MABUCHI MOTOR

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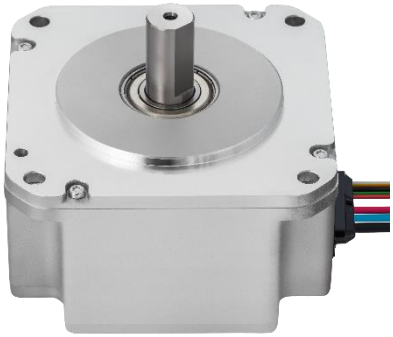
IS-74BZA / IS-94BZC / IS-B5BZA
Instruction Manual

IS-74BZA

IS-94BZC



IS-B5BZA

Notice to users

MABUCHI MOTOR CO., LTD.

MABUCHI MOTOR

FOR YOUR SAFETY

Read the safety warnings for proper use of this product.
Mabuchi Motor Co., Ltd. has no liability to indemnify damages, including any malfunction of the motor resulting from failure to follow this instruction manual. Thank you for your understanding.

Safety Precautions

⚠ Warning: May result in death or serious injury

⚠ Caution: May result in injury or damage

⃠ Prohibition: Prohibited actions.

❗ Instruction: Required actions.

⚠ Warning ⃠ Prohibition

- Do not plug the lead wire or motor terminal into home electrical outlets. This will cause electrical shock, injury, or equipment damage.
- Do not touch conductive parts such as powered terminals when the power is on. This may result in electrical shock.
- Do not touch rotating parts, including attachments, with the hands or fingers while the power is on. This may result in injury.
- Do not lock the shaft while the motor is powered on. This will cause equipment damage.
- The motor operating conditions (installation condition, load, environmental temperature) may cause significant heat buildup in the motor, with the risk of burns.
- Do not disassemble the motor. This may cause equipment damage, injury, or electrical shock.
- Do not use in the presence of corrosive or flammable gas, or near combustibles. This may cause fire, injury, or equipment damage.

MABUCHI MOTOR

Caution **Prohibition** **Instruction**

・This product is a brushless motor. It cannot be used directly connected to an AC or battery power source. Connect a dedicated brushless motor drive circuit compatible with this product between the power source and the motor.

・This is a general purpose product. It cannot be used with special equipment for medical, military, aerospace, or vehicle mounted applications.

・Do not detach connectors while the motor is in operation under any circumstances. Always shut off power before inserting them. This will cause equipment damage.

・When using lead wires, switches, relays, or controllers, etc., give careful consideration to their electrical capacity and heat tolerance. If they do not meet the appropriate standards, this will cause equipment damage due to fire, etc.

・Confirm set installation matching and service life, and perform quality assurance.
Example Checklist for Set Installation:
Laws and standards applicable to the mounting product.
Service life, electrical characteristics, mechanical characteristics, mechanical/electrical noise, storage environment, atmosphere gases, etc.

・The internal resistance and capacity of the motor drive power source (including the circuit) may affect starting performance and rotational stability. Confirm the actual operating conditions at high and low temperatures as well as room temperature.

・If wiring of the main power supply or motor power lines is long or thin, motor torque will drop due to wiring impedance. When selecting a motor, ensure an adequate margin in terms of acceleration/deceleration torque, and check in the final product state.

・When using transmission systems which apply lateral pressure to the motor, such as a belt drive on the output shaft, the lateral pressure on the shaft bearing may reduce service life.

・Using it with an excessive load on the output shaft will reduce service life.
Handle the shaft carefully so that there is no impact load in the direction of thrust.

・Significant radial loads from eccentric cams, etc., during motor operation or outside vibrations may affect motor service life. Verify the actual usage conditions.

・Do not subject the motor output shaft to excessive impacts. This will cause equipment damage.

・If abnormalities occur, shut down power immediately.

・The temperature of the motor rises during operation and after immediately after shut down, so exercise caution. There is a risk of burns.

・When securing the motor, do not apply forces that would cause deformation of the motor. When securing with screws, avoid uneven tightening. This may negatively affect the flatness and other characteristics of the motor installation plate.

・Always use the designated components for extension cable connectors.

・Do not apply excessive force to cables or connectors.
Do not pull cables to reposition or transport the motor.

・Do not damage the cable connector, forcefully pull it, apply excessive force, place a heavy object on top, or allow pinching.

・Plug in the cable connector securely until it is fixed with the lock mechanism.
The connector of the controller section may be damaged if excessive force is applied to the cable connector while it is half-inserted and not fixed with the lock mechanism.
To disconnect, release the lock mechanism, and be careful not to apply excessive force on the plug side.

・When inserting or disconnecting cable connectors, hold the plug with your fingers, release the retainer mechanism, and insert or disconnect in the connector pin direction.
When inserting/disconnecting, be careful not to apply excessive force to the connector.

・Dispose of this product in accordance with local laws and government instructions.

