



SV660ND Series Servo Drive Selection Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00005789 A02

Preface

Introduction

Thank you for purchasing the SV660ND series servo drive developed by Inovance.

The SV660ND AC servo drive is a high performance multi-drive product. It comes with a capacity of 0.4 kW an 0.75 kW, as well as support for EtherCAT bus communication. It features STO (SIL3), one-key tuning and adaptive notch filter, which allow for easy use of the product. It offers quiet and stable operation and accurate position control by working with an MS1 series high-response servo motor with a 23-bit-turn absolute encoder.

Its high integration, bus support, small size, easy commissioning and environment robustness make it a perfect match for equipment of cell phone manufacture, robots, machine tool, lithium battery, silicon semiconductor, touchscreen and LED.

This manual provides instructions on product selection, including the list of supporting components, technical data on the drive and motor, and the selection guide of cables.

More Documents

Name	Data Code	Description
SV660ND Series Servo Drive Selection Guide	PS00005789	Provides instructions on product selection, including the list of supporting components, technical data on the drive and motor, and the selection guide of cables.
SV660ND Series Servo Drive installation Guide	PS00005790	Presents installation of the servo drive, including installation steps, mechanical installation, and electrical installation.
SV660ND Series Servo Drive Hardware Guide	PS00005125	Presents electrical design guidance of the equipment, description of terminals, required certificates and standards and solutions to common EMC problems.
SV660ND Series Servo Drive Commissioning Guide	PS00006000	Presents servo commissioning, parameter descriptions, troubleshooting, including the operating panel, commissioning software, commissioning procedure and a parameter list.
SV660ND Series Servo Drive Function Guide	PS00005950	Presents functions and parameters, including function overview, basic servo functions, adjustment and parameter list.
SV660ND Series Servo Drive Communication Guide	PS00006002	Presents functions and parameters of the servo drive, including EtherCAT communication configuration, parameter description, and communication application cases.
SV660ND Series Servo Drive Troubleshooting Guide	PS00006001	Introduces faults and fault levels, the troubleshooting process, warning codes and fault codes.
SV660ND Series Servo Drive Maintenance Guide	PS00005791	Provides instructions on maintenance and repair of the equipment.
SV660ND Series Servo Drive Safety Guide	PS00005950	Presents the safety function and related certifications and standards, wiring, commissioning process, troubleshooting and functions.
SV660ND Series Servo Drive Manual Package	PS00005852	Provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment.

Revision History

Date of Revision	Version	Description
2023-01	A02	Minor corrections.
2022-12	A01	<ul style="list-style-type: none">• Updated the selection list.• Updated the driver power (kW) and max. applicable motor capacity (kW) in electrical specifications.• Updated information on MS1-R motor selection.• Added information on the S6-C74 connector kit to section Applicable Cables.• Added a new section Service and Support.
2022-05	A00	First release.

Document Acquisition

This manual is not delivered with the product. You can obtain the PDF version in either of the following ways:

- Do keyword search under Service and Support at <http://www.inovance.com>.
- Scan the QR code on the product casing.

Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period, you will be charged if the product is damaged due to the following causes.

- Failure to operate this product as specified in this guide.
- Fire, flood, or abnormal voltage.
- Unintended use of the product.
- Operation beyond the product's ratings.
- Force majeure (natural disaster, earthquake, and lightning strike).

The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

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1 Selection

MS1 series servo motors

Servo Drive (SV660ND****I)				Servo Motor			
Model	Voltage Class	Size	H01.10 No.	Motor without brake	Motor with brake	Flange Size	Capacity (kW)
	MS1H1 (n_N =3000rpm, n_{max} =6000rpm) series ratings						
S2R8	Single-phase/ Three-phase 220 V	A	00003	MS1H1-40B30CB- A331R	MS1H1-40B30CB- A334R	60	0.4
S5R5	Single-phase/ Three-phase 220 V	B	00005	MS1H1-55B30CB- A331R	-	80	0.55
S5R5	Single-phase/ Three-phase 220 V		00005	MS1H1-75B30CB- A331R	MS1H1-75B30CB- A334R	80	0.75
	MS1H4 (n_N =3000rpm, n_{max} =6000rpm) series ratings						
S2R8	Single-phase/ Three-phase 220 V	A	00003	MS1H4-40B30CB-A331R	MS1H4-40B30CB-A334R	60	0.4
S5R5	Single-phase/	B	00005	MS1H4-55B30CB-A331R	-	80	0.55
S5R5	Three-phase 220 V		00005	MS1H4-75B30CB-A331R	MS1H4-75B30CB-A334R	80	0.75

MCS1 series servo motors with deceleration

Servo Drive (SV660ND****I)				Servo gear motor					
Model	Voltage class (V)	Size	H01.10 No.	Motor without brake		Motor with brake	Flange Size	Rated Power (kW)	Voltage Class
S2R8	Single-phase/ Three-phase 220 V	A	00003	MCS1H4-40B30CB	60F/70Y053-A331R	60F/70Y053-A334R	60	0.4	220
					60F/70Y103-A331R	60F/70Y103-A334R			
					60F/70Y255-A331R	60F/70Y255-A334R			
S5R5	Single-phase/ Three-phase 220 V	B	00005	MCS1H4-7530CB	90F/90Y053-A331R	90F/90Y053-A334R	80	0.75	220
					90F/90Y103-A331R	90F/90Y103-A334R			
					90F/90Y255-A331R	90F/90Y255-A334R			

2 SV660ND Series

2.1 Product Information

2.1.1 Nameplate and Model Number

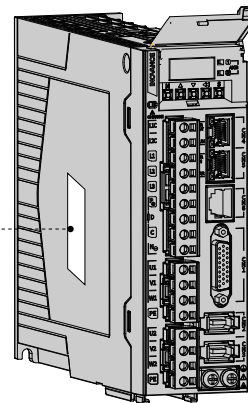
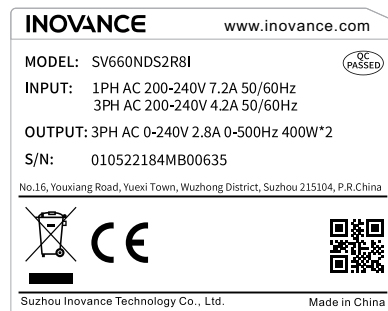
Description of the Model Number

SV660 N D S 2R8 I - *

① ② ③ ④ ⑤ ⑥ ⑦

1 Product Series SV660: SV660 series servo drive	4 Voltage class S: 220 V	6 Installation Mode I: Base plate-mounted
2 Product type N: Network type	5 Rated output current 2R8: 2.8 A 5R5: 5.5 A	7 Non-standard features Blank: standard FS: STO
3 Number of axes D: Dual-axis (two-in-one)		

Description of the nameplate



Encryption of the production serial number

01050202 4 P 7 00001
 ① ② ③ ④ ⑤

1 Internal code Material code	3 Year A: 2010 ... N: 2021 P: 2022 ... Note: I/L/O/Q is not used.	5 Lot number 00001: 1st in current month 00002: 2nd in current month 00003: 3rd in current month ... Range: 00001 to 99999
2 Manufacturer code 4: Suzhou Inovance	4 Month 1: January 2: February ... A: October B: November C: December	

Example: The S/N 010502024H700001 indicates the drive is manufactured in July, 2017.

2.1.2 Components

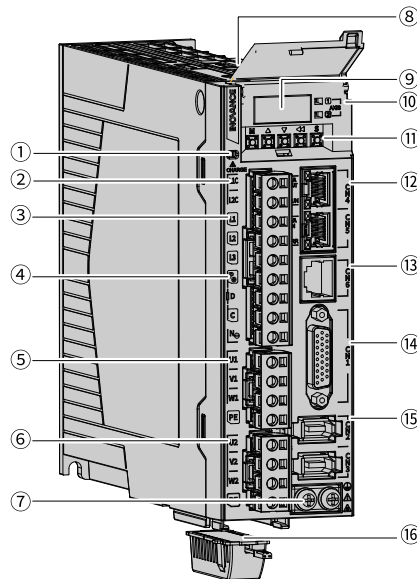


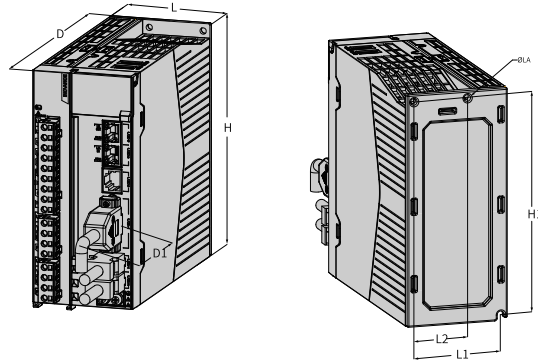
Figure 2-1 Components of servo drives

Table 2-1 Components of the servo drive

No.	Name	Description
①	CHARGE (bus voltage indicator)	Indicates that the bus capacitor carries electric charge. When this indicator is on, charges possibly still exist in the internal capacitor of the servo unit, even if the power supply of the main circuit is OFF. To avoid electric shock, do not touch the power terminals when this indicator is on.
②	L1C, L2C (control circuit power input terminals)	See the nameplate for the rated voltage class.
③	L1, L2, L3 (main circuit power input terminals)	Used as the power input terminals for a three-phase 220 V servo drive. See the nameplate for the rated voltage class.
④	P⊕, D, C (terminals for connecting an external braking resistor) ^[1]	To connect an external braking resistor, remove the jumper between terminals P⊕ and D and connect the resistor between terminals P⊕ and C.
	P⊕, N⊖ (servo bus terminals)	Used when multiple servo drives share one DC bus
⑤	U1, V1, W1, PE (terminals for connecting the servo motor)	Connected to U, V, and W phases and grounding terminal of the servo motor 1
⑥	U2, V2, W2, PE (terminals for connecting the servo motor)	Connected to U, V, and W phases and grounding terminal of the servo motor 2
⑦	Servo drive grounding terminal	Connected to the grounding terminal of the power supply for grounding purpose
⑧	CN7 (STO safety function terminal) ^[3]	Connected to external functional safety signal for functional safety purpose
⑨	LED display	A 5-digit 8-segment LED display used to show the servo drive's operating status and parameter settings
⑩	Axle status indicator	Blinking: The axis is faulty.
		Steady on: Someone is operating the panel. Steady off: No one is operating the panel.
⑪	Keys	M: Press this key to switch parameters in sequence. Press and hold this key to switch axes in cycle. ▲: Used to increase the value of the blinking bit ▼: Used to decrease the value of the blinking bit ◀◀: Used to shift the blinking bit leftwards (Hold down: Turning to the next page when the displayed number exceeds five digits) S: Used to save modifications and enter the next menu
⑫	CN4, CN5 (EtherCAT communication terminals)	CN5 (IN): Connected to the master or the preceding slave device CN4 (OUT): Connected to the next slave device
⑬	CN6 (communication terminal)	Connected to an RS232 communication instruction device
⑭	CN1 (control terminal)	Used for reference input signals and other I/O signals
⑮	CN2, CN3 (terminals for connecting the encoder)	CN2 is connected to the encoder terminal of motor 1. CN3 is connected to the encoder terminal of motor 2.
⑯	Battery location	Used to hold the battery box of the absolute encoder

Note

The built-in braking resistor and jumper bar are not available in model S2R8. If an external braking resistor is needed for this model, connect it between terminals P⊕ and C.

