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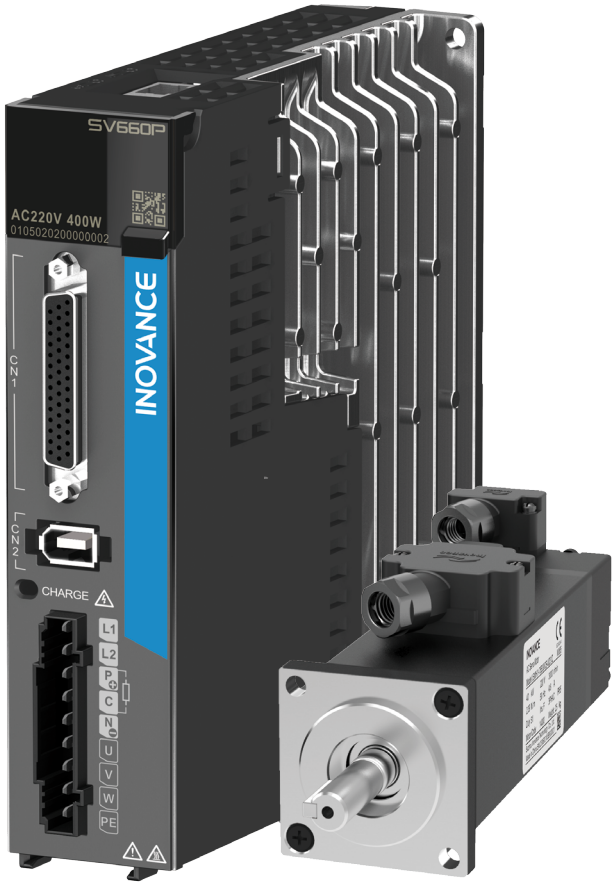


SV660P Series

Servo Drive Selection Guide

Selection Guide

A00
Data code 19011390

Preface

Introduction

The SV660P series high-performance AC servo drive covers a power range from 50 W to 7.5 kW. It supports Modbus, CANopen and CANlink communication protocols and carries necessary communication interfaces to work with the host controller for a networked operation of multiple servo drives.

The SV660P servo drive supports adaptive stiffness level setting, inertia auto-tuning, and vibration suppression to simplify the operation process. It allows a quiet and stable operation together with an MS1 series high-response servo motor with low or medium inertia and a 23-bit single-turn/multi-turn absolute encoder.

The SV660P series servo drive applies to applications requiring quick and accurate position control, speed control and torque control, such as electronic manufacturing machines, manipulators, packing devices, and machine tools.

This selection guide introduces servo drive and servo motor model selections, including product features, specifications, configurations, and applicable cables.

Revision History

Data of Revision	Version	Revision
November 2020	A00	First release

Document Acquisition

This selection guide is not delivered along with the product.
Visit http://en.inovance.cn/support/download.html to download the PDF document.

Contents

Safety Instructions

Safety Precautions

- This chapter presents essential safety instructions for a proper use of the equipment. Before operating on the equipment, read through the selection guide and comprehend all the safety instructions. Failure to comply with the safety instructions may result in death, severe personal injuries or equipment damage.
- "CAUTION", "WARNING", and "DANGER" items in the selection guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

 DANGER	Indicates that failure to comply with the notice will result in death or severe personal injuries.
 WARNING	Indicates that failure to comply with the notice may result in death or severe personal injuries.
 CAUTION	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

Safety Instructions

- Drawings in the selection guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the selection guide are shown for illustration only and may not match the product you purchased.

Unpacking
 WARNING ◆ Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories. ◆ Do not install the equipment if you find water seepage, component missing or damage upon unpacking. ◆ Do not install the equipment if you find the packing list does not conform to the equipment you received.
 CAUTION ◆ Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation. ◆ Unpack the package by following the unpacking sequence. Do not strike the package violently. ◆ Check whether there are damage, rust, or injuries on the surface of the equipment and equipment accessories. ◆ Check whether the package contents are consistent with the packing list.

Storage and Transportation
CAUTION ◆ Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage. ◆ Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage. ◆ Never stand or stay below the equipment when the equipment is being hoisted by a hoisting equipment. ◆ When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.
WARNING ◆ Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage. ◆ When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries. ◆ Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage. ◆ Avoid transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration. ◆ Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections. ◆ Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation. ◆ Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.
Installation
DANGER ◆ The equipment can be operated by well-trained and qualified professionals only.
WARNING ◆ Read through the selection guide and safety instructions before installation. ◆ Do not install this equipment in places with strong electric or magnetic fields. ◆ Before installation, check to ensure the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards. ◆ Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock. ◆ When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire. ◆ Do not retrofit the equipment. ◆ Do not fiddle with the equipment components or the bolts marked in red. ◆ When the equipment is installed in a cabinet or final assembly, protective units such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations. ◆ Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction. ◆ Install the equipment onto an incombustible object such as a metal. Prevent combustible objects from coming into contact with or being attatched to the equipment. Failure to comply will result in a fire.

CAUTION

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent the ventilation holes from being blocked and affecting the heat dissipation performance of the equipment.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the frequency jump function to reduce resonance.

Wiring

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by professionals only.
- Before wiring, cut off all the power supplies of the equipment, and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated period of time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Make sure that the equipment is grounded properly. Failure to comply will result in an electric shock.

WARNING

- Do not connect the input power supply to the output end of the equipment. Failure to comply will result in equipment damage or even a fire.
- When connecting a drive to the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the selection guide. Failure to comply may overheat or damage the connecting part, resulting in the risk of a fire.
- After wiring, make sure that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.

CAUTION

- During wiring, follow the proper electrostatic discharge (ESD) procedure, and wear an antistatic wrist strap. Failure to comply will damage the internal circuits of the equipment.
- Use shielded twisted pairs for the control circuit. Connect the shielding layer to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on

DANGER

- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements. This is to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment; do not touch any terminal or disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.

WARNING

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, make sure that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may resulting in a fire.
- Before power-on, make sure that no one is near the equipment, motor or machine. Failure to comply may result in death or personal injuries.

Operation

DANGER

- The equipment can be operated by professionals only. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disaasembly any unit or component of the equipment during operation. Failure to comply will result in an electric shock.

WARNING

- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in a fire or equipment damage.

Maintenance

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.

WARNING

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment with power ON. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.

WARNING

- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not operate on a damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal

WARNING

- Follow local regulations or standards to dispose of retired equipment. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels.

See the following table for descriptions of the safety labels.

Safety Label	Description
	◆ Read through the safety instructions before operating on the equipment. Failure to comply may result in death, personal injuries or equipment damage. ◆ Do not touch the terminals or remove the cover with power ON or within 10 min after power-off. Failure to comply will result in an electric shock.

1 Servo Drive Models

Items		SV660P	SV660A	SV660C
Control mode	Position control	✓	✓	✓
	Speed control	✓	✓	✓
	Torque control	✓	✓	✓
	Fully closed-loop control	-	-	-
Connecting terminal	RS485	✓	✓	✓
	Safety connector	-	-	-
Network	Modbus	✓	-	-
	CANlink	-	✓	-
	CANopen	-	-	✓
	EtherCAT	-	-	-

2 Servo Motor Models

Motor		Rated Output Capacity (kW)	Rated speed (Max. Rated Speed) (r/min)	Encoder	IP rating
Low inertia, small capacity	MS1H1 	0.05, 0.1, 0.2, 0.4, 0.55, 0.75, 1.0	3000 (6000)	A3: 23-bit multi-turn absolute encoder	IP67
Low inertia, medium capacity	MS1H2 	1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0	3000 (6000/5000)	A3: 23-bit multi-turn absolute encoder	IP67
Medium inertia, medium capacity	MS1H3 	0.85, 1.3, 1.8, 2.9, 4.4, 5.5, 7.5	1500 (3000)	A3: 23-bit multi-turn absolute encoder	IP67
Medium inertia, small capacity	MS1H4 	0.4, 0.75	3000 (6000)	A3: 23-bit multi-turn absolute encoder	IP67

3 General Specifications

3.1 General Specifications of the Servo Drive

3.1.1 Electrical Specifications

■ Single-phase 220 V servo drives

Item	Size A		Size B
Servo drive model	S1R6	S2R8	S5R5
Continuous output current (Arms)	1.6	2.8	5.5
Maximum output current (Arms)	5.8	10.1	16.9
Main circuit power supply	Single-phase 200 VAC to 240 VAC, +10 to -10%, 50/60 Hz		
Control circuit power supply	Powered up by the bus, sharing the same power supply and rectification part with the main circuit		
Braking energy processing	External regenerative resistor		Built-in regenerative resistor

■ Single-phase/Three-phase 220 V servo drives

Item	Size C	Size D
Servo drive model	S7R6	S012
Continuous output current (Arms)	7.6	11.6
Maximum output current (Arms)	23	32
Main circuit power supply	Three-phase 200 VAC to 240 VAC, +10% to -10%, 50/60 Hz	
Control circuit power supply	Single-phase 200 VAC to 240 VAC, +10 to -10%, 50/60 Hz	
Braking energy processing	Built-in regenerative resistor	


NOTE

◆ No derating is required when a single-phase 220 V power supply is used for models S7R6 and S012.

■ Three-phase 380 V servo drives

Item	Size C		Size D		Size E		
Servo drive model	T3R5	T5R4	T8R4	T012	T017	T021	T026
Continuous output current (Arms)	3.5	5.4	8.4	12	17	21	26
Maximum output current (Arms)	11	14	20	29.75	41.25	52.12	64.25
Main circuit power supply	Three-phase 380 VAC to 440 VAC, +10% to -10%, 50/60 Hz						
Control circuit power supply	Single-phase 380 VAC to 440 VAC, +10% to -10%, 50/60 Hz						
Braking energy processing	Built-in regenerative resistor						

3.1.2 Basic Specifications

Item				Description
Basic specifications	Control mode			IGBT PWM control, sine wave current drive mode Power input: single/three-phase full wave 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 (average load ratio not exceeding 80% in ambient temperatures between 45°C to 55°C) (non-freezing)/-40°C to +70°C
		Operating/Storage humidity		Below 90% RH (without condensation)
		Vibration/Shock resistance		4.9 m/s^2, 19.6 m/s^2
		IP rating		IP20
		Pollution degree		PD2
		Altitude		≤ 2000 m Derating is not required for altitudes not higher than 1000 m. Derate 1% for every addtional 100 m for altitudes above 1000 m. Contact Inovance for altitudes above 2000 m.
Position control mode	Performance	Feedforward compensation		0% to 100.0% (resolution: 0.1%)
		Positioning completed width setting		1 to 65535 in encoder unit (resolution: 1 encoder unit)
	Input signals	Pulse reference	Input pulse form	Three forms available: direction+pulse, phase A + phase B quadrature pulse, CW/CCW pulse
			Input form	Differential input: open collector
			Input pulse frequency	Differential input: maximum speed being 4 Mpps, pulse width not lower than 0.125 us Open collector: 200 kpps max., pulse width not lower than 2.5 us
		Power supply for built-in open collector [4]		+24 V (built-in 2.4 kΩ resistor)
		Multi-position reference selection		Position 1 to position 15 selectable through DI signal combination (Other terminals can be assigned with this function.)
	Position output	Output form		Phase A, phase B: differential output Phase Z: differential output or open collector output
		Frequency division ratio		Any frequency division

Item				Description
Speed/Torque control mode	Performance	Speed change rate [2]	Load change rate	Below 0.5% at 0% to 100% load (under rated speed)
			Voltage change rate	0.5% at rated voltage±10% (under rated speed)
			Temperature change rate	Below 0.5% at 25±25°C (under rated speed)
		Speed control range		1:5000 (Under the rated torque load, the servo drive keeps running as long as the lower limit of the speed control range is not exceeded.)
		Frequency characteristics		2 kHz
		Torque control precision		±2%
		Soft startup time setting		0s to 60s (acceleration and deceleration can be set separately)
Input/Output signals	Digital input (DI) signals	Signal assignment can be changed.		7 DIs DI1 to DI5 signal input frequency: 1 kHz max. (or lower when the resistance of the current-limiting resistor is higher than 2.4 kΩ) DI8 to DI9 signal input delay: < 1 ms (when the resistance of the current-limiting resistor is 2.4 kΩ) DI functions: S-ON, fault reset, gain switchover, command switchover, zero clamp, pulse inhibition, forward overtravel prevention, reverse overtravel prevention, forward [3] torque limit, reverse torque limit, forward jog, reverse jog, step enable, home switch, homing enable, and interrupt positioning
	Digital output (DO) signals	Signal assignment can be changed.		5 DOs: with-load capacity: 50 mA voltage range: 5 V to 30 V DO functions: Servo ready, motor rotating, zero speed signal, speed reach, position reach, proximity signal, torque limit, speed limit, brake output, warning, servo fault, and fault code (3-digit output)

Item			Description
Built-in functions	Stop at overtravel		The servo drive stops immediately when the P-OT or N-OT signal is active.
	Electronic gear ratio		0.262144 ≤ B/A ≤ 104857.6
	Protective functions		Including protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, power supply phase loss, overspeed, encoder error, CPU error, and parameter error
	Display		Main power supply CHARGE indicator, 5-digit LED display
	Vibration suppression		Four notches (including two adaptive notches), 50 Hz to 4000 Hz
	Usability functions		One-key parameter tuning, adaptive parameter tuning, speed observer, and model tracking
	Communication functions	Connection devices	RS232, RS485, CAN
		Communication protocols	Modbus, CANlink (including axis-control function)
		1:N communication	N ≤ 32 during RS485 communication
		Axis address setting	Based on parameter settings
		Functions	Including status display, user parameter setting, monitored value display, fault tracing display, jog and auto-tuning, speed/torque reference signal observation
	Others		Gain tuning, fault log, jog

[1] Install the servo drive in environments within the allowable temperature range. When it is installed inside an electric cabinet, the temperature inside the cabinet must also be within this range.

[2] The speed change rate is defined by the following formula:
Speed change rate = (No-load speed – Full-load speed)/Rated speed x 100%

[3] Forward rotation: The motor rotates clockwise when viewed from the load side.

[4] The internal open collector power supply is not electrically insulated from the control circuit in the servo drive.


NOTE

◆ The voltage change and temperature change may result in amplifier deviation, which causes the calculated resistance to change, and such change will be reflected by the speed change. Speed changes caused by voltage change and temperature change will be indicated respectively by a percentage to the rated speed.

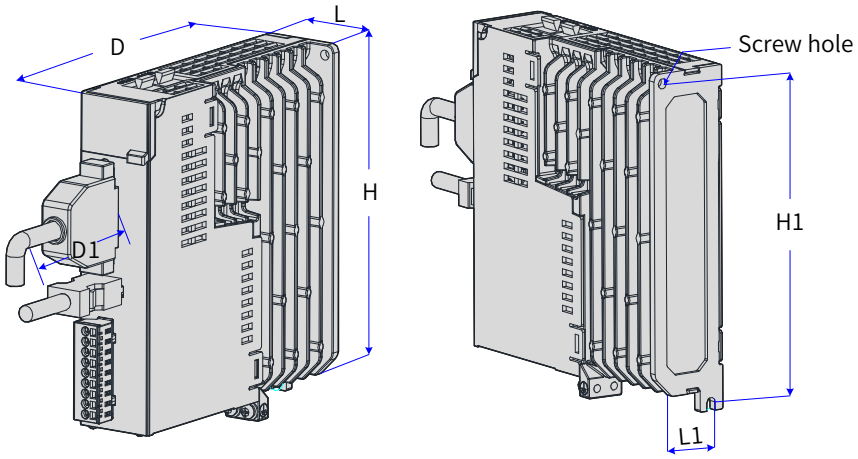
3.1.3 Specifications of the Regenerative Resistor

Servo Drive Model		Specifications of Built-in Regenerative Resistor		Minimum Allowable Resistance (Ω)	Max. Braking Energy Absorbed by the Capacitor (J)
		Resistance (Ω)	Power (W)		
Single-phase 220 V	SV660PS1R6I	-	-	50	13.15
	SV660PS2R8I	-	-	45	26.29
	SV660PS5R5I	50	50	40	22.41
Single-phase/ Three-phase 220 V	SV660PS7R6I	25	80	20	26.70
	SV660PS012I			15	26.70
Three-phase 380 V	SV660PT3R5I	100	80	80	34.28
Three-phase 380 V	SV660PT5R4I	100	80	60	34.28
	SV660PT8R4I	50	80	45	50.41
	SV660PT012I			40	
	SV660PT017I	35	100	35	82.67
	SV660PT021I			25	100.82
	SV660PT026I				100.82

NOTE

Select the external regenerative resistor according to actual operating conditions.

3.1.4 Dimension Drawings



Servo Drive Size	L	H	D	L1	H1	D1	Screw Hole	Tightening Torque	Weight
	Unit: mm (in.)							Unit: N·m	Unit: kg (lb.)
A	40 (1.57)	170 (6.69)	150 (5.91)	28 (1.10)	161 (6.34)	75 (2.95)	2-M4	0.6–1.2	0.8 (1.76)
B	50 (1.97)	170 (6.69)	173 (6.81)	37 (1.46)	161 (6.34)	75 (2.95)	2-M4	0.6–1.2	1.0 (2.20)
C	55±1 (2.17±0.04)	170 (6.69)	173±1 (6.81±0.04)	44 (1.73)	160 (6.30)	75 (2.95)	2-M4	0.6–1.2	1.3 (2.87)
D	80±1 (3.15±0.04)	170 (6.69)	183 (7.20)	71 (2.80)	160 (6.30)	75 (2.95)	3-M4	0.6–1.2	1.8 (3.97)
E	90 (3.54)	250 (9.84)	230 (9.06)	78 (3.07)	240.5 (9.47)	75 (2.95)	4-M4	0.6–1.2	3.6 (7.94)

3.2 General Specifications of the Servo Motor

3.2.1 Mechanical Specifications

Item	Description
Duty type	Continuous
Vibration level	V15
Insulation resistance	500 VDC, above 10 MΩ
Excitation mode	Permanent magnetic
Installation method	Flange
Heat resistance level	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)

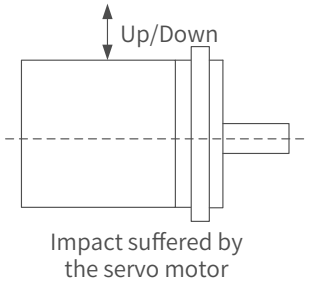
Item		Description
Direction of rotation		Rotates counterclockwise (CCW) when viewed from the load side with a forward run command.
Environment conditions	Ambient temperature	0°C to 40°C (non-freezing) (derating required for temperatures above 40°C)
	Ambient humidity	20%–80% RH (no condensation)
	Installation location	◆ Free from corrosive or explosive gases ◆ Well ventilated with minimum amount of dust, waste and moisture ◆ Convenient for inspection and cleanup ◆ Below 1000 m (Derate based on the derating curve for altitudes above 1000 m.) ◆ Away from sources that may generate strong magnetic field ◆ Away from heating sources such as a stove ◆ Use the servo motor with oil seal when the motor is to be used in a place with grinding fluids, oil mists, iron powders or cuttings
	Storage Environment	Observe the following requirements for storage of a de-energized motor: Storage temperature: -20° C to +60° C (non-freezing) Storage humidity: 20% to 80% RH (no condensation)
Impact resistance [1]	Impact acceleration (taking the flange face as standard)	490 m/s^2
	Times of impact	2
Vibration resistance [2]	Vibration acceleration (taking the flange face as standard)	49 m/s^2

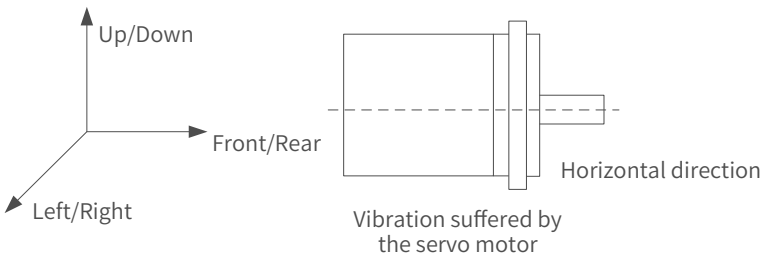
[1] For a servo motor shaft mounted horizontally, the impact resistance value in the up and down directions is shown in the preceding table (air-cooled motors excluded).

[2] For a servo motor shaft mounted horizontally, the vibration resistance value in the up/down, left/right, and front/rear directions is shown in the preceding table (air-cooled motors excluded).

NOTE

◆ The vibration strength applied to the servo motor varies with applications. Therefore, confirm the vibration acceleration according to the actual product.





3.2.2 Overload Characteristics of the Servo Motor

The motor is compliant with NEC and CEC requirements and equipped with protective functions against overload and over-temperature.

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

- The motor operates in environments with high temperature.
- The motor operates in cyclic motion that features a short motion cycle and frequent acceleration/ deceleration.

The motor overload protection curve is shown 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

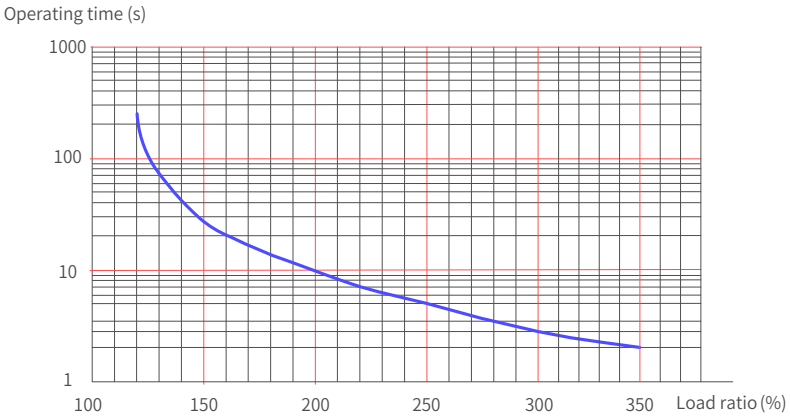


Figure 3-1 Motor overload protection curve

NOTE

- The maximum torque of MS1H1 and MS1H4 models is 3.5 times the rated torque.
- The maximum torque of MS1H2 models is three times the rated torque.
- The maximum torque of MS1H3/ISMH3 models, except those of 2.9 kW, is 2.5 times the rated torque.
- For the models of 2.9 kW, the maximum torque is two times the rated torque.

