

M5

4S

AC SERVO SYSTEM



M5 4S SERIES

General AC Servo System

Drive Specification		Motor Specification	
Supply Voltage	Rated Current (Arms)	Frame Size (mm)	Rated Power
220VAC	3, 4.5, 6	40, 60, 80, 100,130	50W~ 1000W



Application

M5 Servo System is widely used in solar processing equipment, battery processing equipment, semiconductor equipment, medical equipment, industrial robots, custom equipment etc.



Standard



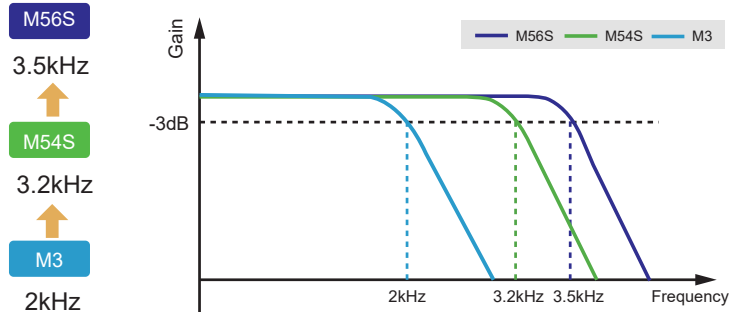
Contents

Features.....	4
Drive Numbering Information.....	14
Drive Overview.....	14
Motor Numbering Information.....	16
Servo Drive and Motor Matching List.....	17
Drive Specification.....	18
Motor Specification.....	22
40mm Frame Low Inertia.....	22
40mm Frame High Inertia.....	23
60mm Frame Low Inertia.....	24
60mm Frame High Inertia.....	25
80mm Frame Low Inertia.....	26
80mm Frame High Inertia.....	27
100mm Frame Low Inertia.....	28
130mm Frame Medium Inertia.....	29
130mm Frame High Inertia.....	29
Accessories.....	30

Superior Performance

High Response Frequency

Based on advanced motion control algorithms, the velocity loop bandwidth is up to 3.2kHz, faster instruction tracking and shorter positioning time.

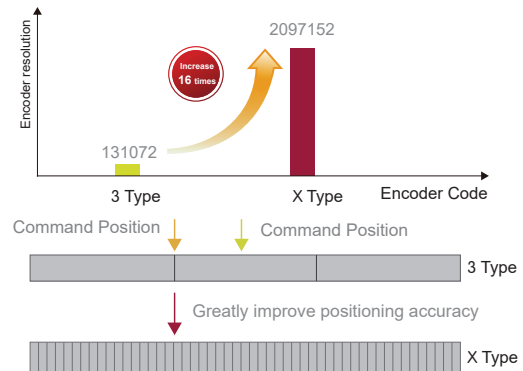


High Precision Positioning

The low cogging torque motor is equipped with high-resolution absolute encoder and built-in high-precision position compensation algorithm, which makes the servo system run more smoothly and with higher accuracy, and significantly improves the positioning accuracy of the equipment.

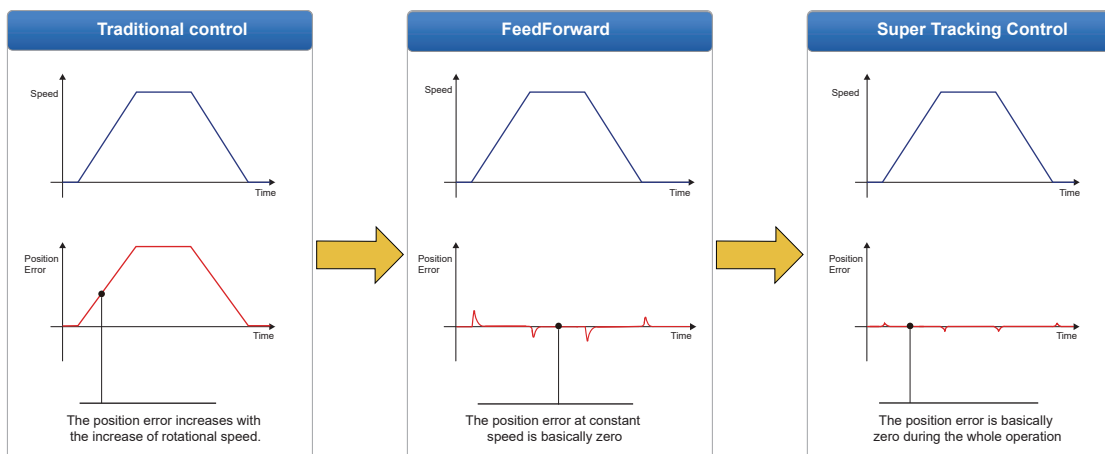
21-bit Absolute Multi-turn Magnetic Encoder

- ◆ High resolution, up to 2,097,152 divisions pre revolution
- ◆ Optional battery backup for 16-bit multi-turn
- ◆ Strong vibration resistance
- ◆ Resistant to dust and oil stains
- ◆ Anti condensation



Super Tracking

Using the super tracking control function, the motor not only runs at a constant speed, the following error is basically zero, and the following error is also close to zero during acceleration and deceleration, improving the trajectory accuracy of high-rigidity equipment.



Easy Set-up

For M54S servo system, our commitment is to improve your work efficiency on every step of the way, from system installation, tuning and maintenance.

Unpacking

Wiring

Tuning

Commissioning

Easy wiring

- Spring type I/O and power connector
- Plug-in type IP67 protection level connector

Easy tuning

- High speed USB communication between Luna software and drive
- The drive automatically recognizes motors with smart encoder
- Both auto-tuning and tuning-less adjustment function are available
- Stable and smooth operation without complicated gain setting

Friendly software

• Operating Status Monitor

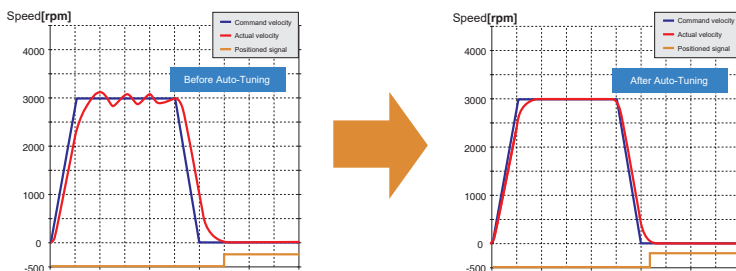
• Real-time Oscilloscope Interface

Easy Tuning

● Auto-tuning

The real-time auto-tuning algorithm can automatically identify the load inertia (ratio), gain and vibration suppression parameters in real time. The auto-tuning function can greatly shorten your system tuning time, improve system responsiveness and equipment production efficiency.

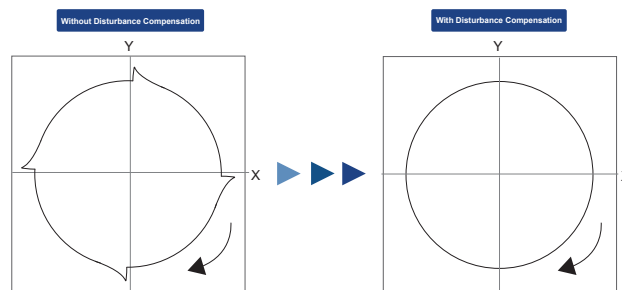
- ◆ No limitation towards any load type and drive control mode.
- ◆ High robustness for maximum control of servo system stability.



● External Disturbance Compensation

The external disturbance compensation can effectively suppress the phenomenon of overquadrant bulge caused by the different friction of the mechanism and the influence of load change, and improve the track accuracy in multi-axis synchronous control.

For example, the accuracy of arc trajectory in the interpolation control of XY mechanism can be improved.

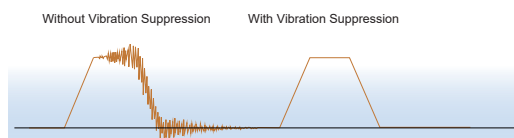


Quadrant protrusion phenomenon in simulating arc trajectories

● Notch Filters

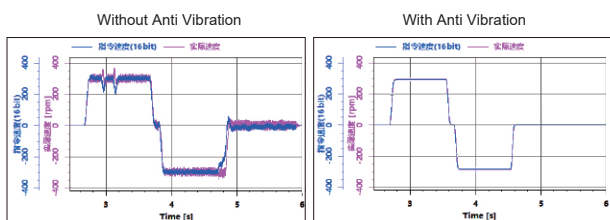
M54S series supply there are 4 notch filters available for suppress mechanical vibration. Filtering frequency range is 100 ~ 4000Hz.

- ◆ 2 sets of automatically set notch filters can search and set resonance frequency automatically.
- ◆ 2 sets of manual notch filters for more adjust options.



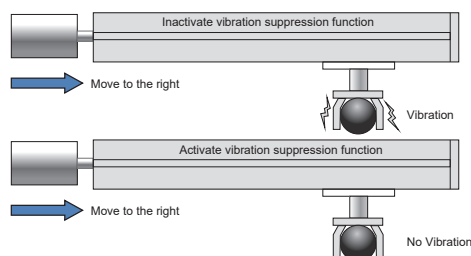
● Novel Resonance Suppression

The new resonance suppression function of the M54S series products can effectively suppress the low-frequency vibration caused by the resonance of 100 ~ 1000Hz.



● Mechanical End Vibration Suppression

Vibration at the end of the machine will lead to longer system setting time, resulting in the decrease of product precision or production efficiency. M54S servo can suppress vibrations at the end of the machine, shortening tuning time, increasing the system precision and productivity.



Reliable operation

Dynamic Brake

Dynamic brake is a mechanism that stops the motor with the fastest speed by shorting the motor three-phase in case of an emergency, the intention is to protect the safety of equipment and surrounding.

Without Dynamic brake	With Dynamic brake
<p>Without Dynamic brake The drive will disable, decelerate and free stop uncontrollable while a fault occurs. The deceleration time and distance are determined by the system inertia and friction.</p>	<p>Dynamic brake is in effect The velocity command is set to 0 as soon as the drive is disabled. The actual velocity ramps down immediately as the braking applies.</p>

Built-in Regenerative Absorbing Resistor

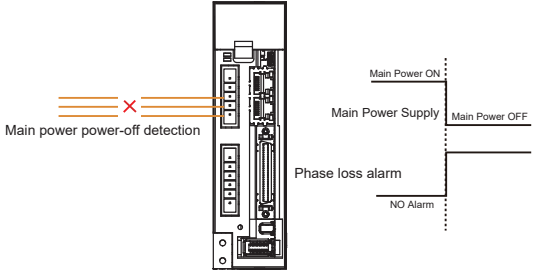
750W and 1000W drives have built-in regenerative absorbing resistor, it can consume the regenerative energy generated when the motor and load decelerate rapidly, make sure the servo system can stop quickly and operate reliably.

