MITSUBISHI ELECTRIC

Changes for the Better

MITSUBISHI CNC

Specifications and Instruction Manual

Built-in Spindle Motor SJ-B Series

IB-1501011(ENG)-B

Introduction

Thank you for selecting the Mitsubishi numerical control unit. This instruction manual describes the handling and caution points for using this AC servo/spindle.Incorrect handling may lead to unforeseen accidents, so always read this instruction manual thoroughly to ensure correct usage.
Make sure that this instruction manual is delivered to the end user. Always store this manual in a safe place.
In order to confirm if all function specifications described in this manual are applicable, refer to the specifications for each CNC.

Notes on Reading This Manual

(1) Since the description of this specification manual deals with NC in general, for the specifications of individual machine tools, refer to the manuals issued by the respective machine manufacturers. The "restrictions" and "available functions" described in the manuals issued by the machine manufacturers have precedence to those in this manual.
(2) This manual describes as many special operations as possible, but it should be kept in mind that items not mentioned in this manual cannot be performed.

Precautions for Safety

Please read this manual and auxiliary documents before starting installation, operation, maintenance or inspection to ensure correct usage. Thoroughly understand the device, safety information and precautions before starting operation.
The safety precautions in this instruction manual are ranked as "WARNING" and "CAUTION".

⚠ DANGER

When there is a potential risk of fatal or serious injuries if handling is mistaken.

⚠ WARNING

When a dangerous situation, or fatal or serious injuries may occur if handling is mistaken.

⚠ CAUTION

When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries, or physical damage.

Note that some items described as "⚠CAUTION" may lead to major results depending on the situation. In any case, important information that must be observed is described.

The signs indicating prohibited and mandatory matters are explained below.

	**Indicates a prohibited matter. For example, "Fire Prohibited" is indicated as  .**
	**Indicates a mandatory matter. For example, grounding is indicated as  .**

The meaning of each pictorial sign is as follows.

 **CAUTION**	 **CAUTION rotated object**	 **CAUTION HOT**	 **Danger Electric shock risk**	 **Danger explosive**
 **Prohibited**	 **Disassembly is prohibited**	 **KEEP FIRE AWAY**	 **General instruction**	 **Earth ground**

After reading this specifications and instructions manual, store it where the user can access it easily for reference.

The numeric control unit is configured of the control unit, operation board, servo drive unit, spindle drive unit, power supply, servo motor and spindle motor, etc.
In this section "Precautions for safety", the following items are generically called the "motor".

- Servo motor
- Linear servo motor
- Spindle motor
- Direct-drive motor

In this section "Precautions for safety", the following items are generically called the "unit".

- Servo drive unit
- Spindle drive unit
- Power supply unit
- Scale interface unit
- Magnetic pole detection unit

 **POINT**

Important matters that should be understood for operation of this machine are indicated as a POINT in this manual.

For Safe Use

Mitsubishi CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes.
Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

⚠ WARNING

1. Electric shock prevention

- **Do not open the front cover while the power is ON or during operation. Failure to observe this could lead to electric shocks.**
- **Do not operate the unit with the front cover removed. The high voltage terminals and charged sections will be exposed, and can cause electric shocks.**
- **Do not remove the front cover and connector even when the power is OFF unless carrying out wiring work or periodic inspections. The inside of the units is charged, and can cause electric shocks.**
- **Since the high voltage is supplied to the main circuit connector while the power is ON or during operation, do not touch the main circuit connector with an adjustment screwdriver or the pen tip. Failure to observe this could lead to electric shocks.**
- **Wait at least 15 minutes after turning the power OFF, confirm that the CHARGE lamp has gone out, and check the voltage between P and N terminals with a tester, etc., before starting wiring, maintenance or inspections. Failure to observe this could lead to electric shocks.**
- **Ground the unit and motor. For the motor, ground it via the drive unit.**
- **Wiring, maintenance and inspection work must be done by a qualified technician.**
- **Wire the servo drive unit and servo motor after installation. Failure to observe this could lead to electric shocks.**
- **Do not touch the switches with wet hands. Failure to observe this could lead to electric shocks.**
- **Do not damage, apply forcible stress, place heavy items on the cables or get them caught. Failure to observe this could lead to electric shocks.**
- **After assembling the built-in IPM spindle motor, if the rotor is rotated by hand etc., voltage occurs between the terminals of lead. Take care not to get electric shocks.**

⚠ WARNING

2. Injury prevention

⚠ **When handling a motor, perform operations in safe clothing.**

⚠ **In the system where the optical communication with CNC is executed, do not see directly the light generated from CN1A/CN1B connector of drive unit or the end of cable. When the light gets into eye, you may feel something is wrong for eye.**
(The light source of optical communication corresponds to class1 defined in JISC6802 or IEC60825-1.)

⚠ **The linear servo motor, direct-drive motor and built-in IPM spindle motor uses permanent magnets in the rotor, so observe the following precautions.**

(1)Handling

- The linear servo motor, direct-drive motor and built-in IPM spindle motor could adversely affect medical electronics such as pacemakers, etc., therefore, do not approach the rotor.
- Do not place magnetic materials as iron.
- When a magnetic material as iron is placed, take safety measure not to pinch fingers or hands due to the magnetic attraction force.
- Remove metal items such as watch, piercing jewelry, necklace, etc.
- Do not place portable items that could malfunction or fail due to the influence of the magnetic force.
- When the rotor is not securely fixed to the machine or device, do not leave it unattended but store it in the package properly.

(2)Transportation and storage

- Correctly store the rotor in the package to transport and store.
- During transportation and storage, draw people's attention by applying a notice saying "Strong magnet-Handle with care" to the package or storage shelf.
- Do not use a damaged package.

(3)Installation

- Take special care not to pinch fingers, etc., when installing (and unpacking) the linear servo motor.

⚠ CAUTION

1. Fire prevention

- **Install the units, motors and regenerative resistor on non-combustible material. Direct installation on combustible material or near combustible materials could lead to fires.**
- **Always install a circuit protector and contactor on the servo drive unit power input as explained in this manual. Refer to this manual and select the correct circuit protector and contactor. An incorrect selection could result in fire.**
- **Shut off the power on the unit side if a fault occurs in the units. Fires could be caused if a large current continues to flow.**
- **When using a regenerative resistor, provide a sequence that shuts off the power with the regenerative resistor's error signal. The regenerative resistor could abnormally overheat and cause a fire due to a fault in the regenerative transistor, etc.**
- **The battery unit could heat up, ignite or rupture if submerged in water, or if the poles are incorrectly wired.**
- **Cut off the main circuit power with the contactor when an alarm or emergency stop occurs.**

2. Injury prevention

- **Do not apply a voltage other than that specified in this manual, on each terminal. Failure to observe this item could lead to ruptures or damage, etc.**
- **Do not mistake the terminal connections. Failure to observe this item could lead to ruptures or damage, etc.**
- **Do not mistake the polarity (+,-). Failure to observe this item could lead to ruptures or damage, etc.**
- **Do not touch the radiation fin on unit back face, regenerative resistor or motor, etc., or place parts (cables, etc.) while the power is turned ON or immediately after turning the power OFF. These parts may reach high temperatures, and can cause burns or part damage.**
- **Structure the cooling fan on the unit back face, etc., etc so that it cannot be touched after installation. Touching the cooling fan during operation could lead to injuries.**
- **Take care not to suck hair, clothes, etc. into the cooling fan.**

⚠ CAUTION

3. Various precautions

Observe the following precautions. Incorrect handling of the unit could lead to faults, injuries and electric shocks, etc.

(1) Transportation and installation

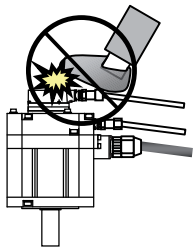
⚠ **Correctly transport the product according to its weight.**

❗ **Use the motor's hanging bolts only when transporting the motor. Do not transport the machine when the motor is installed on the machine.**

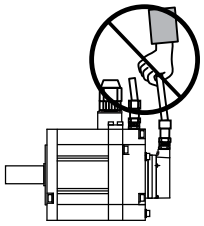
⚠ **Do not stack the products above the tolerable number.**

⚠ **Follow this manual and install the unit or motor in a place where the weight can be borne.**

⚠ **Do not get on top of or place heavy objects on the unit.**



⚠ **Do not hold the cables, axis or encoder when transporting the motor.**



⚠ **Do not hold the connected wires or cables when transporting the units.**

⚠ **Do not hold the front cover when transporting the unit. The unit could drop.**

⚠ **Always observe the installation directions of the units or motors.**

⚠ **Secure the specified distance between the units and control panel, or between the servo drive unit and other devices.**

⚠ **Do not install or run a unit or motor that is damaged or missing parts.**

⚠ **Do not block the intake or exhaust ports of the motor provided with a cooling fan.**

⚠ **Do not let foreign objects enter the units or motors. In particular, if conductive objects such as screws or metal chips, etc., or combustible materials such as oil enter, rupture or breakage could occur.**

⚠ **Provide adequate protection using a material such as connector for conduit to prevent screws, metallic detritus, water and other conductive matter or oil and other combustible matter from entering the motor through the power line lead-out port.**

⚠ **The units, motors and encoders are precision devices, so do not drop them or apply strong impacts to them.**

⚠ CAUTION

⚠ **Store and use the units under the following environment conditions.**

Environment	Unit	Motor
Ambient temperature	Operation: 0 to 55°C (with no freezing), Storage / Transportation: -15°C to 70°C (with no freezing)	Operation: 0 to 40°C (with no freezing), Storage: -15°C to 70°C (Note2) (with no freezing)
Ambient humidity	Operation: 90%RH or less (with no dew condensation) Storage / Transportation: 90%RH or less (with no dew condensation)	Operation: 80%RH or less (with no dew condensation), Storage: 90%RH or less (with no dew condensation)
Atmosphere	Indoors (no direct sunlight) With no corrosive gas, inflammable gas, oil mist, dust or conductive fine particles	
Altitude	Operation/Storage: 1000 meters or less above sea level, Transportation: 13000 meters or less above sea level	Operation: 1000 meters or less above sea level, Storage: 10000 meters or less above sea level
Vibration/impact	According to each unit or motor specification	

(Note 1) For details, confirm each unit or motor specifications in addition.
(Note 2) -15°C to 55°C for linear servo motor.

⚠ **When disinfectants or insecticides must be used to treat wood packaging materials, always use methods other than fumigation (for example, apply heat treatment at the minimum wood core temperature of 56 °C for a minimum duration of 30 minutes (ISPM No. 15 (2009))).**
If products such as units are directly fumigated or packed with fumigated wooden materials, halogen substances (including fluorine, chlorine, bromine and iodine) contained in fumes may contribute to the erosion of the capacitors.
When exporting the products, make sure to comply with the laws and regulations of each country.

⚠ **Do not use the products in conjunction with any components that contain halogenated flame retardants (bromine, etc). Failure to observe this may cause the erosion of the capacitors.**

⚠ **Securely fix the servo motor to the machine. Insufficient fixing could lead to the servo motor slipping off during operation.**

⚠ **Always install the servo motor with reduction gear in the designated direction. Failure to do so could lead to oil leaks.**

⚠ **Structure the rotary sections of the motor so that it can never be touched during operation. Install a cover, etc., on the shaft.**

⚠ **When installing a coupling to a servo motor shaft end, do not apply an impact by hammering, etc. The encoder could be damaged.**

⚠ **Do not apply a load exceeding the tolerable load onto the servo motor shaft. The shaft could break.**

⚠ **Store the motor in the package box.**

⚠ **When inserting the shaft into the built-in IPM spindle motor, do not heat the rotor higher than 130°C. The magnet could be demagnetized, and the specifications characteristics will not be ensured.**

⚠ **Always use a nonmagnetic tool (explosion-proof beryllium copper alloy safety tool: NGK Insulators, etc.) when installing the built-in IPM spindle motor, direct-drive motor and linear servo motor.**

⚠ **Always provide a mechanical stopper on the end of the linear servo motor's travel path.**

❗ **If the unit has been stored for a long time, always check the operation before starting actual operation. Please contact the Service Center, Service Station, Sales Office or delayer.**

⚠ CAUTION

(2) Wiring

⚠ **Correctly and securely perform the wiring. Failure to do so could lead to abnormal operation of the motor.**

⚠ **Do not install a condensing capacitor, surge absorber or radio noise filter on the output side of the drive unit.**

⚠ **Correctly connect the output side of the drive unit (terminals U, V, W). Failure to do so could lead to abnormal operation of the motor.**

⚠ **When using a power regenerative power supply unit, always install an AC reactor for each power supply unit.**

⚠ **In the main circuit power supply side of the unit, always install an appropriate circuit protector or contactor for each unit. Circuit protector or contactor cannot be shared by several units.**

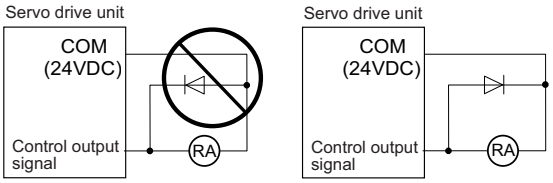
⚠ **Always connect the motor to the drive unit's output terminals (U, V, W).**

⚠ **Do not directly connect a commercial power supply to the servo motor. Failure to observe this could result in a fault.**

⚠ **When using an inductive load such as a relay, always connect a diode as a noise measure parallel to the load.**

⚠ **When using a capacitance load such as a lamp, always connect a protective resistor as a noise measure serial to the load.**

⚠ **Do not reverse the direction of a diode which connect to a DC relay for the control output signals such as contractor and motor brake output, etc. to suppress a surge. Connecting it backwards could cause the drive unit to malfunction so that signals are not output, and emergency stop and other safety circuits are inoperable.**



⚠ **Do not connect/disconnect the cables connected between the units while the power is ON.**

⚠ **Securely tighten the cable connector fixing screw or fixing mechanism. An insecure fixing could cause the cable to fall off while the power is ON.**

⚠ **When using a shielded cable instructed in the instruction manual, always ground the cable with a cable clamp, etc.**

⚠ **Always separate the signals wires from the drive wire and power line.**

⚠ **Use wires and cables that have a wire diameter, heat resistance and flexibility that conforms to the system.**

(3) Trial operation and adjustment

⚠ **Check and adjust each program and parameter before starting operation. Failure to do so could lead to unforeseen operation of the machine.**

⚠ **Do not make remarkable adjustments and changes of parameter as the operation could become unstable.**

⚠ **The usable motor and unit combination is predetermined. Always check the combinations and parameters before starting trial operation.**

⚠ **The direct-drive motor and linear servo motor do not have a stopping device such as magnetic brakes. Install a stopping device on the machine side.**

⚠ **When using the linear servo motor for an unbalance axis, adjust the unbalance weight to 0 by installing an air cylinder, etc. on the machine side. The unbalance weight disables the initial magnetic pole adjustment.**

⚠ CAUTION

(4) Usage methods

In abnormal state, install an external emergency stop circuit so that the operation can be stopped and power shut off immediately.

Turn the power OFF immediately if smoke, abnormal noise or odors are generated from the unit or motor.

Do not disassemble or repair this product.

Never make modifications.

When an alarm occurs, the machine will start suddenly if an alarm reset (RST) is carried out while an operation start signal (ST) is being input. Always confirm that the operation signal is OFF before carrying out an alarm reset. Failure to do so could lead to accidents or injuries.

Reduce magnetic damage by installing a noise filter. The electronic devices used near the unit could be affected by magnetic noise. Install a line noise filter, etc., if there is a risk of magnetic noise.

Use the unit, motor and regenerative resistor with the designated combination. Failure to do so could lead to fires or trouble.

The brake (magnetic brake) of the servo motor are for holding, and must not be used for normal braking.

There may be cases when holding is not possible due to the magnetic brake's life, the machine construction (when ball screw and servo motor are coupled via a timing belt, etc.) or the magnetic brake's failure. Install a stop device to ensure safety on the machine side.

After changing the programs/parameters or after maintenance and inspection, always test the operation before starting actual operation.

Do not enter the movable range of the machine during automatic operation. Never place body parts near or touch the spindle during rotation.

Follow the power supply specification conditions given in each specification for the power (input voltage, input frequency, tolerable sudden power failure time, etc.).

Set all bits to "0" if they are indicated as not used or empty in the explanation on the bits.

Do not use the dynamic brakes except during the emergency stop. Continued use of the dynamic brakes could result in brake damage.

If a circuit protector for the main circuit power supply is shared by several units, the circuit protector may not activate when a short-circuit fault occurs in a small capacity unit. This is dangerous, so never share the circuit protector.

Mitsubishi spindle motor is dedicated to machine tools. Do not use for other purposes.

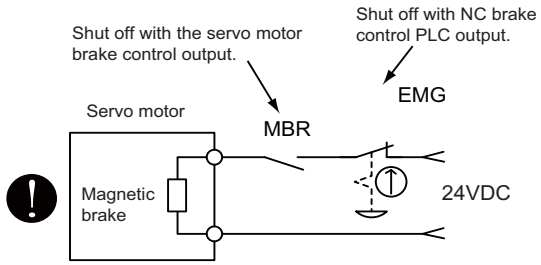
(5) Troubleshooting

If a hazardous situation is predicted during power failure or product trouble, use a servo motor with magnetic brakes or install an external brake mechanism.

Use a double circuit configuration that allows the operation circuit for the magnetic brakes to be operated even by the external emergency stop signal.

Always turn the main circuit power of the motor OFF when an alarm occurs.

If an alarm occurs, remove the cause, and secure the safety before resetting the alarm.



⚠ CAUTION

(6) Maintenance, inspection and part replacement

⚠ **Always backup the programs and parameters before starting maintenance or inspections.**

⚠ **The capacity of the electrolytic capacitor will drop over time due to self-discharging, etc. To prevent secondary disasters due to failures, replacing this part every five years when used under a normal environment is recommended. Contact the Service Center, Service Station, Sales Office or delayer for repairs or part replacement.**

⚠ **Do not perform a megger test (insulation resistance measurement) during inspections.**

⚠ **If the battery low warning is issued, immediately replace the battery. Replace the batteries while applying the drive unit's control power.**

⚠ **Do not short circuit, charge, overheat, incinerate or disassemble the battery.**

⚠ **For after-purchase servicing of the built-in motor, only the servicing parts for MITSUBISHI encoder can be supplied. For the motor body, prepare the spare parts at the machine manufacturers.**

⚠ **For maintenance, part replacement, and services in case of failures in the built-in motor (including the encoder), take necessary actions at the machine manufacturers. For drive unit, Mitsubishi can offer the after-purchase servicing as with the general drive unit.**

(7) Disposal

⚠ **Take the batteries and backlights for LCD, etc., off from the controller, drive unit and motor, and dispose of them as general industrial wastes.**

⚠ **Do not disassemble the unit or motor.**

⚠ **Dispose of the battery according to local laws.**

⚠ **Always return the secondary side (magnet side) of the linear servo motor to the Service Center or Service Station.**

⚠ **When incinerating optical communication cable, hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of optical communication cable, request for specialized industrial waste disposal services that has incineration facility for disposing hydrogen fluoride gas or hydrogen chloride gas.**

(8) Transportation

⚠ **The unit and motor are precision parts and must be handled carefully.**

⚠ **According to a United Nations Advisory, the battery unit and battery must be transported according to the rules set forth by the International Civil Aviation Organization (ICAO), International Air Transportation Association (IATA), International Maritime Organization (IMO), and United States Department of Transportation (DOT), etc.**

(9) General precautions

The drawings given in this manual show the covers and safety partitions, etc., removed to provide a clearer explanation. Always return the covers or partitions to their respective places before starting operation, and always follow the instructions given in this manual.

Treatment of waste

The following two laws will apply when disposing of this product. Considerations must be made to each law. The following laws are in effect in Japan. Thus, when using this product overseas, the local laws will have a priority. If necessary, indicate or notify these laws to the final user of the product.

(1) Requirements for "Law for Promotion of Effective Utilization of Resources"
   (a) Recycle as much of this product as possible when finished with use.
   (b) When recycling, often parts are sorted into steel scraps and electric parts, etc., and sold to scrap contractors. Mitsubishi recommends sorting the product and selling the members to appropriate contractors.

(2) Requirements for "Law for Treatment of Waste and Cleaning"
   (a) Mitsubishi recommends recycling and selling the product when no longer needed according to item (1) above. The user should make an effort to reduce waste in this manner.
   (b) When disposing a product that cannot be resold, it shall be treated as a waste product.
   (c) The treatment of industrial waste must be commissioned to a licensed industrial waste treatment contractor, and appropriate measures, including a manifest control, must be taken.
   (d) Batteries correspond to "primary batteries", and must be disposed of according to local disposal laws.

Disposal

(Note) This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury (0,0005%), Cd: cadmium (0,002%), Pb: lead (0,004%)
In the European Union there are separate collection systems for used batteries and accumulators.
Please, dispose of batteries and accumulators correctly at your local community waste collection/ recycling centre.

Please, help us to conserve the environment we live in!

Trademarks

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Other company and product names that appear in this manual are trademarks or registered trademarks of the respective companies.

本製品の取扱いについて

(日本語 /Japanese)
本製品は工業用 (クラス A) 電磁環境適合機器です。販売者あるいは使用者はこの点に注意し、住商業環境以外での使用をお願いいたします。

Handling of our product

(English)
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

본 제품의 취급에 대해서

(한국어 /Korean)
이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

WARRANTY

Please confirm the following product warranty details before using MITSUBISHI CNC.

1. Warranty Period and Coverage

Should any fault or defect (hereafter called "failure") for which we are liable occur in this product during the warranty period, we shall provide repair services at no cost through the distributor from which the product was purchased or through a Mitsubishi Electric service provider. Note, however that this shall not apply if the customer was informed prior to purchase of the product that the product is not covered under warranty. Also note that we are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit is replaced.

[Warranty Term]
The term of warranty for this product shall be twenty-four (24) months from the date of delivery of product to the end user, provided the product purchased from us in Japan is installed in Japan (but in no event longer than thirty (30) months, Including the distribution time after shipment from Mitsubishi Electric or its distributor).
Note that, for the case where the product purchased from us in or outside Japan is exported and installed in any country other than where it was purchased; please refer to "2. Service in overseas countries" as will be explained.

[Limitations]
(1) The customer is requested to conduct an initial failure diagnosis by him/herself, as a general rule. It can also be carried out by us or our service provider upon the customer's request and the actual cost will be charged.
(2) This warranty applies only when the conditions, method, environment, etc., of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual, user's manual, and the caution label affixed to the product, etc.
(3) Even during the term of warranty, repair costs shall be charged to the customer in the following cases:
  (a) a failure caused by improper storage or handling, carelessness or negligence, etc., or a failure caused by the customer's hardware or software problem
  (b) a failure caused by any alteration, etc., to the product made by the customer without Mitsubishi Electric's approval
  (c) a failure which may be regarded as avoidable, if the customer's equipment in which this product is incorporated is equipped with a safety device required by applicable laws or has any function or structure considered to be indispensable in the light of common sense in the industry
  (d) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  (e) any replacement of consumable parts (including a battery, relay and fuse)
  (f) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning, and natural disasters
  (g) a failure which is unforeseeable under technologies available at the time of shipment of this product from our company
  (h) any other failures which we are not responsible for or which the customer acknowledges we are not responsible for

2. Service in Overseas Countries

If the customer installs the product purchased from us in his/her machine or equipment, and export it to any country other than where he/she bought it, the customer may sign a paid warranty contract with our local FA center.
This falls under the case where the product purchased from us in or outside Japan is exported and installed in any country other than where it was purchased.
For details please contact the distributor from which the customer purchased the product.

3. Exclusion of Responsibility for Compensation against Loss of Opportunity, Secondary Loss, etc.

Whether during or after the term of warranty, we assume no responsibility for any damages arising from causes for which we are not responsible, any losses of opportunity and/or profit incurred by the customer due to a failure of this product, any damages, secondary damages or compensation for accidents arising under specific circumstances that either foreseen or unforeseen by Mitsubishi Electric, any damages to products other than this product, or compensation for any replacement work, readjustment and startup test run of on-site machines or any other operations conducted by the customer.

4. Changes in Product Specifications

Specifications shown in our catalogs, manuals or technical documents are subject to change without notice.

5. Product Application

(1) For the use of this product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in the product, and a backup or fail-safe function should operate on an external system to the product when any failure or malfunction occurs.
(2) Mitsubishi CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes. Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

Contents

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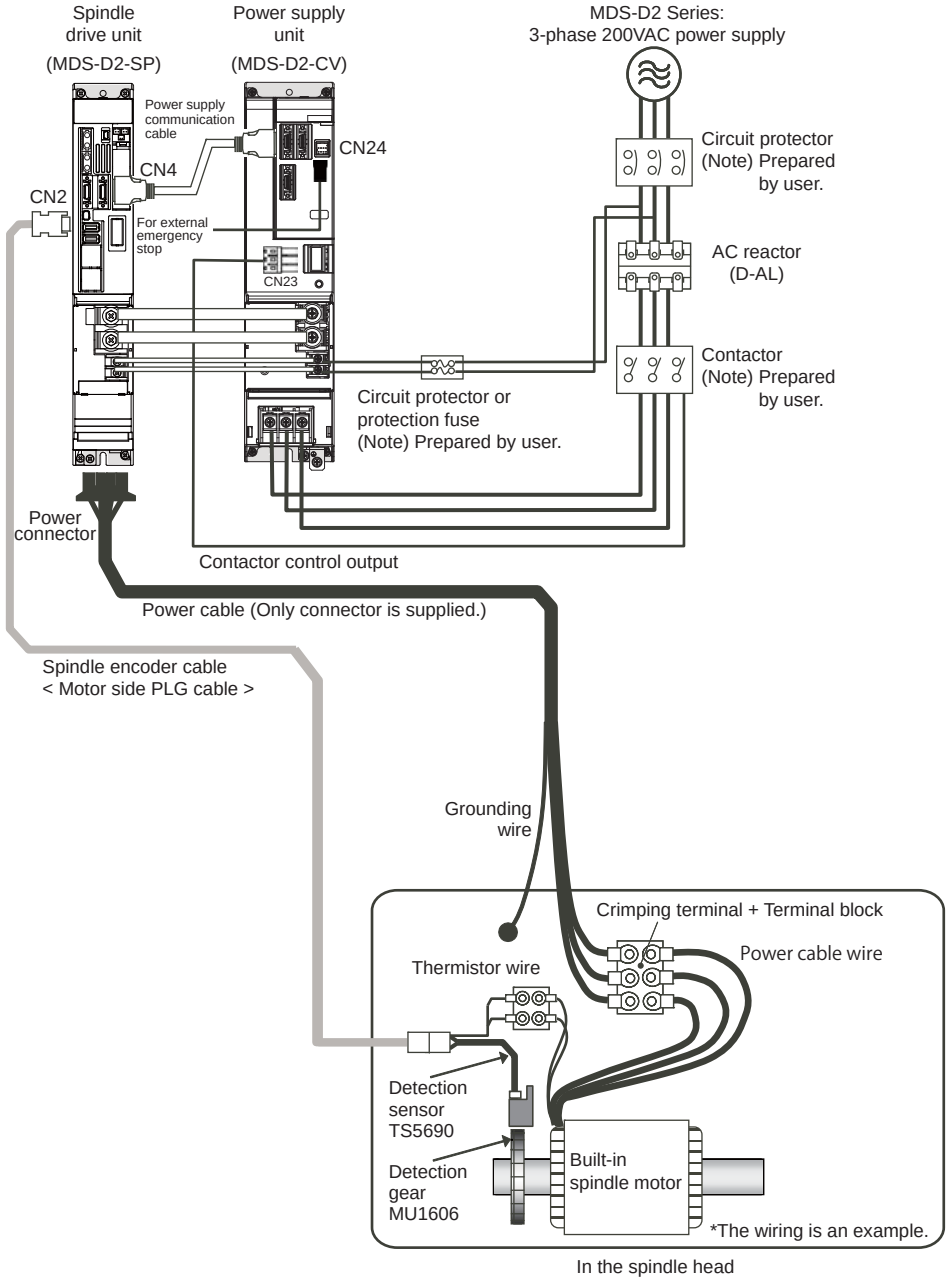
Introduction

1.1 Spindle Drive System Configuration

1.1.1 System Configuration



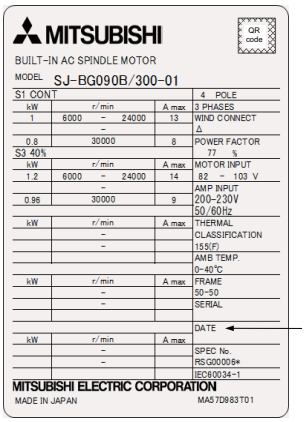
1. For coil changeover specification, refer to the section "Spindle coil changeover" in "MDS-D2/DH2 Series Instruction Manual" (IB-1501127(ENG)).
2. For details on the drive units, refer to "MDS-D2/DH2 Series Specifications Manual" (IB-1501124(ENG)).

⚠ CAUTION

1. Keep the detection sensor cable away from the power cable.
2. Connect the ground to the spindle head.

1.2 Explanation of Type

1.2.1 Built-in Spindle Motor Type



Rating nameplate

(1) Built-in IM spindle motor

< SJ-B Series >

SJ- (1) B (2) (3) (4) (5) (6)

(1) Voltage

Symbol	Voltage
2	200V
4	400V

*400V is available by special order.

(3) Motor size
Stator outline (frame No.) is indicated with 0 to 9, A, B.

Symbol	Stator outline
0	ϕ 110
1	ϕ 128
2	ϕ 160
3	ϕ 180
4	ϕ 210
5	ϕ 230
6	ϕ 255
7	ϕ 300
9	ϕ 370
A	ϕ 90
B	ϕ 115

(2) Number of poles

Symbol	Number of poles
2	2 poles
4	4 poles
6	6 poles

(6) Coil changeover

Symbol	Coil changeover
None	Unavailable
D	Available (Δ-2//Δ)
K	Available (人 -Δ)

(5) Overheat protection sensor

Symbol	Overheat protection sensor
T	Thermistor

(4) Specification code
Specification code (01 to 99)

(2) Built-in IPM spindle motor

< SJ-PMB Series >

SJ- (1) PMB (2) (3) (4) – (5)

(1) Voltage

Symbol	Voltage
None	200V
4	400V

*400V is available by special order.

(4) Overheat protection sensor

Symbol	Overheat protection sensor
T	Thermistor

(5) Design management No.
Indicates with 2 digits number or alphabetic characters
Example) 00, A1

(3) Base rotation speed
Indicates the thousands and the hundreds places (the ten places are rounded off.)
Example) 03 : 250 to 349 [r/min]
15 : 1450 to 1549 [r/min]

(2) Continuous rated torque
Indicates with 3 digits.
For 1000 [N・m] or more (for 9999 [N・m] or less),
the upper digit is indicated by alphabetic character and the others are indicated by the carried number.
Example) 020 : 20 [N・m]
A55 : 1550 [N・m]

> **⚠ CAUTION**
>
> 1. Check the rating table to see whether the coil changeover specification (人- 人 connection, Δ-2//Δconnection) is included or not.
> 2. This explains the model name system of spindle motors, but does not mean all the combinations are available.

