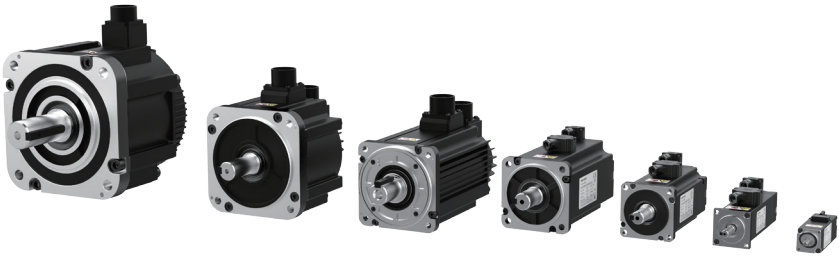
INOVANCE



MS1 Series

Servo Motor Selection Guide

Selection Guide

C02

Data code 19010786

Preface

Thank you for purchasing the MS1 series servo motor.

As the latest generation of servo motors developed by Inovance, MS1 series servo motors carry a power range covering 30 W to 7.5 kW, with flange sizes ranging from 25 mm to 180 mm. Multiple types of inertia and speed configurations and encoders are available for MS1 series servo motors.

MS1 series servo motors serve to achieve quick and accurate position control, speed control and torque control in automation equipment such as semiconductors, SMT machines, PCB punching machines, material handling machineries, machine tools, and transmission machineries.

MS1 series servo motors of 30 W are newly developed and those of 50 W to 1 kW are upgraded with substantial improvements in respects of the length, protection, overload capacity, and torque fluctuation.

This user guide presents information including product descriptions, installation instructions, and cable connections. If you have any question concerning the product function or performance, contact Inovance for technical support.

Documents provided by Inovance are subject to change without notice due to continuous product improvement.

Notes
◆ The drawings in the user guide are sometimes shown without covers or protective guards. Install the covers or protective guards as specified first, and then perform operations in accordance with the instructions described in the user guide. ◆ The drawings in the user guide are shown for descriptions only and may not match the product you purchased. ◆ The user guide is subject to change without notice due to product upgrade, specification modifications as well as efforts to improve the accuracy and convenience of the user guide.

Revision History

Date	Version	Revision
May 2018	A00	First release
January 2019	A01	Added with a note for the flexible cable
December 2019	B00	◆ Added with information related to MS1H2/ ◆ MS1H3 motors. ◆ Updated information related to the matching servo drive and cable connections. ◆ Added with descriptions for the oil seal and flat key disassembly. ◆ Updated outline drawings of the motor.

Date	Version	Revision
October 2020	C00	◆ Updated structure of the user guide. ◆ Added with motor technical data and dimension drawings. ◆ Added with examples for selecting motor capacities, information of connectors and applicable cables, and descriptions for overload capacities of the servo drive applicable to the motor. ◆ Deleted descriptions for air-cooled motors.
November 2020	C01	◆ Made minor corrections. ◆ Updated the motor namplate.
February 2021	C02	◆ Updated the description for IP rating of the enclosure.

Contents

Safety Instructions

Safety Precautions

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3) "CAUTION", "WARNING", and "DANGER" items in the manual do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
5) Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

indicates that failure to comply with the notice will result in severe personal injuries or even death.

indicates that failure to comply with the notice may result in severe personal injuries or even death.

indicates that failure to comply with the notice may result in minor personal injuries or damage to the equipment.

Safety Instructions

Unpacking
 ◆ Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation. ◆ Unpack the package by following the package sequence. Do not hit the package with force. ◆ Check whether there are damage, rust, or injuries on the surface of the equipment or equipment accessories. ◆ Check whether the number of packing materials is consistent with the packing list.

WARNING

- Do not install the equipment if you find damage, rust, or indications 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.

Storage and Transportation

CAUTION

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this 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 this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

WARNING

- Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment.

Installation

WARNING

- Thoroughly read the safety instructions and user guide before installation.
- Do not modify this equipment.
- Do not rotate the equipment components or loosen fixed bolts (especially those marked in red) on equipment components.
- Do not install this equipment in places with strong electric or magnetic fields.
- When this equipment is installed in a cabinet or final equipment, protection measures 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.

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Installation, wiring, maintenance, inspection, or parts replacement must be performed only by experienced personnel who have been trained with necessary electrical information.
- Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Never perform wiring at power-on. Failure to comply will result in an electric shock.
- Before wiring, cut off all equipment power supplies. Wait at least 10 minutes before further operations because residual voltage exists after power-off.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.

- Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Wiring cables must meet cross sectional area and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- After wiring, make sure that no screws are fallen and cables are exposed in the equipment.

Power-on

- 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 to prevent equipment damage or even a fire.
- At power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment at power-on. Failure to comply will result in an electric shock.

Operation

- Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- Do not touch the equipment enclosure, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- Signal detection must be performed only by professionals during operation. Failure to comply will result in personal injuries or equipment damage.

- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- Do not start or stop the equipment using a contactor. Failure to comply may result in equipment damage.

Maintenance

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment at power-on. Failure to comply will result in an electric shock.
- Before maintenance, cut off all equipment power supplies and wait at least 10 minutes.

- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment at power-on. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all equipment power supplies and wait at least 10 minutes.

- Require for repair services according to the product warranty agreement.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment according to the replacement guide.
- Do not operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal

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

Safety Signs

- Description of safety signs in the user guide

Read the user guide before installation and operation.

Reliably ground the system and equipment.

Danger!

High temperature!

Prevent personal injuries caused by machines.

High voltage!

1 Product Information

1.1 Motor Nameplate and Model Number

Model: MS1 H1 – 40B 30C B Type: A3 3 1 Z

Code	Series No.
MS1	MS1 series servo motor

Code	Product Series
H	Max. speed higher than rated speed
V	Max. speed equal to rated speed

Code	Type
1	Low inertia, small capacity
2	Low inertia, medium capacity
3	Medium inertia, medium capacity
4	Medium inertia, small capacity

Code	Rated Power (W)
Comprised of two digits and a letter	
B	x10
C	x100
Example: 40B: 400 W	

Code	Rated Speed (RPM)
Comprised of two digits and a letter	
B	x10
C	x100
Example: 30C: 3000 RPM	

Code	Connection Type
Z	Terminal-type motor
Z-S	Lead wire-type motor

Code	Brake, Reducer, Oil Seal
0	None
1	Oil seal
2	Brake
4	Oil seal+Brake

Code	Shaft Connection Mode
1	Plain shaft*
3	Solid, with key and threaded hole

Code	Encoder Type
Comprised of a digit and a letter	
A3	23-bit multi-turn absolute encoder
T3	18-bit multi-turn encoder
U2	20-bit single-turn absolute encoder*

Code	Voltage Class
B	220 V
D	380 V

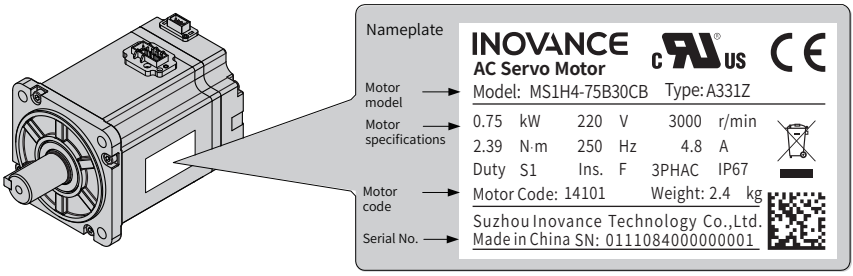


Figure 1-1 Motor model and nameplate

NOTE

Those marked with an asterisk are dedicated for motors in flange size 25.

1.2 Components

■ The following figures show the components of motors in flange sizes 40, 60, and 80.

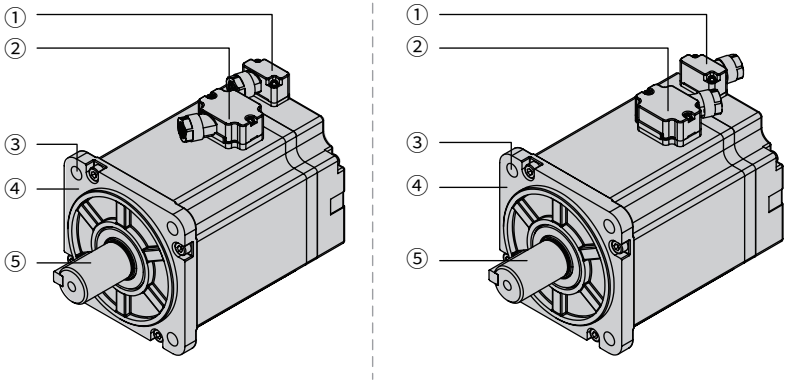


Figure 1-2 Components of terminal-type motors in flange sizes 40, 60 and 80

No.	Name
①	Encoder connector
②	Power connector
③	Mounting flange face
④	Mounting screw through-hole
⑤	Shaft extension (keyed)

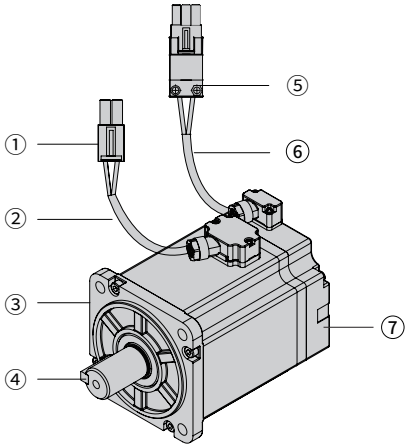


Figure 1-3 Components of lead wire-type motors in flange sizes 40, 60, and 80

No.	Name
①	Power cable connector
②	Power cable
③	Mounting flange face
④	Shaft output
⑤	Encoder connector
⑥	Encoder cable
⑦	Encoder (detection part)

■ The following figure shows components of motors in flange sizes 100, 130, and 180.

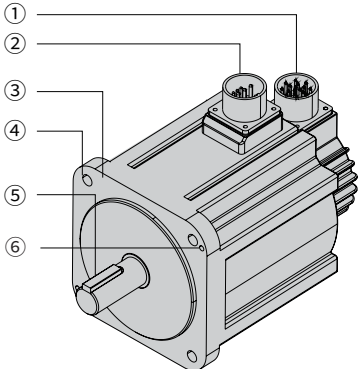


Figure 1-4 Components of connector-type motors in flange sizes 100, 130, and 180

No.	Name
①	Encoder aviation connector
②	Power cable aviation connector
③	Mounting flange face
④	Mounting screw through-hole
⑤	Shaft extension (keyed)
⑥	Hole for disassembly

1.3 System Wiring Diagram

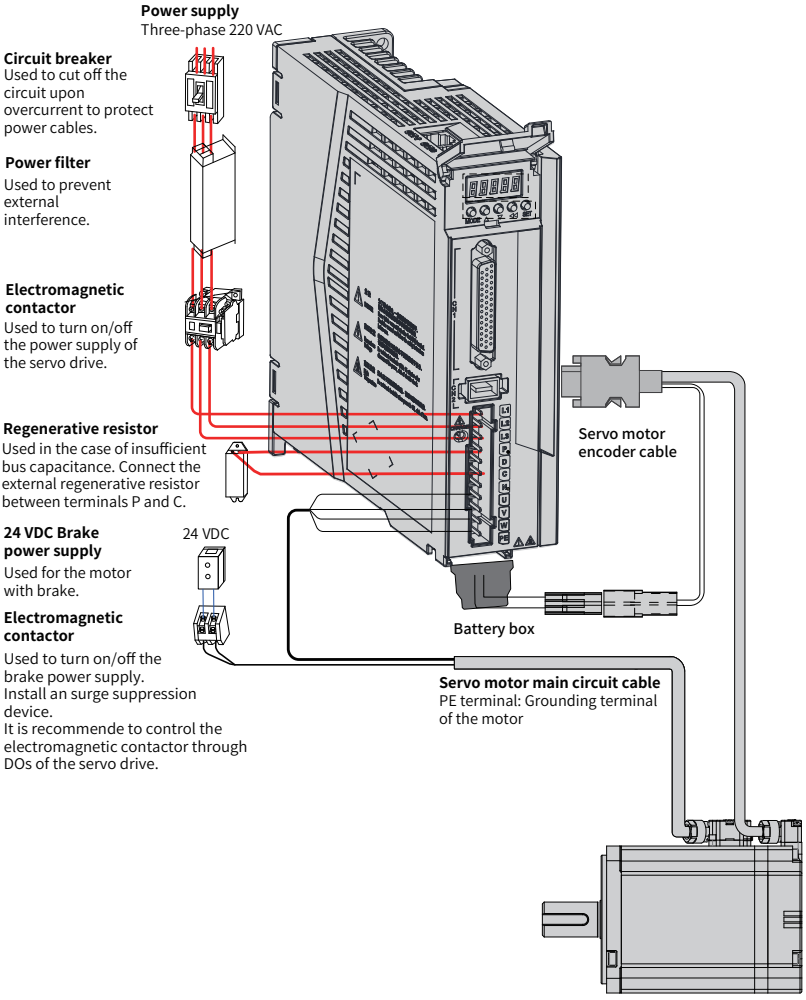


Figure 1-5 Wiring of three-phase 220 V servo systems

1.4 General Specifications

1.4.1 Mechanical Characteristics

No.	Function
Duty type	Continuous
Vibration level	V15
Insulation resistance	500 VDC, above 10 MΩ
Ambient temperature	0°C to 40°C
Storage temperature	-20° C to +60° C (Peak temperature: 80° C for 72 hours)
Excitation mode	Permanent magnetic
Mounting method	Flange
Heat resistance level	Level F
Insulation voltage	1500 VAC, 1 minute (220 V level) 1800 VAC, 1 minute (380 V level)
IP rating of the enclosure	IP67 (except the shaft opening)
Ambient humidity	20%–80% (no condensation)
Direction of rotation	Rotates counterclockwise (CCW) when viewed from the load side with the forward run command.
Vibration	Below 49 m/s^2
Shock	Below 490 m/s^2
Altitude	< 1000 m (derating required for altitudes above 1000 m)

1.4.2 Overload Characteristics

■ MS1H1 (motors in flange size 25 excluded)/MS1H2/MS1H3/MS1H4

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

Load Ratio (%)	Operating Time (s)
250	5
300	3
350	2

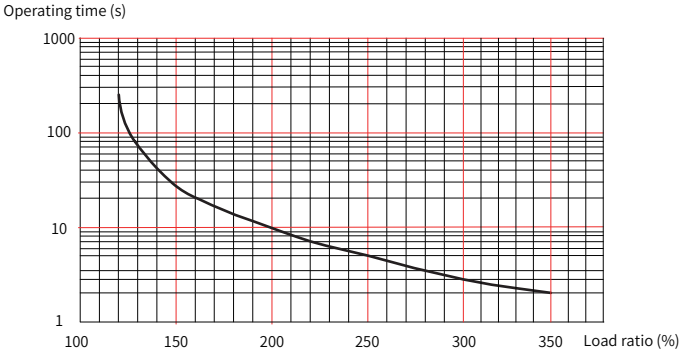


Figure 1-6 Motor overload curve

NOTE

- The maximum torque of H1 and H4 models is 3.5 times the rated torque.
- The maximum torque of H2 models is three times the rated torque.
- The maximum torque of H3 models, except for those of 2.9 kW, is 2.5 times the rated torque.
- For models of 2.9 kW, the maximum torque is two times the rated torque.

■ MS1H1-03B30CB-U210Z-S

Load Ratio (%)	Operating Time (s)
120	75.00
130	43.39
140	27.97
150	19.84
160	15.10
170	15.02
180	9.82
190	8.12
200	6.70
210	5.62
220	4.79
230	4.14
240	3.63
250	3.22
260	2.89

Load Ratio (%)	Operating Time (s)
270	2.61
280	2.38
290	2.18
300	2.01
310	1.86
320	1.73
330	1.60
340	1.50
350	1.40

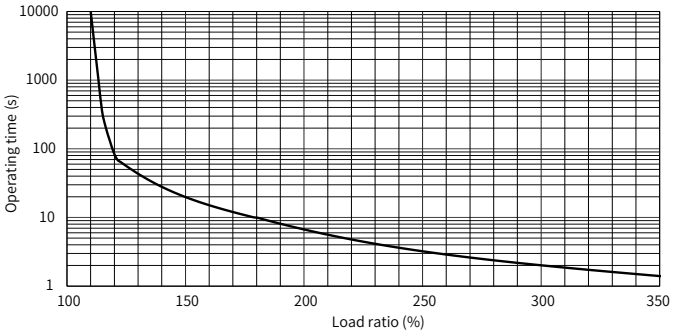


Figure 1-7 Overload curve of MS1H1-03B30CB-U210Z-S series motors

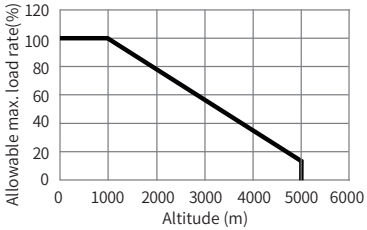
1.4.3 Overload Capacities in Case of SV660 Series Servo Drives

Motor Model	Applicable Servo Drive	Overload Ratio
MS1H1-03B30CB-U210Z-S	SV660P(N)S1R6	3.5
MS1H1-05B30CB-*33*Z(-S)		
MS1H1-10B30CB-*33*Z(-S)		
MS1H1-20B30CB-*33*Z(-S)		
MS1H1-40B30CB-*33*Z(-S)	SV660P(N)S2R8	3.5
MS1H1-55B30CB-*33*Z(-S)	SV660P(N)S5R5	3.5
MS1H1-75B30CB-*33*Z(-S)		
MS1H1-10C30CB-*33*Z(-S)	SV660P(N)S7R6	3
	SV660P(N)S012	3.5
MS1H2-10C30CB-A33*Z	SV660P(N)S7R6	3
MS1H2-10C30CD-A33*Z	SV660P(N)T5R4	3
MS1H2-15C30CB-A33*Z	SV660P(N)S012	3
MS1H2-15C30CD-A33*Z	SV660P(N)T5R4	3

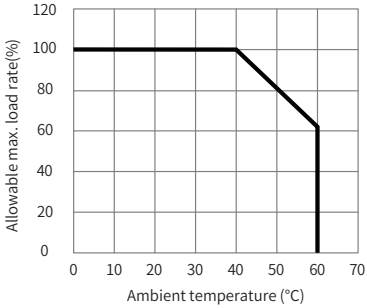
Motor Model	Applicable Servo Drive	Overload Ratio
MS1H2-20C30CD-A33*Z(-S4)	SV660P(N)T8R4	3
MS1H2-25C30CD-A33*Z(-S4)	SV660P(N)T8R4	2.5
	SV660P(N)T012	3
MS1H2-30C30CD-A33*Z(-S4)	SV660P(N)T012	3
MS1H2-40C30CD-A33*Z(-S4)	SV660P(N)T017	3
MS1H2-50C30CD-A33*Z(-S4)	SV660P(N)T017	2.5
	SV660P(N)T021	3
MS1H3-85B15CB-*33*Z	SV660P(N)S7R6	2.5
MS1H3-13C15CB-*33*Z	SV660P(N)S012	2.5
MS1H3-85B15CD-*33*Z	SV660P(N)T3R5	2.5
MS1H3-13C15CD-*33*Z	SV660P(N)T5R4	2.5
MS1H3-18C15CD-*33*Z	SV660P(N)T8R4	2.5
MS1H3-29C15CD-A33*Z	SV660P(N)T012	2.5
MS1H3-44C15CD-A33*Z	SV660P(N)T017	2.5
MS1H3-55C15CD-A33*Z	SV660P(N)T021	2.5
MS1H3-75C15CD-A33*Z	SV660P(N)T026	2.5
MS1H4-40B30CB-*33*Z(-S)	SV660P(N)S2R8	3.5
MS1H4-75B30CB-*33*Z(-S)	SV660P(N)S5R5	3.5

1.4.4 Derating Curves

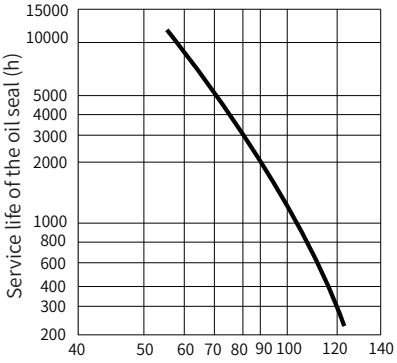
■ Altitude-based derating curve



■ Temperature-based derating curve



1.4.5 Service Life Curve of the Oil Seal



1.5 Motor Model List

Inertia Capacity	Flange Size (mm)	Output (kW)	Voltage Class (V)	Motor Model	Page
MS1H1 low inertia, small capacity	25	0.03	220	MS1H1-03B30CB-U210Z-S	23
	40	0.05		MS1H1-05B30CB-*33*Z(-S)	24
	40	0.1		MS1H1-10B30CB-*33*Z(-S)	26
	60	0.2		MS1H1-20B30CB-*33*Z(-S)	28
	60	0.4		MS1H1-40B30CB-*33*Z(-S)	30
	80	0.55		MS1H1-55B30CB-*33*Z(-S)	32
	80	0.75		MS1H1-75B30CB-*33*Z(-S)	34
	80	1		MS1H1-10C30CB-*33*Z(-S)	36
MS1H2 low inertia, medium capacity	100	1	220	MS1H2-10C30CB-A33*Z	38
	100	1.5		MS1H2-15C30CB-A33*Z	39
	100	1	380	MS1H2-10C30CD-A33*Z	40
	100	1.5		MS1H2-15C30CD-A33*Z	41
	100	2		MS1H2-20C30CD-A331Z	42
	100	2		MS1H2-20C30CD-A334Z-S4	43
	100	2.5		MS1H2-25C30CD-A331Z	44
	100	2.5		MS1H2-25C30CD-A334Z-S4	45
	130	3		MS1H2-30C30CD-A331Z	46
	130	3		MS1H2-30C30CD-A334Z-S4	47
	130	4		MS1H2-40C30CD-A331Z	48
	130	4		MS1H2-40C30CD-A334Z-S4	49
	130	5		MS1H2-50C30CD-A331Z	50
	130	5		MS1H2-50C30CD-A334Z-S4	51

Inertia Capacity	Flange Size (mm)	Output (kW)	Voltage Class (V)	Motor Model	Page
MS1H4 medium inertia, low capacity	60	0.4	220	MS1H4-40B30CB-*33*Z(-S)	52
	80	0.75		MS1H4-75B30CB-*33*Z(-S)	54
MS1H3 medium inertia, medium capacity	130	0.85	220	MS1H3-85B15CB-*33*Z	56
	130	1.3		MS1H3-13C15CB-*33*Z	57
	130	0.85	380	MS1H3-85B15CD-*33*Z	58
	130	1.3		MS1H3-13C15CD-*33*Z	59
	130	1.8		MS1H3-18C15CD-*33*Z	60
	180	2.9		MS1H3-29C15CD-A33*Z	61
	180	4.4		MS1H3-44C15CD-A33*Z	62
	180	5.5		MS1H3-55C15CD-A33*Z	63
	180	7.5		MS1H3-75C15CD-A33*Z	64

2. Motor Model Selection

2.1 Descriptions for Motor Model Selection

- Motors with oil seal must be derated by 10% during use.
- 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 of 0.5 mm^2 and above.
- Technical data and torque-speed characteristic values in the following tables are obtained when motors equipped with the following heatsinks are working with Inovance servo drives under an armature coil temperature of 20° C.

  MS1H1/MS1H4: 250 mm x 250 mm x 6 mm (aluminum)

  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)

  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 (dual-layer aluminum plate)

- Radial and axial loads of the motor

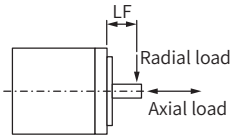


Figure 2-1 Radial and axial loads of the motor

- The tightening tension for terminal screws is 0.19 N · m to 0.21 N · m, exceeding of which may damage the terminal.
- In the following dimension drawings and subsequent tables, dimensions are represented in millimeters (mm) and values inside brackets are for the motor with holding brake.
- Motor models ending with "-S4" represent the duty type S4, indicating the motor is working under S4 duty, with the motor load ratio not exceeding 70%.

