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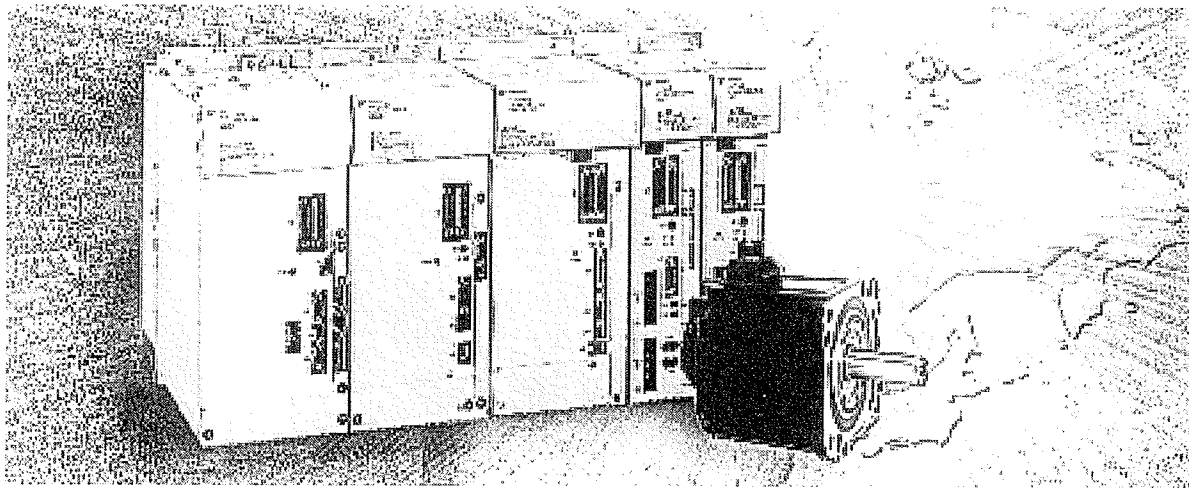
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# Drive Unit for Machine Tools

# USER'S MANUAL

FOR HARDWARE

SGMKS Servomotor
SGDK SERVOPACK
Spindle Drive
Spindle Motor



YASKAWA

MANUAL NO. SIE-S800-60

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# Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

**WARNING** Indicates precautions that, if not heeded, could result in loss of life or serious injury. The following mark is used on WARNING labels on the product: ⚠

**CAUTION** Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.
Some precautions classified as cautions could, if not heeded, have serious results.

**PROHIBITED** Indicates actions that must never be taken. For example, ⊗ indicates that fire and flame are prohibited.

**MANDATORY** Indicates actions that must always be taken. For example, ⏚ indicates that grounding is required.

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# Visual Aids

The following aids are used to indicate certain types of information for easier reference.

IMPORTANT

Indicates important information that should be memorized, including precautions such as alarm displays to avoid damaging the devices.

◀ EXAMPLE ▶

Indicates programming, operation, and other application examples.




Indicates supplemental information.




Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

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# About this Manual

- **This manual provides the following information of the SERVOPACK Drive Unit for Machine Tools: Electrical and structural specifications for connecting the Drive Unit to the control device, machine, high-power circuits, and external devices.**
- **Connections will depend on the control boards produced by the machine tool manufacturer. Use the portions of this manual required for your application.**

# Using this Manual

## Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following examples:

- $\overline{\text{S-ON}}$=/S-ON
- $\overline{\text{P-CON}}$=/P-CON

## Description of Technical Terms

In this manual, the following terms are defined as follows:

- Servo Unit
  A unit that drives a Servomotor
- Inverter
  A unit that drives a spindle motor
- Converter
  A unit that converts AC power to DC power and supplies it to the Servo Unit and Inverter
- SERVOPACK
  A generic name that includes the Servo Unit, Inverter, and Converter

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# Safety Precautions

This section provides important precautions that must be heeded to ensure the safe application of the product. Please read this manual and all accompanying documents completely and be sure you understand the information provided before attempting to install, operate, maintain, or inspect the product. Use the product only after you have acquired a complete understanding of the product, as well as product safety information and precautions.

## ■ Transportation

**⚠ WARNING**

- Do not hold onto the cables when transporting the product.
  Failure to observe this precaution may result in injury or accidents.
- After installing the product into the equipment, remove the eyebolts and replace them with standard bolts of a suitable size.
  Failure to observe this precaution may result in accidents.

**⃠ PROHIBITED**

- Do not transport the product through areas that would subject it to rain or water drops, harmful gases, liquids, or other contaminants.
  Failure to observe this precaution may result in human injury or accidents.

## ■ Storage

**⃠ PROHIBITED**

- Do not store the product in locations that would subject it to rain or water drops, harmful gases, liquids, or other contaminants.
  Failure to observe this precaution may result in accidents.
- Do not drop the product in its package from a height greater than 60 cm.
  Failure to observe this precaution may result in accidents.

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## MANDATORY

- Store the product in a clean location indoors within the following temperature and humidity ranges.
  - Ambient temperature –20 to 60 °C
  - Ambient humidity: 10% to 90%
  - Elevation: 1,000 m max.

  Failure to observe this precaution may result in accidents.

## ■ Installation

## ⚠ CAUTION

- Install the product in a location where the ventilation openings are not restricted. Also, install the product so that foreign material does not enter it.

  Failure to observe this precaution may result in fires or accidents.
- Do not subject the product to strong shock when installing it.

  Failure to observe this precaution may result in accidents.
- Design the power supply line with a capacity higher than the power consumption of the product.

  Failure to observe this precaution may result in malfunction of the product.
- The power supply capacity of the 24-VDC External Power Supply Unit for I/O contacts will depend on the number of contacts that are used.

  Install an additional External Power Supply Unit if the current capacity is not sufficient.
- The end of the motor shaft and flange are coated with an anti-corrosive coating. Wipe this coating off with a cloth before installation.
- Always confirm that the motor shaft and the machine to which it is being connected are aligned before connecting them.

  Failure to observe this precaution may result in vibration, accidents, or human injury.
- Take the following preventative measures when designing and installing the box.
  - The box must have a sealed structure.
  - The average increase in temperature inside the box must be within 10°C of the external temperature.
  - Use a fan to circulate the air in the sealed box to increase the cooling efficiency in the box and prevent localized increases in temperature. (We recommend using a UL-certified fan.)
  - Provide proper seals on cable openings, covers, and other openings.
  - Structure the box to prevent dust and dirt from entering it. Airborne dust and dirt may collect on units and PCBs and cause malfunctions.
  - Cover the cable openings, covers, and other openings with some packing to eliminate any gaps.

  Failure to observe this precaution may result in accidents or malfunction.

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## ⚠ CAUTION

- Take the following preventative measures when installing the units.
  - Install the Servo Unit horizontally with screws or bolts.
  - The Servo Unit generates heat. Provide ventilation space above and below the unit so that heat does not collect in one location.
  - To reduce internal loss caused by heat generation, install the Servo Unit so that the heat sink fins extend outside of the box and provide an external airflow (2.5 m/s) on the fins.
  - When circulating air inside the box, do not allow the air current to strike the Servo Unit directly. Air currents may directly cause dust and dirt to collect on the unit.
  - Mount the units so that they can be easily maintained and inspected, and so that parts can be easily replaced.

  Failure to observe this precaution may result in accidents or malfunction.
- When carrying a unit, do not hold it by the front cover. Hold it by the mounting base.

  Failure to observe this precaution may result in injury.
- Mount the unit to a metal or otherwise non-flammable surface.

  Failure to observe this precaution may result in fire.
- Keep the operating temperature to 55°C max. and the temperature of the air entering the heat sink to 45°C.

  Failure to observe this precaution may result in fire or other accidents.
- Install an external emergency stop circuit so that any operation can be stopped and the power supply can be cut off immediately.

  Failure to observe this precaution may result in injury.

## ■ Wiring

## ⚠ WARNING

- Always confirm that the input power supply is turned off before wiring.

  Failure to observe this precaution may result in electric shock or fire.
- All wiring to be performed only by a qualified electrical engineer.

  Failure to observe this precaution may result in electric shock or fire.
- Always check operation after wiring the emergency stop circuit.
  (The user is responsible for all wiring.)

  Failure to observe this precaution may result in injury.
- Always ground the ground terminal.

  Failure to observe this precaution may result in electric shock or fire.

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## ⚠ CAUTION

- Confirm that all wiring is performed correctly by a qualified electrical engineer.

  Failure to observe this precaution may result in electrical shock, fire, or malfunction.

- Do not connect a three-phase power supply to the U, V, and W motor output terminals on the SERVOPACK.

  The SERVOPACK will be damaged if a three-phase power supply is connected.

- Select a suitable power supply of a suitable size for the operating environment and current capacity The applicable current of the cable will be reduced if the ambient temperature exceeds 30°C. Select cables of a suitable size based on the technical standards of the electric facility and technical references from the cable manufacturer.

  Failure to observe this precaution may result in fire.

- Use twisted pair, multi-conductor twisted pair, or shielded multi-conductor twisted pair cables for signal lines. Always use the specified cable if the cable is specified in this manual and connect the cable correctly.

  Failure to observe this precaution may result in malfunction.

- Keep the wiring distances as short as possible

  Failure to observe this precaution may result in malfunction.

- Do not bundle I/O signal lines with power lines or place them in the same duct either inside or outside of the control panel.

  Sufficient separation from power lines can reduce the affects of noise.

- If there is noise from the power supply line, use a noise filter as a preventative measure. Refer to *B.2 Noise Filter*.

  Proper application of a noise filter can reduce the affects of noise.

- Attach a Terminating Connector to the last SERVOPACK Module.

  Failure to observe this precaution may result in malfunction.

- Confirm that the voltages of the Converter's rated power supply and AC power supply are the same.

  Failure to observe this precaution may result in injury or fire.

- Do not perform withstand voltage tests on the Inverter or Converter.

  Failure to observe this precaution may destroy semiconductor elements or other components.

- Connect the Inverter and Converter correctly according to the mutual wiring diagrams.

  Incorrect connections may damage the Inverter or Converter.

- Tighten all screws to the specified torque.

  Failure to observe this precaution may result in fire.

- Do not connect the main circuit AC power supply to the U/T1, V/T2, and W/T3 output.

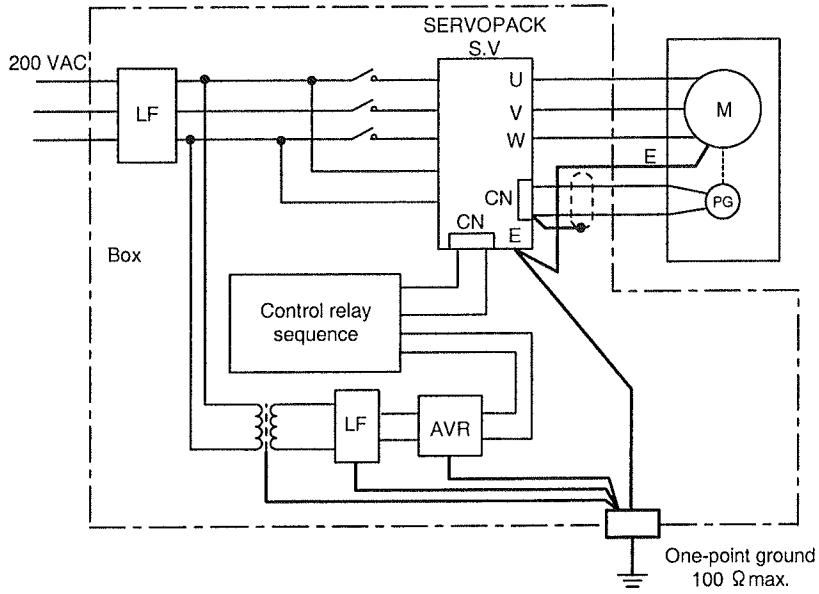
  Failure to observe this precaution may destroy damage the Inverter.