1.2.2 Encoder Type

(1) Spindle side PLG serial output encoder (TS5690, MU1606 Series)

< Sensor type >

TS5690N (1) (2)

(1)

Symbol	The number of compatible detection gear teeth
64	64
12	128
25	256

(2)

Symbol	Length of the cable
10	400mm
20	800mm
30	1200mm
40	1600mm
60	2000mm

< Detection gear type >

MU1606N (1) (2)

(1)

Symbol	The number of detection gear teeth
6	64
7	128
8	256

(2) Each specification number

2

Specifications

2.1 Built-in Spindle Motor

2.1.1 Environmental Conditions

Environment	Conditions
Ambient temperature	0°C to +40°C (with no freezing)
Ambient humidity	90% RH or less (with no dew condensation)
Storage temperature	-20°C to +65°C (with no freezing)
Storage humidity	90% RH or less (with no dew condensation)
Atmosphere	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust
Altitude	Operation/storage: 1000m or less above sea level Transportation: 10000m or less above sea level

2.1.2 Precautions for Storage

(1) If water, dust or foreign matters, etc., adhere or enter the parts, problems such as rust or decrease in the insulation resistivity may occur. This will prevent maintenance of satisfying quality and functions.
Always store the motor indoors, and protect the motor by covering it with a sheet, etc.

(2) To prevent the coils from absorbing water and to prevent the steel center and other metallic parts from rusting due to water entering and internal sweating, place the entire product in a polyethylene bag, etc., insert 0.5kg/m^3 of dehumidifier (silica gel), and seal the bag when storing for six months or longer. Use a dehumidifier that shows the degree of absorption, and when 50% (changes from blue to pink) is reached, replace the agent, or dry it to use again.
Remove all dehumidifiers before using the motor again.

(3) Measure the insulation resistivity of the coils before using a stator that has been stored. Confirm that it is 10MΩ or more at room temperature (use a 500V insulation resistance tester). If the insulation resistance is less than 10MΩ, dry the stator in a dryer that does not exceed 90°C until the insulation resistance is restored.

2.1.3 Specifications List

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4A01T	SJ-2B4002T	SJ-2B4004T	SJ-2B4003T	SJ-2B4B01T	SJ-2B4112T
Compatible spindle drive unit		MDS-D2-SP-80	MDS-D2-SP-20	MDS-D2-SP-40	MDS-D2-SP-40	MDS-D2-SP-160	MDS-D2-SP-40
AC reactor for spindle motor		-	-	-	-	-	-
Coil changeover		-	-	-	-	-	-
Output capacity [kW]	Continuous rating	1.0	0.4	0.75	1.5	2.2	1.5
	Short time rating	1.5 (15-minute rating)	0.75 (15-minute rating)	1.5 (15-minute rating)	2.2 (15-minute rating)	3.7 (15-minute rating)	2.2 (15-minute rating)
	Standard output during acceleration/ deceleration	2.2	0.75	1.5	2.2	7.5	2.2
	Actual acceleration/ deceleration output (Note 4)	2.64	0.9	1.8	2.64	9	2.64
Base rotation speed [r/min]	Continuous	5000	3000	3000	3000	5500	2500
	Short time	5000	3000	3000	3000	5500	2500
Maximum rotation speed		10000	10000	15000	12000	10000	10000
Frame No. - Core width		50-55	63-50	63-50	63-90	70-70	71-66
Torque (Base rotation speed) [N•m]	Continuous	1.91	1.27	2.39	4.77	3.82	5.73
	Short time	2.86	2.39	4.77	7.00	6.42	8.40
Rotor GD^2 [kg•m^2]		0.00081	0.0031	0.0031	0.0055	0.0065	0.0067
Rotor inertia [kg•m^2]		0.00020	0.00078	0.00078	0.00138	0.00163	0.00168
Mass [kg]	Stator	1.9	2.2	2.2	3.9	3.0	4.1
	Rotor	0.5	0.9	0.9	1.7	1.5	1.7
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		540	240	530	570	720	570
Cooling fluid volume [l/min (20°C)]		5	5	5	5	5	5
Motor total length [mm]		110	120	120	160	136	146
Stator outer diameter [mm]		Φ89.5 (Note 3)	Φ109.5 (Note 3)	Φ109.5 (Note 3)	Φ109.5 (Note 3)	Φ114.5 (Note 3)	Φ127.5 (Note 3)
Rotor inner diameter [mm]		Φ28 (Note 3)	Φ42 (Note 3)	Φ42 (Note 3)	Φ42 (Note 3)	Φ52 (Note 3)	Φ45
Motor wire size	[mm^2]	1.25	0.75	0.75	0.75	3.5	0.75
	AWG	16	18	18	18	12	18

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4111T	SJ-2B4105T	SJ-2B4102T	SJ-2B4201T	SJ-2B4218T	SJ-2B4202T
Compatible spindle drive unit		MDS-D2-SP-80	MDS-D2-SP-80	MDS-D2-SP-80	MDS-D2-SP-40	MDS-D2-SP-80	MDS-D2-SP-80
AC reactor for spindle motor		BKO-NC6783H31	-	-	-	-	-
Coil changeover		-	-	-	-	-	-
Output capacity [kW]	Continuous rating	3.7	2.2	1.1	1.5	1.5	2.2
	Short time rating	5.5 (15-minute rating)	3.7 (15-minute rating)	3.7 (10-minute rating)	2.2 (15-minute rating)	3.7 (15-minute rating)	3.7 (15-minute rating)
	Standard output during acceleration/ deceleration	5.5	3.7	3.7	2.2	3.7	3.7
	Actual acceleration/ deceleration output (Note 4)	6.6	4.44	4.44	2.64	4.44	4.44
Base rotation speed [r/min]	Continuous	6000	3000	1500	1500	1500	1500
	Short time	6000	3000	1500	1500	2500	1500
Maximum rotation speed		10000	15000	15000	15000	10000	15000
Frame No. - Core width		71-66	71-120	71-170	100-75	100-75	100-105
Torque (Base rotation speed) [N•m]	Continuous	5.89	7.00	7.00	9.55	9.55	14.0
	Short time	8.75	11.8	23.6	14.0	14.1	23.6
Rotor GD^2 [kg•m^2]		0.0067	0.0012	0.0017	0.020	0.020	0.027
Rotor inertia [kg•m^2]		0.00168	0.003	0.00425	0.005	0.005	0.0068
Mass [kg]	Stator	4.1	7.4	10	7.1	7.1	10
	Rotor	1.7	3.0	4.3	2.9	2.9	4.1
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		870	700	1530	510	650	830
Cooling fluid volume [l/min (20°C)]		5	5	5	5	5	5
Motor total length [mm]		146	200	250	165	165	195
Stator outer diameter [mm]		Φ127.5 (Note 3)	Φ127.5 (Note 3)	Φ127.5 (Note 3)	Φ159.5 (Note 3)	Φ159.5 (Note 3)	Φ159.5 (Note 3)
Rotor inner diameter [mm]		Φ45	Φ45	Φ45	Φ60	Φ60	Φ60
Motor wire size	[mm^2]	3.5	1.25	1.25	0.75	1.25	1.25
	AWG	12	16	16	18	16	16

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4215T	SJ-2B4203T	SJ-2B4219T	SJ-2B4310T
Compatible spindle drive unit		MDS-D2-SP-200	MDS-D2-SP-80	MDS-D2-SP-160	MDS-D2-SP-80
AC reactor for spindle motor		-	-	-	-
Coil changeover		-	-	-	-
Output capacity [kW]	Continuous rating	3.7	3.7	3.7	3.7
	Short time rating	5.5 (15-minute rating)	5.5 (15-minute rating)	7.5 (15-minute rating)	5.5 (30-minute rating)
	Standard output during acceleration/ deceleration	11	5.5	7.5	5.5
	Actual acceleration/ deceleration output (Note 4)	13.2	6.6	9	6.6
Base rotation speed [r/min]	Continuous	1500	1500	1500	1750
	Short time	1500	1500	2000	1750
Maximum rotation speed [r/min]		15000	15000	15000	8000
Frame No. - Core width		100-135	100-135	100-135	112-125
Torque (Base rotation speed) [N•m]	Continuous	23.6	23.6	23.6	20.2
	Short time	35.0	35.0	35.8	30.0
Rotor GD^2 [kg•m^2]		0.034	0.035	0.035	0.051
Rotor inertia [kg•m^2]		0.0085	0.0088	0.0088	0.0128
Mass [kg]	Stator	13	13	13	15
	Rotor	5.1	5.2	5.2	5.6
Overload capacity (for one minute)		120% of short-time rated output			
Ambient temperature [°C]		0 to 40			
Heat-resistant class		155(F)			
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)			
Required cooling capacity (Note 2) [W]		1240	1180	1340	910
Cooling fluid volume [l/min (20°C)]		5	5	5	5
Motor total length [mm]		230	225	225	230
Stator outer diameter [mm]		Φ159.5 (Note 3)	Φ159.5 (Note 3)	Φ159.5 (Note 3)	Φ179.5 (Note 3)
Rotor inner diameter [mm]		Φ60	Φ60	Φ60	Φ75
Motor wire size	[mm^2]	8	3.5	3.5	3.5
	AWG	8	12	12	12

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4301T	SJ-2B4327T	SJ-2B4340T
Compatible spindle drive unit		MDS-D2-SP-160	MDS-D2-SP-160	MDS-D2-SP-200
AC reactor for spindle motor		-	-	-
Coil changeover		-	-	-
Output capacity [kW]	Continuous rating	3.7	5.5	7.5
	Short time rating	5.5 (30-minute rating)	7.5 (30-minute rating)	11 (30-minute rating)
	Standard output during acceleration/ deceleration	7.5	11	11
	Actual acceleration/ deceleration output (Note 4)	9	13.2	13.2
Base rotation speed [r/min]	Continuous	1100	1700	1500
	Short time	1100	1700	1500
Maximum rotation speed [r/min]		12000	8000	8000
Frame No. - Core width		112-125	112-170	112-170
Torque (Base rotation speed) [N•m]	Continuous	32.1	30.9	47.7
	Short time	47.7	42.1	70.0
Rotor GD^2 [kg•m^2]		0.051	0.070	0.070
Rotor inertia [kg•m^2]		0.0128	0.0175	0.0175
Mass [kg]	Stator	15	20	20
	Rotor	5.6	7.6	7.6
Overload capacity (for one minute)		120% of short-time rated output		
Ambient temperature [°C]		0 to 40		
Heat-resistant class		155(F)		
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)		
Required cooling capacity (Note 2) [W]		1510	1140	2500
Cooling fluid volume [l/min (20°C)]		5	5	10
Motor total length [mm]		230	275	270
Stator outer diameter [mm]		Φ179.5 (Note 3)	Φ179.5 (Note 3)	Φ179.5 (Note 3)
Rotor inner diameter [mm]		Φ75	Φ75	Φ80
Motor wire size	[mm^2]	3.5	5.5	5.5
	AWG	12	10	10

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4313TK		SJ-2B4323TK		SJ-2B4325TK	
Compatible spindle drive unit		MDS-D2-SP-160		MDS-D2-SP-200		MDS-D2-SP-240	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	5.5	5.5	5.5	5.5	11	15
	Short time rating	7.5 (30-minute rating)	7.5 (30-minute rating)	7.5 (30-minute rating)	7.5 (30-minute rating)	15 (15-minute rating)	22 (15-minute rating)
	Standard output during acceleration/ deceleration	7.5	7.5	11	11	15	22
	Actual acceleration/ deceleration output (Note 4)	9	9	13.2	13.2	18	26.4
Base rotation speed [r/min]	Continuous	1000	2100	1000	2000	2000	4700
	Short time	1000	2100	1000	2000	2000	4700
Maximum rotation speed [r/min]		2100	12000	2000	12000	5200	12000
Frame No. - Core width		112-170		112-170		112-170	
Torque (Base rotation speed) [N•m]	Continuous	52.5	25.0	52.5	26.3	52.5	30.5
	Short time	71.6	34.1	71.6	35.8	71.6	44.7
Rotor GD^2 [kg•m^2]		0.070		0.070		0.070	
Rotor inertia [kg•m^2]		0.0175		0.0175		0.0175	
Mass [kg]	Stator	20		20		20	
	Rotor	7.6		7.6		7.6	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		2200		4400		2640	
Cooling fluid volume [l/min (20°C)]		10		10		10	
Motor total length [mm]		280		285		295	
Stator outer diameter [mm]		Φ179.5 (Note 3)		Φ179.5 (Note 3)		Φ179.5 (Note 3)	
Rotor inner diameter [mm]		Φ75		Φ75		Φ75	
Motor wire size	[mm^2]	3.5		8		14	
	AWG	12		8		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4303TK		SJ-2B4326TK		SJ-2B4311TK	
Compatible spindle drive unit		MDS-D2-SP-200		MDS-D2-SP-240		MDS-D2-SP-320	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	5.5	5.5	7.5	7.5	15	18.5
	Short time rating	7.5 (30-minute rating)	7.5 (30-minute rating)	11 (30-minute rating)	11 (30-minute rating)	18.5 (15-minute rating)	22 (15-minute rating)
	Standard output during acceleration/ deceleration	11	15	15	18.5	22	30
	Actual acceleration/ deceleration output (Note 4)	13.2	18	18	22.2	26.4	36
Base rotation speed [r/min]	Continuous	680	1250	1000	1600	1500	2570
	Short time	680	1250	1000	1600	1500	2570
Maximum rotation speed [r/min]		3000	12000	2500	12000	3500	12000
Frame No. - Core width		112-220		112-220		112-220	
Torque (Base rotation speed) [N•m]	Continuous	77.2	42.0	71.6	44.8	95.5	68.7
	Short time	105	57.3	105	65.7	118	81.7
Rotor GD^2 [kg•m^2]		0.090		0.090		0.090	
Rotor inertia [kg•m^2]		0.0225		0.0225		0.0225	
Mass [kg]	Stator	26		26		26	
	Rotor	9.8		9.8		9.8	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		3200		3330		4120	
Cooling fluid volume [l/min (20°C)]		10		10		10	
Motor total length [mm]		335		335		345	
Stator outer diameter [mm]		Φ179.5 (Note 3)		Φ179.5 (Note 3)		Φ179.5 (Note 3)	
Rotor inner diameter [mm]		Φ75		Φ75		Φ75	
Motor wire size	[mm^2]	8		14		14	
	AWG	8		6		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4304TK		SJ-2B4318TK		SJ-2B4412T
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-320		MDS-D2-SP-160
AC reactor for spindle motor		-		-		-
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	-
Output capacity [kW]	Continuous rating	5.5	5.5	15	18.5	3.7
	Short time rating	7.5 (30-minute rating)	7.5 (30-minute rating)	18.5 (15-minute rating)	22 (15-minute rating)	5.5 (30-minute rating)
	Standard output during acceleration/ deceleration	15	15	18.5	22	5.5
	Actual acceleration/ deceleration output (Note 4)	18	18	22.2	26.4	6.6
Base rotation speed [r/min]	Continuous	450	750	1200	2500	1500
	Short time	520	750	1200	2500	1500
Maximum rotation speed [r/min]		1500	12000	3000	12000	10000
Frame No. - Core width		112-280		112-280		132-95
Torque (Base rotation speed) [N•m]	Continuous	117	70.0	119	70.7	23.6
	Short time	138	95.5	147	84.0	35.0
Rotor GD^2 [kg•m^2]		0.11		0.11		0.077
Rotor inertia [kg•m^2]		0.028		0.028		0.0193
Mass [kg]	Stator	33		33		15
	Rotor	12		12		6.2
Overload capacity (for one minute)		120% of short-time rated output				
Ambient temperature [°C]		0 to 40				
Heat-resistant class		155(F)				
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)				
Required cooling capacity (Note 2) [W]		3870		4950		920
Cooling fluid volume [l/min (20°C)]		10		10		5
Motor total length [mm]		405		405		205
Stator outer diameter [mm]		Φ179.5 (Note 3)		Φ179.5 (Note 3)		Φ209.5
Rotor inner diameter [mm]		Φ75		Φ75		Φ85
Motor wire size	[mm^2]	14		14		3.5
	AWG	6		6		12

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4501TK		SJ-2B6611TK		SJ-2B4502TK	
Compatible spindle drive unit		MDS-D2-SP-200		MDS-D2-SP-200		MDS-D2-SP-320	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	7.5	7.5	7.5	7.5	7.5	7.5
	Short time rating	11 (30-minute rating)	11 (30-minute rating)	11 (30-minute rating	11 (30-minute rating)	11 (30-minute rating)	11 (30-minute rating)
	Standard output during acceleration/ deceleration	15	15	11	15	22	22
	Actual acceleration/ deceleration output (Note 4)	18	18	13.2	18	26.4	26.4
Base rotation speed [r/min]	Continuous	700	1320	500	1030	525	1050
	Short time	700	1320	500	1030	525	1050
Maximum rotation speed [r/min]		2250	10000	1500	6000	3000	10000
Frame No. - Core width		160-175		160-175		160-230	
Torque (Base rotation speed) [N•m]	Continuous	102	54.3	143	69.5	136	68.2
	Short time	150	79.6	210	102	200	100
Rotor GD^2 [kg•m^2]		0.32		0.41		0.42	
Rotor inertia [kg•m^2]		0.08		0.102		0.105	
Mass [kg]	Stator	29		37		37	
	Rotor	18		19		24	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		3850		3520		4730	
Cooling fluid volume [l/min (20°C)]		10		10		10	
Motor total length [mm]		320		320		380	
Stator outer diameter [mm]		Φ229.5 (Note3)		Φ254.5 (Note 3)		Φ229.5 (Note 3)	
Rotor inner diameter [mm]		Φ95		Φ110		Φ95	
Motor wire size	[mm^2]	8		8		14	
	AWG	8		8		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B6602TK		SJ-2B4601TK		SJ-2B6605TK	
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-320		MDS-D2-SP-240	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	11	11	22	22	11	11
	Short time rating	15 (30-minute rating)	15 (30-minute rating)	26 (30-minute rating)	26 (30-minute rating)	15 (30-minute rating)	15 (30-minute rating)
	Standard output during acceleration/ deceleration	15	22	26	26	15	15
	Actual acceleration/ deceleration output (Note 4)	18	26.4	31.2	31.2	18	18
Base rotation speed [r/min]	Continuous	550	1193	1250	3000	440	1000
	Short time	550	1193	1250	3000	440	1000
Maximum rotation speed [r/min]		2000	8000	3500	10000	1500	6000
Frame No. - Core width		160-230		160-230		160-295	
Torque (Base rotation speed) [N•m]	Continuous	191	88.0	168	70.0	239	105
	Short time	260	120	199	82.8	326	143
Rotor GD^2 [kg•m^2]		0.53		0.42		0.69	
Rotor inertia [kg•m^2]		0.133		0.105		0.173	
Mass [kg]	Stator	49		55		63	
	Rotor	25		24		33	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		3810		3270		4450	
Cooling fluid volume [l/min (20°C)]		10		10		10	
Motor total length [mm]		380		380		440	
Stator outer diameter [mm]		Φ254.5 (Note 3)		Φ254.5 (Note 3)		Φ254.5 (Note 3)	
Rotor inner diameter [mm]		Φ110		Φ95		Φ110	
Motor wire size	[mm^2]	14		14		8	
	AWG	6		6		8	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4503TK		SJ-2B6603TK		SJ-2B4602TK	
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-320		MDS-D2-SP-320	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	11	15	15	15	18.5	18.5
	Short time rating	15 (30-minute rating)	22 (30-minute rating)	22 (30-minute rating)	22 (30-minute rating)	22 (30-minute rating)	22 (30-minute rating)
	Standard output during acceleration/ deceleration	15	22	22	22	22	22
	Actual acceleration/ deceleration output (Note 4)	18	26.4	26.4	26.4	26.4	26.4
Base rotation speed [r/min]	Continuous	475	1250	600	1200	720	1500
	Short time	475	1250	600	1200	720	1500
Maximum rotation speed [r/min]		2000	10000	1500	6000	2000	10000
Frame No. - Core width		160-295		160-295		160-295	
Torque (Base rotation speed) [N•m]	Continuous	221	115	239	119	245	118
	Short time	302	168	350	175	292	140
Rotor GD^2 [kg•m^2]		0.54		0.69		0.54	
Rotor inertia [kg•m^2]		0.135		0.173		0.135	
Mass [kg]	Stator	48		63		71	
	Rotor	31		33		31	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		7220		5160		4500	
Cooling fluid volume [l/min (20°C)]		10		15		10	
Motor total length [mm]		445		445		440	
Stator outer diameter [mm]		Φ229.5 (Note 3)		Φ254.5 (Note 3)		Φ254.5 (Note 3)	
Rotor inner diameter [mm]		Φ95		Φ110		Φ95	
Motor wire size	[mm^2]	14		14		14	
	AWG	6		6		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B4511TK		SJ-2B6720TK		SJ-2B6705TK	
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-320		MDS-D2-SP-200	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	15	22	15	22	7.5	7.5
	Short time rating	22 (10-minute rating)	30 (30-minute rating)	22 (30-minute rating)	26 (30-minute rating)	11 (30-minute rating)	11 (30-minute rating)
	Standard output during acceleration/ deceleration	22	30	22	26	11	11
	Actual acceleration/ deceleration output (Note 4)	26.4	36	26.4	31.2	13.2	13.2
Base rotation speed [r/min]	Continuous	600	1600	700	1550	270	540
	Short time	600	1600	700	1550	270	540
Maximum rotation speed [r/min]		2000	10000	1500	4500	750	4500
Frame No. - Core width		160-330		180-160		180-230	
Torque (Base rotation speed) [N•m]	Continuous	239	131	205	136	265	133
	Short time	350	179	300	160	389	195
Rotor GD^2 [kg•m^2]		0.60		0.80		1.15	
Rotor inertia [kg•m^2]		0.15		0.20		0.288	
Mass [kg]	Stator	54		45		65	
	Rotor	34		26		38	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		8160		5200		4440	
Cooling fluid volume [l/min (20°C)]		15		15		10	
Motor total length [mm]		480		300		400	
Stator outer diameter [mm]		Φ229.5 (Note 3)		Φ299.5 (Note 3)		Φ299.5 (Note 3)	
Rotor inner diameter [mm]		Φ95		Φ130		Φ130	
Motor wire size	[mm^2]	14		14		14	
	AWG	6		6		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B6711TK		SJ-2B6706TK		SJ-2B6716TK	
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-400		MDS-D2-SP-400	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	11	11	15	15	15	22
	Short time rating	15 (30-minute rating)	15 (30-minute rating)	18.5 (30-minute rating)	18.5 (30-minute rating)	22 (30-minute rating)	26 (30-minute rating)
	Standard output during acceleration/ deceleration	22	22	26	30	26	30
	Actual acceleration/ deceleration output (Note 4)	26.4	26.4	31.2	36	31.2	36
Base rotation speed [r/min]	Continuous	400	920	450	1080	350	600
	Short time	500	920	450	1080	420	600
Maximum rotation speed [r/min]		1700	5000	2000	6000	600	4000
Frame No. - Core width		180-230		180-230		180-250	
Torque (Base rotation speed) [N•m]	Continuous	263	114	318	133	409	350
	Short time	286	156	393	164	500	414
Rotor GD^2 [kg•m^2]		1.12		1.15		1.13	
Rotor inertia [kg•m^2]		0.280		0.288		0.283	
Mass [kg]	Stator	65		65		70	
	Rotor	37		38		35	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		3270		4620		7560	
Cooling fluid volume [l/min (20°C)]		10		10		15	
Motor total length [mm]		405		405		390	
Stator outer diameter [mm]		Φ299.5 (Note 3)		Φ299.5 (Note 3)		Φ299.5 (Note 3)	
Rotor inner diameter [mm]		Φ130		Φ130		Φ145	
Motor wire size	[mm^2]	22		22		22	
	AWG	4		4		4	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B6721TK		SJ-2B6704TK		SJ-2B6709TK	
Compatible spindle drive unit		MDS-D2-SP-320		MDS-D2-SP-320		MDS-D2-SP-400	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	18.5	22	15	22	15	22
	Short time rating	22 (30-minute rating)	30 (30-minute rating)	22 (30-minute rating)	30 (30-minute rating)	22 (30-minute rating)	30 (30-minute rating)
	Standard output during acceleration/ deceleration	22	30	22	30	22	30
	Actual acceleration/ deceleration output (Note 4)	26.4	36	26.4	36	26.4	36
Base rotation speed [r/min]	Continuous	500	1500	475	1200	350	1000
	Short time	500	1500	475	1200	420	1000
Maximum rotation speed [r/min]		1500	6000	1150	6000	1500	6000
Frame No. - Core width		180-250		180-295		180-295	
Torque (Base rotation speed) [N•m]	Continuous	353	140	302	175	409	210
	Short time	420	191	442	239	500	286
Rotor GD^2 [kg•m^2]		1.13		1.48		1.48	
Rotor inertia [kg•m^2]		0.283		0.37		0.37	
Mass [kg]	Stator	70		83		83	
	Rotor	35		49		49	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		5230		5210		6180	
Cooling fluid volume [l/min (20°C)]		15		15		15	
Motor total length [mm]		390		470		450	
Stator outer diameter [mm]		Φ299.5 (Note 3)		Φ299.5 (Note 3)		Φ299.5 (Note 3)	
Rotor inner diameter [mm]		Φ145		Φ130		Φ130	
Motor wire size	[mm^2]	22		22		22	
	AWG	4		4		4	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B6802TK		SJ-2B6905TK		SJ-2B6908TK	
Compatible spindle drive unit		MDS-D2-SP-640		MDS-D2-SP-320		MDS-D2-SP-320	
AC reactor for spindle motor		-		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	30	30	22	22	15	22
	Short time rating	37 (30-minute rating)	37 (30-minute rating)	26 (30-minute rating)	26 (30-minute rating)	22 (50%ED rating)	30 (50%ED rating)
	Standard output during acceleration/ deceleration	37	37	26	26	22	30
	Actual acceleration/ deceleration output (Note 4)	44.4	44.4	31.2	31.2	26.4	36
Base rotation speed [r/min]	Continuous	400	650	420	1000	175	450
	Short time	400	650	420	1000	175	450
Maximum rotation speed [r/min]		1000	3200	1500	4000	1000	3300
Frame No. - Core width		200-350		225-270		225-350	
Torque (Base rotation speed) [N•m]	Continuous	716	441	500	210	819	467
	Short time	883	544	591	248	1200	637
Rotor GD^2 [kg•m^2]		2.70		3.41		4.42	
Rotor inertia [kg•m^2]		0.675		0.853		1.105	
Mass [kg]	Stator	116		110		143	
	Rotor	72		70		91	
Overload capacity (for one minute)		120% of short-time rated output					
Ambient temperature [°C]		0 to 40					
Heat-resistant class		155(F)					
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)					
Required cooling capacity (Note 2) [W]		8450		4040		9920	
Cooling fluid volume [l/min (20°C)]		15		10		15	
Motor total length [mm]		550		465		545	
Stator outer diameter [mm]		Φ329.5 (Note 3)		Φ369.5 (Note 3)		Φ369.5 (Note 3)	
Rotor inner diameter [mm]		Φ145		Φ165		Φ165	
Motor wire size	[mm^2]	38		22		22	
	AWG	2		4		4	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-B Series >

Built-in spindle motor type (Note 1)		SJ-2B6906TK		SJ-2B6914TK	
Compatible spindle drive unit		MDS-D2-SP-400		MDS-D2-SP-640	
AC reactor for spindle motor		-		-	
Coil changeover		Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	15	30	25	25
	Short time rating	22 (30-minute rating)	37 (30-minute rating)	30 (30-minute rating)	30 (30-minute rating)
	Standard output during acceleration/ deceleration	22	37	30	30
	Actual acceleration/ deceleration output (Note 4)	26.4	44.4	36	36
Base rotation speed [r/min]	Continuous	175	600	240	470
	Short time	175	600	240	470
Maximum rotation speed [r/min]		1000	3300	1000	3300
Frame No. - Core width		225-350		225-350	
Torque (Base rotation speed) [N•m]	Continuous	819	477	995	508
	Short time	1200	589	1194	610
Rotor GD^2 [kg•m^2]		4.42		4.42	
Rotor inertia [kg•m^2]		1.105		1.105	
Mass [kg]	Stator	143		143	
	Rotor	91		91	
Overload capacity (for one minute)		120% of short-time rated output			
Ambient temperature [°C]		0 to 40			
Heat-resistant class		155(F)			
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)			
Required cooling capacity (Note 2) [W]		9820		9480	
Cooling fluid volume [l/min (20°C)]		15		15	
Motor total length [mm]		555		520	
Stator outer diameter [mm]		Φ369.5 (Note 3)		Φ369.5 (Note 3)	
Rotor inner diameter [mm]		Φ165		Φ165	
Motor wire size	[mm^2]	38		38	
	AWG	2		2	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

(Note 3) These dimensions are the dimensions after machine machining.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

(Note 5) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

< SJ-PMB Series>

Built-in spindle motor type (Note 1)		SJ-PMB02215T-02	SJ-PMB04412T-B0		SJ-PMB14007T-01	
Compatible spindle drive unit		MDS-D2-SP-240	MDS-D2-SP-200		MDS-D2-SP-320	
AC reactor for spindle motor		-	-		-	
Coil changeover		-	Low-speed coil	High-speed coil	Low-speed coil	High-speed coil
Output capacity [kW]	Continuous rating	3.5	5.5	5.5	11	11
	Short time rating	5.5 (50%ED rating)	7.5 (25%ED rating)	7.5 (25%ED rating)	15 (15%ED rating)	15 (15%ED rating)
	Standard output during acceleration/ deceleration	5.5	7.5	7.5	15	15
	Actual acceleration/ deceleration output (Note 4)	6.6	9	9	18	18
Base rotation speed [r/min]	Continuous	1500	1200	3000	750	1800
	Short time	1500	1200	3000	750	1800
Maximum rotation speed [r/min]		10000	3000	8000	1800	6000
Frame No. - Core width		80	112		160	
Torque (Base rotation speed) [N•m]	Continuous	22.3	43.8	17.5	140	58.4
	Short time	35.0	59.7	23.9	191(15%ED rating)	79.6(15%ED rating)
Rotor GD^2 [kg•m^2]		0.024	0.0649		0.253	
Rotor inertia [kg•m^2]		0.006	0.0162		0.0633	
Mass [kg]	Stator	4.4	14.0		30	
	Rotor	3.7	8.0		15	
Overload capacity (for one minute)		120% of short-time rated output				
Ambient temperature [°C]		0 to 40				
Heat-resistant class		155(F)				
Tolerable vibration		Maximum stationary tolerable value 9.8m/s^2(1G), Momentary stationary tolerable value 29.4m/s^2(3G)				
Required cooling capacity (Note 2) [W]		1400	1200		1500	
Cooling fluid volume [l/min (20°C)]		5	5		5	
Motor total length [mm]		150	225		250	
Stator outer diameter [mm]		Φ139.5	Φ179.5		Φ254.5	
Rotor inner diameter [mm]		Φ60	Φ70.6		Φ95	
Motor wire size	[mm^2]	8	14		14	
	AWG	8	6		6	

(Note 1) Please contact your Mitsubishi Electric dealer for the special products not listed above.