2.1.3 Product Dimensions

Size	L	H	D	L1	L2	H1	D1	ØLA	Tightening Torque	Weight
	Unit: mm (in.)								Unit: N·m	Unit: kg
A	55 (2.17)	170 (6.69)	183 (7.20)	45 (1.77)	-	160 (6.30)	75 (2.95)	2-M4	1.2	1.4
B	75 (2.95)	170 (6.69)	183 (7.20)	65 (2.56)	40 (1.57)	160 (6.30)	75 (2.95)	3-M4	1.2	1.8

2.2 Product Specifications**2.2.1 Electrical Specifications****Single-phase 220 V drive**

Item	Size A	Size B
Drive model SV660ND***I	S2R8	S5R5
Power of the Drive (kW)	0.4*2	0.75*2
Max. applicable motor capacity (kW)	0.4*2	0.75*2
Power supply equipment capacity (kVA)	6.0	8.0
Continuous output current (Arms)	2.8	5.5
Max. output current (Arms)	10.1	16.9

Item		Size A	Size B
Main circuit	Continuous input current (Arms)	7.2	12.4
	Main circuit power supply	Single-phase 200 VAC–240 VAC, -10 to +10%, 50 Hz/60Hz	
	Energy Loss (W) ^[1]	21.26	46.52
Control circuit	Control circuit power supply	Single-phase 200 VAC–240 VAC, -10 to +10%, 50 Hz/60Hz	
	Energy Loss (W) ^[1]	7	
Braking resistor	Resistance (Ω)	-	25
	Resistor power (W)	-	80
	Min resistance of external resistor (Ω)	20	20
	Max. braking energy absorbed by capacitor (J)	54.6	80.3
	Braking resistor	No support for built-in resistor	Built-in and external resistor is supported
Cooling method		Air cooling	
Overvoltage class		III	

Three-phase 220 V drive

Item		Size A	Size B
Drive model SV660ND***I		S2R8	S5R5
Power of the Drive (kW)		0.4*2	0.75*2
Max. applicable motor capacity (kW)		0.4*2	0.75*2
Power supply equipment capacity (kVA)		6.0	8.0
Continuous output current (Arms)		2.8	5.5
Max. output current (Arms)		10.1	16.9
Main circuit	Continuous input current (Arms)	4.2	7.5
	Main circuit power supply	3-phase 200 VAC–240 VAC, -10 to +10%, 50 Hz/60 Hz	
	Energy Loss (W) ^[1]	21.26	46.52
Control circuit	Control circuit power supply	Single-phase 200 VAC–240 VAC, -10 to +10%, 50 Hz/60Hz	
	Energy Loss (W) ^[1]	7	
Braking resistor	Resistance (Ω)	-	25
	Resistor power (W)	-	80
	Min resistance of external resistor (Ω)	20	20
	Max. braking energy absorbed by capacitor (J)	54.6	80.3
	Braking resistor	No support for built-in resistor	Built-in and external resistor is supported

Item	Size A	Size B
Cooling method	Air cooling	
Overvoltage class	III	

Note

- [1]: Main circuit energy loss refers to the energy loss under rated output current of the servo drive.
- Select the external regenerative resistor according to actual operating conditions.

2.2.2 Technical Specifications

Item			Description
Basic Specifications	Control mode		IGBT PWM control, sine wave current drive mode 220 V, 380 V: Single-phase/Three-phase full bridge rectification
	Encoder feedback		23-bit multi-turn absolute encoder, which can be used as an incremental encoder in absence of the battery
	Conditions for use	Operating/Storage temperature ^[1]	0°C to +55°C (If the ambient temperature exceeds 45°C, derate by 10% for every additional 5°C)/-20°C to +70°C
		Operating/Storage humidity	Below 90% RH (no condensation)
		Vibration resistance	4.9m/s ²
		Impact resistance	19.6m/s ²
		IP rating	IP20 Note: excluding terminals (IP00)
		Pollution degree	PD2
		Altitude	The maximum altitude is 2000 m. <ul style="list-style-type: none"> • For altitudes not higher than 1000 m, derating is not required • Derating is required for altitudes above 1000 m (derate 1% for every additional 100 m) • For altitudes above 2000 m, contact Inovance
Speed/Torque control mode	Performance	Speed control range	1:6000 (Under the rated torque load, the servo drive keeps running as long as the lower limit of the speed control range is not exceeded.)
		Speed loop bandwidth	3 kHz
		Torque control accuracy (repeatability)	±2%
		Soft startup time	0s to 65s (Acceleration and deceleration can be set separately.)
	Input signal	Speed reference	Source of network-type references: EtherCAT communication
		Torque reference	Local mode and local multi-speed supported
Position control mode	Performance	Positioning time	1 ms to 10 ms
	Input signal	Position reference	Source of network-type references: EtherCAT communication Local mode supported

Item			Description
Position control mode	Digital input (DI) signal	DI signal function assignment	8 DIs
			DI1–DI8: fast DI (rising edge (24 V input high to low) input delay: 30 us, falling edge (24 V input low to high) input delay: 5 us, voltage range: 12 V–24 V)
			P-OT (positive limit switch) N-OT (negative limit switch) HomeSwitch (home switch) TouchProbe1 (touch probe 1) TouchProbe2 (touch probe 2)
	Digital output signal	DI signal function assignment	4 DOs
			With-load capacity: 50 mA Voltage range: 5 V to 30 V
			S-RDY: Servo ready Brake output
Built-in functions	Overtravel (OT) limit		The servo drive stops immediately when P-OT or N-OT is active
	Protective functions		Providing protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, overspeed, encoder error, CPU error, and parameter error
	LED display		Main circuit CHARGE indicator, 5-digit LED display
	Vibration Suppression		Four notches (including two adaptive notches) available, 50 Hz to 5000 Hz
	Communication function	Software commissioning	RS232
		Communication protocol	EtherCAT
		Multi-station communication	Maximum number of slaves: 255
		Axis address setting	No physical knob, set to 0 to 255 through the software
		Function	Including status display, user parameter setting, monitored value display, fault tracing display, JOG and auto-tuning, and speed/torque reference signal observation
	Others		Gain tuning, alarm record, JOG

Note

[1] The temperature of the environment where the servo drive is installed must be within the range specified in the preceding table. When the servo drive is installed into a control cabinet, the temperature inside the cabinet must also be within this range.

2.2.3 Technical Data of EtherCAT Communication

Item		Specification
Basic performance of slave	Communication protocol	EtherCAT protocol
	Available services	CoE (PDO, SDO)
	Synchronization mode	DC - Distributed clock
	Physical layer	100BASE-TX
	Baud rate	100 Mbit/s (100Base-TX)
	Duplex mode	Full duplex
	Topology	Ring and linear
	Transmission medium	Shielded cables of Cat 5e or higher
	Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
	Number of slaves	Up to 65535 by protocol, not exceeding 100 in actual use
	EtherCAT frame length	44 bytes to 1498 bytes
	Process Data	A maximum of 1486 bytes per Ethernet frame
	Synchronous jitter of two slaves	< 1 us
	Update time	1000 digital input/output: 30 us About 100 μs for 100 servo axes Define different update time for different interfaces.
	Communication code error rate	10 ⁻¹⁰ Ethernet standard
Configuration unit	Number of FMMU units	8
	Number of storage synchronization management units	8
	Process data RAM	8 KB
	Distributed Clock	64 bits
	e2prom capacity	32kbit

2.2.4 Dynamic Brake Characteristics

According to the motor model, initial speed and load inertia, the dynamic braking distance can be estimated. The approximate value of the dynamic braking distance can be calculated by the following formula. For the accurate value, please use the dynamic braking calculation function provided by our software.

Maximum braking distance s (turn) is:

$$s = \frac{V_0}{60} (t_e + (\tau_1 + \tau_2 V_0^2) (1 + \frac{J_L}{J_M}))$$

The coefficient is as follows:

$$\tau_1 = \frac{2R_s J}{3p_n^2 \Psi_f^2} = \frac{10000\pi^2 R_s J}{9K_e^2}$$

$$\tau_2 = \frac{\pi^2 L_d^2 J}{4050 R_s \Psi_f^2} = \frac{100 L_d^2 \pi^4 P_n^2 J}{243 R_s K_e^2}$$

$$\Psi_f = \frac{\sqrt{6} K_e}{100 \pi P_n}$$

- V_0 : Maximum feedback speed
- t_e : Dynamic brake program and relay delay
- J_L : Load moment of inertia
- J_M : Motor moment of inertia
- P_n : Number of motor pole pairs
- R_s : Stator resistance (Ω)
- L_q, L_d : q-axis inductance (mH), d-axis inductance (mH).

3 MS1 Motor Series

3.1 Product Information

3.1.1 Nameplate and Model Number

Description of the Model Number

MS1 H1 - 75B 30C B A3 3 1 R - *

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

1 MS1 series servo motor	4 Rated speed (rpm) One letter and two digits B: x 10 C: x 100 Example: 30C: 3,000 rpm	7 Shaft Connection Mode 3: Solid shaft, with key and threaded hole
2 Inertia and Capacity H1: low inertia, small capacity H4: medium inertia, small capacity	5 Voltage Class (V) B: 220 D: 380	8 Brake, Reducer and Oil Sealing [1] 0: No oil sealing and brake 1: With oil sealing but no brake 2: No oil sealing but with brake 4: With oil sealing and brake
3 Rated Power (W) One letter and two digits B: x 10 C: x 100 Example: 75B: 750 W	6 Encoder type One letter and one digit A3: 23-bit multi-turn absolute encoder T3: 18-bit multi-turn absolute encoder	9 Series R: R series 10 Cable Connection and Cooling _: connector type, natural cooling -S ^[2] : flying leads type, natural cooling

Note

- [1]: Oil seals are provided as standard for all H1 (low inertia, small capacity) models except 60-flange and 80-flange models.
- [2]: -S flying leads type only applies to 40/60/80-flange motors.

Description of the nameplate

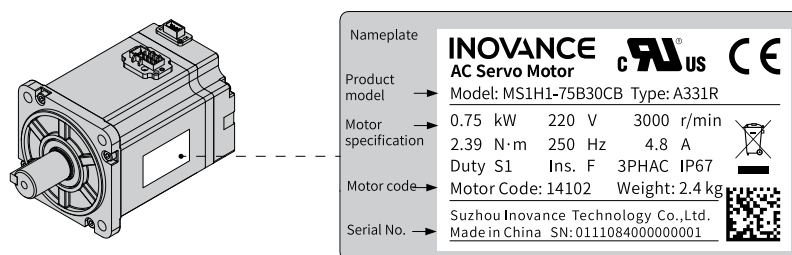


Figure 3-1 Nameplate and Model Number

3.1.2 Components

Motor (60- and 80-flange)

- **Terminal-type servo motor**

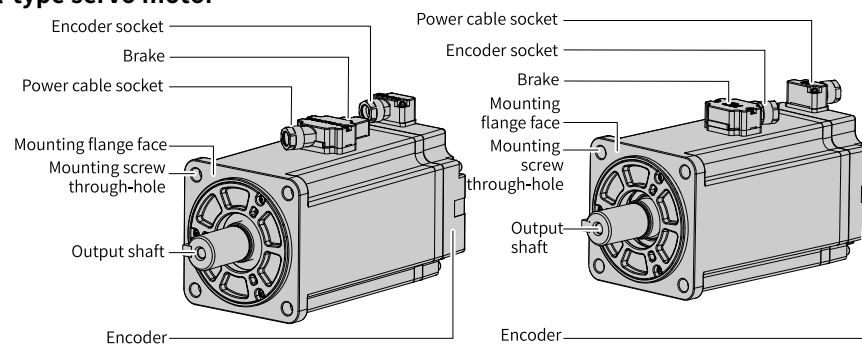


Figure 3-2 Components of terminal-type motors (Left: motor with front cable outlet; Right: motor with rear cable outlet)