3.2.3 Electrical Specifications of the Motor with Brake

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10%	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B	0.32	24	94.4	0.25	≤ 20	≤ 40	≤ 1.5
MS1H1-20B/40B MS1H4-40B	1.5		75.79	0.32	≤ 20	≤ 60	≤ 1.5
MS1H1-75B/MS1H4-75B	3.2		57.6	0.42	≤ 40	≤ 60	≤ 1
MS1H2-10C/15C/20C/25C	8		25	0.96	≤ 30	≤ 85	≤ 0.5
MS1H2-30C/40C/50C	16		21.3	1.13	≤ 60	≤ 100	≤ 0.5
MS1H3-85B/13C/18C	12		29.7	0.81	≤ 60	≤ 120	≤ 0.5
MS1H3-29C/44C/55C/75C	50		14.4	1.67	≤ 100	≤ 200	≤ 0.5

NOTE

- 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 other working devices.
- It is recommended to use cables with a cross sectional area above 0.5 mm^2.

3.2.4 Load Moment of Inertia

The load moment of inertia indicates the inertia of the load. The larger the load moment of inertia, the worse the response. If the moment of inertia is too large, operation will become unstable.

The allowable load moment of inertia (J_L) of the motor is restricted. This value is provided strictly as a guideline and results depend on the motor driving conditions.

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

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

CAUTION

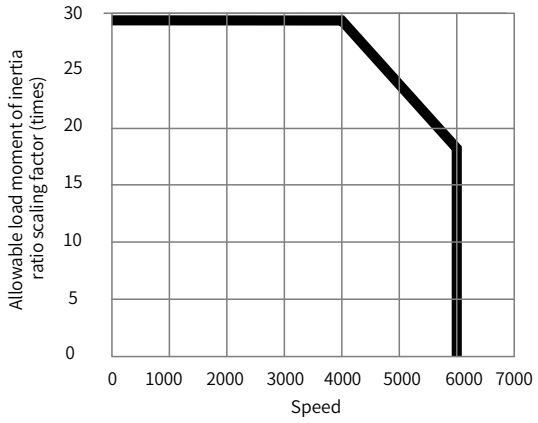
- Regenerative resistors are not built into the servo units for 400 W or smaller servo motors.
- Even for servo units with built-in regenerative resistors, an external regenerative resistor is required if the energy that results from the regenerative driving conditions exceeds the allowable loss capacity (W) of the built-in regenerative resistor.

3.2.5 Allowable Load Moment of Inertia Scaling Factor for Servo Units without Built-in Regenerative Resistor

The following figure shows the allowable load moment of inertia scaling factor of the motor speed for servo units without built-in regenerative resistor when an external regenerative resistor is not connected.

If the servo motor exceeds the allowable load moment of inertia, an overvoltage warning may occur in the servo unit.

The following figure provides reference data for deceleration at the rated torque or higher under 200 VAC power input.



4 Motors with Low Inertia and Small Capacity (MS1H1)

4.1 Model Selection

4.1.1 220 V Motors Without Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H1 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)						
MS1H1-05B30CB-A330Z(-S)	Single-phase 220 V	A	SV660*S1R6I	S6-L-M107-** (Front outlet) S6-L-M108-** (Rear outlet)	S6-L-P114-** (Front outlet) S6-L-P115-** (Rear outlet)	S6-L-P124-** (Front outlet) S6-L-P125-** (Rear outlet)
MS1H1-10B30CB-A331Z(-S)	Single-phase 220 V		SV660*S1R6I			
MS1H1-20B30CB-A331Z(-S)	Single-phase 220 V		SV660*S1R6I			
MS1H1-40B30CB- A331Z(-S)	Single-phase 220 V		SV660*S2R8I			
MS1H1-55B30CB- A331Z(-S)	Single-phase 220 V	B	SV660*S5R5I	S6-L-M100-** (Lead wire-type motor cable)	S6-L-P110-** (Lead wire-type motor cable)	S6-L-P120-** (Lead wire-type motor cable)
MS1H1-75B30CB- A331Z(-S)	Single-phase 220 V		SV660*S5R5I			
MS1H1-10C30CB- A331Z(-S)	Single-phase/ Three-phase 220 V	C	SV660*S7R6I			

Motor Model	Connector Kit		Battery Kit for the Absolute Encoder (Option)	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
	I/O Connector Kit	Encoder Connector Kit					
Ratings of MS1H1 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)							
MS1H1-05B30CB-A330Z(-S)	S6-C8	Not available in terminal-type motors S6-C26 (Lead wire-type motors)	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H1-10B30CB-A331Z(-S)							
MS1H1-20B30CB-A331Z(-S)							
MS1H1-40B30CB- A331Z(-S)							
MS1H1-55B30CB- A331Z(-S)							
MS1H1-75B30CB- A331Z(-S)							
MS1H1-10C30CB- A331Z(-S)							

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

4.1.2 220 V Motors with Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H1 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)						
MS1H1-05B30CB-A332Z(-S)	Single-phase 220 V	A	SV660*S1R6I	S6-L-B107-** (Front outlet) S6-L-B108-** (Rear outlet) S6-L-B100-** (Lead wire-type motor cable)	S6-L-P114-** (Front outlet) S6-L-P115-** (Rear outlet) S6-L-P110-** (Lead wire-type motor cable)	S6-L-P124-** (Front outlet) S6-L-P125-** (Rear outlet) S6-L-P120-** (Lead wire-type motor cable)
MS1H1-10B30CB-A332Z(-S)	Single-phase 220 V		SV660*S1R6I			
MS1H1-20B30CB-A334Z(-S)	Single-phase 220 V		SV660*S1R6I			
MS1H1-40B30CB-A334Z(-S)	Single-phase 220 V		SV660*S2R8I			
MS1H1-75B30CB-A334Z(-S)	Single-phase 220 V	B	SV660*S5R5I			

Motor Model	Connector Kit		Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
	I/O Connector Kit	Encoder Connector Kit					
Ratings of MS1H1 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)							
MS1H1-05B30CB-A332Z(-S)	S6-C8	Not available in terminal-type motors S6-C26 (Lead wire-type motors)	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H1-10B30CB-A332Z(-S)							
MS1H1-20B30CB-A334Z(-S)							
MS1H1-40B30CB- A334Z(-S)							
MS1H1-75B30CB- A334Z(-S)							

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

4.2 Motor Specifications

4.2.1 Motor Ratings

Motor Model	Rated Output (kW)[1]	Rated Torque (N·m)	Max. Torque (N·m)	Rated Current (Arms)	Max. Current (Arms)	Rated Speed (RPM)	Max. Speed (RPM)	Torque (N·m/Arms)	Moment of inertia ($kg \cdot cm^2$)	Voltage (V)
Ratings of MS1H1 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)										
MS1H1-05B30CB	0.05	0.16	0.56	1.3	4.7	3000	6000	0.15	0.026 (0.028)	220
MS1H1-10B30CB	0.1	0.32	1.12	1.3	4.7			0.26	0.041 (0.043)	
MS1H1-20B30CB	0.2	0.64	2.24	1.5	5.8			0.46	0.207 (0.220)	
MS1H1-40B30CB	0.4	1.27	4.46	2.8	10.1			0.53	0.376 (0.390)	
MS1H1-55B30CB	0.55	1.75	6.13	3.8	15.0			0.49	1.06	
MS1H1-75B30CB	0.75	2.39	8.36	4.8	16.9			0.58	1.38 (1.43)	
MS1H1-10C30CB	1.0	3.18	11.1	7.6	28.0			0.46	1.75	

[1] The motor with oil seal must be derated by 10% during use.

NOTE

- Values inside the parentheses "()" are for the motor with brake.
- Values in the preceding table are obtained when motors equipped with the following heatsink work with Inovance servo drives under an armature coil temperature of 20° C.
  MS1H1: 250 mm x 250 mm x 6 mm (aluminum)

4.2.2 Allowable Radial and Axial Loads of the Motor

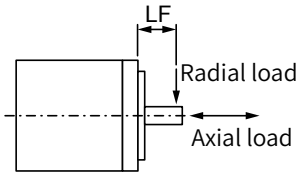


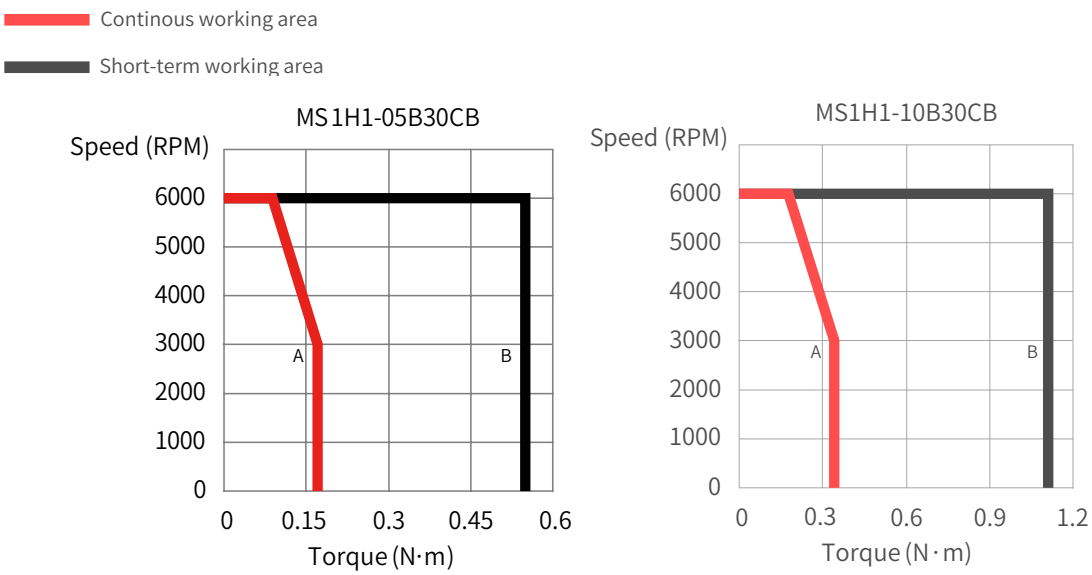
Figure 4-1 Radial and axial loads of the motor

Motor Model	Flange Size (mm)	LF (mm)	Allowable Radial Load (N)	Allowed Axial Load (N)
MS1H1-05B30CB	40	20	78	54
MS1H1-10B30CB	40	20	78	54
MS1H1-20B30CB	60	25	245	74
MS1H1-40B30CB	60	25	245	74
MS1H1-55B30CB	80	35	392	147
MS1H1-75B30CB	80	35	392	147
MS1H1-10C30CB	80	35	392	147

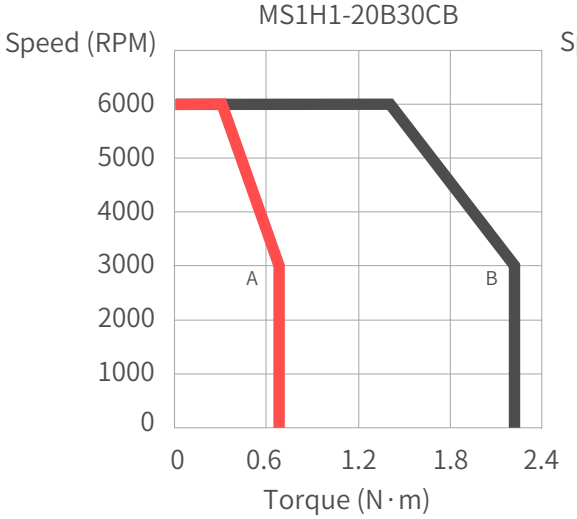
4.2.3 Electrical Specifications of the Motor with Brake

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10%	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B	0.32	24	94.4	0.25	≤ 20	≤ 40	≤ 1.5
MS1H1-20B/40B	1.5		75.79	0.32	≤ 20	≤ 60	≤ 1.5
MS1H1-75B	3.2		57.6	0.42	≤ 40	≤ 60	≤ 1

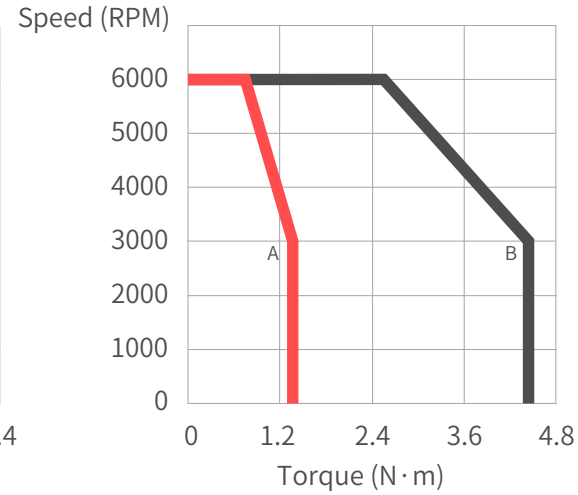
4.2.4 Motor Torque-Speed Characteristics



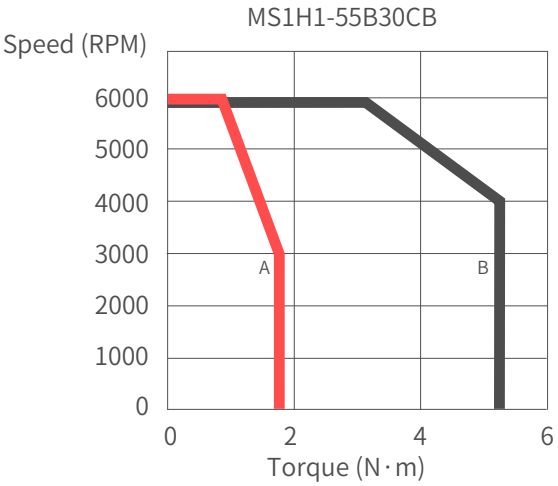
MS1H1-20B30CB



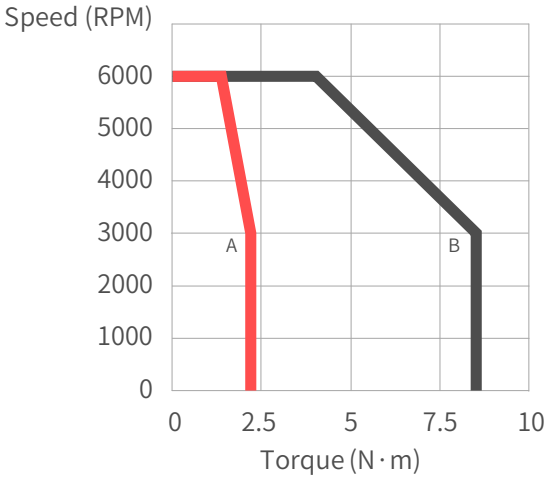
MS1H1-40B30CB



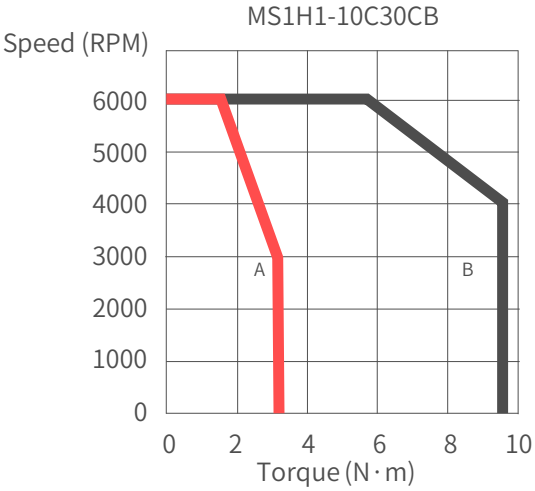
MS1H1-55B30CB



MS1H1-75B30CB

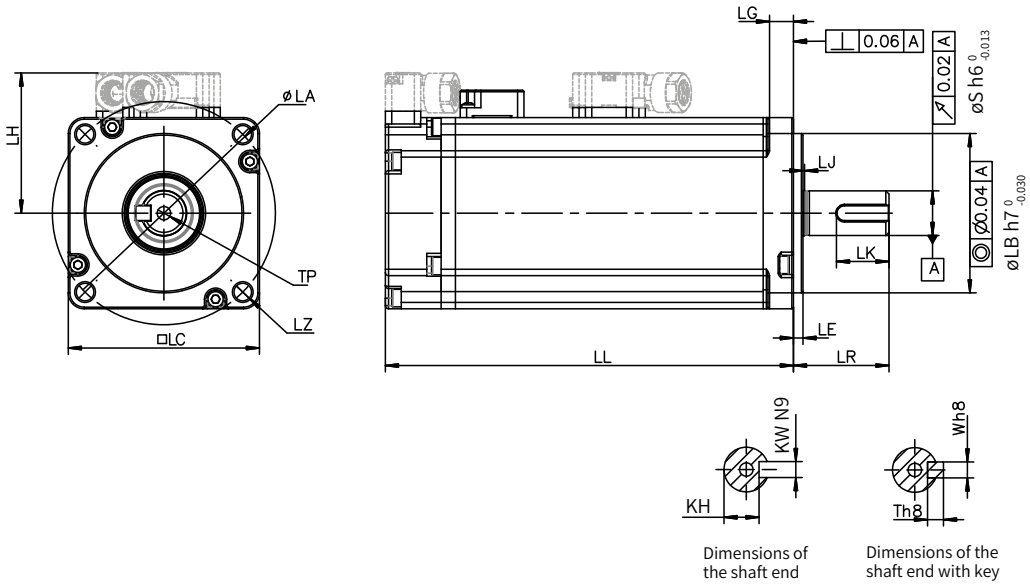


MS1H1-10C30CB

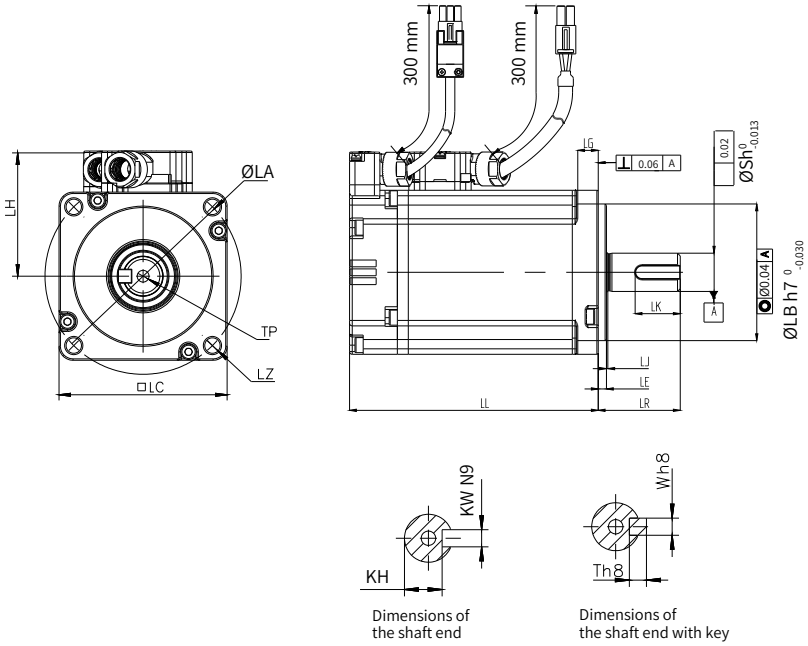


4.2.5 Dimension Drawings of MS1H1 Series Motors

■ Terminal-type motors



■ Lead wire-type motors



Motor Model	LC	LL	LR	LA	LZ	LH	LG	LE	LJ
	Unit: mm (in.)								
MS1H1-05B30CB-A330Z(-S)	40 (1.57)	65 (2.56)	25±0.5 (0.98±0.02)	46 (1.81)	2-φ4.5 (0.08-φ0.18)	34 (1.34)	5 (0.20)	2.5±0.5 (0.10±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-05B30CB-A332Z(-S)		96 (3.78)							
MS1H1-10B30CB-A330Z(-S)	40 (1.57)	77.5 (3.05)	25±0.5 (0.98±0.02)	46 (1.81)	2-φ4.5 (0.08-φ0.18)	34 (1.34)	5 (0.20)	2.5±0.5 (0.10±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-10B30CB-A332Z(-S)		109 (4.29)							
MS1H1-20B30CB-A331Z(-S)	60 (2.36)	72.5 (2.85)	30±0.5 (1.18±0.02)	70 (2.76)	4-φ5.5 (0.16-φ0.18)	44 (1.73)	7.5 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-20B30CB-A334Z(-S)		100 (3.94)							
MS1H1-40B30CB-A331Z(-S)	60 (2.36)	91 (3.58)	30±0.5 (1.18±0.02)	70 (2.76)	4-φ5.5 (0.16-φ0.18)	44 (1.73)	7.5 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-40B30CB-A334Z(-S)		119 (4.69)							

