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M56S EtherNet/IP Series

AC Servo
Hardware Manual

SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.

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Contents

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Revision History

Date of Revision	Version	Description
2023.05	1.0	First released
2025.06	1.1	1. Update warning and fault display 2. Add gantry sync control function

1 Introduction

Thank you for purchasing the M56S EtherNet/IP series servo, this is a high-end 220V/400V AC servo designed based on global leading stardards and application rquirements. It is featured with high speed, high precision, high performance, and complete certifications.

The servo drive covers a power range from 50W to 7.5kW and with EtherNet/IP communication interfaces to work with the host controller for a network operation of multiple servo drives. The drive adopts advanced motion control algorithms, coupled with a 26-bit high precision encoder motor, the velocity loop bandwidth is up to 3.5KHz. Efficient automatically adjusts the loop gain, superior vibration suppression and external disturbance compensation performance. The drive supports full closed-loop control, gantry synchronization control, built-in regenerative energy absorption resistor, STO safety function and dynamic braking module (for certain models). It supports the control mode of position, velocity, torque and Q programming.

M56S Servo System is widely used in semiconductor equipment, battery processing equipment, medical equipment, machine tools, solar processing equipment, industrial robots and custom equipment etc.

1.1 About This Manual

This manual describes the M56S Series Servo.

It provides the information required for installation, configuration and basic operation of the M56S series AC servo drive.

This document is intended for persons who are qualified to transport, assembling, commission, and maintain the equipment described herein.

1.2 Documentation Set for M56S EtherNet/IP Servo

This manual is part of a documentation set. The entire set consists of the following:

- M56S EtherNet/IP Series Hardware Manual. This includes hardware selection, installation, wiring and basic operation.
- M56S AC Servo Drive User Manual. This includes a detailed description on drive configuration, debugging, and exception handling.
- M56S EtherNet/IP Commnunication Manual. This introduces a detailed on the EtherNet/IP communication function of the drive.
- Luna software user manual. This introduces the usage of drive debugging software.

1.3 Safety

Only qualified persons may perform the installation procedures. The following explanations are for things that must be observed in order to prevent harm to people and damage to property.


M56S EtherNet/IP utilizes hazardous voltages. Be sure the drive is properly grounded.

Before you install the M56S EtherNet/IP products, review the safety instructions in this manual. Failure to follow the safety instructions may result in personal injury or equipment damage.

1.4 Safety Symbols

Safety symbols indicate a potential for personal injury or equipment damage if the recommended precautions and safe operating practices are not followed.

The following safety-alert symbols are used on the drive and in the documentation:

 Caution

 Dangerous Voltage

 Earth

 Caution, Hot Surface

1.5 Safety Precautions

1.5.1 Installation Precautions

◆ DO NOT subject the product to water, corrosive or flammable gases, and combustibles.
◆ DO NOT use the motor in a place subject to excessive vibration or shock.
◆ DO NOT directly connect the servo motor to the main power supply.
◆ DO NOT use cables soaked in water or oil.
◆ DO NOT extrude or pull-off the cable, nor damage the cables as electrical shocks, damages may result.
◆ During installation, avoid metal shavings and other conductive objects from entering the drive.
◆ DO NOT touch the rotating shaft when the motor is running.
◆ DO NOT strike the motor when mounting as the motor shaft. The encoder may be damaged.
◆ During the first test run, first disconnect the coupling or belt of the mechanical equipment so that the motor is in a no-load state.
◆ Incorrect parameters will result in abnormal operation under load.
◆ DO NOT Touch either the drive heat sink or the motor and regenerative resister during operation as they may become hot.
◆ DO NOT pull the motor lead during transportation and installation.

1.5.2 Wiring

◆ DO NOT connect any power supplies to the U,V,W terminals of the drive.
◆ Please connect the output U/V/W of the drive and the U/V/W of the servo motor directly without passing through an electromagnetic contactor.
◆ Please tighten the fixing screws of the power supply and motor output terminals, otherwise it may cause a fire.
◆ Please DO NOT switch the main power supply of the drive frequently. If you really need to switch the power supply repeatedly, please control it once a minute.
◆ Install the encoder cable in a separate conduit from the motor power cable to avoid signal noise.
◆ Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal, encoder cables.
◆ As a charge may still remain in the drive with hazardous voltage even after power has been removed, DO NOT touch the terminals when the charge LED is still light.
◆ Please observe the specified voltage.
◆ When wiring, please remove the terminal block from the servo drive.
◆ One wire insertion port of the terminal block, please insert only one wire.
◆ When inserting the wire, please do not short-circuit the core wire with the adjacent wire.
◆ Make sure both the drive and the motor grounded well.
◆ Please ensure grounding wires are securely connected when power up.

1.5.3 Pilot Run

⚠	◆ DO NOT touch the rotating shaft when the motor is running.
	◆ In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions
	◆ Incorrect parameters will cause abnormal operation under load.
	◆ The temperature of the drive radiator, motor, and external regenerative resistor will rise during operation, please avoid touching.
	◆ Before the machine starts to run, please confirm whether the emergency stop device can be activated at any time
	◆ Use servo motors with brakes on vertical loads to prevent equipment from falling when alarms, failures, or power failures occur.

1.6 Certified Specifications

M56S Series servo products are designed to meet the following standards.

		Drive	Motor
Europe	EMC Directive	EN 61800-3	EN 60034-1
			EN 6100-6-2
			EN 6100-6-4
	LVD	EN 61800-5-1	EN 60034-1
			EN 60034-5
Functional Safety(STO)		UL 61800-5-2(SIL 3)	
		IEC 61508(SIL 3)	
		ISO 13849-1(PL e)	
UL Standard		UL 61800-5-1	UL 1004-1
			UL 1004-6
		File No.E332730	File No.525873
CSA Standard		C22.2 No.274.13	CSA C22.2 No.100

Note: The 3kW and above servo products are currently undergoing UL certification.

1.7 Maintenance and Inspection

1.7.1 Check Lems and Cycle

The normal use conditions of the servo are as follows:
Annual average environmental temperature: 30℃
Average load rate: below 80%

Daily running time: less than 20 hours

The items of daily inspection are as follows:

Type	Inspection Cycle	Check Item
Daily inspection	Daily	◆ Confirm the ambient temperature, humidity, dust, foreign matter, and dew condensation
		◆ Whether there is abnormal vibration or noise
		◆ Power supply voltage
		◆ Odor
		◆ Whether the fan is working normally and whether there is any foreign matter in the vent
		◆ Whether the connector is loose
		◆ Whether there is foreign matter between the cable and the connector, and whether the cable conductor is exposed outside
		◆ Whether the fastening part is loose

1.7.2 Replacement of Parts

The internal components of the servo product will wear out or aging, and the replacement time of components will vary according to environmental conditions and usage methods. If you need to replace it, please contact our company or our agent.

Except for our company, please do not disassemble and repair by yourself.

Item	Part	Standard Replacement Cycle	Notice
Drive	Filter capacitor	About 5 years	The standard replacement cycle is for reference only. Even if the standard replacement cycle is not full, it needs to be replaced once an abnormality occurs.
	Aluminum electrolytic capacitors	About 5 years	
	Power-on buffer relay	About 100,000 times(According to the conditions of use)	
	Power-on buffer resistance	About 20,000 times(According to the conditions of use)	
	Fan	2~3 years (10000~30000 hours)	
Motor	Oil seal	5,000 hours	
	Absolute value encoder battery	Lifetime depends on usage conditions	

2 Product Introduction

2.1 Unpacking Check

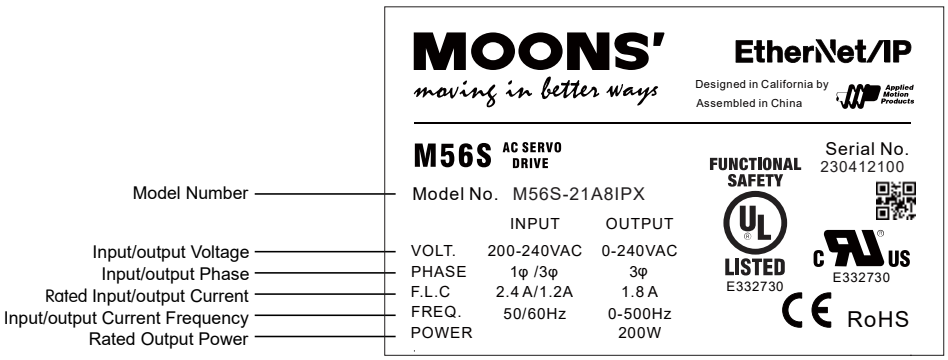
Please refer to the following chapters to confirm the model of servo drive and motor.

A complete and operable servo system should include the following parts:

- Servo drive and servo motor with matching power
- Motor power cable for connecting the drive and servo motor (optional)
- Encoder cable used to connect the drive and servo motor (optional)
- Mini USB communication cable for CN1 port to PC (optional)
- I/O connector for CN2 port (Included)
- Encoder connector for CN3 port (optional)
- The second encoder connector or gantry synchronous control connector for CN4 port (applicable to the drive with full closed-loop function, optional)
- STO connector for CN5 port (applicable to drive with STO function, Included)
- RJ-45 connectors for IN (CN7) and OUT (CN6) ports for EtherNet/IP communication (optional)
- Drive power input connector for P1 port (Included)
- Motor power and regeneration resistor connector for P2 port (Included)

2.2 Servo Drive Model Introduction

2.2.1 Drive Name Plate Description



2.2.2 Drive Model Description

M56S - 2 3A0 IP X - *

① ② ③ ④ ⑤ ⑥

① M56S Series

② Supply Voltage *1

2 --- Single/Three-Phase 220VAC

3 --- Three-Phase 400VAC

④ Function Type

⑤ Model Type

⑥ Customization

Blank: Standard type

G: Gantry synchronous control is available

*1 Line to line voltage

*2 Use single/three-phase 220VAC input

*3 Available for single-phase while the motor power is under 1.5kW

③ Current

	Supply Voltage	Current	Rated Current A(rms)	Peak Current A(rms)	Rated Power
*2	2	1A8	1.8	5.4	200W
*2		3A0	3	12	400W
*2		4A5	4.5	15	750W
*2		6A0	6	21	1.0kW
*3		10A	10	30	1.5kW
*3		13A	13	45	2.0kW
	3	6A0	6	18	1.5kW
		13A	13	40	3.0kW
		17A	17	42.5	5.0kW
		21A	21	52.5	6.0kW
		26A	26	65	7.5kW

⑤ Model Type		X	N
Control Mode	Position Mode	√	√
	Velocity Mode	√	√
	Torque Mode	√	√
	Q Program	√	√
	Full Closed-loop Control Mode	√	--
Interface	2 Analog Inputs	√	--
	8 Inputs /4 Outputs(Digital)	√	√
	Gantry Synchronous Communication*	√	--
	Secondary Encoder Input*	√	--
Communication Interface	USB(Configuration)	√	√
	EtherNet/IP	√	√
Safety Function	Dynamic Brake	√	--
	STO	√	--

Note: *Gantry synchronization communication and secondary encoder input share the same interface, making these two functions mutually exclusive in operation.

2.2.3 Drive Specification

2.2.3.1 AC220V Electrical Specifications

■ Single/three phase 220V AC servo drive

Drive Model	M56S-21A8IP◆	M56S-23A0IP◆	M56S-24A5IP◆	M56S-26A0IPX	M56S-210AIPX
Main Circuit Power Supply	Single / Three-phase, AC200 ~ 240V±10%, 50/60Hz				
Control Circuit Power Supply	Single-phase, AC200 ~ 240V±10%，50/60Hz				
Continuous Output Current A(rms)	1.8	3	4.5	6	10
Max. Output CurrentA(rms)	5.4	12	15	21	30
Withstand Voltage	Primary to earth: withstand 1500 VAC, 1 min, (Leakage current: 20 mA)				

◆: Model Type

■ Three phase 220V AC servo drive

Drive Model	M56S-213AIPX
Main Circuit Power Supply	Three-phase, AC200 ~ 240V±10%，50/60Hz
Control Circuit Power Supply	Single-phase, AC200 ~ 240V±10%，50/60Hz
Continuous Output Current A(rms)	13
Max. Output CurrentA(rms)	45
Withstand Voltage	Primary side to ground: withstand voltage 1500VAC, 1 min, (leakage: 20mA)

2.2.3.2 AC220V Common Specifications

Environment	Temperature		● Ambient temperature: 0°C ~ 55°C (If the ambient temperature of servo drive is higher than 45°C, please install the drive in a well-ventilated location) ● Storage temperature: -20°C ~ 65°C
	Humidity		Both operating and storage : 10 ~ 85%RH or less
	Altitude		Derating is not required for altitudes not higher than 1000m Derating 1% for every additional 100m for altitudes between 1000m and 2000m
	Vibration		9.8m/s² or less, 10 ~ 60Hz (Do not use continuously at resonance frequency)
Control Mode			IGBT: PWM Control
Motor Encoder Feedback			● 26-bit multi-turn absolute optical encoder ● 21-bit multi-turn absolute encoder ● 17-bit battery-less multi-turn absolute encoder
Secondary Encoder Feedback*1			A/B/Z phase signal differential input
I/O	Digital Signal	Input	8 Configurable optically isolate digital general inputs, 24VDC, 20mA
		Output	4 Configurable optically isolate digital general outputs, Max. 30VDC，100mA
	Analog Signal	Input	2 Analog inputs, -10 ~ +10V, 16-bit
Comm Port	USB		Connection with PC for configuration
	EtherNet/IP		EtherNet/IP Communication
Front Panel			4 Keys (MODE, UP, DOWN, SET) 5 Digital LED Display
Regeneration Resistor			● -X Type built-in regenerative resistor ● -N Type only 750W built-in regenerative resistor ● All models can be equipped with external absorption resistors
LED			Port IN/OUT link display
Control Mode			Support PP, PV, TQ, HM mode, Full Closed-loop Control Mode*2, Q programs that are pre-stored in the drive can also be called by command
Control Input Signal			Alarm Reset, CW/CCW Limit, Gain Select, Zero Speed Clamp, Emergency Stop, CW/CCW Torque Limit, Speed Limit, General Purpose Input
Control Output Signal			Warning Output, Fault Output, Servo Ready, Velocity Reached, Torque Reached, Position Reached, Servo-on Status, Brake Release, Dynamic Position Error Following, Positioning Complete, Zero Speed Detected, Velocity Coincidence, Torque Coincidence, Velocity limit, Torque limit, Homing Finished, Soft Limit CW/CCW, General Purpose Output
Protection			Over Current, Over Voltage,Under Voltage, Over Temperature, Bad Encoder Feedback, Over Load, Over Speed, Positon Error, STO, CW/CCW Limit, Full Closed-loop Hybrid Deviation Fault, Main Power Phase Loss
Dynamic Brake			-X Built-in
STO			-X Built-in
Weight			M56S-21A8IP◆: 0.8Kg　M56S-26A0IPX: 1.9Kg M56S-23A0IP◆: 1.1Kg　M56S-210AIPX: 1.9Kg M56S-24A5IP◆: 1.6Kg　M56S-213AIPX: 1.9Kg

Note: *1, *2 Certain models don't support this function, please refer to page12. ◆: Model Type

2.2.3.3 AC400V Electrical specifications

■ Theree phase 400V AC servo drive

Drive Model	M56S-36A0IPX	M56S-313AIPX	M56S-317AIPX	M56S-321AIPX	M56S-326AIPX
Main Circuit Power Supply	Three-phase, AC380 ~ 480V±10%, 50/60Hz				
Control Circuit Power Supply	Single-phase, AC380 ~ 480V±10%, 50/60Hz				
Continuous Output Current A(rms)	6	13	17	21	26
Max. Output CurrentA(rms)	18	40	42.5	52.5	65
Withstand Voltage	Primary side to ground: withstand voltage 1960VAC, 1 min, (leakage: 20mA)				

2.2.3.4 400VAC Common Specifications

Environment	Temperature		● Ambient temperature: 0°C ~ 55°C (If the ambient temperature of servo drive is higher than 45°C, please install the drive in a well-ventilated location) ● Storage temperature: -20°C ~ 65°C
	Humidity		Both operating and storage : 10 ~ 85%RH or less
	Altitude		Derating is not required for altitudes not higher than 1000m Derating 1% for every additional 100m for altitudes between 1000m and 2000m
	Vibration		9.8m/s^2 or less, 10 ~ 60Hz (Do not use continuously at resonance frequency)
Control Mode			IGBT: PWM Control
Motor Encoder Feedback			● 26-bit multi-turn absolute optical encoder ● 21-bit multi-turn absolute encoder
Secondary Encoder Feedback			A/B/Z phase signal differential input
I/O	Digital Signal	Input	8 Configurable optically isolate digital general inputs, 24VDC, 20mA
		Output	4 Configurable optically isolate digital general outputs, Max. 30VDC，100mA
	Analog Signal	Input	2 Analog inputs, -10 ~ +10V, 16-bit
Comm Port	USB		Connection with PC for configuration
	EtherNet/IP		EtherNet/IP Communication
Front Panel			4 Keys (MODE, UP, DOWN, SET) 5 Digital LED Display
Regeneration Resistor			Built-in regenerative resistor (All models can be equipped with external absorption resistors)
LED			Port IN/OUT link display, RUN display, ERROR display
Control Mode			Support PP, PV, TQ, HM mode, Full Closed-loop Control Mode *2, Q programs that are pre-stored in the drive can also be called by command
Control Input Signal			Alarm Reset, CW/CCW Limit, Gain Select, Zero Speed Clamp, Emergency Stop, CW/CCW Torque Limit, Speed Limit, General Purpose Input
Control Output Signal			Warning Output, Fault Output, Servo Ready, Velocity Reached, Torque Reached, Position Reached, Servo-on Status, Brake Release, Dynamic Position Error Following, Positioning Complete, Zero Speed Detected, Velocity Coincidence, Torque Coincidence, Velocity limit, Torque limit, Homing Finished, Soft Limit CW/CCW, General Purpose Output
Protection			Over Current, Over Voltage,Under Voltage, Over Temperature, Bad Encoder Feedback, Over Load, Over Speed, Positon Error, STO, CW/CCW Limit, Full Closed-loop Hybrid Deviation Fault, Main Power Phase Loss
Dynamic Brake			Built-in
STO			Built-in
Weight			M56S-36A0IPX: 1.9Kg M56S-321AIPX: 3.8Kg M56S-313AIPX: 1.9Kg M56S-326AIPX: 3.8Kg M56S-317AIPX: 3.8Kg

2.2.4 EtherNet/IP Communication Specification

Communication Standards	EtherNet/IP，Modbus TCP
Physical Layer	Ethernet
Communication Port	RJ45 x 2
Baud Rate	10/100Mbps (Full duplex)
Communication Cable	Shielded twisted pair cable CAT5e (through)
Communication Object	EtherNet/IP: Implicit Messaging Explicit Messaging Heartbeat Messaging
LED indicator Light	EtherNet/IP Link/Activity x 2
Operation Mode	Profile Position Mode(PP) Profile Velocity Mode(PV) Profile Torque Mode(TQ) Homing Mode(HM) Q Programming

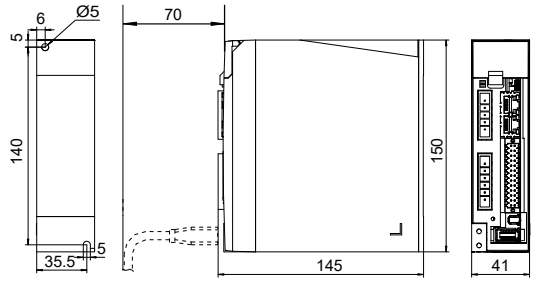
2.2.5 Regeneration resistor specification

When the output torque of the motor shaft is opposite to the direction of rotation, the energy is feedback from the motor load end to the drive bus capacitor, which makes the bus voltage increase. When it reaches the braking voltage point, the energy can only be consumed by the regeneration resistor, otherwise it will damage the servo drive. The regeneration resistor can be built-in or the user can be connected externally; the built-in and external regeneration resistors cannot be used simultaneously. The related specifications of the built-in regeneration resistor in the M56S EtherNet/IP series servo drive are as follows:

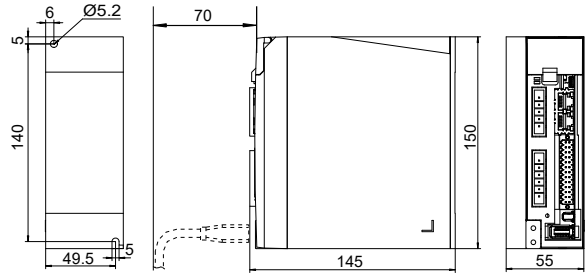
Drive P/N	Built-in Resistor		External Resistor
	ohm (Ω)	Power (W)	Minimal Value (Ω)
M56S-21A8IPN	No built-in		50
M56S-21A8IPX	200	40	50
M56S-23A0IPN	No built-in		50
M56S-23A0IPX	200	40	50
M56S-24A5IPN	100	60	50
M56S-24A5IPX	100	60	50
M56S-26A0IPX	25	80	20
M56S-210AIPX	25	80	20
M56S-213AIPX	25	80	20
M56S-36A0IPX	25	80	20
M56S-313AIPX	25	80	20
M56S-317AIPX	35	100	35
M56S-321AIPX	35	100	25
M56S-326AIPX	35	100	25

2.2.6 Drive Mechanical Dimensions(Unit: mm)

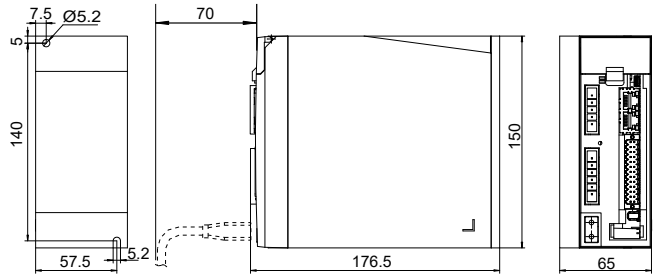
■ M56S-21A8IP◆（200W）



■ M56S-23A0IP◆（400W）



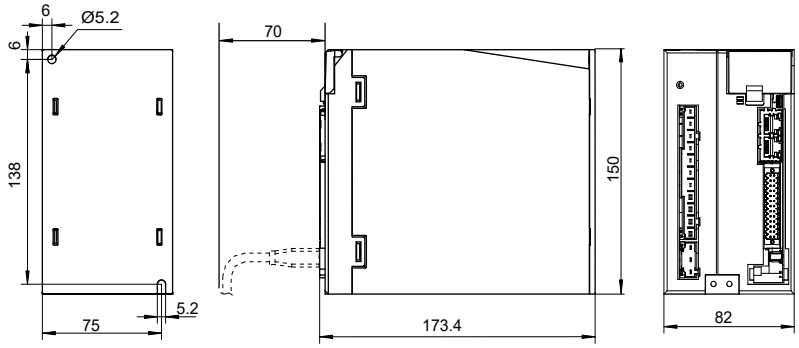
■ M56S-24A5IP◆（750W）



■ M56S-26A0IPX（1.0kW）

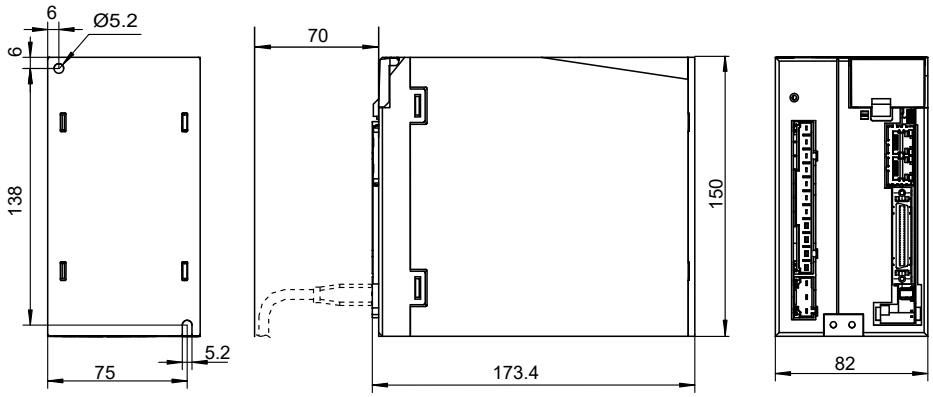
■ M56S-210AIPX（1.5kW）

■ M56S-213AIPX（2.0kW）

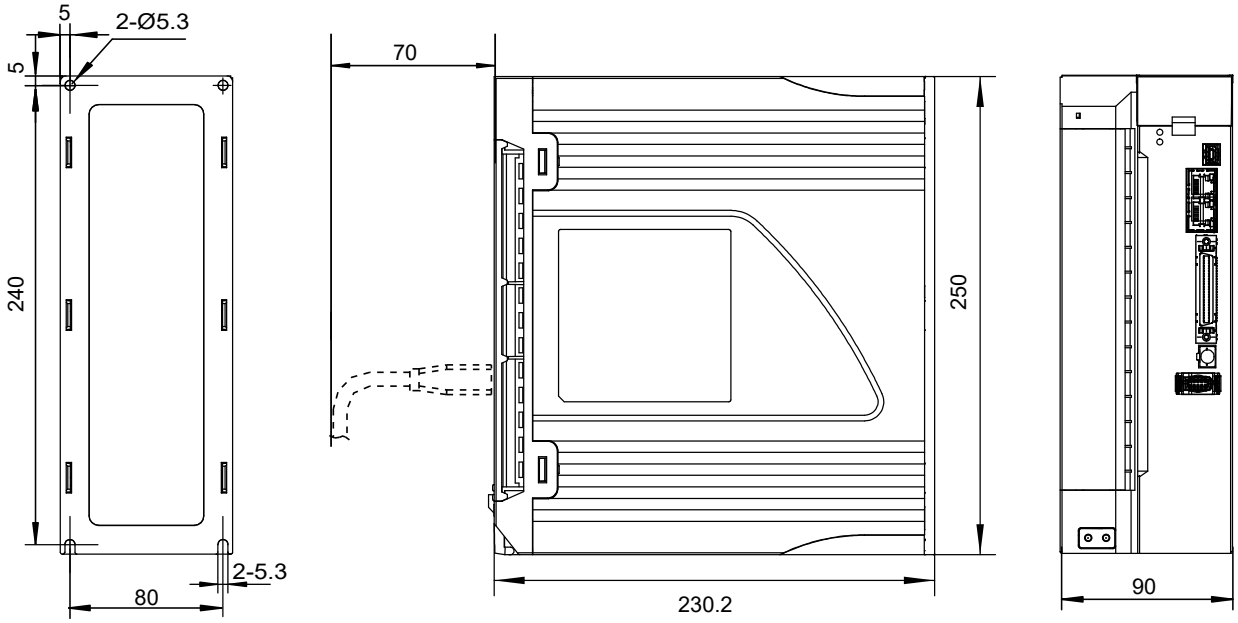


◆ Model Type

- M56S-36A0IPX（1.5kW）
- M56S-313AIPX（3.0kW）

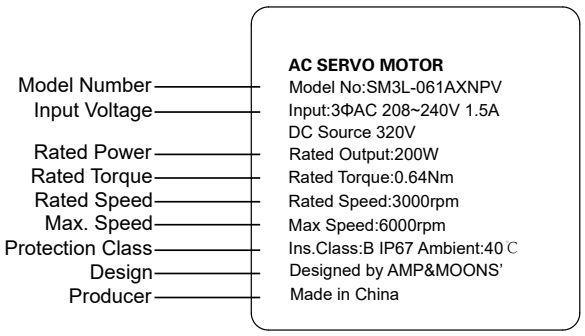


- M56S-317AIPX（5.0kW）
- M56S-321AIPX（6.0kW）
- M56S-326AIPX（7.5kW）



2.3 Motor Model Introduction

2.3.1 Motor Name Plate Description



2.3.2 Motor Part Numbering

SM3 L - 13 2 A X N U V - *

Servo Motor
SM3 Series

Inertia Type	
L	Low Inertia
M	Medium Inertia
H	High Inertia

Frame Size	
04	40mm
06	60mm
08	80mm
10	100mm
13	130mm
18	180mm

Motor Length	
1	1 Stacks
2	2 Stacks
3	3 Stacks
4	4 Stacks
5	5 Stacks

Winding Voltage	
A	220VAC
Y	400VAC

Custom Code

Shaft	
N	Circular shaft without oil seal
V	Keyway without oil seal
K	Keyway with installed oil seal

Connector & Rear Cover Type	
D	Direct-mount with sealed plastic connector, metal rear cover
P	Direct-mount with sealed plastic connector, standard rear cover
U	Direct-mount with sealed metal straight connector, standard rear cover

Brake	
N	No brake
B	With brake(24VDC)

Encoder	
T	26-bit multi-turn absolute optical encoder
X	21-bit multi-turn absolute encoder
B	17-bit battery-less multi-turn absolute encoder

2.3.3 □40mm Frame Low Inertia---220VAC Winding

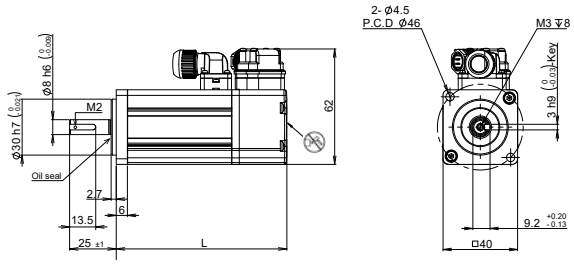
□ Specification

Type*		SM3L - 042A◇□D△
Rated Output Power	watts	100
Rated Speed	rpm	3000
Max.Speed	rpm	6000
Rated Torque	N·m	0.32
Peak Torque	N·m	1.28
Rated Current	A (rms)	1.2
Peak Current	A (rms)	5.9
Voltage Constant ±5%	V (rms) / K rpm	16.8
Torque Constant ±5%	N·m / A (rms)	0.267
Rotor Inertia	$Kg·m^2$	0.038×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	0.0433×10^{-4}
Shaft Load - Axial	N (max.)	50
Shaft Load - Radial (End of Shaft)	N (max.)	60
Weight	Kg	0.49
Weight - With Brake	Kg	0.73

*◇Encoder Options；□Brake Options；△Oil Seal Options

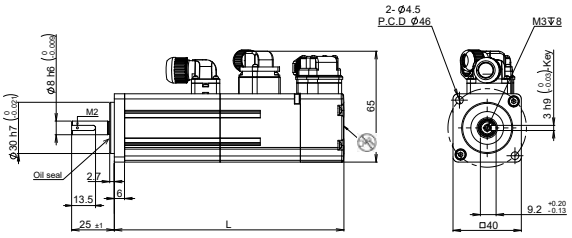
□ Dimensions (Unit: mm)

1) Without Brake



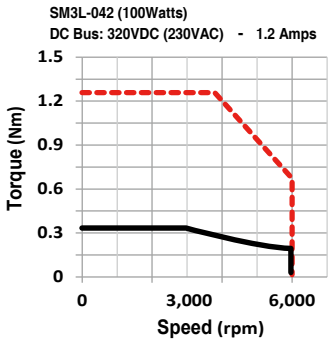
Without Brake	L
SM3L-042A◇ND△	91.5
SM3L-042ABND△	100

2) With Brake



With Brake	L
SM3L-042A◇BD△	134.5
SM3L-042ABBD△	143

□ Torque Curves



Max. Intermittent Torque
Max. Continuous Torque

2.3.4 □40mm Frame High Inertia---220VAC Winding

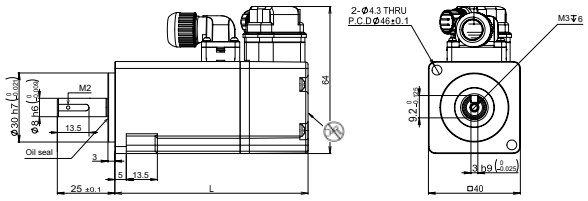
□ Specification

Type*		SM3H - 041A◇□P△	SM3H - 042A◇□P△
Rated Output Power	watts	50	100
Rated Speed	rpm	3000	3000
Max.Speed	rpm	6000	6000
Rated Torque	N·m	0.16	0.32
Peak Torque	N·m	0.64	1.28
Rated Current	A (rms)	1.4	1.4
Peak Current	A (rms)	4.8	5.7
Voltage Constant ±5%	V (rms) / K rpm	9.24	14.8
Torque Constant ±5%	N·m / A (rms)	0.277	0.277
Rotor Inertia	$Kg·m^2$	0.0383×10^{-4}	0.0702×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	0.0395×10^{-4}	0.0724×10^{-4}
Shaft Load - Axial	N (max.)	50	50
Shaft Load - Radial (End of Shaft)	N (max.)	60	60
Weight	Kg	0.31	0.42
Weight - With Brake	Kg	0.55	0.66

*◇Encoder Options；□Brake Options；△Oil Seal Options

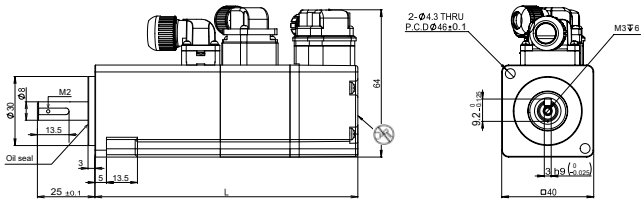
□ Dimensions (Unit: mm)

1) Without Brake



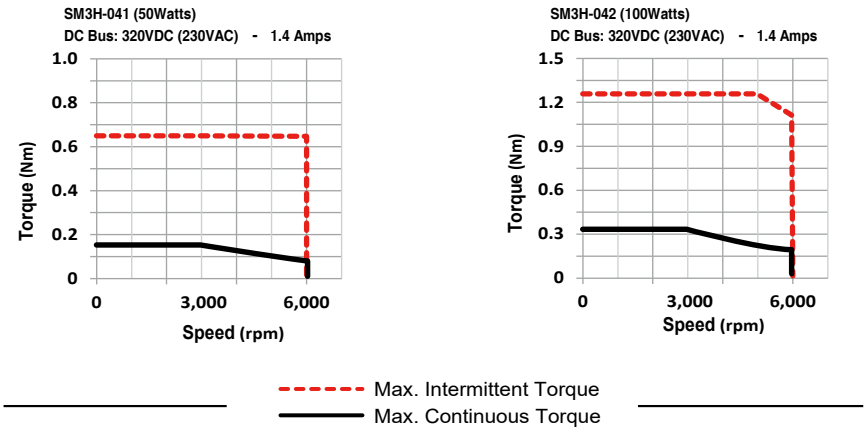
Without Brake	L
SM3H-041A◇NP△	70
SM3H-041ABNPV	63
SM3H-042A◇NP△	84
SM3H-042ABNPV	77

2) With Brake



With Brake	L
SM3H-041A◇BP△	100.3
SM3H-041ABBPV	85.3
SM3H-042A◇BP△	106
SM3H-042ABBPV	99.3

□ Torque Curves



2.3.5 □60mm Frame Low Inertia---220VAC Winding

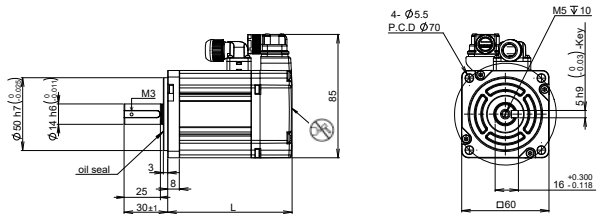
□ Specification

Type*		SM3L - 061A◇□P△	SM3L - 062A◇□P△
Rated Output Power	watts	200	400
Rated Speed	rpm	3000	3000
Max.Speed	rpm	6000	6000
Rated Torque	N·m	0.64	1.27
Peak Torque	N·m	1.9	3.8
Rated Current	A (rms)	1.5	2.8
Peak Current	A (rms)	5.4	10
Voltage Constant ±5%	V (rms) / K rpm	26.5	28.3
Torque Constant ±5%	N·m / A (rms)	0.427	0.454
Rotor Inertia	$Kg·m^2$	0.152×10^{-4}	0.237×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	0.182×10^{-4}	0.268×10^{-4}
Shaft Load - Axial	N (max.)	70	70
Shaft Load - Radial (End of Shaft)	N (max.)	200	240
Weight	Kg	0.85	1.2
Weight - With Brake	Kg	1.3	1.7

*◇Encoder Options；□Brake Options；△Oil Seal Options

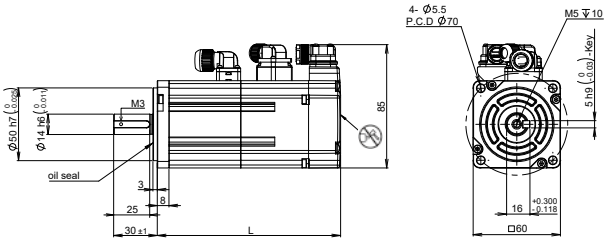
□ Dimensions (Unit: mm)