(Note 2) The value for the short-time rated output is shown for the required cooling capacity. Install a cooling jacket around the stator and use fluid cooling (oil cooling).

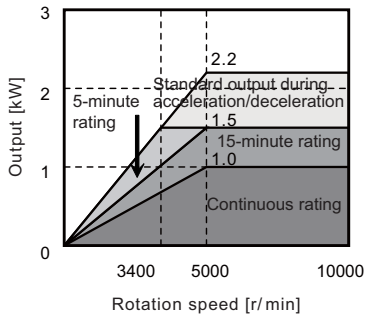
(Note 3) Only the combination designated in this manual can be used for the motor and drive unit. Always use the designated combination.

(Note 4) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

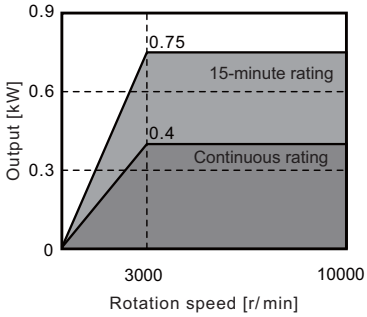
2.1.4 Characteristics

< SJ-B Series >

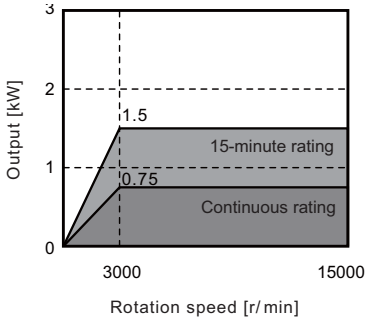
[SJ-2B4A01T]



[SJ-2B4002T]



[SJ-2B4004T]



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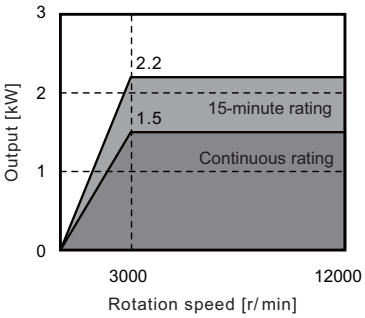
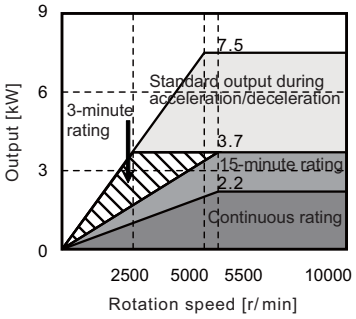


[SJ-2B4B01T]



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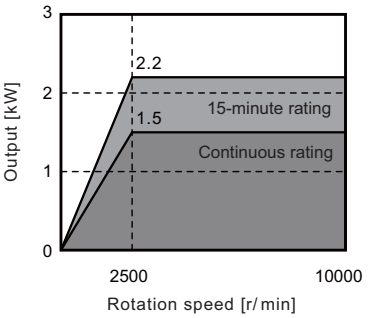
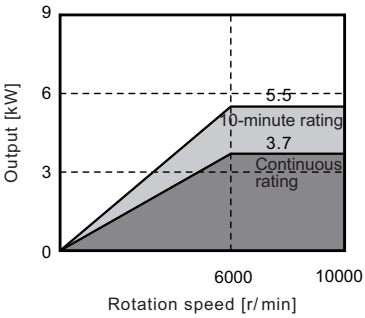
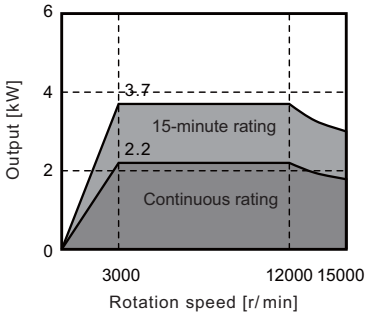


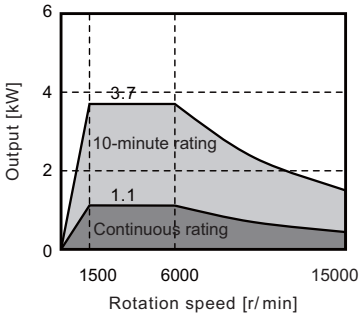
[SJ-2B4111T]



[SJ-2B4105T]



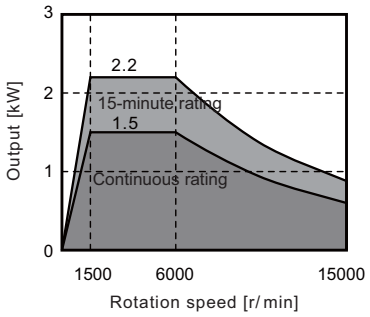
[SJ-2B4102T]



(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

[SJ-2B4201T]



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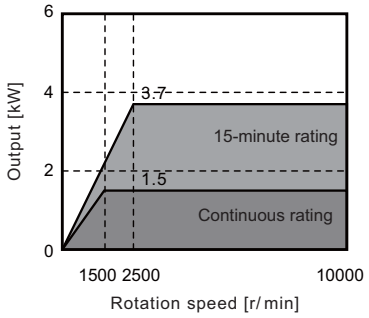

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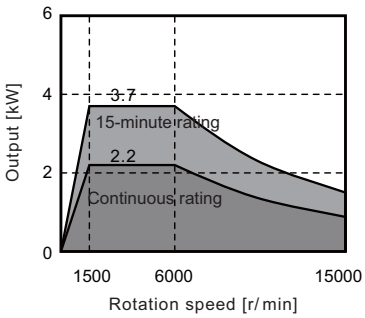

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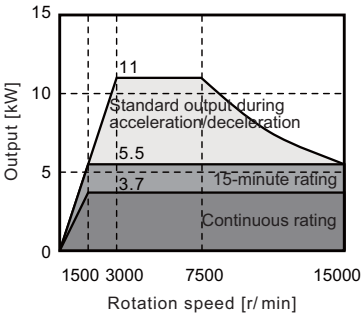

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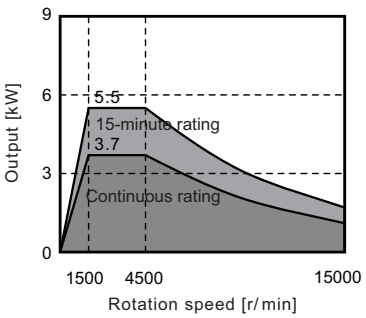

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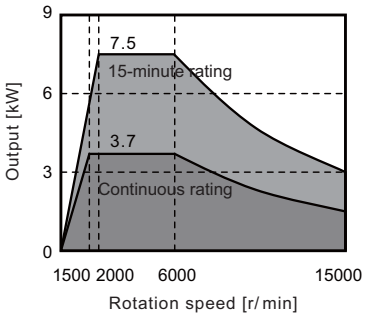

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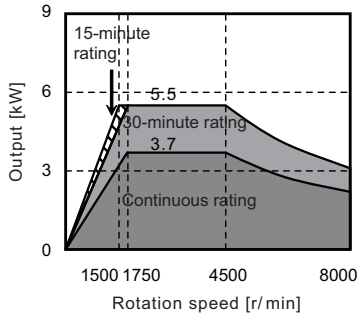
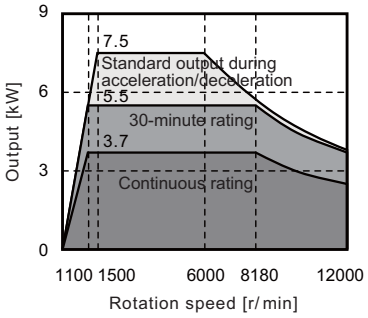
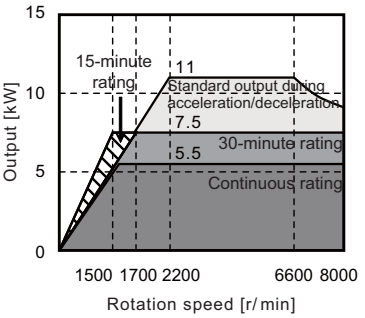


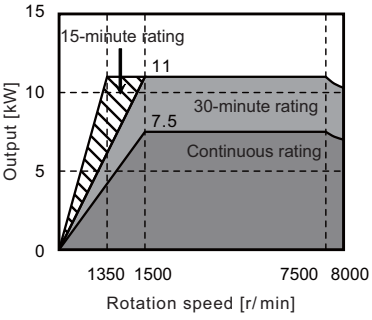
[SJ-2B4301T]



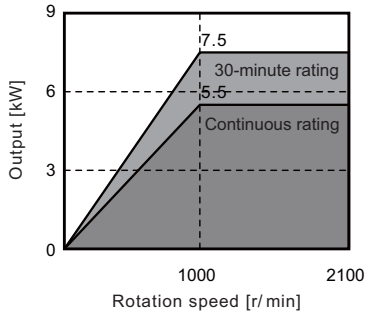
[SJ-2B4327T]



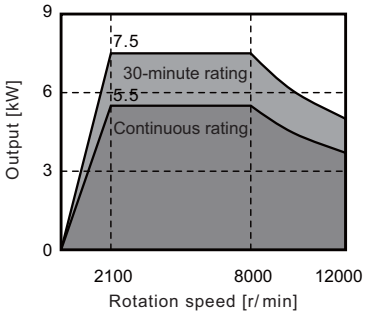
[SJ-2B4340T]



[SJ-2B4313TK (low-speed coil)]



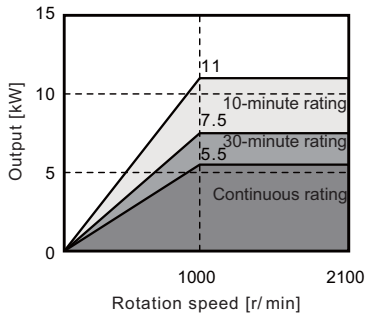
[SJ-2B4313TK (high-speed coil)]



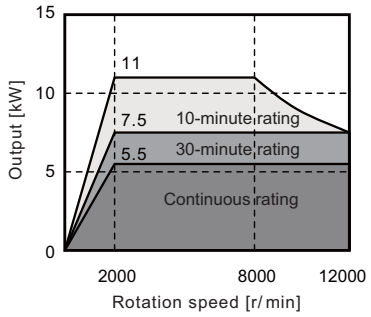
(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

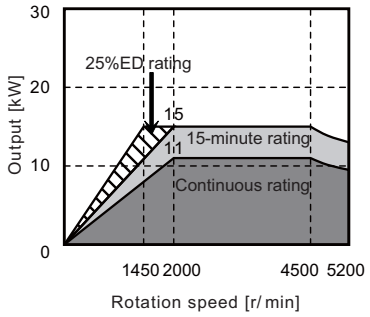
[SJ-2B4323TK (low-speed coil)]



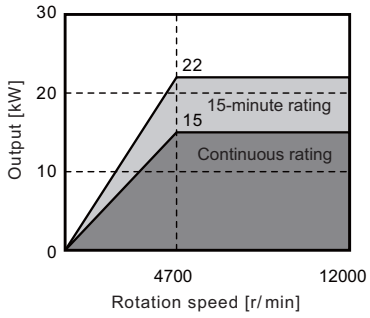
[SJ-2B4323TK (high-speed coil)]



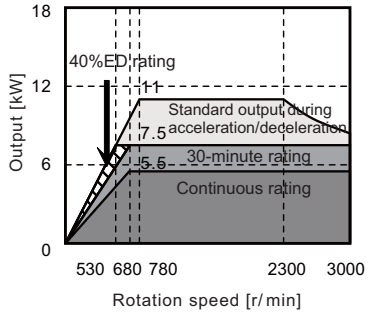
[SJ-2B4325TK (low-speed coil)]



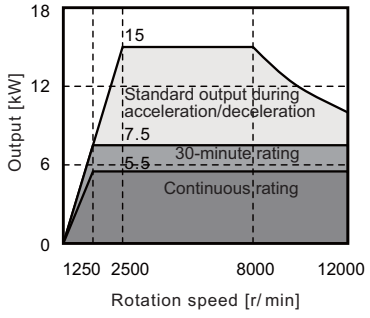
[SJ-2B4325TK (high-speed coil)]



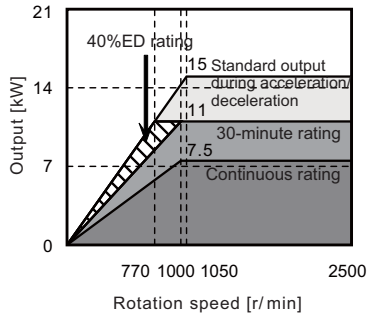
[SJ-2B4303TK (low-speed coil)]



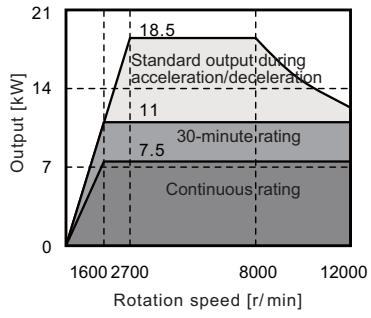
[SJ-2B4303TK (high-speed coil)]



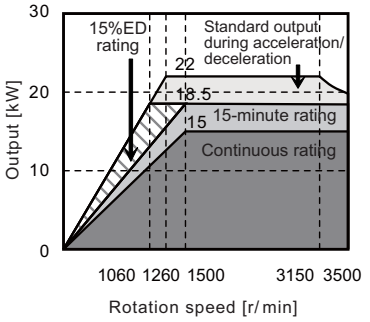
[SJ-2B4326TK (low-speed coil)]



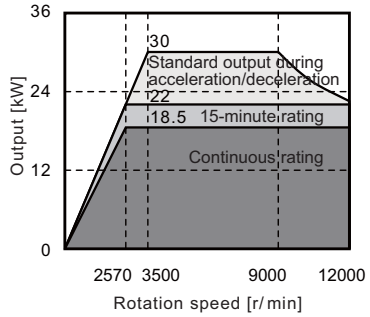
[SJ-2B4326TK (high-speed coil)]



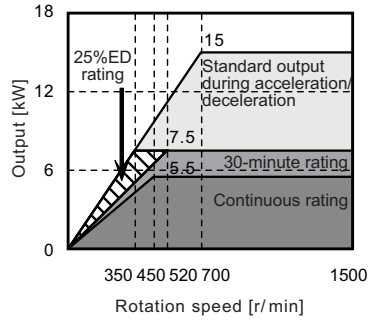
[SJ-2B4311TK(low-speed coil)]



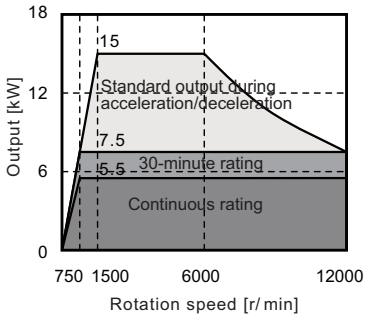
[SJ-2B4311TK (high-speed coil)]



[SJ-2B4304TK(low-speed coil)]



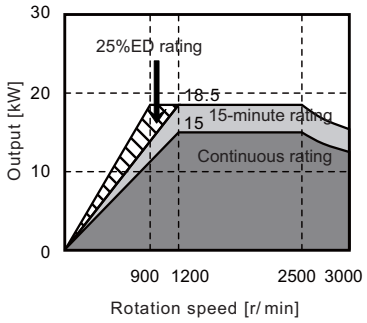
[SJ-2B4304TK (high-speed coil)]



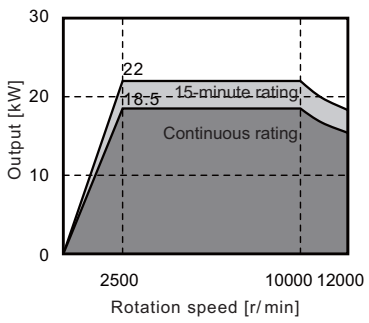
(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

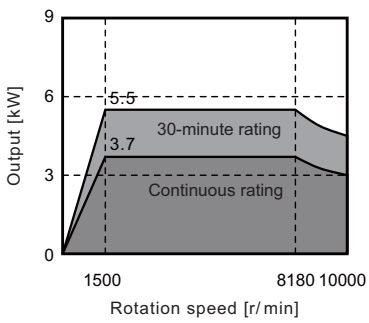
[SJ-2B4318TK (low-speed coil)]



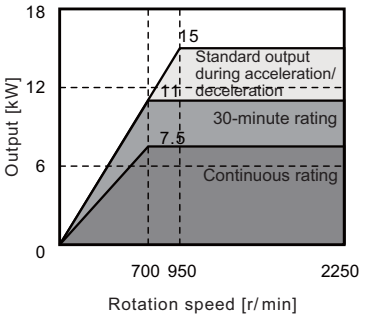
[SJ-2B4318TK (high-speed coil)]



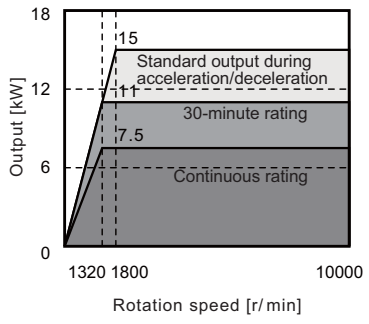
[SJ-2B4412T]



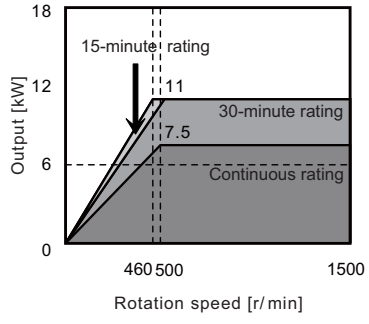
[SJ-2B4501TK (low-speed coil)]



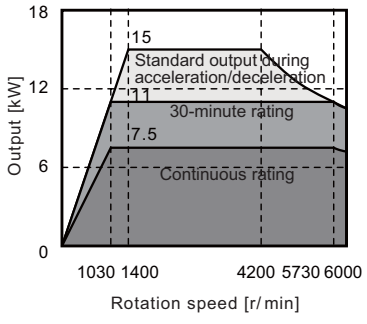
[SJ-2B4501TK (high-speed coil)]



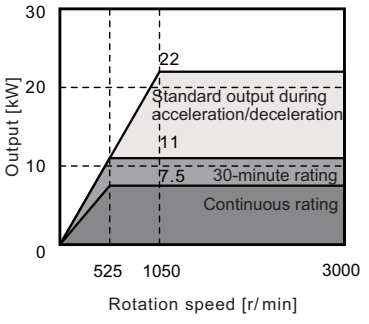
[SJ-2B6611TK (low-speed coil)]



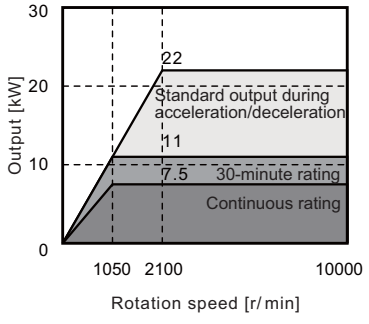
[SJ-2B6611TK (high-speed coil)]



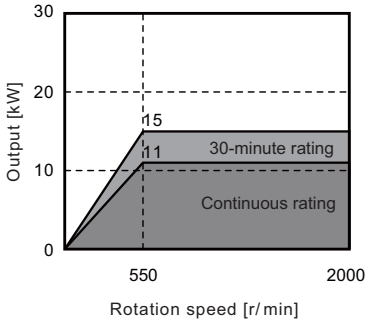
[SJ-2B4502TK (low-speed coil)]



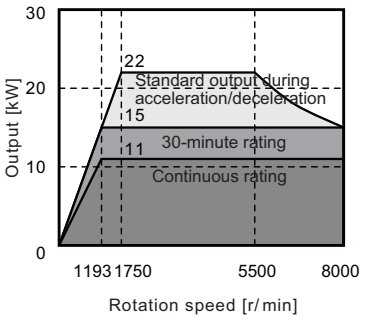
[SJ-2B4502TK (high-speed coil)]



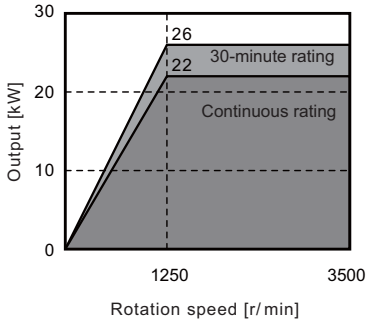
[SJ-2B6602TK (low-speed coil)]



[SJ-2B6602TK (high-speed coil)]



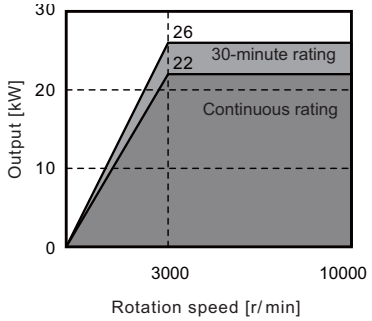
[SJ-2B4601TK (low-speed coil)]



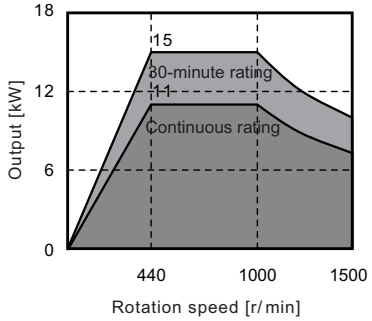
(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

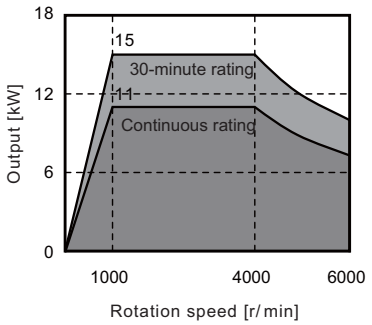
[SJ-2B4601TK (high-speed coil)]



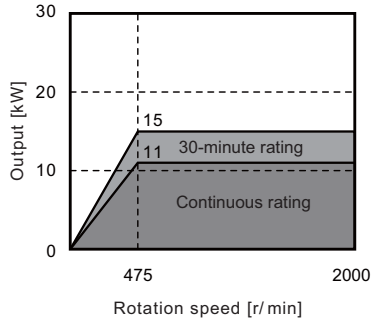
[SJ-2B6605TK (low-speed coil)]



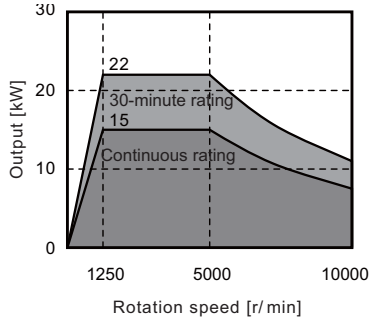
[SJ-2B6605TK (high-speed coil)]



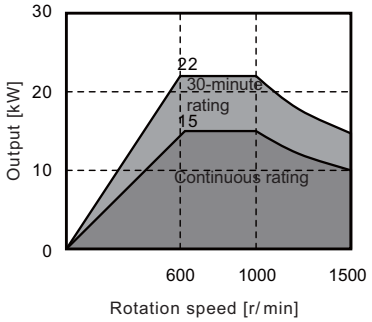
[SJ-2B4503TK (low-speed coil)]



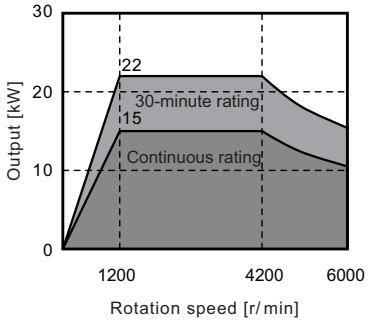
[SJ-2B4503TK (high-speed coil)]



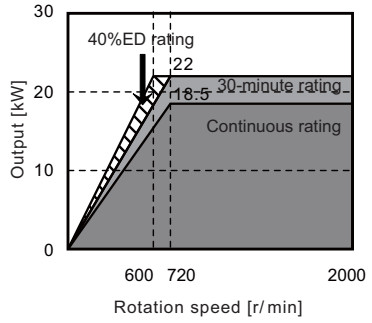
[SJ-2B6603TK (low-speed coil)]



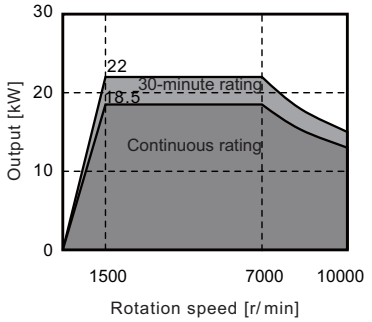
[SJ-2B6603TK (high-speed coil)]



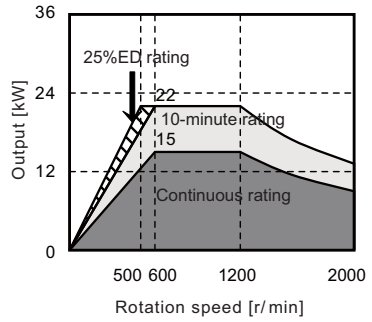
[SJ-2B4602TK (low-speed coil)]



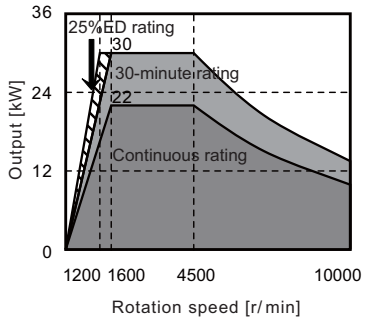
[SJ-2B4602TK (high-speed coil)]



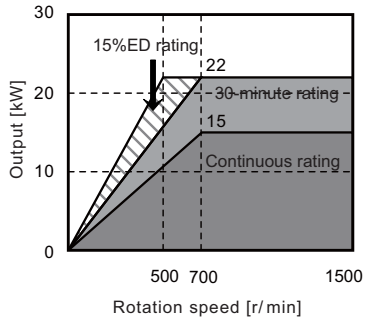
[SJ-2B4511TK (low-speed coil)]



[SJ-2B4511TK (high-speed coil)]



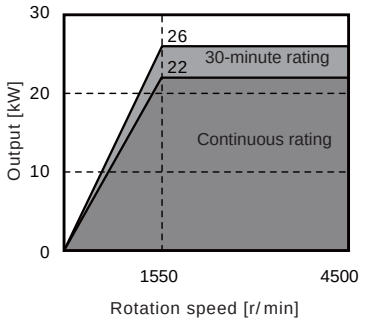
[SJ-2B6720TK (low-speed coil)]



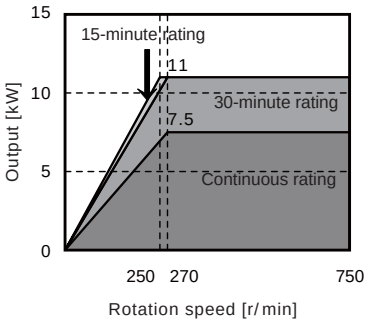
(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

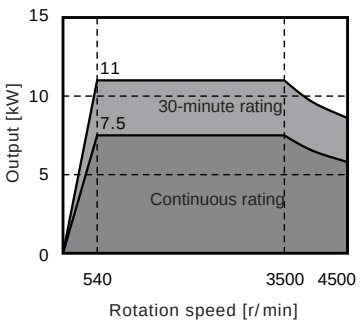
[SJ-2B6720TK (high-speed coil)]



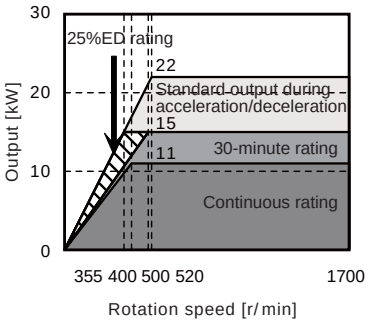
[SJ-2B6705TK (low-speed coil)]



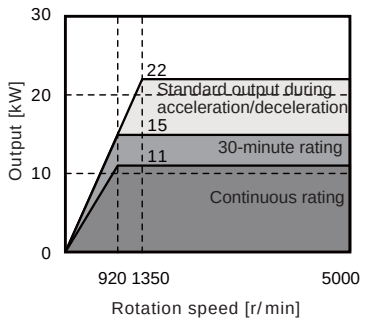
[SJ-2B6705TK (high-speed coil)]



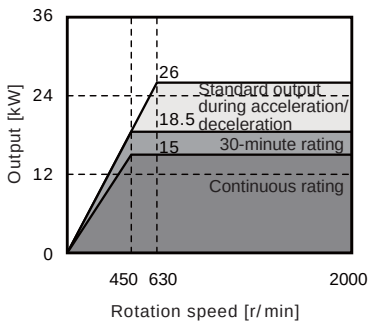
[SJ-2B6711TK (low-speed coil)]



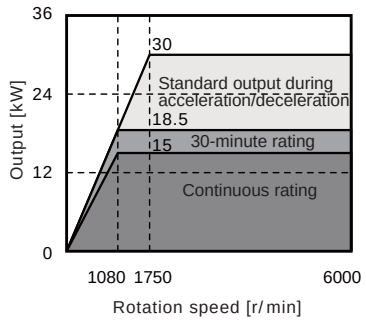
[SJ-2B6711TK (high-speed coil)]



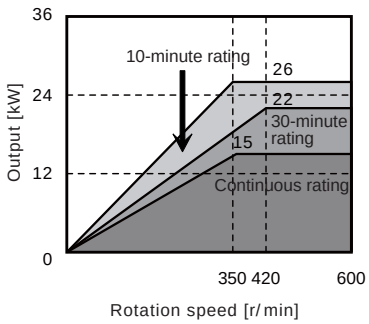
[SJ-2B6706TK(low-speed coil)]



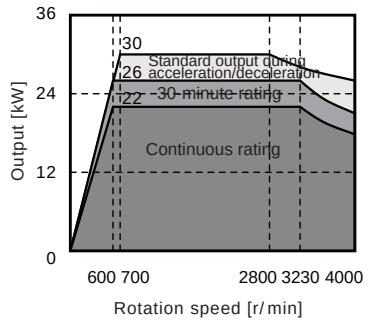
[SJ-2B6706TK (high-speed coil)]



[SJ-2B6716TK (low-speed coil)]



[SJ-2B6716TK (high-speed coil)]