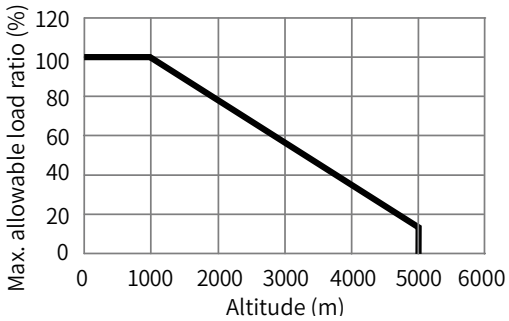
Motor Model	LC	LL	LR	LA	LZ	LH	LG	LE	LJ
	Unit: mm (in.)								
MS1H1-55B30CB-A331Z(-S)	80 (3.15)	96.2 (3.79)	35±0.5 (1.38±0.02)	90 (3.54)	4-φ7 (0.16-φ0.28)	54 (2.13)	7.7 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-75B30CB-A331Z(-S)	80 (3.15)	107 (4.21)	35±0.5 (1.38±0.02)	90 (3.54)	4-φ7 (0.16-φ0.28)	54 (2.13)	7.7 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H1-75B30CB-A334Z(-S)		140 (5.51)							
MS1H1-10C30CB-A331Z(-S)	80 (3.15)	118.2 (4.65)	35±0.5 (1.38±0.02)	90 (3.54)	4-φ7 (0.16-φ0.28)	54 (2.13)	7.7 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
Motor Model	S	LB	TP	LK	KH	KW	W	T	Weight
	Unit: mm (in.)								Unit: kg (lb.)
MS1H1-05B30CB-A330Z(-S)	8 (0.31)	30 (1.18)	M3x6 (M3x0.24)	15.5 (0.61)	6.2 (0.24)	3 (0.12)	3 (0.12)	3 (0.12)	0.39 (0.86)
MS1H1-05B30CB-A332Z(-S)									0.50 (1.10)
MS1H1-10B30CB-A330Z(-S)	8 (0.31)	30 (1.18)	M3x6 (M3x0.24)	15.5 (0.61)	6.2 (0.24)	3 (0.12)	3 (0.12)	3 (0.12)	0.45 (0.99)
MS1H1-10B30CB-A332Z(-S)									0.64 (1.41)
MS1H1-20B30CB-A331Z(-S)	14 (0.55)	50 (1.97)	M5x8 (M3x0.31)	16.5 (0.65)	11 (0.43)	5 (0.20)	5 (0.20)	5 (0.20)	0.78 (1.72)
MS1H1-20B30CB-A334Z(-S)									1.16 (2.56)
MS1H1-40B30CB-A331Z(-S)	14 (0.55)	50 (1.97)	M5x8 (M3x0.31)	16.5 (0.65)	11 (0.43)	5 (0.20)	5 (0.20)	5 (0.20)	1.11 (2.45)
MS1H1-40B30CB-A334Z(-S)									1.48 (3.26)
MS1H1-55B30CB-A331Z(-S)	19 (0.75)	70 (2.76)	M6x20 (M3x0.79)	25 (0.98)	15.5 (0.61)	6 (0.24)	6 (0.24)	6 (0.24)	1.85 (4.08)
MS1H1-75B30CB-A331Z(-S)	19 (0.75)	70 (2.76)	M6x20 (M3x0.79)	25 (0.98)	15.5 (0.61)	6 (0.24)	6 (0.24)	6 (0.24)	2.18 (4.81)
MS1H1-75B30CB-A334Z(-S)									2.82 (6.22)
MS1H1-10C30CB-A331Z(-S)	19 (0.75)	70 (2.76)	M6x20 (M3x0.79)	25 (0.98)	15.5 (0.61)	6 (0.24)	6 (0.24)	6 (0.24)	2.55 (5.62)

NOTE

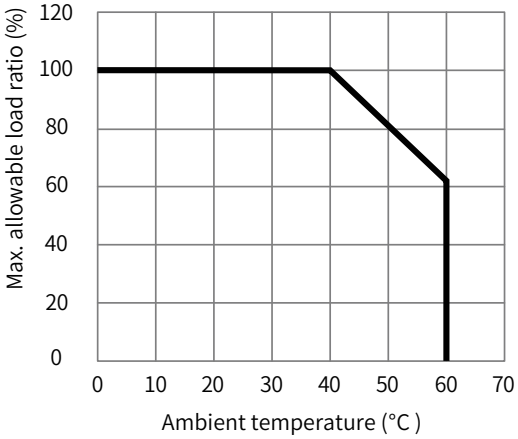
- ◆ Values inside the parentheses "()" are in British system of unit.
- ◆ For dimension drawings of motor models ending with "-S", contact Inovance technical support.
- ◆ Outline drawings vary with the motor model. The actual dimensions are subject to the physical product.

4.2.6 Derating Curves

■ Altitude-based derating curve

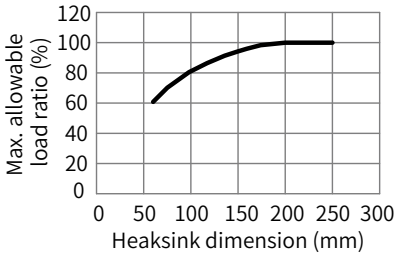


■ Temperature-based derating curve

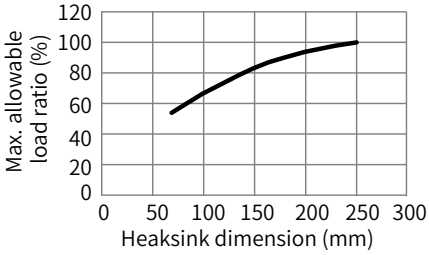


■ Heatsink-based derating curve

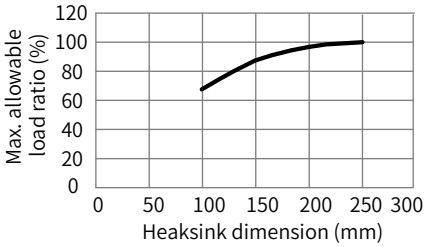
MS1H1-05B30CB/MS1H1-10B30CB



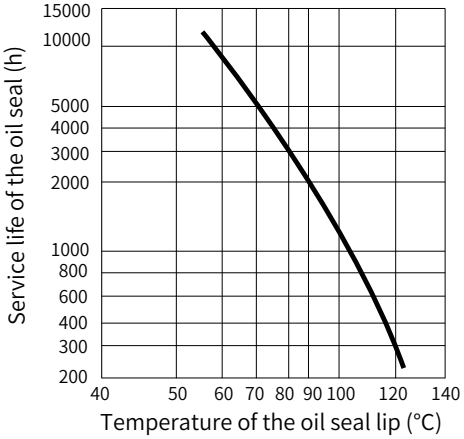
MS1H1-20B30CB/MS1H1-40B30CB



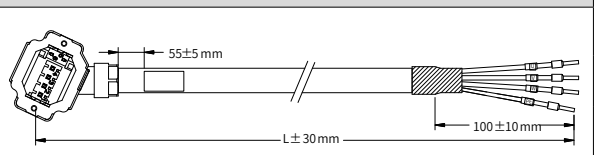
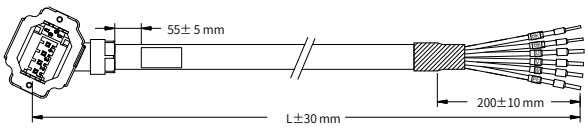
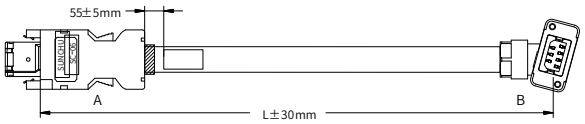
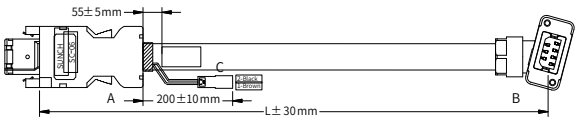
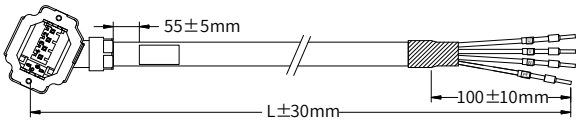
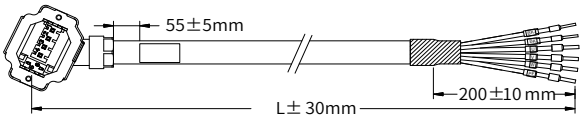
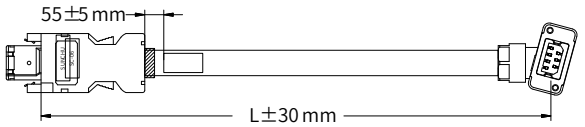
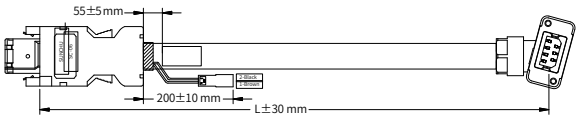
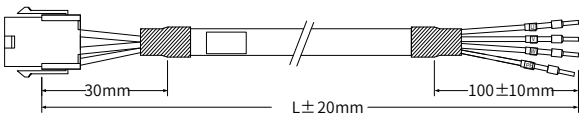
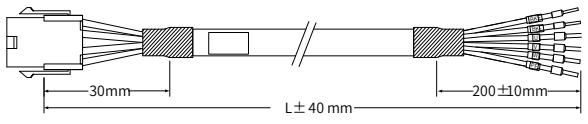
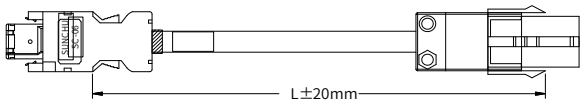
MS1H1-55B30CB/MS1H1-75B30CB /MS1H1-10C30CB

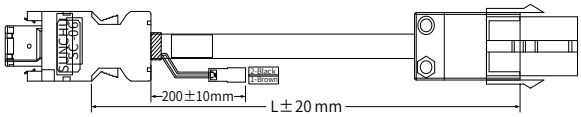


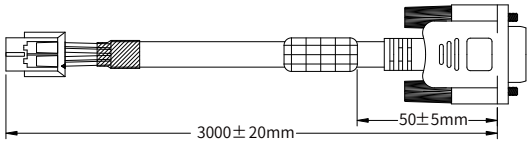
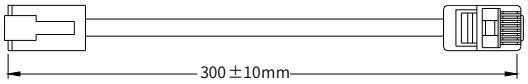
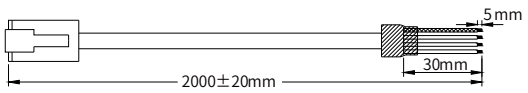
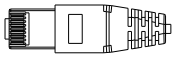
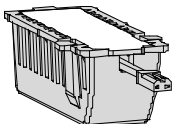
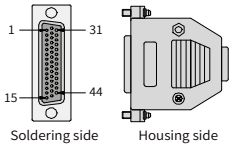
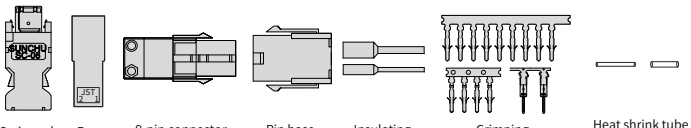
4.2.7 Temperature Curve of Oil Seal



4.3 Selection of Cables and Options

Motor Model	Cable Name		Cable Model	Cable Length (mm)	Outline Drawing
MS1H1 terminal-type motors	Front outlet	Power cable for motor without brake	S6-L-M107-3.0	3000	
			S6-L-M107-5.0	5000	
			S6-L-M107-10.0	10000	
		Power cable for motor with brake	S6-L-B107-3.0	3000	
			S6-L-B107-5.0	5000	
			S6-L-B107-10.0	10000	
		Single-turn absolute encoder cable	S6-L-P114-3.0	3000	
			S6-L-P114-5.0	5000	
			S6-L-P114-10.0	10000	
		Multi-turn absolute encoder (A3**Z) cable	S6-L-P124-3.0	3000	
			S6-L-P124-5.0	5000	
			S6-L-P124-10.0	10000	
	Rear outlet	Power cable for motor without brake	S6-L-M108-3.0	3000	
			S6-L-M108-5.0	5000	
			S6-L-M108-10.0	10000	
		Power cable for motor with brake	S6-L-B108-3.0	3000	
			S6-L-B108-5.0	5000	
			S6-L-B108-10.0	10000	
		Single-turn absolute encoder cable	S6-L-P115-3.0	3000	
			S6-L-P115-5.0	5000	
			S6-L-P115-10.0	10000	
		Multi-turn absolute encoder (A3**Z) cable	S6-L-P125-3.0	3000	
			S6-L-P125-5.0	5000	
			S6-L-P125-10.0	10000	
MS1H1 lead wire-type motors (-S)	Power cable for motor without brake		S6-L-M100-3.0	3000	
			S6-L-M100-5.0	5000	
			S6-L-M100-10.0	10000	
	Power cable for motor with brake		S6-L-B100-3.0	3000	
			S6-L-B100-5.0	5000	
			S6-L-B100-10.0	10000	
	Single-turn absolute encoder cable		S6-L-P110-3.0	3000	
			S6-L-P110-5.0	5000	
			S6-L-P110-10.0	10000	

Motor Model	Cable Name	Cable Model	Cable Length (mm)	Outline Drawing
MS1H1 lead wire-type motors (-S)	Multi-turn absolute encoder (A3**Z) cable	S6-L-P120-3.0	3000	
		S6-L-P120-5.0	5000	
		S6-L-P120-10.0	10000	

Name	Cable Model	Cable Length (mm)	Outline Drawing
SV660P servo drive to PC communication cable	S6-L-T00-3.0	3000	
SV660P multi-drive communication cable (CAN and RS485)	S6-L-T01-0.3	300	
SV660P servo drive to PLC communication cable (CAN and RS485)	S6-L-T02-2.0	2000	
SV660P servo drive termination resistor connector (CAN and RS485)	S6-L-T03-0.0	0	
Battery kit	S6-C4	-	
SV660P CN1 terminal (DB44)	S6-C8	-	 Note: DB44 (purchased separately for MS1 motors)
MS1H1 lead wire-type (Z-S) motor connector	S6-C26	-	

5 Motors with Low Inertia and Medium Capacity (MS1H2)

5.1 Model Selection

5.1.1 220 V/380 V Motors Without Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H2 series motors (Vn = 3000 RPM, Vmax = 6000/5000 RPM)						
MS1H2-10C30CB-A331Z	Single-phase/ Three-phase 220 V	C	SV660*S7R6I	S6-L-M111-**	S6-L-P111-**	S6-L-P121-**
MS1H2-10C30CD-A331Z	Three-phase 380 V		SV660*T5R4I			
MS1H2-15C30CB-A331Z	Single-phase/Three-phase 220 V	D	SV660*S012I			
MS1H2-15C30CD-A331Z	Three-phase 380 V	C	SV660*T5R4I			
MS1H2-20C30CD-A331Z	Three-phase 380 V	D	SV660*T8R4I			
MS1H2-25C30CD-A331Z	Three-phase 380 V		SV660*T8R4I			
MS1H2-30C30CD-A331Z	Three-phase 380 V	D	SV660*T012I			
MS1H2-40C30CD-A331Z	Three-phase 380 V	E	SV660*T017I	S6-L-M011-**		
MS1H2-50C30CD-A331Z	Three-phase 380 V	E	SV660*T017I			

Motor Model	Encoder Connector	Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
Ratings of MS1H2 series motors (Vn = 3000 RPM, Vmax = 6000/5000 RPM)						
MS1H2-10C30CB-A331Z	S6-C29	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H2-10C30CD-A331Z						
MS1H2-15C30CB-A331Z						
MS1H2-15C30CD-A331Z						
MS1H2-20C30CD-A331Z						
MS1H2-25C30CD-A331Z						
MS1H2-30C30CD-A331Z						
MS1H2-40C30CD-A331Z						
MS1H2-50C30CD-A331Z						

5.1.2 220 V/380 V Motors with Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H2 series motors (Vn = 3000 RPM, Vmax = 6000/5000 RPM)						
MS1H2-10C30CB-A334Z	Single-phase/ Three-phase 220 V	C	SV660*S7R6I	S6-L-B111-**	S6-L-P111-**	S6-L-P121-**
MS1H2-10C30CD-A334Z	Three-phase 380 V		SV660*T5R4I			
MS1H2-15C30CB-A334Z	Three-phase 220 V	D	SV660*S012I			
MS1H2-15C30CD-A334Z	Three-phase 380 V	C	SV660*T5R4I			
MS1H2-20C30CD-A334Z(-S4)	Three-phase 380 V	D	SV660*T8R4I			
MS1H2-25C30CD-A334Z(-S4)	Three-phase 380 V		SV660*T8R4I			
MS1H2-30C30CD-A334Z(-S4)	Three-phase 380 V	D	SV660*T012I			
MS1H2-40C30CD-A334Z(-S4)	Three-phase 380 V	E	SV660*T017I	S6-L-B011-**		
MS1H2-50C30CD-A334Z(-S4)	Three-phase 380 V	E	SV660*T017I			

Motor Model	Encoder Connector	Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
Ratings of MS1H2 series motors (Vn = 3000 RPM, Vmax = 6000/5000 RPM)						
MS1H2-10C30CB-A334Z	S6-C29	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H2-10C30CD-A334Z						
MS1H2-15C30CB-A334Z						
MS1H2-15C30CD-A334Z						
MS1H2-20C30CD-A334Z(-S4)						
MS1H2-25C30CD-A334Z(-S4)						
MS1H2-30C30CD-A334Z(-S4)						
MS1H2-40C30CD-A334Z(-S4)						
MS1H2-50C30CD-A334Z(-S4)						

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed , add a suffix "-T" to the end of the cable model number.
- Motor models ending with "-S4" represents the duty type S4, indicating the motor is working under S4 duty, with the motor load ratio not exceeding 70%.

5.2 Motor Specifications

5.2.1 Ratings

Motor Model	Rated Output (kW)[1]	Rated Torque (N·m)	Max. Torque (N·m)	Rated Current (Arms)	Max. Current (Arms)	Rated Speed (RPM)	Max. Speed (RPM)	Torque (N·m/Arms)	Moment of Inertia (kg·cm²)	Voltage (V)
Ratings of MS1H2 series motors (Vn = 3000 RPM, Vmax = 6000/5000 RPM)										
MS1H2-10C30CB	1.0	3.18	9.54	7.5	23.00	3000	6000	0.47	1.87 (3.12)	220
MS1H2-15C30CB	1.5	4.90	14.7	10.8	32.00		5000	0.54	2.46 (3.71)	
MS1H2-10C30CD	1.0	3.18	9.54	3.65	11.00		6000	0.89	1.87 (3.12)	380
MS1H2-15C30CD	1.5	4.90	14.7	4.50	14.00		5000	1.07	2.46 (3.71)	
MS1H2-20C30CD	2.0	6.36	19.1	5.89	20.00		5000	1.14	3.06 (4.31)	380
MS1H2-25C30CD	2.5	7.96	23.9	7.56	25.00			1.11	3.65 (4.90)	
MS1H2-30C30CD	3.0	9.8	29.4	10.00	30.00			1.16	7.72 (10.22)	
MS1H2-40C30CD	4.0	12.6	37.8	13.60	40.80			1.16	12.1 (14.6)	
MS1H2-50C30CD	5.0	15.8	47.6	16.00	48.00			1.16	15.4 (17.9)	

[1] The motor with oil seal must be derated by 10% during use.

NOTE

- Values inside the parentheses "()" are for the motor with brake.
- Values in the preceding table are obtained when motors equipped with the following heatsinks are working with Inovance servo drives under an armature coil temperature of 20° C.
  MS1H2-10C to 25C: 300 mm x 300 mm x 12 mm (aluminum)
  MS1H2-30C to 50C: 400 mm x 400 mm x 20 mm (aluminum)

5.2.2 Allowable Radial and Axial Loads of the Motor

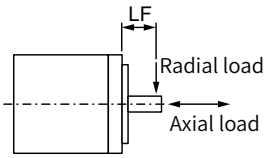


Figure 5-1 Radial and axial loads of the motor

Motor Model	Flange Size (mm)	LF (mm)	Allowable Radial Load (N)	Allowed Axial Load (N)
MS1H2-10C30CB	100	45	686	196
MS1H2-10C30CD	100	45	686	196
MS1H2-15C30CB	100	45	686	196
MS1H2-15C30CD	100	45	686	196
MS1H2-20C30CD	100	45	686	196
MS1H2-25C30CD	100	45	686	196
MS1H2-30C30CD	130	63	980	392
MS1H2-40C30CD	130	63	1176	392
MS1H2-50C30CD	130	63	1176	392

5.2.3 Electrical Specifications of the Motor with Brake

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10%	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H2-10C/15C/20C/25C	8	24	25	0.96	≤ 30	≤ 85	≤ 0.5
MS1H2-30C/40C/50C	16		21.3	1.13	≤ 60	≤ 100	≤ 0.5

NOTE

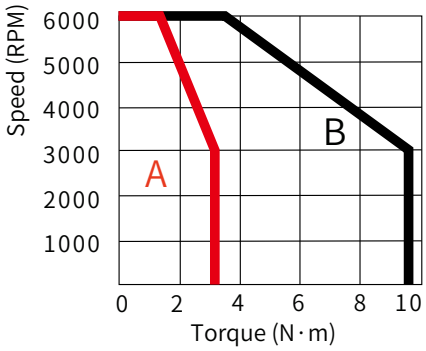
- The brake cannot share the same power supply with other electrical devices. This is to prevent malfunction of the brake due to voltage or current drop caused by other working devices.
- It is recommended to use cables with a cross sectional area above 0.5 mm^2.