● Operating and Storage Environment

• Avoid storing the motor in high temperature or humidity areas, or in contact with corrosive gases.
The recommended environment: +10 to +30°C temperature, 30 to 95% relative humidity

• Chemicals used for fumigation may contaminate metal components of the motor. When fumigating packaging (pallets, etc.) for the motor itself or products into which the motor is integrated, make sure that the motor is not exposed to the fumigating material or gases.

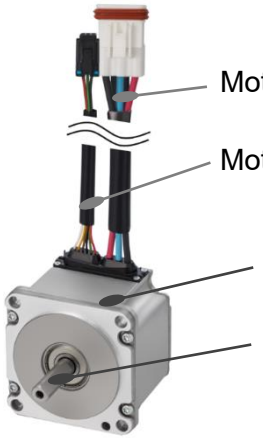
• High ambient temperature while the motor is in use (motor temperature) will affect performance and service life. Exercise special caution in cases of high temperature and humidity.

MABUCHI MOTOR

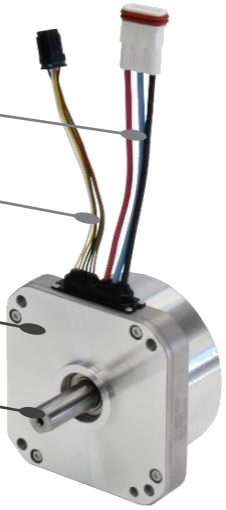
Motor Parts and Features

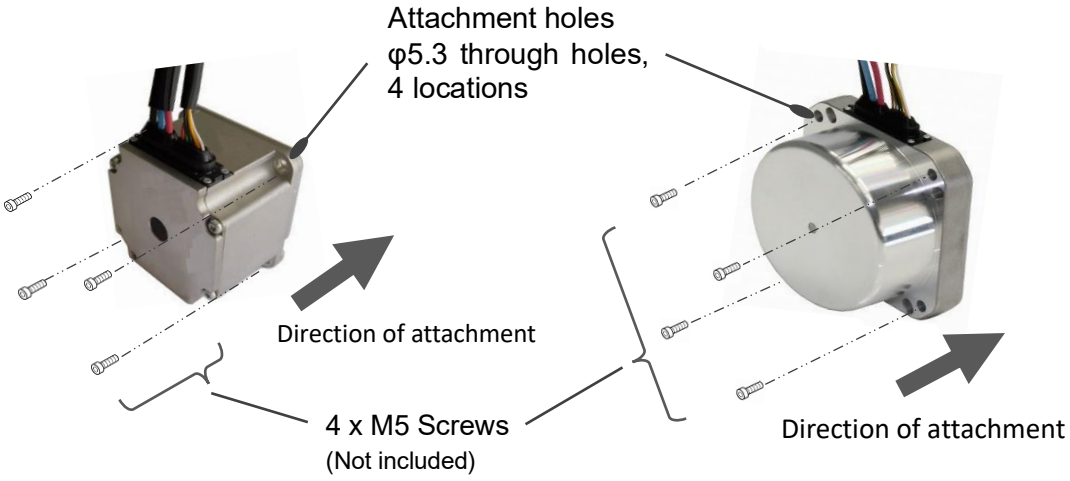
•Motor parts

● IS-74BZA



● IS-94BZC





⚠ Caution ⃠ Prohibition ❗ Instruction

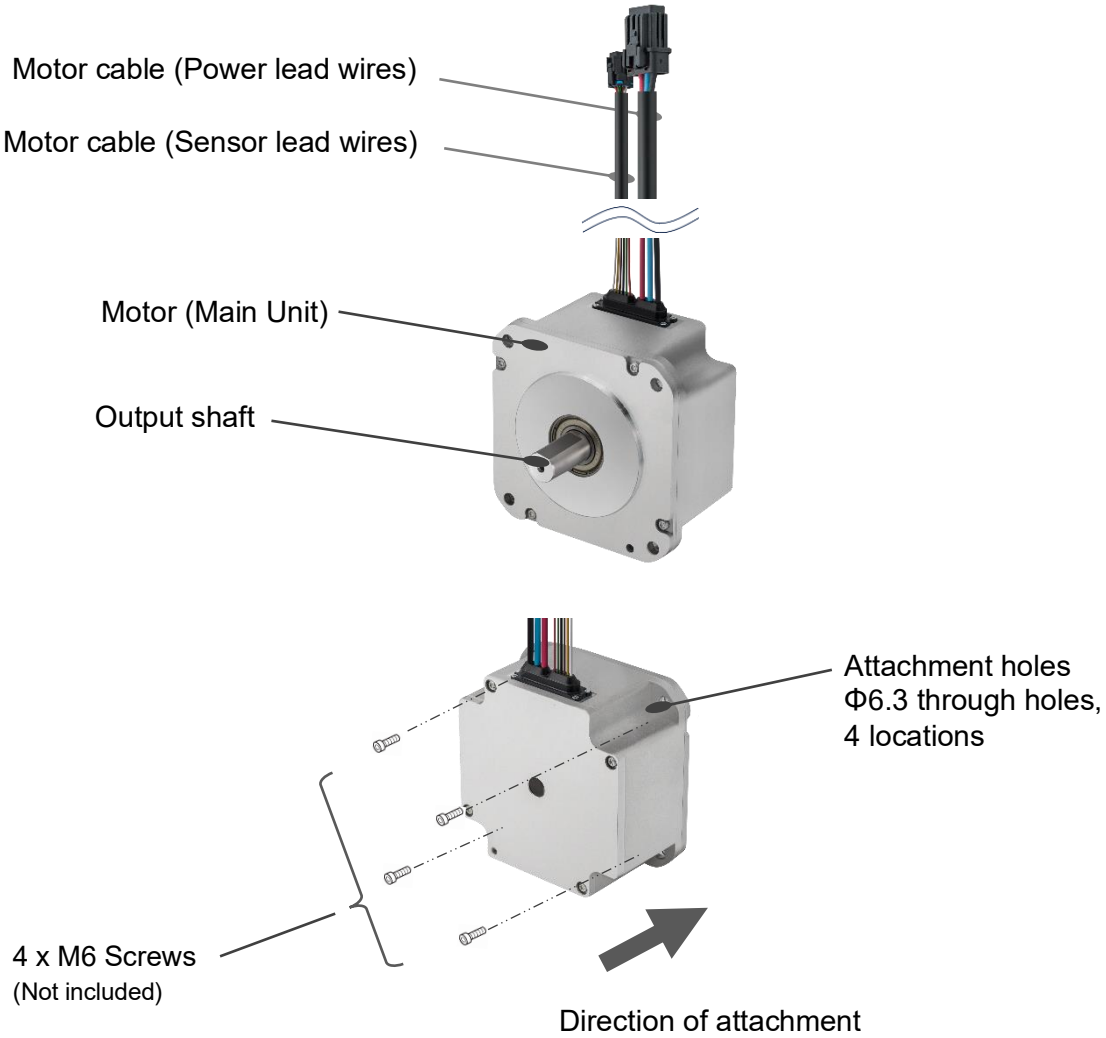
- Make sure there is no gap with the attachment plate.