1) Without Brake



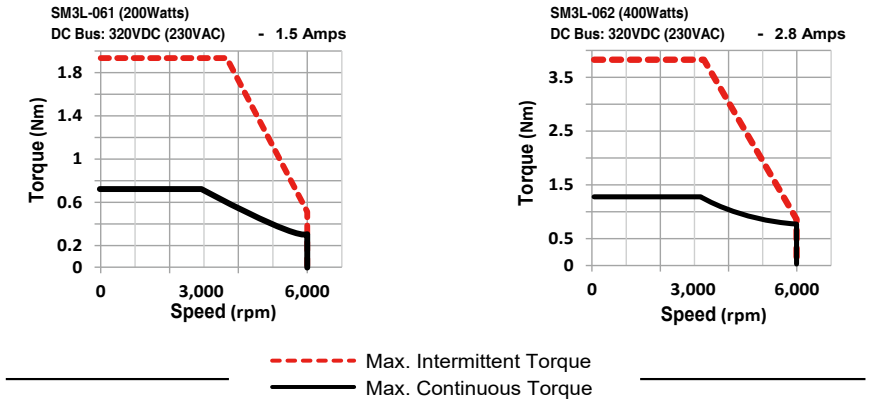
Without Brake	L
SM3L - 061A◇NP△	84.5
SM3L - 061ABND△	85.5
SM3L - 062A◇NP△	103
SM3L - 062ABND△	104

2) With Brake



With Brake	L
SM3L - 061A◇BP△	125
SM3L - 061ABBD△	126
SM3L - 062A◇BP△	143.5
SM3L - 062ABBD△	144.5

□ Torque Curves



2.3.6 □60mm Frame High Inertia---220VAC Winding

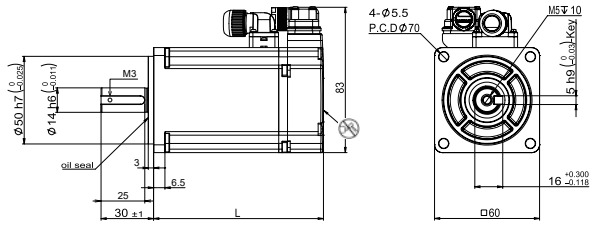
□ Specification

Type*		SM3H - 061A◇□P△	SM3H - 062A◇□P△
Rated Output Power	watts	200	400
Rated Speed	rpm	3000	3000
Max.Speed	rpm	6000	6000
Rated Torque	N·m	0.64	1.27
Peak Torque	N·m	2.24	4.445
Rated Current	A (rms)	1.7	2.8
Peak Current	A (rms)	5.9	9.8
Voltage Constant ±5%	V (rms) / K rpm	24.3	28.9
Torque Constant ±5%	N·m / A (rms)	0.376	0.423
Rotor Inertia	$Kg·m^2$	0.31×10^{-4}	0.566×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	0.32×10^{-4}	0.62×10^{-4}
Shaft Load - Axial	N (max.)	70	70
Shaft Load - Radial (End of Shaft)	N (max.)	200	240
Weight	Kg	0.79	1.2
Weight - With Brake	Kg	1.15	1.5

*◇Encoder Options；□Brake Options；△Oil Seal Options

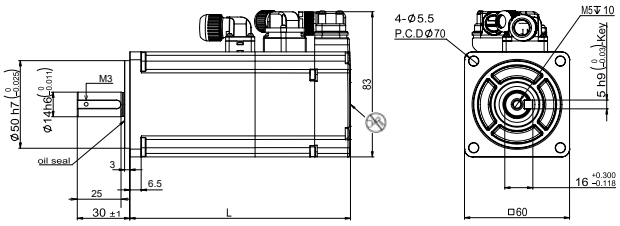
□ Dimensions (Unit: mm)

1) Without Brake



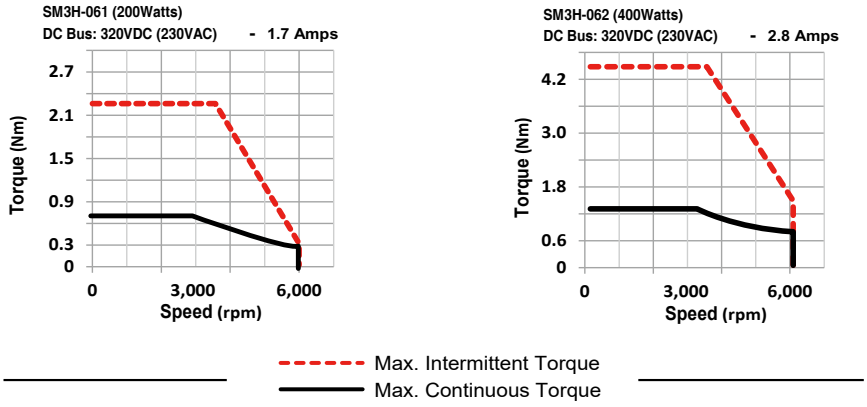
Without Brake	L
SM3H-061A◇NP△	77
SM3H-061ABND △	79
SM3H-062A◇NP△	97
SM3H-062ABND △	100

2) With Brake



With Brake	L
SM3H-061A◇BP△	106
SM3H-061ABBD △	108
SM3H-062A◇BP△	126
SM3H-062ABBD △	129

□ Torque Curves



2.3.7 □80mm Frame Low Inertia---220VAC Winding

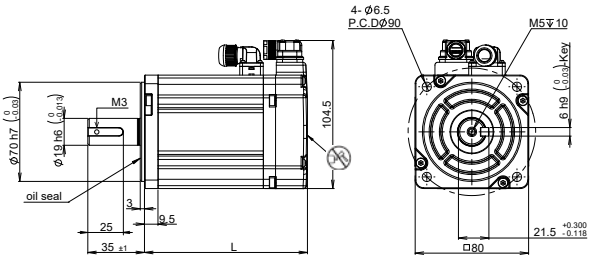
□ Specification

Type*		SM3L - 083A◇□P△	SM3L - 084A◇□P△
Rated Output Power	watts	750	1000
Rated Speed	rpm	3000	3000
Max.Speed	rpm	6000	6000
Rated Torque	N·m	2.4	3.2
Peak Torque	N·m	6.7	9.6
Rated Current	A (rms)	4.5	5.6
Peak Current	A (rms)	14	19
Voltage Constant ±5%	V (rms) / K rpm	33.9	36.65
Torque Constant ±5%	N·m / A (rms)	0.533	0.63
Rotor Inertia	$Kg·m^2$	0.829×10^{-4}	1.01×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	0.961×10^{-4}	1.12×10^{-4}
Shaft Load - Axial	N (max.)	90	90
Shaft Load - Radial (End of Shaft)	N (max.)	270	270
Weight	Kg	2.29	2.77
Weight - With Brake	Kg	3.1	3.62

*◇Encoder Options；□Brake Options；△Oil Seal Options

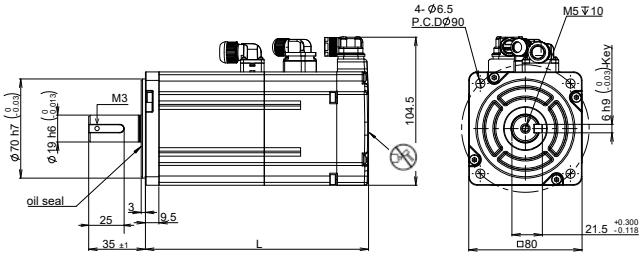
□ Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3L-083A◇NP△	115
SM3L-083ABND△	115
SM3L-084A◇NP△	129
SM3L-084ABND△	129

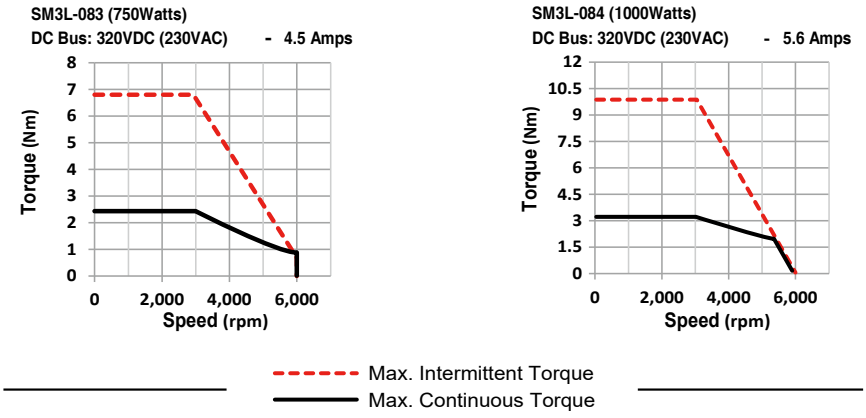
2) With Brake



With Brake	L
SM3L-083A◇BP△	157
SM3L-083ABBD△	157.5
SM3L-084A◇BP△	171
SM3L-084ABBD△	171.5

Note: □80mm frame size, low inertia, encoder type B, with 40mm shaft length.

□ Torque Curves



2.3.8 □80mm Frame High Inertia---220VAC Winding

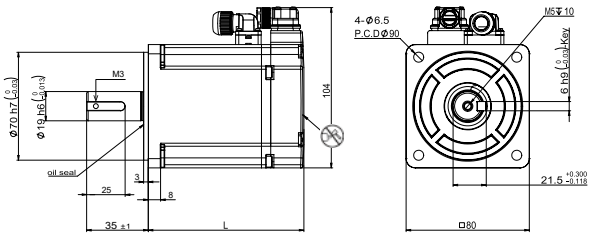
□ Specification

Type*		SM3H - 083A◇□P△	SM3H - 084A◇□P△
Rated Output Power	watts	750	1000
Rated Speed	rpm	3000	3000
Max.Speed	rpm	6000	6000
Rated Torque	N·m	2.4	3.2
Peak Torque	N·m	8.4	11.2
Rated Current	A (rms)	4.5	5.9
Peak Current	A (rms)	16.7	20.5
Voltage Constant ±5%	V (rms) / K rpm	32.3	33
Torque Constant ±5%	N·m / A (rms)	0.53	0.55
Rotor Inertia	$Kg·m^2$	1.46×10^{-4}	1.82×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	1.63×10^{-4}	1.96×10^{-4}
Shaft Load - Axial	N (max.)	90	90
Shaft Load - Radial (End of Shaft)	N (max.)	270	270
Weight	Kg	2.1	2.65
Weight - With Brake	Kg	2.85	3.2

*◇Encoder Options：□Brake Options：△Oil Seal Options

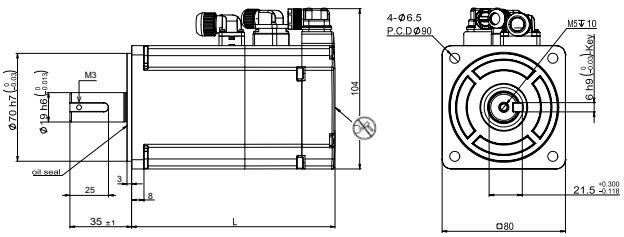
□ Dimensions (Unit: mm)

1) Without Brake



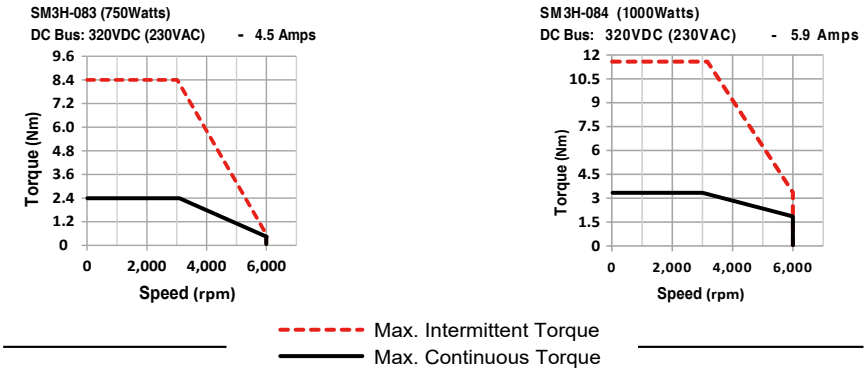
Without Brake	L
SM3H-083A◇NP△	101
SM3H-083ABND △	106
SM3H-084A ◇ NP △	115

2) With Brake



With Brake	L
SM3H-083A◇BP△	132
SM3H-083ABBD △	137
SM3H-084A ◇ BP △	146

□ Torque Curves



2.3.9 □100mm Frame Low Inertia---220VAC Winding

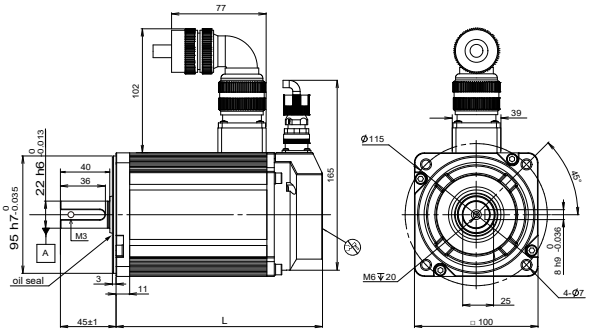
□ Specification

Type*		SM3L - 102A◇□U△	SM3L - 103A◇□U△	SM3L - 104A◇□U△	SM3L - 105A◇□U△
Rated Output Power	watts	1000	1500	2000	2500
Rated Speed	rpm	3000	3000	3000	3000
Max.Speed	rpm	6000	5700	5600	5600
Rated Torque	N·m	3.2	4.9	6.4	8
Peak Torque	N·m	9.6	14.7	19.2	24
Rated Current	A (rms)	6.0	9.6	12.7	13
Peak Current	A (rms)	21	36.5	44	45
Voltage Constant ±5%	V (rms) / K rpm	33	34.1	34.3	37.4
Torque Constant ±5%	N·m / A (rms)	0.543	0.563	0.565	0.61
Rotor Inertia	$Kg·m^2$	1.79×10^{-4}	2.37×10^{-4}	2.98×10^{-4}	3.68×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	2.67×10^{-4}	3.25×10^{-4}	3.86×10^{-4}	4.56×10^{-4}
Shaft Load - Axial	N (max.)	90	90	90	90
Shaft Load - Radial (End of Shaft)	N (max.)	270	270	270	270
Weight	Kg	4	4.39	5.2	6.3
Weight - With Brake	Kg	5.2	5.64	6.12	7.6

*◇Encoder Options；□Brake Options；△Oil Seal Options

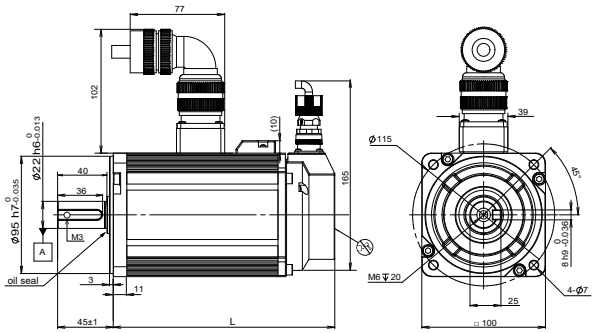
□ Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3L-102ATNU△	142
SM3L-103ATNU△	157
SM3L-104ATNU△	173
SM3L-105ATNU△	191

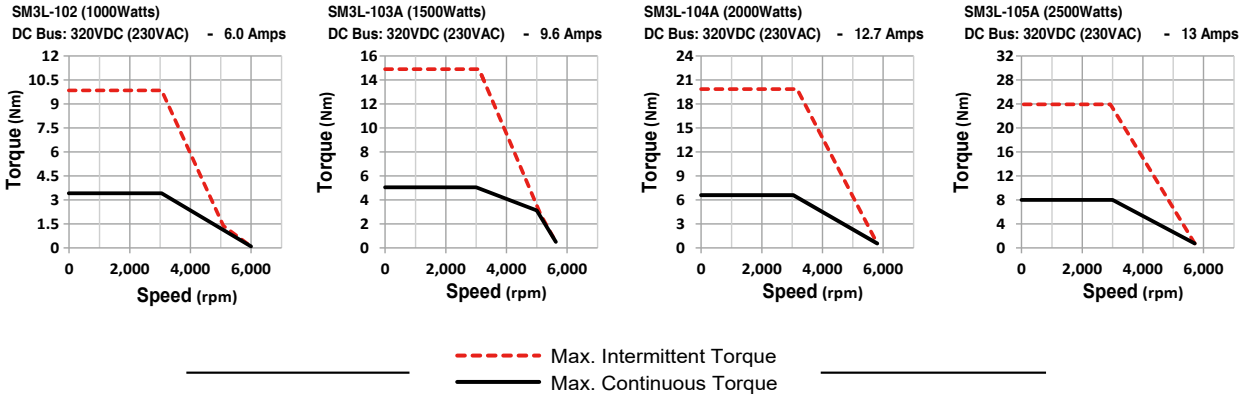
2) With Brake



With Brake	L
SM3L-102ATBU△	184
SM3L-103ATBU△	199
SM3L-104ATBU△	215
SM3L-105ATBU△	233

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



2.3.10 □100mm Frame Low Inertia---400VAC Winding

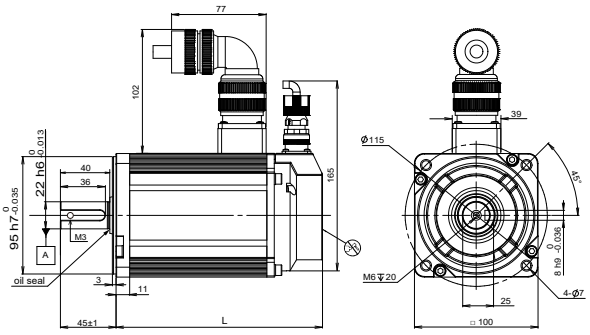
□ Specification

Type*		SM3L - 102Y◇□U△	SM3L - 103Y◇□U△	SM3L - 104Y◇□U△	SM3L - 105Y◇□U△
Rated Output Power	watts	1000	1500	2000	2500
Rated Speed	rpm	3000	3000	3000	3000
Max.Speed	rpm	6000	6000	6000	6000
Rated Torque	N·m	3.2	4.9	6.4	8
Peak Torque	N·m	9.6	14.7	19.2	24
Rated Current	A (rms)	3.8	5.7	7.4	7.7
Peak Current	A (rms)	14	21	25.5	26
Voltage Constant ±5%	V (rms) / K rpm	59	59.2	60.5	70
Torque Constant ±5%	N·m / A (rms)	0.842	0.86	0.86	1.04
Rotor Inertia	$Kg·m^2$	1.79×10^{-4}	2.37×10^{-4}	2.98×10^{-4}	3.68×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	2.67×10^{-4}	3.25×10^{-4}	3.86×10^{-4}	4.56×10^{-4}
Shaft Load - Axial	N (max.)	90	90	90	90
Shaft Load - Radial (End of Shaft)	N (max.)	270	270	270	270
Weight	Kg	4	4.39	5.2	6.3
Weight - With Brake	Kg	5.2	5.64	6.12	7.6

*◇Encoder Options；□Brake Options；△Oil Seal Options

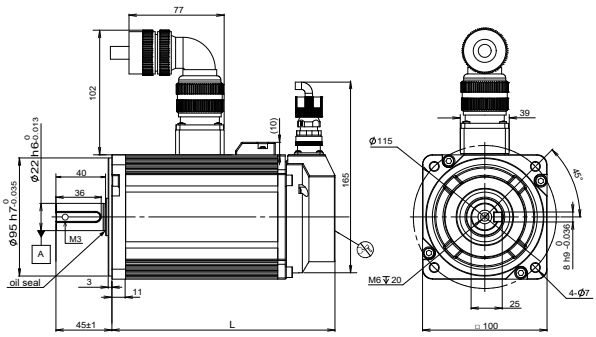
□ Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3L-102YTNU△	142
SM3L-103YTNU△	157
SM3L-104YTNU△	173
SM3L-105YTNU△	191

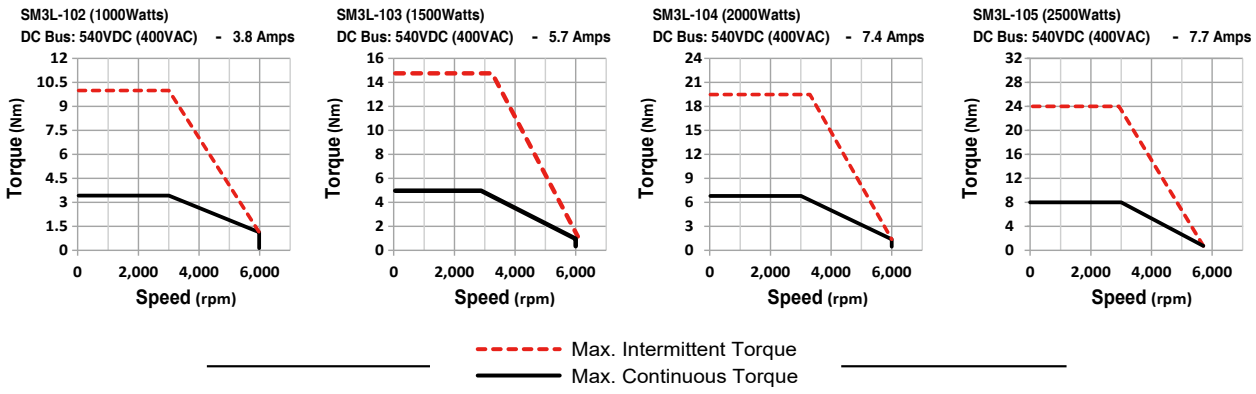
2) With Brake



With Brake	L
SM3L-102YTBU△	184
SM3L-103YTBU△	199
SM3L-104YTBU△	215
SM3L-105YTBU△	233

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



2.3.11 □130mm Frame Medium Inertia---220VAC Winding

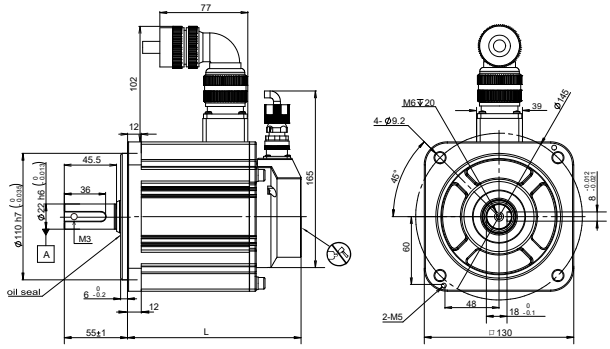
□ Specification

Type*		SM3M - 132A◇□U△	SM3M - 133A◇□U△	SM3M - 134A◇□U△
Rated Output Power	watts	1000	1500	2000
Rated Speed	rpm	2000	2000	2000
Max.Speed	rpm	3000	3000	3000
Rated Torque	N·m	4.77	7.16	9.55
Peak Torque	N·m	14.3	21.5	28.6
Rated Current	A (rms)	5.4	8.5	11
Peak Current	A (rms)	16.9	26	32.7
Voltage Constant ±5%	V (rms) / K rpm	55.3	54.2	55.5
Torque Constant ±5%	N·m / A (rms)	0.883	0.843	0.87
Rotor Inertia	$Kg·m^2$	13×10^{-4}	18.3×10^{-4}	24.4×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	15.2×10^{-4}	20.5×10^{-4}	26.6×10^{-4}
Shaft Load - Axial	N (max.)	196	343	396
Shaft Load - Radial (End of Shaft)	N (max.)	490	686	980
Weight	Kg	5.33	6.67	9.1
Weight - With Brake	Kg	7.25	8.47	10.75

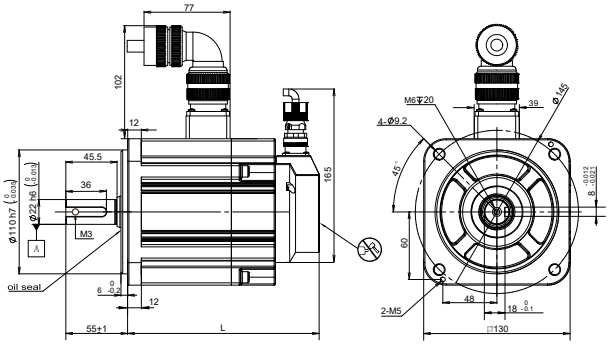
*◇Encoder Options；□Brake Options；△Oil Seal Options

□ Dimensions (Unit: mm)

1) Without Brake



2) With Brake

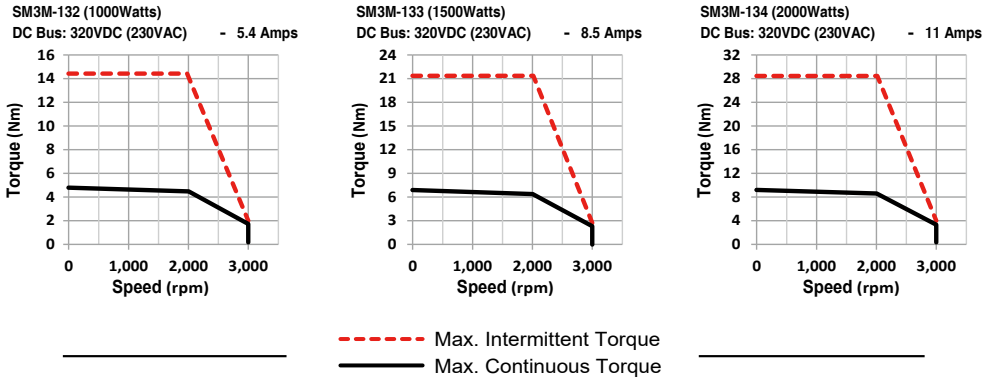


Without Brake	L
SM3M-132ATNU△	143
SM3M-133ATNU△	157
SM3M-134ATNU△	174

With Brake	L
SM3M-132ATBU△	176
SM3M-133ATBU△	190
SM3M-134ATBU△	207

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



2.3.12 □130mm Frame Medium Inertia---400VAC Winding

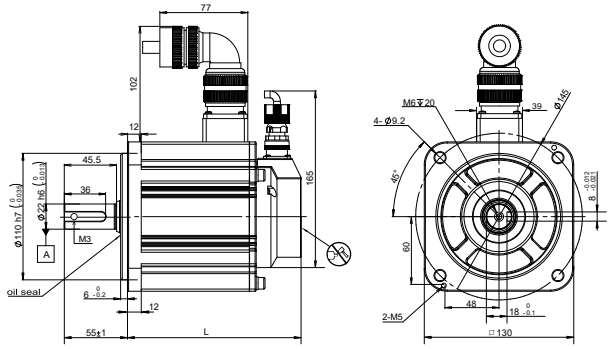
□ Specification

Type*		SM3M - 132Y◇□U△	SM3M - 133Y◇□U△	SM3M - 134Y◇□U△
Rated Output Power	watts	1000	1500	2000
Rated Speed	rpm	2000	2000	2000
Max.Speed	rpm	3000	3000	3000
Rated Torque	N·m	4.77	7.16	9.55
Peak Torque	N·m	14.3	21.5	28.6
Rated Current	A (rms)	3.3	5.1	6.5
Peak Current	A (rms)	10	16	18.6
Voltage Constant ±5%	V (rms) / K rpm	101	97	101
Torque Constant ±5%	N·m / A (rms)	1.45	1.4	1.47
Rotor Inertia	$Kg·m^2$	13×10^{-4}	18.3×10^{-4}	24.4×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	15.2×10^{-4}	20.5×10^{-4}	26.6×10^{-4}
Shaft Load - Axial	N (max.)	196	343	396
Shaft Load - Radial (End of Shaft)	N (max.)	490	686	980
Weight	Kg	5.33	6.67	9.1
Weight - With Brake	Kg	7.25	8.47	10.75

*◇Encoder Options；□Brake Options；△Oil Seal Options

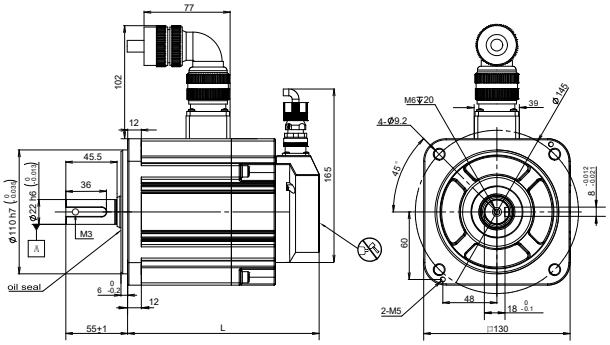
□ Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3M-132YTNU△	143
SM3M-133YTNU△	157
SM3M-134YTNU△	174

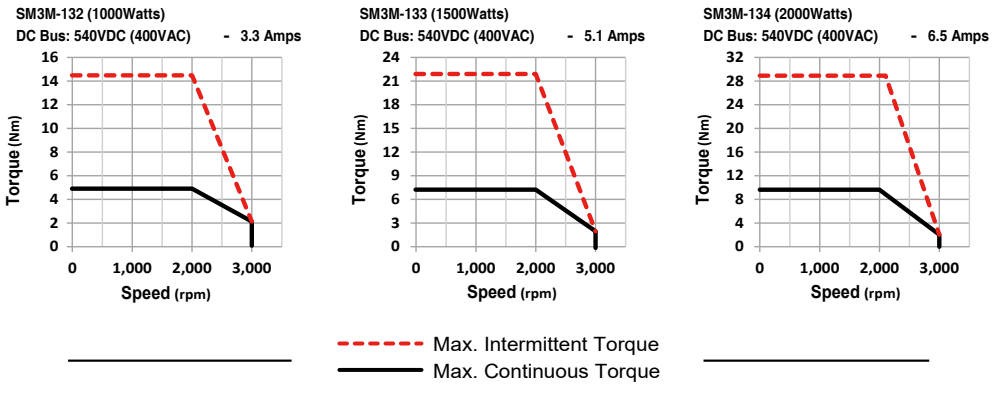
2) With Brake



With Brake	L
SM3M-132YTBU△	176
SM3M-133YTBU△	190
SM3M-134YTBU△	207

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



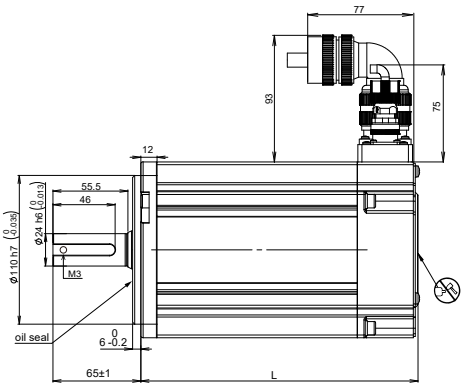
2.3.13 □130mm Frame Medium Inertia---400VAC Winding

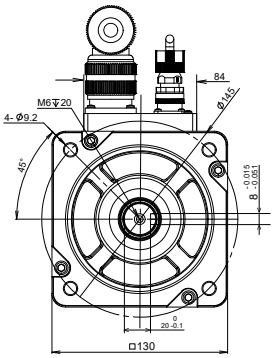
□ Specification

Type*		SM3M - 135Y◇□M△
Rated Output Power	watts	3000
Rated Speed	rpm	2000
Max.Speed	rpm	3000
Rated Torque	N·m	14.3
Peak Torque	N·m	42.9
Rated Current	A (rms)	10.5
Peak Current	A (rms)	30
Voltage Constant ±5%	V (rms) / K rpm	93.2
Torque Constant ±5%	N·m / A (rms)	1.47
Rotor Inertia	$Kg·m^2$	36.4×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	38.6×10^{-4}
Shaft Load - Axial	N (max.)	396
Shaft Load - Radial (End of Shaft)	N (max.)	980
Weight	Kg	12.05
Weight - With Brake	Kg	13.95

*◇Encoder Options；□Brake Options；△Oil Seal Options

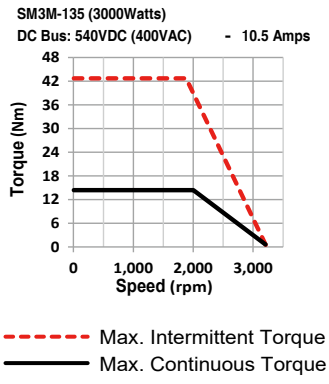
□ Dimensions (Unit: mm)





Model		L
Without Brake	SM3M-135Y◇NM△	205
With Brake	SM3M-135Y◇BM△	238

□ Torque Curves



2.3.14 □130mm Frame High Inertia---220VAC Winding

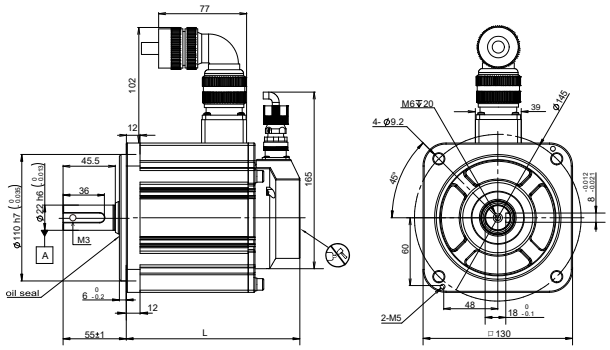
□ Specification

Type*		SM3H - 132A◇□U△	SM3H - 133A◇□U△	SM3H - 134A◇□U△
Rated Output Power	watts	850	1300	1800
Rated Speed	rpm	1500	1500	1500
Max.Speed	rpm	3000	3000	3000
Rated Torque	N·m	5.39	8.34	11.5
Peak Torque	N·m	16.2	25	34.5
Rated Current	A (rms)	6	9.6	13
Peak Current	A (rms)	19	29.6	45
Voltage Constant ±5%	V (rms) / K	55.3	54.2	51
Torque Constant ±5%	N·m / A (rms)	0.891	0.869	0.88
Rotor Inertia	$Kg·m^2$	13×10^{-4}	18.3×10^{-4}	24.4×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	15.2×10^{-4}	20.5×10^{-4}	26.6×10^{-4}
Shaft Load - Axial	N (max.)	196	343	396
Shaft Load - Radial (End of Shaft)	N (max.)	490	686	980
Weight	Kg	5.92	7	8.5
Weight - With Brake	Kg	7.84	8.8	10.15

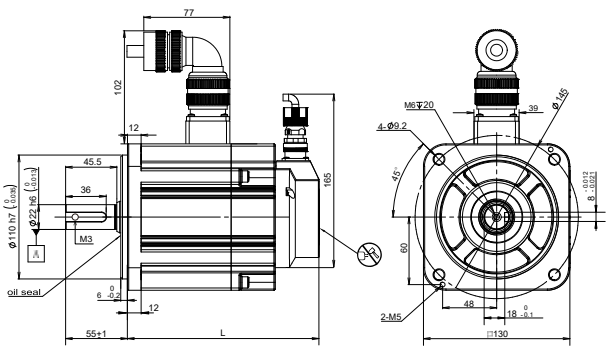
*◇Encoder Options；□Brake Options；△Oil Seal Options

□ Dimensions (Unit: mm)

1) Without Brake



2) With Brake

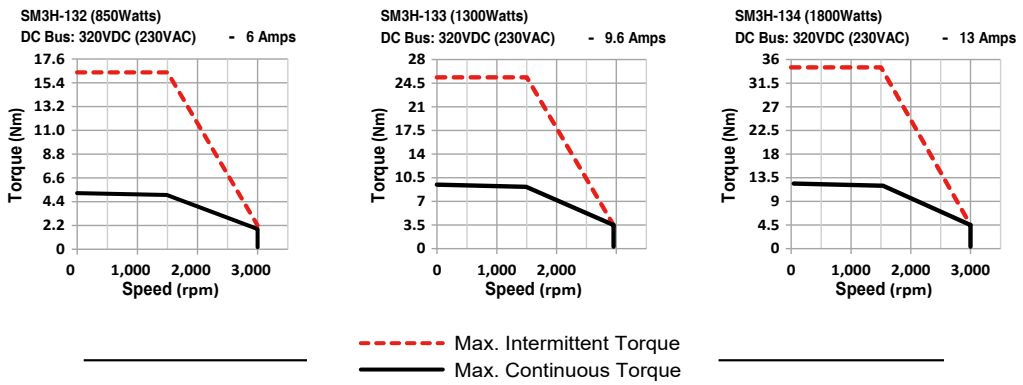


Without Brake	L
SM3H-132ATNU△	143
SM3H-133ATNU△	157
SM3H-134ATNU△	174

With Brake	L
SM3H-132ATBU△	176
SM3H-133ATBU△	190
SM3H-134ATBU△	207

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



2.3.15 □130mm Frame High Inertia---400VAC Winding

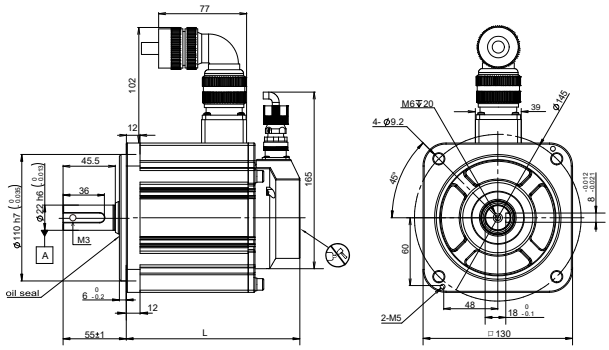
□ Specification

Type*		SM3H - 132Y◇□U△	SM3H - 133Y◇□U△	SM3H - 134Y◇□U△
Rated Output Power	watts	850	1300	1800
Rated Speed	rpm	1500	1500	1500
Max.Speed	rpm	3000	3000	3000
Rated Torque	N·m	5.39	8.34	11.5
Peak Torque	N·m	16.2	25	34.5
Rated Current	A (rms)	3.6	5.8	8.1
Peak Current	A (rms)	11	17.5	23.2
Voltage Constant ±5%	V (rms) / K rpm	101	97	96
Torque Constant ±5%	N·m / A (rms)	1.5	1.44	1.42
Rotor Inertia	$Kg·m^2$	13×10^{-4}	18.3×10^{-4}	24.4×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	15.2×10^{-4}	20.5×10^{-4}	26.6×10^{-4}
Shaft Load - Axial	N (max.)	196	343	396
Shaft Load - Radial (End of Shaft)	N (max.)	490	686	980
Weight	Kg	5.92	7	8.5
Weight - With Brake	Kg	7.84	8.8	10.15

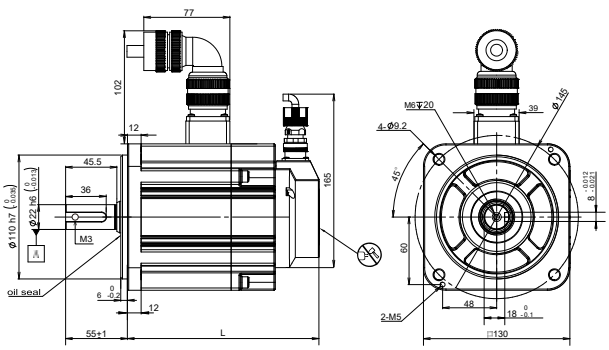
*◇Encoder Options；□Brake Options；△Oil Seal Options

□ Dimensions (Unit: mm)

1) Without Brake



2) With Brake

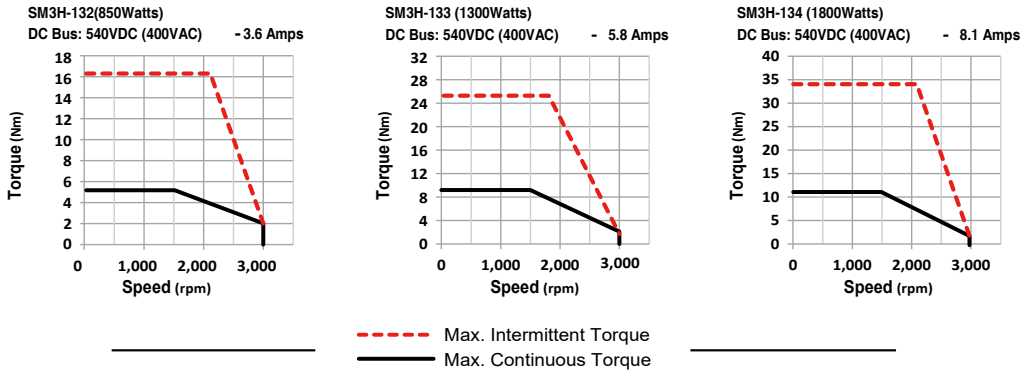


Without Brake	L
SM3H-132YTNU△	143
SM3H-133YTNU△	157
SM3H-134YTNU△	174

With Brake	L
SM3H-132YTBU△	176
SM3H-133YTBU△	190
SM3H-134YTBU△	207

Note: The motor length (L) of type X encoder version is 5mm shorter than type T version.