No additional absorbing resistor is required for most applications.



Main Power Power-off & Phase Loss Detection

The power source is monitored during the operation process, it detects whether the main power power-off or phase loss, and provides faster protection measures for the servo system that fail caused by sudden power failure.



New Motor Features

● Various Product Lineup

- ◆ Power Rating: 50W ~ 1000W
- ◆ Frame Size: 40/60/80/100/130mm
- ◆ Low / Medium / High Inertia Servo Motor



● Low, Medium, High Inertia Servo Motor

The SM3 series of servo motors with the same power provide a variety of moment of inertia options, choosing the right motor is conducive to optimizing the inertia ratio of load to motor and improving mechanical performance.

Low inertia motor	Medium inertia motor	High inertia motor
Suitable for most of applications <ul style="list-style-type: none"> ◆ Low inertia load ◆ High acceleration and deceleration ◆ Quick and frequent starting and stopping 	Suitable for applications with low mechanical stiffness <ul style="list-style-type: none"> ◆ Belt and synchronous belt load ◆ Large inertia load ◆ Stability improvement during high-speed operation 	Suitable for large inertia load <ul style="list-style-type: none"> ◆ Large inertia belt load ◆ Low speed and high torque ◆ Turntable with a large moment of inertia

● Smaller Size and Higher Efficiency

The servo motor adopts a new structure and magnetic circuit design, making the motor smaller and higher power density; At the same time, the electromagnetic scheme is optimized to improve the efficiency of the servo motor and reduce the heating.



● IP67 Protection Level

The SM3 series servo motors meets the IP67 protection level , are designed to protect against water and dust (Except transfixion part of shaft).

If the transfixion part of shaft needs to meet the IP67 protection level, please install the oil seal or select the servo motor model with oil seal.



Note: The installation of oil seal will bring extra torque loss. With oil seal, It is recommended to reduce the rating of motors with oil seals by 10%.

Various of Control Mode

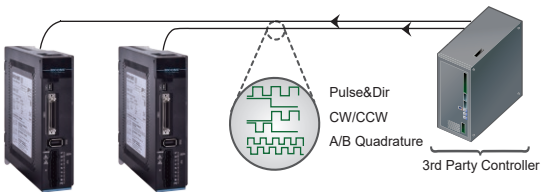
Digital Pulse Position Modes

Support STEP/DIR, CW/CCW pulse and A/B quadrature pulse.

Low-speed Open Collector Pulse Input: 500kHz, 24VDC

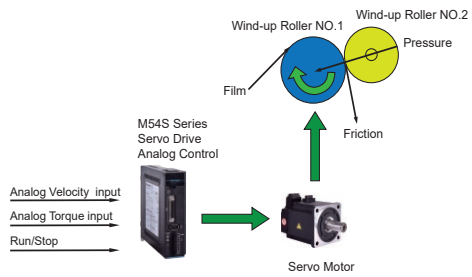
Low-speed Differential Input: 500kHz, 5VDC

High-speed Differential Input: 4MHz, 5VDC



Analog Input / Output Control Modes

M54S Series RS485 Type Certain models have -10V ~ +10V two analog inputs can be used for analog velocity and analog torque control.



Built-in Software PLC — Q Program

Q Programmer is MOONS' own single-axis motion control software based on SCL commands. It can be used to create sophisticated and functional programs that can be saved to a drive's nonvolatile memory, and then run stand-alone, or without a permanent connection to the host. Q drives offer a high level of flexibility and functionality to the machine designer and system integrator.

Features:

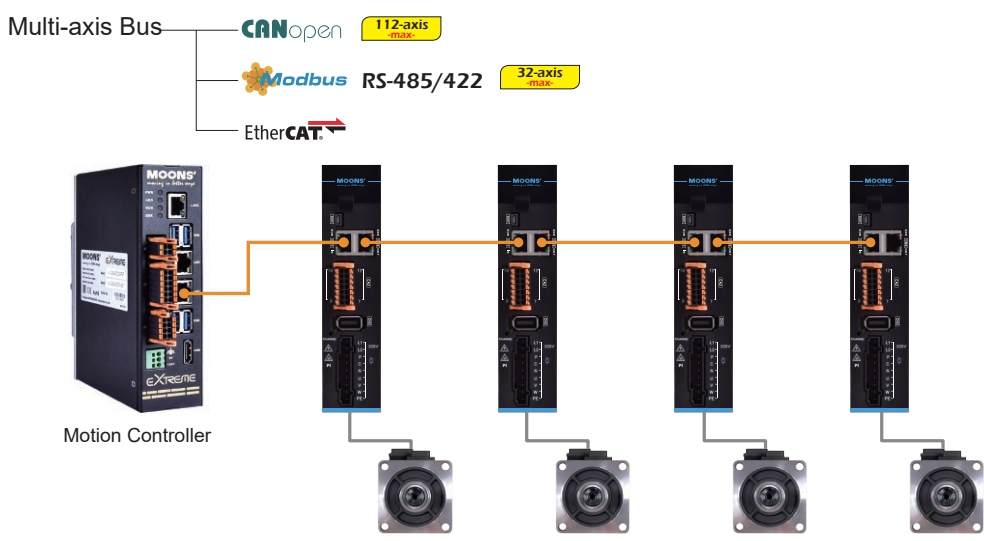
- Motion control commands (relative position, absolute position, homing mode, etc.)
- Multi-tasking
- Conditional Processing (external I/O, internal command)
- Math Calculation (+, -, *, /, &, or)
- Data register manipulation
- Logic motion commands (loop, call functions)

Line	Label	Cmd	Param1	Param2	Comment
1		MT	1		Turn ON Multi-Tasking
2		DL	3		Turn OFF limits
3		PF	2000		Set Position Fault limit
4		CC	2		Set continuous current to 50%
5		CP	2		Also set peak current to same
6		DI	4000		Make distance positive for CW
7		JM	1		Set Jog mode to positioning
8		JS	1		Set Jog speed to 1 rev/sec
9		JA	10		Set Jog accel to 10 rev/sec/sec
10		CJ			Start jogging
11	Label2	TR	x	100	Test Reg "x" against 100
12		QJ	G	#Label1	Jump if greater than
13		TR	x	-100	Test Reg "x" against -100
14		QJ	G	#Label2	Jump if greater than
15	Label1	SM	M		Stop move with max accel (AM)
16		WM			Wait for stop to complete
17		EP	0		Set encoder position to zero
18		VE	1		Set Velocity to 1 rev/sec
19		DI	-8000		Set home offset distance (CCW)
20		FL			Do a Relative move
21		WM			Wait for move to complete
22		SP	0		Set absolute position to zero
23		AX			Clear any faults just in case
24		WT	0.1		Wait 0.1 seconds
25		ME			Enable servo drive
26		CC	2.5		Set current to normal
27		CP	5		Set peak current to normal
28		MT	0		Disable Multi-Tasking
29		QX	3		Jump to Program 2

Field Bus Control

M54S servo system support various of industrial field bus options such as EtherCAT, CANopen, Modbus/RTU, Modbus/TCP, EtherNet/IP and Profinet.

EtherCAT® is a registered trademark, licensed by Beckhoff Automation GmbH.



Various of Field Bus

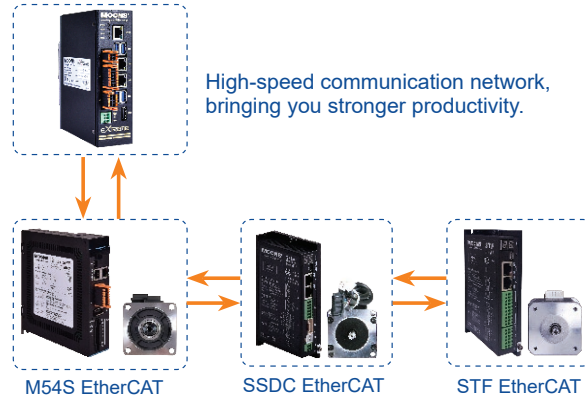
● EtherCAT



□ High Speed, High Efficient

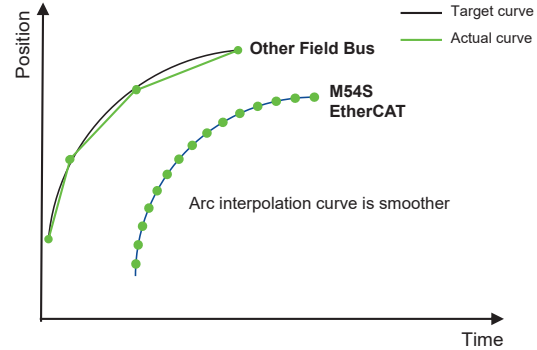
Full duplex, communication baud rate 100Mbps Support CoE(CiA 402 protocol), VoE (Vendor over EtherCAT) Support PP, PV, TQ, CSP, CSV, CST, HM mode, Full closed-loop mode

Combine with MOONS' EtherCAT stepper series product, we can meet all your motion demands.



□ High Performance

The synchronous cycle of M54S series EtherCAT products is up to 0.5ms, which technically makes the position command subdivision smaller, and the equipment movement smoother.



● CANopen



Standard CAN bus interface is available in M56S series servo drives, which makes it easy to get integrated to the industrial field bus.

Features	Specification
Physical Layer Standard	CiA 303-1 Cabling and connector pin assignment
Communication Protocol	CiA 301 Application Layer and Communication Profile CiA 402 Device Profile Drives and Motion Control
Bus Connector	RJ45
Communication Rate	12.5Kbps, 20Kbps, 50Kbps, 125Kbps, 250Kbps, 500Kbps, 800Kbps, 1Mbps
Message Type	SDO, PDO, SYNC, EMCY, NMT, Heartbeat
Control Mode	Profile Position, Profile Velocity, Profile Torque, Homing Mode, Q Program
PDO Data	4 RxPDOs, 4 TxPDOs
Support Axis	Up to 112 axis

● Modbus



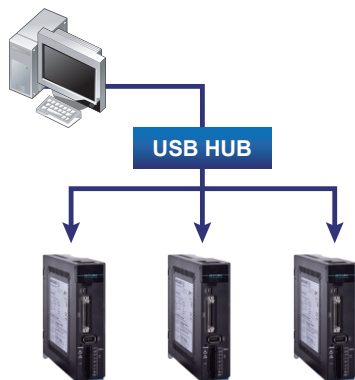
M54S series servo drive supports Modbus/RTU communication protocol which is based on RS-485. Through Modbus protocol, it provides an easy motion control platform for modifying drive parameters, and monitor the status of the servo drive.