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# MANDATORY

- Independently connect the ground wire from all units to the box or ground plate.

Grounding Example




- Wire facilities according to the technical standards of electrical facility and internal wiring standards.
- Always connect the Motor's ground terminal to the ground terminal on the SERVOPACK.
- Ground at one point only and to a resistance of 100 Ω or less.

  Failure to observe this precaution may result in electric shock, fire, or malfunction.
- Do not use the same ground line for both power devices and the SERVOPACK.

  Failure to observe this precaution may result in malfunction.

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## ■ Operation

### ⚠ WARNING

- Never touch any unit or terminal while power is being supplied.

  Failure to observe this precaution may result in electrical shock or malfunction.
- Some parts will still be charged immediately after the power supply is turned off. Do not touch any electrically charged parts for at least five minutes after turning off the power supply.

  Failure to observe this precaution may result in electrical shock or malfunction.
- Do not damage the cables, apply excessive force to them, or pinch them between objects.

  Failure to observe this precaution may result in electrical shock.
- Never touch any rotating parts while power is being supplied.

  Failure to observe this precaution may result in injury.
- Never attempt to modify the product in any way.

  Failure to observe this precaution may result in electric shock, fire, or accidents.
- Always close the top and bottom covers before turning on the input power supply.

  Failure to observe this precaution may result in electric shock.
- Prepare a separate emergency stop switch.

  Failure to observe this precaution may result in injury.

### ⚠ CAUTION

- Use the product in the following environment.
  - Free from corrosive and explosive gases or vapors.
  - Free from cutting oil or organic solvents.
  - Relative humidity of 10% to 90%, with no condensation.
  - Ambient temperature of 5 to 30°C for the control panel, and not subject to freezing. (The location must not be in direct sunlight, must be separated from sources of heat, and must not be outdoors.)
  - Maximum vibration of 4.9 $m/s^2$.

  Using the product under high temperatures, high humidity, dust, dirt, corrosive gases, vibration, and shock may result in fire, electric shock, or malfunction.
- No wire clippings or other foreign matter must enter the product.

  Failure to observe this precaution may result in fire, accidents, or malfunction.
- Observe all precautions for programming functions in the operation manual.

  Failure to observe this precaution may result in human injury or malfunction.
- Do not touch the heat sink, because it may reach high temperatures.

  Failure to observe this precaution may result in injury.
- The Inverter can be easily set to operate from low to high speed. Confirm that the Motor and other equipment have sufficient leeway before starting operation.

  Failure to observe this precaution may result in injury.

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## ⚠ CAUTION

- Do not check signals during operation.

  Failure to observe this precaution may damage the Inverter.

- The correct Inverter settings are made before shipping from the factory. Do not needlessly change settings.

  Failure to observe this precaution may damage the equipment.

## ❗ MANDATORY

- When cycling the power supply, turn off the power and then wait at least two seconds before turning it back on.

  Failure to observe this precaution may result in malfunction.

## ⃠ PROHIBITED

- Never disassemble or modify any unit or device in the SERVOPACK.

  Failure to observe this precaution may result in fire, accidents, or malfunction.

- Do not change the settings of the devices or variable resistors in the control panel.

  Failure to observe this precaution may result in fire, accidents, or malfunction.

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## ■ Maintenance and Inspection

### ⚠ WARNING

- The Inverter, Servo Unit, and Converter contain high-voltage terminals that are extremely dangerous. Do not touch the terminals.

  Failure to observe this precaution may result in electric shock.
- Always keep the top and bottom covers closed while power is being supplied. Always turn off the power supply and the wiring breaker before opening a cover.

  Failure to observe this precaution may result in electric shock.
- After turning off the main circuit power supply and control power supply, always confirm that the CHARGE indicator has turned off before performing maintenance or inspections.

  The capacitor will still be charged, presenting a potential danger.
- Maintenance, inspections, and the replacement of parts should be performed by authorized personnel only.

  Failure to observe this precaution may result in electric shock.

### ⚠ CAUTION

- The control boards use CMOS ICs. Handle the boards with care.

  Directly touching the boards or ICs with your hands can destroy the IC due to static electricity.
- Do not change the wiring, or connect or disconnect connectors, while power is being supplied.

  Failure to observe this precaution may result in electric shock or injury.

## ■ Other Precautions

### ⚠ WARNING

- Do not attempt to modify any unit.

  Failure to observe this precaution may result in electric shock or injury.

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## ■ General Precautions

| Note the following to ensure safe application. |
| --- |
| • The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the covers or protective guards as specified first, and then operate the products in accordance with the manual.<br>• The drawings presented in this manual are typical examples and may not match the product you received.<br>• This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as the next edition. The edition number appears on the front and back covers.<br>• If the manual must be ordered due to loss or damage, contact your nearest Yaskawa representative or one of the offices listed on the back of this manual.<br>• If the nameplates on the product are worn or otherwise damaged, order new ones from your nearest Yaskawa representative or one of the offices listed on the back of this manual.<br>• Yaskawa will not take responsibility for the results of unauthorized modifications of this product. Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modifications. |

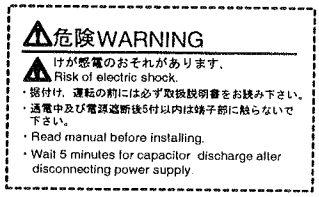
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# Warning Labels

Application warnings are provided on the product in the following locations. Always observe these warnings when handling the product.

## ■ Warning 1






May cause injury or electric shock.

Follow the instructions in the manual before installation or operation.

Disconnect all power before opening the front cover of the unit. Wait five minutes until the DC Bus capacitors discharge.

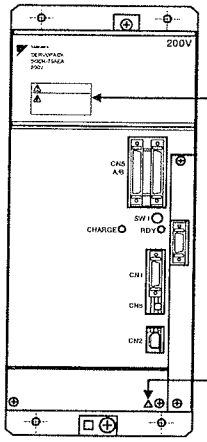
## ■ Warning 2



May cause electric shock.

Disconnect all power and wait five mintues before servicing.

SERVOPACK




Location of warning 1

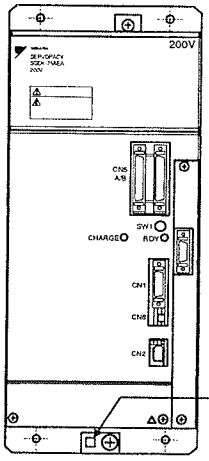
Location of warning 2

## ■ Warning 3



Always connect a ground line to the unit's ground terminal.

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Location of warning 3

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# 1

# System Configuration

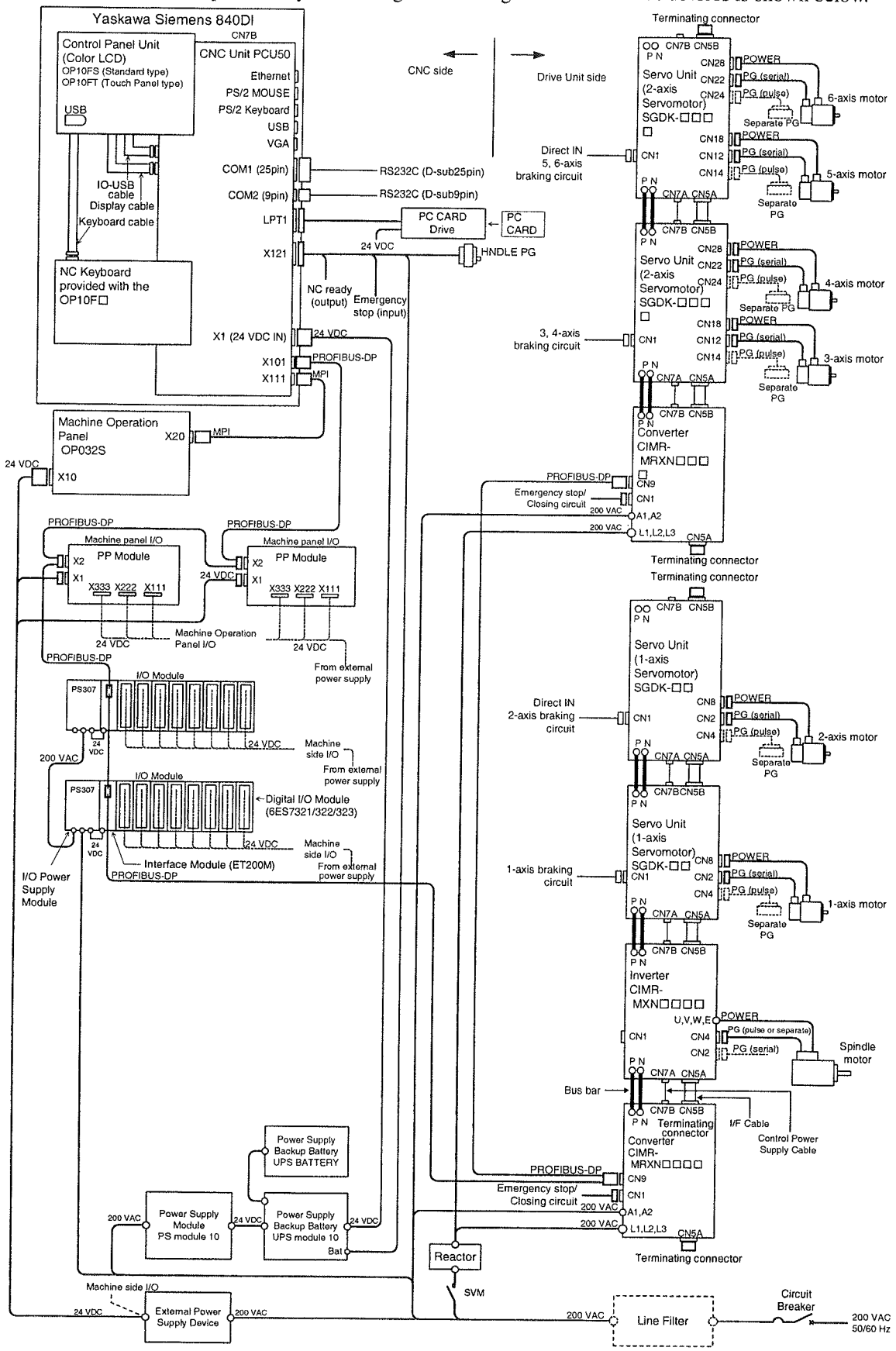
This section describes the configuration of the control panel.