□ Torque Curves



2.3.16 □180mm Frame High Inertia---400VAC Winding

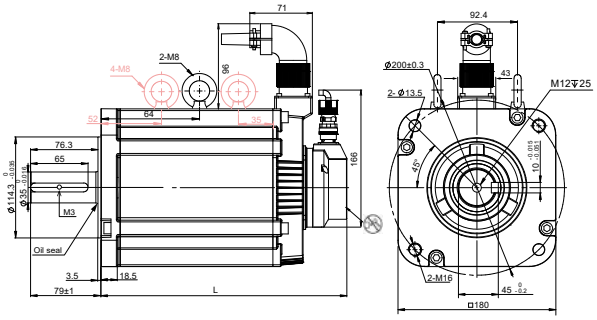
□ Specification

Type*		SM3H - 182Y◇□U△	SM3H - 183Y◇□U△
Rated Output Power	watts	2900	4400
Rated Speed	rpm	1500	1500
Max.Speed	rpm	3000	3000
Rated Torque	N·m	18.5	28
Peak Torque	N·m	55.5	84
Rated Current	A (rms)	10.5	16.7
Peak Current	A (rms)	35.5	54.7
Voltage Constant ±5%	V (rms) / K rpm	115	117
Torque Constant ±5%	N·m / A (rms)	1.76	1.68
Rotor Inertia	$Kg·m^2$	46×10^{-4}	67.5×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	51×10^{-4}	72.5×10^{-4}
Shaft Load - Axial	N (max.)	490	490
Shaft Load - Radial (End of Shaft)	N (max.)	1470	1470
Weight	Kg	13.9	17.4
Weight - With Brake	Kg	15.9	19.4

*◇Encoder Options；□Brake Options；△Oil Seal Options

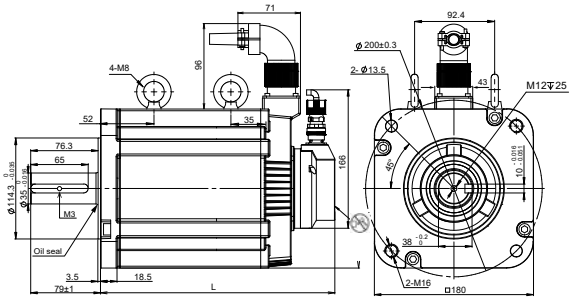
□ Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3H-182Y◇NU△	188
SM3H-183Y◇NU△	213

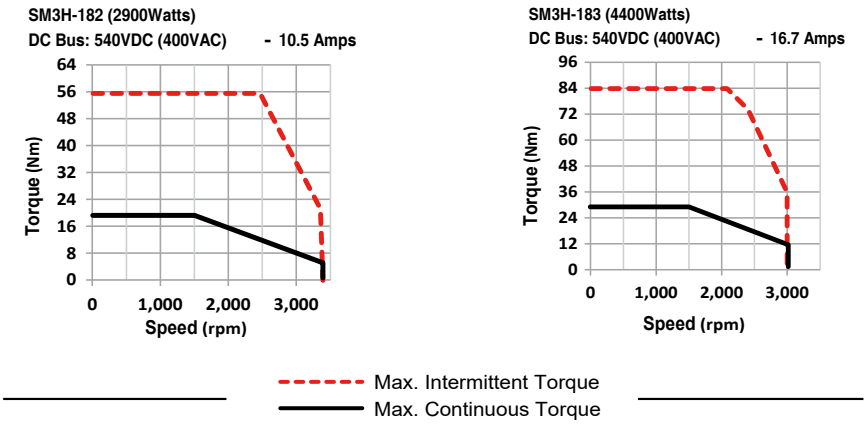
2) With Brake



With Brake	L
SM3H-182Y◇BU△	243
SM3H-183Y◇BU△	263

Note: Red marking shows lifting ring mounting position of motor SM3H-183Y◇NU△.

□ Torque Curves



2.3.17 □180mm Frame High Inertia---400VAC Winding

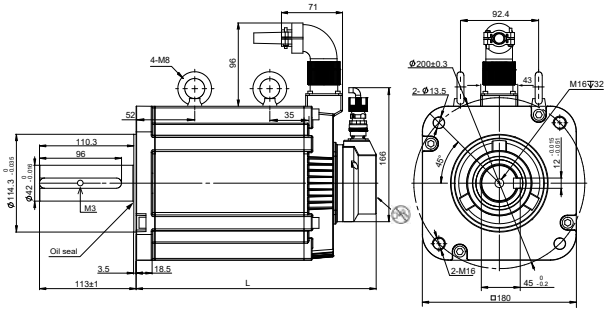
□ Specification

Type*		SM3H - 184Y◇□U△	SM3H - 185Y◇□U△
Rated Output Power	watts	5500	7500
Rated Speed	rpm	1500	1500
Max.Speed	rpm	3000	3000
Rated Torque	N·m	35	48
Peak Torque	N·m	105	120
Rated Current	A (rms)	20.9	25.2
Peak Current	A (rms)	70	73.4
Voltage Constant ±5%	V (rms) / K rpm	114	115
Torque Constant ±5%	N·m / A (rms)	1.67	1.93
Rotor Inertia	$Kg·m^2$	89×10^{-4}	125×10^{-4}
Rotor Inertia - With Brake	$Kg·m^2$	92×10^{-4}	145×10^{-4}
Shaft Load - Axial	N (max.)	588	588
Shaft Load - Radial (End of Shaft)	N (max.)	1764	1764
Weight	Kg	21	26.8
Weight - With Brake	Kg	23	28.9

*◇Encoder Options；□Brake Options；△Oil Seal Options

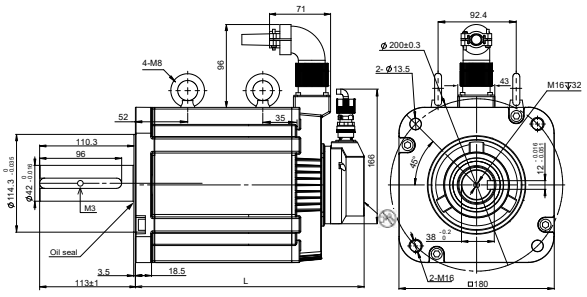
□ Dimensions (Unit: mm)

1) Without Brake



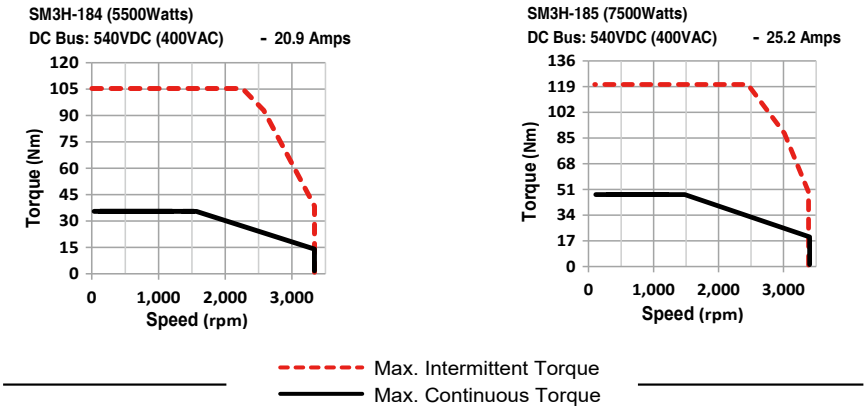
Without Brake	L
SM3H-184Y◇NU△	228
SM3H-185Y◇NU△	278

2) With Brake



With Brake	L
SM3H-184Y◇BU△	278
SM3H-185Y◇BU△	313

□ Torque Curves



2.4 Motor Common Specification

Encoder Type	26-bit, 21-bit, 17-bit multi-turn absolute encoder
Insulation Class	Class F (155℃)
Protection Level	IP67 (Except transfixion part of shaft)
Installation Conditions	Indoor installation, avoiding direct sunlight, corrosive and flammable gas
Ambient Temperature	Working temperature: 0℃~ 40℃ Storage temperature: -20℃ ~ 60℃
Humidity	Storage and usage: 20 ~ 85%RH (No condensation)
Altitude	Derating is not required for altitudes not higher than 1000m Derating 1% for every additional 100m for altitudes between 1000m and 2000m
Vibration	Under 49m/s^2, 10 ~ 60Hz (Do not use continuously at resonance frequency)

2.5 Motor Encoder Specification

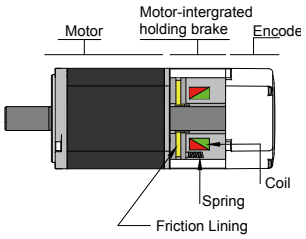
Item	Content		
Motor Model	SM3*-****T***	SM3*-****X***	SM3*-****B***
Power Supply Votage VCC	DC 4.5V～5.5V (Typ 5V)		
External Battery Voltage	DC 3.3～5.5V (Typ 3.6V)		——
VCC Consumption Current	Typ 160mA		
Battery Consumption Current	Typ 15μA		——
Pulses per Rotation	67,108,864 (26-bit)	2,097,152 (21-bit)	131,072 (17-bit)
Multi-turn Counting Range	65,536 (16-bit)		
Communication Method	Half-duplex acyclic serial communication		
Baud Rate	4Mbps		
Operation Temperature	0～105℃		

2.5.1 Motor Brake Specifications

Motor brake is used to prevent motor from rotating by power off the servo system. The most common way of use is in vertical application, when the motor is disabled or powered off, in order to prevent the displacement of the mechanical mechanism driven by the motor due to gravity and other reasons, the servo motor with brake needs to be used.

When the brake is powered on, the armature is retracted, the brake pad is released, and the motor can operate normally. When the brake is powered off, the armature is released, the brake pad is locked, and the motor can't rotate.

Frame	40mm	60mm	80mm	100mm	130mm	180mm
Static Friction Torque (Nm)	0.32	1.5	3.2	8.0	18.5	60
Rated Voltage (VDC)	24					
Power Waste (W @ 20℃)	6.3	7.2	9.6	14.4	24.3	52
Current (A)	0.26	0.3	0.4	0.6	1.05	2.16
Braking Time (ms)	50	50	60	80	100	180
Release Time (ms)	20	20	40	40	40	80
Release Voltage	20VDC max.(at 20℃)					



During normal operation, DO NOT use the motor's brake to decelerate the motor, it will cause damage to the brake.

2.6 Drive Motor Matching Table

2.6.1 220VAC System

Servo Drive				
26pin Plug-in Type I/O Connector				
EtherNet/IP		M56S-21A8IPX	M56S-23A0IPX	M56S-24A5IPX
		M56S-21A8IPN	M56S-23A0IPN	M56S-24A5IPN
Matching Motor				
Motor Frame Size & Power				
		Frame 40, 50W, 100W	-	-
		Frame 60, 200W	Frame 60, 400W	-
		-	-	Frame 80, 750W
Low Inertia	Without Brake	SM3L-042A◇ND△ SM3L-042ABND△ SM3L-061A◇NP△ SM3L-061ABND△	SM3L-062A◇NP△ SM3L-062ABND△	SM3L-083A◇NP△ SM3L-083ABND△
	With Brake	SM3L-042A◇BD△ SM3L-042ABBD△ SM3L-061A◇BP△ SM3L-061ABBD△	SM3L-062A◇BP△ SM3L-062ABBD△	SM3L-083A◇BP△ SM3L-083ABBD△
High Inertia	Without Brake	SM3H-041A◇NP△ SM3H-042A◇NP△ SM3H-061A◇NP△ SM3H-061ABND△	SM3H-062A◇NP△ SM3H-062ABND△	SM3H-083A◇NP△ SM3H-083ABND△
	With Brake	SM3H-041A◇BP△ SM3H-042A◇BP△ SM3H-061A◇BP△ SM3H-061ABBD△	SM3H-062A◇BP△ SM3H-062ABBD△	SM3H-083A◇BP△ SM3H-083ABBD△

◇ Encoder Option △Oil Seal Options

Servo Drive				
26pin Plug-in Type I/O Connector				
EtherNet/IP		M56S-26A0IPX	M56S-210AIPX	M56S-213AIPX
Matching Motor				
Motor Frame Size & Power				
		Frame 80, 1000W	-	-
		Frame 100, 1000W	Frame 100, 1500W	Frame 100, 2000W, 2500W
		Frame 130, 850W, 1000W	Frame 130, 1300W, 1500W	Frame 130, 1800W, 2000W
Low Inertia	Without Brake	SM3L-084A◇NP△ SM3L-084ABNDV SM3L-102A◇NU△	SM3L-103A◇NU△	SM3L-103A◇NU△ SM3L-104A◇NU△
	With Brake	SM3L-084A◇BP△ SM3L-084ABBDV SM3L-102A◇BU△	SM3L-103A◇BU△	SM3L-103A◇BU△ SM3L-104A◇BU△
Medium Inertia	Without Brake	SM3M-132A◇NU△	SM3M-133A◇NU△	SM3M-134A◇NU△
	With Brake	SM3M-132A◇BU△	SM3M-133A◇BU△	SM3M-134A◇BU△
High Inertia	Without Brake	SM3H-084A◇NP△ SM3H-132A◇NU△	SM3H-133A◇NU△	SM3H-134A◇NU△
	With Brake	SM3H-084A◇BP△ SM3H-132A◇BU△	SM3H-133A◇BU△	SM3H-134A◇BU△

◇ Encoder Option △Oil Seal Options

2.6.2 400VAC System

Servo Drive			
26pin Plug-in Type I/O Connector			
EtherNet/IP		M56S-36A0IPX	M56S-313AIPX
Matching Motor			
Motor Frame Size & Power			
		Frame 100, 1000W, 1500W	Frame 100, 2000W, 2500W
		Frame 130, 850W, 1000W 1300W, 1500W	Frame 130, 3000W
		-	Frame 180, 2900W
Low Inertia	Without Brake	SM3L-102Y◇NU△ SM3L-103Y◇NU△	SM3L-104Y◇NU△ SM3L-105Y◇NU△
	With Brake	SM3L-102Y◇BU△ SM3L-103Y◇BU△	SM3L-104Y◇BU△ SM3L-105Y◇BU△
Medium Inertia	Without Brake	SM3M-132Y◇NU△ SM3M-133Y◇NU△	SM3M-135Y◇NM△
	With Brake	SM3M-132Y◇BU△ SM3M-133Y◇BU△	SM3M-135Y◇BM△
High Inertia	Without Brake	SM3H-132Y◇NU△ SM3H-133Y◇NU△	SM3H-182YTNU△
	With Brake	SM3H-132Y◇BU△ SM3H-133Y◇BU△	SM3H-182YTBU△

◇ Encoder Option △Oil Seal Options

Servo Drive				
26pin Plug-in type I/O Connector				
EtherNet/IP		M56S-317AIPX	M56S-321AIPX	M56S-326AIPX
Matching Motor				
Motor Frame Size & Power				
		Frame 180, 4400W	Frame 180, 5500W	Frame 180, 7500W
High Inertia	Without Brake	SM3H-183YTNU△	SM3H-184YTNU△	SM3H-185YTNU△
	With Brake	SM3H-183YTBU△	SM3H-184YTBU△	SM3H-185YTBU△

◇ Encoder Option △Oil Seal Options

2.7 Matching Cable and Connector Accessories

2.7.1 Servo Motor Matching Cable

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3L-042A ◇☐ D△ SM3L-061A ◇☐ P△ SM3L-062A ◇☐ P△ SM3L-083A ◇☐ P△ SM3L-084A ◇☐ P△ SM3H-041A ◇☐ P△ SM3H-042A ◇☐ P△ SM3H-061A ◇☐ P△ SM3H-062A ◇☐ P△ SM3H-083A ◇☐ P△ SM3H-084A ◇☐ P△	Encoder Cables With Battery Absolute Encoder Shielded	2639-0100	2639-0100-C10	1
		2639-0200	2639-0200-C10	2
		2639-0300	2639-0300-C10	3
		2639-0400	2639-0400-C10	4
		2639-0500	2639-0500-C10	5
		2639-0800	2639-0800-C10	8
		2639-1000	2639-1000-C10	10
		2639-1500	2639-1500-C10	15
		2639-2000	2639-2000-C10	20
	Encoder Cables Incremental Encoder Shielded	2640-0100	2640-0100-C10	1
		2640-0200	2640-0200-C10	2
		2640-0300	2640-0300-C10	3
		2640-0400	2640-0400-C10	4
		2640-0500	2640-0500-C10	5
		2640-0800	2640-0800-C10	8
		2640-1000	2640-1000-C10	10
		2640-1500	2640-1500-C10	15
		2640-2000	2640-2000-C10	20
SM3L-042AB☐D△ SM3L-061AB☐D△ SM3L-062AB☐D△ SM3L-083AB☐D△ SM3L-084AB☐D△ SM3H-041AB☐PV SM3H-042AB☐PV SM3H-061AB☐D△ SM3H-062AB☐D△ SM3H-083AB☐D△ SM3H-084AB☐D△	Encoder Cables Without Battery Absolute Encoder Shielded	2641-0100	2641-0100-C10	1
		2641-0200	2641-0200-C10	2
		2641-0300	2641-0300-C10	3
		2641-0400	2641-0400-C10	4
		2641-0500	2641-0500-C10	5
		2641-0800	2641-0800-C10	8
		2641-1000	2641-1000-C10	10
		2641-1500	2641-1500-C10	15
		2641-2000	2641-2000-C10	20
SM3L-042A ◇☐ D△ SM3L-061A ◇☐ P△ SM3L-062A ◇☐ P△ SM3L-083A ◇☐ P△ SM3L-084A ◇☐ P△ SM3H-041A ◇☐ P△ SM3H-042A ◇☐ P△ SM3H-061A ◇☐ P△ SM3H-062A ◇☐ P△ SM3H-083A ◇☐ P△ SM3H-084A ◇☐ P△	Motor Cables Unshielded	1672-0100	1672-0100-C10	1
		1672-0200	1672-0200-C10	2
		1672-0300	1672-0300-C10	3
		1672-0400	1672-0400-C10	4
		1672-0500	1672-0500-C10	5
		1672-0800	1672-0800-C10	8
		1672-1000	1672-1000-C10	10
		1672-1500	1672-1500-C10	15
		1672-2000	1672-2000-C10	20
SM3L-042AB ☐ D△ SM3L-061AB ☐ D△ SM3L-062AB ☐ D△ SM3L-083AB ☐ D△ SM3L-084AB ☐ D△ SM3H-061A B☐ D△ SM3H-062A B☐ D△ SM3H-083A B☐ D△	Brake Cables Unshielded	1674-0100	1674-0100-C10	1
		1674-0200	1674-0200-C10	2
		1674-0300	1674-0300-C10	3
		1674-0400	1674-0400-C10	4
		1674-0500	1674-0500-C10	5
		1674-0800	1674-0800-C10	8
		1674-1000	1674-1000-C10	10
		1674-1500	1674-1500-C10	15
		1674-2000	1674-2000-C10	20

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3L-042A ◇☐ D△	Motor Cables Shielded	1672-0100-S	1672-0100-C10-S	1
SM3L-061A ◇☐ P△		1672-0200-S	1672-0200-C10-S	2
SM3L-062A ◇☐ P△		1672-0300-S	1672-0300-C10-S	3
SM3L-083A ◇☐ P△		1672-0400-S	1672-0400-C10-S	4
SM3L-084A ◇☐ P△		1672-0500-S	1672-0500-C10-S	5
SM3H-041A ◇☐ P△		1672-0800-S	1672-0800-C10-S	8
SM3H-042A ◇☐ P△		1672-1000-S	1672-1000-C10-S	10
SM3H-061A ◇☐ P△		1672-1500-S	1672-1500-C10-S	15
SM3H-062A ◇☐ P△		1672-2000-S	1672-2000-C10-S	20
SM3H-083A ◇☐ P△	Brake Cables Shielded	1674-0100-S	1674-0100-C10-S	1
SM3H-084A ◇☐ P△		1674-0200-S	1674-0200-C10-S	2
SM3L-042AB ☐ D△		1674-0300-S	1674-0300-C10-S	3
SM3L-061AB ☐ D△		1674-0400-S	1674-0400-C10-S	4
SM3L-062AB ☐ D△		1674-0500-S	1674-0500-C10-S	5
SM3L-083AB ☐ D△		1674-0800-S	1674-0800-C10-S	8
SM3L-084AB ☐ D△		1674-1000-S	1674-1000-C10-S	10
SM3H-061A B☐ D△		1674-1500-S	1674-1500-C10-S	15
SM3H-062A B☐D△		1674-2000-S	1674-2000-C10-S	20
SM3H-083A B☐ D△				

* ◇Encoder Options △Oil Seal Options
* Flexible -C10 10 million times
Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3L-102○◇□U△ SM3L-103○◇□U△ SM3L-104○◇□U△ SM3L-105○◇□U△ SM3M-132○◇□U△ SM3M-133○◇□U△ SM3M-134○◇□U△ SM3M-135Y◇□M△ SM3H-132○◇□U△ SM3H-133○◇□U△ SM3H-134○◇□U△ SM3H-182Y◇□U△ SM3H-183Y◇□U△ SM3H-184Y◇□U△ SM3H-185Y◇□U△	Encoder Cables With Battery Absolute Encoder Shielded	2642-0100	2642-0100-C10	1
		2642-0300	2642-0300-C10	3
		2642-0500	2642-0500-C10	5
		2642-1000	2642-1000-C10	10
		2642-1500	2642-1500-C10	15
		2642-2000	2642-2000-C10	20
	Encoder Cables Incremental Encoder Shielded	2643-0100	2643-0100-C10	1
		2643-0300	2643-0300-C10	3
		2643-0500	2643-0500-C10	5
		2643-1000	2643-1000-C10	10
		2643-1500	2643-1500-C10	15
		2643-2000	2643-2000-C10	20
SM3L-102○◇ NU△ SM3L-103Y◇ NU△ SM3M-132○◇ NU△ SM3M-133Y◇ NU△ SM3H-132○◇ NU△ SM3H-133Y◇ NU△	Motor Cables Unshielded	1658-0100	1658-0100-C10	1
		1658-0300	1658-0300-C10	3
		1658-0500	1658-0500-C10	5
		1658-1000	1658-1000-C10	10
		1658-1500	1658-1500-C10	15
		1658-2000	1658-2000-C10	20
SM3L-102○◇ BU△ SM3L-103Y◇ BU△ SM3M-132○◇ BU△ SM3M-133Y◇ BU△ SM3H-132○◇ BU△ SM3H-133Y◇ BU△	Motor Cables With Built-in Brake Cable Unshielded	1660-0100	1660-0100-C10	1
		1660-0300	1660-0300-C10	3
		1660-0500	1660-0500-C10	5
		1660-1000	1660-1000-C10	10
		1660-1500	1660-1500-C10	15
		1660-2000	1660-2000-C10	20
SM3L-103A◇ NU△ SM3L-104Y◇ NU△ SM3L-105Y◇ NU△ SM3M-133A◇ NU△ SM3M-134Y◇ NU△ SM3H-133A◇ NU△ SM3H-134Y◇ NU△	Motor Cables Unshielded	1656-0100	1656-0100-C10	1
		1656-0300	1656-0300-C10	3
		1656-0500	1656-0500-C10	5
		1656-1000	1656-1000-C10	10
		1656-1500	1656-1500-C10	15
		1656-2000	1656-2000-C10	20
SM3L-103A◇ BU△ SM3L-104Y◇ BU△ SM3L-105Y◇ BU△ SM3M-133A◇ BU△ SM3M-134Y◇ BU△ SM3H-133A◇ BU△ SM3H-134Y◇ BU△	Motor Cables With Built-in Brake Cable Unshielded	1662-0100	1662-0100-C10	1
		1662-0300	1662-0300-C10	3
		1662-0500	1662-0500-C10	5
		1662-1000	1662-1000-C10	10
		1662-1500	1662-1500-C10	15
		1662-2000	1662-2000-C10	20
SM3L-104A◇ NU△ SM3L-105A◇ NU△ SM3M-134A◇ NU△ SM3M-135Y ◇ NM△ SM3H-134A◇ NU△	Motor Cables Unshielded	1650-0100	1650-0100-C10	1
		1650-0300	1650-0300-C10	3
		1650-0500	1650-0500-C10	5
		1650-1000	1650-1000-C10	10
		1650-1500	1650-1500-C10	15
		1650-2000	1650-2000-C10	20
SM3L-104A◇ BU△ SM3L-105A◇ BU△ SM3M-134A◇ BU△ SM3M-135Y ◇ BM△ SM3H-134A◇ BU△	Motor Cables With Built-in Brake Cable Unshielded	1652-0100	1652-0100-C10	1
		1652-0300	1652-0300-C10	3
		1652-0500	1652-0500-C10	5
		1652-1000	1652-1000-C10	10
		1652-1500	1652-1500-C10	15
		1652-2000	1652-2000-C10	20

* ○Winding Specification ◇Encoder Options △Oil Seal Options
* Flexible -C10 10 million times
Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3L-102○◇ NU△ SM3L-103Y◇ NU△ SM3M-132○◇ NU△ SM3M-133Y◇ NU△ SM3H-132○◇ NU△ SM3H-133Y◇ NU△	Motor Cables Shielded	1658-0100-S	1658-0100-C10-S	1
		1658-0300-S	1658-0300-C10-S	3
		1658-0500-S	1658-0500-C10-S	5
		1658-1000-S	1658-1000-C10-S	10
		1658-1500-S	1658-1500-C10-S	15
		1658-2000-S	1658-2000-C10-S	20
SM3L-102○◇ BU△ SM3L-103Y◇ BU△ SM3M-132○◇ BU△ SM3M-133Y◇ BU△ SM3H-132○◇ BU△ SM3H-133Y◇ BU△	Motor Cables With Built-in Brake Cable Shielded	1660-0100-S	1660-0100-C10-S	1
		1660-0300-S	1660-0300-C10-S	3
		1660-0500-S	1660-0500-C10-S	5
		1660-1000-S	1660-1000-C10-S	10
		1660-1500-S	1660-1500-C10-S	15
		1660-2000-S	1660-2000-C10-S	20
SM3L-103A◇ NU△ SM3L-104Y◇ NU△ SM3L-105Y◇ NU△ SM3M-133A◇ NU△ SM3M-134Y◇ NU△ SM3H-133A◇ NU△ SM3H-134Y◇ NU△	Motor Cables Shielded	1656-0100-S	1656-0100-C10-S	1
		1656-0300-S	1656-0300-C10-S	3
		1656-0500-S	1656-0500-C10-S	5
		1656-1000-S	1656-1000-C10-S	10
		1656-1500-S	1656-1500-C10-S	15
		1656-2000-S	1656-2000-C10-S	20
SM3L-103A◇ BU△ SM3L-104Y◇ BU△ SM3L-105Y◇ BU△ SM3M-133A◇ BU△ SM3M-134Y◇ BU△ SM3H-133A◇ BU△ SM3H-134Y◇ BU△	Motor Cables With Built-in Brake Cable Shielded	1662-0100-S	1662-0100-C10-S	1
		1662-0300-S	1662-0300-C10-S	3
		1662-0500-S	1662-0500-C10-S	5
		1662-1000-S	1662-1000-C10-S	10
		1662-1500-S	1662-1500-C10-S	15
		1662-2000-S	1662-2000-C10-S	20
SM3L-104A◇ NU△ SM3L-105A◇ NU△ SM3M-134A◇ NU△ SM3M-135Y ◇ NM△ SM3H-134A◇ NU△	Motor Cables Shielded	1650-0100-S	1650-0100-C10-S	1
		1650-0300-S	1650-0300-C10-S	3
		1650-0500-S	1650-0500-C10-S	5
		1650-1000-S	1650-1000-C10-S	10
		1650-1500-S	1650-1500-C10-S	15
		1650-2000-S	1650-2000-C10-S	20
SM3L-104A◇ BU△ SM3L-105A◇ BU△ SM3M-134A◇ BU△ SM3M-135Y ◇ BM△ SM3H-134A◇ BU△	Motor Cables With Built-in Brake Cable Shielded	1652-0100-S	1652-0100-C10-S	1
		1652-0300-S	1652-0300-C10-S	3
		1652-0500-S	1652-0500-C10-S	5
		1652-1000-S	1652-1000-C10-S	10
		1652-1500-S	1652-1500-C10-S	15
		1652-2000-S	1652-2000-C10-S	20

* ○Winding Specification ◇Encoder Options △Oil Seal Options
* Flexible -C10 10 million times
Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3H-182Y◇NU△	Motor Cables Unshielded	1682-0100	1682-0100-C10	1
		1682-0300	1682-0300-C10	3
		1682-0500	1682-0500-C10	5
		1682-1000	1682-1000-C10	10
		1682-1500	1682-1500-C10	15
		1682-2000	1682-2000-C10	20
SM3H-182Y◇BU△	Motor Cables With Built-in Brake Cable Unshielded	1683-0100	1683-0100-C10	1
		1683-0300	1683-0300-C10	3
		1683-0500	1683-0500-C10	5
		1683-1000	1683-1000-C10	10
		1683-1500	1683-1500-C10	15
		1683-2000	1683-2000-C10	20
SM3H-183Y◇NU△	Motor Cables Unshielded	1666-0100	1666-0100-C10	1
		1666-0300	1666-0300-C10	3
		1666-0500	1666-0500-C10	5
		1666-1000	1666-1000-C10	10
		1666-1500	1666-1500-C10	15
		1666-2000	1666-2000-C10	20
SM3H-183Y◇BU△	Motor Cables With Built-in Brake Cable Unshielded	1681-0100	1681-0100-C10	1
		1681-0300	1681-0300-C10	3
		1681-0500	1681-0500-C10	5
		1681-1000	1681-1000-C10	10
		1681-1500	1681-1500-C10	15
		1681-2000	1681-2000-C10	20
SM3H-184Y◇NU△ SM3H-185Y◇NU△	Motor Cables Unshielded	1667-0100	1667-0100-C10	1
		1667-0300	1667-0300-C10	3
		1667-0500	1667-0500-C10	5
		1667-1000	1667-1000-C10	10
		1667-1500	1667-1500-C10	15
		1667-2000	1667-2000-C10	20
SM3H-184Y◇BU△ SM3H-185Y◇BU△	Motor Cables With Built-in Brake Cable Unshielded	1680-0100	1680-0100-C10	1
		1680-0300	1680-0300-C10	3
		1680-0500	1680-0500-C10	5
		1680-1000	1680-1000-C10	10
		1680-1500	1680-1500-C10	15
		1680-2000	1680-2000-C10	20

* ◇Encoder Options △Oil Seal Options
* Flexible -C10 10 million times
Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Motor Model 1*	Description	Common Type Model	Flexible Type Model 2*	Length (Unit: m)
SM3H-182Y◇NU△	Motor Cables Shielded	1682-0100-S	1682-0100-C10-S	1
		1682-0300-S	1682-0300-C10-S	3
		1682-0500-S	1682-0500-C10-S	5
		1682-1000-S	1682-1000-C10-S	10
		1682-1500-S	1682-1500-C10-S	15
		1682-2000-S	1682-2000-C10-S	20
SM3H-182Y◇BU△	Motor Cables With Built-in Brake Cable Shielded	1683-0100-S	1683-0100-C10-S	1
		1683-0300-S	1683-0300-C10-S	3
		1683-0500-S	1683-0500-C10-S	5
		1683-1000-S	1683-1000-C10-S	10
		1683-1500-S	1683-1500-C10-S	15
		1683-2000-S	1683-2000-C10-S	20
SM3H-183Y◇NU△	Motor Cables Shielded	1666-0100-S	1666-0100-C10-S	1
		1666-0300-S	1666-0300-C10-S	3
		1666-0500-S	1666-0500-C10-S	5
		1666-1000-S	1666-1000-C10-S	10
		1666-1500-S	1666-1500-C10-S	15
		1666-2000-S	1666-2000-C10-S	20
SM3H-183Y◇BU△	Motor Cables With Built-in Brake Cable Shielded	1681-0100-S	1681-0100-C10-S	1
		1681-0300-S	1681-0300-C10-S	3
		1681-0500-S	1681-0500-C10-S	5
		1681-1000-S	1681-1000-C10-S	10
		1681-1500-S	1681-1500-C10-S	15
		1681-2000-S	1681-2000-C10-S	20
SM3H-184Y◇NU△ SM3H-185Y◇NU△	Motor Cables Shielded	1667-0100-S	1667-0100-C10-S	1
		1667-0300-S	1667-0300-C10-S	3
		1667-0500-S	1667-0500-C10-S	5
		1667-1000-S	1667-1000-C10-S	10
		1667-1500-S	1667-1500-C10-S	15
		1667-2000-S	1667-2000-C10-S	20
SM3H-184Y◇BU△ SM3H-185Y◇BU△	Motor Cables With Built-in Brake Cable Shielded	1680-0100-S	1680-0100-C10-S	1
		1680-0300-S	1680-0300-C10-S	3
		1680-0500-S	1680-0500-C10-S	5
		1680-1000-S	1680-1000-C10-S	10
		1680-1500-S	1680-1500-C10-S	15
		1680-2000-S	1680-2000-C10-S	20

* ◇Encoder Options △Oil Seal Options
* Flexible -C10 10 million times
Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

2.7.2 Drive Plug Kit

Name	P/N	Description
I/O Connector	MSOP-CN226P	CN2, 26pin push-in spring IO connector
Motor Encoder Connector	MSOP-CN310P	CN3, Drive side motor encoder connector
Second Encoder Connector	MSOP-CN408P-1	CN4, Full closed-loop function encoder connector
STO Function Connector	STO Connector Kit	CN5, STO Connector
Drive Connector Kit	MSOP-DRPWKITA	200/400/750W drive, P1, P2 and handle lever
	MSOP-DRPWKITB	1.0/1.5/2.0/3.0kW drive, P1, P2 and handle lever

2.7.3 Motor Plug Kit

Name	P/N	Description
Motor Connetor	MSOP-MTKITA	Frame 80mm and below motor connector kit (without brake connector)
	MSOP-MTKITD	Frame 80mm and below motor connector kit (with brake connector)
	MSOP-MTKITF	Frame100mm/130mm motor connector kit (Straight)
	MSOP-MTKITE	Frame 180mm motor connector kit (Straight)

2.7.4 Battery Kit

Name	P/N	Description
Battery	MSOP-BA01	For motor with battery absolute encoder
Battery and battery cases	MSOP-BAKIT01	

2.7.5 Communication Cable

Name	P/N	Length (m)	Description
USB Config Cable	2620-150	1.5	CN1, Servo drive and PC communication configuration cable
CN6/CN7 Communiction Cable	2013-030	0.3	Twisted-pair, Shielded type
	2013-300	3	

2.7.6 Other Cable

Name	P/N	Length (m)	Description
Secondary Encoder Feedback Cable	1643-300-C05	3	Flexible type, 5 million times of bending
	1643-500-C05	5	
Gantry Synchronous Communication Cable	2679-0030	0.3	Standard type, no bending performance
	2679-0050	0.5	

2.7.7 Regenerative Resistor

P/N	Specification	Description
REG100W60R	100W, 60Ω	Regenerative absorbing resistor
REG100W120R	100W, 120Ω	
REG200W120R	200W, 120Ω	
REG300W120R	300W, 120Ω	
REG1000W50R	1000W, 50Ω	
REG1500W50R	1500W, 50Ω	
REG2000W30R	2000W, 30Ω	

2.7.8 Dynamic Brake Resistor

P/N	Specification	Description
DBR85W3R5	85W, 3.5Ω	1.0/1.5/2.0/3.0kW type external dynamic brake resistor

2.7.9 EMI Filter

P/N	Specification	Description
MSOP-EMI020	250VAC，20A	EMI filter for AC power of drive side(Single Phase)

2.7.10 Shield Bracket

P/N	Description
MSOP-DRPEKITB	Compatible with M56S series 200W/400W/750W servo drives
MSOP-DRPEKITC	Compatible with M56S series 1000W and above servo drives

3 Installation

3.1 Storage Conditions

3.1.1 Drive Storage Environment Conditions

Please note the following when storing:

- Correctly packaged and store in a clean and dry place, avoid direct sunlight.
- Store within an ambient temperature range of -10℃～+65℃.
- Store within a relative humidity rang of 10% to 85% and non-condensing.
- DO NOT store in a place subjected to corrosive gasses.