5.2.4 Motor Torque-Speed Characteristics

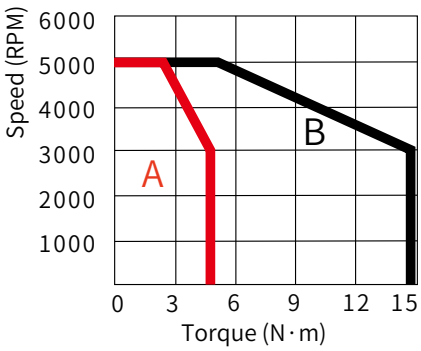
Continous working area

Short-term working area

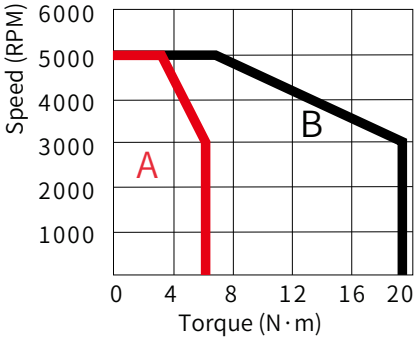
MS1H2-10C30C□



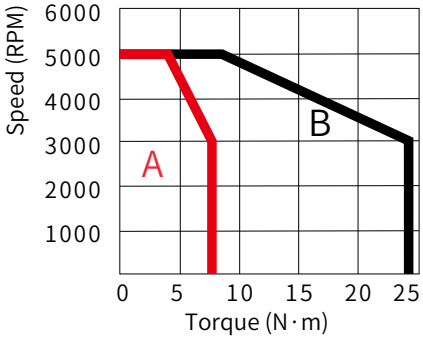
MS1H2-15C30C□



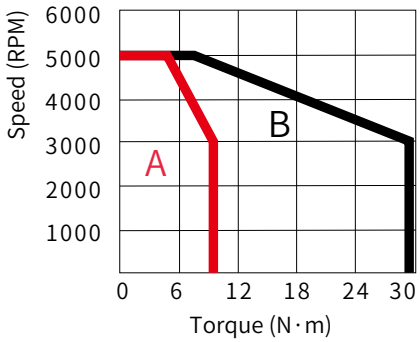
MS1H2-20C30CD-A331



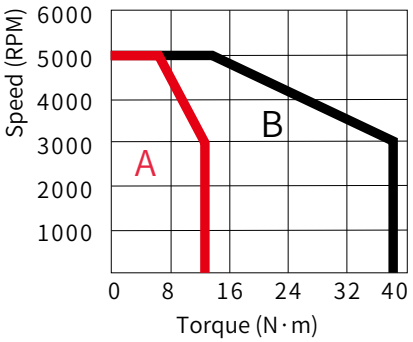
MS1H2-25C30CD-A331



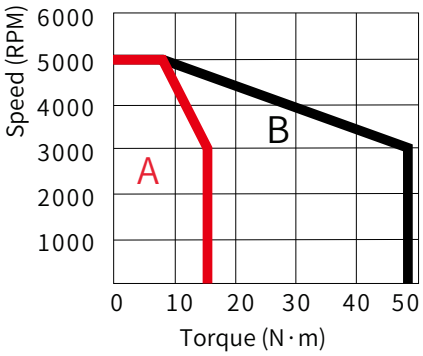
MS1H2-30C30CD-A331



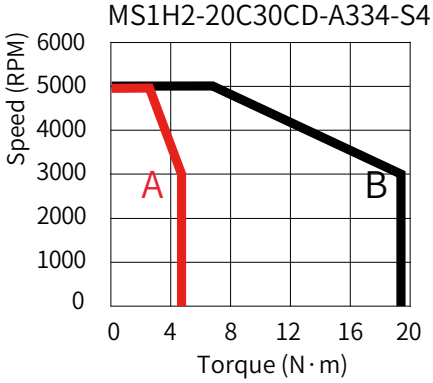
MS1H2-40C30CD-A331



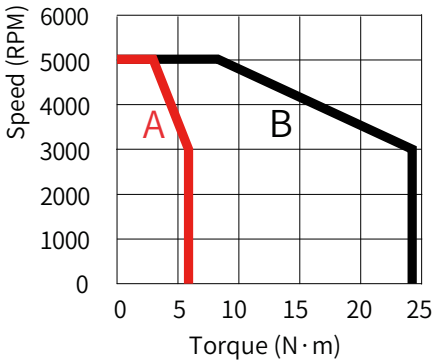
MS1H2-50C30CD-A331



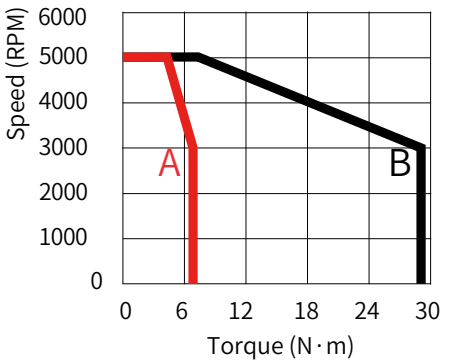
MS1H2-20C30CD-A334-S4



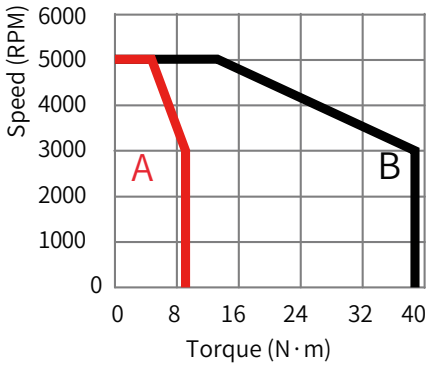
MS1H2-25C30CD-A334-S4



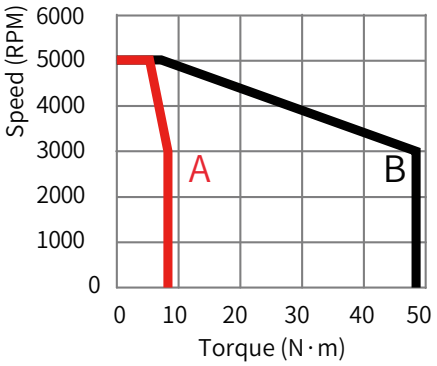
MS1H2-30C30CD-A334-S4



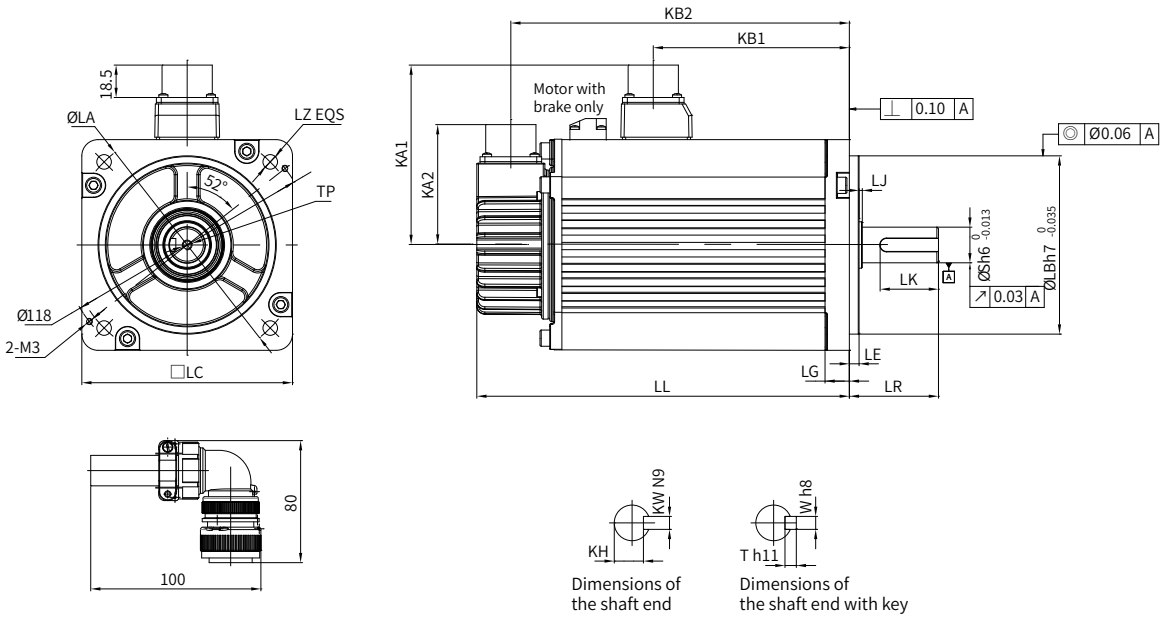
MS1H2-40C30CD-A334-S4



MS1H2-50C30CD-A334-S4



5.2.5 Dimension Drawings of MS1H2 Series Motors



Motor Model	LC	LL	LR	LA	LZ	KA1	KB1	KA2	KB2	LG	LE	LJ	LB
	Unit: mm (in.)												
MS1H2-10C30CB(D)-A331Z	100 (3.94)	164 (6.46)	45±1 (1.77±0.04)	115 (4.53)	4-φ7 (0.16-φ0.28)	88 (3.46)	94.5 (3.72)	74 (2.91)	143.5 (5.65)	10 (0.39)	5±0.3 (0.20±0.01)	2.5±0.75 (0.10±0.03)	95 (3.74)
MS1H2-10C30CB(D)-A334Z		213.5 (8.41)					101 (3.98)		192.5 (5.65)				
MS1H2-15C30CB(D)-A331Z	100 (3.94)	189 (7.44)	45±1 (1.77±0.04)	115 (4.53)	4-φ7 (0.16-φ0.28)	88 (3.46)	119.5 (4.70)	74 (2.91)	168.5 (6.63)	10 (0.39)	5±0.3 (0.20±0.01)	2.5±0.75 (0.10±0.03)	95 (3.74)
MS1H2-15C30CB(D)-A334Z		239 (9.41)					128 (5.04)		219.5 (8.64)				
MS1H2-20C30CD-A331Z	100 (3.94)	214 (8.43)	45±1 (1.77±0.04)	115 (4.53)	4-φ7 (0.16-φ0.28)	88 (3.46)	144.5 (5.69)	74 (2.91)	193.5 (7.62)	10 (0.39)	5±0.3 (0.20±0.01)	2.5±0.75 (0.10±0.03)	95 (3.74)
MS1H2-20C30CD-A334Z(-S4)		265 (10.43)					153 (6.02)		244 (9.61)				
MS1H2-25C30CD-A331Z	100 (3.94)	240.5 (9.47)	45±1 (1.77±0.04)	115 (4.53)	4-φ7 (0.16-φ0.28)	88 (3.46)	169.5 (6.67)	74 (2.91)	218.5 (8.60)	10 (0.39)	5±0.3 (0.20±0.01)	2.5±0.75 (0.10±0.03)	95 (3.74)
MS1H2-25C30CD-A334Z(-S4)		290 (11.42)					178 (7.01)		269 (10.59)				
MS1H2-30C30CD-A331Z	130 (5.12)	209.5 (8.25)	63±1 (2.48±0.04)	145 (5.71)	4-φ9 (0.16-φ0.35)	103 (4.06)	136 (5.35)	74 (2.91)	188.5 (7.42)	14 (0.55)	6±0.3 (0.24±0.01)	0.5±0.75 (0.10±0.03)	110 (4.33)
MS1H2-30C30CD-A334Z(-S4)		265.5 (10.45)					139 (5.47)		244.5 (9.63)				
MS1H2-40C30CD-A331Z	130 (5.12)	252 (9.92)	63±1 (2.48±0.04)	145 (5.71)	4-φ9 (0.16-φ0.35)	103 (4.06)	178.5 (7.03)	74 (2.91)	231 (9.09)	14 (0.55)	6±0.3 (0.24±0.01)	0.5±0.75 (0.10±0.03)	110 (4.33)
MS1H2-40C30CD-A334Z(-S4)		308 (12.13)					181.5 (7.15)		287 (11.30)				
MS1H2-50C30CD-A331Z	130 (5.12)	294.5 (11.59)	63±1 (2.48±0.04)	145 (5.71)	4-φ9 (0.16-φ0.35)	103 (4.06)	221 (8.70)	74 (2.91)	273.5 (10.77)	14 (0.55)	6±0.3 (0.24±0.01)	0.5±0.75 (0.10±0.03)	110 (4.33)
MS1H2-50C30CD-A334Z(-S4)		350.5 (13.80)					224 (8.82)		329.5 (12.97)				

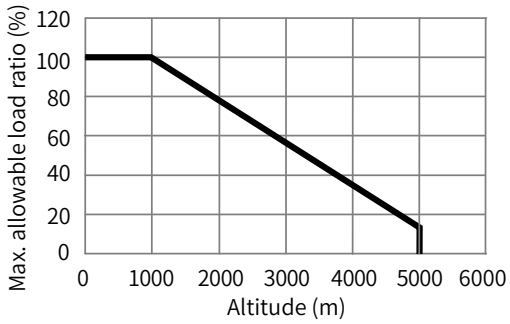
Motor Model	S	TP	LK	KH	KW	W	T	Weight	Connector Model	Power Side (Power Brake Side Included)	Encoder Side
	Unit: mm (in.)							Unit: kg (lb.)			
MS1H2-10C30CB(D)-A331Z	24 (0.94)	M8x16 (M8x0.63)	36 (1.42)	20 $^{0}_{-0.2}$ (0.79 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	5.11 (11.27)	Aviation connector	MI-DTL-5015 series 3102E20-18P	MI-DTL-5015 series 3102E20-29P
MS1H2-10C30CB(D)-A334Z								6.41 (14.13)			
MS1H2-15C30CB(D)-A331Z	24 (0.94)	M8x16 (M8x0.63)	36 (1.42)	20 $^{0}_{-0.2}$ (0.79 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	6.22 (13.71)			
MS1H2-15C30CB(D)-A334Z								7.52 (16.58)			
MS1H2-20C30CD-A331Z	24 (0.94)	M8x16 (M8x0.63)	36 (1.42)	20 $^{0}_{-0.2}$ (0.79 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	7.39 (16.29)			
MS1H2-20C30CD-A334Z(-S4)								8.7 (19.18)			
MS1H2-25C30CD-A331Z	24 (0.94)	M8x16 (M8x0.63)	36 (1.42)	20 $^{0}_{-0.2}$ (0.79 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	8.55 (18.85)			
MS1H2-25C30CD-A334Z(-S4)								9.8 (21.61)			
MS1H2-30C30CD-A331Z	28 (1.10)	M8x20 (M8x0.79)	54 (2.13)	24 $^{0}_{-0.2}$ (0.94 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	10.73 (23.66)	Aviation connector	MI-DTL-5015 series 3102E20-18P	MI-DTL-5015 series 3102E20-29P
MS1H2-30C30CD-A334Z(-S4)								13.2 (29.10)			
MS1H2-40C30CD-A331Z	28 (1.10)	M8x20 (M8x0.79)	54 (2.13)	24 $^{0}_{-0.2}$ (0.94 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	15.43 (34.02)			
MS1H2-40C30CD-A334Z(-S4)								17.9 (39.46)			
MS1H2-50C30CD-A331Z	28 (1.10)	M8x20 (M8x0.79)	54 (2.13)	24 $^{0}_{-0.2}$ (0.94 $^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	16.2 (35.71)			
MS1H2-50C30CD-A334Z(-S4)								18.7 (41.23)			

NOTE

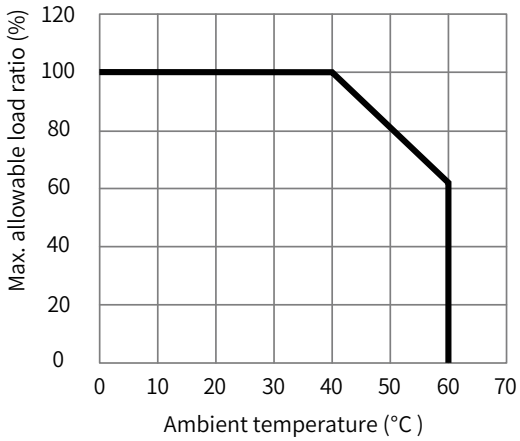
- ◆ Values inside the parentheses "()" are in British system of unit.
- ◆ Motor models ending with "-S4" represents the duty type S4, indicating the motor is working under S4 duty, with the motor load ratio not exceeding 70%.
- ◆ Outline drawings vary with the motor model. The actual dimensions are subject to the physical product.

5.2.6 Derating Curves

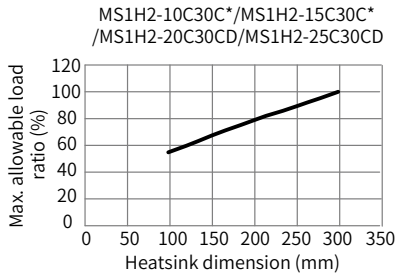
■ Altitude-based derating curve

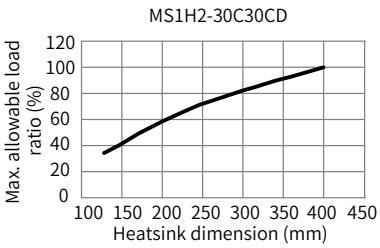


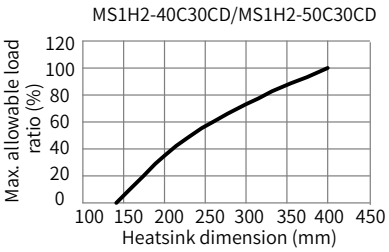
■ Temperature-based derating curve



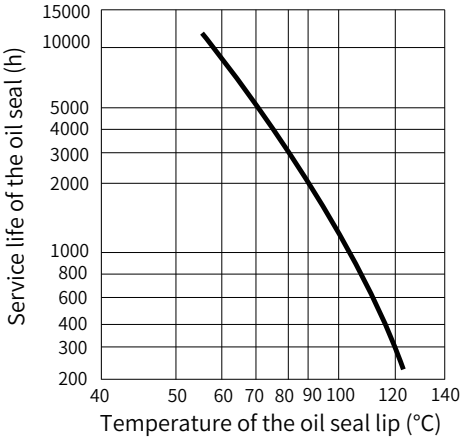
■ Heatsink-based derating curve



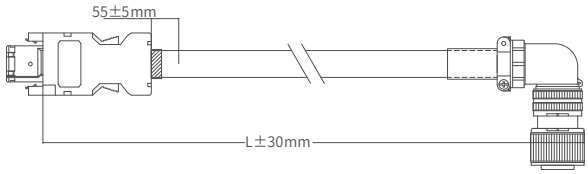
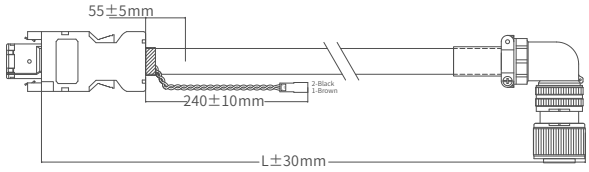
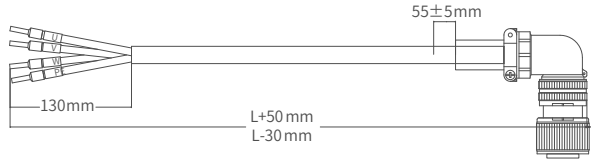
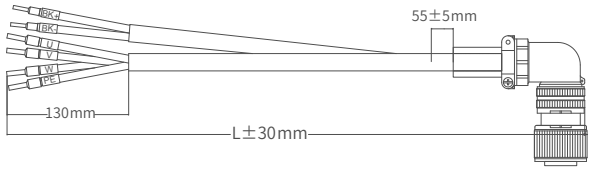
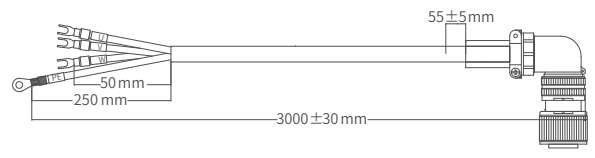
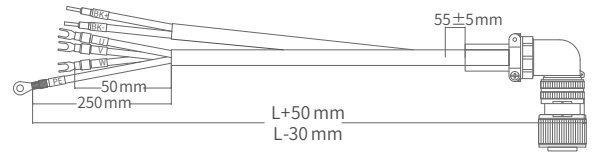


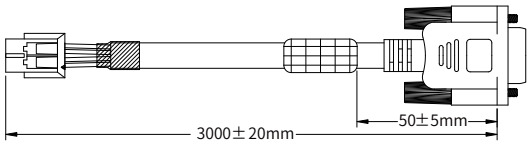
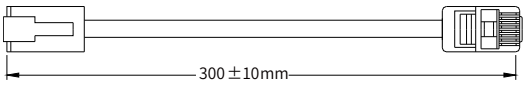
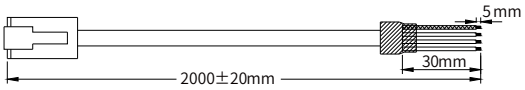
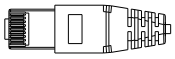
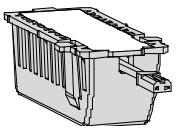
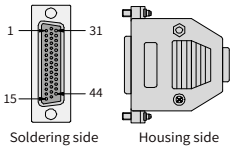
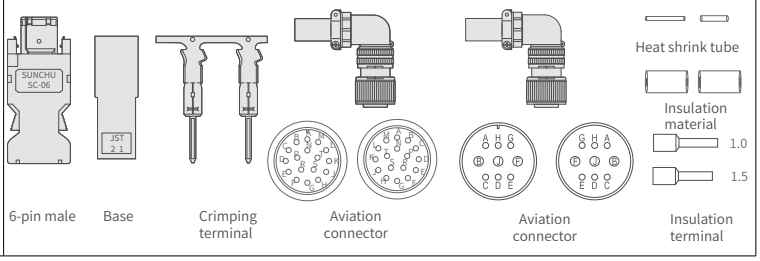


5.2.7 Temperature Curve of the Oil Seal



5.3 Selection of Cables and Options

Motor Model	Cable Name	Cable Model	Cable Length (mm)	Outline Drawing
MS1H2 Motors	Single-turn absolute encoder cable	S6-L-P111-3.0	3000	
		S6-L-P111-5.0	5000	
		S6-L-P111-10.0	10000	
	Multi-turn absolute encoder cable	S6-L-P121-3.0	3000	
		S6-L-P121-5.0	5000	
		S6-L-P121-10.0	10000	
MS1H2 motors (3kW and below)	Power cable for motor without brake	S6-L-M111-3.0	3000	
		S6-L-M111-5.0	5000	
		S6-L-M111-10.0	10000	
	Power cable for motor with brake	S6-L-B111-3.0	3000	
		S6-L-B111-5.0	5000	
		S6-L-B111-10.0	10000	
MS1H2 motors (4 kW/ 5 kW)	Power cable for motor without brake	S6-L-M011-3.0	3000	
		S6-L-M011-5.0	5000	
		S6-L-M011-10.0	10000	
	Power cable for motor with brake	S6-L-B011-3.0	3000	
		S6-L-B011-5.0	5000	
		S6-L-B011-10.0	10000	