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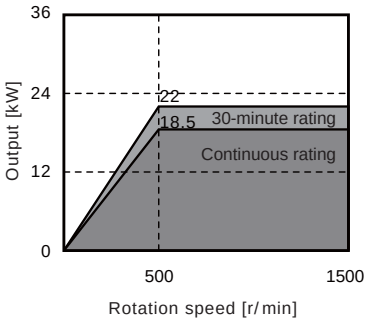
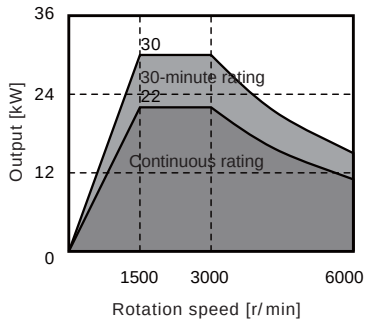
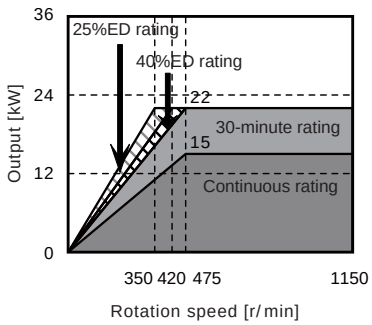


[SJ-2B6721TK (high-speed coil)]



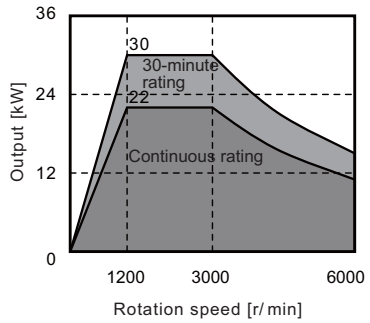
[SJ-2B6704TK (low-speed coil)]



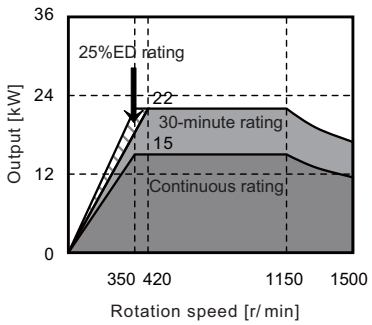
(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

< SJ-B Series >

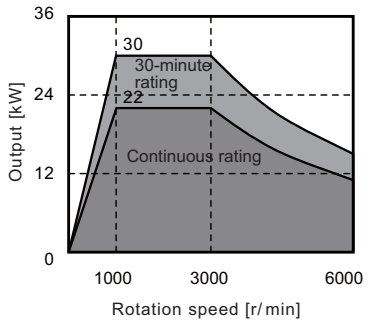
[SJ-2B6704TK (high-speed coil)]



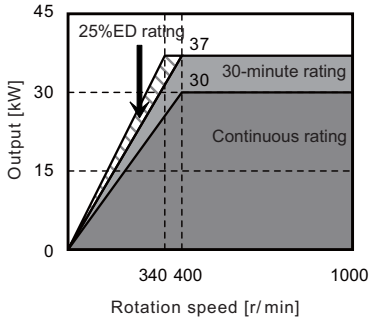
[SJ-2B6709TK (low-speed coil)]



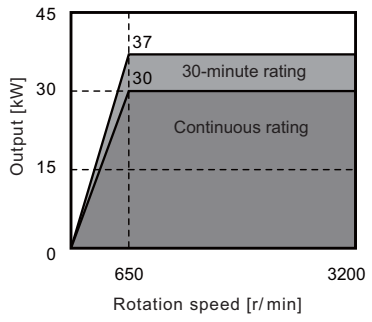
[SJ-2B6709TK (high-speed coil)]



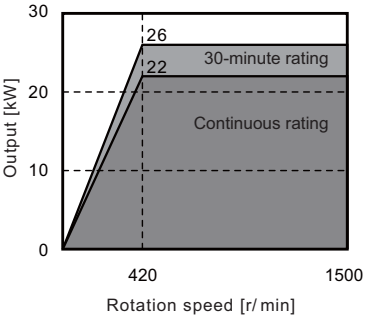
[SJ-2B6802TK (low-speed coil)]



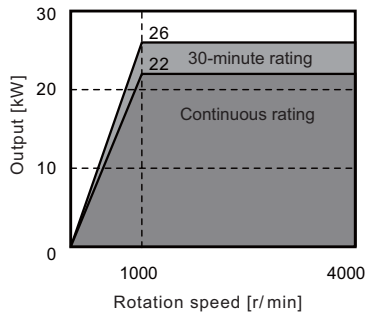
[SJ-2B6802TK (high-speed coil)]



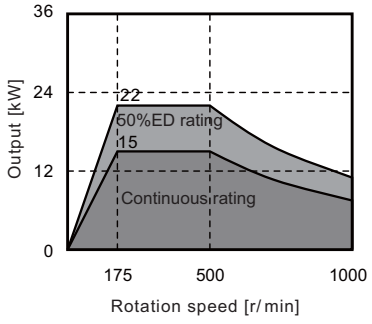
[SJ-2B6905TK (low-speed coil)]



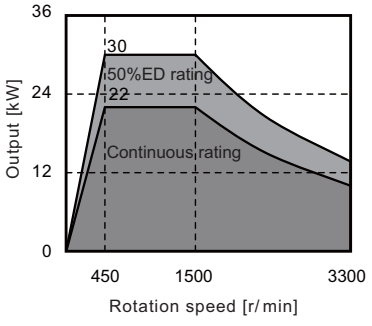
[SJ-2B6905TK (high-speed coil)]



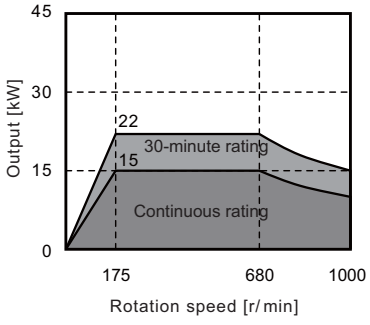
[SJ-2B6908TK (low-speed coil)]



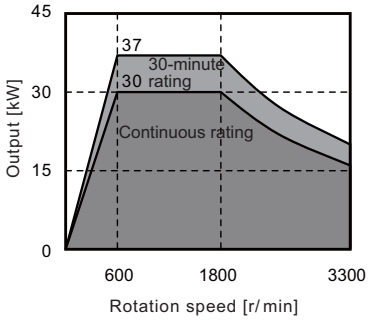
[SJ-2B6908TK (high-speed coil)]



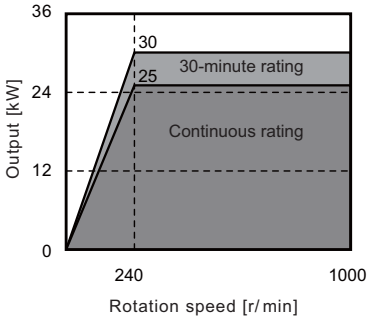
[SJ-2B6906TK (low-speed coil)]



[SJ-2B6906TK (high-speed coil)]



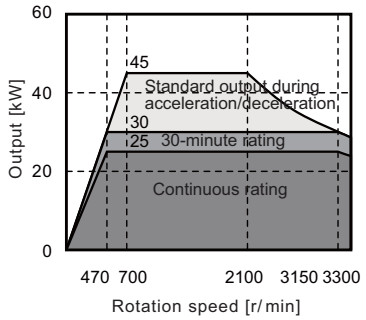
[SJ-2B6914TK (low-speed coil)]



(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

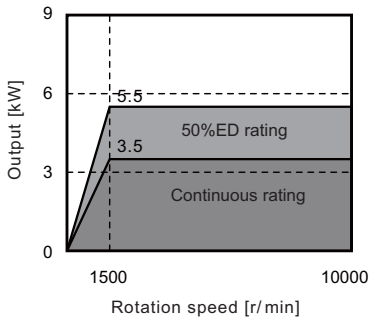
< SJ-B Series >

[SJ-2B6914TK (high-speed coil)]

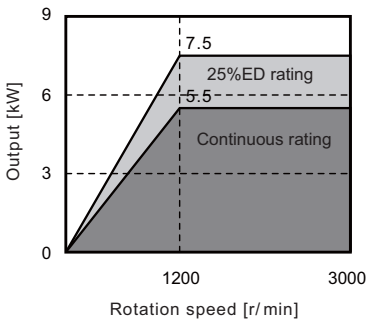


< SJ-PMB Series >

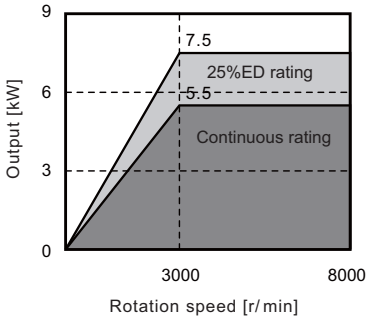
[SJ-PMB02215T-02]



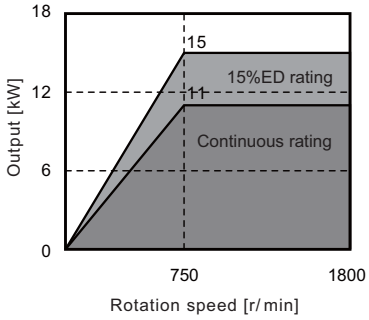
[SJ-PMB04412T-B0 (low-speed coil)]



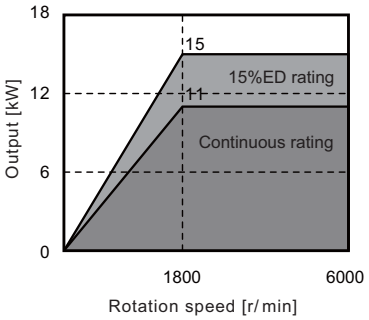
[SJ-PMB04412T-B0 (high-speed coil)]



[SJ-PMB14007T-01 (low-speed coil)]



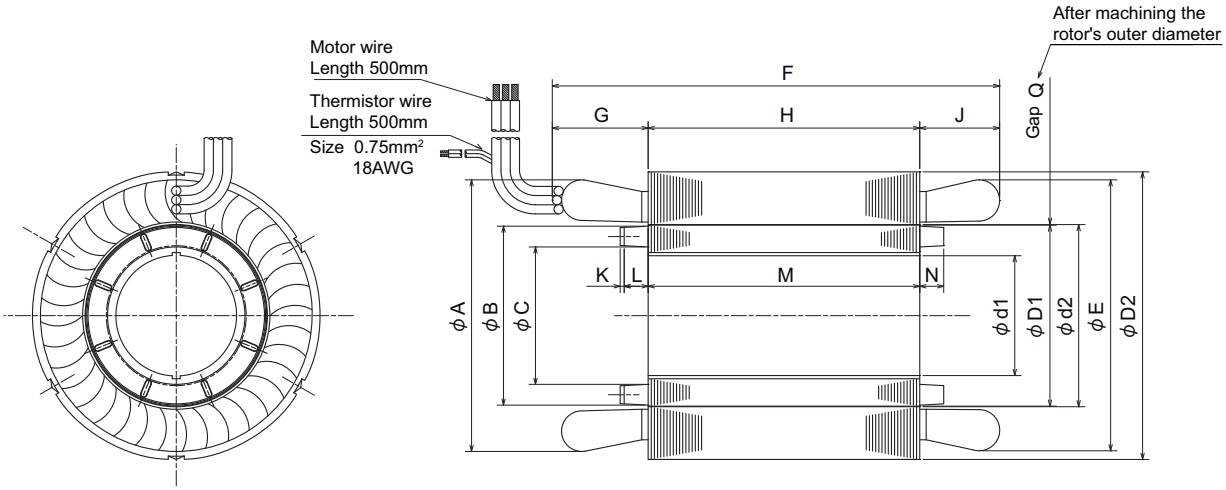
[SJ-PMB14007T-01 (high-speed coil)]



(Note) Actual acceleration/deceleration output is 1.2-fold of "Standard output during acceleration/deceleration" or "Short time rated output".

2.1.5 Outline Dimension Drawings

< SJ-B Series>



[Unit:mm]

Motor type	ΦA	ΦB	ΦC	Φd1	ΦD1	Φd2	ΦE	ΦD2	F	G	H	J	K	L	M	N	Q (*3)
SJ-2B4A01T	85	47	36	28H7 +0.021 0 (*1)	48.5 +0.1 0 (*1) (*2) 48.2js7 +0.0125 -0.0125 (*3)	49	85	89.5h7 0 -0.035 (*1)	110	30	55	25	-	5	55 +4 0	5	0.4
SJ-2B4002T	100	67	45	42H7 +0.025 0 (*1)	69.35 +0.1 0 (*1) (*2) 69.24 +0.02 -0.02 (*3)	70	100	109.5h7 0 -0.035 (*1)	120	40	50	30	-	5	50 +4 0	5	0.38
SJ-2B4004T	100	67	45	42H7 +0.025 0 (*1)	69.35 +0.1 0 (*1) (*2) 69.24 +0.02 -0.02 (*3)	70	100	109.5h7 0 -0.035 (*1)	120	40	50	30	-	5	50 +4 0	5	0.38
SJ-2B4003T	100	67	45	42H7 +0.025 0 (*1)	69.35 +0.1 0 (*1) (*2) 69.24 +0.02 -0.02 (*3)	70	100	109.5h7 0 -0.035 (*1)	160	40	90	30	-	5	90 +4 0	5	0.38
SJ-2B4B01T	112	76.4	58.4	52H7 +0.030 0 (*1)	78.5 +0.1 0 (*1) (*2) 78.2 +0.02 -0.02 (*3)	79	108	114.5h7 0 -0.035 (*1)	136	38	70	28	-	10	70 +4 0	10	0.4
SJ-2B4218T	150	97	70	60H7 +0.030 0	99.4 +0.020 -0.020 (*2) (*3)	100	150	159.5h7 0 -0.040 (*1)	165	50	75	40	-	10	75 +4 0	10	0.3
SJ-2B4215T	150	97	70	60H7 +0.030 0	98.8 +0.020 -0.020 (*3)	100	150	159.5h7 0 -0.040 (*1)	230	55	135	40	-	10	135 +4 0	10	0.6
SJ-2B4310T	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	230	55	125	50	2.5	15	125 +4 0	15	0.35
SJ-2B4301T	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	230	55	125	50	2.5	15	125 +4 0	15	0.35
SJ-2B4327T	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	275	55	170	50	2.5	15	170 +4 0	15	0.35
SJ-2B4340T	170	112	90	80H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	270	55	170	45	2.5	15	170 +4 0	15	0.35
SJ-2B4313TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	280	60	170	50	2.5	15	170 +4 0	15	0.35
SJ-2B4323TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	285	65	170	50	2.5	15	170 +4 0	15	0.35
SJ-2B4325TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	295	75	170	50	2.5	15	170 +4 0	15	0.35

(*1) These dimensions are the dimensions after machine machining.

(*2) Apply finishing machining after carrying out shrink-fitting to the applicable shaft to realize these dimensions.

(*3) These are reference values.

[Unit:mm]

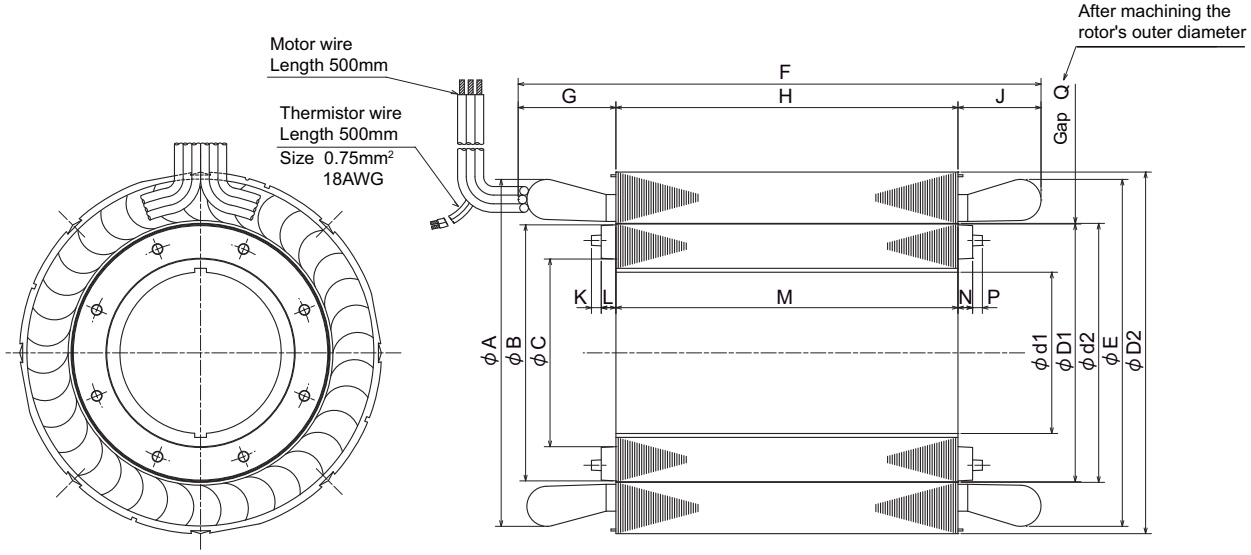
Motor type	ΦA	ΦB	ΦC	Φd1	ΦD1	Φd2	ΦE	ΦD2	F	G	H	J	K	L	M	N	Q (*3)
SJ-2B6611TK	245	171	130	110 +0.035 -0.020	173.2 +0.020 -0.020 (*2) (*3)	174	245	254.5h7 0 -0.052 (*1)	320	80	175	65	-	15	175 +4 0	15	0.4
SJ-2B6602TK	245	171	130	110 +0.035 -0.020	173.2 +0.020 -0.020 (*2) (*3)	174	245	254.5h7 0 -0.052 (*1)	380	85	230	65	-	15	230 +4 0	15	0.4
SJ-2B6605TK	245	171	130	110 +0.035 -0.020	173.2 +0.020 -0.020 (*2) (*3)	174	245	254.5h7 0 -0.052 (*1)	440	80	295	65	-	15	295 +4 0	15	0.4
SJ-2B6603TK	245	171	130	110 +0.035 -0.020	173.2 +0.020 -0.020 (*2) (*3)	174	245	254.5h7 0 -0.052 (*1)	445	85	295	65	-	15	295 +4 0	15	0.4
SJ-2B6711TK	285	207	150	130 +0.040 -0.060	208 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	405	100	230	75	-	15	230 +4 0	15	1.0
SJ-2B6716TK	290	207	160	145 +0.040 -0.020	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	390	80	250	60	-	15	250 +4 0	15	0.5
SJ-2B6721TK	290	207	160	145 +0.040 -0.020	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	390	80	250	60	-	15	250 +4 0	15	0.5
SJ-2B6914TK	360	262	192	165 +0.040 -0.020	263.7h7 0 -0.052 (*2) (*3)	265	360	369.5h7 0 -0.057 (*1)	520	95	350	75	-	15	350 +4 0	15	0.65

(*1) These dimensions are the dimensions after machine machining.

(*2) Apply finishing machining after carrying out shrink-fitting to the applicable shaft to realize these dimensions.

(*3) These are reference values.

< SJ-B Series >



[Unit:mm]

Motor type	ΦA	ΦB	ΦC	Φd1	ΦD1	Φd2	ΦE	ΦD2	F	G	H	J	K	L	M	N	P	Q (*3)
SJ-2B4112T	116	76.4	56.4	45H7 +0.025 0	78.12 +0.020 -0.020 (*2) (*3)	79	115	127.5h7 0 -0.040 (*1)	146	45	66	35	10	10	66 +4 0	10	-	0.44
SJ-2B4111T	116	76.4	56.4	45H7 +0.025 0	78.12 +0.020 -0.020 (*2) (*3)	79	115	127.5h7 0 -0.040 (*1)	146	45	66	35	10	10	66 +4 0	10	-	0.44
SJ-2B4105T	116	76.4	56.4	45H7 +0.025 0	78.12 +0.020 -0.020 (*2) (*3)	79	115	127.5h7 0 -0.040 (*1)	200	45	120	35	10	10	120 +4 0	10	-	0.44
SJ-2B4102T	116	76.4	56.4	45H7 +0.025 0	78.12 +0.020 -0.020 (*2) (*3)	79	115	127.5h7 0 -0.040 (*1)	250	45	170	35	10	10	170 +4 0	10	-	0.44
SJ-2B4201T	150	97	70	60H7 +0.03 0	99.4 +0.020 -0.020 (*2) (*3)	100	150	159.5h7 0 -0.040 (*1)	165	50	75	40	4	10	75 +4 0	10	-	0.3
SJ-2B4202T	150	97	70	60H7 +0.03 0	99.4 +0.020 -0.020 (*2) (*3)	100	150	159.5h7 0 -0.040 (*1)	195	50	105	40	4	10	105 +4 0	10	-	0.3
SJ-2B4203T	150	97	70	60H7 +0.03 0	99.4 +0.020 -0.020 (*2) (*3)	100	150	159.5h7 0 -0.040 (*1)	225	50	135	40	4	10	135 +4 0	10	-	0.3
SJ-2B4219T	150	97	70	60H7 +0.03 0	99.4 +0.020 -0.020 (*2) (*3)	100	150	159.5h7 0 -0.040 (*1)	225	50	135	40	4	10	135 +4 0	10	-	0.3
SJ-2B4303TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	335	65	220	50	5	15	220 +4 0	15	-	0.35
SJ-2B4326TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	335	65	220	50	5	15	220 +4 0	15	-	0.35
SJ-2B4311TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	345	75	220	50	5	15	220 +4 0	15	-	0.35
SJ-2B4304TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	405	75	280	50	5	15	280 +4 0	15	-	0.35
SJ-2B4318TK	170	112	86	75H7 +0.030 0	113.3 +0.020 -0.020 (*2) (*3)	114	170	179.5h7 0 -0.040 (*1)	405	75	280	50	5	15	280 +4 0	15	-	0.35
SJ-2B4412T	200	132	98	85 +0.050 -0.020	133.2 +0.020 -0.020 (*2) (*3)	134	200	209.5h7 0 -0.046	205	60	95	50	12	15	95 +4 0	15	-	0.4
SJ-2B4501TK	224	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	224	229.5h7 0 -0.046 (*1)	320	80	175	65	8	22	175 +4 0	22	-	0.49
SJ-2B4502TK	224	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	224	229.5h7 0 -0.046 (*1)	380	85	230	65	8	22	230 +4 0	22	-	0.49
SJ-2B4601TK	245	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	245	254.5h7 0 -0.052 (*1)	380	85	230	65	8	22	230 +4 0	22	-	0.49
SJ-2B4503TK	224	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	224	229.5h7 0 -0.046 (*1)	445	85	295	65	8	22	295 +4 0	22	-	0.49

(*1) These dimensions are the dimensions after machine machining.

(*2) Apply finishing machining after carrying out shrink-fitting to the applicable shaft to realize these dimensions.

(*3) These are reference values.

[Unit:mm]

Motor type	ΦA	ΦB	ΦC	Φd1	ΦD1	Φd2	ΦE	ΦD2	F	G	H	J	K	L	M	N	P	Q (*3)
SJ-2B4602TK	245	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	245	254.5h7 0 -0.052 (*1)	440	85	295	60	8	22	295 +4 0	22	-	0.49
SJ-2B4511TK	224	159	115	95H7 +0.035 0	161.02 +0.020 -0.020 (*2) (*3)	162	224	229.5h7 0 -0.046 (*1)	480	85	330	65	8	22	330 +4 0	22	-	0.49
SJ-2B6720TK	290	207	150	130 +0.040 -0.020	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	300	80	160	60	10	15	160 +4 0	15	10	0.5
SJ-2B6705TK	285	207	150	130 +0.040 -0.060	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	400	95	230	75	10	15	230 +4 0	15	10	0.5
SJ-2B6706TK	285	207	150	130 +0.040 -0.060	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	405	100	230	75	10	15	230 +4 0	15	10	0.5
SJ-2B6704TK	285	207	150	130 +0.040 -0.060	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	470	100	295	75	10	15	295 +4 0	15	10	0.5
SJ-2B6709TK	290	207	150	130 +0.040 -0.060	209 +0.020 -0.020 (*2) (*3)	210	285	299.5h7 0 -0.052 (*1)	450	85	295	70	10	15	295 +4 0	15	10	0.5
SJ-2B6802TK	325	231	167	145 +0.040 -0.060	232.9 +0.020 -0.020 (*2) (*3)	234	320	329.5h7 0 -0.057 (*1)	550	115	350	85	10	15	350 +4 0	15	10	0.55
SJ-2B6905TK	355	262	192	165 +0.040 -0.060	263.7h7 0 -0.052 (*2) (*3)	265	355	369.5h7 0 -0.057 (*1)	465	110	270	85	10	15	270 +4 0	15	10	0.65
SJ-2B6908TK	355	262	192	165 +0.040 -0.020	263.7h7 0 -0.052 (*2) (*3)	265	355	369.5h7 0 -0.057 (*1)	545	110	350	85	10	15	350 +4 0	15	10	0.65
SJ-2B6906TK	355	262	192	165 +0.040 -0.020	263.7h7 0 -0.052 (*2) (*3)	265	355	369.5h7 0 -0.057 (*1)	555	120	350	85	10	15	350 +4 0	15	10	0.65

(*1) These dimensions are the dimensions after machine machining.

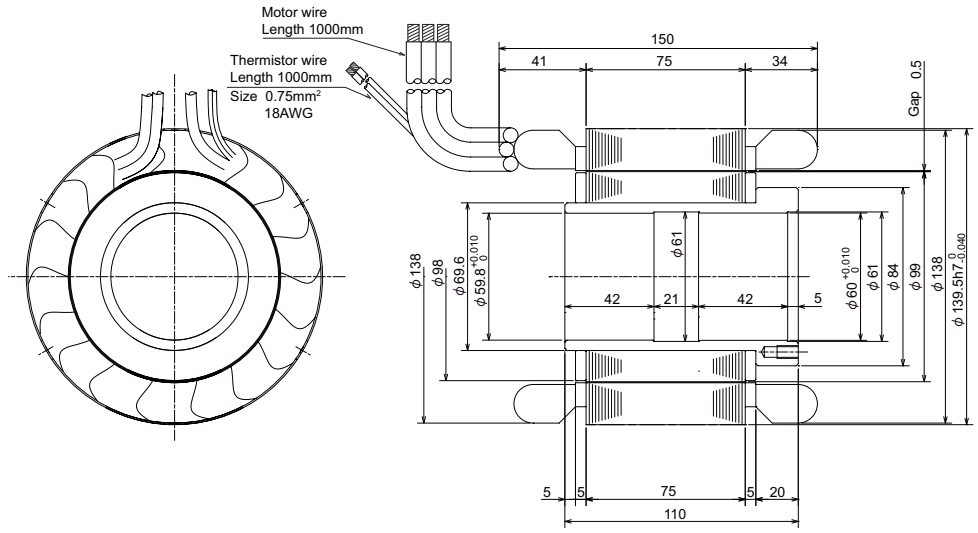
(*2) Apply finishing machining after carrying out shrink-fitting to the applicable shaft to realize these dimensions.

(*3) These are reference values.