- Do not disassemble the motor.
- Connect the motor cable so that it is not under tension.

MABUCHI MOTOR

Motor Parts and Features

●Motor parts

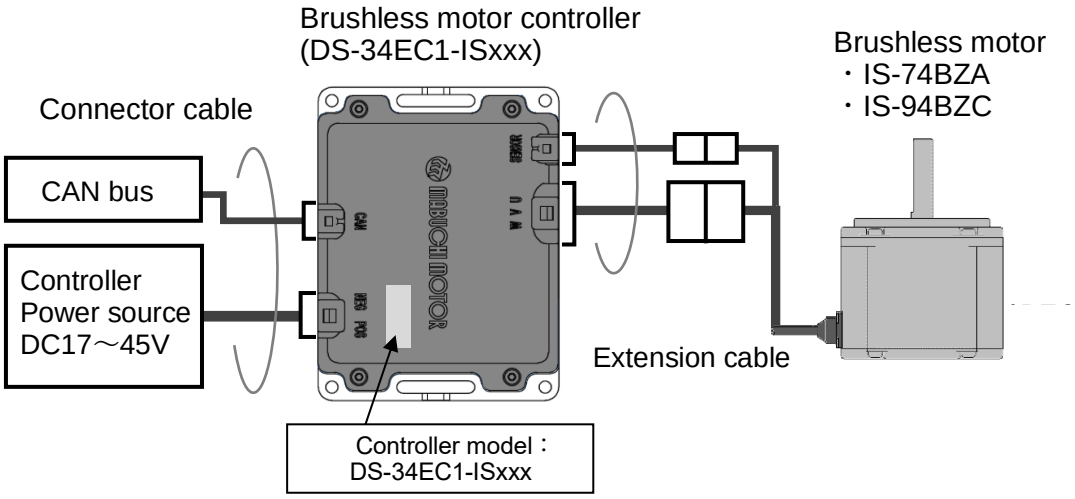
● **IS-B5BZA**



⚠ Caution ⊘ Prohibition ❗ Instruction

- Make sure there is no gap with the attachment plate.
- Do not disassemble the motor.
- Connect the motor cable so that it is not under tension.

●Connection diagram(IS-74BZA、IS-94BZC)



・Connection of our controller and power supply, etc. to IS-74BZA or IS-94BZC is shown.
・The compatibility table of the motor and controller is shown in the following chart.

Motor Model	Controller Model
IS-74BZA	DS-34EC1-IS311
IS-94BZC	DS-34EC1-IS221

・Controllers and cables are available as optional items.

・See "Brushless motor controller DS-34EC1 series instruction manual" for detailed of controllers.

⚠Caution ❗Instruction

• The controller power supply has polarity. Be sure to connect it correctly.

• Use the designated extension cables (motor power, sensor).