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1.3 SERVOPACK Model Numbers ..... 1-6

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# 1.1 CNC System Configuration

An example CNC system configuration using Yaskawa Siemens devices is shown below.



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# 1.2 Drive Unit Equipment

The model numbers for the drive unit equipment are listed in this table.

| Type | Name | Equipment name | Model/order number | Specifications, notes |
|---|---|---|---|---|
| SERVOPACK | Converter | 45-kW Converter | CIMR-MRXN20455A | — |
| | | 37-kW Converter | CIMR-MRXN20375A | — |
| | | 30-kW Converter | CIMR-MRXN20305A | — |
| | | 22-kW Converter | CIMR-MRXN20225A | — |
| | | 18.5-kW Converter | CIMR-MRXN20185A | — |
| | | 15-kW Converter | CIMR-MRXN20155A | — |
| | | 11-kW Converter | CIMR-MRXN20115A | — |
| | | 7.5-kW Converter | CIMR-MRXN27P55A | — |
| | | 5.5-kW Converter | CIMR-MRXN25P55A | — |
| | | 3.7-kW Converter | CIMR-MRXN23P75A | — |
| | Inverter | 45-kW Inverter | CIMR-MXN20455A | — |
| | | 37-kW Inverter | CIMR-MXN20375A | — |
| | | 30-kW Inverter | CIMR-MXN20305A | — |
| | | 22-kW Inverter | CIMR-MXN20225A | — |
| | | 18.5-kW Inverter | CIMR-MXN20185A | — |
| | | 15-kW Inverter | CIMR-MXN20155A | — |
| | | 11-kW Inverter | CIMR-MXN20115A | — |
| | | 7.5-kW Inverter | CIMR-MXN27P55A | — |
| | | 5.5-kW Inverter | CIMR-MXN25P55A | — |
| | | 3.7-kW Inverter | CIMR-MXN23P75A | — |
| | 1-axis Servo Unit | 0.5-kW Servo Unit | SGDK-05AEA | — |
| | | 1-kW Servo Unit | SGDK-10AEA | — |
| | | 1.5-kW Servo Unit | SGDK-15AEA | — |
| | | 2-kW Servo Unit | SGDK-20AEA | — |
| | | 3-kW Servo Unit | SGDK-30AEA | — |
| | | 5-kW Servo Unit | SGDK-50AEA | — |
| | | 6-kW Servo Unit | SGDK-60AEA | — |
| | | 7.5-kW Servo Unit | SGDK-75AEA | — |
| | 2-axis Servo Unit | 0.5-kW × 2 Servo Unit | SGDK-0505AEA | The sum of the actual output current of two axes must be equal to or less than 70% of the continuous output current multiplied by 2. |
| | | 1-kW × 2 Servo Unit | SGDK-1010AEA | |
| | | 1.5-kW × 2 Servo Unit | SGDK-1515AEA | |
| | | 2-kW × 2 Servo Unit | SGDK-2020AEA | |
| | | 3-kW × 2 Servo Unit | SGDK-3030AEA | |
| | 3-axis Servo Unit | 0.5-kW × 3 Servo Unit | SGDK-050505AEA | The sum of the actual output current of unit must be equal to or less than 70% of the continuous output current multipled by the number of axes. |
| | | 1.0-kW × 3 Servo Unit | SGDK-101010AEA | |
| | Option Unit | External PG Card | SGDK-CF01A | One per axis |

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| Type | Name | Equipment name | Model/order number | Specifications, notes |
|---|---|---|---|---|
| Motor | Spindle Motor | Single Winding Type 30-kW | UAKA-30A□□□□□ | — |
| | | Single Winding Type 37-kW | UAKA-37A□□□□□ | — |
| | | Winding Selection Type 18.5-kW | UAKB-19A□□□□□ | — |
| | | Winding Selection Type 22-kW | UAKB-22A□□□□□ | — |
| | Servomotor | 0.45-kW Servomotor | SGMKS-05A□□□□ | — |
| | | 0.85-kW Servomotor | SGMKS-09A□□□□ | — |
| | | 1.3-kW Servomotor | SGMKS-13A□□□□ | — |
| | | 1.8-kW Servomotor | SGMKS-20A□□□□ | — |
| | | 2.9-kW Servomotor | SGMKS-30A□□□□ | — |
| | | 4.4-kW Servomotor | SGMKS-44A□□□□ | — |
| | | 5.5-kW Servomotor | SGMKS-55A□□□□ | — |
| | | 7.5-kW Servomotor | SGMKS-75A□□□□ | — |
| Bus Bar | Bus Bar | — | JZSP-CGB02-1 | 250-mm wide unit<br>For internal connection |
| | | — | JZSP-CGB02-2 | For 250 mm to 150 mm width |
| | | — | JZSP-CGB02-4 | For 250 mm to 75 mm width |
| | | — | JZSP-CGB02-3 | For 150mm to 150 mm width |
| | | — | JZSP-CGB02-5 | For 150 mm to 75mm width |
| | | — | JZSP-CGB02-6 | For 75 mm to 75mm width |
| | | — | JZSP-CGB02-7 | For 150 mm to 250 mm width |
| | | — | JZSP-CGB02-8 | For 75 mm to 250 mm width |
| | | — | JZSP-CGB02-9 | For 75 mm to 150 mm width |
| | Local Bus Cable | — | JZSP-CNS90-1 | For 250 mm to 150 mm width<br>For 150 mm to 150 mm width<br>75 mm to 150mm width |
| | | — | JZSP-CNS90-2 | For 250 mm to 75 mm width<br>For 150 mm to 75mm width<br>For 75 mm to 75 mm width |
| | | — | JZSP-CNS90-4 | For top/bottom connection<br>(cable length: 1 m) |
| | | — | JZSP-CNS90-5 | For 150 mm to 250 mm width<br>For 75 mm to 250mm width |
| | Control Power Supply Cable | — | JZSP-CNB00-1 | For 250 mm to 150 mm width<br>For 150 mm to 150 mm width<br>For 75 mm to 150 mm width |
| Bus Bar | Control Power Supply Cable | — | JZSP-CNB00-2 | For 250 mm to 75 mm width<br>For 150 mm to 75 mm width<br>For 75 mm to 75 mm width |
| | | — | JZSP-CNB00-3 | For top/bottom connection<br>(cable length: 1 m) |
| | | — | JZSP-CNB00-4 | 150 mm to 250mm width<br>75 mm to 250mm width |
| | Terminating Connector | — | JZSP-CNS90-9 | — |

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| Type | Name | Equipment name | Model/order number | Specifications, notes |
|---|---|---|---|---|
| AC Reactor | Reactor | UZBA-B, 150 A, 0.07 mH | X10199 | For 45-kW Converter |
| | | UZBA-B, 120 A, 0.09 mH | X10201 | For 37-kW Converter |
| | | UZBA-B, 92 A, 0.10 mH | X10205 | For 30-kW Converter |
| | | UZBA-B, 77 A, 0.14 mH | X10204 | For 22-kW Converter |
| | | UZBA-B, 63 A, 0.17 mH | X10203 | For 18-kW Converter |
| | | UZBA-B, 46 A, 0.21 mH | X10202 | For 15-kW Converter |
| | | UZBA-B, 32 A, 0.28 mH | X10217 | For 11-kW Converter |
| | | UZBA-B, 23 A, 0.41 mH | X10216 | For 7.5-kW Converter |
| | | UZBA-B, 16 A, 0.56 mH | X10215 | For 5.5-kW Converter |
| | | UZBA-B, 10 A, 0.84 mH | X10214 | For 3.7-kW Converter |
| Related Equipment | Brake Power Supply Unit | BK Unit | OPR-109A | For 200 VAC |
| | | | OPR-109F | For 100 VAC |
| | PROFIBUS-DP Connector | Horizontal wiring type connector | 6GK1500-0EA0 | For Converter |

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# 1.3 SERVOPACK Model Numbers

## ■ Converter

CIMR-MRX N 2 045 5

- Series name
- Specification
  N: NC System (YS840DI)
- Power supply voltage
  2: 200 V
- Max. output

| | |
|---|---|
| 045 | 45 kW |
| 037 | 37 kW |
| 030 | 30 kW |
| 022 | 22 kW |
| 018 | 18 kW |
| 015 | 15 kW |
| 011 | 11 kW |
| 7P5 | 7.5 kW |
| 5P5 | 5.5 kW |
| 3P7 | 3.7 kW |

- Protective structure
  5: External cooling

## ■ Inverter

CIMR - MX N 2 030 5

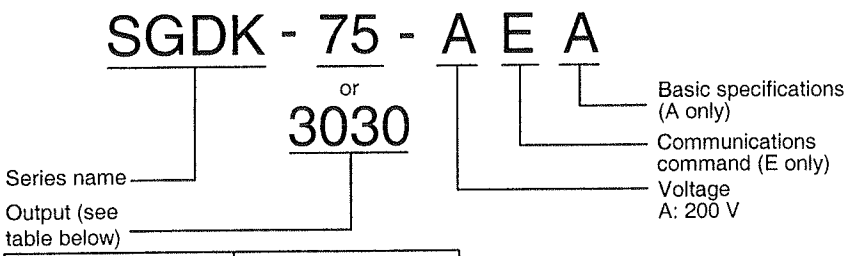
- Series name
- Specification
  N: NC System (YS840DI)
- Power supply voltage
  2: 200 V
- Max. output

| | |
|---|---|
| 045 | 45 kW |
| 037 | 37 kW |
| 030 | 30 kW |
| 022 | 22 kW |
| 018 | 18 kW |
| 015 | 15 kW |
| 011 | 11 kW |
| 7P5 | 7.5 kW |
| 5P5 | 5.5 kW |
| 3P7 | 3.7 kW |

- Protective structure
  5: External cooling

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## ■ Servo Unit




| 1-axis Unit | | 2-axis Unit | |
|---|---|---|---|
| Symbol | Capacity | Symbol | Capacity |
| 0.5 | 0.5 kW | 0505 | 0.5 kW |
| 10 | 1 kW | 1010 | 1 kW |
| 15 | 1.5 kW | 1515 | 1.5 kW |
| 20 | 2 kW | 2020 | 2 kW |
| 30 | 3 kW | 3030 | 3 kW |
| 50 | 5 kW | — | — |
| 60 | 6 kW | — | — |
| 75 | 7.5 kW | — | — |

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# 2

# Control Panel Installation

This section describes the method for installing the drive units.


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# 2.1 Control Panel and Electrical Component Installation Conditions

The operating temperature limits for drive unit equipment are listed below.

| Name | Equipment name | Temperature limits |
|---|---|---|
| SERVOPACK | SERVOPACK | 0 to 55°C<br>0 to 45°C (heat sink part) |
| Reactor, switching device | Reactor | −10 to 55°C |
| Brake power supply unit | BK Unit | 0 to 60°C |

IMPORTANT

The performance may drop if the above temperature limits are exceeded during operation.

The environmental conditions are listed below for information when the customer installs the control panel.