< SJ-PMB Series >

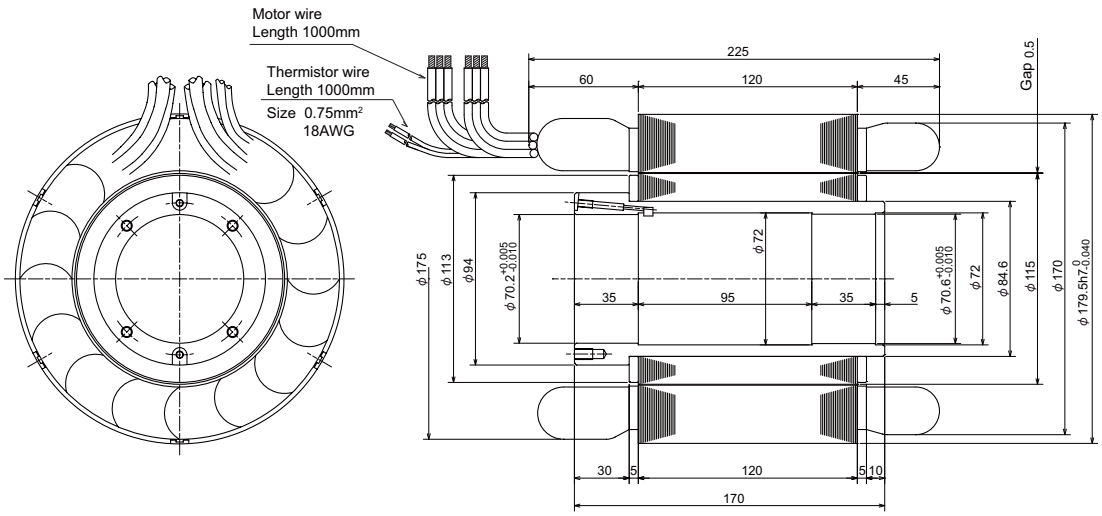
[SJ-PMB02215T-02]

[Unit:mm]



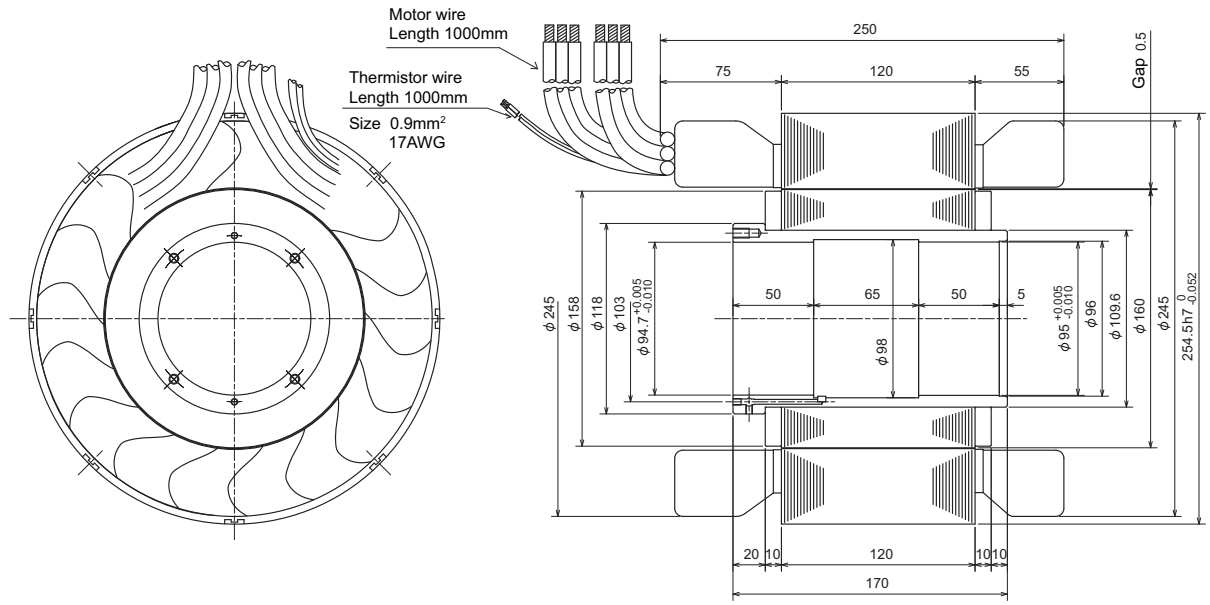
[SJ-PMB04412T-B0]

[Unit:mm]



[SJ-PMB14007T-01]

[Unit:mm]



2.2 PLG Serial Output Encoder (TS5690, MU1606 Series)

2.2.1 Specifications List

Sensor	**Series type**	**TS5690N64xx**					**TS5690N12xx**					**TS5690N25xx**				
	xx (The end of the type name)	10	20	30	40	60	10	20	30	40	60	10	20	30	40	60
	Length of lead [mm]	400 ±10	800 ±20	1200 ±20	1600 ±30	2000 ±30	400 ±10	800 ±20	1200 ±20	1600 ±30	2000 ±30	400 ±10	800 ±20	1200 ±20	1600 ±30	2000 ±30
Detection gear	**Type**	**MU1606N601**					**MU1606N709**					**MU1606N805**				
	The number of teeth	64					128					256				
	Outer diameter [mm]	Φ52.8					Φ104.0					Φ206.4				
	Inner diameter [mm]	Φ40H5					Φ80H5					Φ140H5				
	Thickness [mm]	12					12					14				
	Shrink fitting [mm]	0.020 to 0.040					0.030 to 0.055					0.050 to 0.085				
Notched fitting section	**Outer diameter [mm]**	Φ72.0					Φ122.0					Φ223.6				
	Outer diameter tolerance [mm]	+0.010 to +0.060					-0.025 to +0.025					-0.025 to +0.025				
The number of output pulse	**A/B phase**	64					128					256				
	Z phase	1					1					1				
Detection resolution [p/rev]		2 million					4 million					8 million				
Absolute accuracy at stop		150"					100"					95"				
Tolerable speed [r/min]		40,000					20,000					10,000				
Signal output		Mitsubishi high-speed serial														

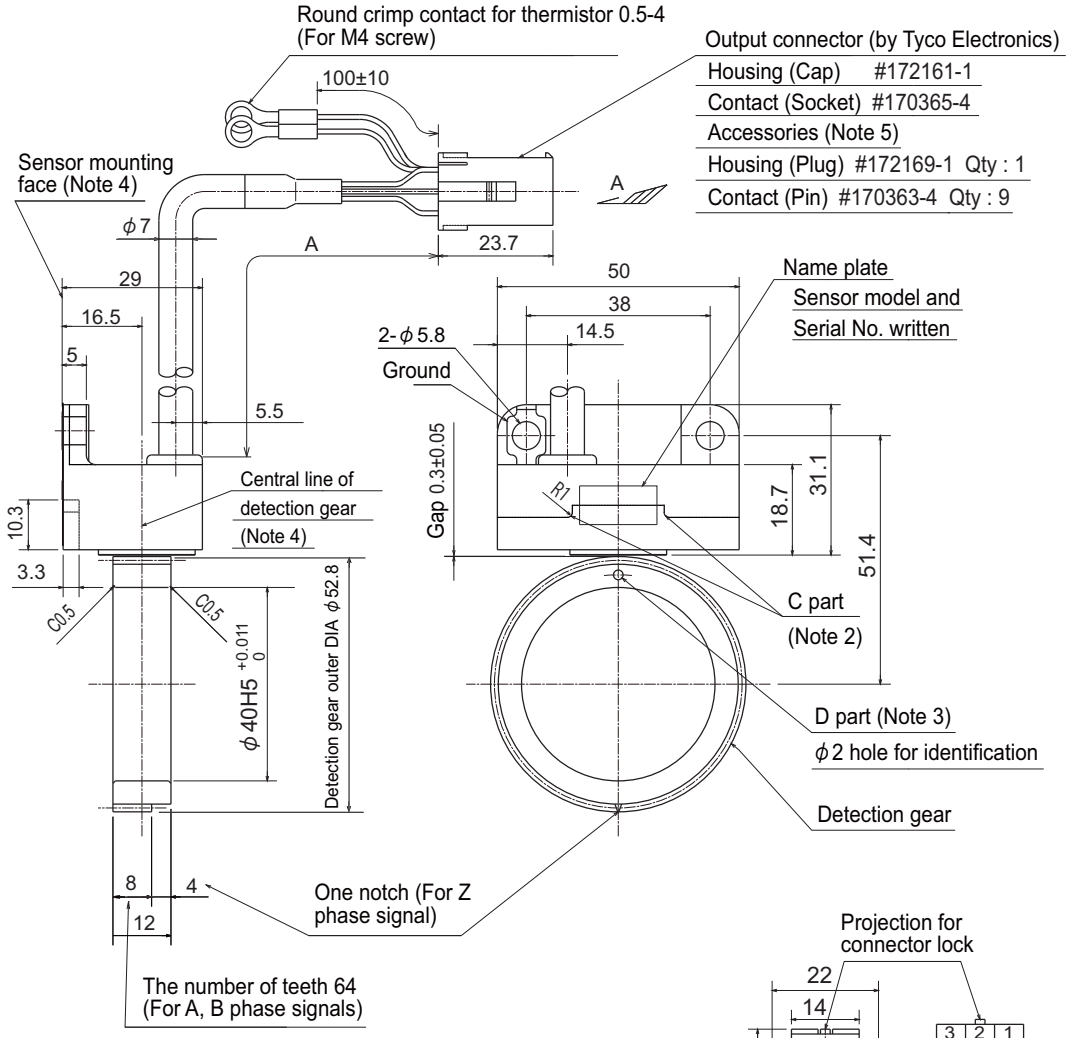
> ⚠ **CAUTION**
>
> 1. Selected encoders must be able to tolerate the maximum rotation speed of the motor.
> 2. Please contact your Mitsubishi Electric dealer for the special products not listed above.

2.2.2 Outline Dimension Drawings

> **⚠ CAUTION**
>
> Always apply the notched fitting section machining with the specified dimensions to the sensor installation surface.

<TS5690N64xx + MU1606N601>

[Unit:mm]



(Note 1) Handle with care as this is a precision component. Pay special attention not to apply excessive external force on the sensor's detection face. Applying such force will cause a fault.

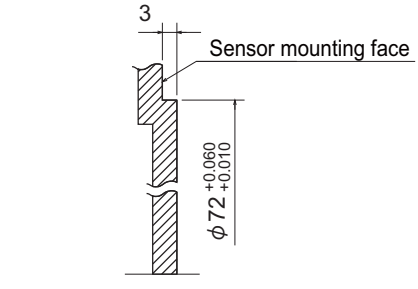
(Note 2) In installing the sensor, keep the protruding fitting of $\phi 72^{+0.060}_{+0.010}$ mm on the machine side, and push the C part of the sensor mounting seat against the fitting.

(Note 3) In installing the detection gear, make sure that the D part side comes the opposite side of the sensor installation side (sensor's lead wire side).

(Note 4) The diviation of the center of the detection gear is 16.5±0.25mm from the sensor mounting face.

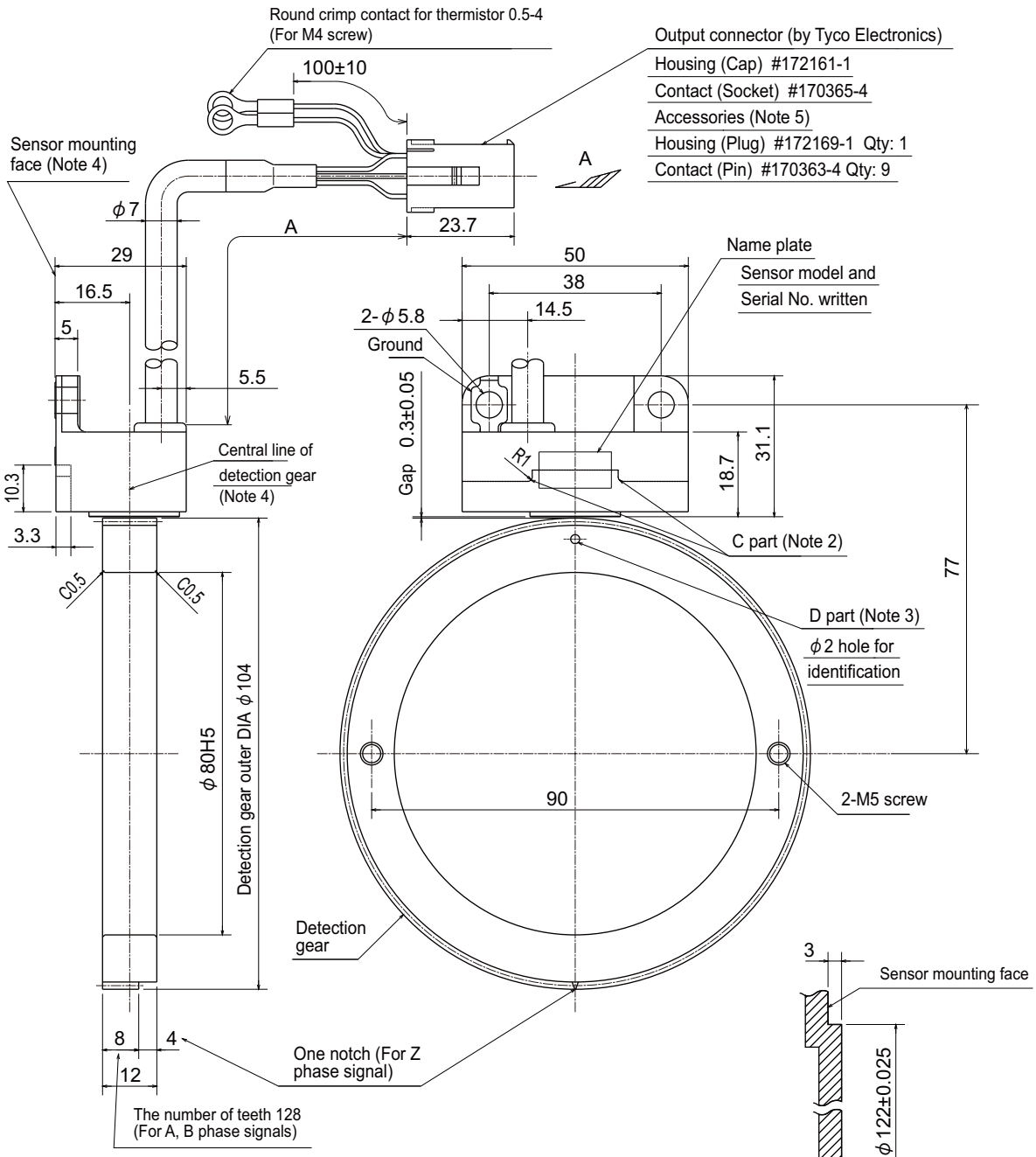
(Note 5) A connector of the signal cable side (one plug and nine pins) is attached.

Sensor		Detection gear
Parts name	Lead wire length A [mm]	Parts name
TS5690N6410	400±10	MU1606N601
TS5690N6420	800±20	
TS5690N6430	1200±20	
TS5690N6440	1600±30	
TS5690N6460	2000±30	



<TS5690N12xx + MU1606N709>

[Unit:mm]



(Note 1) Handle with care as this is a precision component.
Pay special attention not to apply excessive external force on the sensor's detection face. Applying such force will cause a fault.

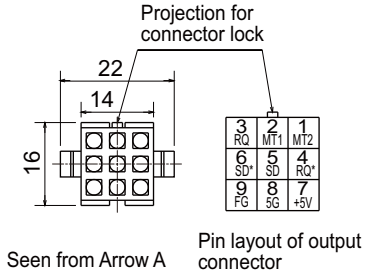
(Note 2) In installing the sensor, keep the protruding fitting of φ122±0.025 mm on the machine side, and push the C part of the sensor mounting seat against the fitting.

(Note 3) In installing the detection gear, make sure that the D part side comes the opposite side of the sensor installation side (sensor's lead wire side).

(Note 4) The diviation of the center of the detection gear is 16.5±0.25mm from the sensor mounting face.

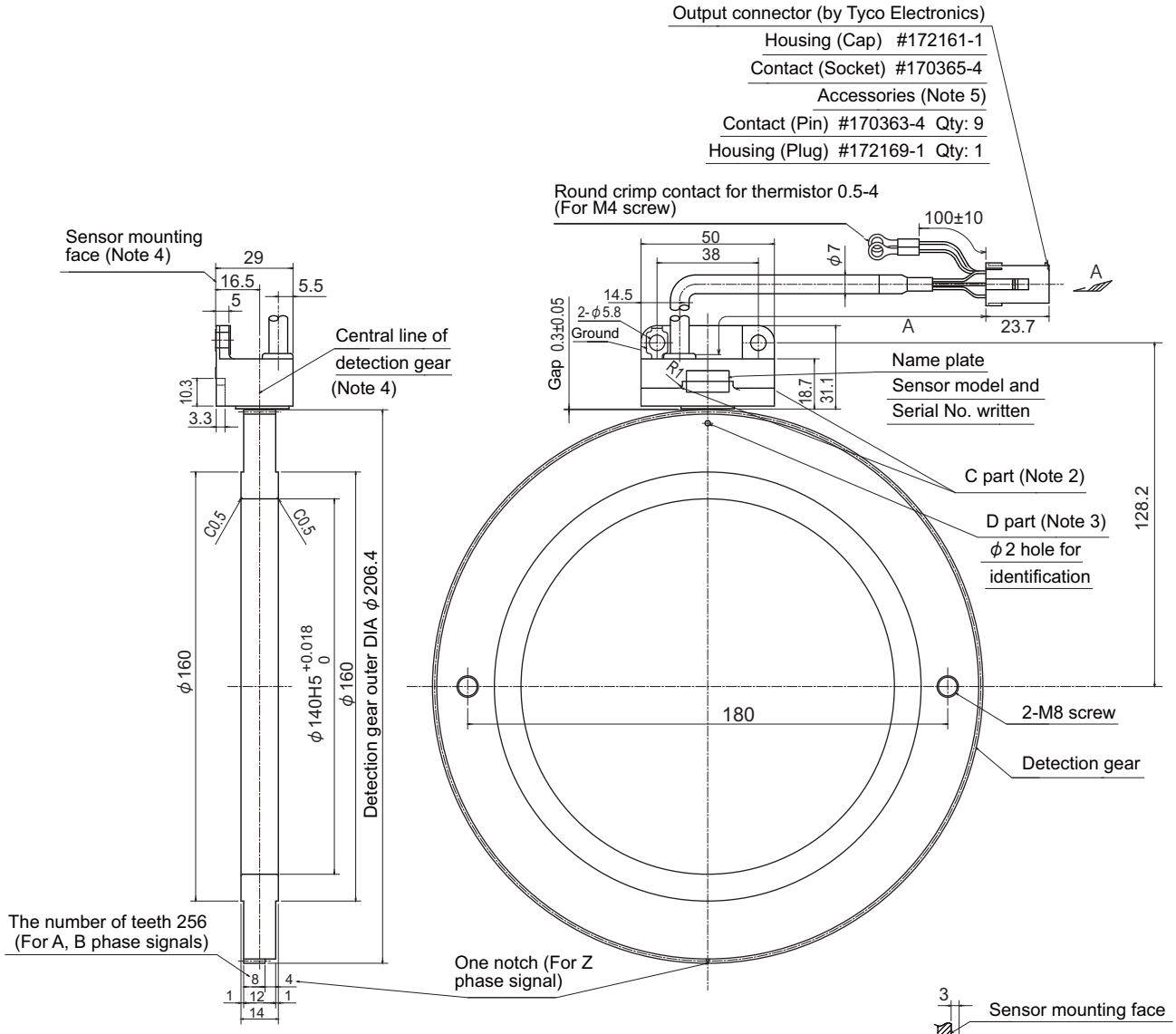
(Note 5) A connector of the signal cable side (one plug and nine pins) is attached.

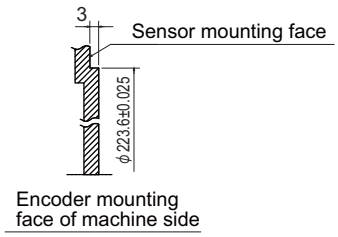
Sensor		Detection gear
Parts name	Lead wire length A [mm]	Parts name
TS5690N1210	400±10	MU1606N709
TS5690N1220	800±20	
TS5690N1230	1200±20	
TS5690N1240	1600±30	
TS5690N1260	2000±30	



<TS5690N25xx + MU1606N805>

[Unit:mm]





(Note 1) Handle with care as this is a precision component.
Pay special attention not to apply excessive external force on the sensor's detection face. Applying such force will cause a fault.

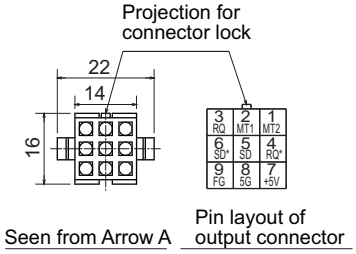
(Note 2) In installing the sensor, keep the protruding fitting of φ223.6±0.025 mm on the machine side, and push the C part of the sensor mounting seat against the fitting.

(Note 3) In installing the detection gear, make sure that the D part side comes the opposite side of the sensor installation side (sensor's lead wire side).

(Note 4) The diviation of the center of the detection gear is 16.5±0.25mm from the sensor mounting face.

(Note 5) A connector of the signal cable side (one plug and nine pins) is attached.

Sensor		Detection gear
Parts name	Lead wire length A [mm]	Parts name
TS5690N2510	400±10	MU1606N805
TS5690N2520	800±20	
TS5690N2530	1200±20	
TS5690N2540	1600±30	
TS5690N2560	2000±30	



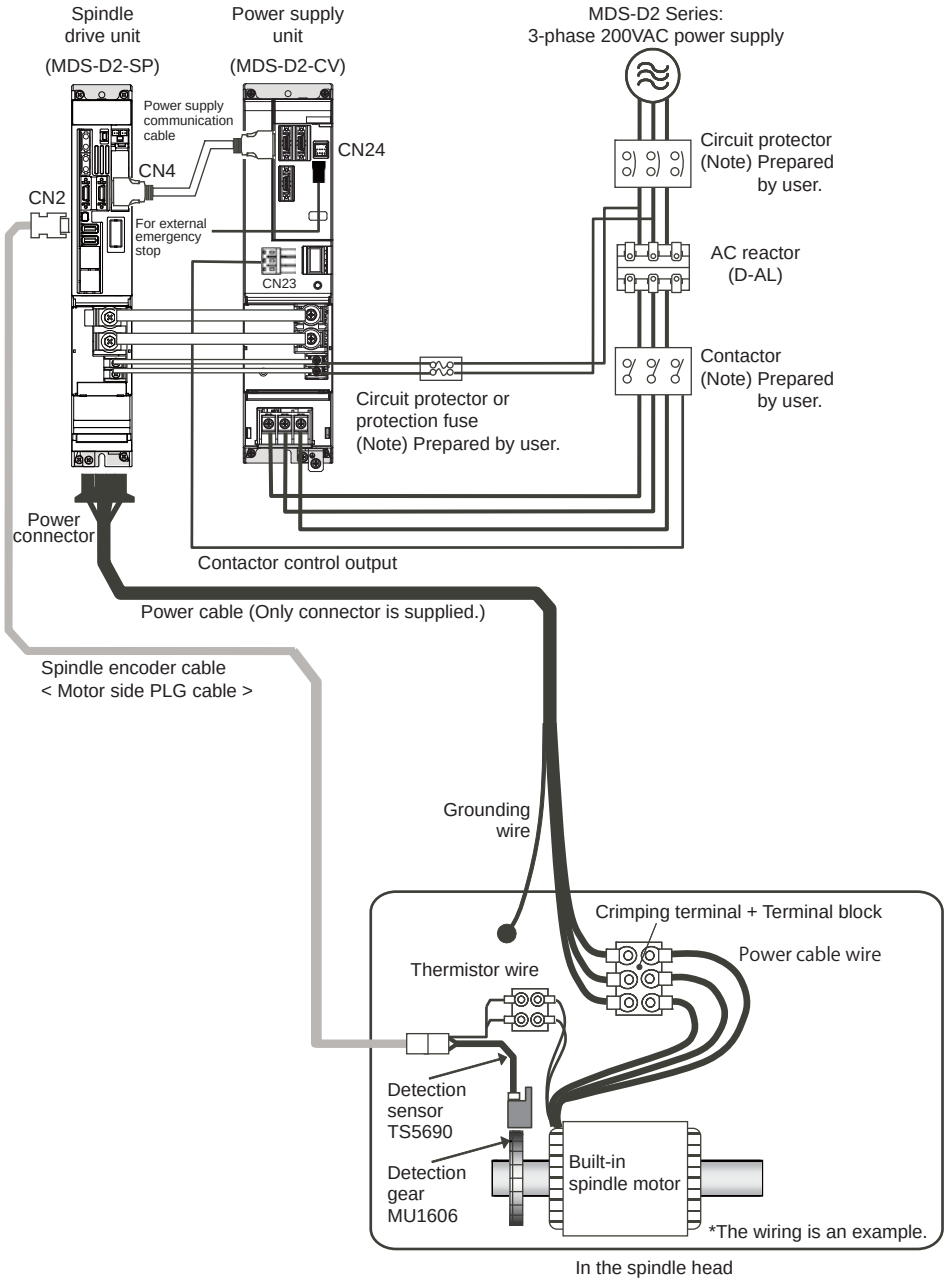
3

Dedicated Options

3.1 Cables and Connectors

3.1.1 Cable Connection Diagram

The cables and connectors that can be ordered from Mitsubishi Electric Corp. as option parts are shown below. Cables can only be ordered in the designated lengths. Purchase a connector set, etc., to create special length cables.

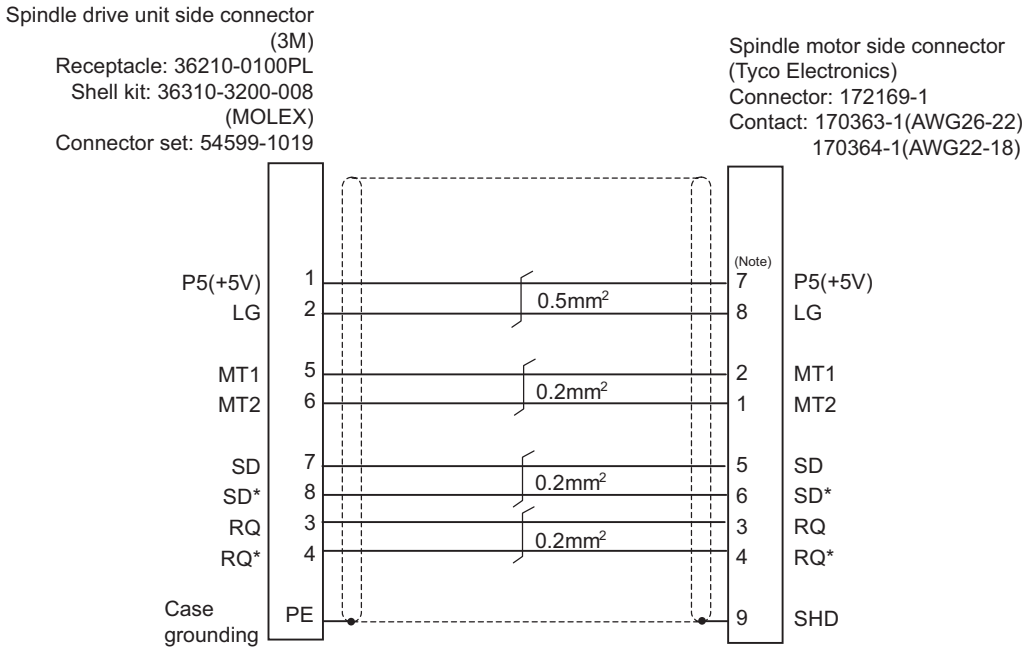


3.1.2 List of Cables and Connectors

<Spindle encoder cable and connector>

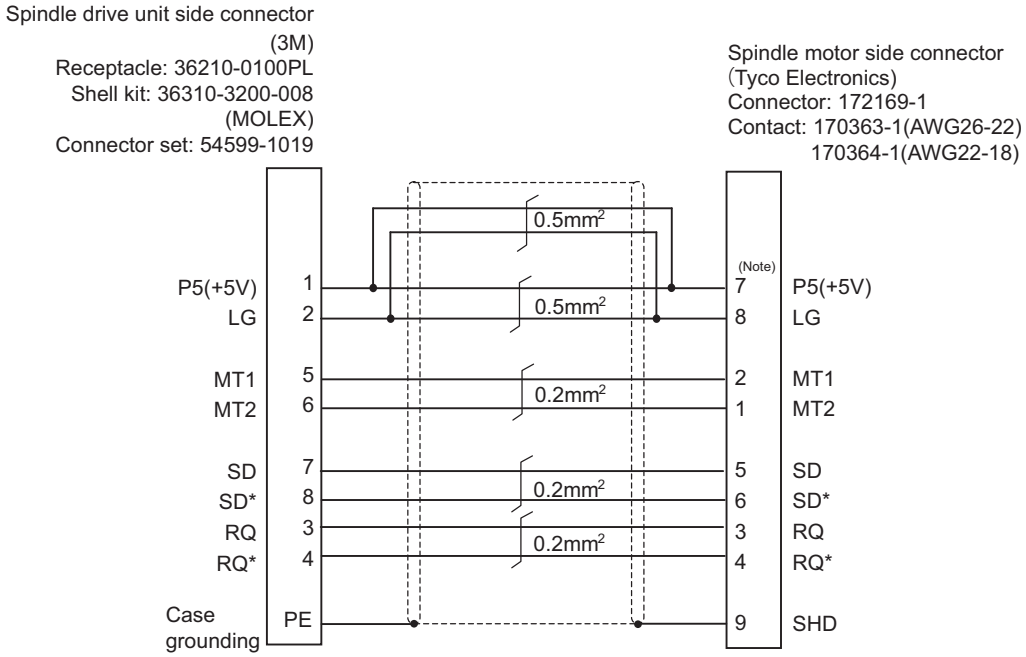
Item		Model	Contents	
For CN2	Motor side PLG cable Spindle side accuracy encoder TS5690 cable	CNP2E-1- ☐ M ☐ : Length 2, 3, 4, 5, 7, 10, 15, 20, 25, 30m	Spindle drive unit side connector (3M) Receptacle : 36210-0100PL Shell kit : 36310-3200-008 (MOLEX) Connector set : 54599-1019	Spindle motor side connector (Tyco Electronics AMP) Connector : 172169-1 Contact :170363-1(AWG26-22) 170364-1(AWG22-18)
For spindle motor	Motor side PLG connector Spindle side accuracy encoder TS5690 connector	CNEPGS		Spindle motor side connector (Tyco Electronics AMP) Connector : 172169-1 Contact :170363-1(AWG26-22) 170364-1(AWG22-18)
For CN2	Spindle encoder drive unit side connector	CNU2S(AWG18)	Spindle drive unit side connector (3M) Receptacle : 36210-0100PL Shell kit : 36310-3200-008 (MOLEX) Connector set : 54599-1019	

<CNP2E-1 cable connection diagram>



(Note) For the pin "7" or "8", use the contact "170364-1".
For the other pins, use the contact "170363-1".

<For 15m or less>

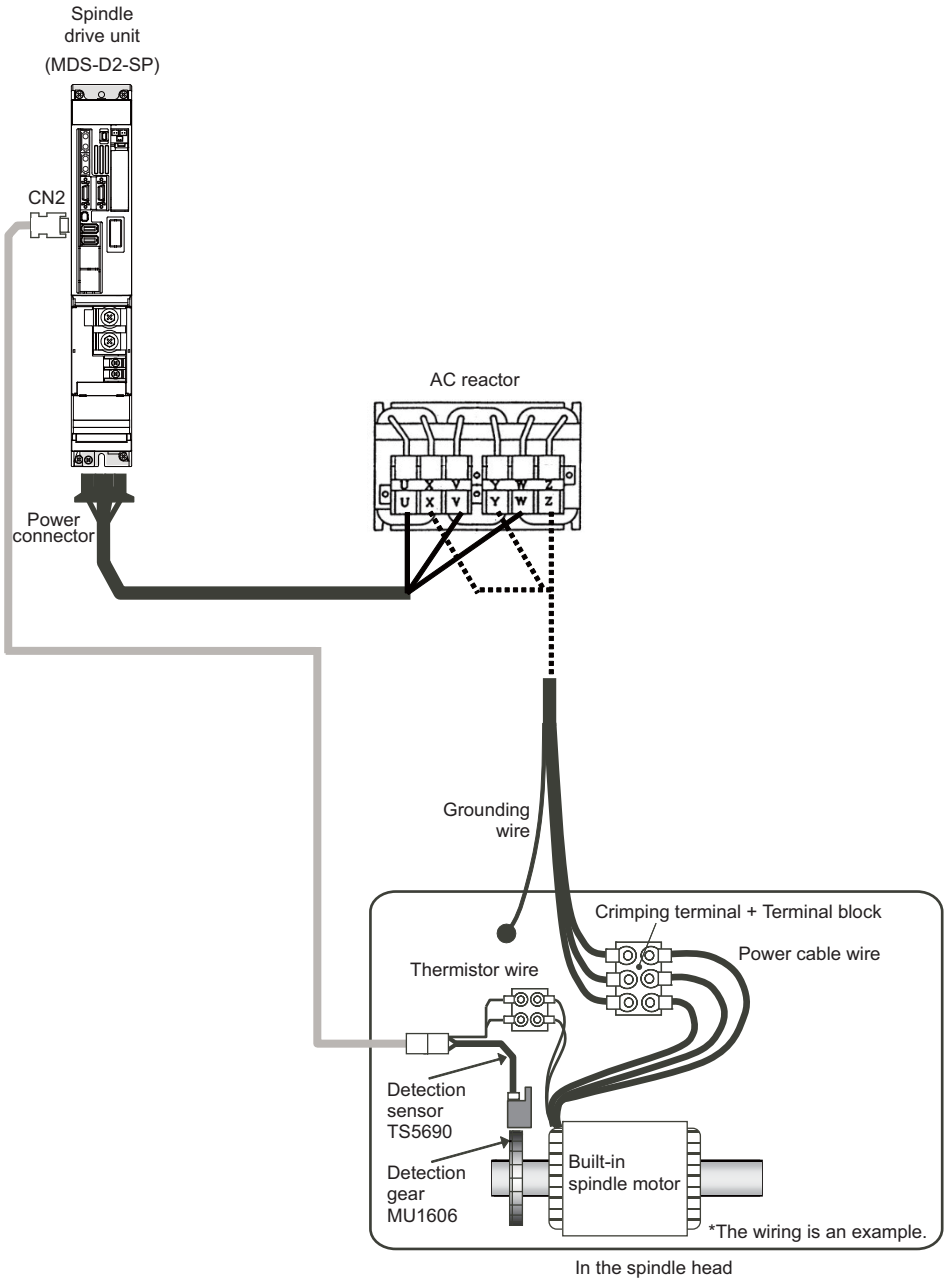


(Note) For the pin "7" or "8", use the contact "170364-1".
For the other pins, use the contact "170363-1".