2.2 Motors with Low Inertia and Small Capacity (MS1H1)

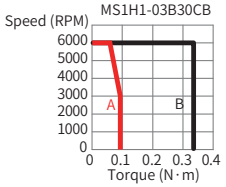
2.2.1 MS1H1-03B30CB-U210Z-S

Technical Data for Motors in Flange Size 25 (mm) (Low Inertia, Small Capacity)	
Rated output (kW)	0.03
Voltage (V)	220
Rated torque (N·m)	0.0955
Maximum torque (N·m)	0.33
Rated current (Arms)	0.93
Maximum current (Arms)	4.2
Rated speed (RPM)	3000
Maximum speed (RPM)	6000
Torque coefficient (N·m/Arms)	0.11
Rotor moment of inertia ($kg \cdot cm^2$)	0.00668

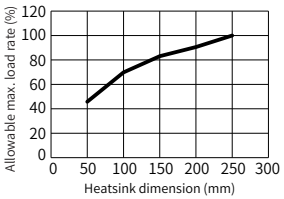
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



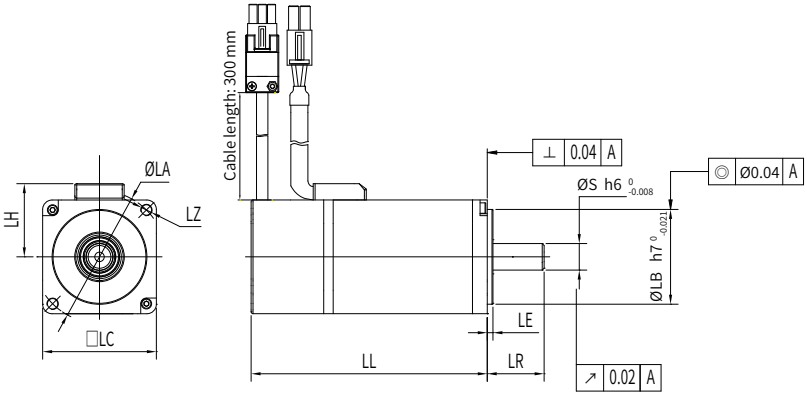
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
20	78	54

■ Dimension drawing



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
73.5	25	16±0.5	28	3	17	-	2.5±0.3	-
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
5	20	-	-	-	-	-	-	0.2

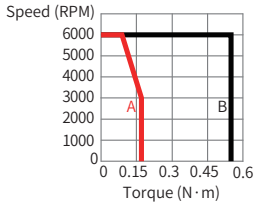
2.2.2 MS1H1-05B30CB-*33*Z(-S)

Technical Data for Motors in Flange size 40 (mm) (Low Inertia, Small Capacity)		
Rated output (kW)	0.05	
Voltage (V)	220	
Rated torque (N·m)	0.16	
Maximum torque (N·m)	0.56	
Rated current (Arms)	1.3	
Maximum current (Arms)	4.70	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.15	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	0.026
	Motor with brake	0.028

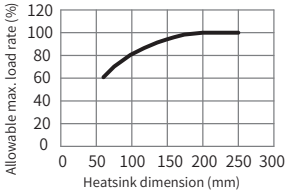
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



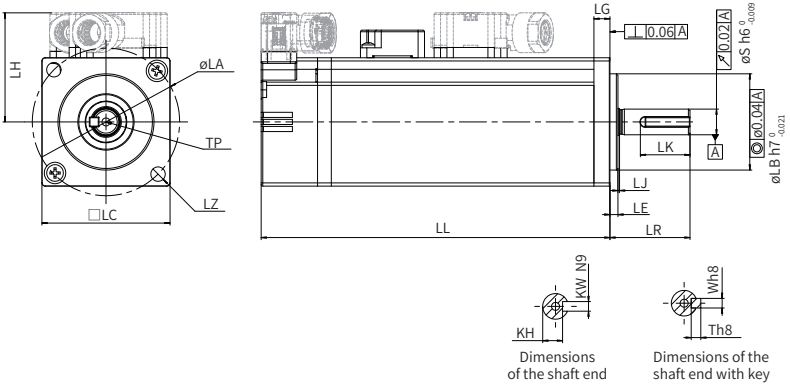
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
0.32	24	6.1	94.4	0.25	⩽ 40	⩽ 20	⩽ 1.5

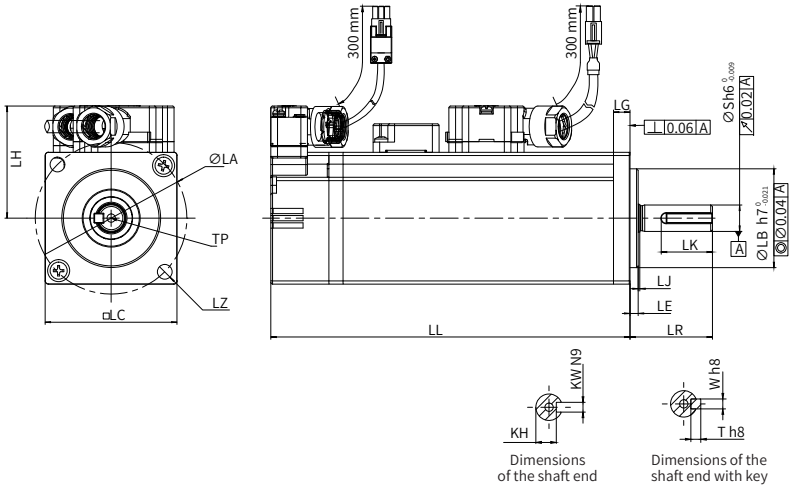
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
20	78	54

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
65 (96)	40	25±0.5	46	2-ϕ4.5	34	5	2.5±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
8	30	M3x6	15.5	6.2 $^{0}_{-0.1}$	3	3	3	0.39 (0.50)

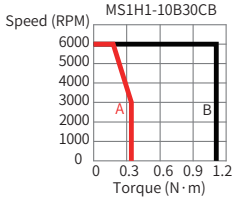
2.2.3 MS1H1-10B30CB-*33*Z(-S)

Technical Data for Motors in Flange Size 40 (mm) (Low Inertia, Small Capacity)		
Rated output (kW)	0.1	
Voltage (V)	220	
Rated torque (N·m)	0.32	
Maximum torque (N·m)	1.12	
Rated current (Arms)	1.3	
Maximum current (Arms)	4.70	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.26	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	0.041
	Motor with brake	0.043

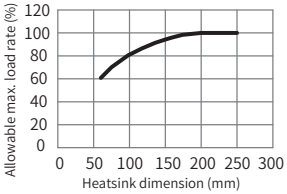
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



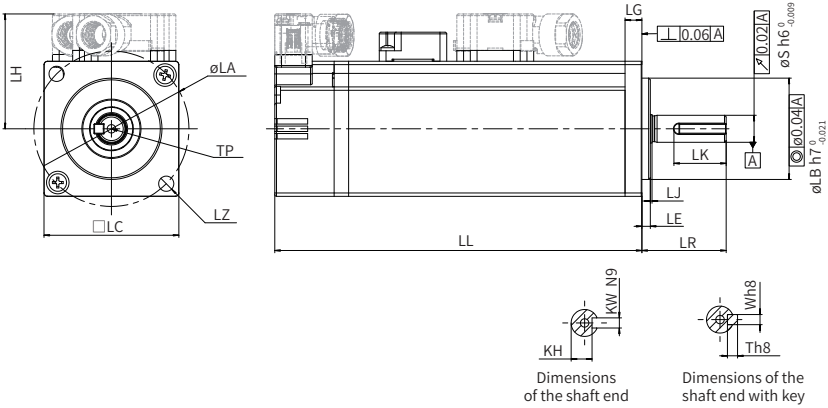
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
0.32	24	6.1	94.4	0.25	⩽ 40	⩽ 20	⩽ 1.5

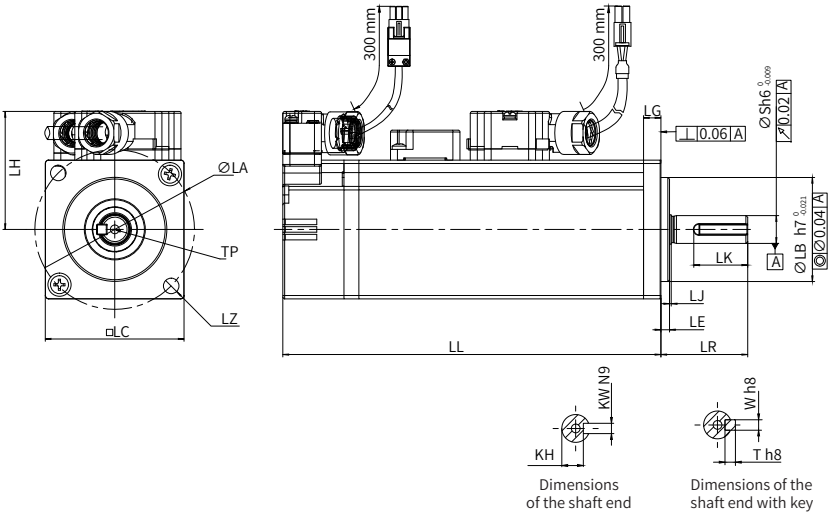
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
20	78	54

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
77.5(109)	40	25±0.5	46	2-ϕ4.5	34	5	2.5±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
8	30	M3x6	15.5	6.2 0 -0.1	3	3	3	0.45 (0.64)

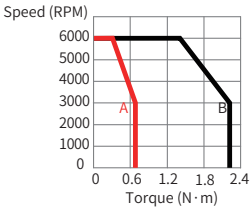
2.2.4 MS1H1-20B30CB-*33*Z(-S)

Technical Data for Motors in Flange Size 60 (mm) (Low Inertia, Small Capacity)		
Rated output (kW)	0.2	
Voltage (V)	220	
Rated torque (N·m)	0.64	
Maximum torque (N·m)	2.24	
Rated current (Arms)	1.5	
Maximum current (Arms)	5.80	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.46	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	0.207
	Motor with brake	0.22

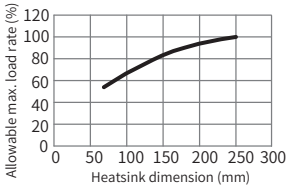
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



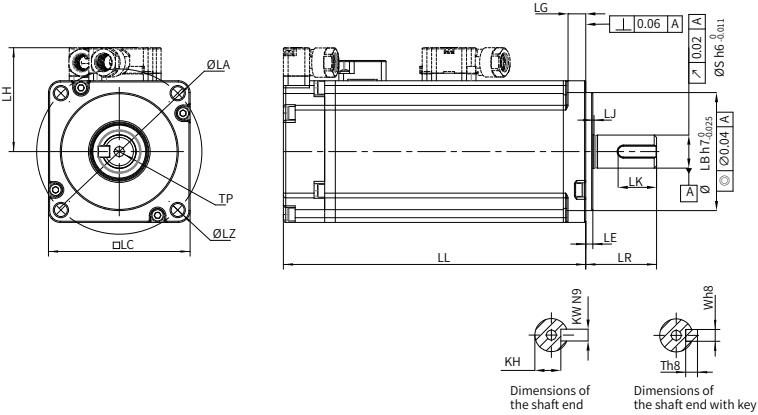
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	⩽ 60	⩽ 20	⩽ 1.5

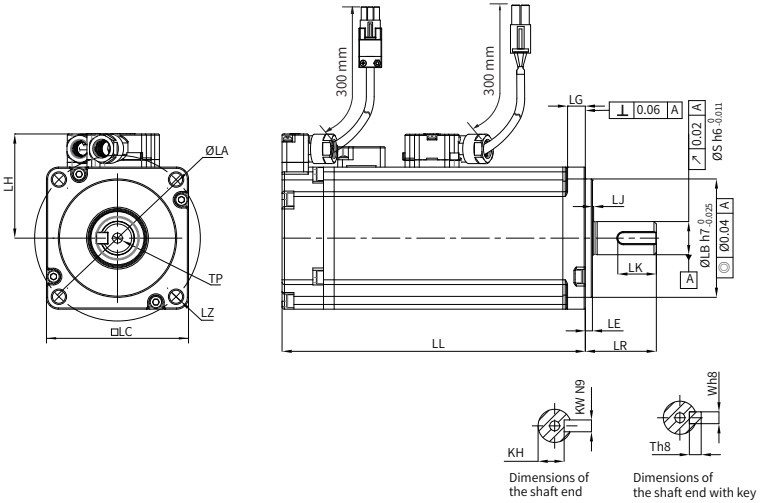
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
25	245	74

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
72.5 (100)	60	30±0.5	70	4-ϕ5.5	44	7.5	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
14	50	M5x8	16.5	11 $^{0}_{-0.1}$	5	5	5	0.78 (1.16)

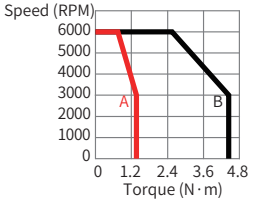
2.2.5 MS1H1-40B30CB-*33*Z(-S)

Technical Data of Motors in Flange Size 60 (mm) (Low Inertia, Small Capacity)		
Rated output (kW)	0.4	
Voltage (V)	220	
Rated torque (N·m)	1.27	
Maximum torque (N·m)	4.46	
Rated current (Arms)	2.8	
Maximum current (Arms)	10.1	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.53	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	0.376
	Motor with brake	0.39

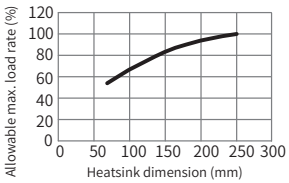
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



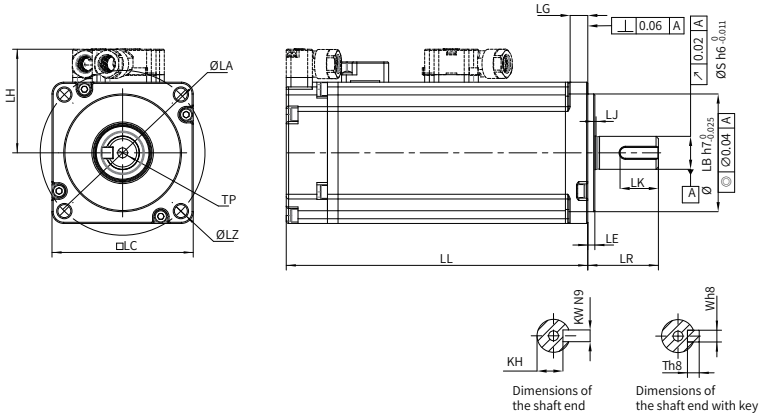
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	⩽ 60	⩽ 20	⩽ 1.5

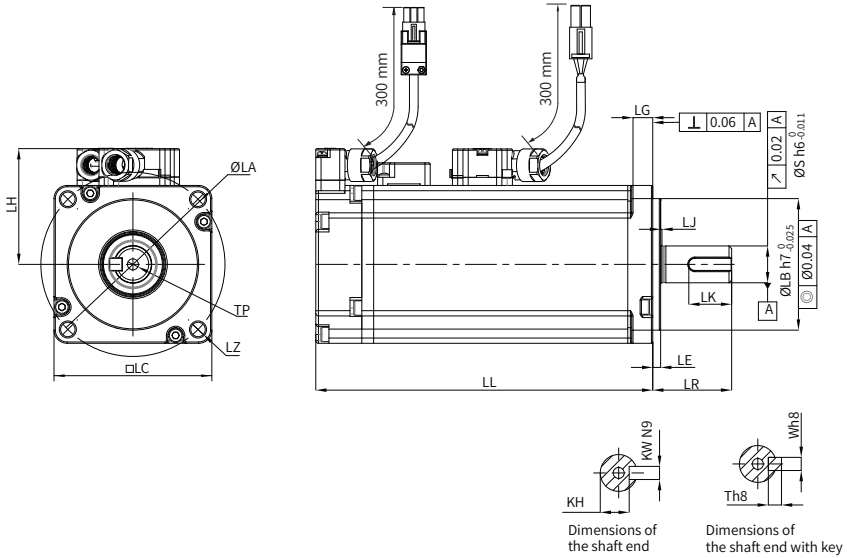
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
25	245	74

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
91 (119)	60	30±0.5	70	4-ϕ5.5	44	7.5	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
14	50	M5x8	16.5	11 $^{0}_{-0.1}$	5	5	5	1.11 (1.48)

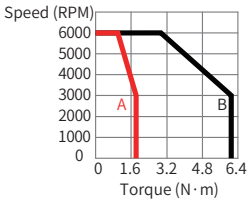
2.2.6 MS1H1-55B30CB-*33*Z(-S)

Technical Data for Motors in Flange Size 80 (mm) (Low Inertia, Small Capacity)	
Rated output (kW)	0.55
Voltage (V)	220
Rated torque (N·m)	1.75
Maximum torque (N·m)	6.13
Rated current (Arms)	3.8
Maximum current (Arms)	15
Rated speed (RPM)	3000
Maximum speed (RPM)	6000
Torque coefficient (N·m/Arms)	0.49
Rotor moment of inertia (kg·cm^2)	1.06

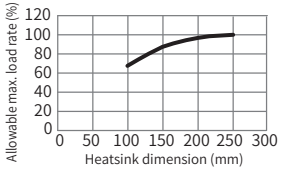
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



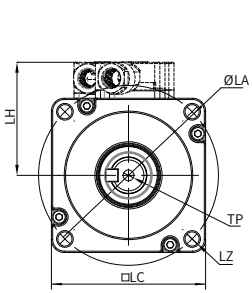
■ Heatsink-based derating curve

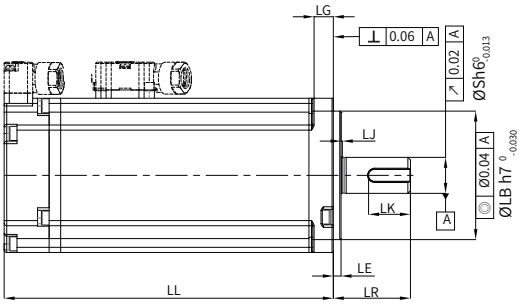


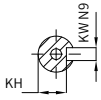
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
35	392	147

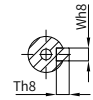
■ Terminal-type motor





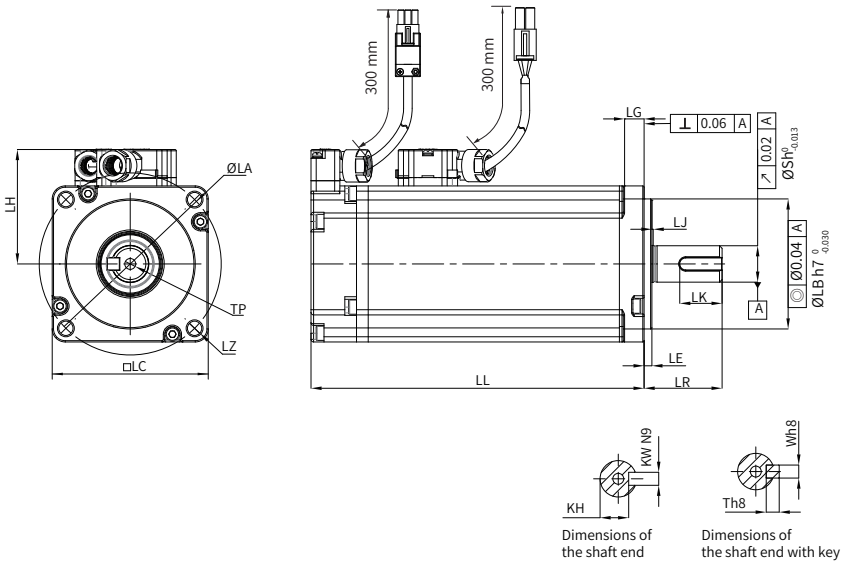


Dimensions of the shaft end



Dimensions of the shaft end with key

■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
96.2	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
19	70	M6x20	25	15.5 $^{0}_{-0.1}$	6	6	6	1.85

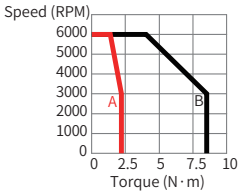
2.2.7 MS1H1-75B30CB-*33*Z(-S)

Technical Data for Motors in Flange Size 80 (mm) (Low Inertia, Small Capacity)		
Rated output (kW)	0.75	
Voltage (V)	220	
Rated torque (N·m)	2.39	
Maximum torque (N·m)	8.36	
Rated current (Arms)	4.8	
Maximum current (Arms)	16.9	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.58	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	1.38
	Motor with brake	1.43

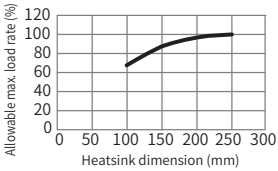
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



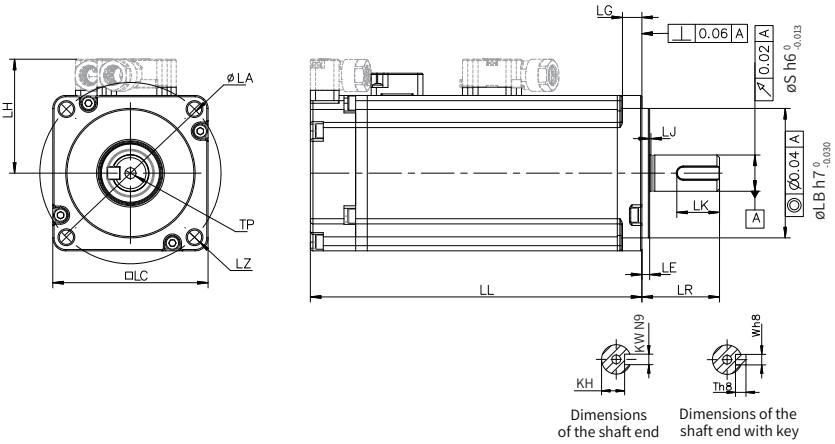
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	⩽ 60	⩽ 40	⩽ 1

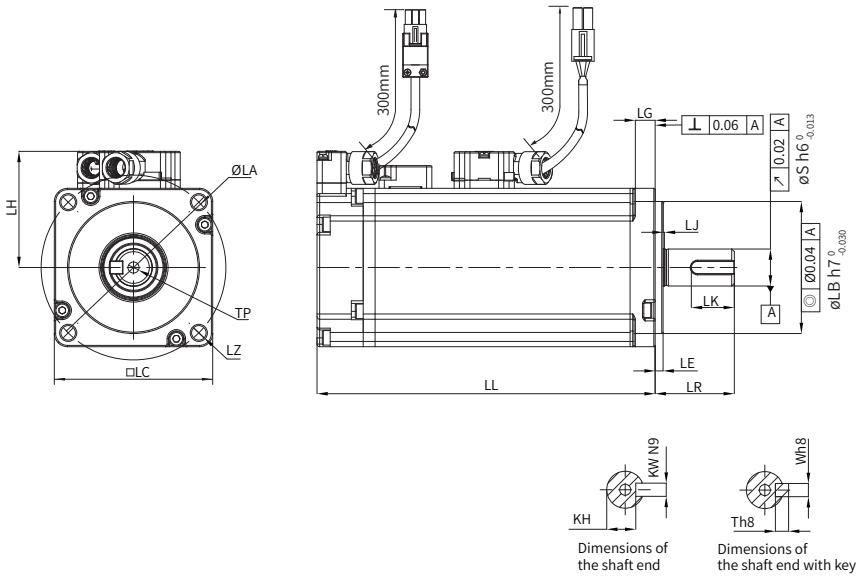
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
35	392	147

■ Terminal-type motor



■ Lead wire-type motor

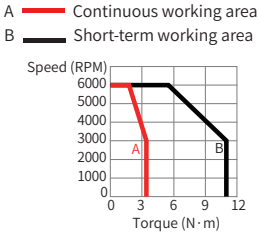


LL	LC	LR	LA	LZ	LH	LG	LE	LJ
107(140)	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
19	70	M6x20	25	15.5 $^{0}_{-0.1}$	6	6	6	2.18 (2.82)

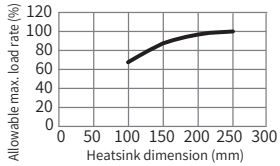
2.2.8 MS1H1-10C30CB-*33*Z(-S)