Table 2.1 Control Panel and Electrical Component Installation Conditions

| Item | | Condition | |
|---|---|---|---|
| Environmental conditions | Operating temperature*1 | During storage and transport | −20 to +60°C |
| | | Ambient temperature during control panel operation | 5 to 30°C *2 |
| | Humidity | 10 to 90% RH (no condensation) | |
| | Vibration/impact | During operation: 4.9 m/s$^2$/19.6 m/s$^2$ | |
| | Atmosphere | Avoid use in environments subject to high levels of dust or highconcentrations of cutting oils or organic solvents. | |
| | Converter | Main circuit power supply | 3-phase, 200 to 230 VAC +10 to −15%, 50/60 Hz ±5% |
| | | Control power supply | Single-phase, 200V to 230 VAC +10 to −15%, 50/60Hz ±5% |

*1 Refrain from installing in a place subject to direct sunlight, near a heat source, or outdoors, even if the conditions are within the designated operating range.

*2 The ambient temperature of the control panel during operation is 5 to 30°C assuming a temperature rise of +10°C. Considering the control panel's interior temperature, the value corresponds to the operating temperature limit of the UPS battery.

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# 2.2 Cabinet Design

## 2.2.1 Thermal Design

The design prerequisite for the cabinet to hold the drive unit and other units is that the average internal temperature rise of the closed structure be no more than 10°C higher than the outside air.

### ■ Cabinet Internal Temperature Rise (Average Temperature Rise)

The internal temperature rise for sheet-metal cabinets shall be as follows.

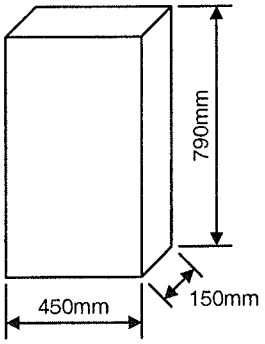
$$\triangle T = \frac{P}{qe} = \frac{P}{k \cdot A}$$

| | |
|---|---|
| ΔT | Internal temperature rise (°C) |
| P | Heat generated inside cabinet (W) |
| qe | Cabinet thermal flow rate (W/°C) |
| k | Sheet metal heat transfer coefficient ($W/m^2°C$)<br>Circulating fan inside cabinet: 6W $m^2°C$<br>No circulating fan inside cabinet: 4W/ $m^2°C$ |
| A | Effective heat discharge area ($m^2$)* |

* The part of the cabinet surface area that is capable of heat discharge excluding surfaces that are in contact with other structures.

◀ EXAMPLE ▶ **Example of allowable heat loss for a cabinet equipped with a circulating fan**

Cabinet size (W × H × D): 450 × 790 × 150




- Effective heat discharging area: A = 1.0155 ($m^2$)
  Due to the standalone installation design, the bottom surface is excluded.
- Heat generated inside cabinet: P = 60 (W)
- Internal temperature rise: $\triangle T = \frac{P}{qe} = \frac{P}{k \cdot A} = \frac{60}{6 \times 1.0155} = 9.8$ (°C)

From the above, the internal temperature rise of ΔT = 9.8 (°C) clears the standard of 10 (°C) max.

If the temperature rise exceeds 10°C, a separate cooling countermeasure must be provided.

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## ■ Cooling Capacity of the Heat Exchanger

When it is not sufficient to simply install a circulating fan inside the cabinet, provide the following heat exchanger.

Table 2.2 Heat Exchanger

| Model | Name | Cooling capacity | Dimensions (mm) |
|---|---|---|---|
| DE9404550-1 | REX1600ESYE | 110 W/10°C | 194 × 800 × 65 (W × H × D) |

* This is the allowable heat loss when the temperature rise is maintained at 10°C max.

◀ EXAMPLE ▶

### Example of allowable heat loss in a cabinet equipped with a heat exchanger

In order to install the heat exchanger described in the table above and keep the temperature rise to 10°C max. in the example cabinet given for internal temperature rise, the following formula shows that the internal heat loss must be 359 W max.

- $P = k \cdot A \cdot \Delta T + 110W/10°C = 6 \times 4.16 \times 10 + 110 = 359W$

## ■ Installing the Heat Exchanger

Install the heat exchanger into the customer-built cabinet.

Install so that the outside air is drawn in from the bottom and discharged to the top. This will cause the internal air to be drawn in from the top and discharged to the bottom.

**! MANDATORY**

- Be sure to install a heat exchanger.
  Not installing a heat exchanger may cause a malfunction.

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An installatin example is given below.

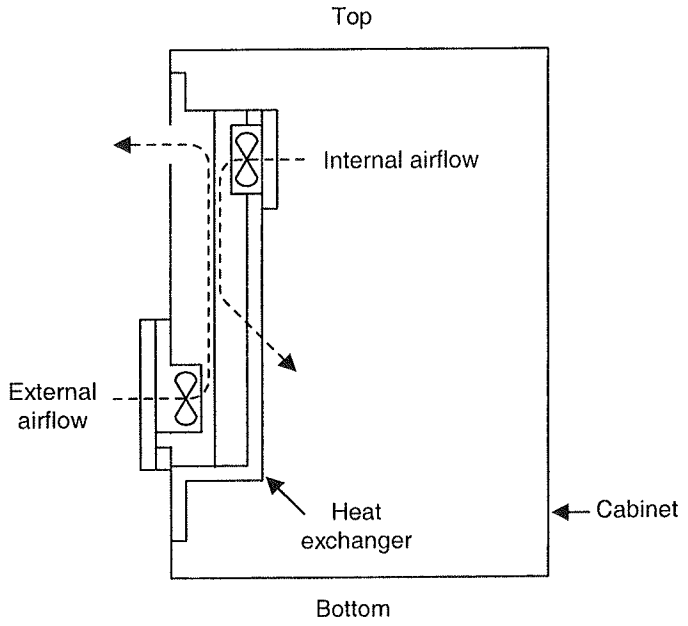



Fig. 2.1 Heat Exchanger Installation

## 2.2.2 Heat Loss

The heat loss of the drive units is shown below.

### ■ Servo Unit

| Name | Equipment name | Heat loss at 60% load | | | Heat loss at 70% load | | | Min. cooling air velocity (m/s) |
|---|---|---|---|---|---|---|---|---|
| | | Total heat loss (W) | Residual heat loss inside panel (W) | Heat loss outside panel (heat sink part) (W) | Total heat loss (W) | Residual heat loss inside panel (W) | Heat loss outside panel (heat sink part) (W) | |
| 1-axis Servo Unit | SGDK-75AEA | 240 | 80 | 160 | 270 | 90 | 180 | 2.5 |
| | SGDK-60AEA | 220 | 80 | 140 | 240 | 80 | 160 | |
| | SGDK-50AEA | 170 | 70 | 100 | 180 | 70 | 110 | |
| | SGDK-30AEA | 135 | 60 | 75 | 150 | 65 | 85 | |
| | SGDK-20AEA | 115 | 60 | 55 | 125 | 60 | 65 | |
| | SGDK-15AEA | 90 | 55 | 35 | 95 | 55 | 40 | |
| | SGDK-10AEA | 75 | 50 | 25 | 80 | 55 | 25 | |
| | SGDK-05AEA | 60 | 50 | 10 | 65 | 50 | 15 | |
| 2-axis Servo Unit | SGDK-3030AEA | 260 | 110 | 150 | 290 | 120 | 170 | 2.5 |
| | SGDK-2020AEA | 210 | 100 | 110 | 230 | 100 | 130 | |
| | SGDK-1515AEA | 165 | 95 | 70 | 180 | 100 | 80 | |
| | SGDK-1010AEA | 135 | 90 | 45 | 145 | 90 | 55 | |
| | SGDK-0505AEA | 110 | 85 | 25 | 110 | 85 | 25 | |
| 3-axis Servo Unit | SGDK-101010AEA | 205 | 135 | 70 | 220 | 135 | 85 | 2.5 |
| | SGDK-050505AEA | 170 | 130 | 40 | 170 | 130 | 40 | |

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## ■ Heat loss of Converter and Inverter Units

| Name | Equipment name | Heat loss during continuous, rated operation | | | Heat loss during 50% ED | | | Min. cooling air velocity (m/s) |
|---|---|---|---|---|---|---|---|---|
| | | Total heat loss (W) | Residual heat loss inside panel (W) | Heat loss outside panel (heat sink part) (W) | Total heat loss (W) | Residual heat loss inside panel (W) | Heat loss outside panel (heat sink part) (W) | |
| Converter | CIMR-MRXN20455A | 590 | 210 | 380 | 720 | 250 | 470 | 2.5 |
| | CIMR-MRXN20375A | 400 | 170 | 230 | 490 | 200 | 290 | |
| | CIMR-MRXN20305A | 330 | 150 | 180 | 440 | 180 | 260 | |
| | CIMR-MRXN20225A | 290 | 140 | 150 | 330 | 150 | 180 | |
| | CIMR-MRXN20185A | 260 | 130 | 130 | 300 | 140 | 160 | |
| | CIMR-MRXN20155A | 210 | 120 | 90 | 260 | 130 | 130 | |
| | CIMR-MRXN20115A | 180 | 110 | 70 | 220 | 120 | 100 | |
| | CIMR-MRXN27P55A | 160 | 110 | 50 | 190 | 120 | 70 | |
| | CIMR-MRXN25P55A | 140 | 110 | 30 | 160 | 110 | 50 | |
| | CIMR-MRXN23P75A | 120 | 100 | 20 | 140 | 110 | 30 | |
| Inverter | CIMR-MXN20455A | 1200 | 340 | 860 | 1500 | 450 | 1050 | 2.5 |
| | CIMR-MXN20375A | 950 | 300 | 650 | 1200 | 380 | 820 | |
| | CIMR-MXN20305A | 700 | 220 | 480 | 950 | 320 | 630 | |
| | CIMR-MXN20225A | 590 | 190 | 400 | 950 | 230 | 720 | |
| | CIMR-MXN20185A | 500 | 160 | 340 | 600 | 200 | 400 | |
| | CIMR-MXN20155A | 390 | 130 | 260 | 520 | 180 | 340 | |
| | CIMR-MXN20115A | 280 | 100 | 180 | 400 | 150 | 250 | |
| | CIMR-MXN27P55A | 230 | 85 | 145 | 300 | 110 | 190 | |
| | CIMR-MXN25P55A | 180 | 70 | 110 | 230 | 95 | 135 | |
| | CIMR-MXN23P75A | 150 | 60 | 90 | 215 | 85 | 130 | |

## ■ Reactor Heat loss

| Name | Equipment name | Heat loss (W) |
|---|---|---|
| Reactor | UZBA-B, 150A, 0.07 mH | 88 |
| | UZBA-B, 120 A, 0.09 mH | 93 |
| | UZBA-B, 92 A, 0.10 mH | 85 |
| | UZBA-B, 77 A, 0.14 mH | 80 |
| | UZBA-B, 63 A, 0.17 mH | 70 |
| | UZBA-B, 46 A, 0.21 mH | 55 |
| | UZBA-B, 32 A, 0.28 mH | 52 |
| | UZBA-B, 23 A, 0.41 mH | 50 |
| | UZBA-B, 16 A, 0.56 mH | 31 |
| | UZBA-B, 10 A, 0.84 mH | 21 |

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## 2.2.3 Weight

The drive unit weight is shown below.