- **flying leads type servo motors**

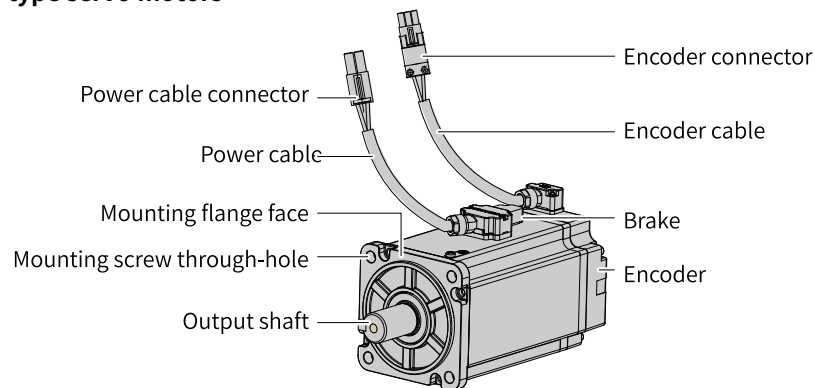




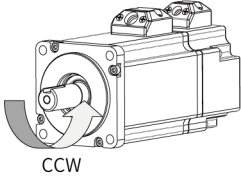
Figure 3-3 Components of flying leads type motors

3.1.3 Motor Models

Motor type		Rated Output Capacity (kW)	Rated speed (max. speed) (RPM)	Encoder	IP rating of the enclosure
Low inertia, small capacity	MS1H1 	0.4, 0.55, 0.75	3000 (6000)	A3: 23-bit multi-turn absolute encoder	IP67
Medium inertia, small capacity	MS1H4 	0.4, 0.55, 0.75	3000 (6000)	A3: 23-bit multi-turn absolute encoder	IP67

3.2 Product Specifications

3.2.1 Mechanical Characteristics

Item		Description
Duty type		S1 (continuous duty)
Vibration level ^[1]		V15
Insulation resistance		500 VDC, above 10 MΩ
Excitation mode		Permanent magnetic
Installation mode		Flange
Heat resistance level		F
Insulation voltage		1500 VAC, 1 minute (220 V class) 1800 VAC, 1 minute (380 V class)
IP rating of the enclosure		IP67 (except the shaft opening and connectors of motors with flying leads)
Forward rotation		<p>The motor rotates counterclockwise by default when viewed from the shaft extension side upon forward rotation command.</p>  <p>CCW</p>
Environment condition	Ambient temperature	0°C to 40°C (non-freezing) (Derate based on the derating curve for temperatures above 40°C.)
	Ambient humidity	20% to 80% (without condensation)
	Installation location	<p>Install the motor in a place that meets the following requirements:</p> <ul style="list-style-type: none"> • Free from corrosive or explosive gases • Well ventilated with minimum amount of dust, waste and moisture • Convenient for inspection and cleaning • Derating required only for altitudes above 1000 m “3.2.3 Derating Characteristics” on page 19 • Away from sources that may generate strong magnetic field • Away from heating sources such as a stove • Use the motor with oil seal in places with grinding fluid, oil mist, iron powders or cuttings. • The oil seal is only dust-proof. It cannot withstand the intrusion of oil in a long term. • The motor does not apply to vacuum environments. • The motor does not apply to inching condition, which may result in stuck. • The motor with brake may generate a pattering sound. • Use the correct type of couplers and comply with installation alignment requirements.
	Storage environment	<p>Observe the following requirements for keeping a de-energized motor.</p> <ul style="list-style-type: none"> • Temperature: -20°C to +60°C (non-freezing) • Humidity: 20% to 80% RH (without condensation)
Shock resistance ^[2]	Shock acceleration (taking flange face as standard)	490 m/s ²
	Number of shocks	2

Item		Description
Vibration resistance ^[3]	Vibration acceleration (taking flange face as standard)	49 m/s ²

Note

- [1] Vibration level V15 indicates that the vibration amplitude is less than 15 μm when a single servo motor rotates at rated values.
- [2] The resistance for shock in the vertical direction when the servo motor is mounted with the shaft in a horizontal position is shown in the preceding table.
- [3] For a servo motor shaft mounted horizontally, the vibration resistance level in the up/down, left/right, and front/rear directions is shown in the preceding table.
- The strength of the vibration that the servo motor can withstand depends on the application. Check the vibration acceleration rate applied to the servo motor through the actual product.

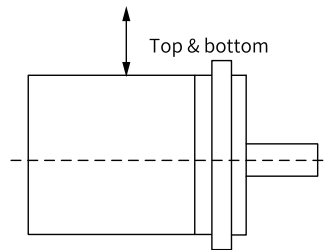


Figure 3-4 Shock applied to the servo motor

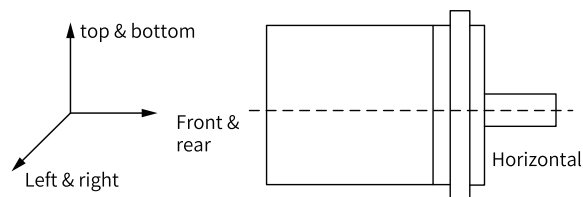


Figure 3-5 Vibration applied to the servo motor

3.2.2 Overload Characteristics

The equipment is compliant with NEC and CEC requirements and equipped with protective functions against overload and overtemperature.

To protect motors with different loads, set motor overload protection gain based on the overload capacity of the motor. Use the default gains in general conditions, however, when one of the following condition occurs, change the gains based on the temperature rise condition of the motor:

- The motor operates in environments with high temperature.
- The motor is in cyclic motion featuring a short motion cycle and frequent acceleration/ deceleration.
- Overload thermal protection only occurs during continuous energized operation. You need to check the motor temperature when the drive is powered off.

Motor overload protection curve is as follows:

Load Ratio (%)	Operating time (s)
120	230
130	80
140	40
150	30
160	20
170	17
180	15
190	12
200	10
210	8.5
220	7
230	6
240	5.5
250	5
300	3
350	2

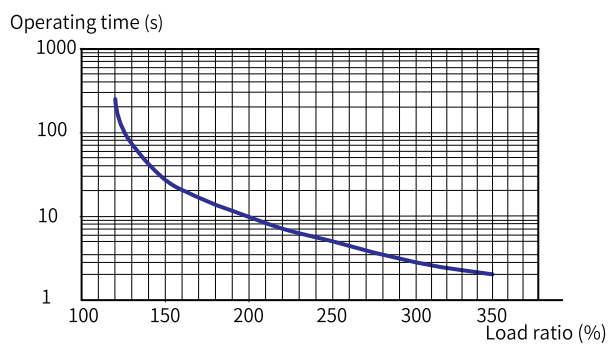


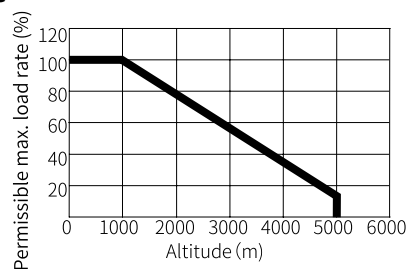
Figure 3-6 Overload curve of MS1H1 and MS1H4 series motors

Note

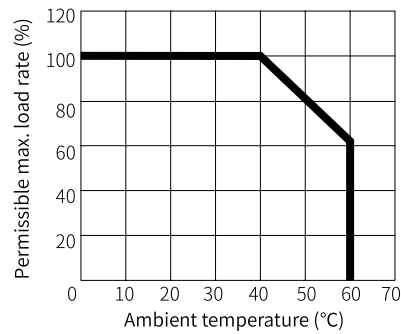
The maximum torque of MS1H1 and MS1H4 models is 3.5 times the rated torque.

3.2.3 Derating Characteristics

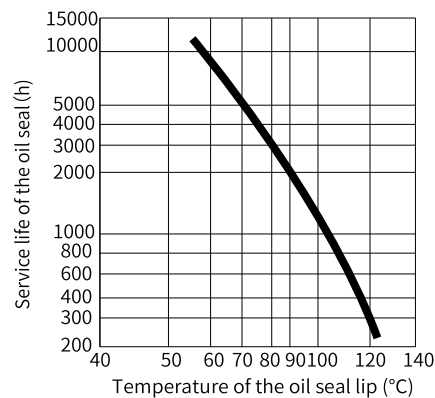
- Altitude-based derating curve



- Temperature-based derating curve



3.2.4 Temperature curve of the oil seal



3.2.5 Load Moment of Inertia

The load moment of inertia represents the inertia of the load. The larger the load moment of inertia is, the weaker the responsiveness is. An excessively high inertia may result in unstable motion. A limit value is set for the allowable load moment of inertia of the motor. This limit value is provided as a guideline and varies with the motor driving conditions.

An overvoltage warning may occur during deceleration if the load moment of inertia exceeds the allowable load moment of inertia. The servo drive with a built-in regenerative resistor may generate an overload warning. In case of such warnings, take one of the following measures:

- Reduce the torque limit value.
- Reduce the deceleration rate.
- Reduce the maximum speed.
- Install an external regenerative resistor if the warning cannot be cleared using the above measures.

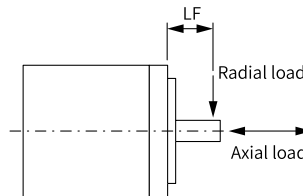


Caution

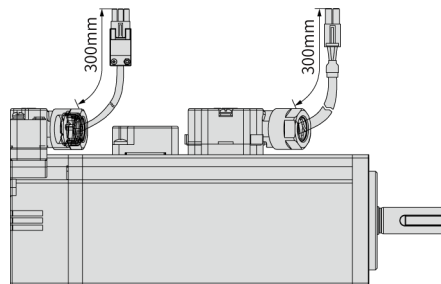
- Drives below 400 W does not provide a built-in braking resistor.
 - Even you use a built-in resistor, the energy generated in some conditions will exceed the allowable capacity loss (W) of the resistor. Therefore, an external braking resistor is required.
-

3.3 Selection Precautions

- Description of the torque-speed characteristics curve:
 - Technical data and torque/speed characteristic values in the following tables are applicable to motors working with Inovance servo drives with the the armature coil temperature being 20°C.
 - Continuous working area: refers to a series of states in which the motor can operate safely and continuously, and the actual torque must be located in this area.
 - Short-time working area: refers to a series of states in which the motor can run in a short time when the actual torque is greater than the rated torque.
- The characteristic parameter values are obtained in cases where the motor is installed with the following heatsink:
 - MS1H1/MS1H4: 250 × 250 × 6 (mm) (aluminum)
 - MS1H2-10C to 25C: 400 × 400 × 20 ((mm) (steel)
 - MS1H2-30C to 50C: 400 × 400 × 20 ((mm) (steel)
 - MS1H3-85B to 18C: 400 × 400 × 20 ((mm) (steel)
 - MS1H3-29C to 55C: 550 × 550 × 30 (mm) (aluminum)
 - MS1H2-50CD and MS1H3-75C: 700 × 700 × 30 (mm) (aluminum)
- Radial and axial loads of the motor:



- Dimensions of flying leads type motors
The 40/60/80-flange flying leads type motor (with “-S”) provides a drain wire of about 300 mm long, as shown in the following figure.



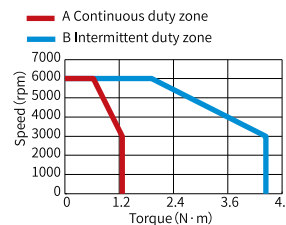
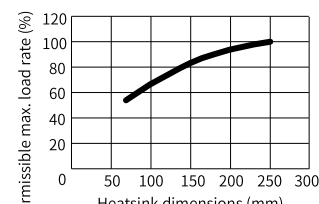
- MS1H3 (130-flange and 180-flange) comes with a key slot. When the operating speed is above 3000 rpm, the motor must run with the key. If you need to run the motor without the key, you can ask for customization from Inovance.