Name	Cable Model	Cable Length (mm)	Outline Drawing
SV660P servo drive to PC communication cable	S6-L-T00-3.0	3000	
SV660P multi-drive communication cable (CAN and RS485)	S6-L-T01-0.3	300	
SV660P servo drive to PLC communication cable (CAN and RS485)	S6-L-T02-2.0	2000	
SV660P servo drive termination resistor connector (CAN and RS485)	S6-L-T03-0.0	0	
Battery kit	S6-C4	-	
SV660P CN1 terminal (DB44)	S6-C8	-	 Note: DB44 (purchased separately for MS1 motors)
Connector of MS1H2 motors (1.8 kW and below)	S6-C29	-	

6 Motors with Medium Inertia and Medium Capacity (MS1H3)

6.1 Model Selection

6.1.1 220 V/380 V Motors Without Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H3 series motors (Vn = 1500 RPM, Vmax = 3000 RPM)						
MS1H3-85B15CB-A331Z	Single-phase/ Three-phase 220 V	C	SV660*S7R6I	S6-L-M111-**	S6-L-P111-**	S6-L-P121-**
MS1H3-85B15CD-A331Z	380 V	C	SV660*T3R5I			
MS1H3-13C15CB-A331Z	Single-phase/ Three-phase 220 V	D	SV660*S012I			
MS1H3-13C15CD-A331Z	380 V	C	SV660*T5R4I			
MS1H3-18C15CD-A331Z	380 V	D	SV660*T8R4I			
MS1H3-29C15CD-A331Z	380 V		SV660*T012I	S6-L-M112-**		
MS1H3-44C15CD-A331Z	380 V	E	SV660*T017I	S6-L-M022-**		
MS1H3-55C15CD-A331Z	380 V	E	SV660*T021I			
MS1H3-75C15CD-A331Z	380 V	E	SV660*T026I			

Motor Model	Encoder Connector	Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
Ratings of MS1H3 series motors (Vn = 1500 RPM, Vmax = 3000 RPM)						
MS1H3-85B15CB-A331Z	S6-C29	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H3-85B15CD-A331Z						
MS1H3-13C15CB-A331Z						
MS1H3-13C15CD-A331Z						
MS1H3-18C15CD-A331Z						
MS1H3-29C15CD-A331Z						
MS1H3-44C15CD-A331Z						
MS1H3-55C15CD-A331Z						
MS1H3-75C15CD-A331Z						

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

6.1.2 220 V/380 V Motors with Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H3 series motors (Vn = 1500 RPM, Vmax = 3000 RPM)						
MS1H3-85B15CB-A334Z	Single-phase/ Three-phase 220 V	C	SV660*S7R6I	S6-L-B111-**	S6-L-P111-**	S6-L-P121-**
MS1H3-85B15CD-A334Z	380 V	C	SV660*T3R5I			
MS1H3-13C15CB-A334Z	Single-phase/ Three-phase 220 V	D	SV660*S012I			
MS1H3-13C15CD-A334Z	380 V	C	SV660*T5R4I			
MS1H3-18C15CD-A334Z	380 V	D	SV660*T8R4I			
MS1H3-29C15CD-A334Z	380 V		SV660*T012I	S6-L-B112-**		
MS1H3-44C15CD-A334Z	380 V	E	SV660*T017I	S6-L-B022-**		
MS1H3-55C15CD-A334Z	380 V	E	SV660*T021I			
MS1H3-75C15CD-A334Z	380 V	E	SV660*T026I			

Motor Model	Encoder Connector	Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
Ratings of MS1H3 series motors (Vn = 1500 RPM, Vmax = 3000 RPM)						
MS1H3-85B15CB-A334Z	S6-C29	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H3-85B15CD-A334Z						
MS1H3-13C15CB-A334Z						
MS1H3-13C15CD-A334Z						
MS1H3-18C15CD-A334Z						
MS1H3-29C15CD-A334Z						
MS1H3-44C15CD-A334Z						
MS1H3-55C15CD-A334Z						
MS1H3-75C15CD-A334Z						

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

6.2 Motor Specifications

6.2.1 Motor Ratings

Motor Model	Rated Output (kW)[1]	Rated Torque (N·m)	Max. Torque (N·m)	Rated Current (Arms)	Max. Current (Arms)	Rated Speed (RPM)	Max. Speed (RPM)	Torque (N·m/Arms)	Moment of Inertia ($kg \cdot cm^2$)	Voltage (V)
Ratings of MS1H3 series motors (Vn = 1500 RPM, Vmax = 3000 RPM)										
MS1H3-85B15CB	0.85	5.39	13.5	6.60	16.50	1500	3000	0.95	13.3 (14)	220 V
MS1H3-13C15CB	1.3	8.34	20.85	10.00	25.00			0.96	17.8 (18.5)	
MS1H3-85B15CD	0.85	5.39	13.5	3.30	8.25			1.87	13.3 (14)	380 V
MS1H3-13C15CD	1.3	8.34	20.85	5.00	12.50			1.87	17.8 (18.5)	
MS1H3-18C15CD	1.8	11.5	28.75	6.60	16.50	1500	3000	1.87	25 (25.7)	380 V
MS1H3-29C15CD	2.9	18.6	37.2	11.90	23.80			1.82	55 (57.2)	
MS1H3-44C15CD	4.4	28.4	71.1	16.50	40.50			1.90	88.9 (90.8)	
MS1H3-55C15CD	5.5	35.0	87.6	20.85	52.00			1.74	107 (109.5)	
MS1H3-75C15CD	7.5	48.0	119	25.70	65.00			1.99	141 (143.1)	

[1] The motor with oil seal must be derated by 10% during use.

NOTE

- Values inside the parentheses "()" are for the motor with brake.
- Values in the preceding table are obtained when motors equipped with the following heatsinks work with Inovance servo drives under an armature coil temperature of 20° C.

  MS1H3-85B to 18C: 400 mm x 400 mm x 20 mm (iron)

  MS1H3-29C to 75C: 360 mm x 360 mm x 25 mm (double aluminum plate)

6.2.2 Allowable Radial and Axial Loads of the Motor

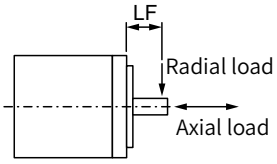


Figure 6-1 Radial and axial loads of the motor

Motor Model	Flange Size (mm)	LF (mm)	Allowable Radial Load (N)	Allowed Axial Load (N)
MS1H3-85B15CB	130	45	686	196
MS1H3-13C15CB	130	45	686	196
MS1H3-85B15CD	130	45	686	196
MS1H3-13C15CD	130	45	686	196
MS1H3-18C15CD	130	45	686	196
MS1H3-29C15CD	180	79	1470	490
MS1H3-44C15CD	180	79	1470	490
MS1H3-55C15CD	180	113	1764	588
MS1H3-75C15CD	180	113	1764	588

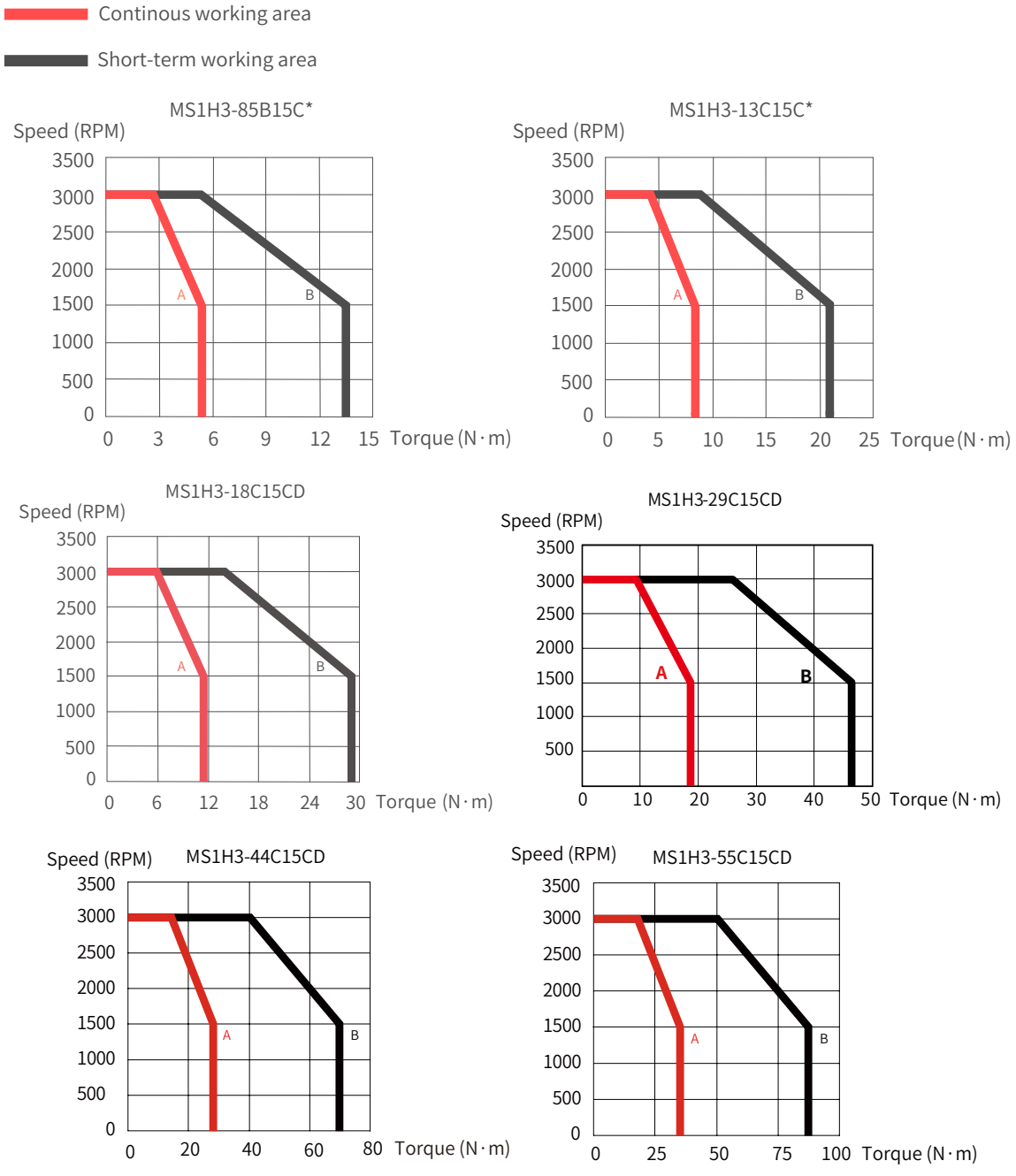
6.2.3 Electrical Specifications of the Motor with Brake

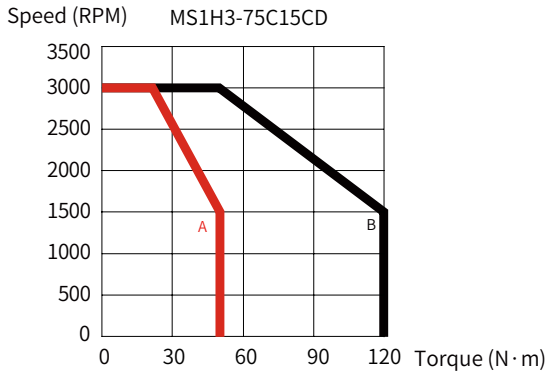
Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10%	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H3-85B/13C/18C	12	24	29.7	0.81	≤ 60	≤ 120	≤ 0.5
MS1H3-29C/44C/55C/75C	50		14.4	1.67	≤ 100	≤ 200	≤ 0.5

NOTE

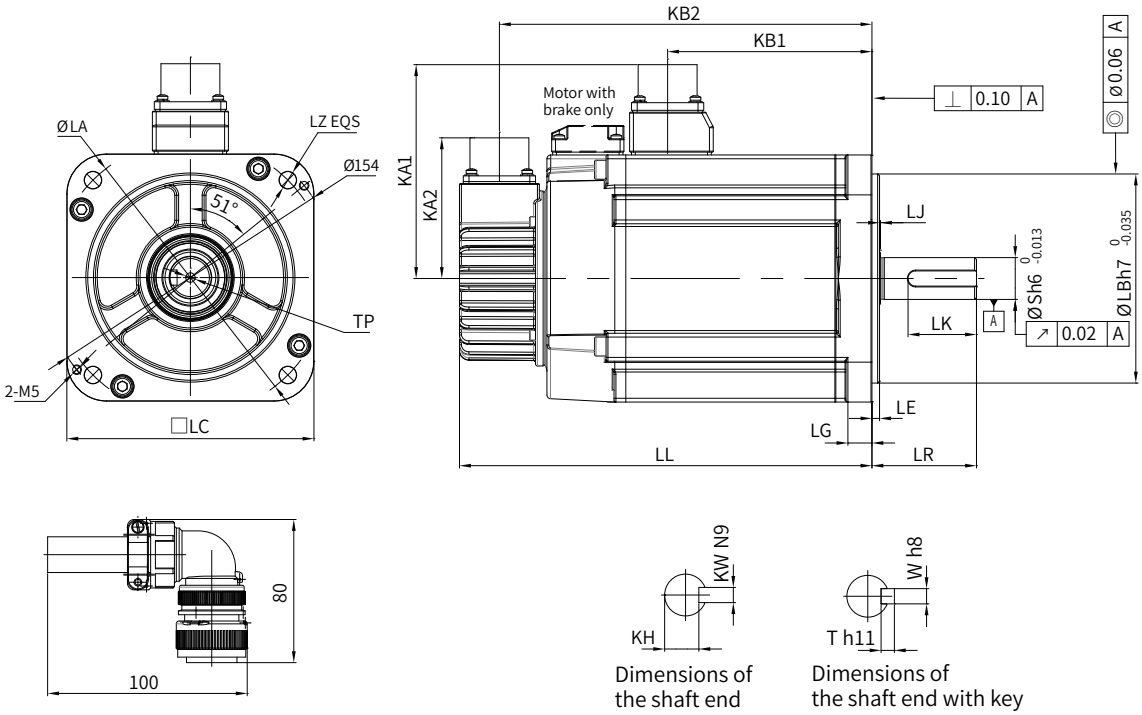
- The brake cannot share the same power supply with other electrical devices. This is to prevent malfunction of the brake due to voltage or current drop caused by other working devices.
- It is recommended to use cables with a cross sectional area above 0.5 mm^2.

6.2.4 Motor Torque-Speed Characteristics





6.2.5 Dimension Drawings of MS1H3 Series Motors



Dimensions of the shaft end

Dimensions of the shaft end with key

Motor Model	LC	LL	LR	LA	LZ	KA1	KB1	KA2	KB2	LG	LE	LJ	LB
	Unit: mm (in.)												
MS1H3-85B15CB(D)-A331Z	130 (5.12)	146 (5.75)	55±1 (2.17±0.04)	145 (5.71)	4-Φ9 (0.16-Φ0.35)	103 (4.06)	72.5 (2.85)	74 (2.91)	125 (4.92)	14 (0.55)	4 (0.16)	0.5±0.75 (0.02±0.03)	110 (4.33)
MS1H3-85B15CB(D)-A334Z		182 (7.17)							161 (6.34)				
MS1H3-13C15CB(D)-A331Z	130 (5.12)	163 (6.42)	55±1 (2.17±0.04)	145 (5.71)	4-Φ9 (0.16-Φ0.35)	103 (4.06)	89.5 (3.52)	74 (2.91)	142 (5.59)	14 (0.55)	4 (0.16)	0.5±0.75 (0.02±0.03)	110 (4.33)
MS1H3-13C15CB(D)-A334Z		199 (7.83)							178 (7.01)				
MS1H3-18C15CD-A331Z	130 (5.12)	181 (7.13)	55±1 (2.17±0.04)	145 (5.71)	4-Φ9 (0.16-Φ0.35)	103 (4.06)	107.5 (4.23)	74 (2.91)	160 (6.30)	14 (0.55)	4 (0.16)	0.5±0.75 (0.02±0.03)	110 (4.33)
MS1H3-18C15CD-A334Z		217 (8.54)							196 (7.72)				

Motor Model	LC	LL	LR	LA	LZ	KA1	KB1	KA2	KB2	LG	LE	LJ	LB
	Unit: mm (in.)												
MS1H3-29C15CD-A331Z	180 (7.09)	197 (7.76)	79±1 (3.11±0.04)	200 (7.87)	4-φ13.5 (0.16-Φ0.53)	138 (5.43)	136 (5.35)	74 (2.91)	177 (6.97)	18 (0.71)	3.2±0.3 (0.13±0.01)	0.3±0.75 (0.01±0.03)	114.3 (4.50)
MS1H3-29C15CD-A334Z		273 (10.75)					134 (5.28)		253 (9.96)				
MS1H3-44C15CD-A331Z	180 (7.09)	230 (9.06)	79±1 (3.11±0.04)	200 (7.87)	4-φ13.5 (0.16-Φ0.53)	138 (5.43)	169 (6.65)	74 (2.91)	210 (8.27)	18 (0.71)	3.2±0.3 (0.13±0.01)	0.3±0.75 (0.01±0.03)	114.3 (4.50)
MS1H3-44C15CD-A334Z		307 (12.09)					167 (6.57)		286 (11.26)				
MS1H3-55C15CD-A331Z	180 (7.09)	274 (10.79)	113±1 (4.45±0.04)	200 (7.87)	4-φ13.5 (0.16-Φ0.53)	138 (5.43)	213 (8.39)	74 (2.91)	254 (10.00)	18 (0.71)	3.2±0.3 (0.13±0.01)	0.3±0.75 (0.01±0.03)	114.3 (4.50)
MS1H3-55C15CD-A334Z		350 (13.78)					211 (8.31)		330 (12.99)				
MS1H3-75C15CD-A331Z	180 (7.09)	330 (12.99)	113±1 (4.45±0.04)	200 (7.87)	4-φ13.5 (0.16-Φ0.53)	138 (5.43)	269 (10.59)	74 (2.91)	310 (12.20)	18 (0.71)	3.2±0.3 (0.13±0.01)	0.3±0.75 (0.01±0.03)	114.3 (4.50)
MS1H3-75C15CD-A334Z		407 (16.02)					267 (10.51)		386 (15.20)				

Motor Model	S	TP	LK	KH	KW	W	T	Weight	Connector Model	Power Side (Power Brake Side Included)	Encoder Side
	Unit: mm (in.)							Unit: kg (lb.)			
MS1H3-85B15CB(D)-A331Z	22 (0.87)	M6x20 (M6x0.79)	36 (1.42)	$18^{0}_{-0.2}$ ($0.71^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	7 (15.43)	Aviation connector	MI-DTL-5015 series 3102E20-18P	MI-DTL-5015 series 3102E20-29P
MS1H3-85B15CB(D)-A334Z								8 (17.64)			
MS1H3-13C15CB(D)-A331Z	22 (0.87)	M6x20 (M6x0.79)	36 (1.42)	$18^{0}_{-0.2}$ ($0.71^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	8 (17.64)			
MS1H3-13C15CB(D)-A334Z								9.5 (20.94)			
MS1H3-18C15CD-A331Z	22 (0.87)	M6x20 (M6x0.79)	36 (1.42)	$18^{0}_{-0.2}$ ($0.71^{0}_{-0.01}$)	8 (0.31)	8 (0.31)	7 (0.28)	9.5 (20.94)			
MS1H3-18C15CD-A334Z								11 (24.25)			
MS1H3-29C15CD-A331Z	35 (1.38)	M12x25 (M12×0.98)	65 (2.56)	$30^{0}_{-0.2}$ ($1.18^{0}_{-0.01}$)	10 (0.39)	10 (0.39)	8 (0.31)	15 (33.07)			
MS1H3-29C15CD-A334Z								25 (55.12)			

Motor Model	LC	LL	LR	LA	LZ	KA1	KB1	KA2	KB2	LG	LE	LJ	LB
	Unit: mm (in.)												
MS1H3-44C15CD-A331Z	35 (1.38)	M12x25 (M12×0.98)	65 (2.56)	30 $^{0}_{-0.2}$ (1.18 $^{0}_{-0.01}$)	10 (0.39)	10 (0.39)	8 (0.31)	19.5 (42.99)	Aviation connector	MI-DTL-5015 series 3102E20-22P		MI-DTL-5015 series 3102E20-29P	
MS1H3-44C15CD-A334Z								30 (66.14)					
MS1H3-55C15CD-A331Z	42 (1.65)	M16x32 (M16x1.26)	96 (3.78)	37 $^{0}_{-0.2}$ (1.46 $^{0}_{-0.01}$)	12 (0.47)	12 (0.47)	8 (0.31)	28 (61.73)					
MS1H3-55C15CD-A334Z								38 (83.78)					
MS1H3-75C15CD-A331Z	42 (1.65)	M16x32 (M16x1.26)	96 (3.78)	37 $^{0}_{-0.2}$ (1.46 $^{0}_{-0.01}$)	12 (0.47)	12 (0.47)	8 (0.31)	32 (70.55)					
MS1H3-75C15CD-A334Z								42 (92.59)					

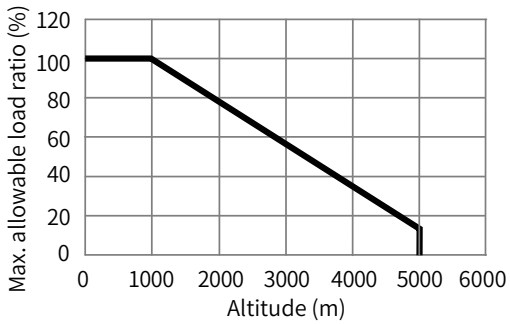
NOTE

◆ Values inside the parentheses "()" are in British system of unit.

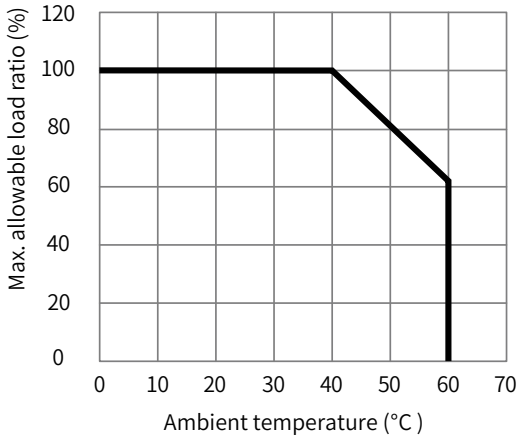
◆ Outline drawings vary with the motor model. The actual dimensions are subject to the physical product.