| Name | Equipment name | Mass (kg) |
|---|---|---|
| Converter | CIMR-MRXN20455A | 17.5 |
| | CIMR-MRXN20375A | 17.5 |
| | CIMR-MRXN20305A | 11 |
| | CIMR-MRXN20225A | 10.5 |
| | CIMR-MRXN20185A | 10.5 |
| | CIMR-MRXN20155A | 10.5 |
| | CIMR-MRXN20115A | 5.5 |
| | CIMR-MRXN27P55A | 5.5 |
| | CIMR-MRXN25P55A | 5.5 |
| | CIMR-MRXN23P75A | 5.5 |
| Inverter | CIMR-MXN20455A | 17 |
| | CIMR-MXN20375A | |
| | CIMR-MXN20305A | 11 |
| | CIMR-MXN20225A | 11 |
| | CIMR-MXN20185A | 11 |
| | CIMR-MXN20155A | 11 |
| | CIMR-MXN20115A | 5.5 |
| | CIMR-MXN27P55A | 5.5 |
| | CIMR-MXN25P55A | 4 |
| | CIMR-MXN23P75A | 4 |
| 1-axis Servo Unit | SGDK-75AEA | 11 |
| | SGDK-60AEA | |
| | SGDK-50AEA | 4 |
| | SGDK-30AEA | |
| | SGDK-20AEA | |
| | SGDK-15AEA | |
| | SGDK-10AEA | |
| | SGDK-05AEA | |
| 2-axis Servo Unit | SGDK-3030AEA | 4.2 |
| | SGDK-2020AEA | |
| | SGDK-1515AEA | 3.7 |
| | SGDK-1010AEA | |
| | SGDK-0505AEA | |
| 3-axis Servo Unit | SGDK-101010AEA | 3.7 |
| | SGDK-050505AEA | |
| Reactor | UZBA-B, 150 A, 0.07 mH | 34 |
| | UZBA-B, 120 A, 0.09 mH | 16 |
| | UZBA-B, 92 A, 0.10 mH | 12 |
| | UZBA-B, 77 A, 0.14 mH | 12 |
| | UZBA-B, 63 A, 0.17 mH | 8 |
| | UZBA-B, 46 A, 0.21 mH | 8 |
| | UZBA-B, 32 A, 0.28 mH | 6 |
| | UZBA-B, 23 A, 0.41 mH | 4 |
| | UZBA-B, 16 A, 0.56 mH | 3 |
| | UZBA-B, 10 A, 0.84 mH | 2.5 |

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# 2.3 Noise Countermeasures

## 2.3.1 Wiring Separation

The cables used in the CNC system are classified as shown below.

Use the cables in each category according to the handling instructions.

| Category | Cable | Handling |
|---|---|---|
| Power lines | AC power supply line (primary side/secondary side) | Bundle these cables separately from those classified as DC power lines and signal wires, or provide electromagnetic shields.<br>Install a spark killer or diode on solenoids, relays, etc. |
| | Power supply lines to the main motor and Servomotor | |
| | AC power supply lines to solenoids, contactors, relays, etc. | |
| DC power lines | DC power supply lines (24 VDC) for CNC, I/O, power supply modules, etc. | Bundle these cables separately from those classified as power lines, or provide electromagnetic shields.<br>Separate these cables as much as possible from the cables classified as signal wires.<br>Install a diode on DC solenoids and relays. |
| | I/O lines (24 VDC) for use between I/O and machines. | |
| | Power supply lines (24 VDC) to solenoids, relays, etc. | |
| Signal wires | PROFIBUS-DP cables between CNC, I/O modules, and converter. | Bundle these cables separately from those classified as power lines, or provide electromagnetic shields.<br>Separate these cables as much as possible from the cables classified as DC power lines.<br>Be sure to install shields on all cables with shield processing instructions. |
| | RS-232C cables | |
| | Manual pulse generator cables | |
| | Encoder cables between main-axis inverter and main-axis motor | |
| | Encoder cables between Servo Unit and Servomotor. | |
| | Standalone PG cables | |
| | Battery cables | |
| | All cables with shield processing instructions | |

INFO

- Separate bundling refers to separating the cable categories by a minimum of 100 mm.
- Electromagnetic shields refer to grounded metal plates which are used as a block between cables of different categories.

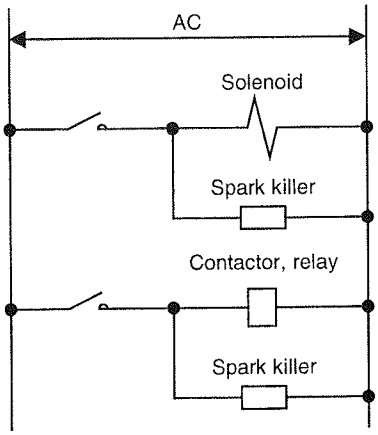
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## 2.3.2 Noise Countermeasure Equipment

### ■ Installing CR-type Spike Killers

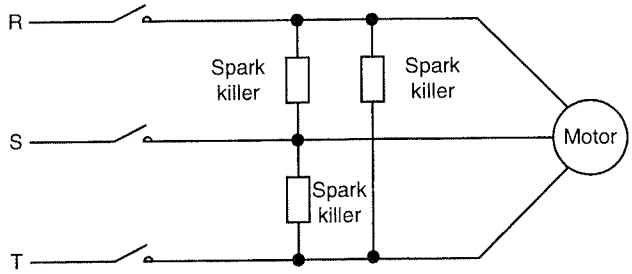
Install CR-type spike killers on AC power supply solenoids, contactors, relays, induction motors, etc.

#### Solenoids, contactors, and relays




Note: Install the spark killer near the coil.

#### Induction motors (not spindle motor)

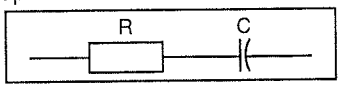



Note: Install the spark killers near the coil.

---

INFO

■ Spark killer construction




Use the following guideline for selecting spark killers.

- R = Coil's DC resistance equivalent (Ω)
- $C = \frac{I^2}{10}$ to $\frac{I^2}{20}$ (μF)

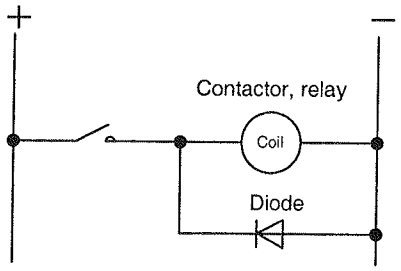
Note: I = Steady coil current.

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## ■ Installing Diodes

Install diodes to DC power supply contactors, relays, etc.




Note: Install the diode near the coil. Be careful of polarity.

INFO

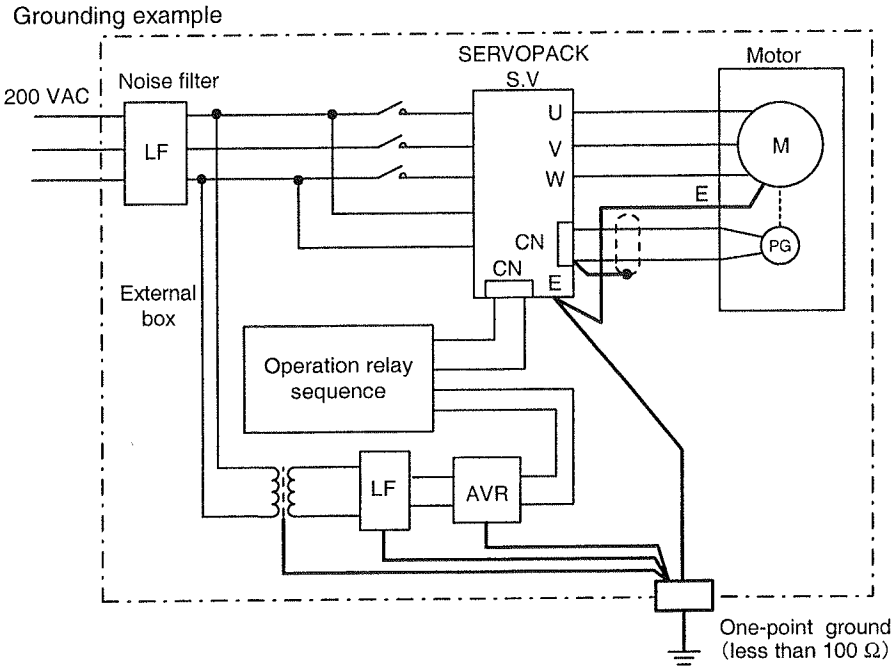
As a guideline, select diodes with about twice the applied voltage and current.

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## 2.3.3 Grounding

Wire the ground wire for each unit separately to the cabinet or a ground plate.

Grounding example




- For information on cables for installation, refer to the relative regulations (e.g., *Electrical Facilities Technical Standard and Internal Wiring Regulations* in Japan).
- Be sure to connect the motor's ground terminal to the SERVOPACK's ground terminal.
- Be sure to use single grounding of less than 100 Ω. Failure to follow these instructions may cause electric shock, fire, and/or malfunction.
- Do not use the ground wires for this equipment for jointly grounding other power equipment. Failure to follow these instructions may cause malfunction.

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## 2.3.4 Cable Shields and Clamps

Be sure to use shielding on the encoder cables between the Servo Unit and the motor. Shields of the encoder cables must also be grounded.

Following the method shown below, use cable clamping brackets to connect the cables securely to the ground plate.

Because this clamp shields the cables as well as supports them, it serves an extremely important safety role. Be sure to use it.

As shown in the recommended example below, part of the cable cover is removed to expose the shield's outer covering, and this outer covering is pressed against the ground plate by the cable clamp.

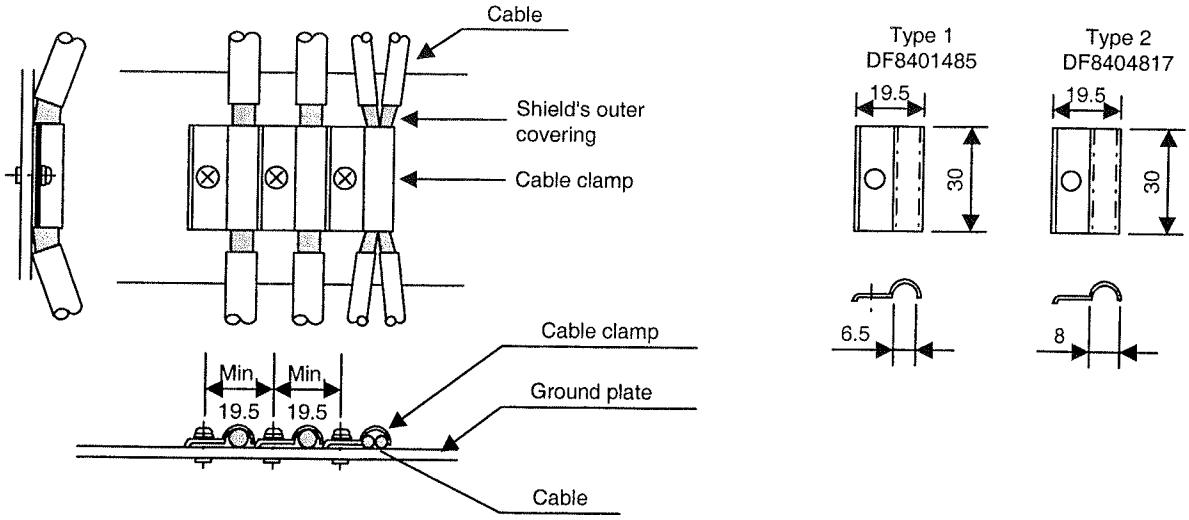



Fig. 2.2 Cable Clamp

Mount the ground plate near the SERVOPACK, as shown in the figure below.