• Do not interconnect multiple extension cables, as it may reduce performance.

• Ensure that there is a sufficient safety margin for the current capacity of the power source and the current carrying capacity of distribution cables, etc.

●Extension cables

・Motor power line extension cables can be used on both IS-74BZA and IS-94BZC.
・The same extension cable cannot be used for the IS-B5BZA as for the IS-74BZA and IS-94BZC because the connector specifications are different.
・The motor sensor line extension cable can be used in common with the IS-74BZA, IS-94BZC and IS-B5BZA.

● Motor power line：IS-74BZA / IS-94BZC

・Motor power line extension cable
Part number:67-Q22AA
Cable length：1m
Poles：3
Terminals：Double ended connectors

● Motor sensor line：IS-74BZA、IS-94BZC、IS-B5BZA

・Motor sensor line extension cable
Part number: 67-Q23AA
Cable length：1m
Poles：6
Terminals：Double ended connectors

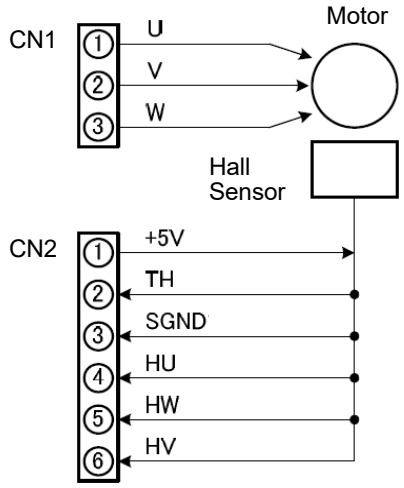
●Extension cable connector specifications

Cable name	Applicable models	Connector maker	Connector type name (Controller side)		Connector type name (Motor side)		Wire seal	Poles	Wire type (AWG)
			Housing	Terminal	Housing	Terminal			
Motor Power line	IS-74BZA IS-94BZC	Minebea Connect	CL07D03A	215006-2M	CL07D03M	215005-2M	WS07MF-0D (red-brown)	3	AWG14
Motor Power line	IS-B5BZA	Minebea Connect	Extension cables for the IS-B5BZA are currently being prepared. Please enquire separately.						
Motor Sensor line	IS-74BZA IS-94BZC IS-B5BZA	Minebea Connect	CA01A6-06B0-01	CA01C6-010A	CA01A5-06B0-01	CA01C5-010A	01 (light blue)	6	AWG26

For detailed connector specifications, please consult the connector maker’s website.

● Connector Signal Specification

Connectors, signal names, and Hall sensor output signal specification are common for both IS-74BZA and IS-94BZC.