Technical Data for Motors in Flange Size 80 (mm) (Low Inertia, Small Capacity)	
Rated output (kW)	1.0
Voltage (V)	220
Rated torque (N·m)	3.18
Maximum torque (N·m)	11.1
Rated current (Arms)	7.6
Maximum current (Arms)	28
Rated speed (RPM)	3000
Maximum speed (RPM)	6000
Torque coefficient (N·m/Arms)	0.46
Rotor moment of inertia ($kg \cdot cm^2$)	1.75

■ Torque-Speed characteristics



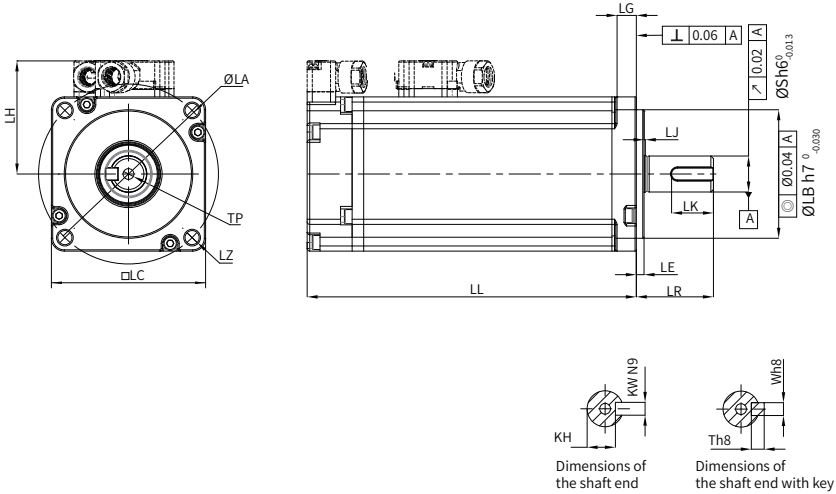
■ Heatsink-based derating curve



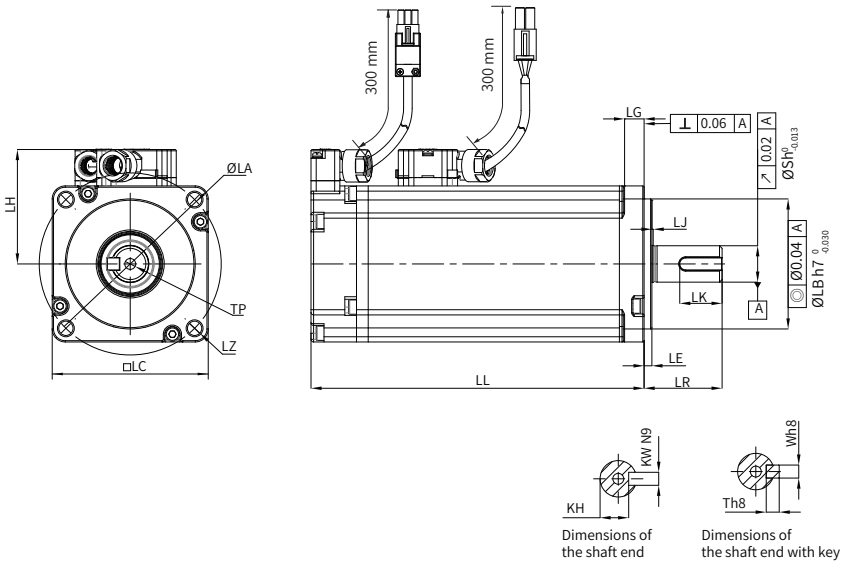
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
35	392	147

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
118.2	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
19	70	M6x20	25	15.5 $^{0}_{-0.1}$	6	6	6	2.55

2.3 Motors with Low Inertia and Medium Capacity (MS1H2)

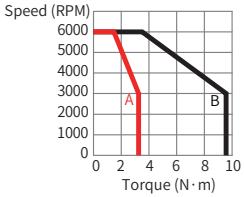
2.3.1 MS1H2-10C30CB-A33*Z

Technical Data for Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)		
Rated output (kW)	1.0	
Voltage (V)	220	
Rated torque (N·m)	3.18	
Maximum torque (N·m)	9.54	
Rated current (Arms)	7.5	
Maximum current (Arms)	23	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.47	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	1.87
	Motor with brake	3.12

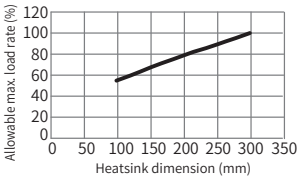
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



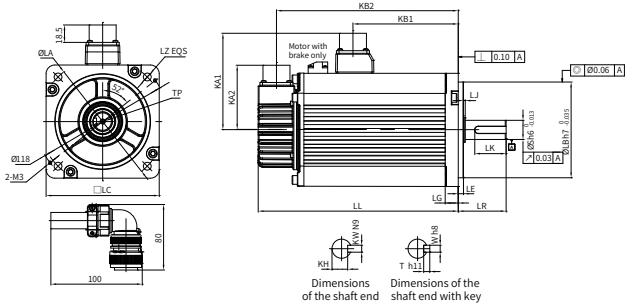
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

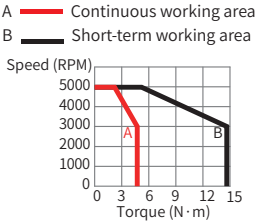


LL	LC	LE	LA	LZ	KA1	KA2	LJ	KB1	KB2	
164(213.5)	100	5±0.3	115	4-Φ7	88	74	2.5±0.75	94.5(101)	143.5(192.5)	
LR		S	LB	TP	LK	KH	KW	W	T	LG	Weight (kg)
45±1		24	95	M8x16	36	$20^{0}_{-0.2}$	8	8	7	10	5.11 (6.41)

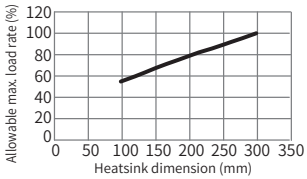
2.3.2 MS1H2-15C30CB-A33*Z

Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)		
Rated output (kW)	1.5	
Voltage (V)	220	
Rated torque (N·m)	4.9	
Maximum torque (N·m)	14.7	
Rated current (Arms)	10.8	
Maximum current (Arms)	32	
Rated speed (RPM)	3000	
Maximum speed (RPM)	5000	
Torque coefficient (N·m/Arms)	0.54	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	2.46
	Motor with brake	3.71

■ Torque-Speed characteristics



■ Heatsink-based derating curve



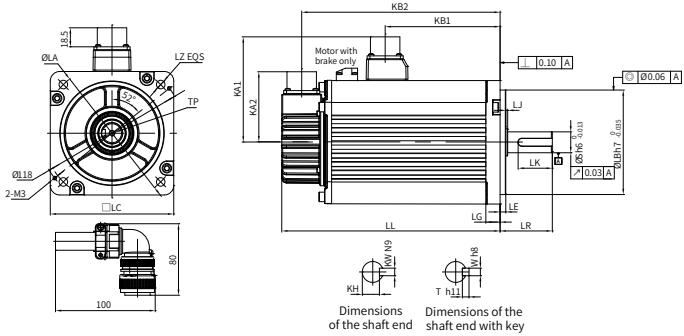
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

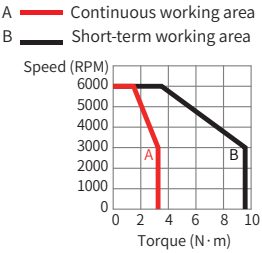


LL	LC	LE	LA	LZ	KA1	KA2	LJ	KB1	KB2	
189 (239)	100	5±0.3	115	4-Φ7	88	74	2.5±0.75	119.5 (128)	168.5 (219.5)	
LR		S	LB	TP	LK	KH	KW	W	T	LG	Weight (kg)
45±1		24	95	M8x16	36	$20^{0}_{-0.2}$	8	8	7	10	6.22 (7.52)

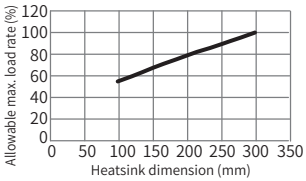
2.3.3 MS1H2-10C30CD-A33*Z

Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)		
Rated output (kW)	1	
Voltage (V)	380	
Rated torque (N·m)	3.18	
Maximum torque (N·m)	9.54	
Rated current (Arms)	3.65	
Maximum current (Arms)	11	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.89	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	1.87
	Motor with brake	3.12

■ Torque-Speed characteristics



■ Heatsink-based derating curve



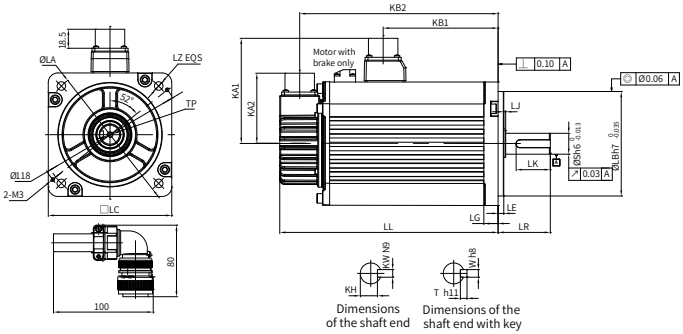
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

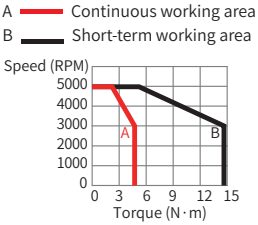


LL	LC	LE	LA	LZ	KA1	KA2	LJ		KB1	KB2	
164(213.5)	100	5±0.3	115	4-Φ7	88	74	2.5±0.75		94.5(101)	143.5 (192.5)	
LR		S	LB	TP	LK	KH	KW	W	T	LG	Weight (kg)
45±1		24	95	M8x16	36	$20^{\ 0}_{-0.2}$	8	8	7	10	5.11 (6.41)

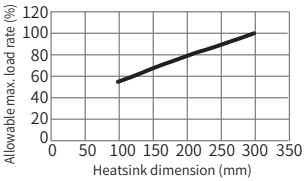
2.3.4 MS1H2-15C30CD-A33*Z

Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)		
Rated output (kW)	1.5	
Voltage (V)	380	
Rated torque (N·m)	4.9	
Maximum torque (N·m)	14.7	
Rated current (Arms)	4.5	
Maximum current (Arms)	14	
Rated speed (RPM)	3000	
Maximum speed (RPM)	5000	
Torque coefficient (N·m/Arms)	1.07	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	2.46
	Motor with brake	3.71

■ Torque-Speed characteristics



■ Heatsink-based derating curve



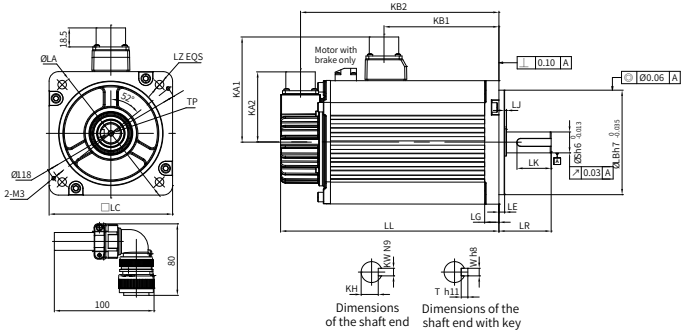
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

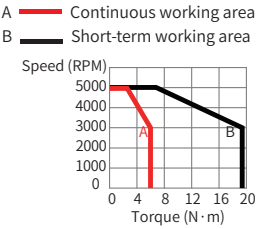


LL	LC	LE	LA	LZ	KA1	KA2	LJ		KB1	KB2	
189 (239)	100	5±0.3	115	4-Φ7	88	74	2.5±0.75		119.5 (128)	168.5 (219.5)	
LR		S	LB	TP	LK	KH	KW	W	T	LG	Weight (kg)
45±1		24	95	M8x16	36	$20^{0}_{-0.2}$	8	8	7	10	6.22 (7.52)

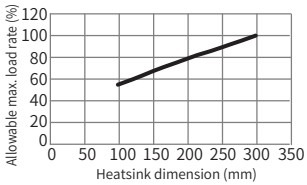
2.3.5 MS1H2-20C30CD-A331Z

Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	2
Voltage (V)	380
Rated torque (N·m)	6.36
Maximum torque (N·m)	19.1
Rated current (Arms)	5.89
Maximum current (Arms)	20
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.19
Rotor moment of inertia ($kg \cdot cm^2$)	3.06

■ Torque-Speed characteristics



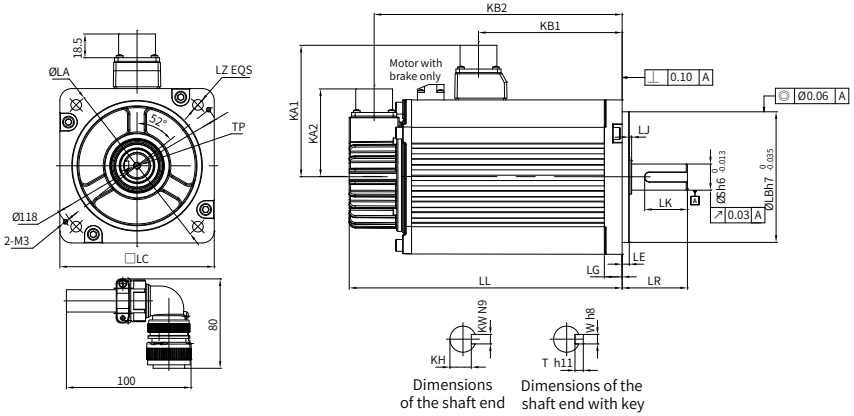
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



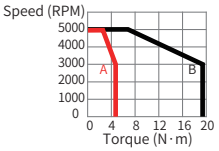
LL	LC	LE	LA	LZ	KA1	KA2	LJ		KB1	KB2	
214	100	5±0.3	115	4-Φ7	88	74	2.5±0.75		144.5	193.5	
LR		S	LB	TP	LK	KH	KW	W	T	LG	Weight (kg)
45±1		24	95	M8x16	36	20 $^{0}_{-0.2}$	8	8	7	10	7.39

2.3.6 MS1H2-20C30CD-A334Z-S4

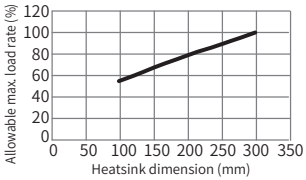
Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	2
Voltage (V)	380
Rated torque (N·m)	6.36
Maximum torque (N·m)	19.1
Rated current (Arms)	5.89
Maximum current (Arms)	20
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.19
Rotor moment of inertia ($kg \cdot cm^2$)	4.31

■ Torque-Speed characteristics

A Continuous working area
B Short-term working area



■ Heatsink-based derating curve



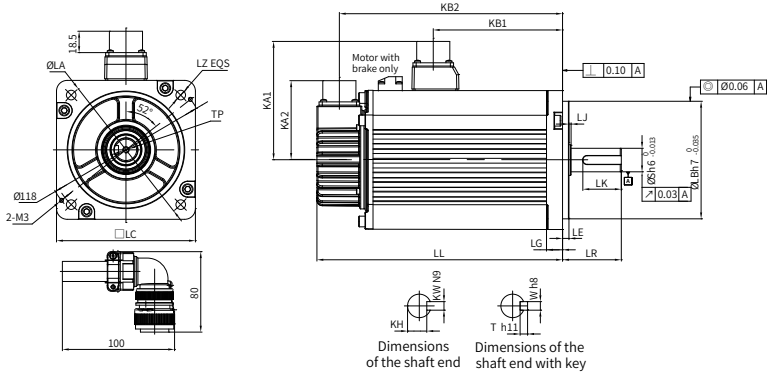
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

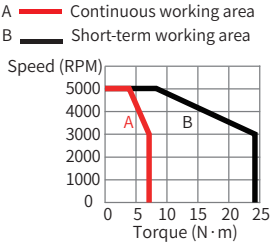


LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
265	100	5±0.3	115	4-Φ7	88	74	8	10	153	244	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
45±1		24	95	M8x16	36	$20^{\ 0}_{-0.2}$	2.5±0.75		8	7	8.7

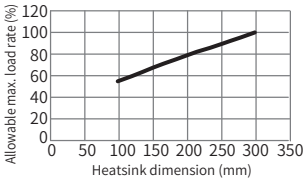
2.3.7 MS1H2-25C30CD-A331Z

Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	2.5
Voltage (V)	220
Rated torque (N·m)	7.96
Maximum torque (N·m)	23.9
Rated current (Arms)	7.56
Maximum current (Arms)	25
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.2
Rotor moment of inertia ($kg \cdot cm^2$)	3.65

■ Torque-Speed characteristics



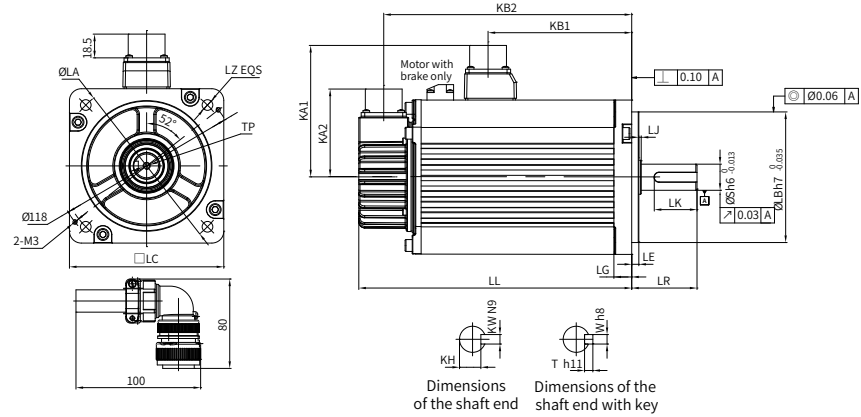
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



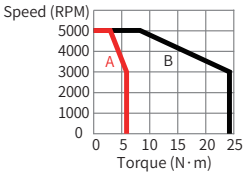
LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
240.5	100	5±0.3	115	4-Φ7	88	74	8	10	169.5	218.5	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
45±1		24	95	M8x16	36	20 $^{0}_{-0.2}$	2.5±0.75		8	7	8.55

2.3.8 MS1H2-25C30CD-A334Z-S4

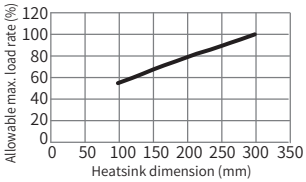
Technical Data of Motors in Flange Size 100 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	2.5
Voltage (V)	220
Rated torque (N·m)	7.96
Maximum torque (N·m)	23.9
Rated current (Arms)	7.56
Maximum current (Arms)	25
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.2
Rotor moment of inertia ($kg \cdot cm^2$)	4.9

■ Torque-Speed characteristics

A Continuous working area
B Short-term working area



■ Heatsink-based derating curve



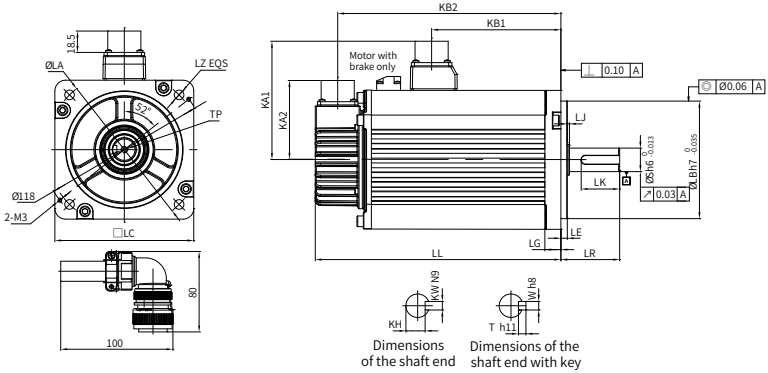
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
8	24	23	25	0.96	⩽ 85	⩽ 30	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

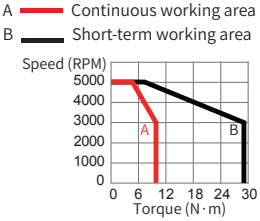


LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
290	100	5±0.3	115	4-Φ7	88	74	8	10	178	269	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
45±1		24	95	M8x16	36	$20^{\ 0}_{-0.2}$	2.5±0.75		8	7	9.8

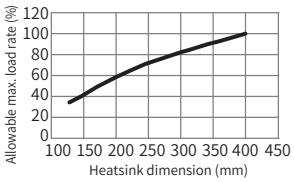
2.3.9 MS1H2-30C30CD-A331Z

Technical Data of Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	3
Voltage (V)	380
Rated torque (N·m)	9.8
Maximum torque (N·m)	29.4
Rated current (Arms)	10
Maximum current (Arms)	30
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.2
Rotor moment of inertia ($kg \cdot cm^2$)	7.72

■ Torque-Speed characteristics



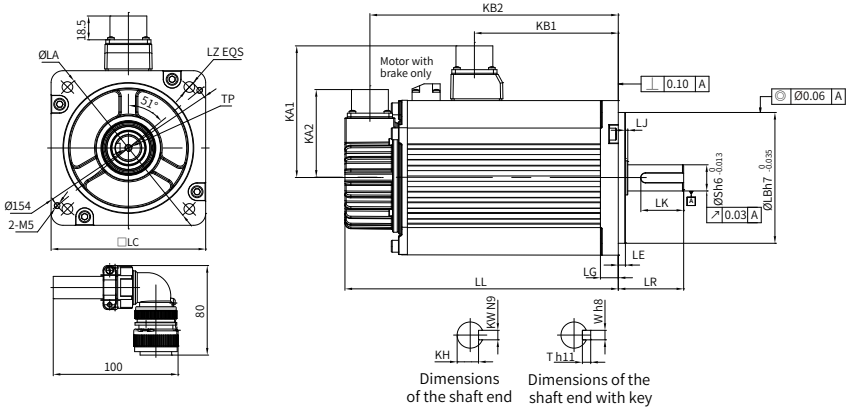
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	980	392

■ Dimension drawing



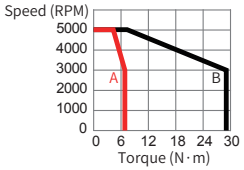
LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
209.5	130	6±0.3	145	4-Φ9	103	74	8	14	136	188.5	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
63±1		28	110	M8x20	54	24 $^{0}_{-0.2}$	0.5±0.75		8	7	10.73

2.3.10 MS1H2-30C30CD-A334Z-S4

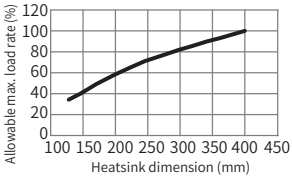
Technical Data of Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	3
Voltage (V)	380
Rated torque (N·m)	9.8
Maximum torque (N·m)	29.4
Rated current (Arms)	10
Maximum current (Arms)	30
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.2
Rotor moment of inertia ($kg \cdot cm^2$)	10.22

■ Torque-Speed characteristics

A Continuous working area
B Short-term working area



■ Heatsink-based derating curve



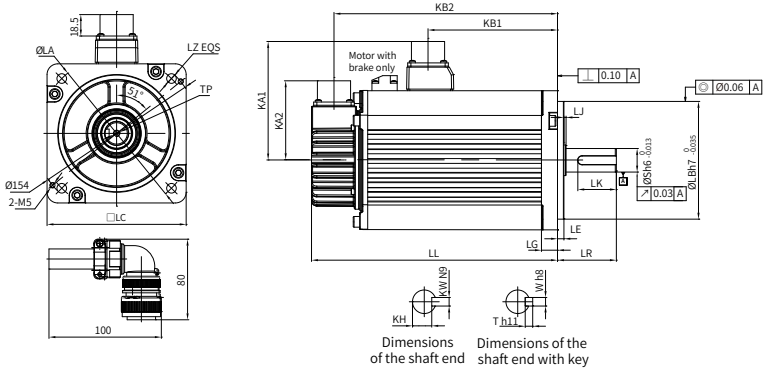
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
16	24	27	21.3	1.13	⩽ 100	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	980	392

■ Dimension drawing

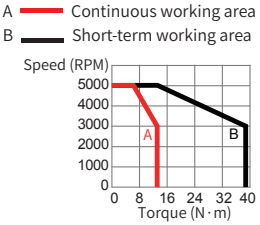


LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
265.5	130	6±0.3	145	4-Φ9	103	74	8	14	139	244.5	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
63±1		28	110	M8x20	54	24 $^{0}_{-0.2}$	0.5±0.75		8	7	13.2

