-EmC200-02A		20 m
CANopen/DeviceNet TAP	TAP-CN01	1 in 2 out, built-in 121Ω terminal resistor	1 in 2 out
	TAP-CN02		1 in 2 out, RJ45
	TAP-CN03	1 in 4 out, RJ45 connector, built-in 121Ω terminal resistor	1 in 4 out
PROFIBUS Cable	UC-PF01Z-01A	PROFIBUS DP cable	305 m

Extension Cable for Digital Keypad

- **RJ45 Extension Cable / CANopen Communication Cable**



Part No.	L	
	mm	inch
UC-CMC003-01A	300	11.8
UC-CMC005-01A	500	19.6
UC-CMC010-01A	1,000	39
UC-CMC015-01A	1,500	59
UC-CMC020-01A	2,000	78.7
UC-CMC030-01A	3,000	118.1
UC-CMC050-01A	5,000	196.8
UC-CMC100-01A	10,000	393.7
UC-CMC200-01A	20,000	787.4

Model Name Explanation

VFD 1A5 MH 43 A N S A A

Variable Frequency Drive

Rated Output Current

Under Heavy Duty Mode (150% 60 seconds)

Series Name

MH: High Performance MH300

Input Voltage

11 : 115 V single-phase
21 : 230 V single-phase
23 : 230 V 3-phase
43 : 460 V 3-phase

IP Level

A : IP20
E : IP40 (Anti-dust)

Version

Model Type

A: Standard Model
N: No Cooling Fan
*Only for MH300 1HP(0.75kW) model (230V 3-phase / 460V 3-phase)

Safe Torque Off (STO)

S: Integrated STO

EMC Filter

N : No Function
F : Built-in EMC Filter

Ordering Information

Power Range			Frame Size	Model Name	Standard Models (0 ~ 599 Hz)		
Max. Applicable Motor Capacity		Drive Rated Output Current			Built-in EMC Filter	IP40 Models	F: Forced air cooling N: Natural air cooling
[HP]	[kW]	[A]					
115 V / single-phase							
0.25	0.2	1.6	A	VFD1A6MH11ANSAA	-	-	N
				VFD1A6MH11ENSAA	-	V	N
0.5	0.4	2.5	A	VFD2A5MH11ANSAA	-	-	N
				VFD2A5MH11ENSAA	-	V	N
1	0.75	5.0	C	VFD5A0MH11ANSAA	-	-	F
				VFD5A0MH11ENSAA	-	V	F
230 V / single-phase							
0.25	0.2	1.6	A	VFD1A6MH21ANSAA	-	-	N
			A	VFD1A6MH21ENSAA	-	V	N
			B	VFD1A6MH21AFSAA	V	-	N
0.5	0.4	2.8	A	VFD2A8MH21ANSAA	-	-	N
			A	VFD2A8MH21ENSAA	-	V	N
			B	VFD2A8MH21AFSAA	V	-	F
1	0.75	5.0	B	VFD5A0MH21ANSAA	-	-	N
				VFD5A0MH21AFSAA	V	-	F
				VFD5A0MH21ENSAA	-	V	N
2	1.5	7.5	C	VFD7A5MH21ANSAA	-	-	F
				VFD7A5MH21AFSAA	V	-	F
				VFD7A5MH21ENSAA	-	V	F
3	2.2	11.0	C	VFD11AMH21ANSAA	-	-	F
				VFD11AMH21AFSAA	V	-	F
				VFD11AMH21ENSAA	-	V	F
230 V / 3-phase							
0.25	0.2	1.6	A	VFD1A6MH23ANSAA	-	-	N
				VFD1A6MH23ENSAA	-	V	N
0.5	0.4	2.8	A	VFD2A8MH23ANSAA	-	-	N
				VFD2A8MH23ENSAA	-	V	N
1	0.75	5.0	A	VFD5A0MH23ANSAA	-	-	F
				VFD5A0MH23ENSAA	-	V	F
				VFD5A0MH23ANSNA			N
				VFD5A0MH23ENSNA		V	N
2	1.5	7.5	B	VFD7A5MH23ANSAA	-	-	F
				VFD7A5MH23ENSAA	-	V	F
3	2.2	11.0	C	VFD11AMH23ANSAA	-	-	F
				VFD11AMH23ENSAA	-	V	F
5	3.7 / 4	17.0	C	VFD17AMH23ANSAA	-	-	F
				VFD17AMH23ENSAA	-	V	F
7.5	5.5	25.0	D	VFD25AMH23ANSAA	-	-	F
				VFD25AMH23ENSAA	-	V	F
10	7.5	33.0	E	VFD33AMH23ANSAA	-	-	F
				VFD33AMH23ENSAA	-	V	F
15	11	49.0	E	VFD49AMH23ANSAA	-	-	F
				VFD49AMH23ENSAA	-	V	F
20	15	65.0	F	VFD65AMH23ANSAA	-	-	F
				VFD65AMH23ENSAA	-	V	F
25	18.5	75	G	VFD75AMH23ANSAA	-	-	F
30	22	90		VFD90AMH23ANSAA	-	-	F
40	30	120	I	VFD120MH23ANSAA	-	-	F
50	37	146		VFD146MH23ANSAA	-	-	F