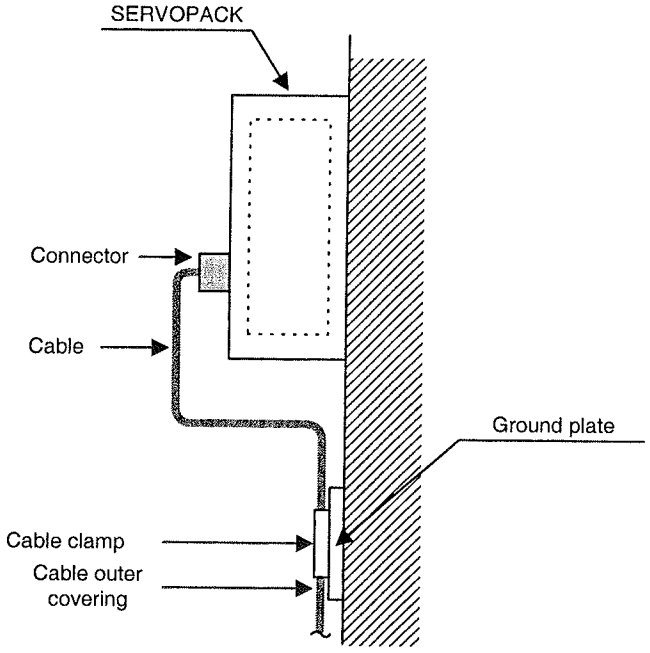



Fig. 2.3 Ground Plate Positioning Example

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# 2.4 Mounting Precautions

When designing the cabinet to hold the CNC Unit or other, consider the following points.

## 2.4.1 General Precautions

- Be sure that the cabinet has a closed structure.
- Mount the units so that they can be easily inspected (during maintenance), removed, and installed.
- To prevent blocking the airflow, leave about 100 mm between components and the cabinet wall surface.
- When embedding the control panel into a machine door or something similar, be sure to provide reinforcement against vibration, because it will definitely be affected by vibration from the machine.
- Design the cabinet so that the average internal temperature rise will be no more than 10°C higher than the outside air.
- To increase the cooling efficiency of the closed cabinet, and to prevent local temperature rises, use a fan to circulate the air.
- To prevent malfunction due to noise, allow at least 10 mm of space between the units and all cables and components of 90 VDC or more, and between the units and AC power supply cables and components.
  When wiring, observe the following points.
  - Separate AC lines (power supply lines) and DC wires (signal wires).
  - Separate primary side and secondary side parts (transformer, line filter, etc.)

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## 2.4.2 Precautions for Mounting Feed Axis/Spindle SERVOPACK

- The SERVOPACK is designed for wall mounting. Use screws or bolts to mount it securely, making sure that it is vertical.
- When mounting, allow for easy inspection and replacement during maintenance.
- In order to minimize internal loss of generated heat, bring the SERVOPACK's heat sink outside the cabinet and expose the heat discharge fins to the outside air.
  This results in a closed structure, and reduces the heat sink capacity. (See figure below.)
- To cool the heat sink, an airflow of 2.5 m/s is necessary near the heat sink.
- Make sure that sufficient cooling airflow reaches every individual SERVOPACK.
- A metal cooling fan is recommended. Plastic (resin) fans become degraded when cutting oils adhere to them, resulting in drive malfunctions and other problems.

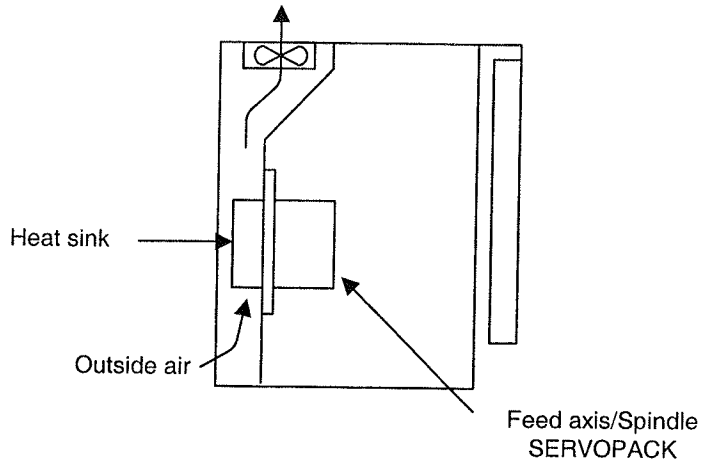



Fig. 2.4 Type of Heat Sink Brought Outside the Cabinet

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## 2.4.3 SERVOPACK Installation Direction and Space

For efficient cooling, be sure to mount the SERVOPACK vertically and allow the space shown in the figure below.

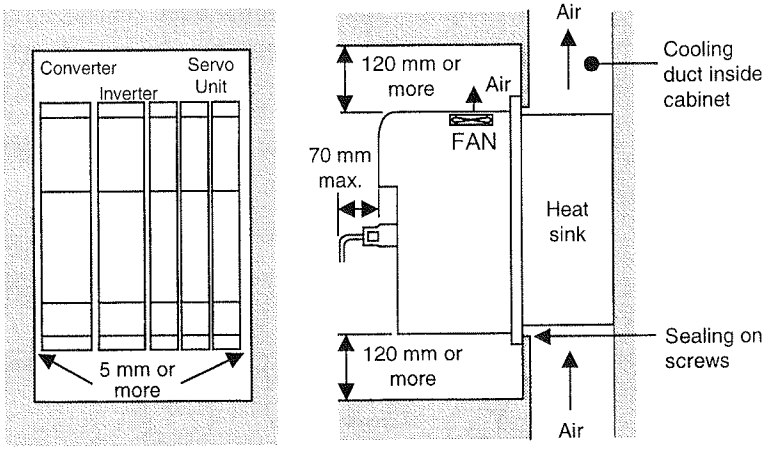


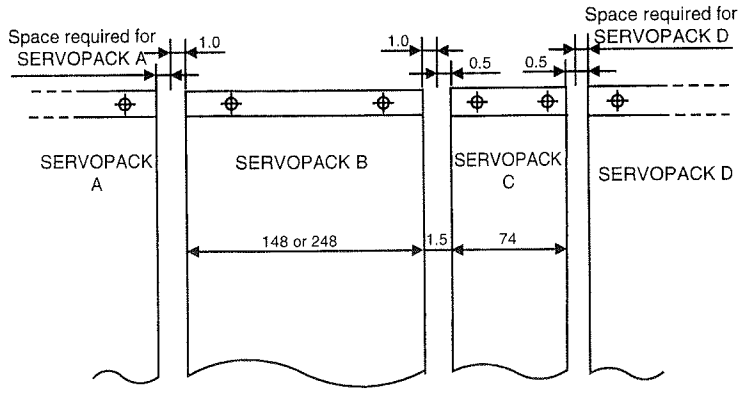

Fig. 2.5 SERVOPACK Installation Direction and Space

- All SERVOPACKS are designed with externally cooled heat sinks.
- For the external dimensions installation dimensions of all products, refer to the dimension diagrams in Attachment B, 13 to 15.
- Make sure the inlet air temperature for the SERVOPACK is 0 to 45°C at the heat sink, and 0 to 55°C inside the panel.
- Use sealing on the SERVOPACK screws to prevent oil from entering.
- The SERVOPACK includes the built-in fan shown in the figure above.
- Because the SERVOPACK generates heat, allow space above and below it when installing other units and devices to prevent the heat from remaining inside.
- When circulating air inside the cabinet, do not allow the air to directly strike the SERVOPACK (to prevent the adherence of dust and dirt).

Leave the following space on both sides of each SERVOPACK.

| SERVOPACK width | Required space for each unit |
|---|---|
| 74 mm | 0.5 mm on both right and left |
| 148 mm or 248 mm | 1.0 mm on both right and left |

As shown in the figure below, the space between units is the sum of the space required for each of the units.



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## 2.4.4 Installing Lightning Surge Countermeasure Equipment

Lightning surge countermeasures refer to those which prevent malfunction in electric or electronic equipment when the power lines, communication lines and signal wires are disrupted by high energy, i.e., when they are subjected to switching or lightning surge voltage during operation.

Normally, surge absorbers should be installed on the power lines, as shown in the figure below.

- Surge absorbers between power lines (normal)
- Surge absorbers between power lines and ground (common)

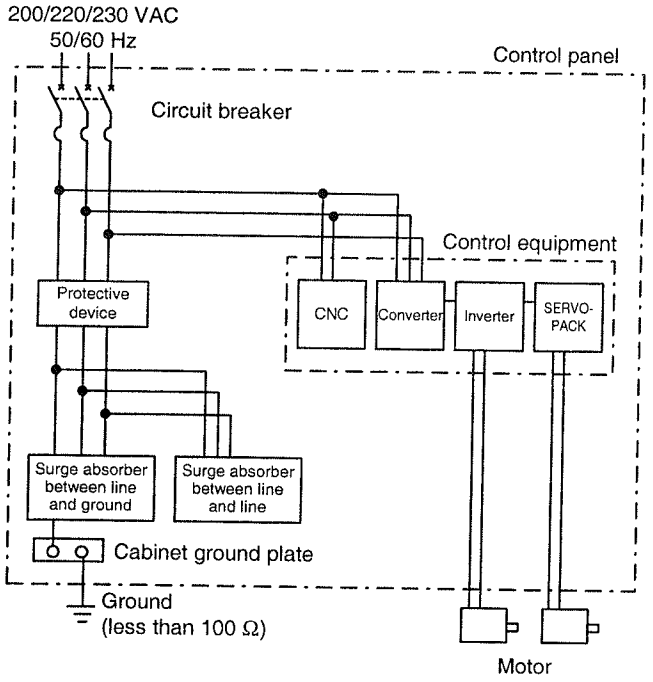



Fig. 2.6 Installing Lightning Surge Countermeasure

### ■ Recommended surge absorber models

| Installation location | Recommended model | Maker |
|---|---|---|
| Between power lines (normal) | R·A·V-781BYZ-2 | Okaya Electric |
| Between power lines and ground (common) | R·A·V-781BXZ-4 | Okaya Electric |

IMPORTANT

To prevent wires or other parts from burning because a surge absorber short-circuits due to frequent lightning surges or switching, be sure to include a protective device, such as a 5-A circuit protector or fuse, in the circuit.