3.1.2 Motor Storage Conditions

- Correctly packaged and stored in a clean and dry place, avoid direct sunlight.
- Store within an ambient temperature range of -20℃～+60℃.
- Store within a relative humidity rang of 20% to 85% and non-condensing.
- DO NOT store in a place subjected to corrosive gasses.

3.2 Installation Conditions

3.2.1 The Drive Operation Ambient Conditions

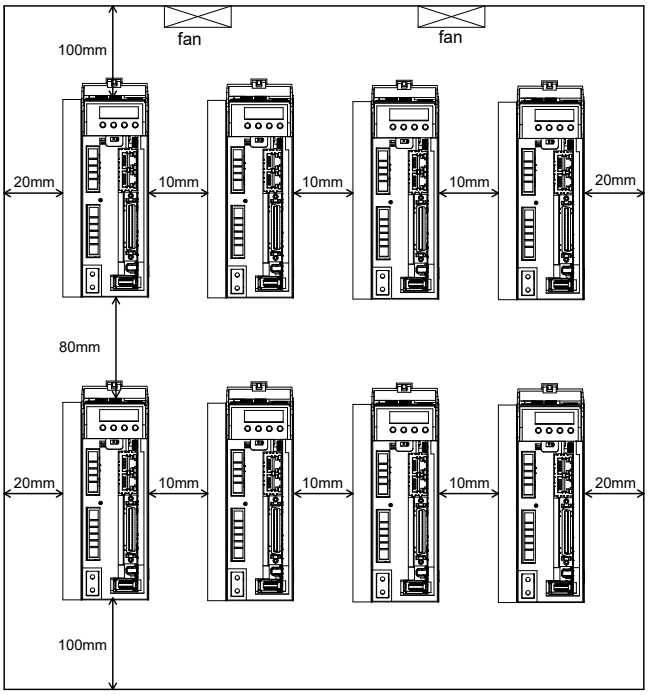
- The ambient temperature is 0℃～55℃. If the ambient temperature exceeds 45℃, please place it in a well-ventilated place. It is recommended to keep the ambient temperature below 45℃ for a long time operation to ensure the reliable performance of the product.
- If this product is installed in a distribution box, the distribution box must be sized and ventilated so that there is no danger of overheating of all electronic devices used inside.
- Ambient humidity is 10%～85% RH, no condensation.
- Vibration below 9.8m/s^2.
- Do not use the drive near corrosive gas, flammable gas or combustible material.
- Please install the drive in an indoor electrical control box without water and direct sunlight.
- Please avoid using the drive in dusty places.

3.2.2 The Motor Operation Ambient Conditions

- The ambient temperature is 0℃～40℃.
- Ambient humidity is 10%～85% RH, no condensation.
- Vibration below 49m/s^2.
- Do not use the motor near corrosive gas, flammable gas, or combustible materials.
- Do not use the motor in a closed environment, the closed environment will cause the motor to high temperature and shorten the service life.

3.3 Drive Installation Space

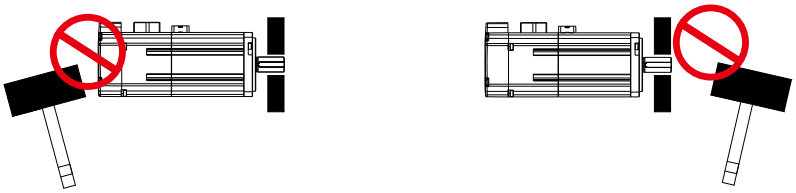
- When installing the drive, please reserve enough around space for the drive to ensure a good circulating cooling effect.
- DO NOT block the cooling holes of the drive.
- To ensure the temperature in the cabinet, it is recommended to install a cooling fan in the cabinet.
- Please ground the drive well during installation.



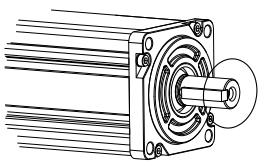
3.4 Motor Installation

3.4.1 Encoder and Bearing Protection

- DO NOT impact the motor when mounting as the motor shaft or encoder may be damaged.



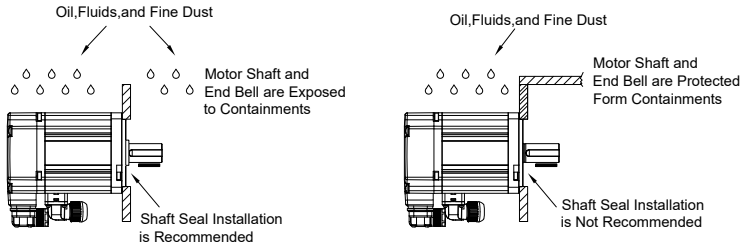
- It is recommended to use a disturbing coupling specially designed for servo motors, which can provide some cushioning during eccentricity or deflection.
- When installing the coupling, please wipe clean the anti-rust oil on the output shaft end of the motor.
- When using the keyway motor, please use the standard key in the motor box.
- When installing a pulley on a servo motor with a keyway, please use the threaded hole of the motor shaft to push the pulley into the motor shaft with a screw.



- When disassembling the pulley, please use professional tools such as pulley remover to prevent the bearing from being injured.
- When connecting the shaft, make sure to achieve the required concentricity. If the concentricity is not good, it will produce vibration and damage the bearing and encoder.
- The load applied in the axial or radial direction of the motor should not exceed the range specified in the specifications, please refer to the specifications table of each servo motor.
- The output shaft material of the servo motor does not have the ability to prevent rust. Although grease has been used for rust protection before leaving the factory, if the storage time exceeds six months, to ensure that the motor shaft is free from rust, please check the condition of the motor shaft regularly every three months and add appropriate anti-rust grease in time.

3.4.2 Precautions for Motor Use in Oil or Water Environment

- DO NOT allow oil and water to enter the inside of the motor.
- DO NOT place cables in water or oil.
- Since the through part of the motor shaft and the motor lead wires are not IP65 protected, please ensure that no water or oil enters the motor from such parts.
- The motor industrial grade skeleton oil seal can block pollutants (oil, impurities) to prolong the life of the motor. After the oil seal is installed, the oil seal will produce a certain resistance and torque loss to the rotation of the motor shaft. It is recommended to use the motor in derating.
- In the application with liquid, please install the motor wiring port downward.



- Ensure that the lip of the oil seal faces outward during installation.

3.4.3 Wiring

- If using a cable chain, please use bending resistant cable. And ensure that there is a bending diameter of more than 100mm.
- DO NOT twist the cable.
- When moving the motor, do not pull on the cable.
- DO NOT use the same sleeve for the main circuit cable and the input/output signal cable or encoder cable, and do not bundle them together. Wiring in this case, the main circuit cable and the input/output signal cable or encoder cable should be separated by more than 30cm.

3.4.4 Motor Temperature Rise

Servo motors are rated for continuous operation when mounted on a standard heat sink and in an ambient temperature of 40°C. When the servo motor is installed in a small device, the temperature may rise significantly due to the reduced heat dissipation area of the servo motor.

The dimensions of the standard cooling plate of the servo motor are as follows:

Frame Size	Power	Heat Sink Size
40mm	50W, 100W	200*200*6 aluminum
60mm	200W, 400W	250*250*6 aluminum
80mm	750W	250*250*6 aluminum
	1kW	300*300*12 aluminum
100mm	1kW ~ 2.5kW	300*300*12 aluminum
130mm	850W～3kW	400*400*20 mild steel
180mm	2.9kW ~ 7.5kW	550*550*30 mild steel

If the installation environment makes it difficult to use a large heat sink, or if the ambient temperature exceeds the specification requirements, the following requirements need to be followed:

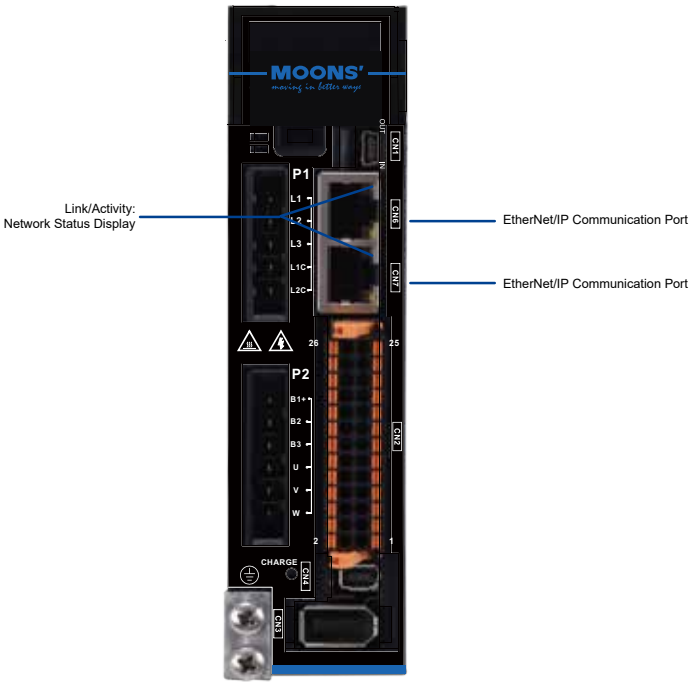
- DO NOT work at rated power, choose a motor that is 1 to 2 times larger than the actual motor power required.
- Reduce the acceleration and deceleration of the duty cycle to reduce the motor load.
- Reduce duty cycle for work.
- External forced air cooling of the servo motor using a cooling fan or other means.
- When using a motor with an oil seal, the oil seal will produce a certain resistance and torque loss to the rotation of the motor shaft, and heat is generated due to the friction between the them. It is recommended to derate the motor by 10% when using a motor with an oil seal.

Note: DO NOT put any thermal insulation material between the servo motor and the metal heat sink, so as to avoid the failure of the motor to dissipate heat and cause the motor temperature to rise, which may cause the motor to malfunction.

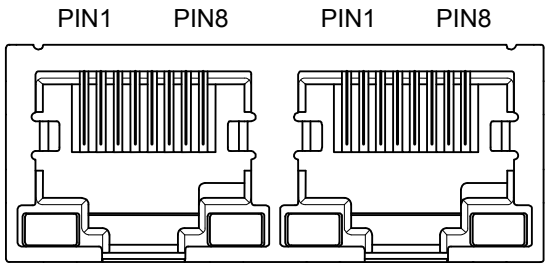
4 Wiring

4.1 EtherNet/IP Communication Port

4.1.1 Communication Interface



4.1.2 RJ45(8p8c) Pin Definition



PIN NO.	Signal Name	Description
1	TX+	Transmit +
2	TX-	Transmit -
3	RX+	Receive +
4	-	-
5	-	-
6	RX-	Receive -
7	-	-
8	-	-

4.2 EMC Control

⚠	M56S servo drive uses high-speed switching elements inside, which will generate high frequency or low frequency during normal operation interference, and interfere with peripheral equipment through conduction or radiation.
	There is also a low-voltage unit inside the servo drive, which is likely to be interfered by the noise of the drive's peripheral equipment. The interfered signal may cause the device to make unexpected actions.

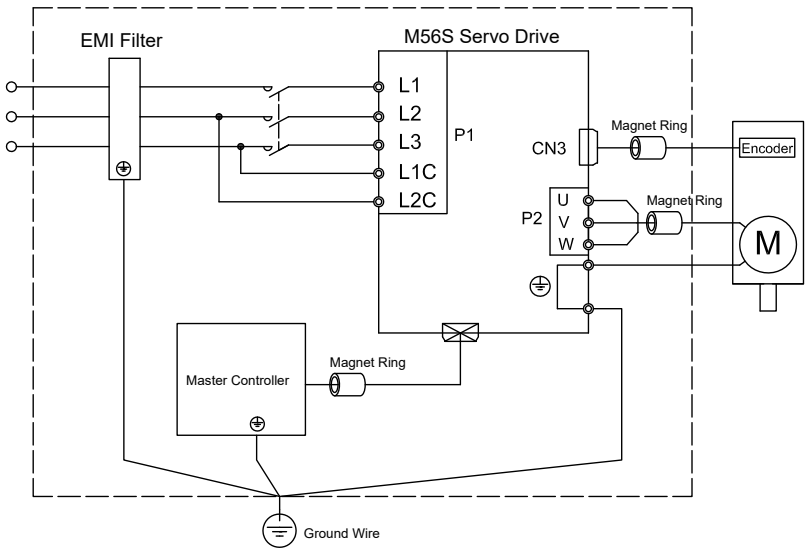
Please follow the electromagnetic compatibility regulations described in this manual during installation and wiring. This product can comply with the EN 61800-3 specifications.

In order to prevent mutual electromagnetic interference between the servo drive and its peripheral devices, the following countermeasures can be taken.

- Equipped with appropriate EMI noise filter on the power input side.
- Please make sure that the drive and motor are well grounded, and the grounding wire should preferably be a cable of AWG10 or above.
- DO NOT use the same sleeve for the main circuit cable and the input / output signal cable or encoder cable, and do not bundle them together. When wiring, the main circuit cable and the input / output signal cable or encoder cable should be separated by more than 30cm.
- For input/output signal cables and encoder cables, use twisted-pair wires or multi-core twisted-pair shielded wires.
- The length of the input and output signal cables is less than 3m, and the encoder cable is less than 20m.
- Do not use the same power source as an electric welding machine, electric discharge machine, etc. Even if it is not the same power supply, when there is a high-frequency generator nearby, please connect a noise filter to the input side of the main circuit power supply cable and the control power supply cable.

4.2.1 EMI Noise Filter

Installing a noise filter in the appropriate place will minimize the noise as much as possible.
The following diagram shows an solution of wiring for noise control.



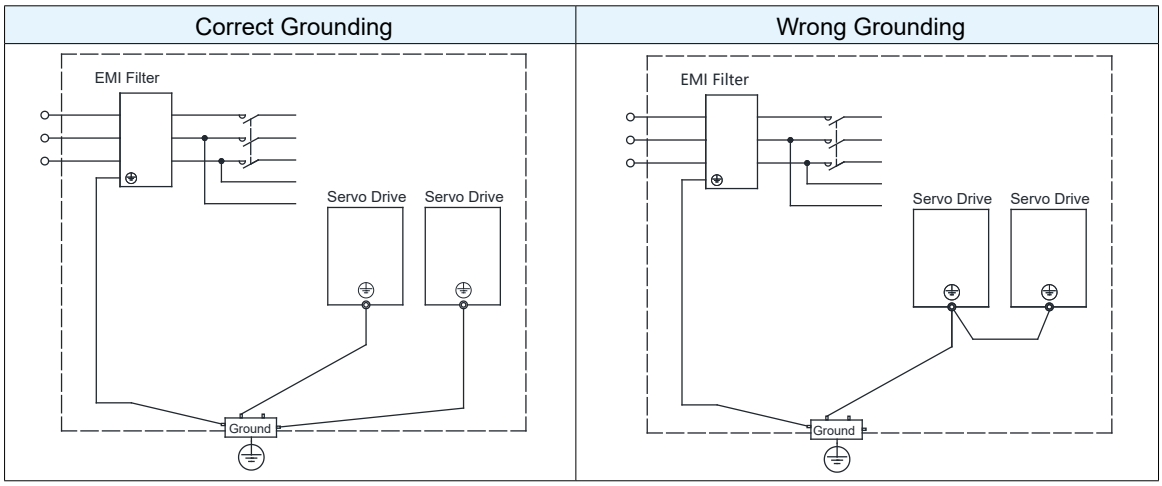
In addition to installation and wiring in accordance with the manual, you also need to pay attention to:

- Remove the paint layer on the contact surface when the drive is mounted on a metal plate.
- Servo drive and EMI filter are mounted on the same metal plate.
- Shorten the wiring length between the EMI filter and the servo drive as much as possible.
- Please route the input and output wires separately, DO NOT bundle them together.
- The noise filter must be well grounded.
- Please install the ferrite ring as shown in the figure above for the input and output signal cables and power lines of the drive to obtain better EMC effects.

4.2.2 Grounding

Good grounding treatment can give full play to the effect of EMI filter and greatly reduce interference.

- Must be parallel single-point grounding

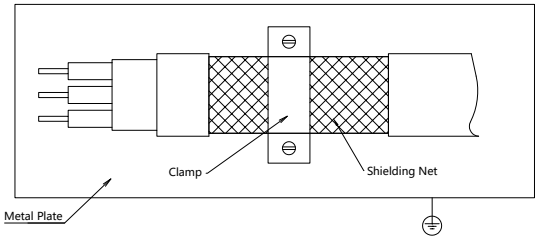


- Use a cable with a shielded net as the power extension cable between the drive and the motor.
- The shielding net of the motor power cable must be grounded or connected to the grounding terminal of the drive.

4.2.3 Motor Cable Shielding Net Processing

Choosing the motor cable with shielding net and installing the shielding net correctly can obtain better EMC effect and interference suppression effect. Please note the following:

- Use a cable with shielded net (if there is a double-layer isolation layer is better)
- The shielding nets at both ends of the motor cable must be grounded with the shortest distance and maximum contact area. Use clamps to fix the shielding nets at both ends of the motor cable to the metal plane as shown in the figure below.
- The protective paint must be removed from the fixing place between the clamp and the metal plane to ensure good contact.

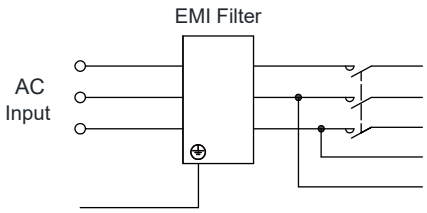
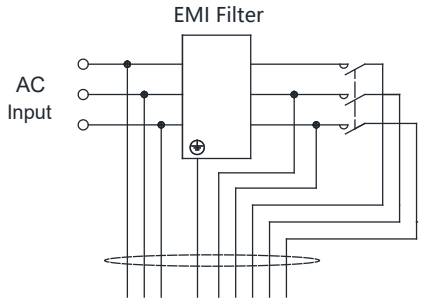


4.2.4 Recommended Model of EMI Filter

When the servo drive is running normally, electromagnetic interference will be generated. In order to prevent interference to external sensitive equipment, select appropriate EMI noise filters to minimize interference.

Note:

- Please select a noise filter that matches the power of the drive.
- Please separate the power input and output cables. Do not bundle the input and output wires together and put them in the same wire trough.

Correct Routing	Wrong Routing
	

Recommended EMI Filter

MOONS' P/N	Spec.	Manufacturer	Description
MSOP-EMI020	250VAC, 20A	LCR	EMI Noise Filter (Single Phase)

Other Recommended Part number：

Drive P/N	Main Circuit Power	Manufacturer	EMI Filter P/N
M56S-21A8IP◆	Single Phase	TYCO	3ET1
M56S-23A0IP◆		TYCO	6ET1
M56S-24A5IP◆		TYCO	6ET1
M56S-26A0IPX		TYCO	10ET1
M56S-210AIPX	Three Phase	Dephir	DF300-16A-01
M56S-213AIPX		Dephir	
M56S-36A0IPX		Dephir	
M56S-313AIPX		Dephir	
M56S-317AIPX		Dephir	DF300-20A-01
M56S-321AIPX		Dephir	DF300-30A-01
M56S-326AIPX		Dephir	

◆ Represents the function type

4.2.5 Ferrite Ring

The ferrite magnetic ring can effectively absorb the radiation interference of the wire harness.

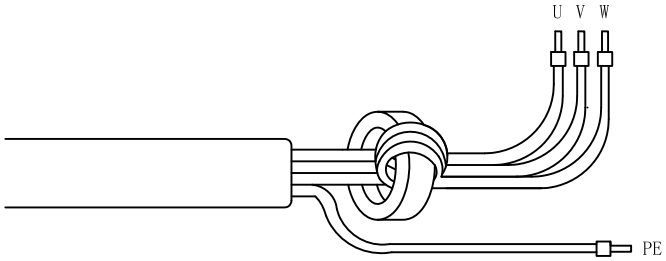
The magnetic ring has different impedance characteristics at different frequencies. Generally, the impedance is very small at low frequencies. When the signal frequency increases, the impedance shown by the magnetic ring rises sharply, which makes it easy for normal useful signals to pass through, and can effectively suppress high frequencies. The passage of interference signals solves the problem of high-frequency interference of power lines, signal lines and connectors.

When the magnetic ring suppresses common mode interference, the eddy current loss of the magnetic ring to the high-frequency signal converts the high-frequency component into heat loss, so that a low-pass filter can be formed, which makes the high-frequency noise attenuate greatly. The impedance of low-frequency useful signals can be ignored and does not affect the normal operation of the circuit.

The wire passing through the magnetic ring can be repeatedly wound on the magnetic ring to increase the inductance, thereby enhancing the use effect of the magnetic ring, but too many turns will cause excessive loss and increase the temperature of the magnetic ring.

The recommended winding method and number of turns are as follows:

Signal Cable	Wind cables the 2 to 3 turns to form the signal noise filter.
Motor Cable	Remove the cables jacket to the length so that wires can be wound on the clamp noise filter for 2 to 3 turns. For effective noise reduction, U/V/W should be wound.
Encoder Cable	Wind cables the 2 to 3 turns to form the signal noise filter.



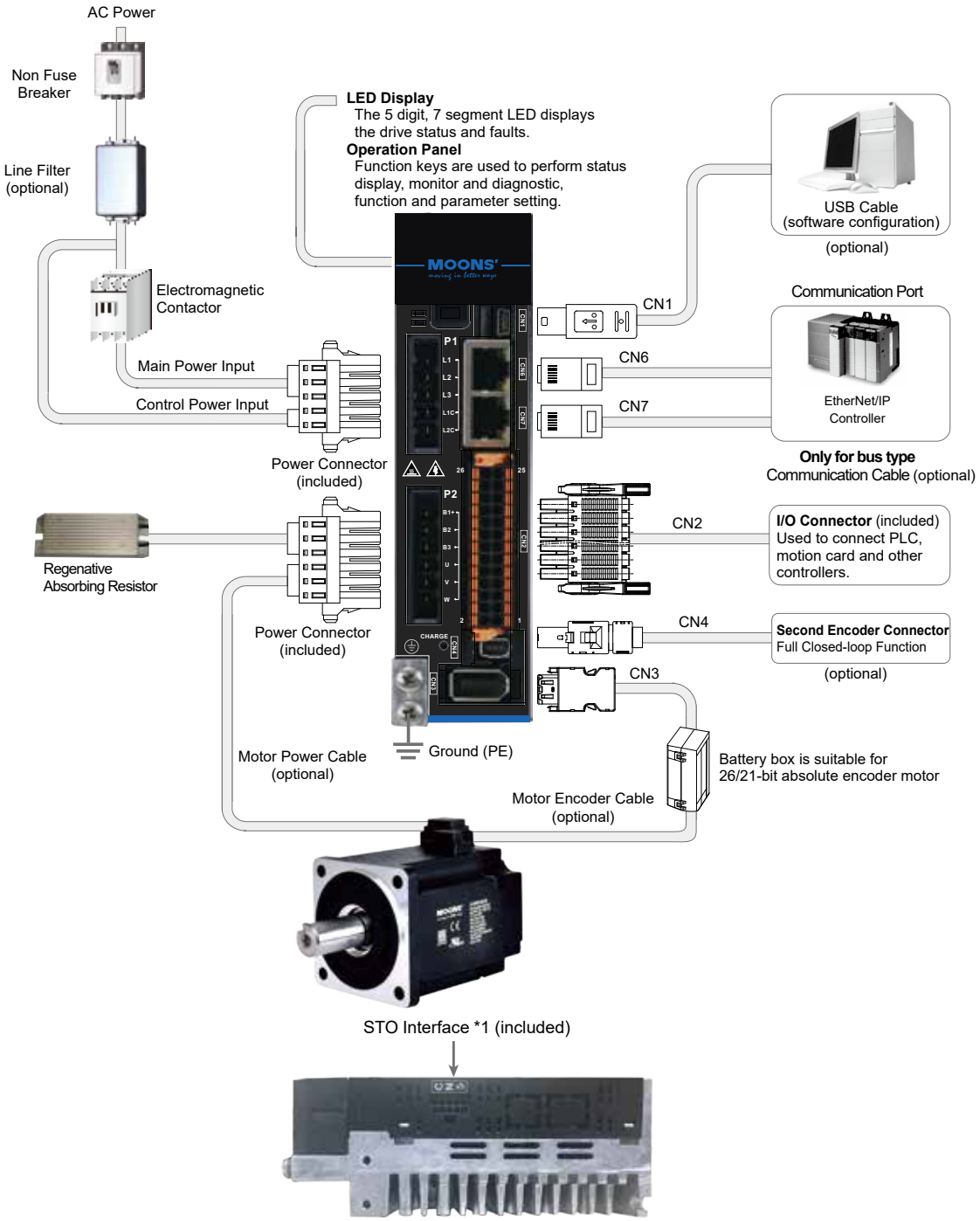
Recommended ferrite ring:

MOONS' P/N	P/N	Manufacturer
MSOP-MR3035	ZCAT3035-1330	TDK

4.3 External Main Circuit Wiring

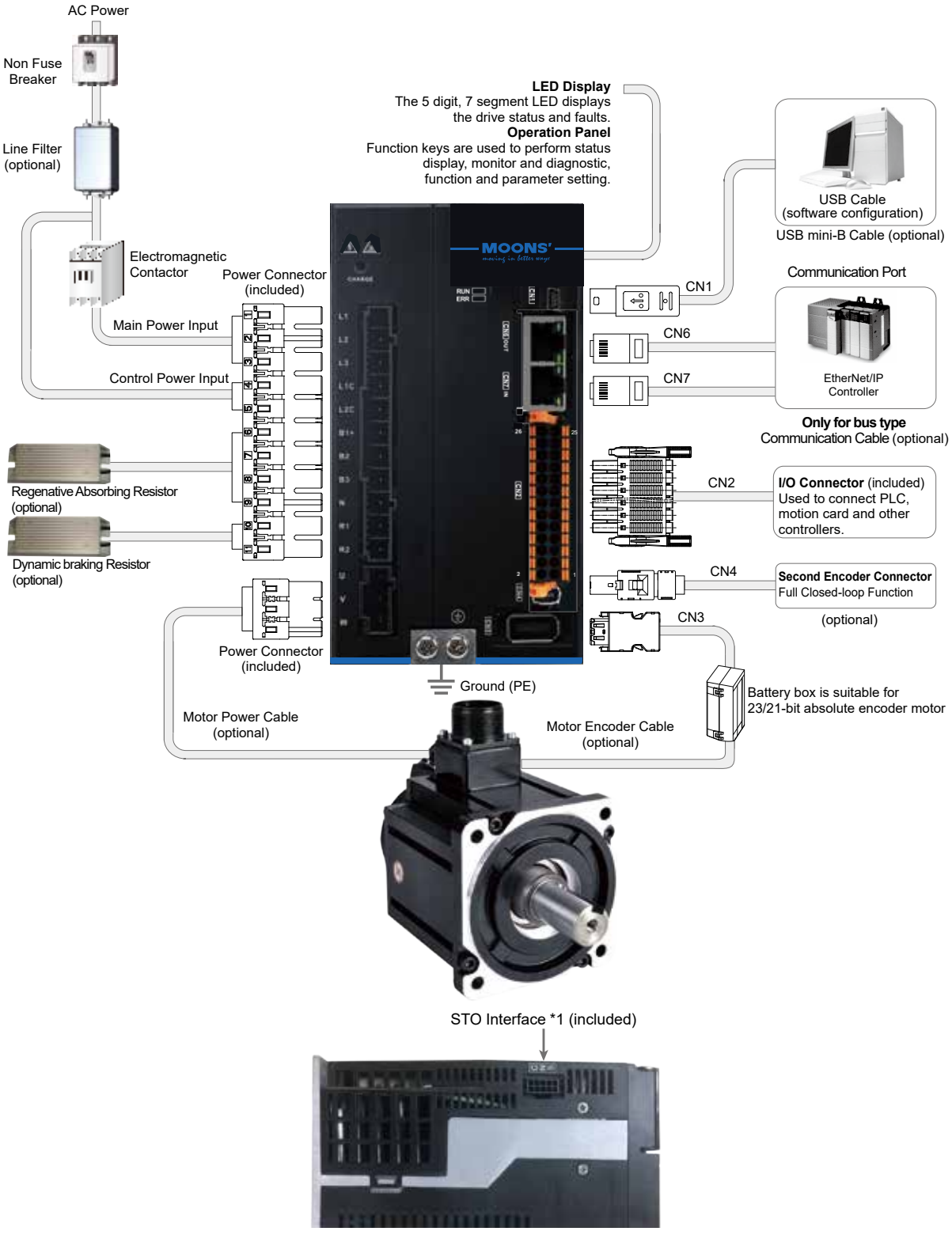
4.3.1 System Configuration

4.3.1.1 200/400/750W Type

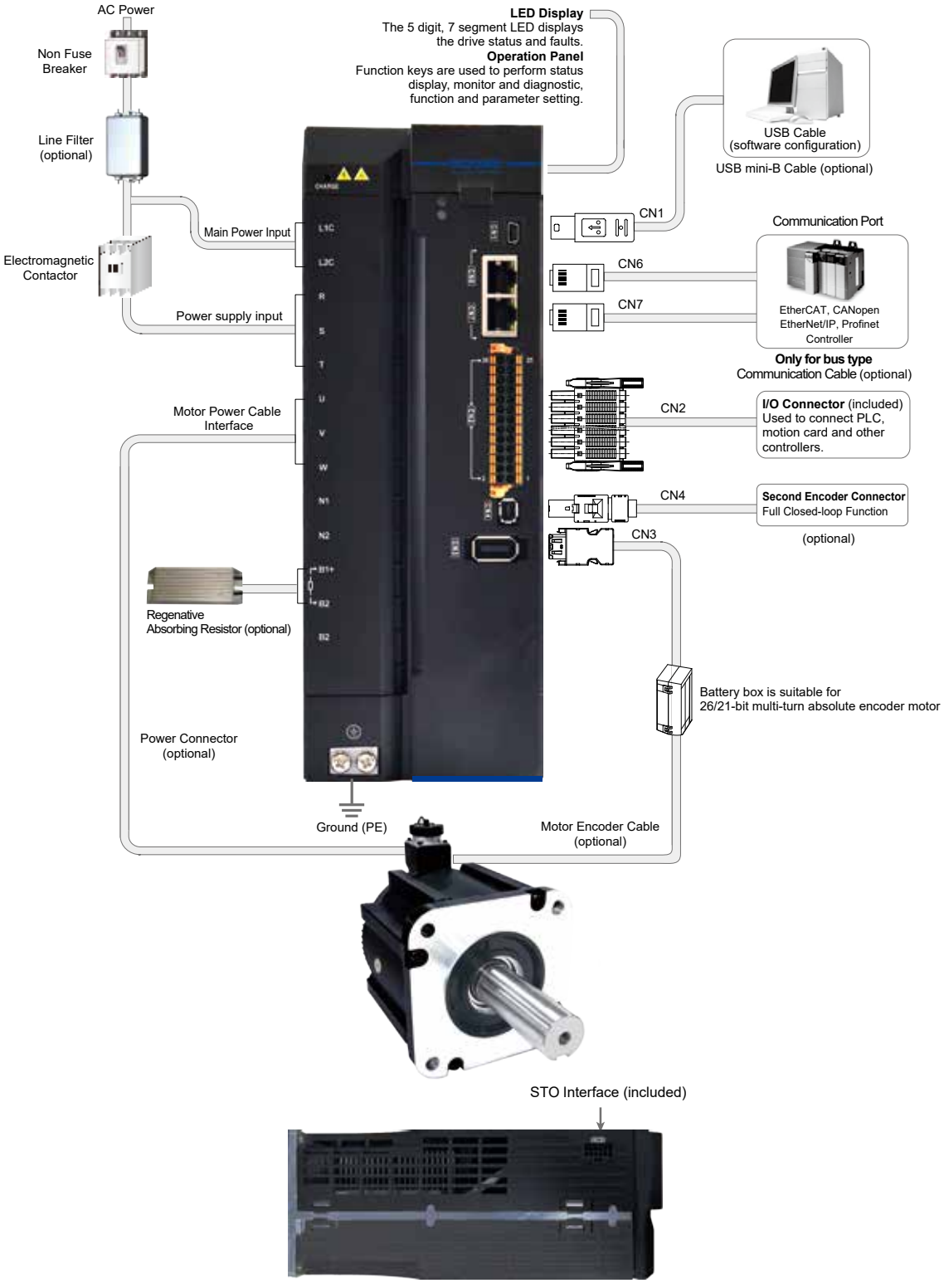


Note: *1 Certain models don't support this function, please refer to page 12.