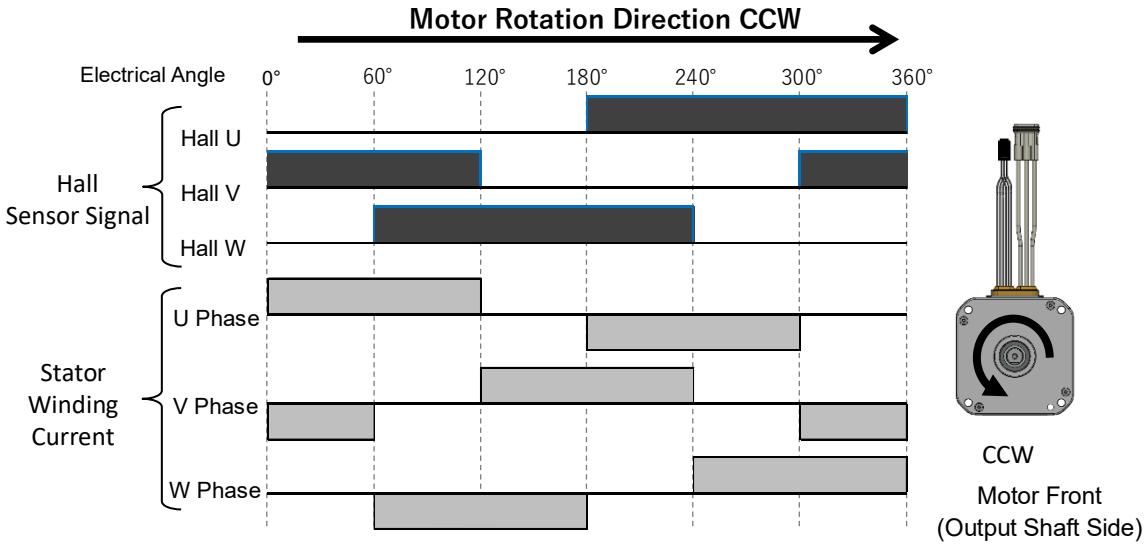


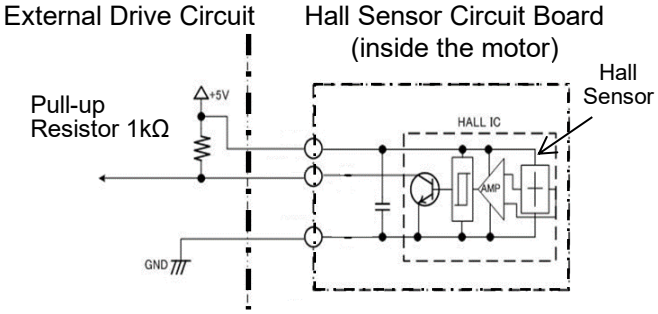
Connector	Pin #	Signal Name, Specification	Abbrev.
CN1	1	Stator Winding: U	U
	2	Stator Winding: V	V
	3	Stator Winding: W	W
CN2	1	Hall Sensor Power Supply: DC＋5 V	+5V
	2	Temperature Monitoring Thermistor	TH
	3	Signal Ground: SGND	SGND
	4	Rotor Position Detection Hall Sensor Output: U Phase	HU
	5	Rotor Position Detection Hall Sensor Output: W Phase	HW
	6	Rotor Position Detection Hall Sensor Output: V Phase	HV

● Hall Sensor Output Signal

The relationship between the Hall sensor signal and the stator winding current is shown in the following chart.

Example: Motor driven by 120° square wave current





- The hall sensors in this motor are equipped with pull-up resistors. Connect pull-up resistors for each phase on the drive circuit end.
- If you are using the motor controller (DS-34EC1-IS221/-IS311), pull-up resistors are not necessary.

MABUCHI MOTOR

●Specification

Item		IS-74BZA	IS-94BZC	IS-B5BZA
Mechanical Characteristics	Appearance	See outline drawing		
	Mass (Reference)	520g	830g	1760g
	Water Resistance	IPX4 (Excluding shaft hole. Use of special waterproof connectors)		
	Cable, Connector Tensile Strength	9.8N (min.)		
Standard Usage Conditions	Rated Voltage	24V (with DS-34EC1-IS331 controller, controller power supply voltage.)	24V,36V (with DS-34EC1-IS221 controller, controller power supply voltage.)	48V
	Operating Voltage Range (*1)	DC 17 to 45V (with DS-34EC1-IS331 controller, controller power supply voltage.)	DC 17 to 45V (with DS-34EC1-IS221 controller, controller power supply voltage.)	DC 17～63V
	Operating Temperature Range	-10 to +50 °C (*2)		
	Operating Humidity Range	20 to 95%RH (no condensation)		
	Direction of Rotation	CCW/CW viewed from the output shaft side.		
	Temperature Range for Storage	+10 to +30°C		
	Humidity Range for Storage	30 to 95%RH（no condensation）		
Motor Electrical Characteristics	No Load Current	1.3A(max) (Reference, under 120° square wave current, 24V DC power)	1.0A(max) (Reference, under 120° square wave current, 24V DC power) 1.3A(max) (Reference, under 120° square wave current, 36V DC power)	1.6A(max) (Reference, under 120° square wave current, 48V DC power)
	No Load Speed	4330r/min (Reference, under 120° square wave current, 24V DC power)	2850r/min (Reference, under 120° square wave current, 24V DC power) 4300r/min (Reference, under 120° square wave current, 36V DC power)	3250r/min (Reference, under 120° square wave current, 48V DC power)
	Instantaneous Maximum Torque	0.9Nm、10 sec(max) (Reference, under 120° square wave current, 24V DC power)	2.0Nm、10 sec(max) (Reference, under 120° square wave current, 24V,36V DC power)	4.0Nm、10 sec(max) (Reference, under 120° square wave current, 48V DC power)
	Maximum Output	280W、10 sec(max) (Reference, under 120° square wave current, 24V DC power)	410W、10 sec(max) (Reference, under 120° square wave current, 24V DC power) 680W、10 sec(max) (Reference, under 120° square wave current, 36V DC power)	1000W、10 sec(max) (Reference, under 120° square wave current, 48V DC power)
	Insulation Resistance	10MΩ (min.) (DC500V) between motor winding and housing.		
	Withstand Voltage	AC500V, 1 minute between motor winding and housing.		
	Thermistor	For the motor winding temperature monitor (*2) 100kΩ±10%, B constant (25/50°C), 4250K±10% (reference)		

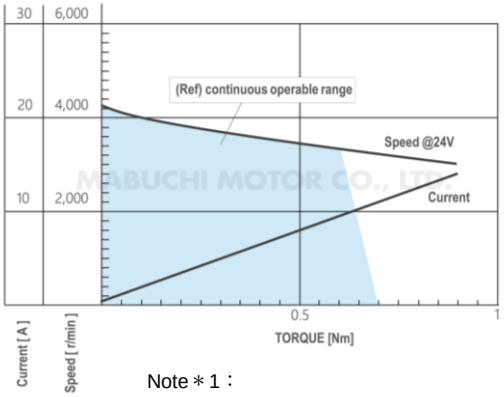
• The product's performance, specifications, and appearance may be modified for improvements without advance notice.