Note

- The data in the () is the value of the servo motor with the brake.
- The motor with oil seal must be derated by 10% during use.
- It is recommended that the cross sectional area of brake cables is above 0.5 mm².
- The brake cannot share the same power supply with other electrical devices. This is to prevent malfunction of the brake due to voltage or current drop caused by operation of other electrical devices.
- The holding brake cannot be used for braking purpose.
- The brake apply time and release time vary with the discharge circuit. Check the actual action delay of the product during use.
- The 24 VDC power supply should be prepared by users.
- In the dimensions: The MS1-R series motor encoder is T3 (18-bit single-turn absolute encoder), in which KA2 = 74 mm.
- The tightening torque for terminal screws must be between 0.19 N·m to 0.21 N·m, exceeding of which may damage the terminal.

3.4 Motor with Low Inertia and Small Capacity (MS1H1)

3.4.1 MS1H1-40B30CB-A33*R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	60			
Inertia, capacity	Low inertia, small capacity			
Rated power (kW)	0.4			
Voltage (V)	220			
Rated torque (N·m)	1.27			
Max. torque (N·m)	4.45			
Rated current (Arms)	2.5		Heatsink-based derating curve	
Max. current (Arms)	9.8			
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.53			
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.145		
	Motor with brake	0.157		

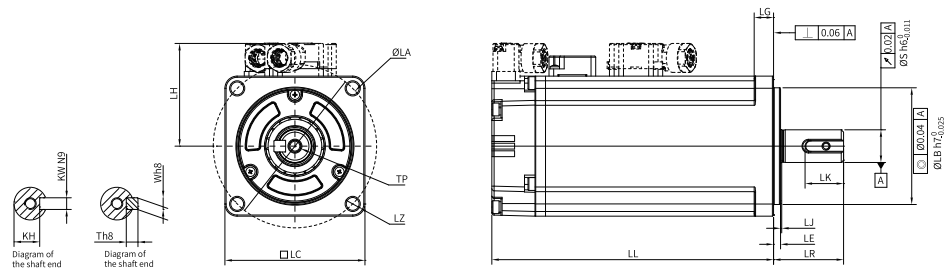
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	≤ 60	≤ 20	≤ 1.5

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
25	245	74

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
60	93 (121)	30±0.5	70	4- Ø 5.5	44	8.0	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø50h7 ⁰ _{-0.025}	14	M5x8	16.5	11 ⁰ _{-0.1}	5	5	5	1.11 (1.48)

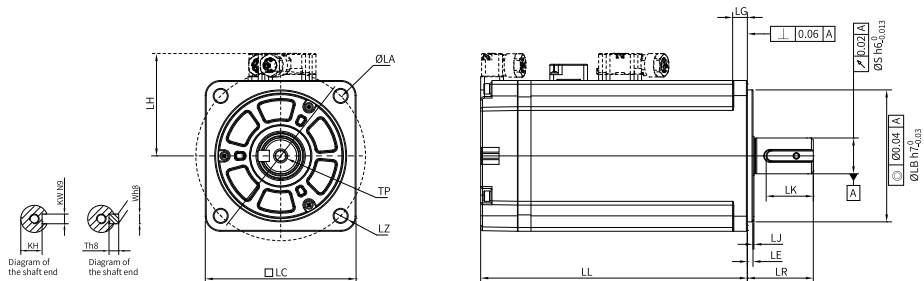
3.4.2 MS1H1-55B30CB-A331R

Motor specifications			Torque-Speed characteristics																
Flange size (mm)	80		<p>A Continuous duty zone B Intermittent duty zone</p> <table border="1"><caption>Torque-Speed Characteristics Data</caption><thead><tr><th>Torque (N·m)</th><th>Speed (rpm) - Zone A</th><th>Speed (rpm) - Zone B</th></tr></thead><tbody><tr><td>0</td><td>5800</td><td>5800</td></tr><tr><td>1.6</td><td>3000</td><td>5800</td></tr><tr><td>3.2</td><td>-</td><td>5800</td></tr><tr><td>6.4</td><td>-</td><td>3000</td></tr></tbody></table>		Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B	0	5800	5800	1.6	3000	5800	3.2	-	5800	6.4	-	3000
Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B																	
0	5800	5800																	
1.6	3000	5800																	
3.2	-	5800																	
6.4	-	3000																	
Inertia, capacity	Low inertia, small capacity																		
Rated power (kW)	0.55																		
Voltage (V)	220																		
Rated torque (N·m)	1.75																		
Max. torque (N·m)	6.13																		
Rated current (Arms)	3.9		Heatsink-based derating curve																
Max. current (Arms)	15		<p>Permissible max. load rate (%)</p> <table border="1"><caption>Heatsink-based Derating Curve Data</caption><thead><tr><th>Heatsink dimensions (mm)</th><th>Permissible max. load rate (%)</th></tr></thead><tbody><tr><td>100</td><td>65</td></tr><tr><td>150</td><td>90</td></tr><tr><td>200</td><td>98</td></tr><tr><td>250</td><td>100</td></tr><tr><td>300</td><td>100</td></tr></tbody></table>		Heatsink dimensions (mm)	Permissible max. load rate (%)	100	65	150	90	200	98	250	100	300	100			
Heatsink dimensions (mm)	Permissible max. load rate (%)																		
100	65																		
150	90																		
200	98																		
250	100																		
300	100																		
Rated speed (rpm)	3000																		
Max. speed (rpm)	6000																		
Torque coefficient (N·m/Arms)	0.49																		
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.55																	
	Motor with brake	-																	

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	96.7	35±0.5	90	4- Ø 7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	1.88

3.4.3 MS1H1-75B30CB-A33*R

Motor specifications			Torque-Speed characteristics																												
Flange size (mm)	80		<p>The graph shows two operating zones: A (Continuous duty zone, red line) and B (Intermittent duty zone, blue line). The y-axis is Speed (rpm) from 0 to 7000, and the x-axis is Torque (N·m) from 0 to 10. Zone A is a vertical line at 2.39 N·m from 3000 to 6000 rpm. Zone B is a horizontal line at 6000 rpm from 0 to 2.39 N·m, and a diagonal line from (2.39, 6000) to (8.37, 3000), and a vertical line at 8.37 N·m from 3000 to 0 rpm.</p> <table border="1"><caption>Torque-Speed Characteristics Data</caption><thead><tr><th>Torque (N·m)</th><th>Speed (rpm)</th><th>Duty Zone</th></tr></thead><tbody><tr><td>0</td><td>6000</td><td>A</td></tr><tr><td>2.39</td><td>6000</td><td>A</td></tr><tr><td>2.39</td><td>3000</td><td>A</td></tr><tr><td>2.39</td><td>0</td><td>A</td></tr><tr><td>0</td><td>6000</td><td>B</td></tr><tr><td>2.39</td><td>6000</td><td>B</td></tr><tr><td>8.37</td><td>3000</td><td>B</td></tr><tr><td>8.37</td><td>0</td><td>B</td></tr></tbody></table>		Torque (N·m)	Speed (rpm)	Duty Zone	0	6000	A	2.39	6000	A	2.39	3000	A	2.39	0	A	0	6000	B	2.39	6000	B	8.37	3000	B	8.37	0	B
Torque (N·m)	Speed (rpm)	Duty Zone																													
0	6000	A																													
2.39	6000	A																													
2.39	3000	A																													
2.39	0	A																													
0	6000	B																													
2.39	6000	B																													
8.37	3000	B																													
8.37	0	B																													
Inertia, capacity	Low inertia, small capacity																														
Rated power (kW)	0.75																														
Voltage (V)	220																														
Rated torque (N·m)	2.39																														
Max. torque (N·m)	8.37																														
Rated current (Arms)	4.4																														
Max. current (Arms)	16.9																														
Rated speed (rpm)	3000																														
Max. speed (rpm)	6000																														
Torque coefficient (N·m/Arms)	0.58																														
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.68																													
	Motor with brake	0.71																													

Heatsink-based derating curve													
<p>The graph shows the permissible maximum load rate (%) as a function of heatsink dimensions (mm). The y-axis ranges from 0 to 120%, and the x-axis ranges from 0 to 300 mm. The curve starts at approximately 70% for 100 mm and rises to 100% for 250 mm and above.</p> <table border="1"><caption>Heatsink-based derating curve Data</caption><thead><tr><th>Heatsink dimensions (mm)</th><th>Permissible max. load rate (%)</th></tr></thead><tbody><tr><td>100</td><td>70</td></tr><tr><td>150</td><td>90</td></tr><tr><td>200</td><td>98</td></tr><tr><td>250</td><td>100</td></tr><tr><td>300</td><td>100</td></tr></tbody></table>		Heatsink dimensions (mm)	Permissible max. load rate (%)	100	70	150	90	200	98	250	100	300	100
Heatsink dimensions (mm)	Permissible max. load rate (%)												
100	70												
150	90												
200	98												
250	100												
300	100												

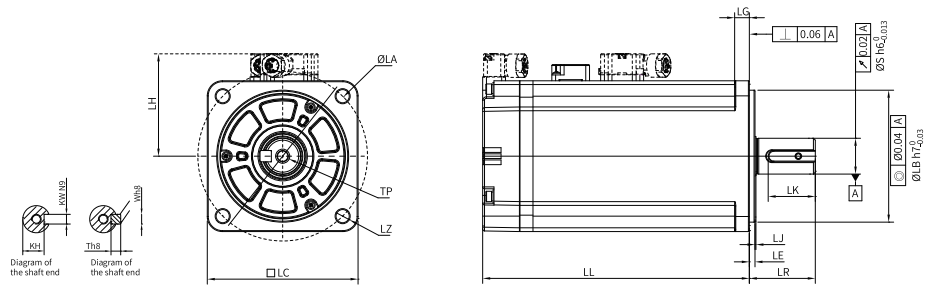
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	≤ 60	≤ 40	≤ 1

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	107.3 (141.5)	35±0.5	90	4- Ø 7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	2.22 (2.88)

3.5 Motor with Medium Inertia and Small Capacity (MS1H4)

3.5.1 MS1H4-40B30CB-A33*R

Motor specifications			Torque-Speed characteristics																
Flange size (mm)	60		<p>A line graph showing the torque-speed characteristics of the motor. The x-axis represents Torque (N·m) from 0 to 4.8, and the y-axis represents Speed (rpm) from 0 to 7000. Two duty zones are shown: A (Continuous duty zone, red line) and B (Intermittent duty zone, blue line). Zone A starts at 6000 rpm for 0 to 1.27 N·m, then drops to 3000 rpm at 1.27 N·m, and ends at 0 rpm at 1.27 N·m. Zone B starts at 6000 rpm for 0 to 2.4 N·m, then drops to 3000 rpm at 2.4 N·m, and ends at 0 rpm at 4.45 N·m.</p> <table border="1"><thead><tr><th>Torque (N·m)</th><th>Speed (rpm) - Zone A</th><th>Speed (rpm) - Zone B</th></tr></thead><tbody><tr><td>0</td><td>6000</td><td>6000</td></tr><tr><td>1.27</td><td>3000</td><td>6000</td></tr><tr><td>2.4</td><td>0</td><td>3000</td></tr><tr><td>4.45</td><td>0</td><td>0</td></tr></tbody></table>		Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B	0	6000	6000	1.27	3000	6000	2.4	0	3000	4.45	0	0
Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B																	
0	6000	6000																	
1.27	3000	6000																	
2.4	0	3000																	
4.45	0	0																	
Inertia, capacity	medium inertia, small capacity																		
Rated power (kW)	0.4																		
Voltage (V)	220																		
Rated torque (N·m)	1.27																		
Max. torque (N·m)	4.45																		
Rated current (Arms)	2.4		Heatsink-based derating curve																
Max. current (Arms)	9.2		<p>A line graph showing the permissible maximum load rate (%) as a function of heatsink dimensions (mm). The x-axis represents Heatsink dimensions (mm) from 0 to 300, and the y-axis represents Permissible max. load rate (%) from 0 to 120. The curve starts at approximately 55% load rate for 75 mm dimensions and increases to 100% load rate for 250 mm dimensions.</p> <table border="1"><thead><tr><th>Heatsink dimensions (mm)</th><th>Permissible max. load rate (%)</th></tr></thead><tbody><tr><td>75</td><td>55</td></tr><tr><td>100</td><td>65</td></tr><tr><td>150</td><td>85</td></tr><tr><td>200</td><td>95</td></tr><tr><td>250</td><td>100</td></tr></tbody></table>		Heatsink dimensions (mm)	Permissible max. load rate (%)	75	55	100	65	150	85	200	95	250	100			
Heatsink dimensions (mm)	Permissible max. load rate (%)																		
75	55																		
100	65																		
150	85																		
200	95																		
250	100																		
Rated speed (rpm)	3000																		
Max. speed (rpm)	6000																		
Torque coefficient (N·m/Arms)	0.53																		
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.43																	
	Motor with brake	0.44																	