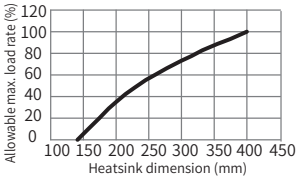
2.3.11 MS1H2-40C30CD-A331Z

Technical Data for Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	4
Voltage (V)	380
Rated torque (N·m)	12.6
Maximum torque (N·m)	37.8
Rated current (Arms)	13.6
Maximum current (Arms)	40.8
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.12
Rotor moment of inertia ($kg \cdot cm^2$)	12.1

■ Torque-Speed characteristics



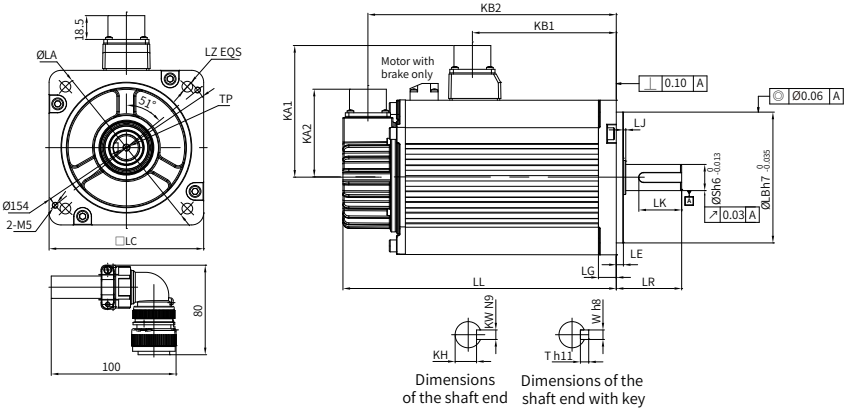
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	1176	392

■ Dimension drawing



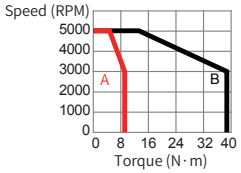
LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
252	130	6±0.3	145	4-Φ9	103	74	8	14	178.5	231	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
63±1		28	110	M8x20	54	24 $^{0}_{-0.2}$	0.5±0.75		8	7	15.43

2.3.12 MS1H2-40C30CD-A334Z-S4

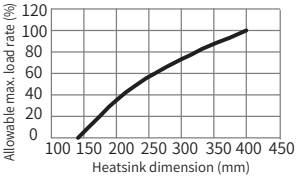
Technical Data of Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	4
Voltage (V)	380
Rated torque (N·m)	12.6
Maximum torque (N·m)	37.8
Rated current (Arms)	13.6
Maximum current (Arms)	40.8
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.12
Rotor moment of inertia ($kg \cdot cm^2$)	14.6

■ Torque-Speed characteristics

A Continuous working area
B Short-term working area



■ Heatsink-based derating curve



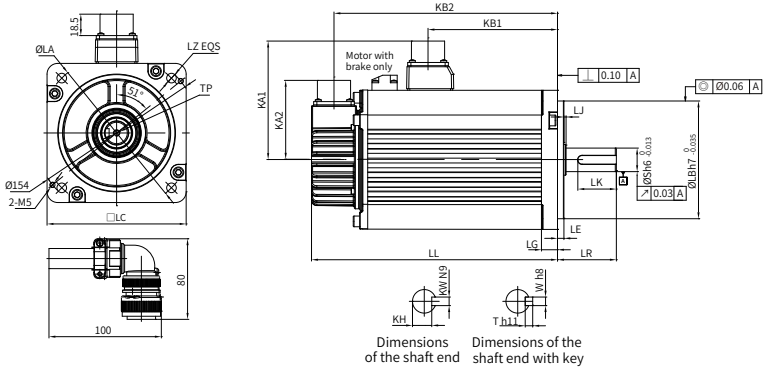
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
16	24	27	21.3	1.13	⩽ 100	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	1176	392

■ Dimension drawing

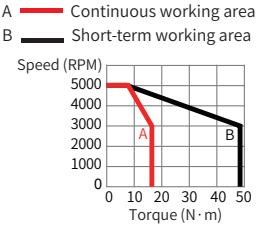


LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
308	130	6±0.3	145	4-Φ9	103	74	8	14	181.5	287	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
63±1		28	110	M8x20	54	24 $^{0}_{-0.2}$	0.5±0.75		8	7	17.9

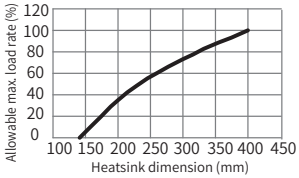
2.3.13 MS1H2-50C30CD-A331Z

Technical Data of Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	5
Voltage (V)	380
Rated torque (N·m)	15.8
Maximum torque (N·m)	47.6
Rated current (Arms)	16
Maximum current (Arms)	48
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.29
Rotor moment of inertia ($kg \cdot cm^2$)	15.4

■ Torque-Speed characteristics



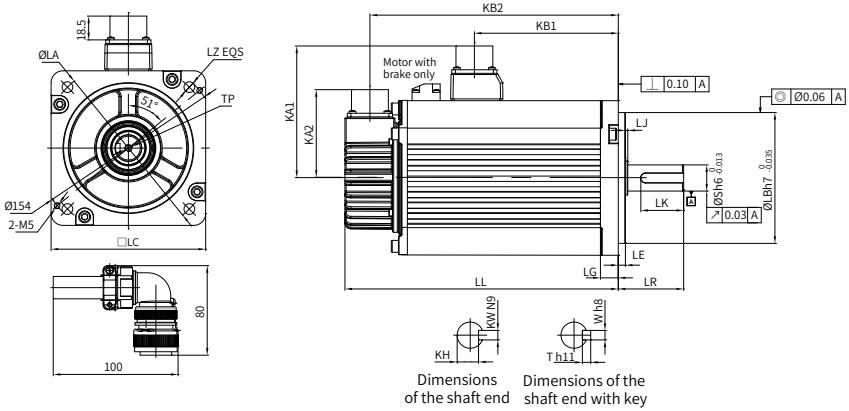
■ Heatsink-based derating curve



■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	1176	392

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2
294.5	130	6±0.3	145	4-Φ9	103	74	8	14	221	273.5

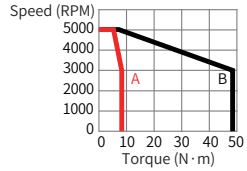
LR	S	LB	TP	LK	KH	LJ	W	T	Weight (kg)
63±1	28	110	M8x20	54	$24^{0}_{-0.2}$	0.5±0.75	8	7	16.2

2.3.14 MS1H2-50C30CD-A334Z-S4

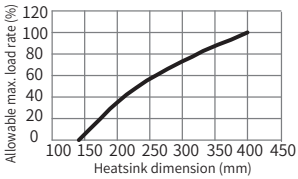
Technical Data of Motors in Flange Size 130 (mm) (Low Inertia, Medium Capacity)	
Rated output (kW)	5
Voltage (V)	380
Rated torque (N·m)	15.8
Maximum torque (N·m)	47.6
Rated current (Arms)	16
Maximum current (Arms)	48
Rated speed (RPM)	3000
Maximum speed (RPM)	5000
Torque coefficient (N·m/Arms)	1.29
Rotor moment of inertia ($kg \cdot cm^2$)	17.9

■ Torque-Speed characteristics

A Continuous working area
B Short-term working area



■ Heatsink-based derating curve



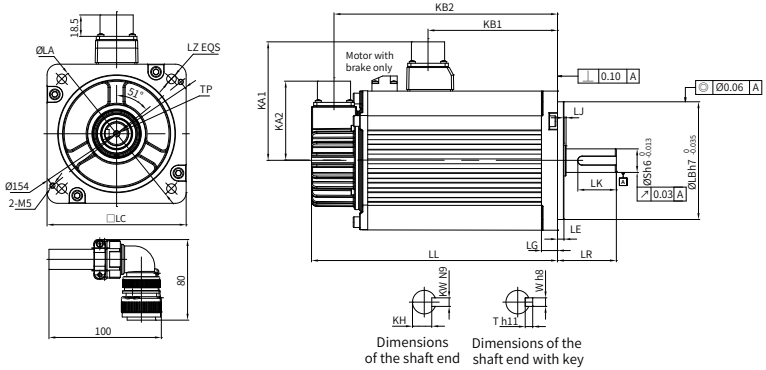
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
16	24	27	21.3	1.13	⩽ 100	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
63	1176	392

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
350.5	130	6±0.3	145	4-Φ9	103	74	8	14	224	329.5	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
63±1		28	110	M8x20	54	$24^{\ 0}_{-0.2}$	0.5±0.75		8	7	18.4

2.4 Motors with Medium Inertia and Small Capacity (MS1H4)

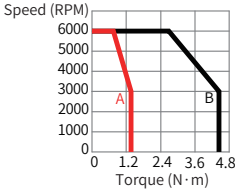
2.4.1 MS1H4-40B30CB-*33*Z(-S)

Technical Data of Motors in Flange Size 60 (mm) (Medium Inertia, Small Capacity)		
Rated output (kW)	0.4	
Voltage (V)	220	
Rated torque (N·m)	1.27	
Maximum torque (N·m)	4.46	
Rated current (Arms)	2.8	
Maximum current (Arms)	10.1	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.53	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	0.657
	Motor with brake	0.667

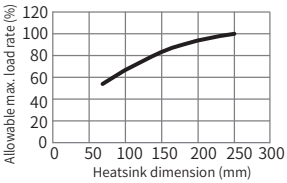
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



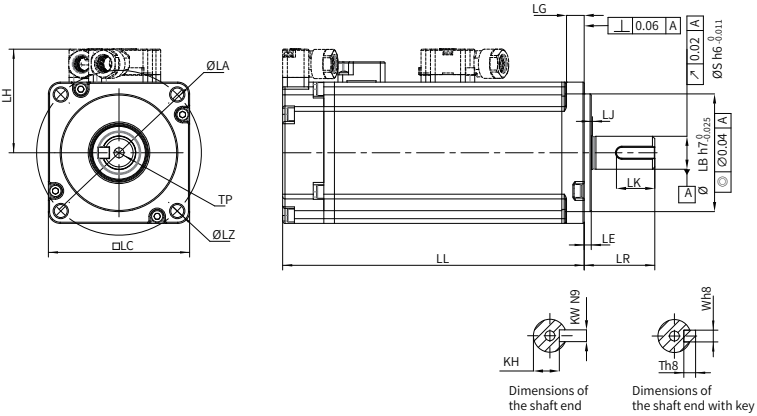
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
1.5	24	7.6	75.79	0.32	⩽ 60	⩽ 20	⩽ 1.5

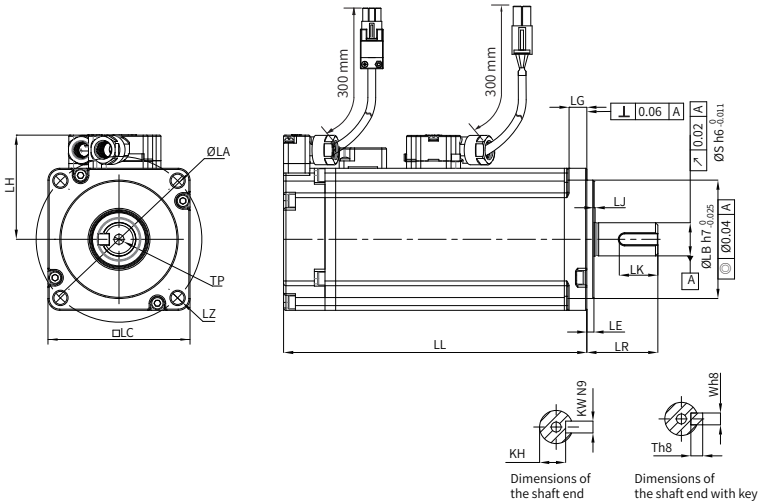
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
25	245	74

■ Terminal-type motor



■ Lead wire-type motor

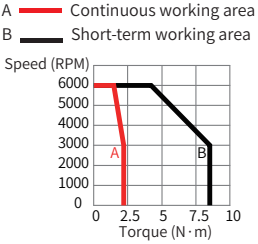


LL	LC	LR	LA	LZ	LH	LG	LE	LJ
105 (128)	60	30±0.5	70	4-ϕ5.5	44	7.5	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
14	50	M5x8	16.5	11 $^{0}_{-0.1}$	5	5	5	1.27 (1.62)

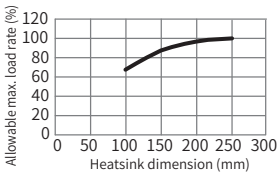
2.4.2 MS1H4-75B30CB-*33*Z(-S)

Technical Data of Motors in Flange Size 80 (mm) (Medium Inertia, Small Capacity)		
Rated output (kW)	0.75	
Voltage (V)	220	
Rated torque (N·m)	2.39	
Maximum torque (N·m)	8.36	
Rated current (Arms)	4.8	
Maximum current (Arms)	16.9	
Rated speed (RPM)	3000	
Maximum speed (RPM)	6000	
Torque coefficient (N·m/Arms)	0.58	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	2
	Motor with brake	2.012

■ Torque-Speed characteristics



■ Heatsink-based derating curve



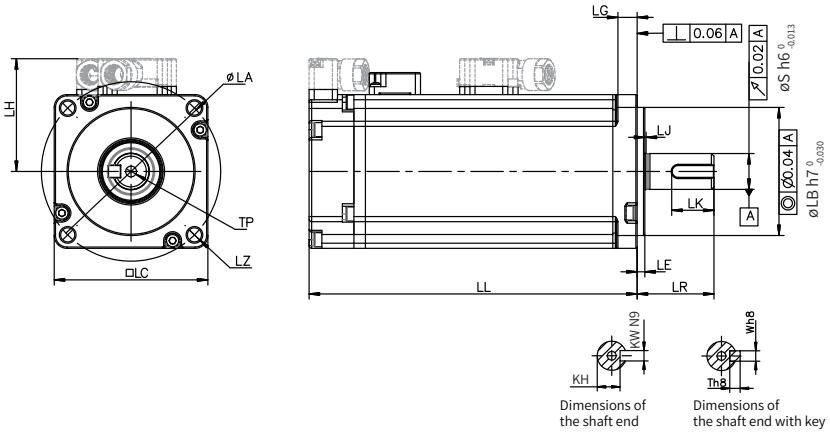
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage ±10% (VDC)	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
3.2	24	10	57.6	0.42	⩽ 60	⩽ 40	⩽ 1.0

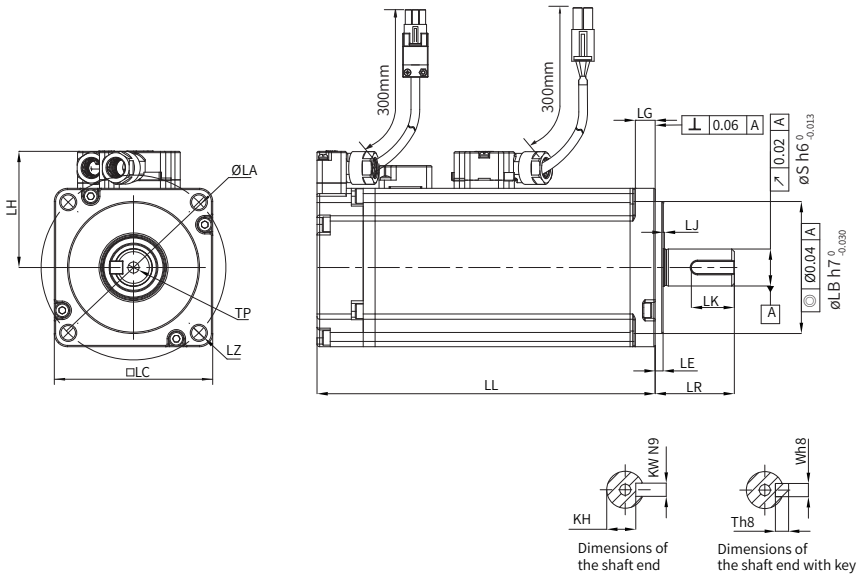
■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
35	392	147

■ Terminal-type motor



■ Lead wire-type motor



LL	LC	LR	LA	LZ	LH	LG	LE	LJ
117.5(147.5)	80	35±0.5	90	4-ϕ7	54	7.7	3±0.5	0.5±0.35
S	LB	TP	LK	KH	KW	W	T	Weight (kg)
19	70	M6x20	25	15.5 $^{0}_{-0.1}$	6	6	6	2.40 (3.04)

2.5 Motors with Medium Inertia and Medium Capacity (MS1H3)

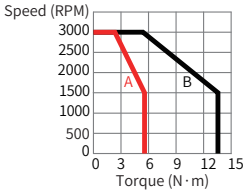
2.5.1 MS1H3-85B15CB-*33*Z

Technical Data of Motors in Flange Size 130 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	0.85	
Voltage (V)	220	
Rated torque (N·m)	5.39	
Maximum torque (N·m)	13.5	
Rated current (Arms)	6.6	
Maximum current (Arms)	16.5	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	0.95	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	13.3
	Motor with brake	14

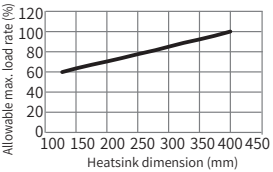
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



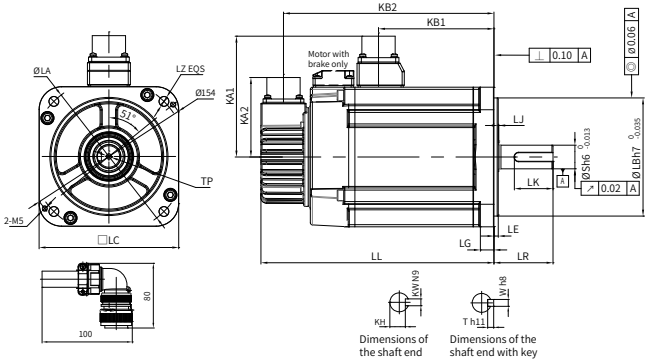
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
12	24	19.4	29.7	0.81	⩽ 120	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing

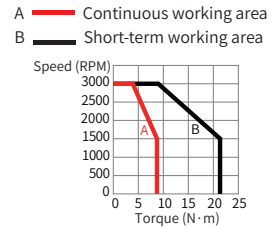


LL	LC	LE	LA	LZ	KA1	KB1	KA2	KB2	LG	KW	
146 (182)	130	4	145	4-Φ9	103	72.5	74	125 (161)	14	8	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
55±1		22	110	M6x20	36	$18^{0}_{-0.2}$	0.5±0.75		8	7	7 (8)

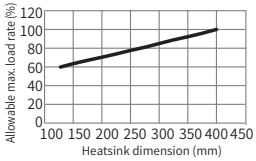
2.5.2 MS1H3-13C15CB-*33*Z

Technical Data of Motors in Flange Size 130 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	1.3	
Voltage (V)	220	
Rated torque (N·m)	8.34	
Maximum torque (N·m)	20.85	
Rated current (Arms)	10	
Maximum current (Arms)	25	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	0.95	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	17.8
	Motor with brake	18.5

■ Torque-Speed characteristics



■ Heatsink-based derating curve



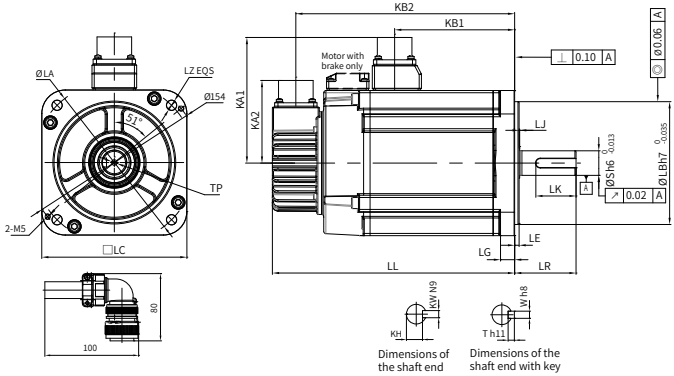
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
12	24	19.4	29.7	0.81	⩽ 120	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KB1	KA2	KB2	LG	KW		
163 (199)	130	4	145	4-Φ9	103	89.5	74	142 (178)	14	8		
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)	
55±1		22	110	M6x20	36	$18^{\ 0}_{-0.2}$	0.5±0.75		8	7	8 (9.5)	

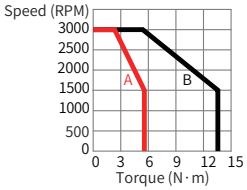
2.5.3 MS1H3-85B15CD-*33*Z

Technical Data of Motors in Flange Size 130 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	0.85	
Voltage (V)	380	
Rated torque (N·m)	5.39	
Maximum torque (N·m)	13.5	
Rated current (Arms)	3.3	
Maximum current (Arms)	8.25	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.87	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	13.3
	Motor with brake	14

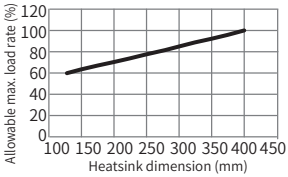
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



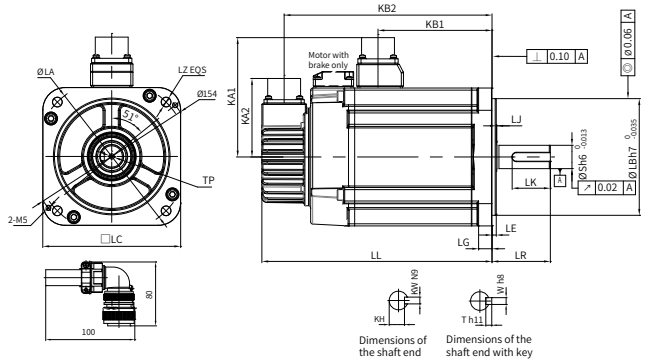
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
12	24	19.4	29.7	0.81	⩽ 120	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KB1	KA2	KB2	LG	KW	
146 (182)	130	4	145	4-Φ9	103	72.5	74	125 (161)	14	8	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
55±1		22	110	M6x20	36	$18^{0}_{-0.2}$	0.5±0.75		8	7	7 (8)

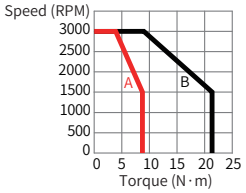
2.5.4 MS1H3-13C15CD-*33*Z

Technical Data for Motors in Flange Size 130 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	1.3	
Voltage (V)	380	
Rated torque (N·m)	8.34	
Maximum torque (N·m)	20.85	
Rated current (Arms)	5	
Maximum current (Arms)	12.5	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.87	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	17.8
	Motor with brake	18.5

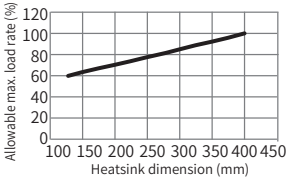
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



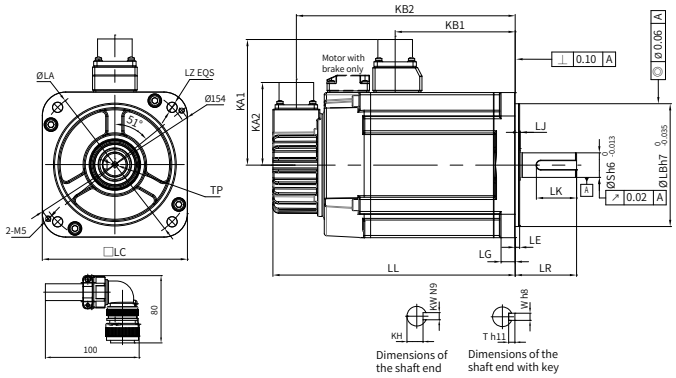
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
12	24	19.4	29.7	0.81	⩽ 120	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KB1	KA2	KB2	LG	KW	
163 (199)	130	4	145	4-Φ9	103	89.5	74	142 (178)	14	8	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
55±1		22	110	M6x20	36	$18^{\ 0}_{-0.2}$	0.5±0.75		8	7	8 (9.5)