*1: If you are supplying your own controller, be careful that the controller power voltage does not exceed the maximum limit.

*2: The motor operating conditions (installation condition, load, environmental temperature) may cause significant heat buildup in the motor. Be careful that the detected temperature of the thermistor does not exceed 100°C. High ambient temperature while the motor is in use (motor temperature) will affect performance and service life.

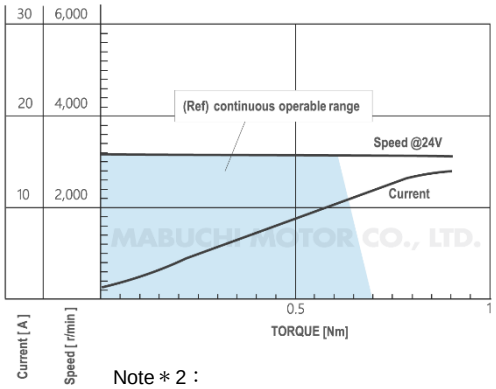
●Motor Characteristics：IS-74BZA

120°square wave current＊1



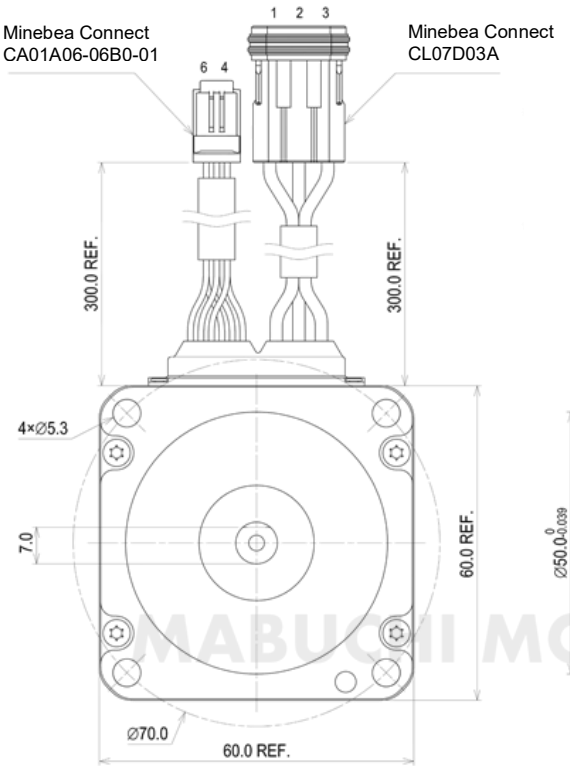
Note＊1：
Controller power supply voltage: 24 V
Under open space, Temp 25 degC

DS-34EC1-IS331 connected ＊2
(180°sine wave drive)



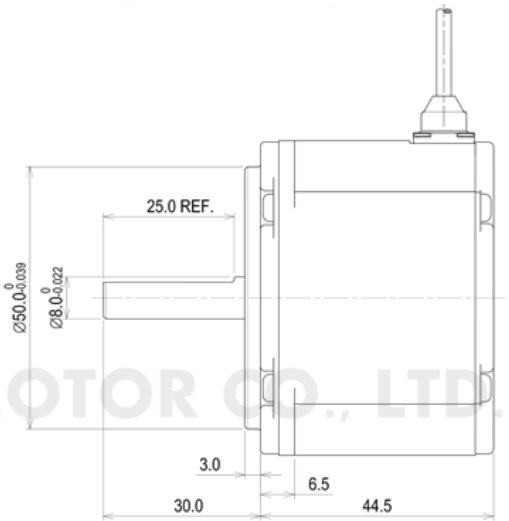
Note＊2：
Set the motor speed at 3,200 rpm.
Controller power supply voltage: 24 V
Under open space, Temp 25 degC

●Drawing：IS-74BZA



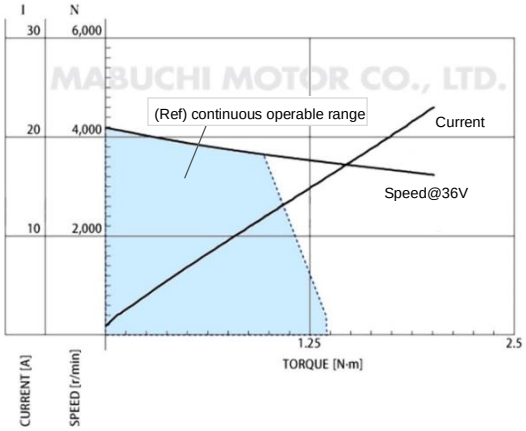
CIRCUIT No. AND CHARACTERISTICS			
CONNECTOR	No.	DEFINITION	COLOR
CL07D03A	1	U PHASE OF MOTOR	RED
	2	V PHASE OF MOTOR	BLUE
	3	W PHASE OF MOTOR	BLACK
CA01A6-06B0-01	1	+5V POSITIVE ELECTRODE	RED
	2	THERMISTOR	GREEN
	3	GND	BLACK
	4	U SIGNAL BY ELECTROMAGNETIC WAVE	BROWN
	5	W SIGNAL BY ELECTROMAGNETIC WAVE	YELLOW
	6	V SIGNAL BY ELECTROMAGNETIC WAVE	WHITE