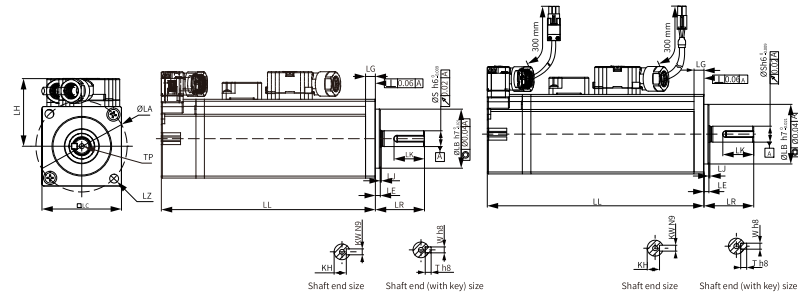
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	≤ 60	≤ 20	≤ 1.5

Allowable load

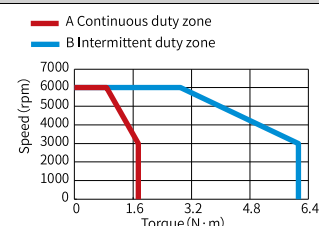
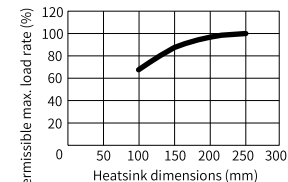
LF (mm)	Allowable radial load (N)	Allowable axial load (N)
25	245	74

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
60	92 (119.8)	30±0.5	70	4-Ø5.5	44	8.0	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø50h7 ⁰ _{-0.025}	14	M5x8	16.5	11 ⁰ _{-0.1}	5	5	5	1.11 (1.48)

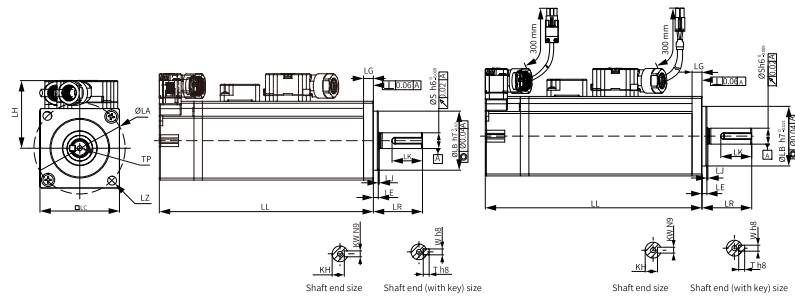
3.5.2 MS1H4-55B30CB-A331R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	80			
Inertia, capacity	medium inertia, small capacity			
Rated power (kW)	0.55			
Voltage (V)	220			
Rated torque (N·m)	1.75			
Max. torque (N·m)	6.13			
Rated current (Arms)	3.3			
Max. current (Arms)	13.2		Heatsink-based derating curve	
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.49			
Rotor moment of inertia (kg·cm ²)	Motor without brake	1.12		
	Motor with brake	-		

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	96.7	35±0.5	90	4- Ø7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	1.85

3.5.3 MS1H4-75B30CB-A33*R

Motor specifications			Torque-Speed characteristics																
Flange size (mm)	80		<p>The graph shows two operating zones: A (Continuous duty zone, red line) and B (Intermittent duty zone, blue line). The y-axis is Speed (rpm) from 0 to 7000, and the x-axis is Torque (N·m) from 0 to 10. Zone A is a vertical line at 2.39 N·m from 3000 to 6000 rpm. Zone B is a horizontal line at 6000 rpm from 0 to 4.78 N·m, and a diagonal line from (4.78, 6000) to (9.56, 3000).</p> <table border="1"><caption>Torque-Speed Data</caption><thead><tr><th>Torque (N·m)</th><th>Speed (rpm) - Zone A</th><th>Speed (rpm) - Zone B</th></tr></thead><tbody><tr><td>0</td><td>-</td><td>6000</td></tr><tr><td>2.39</td><td>3000 - 6000</td><td>6000</td></tr><tr><td>4.78</td><td>-</td><td>6000</td></tr><tr><td>9.56</td><td>-</td><td>3000</td></tr></tbody></table>		Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B	0	-	6000	2.39	3000 - 6000	6000	4.78	-	6000	9.56	-	3000
Torque (N·m)	Speed (rpm) - Zone A	Speed (rpm) - Zone B																	
0	-	6000																	
2.39	3000 - 6000	6000																	
4.78	-	6000																	
9.56	-	3000																	
Inertia, capacity	medium inertia, small capacity																		
Rated power (kW)	0.75																		
Voltage (V)	220																		
Rated torque (N·m)	2.39																		
Max. torque (N·m)	8.37																		
Rated current (Arms)	4.4																		
Max. current (Arms)	16.9																		
Rated speed (rpm)	3000																		
Max. speed (rpm)	6000																		
Torque coefficient (N·m/Arms)	0.58																		
Rotor moment of inertia (kg·cm ²)	Motor without brake	1.46																	
	Motor with brake	1.51																	

Heatsink-based derating curve											
<p>The graph shows the permissible maximum load rate as a function of heatsink dimensions. The y-axis is Permissible max. load rate (%) from 0 to 120, and the x-axis is Heatsink dimensions (mm) from 0 to 300. The curve starts at (100, 70) and rises to (250, 100).</p> <table border="1"><caption>Heatsink-based derating curve Data</caption><thead><tr><th>Heatsink dimensions (mm)</th><th>Permissible max. load rate (%)</th></tr></thead><tbody><tr><td>100</td><td>70</td></tr><tr><td>150</td><td>90</td></tr><tr><td>200</td><td>98</td></tr><tr><td>250</td><td>100</td></tr></tbody></table>		Heatsink dimensions (mm)	Permissible max. load rate (%)	100	70	150	90	200	98	250	100
Heatsink dimensions (mm)	Permissible max. load rate (%)										
100	70										
150	90										
200	98										
250	100										

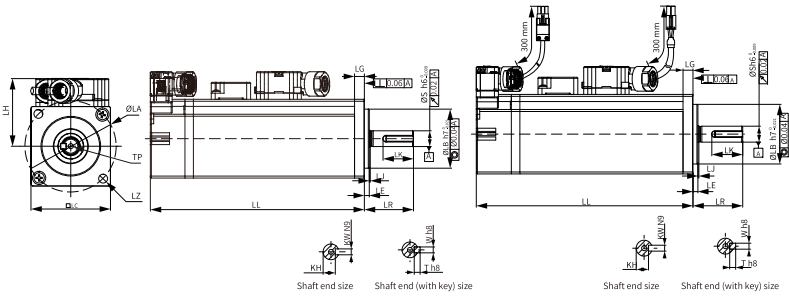
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	≤ 60	≤ 40	≤ 1

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

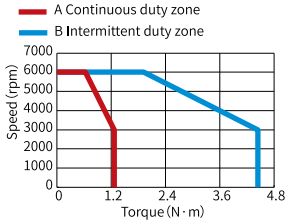
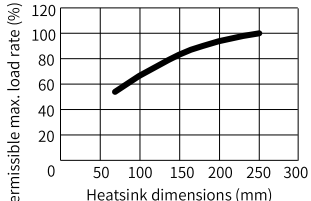
Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	107.3 (140.5)	35±0.5	90	4-Ø7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	2.18 (2.82)

4 Motor with Low Inertia and Small Capacity (MS1H1)

4.1 MS1H1-40B30CB-A33*R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	60			
Inertia, capacity	Low inertia, small capacity			
Rated power (kW)	0.4			
Voltage (V)	220			
Rated torque (N·m)	1.27			
Max. torque (N·m)	4.45			
Rated current (Arms)	2.5			
Max. current (Arms)	9.8		<h3>Heatsink-based derating curve</h3> 	
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.53			
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.145		
	Motor with brake	0.157		

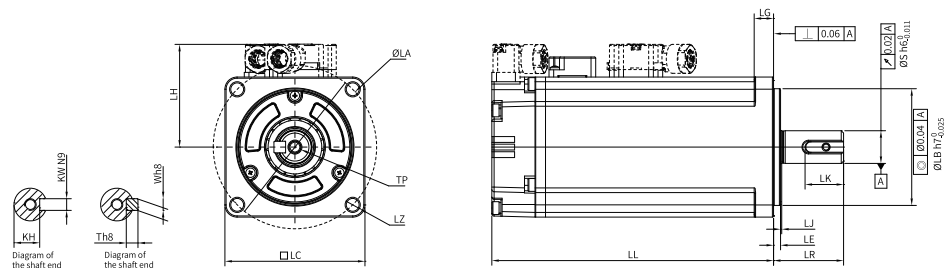
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC) ±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	≤ 60	≤ 20	≤ 1.5

Allowable load

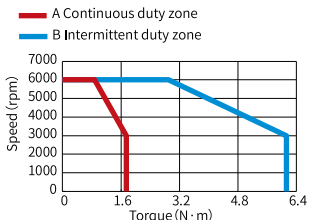
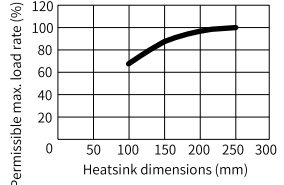
LF (mm)	Allowable radial load (N)	Allowable axial load (N)
25	245	74

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
60	93 (121)	30±0.5	70	4- Ø 5.5	44	8.0	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø50h7 ⁰ -0.025	14	M5x8	16.5	11 ⁰ -0.1	5	5	5	1.11 (1.48)

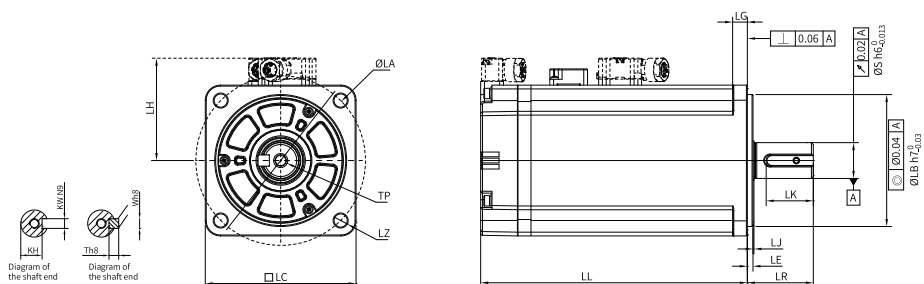
4.2 MS1H1-55B30CB-A331R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	80			
Inertia, capacity	Low inertia, small capacity			
Rated power (kW)	0.55			
Voltage (V)	220			
Rated torque (N·m)	1.75			
Max. torque (N·m)	6.13			
Rated current (Arms)	3.9			
Max. current (Arms)	15			
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.49			
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.55		
	Motor with brake	-		