Power Range			Frame Size	Model Name	Standard Models (0 ~ 599 Hz)		
Max. Applicable Motor Capacity		Drive Rated Output Current			Built-in EMC Filter	IP40 Models	F: Forced air cooling N: Natural air cooling
[HP]	[kW]	[A]					
460 V / 3-phase							
0.5	0.4	1.5	A	VFD1A5MH43ANSAA	-	-	N
			A	VFD1A5MH43ENSAA	-	V	N
			B	VFD1A5MH43AFSAA	V	-	F
1	0.75	3.0	A	VFD3A0MH43ANSAA	-	-	F
			A	VFD3A0MH43ENSAA	-	V	F
			B	VFD3A0MH43AFSAA	V	-	F
			A	VFD3A0MH43ANSNA			N
			A	VFD3A0MH43ENSNA		V	N
2	1.5	4.2	B	VFD4A2MH43ANSAA	-	-	F
				VFD4A2MH43ENSAA	-	V	F
				VFD4A2MH43AFSAA	V	-	F
3	2.2	5.7	C	VFD5A7MH43ANSAA	-	-	F
				VFD5A7MH43ENSAA	-	V	F
				VFD5A7MH43AFSAA	V	-	F
5	3.7 / 4	9.0	C	VFD9A0MH43ANSAA	-	-	F
				VFD9A0MH43ENSAA	-	V	F
				VFD9A0MH43AFSAA	V	-	F
7.5	5.5	13.0	D	VFD13AMH43ANSAA	-	-	F
				VFD13AMH43ENSAA	-	V	F
				VFD13AMH43AFSAA	V	-	F
10	7.5	17.5	D	VFD17AMH43ANSAA	-	-	F
				VFD17AMH43ENSAA	-	V	F
				VFD17AMH43AFSAA	V	-	F
15	11	25.0	E	VFD25AMH43ANSAA	-	-	F
				VFD25AMH43ENSAA	-	V	F
				VFD25AMH43AFSAA	V	-	F
20	15	32.0	E	VFD32AMH43ANSAA	-	-	F
				VFD32AMH43ENSAA	-	V	F
				VFD32AMH43AFSAA	V	-	F
25	18.5	38.0	F	VFD38AMH43ANSAA	-	-	F
				VFD38AMH43ENSAA	-	V	F
				VFD38AMH43AFSAA	V	-	F
30	22	45.0	F	VFD45AMH43ANSAA	-	-	F
				VFD45AMH43ENSAA	-	V	F
				VFD45AMH43AFSAA	V	-	F
40	30	60	G	VFD60AMH43AFSAA	V	-	F
				VFD60AMH43ANSAA	-	-	F
50	37	75	H	VFD75AMH43AFSAA	V	-	F
				VFD75AMH43ANSAA	-	-	F
60	45	91	H	VFD91AMH43AFSAA	V	-	F
				VFD91AMH43ANSAA	-	-	F
75	55	112	I	VFD112MH43AFSAA	V	-	F
				VFD112MH43ANSAA	-	-	F
100	75	150	I	VFD150MH43AFSAA	V	-	F
				VFD150MH43ANSAA	-	-	F

Smarter. Greener. Together.

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