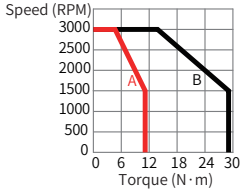
2.5.5 MS1H3-18C15CD-*33*Z

Technical Data of Motors in Flange Size 130 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	1.8	
Voltage (V)	380	
Rated torque (N·m)	11.5	
Maximum torque (N·m)	28.75	
Rated current (Arms)	6.6	
Maximum current (Arms)	16.5	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.87	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	25
	Motor with brake	25.7

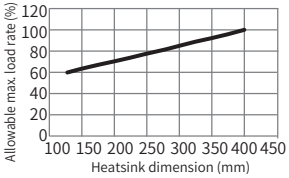
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



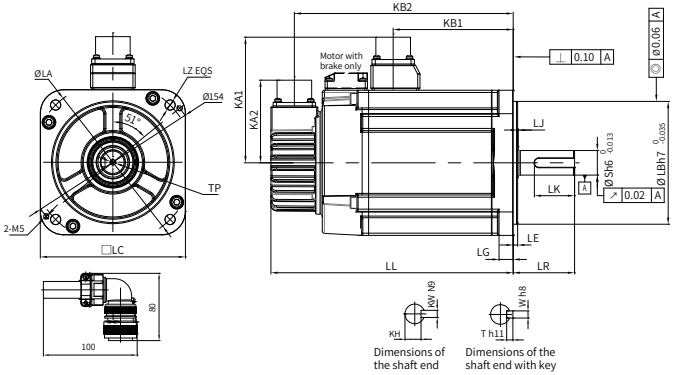
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
12	24	19.4	29.7	0.81	⩽ 120	⩽ 60	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
45	686	196

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KB1	KA2	KB2	LG	KW		
181 (217)	130	4	145	4-Φ9	103	107.5	74	160 (196)	14	8		
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)	
55±1		22	110	M6x20	36	$18^{\ 0}_{-0.2}$	0.5±0.75		8	7	9.5 (11)	

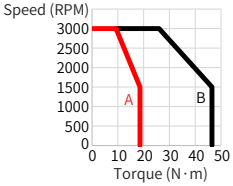
2.5.6 MS1H3-29C15CD-A33*Z

Technical Data of Motors in Flange Size 180 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	2.9	
Voltage (V)	380	
Rated torque (N·m)	18.6	
Maximum torque (N·m)	46.5	
Rated current (Arms)	11.9	
Maximum current (Arms)	29.75	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.82	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	55
	Motor with brake	57.2

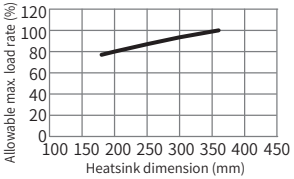
■ Torque-Speed characteristics

A — Continuous working area

B — Short-term working area



■ Heatsink-based derating curve



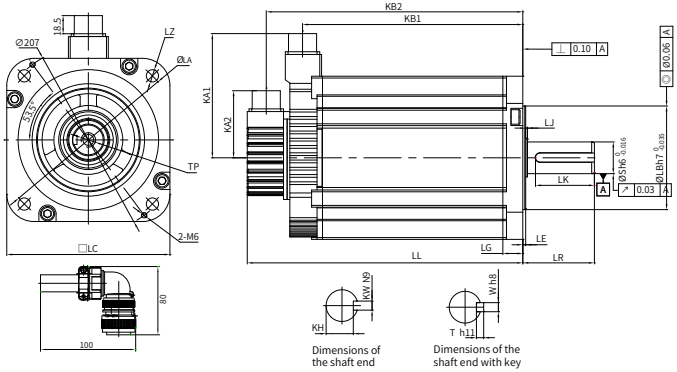
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
50	24	40	14.4	1.67	⩽ 200	⩽ 100	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
79	1470	490

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
197 (273)	180	3.2±0.3	200	4-Φ13.5	138	74	10	18	136 (134)	177 (253)	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
79±1		35	114.3	M12x25	65	$30^{0}_{-0.2}$	0.3±0.75		10	8	15 (25)

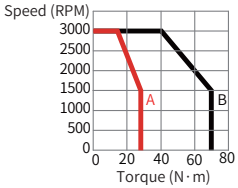
2.5.7 MS1H3-44C15CD-A33*Z

Technical Data of Motors in Flange Size 180 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	4.4	
Voltage (V)	380	
Rated torque (N·m)	28.4	
Maximum torque (N·m)	71.1	
Rated current (Arms)	16.5	
Maximum current (Arms)	40.5	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.9	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	88.9
	Motor with brake	90.8

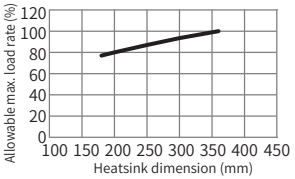
■ Torque-Speed characteristics

A — Continuous working area

B — Short-term working area



■ Heatsink-based derating curve



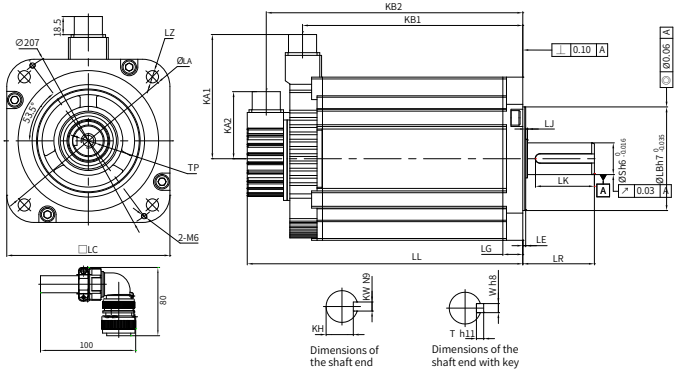
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
50	24	40	14.4	1.67	⩽ 200	⩽ 100	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
79	1470	490

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
230 (307)	180	3.2±0.3	200	4-Φ13.5	138	74	10	18	169 (167)	210 (286)	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
79±1		35	114.3	M12x25	65	$30^{0}_{-0.2}$	0.3±0.75		10	8	19.5 (30)

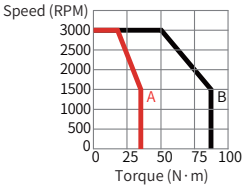
2.5.8 MS1H3-55C15CD-A33*Z

Technical Data of Motors in Flange Size 180 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	5.5	
Voltage (V)	380	
Rated torque (N·m)	35	
Maximum torque (N·m)	87.6	
Rated current (Arms)	20.85	
Maximum current (Arms)	52	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.74	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	107
	Motor with brake	109.5

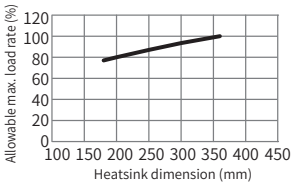
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



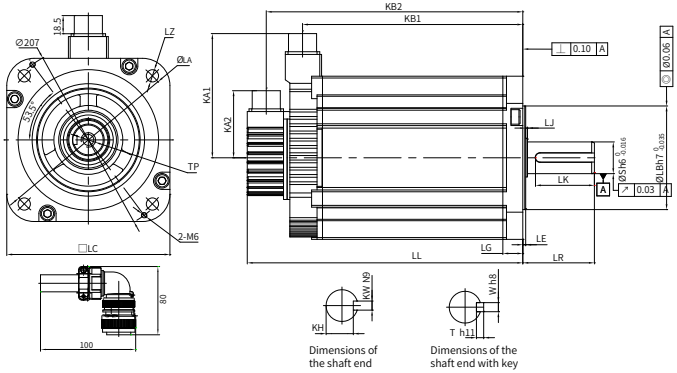
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
50	24	40	14.4	1.67	⩽ 200	⩽ 100	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
113	1764	588

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
274 (350)	180	3.2±0.3	200	4-Φ13.5	138	74	12	18	213 (211)	254 (330)	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
113±1		42	114.3	M16x32	96	37 $^{0}_{-0.2}$	0.3±0.75		12	8	28 (38)

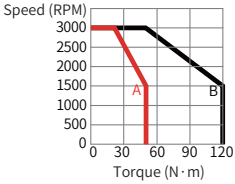
2.5.9 MS1H3-75C15CD-A33*Z

Technical Data of Motors in Flange Size 180 (mm) (Medium Inertia, Medium Capacity)		
Rated output (kW)	7.5	
Voltage (V)	380	
Rated torque (N·m)	48	
Maximum torque (N·m)	119	
Rated current (Arms)	25.7	
Maximum current (Arms)	65	
Rated speed (RPM)	1500	
Maximum speed (RPM)	3000	
Torque coefficient (N·m/Arms)	1.99	
Rotor moment of inertia ($kg \cdot cm^2$)	Motor without brake	141
	Motor with brake	143.1

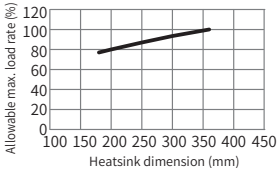
■ Torque-Speed characteristics

A Continuous working area

B Short-term working area



■ Heatsink-based derating curve



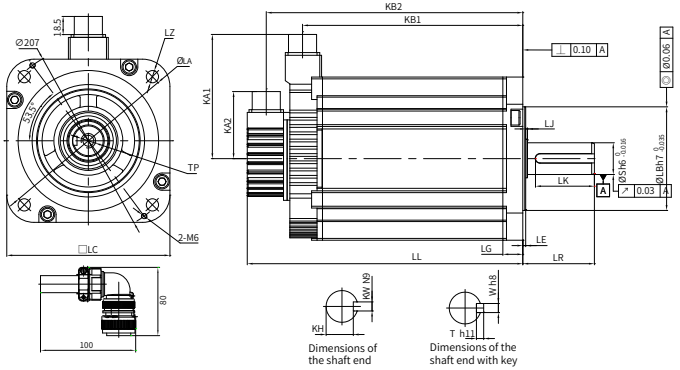
■ Electrical specifications of the motor with brake

Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated Power (W)	Coil Resistance (Ω) (±7%)	Exciting Current (A)	Apply Time (ms)	Release Time (ms)	Backlash (°)
50	24	40	14.4	1.67	⩽ 200	⩽ 100	⩽ 0.5

■ Allowable load

LF (mm)	Allowable Radial Load (N)	Allowable Axial Load (N)
113	1764	588

■ Dimension drawing



LL	LC	LE	LA	LZ	KA1	KA2	KW	LG	KB1	KB2	
330 (407)	180	3.2±0.3	200	4-Φ13.5	138	74	12	18	269 (267)	310 (386)	
LR		S	LB	TP	LK	KH	LJ		W	T	Weight (kg)
113±1		42	114.3	M16x32	96	$37^{0}_{-0.2}$	0.3±0.75		12	8	32 (42)

3. Cables

3.1 Cable Models

3.1.1 Encoder Cable Model

S6– L– P 0 0 0 – 3.0 – T

Code	Cable Series
S6	S6 series

Code	Definition
L	Line

Code	Cable Type
P	Encoder cable

Code	Terminal Type
0	DB9 (IS620/IS810)
1	USB (SV820/SV660)

Code	Encoder Type
0	2500-PPR encoder
1	18-/20-/23-bit incremental encoder
2	Multi-turn absolute encoder

Code	Special Requirement
None	Fixed cable
T	Flexible cable
TS	Oil-resistant shielded flexible cable

Code	Cable Length
3.0	3.0 m
5.0	5.0 m
10.0	10.0 m

Code	Interface Type
0	AMP
1	MIL-SPEC connector
2	CHOGORI connector
4	Connector with front outlet
5	Connector with rear outlet

Figure 3-1 Description of encoder cable model

3.1.2 Power Cable Model

S6– L– M 0 0 0 – 3.0 – T

Code	Cable Series
S6	S6 series

Code	Definition
L	Line

Code	Cable Type
M	Power cable without brake
B	Power cable with brake

Code	Terminal Type
0	U-type cable lug (IS620)
1	Pin-type cable lug (SV820/SV660/IS810)

Code	Conductor Specification
0	18 AWG / 20 AWG
1	14 AWG
2	12 AWG

Code	Special Requirement
None	Fixed cable
T	Flexible cable
TS	Oil-resistant shielded flexible cable

Code	Cable Length
3.0	3.0 m
5.0	5.0 m
10.0	10.0 m

Code	Interface Type
0	AMP
1	Aviation connector (9-pin)
2	Aviation connector (6-pin)
4	Middle series aviation connector (4-pin)
5	Middle series aviation connector (5-pin)
6	SM-PW series aviation connector (6-pin)
7	SDC-061 series aviation connector (front outlet)
8	SDC-06T series aviation connector (rear outlet)

Figure 3-2 Description of power cable model

- Cable models ending with "-T" are flexible cables fit for cable carriers. For example, model number "S6-L-P120-**" represents fixed cables; model number "S6-L-P120-**-T" represents flexible cables.
- Cable models ending with "-TS" are oil-resistant shielded flexible cables. Inovance encoder cables are shielded cables.

3.2 Cables Types

1 Fixed cables

Do not bend or move fixed cables during use. Bending or moving fixed cables may break cables and lead to a series of cable-related faults such as poor contact. Secure fixed cables through fixed binding and reserve certain bending radius to avoid stress on cables.

2 Flexible cables

Flexible cables can move along with cable carriers without high risk of abrasion.

- Do not twine or twist cables inside the cable carrier.
- Ensure cables can move within the bending radius. Do not move cables by force. A relative movement between cables or between the cable and the guiding device must be available.
- Do not fix or bundle cables inside the cable carrier. Cables can be bundled and fixed only at the two unmovable ends of the cable carrier.

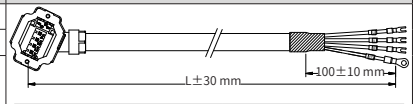
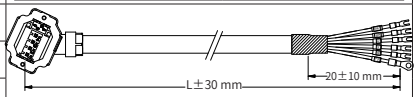
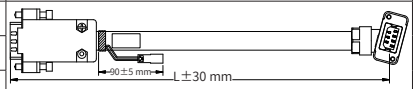
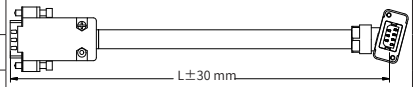
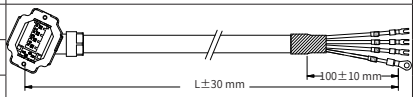
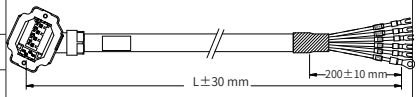
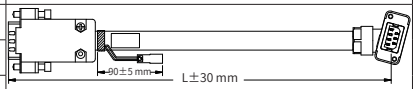
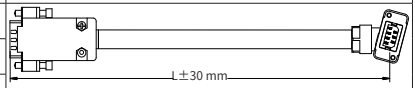
3 Oil-resistant shielded flexible cables

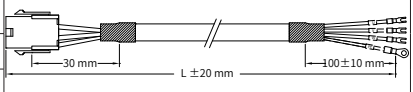
Oil-resistant shielded flexible cables apply to applications requiring shielded power cables, such as machine tools, cutting fluids, and cutting compounds.

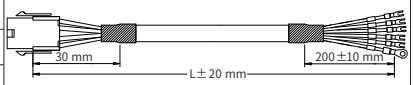
- S6-C24 cable kit is required for terminal-type motor encoder cables longer than 25 m. Contact Inovance sales staff for details on the cable length.
- For lead wire-type motor encoder cables longer than 25 m, contact Inovance sales staff.

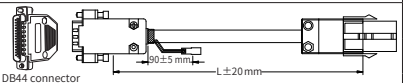
3.3 Selection of Motor Cables and Connectors

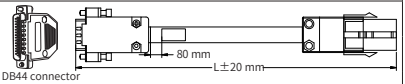
3.3.1 IS620 Series Servo Drives

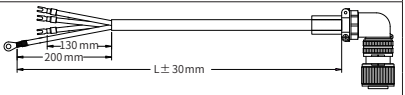
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th colspan="2">Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="12">40
60
80</td><td rowspan="12">Front outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M007-3.0</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-M007-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M007-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B007-3.0</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-B007-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B007-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P024-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P024-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P024-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P014-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P014-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P014-10.0</td><td>10000</td></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="12">40
60
80</td><td rowspan="12">Rear outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M008-3.0</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-M008-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M008-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B008-3.0</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-B008-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B008-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P025-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P025-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P025-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P015-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P015-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P015-10.0</td><td>10000</td></tr>
</table>

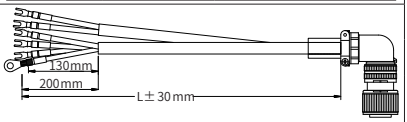
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 lead wire-type motors</td><td rowspan="12">40
60
80</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M00-3.0</td><td>3000</td><td rowspan="3"> 

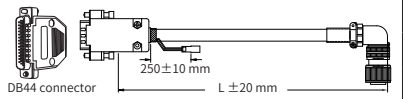
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M00-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M00-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B00-3.0</td><td>3000</td><td rowspan="3"> 

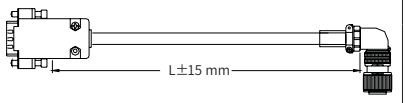
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B00-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B00-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P20-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P20-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P20-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P00-3.0</td><td>3000</td><td rowspan="3"> 

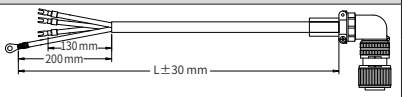
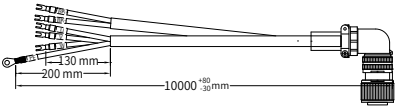
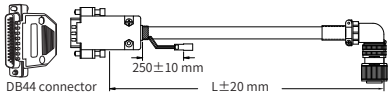
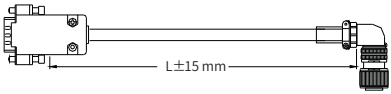
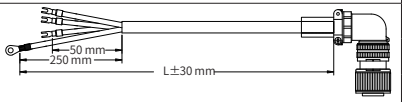
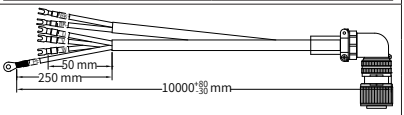
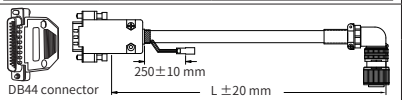
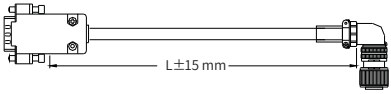
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P00-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P00-10.0</td><td>10000</td></tr>
<tr><td rowspan="12">MS1H2 and MS1H3 connector-type motors</td><td rowspan="12">100
130</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M11-3.0</td><td>3000</td><td rowspan="3"> 

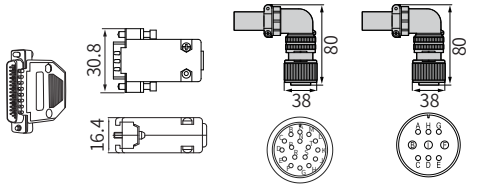
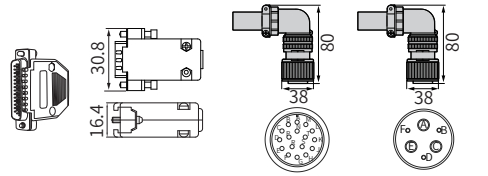
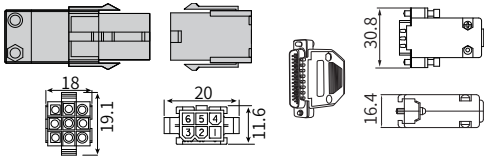
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-M11-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M11-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B11-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-B11-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B11-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P21-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P21-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P21-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P01-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P01-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P01-10.0</td><td>10000</td></tr>
</table>

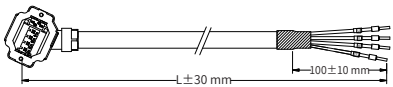
Motor Model	Flange Size	Cable Name	Cable Model	Length (mm)	Outline Drawing of the Cable
MS1H3 connector-type motors (2.9 kW)	180	Power cable (without brake)	S6-L-M12-3.0	3000	
			S6-L-M12-5.0	5000	
			S6-L-M12-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 9.5 mm; Flexible Cable: 10.2 mm; Shielded Flexible Cable: 10.6 mm
		Power cable (with brake)	S6-L-B12-3.0	3000	
			S6-L-B12-5.0	5000	
			S6-L-B12-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 9.5 mm; Flexible Cable: 10.2 mm; Shielded Flexible Cable: 10.6 mm
		Absolute encoder cable	S6-L-P21-3.0	3000	
			S6-L-P21-5.0	5000	
			S6-L-P21-10.0	10000	The outer diameter of the sheath is 6.0 mm.
		Incremental encoder cable	S6-L-P01-3.0	3000	
			S6-L-P01-5.0	5000	
			S6-L-P01-10.0	10000	The outer diameter of the sheath is 6.0 mm.
MS1H3 connector-type motors (4.4 kW and above)	180	Power cable (without brake)	S6-L-M22-3.0	3000	
			S6-L-M22-5.0	5000	
			S6-L-M22-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 12.2 mm; Flexible Cable: 12.5 mm; Shielded Flexible Cable: 13.2 mm
		Power cable (with brake)	S6-L-B22-3.0	3000	
			S6-L-B22-5.0	5000	
			S6-L-B22-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 12.2 mm; Flexible Cable: 12.5 mm; Shielded Flexible Cable: 13.2 mm
		Absolute encoder cable	S6-L-P21-3.0	3000	
			S6-L-P21-5.0	5000	
			S6-L-P21-10.0	10000	The outer diameter of the sheath is 6.0 mm.
		Incremental encoder cable	S6-L-P01-3.0	3000	
			S6-L-P01-5.0	5000	
			S6-L-P01-10.0	10000	The outer diameter of the sheath is 6.0 mm.

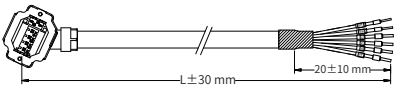
Applicable Motor Model	Connector Kit	Outline Drawing and Dimensions
MS1H2	S6-C2	 DB44 connector; DB9 connector; 3108E20-29S aviation connector; 3108E20-18S aviation connector
MS1H3/MS1V3 (1.8 kW and below)	S6-C2	
MS1H3 (2.9 kW and above)	S6-C3	 DB44 connector; DB9 connector; 3108E20-29S aviation connector; 3108E20-22S aviation connector
MS1H1/MS1H4 lead wire-type (Z-S) motors	S6-C1	 9-pin connector; Pin base; DB44 conector; DB9 connector

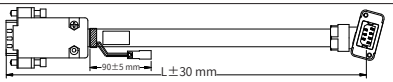
NOTE

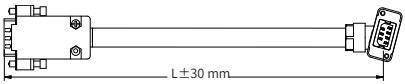
◆ Connector kits are needed only when customized cables are used.