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	96.7	35±0.5	90	4- Ø 7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	1.88

4.3 MS1H1-75B30CB-A33*R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	80		<p>— A Continuous duty zone — B Intermittent duty zone</p> <p>Speed (rpm)</p> <p>Torque (N · m)</p>	
Inertia, capacity	Low inertia, small capacity			
Rated power (kW)	0.75			
Voltage (V)	220			
Rated torque (N · m)	2.39			
Max. torque (N · m)	8.37			
Rated current (Arms)	4.4			
Max. current (Arms)	16.9			
Rated speed (rpm)	3000		Heatsink-based derating curve	
Max. speed (rpm)	6000			
Torque coefficient (N · m/Arms)	0.58			
Rotor moment of inertia (kg · cm ²)	Motor without brake	0.68		
	Motor with brake	0.71		

Heatsink-based derating curve	
<p>Permissible max. load rate (%)</p> <p>Heatsink dimensions (mm)</p>	

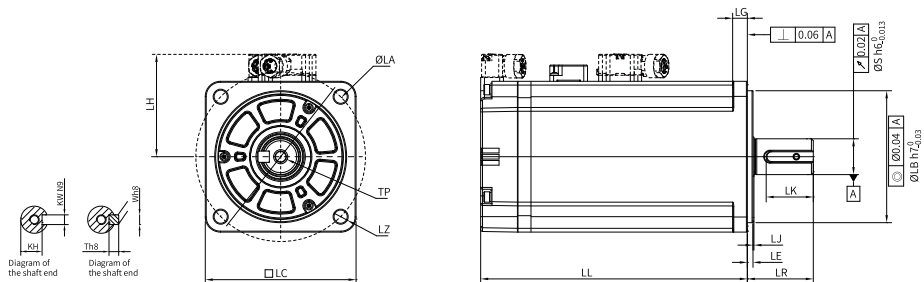
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	≤ 60	≤ 40	≤ 1

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

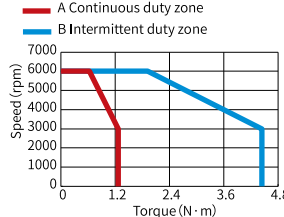
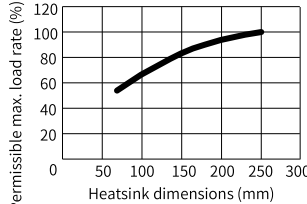
Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	107.3 (141.5)	35±0.5	90	4- Ø 7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	2.22 (2.88)

5 Motor with Medium Inertia and Small Capacity (MS1H4)

5.1 MS1H4-40B30CB-A33*R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	60			
Inertia, capacity	medium inertia, small capacity			
Rated power (kW)	0.4			
Voltage (V)	220			
Rated torque (N·m)	1.27			
Max. torque (N·m)	4.45			
Rated current (Arms)	2.4			
Max. current (Arms)	9.2			
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.53			
Rotor moment of inertia (kg·cm ²)	Motor without brake	0.43		
	Motor with brake	0.44		

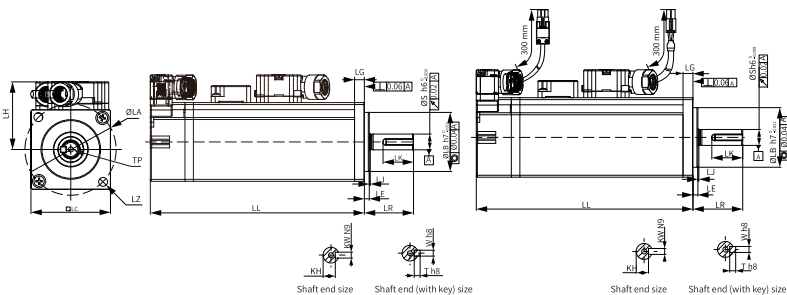
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	≤ 60	≤ 20	≤ 1.5

Allowable load

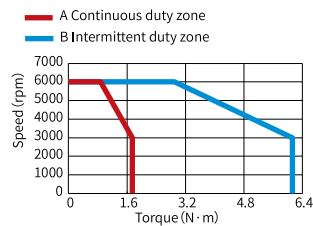
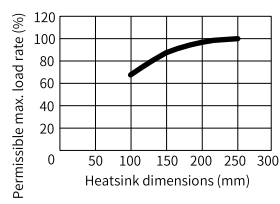
LF (mm)	Allowable radial load (N)	Allowable axial load (N)
25	245	74

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
60	92 (119.8)	30±0.5	70	4-Ø5.5	44	8.0	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø50h7 ⁰ _{-0.025}	14	M5x8	16.5	11 ⁰ _{-0.1}	5	5	5	1.11 (1.48)

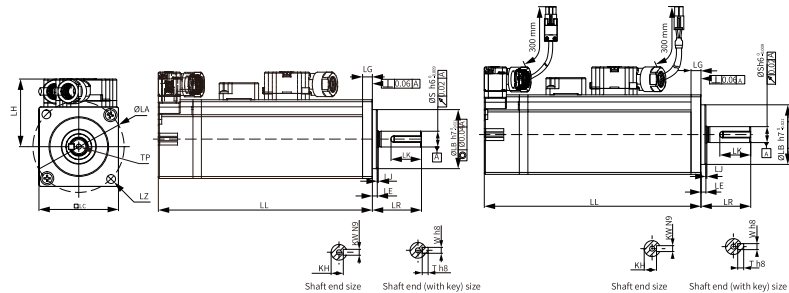
5.2 MS1H4-55B30CB-A331R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	80			
Inertia, capacity	medium inertia, small capacity			
Rated power (kW)	0.55			
Voltage (V)	220			
Rated torque (N·m)	1.75			
Max. torque (N·m)	6.13			
Rated current (Arms)	3.3		Heatsink-based derating curve	
Max. current (Arms)	13.2			
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.49			
Rotor moment of inertia (kg·cm ²)	Motor without brake	1.12		
	Motor with brake	-		

Allowable load

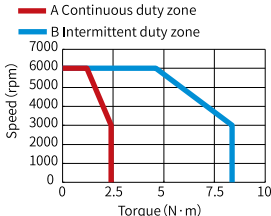
LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

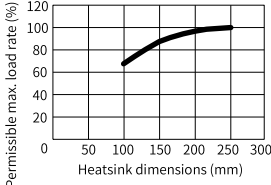
Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	96.7	35±0.5	90	4- Ø7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	1.85

5.3 MS1H4-75B30CB-A33*R

Motor specifications			Torque-Speed characteristics	
Flange size (mm)	80			
Inertia, capacity	medium inertia, small capacity			
Rated power (kW)	0.75			
Voltage (V)	220			
Rated torque (N·m)	2.39			
Max. torque (N·m)	8.37			
Rated current (Arms)	4.4			
Max. current (Arms)	16.9			
Rated speed (rpm)	3000			
Max. speed (rpm)	6000			
Torque coefficient (N·m/Arms)	0.58		Heatsink-based derating curve	
Rotor moment of inertia (kg·cm ²)	Motor without brake	1.46		
	Motor with brake	1.51		

Heatsink-based derating curve	
	

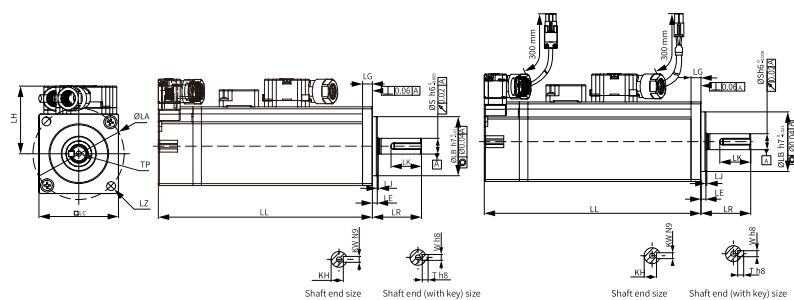
Electrical specifications of the motor with brake

Holding torque (N·m)	Supply voltage (VDC)±10%	Rated power (W)	Coil resistance (Ω) (±7%)	Exciting current (A)	Apply time (ms)	Release time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	≤ 60	≤ 40	≤ 1

Allowable load

LF (mm)	Allowable radial load (N)	Allowable axial load (N)
35	392	147

Product dimensions (unit: mm)



LC	LL	LR	LA	LZ	LH	LG	LE	LJ
80	107.3 (140.5)	35±0.5	90	4-Ø7	54	7.5	3±0.5	0.5±0.35
LB	S	TP	LK	KH	KW	W	T	Weight (kg)
Ø70h7 ⁰ _{-0.03}	19	M6x20	25	15.5 ⁰ _{-0.1}	6	6	6	2.18 (2.82)

6 Options

6.1 List of Optional Parts

Type	Name	Location	Applicable Model	Description
Peripheral components	Fuse and circuit breaker	Input side of the servo drive	All	To comply with EN 61800-5-1 standards, install a fuse/circuit breaker on the input side of the servo drive to prevent accidents caused by short circuit in the internal circuit.
	AC Input Reactor	Input side of the servo drive		Eliminates harmonics on the input side and improves the power factor on the input side.
	EMC filter	Input side of the servo drive		Reduces the conducted and radiated interference escaped from the servo drive to the outside.
	Magnetic ring	Output side of the servo drive		Reduces interferences to the outside and the bearing current.
		Signal cable		Improves the anti-interference performance of signals.

6.2 Cables

6.2.1 Description of the Model Number

Power cable

$$\begin{array}{ccccccc} \text{S6-L-M} & 0 & 0 & 0 & - & 3.0 & - & \text{T} & - & \text{X} \\ \text{①} & \text{②} & \text{③} & \text{④} & & \text{⑤} & & \text{⑥} & & \text{⑦} \end{array}$$

1 Cable Type S6-L-B/M: motion control power cable B: with brake M: without brake	4 Connector type at motor side 0: AMP 1: 9-core military-spec connector 2: 6-core military-spec connector 4: Middle series 4-core connector 5: Middle series 6-core connector 6: SM-PW series 6-core connector 7: SDC-06T series connector (front outgoing) 8: SDC-06T series connector (rear outgoing)	5 Cable Length (m) 3.0: 3 m 5.0: 5 m 8.0: 8 m 10.0: 10 m
2 Connector type at drive side 0: U-shaped cable lug 1: Needle-shaped cable lug		6 Special requirements T: Drag chain TS: Shielded flexible cable S: Single shield TTS: Drag chain shielding 20 million times
3 Cable Size (mm²) 0: Wire-saving encoder 1: 100/130/180 flange (drive rated current < 13 A) 2: 180 (drive rated current > 13 A) 3: 4×12 AWG 4: 4×14 AWG 5: 4×16 AWG 6: 4×18 AWG 7: 4×20 AWG		7 Manufacturer YGS: Igus