4.3.1.2 1.0/1.5/2.5/3.0kW Type



4.3.1.3 5.0/6.0/7.5kW Type



4.3.2 Servo Drive Connectors and Terminals (750W and below)

<table>
<tr><th>Terminal Identification</th><th>Description</th><th colspan="3">Details</th></tr>
<tr><td rowspan="2">P1</td><td>L1、L2、L3</td><td colspan="3">Used to connect single or three-phase AC for main circuit power</td></tr>
<tr><td>L1C、L2C</td><td colspan="3">Used to connect single-phase AC for control circuit power</td></tr>
<tr><td rowspan="6">P2</td><td rowspan="4">U、V、W</td><td colspan="3">Used to connect servo motor</td></tr>
<tr><td>Terminal Symbol</td><td>Wire color</td><td>Description</td></tr>
<tr><td>U</td><td>Red</td><td rowspan="3">Connecting to three-phase motor main circuit cable</td></tr>
<tr><td>V</td><td>Yellow</td></tr>
<tr><td>W</td><td>Blue</td></tr>
<tr><td rowspan="2">B1+、B2、B3</td><td>Internal Resistor</td><td colspan="2">Ensure the circuit is closed between B2 and B3, and the circuit is open between B1+ and B3.</td></tr>
<tr><td>External Resistor</td><td colspan="2">Ensure the circuit is open between B2 and B3, and connect the external regenerative resistor between B1+ and B2.</td></tr>
<tr><td>CN1</td><td>USB mini-B Interface</td><td colspan="3">Connect to PC</td></tr>
<tr><td>CN2</td><td>I/O Interface</td><td colspan="3">Used to connect external controllers</td></tr>
<tr><td>CN3</td><td>Encoder Interface</td><td colspan="3">Used to connect encoder of servo motor</td></tr>
<tr><td>CN4</td><td>Second Encoder Interface</td><td colspan="3">Secondary feedback input for full closed-loop control</td></tr>
<tr><td>CN5</td><td>STO Interface</td><td colspan="3">STO function</td></tr>
<tr><td>CN6</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
<tr><td>CN7</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
</table>

4.3.3 Servo Drive Connectors and Terminals (1.0/1.5/2.0/3.0kW)

<table>
<tr><th>Terminal Identification</th><th>Description</th><th colspan="3">Details</th></tr>
<tr><td rowspan="4">P1</td><td>L1、L2、L3</td><td colspan="3">Used to connect single or three-phase AC for main circuit power</td></tr>
<tr><td>L1C、L2C</td><td colspan="3">Used to connect single-phase AC for control circuit power</td></tr>
<tr><td rowspan="2">B1+、B2、B3</td><td>Internal Resistor</td><td colspan="2">Ensure the circuit is closed between B2 and B3, and the circuit is open between B1+ and B3.</td></tr>
<tr><td>External Resistor</td><td colspan="2">Ensure the circuit is open between B2 and B3, and connect the external regenerative resistor between B1+ and B2.</td></tr>
<tr><td>N、R1、R2</td><td>External dynamic braking resistor</td><td colspan="2">When using the dynamic braking function with an external dynamic braking resistor, the resistor is connected between R1 and R2, and the recommended model is DBR85W3R5.</td></tr>
<tr><td rowspan="5">P2</td><td rowspan="4">U、V、W</td><td colspan="3">Used to connect servo motor</td></tr>
<tr><td>Terminal Symbol</td><td>Wire color</td><td>Description</td></tr>
<tr><td>U</td><td>Red</td><td rowspan="3">Connecting to three-phase motor main circuit cable</td></tr>
<tr><td>V</td><td>Yellow</td></tr>
<tr><td>W</td><td>Blue</td></tr>
<tr><td>CN1</td><td>USB mini-B Interface</td><td colspan="3">Connect to PC</td></tr>
<tr><td>CN2</td><td>I/O Interface</td><td colspan="3">Used to connect external controllers</td></tr>
<tr><td>CN3</td><td>Encoder Interface</td><td colspan="3">Used to connect encoder of servo motor</td></tr>
<tr><td>CN4</td><td>Second Encoder Interface</td><td colspan="3">Secondary feedback input for full closed-loop control</td></tr>
<tr><td>CN5</td><td>STO Interface</td><td colspan="3">STO function</td></tr>
<tr><td>CN6</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
<tr><td>CN7</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
</table>

4.3.4 Servo Drive Connectors and Terminals (5.0/6.0/7.5kW)

<table>
<tr><th>Terminal Identification</th><th>Description</th><th colspan="3">Details</th></tr>
<tr><td rowspan="10">Power Supply</td><td>R、S、T</td><td colspan="3">Used to connect three-phase AC for main circuit power</td></tr>
<tr><td>L1C、L2C</td><td colspan="3">Used to connect single-phase AC for control circuit power</td></tr>
<tr><td rowspan="2">B1+、B2、B3</td><td>Internal Resistor</td><td colspan="2">Ensure the circuit is closed between B2 and B3, and the circuit is open between B1+ and B3.</td></tr>
<tr><td>External Resistor</td><td colspan="2">Ensure the circuit is open between B2 and B3, and connect the external regenerative resistor between B1+ and B2.</td></tr>
<tr><td>N1、N2</td><td>External reactor</td><td colspan="2">DC reactor used for suppressing high-order harmonics in power supply, connected between N1 and N2. When a reactor is not needed, short circuit between N1 and N2.</td></tr>
<tr><td rowspan="5">U、V、W</td><td colspan="3">Used to connect servo motor</td></tr>
<tr><td>Terminal Symbol</td><td>Wire color</td><td>Description</td></tr>
<tr><td>U</td><td>Red</td><td rowspan="3">Connecting to three-phase motor main circuit cable</td></tr>
<tr><td>V</td><td>Yellow</td></tr>
<tr><td>W</td><td>Blue</td></tr>
<tr><td>CN1</td><td>USB mini-B Interface</td><td colspan="3">Connect to PC</td></tr>
<tr><td>CN2</td><td>I/O Interface</td><td colspan="3">Used to connect external controllers</td></tr>
<tr><td>CN3</td><td>Encoder Interface</td><td colspan="3">Used to connect encoder of servo motor</td></tr>
<tr><td>CN4</td><td>Second Encoder Interface</td><td colspan="3">Secondary feedback input for full closed-loop control</td></tr>
<tr><td>CN5</td><td>STO Interface</td><td colspan="3">STO function</td></tr>
<tr><td>CN6</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
<tr><td>CN7</td><td>EtherNet/IP Interface</td><td colspan="3">EtherNet/IP communication port</td></tr>
</table>

4.3.5 Connections and Wiring Notes

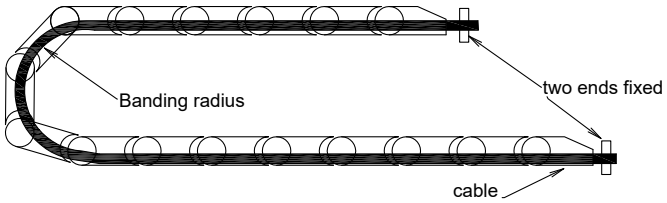
- Please ensure grounding wires are securely connected, wires with more than AWG 10(5.3mm^2) on sectional area is recommended.
- Please DO NOT power on when the screws or cables are loose.
- Grounding method must be single point grounding.
- Ensure L1/L2/L3 and L1C/L2C are correctly wired, and voltage supplies are within the specification range.(3kW and below power type)
- Ensure R/S/T and L1C/L2C are correctly wired, and voltage supplies are within the specification range.(5.0/6.0/7.5kW type)
- When using single-phase power supply, please connect to the L1, L3 pins.(1.5kW and below power type)
- Ensure U/V/W is following the order of RED/YELLOW/BLUE. Wrong connections will cause motor stop rotation, or wrong rotatory directions.
- Isolation transformer and EMI filter are recommended on drive's power supply to ensure safety and improve its anti-interference level.
- Please setup an emergence stop circuitry to switch off the power supply when fault occurs.
- Please DO NOT touch drive or motor's connector terminals 5 minutes after drive and motor is powered off. There are electrical charge components in the circuitry. Therefore, even power is off, there might still be hazardous voltages within the circuitry, before its total discharge.
- DO NOT route the main circuit cables and the I/O signal cables/encoder cables in the same conduit, nor bundle them together. When wiring, ensure that the main circuit cables and the I/O signal cables/encoder cables are spaced at least 30 cm apart. If the distance is too close, it may cause malfunction.
- Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal and encoder feedback cables.
- The maximum wiring length for I/O signal cables is 3 meters, and for encoder cables is 20 meters. If longer cables are required, please contact the manufacturer.

4.3.6 Precautions for The Use of Towline Cables

When you need to move the motor cable or install the cable in a drag chain, please use a dedicated flexible cable. Standard cables can be easily damaged by repeated bending, which may prevent the servo motor from functioning properly.

When using cables in a drag chain, ensure the following:

- Select cables that meet the required bending cycle specifications.
- The bending radius of the cable should generally be more than 10 times the outer diameter of the cable.
- Avoid pulling the cable. When wiring inside the drag chain, DO NOT fix or bundle it, so as to avoid the bending radius is not enough and the cable will be pulled.
- Please bundle the cables at the two ends of the drag chain and the fixed place of the mechanical part.



- The wiring in the drag chain should not be too dense to ensure that the cable occupies less than 60% of the internal space of the drag chain.
- Avoid mixing cables with large outer diameter differences. If you really need to mix cables, please install baffles.

4.3.7 Recommended Wires

- For the main circuit, it is recommended to use insulated wires rated for 600V and with a temperature resistance of at least 80°C.
- Be sure to choose the corresponding allowable current cable to prevent the cable from overheating.

Recommended wires for each part of the drive are as follows:

<table>
<tr><th colspan="2" rowspan="3">Drive and Matching Servo Motor</th><th rowspan="3">Rated Power (W)</th><th colspan="7">Diameter of Cable (AWG)</th></tr>
<tr><th colspan="2">Connector P1</th><th colspan="2">Connector P2</th><th>Connector CN3</th><th colspan="2">--</th></tr>
<tr><th>L1/L2/L3 R/S/T</th><th>L1C/L2C</th><th>U/V/W</th><th>B1+, B2</th><th>Encoder</th><th>Brake</th><th>PE</th></tr>
<tr><td rowspan="8">M56S-21A8IP◆</td><td>SM3H-041A◇□P△</td><td>50</td><td rowspan="10">2.0mm²
AWG14</td><td rowspan="30">2.0mm²
(AWG14)</td><td rowspan="10">0.75 ~ 2.0mm²
AWG14 ~ 18</td><td rowspan="10">1.25 ~ 2.0mm²
AWG14 ~ 16</td><td rowspan="30">0.2mm²
AWG24</td><td rowspan="30">0.5mm²
AWG20</td><td rowspan="30">2.0 ~ 5.3mm²
AWG10 ~ 14</td></tr>
<tr><td>SM3L-042A◇□D△</td><td rowspan="2">100</td></tr>
<tr><td>SM3H-042A◇□D△</td></tr>
<tr><td>SM3L-061A◇□P△</td><td rowspan="2">200</td></tr>
<tr><td>SM3H-061A◇□P△</td></tr>
<tr><td rowspan="2">M56S-23A0IP◆</td><td>SM3L-062A◇□P△</td><td rowspan="2">400</td></tr>
<tr><td>SM3H-062A◇□P△</td></tr>
<tr><td rowspan="2">M56S-24A5IP◆</td><td>SM3L-083A◇□P△</td><td rowspan="2">750</td></tr>
<tr><td>SM3H-083A◇□P△</td></tr>
<tr><td rowspan="5">M56S-26A0IPX</td><td>SM3H-132A◇□U△</td><td>850</td><td rowspan="5">2.0mm²
AWG14</td><td rowspan="5">2.0 ~ 3.5mm²
AWG12 ~ 14</td><td rowspan="20">2.0 ~ 3.5mm²
AWG12 ~ 14</td></tr>
<tr><td>SM3L-084A◇□P△</td><td rowspan="4">1000</td></tr>
<tr><td>SM3H-084A◇□P△</td></tr>
<tr><td>SM3L-102A◇□U△</td></tr>
<tr><td>SM3M-132A◇□U△</td></tr>
<tr><td rowspan="3">M56S-210AIPX</td><td>SM3H-133A◇□U△</td><td>1300</td><td rowspan="5">2.0 ~ 3.5mm²
AWG12 ~ 14</td><td rowspan="5">3.5 ~ 5.3mm²
AWG10 ~ 12</td></tr>
<tr><td>SM3L-103A◇□U△</td><td rowspan="2">1500</td></tr>
<tr><td>SM3M-133A◇□U△</td></tr>
<tr><td rowspan="4">M56S-213AIPX</td><td>SM3H-134A◇□U△</td><td>1800</td></tr>
<tr><td>SM3L-104A◇□U△</td><td rowspan="2">2000</td></tr>
<tr><td>SM3M-134A◇□U△</td></tr>
<tr><td>SM3L-105A◇□U△</td><td>2500</td></tr>
<tr><td rowspan="6">M56S-36A0IPX</td><td>SM3H-132Y◇□U△</td><td>850</td><td rowspan="11">2.0mm²
AWG14</td><td rowspan="11">2.0mm²
AWG14</td></tr>
<tr><td>SM3L-102Y◇□U△</td><td rowspan="2">1000</td></tr>
<tr><td>SM3M-132Y◇□U△</td></tr>
<tr><td>SM3H-133Y◇□U△</td><td>1300</td></tr>
<tr><td>SM3L-103Y◇□U△</td><td rowspan="2">1500</td></tr>
<tr><td>SM3M-133Y◇□U△</td></tr>
<tr><td rowspan="4">M56S-313AIPX</td><td>SM3L-104Y◇□U△</td><td>2000</td></tr>
<tr><td>SM3L-105Y◇□U△</td><td>2500</td></tr>
<tr><td>SM3H-182Y◇□U△</td><td>2900</td></tr>
<tr><td>SM3M-135Y◇□M△</td><td>3000</td></tr>
<tr><td>M56S-317AIPX</td><td>SM3H-183Y◇□U△</td><td>4400</td><td rowspan="3">5.3mm²
AWG10</td><td rowspan="3">5.3mm²
AWG10</td><td rowspan="3">5.3mm²
AWG10</td></tr>
<tr><td>M56S-321AIPX</td><td>SM3H-184Y◇□U△</td><td>5500</td></tr>
<tr><td>M56S-326AIPX</td><td>SM3H-185Y◇□U△</td><td>7500</td></tr>
</table>

◆ Model Type， ◇ Encoder Options，□ Brake Options，△ Oil Seal Options

- Please use insulated pin terminals for power connectors P1 and P2

Crimp Type	Sleeve Type	Parallel Terminal
		

- Please select the pin terminal according to the recommended wire
  Connector applicable wire type: AWG14～AWG18

  The outer diameter of the wire for the connector: ø2.1～4.2mm

4.3.8 Ground Wire Terminal

- In order to obtain a better EMC effect, please use 5.3mm^2(AWG10) dedicated copper conductor cable.
- Please use O-shaped cold pressed terminals.
- Tightening torque of ground wire terminals.

Drive Model	Grounding Screw	
	Specification	Tightening Torque
M56S-21A8IP◆ M56S-23A0IP◆ M56S-24A5IP◆ M56S-26A0IPX M56S-210AIPX M56S-213AIPX M56S-313AIPX M56S-36A0IPX M56S-317AIPX M56S-321AIPX M56S-326AIPX	M4	1.4 N.m

◆ Function type

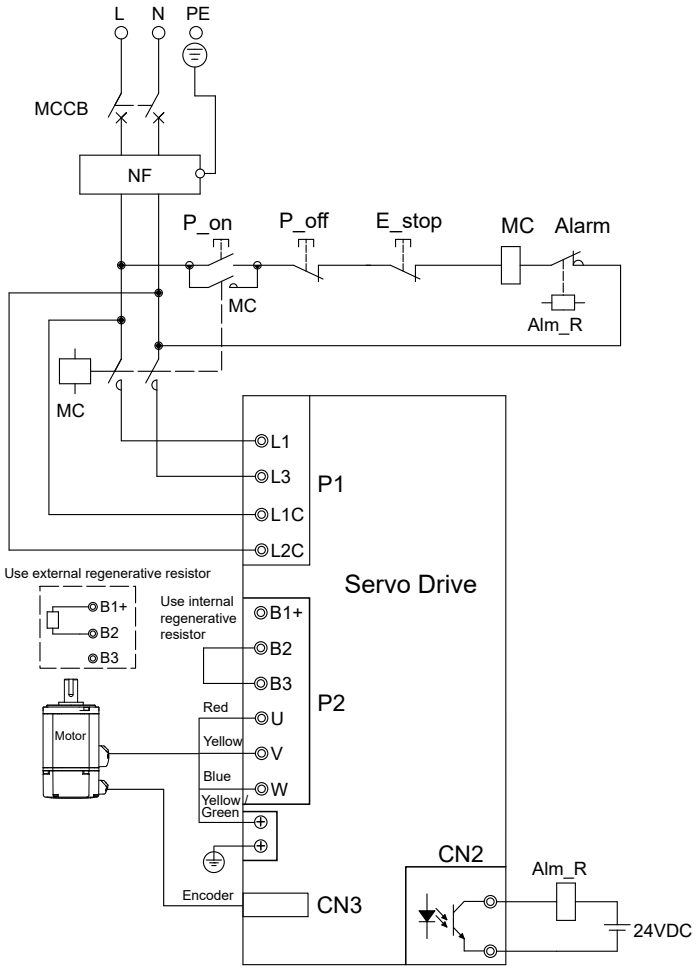
Notes:

- Exceeding the maximum tightening torque will cause damage to the screw hole.
- DO NOT install the grounding screw when the power is on, it may cause electric sparks.
- Please regularly check whether the grounding screw is loose.

4.4 Drive Power Supply Interface

220V AC servo drive supports single phase or three phase wiring method. Three phase wiring method for 1.5kW and above drives are recommended.

4.4.1 Single-Phase Power Supply Connection-AC220V (750W and below)



Notes:

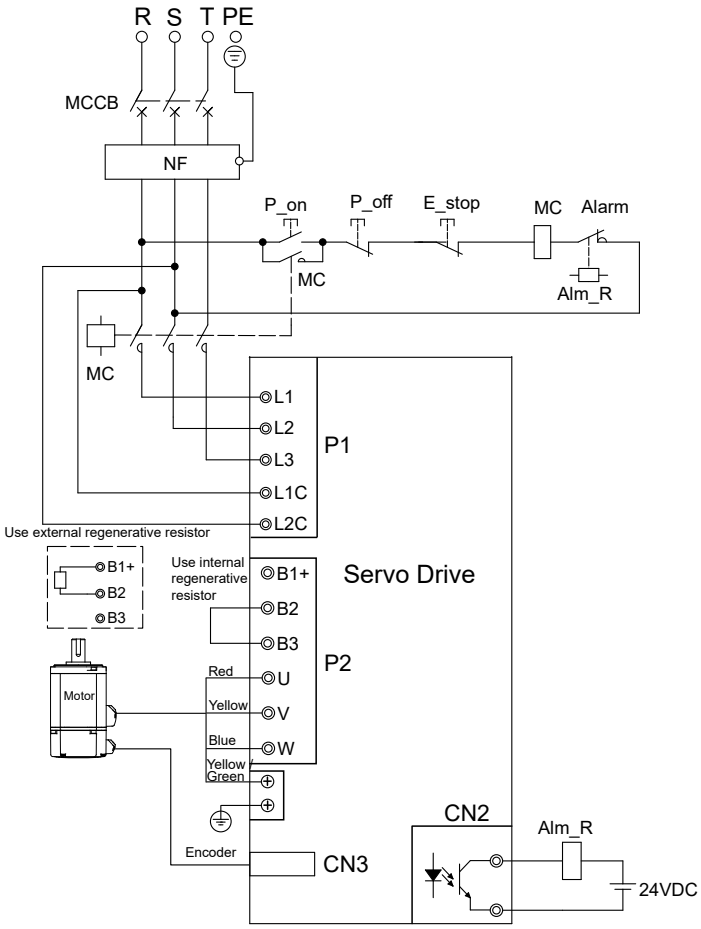
Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-21A8IP◆	Single-Phase 220	50	0.3	6	9A (3P+1a)
		100	0.4		
		200	0.5		
M56S-23A0IP◆		400	0.9	10	
M56S-24A5IP◆		750	1.3	16	

◆ Model Type

4.4.2 Three-Phase Power Supply Connection-AC220V (750W and below)



Note: Three-phase 220V is the line voltage

Notes:

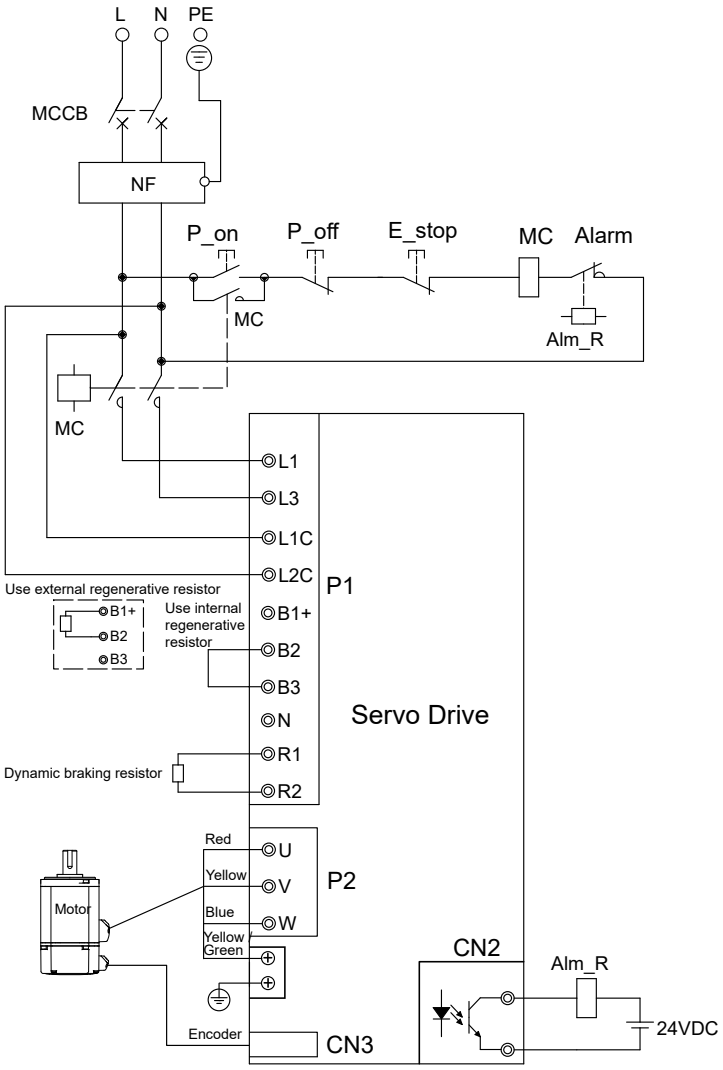
Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-21A8IP◆	Three Phase 220	50	0.3	4	9A (3P+1a)
		100	0.4		
		200	0.5		
M56S-23A0IP◆		400	0.9		
M56S-24A5IP◆		750	1.3	6	

◆ Model Type

4.4.3 Single-Phase Power Supply Connection-AC220V (1.0/1.5kW)



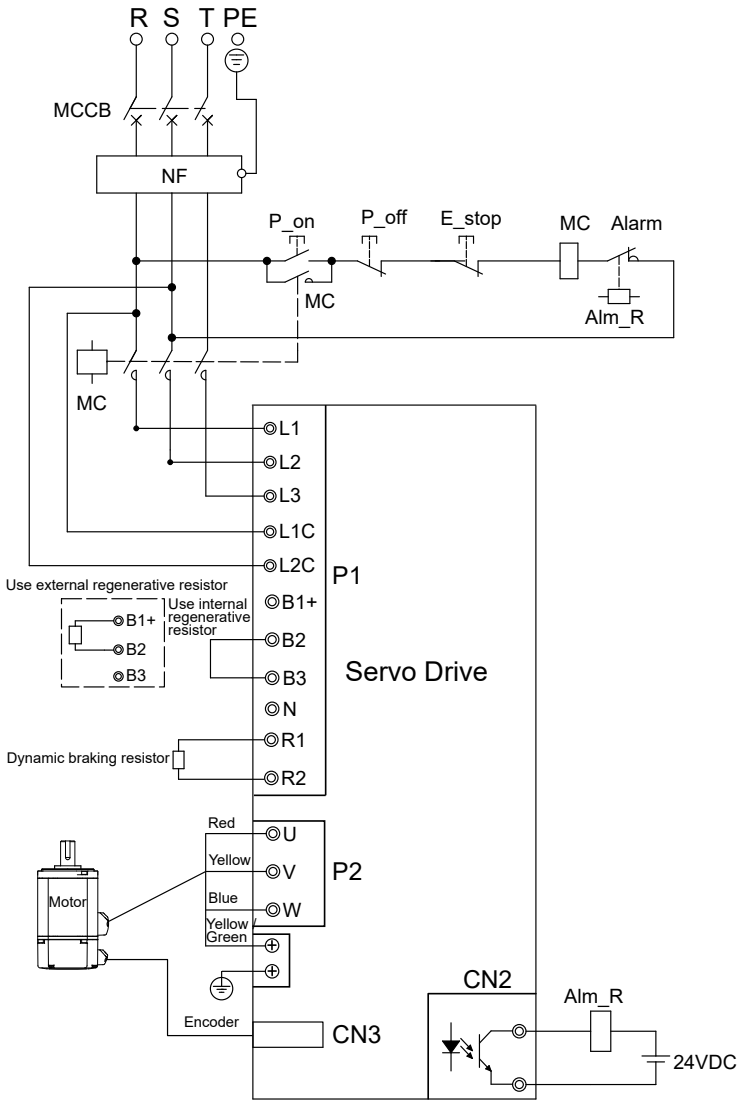
Notes：

Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-26A0IPX	Single Phase 220	850，1000	1.8	16	12A (3P+1a)
M56S-210AIPX		1300，1500	2.3	20	18A (3P+1a)

4.4.4 Three-Phase Power Supply Connection-AC220V (1.0/1.5/2.0kW)



Note: Three-phase 220V is the line voltage

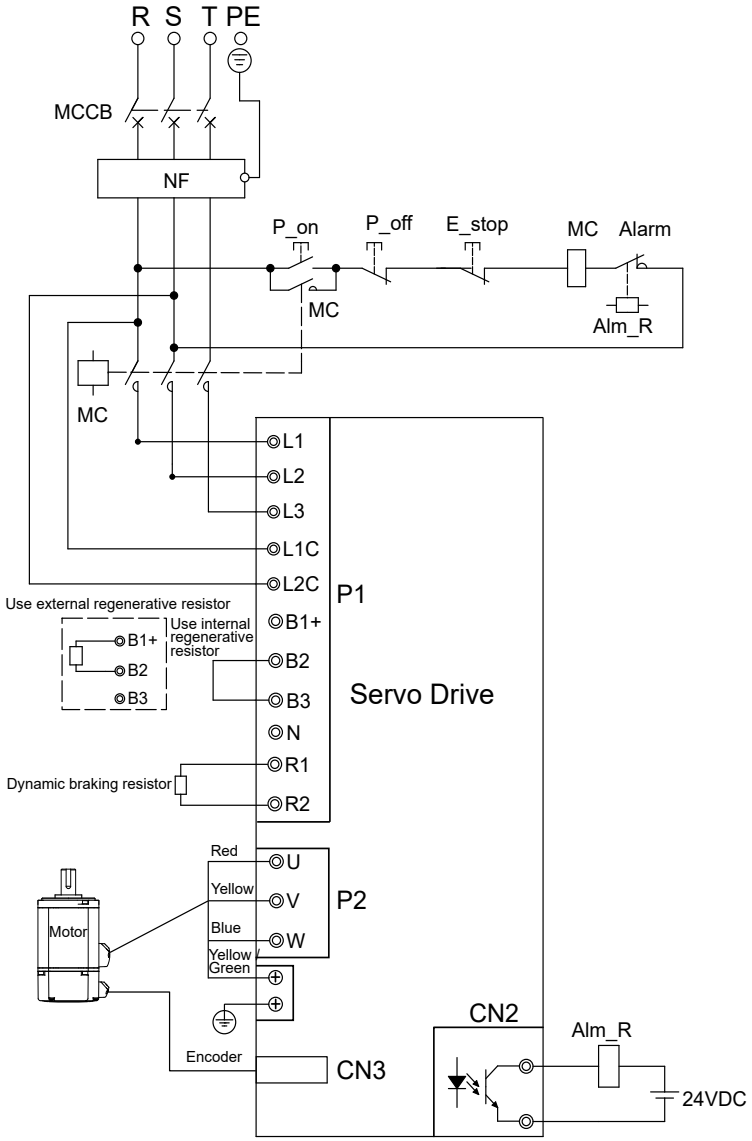
Notes：

Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-26A0IPX	Three-Phase 220	850，1000	1.8	10	9A (3P+1a)
M56S-210AIPX		1300，1500	2.3	16	
M56S-213AIPX		1800，2000	3.3		

4.4.5 Three-Phase Power Supply Connection-AC400V (1.5/3.0kW)



Note: Three-phase 400V is the line voltage

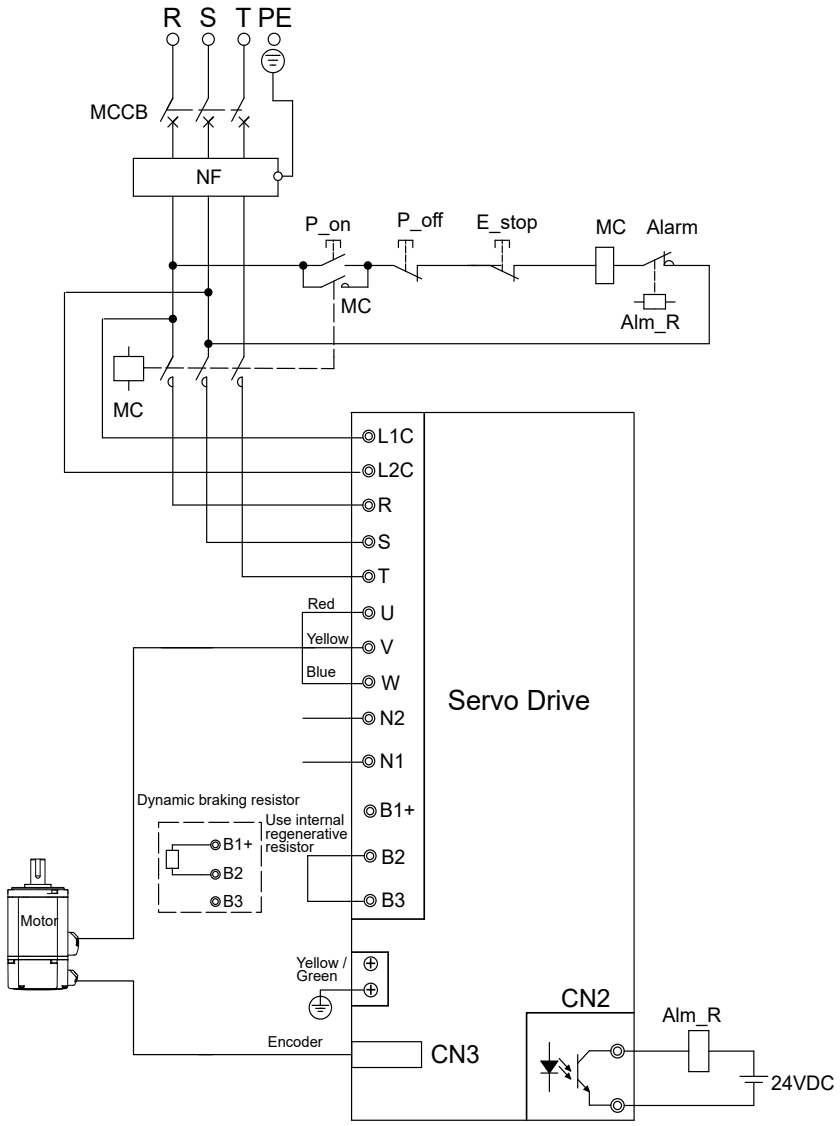
Notes：

Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-36A0IPX	Three-Phase 400	850, 1000 1300,1500	9.08	6	9A (3P+1a)
M56S-313AIPX		2900, 3000	15.15	16	

4.4.6 Three-Phase Power Supply Connection-AC400V (5.0/6.0/7.5kW)



Note: Three-phase 400V is the line voltage

Notes：

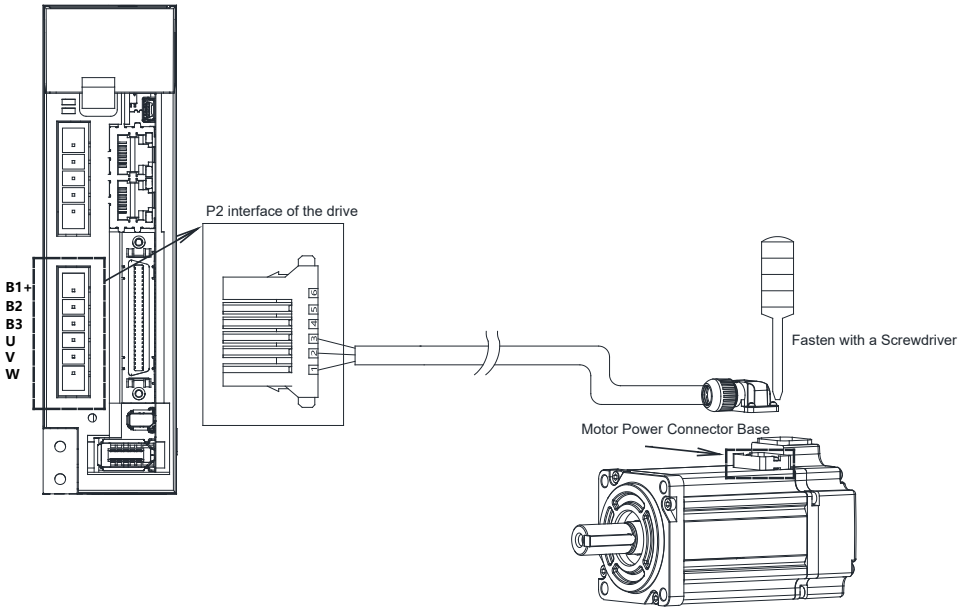
Symbol	Description		Symbol	Description
MCCB	Circuit Breaker		E_stop	Emergency Stop Switch
NF	EMI Noise Filter		MC	Magnetic Contactor
P_on	Power On Switch		Alm_R	Alarm Relay
P_off	Power Off Switch		Alarm	Alarm Relay Contactor

■ Peripheral equipment capacity for wiring

Drive	Voltage (VAC)	Motor Rated Output Power (W)	Drive Power Capacity kVA (Rated Load)	Circuit Breaker Rated Current (A)	Contactor Rated Current(A)
M56S-317AIPX	Three-Phase 400	4400	22.25	20	18A (3P+1a)
M56S-321AIPX		5500	25	25	
M56S-326AIPX		7500	31.25	32	25A (3P+1a)

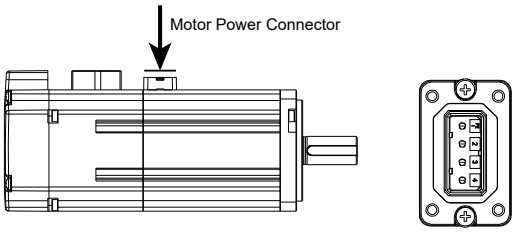
4.5 P2 Wiring to the Connector

4.5.1 Motor Power Cable Configuration



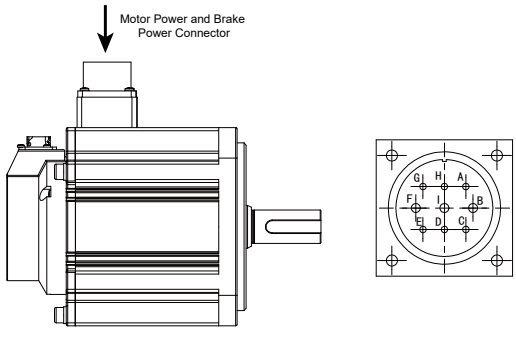
4.5.2 Motor Power Connector Specifications

4.5.2.1 ☐40/60/80mm Motor Power Connectors PIN Assignments

Motor Model		PIN.No	Name	Define	Interface Diagram
SM3L-042A◇☐D△	SM3H-041A◇☐P△	1	PE	Motor ground wire	
SM3L-061A◇☐P△	SM3H-042A◇☐P△				
SM3L-062A◇☐P△	SM3H-061A◇☐P△	2	U	U Phase	
SM3L-083A◇☐P△	SM3H-062A◇☐P△				
SM3L-084A◇☐P△	SM3H-083A◇☐P△				
SM3L-042AB☐D△	SM3H-084A◇☐P△	3	V	V Phase	
SM3L-061AB☐D△	SM3H-061AB☐D△				
SM3L-062AB☐D△	SM3H-062AB☐D△				
SM3L-083AB☐D△	SM3H-083AB☐D△	4	W	W Phase	
SM3L-084AB☐D△	SM3H-084AB☐D△				

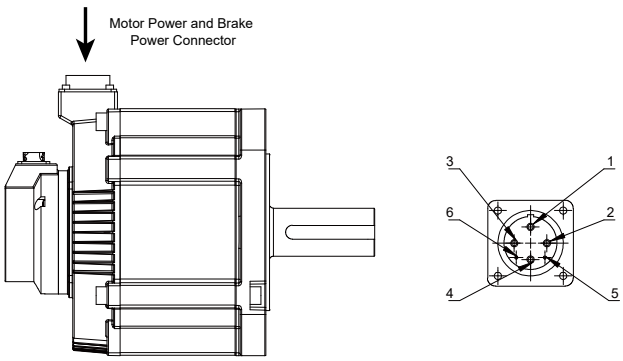
◇ Encoder Options，☐ Brake Options，△ Oil Seal Options

4.5.2.2 ☐100mm/130mm Motor Power Connectors PIN Assignments

Motor Model		PIN.No	Name	Define	Interface Diagram
SM3L-102○◇☐U△	SM3M-132○◇☐U△	A	PE	Motor ground wire	
SM3L-103○◇☐U△	SM3M-133○◇☐U△	F	U	U Phase	
SM3L-104○◇☐U△	SM3M-134○◇☐U△	I	V	V Phase	
SM3L-105○◇☐U△	SM3M-135Y◇☐M△	B	W	W Phase	
	SM3H-132○◇☐U△	C	Brake 1	Brake power supply +	
	SM3H-132○◇☐U△				
	SM3H-134○◇☐U△	D	Brake 2	Brake power supply -	

○Winding Specification，◇ Encoder Options，☐ Brake Options，△ Oil Seal Options

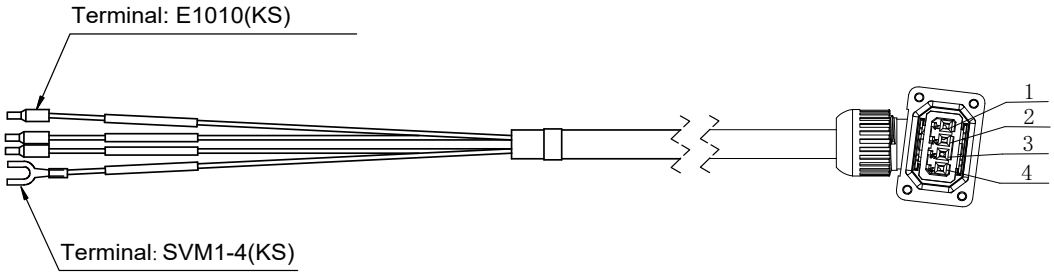
4.5.2.3 □180mm Motor Power Connectors PIN Assignments

Motor Model	PIN.No	Name	Define	Interface Diagram
SM3H-182Y◇□U△ SM3H-183Y◇□U△ SM3H-184Y◇□U△ SM3H-185Y◇□U△	1	PE	Motor Ground Wire	
	2	U	U Phase	
	3	V	V Phase	
	4	W	W Phase	
	5	Brake 1	Brake Power Supply +	
	6	Brake 2	Brake Power Supply -	

◇ Encoder Options，□ Brake Options，△ Oil Seal Options

4.5.3 Motor Power Cable Wiring Definition

4.5.3.1 □40/60/80mm Motor Power Cable Wiring Definition



Motor Model		Drive Side	Item	Color	Motor Side
SM3L-042A◇□D△	SM3H-041A◇□P△	Grounding Screw	PE	Yellow/Green	1
SM3L-061A◇□P△	SM3H-042A◇□P△				
SM3L-062A◇□P△	SM3H-061A◇□P△	3	U	Red	2
SM3L-083A◇□P△	SM3H-062A◇□P△				
SM3L-084A◇□P△	SM3H-083A◇□P△				
SM3L-042AB□D△	SM3H-084A◇□P△	2	V	Yellow	3
SM3L-061AB□D△	SM3H-061AB□D△				
SM3L-062AB□D△	SM3H-062AB□D△				
SM3L-083AB□D△	SM3H-083AB□D△	1	W	Blue	4
SM3L-084AB□D△	SM3H-084AB□D△				

□Encoder Options ◇Brake Optionst △Oil seal Options

NOTE: Ensure U/V/W is following the order of RED/YELLOW/BULE. Wrong connections will cause motor stop rotation, or wrong rotary directions.