Features	Specification
Physical Layer Standard	RS-485
Communication Protocol	Modbus/RTU
Bus Connector	RJ45
Communication Rate	RS-485: 9600bps, 19200bps, 38400bps, 57600bps, 115200bps
Control Mode	Position Mode, Velocity Mode, Torque Mode, Homing Mode, Q Program
Support Axis	Up to 32 axes

Friendly Software

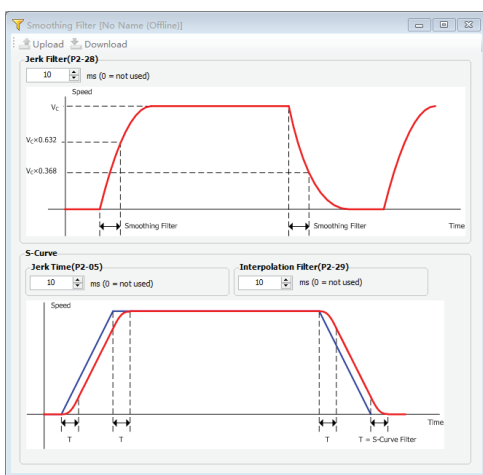
● USB Multi-axis Tuning

Based on USB communication, it can realize multi-axis tuning, simple and convenient.



● Graphical Setting Interface

The setting interface adopts a simple and clear graphical interface, which can intuitively set the required functions.

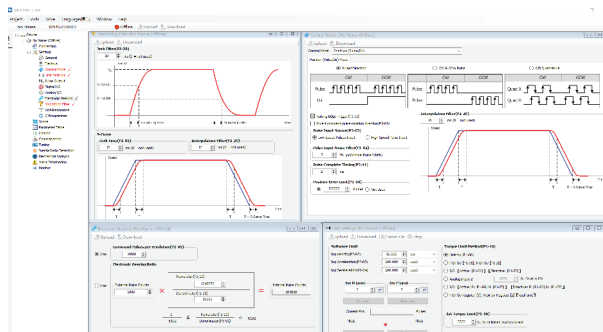


● Powerful Oscilloscope Function

- Real-time data curve display
- Up to 4 channels with 16bit data per channel and 8kHz sampling rate
- Up to 2 channels with 32bit data per channel and 8kHz sampling rate
- In the selected cursor area, display the maximum value, minimum value, root mean square, etc.
- Customizing trigger conditions
- Monitoring the operation status of the drive and the digital inputs and outputs

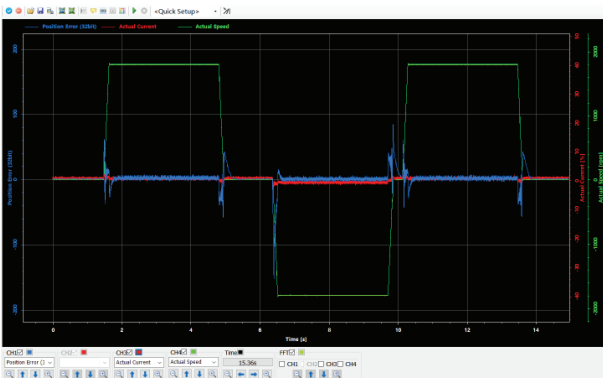
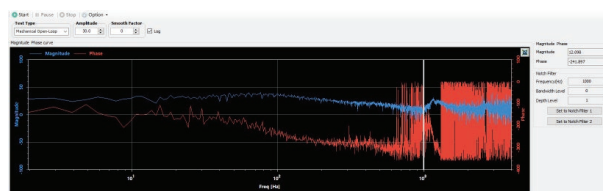
● Tree Structure

Newly designed tree-structure software, multi-window display, clear function classification.



● Mechanical Analysis

Quickly diagnose the frequency characteristics of mechanical equipment and draw a Bode diagram. It can be used to detect the resonance point and frequency response characteristics of the machine, and quickly set the notch filter.



General Specifications

Safety Certification

M54 series products are designed to meet the following standards.



		Drive	Motor
Europe	EMC	EN 61800-3	EN 60034-1
			EN 61000-6-2
			EN 61000-6-4
	LVD	EN 61800-5-1	EN 60034-1
UL Standard		UL 61800-5-1	UL 1004-1
			UL 1004-6
CSA Standard		C22.2 No.274.13	CSA C22.2 No.100

Motor General Specifications

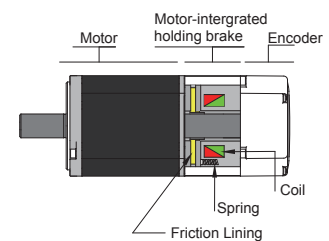
Insulation class	Class F (155°C)	Ambient temperature	Working temperature: 0°C ~ 40°C Storage temperature: -20°C ~ 60°C
Protection level	IP67 (Except transfixion part of shaft)	Humidity	Storage and usage: 20 ~ 85%RH (no condensation)
Installation conditions	indoor installation, avoiding direct sunlight, corrosive and flammable gas	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)		

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.

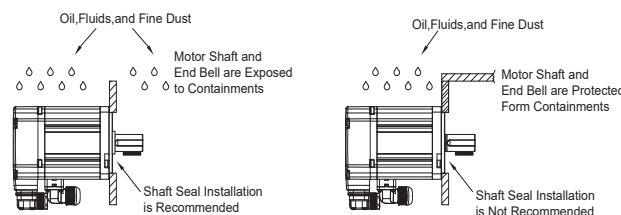
When the brake is powered on, the armature is adsorbed, the brake pad is released, and the motor can operate normally. When the brake is powered off, the armature is released, the brake pad is locked, and the motor can't rotate normally.

Frame	40mm	60mm	80mm	100mm	130mm
Static Friction Torque (Nm)	0.32	1.5	3.2	8.0	18.5
Rated Voltage (VDC)	24				
Power Waste (W @ 20°C)	6.3	7.2	9.6	14.4	24.3
Current (A)	0.26	0.3	0.4	0.6	1.05
Braking Time	< 70ms (Standard air gap,at 20°C)				
Release Time	<25ms				
Release Voltage	18.5VDC max.(at 20°C)				



Shaft Seal

Industrial oil seals can block contaminants (oils, impurities) to extend the life of the motor. The oil seal will produce a certain resistance to the motor shaft, about 10% torque will be lost.



More Functions

Position / Velocity / Torque Control
<p>Support position control, velocity control and torque control.</p> <ul style="list-style-type: none"> Position control supports pulse, internal position or communication command for positioning. Velocity control supports analog, internal multi-segments velocity or communication commands. Torque control supports analog, internal torque or communication commands.
Control Mode Switching
<p>Position control, speed control, and torque control can be switched using an external digital input. The P and R types of drive can switch between 2 control modes.</p>
Gain Switching Function
<p>The gain during operation and stop can be automatically switched under certain conditions. Or freely switch between the two sets of gains via digital input.</p>
Internal Multi-segment Velocity Function
<p>Velocity control is possible with digital inputs. 8 segments of velocity can be saved in the drive, and the corresponding internal velocity control commands can be selected via digital inputs.</p>
Pulse Input Inhibit Function
<p>When the pulse inhibit input signal is valid, the drive ignores the external pulse command and the motor decelerates to stop.</p>
Internal Software Position Limit
<p>In absolute value systems, the software position limit can be set to protect the device without the external limit sensor.</p>

Configurable Input and Output
<ul style="list-style-type: none"> The input functions can be assigned to any of the digital input by parameters. The output functions can be assigned to any of the digital output by parameters.
Encoder Feedback Output
<ul style="list-style-type: none"> The motor encoder feedback and the second encoder feedback are output in A/B/Z pulse mode, and the pulse division output is supported. Support for pulse command By-pass output.
Analog Input
<p>Support 2 analog voltage inputs for analog velocity control and torque control.</p>
Analog Monitor output
<p>2 analog output, real-time voltage output the command or actual speed, command or actual torque, or the actual position error of the motor.</p>
Zero Speed Clamp Function
<p>In the velocity control mode, when the zero speed clamp signal is valid, when the actual speed is less than the zero speed threshold value, the servo motor enters the zero position lock state. At this time, the internal position loop of the drive is activated, and even if the external force rotates the motor, it also returns to the clamping position.</p>
Stop Mode Setting
<p>When the drive servo off or fault, the stop type(free run, reduce speed, dynamic brake) and the status after stopping can be selected.</p>
Moving Command Smoothing Filter
<p>The command smoothing function filters the position command and the speed command, which makes the servo motor run smoother even if the command is abrupt.</p>

● Numbering System for Servo Drive

M54S - 2 3A0 R D - ***




- ① M54S Series
- ② Supply Voltage
2 --- Single220VAC
- ④ Function Type
- ⑤ Model Type
- ⑥ Customization

③ Current

Supply Voltage	Current	Rated Current A(rms)	Peak CurrentA(rms)	Rated Power
2	3A0	3	12	400W
	4A5	4.5	15	750W
	6A0*1	6	21	1000W

*1: It will be released in the first quarter of 2024.