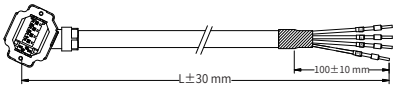
3.3.2 IS810N-INT Series Servo Drives

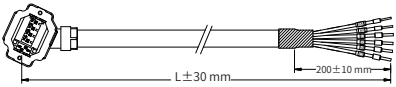
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th colspan="2">Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="12">40
60
80</td><td rowspan="6">Front outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M107-3.0</td><td>3000</td><td rowspan="3"> 

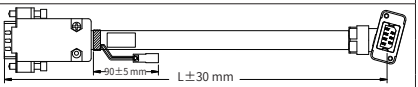
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M107-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B107-3.0</td><td>3000</td><td rowspan="3"> 

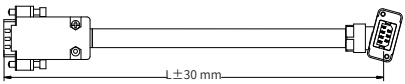
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B107-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Absolute encoder cable</td><td>S6-L-P024-3.0</td><td>3000</td><td rowspan="2"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P024-5.0</td><td>5000</td></tr>
<tr><td rowspan="2">Incre-mental encoder cable</td><td>S6-L-P014-3.0</td><td>3000</td><td rowspan="2"> 

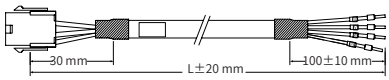
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P014-5.0</td><td>5000</td></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="12">40
60
80</td><td rowspan="6">Rear outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M108-3.0</td><td>3000</td><td rowspan="3"> 

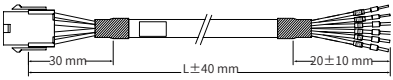
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M108-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B108-3.0</td><td>3000</td><td rowspan="3"> 

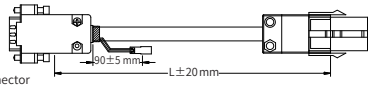
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B108-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Absolute encoder cable</td><td>S6-L-P025-3.0</td><td>3000</td><td rowspan="2"> 

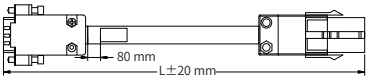
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P025-5.0</td><td>5000</td></tr>
<tr><td rowspan="2">Incre-mental encoder cable</td><td>S6-L-P015-3.0</td><td>3000</td><td rowspan="2"> 

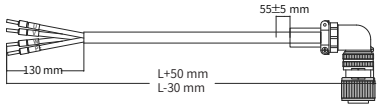
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P015-5.0</td><td>5000</td></tr>
</table>

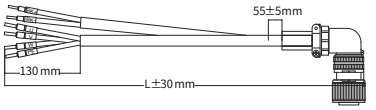
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="15">MS1H1 and MS1H4 lead wire-type motors</td><td rowspan="15">40
60
80</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M100-3.0</td><td>3000</td><td rowspan="3"> 

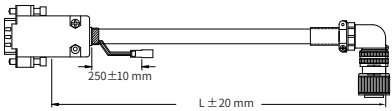
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-M100-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M100-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B100-3.0</td><td>3000</td><td rowspan="3"> 

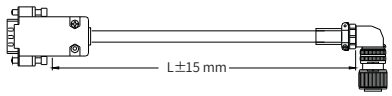
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
6.5 mm | 6.5 mm | 6.5 mm</td></tr>
<tr><td>S6-L-B100-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B100-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P020-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P020-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P020-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P010-3.0</td><td>3000</td><td rowspan="3"> 

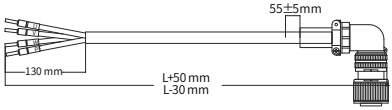
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P010-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P010-10.0</td><td>10000</td></tr>
<tr><td rowspan="15">MS1H2 and MS1H3 connector-type motors</td><td rowspan="15">100
130</td><td rowspan="3">Power cable (motor without brake)</td><td>S6-L-M111-3.0</td><td>3000</td><td rowspan="3"> 

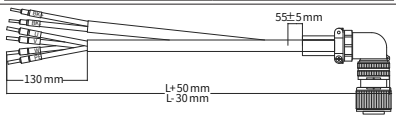
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
9.5 mm | 10.2 mm | 10.6 mm</td></tr>
<tr><td>S6-L-M111-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M111-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (motor with brake)</td><td>S6-L-B111-3.0</td><td>3000</td><td rowspan="3"> 

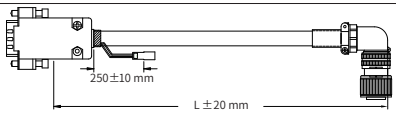
Outer Diameter of the Sheath
Fixed Cable | Flexible Cable | Shielded Flexible Cable
9.5 mm | 10.2 mm | 10.6 mm</td></tr>
<tr><td>S6-L-B111-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B111-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

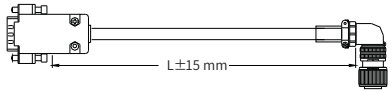
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

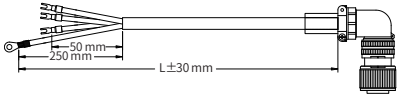
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
</table>

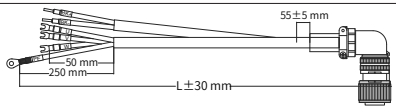
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="12">MS1H3 connector-type motors (2.9 kW)</td><td rowspan="12">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M112-3.0</td><td>3000</td><td rowspan="3"> 

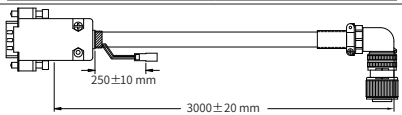
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-M112-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M112-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B112-3.0</td><td>3000</td><td rowspan="3"> 

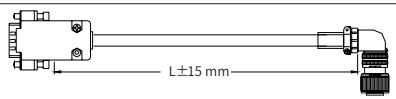
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-B112-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B112-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

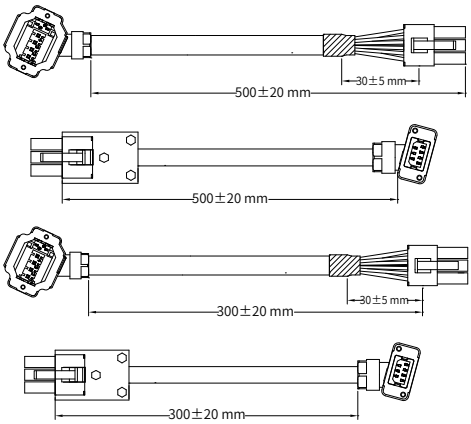
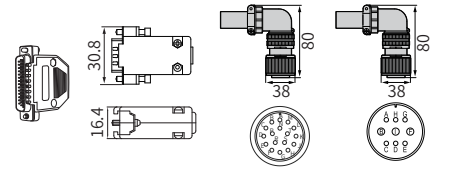
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
<tr><td rowspan="12">MS1H3 connector-type motors (4.4 kW and above)</td><td rowspan="12">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M022-3.0</td><td>3000</td><td rowspan="3"> 

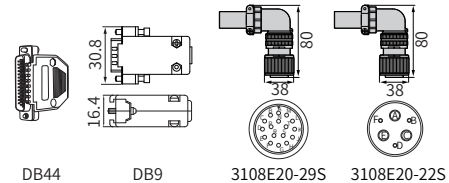
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr></table></td></tr>
<tr><td>S6-L-M022-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M022-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B022-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr></table></td></tr>
<tr><td>S6-L-B022-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B022-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
</table>

<table>
<tr><th>Applicable Motor Model</th><th>Connector Kit</th><th>Outline Drawing and Dimensions</th></tr>
<tr><td>MS1H1-*******-A3***
MS1H4-*******-A3***
(100 W to 1 kW)</td><td>S6-C23
S6-C24</td><td> 
</td></tr>
<tr><td>MS1H2-*******-A3***
(1.0 kW to 2.5 kW)</td><td>S6-C2</td><td rowspan="3"> 

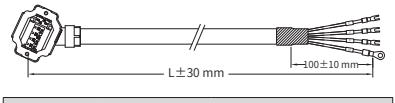
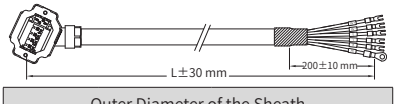
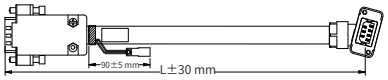
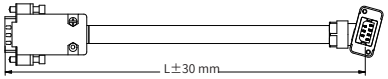
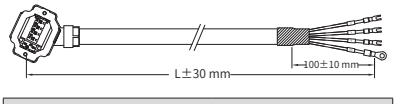
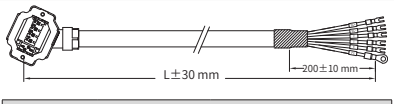
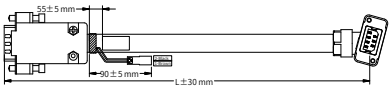
DB44 connector　DB9 connector　3108E20-29S aviation connector　3108E20-18S aviation connector</td></tr>
<tr><td>MS1H2-*******-A3***
(3.0 kW to 5.0 kW)</td><td>S6-C2</td></tr>
<tr><td>MS1H3-*******-A3***
(850 W to 1.8 kW)</td><td>S6-C2</td></tr>
<tr><td>MS1H3-*******-A3***
(2.9 kW to 7.5 kW)</td><td>S6-C3</td><td> 

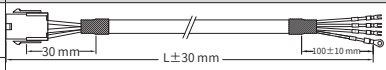
DB44 connector　DB9 connector　3108E20-29S aviation connector　3108E20-22S aviation connector</td></tr>
</table>

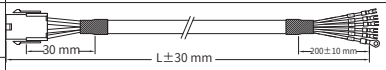
NOTE

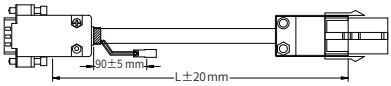
◆ Connector kits are needed only when customized cables are used.

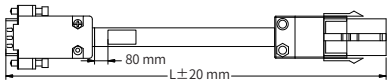
3.3.3 IS810P Series Servo Drives

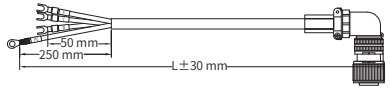
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th colspan="2">Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="15">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="15">40
60
80</td><td rowspan="6">Front outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M007-3.0-810P</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable: 6.5 mm | Flexible Cable: 6.5 mm | Shielded Flexible Cable: 6.5 mm</td></tr>
<tr><td>S6-L-M007-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M007-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B007-3.0-810P</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable: 6.5 mm | Flexible Cable: 6.5 mm | Shielded Flexible Cable: 6.5 mm</td></tr>
<tr><td>S6-L-B007-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B007-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P024-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P024-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P024-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P014-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P014-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P014-10.0</td><td>10000</td></tr>
<tr><td rowspan="15">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="15">40
60
80</td><td rowspan="6">Rear outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M008-3.0-810P</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable: 6.5 mm | Flexible Cable: 6.5 mm | Shielded Flexible Cable: 6.5 mm</td></tr>
<tr><td>S6-L-M008-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M008-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B008-3.0-810P</td><td>3000</td><td rowspan="3"> 
Outer Diameter of the Sheath
Fixed Cable: 6.5 mm | Flexible Cable: 6.5 mm | Shielded Flexible Cable: 6.5 mm</td></tr>
<tr><td>S6-L-B008-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B008-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P025-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P025-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P025-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P015-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P015-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P015-10.0</td><td>10000</td></tr>
</table>

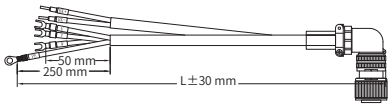
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="14">MS1H1 and MS1H4 lead wire-type motors</td><td rowspan="14">40
60
80</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M000-3.0-810P</td><td>3000</td><td rowspan="3"> 

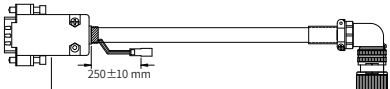
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M000-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M000-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B000-3.0-810P</td><td>3000</td><td rowspan="3"> 

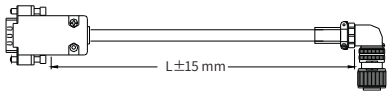
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B000-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B000-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P020-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P020-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P020-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P010-3.0</td><td>3000</td><td rowspan="3"> 

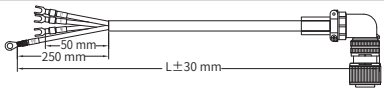
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P010-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P010-10.0</td><td>10000</td></tr>
<tr><td rowspan="14">MS1H2 and MS1H3 connector-type motors</td><td rowspan="14">100
130</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M011-3.0-810P</td><td>3000</td><td rowspan="3"> 

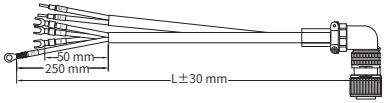
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M011-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M011-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B011-3.0-810P</td><td>3000</td><td rowspan="3"> 

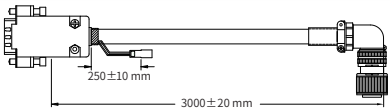
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B011-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B011-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

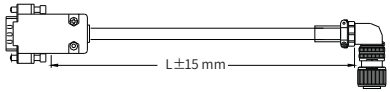
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

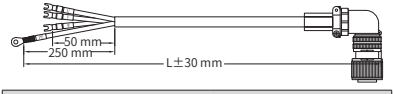
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
</table>

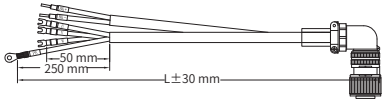
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="10">MS1H3 connector-type motors (2.9 kW)</td><td rowspan="10">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M012-3.0-810P</td><td>3000</td><td rowspan="3"> 

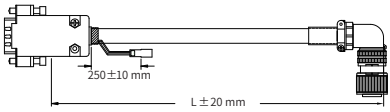
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M012-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M012-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B012-3.0-810P</td><td>3000</td><td rowspan="3"> 

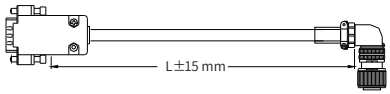
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B012-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B012-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

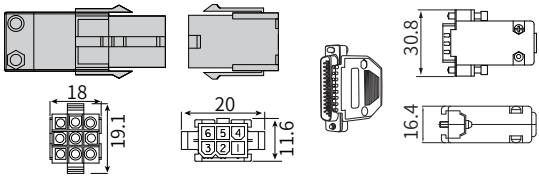
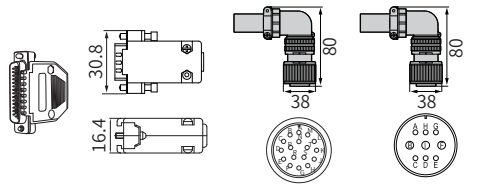
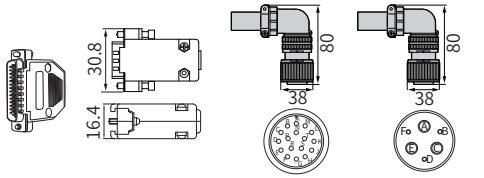
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
<tr><td rowspan="10">MS1H3 connector-type motors (4.4 kW and above)</td><td rowspan="10">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M022-3.0-810P</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr></table></td></tr>
<tr><td>S6-L-M022-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-M022-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B022-3.0-810P</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr></table></td></tr>
<tr><td>S6-L-B022-5.0-810P</td><td>5000</td></tr>
<tr><td>S6-L-B022-10.0-810P</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P021-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P021-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P021-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P011-3.0</td><td>3000</td><td rowspan="3"> 

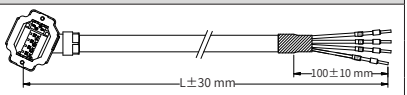
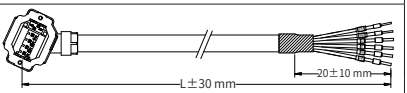
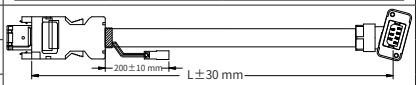
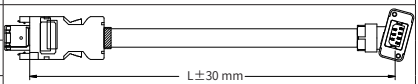
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P011-10.0</td><td>10000</td></tr>
</table>

Applicable Motor	Connector Kit	Outline Drawing and Dimensions
MS1H1/MS1H4 lead wire-type (Z-S) motors	S6-C1	 9-pin connector　Pin base　DB44 connector　DB9 connector
MS1H2 MS1H3 (1.8 kW and below)	S6-C2	 DB44 connector　DB9 connector　3108E20-29S aviation connector　3108E20-18S aviation connector
MS1MH3 (2.9 kW and above)	S6-C3	 DB44 connector　DB9 connector　3108E20-29S aviation connector　3108E20-22S aviation connector

NOTE

◆ Connector kits are needed only when customized cables are used.

3.3.4 SV820N Series Servo Drives

<table>
<tr><th>Motor Model</th><th>Flange Size</th><th colspan="2">Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="10">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="10">40
60
80</td><td rowspan="5">Front outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M107-3.0</td><td>3000</td><td rowspan="3"> 
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M107-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B107-3.0</td><td>3000</td><td rowspan="3"> 
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B107-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Absolute encoder cable</td><td>S6-L-P124-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P124-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P124-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Incre-mental encoder cable</td><td>S6-L-P114-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P114-3.0</td><td>5000</td></tr>
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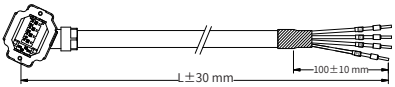
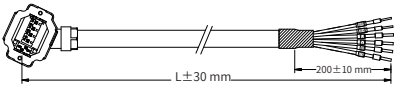
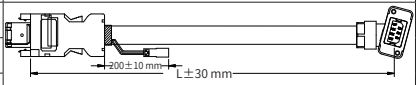
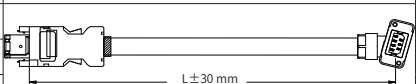
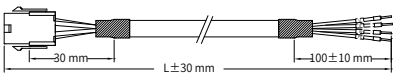
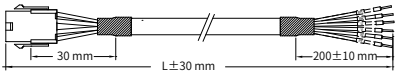
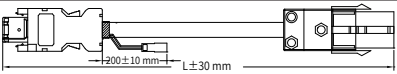
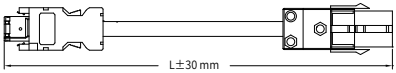
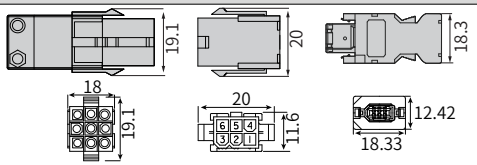
<tr><td rowspan="10">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="10">40
60
80</td><td rowspan="5">Rear outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M108-3.0</td><td>3000</td><td rowspan="3"> 
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M108-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B108-3.0</td><td>3000</td><td rowspan="3"> 
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B108-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Absolute encoder cable</td><td>S6-L-P125-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P125-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P125-10.0</td><td>10000</td></tr>
<tr><td rowspan="2">Incre-mental encoder cable</td><td>S6-L-P115-3.0</td><td>3000</td><td rowspan="3"> 
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P115-3.0</td><td>5000</td></tr>
<tr><td>S6-L-P115-3.0</td><td>10000</td></tr>
</table>

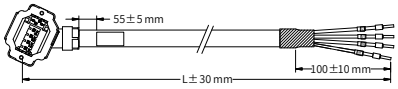
Motor Model	Flange Size	Cable Name	Cable Model	Length (mm)	Outline Drawing of the Cable
MS1H1 and MS1H4 lead wire-type motors	40 60 80	Power cable (without brake)	S6-L-M100-3.0	3000	
			S6-L-M100-5.0	5000	
			S6-L-M100-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 6.5 mm; Flexible Cable: 6.5 mm; Shielded Flexible Cable: 6.5 mm
		Power cable (with brake)	S6-L-B100-3.0	3000	
			S6-L-B100-5.0	5000	
			S6-L-B100-10.0	10000	Outer Diameter of the Sheath Fixed Cable: 6.5 mm; Flexible Cable: 6.5 mm; Shielded Flexible Cable: 6.5 mm
		Absolute encoder cable	S6-L-P120-3.0	3000	
			S6-L-P120-5.0	5000	
			S6-L-P120-10.0	10000	The outer diameter of the sheath is 6.0 mm.
		Incremental encoder cable	S6-L-P110-3.0	3000	
			S6-L-P110-5.0	5000	
			S6-L-P110-10.0	10000	The outer diameter of the sheath is 6.0 mm.

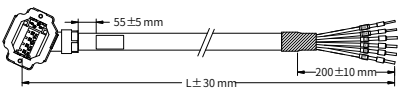
Applicable Motor	Connector Kit	Outline Drawing and Dimensions
MS1H1/MS1H4 lead wire-type (Z-S) motors	S6-C26	

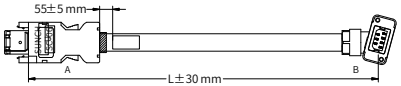
NOTE

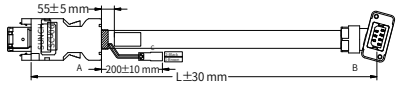
◆ Connector kits are needed only when customized cables are used.

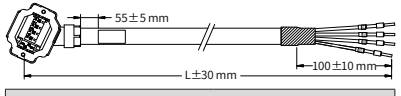
3.3.5 SV660P/N Series Servo Drives

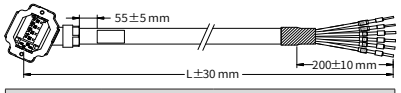
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th colspan="2">Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="20">MS1H1 and MS1H4 terminal-type motors</td><td rowspan="10">40
60
80</td><td rowspan="6">Front outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M107-3.0</td><td>3000</td><td rowspan="3"> 

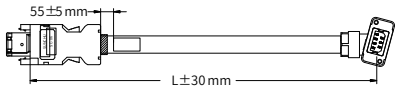
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M107-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B107-3.0</td><td>3000</td><td rowspan="3"> 

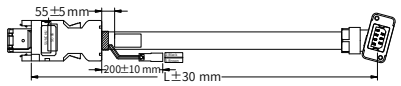
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B107-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B107-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P114-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P114-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P114-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P124-3.0</td><td>3000</td><td rowspan="3"> 

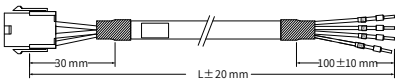
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P124-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P124-10.0</td><td>10000</td></tr>
<tr><td rowspan="10">40
60
80</td><td rowspan="6">Rear outlet</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M108-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M108-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B108-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B108-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B108-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incre-mental encoder cable</td><td>S6-L-P115-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P115-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P115-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P125-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P125-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P125-10.0</td><td>10000</td></tr>
</table>

<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="12">MS1H1 and MS1H4 lead wire-type motors</td><td rowspan="12">40
60
80</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M100-3.0</td><td>3000</td><td rowspan="3"> 

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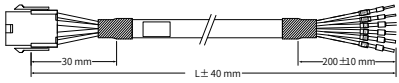
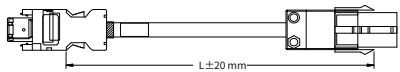
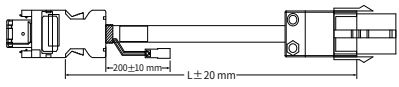
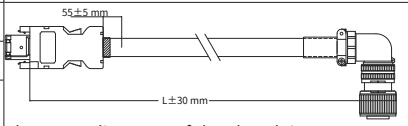
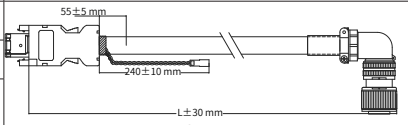
<tr><td>S6-L-M100-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M100-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B100-3.0</td><td>3000</td><td rowspan="3"> 

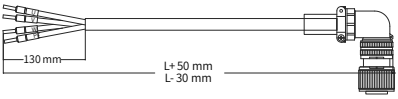
<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>6.5 mm</td><td>6.5 mm</td><td>6.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B100-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B100-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Incremental encoder cable</td><td>S6-L-P110-3.0</td><td>3000</td><td rowspan="3"> 

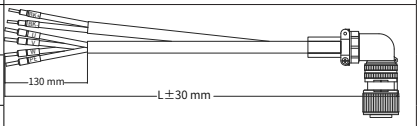
The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P110-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P110-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P120-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P120-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P120-10.0</td><td>10000</td></tr>
<tr><td rowspan="6">MS1H2 and MS1H3 motors</td><td rowspan="6">100
130
180</td><td rowspan="3">Incremental encoder cable</td><td>S6-L-P111-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P111-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P111-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Absolute encoder cable</td><td>S6-L-P121-3.0</td><td>3000</td><td rowspan="3"> 

The outer diameter of the sheath is 6.0 mm.</td></tr>
<tr><td>S6-L-P121-5.0</td><td>5000</td></tr>
<tr><td>S6-L-P121-10.0</td><td>10000</td></tr>
</table>

<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="6">MS1H2 motors (3 kW and below) and MS1H3 motors (1.8 kW and below)</td><td rowspan="6">100
130</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M111-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-M111-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M111-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B111-3.0</td><td>3000</td><td rowspan="3"> 

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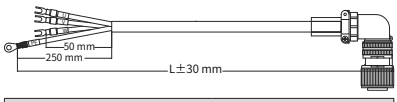
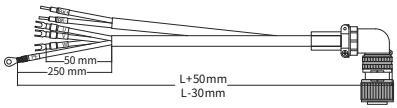
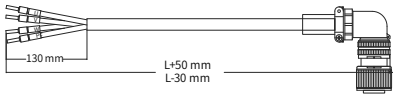
<tr><td>S6-L-B111-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B111-10.0</td><td>10000</td></tr>
<tr><td rowspan="6">MS1H2 motors (4 kW/ 5 kW)</td><td rowspan="6">130</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M011-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-M011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M011-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B011-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>10.5 mm</td><td>11.1 mm</td><td>11.5 mm</td></tr></table></td></tr>
<tr><td>S6-L-B011-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B011-10.0</td><td>10000</td></tr>
<tr><td rowspan="6">MS1H3 motors (2.9 kW)</td><td rowspan="6">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M112-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-M112-5.0</td><td>5000</td></tr>
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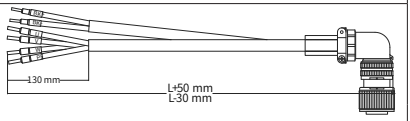
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B112-3.0</td><td>3000</td><td rowspan="3"> 