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# 3

# Motor Installation

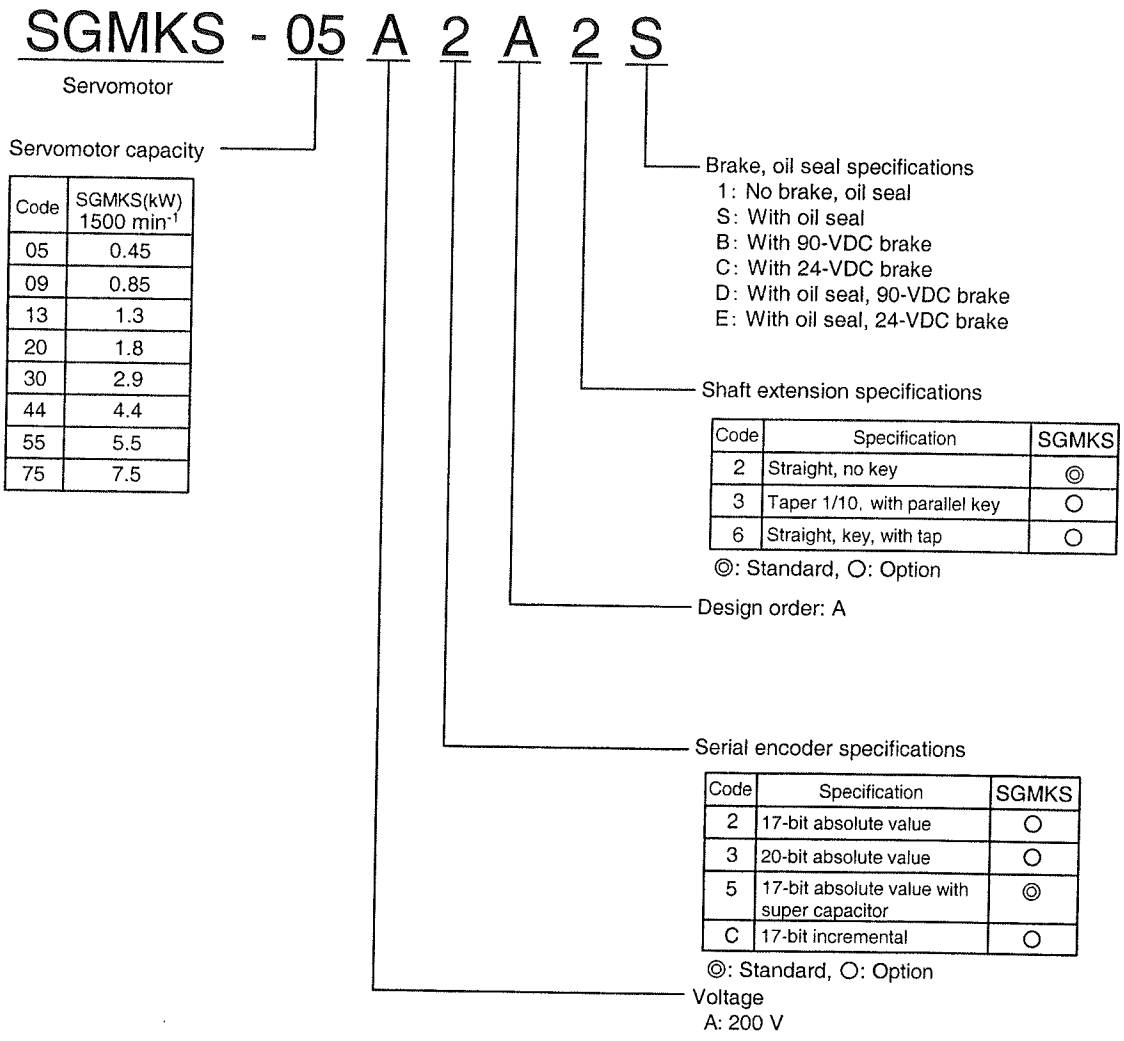
This section describes the installation of the YS840DI motor.


3.1 Servomotor ..... 3-2
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# 3.1 Servomotor

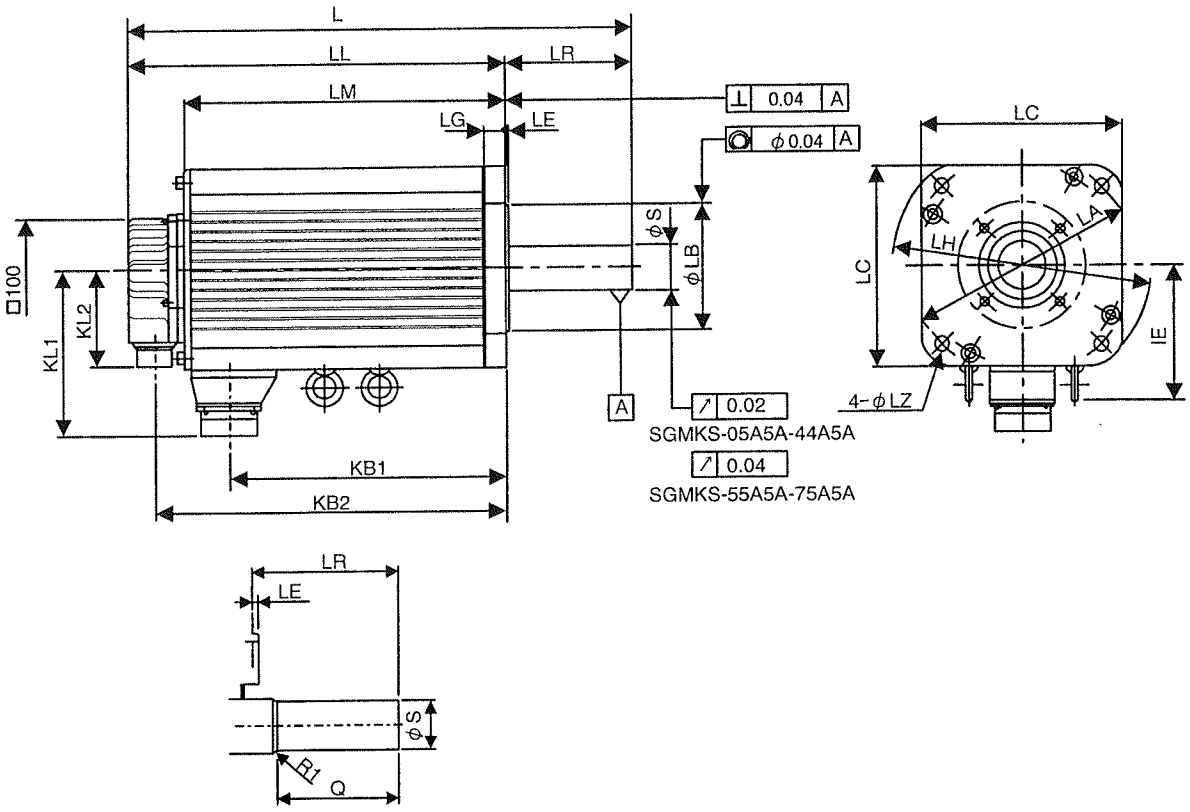
## 3.1.1 Servomotor Model Number



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## 3.1.2 Servomotor Dimensions

### ■ Motor without Brake




Note: There is no eyebolt on the SGMKS-05A5A to -30A5A.

(Unit: mm)

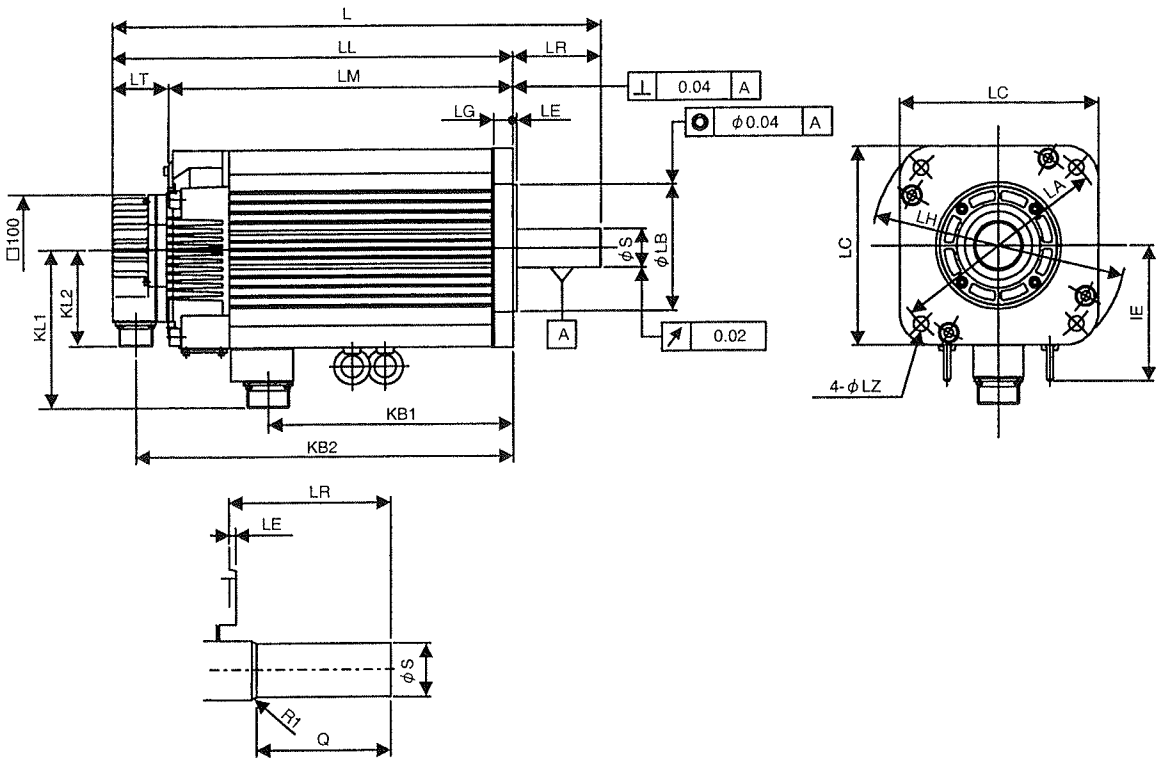
| Model SGMKS- | L | LL | LM | LR | KB1 | KB2 | IE | KL1 | KL2 |
|---|---|---|---|---|---|---|---|---|---|
| 05A5A | 251 | 193 | 144 | 58 | 115 | 173 | — | 109 | 88 |
| 09A5A | 280 | 222 | 173 | 58 | 144 | 202 | — | 109 | 88 |
| 13A5A | 310 | 252 | 203 | 58 | 174 | 232 | — | 109 | 88 |
| 20A5A | 316 | 237 | 188 | 79 | 156 | 217 | — | 140 | 88 |
| 30A5A | 354 | 275 | 226 | 79 | 194 | 255 | — | 140 | 88 |
| 44A5A | 394 | 315 | 266 | 79 | 234 | 295 | 123 | 140 | 88 |
| 55A5A | 482 | 369 | 320 | 113 | 279 | 349 | 123 | 150 | 88 |
| 75A5A | 562 | 449 | 400 | 113 | 359 | 429 | 123 | 150 | 88 |

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| Model SGMKS- | Flange surface dimensions (mm) | | | | | | | Shaft extension dimensions (mm) | | Approx. mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | LA | LB | LC | LE | LG | LH | LZ | S | Q | |
| 05A5A | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $19^{\ 0}_{-0.013}$ | 40 | 6.9 |
| 09A5A | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $19^{\ 0}_{-0.013}$ | 40 | 9.8 |
| 13A5A | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $22^{\ 0}_{-0.013}$ | 40 | 12 |
| 20A5A | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 18 |
| 30A5A | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 23 |
| 44A5A | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 29 |
| 55A5A | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $42^{\ 0}_{-0.016}$ | 110 | 37 |
| 75A5A | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $42^{\ 0}_{-0.016}$ | 110 | 49 |

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## ■ Motor with Brake




Note: There is no eyebolt on models SGMKS-05A5A to SGMKS-30A5A.