Model number of encoder cables

S6-L-P 0 0 0 - 3.0 - T - X
 ① ② ③ ④ ⑤ ⑥ ⑦

1 Cable Type S6-L-P: Motion control encoder cable	4 Connector type at motor side 0: AMP 1: 9-core military-spec connector 2: 6-core military-spec connector 4: Middle series 4-core connector 5: Middle series 6-core connector 6: SM-PW series 6-core connector 7: SDC-07T series connector (front outgoing) 8: SDC-07T series connector (rear outgoing) 9: DB9 2-rows-Inno A: DB15 2-row-RSF B: DB15 2-row-Renishaw C: DB15 2-row-Banyan D: DB15 3-row-Inovance	5 Cable Length (m) 3.0: 3 m 5.0: 5 m 8.0: 8 m 10.0: 10 m
2 Connector type at drive side 0: DB9 1: USB 2: DB15		6 Special requirements T: Drag chain TS: Shielded flexible cable TTS: Drag chain shielding 20 million times
3 Encode 0: Wire-saving encoder 1: Communication incremental encoder 2: Communication multi-turn absolute encoder 3: Optical 4: Magnetic		7 Manufacturer YGS: Igus

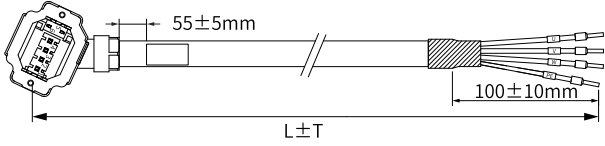
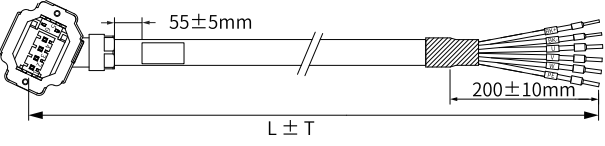
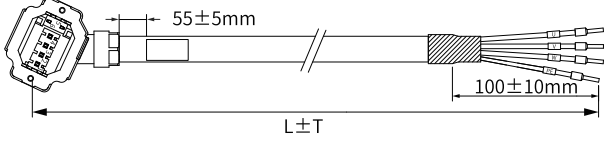
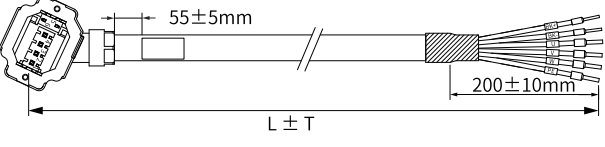
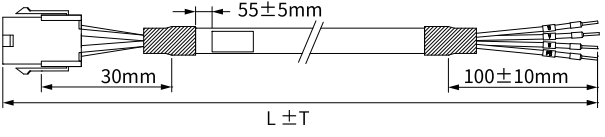
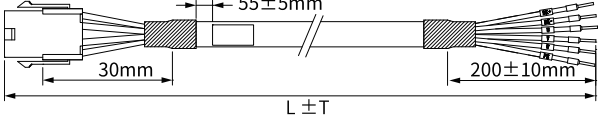
Model number of communication cables

S6N-L-T 00 - 3.0
 ① ② ③


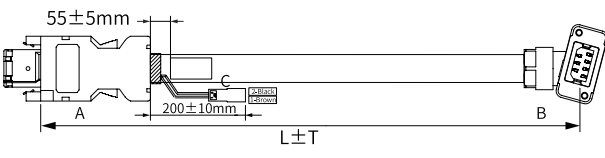
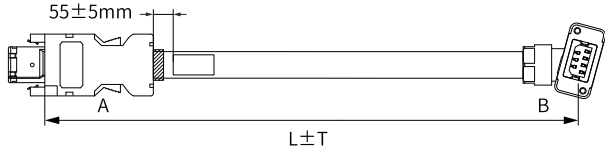
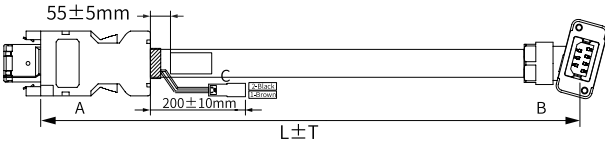
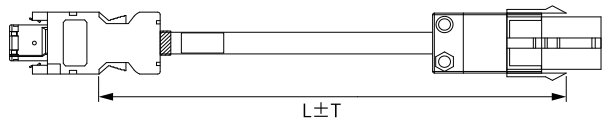
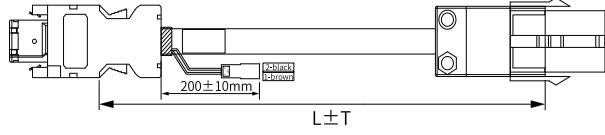
1 Cable Type S6-L-T: Motion control communication cable S6N-L-T: IS620F Motion Control Encoder Cable (only for servo drive PC communication cable)	2 Cable type 00: Servo drive PC communication cable 01: Servo drive network communication cable (CAN&485) 02: Servo drive and PLC communication cable 03: Servo drive termination resistor cable 04: Servo drive network communication cable (EtherCAT) 05: Servo drive network communication cable (Mechatrolink II) 06: Servo drive termination resistor cable (Mechatrolink II)	3 Cable Length (m) 3.0: 3 m 5.0: 5 m 8.0: 8 m 10.0: 10 m
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6.2.2 Applicable Cables

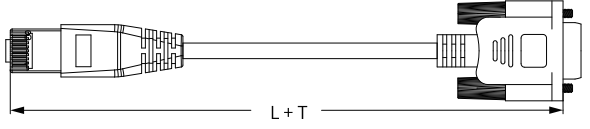
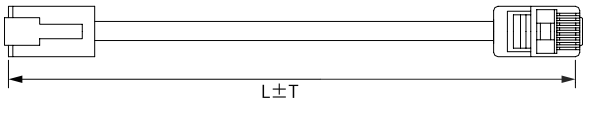
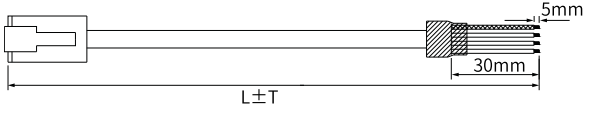
Power cable

Motor Model	Cable Name		Cable Model	Cable Length (mm)	Tolerance (T) (mm)	Outline Drawing
MS1H1/ MS1H4 terminal- type motor	Front outlet	Power cable for motor without brake	S6-L-M107-3.0	3000	(-30.30)	
			S6-L-M107-5.0	5000	(-30.50)	
			S6-L-M107-10.0	10000	(-30.80)	
		Brake	S6-L-B107-3.0	3000	(-30.30)	
			S6-L-B107-5.0	5000	(-30.50)	
			S6-L-B107-10.0	10000	(-30.80)	
	Rear outlet	Power cable for motor without brake	S6-L-M108-3.0	3000	(-30.30)	
			S6-L-M108-5.0	5000	(-30.50)	
			S6-L-M108-10.0	10000	(-30.80)	
		Brake	S6-L-B108-3.0	3000	(-30.30)	
			S6-L-B108-5.0	5000	(-30.50)	
			S6-L-B108-10.0	10000	(-30.80)	
MS1H1/ MS1H4 lead- type (-S) motor	Power cable for motor without brake		S6-L-M100-3.0	3000	(-30.30)	
			S6-L-M100-5.0	5000	(-30.50)	
			S6-L-M100-10.0	10000	(-30.80)	
	Brake		S6-L-B100-3.0	3000	(-30.30)	
			S6-L-B100-5.0	5000	(-30.50)	
			S6-L-B100-10.0	10000	(-30.80)	

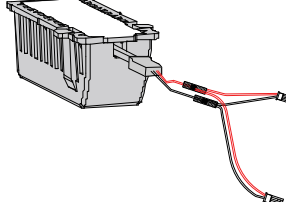
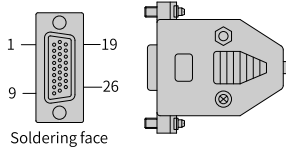
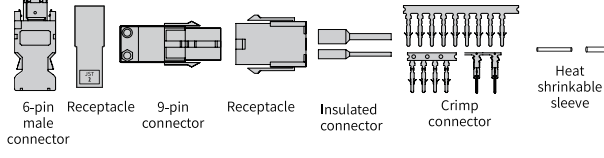
Encoder cable

Motor Model	Cable Name		Cable Model	Cable Length (mm)	Tolerance (T) (mm)	Outline Drawing
MS1H1/ MS1H4 terminal- type motor	Front outlet	Single-turn absolute encoder cable	S6-L-P114-3.0	3000	(-30.30)	
			S6-L-P114-5.0	5000	(-30.50)	
			S6-L-P114-10.0	10000	(-30.80)	
		Multi-turn absolute encoder cable	S6-L-P124-3.0	3000	(-30.30)	
			S6-L-P124-5.0	5000	(-30.50)	
			S6-L-P124-10.0	10000	(-30.80)	
	Rear outlet	Single-turn absolute encoder cable	S6-L-P115-3.0	3000	(-30.30)	
			S6-L-P115-5.0	5000	(-30.50)	
			S6-L-P115-10.0	10000	(-30.80)	
		Multi-turn absolute encoder cable	S6-L-P125-3.0	3000	(-30.30)	
			S6-L-P125-5.0	5000	(-30.50)	
			S6-L-P125-10.0	10000	(-30.80)	
MS1H1/MS1H4 lead-type (-S) motor	Single-turn absolute encoder cable	Single-turn absolute encoder cable	S6-L-P110-3.0	3000	(-30.30)	
			S6-L-P110-5.0	5000	(-30.50)	
			S6-L-P110-10.0	10000	(-30.80)	
	Multi-turn absolute encoder cable	Multi-turn absolute encoder cable	S6-L-P120-3.0	3000	(-30.30)	
			S6-L-P120-5.0	5000	(-30.50)	
			S6-L-P120-10.0	10000	(-30.80)	

Communication cables

Cable Name	Cable Model	Cable Length (mm)	Tolerance (T) (mm)	Outline Drawing
Drive-PC communication cable	S6-L-T00-3.0	3000	(-30.30)	
Multi-Drive Communication Cable	S6-L-T01-0.3	300	(-10.10)	
Servo drive to host controller communication cable	S6-L-T02-2.0	2000	(-20.20)	

Connector Kit

Name	Model	Outline Drawing
Battery kit	S6-C9A	
CN1 terminal (DB26)	S6-C74	
MS1H1 flying leads type (-S) motor connector	S6-C26	

6.3 Peripheral Electrical Devices

6.3.1 Circuit breaker

Table 6–1 Recommended circuit breaker models

Servo drive SV660ND****I			Recommended Circuit Breaker		
Size	Model	Rated Input Current (A)	Manufacturer	Current (A)	Model
Single-phase 220 V					
Size A	S2R8	7.2	Schneider	16	OSMC32N2C16
Size B	S5R5	12.4		20	OSMC32N2C20
Three-phase 220 V					
Size A	S2R8	4.2	Schneider	6	OSMC32N3C6
Size B	S5R5	7.5		16	OSMC32N3C16

If a residual current device (RCD) is needed, select the RCD according to the following requirements:

- Use a B-type RCD because the drive may generate DC leakage current in the protective conductor.
- For each drive, use an RCD whose tripping current is not lower than 150 mA to prevent RCD malfunction due to high-frequency leakage current generated by the drive.
- When multiple drives are connected in parallel and share one RCD, select an RCD whose tripping current is not lower than 300 mA.
- Use Chint or Schneider RCDs (recommended).

6.3.2 Fuse

To prevent accidents caused by short circuit, install a fuse on the input side of the servo drive.