<For 15m to 30m>

3.2 AC Reactor

When using a compatible built-in spindle motor, insert an AC reactor between the drive unit and the motor as shown below.



There are no limits to the cable length between the drive unit and AC reactor, and between the AC reactor and built-in spindle motor.

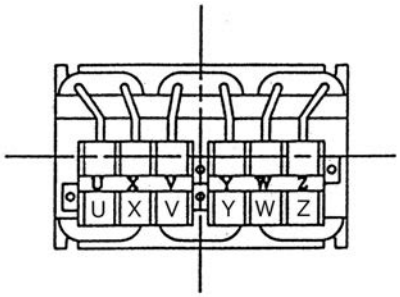
⚠ CAUTION

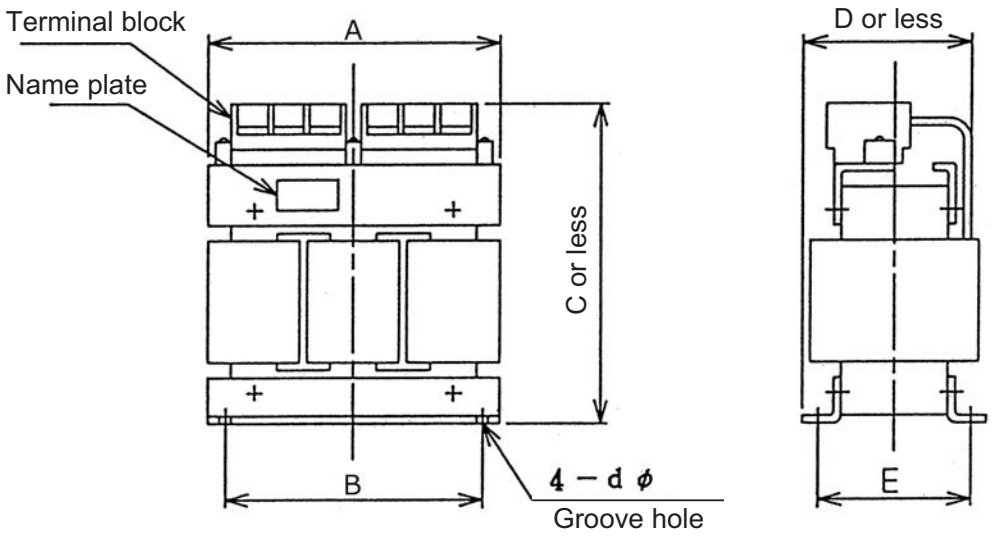
1. Install the AC reactor where it will not be subject to water or oil, etc. (in the power distribution panel)
2. Take care of the heat dissipation because the AC reactor generates heat during operation.

(1) Specifications

AC reactor model		BKO-NC6783H31
Compatible built-in spindle motor type		SJ-2B4111T
Rated voltage [V]		200V
Rated current [[A]		36
Inductance [mH]		0.25
Terminal block		TE-K14-3S (screw: M5)
Environment	Ambient temperature	Operation: -10°C to 60°C (with no freezing), Storage: -10°C to 60°C (with no freezing)
	Ambient humidity	Operation: 80%RH or less (with no dew condensation), Storage: 80%RH or less (with no dew condensation)
	Atmosphere	Indoors (no direct sunlight) With no corrosive gas, inflammable gas, oil mist or dust
	Altitude	Operation/Storage: 1000 meters or less above sea level, Transportation: 10000 meters or less above sea level
	Vibration / impact	9.8m/s^2(1G) / 98m/s^2(10G)
Mass [kg]		12

(2) Outline dimension drawing





Type	Dimensions [mm]					
	A	B	C	D	E	dΦ
BKO-NC6783H31	215	190	230	140	110	7（Groove hole）

4

Assembly and Installation

4.1 Stator Assembly

(1) Shrink fitting interference within the housing

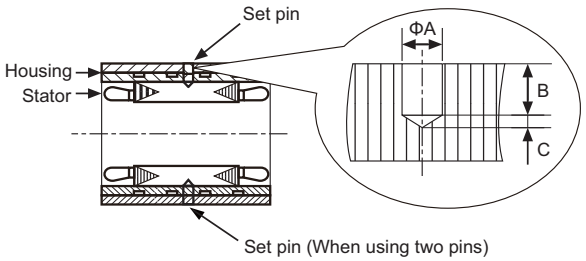
Shrink fitting is recommended for the matching of the stator and housing (cooling jacket, external sleeve, etc.). The recommended values for the shrink fitting interference are given below. If the interference amount is near the upper limit, the housing outer diameter may expand after shrink fitting. Thus, machining the housing outer diameter after shrink fitting is recommended. If expansion at the housing outer diameter after shrink fitting is not permissible, match the size the housing inner diameter according to the stator outer diameter so that the shrink fitting interference is within the reference values given below.

Stator outer diameter [mm]	Recommended interference [mm]	Reference interference [mm] (when machining housing inner diameter)
Φ109.5	0.01 to 0.07	0.01 to 0.015
Φ127.5, Φ159.5, Φ179.5	0.01 to 0.075	0.01 to 0.015
Φ209.5, Φ229.5	0.01 to 0.085	0.01 to 0.02
Φ254.5	0.01 to 0.095	0.01 to 0.025
Φ299.5	0.02 to 0.095	0.02 to 0.035
Φ369.5	0.02 to 0.105	0.02 to 0.04

< When recommended interference cannot be ensured >

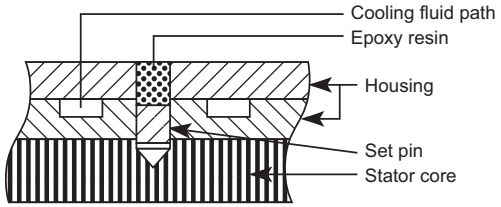
When recommended interference cannot be ensured for the matching of the stator and housing, a stopper must be created with the set pins. The recommended set pin dimensions and machinable depth of the set holes are shown below. The stator coils may be damaged if the set holes are deeper than the dimensions given below. If pins that are too long are used or if excessive force is applied when inserting the pins, an excessive force will be applied onto the layered steel plates inside the set pin section causing them to project into the stator or may damage the coils.

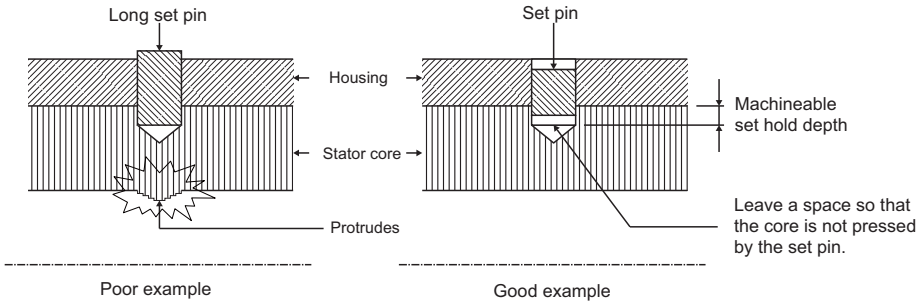
Stator outer diameter [mm]	Set pin outer diameter × Qty ΦA [mm]	Machineable depth of set holes B [mm]	Drilling depth (reference) C [mm]	Remarks
Φ109.5	Φ8 ×1	3	2.3	
Φ127.5, Φ159.5, Φ179.5	Φ8 × 1	5.5	2.3	
Φ179.5	Φ8 × 2	5.5	2.3	Applicable to SJ-2B4304K
Φ209.5, Φ229.5, Φ254.5	Φ10 × 1	8	2.9	
Φ299.5, Φ369.5	Φ10 × 2	10	2.9	



< Installation of the set pin >

Avoid inserting the set pin into the welded section on the circumference of the stator core, the clamp section or notched section. Insert the set pin near the center of the core width. Fill the top of the pin with epoxy resin after inserting the pins so that the cooling fluid will not leak out.

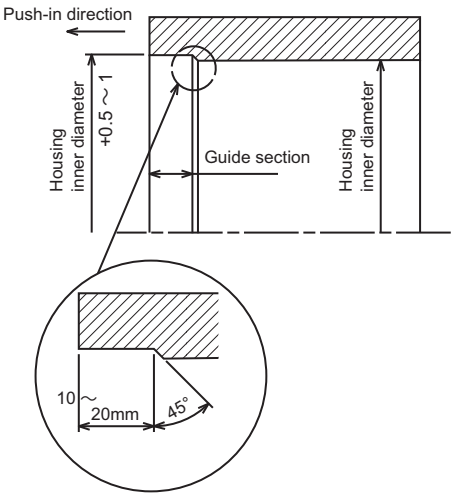




(2) Machining accuracy of the housing inner diameter

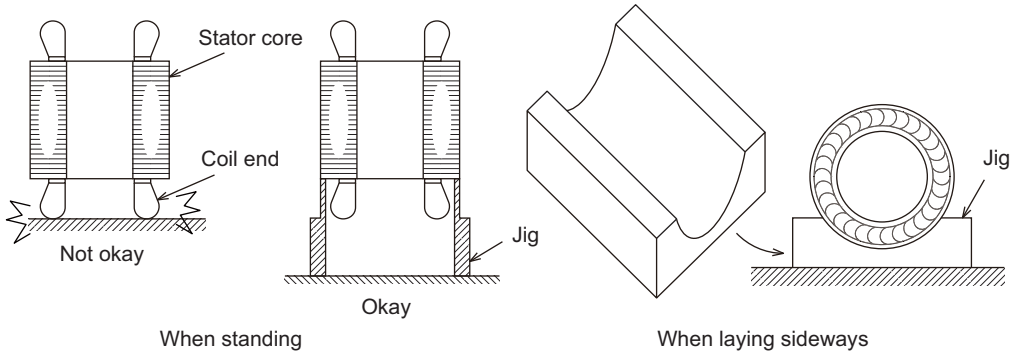
Use the values given below as a guideline for the machining precision of the housing inner diameter. It is recommended that a push-in guide section that is 0.5-1mm larger than the housing diameter be created.

Item	Guideline
Circularity	0.02 or less
Cylindricity	0.02 or less



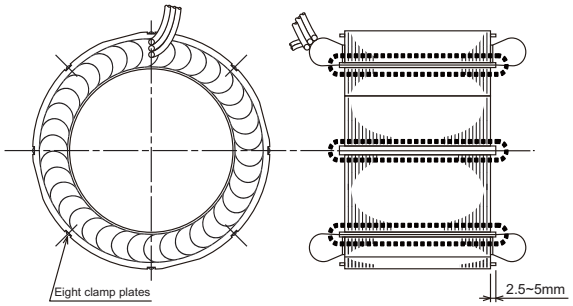
(3) Handling the stator

Take care not to apply an external force to the coil ends of the stator or allow foreign matters to stick to it. An insulation defect may occur if chemicals or metallic dust stick to the coil end, or if there are bumps or scratches on the coil end. Do not place the stator directly onto a table or the floor, but use jigs as shown below. Place the stator sideways when possible, and do not stack more than three layers.



⚠ CAUTION

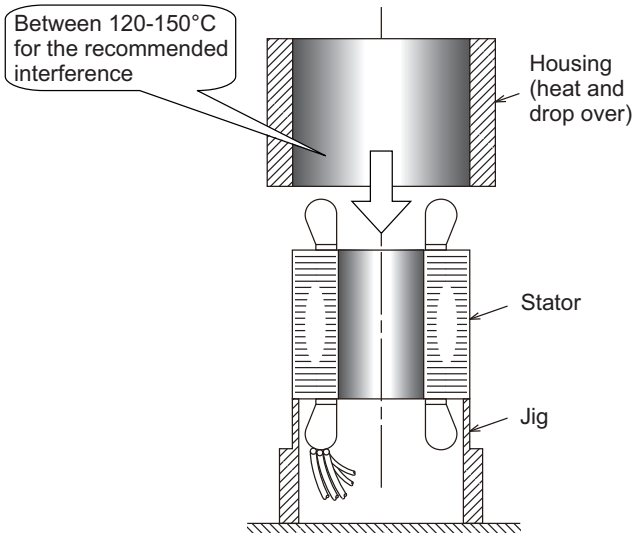
1. Prepare a cylindrical jig when pressing the stator into the housing. Press the stator core end, and never press the coil end.
2. If the stator and housing are shrink fit assembled, it may be difficult to pull the stator out of the housing. Confirm the position of the lead wire inlets before assembly.
3. The layered steel of the stator with an outer diameter of Φ229.5 or more is caulked with clamp plates. The clamp plates will protrude 2.5-5mm from the state core end, so take care when making a step for positioning on the inner diameter of the housing or when preparing a jig. An example of the clamp plate positions is shown below.



4. The stator core is layered steel that is fixed by welding or caulking, so the end may be wavy.
5. Re-machining the stator outer diameter is not recommended. When inevitable, completely cover the coil end with tape, etc., so that the cutting powder does not adhere on the coil end, and use dry machining when possible.

(4) Installation to the housing

An example of shrink fitting the housing to the stator is shown below. Hold the stator with a jig so that the coil end is not damaged. Evenly heat the housing with an electric furnace, and when using an oil vat, use insulating oil. The housing has a small heat capacity and easily cools down, so carry out the operation swiftly. When using the interference shown in section (1), the housing heating temperature should be between 120 - 150°C for the recommended interference in item (1).



⚠ CAUTION

1. A 0.1mm curve may occur to the outer diameter as the stator is made of layered steel. However, after assembling, the stator will fit to the housing diameter, so reference value of the stator outer diameter is that shown in the diameter dimension diagram.
2. Do not apply excessive shocks to the stator that is not assembled into the housing.

(5) Checking for the stator and housing insulation and the stator coil resistance

Check the following items between the stator terminal and the housing after assembling the stator into the housing.
(a)Insulation resistivity 10MΩ or higher at room temperature (use a 500V insulation resistance tester)
(b)Dielectric strength AC1500V/min.

When measuring the stator coil resistivity, use a resistance tester that has a low resistance measurement range. The coil resistivity is low at 1Ω or less, so the measurement error will be large if there is a contact resistivity, etc., in the measurement circuit when a general-purpose tester is used. If a solderless terminal is installed on the lead wire, a contact resistance may occur due to the oxidized film on the solderless terminal surface. Hold the terminal with a clip, and move the clip two to three times before measuring.

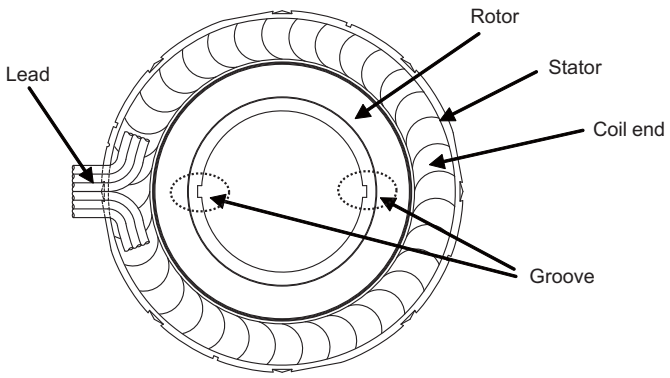
4.2 Rotor Assembly

(1) Rotor installation to the shaft

- Shrink fitting is recommended for fixing the rotor to the shaft or sleeve. The shrink fit interference will differ according to the type, so refer to the motor outline diagram. If the recommended interference width is small, match and machine the shaft or sleeve outer diameter.
- When shrink fitting the shaft or sleeve onto the rotor, heat the rotor in an electrical furnace so that the temperature of each part is even. The recommended heating temperature is 300-350°C for IM rotor and 130°C or less for IPM rotor. If the heating is improper or if uneven, trouble may occur. The upper limit of the rotor temperature is 400°C or less on the rotor surface.
- The inside surface of the rotor is not machined unless a special note is made on the outline diagram. Remember that the rotor is weak as the rotor core is composed of layered steel when selecting the machining conditions for finish machining. Machining with difficult conditions may cause the steel plates to deform or peel.

⚠ CAUTION

1. The rotor before shrink fitting is weak, so take care not to apply strong impacts to it. Take care not to let foreign matters (metallic powder, etc.) enter the rotor before assembling.
2. The inner diameter and outer diameter may have an approximately 0.1mm curve as the rotor core is composed of layered steel. However, when the rotor is shrink fit, it will be resolved, so the dimensions noted in the outline diagram can be used for the reference value of the rotor inner diameter.
3. Use a magnetic material for the shaft.
4. Some rotor types have a groove to be used as a guide when layering the steel plates, however, do not use this to fix the rotor.



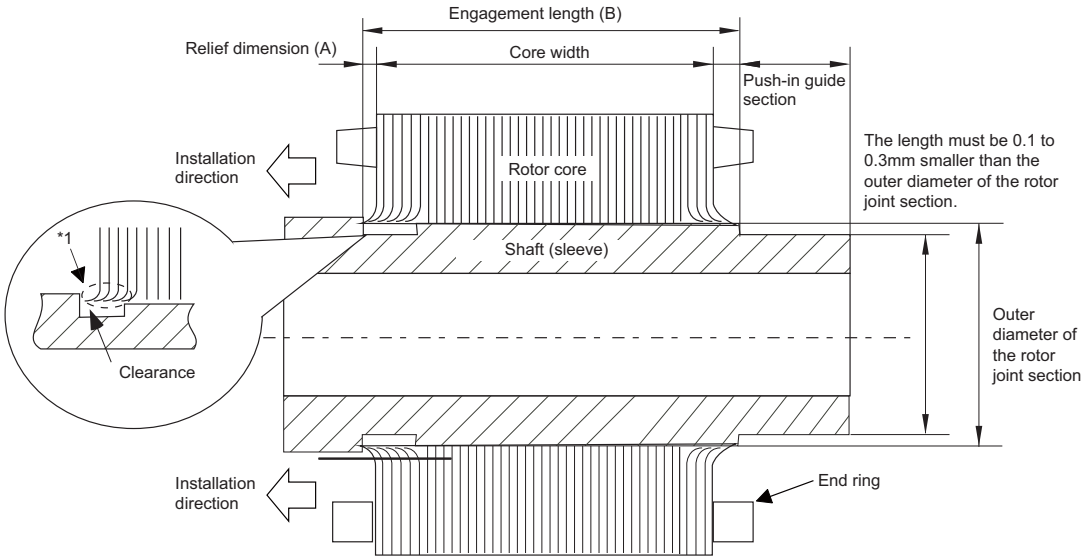
Lead side outline diagram

5. If the heating is improper or if uneven, trouble may occur. Be careful that the recommended heating temperature differs between IM and IPM.
6. The material of the end ring for the high-speed series rotor differs from the standard series rotor, so strict temperature control is necessary when the rotor is heated.
7. The oils on the rotor may evaporate and generate a gas when the rotor is heated, so ventilate the area well.
8. Natural cooling is recommended after shrink fitting the rotor.
9. A slight strain may occur on the shaft from the rotor shrink fitting, so finish machine the parts that require precision after shrink fitting.

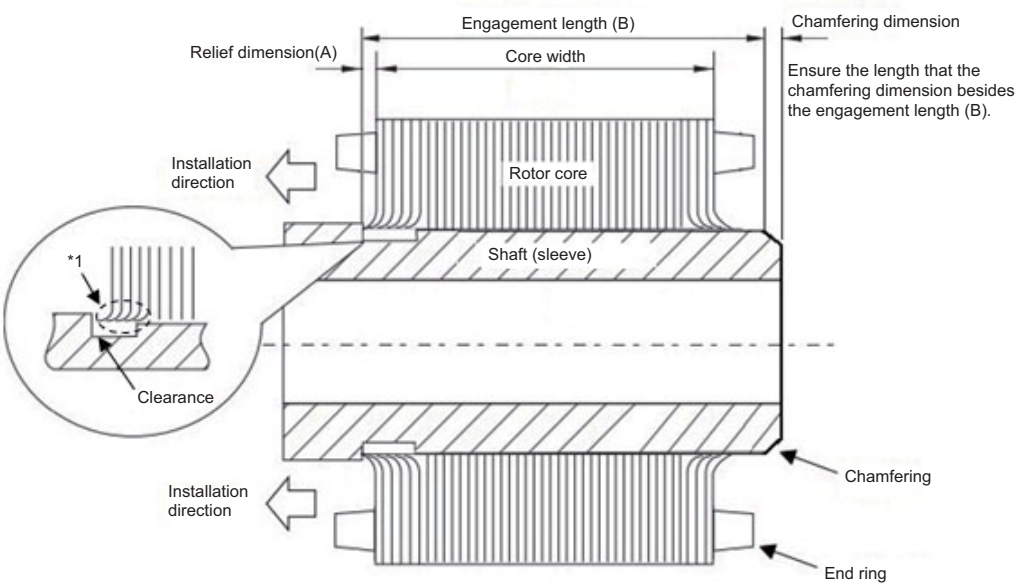
[1] **Fixing the rotor without sleeve**

When installing the rotor without sleeve, assembly becomes easier if a push-in guide section or chamfer section is created on the shaft (sleeve).

< When a push-in guide is created >



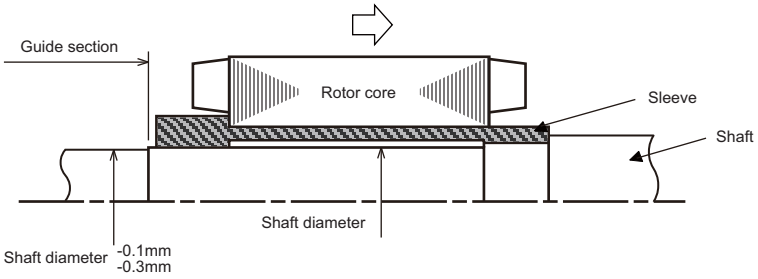
< When a chamfer is created >



The inside of the rotor is swollen like *1 as the rotor core is made of layered steel. Therefore, take into consideration the swell in the rotor and ensure the relief dimension (A) and engagement length (B).
The following are the relief dimension (A) and engagement length (B).
To contact and stop the shaft (sleeve) on the swollen part, create a clearance on the shaft (sleeve).

Frame No.	50	63	70	71	100	112	132	160	180	225
Relief dimension A [mm]	0.5						1			
Engagement length B [mm]	Core width + 4 or more						Core width + 6 or more			

[2] Fixing the rotor with sleeve



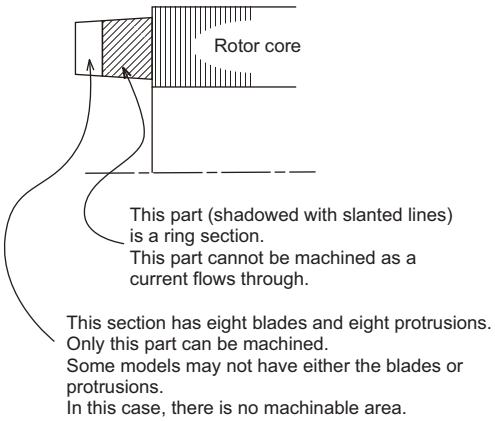
It is recommended that a push-in guide 0.1 to 0.3mm smaller than the outer diameter of the rotor fixing part be created on the shaft.

(2) Finish machining of the rotor

- The rotor outer diameter is not finish machined, so finish machine the rotor outer diameter to the dimensions specified on the outline diameter after shrink fitting. The finish amount will be more than 0.15mm unless otherwise specified in the outline drawings.
  (Note) Never carry out a machining on the IPM rotor.
- Dry machining should be used on the machining of the rotor's outer diameter to prevent corrosion of the steel or aluminum. If dielectric fluid must be used, use noncorrosive, and dry the part completely after machining. If dielectric fluid remains between the layered steel, the rotor balance may be lost.
- Applying an anti-corrosive agent onto the rotor after machining the rotor's outer diameter is recommended.

(3) Balancing

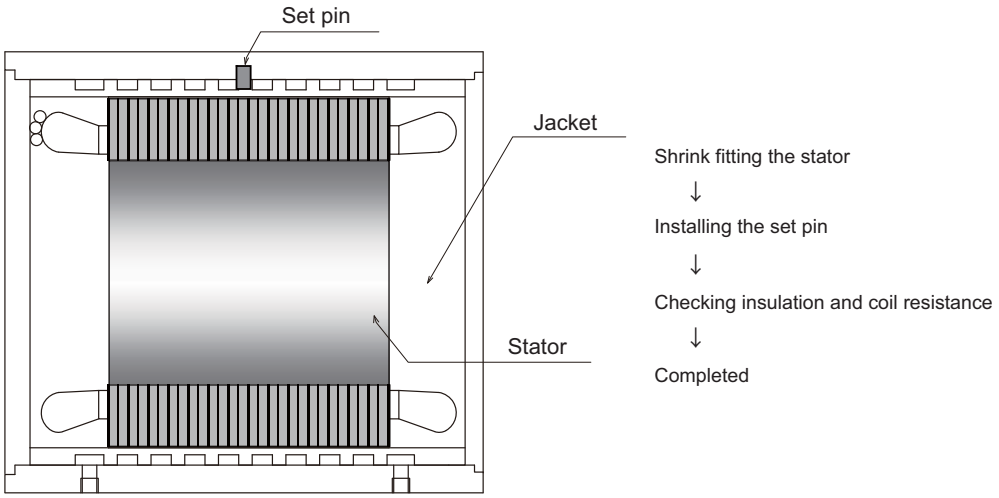
- The dynamic balance of the rotor unit has not been adjusted. Adjust the balance by opening a hole in the balance ring installed by the user.
- Install balance rings in front and back of the rotor. The unbalance of the rotor will cause vibration and noise during high speed operation.
- Do not machine the rotor core and end ring when adjusting the balance. If the rotor end ring has a protrusion as shown below, the protrusion may be cut off to adjust the balance, but this must be used as a measure for fine adjustment. Take care not to scratch the ring-shaped part at this time.



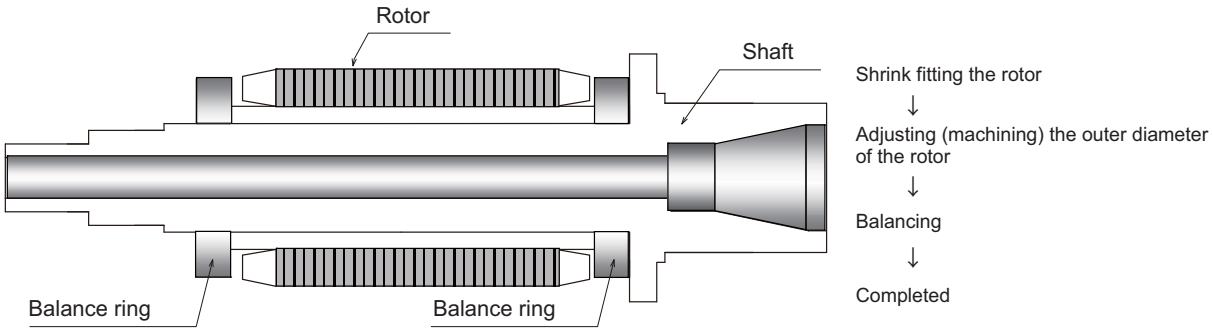
4.3 Motor Assembly

After assembling the stator and the rotor, assemble the motor. The basis of the built-in motor is completed in this procedure.

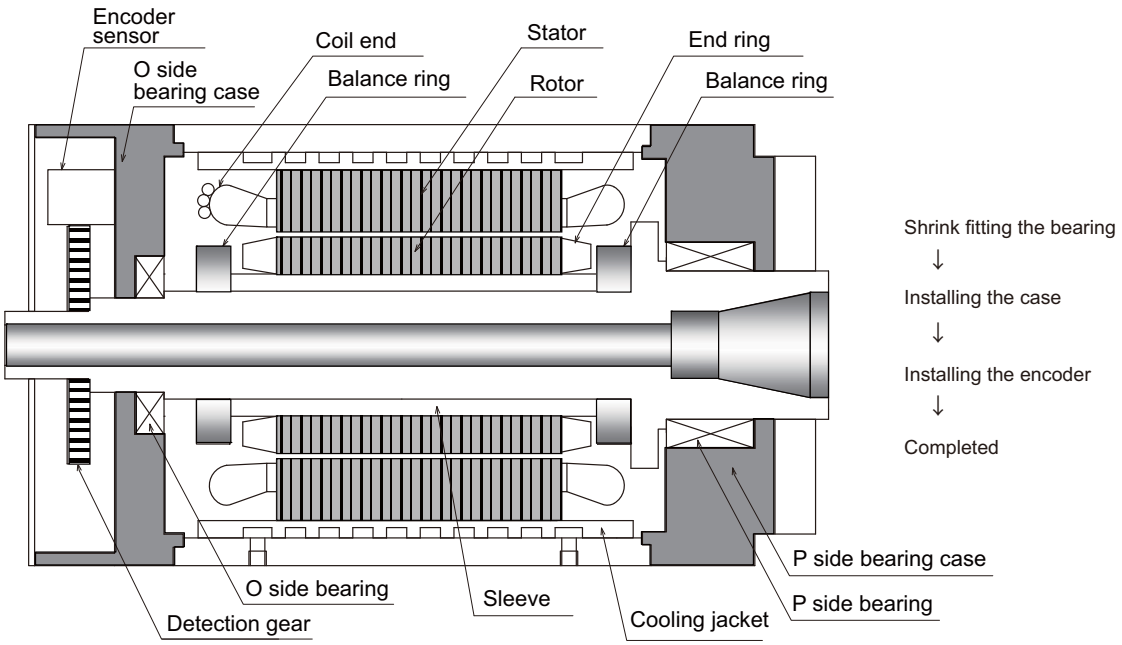
< Example of finished stator assembly >



< Example of finished rotor assembly >

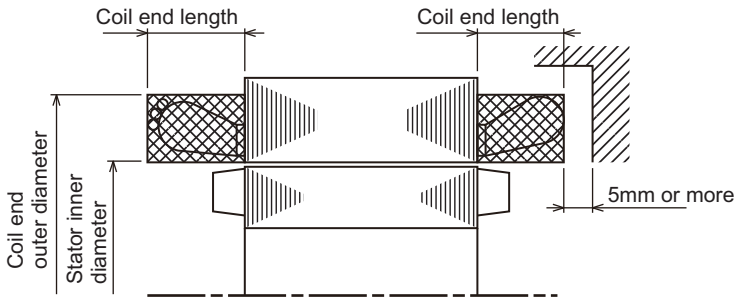


< Example of finished built-in motor assembly >



(1) Ensuring the space for the stator coil end

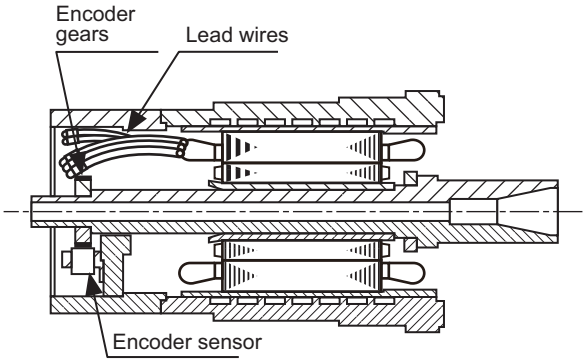
- The coil end dimensions are as shown in the outline diagram but the minimum value of the coil end inner diameter must take the stator inner diameter into consideration. The coil end is made of a congregation of coil ends, so there may be an inconsistency in the shape and dimensions. Leave at least 5mm between the structure and the coil end assuming that the coil end might exist in the areas indicated with cross-lines in the diagram below.