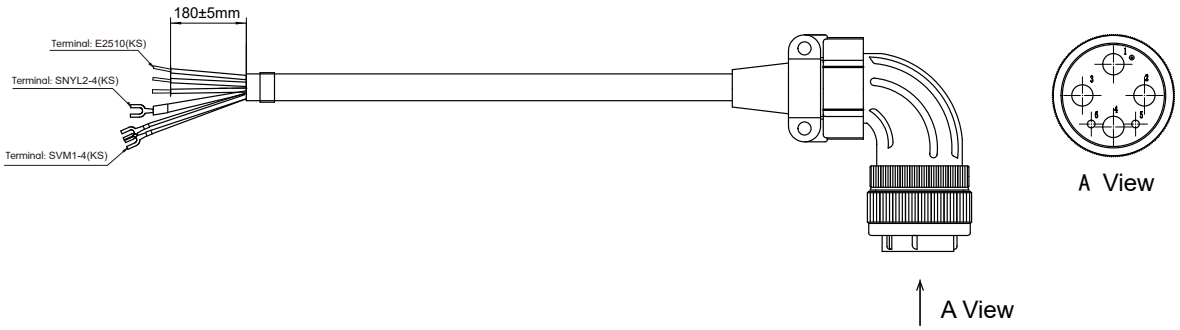
4.5.3.2 □100mm/130mm Motor Power Cable Wiring Definition

Motor Model		Drive Side	Item	Color	Motor Side
SM3L-102○◇□U△ SM3L-103○◇□U△ SM3L-104○◇□U△ SM3L-105○◇□U△	SM3M-132○◇□U△ SM3M-133○◇□U△ SM3M-134○◇□U△ SM3M-135Y◇□M△ SM3H-132○◇□U△ SM3H-132○◇□U△ SM3H-134○◇□U△	U	U	Red	F
		V	V	Yellow	I
		W	W	Blue	B
		Grounding Screw	FG	Yellow/Green	A
		-	Brake 1	Red	C
		-	Brake 2	Black	D

○Winding Specification □Encoder Options ◇Brake Optionst △Oil seal Options

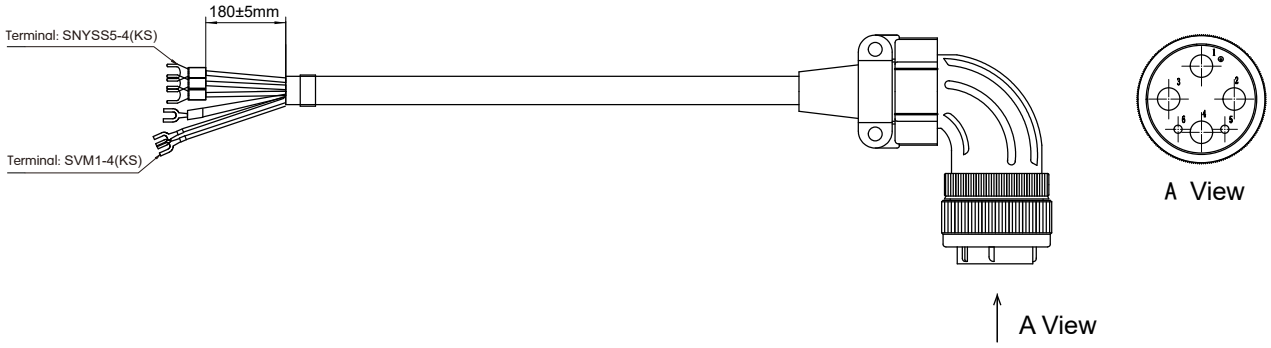
NOTE: Ensure U/V/W is following the order of RED/YELLOW/BULE. Wrong connections will cause motor stop rotation, or wrong rotary directions.

4.5.3.3 □180mm Motor Power Cable Wiring Definition



Motor Model	Drive Side	Item	Color	Motor Side
SM3H-182Y◇□U△	U	U	Red	2
	V	V	Yellow	3
	W	W	Blue	4
	Grounding Screw	FG	Yellow/Green	1
	-	Brake 1	Red	5
	-	Brake 2	Black	6

□Encoder Options ◇Brake Optionst △Oil seal Options

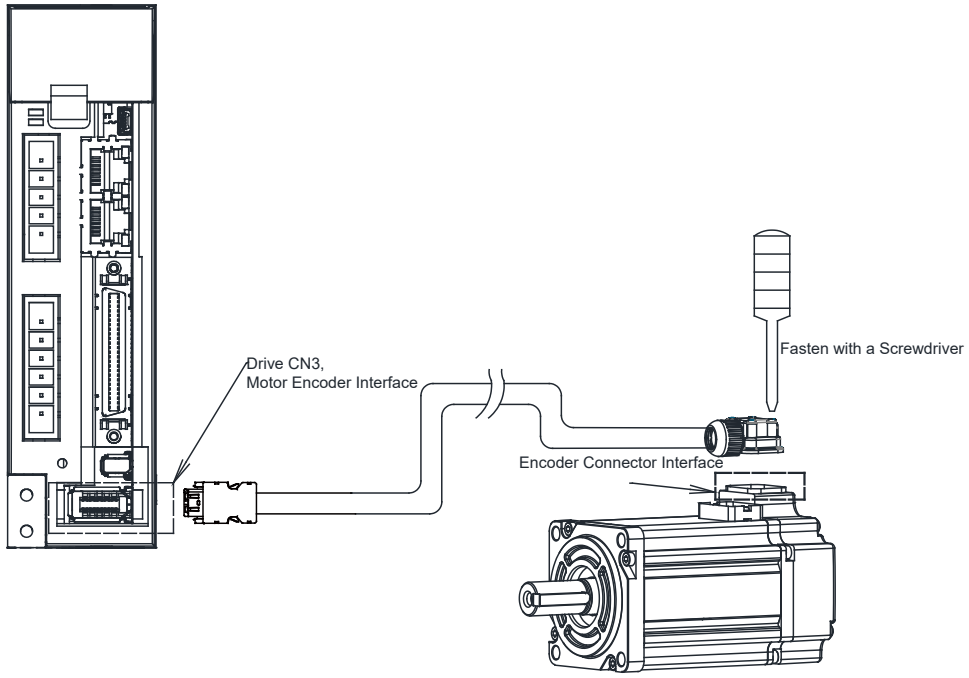


Motor Model	Drive Side	Item	Color	Motor Side
SM3H-183Y◇□U△ SM3H-184Y◇□U△ SM3H-185Y◇□U△	U	U	Red	2
	V	V	Yellow	3
	W	W	Blue	4
	Grounding Screw	FG	Yellow/Green	1
	-	Brake 1	Red	5
	-	Brake 2	Black	6

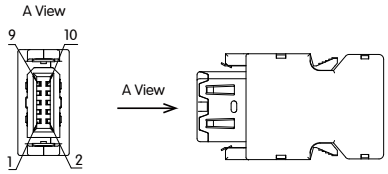
NOTE: Ensure U/V/W is following the order of RED/YELLOW/BULE. Wrong connections will cause motor stop rotation, or wrong rotary directions.

4.6 CN3 Encoder Connector

4.6.1 Motor Encoder Cable Configuration



4.6.2 Encoder Connector PIN Assignments

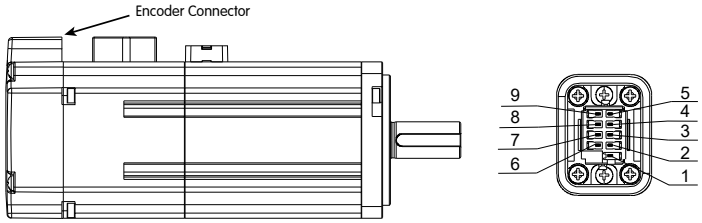


PIN.No	Symbol	Description
1	5V	Encoder Power +5V
2	GND	Encoder Power GND
7	CLK-	CLK- Signal
8	CLK+	CLK+ Signal
9	SD-/DATA-	Encoder Data -
10	SD+/DATA+	Encoder Data +
Shield	Shield	Shield

Note: DO NOT connect the UN-defination PINs.

4.6.3 Motor Encoder Connector Specifications

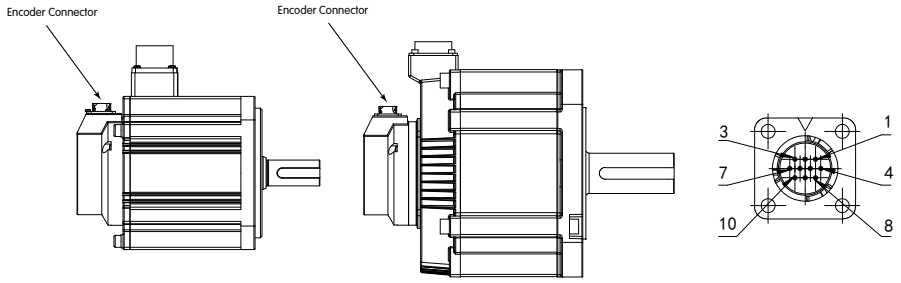
4.6.3.1 □40/60/80mm Motor Encoder Connectors PIN Assignments



Motor Model		PIN.No	Symbol	Description
SM3L-042AT□D△ SM3L-061AT□P△ SM3L-062AT□P△ SM3L-083AT□P△ SM3L-084AT□P△ SM3H-041AT□P△ SM3H-042AT□P△ SM3H-061AT□P△ SM3H-062AT□P△ SM3H-083AT□P△ SM3H-084AT□P△	SM3L-042AX□D△ SM3L-061AX□P△ SM3L-062AX□P△ SM3L-083AX□P△ SM3L-084AX□P△ SM3H-041AX□P△ SM3H-042AX□P△ SM3H-061AX□P△ SM3H-062AX□P△ SM3H-083AX□P△ SM3H-084AX□P△	1	Shield	Shield
		2	--	--
		3	5V	Encoder Power 5V
		4	VBAT+	Battery Power Input +
		5	SD+	Encoder Data +
		6	--	--
		7	GND	Encoder Power GND
		8	VBAT_GND	Battery Power Input -
		9	SD-	Encoder Data -

Motor Model		PIN.No	Symbol	Description
SM3L-041AB□D△ SM3L-042AB□D△ SM3L-061AB□D△ SM3L-062AB□D△ SM3L-083AB□D△ SM3L-084AB□D△	SM3H-041AB□PV SM3H-042AB□PV SM3H-061AB□D△ SM3H-062AB□D△ SM3H-083AB□D△ SM3H-084AB□D△	1	Shield	Shield
		2	CLK+	CLK+
		3	CLK-	CLK-
		4	DATA-	Encoder Data -
		5	DATA+	Encoder Data +
		6	5V	Encoder Power 5V
		7	--	--
		8	GND	Encoder Power GND
		9	--	--

4.6.3.2 □100mm/130mm/180mm Motor Encoder Connectors PIN Assignments



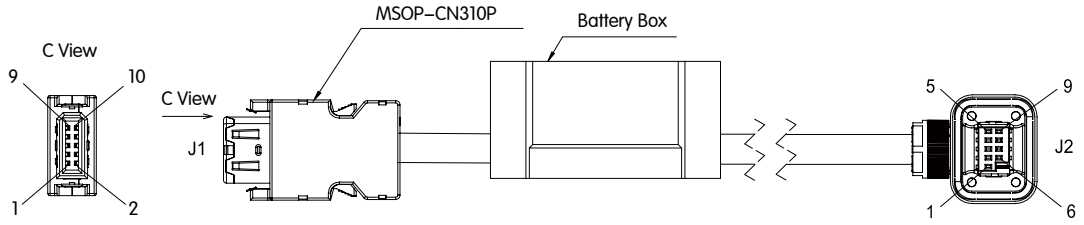
Motor Model			PIN.No	Symbol	Description
SM3L-102○T□U△ SM3L-103○T□U△ SM3L-104○T□U△ SM3L-105○T□U△ SM3M-132○T□U△ SM3M-133○T□U△ SM3M-134○T□U△ SM3M-135YT□M△ SM3H-132○T□U△ SM3H-133○T□U△ SM3H-134○T□U△	SM3L-102○X□U△ SM3L-103○X□U△ SM3L-104○X□U△ SM3L-105○X□U△ SM3M-132○X□U△ SM3M-133○X□U△ SM3M-134○X□U△ SM3M-135YX□M△ SM3H-132○X□U△ SM3H-133○X□U△ SM3H-134○X□U△	SM3H-182YT□U△ SM3H-183YT□U△ SM3H-184YT□U△ SM3H-185YT□U△	1	5V	Encoder Power 5V
			2	GND	Encoder Power GND
			3	SD-	Encoder Data -
			4	SD+	Encoder Data +
			5	VBAT+	Battery Power Input +
			6	VBAT_GND	Battery Power Input -
			7,8,9	NC	---
			10	Shield	Shield

○Winding Specification □ Brake Options △ Oil seal Opions

Note: DO NOT connect the UN-defination PINs.

4.6.4 Motor Encoder Cable Wiring Definition

4.6.4.1 □40/60/80mm Motor Encoder Cable Wiring Definition

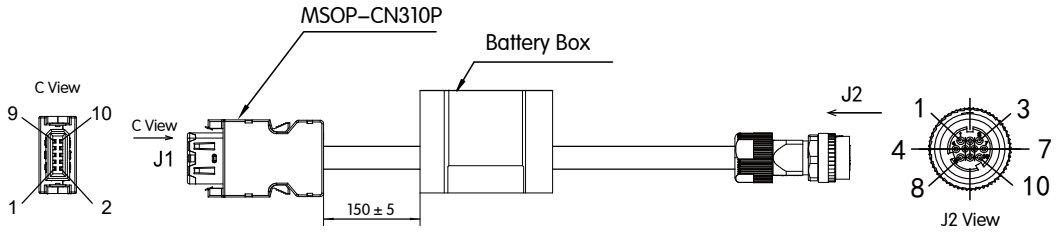


Encoder Type	Drive Side J1	Battery	Signal	Color	Motor Side J2
-T Type: 26-bit multi-turn absolute -X Type: 21-bit multi-turn absolute	1	--	5V	Red	3
	2	--	GND	Black	7
	--	Vbat+	VBAT+	Green	4
	--	Vbat-	VBAT_GND	Orange	8
	9	--	SD-	Blue/Black	9
	10	--	SD+	Blue	5
	--	--	Shield	--	1

Encoder Type	Drive Side J1	Signal	Color	Motor Side J2
-B Type: 17-bit battery-less multi-turn absolute	1	5V	Red	6
	2	GND	Black	8
	7	CLK-	Green	3
	8	CLK+	Orange	2
	9	DATA-	Blue/Black	4
	10	DATA+	Blue	5
	--	Shield	--	1

Note: DO NOT connect the UN-defination PINs.

4.6.4.2 □100mm/130mm/180mm Motor Encoder Cable Wiring Definition



Encoder Type	Drive Side J1	Battery	Signal	Color	Motor Side J2
-T Type: 26-bit multi-turn absolute -X Type: 21-bit multi-turn absolute	1	--	5V	Red	1
	2	--	GND	Black	2
	--	Vbat+	VBAT+	Green	5
	--	Vbat-	VBAT_GND	Orange	6
	9	--	SD-	Blue/Black	3
	10	--	SD+	Blue	4
	--	--	Shield	--	10

Note: DO NOT connect the UN-defination PINs.

4.6.5 Battery of Absolute Encoder

When the SM3 series 26-bit and 21-bit absolute encoder motor is used in a multi-turn absolute position system, a battery is required to supply power during drive power-off to record multi-turn data. After power-on, the drive calculates the absolute position of the mechanical load based on the absolute position of the encoder. There is no need to repeat the mechanical homing operation.

When using our company's encoder cable with a battery box, the battery box has a built-in battery MSOP-BA01, which meets the UL lithium battery standard and the IEC lithium battery international safety standard.

■ Battery replacement

There is a risk of electrolyte leakage after long-term use of the battery. It is recommended to replace the battery every two years. To avoid losing the absolute position data of the motor encoder, it is strongly advised to replace the battery while the drive is powered on. If the battery is removed while the drive remains powered, the drive will issue a warning indicating "absolute encoder battery under-voltage." This warning will automatically clear once the battery is reconnected.

■ Battery selection

Please refer to the information in the table below to select a battery of appropriate specifications.

Battery Spec.	Item&Unit	Rated Value			Description
		Min.	Typical	Max.	
Output Spec. 3.6V, 2.7Ah	Battery Voltage(V)	3.3	3.6	5	Standby work
	Battery low Voltage(V)	——	2.8	——	
	Battery alarm Voltage(V)	——	3.2	——	
	Current Consumption(μA)	——	2	——	During normal work
		——	10	——	During standby operation, the shaft is stationary
		——	30	——	During standby operation, the shaft rotates
	Operation Ambient(℃)	0	——	40	Same as the ambient temperature of motor
	Storage Ambient(℃)	-20	——	60	

■ Precautions for Battery Use

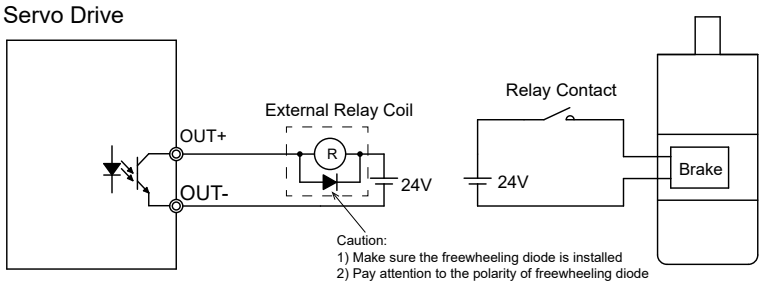
1. Connect the positive and negative electrodes correctly.
2. If a battery that has been used for a long time or an unusable battery is installed in the machine, liquid leakage may occur. It will not only corrode the surrounding parts, but also has the risk of short circuit. It is recommended to replace it regularly (reference period: it is recommended to replace it every two years).
3. It is forbidden to disassemble the battery to prevent the electrolyte from flying and affecting personal safety.
4. It is forbidden to throw the battery into the fire to avoid the danger of explosion.
5. It is strictly forbidden to short-circuit between the positive and negative electrodes of the battery
6. It is forbidden to charge the battery.
7. It is forbidden to solder directly on the surface of the battery, and the battery with solder feet or leads should be used.
8. Please discard the replaced battery according to local regulations.

4.7 Electromagnetic Brake

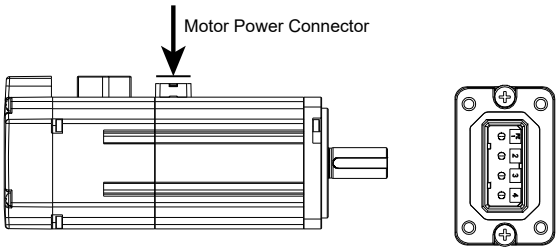
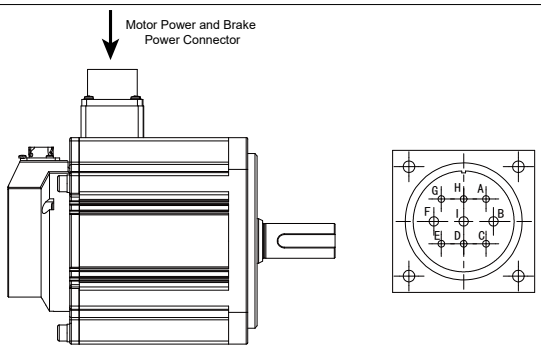
Servo motors are used in applications such as vertical axes, where there is a risk of the mechanical structure falling due to gravity when the servo motor is not enabled or powered off, a servo motor equipped with an electromagnetic brake must be used to hold the position safely.

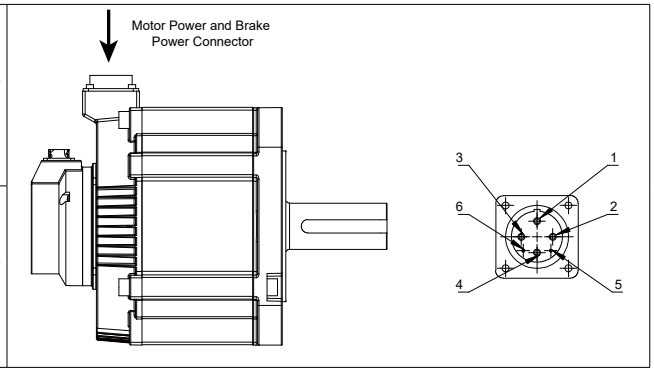
Note: The brake of the servo motor can only be used to hold the position of the mechanism when the motor is disabled or power-off. DO NOT use it for braking during deceleration, otherwise the motor will be damaged.

4.7.1 Wiring Diagram



■ PIN Definition

Motor Model	PIN.No	Item	Definition	Interface Diagram
SM3L-042A◇BD△ SM3L-061A◇BP△ SM3L-062A◇BP△ SM3L-083A◇BP△ SM3L-084A◇BP△ SM3H-041A◇BP△ SM3H-042A◇BP△ SM3H-061A◇BP△	1	24V	Brake Power Supply +	
SM3H-062A◇BP△ SM3H-083A◇BP△ SM3H-084A◇BP△ SM3H-061ABBD△ SM3H-062ABBD△ SM3H-083ABBD△ SM3H-084ABBD△	2	0V	Brake Power Supply -	
SM3L-102○◇BU△ SM3L-103○◇BU△ SM3L-104○◇BU△ SM3L-105○◇BU△ SM3M-132○◇BU△ SM3M-133○◇BU△ SM3M-134○◇BU△ SM3M-135Y◇BM△ SM3H-132○◇BU△ SM3H-133○◇BU△ SM3H-134○◇BU△	C	24V	Brake Power Supply +	
	D	0V	Brake Power Supply -	

SM3H-182Y◇BU△ SM3H-183Y◇BU△ SM3H-184Y◇BU△ SM3H-185Y◇BU△	5	24V	Brake Power Supply +	
	6	0V	Brake Power Supply -	

○ Winding Specification，◇ Encoder Options，△ Oil Seal Options

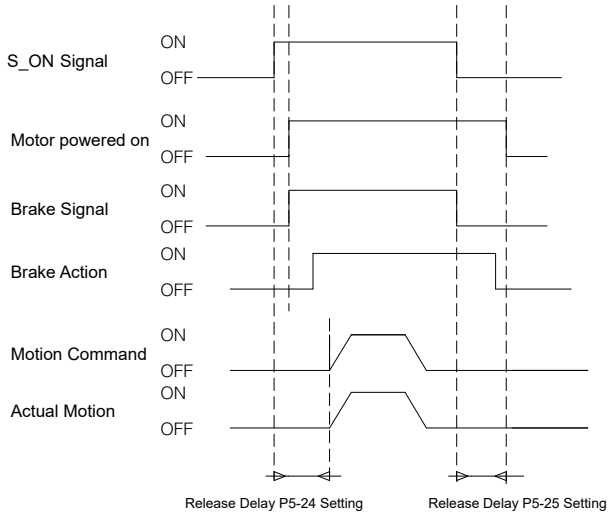
4.7.2 Precautions for Using Servo Motors with Brakes

- The brake control signal from the drive cannot directly actuate the motor brake. An external 24V power supply and relay are required. It is strongly recommended not to share the 24V power supply with other external devices, as voltage instability caused by other equipment may lead to brake malfunction.
- The digital output signal of the drive is an optocoupler output, the maximum is 30VDC, 100mA. When controlling inductive loads such as relays, a flyback diode must be installed to prevent damage to the drive's output circuitry, which could cause signal failure.
- The electromagnetic brake is a normally closed type, and the motor shaft cannot rotate when the brake is not powered.
- The electromagnetic brake coil has no polarity requirements.
- It is recommended to use cables of 0.5 mm² (AWG 20) or larger to prevent excessive voltage drop due to thin wires, which may affect proper brake operation.
- Brake specifications are listed in the table below.

Motor	Power	Holding Torque (Nm)	Release Continuous Current (A)	Release Continuous Power (W@20℃)	Rated Vlotage (VDC)	Release Time (ms)	Release Vlotage (VDC)	Brake Time (ms)
SM3*-04******	50W, 100W	0.32	0.26	6.3	24V±10%	20	20	50
SM3*-06******	200W, 400W	1.5	0.3	7.2		20		50
SM3*-08******	750W, 1000W	3.2	0.4	9.6		40		60
SM3*-10******	1kW ~ 2.5kW	8.0	0.6	14.4		40		80
SM3*-13******	850W ~ 3kW	18.5	1.05	24.3		40		100
SM3*-18******	2.9kW ~ 7.5kW	60	2.16	52		80		180

4.7.3 Timing Charts of Electromagnetic Brake

Since the brake has an inherent response delay, proper timing must be observed during operation to prevent damage. When operating in CSP, CST or CSV control modes, the P5-24 parameter setting is not effective. Therefore, when designing the control program, it is critical to allocate sufficient time to ensure that the brake is fully released before initiating motor movement, otherwise the motor brake will be damaged.



The motion waiting time and the disable delay time can be configured using Luna software, or by modifying parameters P5-24 and P5-25 via the control panel.

4.8 P2 Regenerative Resistor

When the output torque of the motor shaft is opposite to the direction of rotation, the energy is fed back from the motor load side to the drive's DC bus capacitors, causing the bus voltage to rise. This feedback energy is known as regenerative energy, and commonly occurs during deceleration.

Excessive DC bus voltage can damage the drive. Therefore, when the bus voltage exceeds a certain threshold, a regenerative braking resistor must be used to dissipate the excess energy. Otherwise, the drive will trigger an over-voltage alarm.

The regenerative resistor can be either built-in or externally connected, but both must not be used simultaneously. The specifications of the built-in regenerative resistor for the M56S EtherNet/IP series servo drives are as follows.

Drive P/N	Built-in Resistor		External Resistor
	Resistor (Ω)	Power P_R(W)	Minimum Resistor (Ω)
M56S-21A8IPN	no built-in	no built-in	50
M56S-21A8IPX	200	40	50
M56S-23A0IPN	no built-in	no built-in	50
M56S-23A0IPX	200	40	50
M56S-24A5IPN	100	60	50
M56S-24A5IPX	100	60	50
M56S-26A0IPX	25	80	20
M56S-210AIPX	25	80	20
M56S-213AIPX	25	80	20
M56S-36A0IPX	25	80	20
M56S-313AIPX	25	80	20
M56S-317AIPX	35	100	35
M56S-321AIPX	35	100	25
M56S-326AIPX	35	100	25

4.8.1 Regenerative Energy Calculation Method

A. Reciprocating motion

When the motor decelerates, the kinetic energy during deceleration will be converted into electrical energy and fed back to the DC bus capacitors.

The regenerative energy during deceleration consists of two parts:

A) Energy generated by the motor during deceleration

B) Energy generated by the external load during deceleration

The following is a simplified method to estimate the required regenerative braking resistor.

1) Calculating the Regenerative Energy from Motor Deceleration (E_M)

The table below shows the energy generated when an SM3 series servo motor decelerates from 3000 rpm to 0 rpm without any external load.

Inertia Tyep	Power (W)	Motor P/N	Rotor Inertia $J_M(10^{-4}Kg{\cdot}m^2)$	Energy Generated During Deceleration to 0 rpm $E_M(J)$	Maximum Energy Absorbed by Drive Capacitor $E_C(J)$
Low Inertia	100	SM3L-042A****	0.043	0.21	8.7
	200	SM3L-061A****	0.182	0.90	8.7
	400	SM3L-062A****	0.268	1.32	13
	750	SM3L-083A****	0.961	4.74	26.6
	1000	SM3L-084A****	1.12	5.52	40.6
	1000	SM3L-102*****	2.67	13.16	40.6
	1500	SM3L-103*****	3.25	16.02	40.6
	2000	SM3L-104*****	3.86	19.03	40.6
	2500	SM3L-105*****	4.56	22.48	40.6
Medium Inertia	1000	SM3M-132*****	15.2	33.30	40.6
	1500	SM3M-133*****	20.5	44.92	40.6
	2000	SM3M-134*****	26.6	58.28	40.6
	3000	SM3M-135*****	38.6	84.57	65
High Inertia	50	SM3H-041A****	0.0395	0.19	8.7
	100	SM3H-042A****	0.0724	0.36	8.7
	200	SM3H-061A****	0.32	1.58	8.7
	400	SM3H-062A****	0.62	3.06	13
	750	SM3H-083A****	1.63	8.04	26.6
	850	SM3H-132*****	15.2	18.73	40.6
	1000	SM3H-084****	1.96	9.66	40.6
	1300	SM3H-133*****	20.5	25.27	40.6
	1800	SM3H-134*****	26.6	32.78	40.6
	2900	SM3H-182*****	51	62.85	65
	4400	SM3H-183*****	72.5	89.35	106.6
	5500	SM3H-184*****	92	113.39	130
	7500	SM3H-185*****	145	178.71	156

2) Calculating the Regenerative Energy Generated by the Load (E_L)

Assuming the load inertia is N times the motor's rotor inertia, the energy generated by the load during deceleration from rated speed to 0 rpm can be calculated as:

$$E_L = N \times E_M$$

If $\mathbf{E_M + E_L < E_C}$, the total energy generated by the motor and the load during deceleration is less than the energy absorption capacity of the drive's internal capacitors, then no regenerative braking resistor is required.

3) Calculating the Average Power Required for the Regenerative Braking Resistor (P_{AV})

$$P_{AV} = \frac{E_M + E_L - E_C}{t_{dec}}$$

$\mathbf{t_{dec}}$ is the total time consisting of deceleration time and the interval between two deceleration events.

4) Evaluation

If $P_{AV} < P_R$, the total regenerative power is less than the rated power of the built-in braking resistor, then no external resistor is needed.

If $P_{AV} > P_R$, the total regenerative power exceeds the rated power of the built-in resistor, an external braking resistor must be installed.

In order to control the temperature rise of the external resistor effectively, the minimum resistance power is 2 times P_{AV}.

Example Caculation：

SM3L-062A**** is a 400W servo motor. The load inertia is assumed to be 15 times the motor's rotor inertia. Assuming the total deceleration cycle time t_{dec} including both deceleration and the interval between deceleration events is 0.5s, and each cycle involves decelerating from 3000 rpm to 0 rpm.

The required power of the regeneration resistance is calculated as:

E_M = 1.2J, E_C = 13.04J

E_L = N x E_M = 15 x 1.2 = 18J

$P_{AV}=(E_M+E_L-E_C)/t_{dec}=(1.2+18-13.04)/0.5$ = 12.32W

Since the rated power built-in regenerative resistor of the 400W drive is 40W, which is greater than P_{AV}, the external regenerative resistor is not required.

B. Motor Operates in Regenerative Mode Due to External Load Torque

In most applications, the motor operates in motoring mode, meaning the direction of the output torque is the same as the direction of rotation. However, in certain special cases, the motor's output torque direction is opposite to its rotational direction. This results in external energy being fed back into the drive.

A common example is a vertically descending heavy load. In order to meet position and speed requirements, the servo motor outputs torque in the opposite direction to counteract the gravitational force of the load. During prolonged operation, the DC bus capacitors may become fully charged and unable to absorb additional regenerative energy.

In such scenarios, a regenerative braking resistor must be used to dissipate the excess energy. The power of the regenerative energy can be calculated using the following formula:

$$P_T = 2\pi T_M N_M$$

Where:

T_M is the motor output torque，Unit: N.m

N_M is the motor speed，Unit: rps

Example Calculation:

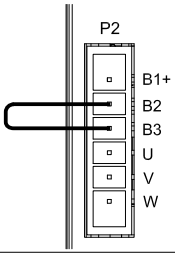
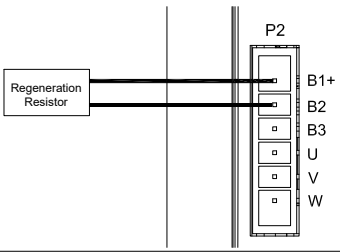
If the motor torque is 0.64 Nm and the rotational speed is 2400 rpm, the torque output direction of the motor is opposite to the direction of rotation, the power at this time is:

P_T=2 x 3.14 x 0.64 x 2400 / 60= 160.77W

In this case, an external regenerative resistor is required. To ensure proper thermal management and safe operation, the minimum recommended power rating for the resistor is 300 W.

4.8.2 Wiring Method

In some applications, the built-in regenerative resistor may be insufficient to absorb the regenerative energy generated during operation. To prevent the drive from triggering an over-voltage alarm, an external regenerative resistor with a higher power rating must be connected. The wiring method for external regenerative resistors applicable to drive systems with a power rating of 3kW and below is shown below.

Using Built-in Resister	Using External Resistor
Please short-circuit the B2 and B3 of the P2 connector. Note: A shorting wire is pre-installed at the factory	Connect the resistor between B1+ and B2, and ensure B2 and B3 remain disconnected
	

4.8.3 Drive Parameter Settings

The relevant parameters are as follows：

Parameter	Item	Unit	Description
P1-19	Resistor Value	Ω	Sets the resistance value of the regeneration resistor
P1-20	Resistor Power	W	Sets the power rating of the regeneration resistor
P1-21	Regeneration absorption time constant	ms	Sets the duration for continuous energy absorption

Note:
Please set the resistor value, power and absorption time of the absorption resistor correctly, incorrect settings may impair function and cause over-voltage alarms or regenerative absorption failures.

When using an external regenerative resistor, make sure that the total resistance is not less than the minimum allowable resistance specified by the drive. For multiple resistors connected in series or parallel, accurately calculate the total resistance and power rating.

Specifications	Parameter Setting
External: 100Ω, 200W	P1-19 = 100 P1-20 = 200
External: 2*50Ω, 200W, in serial	P1-19 = 100 P1-20 = 400
External: 2*100Ω, 200W, in parallel	P1-19 = 50 P1-20 = 400

4.9 CN1 USB Mini-B Host Configuration Interface

The CN1 port is used for communication between the drive and a PC. Using the Luna configuration software, you can set control modes, modify parameters, perform online auto-tuning, and other operations.

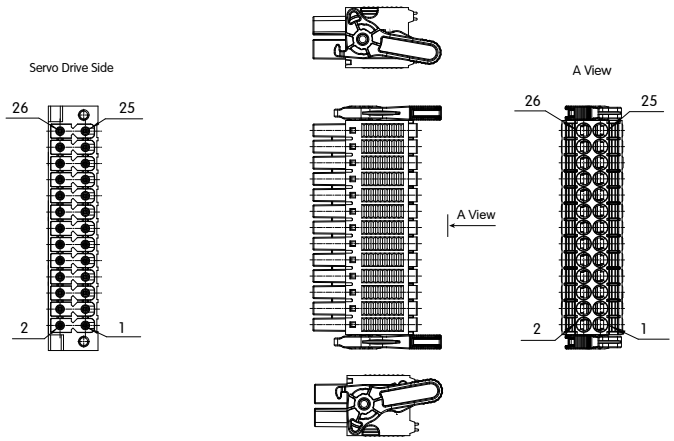
Pin No.	Symbol	Function
1	+5V	USB Power 5V
2	D-	USB Data-
3	D+	USB Data+
4	--	Reserved
5	GND	USB GND

Note: Please use USB Mini-B connector on the drive side.