● Servo Drive Table

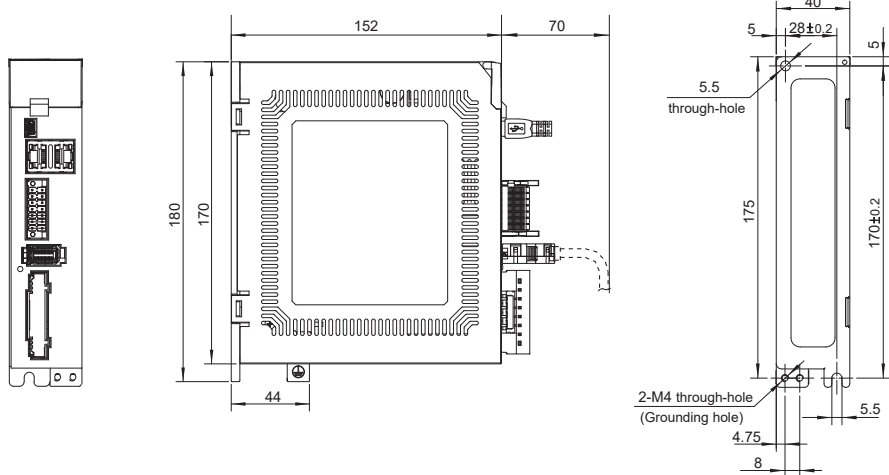
Function Type		-R—RS-485 Type	-EC—EtherCAT Type	-C—CANopen Type*2
				
Model Type		D	N	N
Control Mode	Position Mode	●	●	●
	Velocity Mode	●	●	●
	Torque Mode	●	●	●
	Q Program	●	●	●
Interface	5V Pulse Inputs	●		
	24V Pulse Inputs	●		
	1 Analog Inputs		●	●
	2 Analog outputs	●		
	10 inputs/6 outputs (Digital)	●		
	6 inputs/3 outputs (Digital)		●	●
	Encoder Feedback Output	●		
Comm Port	USB (Configuration)	●	●	●
	RS-485	●		
	EtherCAT		●	
	CANopen			●
Safety Function	Dynamic Brake	●	●	●
	STO*3			

*2: CANopen Model Under developing

*3: Reserve STO interface. If you need this function, please contact sales personnel.

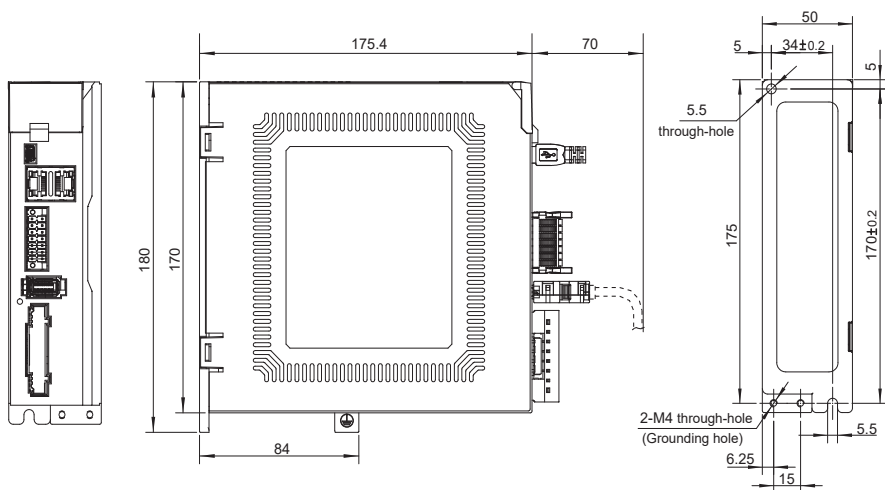
● Drive Mechanical Dimensions (Unit: mm)

□ M54S-23A0 ■◆ (400W Type)



□ M54S-24A5 ■◆ (750W Type)

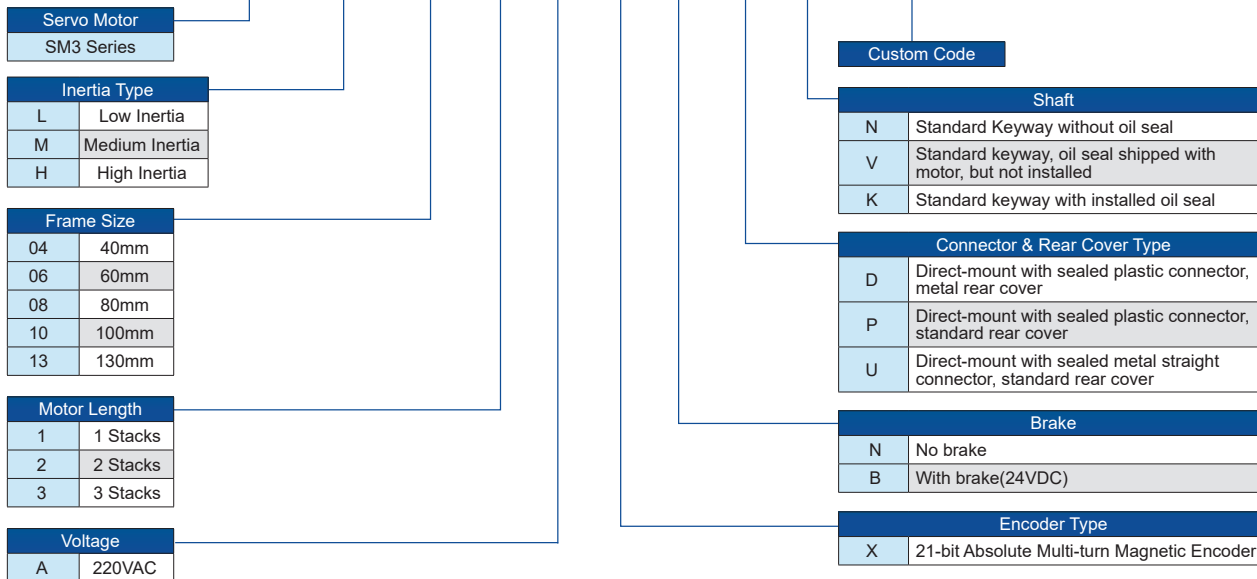
□ M54S-26A0 ■◆ (1000W Type)



■: Function Type ◆: Model Type

● Numbering System for SM3 Servo Motor

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



● Motor Products Table

	Low Inertia		Medium Inertia		High Inertia	
Rated Power	Frame Size	Rated Speed (Max.Speed)	Frame Size	Rated Speed (Max. Speed)	Frame Size	Rated Speed (Max. Speed)
W	mm	rpm	mm	rpm	mm	rpm
50					40	3000 (6000)
100	40	3000 (6000)			40	
200	60				60	
400	60				60	
750	80				80	
850						130
1000	80					1500 (3000)
1000	100		130	2000 (3000)		

Drive and Motor Table

Frame Size (mm)	Inertia Type	Rated Power (watts)	Rated Torque (N·m)	Peak Torque (N·m)	Rated Speed (rpm)	Max. Speed (rpm)	Rated Current A(rms)	Peak Current A(rms)	Matching Servo Motor	Matching Servo Drive					
									21-bit Absolute Multi-turn Magnetic Encoder	-R RS-485 Type	-EC EtherCAT Type	-C CANopen Type			
40	High Inertia	50	0.16	0.64	3000	6000	1.4	4.8	SM3H-041AX □ P △	M54S-23A0RD	M54S-23A0ECN	M54S-23A0CN			
	Low Inertia	100	0.32	1.28			1.2	5.9	SM3L-042AX □ D △						
	High Inertia		0.32	1.28			1.4	5.7	SM3H-042AX □ P △						
60	Low Inertia	200	0.64	1.9			1.5	5.4	SM3L-061AX □ P △						
	High Inertia		0.64	2.24			1.7	5.9	SM3H-061AX □ P △						
	Low Inertia	400	1.27	3.8			2.8	10	SM3L-062AX □ P △						
	High Inertia		1.27	4.44			2.8	9.8	SM3H-062AX □ P △						
80	Low Inertia	750	2.4	6.7			4.5	14	SM3L-083AX □ P △						
	High Inertia		2.4	8.4			4.5	16.7	SM3H-083AX □ P △						
	Low Inertia	1000	3.2	9.6			5.6	19	SM3L-084AX □ P △						
100	Low Inertia	1000	3.2	9.6			6.0	21	SM3L-102AX □ U △				M54S-26A0RD	M54S-26A0ECN	M54S-26A0CN
130	Medium Inertia	1000	4.77	14.3			2000	3000	5.4						
	High Inertia	850	5.39	16.2	1500	6	19	SM3H-132AX □ U △							

□ : Brake Options △ : Oil Seal Options Please refer to the numbering system of servo motor on page 16.

Features

Drive Numbering Information

Drive Overview

Motor Numbering Information

Servo Drive and Motor Matching List

Drive Specification

Motor Specification

Accessories

Drive Specification -R—RS485 Type

Input Power	M54S-23A0RD	Main Circuit	Single, AC200 ~ 240V ± 10%, 50/60Hz
	M54S-24A5RD M54S-26A0RD	Control Circuit	Powered by main circuit
Withstand Voltage			Primary to earth: withstand 1500 VAC, 1 min, (Leakage current: 20 mA) [220V Input]
Environment	Temperature		<ul style="list-style-type: none"> 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)
Motor Encoder Feedback			21-bit Absolute Multi-turn Magnetic Encoder
I/O	Digital Signal	Input	10 Configurable optically isolate digital general inputs, 24VDC, 20mA
		Output	6 Configurable optically isolate digital general outputs, Max. 30VDC, 100mA
	Analog Signal	Input	2 Analog inputs, -10 ~ +10V, 12bit
	Pulse Signal	Input	2 Pulse Inputs (Optocoupler input, Line Receiver input): <ul style="list-style-type: none"> Optocoupler input: 5 ~ 24V, minimum pulse width 1μs, max. pulse frequency 500KHz Line Receiver input: 5V differential signal, minimum pulse width 0.125μs, max. pulse frequency 4MHz
Output		4 Outputs(3 Line Driver outputs, 1 open collector output) <ul style="list-style-type: none"> Line Driver output: Encoder A、B、Z feedback output Open collector output: Encoder Z phase 	
Comm Port	USB		Connection with PC for configuration
	RS-485		Modbus/RTU Communication protocol
Front Panel			5 keys(MODE, RIGHT, UP, DOWN, SET) 5 - digital LED Display
Regeneration Resistor			750W Built-in regenerative resistor (All models can be equipped with external absorption resistors)
Control Mode			1. Pulse Position Mode 2. Analog Velocity Mode 3. Analog Torque Mode 4. Internal Position Mode 5. Internal Torque Mode 6. Internal Velocity Mode 7. Command Torque Mode Each control mode can be switched by digital input
Control Input Signal			Servo-ON, Alarm Reset, CW/CCW Limit, Control Mode Select, Gain Select, Clear Position Error, Zero Speed Clamp, Command and Velocity input Direction control, Command and Torque input Direction control, Emergency Stop, Homing Switch, Torque Limit, Speed Limit, Pulse Inhibit, Multi-velocity Switch, Start Q Program, 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, Position Error, STO, CW/CCW Limit, Full Closed-loop Hybrid Deviation Fault, Communication exception
Dynamic Brake			Built in
STO ^{*1}			Built in
Weight			M54S-23A0RD: 1.0Kg M54S-24A5RD: 1.3Kg M54S-26A0RD: 1.5Kg