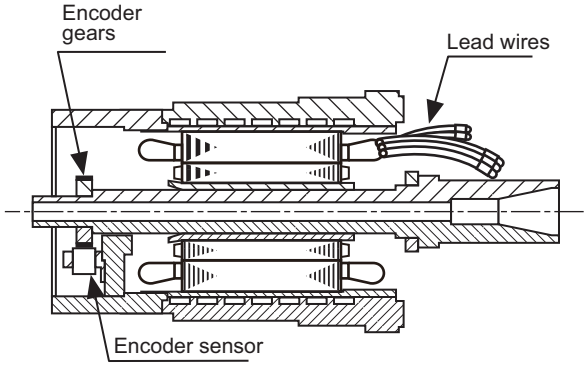
(2) Cautions for assembling

- Install a cooling jacket around the stator and use fluid cooling (oil cooling).
- Take care so that water, cutting fluid or conductive oils do not contact the stator coil ends. Also, make sure to prevent non-conductive oils from contacting the structure.
- Leave a space of 5mm or more between the stator coil ends and the structure.
- Create a grounding terminal on the machine side structure (stator housing, etc.), and connect with the controller grounding terminal.
- Chamfer or round the corners so that the lead wires from the stator are not damaged by the inlet edges.
- The deviation in the stator and rotor shaft direction must be ±2mm or less. If the core width is smaller than 100mm, the deviation must be ±2% or less of the core width.
- The unbalance between the stator and rotor must be less than ±5% of the specified gap shown in the outline diagram.
- Create a structure that will prevent foreign matter from entering the encoder balance section and encoder gears. Make sure that the structure allows repairs and replacement.
- Unless otherwise noted in the outline drawing, there are no limits to the installation direction of the stator and motor. The stator and motor combination can be changed without problems if the same motor specifications are used.
- When machining the housing outer diameter after assembling the stator onto the housing, cover the coil ends with tape, etc., so that the cutting chips do not adhere onto the coil. Any chips on the coil will cause defective insulation.

- The installation direction of the stator and encoder is the "standard installation direction" if the lead wires are both protruding in the same direction as shown in the figure below. If the both lead wires are protruding away from each other, this will be the "reverse installation direction". Reverse the order of the phases of the stator lead wire when using the "reverse installation direction".

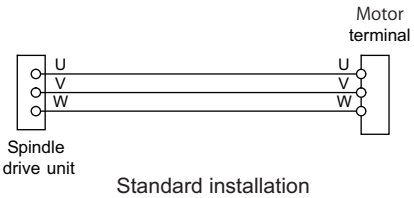


Standard installation
(The encoder and lead wires of stator are at the same side.)

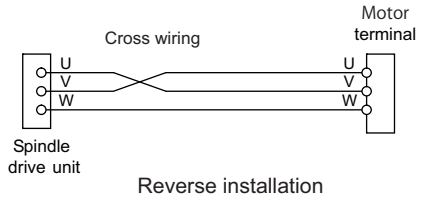


Reverse installation
(The encoder and lead wires of stator are at the opposite side

< The wiring between the drive unit and motor (When not using coil changeover) >



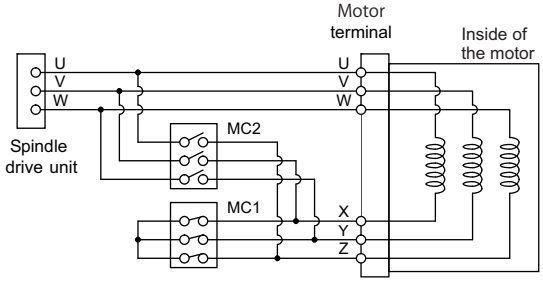
Standard installation



Reverse installation

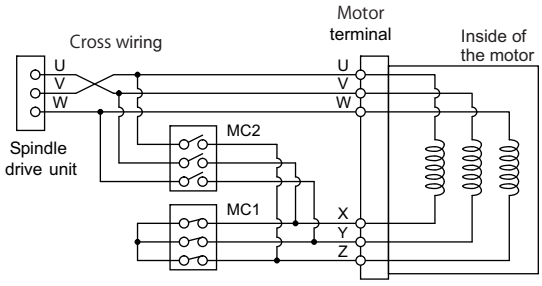
< The wiring between the drive unit and motor (When using coil changeover) >

(a) Y (low-speed) - Δ (high-speed) changeover
Y (star) - Δ (delta) changeover circuit



MC1: Contactor to connect low-speed coil (Y-connection)
MC2: Contactor to connect high-speed coil (Δ-connection)

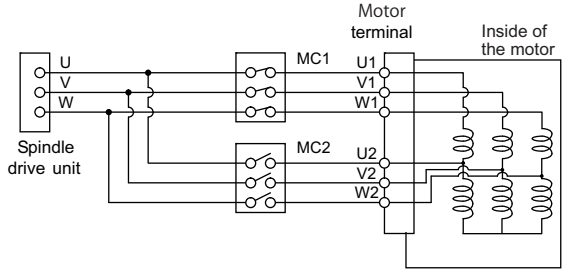
Standard installation



MC1: Contactor to connect low-speed coil (Y-connection)
MC2: Contactor to connect high-speed coil (Δ-connection)

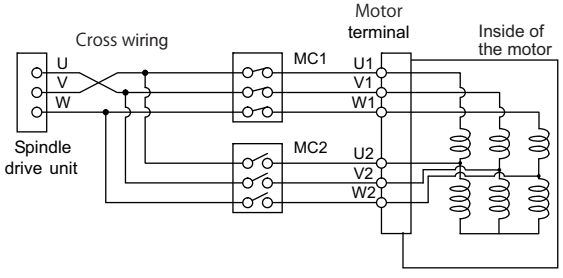
Reverse installation

(b) Y (low-speed) - Y (high-speed) changeover
Y (star) - Y (star) changeover circuit



MC1: Contactor to connect low-speed coil (1st Y-connection)
MC2: Contactor to connect high-speed coil (2nd Y-connection)

Standard installation



MC1: Contactor to connect low-speed coil (1st Y-connection)
MC2: Contactor to connect high-speed coil (2nd Y-connection)

Reverse installation

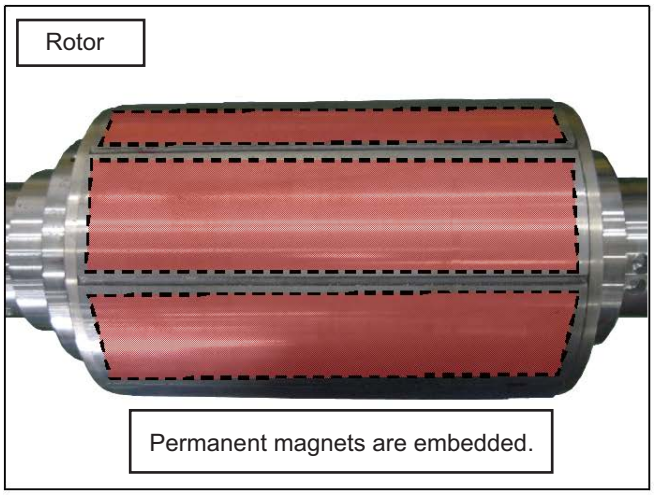
4.4 Precautions for Handling IPM Spindle Motor

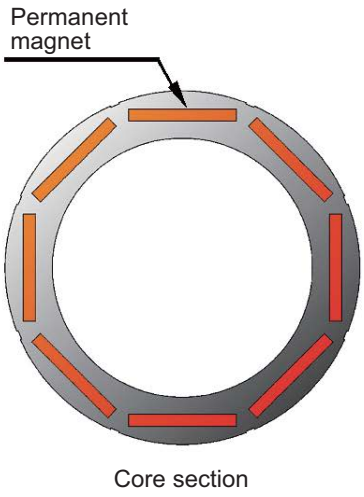
4.4.1 Precautions

The built-in IPM spindle motor rotor has a core in which permanent magnets are arranged. Very strong magnetic attraction force is generated between magnetic material as iron. The magnetic attraction force is generated mainly on the core surface side (rotor outside). (Almost no attraction force is generated on the sleeve inside.)
Therefore, when handling the single rotor unit, take safety measure to avoid accidents as fingers or hands may be caught due to the magnetic attraction force.
In addition, the magnetic force is released into the air, so it is highly dangerous to approach the rotor before assembling because medical electronics such as pacemaker may not operate normally.
Please note that if watch, magnetic tape, floppy disk, cash card, prepaid card, ticket etc., are approached, their magnetic memories may be destroyed or magnetized and may not be able to use due to the magnetic force.

< General precautions>

(1) Do not put magnetic materials as iron close to the single rotor unit.





(2) Before handling, remove metal items such as watch, piercing jewelry, necklace, etc.
(3) Do not leave the rotor unattended.
-> When the rotor is not securely fixed to the machine or device, make sure to store it in the package properly.
(4) Do not modify the product, or do not give a shock.
(5) Do not get on top of or place heavy objects on the product.

< Transportation and storage >

(1) Correctly store the rotor in the package to transport and store.
(2) During transportation and storage, draw people's attention by applying a notice saying "Strong magnet-Handle with care" to the package or storage shelf.
(3) Do not use a damaged package.

< Assembly >

(1) For the rotor shrink fitting to the spindle, the rotor should be heated at 130°C or less. If it exceeds the temperature, the magnet could be demagnetized, and the specified characteristics will not be ensured.

(2) For the rotor shrink fitting, refer to the recommended value as shown in the delivery specifications (outline dimension drawings).

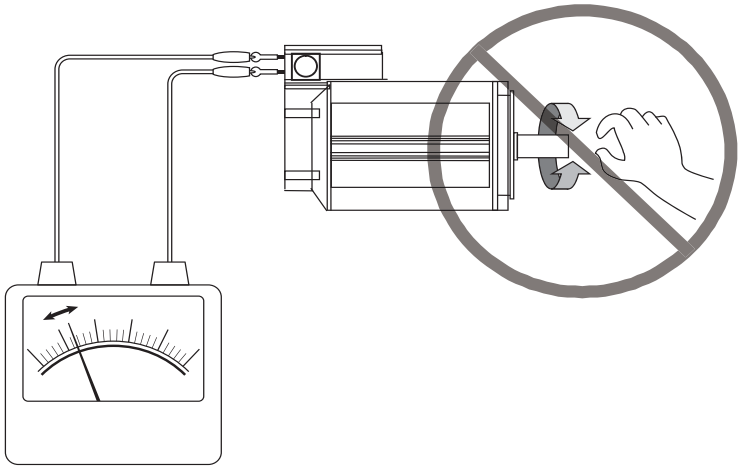
(3) Finishing machining for the rotor has already been performed, so do not modify such as the outer and inner diameters.
Tools may be attracted or cutting chips may stick onto the rotor surface due to magnetic attraction force.

(4) At the start of inserting a spindle with a rotor into a stator, the magnetic force attracting to the stator side is generated. Use a jig, etc. so as not to catch your hand or fingers.

Example of assembling a rotor

(5) The dynamic balance of the rotor has not been adjusted. After the rotor is assembled to the spindle, adjust the dynamic balance. Adjust the balance by opening a hole in the balance ring installed by the user.

(6) After assembling the spindle, if the rotor is rotated by hand etc., voltage occurs between the terminals of lead. Take care not to get electric shocks.



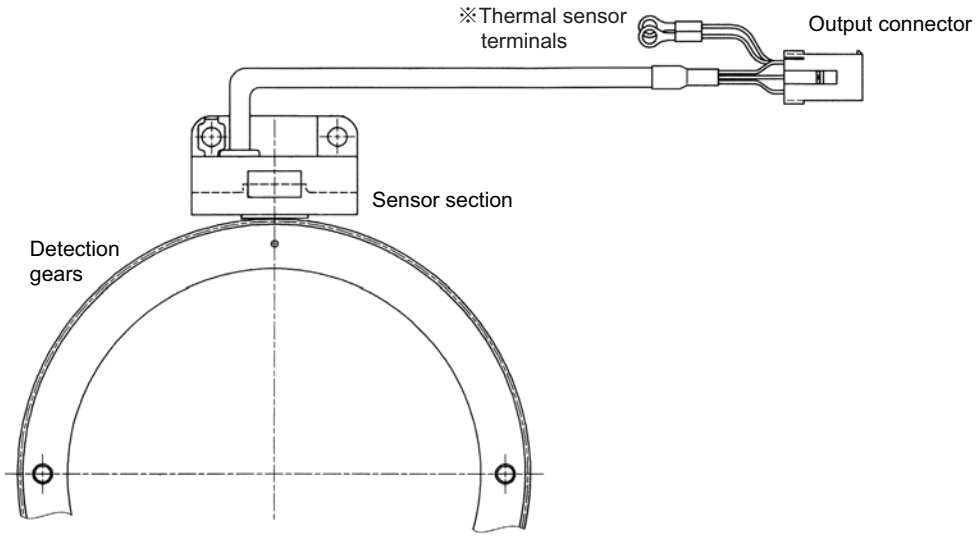
4.5 Installation of Motor Encoder

4.5.1 Accuracy Encoder (TS5690 Series)

(1) Part configuration

The encoder is configured of a sensor and detection gear. The sensor and detection gear must be used in the designated combination.

These are precision parts, and require care when handling. Do not apply an excessive force on the sensor's detection surface, as this could result in faults. Do not pull and apply a load on the lead wires. Make sure that foreign matters (iron chips, etc.) do not get on the sensor's detection surface or detection gears. If any foreign matter should get on these parts, carefully remove while taking care not to damage the parts. When handling the detection gears, take care not to damage or deform the teeth.



Accuracy encoder TS5690 Series

(2) Installing the detection gears

[1] Install the detection gears so that the first gear's teeth side (Z phase) face the sensor's lead side.

[2] The detection gears and shaft or sleeve should be fixed with shrink fitting. Refer to the following table for the shrink fitting values. The detection gears should be heated evenly between 120 and 150°C using an electric furnace, etc.

Guideline for detection gear shrink fitting values

Inner diameter (mm)	Shrink fitting (mm)	Inner diameter (mm)	Shrink fitting (mm)
Φ40	0.020 to 0.040	Φ140	0.050 to 0.085
Φ70	0.030 to 0.055	Φ160	0.060 to 0.090
Φ80	0.030 to 0.055	Φ215	0.080 to 0.110
Φ125	0.050 to 0.085		

[3] Keep the deflection of the outer diameter, when the detection gears are installed on the shaft, to 0.02mm or less.

[4] To remove a detection gear fixed with shrink fitting, use the screw holes opened in the axial direction for pulling (two M5 screw holes or two M8 screw holes), or push the end with a jig. Carry out this work carefully. Applying excessive force when pulling out the gears could cause the inner diameter of the detection gears to deform.

[5] Before reusing detection gears which have been removed, always measure the inner diameter dimensions, and carefully check that the inner diameter is not deformed, and that the sufficient tightening amount can be secured. Do not reuse the detection gears if the inner diameter is deformed, or if any abnormality such as damage to the teeth is found.

(3) Installing the sensor section

[1] Prepare the notched fitting section at the machine side's installation position to be of the specified dimensions in advance.

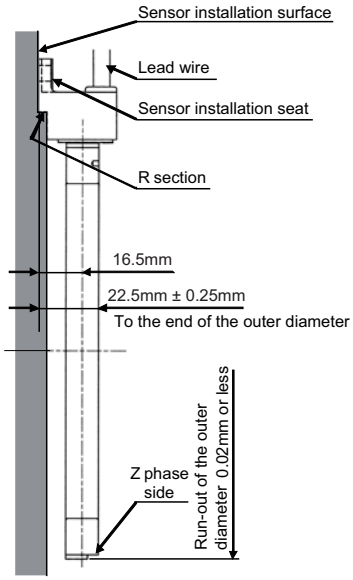
[2] With the sensor installation seat's R section butted against the notched fitting section, fix the sensor installation seat with a mounting screw (M5 x 0.8 screws). A locking agent should be applied on the mounting screw before it is tightened.

[3] Fix the sensor with its R section butted against the notched fitting section so that the position relation between the detection gear and sensor is kept constant. This ensures favorable accuracy of the sensor installation.

[4] Keep the deviation of the sensor center and outer diameter center of the detection gear to ±0.25mm or less. If the center deviation cannot be directly measured, set so that the dimension from the sensor installing surface to the outer diameter edge of the detection gears is 22.5±0.25mm. (Some detection gears have thickness at the inner diameter section.)

[5] Make sure that force is not constantly applied on the sensor's lead wires.

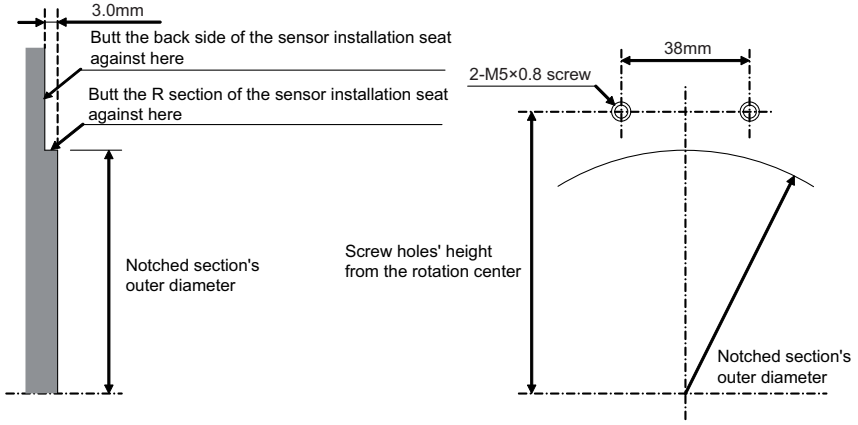
[6] Check the gap between the encoder sensor and the gear (0.3±0.05mm).



Installing the detector

POINT

To install the sensor section, the notched fitting section on the machine side must have the specified dimensions.
The sensor's installation accuracy is assured by adjusting the outside dimensions of the notched fitting section.



Shape of notched fitting section

Installing dimension of the sensor section

Sensor series type	Screw holes' height from the rotation center (mm)	Notched fitting section's outer diameter (mm)
TS5690N6400	51.4	Φ72.0 +0.060 -0.010
TS5690N1200	77.0	Φ122.0 +0.025 -0.025
TS5690N2500	128.2	Φ223.6 +0.025 -0.025

(4) Installation accuracy diagnosis for spindle side PLG encoder

> **⚠ CAUTION**
>
> Do not operate the spindle before performing this installation accuracy diagnosis.
> If operated with an improperly installed spindle side PLG encoder, the spindle motor may rotate at high speed. Always perform this diagnosis before normal operation.

[1] Outline

In this section, check if the installation polarity of spindle side PLG encoder corresponds to the parameter setting, and the gap between the gear and the sensor is appropriate. In a full-closed loop control where the encoder is also installed on the spindle side, it is controlled based on the feedback of the spindle side encoder during the speed command operation (S command). Do not command a normal spindle operation before confirming the installation accuracy of the spindle side encoder.Spindle side PLG encoders (TS5690 Series) have the specified gap from the gear by installing the sensor section on the machine-notched fitting section. Whether a signal is detected correctly or not can be confirmed using the servo diagnosis screen on NC while rotating the spindle motor in an open loop control.

[2] Confirmation of encoder installation polarity

Open the drive monitor/spindle unit on the NC Diagnosis screen, and display "Machine position", "Motor end FB" and "FB error".Confirm that "Machine position" and "Motor end FB" are counted on the same polarity, and that "FB error" is not cumulated while rotating the spindle by hand. When the polarity of "Machine position" and "Motor end FB" is different and "FB error" is cumulated, change the setting of #13017/bit4(SP017/bit4).Set the spindle parameter so that the spindle system is in a full-closed loop control during this confirmation.

- #13019(SP019) Set the encoder resolution of spindle side PLG encoder correctly
- #13031(SP031) Set to full closed loop control (6200)

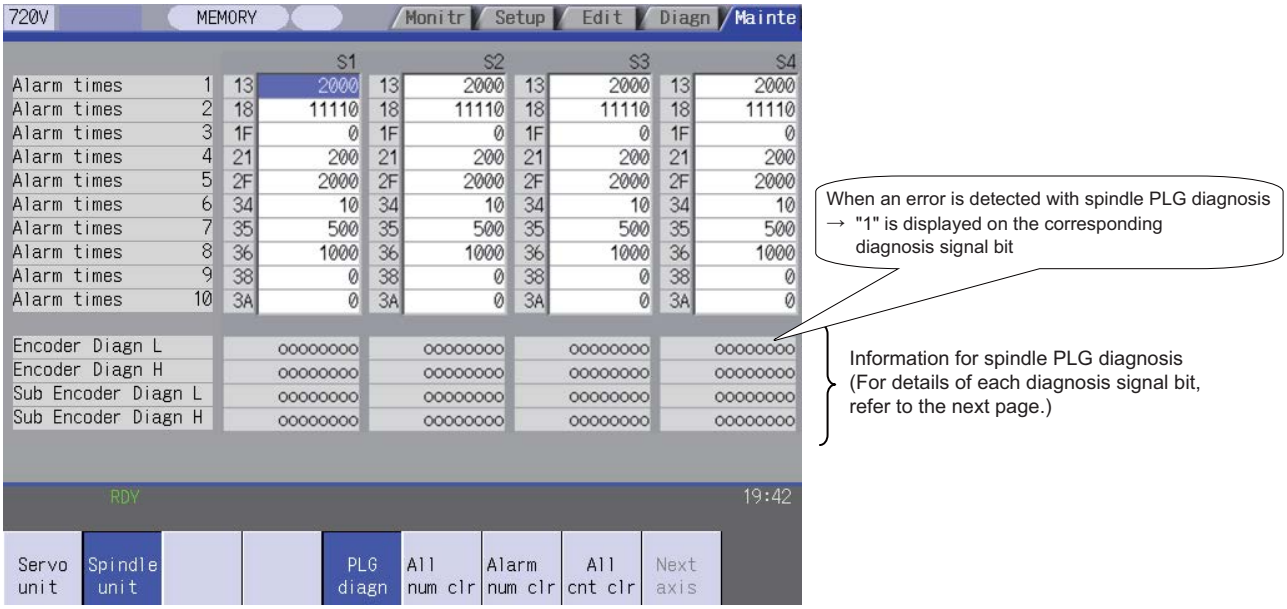
[3] Confirmation of encoder installation accuracy

Whether the gap between the sensor section and the gear is ensured correctly or not can be confirmed using the servo diagnosis screen, [PLG diagn] on NC while rotating the spindle motor in an open loop control. Confirm it according to the following procedures.

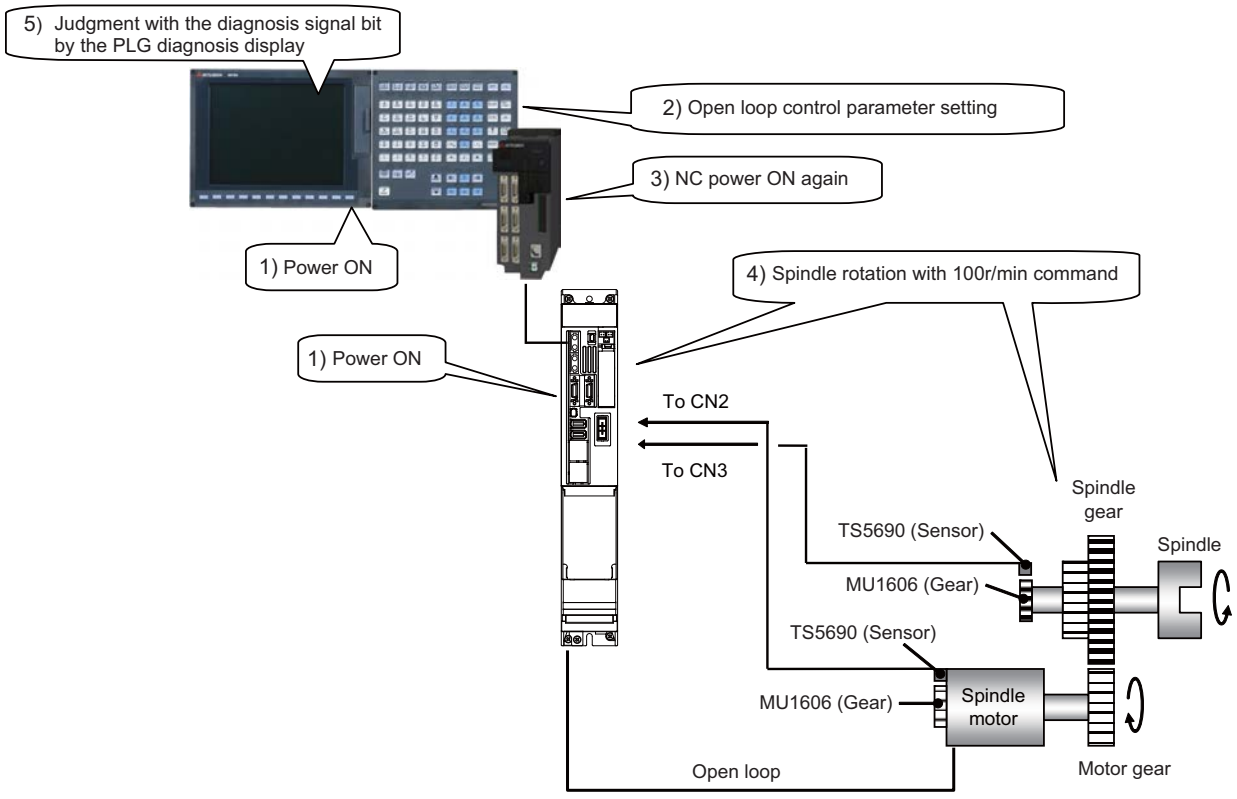
1) Power ON the spindle drive unit and the NC.
2) Set the spindle parameter #13018/bit1 (SP018/bit1) to 1, and set to an open loop control.
3) Turn the NC power OFF and then ON again.
4) Rotate the spindle by inputting 100r/min command. Although this is the same as normal S command operation, neither the spindle side encoder feed back or the motor side encoder feed back is used for the motor control on the spindle drive unit since the open loop control is set with the spindle parameter.
5) Switch to the [Servo diagn] menu on the NC maintenance screen and change from [Spindle unit] to [PLG diagn].When all the diagnosis signal bits are constantly at "0", the installation of PLG encoder is normal. When the diagnosis signal bit is "1", the result of diagnosis is abnormal. Perform troubleshooting following "(4) Diagnosis and remedy" by reference to the error details and main cause.
6) Set the spindle parameter #13018/bit1 (SP018/bit1) to 0 again and finish the open loop control.

> **⚠ CAUTION**
>
> The spindle PLG diagnosis is only performed during the open loop control operation.Diagnosis screen is displayed even during the normal operation, however, the error detection ("1" display) will not be performed.

<Display of spindle PLG diagnosis>



Item	Details
Encoder Diagn L	Display the motor end PLG diagnosis signal bit 7 to 0.
Encoder Diagn H	Display the motor end PLG diagnosis signal bit F to 8.
Sub Encoder Diagn L	Display the machine end PLG diagnosis signal bit 7 to 0.
Sub Encoder Diagn H	Display the machine end PLG diagnosis signal bit F to 8.



Installation diagnosis for spindle side PLG encoder

Details of each diagnosis signal bit which is displayed as information for spindle PLG diagnosis are shown in the following table.

Diagnosis signal bit	Error details	Description	Main factor
0	A-phase amplitude excessive	The A-phase amplitude is larger than the specified value.	Too small gap
1	A-phase amplitude too small	The A-phase amplitude is smaller than the specified value.	Excessive gap
2	A-phase offset excessive ＋	The A-phase offset is larger than the specified value to + side.	The deviation between the sensor and the center of the gear
3	A-phase offset excessive -	The A-phase offset is larger than the specified value to - side.	The deviation between the sensor and the center of the gear
4	B-phase amplitude excessive	The B-phase amplitude is larger than the specified value.	Too small gap
5	B-phase amplitude too small	The B-phase amplitude is smaller than the specified value.	Excessive gap
6	B-phase offset excessive ＋	The B-phase offset is larger than the specified value to + side.	The deviation between the sensor and the center of the gear
7	B-phase offset excessive -	The B-phase offset is larger than the specified value to - side.	The deviation between the sensor and the center of the gear
8	Z-phase width excessive	The Z-phase width is larger than the specified value. [AL2C factor]	Too small gap
9	Z-phase width too small	The Z-phase width is smaller than the specified value.	Excessive gap
A	Z-phase error incorrect output	The relation of the phases between AB and Z is abnormal. [AL2C factor]	The deviation between the sensor and the center of the gear
B	Z-phase error sliver waveform	The relation of the phases between AB and Z is abnormal. [AL2C factor]	The deviation between the sensor and the center of the gear
C	Z-phase error no signal	The Z-phase signal is not detected. [AL2C factor]	Excessive gap, detection gear error
D	-	-	-
E	Z-phase error logic reversed	The Z-phase logic (normally positive) is reversed. [AL2C factor]	Detection gear error
F	-	-	-

[4] Diagnosis and remedy

When the diagnosis signal bit on [PLG diagn] is "1", check the installation of the PLG encoder again.

<When the waveform of spindle end PLG installation gap diagnosis is abnormal>

The gap between the sensor section and the gear may deviate from the specified value. Confirm that the sensor section is installed on the notched fitting section properly. Also confirm that the notched fitting section is machined properly based on the specified dimensions for each PLG encoder.

<When the waveform of spindle end PLG installation all errors diagnosis is abnormal>

The sensor section may deviate from the center of the gear. Confirm the installation of the sensor section and the gear.

⚠ CAUTION

1. When finely adjusting the sensor installation position, adjust after turning the power of the drive unit OFF.
2. "00000000" is also displayed in the following cases.
   (1) When the spindle parameter #13018/bit1(SP018/bit1) is 0 (open loop disabled)
   (2) When the spindle side PLG encoder (TS5690 Series) is not connected

【#13017(PR)】 SP017 SPEC1 Spindle specification 1

bit 4 : fdir Position feedback

Set the machine side encoder's installation polarity.
0: Forward polarity 1: Reverse polarity

【#13018(PR)】 SP018 SPEC2 Spindle specification 2

bit 1 : oplp Open loop control

This allows the operation in which no encoder feedback signals are used.
It is used when adjusting the encoder, etc.
0: Disable 1: Enable

【#13113】 SP113 OPLP Current command value for open loop

Set the current command value for when the open loop control is enabled.
When "0" is set, the state will be the same as when "50" is set.
When not using, set to "0".
The open loop control is enabled when "SP018/bit1" is set to "1".