LEAD WIRE AND CONNECTOR



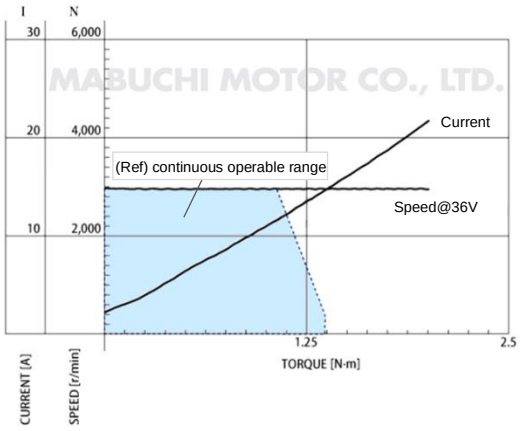
●Motor Characteristics：IS-94BZC

120°square wave current ＊1



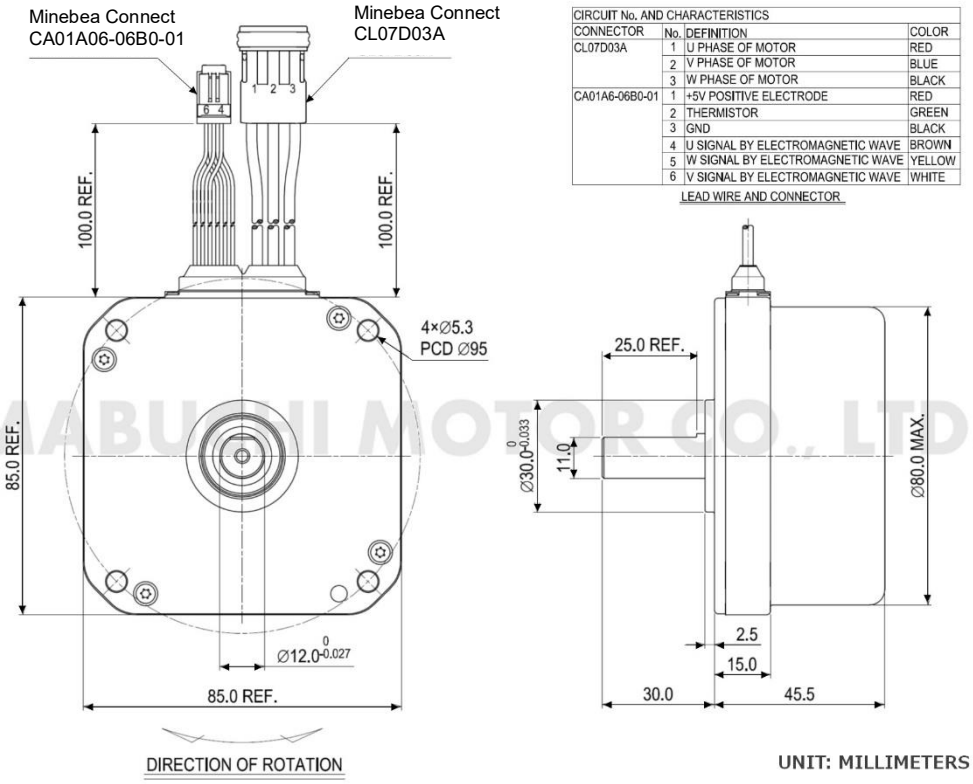
Characteristics in 120-degree conduction.
Controller power supply voltage: 36V
Under open space, Temp 25℃

DS-34EC1-IS221connected ＊2
(180°sine wave drive)



Note＊2：
Set the motor speed at 3,000r/min.
Controller power supply voltage: 36V
Under open space, Temp 25℃

●Drawing：IS-94BZC

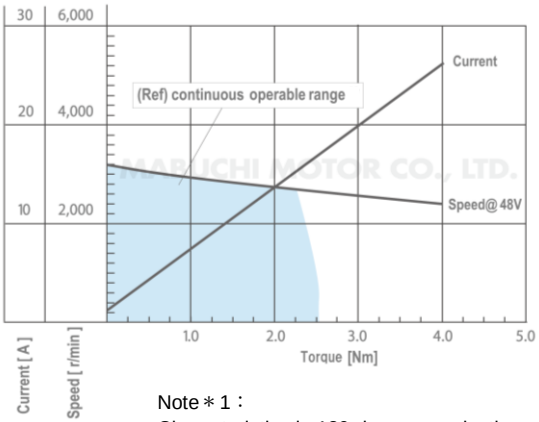


CIRCUIT No. AND CHARACTERISTICS			
CONNECTOR	No.	DEFINITION	COLOR
CL07D03A	1	U PHASE OF MOTOR	RED
	2	V PHASE OF MOTOR	BLUE
	3	W PHASE OF MOTOR	BLACK
CA01A6-06B0-01	1	+5V POSITIVE ELECTRODE	RED
	2	THERMISTOR	GREEN
	3	GND	BLACK
	4	U SIGNAL BY ELECTROMAGNETIC WAVE	BROWN
	5	W SIGNAL BY ELECTROMAGNETIC WAVE	YELLOW
	6	V SIGNAL BY ELECTROMAGNETIC WAVE	WHITE