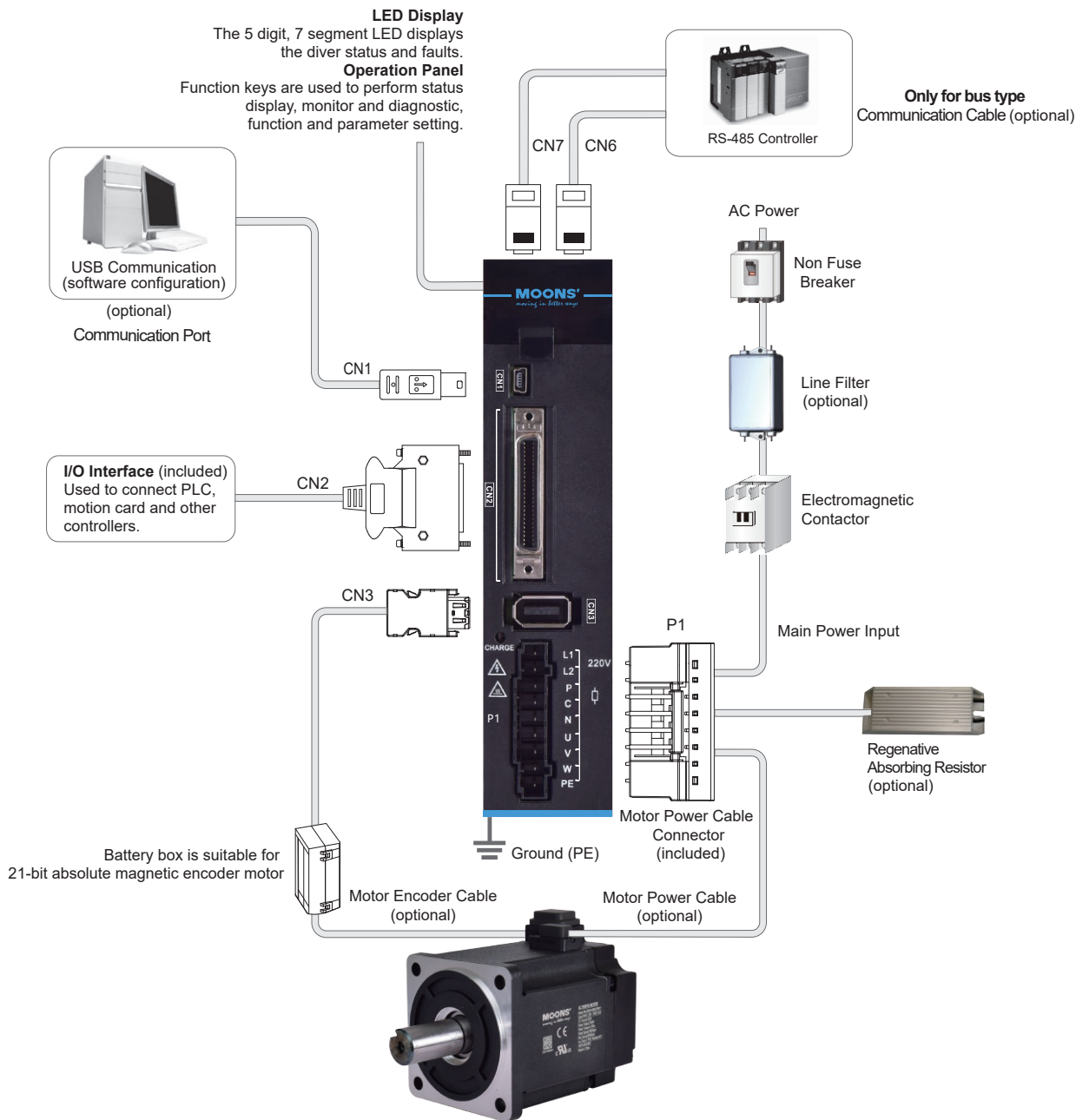
Note: *1 Reserve STO interface. If you need this function, please contact sales personnel.

Drive Specification -EC—EtherCAT Type -C—CANopen Type

Input Power	M54S-23A0 ■ N	Main Circuit	Single, AC200 ~ 240V ± 10%, 50/60Hz
	M54S-24A5 ■ N M54S-26A0 ■ N	Control Circuit	Powered by main circuit
Withstand Voltage			Primary to earth: withstand 1500 VAC, 1 min, (Leakage current: 20 mA) [220V Input]
Environment	Temperature		<ul style="list-style-type: none"> ● 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)
Motor Encoder Feedback			21-bit Absolute Multi-turn Magnetic Encoder
I/O	Digital Signal	Input	6 Configurable optically isolate digital general inputs, 24VDC, 20mA
		Output	3 Configurable optically isolate digital general outputs, Max. 30VDC, 100mA
	Analog Signal	Input	1 Analog input, -10 ~ +10V, 12bit
Comm Port	USB		Connection with PC for configuration
	EtherCAT		-EC Control Function Type: EtherCAT communication
	CANopen		-C Control Function Type: CANopen communication
Front Panel			5 keys(MODE, RIGHT, UP, DOWN, SET) 5 - digital LED Display
Regeneration Resistor			750W Built-in regenerative resistor (All models can be equipped with external absorption resistors)
Control Mode			<p>-EC Control Function Type:</p> <p>CoE(Complies with CiA402 standard), support PP, PV, TQ, CSP, CSV, CST and HM mode, Q programs that are pre-stored in the drive can also be started with EtherCAT instructions</p> <p>-C Control Function Type:</p> <p>Complies with CiA402 standard, support PP, PV, TQ and HM mode, Q programs that are pre-stored in the drive can also be started with CANopen instructions</p>
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, Position Error, STO, CW/CCW Limit, Communication exception
Dynamic Brake			Built in
STO*1			Built in
Weight			M54S-23A0 ■ N: 1.0Kg M54S-24A5 ■ N: 1.3Kg M54S-26A0 ■ N: 1.5Kg

Note: *1 Reserve STO interface. If you need this function, please contact sales personnel.

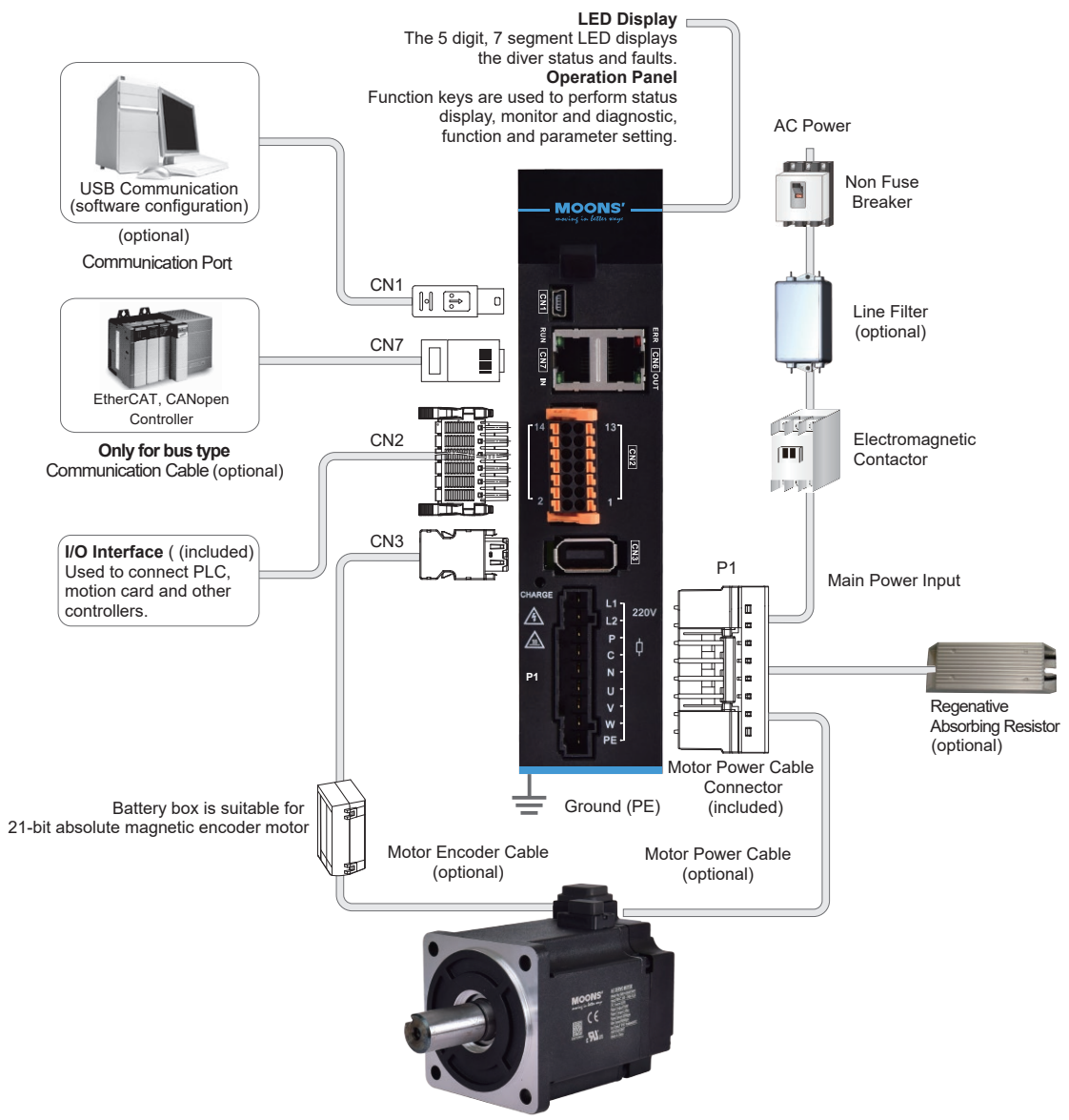
■ : Control Function Type



RS-485 Communication interface



System Configuration Push-in Spring I/O Connector Model Type: X 400/750/1000W Type



- Features
- Drive Numbering Information
- Drive Overview
- Motor Numbering Information
- Servo Drive and Motor Matching List
- Drive Specification
- Motor Specification
- Accessories