6.2.6 Derating Characteristics

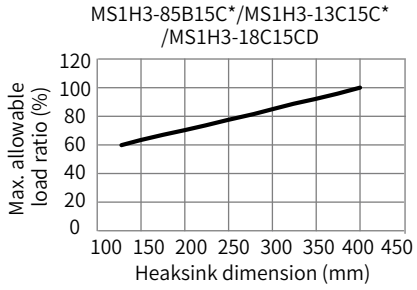
■ Altitude-based derating curve

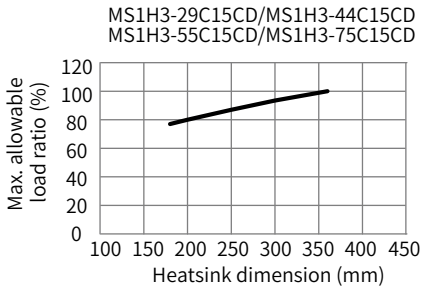


■ Temperature-based derating curve

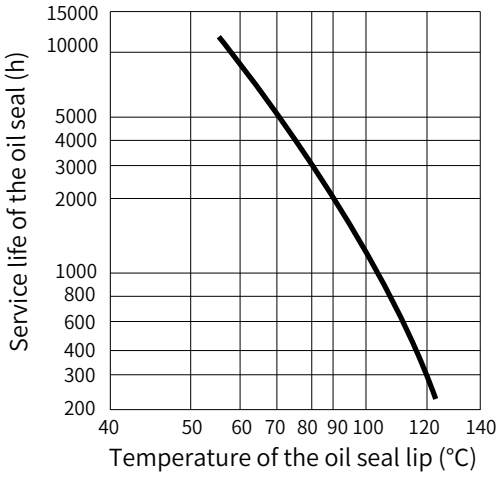


■ Heatsink-based derating curve

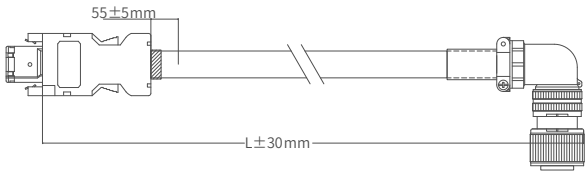
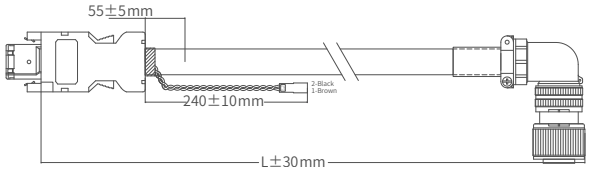
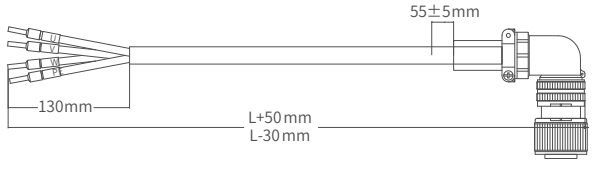
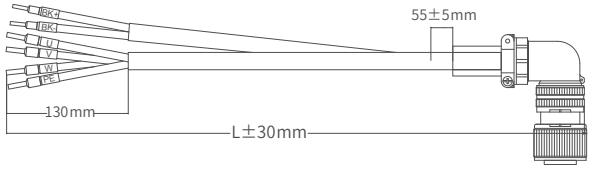


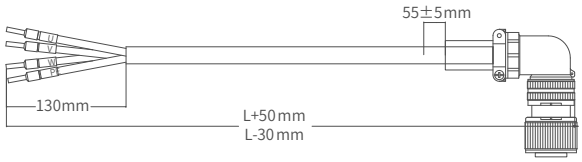
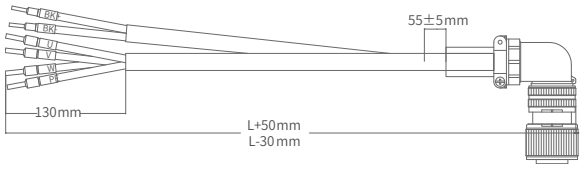
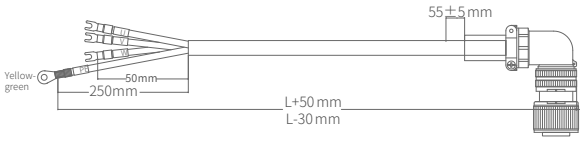
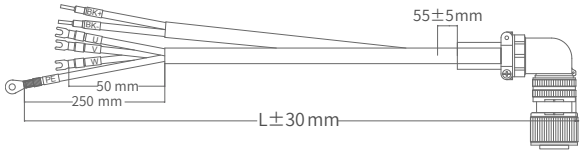


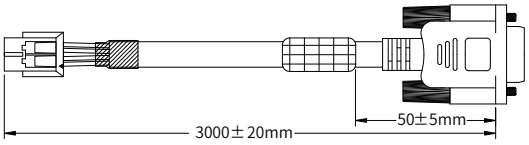
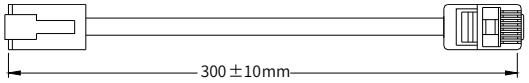
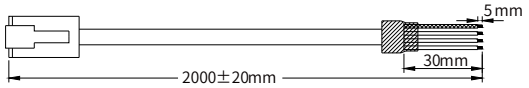
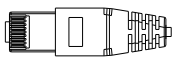
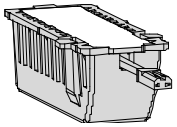
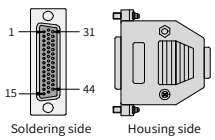
6.2.7 Temperature Curve of the Oil Seal

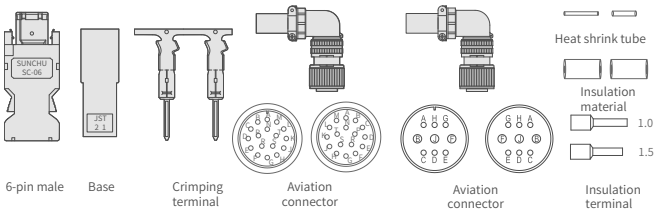
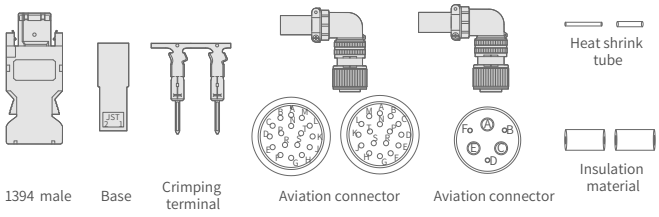


6.3 Selection of Cables and Options

Motor Model	Cable Name	Cable Model	Cable Length (mm)	Outline Drawing
MS1H3 Motors	Single-turn absolute encoder cable	S6-L-P111-3.0	3000	
		S6-L-P111-5.0	5000	
		S6-L-P111-10.0	10000	
	Multi-turn absolute encoder (A3**Z) cable	S6-L-P121-3.0	3000	
		S6-L-P121-5.0	5000	
		S6-L-P121-10.0	10000	
MS1H3 motors (1.8kW and below)	Power cable for motor without brake	S6-L-M111-3.0	3000	
		S6-L-M111-5.0	5000	
		S6-L-M111-10.0	10000	
	Power cable for motor with brake	S6-L-B111-3.0	3000	
		S6-L-B111-5.0	5000	
		S6-L-B111-10.0	10000	

Motor Model	Cable Name	Cable Model	Cable Length (mm)	Outline Drawing
MS1H3 motors (2.9 kW)	Power cable for motor without brake	S6-L-M112-3.0	3000	
		S6-L-M112-5.0	5000	
		S6-L-M112-10.0	10000	
	Power cable for motor with brake	S6-L-B112-3.0	3000	
		S6-L-B112-5.0	5000	
		S6-L-B112-10.0	10000	
MS1H3 motors (4.4kW and above)	Power cable for motor without brake	S6-L-M022-3.0	3000	
		S6-L-M022-5.0	5000	
		S6-L-M022-10.0	10000	
	Power cable for motor with brake	S6-L-B022-3.0	3000	
		S6-L-B022-5.0	5000	
		S6-L-B022-10.0	10000	

Name	Cable Model	Cable Length (mm)	Outline Drawing
SV660P servo drive to PC communication cable	S6-L-T00-3.0	3000	
SV660P multi-drive communication cable (CAN and RS485)	S6-L-T01-0.3	300	
SV660P servo drive to PLC communication cable (CAN and RS485)	S6-L-T02-2.0	2000	
SV660P servo drive termination resistor connector (CAN and RS485)	S6-L-T03-0.0	0	
Battery kit	S6-C4	-	
SV660P CN1 terminal (DB44)	S6-C8	-	 Note: DB44 (purchased separately for MS1 motors)

Name	Cable Model	Cable Length (mm)	Outline Drawing
Connector of MS1H3 motors (1.8 kW and below)	S6-C29	-	
Connector of MS1H3 motors (2.9kW and above)	S6-C39	-	

7 Motors with Medium Inertia and Small Capacity (MS1H4)

7.1 Model Selection

7.1.1 220 V Motors Without Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H4 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)						
MS1H4-40B30CB-A331Z(-S)	Single-phase 220 V	A	SV660*S2R8I	S6-L-M107-** (Front outlet) S6-L-M108-** (Rear outlet) S6-L-M100-** (Lead wire-type motor cable)	S6-L-P114-** (Front outlet) S6-L-P115-** (Rear outlet) S6-L-P110-** (Lead wire-type motor cable)	S6-L-P124-** (Front outlet) S6-L-P125-** (Rear outlet) S6-L-P120-** (Lead wire-type motor cable)
MS1H4-75B30CB-A331Z(-S)	Single-phase 220 V	B	SV660*S5R5I			

Motor Model	Connector Kit		Battery Kit for the Absolute Encoder	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
	I/O Connector Kit	Encoder Connector Kit					
Ratings of MS1H4 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)							
MS1H4-40B30CB-A331Z(-S)	S6-C8	Not available in terminal-type motors S6-C26 (Lead wire-type motor) S6-C29	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H4-75B30CB-A331Z(-S)							

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

7.1.2 220 V Motors with Brake

Motor Model	Servo Drive			Power Cable	23-bit Single-Turn Absolute Encoder Cable	23-bit Multi-Turn Absolute Encoder Cable (Battery Kit Required)
	Voltage Class	Size	Model			
Ratings of MS1H4 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)						
MS1H4-40B30CB-A334Z(-S)	Single-phase 220 V	A	SV660*S2R8I	S6-L-B107-** (Front outlet) S6-L-B108-** (Rear outlet) S6-L-B100-** (Lead wire-type motor cable)	S6-L-P114-** (Front outlet) S6-L-P115-** (Rear outlet) S6-L-P110-** (Lead wire-type motor cable)	S6-L-P124-** (Front outlet) S6-L-P125-** (Rear outlet) S6-L-P120-** (Lead wire-type motor cable)
MS1H4-75B30CB-A334Z(-S)	Single-phase 220 V	B	SV660*S5R5I			

Motor Model	Connector Kit		Connector Kit	Servo Drive to PC Communication Cable	Servo Drive to Host Controller Communication Cable	Servo Drive Termination Resistor Connector	Multi-Drive Communication Cable (CANlink, CANopen, RS485)
	I/O Connector Kit	Encoder Connector Kit					
Ratings of MS1H4 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)							
MS1H4-40B30CB-A334Z(-S)	S6-C8	Not available in terminal-type motors S6-C26 (Lead wire-type motors)	S6-C4	S6-L-T00-3.0	S6-L-T02-2.0	S6-L-T03-0.0	S6-L-T01-**
MS1H4-75B30CB-A334Z(-S)							

NOTE

- "**" represents the cable length, which can be 3.0 m, 5.0 m, or 10.0 m.
- If highly flexible cables (fit for cable carriers) are needed, add a suffix "-T" to the end of the cable model number.

7.2 Motor Specifications

7.2.1 Motor Ratings

Motor Model	Rated Output (kW)[1]	Rated Torque (N·m)	Max. Torque (N·m)	Rated Current (Arms)	Max. Current (Arms)	Rated Speed (RPM)	Max. Speed (RPM)	Torque (N·m/Arms)	Moment of inertia (kg·cm^2)	Voltage (V)
Ratings of MS1H4 series motors (Vn = 3000 RPM, Vmax = 6000 RPM)										
MS1H4-40B30CB	0.4	1.27	4.46	2.80	10.10	3000	6000	0.53	0.657 (0.667)	220
MS1H4-75B30CB	0.75	2.39	8.36	4.80	16.9			0.58	2 (2.012)	

[1] The motor with oil seal must be derated by 10% during use.

NOTE

- Values inside the parentheses "()" are for the motor with brake.
- Values in the preceding table are obtained when motors equipped with the following heatsink work with Inovance servo drives under an armature coil temperature of 20° C.
  MS1H4: 250 mm x 250 mm x 6 mm (aluminum)

7.2.2 Allowable Radial and Axial Loads of the Motor

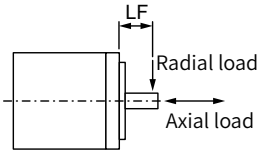


Figure 7-1 Radial and axial loads of the motor

Motor Model	Flange Size (mm)	LF (mm)	Allowable Radial Load (N)	Allowed Axial Load (N)
MS1H4-40B30CB	60	25	245	74
MS1H4-75B30CB	80	35	392	147

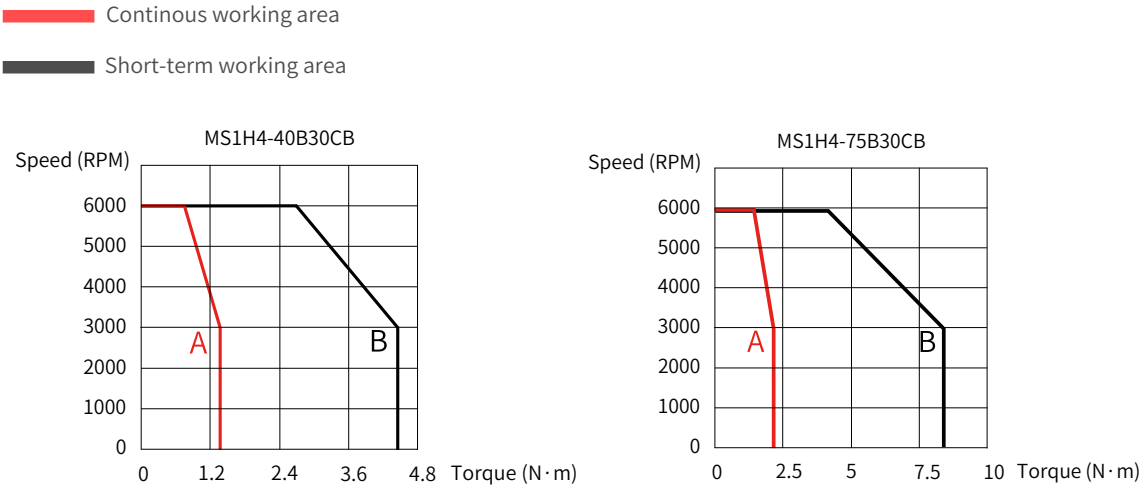
7.2.3 Electrical Specifications of Motors with Brake

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC)±10%	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H4-40B	1.5	24	75.79	0.32	≤ 20	≤ 60	≤ 1.5
MS1H4-75B	3.2		57.6	0.42	≤ 40	≤ 60	≤ 1

NOTE

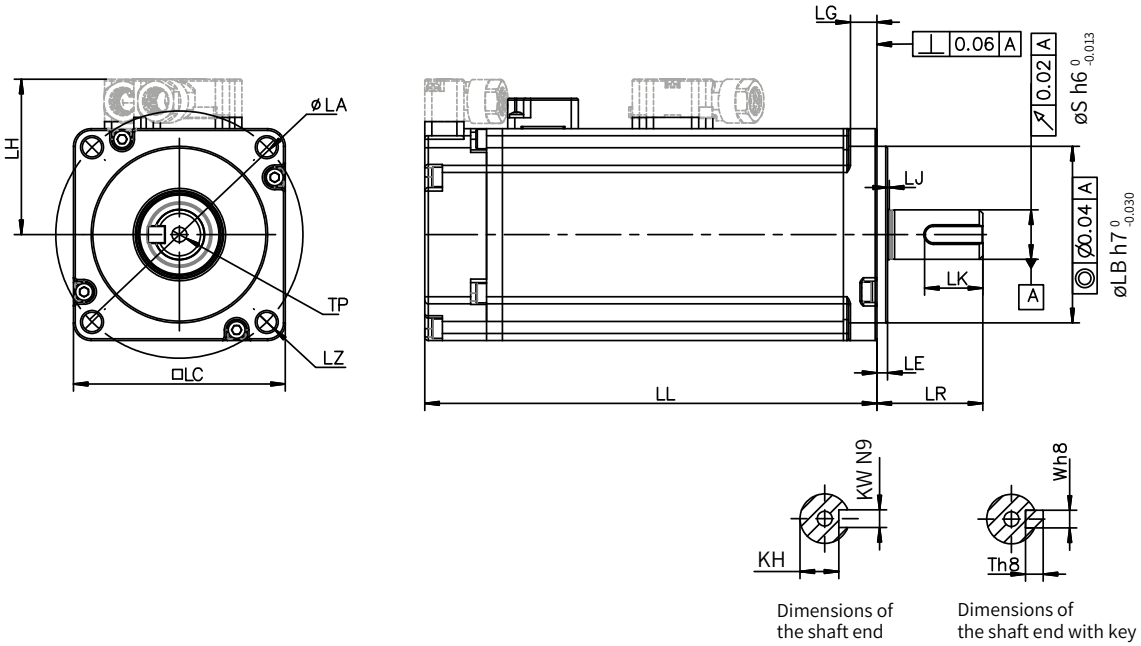
- The brake cannot share the same power supply with other electrical devices. This is to prevent malfunction of the brake due to voltage or current drop caused by other working devices.
- It is recommended to use cables with a cross section area above 0.5 mm^2.

7.2.4 Motor Torque-Speed Characteristics



7.2.5 Dimension Drawings of MS1H4 Series Motors

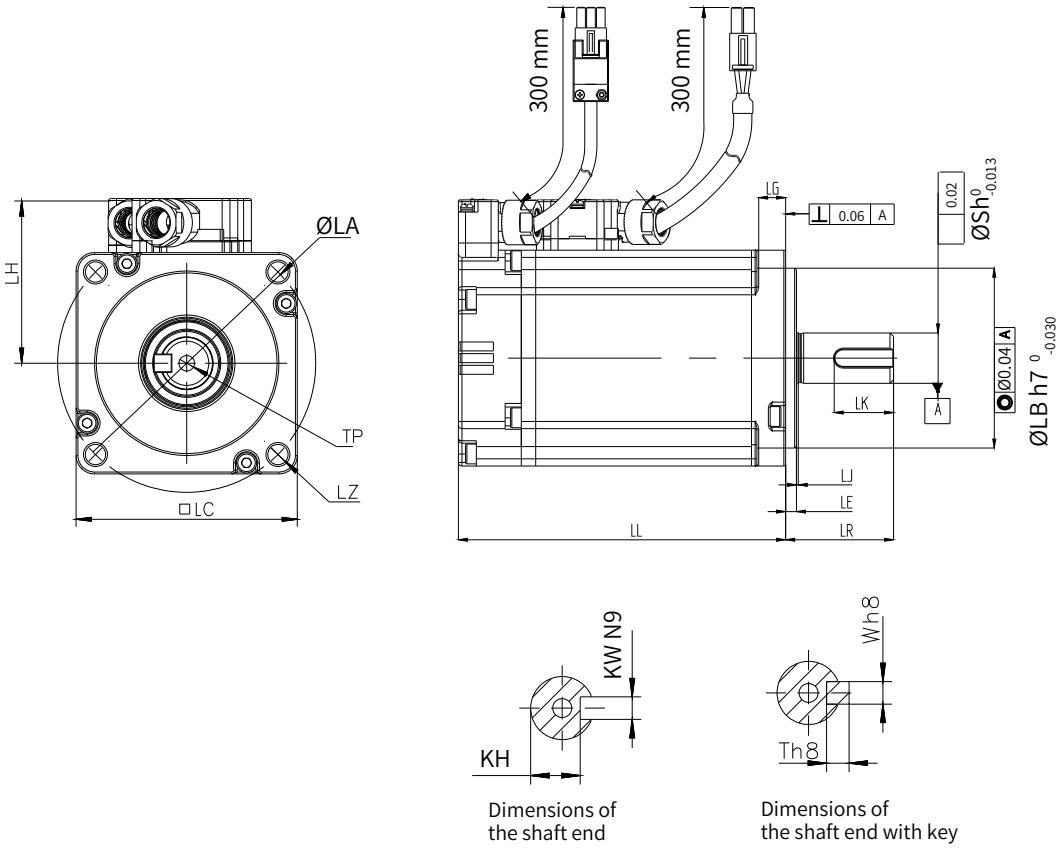
■ Terminal-type motors



Dimensions of the shaft end

Dimensions of the shaft end with key

■ Lead wire-type motors



Dimensions of the shaft end

Dimensions of the shaft end with key

Motor Model	LC	LL	LR	LA	LZ	LH	LG	LE	LJ
	Unit: mm (in.)								
MS1H4-40B30CB-A331Z(-S)	60 (2.36)	105 (4.13)	30±0.5 (1.18±0.02)	70 (2.76)	4-Φ5.5 (0.16-Φ0.22)	44 (1.73)	7.5 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H4-40B30CB-A334Z(-S)		128 (5.04)							
MS1H4-75B30CB-A331Z(-S)	80 (3.15)	117.5 (4.63)	35±0.5 (1.38±0.02)	90 (3.54)	4-Φ7 (0.16-Φ0.28)	54 (2.13)	7.7 (0.30)	3±0.5 (0.12±0.02)	0.5±0.35 (0.02±0.01)
MS1H4-75B30CB-A334Z(-S)		147.5 (5.81)							

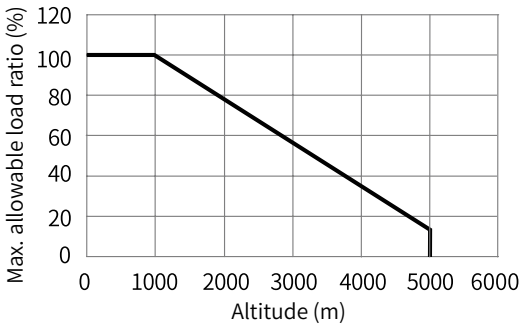
Motor Model	LB	S	TP	LK	KH	KW	W	T	Weight
	Unit: mm (in.)								Unit: kg (lb.)
MS1H4-40B30CB-A331Z(-S)	50 (1.97)	14 (0.55)	M5x8 (M5x0.31)	16.5 (0.65)	11 (0.43)	5 (0.20)	5 (0.20)	5 (0.20)	1.27 (2.80)
MS1H4-40B30CB-A334Z(-S)									1.62 (3.57)
MS1H4-75B30CB-A331Z(-S)	70 (2.76)	19 (0.75)	M6x20 (M6x0.79)	25 (0.98)	15.5 (0.61)	6 (0.24)	6 (0.24)	6 (0.24)	2.40 (5.29)
MS1H4-75B30CB-A334Z(-S)									3.04 (6.70)

NOTE

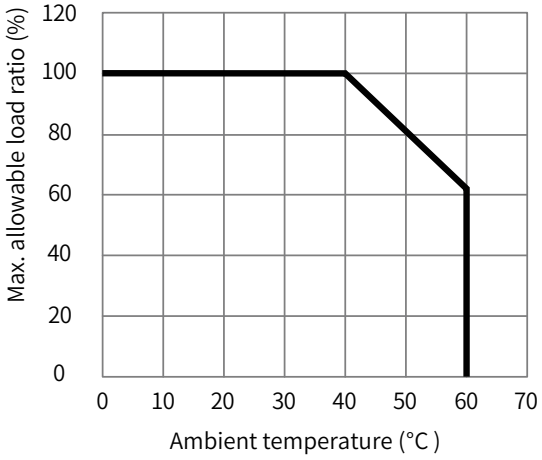
- ◆ Values inside the parentheses "()" are in English units.
- ◆ For dimension drawings of motor models ending with "-S", contact Inovance technical support.
- ◆ Outline drawings vary with the motor model. The actual dimensions are subject to the physical product.