LEAD WIRE AND CONNECTOR

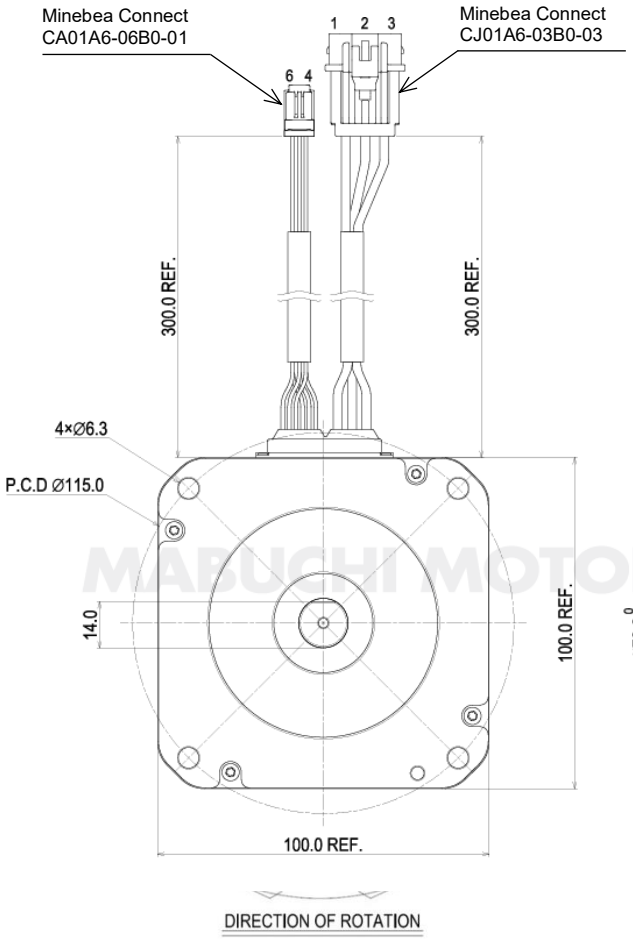
●Motor Characteristics：IS-B5BZA

120°square wave current ＊1



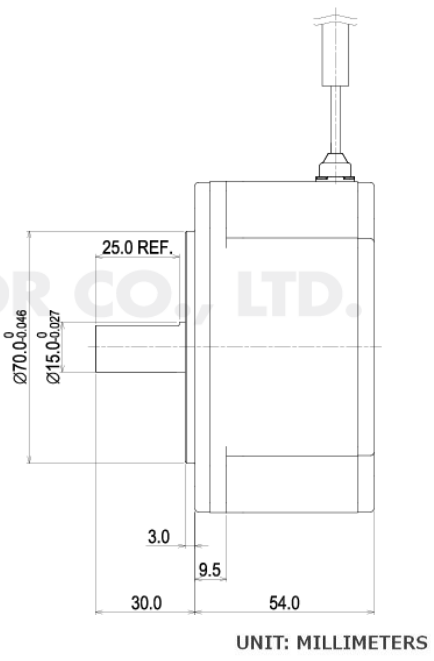
Note＊1：
Characteristics in 120-degree conduction.
Controller power supply voltage: 48V
Under open space, Temp 25℃

●Drawing：IS-B5BZA



CIRCUIT No. AND CHARACTERISTICS			
CONNECTOR	No.	DEFINITION	COLOR
CJ01A6-03B0-03	1	U PHASE OF MOTOR	RED
	2	V PHASE OF MOTOR	BLUE
	3	W PHASE OF MOTOR	BLACK
CA01A6-06B0-01	1	+5V POSITIVE ELECTRODE	RED
	2	THERMISTOR	GREEN
	3	GND	BLACK
	4	U SIGNAL BY ELECTROMAGNETIC WAVE	BROWN
	5	W SIGNAL BY ELECTROMAGNETIC WAVE	YELLOW
	6	V SIGNAL BY ELECTROMAGNETIC WAVE	WHITE

LEAD WIRE AND CONNECTOR



MABUCHI MOTOR

Product Warranty, Inquiries

Please contact the retailer where you purchased this product.

*Recorded for engineers

No.1

Instruction Manual Update History

Model : IS-94BZC

Specification (Publication) Number	Date of Publication	Update Details
TKS-A10-002140	Dec.06. 2024	Publication of first version. The existing IS series operating instructions (issue no. TKS-A10-000440-01) with additional explanatory information on the IS-B5BZA.