Motor Specification

40mm Frame Low Inertia

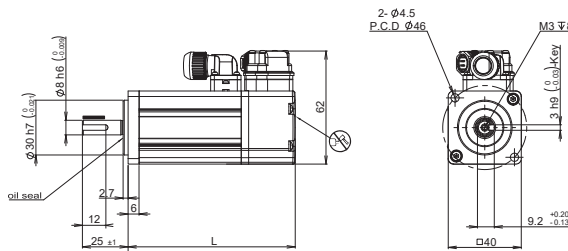
Specifications

Type*		SM3L - 042AX □ 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	0.55
Weight - With Brake	Kg	0.8

* □ Brake Options: △ Oil Seal Options

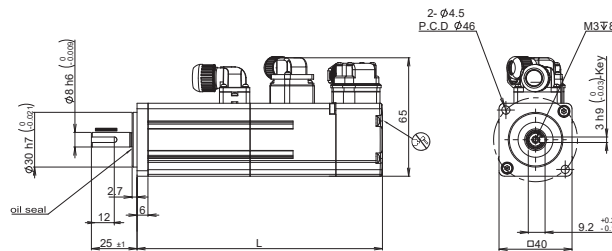
Dimensions (Unit: mm)

1) Without Brake



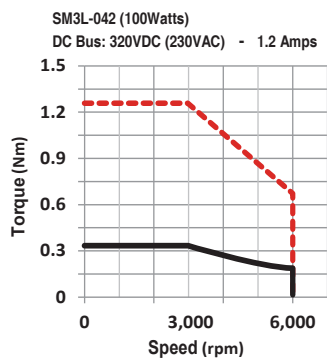
Without Brake	L
SM3L-042AXND △	91.5

2) With Brake



With Brake	L
SM3L-042AXBD △	134.5

Torque Curves



----- Max. Intermittent Torque
————— Max. Continuous Torque

Motor Specification 40mm Frame High Inertia

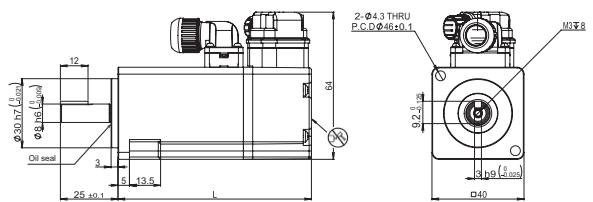
Specifications

Type*		SM3H - 041AX □ P △	SM3H - 042AX □ 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	0.45	0.55
Weight - With Brake	Kg	0.55	0.8

* □ Brake Options; △ Oil Seal Options

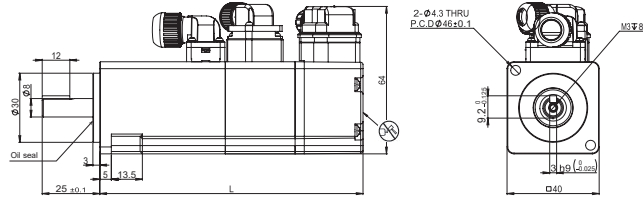
Dimensions (Unit: mm)

1) Without Brake



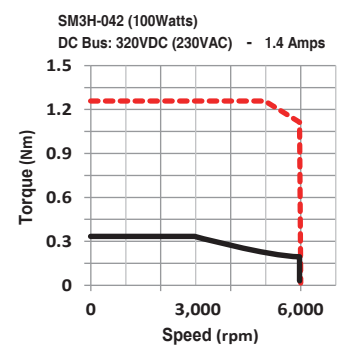
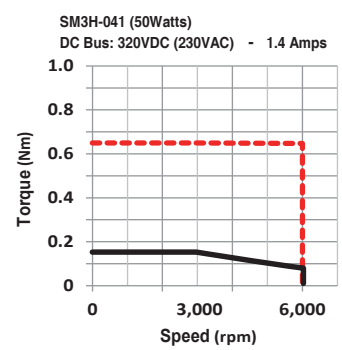
Without Brake	L
SM3H-041AXNP △	70
SM3H-042AXNP △	84

2) With Brake



With Brake	L
SM3H-041AXBP △	100.3
SM3H-042AXBP △	114.3

Torque Curves



----- Max. Intermittent Torque
 ————— Max. Continuous Torque

Motor Specification

60mm Frame Low Inertia

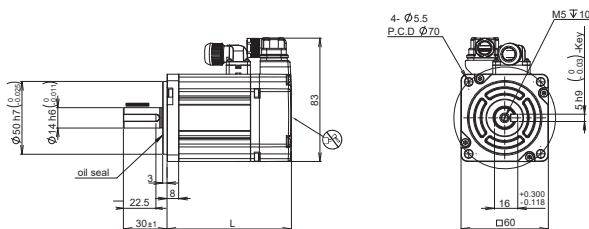
Specifications

Type*		SM3L - 061AX □ P △	SM3L - 062AX □ 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	1.1	1.4
Weight - With Brake	Kg	1.5	1.9

* □ Brake Options: △ Oil Seal Options

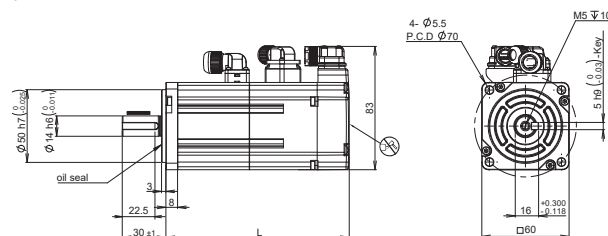
Dimensions (Unit: mm)

1) Without Brake



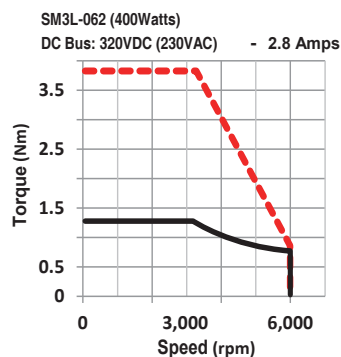
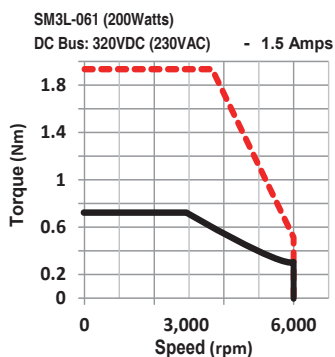
Without Brake	L
SM3L - 061AXNP △	84.5
SM3L - 062AXNP △	103

2) With Brake



With Brake	L
SM3L - 061AXBP △	125
SM3L - 062AXBP △	143.5

Torque Curves



----- Max. Intermittent Torque
 ————— Max. Continuous Torque

Motor Specification

60mm Frame
High Inertia

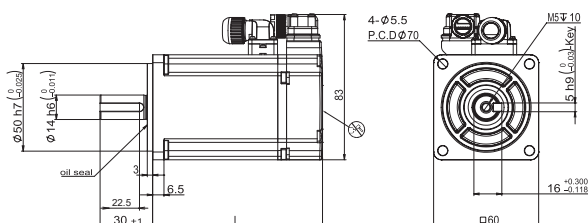
Specifications

Type*		SM3H - 061AX □ P △	SM3H - 062AX □ 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	0.8	1.4
Weight - With Brake	Kg	1.2	1.7

* □ Brake Options: △ Oil Seal Options

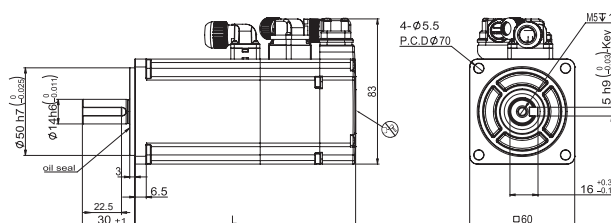
Dimensions (Unit: mm)

1) Without Brake



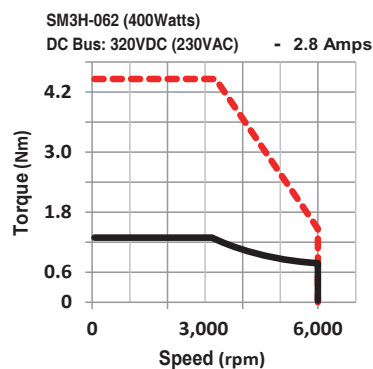
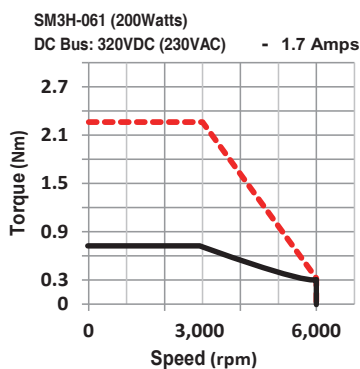
Without Brake	L
SM3H-061AXNP △	77
SM3H-062AXNP △	97

2) With Brake



With Brake	L
SM3H-061AXBP △	106
SM3H-062AXBP △	126

Torque Curves



--- Max. Intermittent Torque
— Max. Continuous Torque

Motor Specification

80mm Frame Low Inertia

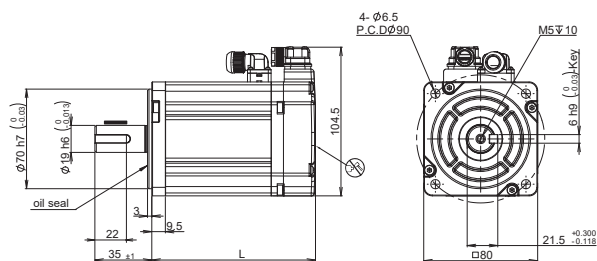
Specifications

Type*		SM3L - 083AX □ P △	SM3L - 084AX □ 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	2.6	2.8
Weight - With Brake	Kg	3.4	3.6

* □ Brake Options: △ Oil Seal Options

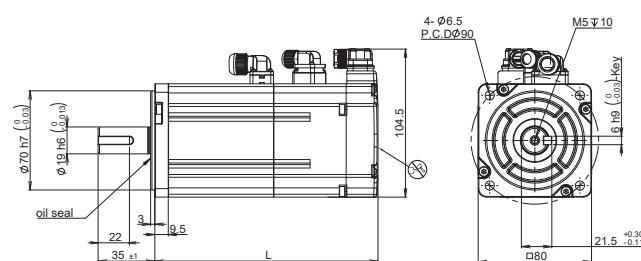
Dimensions (Unit: mm)