Table 6–2 List of recommended fuses

Servo drive SV660ND****I			Recommended Fuse		
Size	Model	Rated input current (A)	Manufacturer	Rated Current (A)	Model
Single-phase 220 V					
Size A	S2R8	7.2	Bussmann	20	FWP-20B
Size B	S5R5	12.4		35	FWP-35C
Three-phase 220 V					
Size A	S2R8	4.2	Bussmann	20	FWP-20B
Size B	S5R5	7.5		35	FWP-35C

6.3.3 Electromagnetic contactor

Table 6-3 Recommended electromagnetic contactor models

Servo drive SV660ND****I			Recommended Contactor		
Size	Model	Rated input current (A)	Manufacturer	Current (A)	Model
Single-phase 220 V					
Size A	S2R8	7.2	Schneider	9	LC1 D09
Size B	S5R5	12.4		18	LC1 D18
Three-phase 220 V					
Size A	S2R8	4.2	Schneider	9	LC1 D09
Size B	S5R5	7.5		9	LC1 D09

6.3.4 AC Input Reactor

Model selection

An AC input reactor is optional and mainly used to reduce harmonics in the input current. Install an external reactor as needed in actual applications. The following table lists the recommended manufacturers and models of input reactors.

Table 6-4 AC input reactor model selection

Servo drive SV660ND****I			Applicable Reactor	Inductance (mH)
Size	Model	Rated Input Current (A)		
Three-phase 220 V				
Size A	S2R8	4.2	MD-ACL-10-5-4T	5
Size B	S5R5	7.5	MD-ACL-10-5-4T	5

Dimensions

- Inovance input reactors

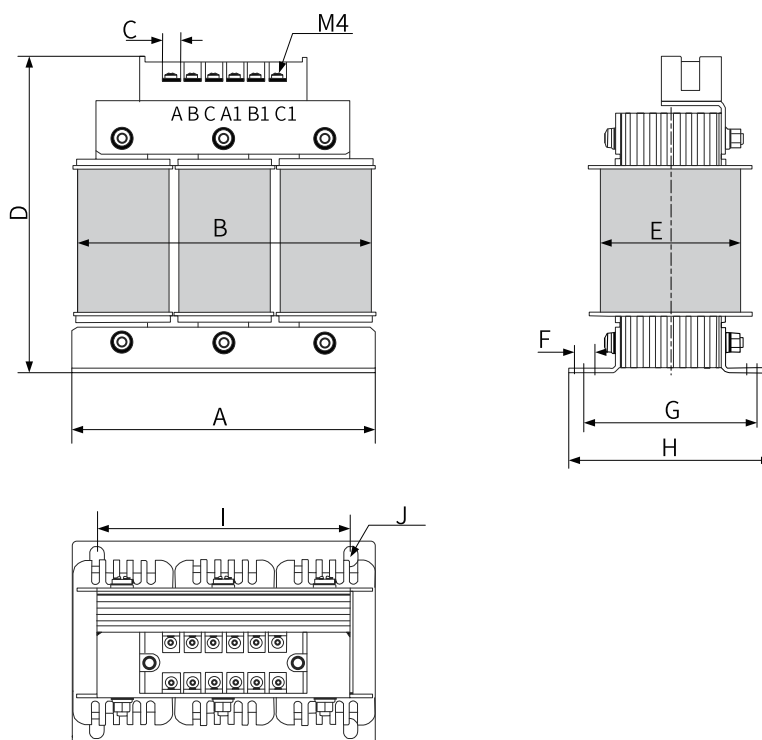


Figure 6-1 Dimensions of 10 A–15 A AC input reactors

Table 6-5 Dimensions of Inovance AC input reactors (unit: mm)

Model	A	B	C	D	E	F	G	H	I	J
MD-ACL-10-5-4T	150±2	155	8	160	80	10	85±2	100±2	125±1	Φ7 x 10

6.3.5 EMC Filter

Model selection

To comply with EN IEC 61800-3 requirements in terms of radiated and conducted emission, install an EMC filter listed in the following table. You can only use the FN3287 series EMC filters manufactured by Schaffner. Select the EMC filter according to the rated input current of the servo drive, as shown in the following table.

Table 6-6 Standard EMC filter model and appearance

Filter Model	
Schaffner	FN 3287 series

Table 6-7 Filter model selection (Schaffner)

Servo drive SV660ND****I			Applicable Filter
Size	Model	Rated Input Current (A)	
Single-phase 220 V			
Size A	S2R8	7.2	FN 3287-16-44-C33-R65
Size B	S5R5	12.4	FN 3287-16-44-C33-R65
Three-phase 220 V			

Servo drive SV660ND****I			Applicable Filter
Size	Model	Rated Input Current (A)	
Size A	S2R8	4.2	FN 3287-10-44-C33-R65
Size B	S5R5	7.5	FN 3287-10-44-C33-R65

Dimensions

Dimensions of Schaffner FN 3287 series filters

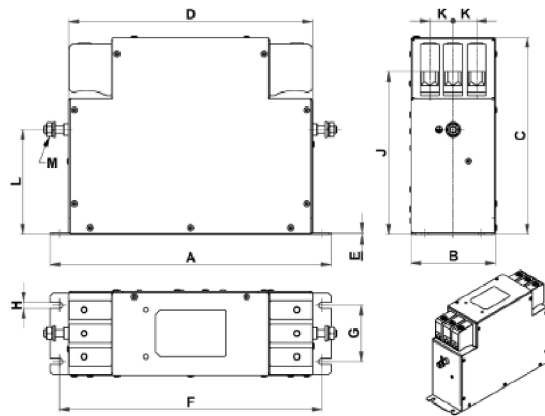


Figure 6-2 Dimension drawing of FN 3287 series filters (unit: mm)

Table 6-8 Dimensions of FN 3287 series filters (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	J±2	K	L±1	M
10	180	40	112	153	0.8	170	20	4.5	94	11	68	M5
16	200	45	112	170	0.8	185	25	5.4	102	11	76	M5

6.3.6 Magnetic Ring and Magnetic Buckle

The magnetic ring is intended to be installed on the input or output side of the drive. Install the magnetic ring as close to the drive as possible. Installing the magnetic ring on the input side suppresses the noise in the input power supply system of the drive. Installing the magnetic ring on the output side reduces the bearing current and interference escaped to the outside.

In applications with leakage current and signal cable interference, install a magnetic ring or a ferrite clamp.

Model selection

- Amorphous magnetic ring: featuring a high permeability within 1 MHz and excellent anti-interference performance, but not as low-cost as the ferrite clamp. See for details. [“Dimensions” on page 45](#)
- Ferrite clamp: featuring a good interference suppression performance within a frequency band above 1MHz, applicable to low-power servo drives and signal cables, low-cost and easy to install

Magnetic ring and ferrite clamp		Appearance
Magnetic ring	DY644020H	
	DY805020H	
Ferrite clamp	7427122S	

Dimensions

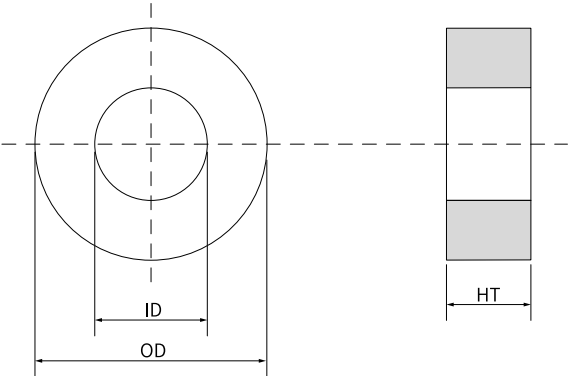


Figure 6-3 Dimension drawing of the magnetic ring

Table 6-9 Dimensions of the magnetic ring

Model	Size (OD×ID×HT) (mm)
DY644020H	64 × 40 × 20
DY805020H	80 × 50 × 20

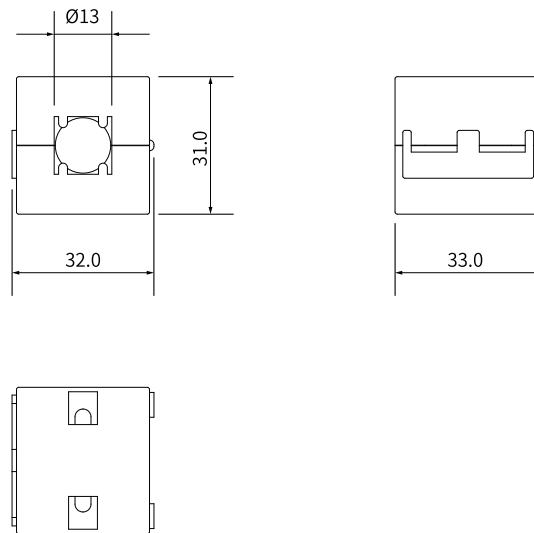


Figure 6-4 Dimension drawing of the ferrite clamp

Table 6-10 Specifications of the ferrite ring

Model	Size (Length × OD × ID) (mm)
7427122S	32.0 × 31 × 13

6.4 Braking resistor

Servo drive SV660ND****I	Resistance (Ω)	Resistor power (W)	Min resistance of external resistor (Ω)	Max. Braking Energy Absorbed by Capacitors (J)	Braking resistor
S2R8	-	25	20	54.6	No support for built-in resistor
S5R5	-	80	20	80.3	Built-in and external resistor is supported

6.5 Absolute Encoder Batteries

Model selection

Select an appropriate battery according to the following table.

Table 6–11 Description of the absolute encoder battery

Battery Specifications	Item	Rated Values			Condition
		Min. Value	Typical Value	Max. Value	
Output: 3.6 V, 2500 mAh	External battery voltage (V)	3.2	3.6	5	In standby state ^[1]
	Circuit fault voltage (V)	-	2.6	-	In standby state
	Battery alarm voltage (V)	2.85	3	3.15	-
	Current consumed by the circuit (uA)	-	2	-	In normal operation ^[2]
		-	10	-	In standby state, shaft at standstill
		-	80	-	In standby state, shaft rotating
	Ambient temperature (°C)	0	-	40	Same as the motor.
	Storage temperature (°C)	-20	-	60	

The preceding values are obtained under an ambient temperature of 20°C.

Note

- [1]: The "standby state" means the encoder counts the multi-turn data by using the power from the external battery when the servo drive power supply is not switched on. In this case, data transeiving stops.
- [2]: During normal operation, the absolute encoder supports one-turn or multi-turn data counting and transeiving. Power on the servo drive after connecting the absolute encoder properly. The encoder starts data transeiving after a short delay of about 5s upon power-on. The motor speed must be lower than or equal to 10 rpm during transition from the standby state to the normal operation state (upon power-on). Otherwise, Er.740 (Encoder fault) may occur. In this case, you need to power off and on the servo drive again.

Design life of the battery

The following calculation only covers the current consumed by the encoder.

Assume that the drive works normally for T1 in a day, the motor rotates for T2 after the drive is powered off, and the motor stops rotating for T3 after power-off [unit: hour (H)].

Example:

Table 6–12 Design life of the absolute encoder battery

Item	Schedule 1	Schedule 2
Working Days in Different Operating Conditions in 1 Year	313	52
T1 (h)	8	0
T2 (h)	0.1	0
T3 (h)	15.9	24

Capacity consumed in 1 year = $(8 \text{ h} \times 2 \text{ uA} + 0.1 \text{ h} \times 80 \text{ uA} + 15.9 \text{ h} \times 10 \text{ uA}) \times 313 + (0 \text{ h} \times 2 \text{ uA} + 0 \text{ h} \times 80 \text{ uA} + 24 \text{ h} \times 10 \text{ uA}) \times 52 \approx 70 \text{ mAh}$

Design life = Battery capacity \div Capacity consumed in 1 year = $2600 \text{ mAh} \div 70 \text{ mAh} = 37.1 \text{ years}$

Note

The life is calculated based on single-axis conditions. When a battery supplies power to two axes, you must calculate the life accordingly.

7 Service and Support

Downloads

More product manuals, leaflets, brochures, certificates, 2D/3D drawings and other information can be downloaded in the following ways:

Do keyword search under “Service and Support-After-sales Service” at <https://www.inovance.com>”.

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