4.10 CN2 Input and Output Signal Interface

4.10.1 Input and Output Signal Specifications and Block Diagram

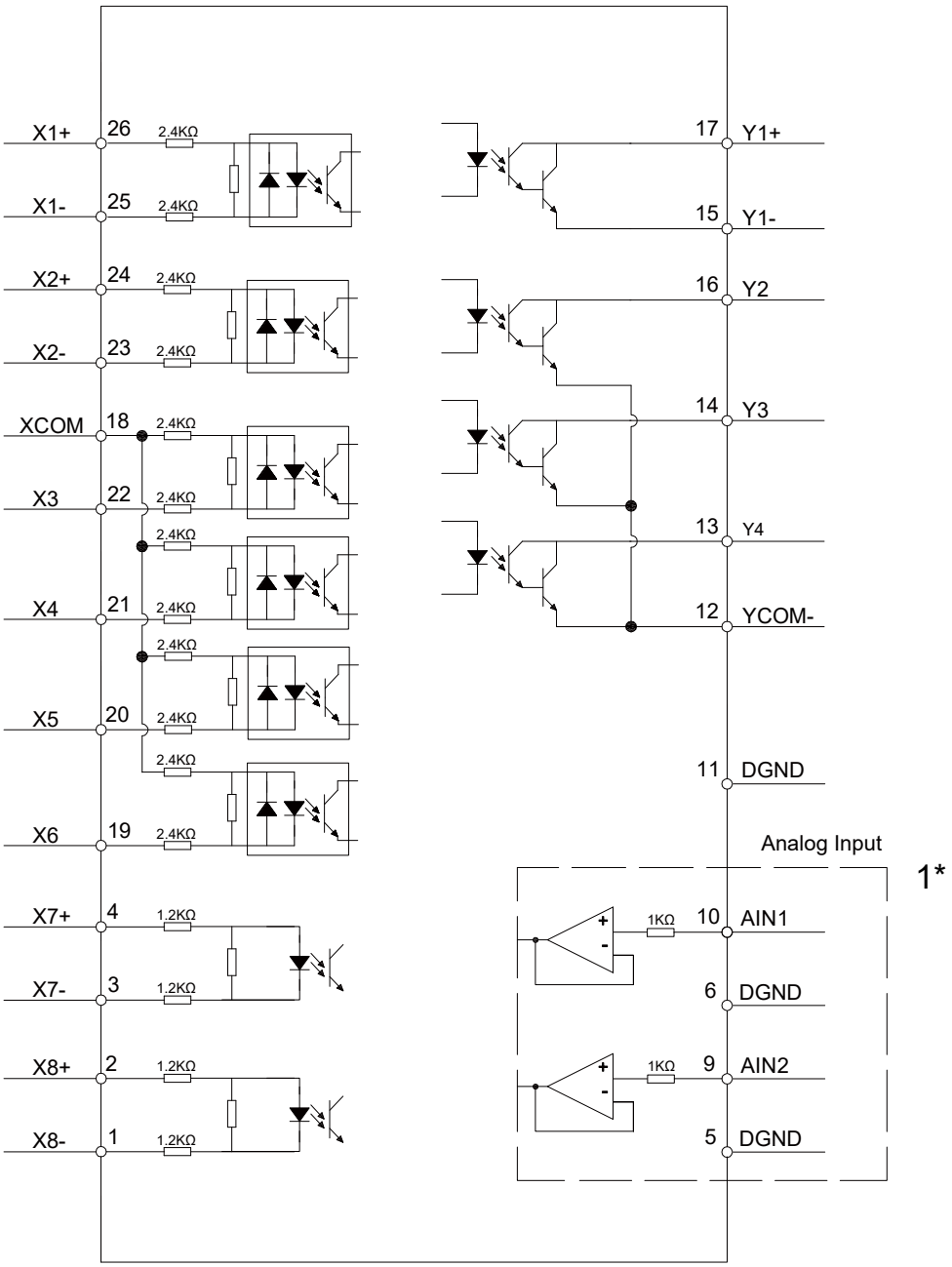
The CN2 port on the M56S EtherNet/IP series AC servo drive is used for connecting input and output signals. The pin definitions are as follows.



■ Input and output specification

I/O	Digital Signal	Inputs	8 Configurable Optically isolate general Inputs, 24VDC, 20mA
		Outputs	4 Configurable Optically isolate general Outputs, max 30VDC, 100mA
	Analog Signal	Inputs	2 analog inputs, -10V~+10V, resolution 16-bit (X-type only)

■ I/O Diagram



1*: The signal marked within the dashed box applies only to drives of X type.

Note: DO NOT make any connections to undefined pins.

4.10.2 Input and Output Pin Assignments

PIN No.	Symbol	Description	PIN No.	Symbol	Description
25	X1-	Digital Input 1-	26	X1+	Digital Input 1+
23	X2-	Digital Input 2-	24	X2+	Digital Input 2+
21	X4	Digital Input 4	22	X3	Digital Input 3
19	X6	Digital Input 6	20	X5	Digital Input 5
17	Y1+	Digital Output 1+	18	XCOM	Digital Input Common
15	Y1-	Digital Output 1-	16	Y2	Digital Output 2
13	Y4	Digital Output 4	14	Y3	Digital Output 3
11	DGND	Digital GND	12	YCOM-	Digital Output Common
9	AIN2	Analog Input 2	10	AIN1	Analog Input 1
7	--	--	8	--	--
5	DGND	Digital GND	6	DGND	Digital GND
3	X7-	Digital Input 7-	4	X7+	Digital Input 7+
1	X8-	Digital Input 8-	2	X8+	Digital Input 8+

Note:

1. The pins highlighted in grey are only applicable to drive models of X type.
2. DO NOT make any connections to undefined pins.

4.10.3 Digital Input Signals

M56S EtherNet/IP series AC servo drives are equipped with 8 digital input channels. Each input can be flexibly configured via parameters to perform specific functions and define signal logic levels. The input pins support the following types of signals:

◆ Dedicated functional signals

Such as alarm reset, limit switch inputs, and touch probe inputs, etc.

◆ General-purpose input signals

It serve as standard inputs without predefined functions.

■ List of assignable function inputs

Function	Symbol	Function Code	
		Closed	Open
General Input	GPIN	0	--
Alarm Reset	A-CLR	3	4
CW Limit	CW-LMT	5	6
CCW Limit	CCW-LMT	7	8
Gain Select	GAIN-SEL	11	12
Emergency Stop	E-STOP	13	14
Torque Limit Input	TQ-LMT	19	20
Zero speed Clamp	ZCLAMP	21	22
Velocity Limit Input	V-LMT	37	38
Homing Sensor Switch	HOM-SW	39	40
Virtual-CW-LMT	Virtual-CW-LMT	41	42
Virtual-CCW-LMT	Virtual-CCW-LMT	43	44

Signal	Symbol	CN2-PIN No.	Default	
			Function	Input Logic*1
X1	X1+	26	CCW-LMT	Closed
	X1-	25		
X2	X2+	24	CW-LMT	Closed
	X2-	23		
X3	X3	22	Alarm Reset	Closed
X4	X4	21	General Purpose Input	Closed
X5	X5	20	Emergency Stop	Closed
X6	X6	19	Torque Limit Input	Closed
XCOM	XCOM	18	--	--
X7	X7+	4	General Purpose Input	Closed
	X7-	3		
X8	X8+	2	Homing Switch	Closed
	X8-	1		

Note: The logic levels of the digital input pins are defined as follows.

Closed: The digital input circuit of the drive forms a closed loop, allowing current to flow into or out of the input pin.

Open: The digital input circuit of the drive is not closed, and no current flows into or out of the input pin.

4.10.4 Digital Output Signals

M56S EtherNet/IP Series AC Servo Drives are equipped with 4 digital output channels. Each output can be configured through parameters to perform specific functions and define output logic levels.

■ List of assignable function outputs

Function	Symbol	Function Code	
		Closed	Open
General purpose Output	GPOUT	0	--
Alarm Output	ALM	1	2
Warning Output	WARN	3	4
Brake Release Output	BRK	5	6
Servo on Status	SON-ST	7	8
Positioning Complete	COIN	9	10
Dynamic Pos. Output	DYM-LMT	11	12
Torque Reach Output	TQ-REACH	13	14
Torque Limit Output	T-LMT	15	16
Velocity Coincidence Output	V-COIN	17	18
Velocity Reach Output	AT-SPD	19	20
Velocity Limit Output	V-LMT	21	22
Servo Ready	S-RDY	23	24
Homing Finished	HOMED	25	26
Soft Limit CW	SLCW	27	28
Soft Limit CCW	SLCCW	29	30
Near Target Position Output	IN-POS	31	32
Zero speed detected Output	Z-SPD	33	34
Torque Coincidence Output	T-COIN	35	36

Signal	Symbol	CN2-PIN No.	Default	
			Function	Input Logic*1
Y1	Y1+	17	General purpose Output	Closed
	Y1-	15		
Y2	Y2	16	Servo Ready	Closed
Y3	Y3	14	Alarm Output	Open
Y4	Y4	13	Positioning Complete	Closed
YCOM-	YCOM-	12	Y2~Y4 Output Common	--

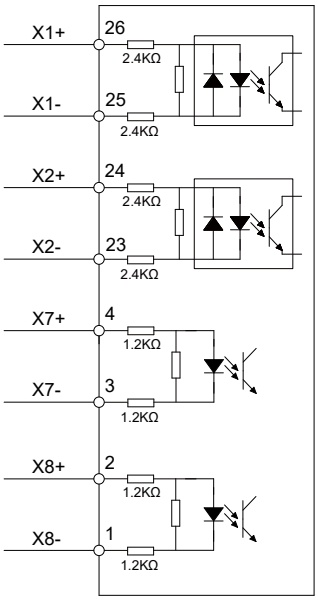
Note: The logic levels of the digital input pins are defined as follows.
Closed: The digital input circuit of the drive forms a closed loop, allowing current to flow into or out of the input pin.
Open: The digital input circuit of the drive is not closed, and no current flows into or out of the input pin.

4.10.5 Digital Input Signal Wiring Instructions

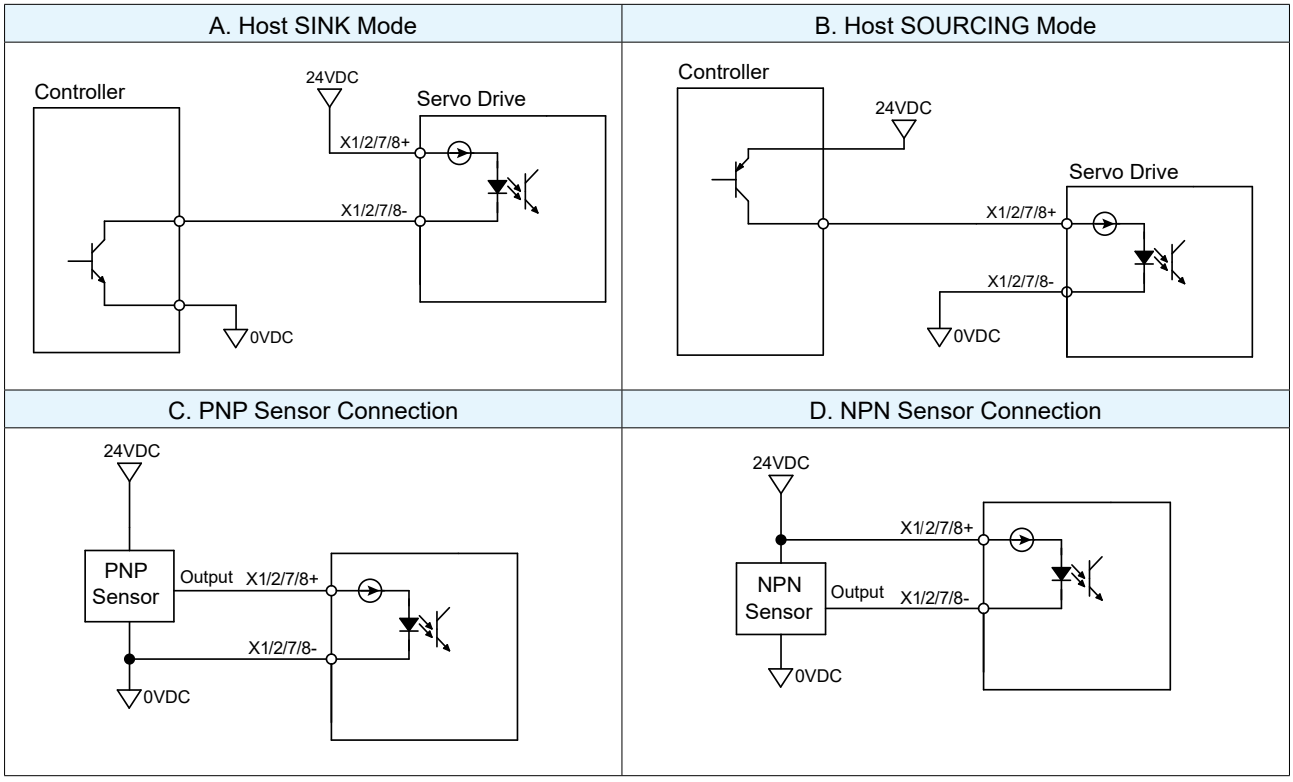
■ Digital input X1, X2, X7 and X8

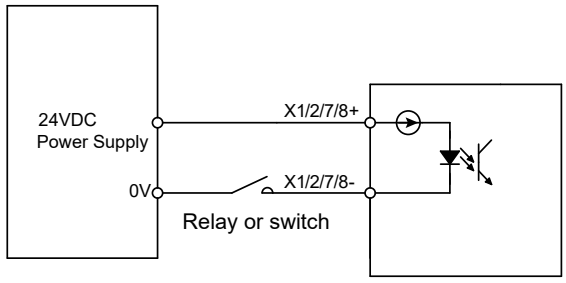
M56S EtherNet/IP series AC servo drive has 4 optically isolated digital input channels—X1, X2, X7, and X8. These inputs are independent (non-common COM), rated for 24 VDC, with a maximum input current of 20 mA. These inputs can be configured as general-purpose inputs and are suitable for receiving signals from sensors, PLCs, and other control devices.

■ Internal circuit diagram of X1, X2, X7 and X8



■ Example wiring diagram for inputs X1, X2, X7 and X8



E. Sensor or Switch Connection	
	

■ Digital Input X3, X4, X5 and X6

M56S EtherNet/IP series AC servo drives also provide 4 channels of optocoupler-isolated single-ended inputs sharing a common COM terminal. Since these inputs are optically isolated, an external power supply is required.

If connected to a PLC, you can use the PLC's power supply. For relays or mechanical switches, a 24VDC power supply is required.

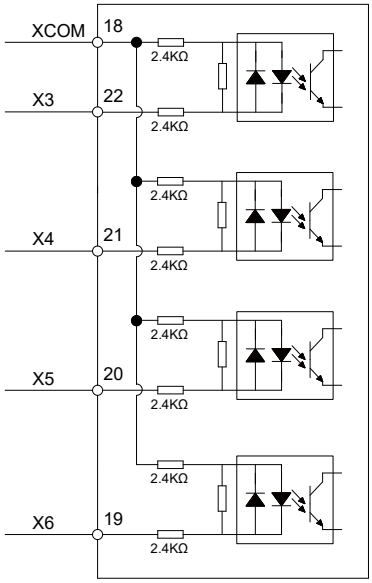
■ What's COM?

"Common" terminal serves as a reference point at the same potential.

For sourcing (PNP) signals, connect COM to ground (negative power supply).

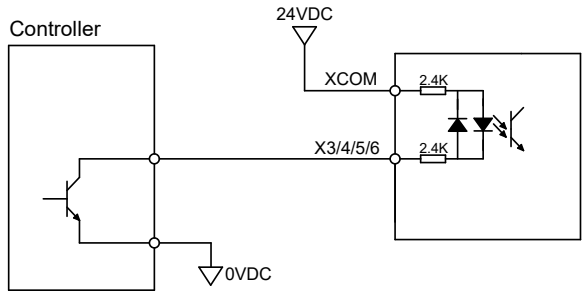
For sinking (NPN) signals, connect COM to the positive power supply.

■ Internal circuit diagram of X3, X4, X5 and X6

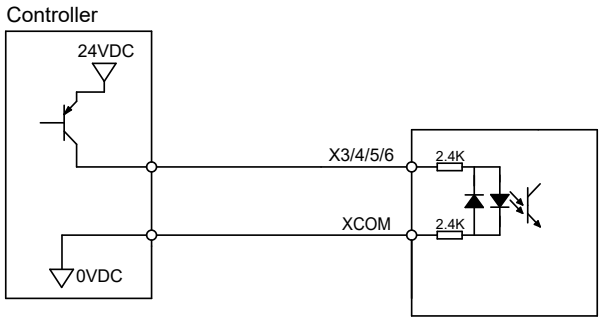


■ Example wiring diagram for inputs X3, X4, X5 and X6

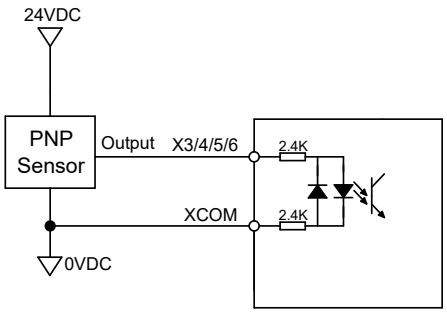
A. Host SINK Mode



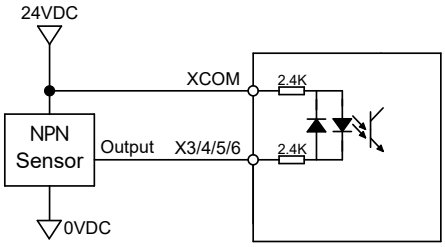
B. Host Sourcing Mode



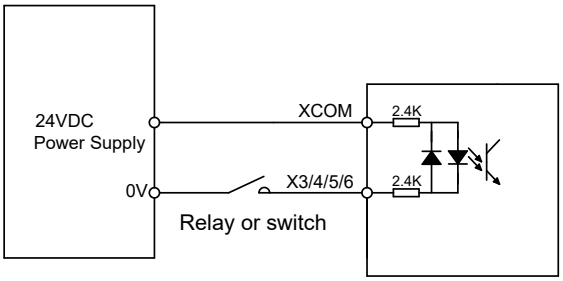
C. PNP Sensor Connection



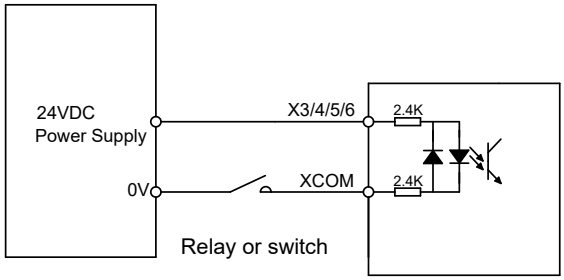
D. NPN Sensor Connection



E. Sensor or Switch Connection(XCOM to Power supply)



F. Sensor or Switch Connection(XCOM to GND)



Note:

1. Digital input voltage threshold for a valid signal: >16V
2. Digital input voltage threshold for an invalid signal: <8V
3. Indeterminate range (undefined behavior): 8V ≤ Voltage ≤ 16V

Avoid applying input voltages within the indeterminate range to prevent abnormal signal detection.

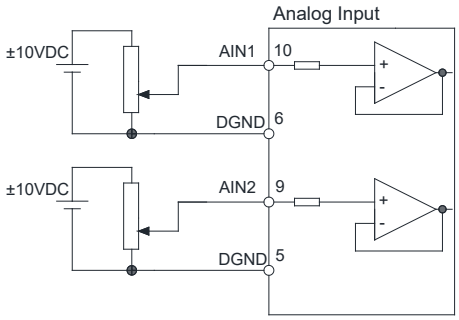
4.10.6 Analog Input Signals

M56S EtherNet/IP series AC servo drives of type X is equipped with 2 single-ended analog inputs channel, supporting a voltage range of -10V to +10V, the resolution is 16-bit.

■ Pin assignments

Signal		CN2-Pin No.	Description
		X Type	
AIN1	Analog Input Signal	10	Analog input 1
AIN2		9	Analog input 2
DGND		5，6	Reference ground for analog input signal

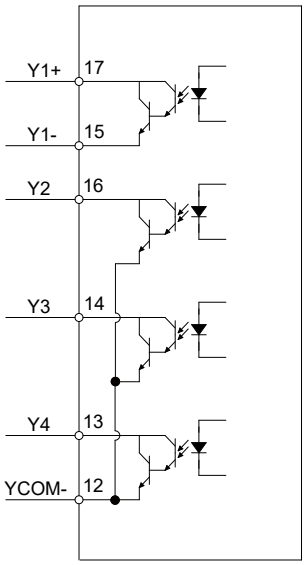
■ Example wiring for analog input



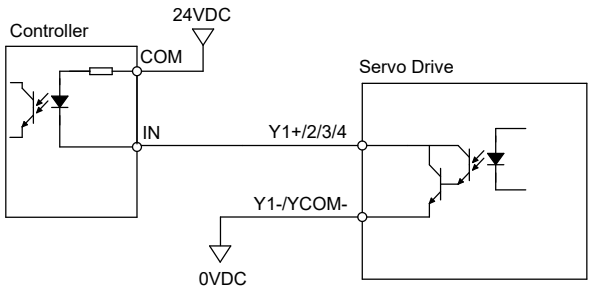
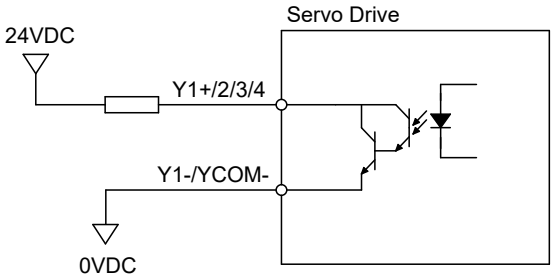
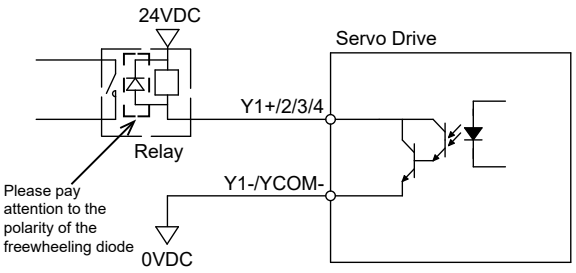
4.10.7 Digital Output Signal Wiring Instructions

The M56S EtherNet/IP series AC servo drives are equipped with 4 opto-isolated digital output points. Each output can be configured for specific functions through parameter settings and supports both SINK and SOURCE wiring methods.

■ Internal circuit diagram of output signals



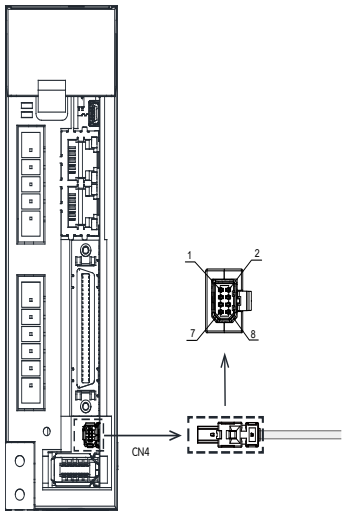
■ Example wiring diagram for output signals

A. Optocoupler Circuity	B. Connect to External Load
	
C.Connect to Relay Circuity	
	

Note: Maximum output current is 30VDC, 100mA.

4.11 CN4 Full Closed-loop Feedback & Gantry Sync Comm Interface

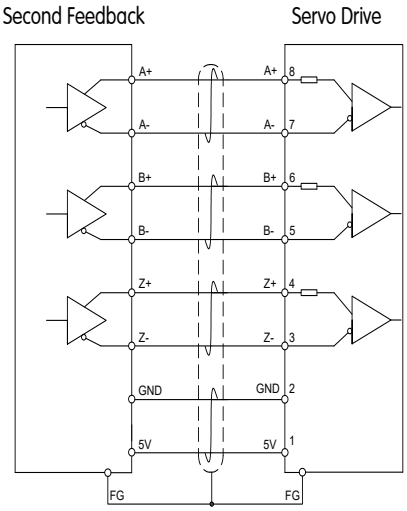
The CN4 connector is used to receive feedback signals from external encoders or linear scales mounted on the machine, enabling the servo drive to operate in full-closed loop control mode. When gantry synchronization control is enabled, signal exchange between the master and slave servo drives that form the gantry is carried out via the CN4 connector.



4.11.1 Full Closed-loop Feedback Signal Interface Pin Assignments

Signal	CN4- PIN X Type	Item	Description
5V	1	Power Supply	Power supply for the second feedback signal
GND	2		
Z-	3	Encoder Signal Input	Pulse type: differential Maximum frequency: 1Mpps Minimum pulse width: 0.5μs
Z+	4		
B-	5		
B+	6		
A-	7		
A+	8		

■ Example wiring for full-closed loop feedback signal



Precautions:

1. Please use a twisted-pair shielded cables for the external second encoder signal wiring. The recommended wire diameter is 0.13 mm² (AWG26). the total length of the cable is recommended to be within 5m.

2. To avoid electrical interference, make sure the digital ground (GND) of the external encoder is properly connected to the digital ground of the drive, and the cable shielding is well-grounded to the drive.

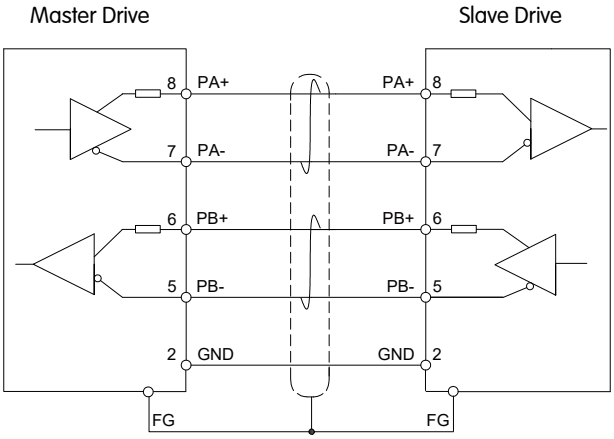
3. The drive's 5V output can supply a maximum current of 200 mA at 5V ±5%, if the external encoder requires more current, please use an external power supply.

4. When using an external power supply, DO NOT connect the external 5V to the 5V power output of CN4. However, the 0V of the external power supply must be connected to the 0V pin of CN4 to maintain a common reference potential.

4.11.2 Gantry Sync Comm Signal Interface Pin Assignments

Signal	CN4- PIN X Type	Item	Description
GND	2	Digital ground	Common ground for master and slave drives
PB-	5	Communication signal	Communication between master and slave drives
PB+	6		
PA-	7		
PA+	8		

■ Example wiring for gantry sync communication signal



Precautions:

1. DO NOT connect the UN-defination PINs.

2. Please use a twisted-pair shielded cables for gantry synchronization communication. The recommended wire diameter is 0.13 mm² (AWG26), the total length of the cable is recommended to be within 5m.

3. To avoid electrical interference, make sure the digital grounds (GND) of the master and slave drives are properly connected. The shield of the cable must also be securely grounded to the drive.

4.12 CN5 Safe Torque OFF(STO) Interface

M56S EtherNet/IP series AC servo drives of type X is equipped with the safe torque off (STO) function. The STO function is accessible via CN5 connector on the drive. When the STO function is activated, it triggers the drive's internal circuit to forcibly shut off the power transistors, preventing the motor from operating. The drive enters a disabled state, providing effective protection for both personnel and equipment in emergency situations.

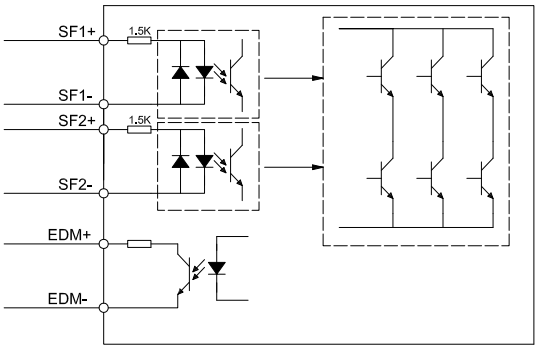
Once the STO function is triggered, the motor is disabled and cannot operate, the drive enters an alarm state, and the LED panel will display the corresponding alarm code r20to.

4.12.1 Safety Precautions

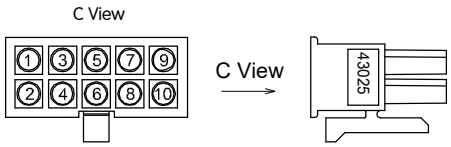
- If the STO function is not required, make sure the factory provided STO jumper terminal is properly inserted into the CN5 connector.
- If using the STO function, make sure you fully understand its operating mechanism and the associated safety considerations.
- When the STO function is active, the motor may still rotate due to external forces (e.g., gravity acting on a vertical axis load), in such cases, a servo motor with a brake should be used, and the brake control circuit must be properly wired.
- The motor will come to a free stop when STO is activated, meaning the stopping distance may be extended due to inertia, make sure this will not be a safety issue.
- When STO is active, the drive's internal power transistors are disabled, but the drive's power supply remains energized. Make sure the power is disconnected if full shutdown is required during maintenance or troubleshooting.
- When the STO function operates, it will turn off the current to the motor, but it does not turn off the power to the servo drive. Make sure to disconnect the power to the drive before performing any maintenance on it.
- Once the STO function is triggered, the drive will have a fault alarm status, and the motor will be disabled.
- After the STO signal returns to normal, the STO alarm will not be cleared automatically, and the drive will remain in a disabled state.

4.12.2 STO Input/Output Signals

■ Internal circuit diagram



■ Input and output pin No.



The connector and terminal models are as follows:

Name	P/N	Manufacturer
Plastic	43025-1000	MOLEX
Contact Pin	43030-0005	MOLEX

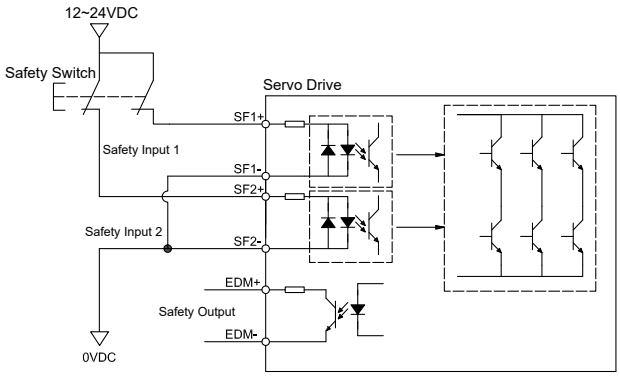
■ Pin assignments

Signal	Symbol	Pin	Description	Control Mode
Safety Input SF1	SF1+	1	When SF1 has no input signal, e.g. the port is disconnected, SF1 will be considered OFF. The upper half of the internal power transistor will be shut off.	Compatible with all control mode
	SF1-	5		
Safety Input SF2	SF2+	3	When SF2 has no input signal, e.g. the port is disconnected, SF2 will be considered OFF. The upper half of the internal power transistor will be shut off.	
	SF2-	2		
Safety Output	EDM+	6	Output monitor signal used to check the safety function.	
	EDM-	4		
Ground	DGND	7,8	+12VDC power ground, 750W and below type +24VDC power ground, 1000W and above type	
Power	VCC	9,10	+12VDC power output, 750W and below type +24VDC power output, 1000W and above type	

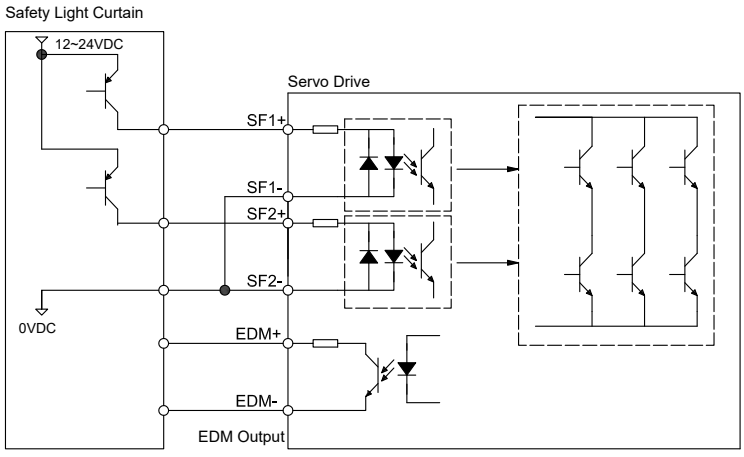
Note: When either of the safety inputs SF1 or SF2 is OFF, the STO function will be activated.

■ STO connection diagrams

● Connection to safety switch

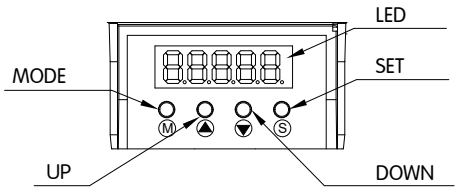


● Safety light curtain connection



5 Display and Operation

5.1 Description of Control Panel

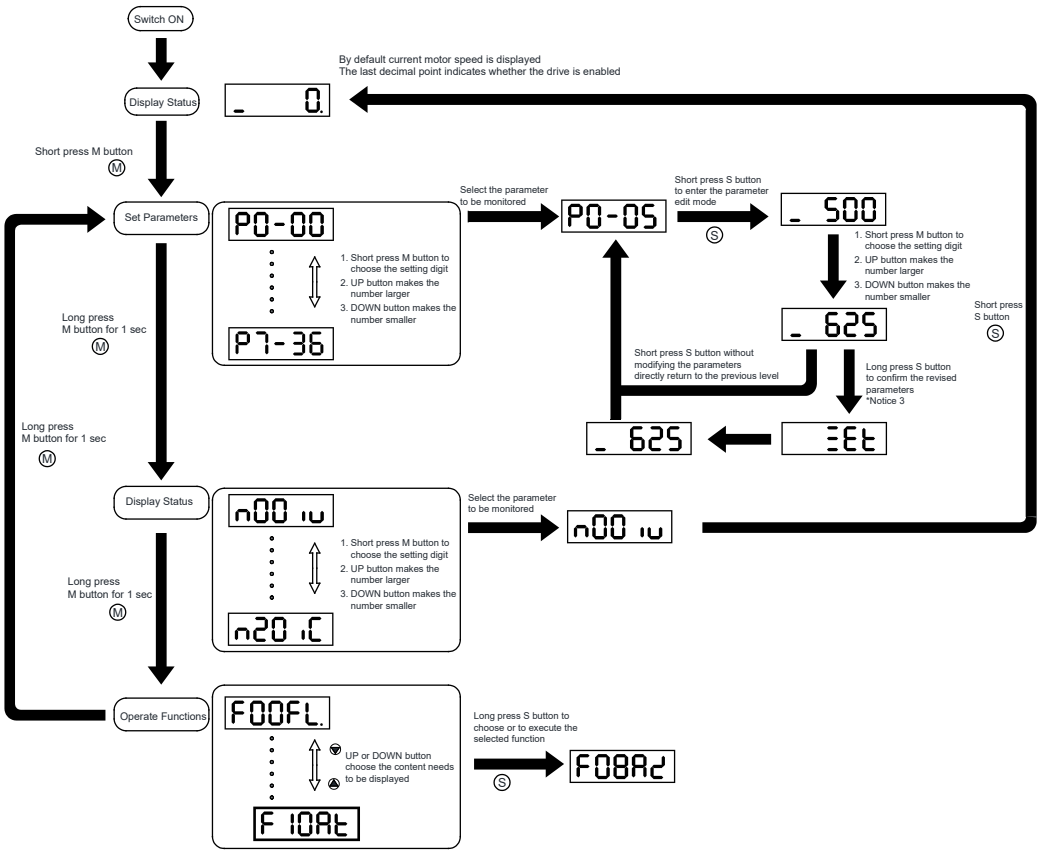


Symbol	Name	Details
--	LED Display	5-digit 7-segment LED display showing drive status, alarm information, parameter values, and settings.
M	MODE Button	Press and hold on mode button to switch LED display mode: a). Monitor selection mode b). Function selection mode c). Parameter setting mode When editing the parameters, press on MODE button can move the cursor to the left and then change parameters by using arrow Buttons.
▲ ▼	UP/DOWN Button	Short press to scroll through monitoring items, functions or to modify parameter, settings values
S	SET Button	Short press to enter the selected parameter. Press and hold to save the modified parameter.