---Setting range---
0 to 999 (Short-time rated %)

5

Wiring and Connection

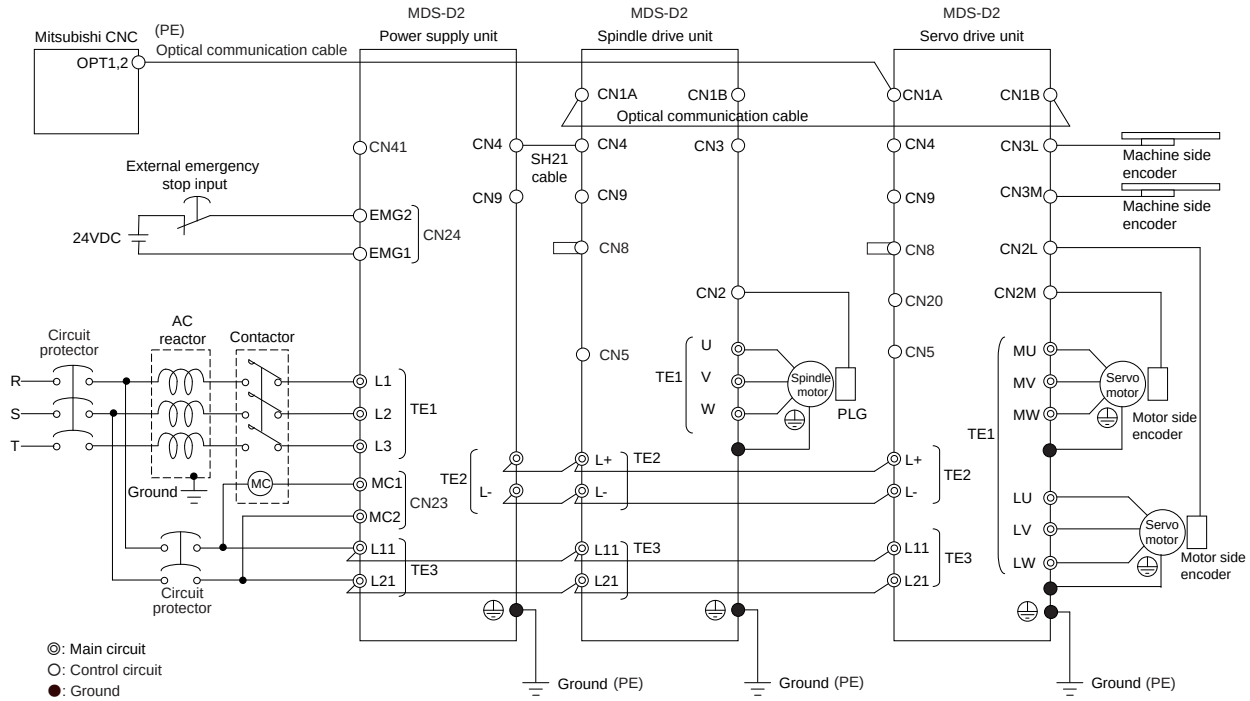
⚠ DANGER

1. Wiring work must be done by a qualified technician.
2. Wait at least 15 minutes after turning the power OFF and check the voltage with a tester, etc., before starting wiring. Failure to observe this could lead to electric shocks.
3. Securely ground the drive units and spindle motor.
4. Wire the drive units and spindle motor after installation. Failure to observe this could lead to electric shocks.
5. Do not damage, apply forcible stress, place heavy items on the cables or get them caught. Failure to observe this could lead to electric shocks.
6. Always insulate the power terminal connection section. Failure to observe this could lead to electric shocks.

⚠ CAUTION

1. Correctly and securely perform the wiring. Failure to do so could result in runaway of the spindle motor or injury.
2. Do not mistake the terminal connections.
3. Do not mistake the polarity (+ , -). Failure to observe this item could lead to ruptures or damage, etc.
4. Electronic devices used near the drive units may receive magnetic obstruction. Reduce the effect of magnetic obstacles by installing a noise filter, etc.
5. Do not install a phase advancing capacitor, surge absorber or radio noise filter on the power line (U, V, W) of the spindle motor.
6. Do not modify this unit.
7. If the connectors are connected incorrectly, faults could occur. Make sure that the connecting position and the connection are correct.
8. When grounding the motor, connect to the protective grounding terminal on the drive units, and ground from the other protective grounding terminal.(Use one-point grounding)
   Do not separately ground the connected motor and drive unit as noise could be generated.

5.1 Part System Connection Diagram



(Note 1) The total length of the optical communication cable from the NC must be within 30m and the minimum-bending radius within 80mm.

(Note 2) The connection method will differ according to the used motor.

(Note 3) Battery for the encoder back up is built-in the drive unit. (An external battery is available as an option.)

(Note 4) The main circuit (◎), control circuit (○) and ground (●) are safely separated.

(Note 5) Connect the ground of the motor to the ground of the connected drive unit.

6

Setup

6.1 Initial Setup for IPM Spindle Motor

This section explains the initial setup procedures for IPM spindle motor system.

> **⚠ CAUTION**
>
> 1. Perform the initial setup after the operation is enabled for NC system.
> 2. The initial setup is required for each IPM spindle motor.
> 3. Perform the initial setup again after replacing the encoder.

6.1.1 Adjustment Procedure

In the IPM spindle motor drive system, create the initial magnetic pole by the method listed below after the power ON. The DC excitation function detects the magnetic pole shift amount on the Z-phase basis when using an IPM spindle motor, so the IPM spindle motor will be driven with the initial magnetic pole and perform the DC excitation function (decision of the magnetic pole shift amount) after the Z-phase has been passed.

Creation method of the initial magnetic pole	Creation timing of the initial magnetic pole	Related parameters	Compatible system
[1] Detection by the initial magnetic pole estimate function	At the initial servo ON	SP121(Kpp), SP122(Kvp), SP123(Kvi)	IPM spindle motor + Relative position encoder
[2] Detection by pulse-applied method	At the initial servo ON	-	IPM spindle motor + Relative position encoder

The IPM spindle motor will be driven according to the magnetic pole shift amount set in the spindle parameter #13118(SP118), which you determined through the DC excitation function, after turning the NC power ON next and the Z-phase has been passed. (The IPM spindle motor will be driven with the initial magnetic pole in the above table until the Z-phase has been passed even after the magnetic pole shift amount is set.)
With the DC excitation function, once the spindle parameter #13118(SP118) is set, resetting is not required unless the encoder is replaced.

< Confirmation of the initial magnetic polar detection >

(1) Turn ON the spindle drive unit and NC. Confirm that there is no error such as Initial parameter error (37).
(2) Release the emergency stop and then start the spindle with S command.
    -> When pulse-applied method is not used, the parameters related to the initial magnetic pole estimate function are required to be set.
    (#13121(SP121) to 6, #13122(SP122) to 1500, and #13123(SP123) to 2000)
(3) The LED on the drive unit changes to "Cx" and the IPM spindle motor moves by little and little for about five seconds (start initial magnetic pole estimate).
(4) Confirm that the LED on the drive unit changes to "dx" and the motor stops (terminate initial magnetic pole estimate).
    [Check] Spindle monitor Control output 1/bit1(In servo ON) changes from "0" to "1"
    Control output 4/bit7(Magnetic pole position not set) changes from "1" to "0"
(5) The IPM spindle motor will be driven after the operation (4). Drive the motor until the Z-phase has been detected.
    -> Switch to the [Servo diagn] menu on the NC maintenance screen, select [Servo unit] and confirm [Control output 2/bit0(Z-phase passed)] is "1".

< DC excitation function >

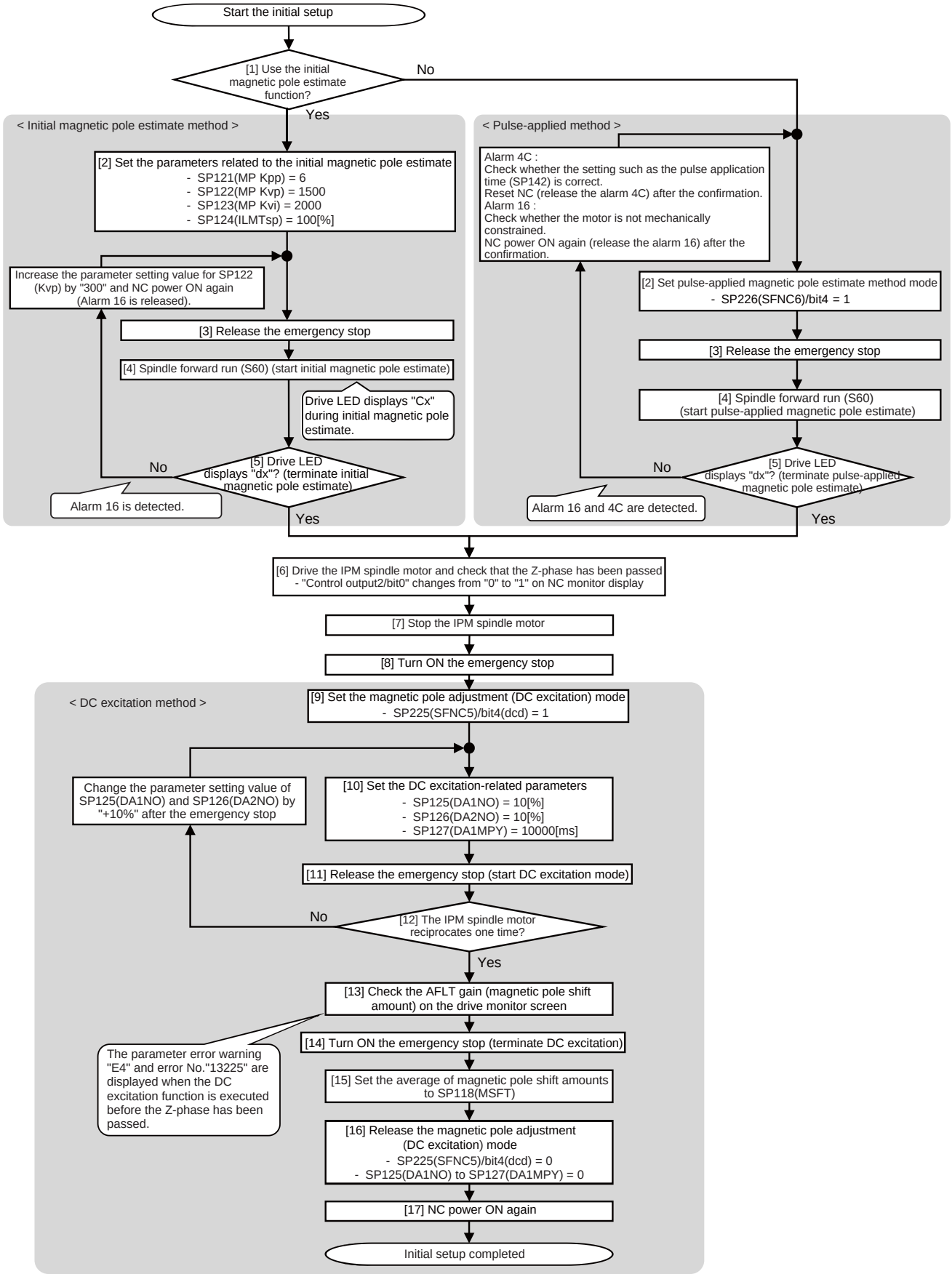
(6) Turn ON the emergency stop.
(7) Set the parameters related to the DC excitation (#13125(SP125) to 10, #13126(SP126) to 10, and #13127(SP127) to 1000).
(8) Set the spindle parameter #13225/bit4(SP225/bit4) to "1" to enable the DC excitation mode.
(9) Release the emergency stop.
(10) Confirm that the IPM spindle motor carries out a reciprocation operation between about ±10° and 20° once (start DC excitation).
(11) Confirm that the IPM spindle motor stops after the reciprocation operation.
(12) Switch to the [Diagn] menu on the NC maintenance screen, select [Spindle unit] and monitor [AFLT gain].
(13) Turn ON the emergency stop (terminate DC excitation).
(14) Repeat (9) to (13) 5 times, and monitor the ALFT gain value (magnetic pole shift amount) each time.
If difference of the magnetic pole shift amounts is 1000 data or bigger, reset the related parameter settings (#13125(SP125)=+10, #13126(SP126)=+10) and perform (9) to (13) again.
(15) Calculate the average of the magnetic pole shift amounts, and set it to #13118(SP118).
(16) Return the spindle parameter #13225/bit4(SP225/bit4) back to the original setting, "0".
(17) Turn the NC power ON again.

⚠ CAUTION

1. Never operate the IPM spindle motor before DC excitation function is enabled.
2. The motor carries out a reciprocation operation at about the magnetic pole pitch while DC excitation function is enabled.
3. The magnetic pole shift amount cannot be calculated correctly with incorrect wiring in the motor power line or encoder cable.

Initial setup procedures for IPM spindle motor

Perform the initial setup for the IPM spindle motor by following the steps in the flow diagram below.



6.1.2 Related Parameters

As DC excitation is a function used for initial setup for the IPM spindle motor, use the spindle parameters #13125(SP125), #13126(SP126), and #13127(SP127) that have another function (D/A output) used for adjustment. Note, however, that these parameters are enabled as the DC excitation function parameters when the spindle parameter #13225/bit4(SP225/bit4) is set to "1".

< DC excitation function related parameters >

【 #13118(PR)】 SP118 MSFT Magnetic pole shift amount

Set the magnetic pole shift amount of IPM spindle motor.
During DC excitation of the initial setup: Set the same value displayed in the "AFLT gain" on the NC monitor screen in SP225(SFNC5)/bit4(dcd)=1.

---Setting range---
-18000 to 18000 (electrical angle 0.01°)

【 #13125】 SP125 DA1NO Initial DC excitation level

[When driving an IPM spindle motor (MDS-D2/DH2 Series)]
Use in the DC excitation function.
DC excitation: Set the initial excitation level when SP225(SFNC5)/bit4(dcd)=1.
When "0" is set, the state will be the same as when "20" is set.

---Setting range---
-32768 to 32767

【#13126】 SP126 DA2NO Final DC excitation level

[When driving an IPM spindle motor (MDS-D2/DH2 Series)]
Use in the DC excitation function.
DC excitation: Set the final excitation level when SP225(SFNC5)/bit4(dcd)=1.
When "0" is set, the state will be the same as when "50" is set.

---Setting range---
-32768 to 32767

【#13127】 SP127 DA1MPY Initial DC excitation time

[When driving an IPM spindle motor (MDS-D2/DH2 Series)]
Use in the DC excitation function.
DC excitation: Set the initial excitation time when SP225(SFNC5)/bit4(dcd)=1.
When "0" is set, the state will be the same as when "10000" is set.

---Setting range---
-32768 to 32767 (1/100-fold)

【#13225】 SP225 SFNC5 Spindle function 5

bit 4 : dcd DC excitation mode

0: Normal 1: Start

> ⚠ **CAUTION**
>
> The parameters SP125 to 128 act as the adjustment parameters while IPM magnetic pole is being estimated, and thus normal D/A output is disabled.

< Initial magnetic pole estimate function related parameters >

【#13121】 SP121 MP Kpp Magnetic pole detection position loop gain

Set the position loop gain in the magnetic polar detection loop.
This is used in the initial magnetic polar detection when the IPM spindle motor is turned ON.
Set to "0" when using an IM spindle motor.

---Setting range---
0 to 32767

【#13122】 SP122 MP Kvp Magnetic pole detection speed loop gain

Set the speed loop gain in the magnetic polar detection loop.
This is used in the initial magnetic polar detection when the IPM spindle motor is turned ON.
Set to "0" when using an IM spindle motor.

---Setting range---
0 to 32767

【#13123】 SP123 MP Kvi Magnetic pole detection speed loop lead compensation

Set the speed loop lead compensation in the magnetic polar detection loop.
This is used in the initial magnetic polar detection when the IPM spindle motor is turned ON.
Set to "0" when using an IM spindle motor.

---Setting range---
0 to 32767

【#13124】 SP124 ILMTsp Magnetic pole detection current limit value

Set the current limit value for the magnetic polar detection loop.
This is used in the initial magnetic polar detection when the IPM spindle motor is turned ON.
Set to "0" when using an IM spindle motor.

---Setting range---
0 to 999 (Short-time rated %)

< Pulse-applied magnetic pole estimate function related parameters >

【#13142(PR)】 SP142

Set the unique constants for the spindle motor. (High-speed coil)
The setting value is determined by the motor's mechanical and electrical characteristics and specifications, so normally set the value given in the spindle parameter list.

For IPM spindle motor
This parameter is used in initial magnetic pole detection of IPM spindle motor.

(1) Pulse application time: Set it in [μs] unit.(0 < application time < 350)
(2) Pulse application coil: To select a low-speed coil, add 1000 to the pulse application time.
(3) Polarity of estimated magnetic pole: When it is set to the reverse polarity, add "-" to the total of (1) and (2).

E.g.: When performing 333μs pulse-applied magnetic pole estimation in a low-speed coil and selecting the reverse polarity for the estimated polarity
SP142 = -(333+1000) = -1333

【#13226】 SP226 SFNC6 Spindle function 6

bit 5 : pon IPM spindle pulse application magnetic pole estimation

0: Normal 1: Enable

6.2 Protective Functions List of Units

The following are the alarms and warnings specific to the IPM spindle motor system. Refer to the Instruction Manual of the drive unit currently used for other alarms and warnings.

6.2.1 Drive Unit Alarm

No.	Name	Details	Reset method	Stop method
16	Initial magnetic pole position detection error	- In the IPM spindle motor system, the magnetic pole position is not correctly detected during the initial magnetic pole position detection function. It can occur when the motor is mechanically constrained at servo ON or when an excessive force is applied to the motor during magnetic pole estimation.	PR	Coast to a stop
37	Initial parameter error	- An incorrect set value was detected among the parameters send from the NC at the power ON.	PR	Initial error
3E	Magnetic pole position detection error	- The magnetic pole position, detected in the magnetic pole position detection control, is not correctly detected. The setting of magnetic pole shift amount (SP118) is not reliable. - The encoder installation polarity may be reverse.	AR	Coast to a stop
46	Motor overheat / Thermal error	- An overheat is detected on the motor. - The thermistor signal receiving circuit of the motor was disconnected. - The thermistor signal receiving circuit was short-circuited.	NR	Deceleration stop
4C	Current error at magnetic pole estimate	Current detection failed during the pulse-applied magnetic pole estimation for IPM spindle motor.	NR	Coast to a stop
51	Overload 2	- Current command of 95% or more of the unit's max. current was given continuously for 1 second or longer. - The encoder installation polarity may be reverse.	NR	Deceleration stop
52	Excessive error 1	- A position tracking error during servo ON was excessive. - The encoder installation polarity may be reverse.	NR	Deceleration stop

(Note 1) Resetting methods
NR : Reset with the NC RESET button. This alarm can also be reset with the PR and AR resetting conditions.
PR : Reset by turning the NC power ON again. This alarm can also be reset with the AR resetting conditions.
When the control axis is removed, this alarm can be reset with the NC RESET button. (Excluding alarms 32 and 37.)
AR : Reset by turning the servo drive unit power ON again.

Encoder alarm (Spindle drive unit)

Alarm number when the encoder is connected toCN2 side		2B	2C	2D	2E	48	49	4A	4B
Alarm number when the encoder is connected to CN3 side		1B	1C	1D	1E	27	28	29	2A
TS5690 TS5691	Mitsubishi Electric	Memory error	Waveform error	-	-	-	Overspeed	-	Relative position data error

(Note) A drive unit processes all reset types of alarms as "PR". However, "AR" will be applied according to the encoder.

6.2.2 Drive Unit Warning

No.	Name	Details	Reset method	Stop method
E4	Parameter warning	An incorrect set value was detected among the parameters send from the NC in the normal operation.	*	-

(Note 1) A drive unit processes all reset types of alarms as "PR". However, "AR" will be applied according to the encoder.
(Note 2) Resetting methods
* : Automatically reset once the cause of the warning is removed.
NR: Reset with the NC RESET button. This warning can also be reset with the PR and AR resetting conditions.
PR: Reset by turning the NC power ON again. This warning can also be reset with the AR resetting conditions.
AR: Reset by turning the spindle drive unit power ON again.
(Note 3) IPM spindle motor does not stop when the warning occurs.
(Note 4) When an emergency stop is input, IPM spindle motor decelerates to a stop. (When SP055 or SP056 is set.)

6.2.3 Parameter Numbers during Initial Parameter Error

< Parameter error No. >

If an initial parameter error (alarm 37) or set parameter warning (warning E4) occurs, the axis name and the No. of the error parameter that exceeds the setting range will appear on the NC Diagnosis screen as shown below:

S02 Initial parameter error ○○○○□
○○○○ : Error parameter No.
□ : Axis name

S52 Parameter error warning ○○○○□
○○○○ : Error parameter No.
□ : Axis name

If an error No. in the following table is displayed as the error parameter No. even when the parameter is set to a value within the setting range, an error is occurring due to the hardware compatibility or specifications or in relation to several other parameters. Check the specifications and initial setup method of the IPM spindle motor system, and correctly set the parameters according to the descriptions in the following table.

Error parameter No.	Details	Related parameters
13017	The motor selected is of a motor series different from the drive unit's input voltage (200V/400V). Or a motor of an incompatible motor series is selected.	SP017
13019	- In a semi-closed loop control system, the setting value of SP019 is different from that of SP020. Set them to the same value. - SP019 is set to a value outside the setting range.	SP019
13032	The power supply type (SP032) is set, but a power supply unit is not connected. Always set the power supply type for the drive unit connected last on the NC optical communication cable.	SP032
13097	-The expansion sub side encoder resolution (SP097) is set to "0" for a encoder that requires the resolution expansion setting. If the upper 16 bits for the encoder resolution are "0", this should be set to "-1". -The expansion sub side encoder resolution (SP097) is set to a value other than "0" for a encoder that does not support the resolution expansion setting.	SP019,SP097
13098	-The expansion main side encoder resolution (SP098) is set to "0" for a encoder that requires the resolution expansion setting. If the upper 16 bits for the encoder resolution are 0, this should be set to "-1". -The expansion main side encoder resolution (SP098) is set to a value other than "0" for a encoder that does not support the resolution expansion setting.	SP020,SP098
13125	When the DC excitation mode (SP225/bit4) is set, the initial DC excitation level (SP125) is set to a value outside the setting range.	SP225, SP125
13126	When the DC excitation mode (SP225/bit4) is set, the final DC excitation level (SP126) is set to a value outside the setting range.	SP225, SP126
13127	When the DC excitation mode (SP225/bit4) is set, the initial DC time (SP127) is set to a value outside the setting range.	SP225, SP127
13142	-The pulse application time for an IPM spindle motor is excessive. Set the pulse application time (SP142) to a value lower than 350μs. -The coil switch function is disabled and the pulse application coil for an IPM spindle motor is set to the low-speed coil. Set the pulse application coil to the high-speed coil, or enable the coil switch function.	SP017,SP018,SP142, SP226
13225	The DC excitation mode (SP225/bit4) has been set before the axis passes the Z phase. Set the DC excitation mode after the axis passes the Z phase.	SP225

Revision History

Date of revision	Manual No.	Revision details
Mar. 2011	IB(NA)1501011-A	First edition created.
Jul. 2014	IB(NA)1501011-B	- "SJ-B Series" is added to the manual name (cover). - The words "detector" were replaced by "encoder". - "Introduction" was revised. - "Handling of our product" and "WARRANTY" were added. - Revisions were made to support MDS-D2/DH2 Series. - The following motors were deleted. SJ-2B4207T, SJ-2B4211T, SJ-2B6702TK, SJ-2B6904TK - "System Configuration" and "Built-in Spindle Motor Type" were revised. - "Specifications List", "Characteristics" and "Outline Dimension Drawings" in "Built-in Spindle Motor" were revised. - "Outline Dimension Drawings" in "PLG Serial Output Encoder (TS5690, MU1606 Series)" was revised. - "Cable Connection Diagram" was revised. - "AC Reactor" was added. - "Stator Assembly" was revised. - "Accuracy Encoder (TS5690 Series)" was revised. - "Part System Connection Diagram" was revised. - "Setup" was revised. - "Global service network" was revised.

Global Service Network

AMERICA

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4299 14TH AVENUE MARKHAM, ONTARIO L3R OJ2, CANADA
TEL: +1-905-475-7728 / FAX: +1-905-475-7935

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TEL: +1-905-475-7728 FAX: +1-905-475-7935

Mexico Region Service Center
MARIANO ESCOBEDO 69 TLALNEPANTLA, 54030 EDO. DE MEXICO
TEL: +52-55-3067-7500 / FAX: +52-55-9171-7649

Monterrey Service Satellite
MONTERREY, N.L., 64720, MEXICO
TEL: +52-81-8365-4171

BRAZIL

MELCO CNC do Brasil Comércio e Servicos S.A

Brazil Region Service Center
ACESSO JOSE SARTORELLI, KM 2.1 CEP 18550-000, BOITUVA-SP, BRAZIL
TEL: +55-15-3363-9900 / FAX: +55-15-3363-9911

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Germany Service Center
KURZE STRASSE. 40, 70794 FILDERSTADT-BONLANDEN, GERMANY
TEL: + 49-711-770598-123 / FAX: +49-711-770598-141

France Service Center DEPARTEMENT CONTROLE NUMERIQUE
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TEL: +33-1-41-02-83-13 / FAX: +33-1-49-01-07-25

France (Lyon) Service Satellite DEPARTEMENT CONTROLE NUMERIQUE
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Italy Service Center
VIALE COLLEONI, 7 - CENTRO DIREZIONALE COLLEONI PALAZZO SIRIO INGRESSO 1
20864 AGRATE BRIANZA (MB), ITALY
TEL: +39-039-6053-342 / FAX: +39-039-6053-206

Italy (Padova) Service Satellite
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Spain Service Center
CTRA. DE RUBI, 76-80-APDO. 420
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TEL: +34-935-65-2236 / FAX: +34-935-89-1579

Poland Service Center
UL.KRAKOWSKA 50, 32-083 BALICE, POLAND
TEL: +48-12-630-4700 / FAX: +48-12-630-4701

Mitsubishi Electric Turkey A.Ş Ümraniye Şubesi
Turkey Service Center
ŞERIFALI MAH. NUTUK SOK. NO.5 34775
ÜMRANIYE, ISTANBUL, TURKEY
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Czech Republic Service Center
KAFKOVA 1853/3, 702 00 OSTRAVA 2, CZECH REPUBLIC
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Bulgaria Service Center
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TEL: +359-2-8176009 / FAX: +359-2-9744061

Ukraine (Kharkov) Service Center
APTEKARSKIY LANE 9-A, OFFICE 3, 61001 KHARKOV, UKRAINE
TEL: +380-57-732-7774 / FAX: +380-57-731-8721

Ukraine (Kiev) Service Center
4-B, M. RASKOVOYI STR., 02660 KIEV, UKRAINE
TEL: +380-44-494-3355 / FAX: +380-44-494-3366

Belarus Service Center
OFFICE 9, NEZAVISIMOSTI PR.177, 220125 MINSK, BELARUS
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South Africa Service Center
5 ALBATROSS STREET, RHODESFIELD, KEMPTON PARK 1619, GAUTENG, SOUTH AFRICA
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ASEAN

MITSUBISHI ELECTRIC ASIA PTE. LTD. (ASEAN FA CENTER)

Singapore Service Center
307 ALEXANDRA ROAD #05-01/02 MITSUBISHI ELECTRIC BUILDING SINGAPORE 159943
TEL: +65-6473-2308 / FAX: +65-6476-7439

Malaysia (KL) Service Center
60, JALAN USJ 10 /1B 47620 UEP SUBANG JAYA SELANGOR DARUL EHSAN, MALAYSIA
TEL: +60-3-5631-7605 / FAX: +60-3-5631-7636

Malaysia (Johor Baru) Service Center
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TEL: +60-7-557-8218 / FAX: +60-7-557-3404

Philippines Service Center
UNIT NO.411, ALABAMG CORPORATE CENTER KM 25. WEST SERVICE ROAD
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MITSUBISHI ELECTRIC VIETNAM CO.,LTD

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HO CHI MINH CITY, VIETNAM
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Vietnam (Hanoi) Service Satellite
SUITE 9-05, 9TH FLOOR, HANOI CENTRAL OFFICE BUILDING, 44B LY THUONG KIET STREET,
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INDONESIA

PT. MITSUBISHI ELECTRIC INDONESIA

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THAILAND

MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO.,LTD

Thailand Service Center
12TH FLOOR, SV.CITY BUILDING, OFFICE TOWER 1, NO. 896/19 AND 20 RAMA 3 ROAD,
KWAENG BANGPONGPANG, KHET YANNAWA, BANGKOK 10120,THAILAND
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INDIA

MITSUBISHI ELECTRIC INDIA PVT. LTD.

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Ludhiana satellite office
Jamshedpur satellite office

India (Pune) Service Center
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Baroda satellite office
Mumbai satellite office

India (Bangalore) Service Center
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Coimbatore satellite office

OCEANIA

MITSUBISHI ELECTRIC AUSTRALIA LTD.

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CHINA

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. (CHINA FA CENTER)

China (Shanghai) Service Center
1-3,5-10,18-23/F, NO.1386 HONG QIAO ROAD, CHANG NING QU,
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China (Wuxi) Service Dealer
China (Jinan) Service Dealer
China (Hangzhou) Service Dealer
China (Wuhan) Service Satellite

China (Beijing) Service Center
9/F, OFFICE TOWER 1, HENDERSON CENTER, 18 JIANGUOMENNEI DAJIE,
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China (Beijing) Service Dealer

China (Tianjin) Service Center
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TIANJIN 300061, CHINA
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China (Changchun) Service Satellite

China (Chengdu) Service Center
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JINJIANG DISTRICT, CHENGDU, SICHUAN 610021, CHINA
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China (Shenzhen) Service Center
ROOM 2512-2516, 25/F., GREAT CHINA INTERNATIONAL EXCHANGE SQUARE, JINTIAN RD.S.,
FUTIAN DISTRICT, SHENZHEN 518034, CHINA
TEL: +86-755-2399-8272 / FAX: +86-755-8218-4776
China (Xiamen) Service Dealer
China (Dongguan) Service Dealer

KOREA

MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. (KOREA FA CENTER)

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Korea Taegu Service Satellite
4F KT BUILDING, 1630 SANGYEOK-DONG, BUK-KU, DAEGU 702-835, KOREA
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TAIWAN

MITSUBISHI ELECTRIC TAIWAN CO., LTD. (TAIWAN FA CENTER)

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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.
Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

Duplication Prohibited

MITSUBISHI CNC

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE : TOKYO BLDG.,2-7-3 MARUNOUCHI,CHIYODA-KU,TOKYO 100-8310,JAPAN

MODEL	Built-in Spindle Motor SJ-B Series
MODEL CODE	100-290
Manual No.	IB-1501011

IB(NA)1501011(ENG)-B(1407)MEE
Made in JAPAN