1) Without Brake



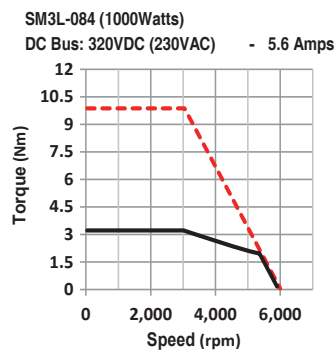
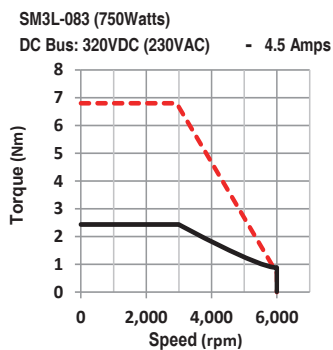
Without Brake	L
SM3L-083AXNP △	115
SM3L-084AXNP △	129

2) With Brake



With Brake	L
SM3L-083AXBP △	157
SM3L-084AXBP △	171

Torque Curves



----- Max. Intermittent Torque
 _____ Max. Continuous Torque

Motor Specification 80mm Frame High Inertia

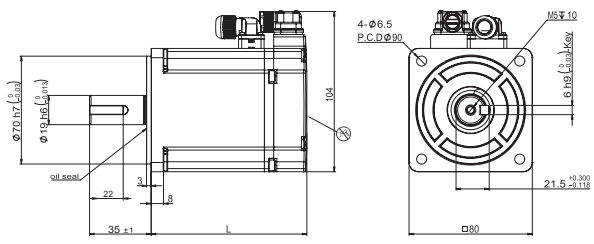
Specifications

Type*		SM3H - 083AX □ P △
Rated Output Power	watts	750
Rated Speed	rpm	3000
Max.Speed	rpm	6000
Rated Torque	N·m	2.4
Peak Torque	N·m	8.4
Rated Current	A (rms)	4.5
Peak Current	A (rms)	16.7
Voltage Constant ± 5%	V (rms) / K rpm	32.3
Torque Constant ± 5%	N·m / A (rms)	0.53
Rotor Inertia	Kg·m ²	1.46 × 10 ⁻⁴
Rotor Inertia - With Brake	Kg·m ²	1.63 × 10 ⁻⁴
Shaft Load - Axial	N (max.)	90
Shaft Load - Radial (End of Shaft)	N (max.)	270
Weight	Kg	2.6
Weight - With Brake	Kg	3.2

* □ Brake Options: △ Oil Seal Options

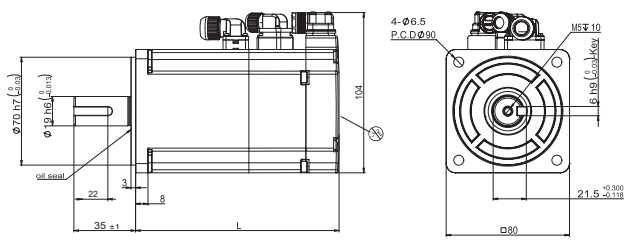
Dimensions (Unit: mm)

1) Without Brake



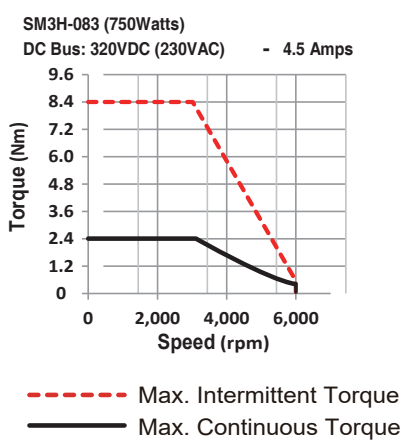
Without Brake	L
SM3H-083AXNP △	101

2) With Brake



With Brake	L
SM3H-083AXBP △	132

Torque Curves



Features

Drive
Numbering Information

Drive Overview

Motor
Numbering Information

Servo Drive and
Motor Matching List

Drive Specification

Motor Specification

Accessories

Motor Specification

100mm Frame Low Inertia

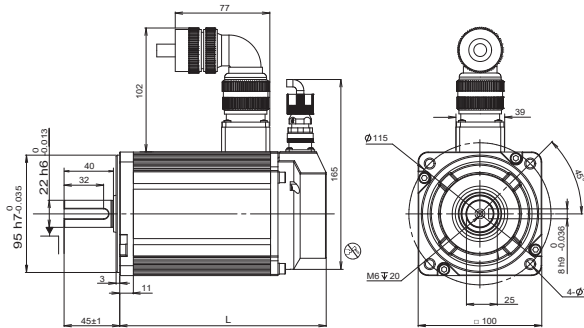
Specifications

Type*		SM3L - 102AX □ U △
Rated Output Power	watts	1000
Rated Speed	rpm	3000
Max.Speed	rpm	6000
Rated Torque	N·m	3.2
Peak Torque	N·m	9.6
Rated Current	A (rms)	6.0
Peak Current	A (rms)	21
Voltage Constant ± 5%	V (rms) / K rpm	33
Torque Constant ± 5%	N·m / A (rms)	0.543
Rotor Inertia	Kg·m ²	1.79 × 10 ⁻⁴
Rotor Inertia - With Brake	Kg·m ²	2.67 × 10 ⁻⁴
Shaft Load - Axial	N (max.)	90
Shaft Load - Radial (End of Shaft)	N (max.)	270
Weight	Kg	4
Weight - With Brake	Kg	5.2

* □ Brake Options; △ Oil Seal Options

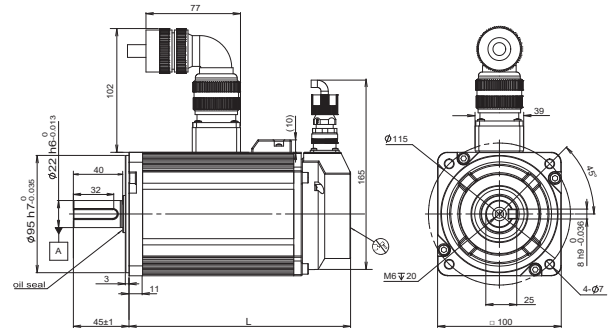
Dimensions (Unit: mm)

1) Without Brake



Without Brake	L
SM3L-102AXNU △	137

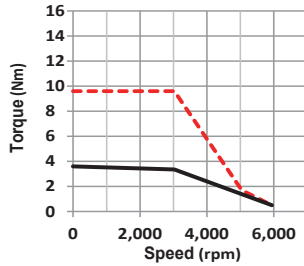
2) With Brake



With Brake	L
SM3L-102AXBU △	179

Torque Curves

SM3L-102A (1000Watts)
DC Bus: 320VDC (230VAC) - 6.0 Amps



--- Max. Intermittent Torque
— Max. Continuous Torque

Motor Specification

130mm Frame Medium, High Inertia

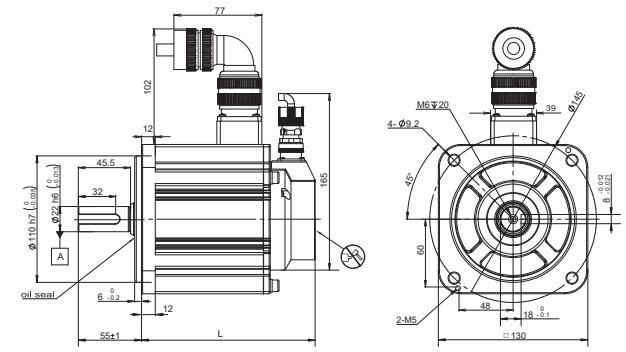
Specifications

Type*		SM3H - 132AX □ U △	SM3M - 132AX □ U △
Rated Output Power	watts	850	1000
Rated Speed	rpm	1500	2000
Max.Speed	rpm	3000	3000
Rated Torque	N·m	5.39	4.77
Peak Torque	N·m	16.2	14.3
Rated Current	A (rms)	6	5.4
Peak Current	A (rms)	19	16.9
Voltage Constant ± 5%	V (rms) / K rpm	55.3	55.3
Torque Constant ± 5%	N·m / A (rms)	0.891	0.883
Rotor Inertia	Kg·m ²	13 × 10 ⁻⁴	13 × 10 ⁻⁴
Rotor Inertia - With Brake	Kg·m ²	15.2 × 10 ⁻⁴	15.2 × 10 ⁻⁴
Shaft Load - Axial	N (max.)	196	196
Shaft Load - Radial (End of Shaft)	N (max.)	490	490
Weight	Kg	6.2	6.2
Weight - With Brake	Kg	8.5	8.5

* □ Brake Options: △ Oil Seal Options

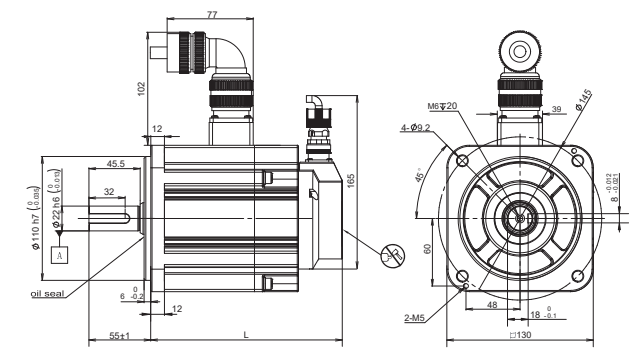
Dimensions (Unit: mm)

1) Without Brake



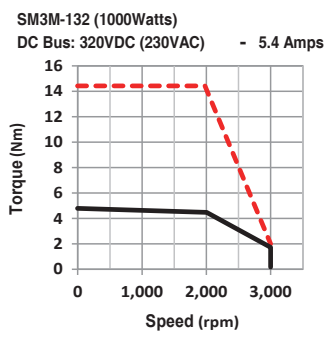
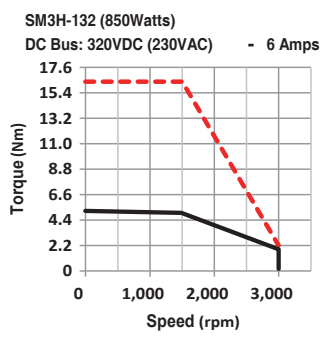
Without Brake	L
SM3H-132AXNU △	138
SM3M-132AXNU △	138