<table><tr><th colspan="3">Outer Diameter of the Sheath</th></tr><tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr><tr><td>9.5 mm</td><td>10.2 mm</td><td>10.6 mm</td></tr></table></td></tr>
<tr><td>S6-L-B112-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B112-10.0</td><td>10000</td></tr>
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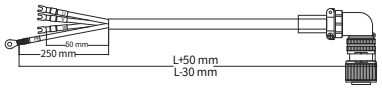
<table>
<tr><th>Motor Model</th><th>Flange Size</th><th>Cable Name</th><th>Cable Model</th><th>Length (mm)</th><th>Outline Drawing of the Cable</th></tr>
<tr><td rowspan="6">MS1H3 motors (4.4 kW and above)</td><td rowspan="6">180</td><td rowspan="3">Power cable (without brake)</td><td>S6-L-M022-3.0</td><td>3000</td><td rowspan="3"> 

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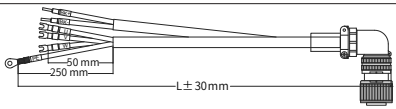
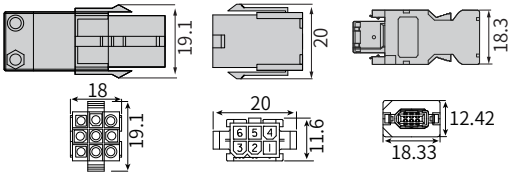
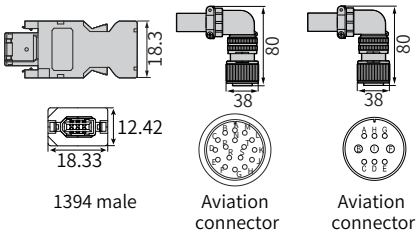
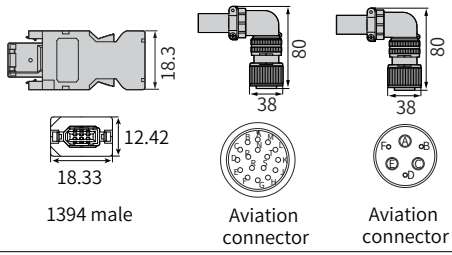
<tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr>
<tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr>
</table></td></tr>
<tr><td>S6-L-M022-5.0</td><td>5000</td></tr>
<tr><td>S6-L-M022-10.0</td><td>10000</td></tr>
<tr><td rowspan="3">Power cable (with brake)</td><td>S6-L-B022-3.0</td><td>3000</td><td rowspan="3"> 

<table>
<tr><th colspan="3">Outer Diameter of the Sheath</th></tr>
<tr><th>Fixed Cable</th><th>Flexible Cable</th><th>Shielded Flexible Cable</th></tr>
<tr><td>12.2 mm</td><td>12.5 mm</td><td>13.2 mm</td></tr>
</table></td></tr>
<tr><td>S6-L-B022-5.0</td><td>5000</td></tr>
<tr><td>S6-L-B022-10.0</td><td>10000</td></tr>
</table>

Applicable Motor	Connector Kit	Outline Drawing and Dimensions
MS1H1/MS1H4 lead wire-type (Z-S) motors	S6-C26	
MS1H2/MS1H3 (1.8 kW and below)	S6-C29	
MS1H3 (2.9 kW and above)	S6-C39	

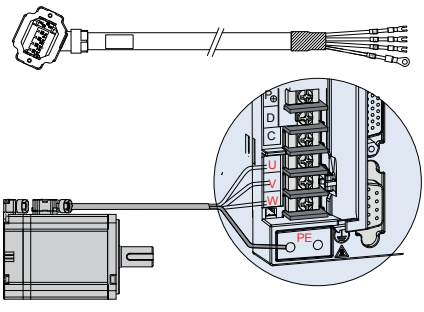
NOTE

◆ Connector kits are needed only when customized cables are used.

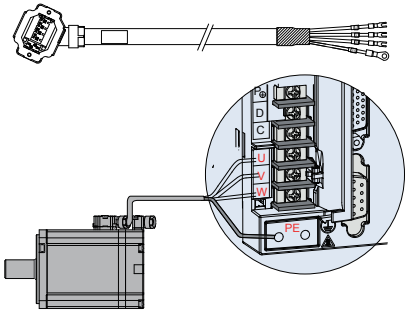
3.4 Cable Connections

3.4.1 Connecting Motor Power Cables

1 Connecting to IS620 series servo drives



Motor cable outlet direction: front outlet



Motor cable outlet direction: rear outlet

Figure 3-3 Connection between IS620 series servo drive and servo motor

Table 3-1 Power cable connector of terminal-type servo motors (motor side)

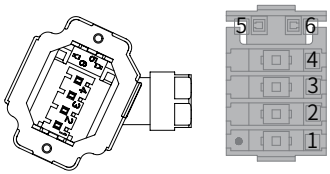
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout			
		Pin No.	Signal Name		Color
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	 SDC-06T (manufacturer: JONHON)	1	PE		Yellow/ Green
		2	W		Red
		3	V		Black
		4	U		White
		5	Brake	+	Brown
		6	Brake	-	Blue

Table 3-2 Power cable connector of connector-type servo motors (motor side)

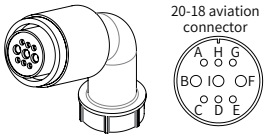
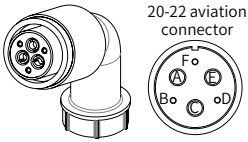
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout		
		New Structure		Color
		Pin No.	Signal Name	
Connector-type motors: 100 130	 MIL-DTL-5015 series 3108E20-18S aviation connector	B	U	Blue
		I	V	Black
		F	W	Red
		G	PE	Yellow/Green
		C	Brake (+)	-
		E	Brake (-)	-

Table 3-3 Power cable connector of connector-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Pin Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 180	 MIL-DTL-5015 series 3108E20-22S aviation connector	A	U	Blue
		C	V	Black
		E	W	Red
		F	PE	Yellow/Green
		B	Brake (-)	-
		D	Brake (+)	

NOTE

- The flange size refers to the width of the mounting flange.
- Power cable colors are subject to the actual cables. Cable colors mentioned in this user guide all refer to Inovance cables.

2 Connecting to IS810N-INT series servo drives

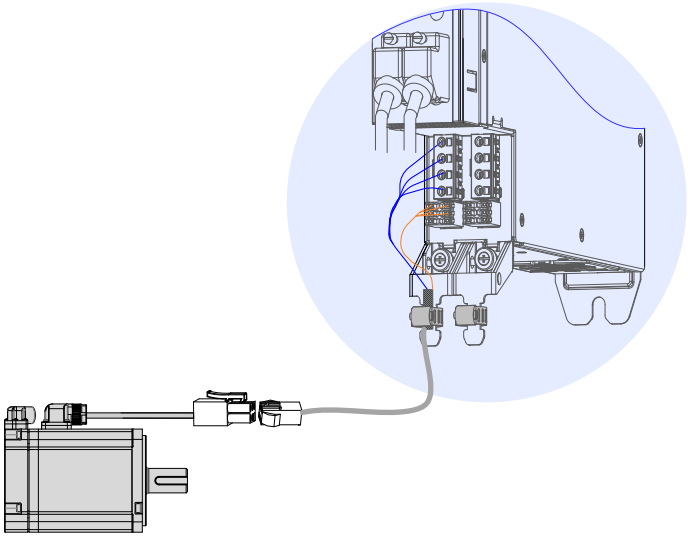


Figure 3-4 Connection between IS810-INT series servo drive and servo motor

Table 3-4 Power cable connector of terminal-type and lead wire-type servo motors (motor side)

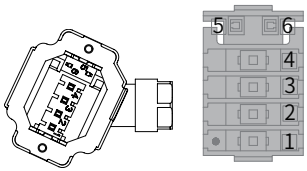
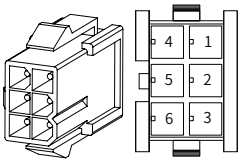
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout			
		Pin No.	Signal Name		Color
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	 SDC-06T (manufacturer: JONHON)	1	PE		Yellow/ Green
		2	W		Red
		3	V		Black
		4	U		White
		5	Brake	Polarity insensitive	Brown
		6	Brake		Blue
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	 Black 6-pin connector Recommendation: Plastic housing: MOLEX-50361736 Terminal: MOLEX-39000061	1	U		White
		2	V		Black
		4	W		Red
		5	PE		Yellow/ Green
		3	Brake (polarity insensitive)		-
		6			

Table 3-5 Power cable connector of connector-type servo motors (motor side)

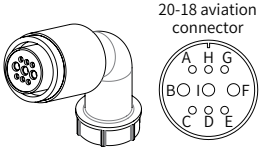
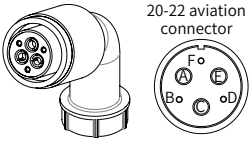
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 100 130	 MIL-DTL-5015 series 3108E20-18S aviation connector	B	U	Blue
		I	V	Black
		F	W	Red
		G	PE	Yellow/Green
		C	Brake (+)	-
		E	Brake (-)	-

Table 3-6 Power cable connector of connector-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Pin Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 180	 MIL-DTL-5015 series 3108E20-22S aviation connector	A	U	Blue
		C	V	Black
		E	W	Red
		F	PE	Yellow/Green
		B	Brake (-)	-
		D	Brake (+)	

NOTE

- The flange size refers to the width of the mounting flange.
- Power cable colors are subject to the actual cables. Cable colors mentioned in this user guide all refer to Inovance cables.

3 Connecting to IS810P series servo drives

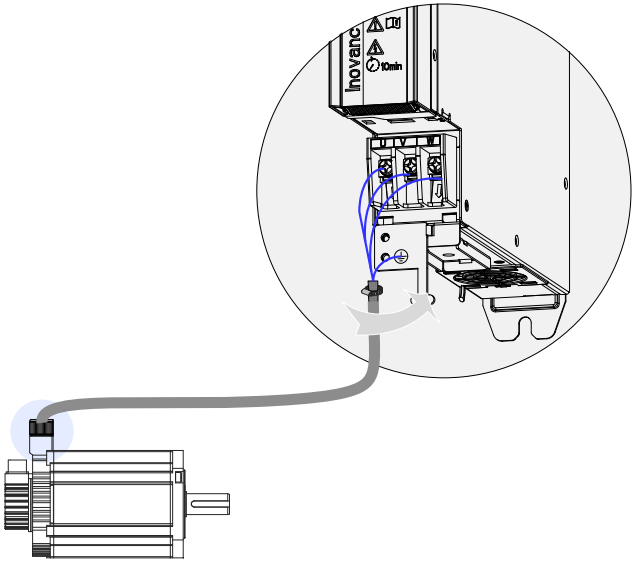


Figure 3-5 Connection between IS810P series servo drive and servo motor

Table 3-7 Power cable connectors of terminal-type and lead wire-type servo motors (motor side)

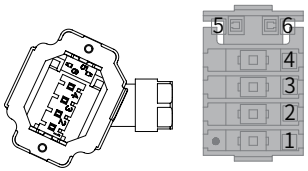
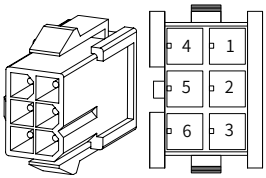
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout			
		Pin No.	Signal Name		Color
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	 SDC-06T (manufacturer: JONHON)	1	PE		Yellow/ Green
		2	W		Red
		3	V		Black
		4	U		White
		5	Brake	+	Brown
		6	Brake	-	Blue
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	 Black 6-pin connector Recommendation: Plastic housing: MOLEX-50361736 Terminal: MOLEX-39000061	1	U		White
		2	V		Black
		4	W		Red
		5	PE		Yellow/ Green
		3	Brake (polarity insensitive)		-
		6			

Table 3-8 Power cable connector of connector-type servo motors (motor side)

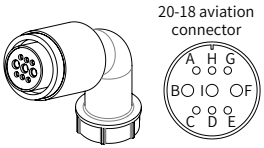
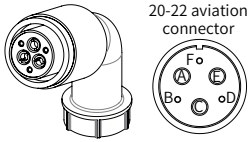
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout		
		New Structure		Color
		Pin No.	Signal Name	
Connector-type motors: 100 130	 MIL-DTL-5015 series 3108E20-18S aviation connector	B	U	Blue
		I	V	Black
		F	W	Red
		G	PE	Yellow/Green
		C	Brake (+)	-
		E	Brake (-)	-

Table 3-9 Power cable connector of connector-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Pin Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 180	 MIL-DTL-5015 series 3108E20-22S aviation connector	A	U	Blue
		C	V	Black
		E	W	Red
		F	PE	Yellow/Green
		B	Brake (-)	-
		D	Brake (+)	

NOTE

- The flange size refers to the width of the mounting flange.
- Power cable colors are subject to the actual cables. Cable colors mentioned in this user guide all refer to Inovance cables.

4 Connecting to SV820N series servo drives

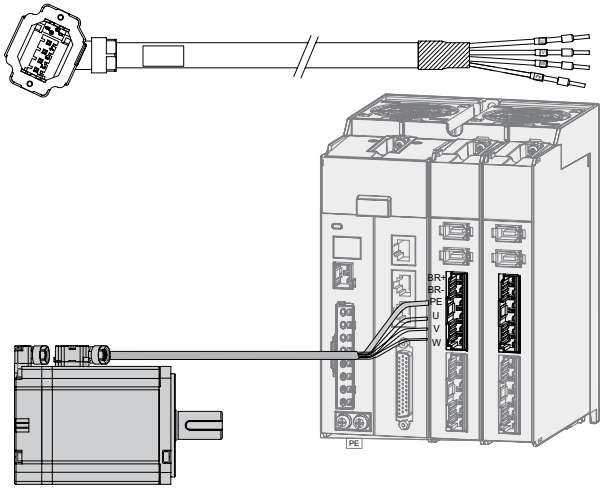
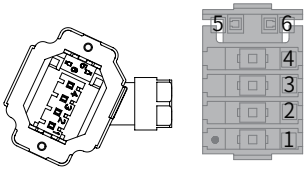
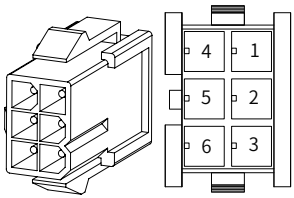


Figure 3-6 Connection between SV820N series servo drive and servo motor

Table 3-10 Power cable connectors of lead wire-type and terminal-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout			
		Pin No.	Signal Name		Color
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	 SDC-06T (manufacturer: JONHON)	1	PE		Yellow/ Green
		2	W		Red
		3	V		Black
		4	U		White
		5	Brake	+	Brown
		6	Brake	-	Blue
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	 Black 6-pin connector Recommendation: Plastic housing: MOLEX-50361736 Terminal: MOLEX-39000061	1	U		White
		2	V		Black
		4	W		Red
		5	PE		Yellow/ Green
		3	Brake	+	Brown
		6	Brake	-	Blue

5 Connecting to SV660 series servo drives

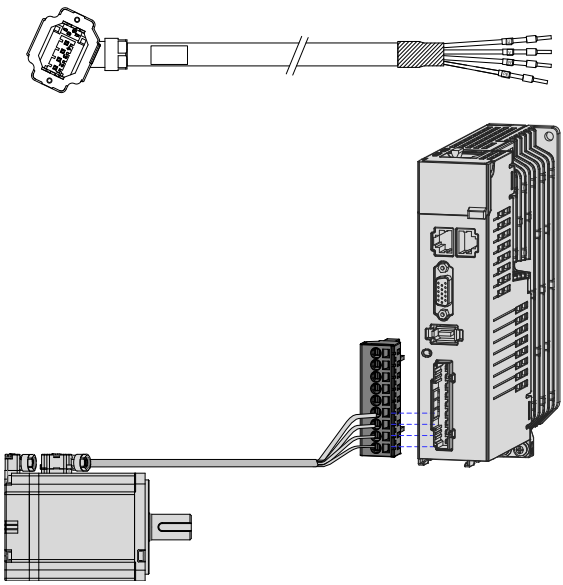
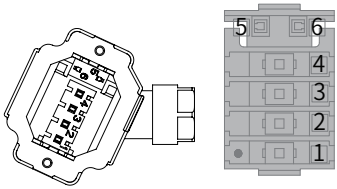


Figure 3-7 Connection between SV660 series servo drive and terminal-type servo motor

Table 3-11 Power cable connector of terminal-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout			
		Pin No.	Signal Name		Color
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	 SDC-06T (manufacturer: JONHON)	1	PE		Yellow/ Green
		2	W		Red
		3	V		Black
		4	U		White
		5	Brake	+	Brown
		6	Brake	-	Blue

NOTE

- The flange size refers to the width of the mounting flange.
- Power cable colors are subject to the actual cables. Cable colors mentioned in this user guide all refer to Inovance cables.

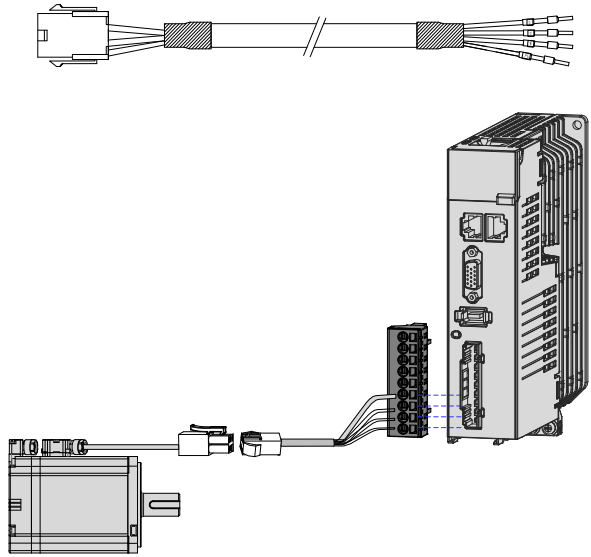


Figure 3-8 Connection between SV660 series servo drive and lead wire-type servo motor

Table 3-12 Power cable connector of lead wire-type servo motors (motor side)

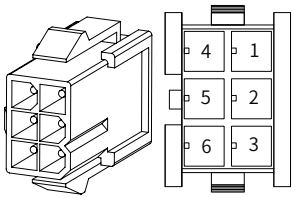
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout		
		Pin No.	Signal Name	Color
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	 Black 6-pin connector Recommendation: Plastic housing: MOLEX-50361736 Terminal: MOLEX-39000061	1	U	White
		2	V	Black
		4	W	Red
		5	PE	Yellow/ Green
		3	Brake (polarity insensitive)	-
		6		

Table 3-13 Power cable connector of connector-type servo motors (motor side)

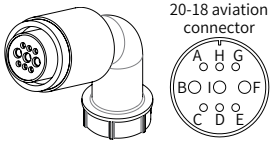
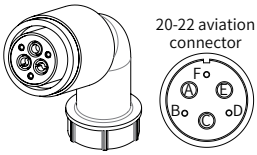
Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Pin Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 100 130	 MIL-DTL-5015 series 3108E20-18S aviation connector	B	U	Blue
		I	V	Black
		F	W	Red
		G	PE	Yellow/Green
		C	Brake (+)	-
		E	Brake (-)	-

Table 3-14 Power cable connector of connector-type servo motors (motor side)

Applicable Motor Flange Size [1]	Outline Drawing of the Connector	Terminal Layout		
		Pin No.	Signal Name	Color
Connector-type motors: 180	 MIL-DTL-5015 series 3108E20-22S aviation connector	A	U	Blue
		C	V	Black
		E	W	Red
		F	PE	Yellow/Green
		B	Brake (polarity insensitive)	-
		D		

NOTE

- The flange size refers to the width of the mounting flange.
- Power cable colors are subject to the actual cables. Cable colors mentioned in this user guide all refer to Inovance cables.

3.4.2 Connecting the Absolute Encoder

1 Connecting to IS620 series servo drives

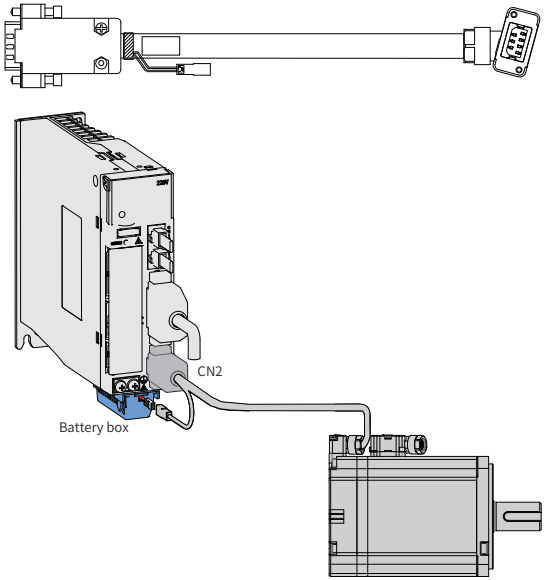


Figure 3-9 Connection between IS620 series servo drive and encoder

Table 3-15 Encoder cable connector of terminal-type servo motors

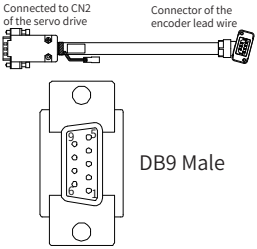
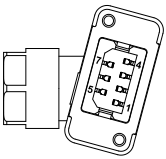
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	Servo drive side	 DB9 Male	1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side	 SDC-07T (manufacture: JONHON)	1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			3	DC+	Brown	Twisted pair
			4	DC-	Black	
			5	+5V	Red	Twisted pair
			6	0V	Orange	
			7	PE	-	-

Table 3-16 Encoder cable connector for of lead wire-type servo motors

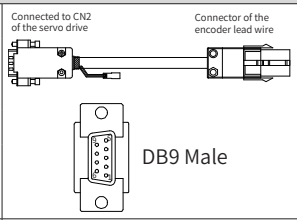
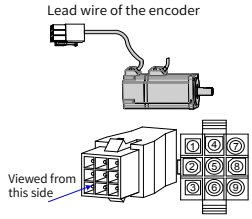
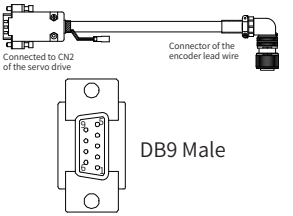
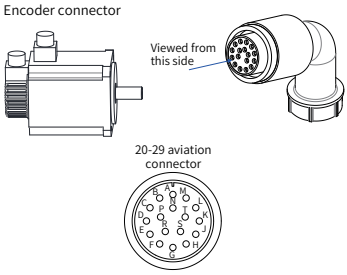
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side	 Recommendation: Plastic housing: AMP 172161-1; Terminal: AMP 770835-1	1	Battery (+)	Brown	-
			4	Battery (-)	Black	
			3	PS+	Blue	Twisted pair
			6	PS-	Purple	
			9	+5V	Red	-
			8	GND	Orange	
			7	Shield		

Table 3-17 Encoder cable connector of connector-type servo motors

Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Connector-type motors: 100 130 180	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		A	PS+	Blue	Twisted pair
			B	PS-	Purple	
			E	DC+	Brown	Twisted pair
			F	DC-	Black	
			G	+5V	Red	Twisted pair
			H	GND	Orange	
			J	Shield	-	-