7.2.6 Derating Curves

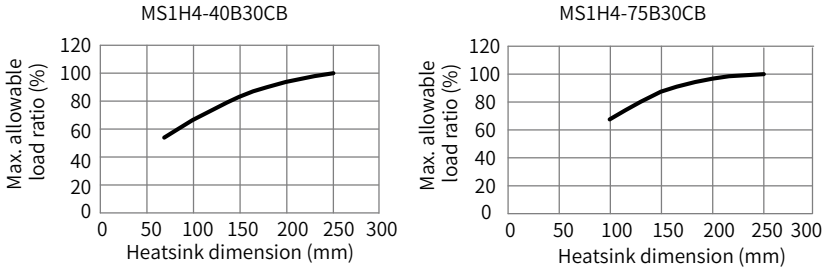
■ Altitude-based derating curve



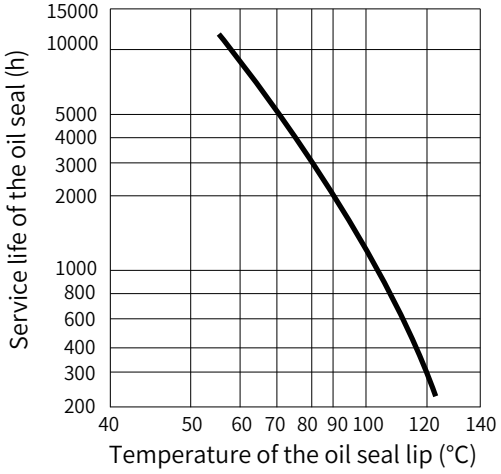
■ Temperature-based derating curve



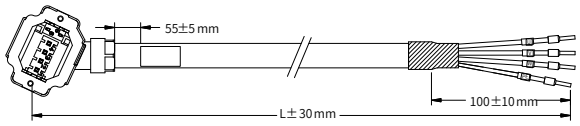
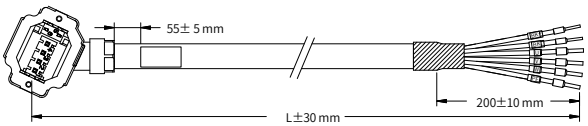
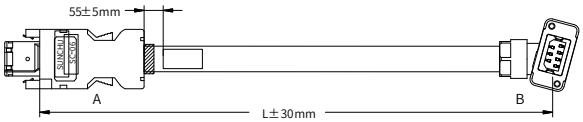
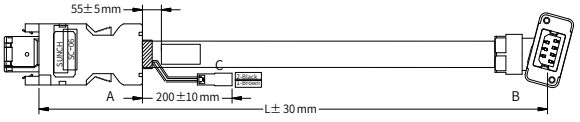
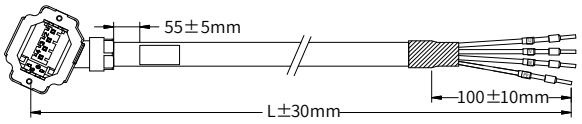
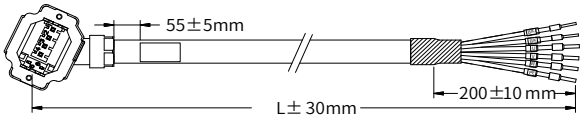
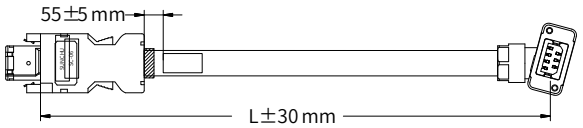
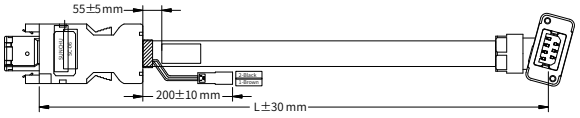
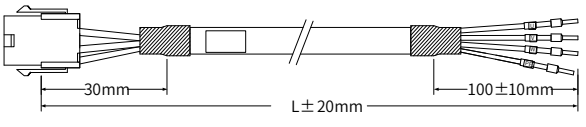
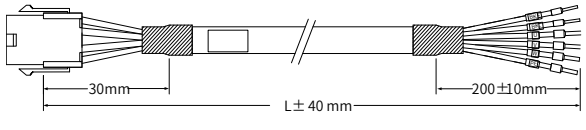
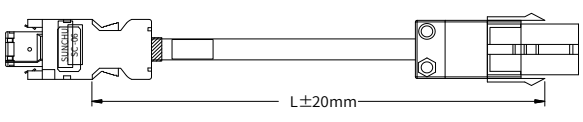
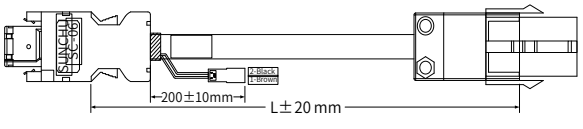
■ Heatsink-based derating curve

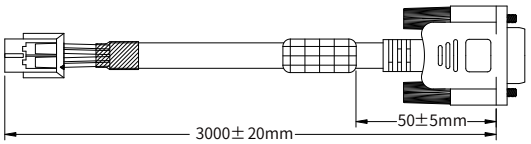
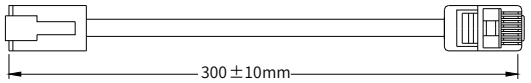
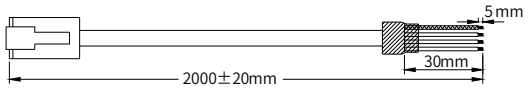
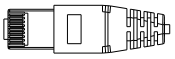
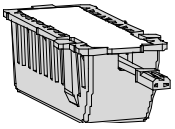
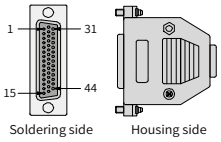
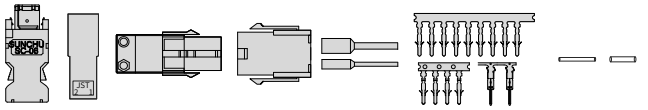


7.2.7 Temperature Curve of the Oil Seal



7.3 Selection of Cables and Options

Motor Model	Cable Name		Cable Model	Cable Length (mm)	Outline Drawing
MS1H4 terminal-type motors	Front outlet	Power cable for motor without brake	S6-L-M107-3.0	3000	
			S6-L-M107-5.0	5000	
			S6-L-M107-10.0	10000	
		Power cable for motor with brake	S6-L-B107-3.0	3000	
			S6-L-B107-5.0	5000	
			S6-L-B107-10.0	10000	
		Single-turn absolute encoder cable	S6-L-P114-3.0	3000	
			S6-L-P114-5.0	5000	
			S6-L-P114-10.0	10000	
		Multi-turn absolute encoder (A3**Z) cable	S6-L-P124-3.0	3000	
			S6-L-P124-5.0	5000	
			S6-L-P124-10.0	10000	
	Rear outlet	Power cable for motor without brake	S6-L-M108-3.0	3000	
			S6-L-M108-5.0	5000	
			S6-L-M108-10.0	10000	
		Power cable for motor with brake	S6-L-B108-3.0	3000	
			S6-L-B108-5.0	5000	
			S6-L-B108-10.0	10000	
		Single-turn absolute encoder cable	S6-L-P115-3.0	3000	
			S6-L-P115-5.0	5000	
			S6-L-P115-10.0	10000	
		Multi-turn absolute encoder (A3**Z) cable	S6-L-P125-3.0	3000	
			S6-L-P125-5.0	5000	
			S6-L-P125-10.0	10000	
MS1H4 lead wire-type motors (-S)	Power cable for motor without brake		S6-L-M100-3.0	3000	
			S6-L-M100-5.0	5000	
			S6-L-M100-10.0	10000	
	Power cable for motor with brake		S6-L-B100-3.0	3000	
			S6-L-B100-5.0	5000	
			S6-L-B100-10.0	10000	
	Single-turn absolute encoder cable		S6-L-P110-3.0	3000	
			S6-L-P110-5.0	5000	
			S6-L-P110-10.0	10000	
MS1H4 lead wire-type motors (-S)	Multi-turn absolute encoder (A3**Z) cable		S6-L-P120-3.0	3000	
			S6-L-P120-5.0	5000	
			S6-L-P120-10.0	10000	

Name	Cable Model	Cable Length (mm)	Outline Drawing
SV660P servo drive to PC communication cable	S6-L-T00-3.0	3000	
SV660P multi-drive communication cable (CAN and RS485)	S6-L-T01-0.3	300	
SV660P servo drive to PLC communication cable (CAN and RS485)	S6-L-T02-2.0	2000	
SV660P servo drive termination resistor connector (CAN and RS485)	S6-L-T03-0.0	0	
Battery kit	S6-C4	-	
SV660P CN1 terminal (DB44)	S6-C8	-	 Note: DB44 (purchased separately for MS1 motors)
MS1H4 lead wire-type (Z-S) motor connector	S6-C26	-	

8 Optional Parts

8.1 List of Optional Parts

Type	Name	Location	Applicable Model	Function
Peripheral components	Fuse and circuit breaker	Input side of the servo drive	All	To comply with EN 61800-5-1 and UL 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	All	Eliminates harmonics on the input side and improves the power factor on the input side.
	EMC filter	Input side of the servo drive	All	Reduces conducted and radiated disturbances escaped from the servo drive to the outside.
	Magnetic ring, ferrite clamp	Output side of the servo drive	All	Reduces the bearing current and disturbances to the outside.
		Signal cable	All	Improves the anti-disturbance performance of signals.

8.2 Fuse, Contactor, and Circuit Breaker

8.2.1 Fuse

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

Table 8-1 List of recommended fuses

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Recommended Fuse		
			Manufacturer	Rated Current (A)	Model
Single-phase 220 V					
A	SV660PS1R6I	2.3	Bussmann	15	FWP-15B
	SV660PS2R8I	4		20	FWP-20B
B	SV660PS5R5I	7.9		35	FWP-35C
C	SV660PS7R6I	9.6		40	FWP-40C
D	SV660PS012I	12.8		40	FWP-40C
Three-phase 220 V					
C	SV660PS7R6I	5.1	Bussmann	50	FWP-50C
D	SV660PS012I	8		50	FWP-50C
Three-phase 380 V					
C	SV660PT3R5I	2.4	Bussmann	15	FWP-15B
	SV660PT5R4I	3.6		20	FWP-20B
D	SV660PT8R4I	5.6		20	FWP-20B
	SV660PT012I	8		50	FWP-50C
E	SV660PT017I	12		50	FWP-50C
	SV660PT021I	16		70	FWP-70C
	SV660PT026I	21		125	FWP-125C

8.2.2 Electromagnetic Contactor

Table 8-2 Recommended electromagnetic contactors

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Recommended Contactor		
			Manufacturer	Current (A)	Model
Single-phase 220 V					
A	SV660PS1R6I	2.3	Schneider	9	LC1 D09
	SV660PS2R8I	4		9	LC1 D09
B	SV660PS5R5I	7.9		9	LC1 D09
C	SV660PS7R6I	9.6		12	LC1 D12
D	SV660PS012I	12.8		18	LC1 D18
Three-phase 220 V					
C	SV660PS7R6I	5.1	Schneider	9	LC1 D09
D	SV660PS012I	8		9	LC1 D09
Three-phase 380 V					
C	SV660PT3R5I	2.4	Schneider	9	LC1 D09
	SV660PT5R4I	3.6		9	LC1 D09
D	SV660PT8R4I	5.6		9	LC1 D09
	SV660PT012I	8		9	LC1 D09
E	SV660PT017I	12		12	LC1 D12
	SV660PT021I	16		18	LC1 D18
	SV660PT026I	21		25	LC1 D25

8.2.3 Circuit Breaker

Table 8-3 Recommended circuit breakers

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Recommended Circuit Breaker		
			Manufacturer	Current (A)	Model
Single-phase 220 V					
A	SV660PS1R6I	2.3	Schneider	4	OSMC32N2C4
	SV660PS2R8I	4		6	OSMC32N2C6
B	SV660PS5R5I	7.9		16	OSMC32N2C16
C	SV660PS7R6I	9.6		16	OSMC32N2C16
D	SV660PS012I	12.8		20	OSMC32N2C20
Three-phase 220 V					
C	SV660PS7R6I	5.1	Schneider	10	OSMC32N3C10
D	SV660PS012I	8		16	OSMC32N3C16

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Recommended Circuit Breaker		
			Manufacturer	Current (A)	Model
Three-phase 380 V					
C	SV660PT3R5I	2.4	Schneider	4	OSMC32N3C4
	SV660PT5R4I	3.6		6	OSMC32N3C6
D	SV660PT8R4I	5.6		10	OSMC32N3C10
	SV660PT012I	8		16	OSMC32N3C16
E	SV660PT017I	12		20	OSMC32N3C20
	SV660PT021I	16		25	OSMC32N3C25
	SV660PT026I	21		32	OSMC32N3C32

NOTE

For UL-compliant products, see chapter "UL/cUL Certification" in SV660P Series Servo Drive Hardware Guide for recommended fuse/circuit breakers.

Select a proper residual current device (RCD) according to the following requirements when a RCD is needed:

- The servo drive may generate DC leakage current in the protective conductor, a B-type (delay-type) RCD therefore must be used.
- The servo drive may generate high-frequency leakage current during operation. To prevent malfunction of the RCD, install a RCD with action current not lower than 100 mA for each servo drive.
- When multiple servo drives share the same RCD through parallel connection, select a RCD with action current not lower than 300 mA.
- Recommended RCD manufacturers are Siemens and Schneider.

8.3 AC Input Reactor

8.3.1 Model Selection

An AC input reactor is mainly used to reduce harmonics in the input current. As an optional part, you can install an external reactor based on actual applications. The following table lists the recommended manufacturers and models of input reactors.

Table 8-4 Recommended AC input reactors

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Applicable Reactor	Inductance (mH)
Three-phase 220 V				
C	SV660PS7R6I	5.1	MD-ACL-10-5-4T	5
D	SV660PS012I	8	MD-ACL-10-5-4T	5
Three-phase 380 V				
C	SV660PT3R5I	2.4	MD-ACL-10-5-4T	5
	SV660PT5R4I	3.6	MD-ACL-10-5-4T	5
D	SV660PT8R4I	5.6	MD-ACL-10-5-4T	5
	SV660PT012I	8	MD-ACL-10-5-4T	3

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Applicable Reactor	Inductance (mH)
E	SV660PT017I	12	MD-ACL-15-3-4T	3
	SV660PT021I	16	MD-ACL-40-1.45-4T	1.45
	SV660PT026I	21	MD-ACL-40-1.45-4T	1.45

8.3.2 Dimensions

■ Inovance input reactors

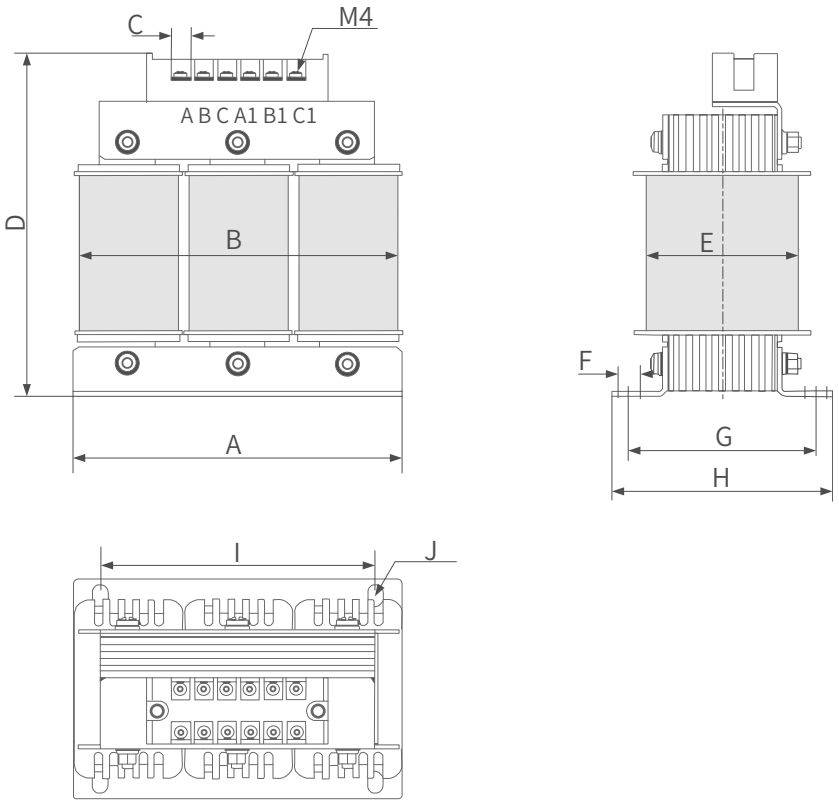


Figure 8-1 Dimensions of 10 A to 15 A AC input reactors

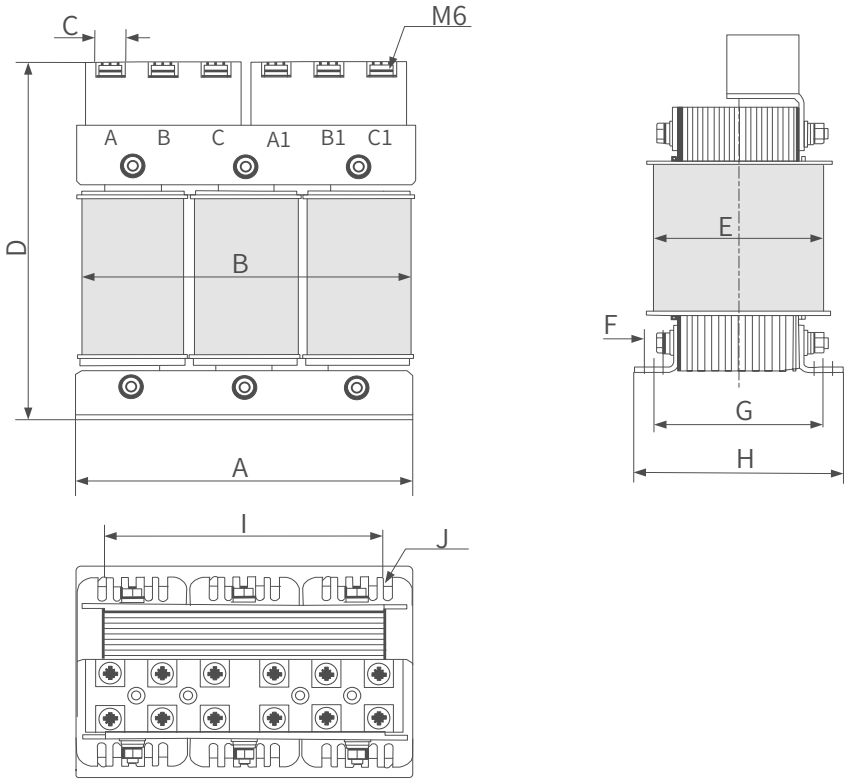


Figure 8-2 Dimensions of 40 A (1.45 mH) AC input reactors

Table 8-5 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*10
MD-ACL-15-3-4T	150±2	155	8	160	80	10	85±2	100±2	125±1	Φ7*10
MD-ACL-40-1.45-4T	180±2	185	16	200	105	10	95±2	117±2	150±1	Φ7*10

8.4 EMC Filter

8.4.1 Model Selection

To comply with the radiated and conducted emission requirements of EN IEC 61800-3, install the EMC filter listed in the following table. FN 2090 and FN 3258 series filters manufactured by Schaffner are available. Select the EMC filter according to the rated input current of the servo drive, as shown in the following tables.