2) With Brake



With Brake	L
SM3H-132AXBU △	171
SM3M-132AXBU △	171

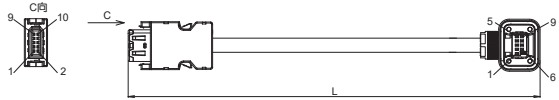
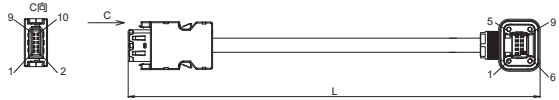
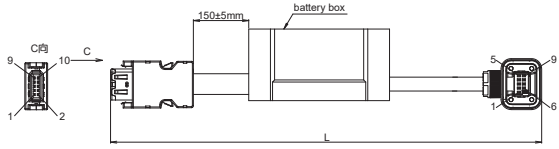
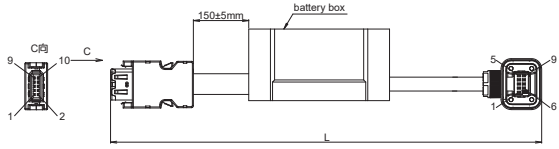
Torque Curves



----- Max. Intermittent Torque
 ————— Max. Continuous Torque

Accessories

Encoder Cables
For 40mm, 60mm, 80mm Frame Size Motor

Model*	Length(L)	Description	For Servo Motor*	Outline
2640-0100	1m	Encoder Cables Incremental Encoder Standard		
2640-0200	2m			
2640-0300	3m			
2640-0400	4m			
2640-0500	5m			
2640-0800	8m			
2640-1000	10m			
2640-1500	15m			
2640-2000	20m			
2640-0100-C10	1m	Encoder Cables Incremental Encoder Flexible	SM3L-042AX □ D △ SM3L-061AX □ P △ SM3L-062AX □ P △ SM3L-083AX □ P △ SM3L-084AX □ P △	
2640-0200-C10	2m			
2640-0300-C10	3m			
2640-0400-C10	4m			
2640-0500-C10	5m			
2640-0800-C10	8m			
2640-1000-C10	10m			
2640-1500-C10	15m			
2640-2000-C10	20m			
2639-0100	1m	Encoder Cables With Battery Absolute Encoder Standard	SM3H-041AX □ P △ SM3H-042AX □ P △ SM3H-061AX □ P △ SM3H-062AX □ P △ SM3H-083AX □ P △	
2639-0200	2m			
2639-0300	3m			
2639-0400	4m			
2639-0500	5m			
2639-0800	8m			
2639-1000	10m			
2639-1500	15m			
2639-2000	20m			
2639-0100-C10	1m	Encoder Cables With Battery Absolute Encoder Flexible		
2639-0200-C10	2m			
2639-0300-C10	3m			
2639-0400-C10	4m			
2639-0500-C10	5m			
2639-0800-C10	8m			
2639-1000-C10	10m			
2639-1500-C10	15m			
2639-2000-C10	20m			

* □ Brake Options △ Oil Seal Options

* Flexible -C10 10 million times

Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Features

Drive
Numbering Information

Drive Overview

Motor
Numbering Information

Servo Drive and
Motor Matching List

Drive Specification

Motor Specification

Accessories

Accessories

Motor Power Cables, Motor Brake Cables
For 40mm, 60mm, 80mm Frame Size Motor

Model*	Length(L)	Description	For Servo Motor*	Outline	
1672-0100	1m	Motor Cables Standard	SM3L-042AX □ D △ SM3L-061AX □ P △ SM3L-062AX □ P △ SM3L-083AX □ P △		
1672-0200	2m				
1672-0300	3m				
1672-0400	4m				
1672-0500	5m				
1672-0800	8m				
1672-1000	10m				
1672-1500	15m				
1672-2000	20m				
1672-0100-C10	1m	Motor Cables Flexible	SM3H-041AX □ P △ SM3H-042AX □ P △ SM3H-061AX □ P △ SM3H-062AX □ P △ SM3H-083AX □ P △		
1672-0200-C10	2m				
1672-0300-C10	3m				
1672-0400-C10	4m				
1672-0500-C10	5m				
1672-0800-C10	8m				
1672-1000-C10	10m				
1672-1500-C10	15m				
1672-2000-C10	20m				
1674-0100	1m	Motor Cables With Brake Cable Standard	SM3L-042AXBD △ SM3L-061AXBP △ SM3L-062AXBP △ SM3L-083AXBP △ SM3L-084AXBP △		
1674-0200	2m				
1674-0300	3m				
1674-0400	4m				
1674-0500	5m				
1674-0800	8m				
1674-1000	10m				
1674-1500	15m				
1674-2000	20m				
1674-0100-C10	1m	Motor Cables With Brake Cable Flexible	SM3H-041AXBP △ SM3H-042AXBP △ SM3H-061AXBP △ SM3H-062AXBP △ SM3H-083AXBP △		
1674-0200-C10	2m				
1674-0300-C10	3m				
1674-0400-C10	4m				
1674-0500-C10	5m				
1674-0800-C10	8m				
1674-1000-C10	10m				
1674-1500-C10	15m				
1674-2000-C10	20m				

* □ Brake Options △ Oil Seal Options
* Flexible -C10 10 million times

Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Note: SM3L-084AX □ P △ Normal Power cable 1645-XXXX series, Flexible Power cable 1645-XXXX-C10 series.

Accessories

Encoder Cables (Straight Plug)
For 100mm, 130mm Frame Size Motor

Model*	Length(L)	Description	For Servo Motor*	Outline	
2643-0100	1m	Encoder Cables Incremental Encoder Standard	SM3L-102AX □ U △		
2643-0300	3m				
2643-0500	5m				
2643-1000	10m				
2643-1500	15m				
2643-2000	20m				
2643-0100-C10	1m	Encoder Cables Incremental Encoder Flexible		SM3M-132AX □ U △	
2643-0300-C10	3m				
2643-0500-C10	5m				
2643-1000-C10	10m				
2643-1500-C10	15m				
2643-2000-C10	20m				
2642-0100	1m	Encoder Cables With Battery Absolute Encoder Standard	SM3H-132AX □ U △		
2642-0300	3m				
2642-0500	5m				
2642-1000	10m				
2642-1500	15m				
2642-2000	20m				
2642-0100-C10	1m	Encoder Cables With Battery Absolute Encoder Flexible			
2642-0300-C10	3m				
2642-0500-C10	5m				
2642-1000-C10	10m				
2642-1500-C10	15m				
2642-2000-C10	20m				

* □ Brake Options △ Oil Seal Options

* Flexible -C10 10 million times

Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

Features

Drive
Numbering Information

Drive Overview

Motor
Numbering Information

Servo Drive and
Motor Matching List

Drive Specification

Motor Specification

Accessories

Accessories Motor Power Cables (Angled Plug)
For 100mm Frame Size 1.0kW Motor; 130mm Frame Size 0.85/1.0kW Motor

Model*	Length(L)	Description	For Servo Motor*	Outline
1658-0100	1m	Motor Cables Standard	SM3L-102AXNU △ SM3M-132AXNU △ SM3H-132AXNU △	
1658-0300	3m			
1658-0500	5m			
1658-1000	10m			
1658-1500	15m			
1658-2000	20m			
1658-0100-C10	1m	Motor Cables Flexible		
1658-0300-C10	3m			
1658-0500-C10	5m			
1658-1000-C10	10m			
1658-1500-C10	15m			
1658-2000-C10	20m			
1660-0100	1m	Motor Cables With Built-in Brake Cable Standard	SM3L-102AXBU △ SM3M-132AXBU △ SM3H-132AXBU △	
1660-0300	3m			
1660-0500	5m			
1660-1000	10m			
1660-1500	15m			
1660-2000	20m			
1660-0100-C10	1m	Motor Cables With Built-in Brake Cable Flexible		
1660-0300-C10	3m			
1660-0500-C10	5m			
1660-1000-C10	10m			
1660-1500-C10	15m			
1660-2000-C10	20m			

* □ Brake Options △ Oil Seal Options

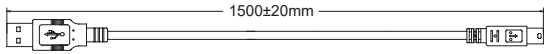
* Flexible -C10 10 million times

Test Conditions: Bend Radius 50mm, Frequency 40 times/min, Distance 1000mm

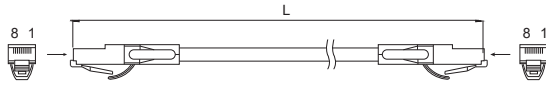
Accessories

Drive peripheral accessories

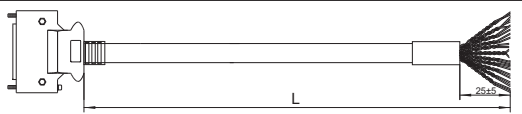


USB Cable

Model	Length	Description	Outline
2620-150	1.5m	USB configuration cable connect with PC	

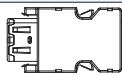
CN6/CN7 Communication Daisy Chain Cable

Model	Length (L)	Description	Outline
2012-030	0.3m	Twisted-pair, Standard type	
2012-300	3m		
2013-030	0.3m	Twisted-pair, Shielded type	
2013-300	3m		

IO Connector, I/O Signal Cable

Model	Length (L)	Description	Outline
1644-100	1m	CN2 50pin high density I/O cable Shielded type	
1644-200	2m		
1644-300	3m		
M2-50P	-	CN2 50pin high density I/O connector	
MSOP-CN214P	-	CN2 14pin push-in spring I/O connector	

Motor Encoder Connector (Drive Side)

Model	Length (L)	Description	Outline
MSOP-CN310P	-	CN3 Motor encoder connector	

EMI Filter

Model	Specification	Description	Outline
MSOP-EMI020	250VAC, 20A	EMI filter for AC power of drive side	-

Absolute Encoder System Battery Kit

Model	Specification	Description	Outline
MSOP-BA01	Battery	For motor with battery absolute encoder	-
MSOP-BAKIT01	Batteries and battery cases		

External Regenerative Resistor

Model	Specification	Description	Outline
REG100W120R	100W, 120Ω	Regenerative absorbing resistor	-
REG200W120R	200W, 120Ω		
REG300W120R	300W, 120Ω		

Drive Connector Kit

Model	Description	Outline
MSOP-P109P	P1 Power Connector, JST handle lever	-

Motor Connector Kit (Motor Side)

Model	Description	Outline
MSOP-MTKITA	80mm and lower frame size motor (without brake connector)	-
MSOP-MTKITD	80mm and lower frame size motor (with brake connector)	
MSOP-MTKITF	100mm/130mm frame size motor (angle plug type)	

Features

Drive
Numbering Information

Drive Overview

Motor
Numbering Information

Servo Drive and
Motor Matching List

Drive Specification

Motor Specification

Accessories

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