2 Connecting to IS810N-INT Series Servo Drives

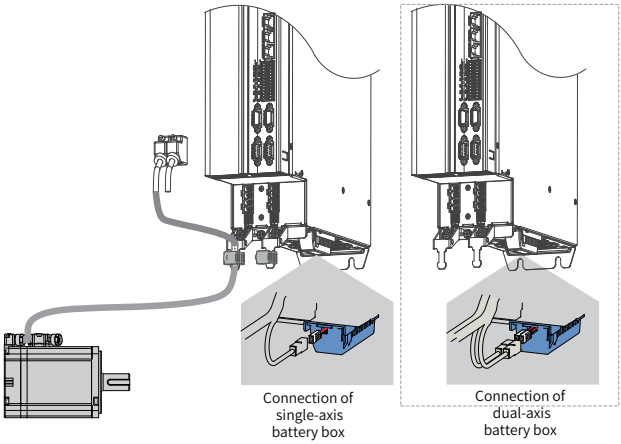


Figure 3-10 Connection between IS810-INT series servo drive and encoder

Table 3-18 Encoder cable connector of terminal-type servo motors

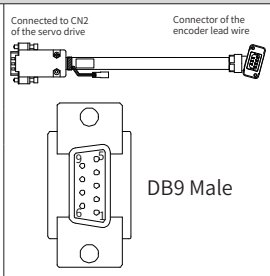
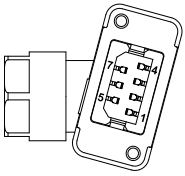
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			3	DC+	Brown	Twisted pair
			4	DC-	Black	
			5	+5V	Red	Twisted pair
			6	0V	Orange	
			7	PE	-	-

Table 3-19 Encoder cable connector of lead wire-type servo motors

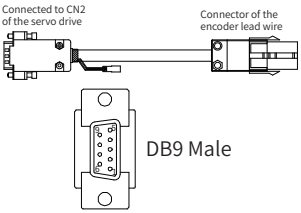
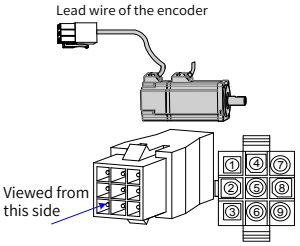
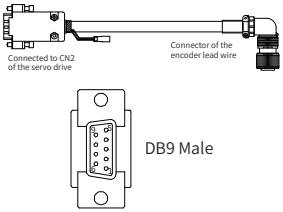
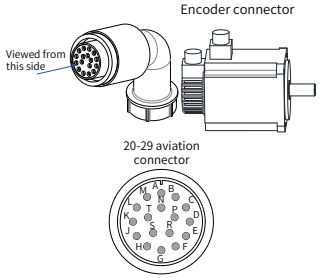
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side	 9-pin connector Recommendation: Plastic housing: AMP 172161-1; Terminal: AMP 770835-1	1	Battery (+)	Brown	-
			4	Battery (-)	Black	
			3	PS+	Blue	Twisted pair
			6	PS-	Purple	
			9	+5V	Red	-
			8	GND	Orange	
			7	Shield		

Table 3-20 Encoder cable connector of connector-type servo motors

Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Connector-type motors: 100 130 180	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		A	PS+	Yellow	Twisted pair
			B	PS-	Blue	
			E	DC+	Brown	Twisted pair
			F	DC-	Black	
			G	+5V	Red	-
			H	GND	Orange	
			J	Shield	-	

3 Connecting to IS810P series servo drive

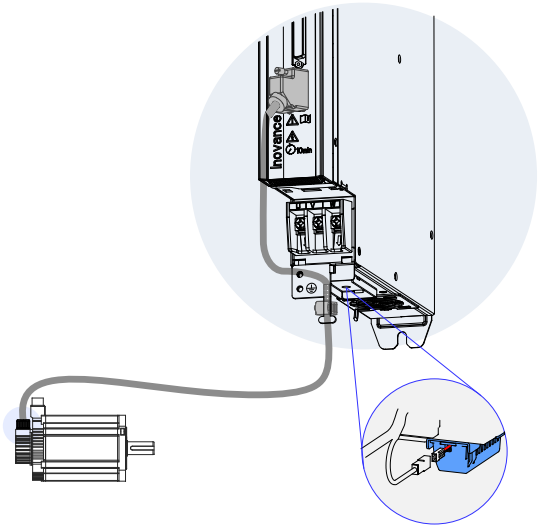


Figure 3-11 Connection between IS810P series servo drive and encoder

Table 3-21 Encoder cable connector of terminal-type servo motors

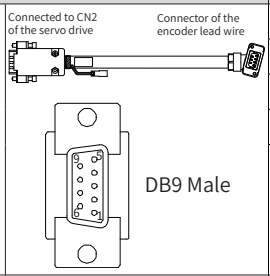
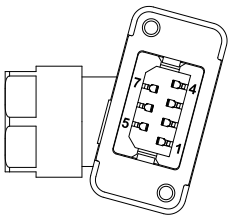
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			3	DC+	Brown	Twisted pair
			4	DC-	Black	
			5	+5V	Red	Twisted pair
			6	0V	Orange	
			7	PE	-	-

Table 3-22 Encoder cable connector of lead wire-type servo motors

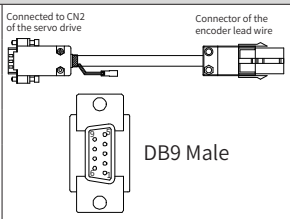
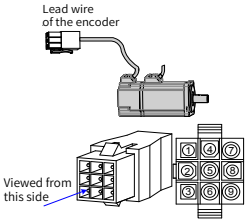
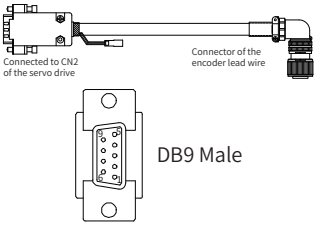
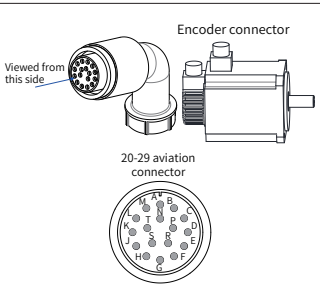
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		1	Battery (+)	Brown	-
			4	Battery (-)	Black	
			3	PS+	Blue	Twisted pair
			6	PS-	Purple	
			9	+5V	Red	-
			8	GND	Orange	
			7	Shield		

Table 3-23 Encoder cable connector (MIL-DTL-5015 series 3108E20-29S aviation connector)

Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Connector-type motors: 100 130 180	Servo drive side		1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			7	+5V	Red	Twisted pair
			8	0V	Orange	
			Enclosure	PE	-	-
	Motor side		A	PS+	Blue	Twisted pair
			B	PS-	Purple	
			E	DC+	Brown	Twisted pair
			F	DC-	Black	
			G	+5V	Red	-
			H	GND	Orange	
			J	Shield	-	

4 Connecting to SV820N series servo drives

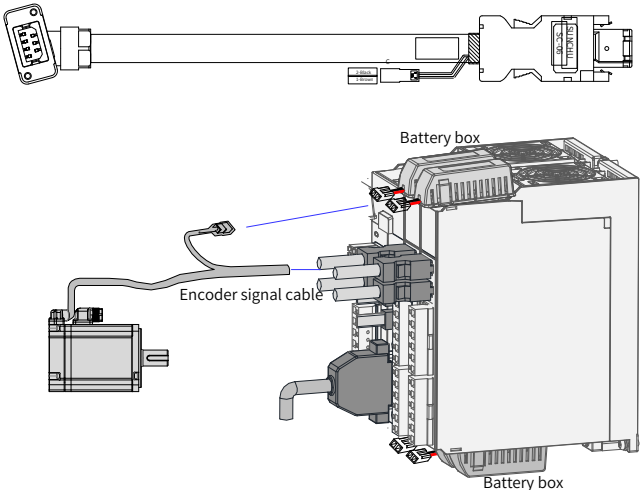


Figure 3-12 Connection between SV820N series servo drive and encoder

Table 3-24 Encoder cable connector of terminal-type servo motors

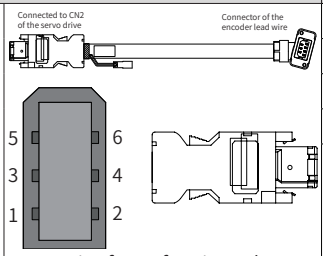
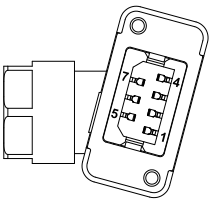
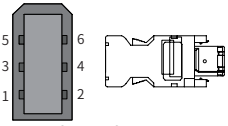
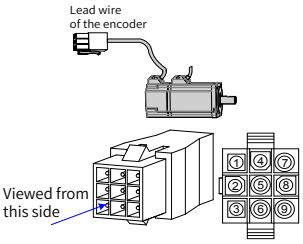
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	Servo drive side	 Joint face of 6-pin male	1	+5V	Red	Twisted pair
			2	0 V	Orange	
			5	PS+	Blue	Twisted pair
			6	PS-	Purple	
			Enclosure	PE	-	-
	Motor side	 SDC-07T (manufacture: JONHON)	1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			3	DC+	Brown	Twisted pair
			4	DC-	Black	
			5	+5V	Red	Twisted pair
			6	0V	Orange	
			7	PE	-	-

Table 3-25 Encoder cable connector of lead wire-type servo motors

Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	Servo drive side	  Joint face of 6-pin male	1	+5V	Red	Twisted pair
			2	0 V	Orange	
			5	PS+	Blue	Twisted pair
			6	PS-	Purple	
			Enclosure	PE	-	-
	Motor side	 9-pin connector Recommendation: Plastic housing: AMP 172161-1 Terminal: AMP 770835-1	1	Battery (+)	Brown	Twisted pair
			4	Battery (-)	Black	
			3	PS+	Blue	Twisted pair
			6	PS-	Purple	
			9	+5V	Red	Twisted pair
			8	GND	Orange	
			7	Shield		

5 Connecting to SV660 Series Servo Drives

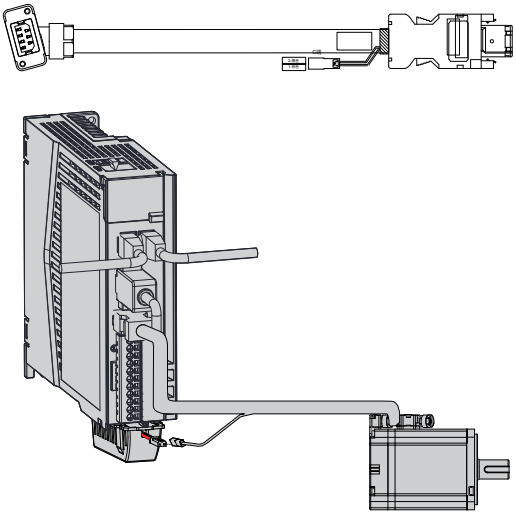


Figure 3-13 Connection between SV660 series servo drive and terminal-type motor encoder

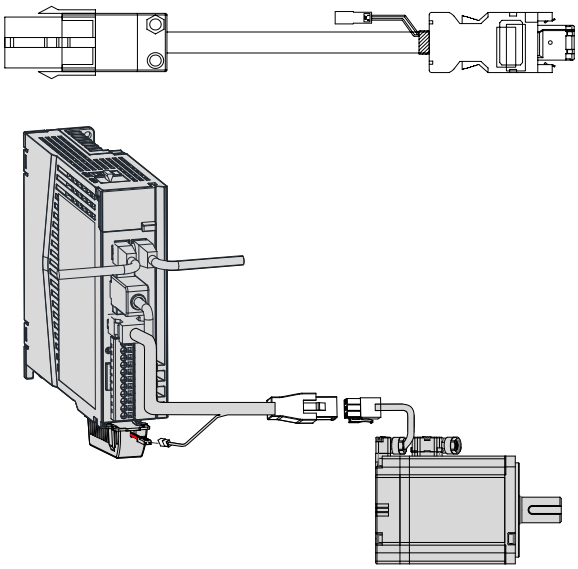


Figure 3-14 Connection between SV660 series servo drive and lead wire-type motor encoder

Table 3-26 Encoder cable connector of terminal-type servo motors

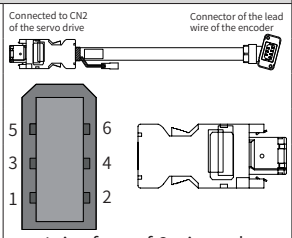
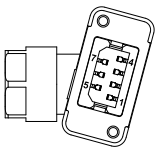
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Terminal-type motors: 40 (Z series) 60 (Z series) 80 (Z series)	Servo drive side	 Joint face of 6-pin male	1	+5V	Red	Twisted pair
			2	0V	Orange	
			5	PS+	Blue	Twisted pair
			6	PS-	Purple	
			Enclosure	PE	-	-
	Motor side	 SDC-07T (manufacture: JONHON)	1	PS+	Blue	Twisted pair
			2	PS-	Purple	
			3	DC+	Brown	Twisted pair
			4	DC-	Black	
			5	+5V	Red	Twisted pair
			6	0V	Orange	
			7	PE	-	-

Table 3-27 Encoder cable connector of lead wire-type servo motors

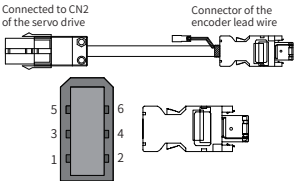
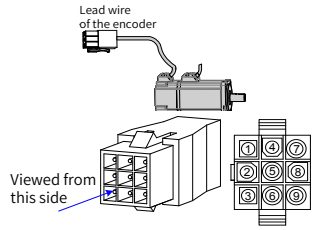
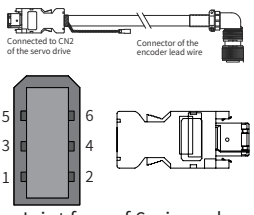
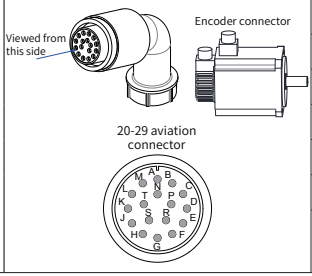
Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Lead wire-type motors: 40 (Z-S series) 60 (Z-S series) 80 (Z-S series)	Servo drive side	 Joint face of 6-pin male	1	+5V	Red	Twisted pair
			2	0V	Orange	
			5	PS+	Blue	Twisted pair
			6	PS-	Purple	
			Enclosure	PE	-	-
	Motor side	 9-pin connector Recommendation: Plastic housing: AMP 172161-1 Terminal: AMP 770835-1	1	Battery (+)	Brown	Twisted pair
			4	Battery (-)	Black	
			3	PS+	Blue	Twisted pair
			6	PS-	Purple	
			9	+5V	Red	Twisted pair
			8	GND	Orange	
			7	Shield		

Table 3-28 Encoder cable connector (MIL-DTL-5015 series 3108E20-29S aviation connector)

Applicable Motor Flange Size	Outline Drawing of the Connector		Terminal Pin Layout			
			Pin No.	Signal Name	Color	Type
Connector-type motors 100 130 180	Servo drive side	 Joint face of 6-pin male	A	PS+	Yellow	Twisted pair
			B	PS-	Yellow/Black	
			E	Battery (+)	Blue	-
			F	Battery (-)	Blue/Black	
			G	+5V	Red	-
			H	GND	Black	
			J	Shield		
	Motor side		A	PS+	Yellow	Twisted pair
			B	PS-	Yellow/Black	
			E	Battery (+)	Blue	-
			F	Battery (-)	Blue/Black	
			G	+5V	Red	-
			H	GND	Black	
			J	Shield		

3.4.3 Requirements for connecting connectors

1 Power connector

WARNING	
	Screw-down is allowed only when the rubber gasket of the plug is in place with both long edges kept flat.

Align pins 5 and 6 to corresponding holes and insert them into the holes. Do not insert pins 5 and 6 by force. After insertion, screw down with a tightening torque of 0.1 N · m to 0.15 N · m.

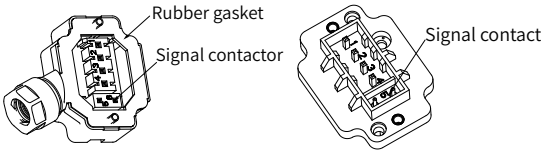
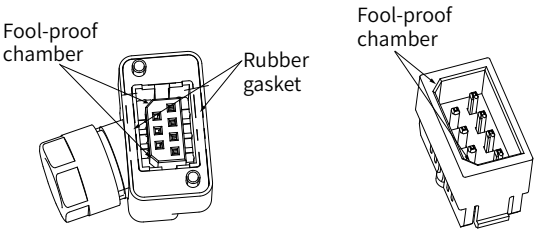


Figure 3-15 Power connector

2 Encoder connector

WARNING	
	Screw-down is allowed only when the rubber gasket of the plug is in place with both long edges locked into the enclosure slot flatly.

Plugs and sockets are designed with fool-proof chamfers (as shown below). Align the fool-proof chamfer before insertion (forcible insertion is not allowed). After insertion, screw down the plug screws with a tightening torque of 0.1 N · m to 0.15 N · m.



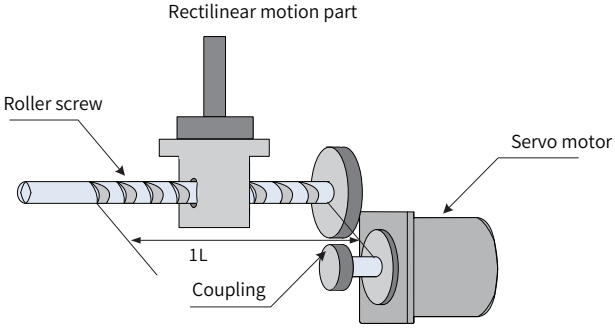
Note that the two long edges of the rubber gasket must be flatly locked into the slot of the enclosure.

Figure 3-16 Encoder connector

- The assembly direction of the plug insulator is subject to the actual direction.
- Do not energize an electrical connector connected loosely. Plug-in or Plug-out is not allowed when the power supply is switched on.
- The mating life of the electrical connector is 50 cycles. Ensure the joint face of the socket and plug is clean and free from greasy dirt in the whole service life. Handle with enough care during use to prevent injuries.
- Check whether the socket and plug are free from condensation and greasy dirt each time before mating.
- When the connector is idled with its socket and plug separated, take proper measures to prevent intrusion of dust and liquid.

Appendix A Motor Selection Examples

A.1 Examples 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 times/min

Length of feeding (L): 0.25 m

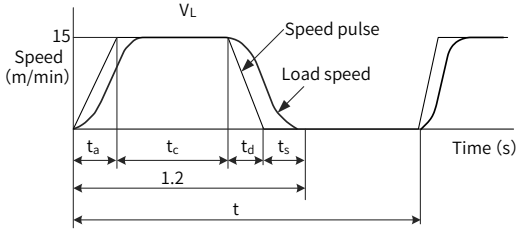
Time of feeding (t_m): < 1.2s

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 to the motor, the reduction 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

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

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

■ Technical data 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)

■ Confirmation of the servo motor selected temporarily

Confirm the startup torque required

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

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

Confirm the braking torque required

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

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

Confirm the effective torque value

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

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

Capacities of the servo motor and servo drive selected temporarily based on preceding steps are available for use. Analysis on position control 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).

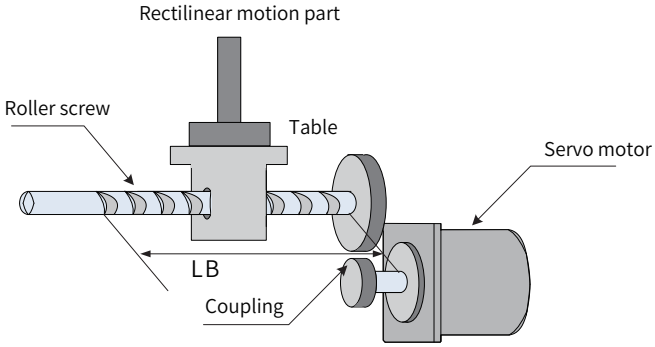
$$\varepsilon = \frac{vs}{Kp} = \frac{25000}{30} = 833\,(pulse)$$

■ 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 Examples for Speed Control



Load speed (VL): 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): 0.01 m

Mass of the coupling (m_c): 1 kg

Outer diameter of the coupling (d_c): 0.06 m

Times of feeding (n): 40 times/min

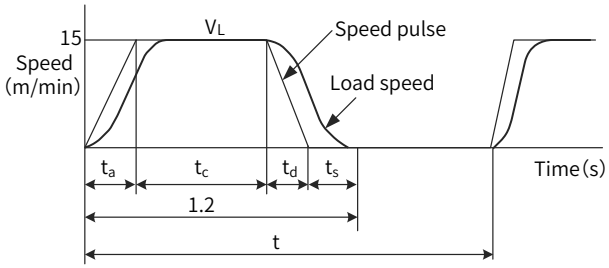
Length of feeding (L): 0.275 m

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 to the motor, the reduction 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

$$Jc = \frac{1}{8} mc \cdot dc^4 = \frac{1}{8} x1 x (0.06)^2 = 4.5 x 10^{-4} (kg \cdot m^2)$$

5 Load moving power

$$Po = \frac{2\pi nM \cdot T_L}{60} = \frac{2\pi x 1500 x 1.73}{60} = 272(W)$$

6 Load acceleration power

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

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

■ Technical data 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} ($kg \cdot m^2$)

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

8 Confirmation of the servo motor selected temporarily

■ Confirm the startup torque required

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

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

■ Confirm the braking torque required

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

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

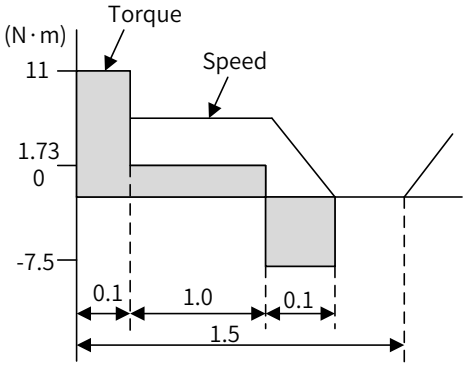
■ Confirm the effective torque value

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

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

9 Selection result

By observing preceding steps, the servo motor and servo drive selected temporarily for speed control are available for use. The torque diagram is as follows.

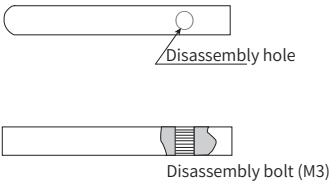


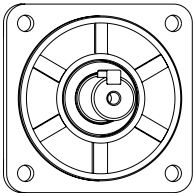
Appendix B: Disassembly of the Flat Key and Oil Seal

WARNING	
	◆ Observe all the requirements presented in this chapter. Failure to comply may result in device fault or damage. ◆ Violent disassembly is not allowed. Take enough care during disassembly to prevent physical injuries.

■ Removing the flat key

Standard MS1 series motors in flange sizes 60, 80, and 130 adopt C-type flat keys equipped with disassembly hole. To remove the flat key, select a proper disassembly bolt (inner hexagon bolt recommended) and an Allen wrench to screw down the bolt clockwise until A-A end of the flat key is completely detached from the keyway, as shown below.





Specifications and Dimensions		
Specification of MS1 Motor	Dimensions of Flat Key	Specifications of Disassembly Bolt (Inner Hexagon Bolt)
Flange size 40	A-type flat key—A3x3x14	Disassembly hole not available
Flange size 60	C-type flat key—C5x5x16.5	M3x10 and above
Flange size 80	C-type flat key—C6x6x25	M3x15 and above
Flange size 100	C-type flat key—C8x7x35	M3x20 and above
Flange size 130	C-type flat key—C8x7x35	M3x20 and above
Flange size 180	C-type flat key—C10x8x64	M3x20 and above

■ Removing the oil seal

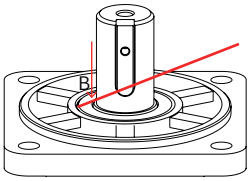
Tools needed: a pair of needle-nose pliers, a pair of slip-proof gloves, and a piece of cotton cloth

Operating steps:

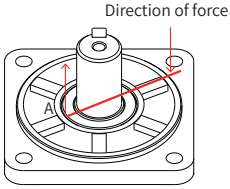
1) Step1: Put the cotton cloth on the supporting point B to avoid the end cover from being scratched during disassembly.

2) Step 2: Secure the motor and use the needle-nose pliers to hold point A of the oil seal lip.

3) Step 3: Pry the oil seal out gradually based on the supporting point B.



(Point B acts on the shaft extension stairs)



(Point A acts on the oil seal lip)

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