5.2 Mode Switch Control

- Pressing the "MODE" and "SET" buttons allows switching between different modes, including status monitoring, parameters setting, and function operation.
- The alarm display mode will not appear unless an alarm condition occurs.
- If an alarm is triggered, the panel will immediately switch to the alarm display mode regardless of the current mode, and the corresponding alarm code will be shown. Press the "MODE" and "SET" buttons to return to the previous mode. Use the "UP" and "DOWN" buttons to view additional alarm information.
- If no button(s) on the control panel is pressed for 20 seconds, the display will switch back to the previous status monitoring display mode.
- In monitoring selection mode, function selection mode and parameter setting mode, short pressing the "MODE" button shifts the editable digit to the left, the selected digit will flash, then change parameters by using the "UP/DOWN" buttons.
- In status monitoring mode, press and hold the "SET" button to lock the control panel. To unlock the panel, press and hold the "SET" button again.

Control mode switch flowchart:

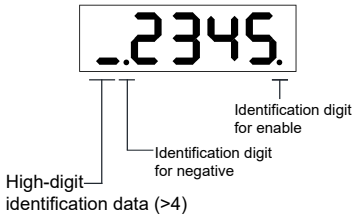


NOTE:

1. After power on, the display will show the status item selected by the user. By default, it displays the current motor speed.
2. In the parameter setting mode, short press "SET" button will exit the parameter edit mode and return to the parameter selection screen. Any changes made will not be saved.
3. In parameter setting mode, long press "SET" button will apply the modified parameter immediately, however, it will not be saved to the drive's Flash memory. To save the parameter permanently (retained after power-off), navigate to the function operation mode, select the parameter save function, and long press the "SET" button to store the parameter.
4. DO NOT save parameters while the motor is running.

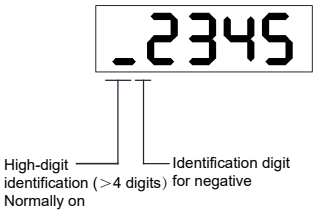
5.3 LED Display Description

5.3.1 Decimal Point and Negative Sign Description

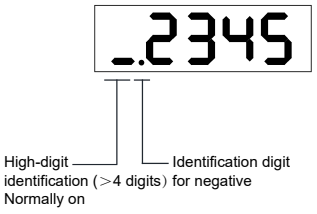
LED Display	Description
	◆ Enable Status Indicator The decimal point at the bottom right corner of the LED panel indicates whether the drive is enabled. ON: it means the drive is enabled and the motor is energized. OFF: it means the drive is disabled and the motor is not energized. ◆ Negative Value Indicator This indicator shows whether the displayed value is negative or positive. ON: the displayed value is negative. OFF: the displayed value is positive. ◆ High-Digit Indicator for Values Exceeding 4 Digits When the displayed value exceeds 4 digits, the drive uses a paging mechanism to display the complete number. The indicator shows which digit segment is currently being displayed. For details, please refer to 5.3.2 "display with more than 4 digits".

5.3.2 Data Display

■ Positive display (≤4 digits)

LED Display	Description
	◆ The leftmost digit serves as the high-digit indicator for values exceeding 4 digits. When this indicator appears at the bottom of the 7-segment LED display, it signifies that the currently displayed value represents the lowest 4 digits. ON: it means only the lower 4 digits are present and there are no higher digits. Blinking: It represents the displayed data is the lower 4-digit data and there exists numbers greater than 4 digits. ◆ When the negative value indicator (decimal point) is OFF, it means the displayed value is positive. As shown in the figure, the displayed number is 2345.

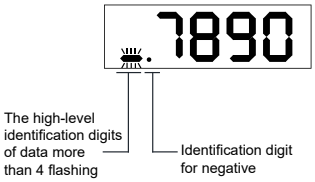
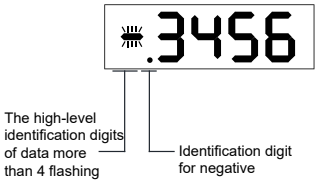
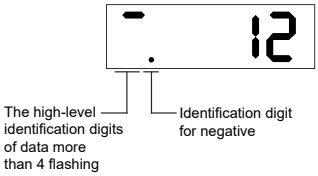
■ Negative display(≤4 digits)

LED Display	Description
	◆ The leftmost digit serves as the high-digit indicator for values exceeding 4 digits. When this indicator appears at the bottom of the 7-segment LED display, it signifies that the currently displayed value represents the lowest 4 digits. ON: it means only the lower 4 digits are present and there are no higher digits. Blinking: it represents the displayed data is the lower 4-digit data and there exists numbers greater than 4 digits. ◆ When the negative value indicator (decimal point) is ON, it means the displayed value is negative. As shown in the figure, the displayed number is -2345.

■ Number display (≥5 digits)

Since the LED display panel of the M56S series AC servo drive is limited to 5 digits, numbers exceeding 5 digits are displayed using the following method.

e.g. To display the value -1234567890

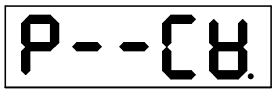
	LED Display	Description
Display "7890" in the lower 4 bits		◆ The leftmost digit serves as the high-digit indicator for values exceeding 4 digits. When this indicator appears at the bottom of the 7-segment LED display, it signifies that the currently displayed value represents the lowest 4 digits. Blinking: it represents the displayed data is the lower 4-digit data and there exists numbers greater than 4 digits. ◆ When the decimal point of negative number identification digit is always on, it means the displayed data is negative.
Display "3456" in the middle 4 digits		◆ The leftmost digit's decimal point is lit in the middle of the 7-segment LED, it indicates that the middle 4 digits of the value are being displayed. ON: it means the displayed value consists of the middle four digits, and there are no higher digits. Blinking: it means the displayed value consists of the middle 4 digits, and higher digits still remain to be displayed.
Display "12" as the highest digits		◆ The leftmost digit's decimal point is lit in the top of the 7-segment LED, it indicates that the highest 4 digits of the value are being displayed. ON: it means the displayed value consists of the highest 4 digits, and there are no additional higher digits.

Note: When the high-digit indicator is blinking, it means that there are additional higher digits remaining. Short press on "▲" or "▼" button to switch between display pages.

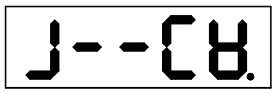
5.3.3 Other LED Display

LED Display	Description
	It means "SET". When modifying the parameter, long press "S" button for 1s. When the parameter is modified successfully, it takes effect immediately. It will not be saved when power failure happens.
	In parameter setting mode, pressing and holding the "S" button will save the change. "Saved" will also be displayed on the LED.
	In parameter setting mode when the motor is rotating and the is pressed and held, the LED display will read "busy" meaning that the current parameter change cannot be saved. Stop the current motor motion and save the parameter again.

5.3.4 Point To Point Motion Mode

LED Display	Description
	When the LED display reads "P-CW" it means the motor is rotating in a CW direction in the point-to-point mode.
	When the LED display reads "P-CCW" it means the motor is rotating in a CCW direction in the point-to-point mode.

5.3.5 Jog Mode

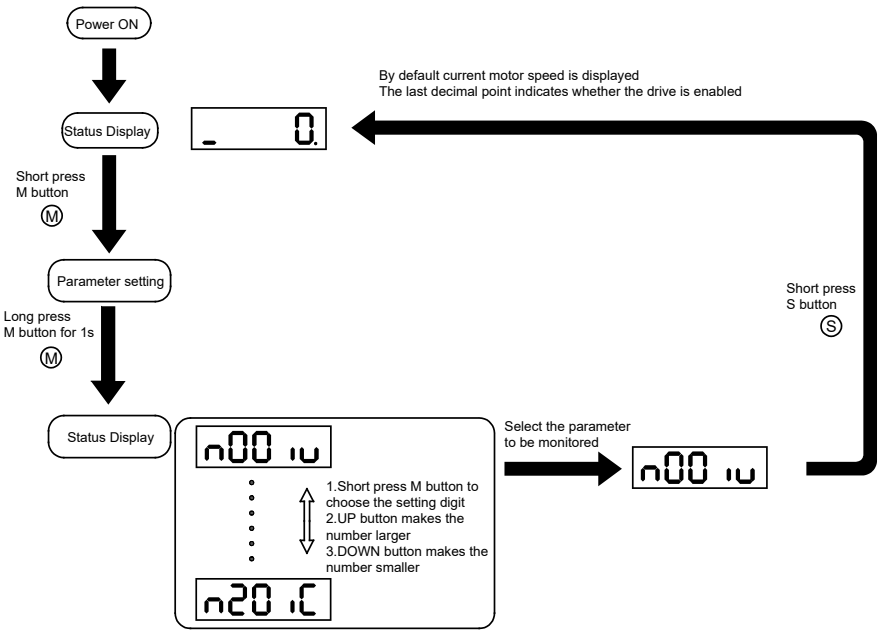
LED Display	Description
	When the LED display reads "J-CW" it means the motor is rotating in a CW direction in JOG mode.
	When the LED display reads "J-CCW" it means the motor is rotating in a CCW direction in JOG mode.

5.3.6 Control Panel Lock

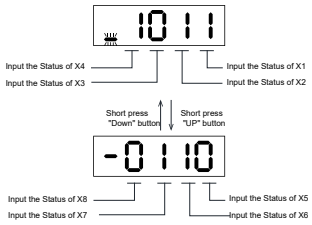
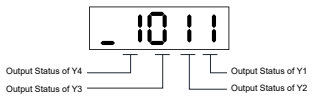
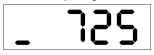
LED Display	Description
	This means the key panel is locked. Press and hold 'S" for 1 second while in status monitoring mode to lock.
	When the control panel is locked, press and hold "S" for 1 second to unlock it.

5.4 Status Monitoring Selection Mode

To change the status monitoring type, please press "M" to enter monitoring selection mode, and thenuse   to make selections, and press "S" to confirm. Steps are shown as follows:



n-Status Display	Display Symbols	Explanation	Unit	Display Example
n-00	n00 iu	Actual motor speed	RPM	◆ Display when "3000" rpm _3000. ◆ Display when "-3000" rpm _.3000.
n-01	n01 h	Real time position error of motor	Pulses	◆ Display -1234567890 .7890 Short press "down" button / Short press "UP" button .3456 Short press "down" button / Short press "UP" button 12
n-02	n02L =	Command pulse input count	Pulses	
n-03	n03 iE	Motor encoder location	Pulses	
n-04	n04 iP	Command location	Pulses	
n-05	n05 it	Drive PCB temperature	0.1℃	◆ Display "62.5" ℃ _625
n-06	n06 iU	DC Bus Voltage	0.1V	◆ Display "315.7" VDC _3157
n-07	n07dA	EtherNet/IP communication node address		◆ Display address is "1" _1001
n-08	n08AH	Alarm history 0		◆ Display "r07" as alarm code _ 7
n-09	n09AH	Alarm history 1		◆ Display "r07" as alarm code _ 7
n-10	n 10AH	Fault history 2		◆ Display "r07" as alarming code _ 7
n-11	n 11AH	Fault history 3		◆ Display "r07" as alarming code _ 7
n-12	n 12AH	Fault history 4		◆ Display "r07" as alarming code _ 7
n-13	n 13AH	Fault history 5		◆ Display "r07" as alarming code _ 7
n-14	n 14AH	Fault history 6		◆ Display "r07" as alarming code _ 7
n-15	n 15AH	Fault history 7		◆ Display "r07" as alarming code _ 7
n-16	n 16 iA	Analog input 1 sample voltage	mV	◆ Display "8.211" V _8211
n-17	n 17 iA	Analog input 2 sample voltage	mV	◆ Display "8.707" V _8707

n-Status Display	Display Symbols	Explanation	Unit	Display Example
n-18		Digital input status		◆ Each 7-segment number represents the state of a digital input 1: Closed Status 0: Open 
n-19		Digital Output status		◆ Each 7-segment number represents the state of a digital output 1: Closed Status 0: Open 
n-20		Command current percentage	0.1%	◆ Display current command - 72.5% 

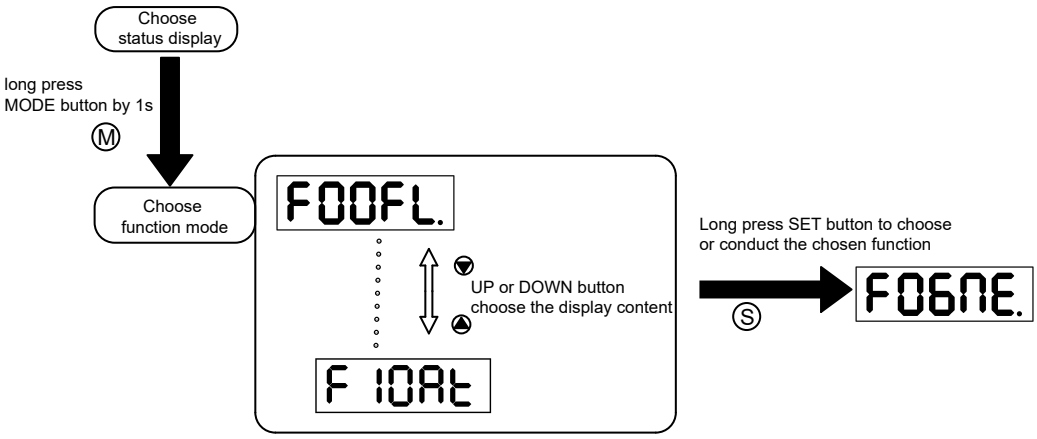
NOTE:

Closed: The digital input/ output circuit of the drive forms a loop and the current flows in or out from the input/ output pin. The drive has an input/ output signal.

Open: The drive digital input/ output circuit does not form a loop. No current flows in or out of the input/ output pin and the drive has no input/ output signal.

5.5 Function Mode Control

In function mode (display F+ parameter number), you can select functions for preoperational mode, restart the drive, enable or disable the drive and so on. In status monitoring mode, press and hold M for 1 second will enter function control mode. Press ▲ ▼ to select function, and then press and hold S to confirm or execute the function. **(NOTE: F-00(FL) and F-01(CJ) excepted)**

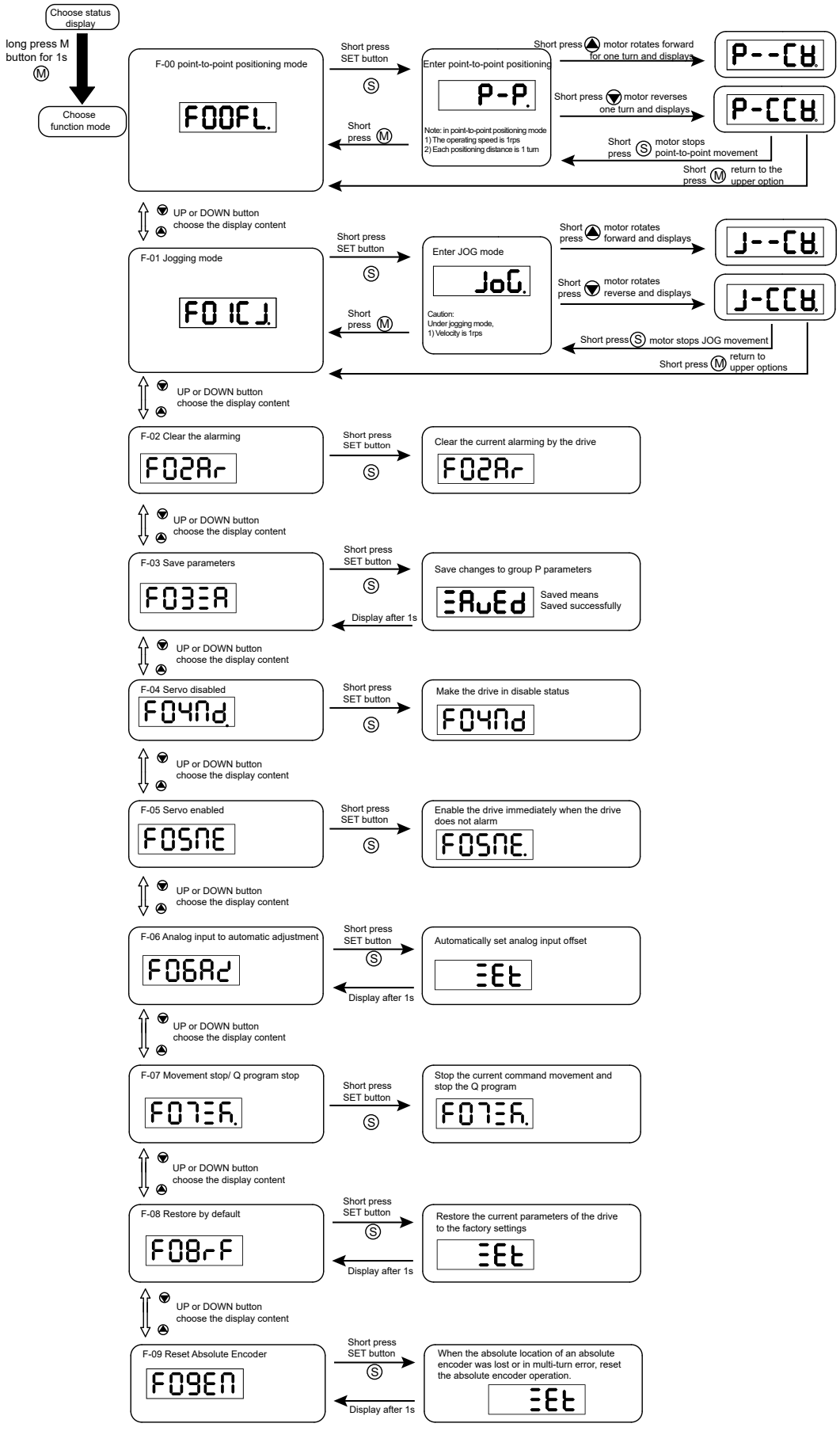


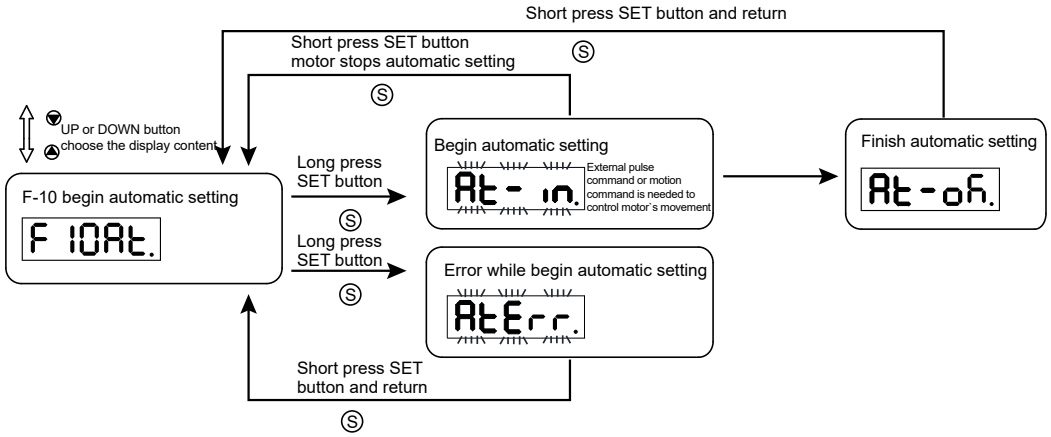
5.5.1 Function Mode Description

Function mode details are as follows:

Function Mode Number	LED Display	Description
F00	F00FL	point to point position mode: rotating speed is 1rps; travel distance is 1rev
F01	F01CJ	JOG mode:JOG speed 1rps
F02	F02Ar	(F02AR) ---- Clear drive's current alarm
F03	F03SA	(F03SA) ---- Save parameter changes for P
F04	F04Md	(F04MD) ---- Drive disable
F05	F05ME	(F05ME) ---- Drive enable
F06	F06Az	(F06AZ) ---- Analog auto tunning
F07	F07SK	(F07SK) ---- Motion stop or Q stop
F08	F08rF	(F08RF) ---- Restore drive parameter to default setting value
F09	F09EN	(F09EM) ---- Reset absolute encoder
F10	F 10AT	(F10AT) ---- Start automatic setting

5.5.2 Operation Flow Chart



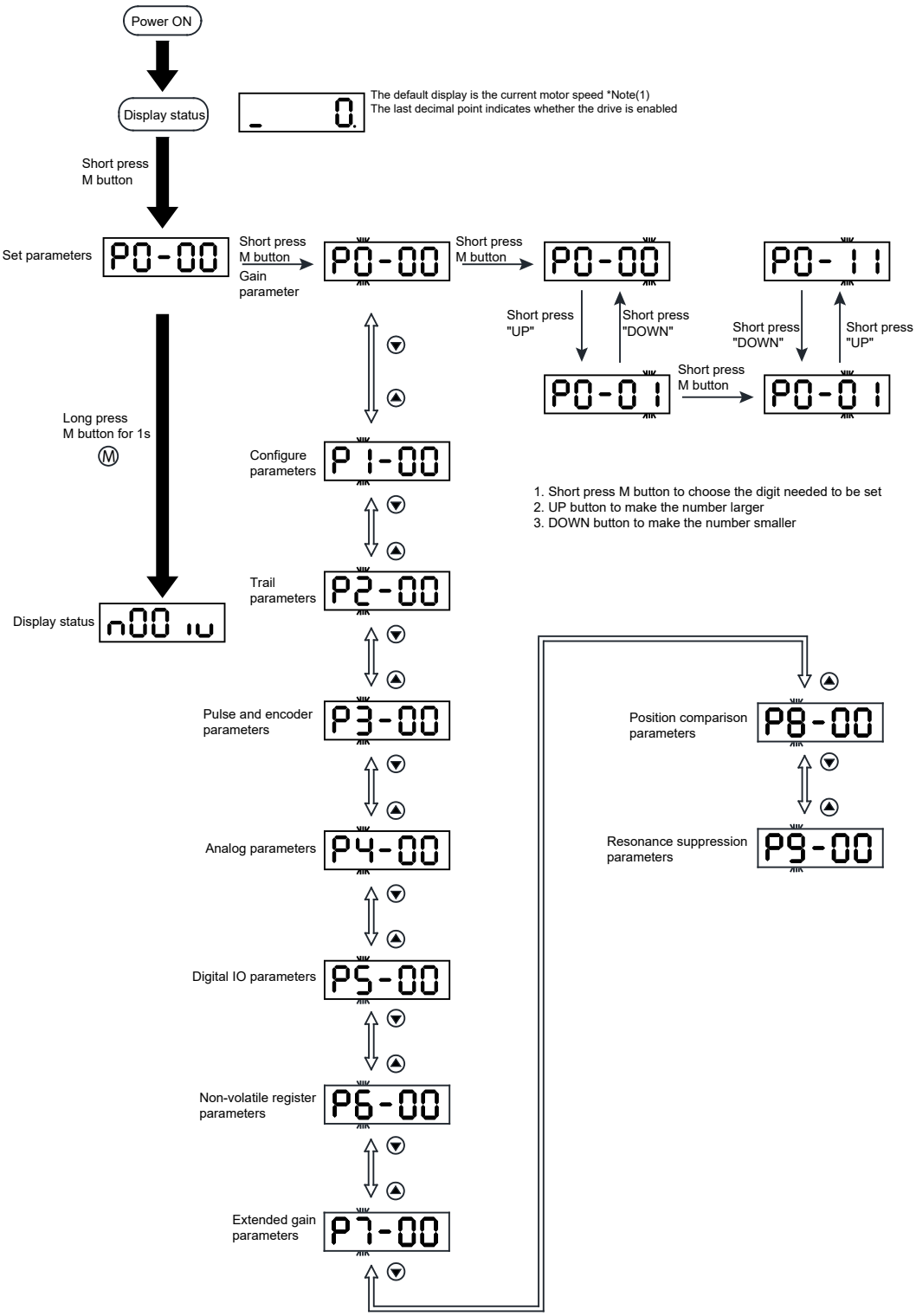

Short press SET button and return
Short press SET button
motor stops automatic setting
UP or DOWN button
choose the display content
F-10 begin automatic setting
F 10At.
Long press
SET button
Long press
SET button
Begin automatic setting
At- in.
External pulse
command or motion
command is needed to
control motor's movement
Error while begin automatic setting
AtErr.
Finish automatic setting
At-oh.
Short press SET
button and return

5.6 Parameter Setting Mode

5.6.1 Parameter Setting Method

In this mode, users can modify the parameters to be set and display them with P+ parameter number。

1) Short press "M" button to choose the digit needed to be set
2) Short press "UP" to make the number larger
3) Short press "DOWN" to make the number smaller



5.6.2 Revision and Saving Parameters

A. Revise parameters

1) Short press "M" button to make move to higher-digit and choose the digit needed to be set

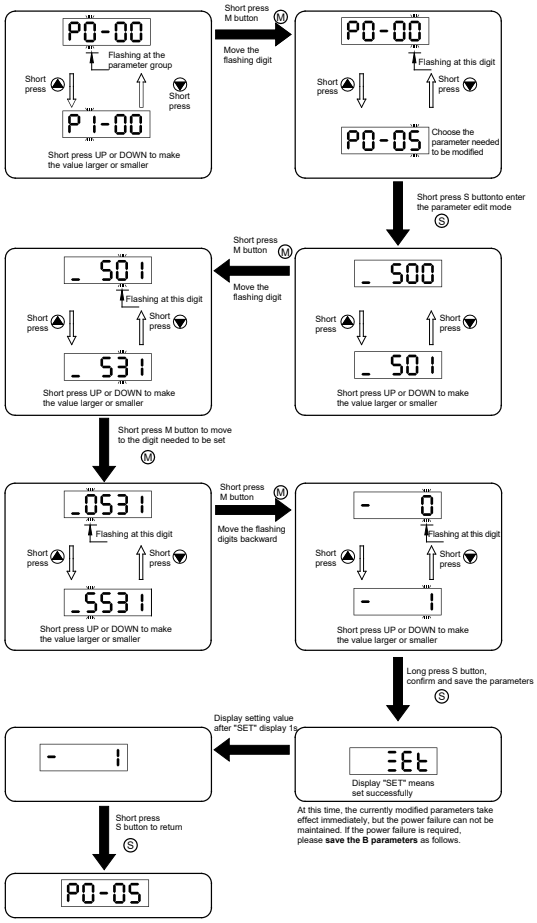
2) Long press "M" button to make move to lower-digit and choose the digit needed to be set

3) Short press "UP" button to make the number bigger

4) Short press "DOWN" button to make the number smaller

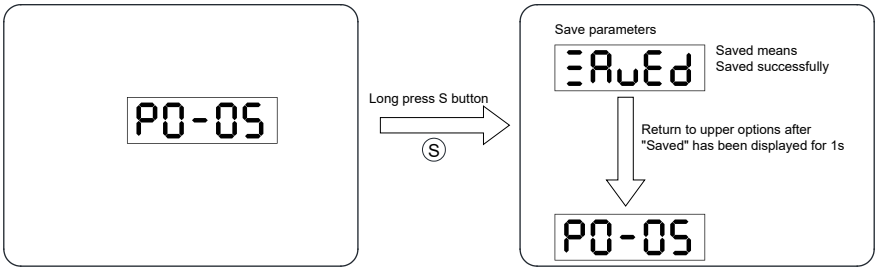
5) Long press "S" button to confirm modify the parameters

Set example: modify the content parameter P0-05 to "15531"



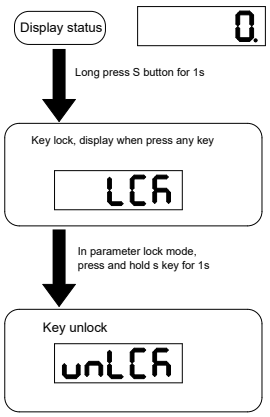
B. Save parameters

After the parameters have been modified successfully, it takes immediate effect (except for some parameters that need to be powered off to take effect). However, it will not be powered off, that is, after the next power on, it will restore to previously saved values. To maintain power-off, please do the following.



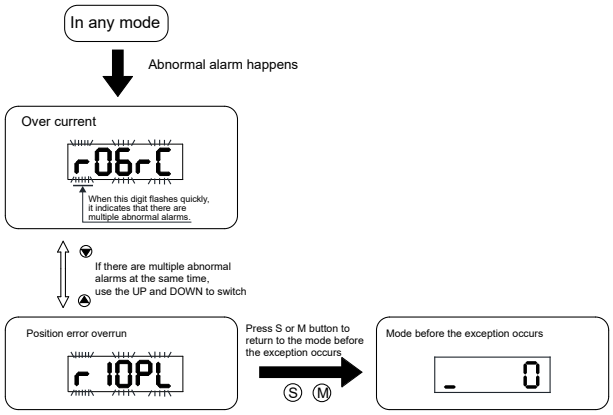
5.7 Control Panel Lock

In order to prevent misoperation by personnel unfamiliar with the drive, M56S Ether CAT series AC servo drive provides key lock function. When the button has been locked, man can not operate or modify parameters.



5.8 Warning and Fault Display

In any case, once the drive generates the following alarms, it will enter the abnormal alarm display mode. If multiple abnormal alarms are generated at the same time, you can press ▲ ▼ page turning to view. Short press M to S return to the mode before the abnormal alarm.



Alarm display codes are as follows

LED Display	Description	Alarm Type	Drive Status after Alarm Occurs
r0 IoE	Drive over temperature	Fault	Servo off
r02ur	Internal voltage fault	Fault	Servo off
r03uH	Over voltage	Fault	Servo off
r04HC	Over current	Fault	Servo off
r05LC		Fault	Servo off
r06rC		Fault	Servo off
r07Fb	FPGA Error	Fault	Servo off
r09Eb	Motor encoder not connected	Fault	Servo off

LED Display	Description	Alarm Type	Drive Status after Alarm Occurs
r 10PL	Position error	Fault	Servo off
r 11Lu	Low voltage	Fault	Servo off
r 12ou	Velocity limited	Fault	Servo off
r 13Lt	CW limit or CCW limit activated	Warning	No change to drive's status
r 14cL	CW limit is activated	Warning	The motor cannot continue to reverse without changing the current state
r 15JL	CCW limit is activated	Warning	The motor cannot continue to rotate forward without changing the current state
r 16CL	Drive overload	Warning	No change to drive's status
r 17CE	USB Communication error	Warning	No change to drive's status
r 18EF	Parameter save failed	Fault	Servo off
r 19LP	Drive main circuit power input phase loss	Warning	No change to drive's status
r20to	STO is activated	Fault	Servo off
r21rF	Regeneration failed	Warning	No change to drive's status
r22uH	Low voltage	Warning	No change to drive's status
r239E	Q program is empty	Warning	No change to drive's status
r24dd	Move when the drive is disabled	Warning	No change to drive's status
r25ur	Drive internal voltage error	Fault	Servo off
r26ur		Fault	Servo off
r27E=	Emergency stop	Fault	Servo off
r28FP	Full closed-loop position error overrun	Fault	Servo off
r29FE	Second encoder signal error	Fault	Servo off
r30nE	Storage error	Fault	Servo off
r31bt	Absolute encoder battery low voltage	Warning	No change to drive's status
r32AP	Missing absolute position	Warning	No change to drive's status
r33oP	Absolute position overflow	Warning	No change to drive's status
r34nt	Over temperature	Fault	Servo off
r35Ct	Drive processor over temperature	Fault	Servo off
r36Ar	Absolute encoder battery low voltage	Fault	Servo off
r37Et	Motor stall	Fault	Servo off
r38CE	EtherNet/IP Communication error	Fault	Servo off
r39Hr	Origin regression parameter configuration error	Warning	No change to drive's status
r40H1	Motor Collision Alarm	Fault	Servo off
r41Er	Motor Encoder Communication Error	Fault	Servo off

LED Display	Description	Alarm Type	Drive Status after Alarm Occurs
r42 10	I/O Signal Function Conflict Alarm	Warning	No change to drive's status
r44CU	Modbus TCP communication watchdog is triggered	Fault	Servo off
r45ro	Motor runaway detected	Fault	Servo off
r46GA	Gantry synchronization not enabled on both paired axes	Fault	Servo off
r47Gd	Gantry paired axis error	Fault	Servo off
r48Gn	Gantry paired axis warning	Warning	No change to drive's status
r49GL	Gantry paired axis disconnected	Fault	Servo off
r50GN	Gantry not operating in position mode	Warning	No change to drive's status
r5 1GP	Gantry control signal sync failed	Fault	Servo off
r52Gb	Gantry alignment failed	Warning	No change to drive's status
r53GE	Gantry axes not enabled/disabled simultaneously	Fault	Servo off
r54GC	Gantry communication timeout	Fault	Servo off
r55GF	Gantry communication CRC error	Fault	Servo off
r56Gr	Gantry communication CRC warning	Warning	No change to drive's status
r57G=	Gantry position deviation overrun	Fault	Servo off
r58Gt	Gantry torque deviation overrun	Warning	No change to drive's status
r59GH	Homing mode not supported in gantry mode	Warning	No change to drive's status
r60GU	Function not supported in gantry mode	Warning	No change to drive's status
r6 1GH	Gantry homing failed	Warning	No change to drive's status

6 Trial Run

6.1 Inspection Before Trial Run

In order to ensure the safety of the servo drive and mechanical structure, it is strongly recommended to check the following items before powering on the drive.

1) Wiring inspection

Please ensure secure wirings for power connector P1, motor connector P2, Encoder connector CN3, communication connector CN1. Ensure wirings connection, and wires are correctly insulated (not short circuit) for all connectors. Ensure ground wire from power connector

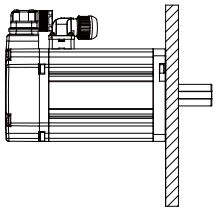
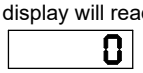
2) Power supply voltage check

Check and ensure voltage supplies between L1/L2/L3 or R/S/T, meets drive's power supply specifications.
Check and ensure voltage between L1C/L2C is within the correct supply voltage range.

3) Make sure the motor is installed securely

4) Make sure the motor shaft is not loaded

6.2 Trail Run Procedure

Step	Details	Description
1	Install the motor securely. 	- The motor can be installed on the machine. - Ensure no load is installed on the servo motor.
2	Make sure the wiring between the drive and motor is correct.	- The terminals on connector P2 must be connected in the order of U - Red, V - Yellow, U - Blue, FG - Yellow/Green. If the terminals are not connected to the specified wire, the drive will not be able to control the motor. - Ensure the encoder cable is connected to CN3 correctly.
3	Confirm that the drive power circuit is connected correctly	Refer to 4.3 external main circuit wiring selection to confirm whether the power input circuit is correct
4	Before using the motor with electromagnetic brake, electromagnetic braking control circuit shall be set	Refer to 4.7 connection method of motor with electromagnetic brake
5	Supply power	DO NOT apply more than 380VAC power supply to the servo system.
6	If there are no alarms the LED display will read:  If an alarm occurs, it will display: 	- When the power is on, the normal display should be shown without any alarm codes and the drive is disabled. - If the display shows alarm codes such as r-09 the encoder feedback connection is incorrect. Check the encoder wiring to the servo motor to see if it is loose or incorrect. - See Section 5.8 for a list of alarm codes.
7	JOG trial run without load	The system is ready to run JOG trial if all the above steps are completed.

6.3 Jog Operation

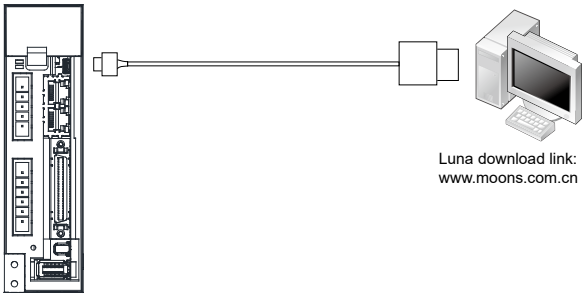
Step	LED display	Description
1	F00FL	Press M into the Function Parameters mode at the Monitor Status mode
2	F05nE	Press the ▲ and ▼ key to select F05ME
3	F05nE.	Press the S key, The last decimal digit lights up, indicating that the servo is enabled
4	F01CJ.	Use ▲、▼ key, Select F01CJ Jog function
5	JoG.	Short press S key, Enter JOG mode
6	J--CW.	Short press ▲ key, The motor rotates forward at 1 revolution per second
7	or J-CCW.	or Short press ▼ key, The motor reverses at 1 revolution per second
8	JoG.	Short press S key, The motor will be stop
9	F01CJ.	Short press M key, Return to function operation mode
10	F04Md	Select F04MD, Press S key 1S, The motor will be disabled

6.4 Configuration by Personal Computer

In order to ensure servo drive and motor meet your operation requirements, we strongly recommend customers to use "Luna Software" for following configuration setups:

1. Configure encoder usage mode
2. Define drive's input/output mode
3. Apply auto tuning function on PID parameters for optimized motor performance

■ Connection method



Please refer to the software user manual for the detail.

7 Appendix 1: LED Character Reference

									
1	2	3	4	5	6	7	8	9	10
									
A	B	C	D	E	F	G	H	I	J
									
K	L	M	N	O	P	Q	R	S	T
									
U	V	W	X	Y	Z				

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