Table 8-6 Schaffner filter series and appearances

Filter Model		Appearance
Schaffner	FN 2090 series	
	FN 3258 series	

Table 8-7 Schaffner filter model selection

Servo Drive Size	Servo Drive Model	Rated Input Current (A)	Applicable Filter
Single-phase 220 V			
A	SV660PS1R6I	2.3	FN 2090-3-06
	SV660PS2R8I	4	FN 2090-4-06
B	SV660PS5R5I	7.9	FN 2090-8-06
C	SV660PS7R6I	9.6	FN 2090-10-06
D	SV660PS012I	12.8	FN 2090-16-06
Three-phase 220 V			
C	SV660PS7R6I	5.1	FN 3258-7-44
D	SV660PS012I	8	FN 3258-16-44
Three-phase 380 V			
C	SV660PT3R5I	2.4	FN 3258-7-44
	SV660PT5R4I	3.6	FN 3258-7-44
D	SV660PT8R4I	5.6	FN 3258-7-44
	SV660PT012I	8	FN 3258-16-44
E	SV660PT017I	12	FN 3258-16-44
	SV660PT021I	16	FN 3258-16-44
	SV660PT026I	21	FN 3258-30-44

8.4.2 Dimensions

■ Dimensions of Schaffner FN 2090 series filters

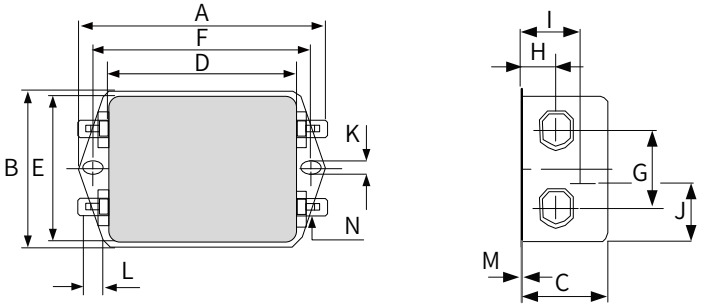


Figure 8-3 Dimension drawing of FN 2090 series filters (unit: mm)

Table 8-8 Dimensions of FN 2090 series filters (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3	85	54	30.3	64.8	49.8	75	27	12.3	20.8	19.9	5.3	6.3	0.7	6.3x0.8
4														
6														
8	113.5±1	57.5±1	45.4±1	94±1	56	103	25	12.4	32.4	15.5	4.4	6	1	6.3x0.8

■ Dimensions of Schaffner FN 3258 series filters

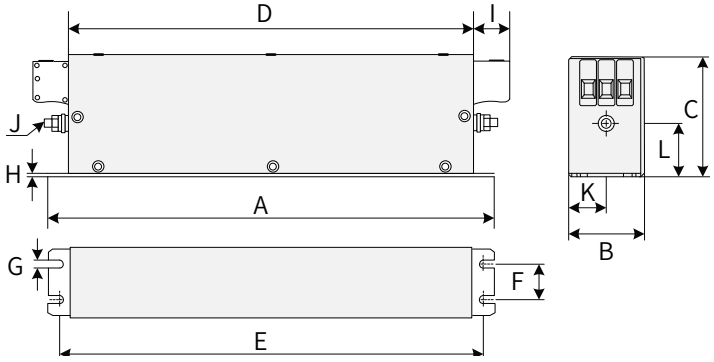


Figure 8-4 Dimension drawing of FN 3258 series filters (unit: mm)

Table 8-9 Dimensions of FN 3258 series filters (unit: mm)

Rated current (A)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J	K (mm)	L (mm)
7	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
16	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
30	270	50	85	240	255	30	5.4	1	25	M5	25	39.5

8.5 Magnetic Ring and Ferrite Clamp

8.5.1 Model Selection

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

For applications suffering from leakage current and signal cable interferences, install a magnetic ring or ferrite clamp to suppress the interference.

- Amorphous magnetic ring: featuring an excellent interference suppression performance and a high permeability within a frequency band of 1 M, but not as low-cost as the ferrite clamp. See *"8.5.2 Dimensions"* for detailed specifications.
- Ferrite clamp: featuring a good intereference suppression performance within a frequency band above 1 M, applicable to low-power servo drives and signal cables, low-cost and easy to install

Table 8-10 Appearance of the magnetic ring and ferrite clamp

Magnetic Ring and Ferrite Clamp		Appearance
Magnetic ring	DY644020H	
	DY805020H	
Ferrite clamp	7427122S	

8.5.2 Dimensions

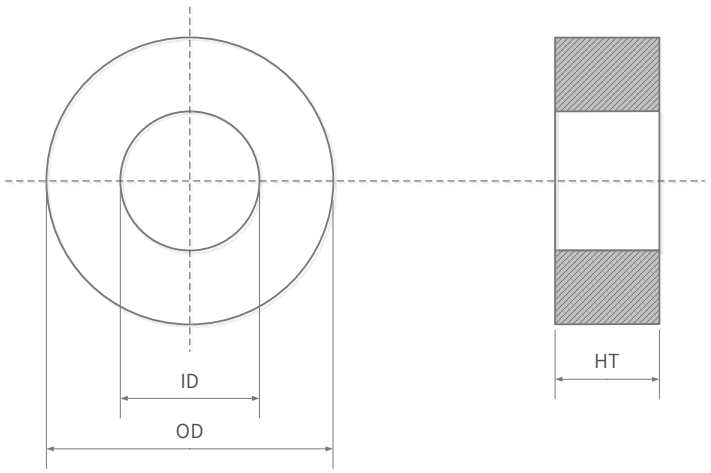


Figure 8-5 Dimension drawing of the magnetic ring

Table 8-11 Dimensions of the magnetic ring

Model	Dimensions (OD x ID x HT) (mm)
DY644020H	64 x 40 x 20
DY805020H	80 x 50 x 20

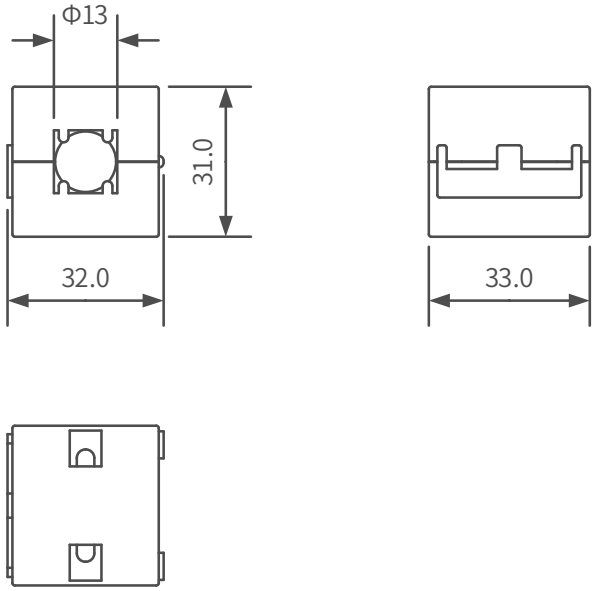


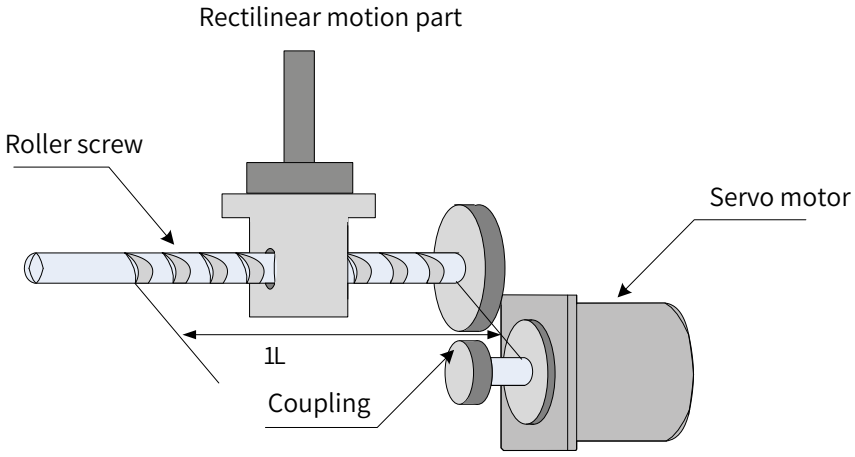
Figure 8-6 Dimension drawing of the ferrite clamp

Table 8-12 Dimensions of the ferrite clamp

Model	Dimensions (OD x ID x HT) (mm)
7427122S	32.0 x 31 x 13

Appendix A Examples of Servo Motor Capacity Selection

A.1 Example for Position Control



Load speed (V_L): 15 m/min

Mass of the rectilinear motion part (m): 80 kg

Length of the roller screw (l_B): 0.8 m

Diameter of the roller screw (d_B): 0.8 m

Pitch of the roller screw (P_B): 0.005 m

Mass of the coupling (m_c): 0.3 kg

Outer diameter of the coupling (d_c): 0.03 m

Times of feeding (n): 40/min

Length of feeding (L): 0.25 m

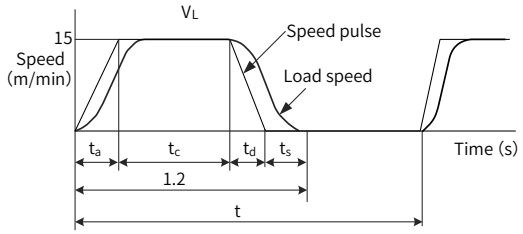
Time of feeding (t_m): < 1.2s

Electrical stop precision (δ): ± 0.01 mm

Friction coefficient (μ): 0.2

Mechanical efficiency (η): 0.9 (90%)

1 Speed diagram



$t = \frac{60}{n} = \frac{60}{40} = 1.5\,(s)$

$T_a = t_d,\ t_s = 0.1\,(s)$

$T_a = t_m - t_s - \frac{60L}{V_L} = 1.2 - 0.1 - \frac{60 \times 0.25}{15} = 0.1\,(s)$

$t_c = 1.2 - 0.1 - 0.1 \times 2 = 0.9\,(s)$

2 Rotational speed

■ Rotational speed of the load shaft

$$nl = \frac{V_L}{P_B} = \frac{15}{0.005} = 3000\,(RPM)$$

■ Rotational speed of the motor shaft

As the coupling is connected directly, the gear ratio (1/R) is 1:1.

$$nM = nL;\ R = 3000 \times 1 = 3000\ (RPM)$$

3 Load torque

$$T_L = \frac{V_L}{P_B} = \frac{9.8\mu \cdot m \cdot P_B}{2\pi R \cdot \eta} = \frac{9.8 \times 0.2 \times 80 \times 0.005}{2\pi \times 1 \times 0.9} = 0.139\,(N \cdot m)$$

4 Load moment of inertia

■ Rectilinear motion part

$$J_{LI} = m\left(\frac{P_B}{2\pi R}\right)^2 = 80 \times \left(\frac{0.005}{2\pi \times 1}\right)^2 = 0.507 \times 10^{-4}\,(kg \cdot m^2)$$

■ Roller screw

$$J_B = \frac{\pi}{32} P \cdot LB \cdot dB^4 = \frac{\pi}{32} \times 7.87 \times 10^3 \times 0.8 \times (0.016)^4 = 0.405 \times 10^{-4}\,(kg \cdot m^2)$$

■ Coupling

$$J_C = \frac{1}{8} mc \cdot dC^4 = \frac{1}{8} \times 0.3 \times (0.03)^2 = 0.338 \times 10^{-4}\,(kg \cdot m^2)$$

5 Load moving power

$$P_O = \frac{2\pi n_M \cdot T_L}{60} = \frac{2\pi \times 3000 \times 0.139}{60} = 43.7\,(W)$$

6 Load acceleration power

$$Pa = \left(\frac{2\pi}{60} nm\right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 3000\right)^2 \times \frac{1.25 \times 10^{-4}}{0.1} = 123.4\,(W)$$

7 Temporary settings of the servo motor

■ Selection condition

TL ≤ Rated torque of the motor

Pa + Po = (1 to 2) x Rated output of the motor

nM ≤ Rated speed of the motor

JL ≤ Allowable load moment of inertia of the servo unit

Perform the following temporary selections according to preceding conditions:

Servo motor: MS1H1-20B30CB-A331Z

Servo drive: SV660PS2R8I

■ Specifications of the servo motor and servo drive

Rated output: 200 (W)

Rated speed: 3000 (min^{-1})

Rated torque: 0.637 (N · m)

Maximum transient torque: 1.91 (N · m)

Rotor moment of inertia: 0.158 x 10^{-4} (kg · m^2)

Allowable load moment of inertia: 3.69 x 10^{-4} (kg · m^2)

Number of encoder pulses: 8388608 PPR

■ Confirming the servo motor selected temporarily

Confirming the startup torque required

$$Tp = \frac{2\pi nm(J_M + J_L)}{60ta} + T_L = \frac{2\pi \times 3000 \times (0.209 + 1.25) \times 10^{-4}}{60 \times 0.1} + 0.139$$

$$= 0.597\ (N \cdot m) < \text{Max. transient torque...(available for use)}$$

Confirming the brake torque required

$$T_s = \frac{2\pi nm(J_M + J_L)}{60\,t_a} - T_L = \frac{2\pi \times 3000 \times (0.209+1.25) \times 10^{-4}}{60 \times 0.1} - 0.139$$

$$= 0.319\ (N \cdot m) < \text{Max. transient torque...(available for use)}$$

Confirming the effective torque value

$$Trms = \sqrt{\frac{Tp^2 \cdot ta + T_L^2 \cdot tc + Ts^2 \cdot td}{t}} = \sqrt{\frac{(0.597)^2 \times 0.1 + (0.139)^2 \times 0.9 + (0.139)^2 \times 0.1}{1.5}}$$

$$= 0.205\ (N \cdot m) < \text{Rated torque... (available for use)}$$

The capacities of the servo motor and servo drive selected temporarily based on preceding steps are available for use. The position control analysis is as follows.

8 Electronic gear ratio (B/A)

As the electrical stop precision (δ) is ±0.01 mm, set the position detection unit (△ L) to 0.01 mm/pulse.

$$\frac{P_B}{\Delta L} \times \left(\frac{B}{A}\right) = \frac{5}{0.01} \times \left(\frac{B}{A}\right) = 1048576 \times 4$$

$$k = \left(\frac{B}{A}\right) = \frac{1048576 \times 4}{500}$$

9 Reference pulse frequency

$$vs = \frac{1000 \times 4V_L}{60 \times \Delta l} = \frac{1000 \times 15}{60 \times 0.01} = 25000\,(pps)$$

10 Offset counter droop pulse

■ Set the position loop gain (Kp) to 30 (I/s).

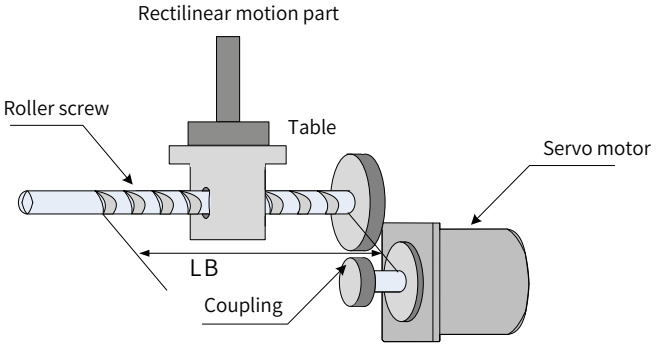
$$\varepsilon = \frac{vs}{Kp} = \frac{25000}{30} = 833\,(pulse)$$

■ Electrical stop precision

$$\pm\Delta\varepsilon = \pm\frac{\varepsilon}{(\text{Servo drive control range}) \times \frac{nM}{nR}} = \pm\frac{833}{5000 \times \frac{3000}{3000}} = \pm 0.17 < \pm 1\,(pulse) = \pm 0.01\,(mm/pulse)$$

By observing preceding steps, the servo motor and servo drive selected temporarily for position control are available for use.

A.2 Example for Speed Control



Load speed (V_L): 15 m/min

Mass of the rectilinear motion part (m): 80 kg

Length of the roller screw (LB): 1.4 m

Diameter of the roller screw (dB): 0.04 m

Pitch of the roller screw (PB): 0.01m

Mass of the coupling (m_c): 1 kg

Outer diameter of the coupling (d_c): 0.06 m

Times of feeding (n): 40/min

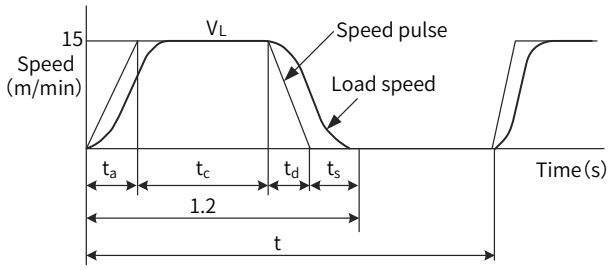
Length of feeding (L): 0.275 m

Time of feeding (t_m): < 1.2s

Friction coefficient (μ): 0.2

Mechanical efficiency (η): 0.9 (90%)

1 Speed diagram



$$t = \frac{60}{n} = \frac{60}{40} = 1.5\,(s)$$

Set t_a to the same value as t_d.

$$t_a = t_m - t_s - \frac{60L}{V_L} = 1.2 - 0.1 - \frac{60 \times 0.25}{15} = 0.1(s)$$

$$t_c = 1.2 - 0.1 \times 2 = 1.0\ (s)$$

2 Rotational speed

■ Rotational speed of the load shaft

$$nl = t_m - \frac{V_L}{P_B} = \frac{15}{0.01} = 1500\,(min^{-1})$$

■ Rotational speed of the motor shaft

As the coupling is connected directly, the gear ratio (1/R) is 1:1.

$$nM = nL;\ R = 1500 \times 1 = 1500\ (min^{-1})$$

3 Load torque

$$T_L = \frac{V_L}{P_B} = \frac{9.8\mu \cdot m \cdot P_B}{2\pi R \cdot \eta} = \frac{9.8 \times 0.2 \times 500 \times 0.01}{2\pi \times 1 \times 0.9} = 1.73\,(N \cdot m)$$

4 Load moment of inertia

■ Rectilinear motion part

$$J_{LI} = m\left(\frac{P_B}{2\pi R}\right)^2 = 500 \times \left(\frac{0.01}{2\pi \times 1}\right)^2 = 12.7 \times 10^{-4}\,(kg \cdot m^2)$$

■ Roller screw

$$J_B = \frac{\pi}{32} P \cdot LB \cdot dB^4 = \frac{\pi}{32} \times 7.87 \times 10^{-3} \times 1.4 \times (0.04)^4 = 27.7 \times 10^{-4}\,(kg \cdot m^2)$$

■ Coupling

$$J_C = \frac{1}{8} mc \cdot dc^4 = \frac{1}{8} \times 1 \times (0.06)^2 = 4.5 \times 10^{-4}\,(kg \cdot m^2)$$

5 Load moving power

$$P_O = \frac{2\pi nM \cdot T_L}{60} = \frac{2\pi \times 1500 \times 1.73}{60} = 272\,(W)$$

6 Load acceleration power

$$Pa = \left(\frac{2\pi}{60} nm\right)^2 \frac{J_L}{t_a} = \left(\frac{2\pi}{60} \times 1500\right)^2 \times \frac{44.9 \times 10^{-4}}{0.1} = 1108\,(W)$$

7 Temporary settings of the servo motor

■ Selection condition

TL ≤ Rated torque of the motor

Pa + Po = (1 to 2) x Rated output of the motor

nM ≤ Rated torque of the motor

JL ≤ Allowable load moment of inertia of the servo unit

Perform the following temporary selections according to preceding conditions:

Servo motor: MS1H3-85C15CD-A331Z

Servo drive: SV660PT5R4I

■ Specifications of the servo motor and servo drive

Rated output: 850 (W)

Rated speed: 1500 (min^{-1})

Rated torque: 5.39 (N · m)

Maximum transient torque: 13.8 (N · m)

Rotor moment of inertia: 13.0 x 10^{-4} (kg · m^2)

Allowable load moment of inertia: 69.58 x 10^{-4} (kg · m^2)

8 Confirming the servo motor selected temporarily

■ Confirming the startup torque required

$$Tp = \frac{2\pi nm(J_M + J_L)}{60\, t_a} + T_L = \frac{2\pi \times 1500 \times (13.9+44.9) \times 10^{-4}}{60 \times 0.1} + 1.73$$

$$= 11(N \cdot m) < \text{Max. transient torque...(available for use)}$$

■ Confirming the brake torque required

$$Ts = \frac{2\pi nm(J_M + J_L)}{60 t_a} - T_L = \frac{2\pi \times 1500 \times (13.9+44.9) \times 10^{-4}}{60 \times 0.1} - 1.73$$

$$= 7.5(N \cdot m) < \text{Max. transient torque...(available for use)}$$

■ Confirming the effective torque value

$$Trms = \sqrt{\frac{Tp^2 \cdot t_a + T_L^2 \cdot t_c + Ts^2 \cdot t_d}{t}} = \sqrt{\frac{(11)^2 \times 0.1 + (1.73)^2 \times 0.1 + (7.5)^2 \times 0.1}{1.5}}$$

$$= 3.72(N \cdot m) < \text{Rated torque...(available for use)}$$

9 Selection result

The servo motor and servo drive selected temporarily according to preceding steps are available for use. The torque diagram is as follows.

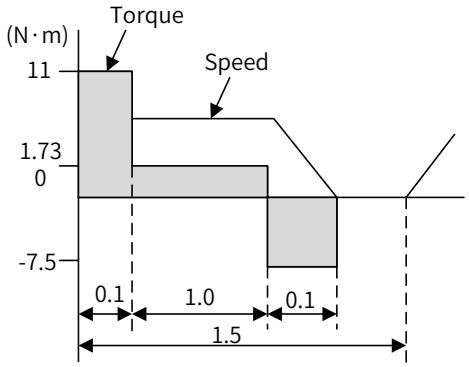


Figure A-1 Torque diagram

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