(Unit: mm)

| Model SGMKS- | L | LL | LM | LR | LT | KB1 | KB2 | IE | KL1 | KL2 |
|---|---|---|---|---|---|---|---|---|---|---|
| 05A5A□B | 286 | 228 | 180 | 58 | 48 | 106 | 206 | — | 116 | 88 |
| 09A5A□B | 315 | 257 | 209 | 58 | 48 | 135 | 235 | — | 116 | 88 |
| 13A5A□B | 345 | 287 | 239 | 58 | 48 | 165 | 265 | — | 116 | 88 |
| 20A5A□B | 367 | 288 | 236 | 79 | 52 | 146 | 266 | — | 146 | 88 |
| 30A5A□B | 405 | 326 | 274 | 79 | 52 | 184 | 304 | — | 146 | 88 |
| 44A5A□B | 445 | 366 | 314 | 79 | 52 | 224 | 344 | 123 | 146 | 88 |

| Model SGMKS- | Flange surface dimensions (mm) | | | | | | | Shaft extension dimensions (mm) | | Approx. mass ( kg ) |
|---|---|---|---|---|---|---|---|---|---|---|
| | LA | LB | LC | LE | LG | LH | LZ | S | Q | |
| 05A5A□B | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $19^{\ 0}_{-0.013}$ | 40 | 9 |
| 09A5A□B | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $19^{\ 0}_{-0.013}$ | 40 | 12 |
| 13A5A□B | 145 | $110^{\ 0}_{-0.035}$ | 130 | 6 | 12 | 165 | 9 | $22^{\ 0}_{-0.013}$ | 40 | 14 |
| 20A5A□B | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 24 |
| 30A5A□B | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 29 |
| 44A5A□B | 200 | $114.3^{\ 0}_{-0.025}$ | 180 | 3.2 | 18 | 230 | 13.5 | $35^{\ +0.01}_{\ 0}$ | 76 | 35 |

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## 3.1.3 Servomotor Characteristics

| Servomotor model SGMKS- | | 05A□A | | 09A□A | | 13A□A | |
|---|---|---|---|---|---|---|---|
| Combination Servo Unit capacity | | Same frame | One frame larger | Same frame | One frame larger | Same frame | One frame larger |
| Rated output* | kW | 0.38 | 0.45 | 0.85 | 0.85 | 1.3 | 1.3 |
| Rated torque* | N·m | 2.40 | 2.84 | 5.39 | 5.39 | 8.34 | 8.34 |
| Instantaneous maximum torque* | N·m | 7.55 | 11.4 | 13.4 | 21.6 | 22.9 | 33.4 |
| Rated armature current* | Arms | 3.8 | 4.5 | 7.3 | 7.3 | 10.7 | 10.7 |
| Instantaneous maximum armature current* | Arms | 11.0 | 16.9 | 17.0 | 28.0 | 28.0 | 41.7 |
| Rated rotational speed* | $min^{-1}$ | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Maximum rotational speed* | $min^{-1}$ | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Torque constant | N-m/Arms | 0.708 | 0.708 | 0.811 | 0.811 | 0.842 | 0.842 |
| Rotor moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 13 | 13 | 25 | 25 | 36.9 | 36.9 |
| Rated power rate* | kW/s | 4.42 | 6.2 | 11.6 | 11.6 | 18.8 | 18.8 |
| Rated angular velocity* | rad/s$^2$ | 1840 | 2180 | 2160 | 2160 | 2260 | 2260 |
| Mechanical time constant | ms | 8.2 | 8.2 | 5.2 | 5.2 | 4.0 | 4.0 |
| Electrical time constant | ms | 2.3 | 2.3 | 3.1 | 3.1 | 3.5 | 3.5 |
| Brake moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Brake static friction torque | N·m | 4.41 | 4.41 | 12.7 | 12.7 | 12.7 | 12.7 |

| Servomotor model SGMKS- | | 20A□A | | | 30A□A | | |
|---|---|---|---|---|---|---|---|
| Combination Servo Unit capacity | | Same frame | One frame larger | Two frames larger | Same frame | One frame larger | Two frames larger |
| Rated output* | kW | 1.8 | 1.8 | 1.8 | 2.9 | 2.9 | 2.9 |
| Rated torque* | N·m | 11.5 | 11.5 | 11.5 | 18.6 | 18.6 | 18.6 |
| Instantaneous maximum torque* | N·m | 30.9 | 41.1 | 46.0 | 42.9 | 63.1 | 74.4 |
| Rated armature current* | Arms | 15.7 | 15.7 | 15.7 | 24.8 | 24.8 | 24.8 |
| Instantaneous maximum armature current* | Arms | 41.3 | 54.9 | 61.5 | 56.0 | 84.0 | 99.0 |
| Rated rotational speed* | $min^{-1}$ | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Maximum rotational speed* | $min^{-1}$ | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Torque constant | N-m/Arms | 0.788 | 0.788 | 0.788 | 0.791 | 0.791 | 0.791 |
| Rotor moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 57.1 | 57.1 | 57.1 | 82.8 | 82.8 | 82.8 |
| Rated power rate* | Kw/s | 23.2 | 23.2 | 23.2 | 41.8 | 41.8 | 41.8 |
| Rated angular velocity* | rad/s$^2$ | 2010 | 2010 | 2010 | 2250 | 2250 | 2250 |
| Mechanical time constant | ms | 4.2 | 4.2 | 4.2 | 2.8 | 2.8 | 2.8 |
| Electrical time constant | ms | 7.2 | 7.2 | 7.2 | 7.4 | 7.4 | 7.4 |
| Brake moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| Brake static friction torque | N·m | 43.1 | 43.1 | 43.1 | 43.1 | 43.1 | 43.1 |

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| Servomotor model SGMKS- | | 44A□A | | | 55A□A | | 75A□A |
|---|---|---|---|---|---|---|---|
| Combination Servo Unit capacity | | Same frame | One frame larger | Two frames larger | Same frame | One frame larger | Same frame |
| Rated output* | kW | 3.9 | 4.4 | 4.4 | 5.5 | 5.5 | 7.5 |
| Rated torque* | N·m | 24.9 | 28.4 | 28.4 | 35.0 | 35.0 | 48.0 |
| Instantaneous maximum torque* | N·m | 64.4 | 82.6 | 114 | 93.5 | 125 | 131 |
| Rated armature current* | Arms | 32.9 | 37.5 | 37.5 | 42.5 | 42.5 | 55.6 |
| Instantaneous maximum armature current* | Arms | 84.0 | 110 | 150 | 110 | 150 | 150 |
| Rated rotational speed* | $min^{-1}$ | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Maximum rotational speed* | $min^{-1}$ | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Torque constant | N-m/Arms | 0.791 | 0.791 | 0.791 | 0.877 | 0.877 | 0.920 |
| Rotor moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 122 | 122 | 122 | 160 | 160 | 225 |
| Rated power rate* | kW/s | 50.9 | 66.1 | 66.1 | 76.6 | 76.6 | 102 |
| Rated angular velocity* | rad/s$^2$ | 2040 | 2330 | 2330 | 2190 | 2190 | 2130 |
| Mechanical time constant | ms | 2.3 | 2.3 | 2.3 | 2.0 | 2.0 | 1.6 |
| Electrical time constant | ms | 8.8 | 8.8 | 8.8 | 10 | 10 | 11.5 |
| Brake moment of inertia | $\times 10^{-4}$ kg·m$^2$ | 8.5 | 8.5 | 8.5 | — | — | — |
| Brake static friction torque | N·m | 43.1 | 43.1 | 43.1 | — | — | — |

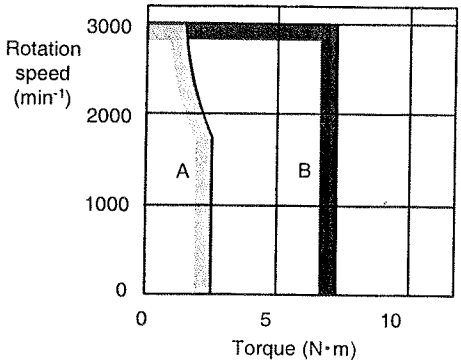
*These items and the torque and rotational speed characteristics are measured when running in combination with an SGDK Servo Unit, where the armature winding temperature is 20°C.

Note: These characteristics show the values when the following heat sinks are installed as a cooling condition.
400 × 400 × 20 (mm) Fe plate: 05A□A to 13A□A Servomotors
550 × 550 × 30 (mm) Fe plate: 20A□A to 75A□A Servomotors

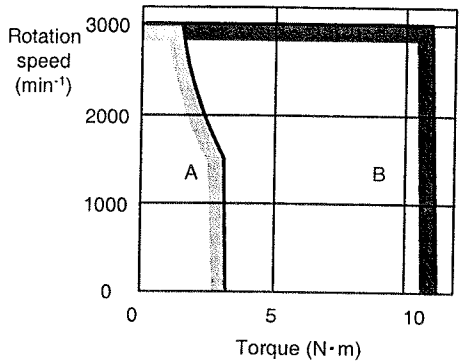
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## 3.1.4 Servomotor Torque Characteristics

### ■ SGMKS-05A□A

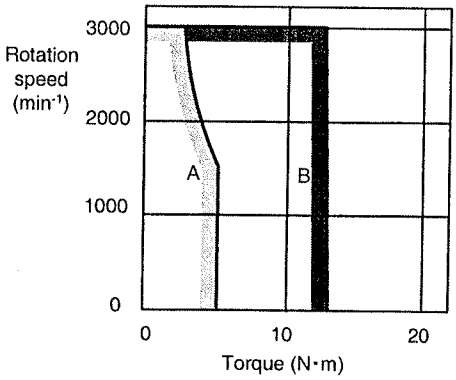



Combined with same-frame Servo Unit

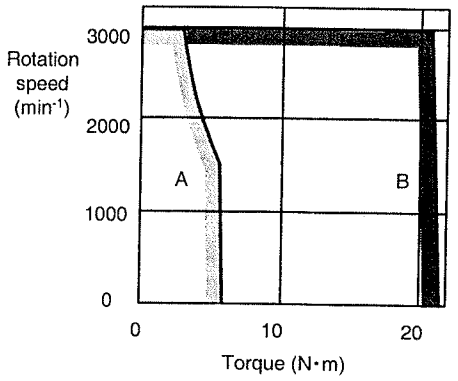



Combined with one frame larger Servo Unit

### ■ SGMKS-09A□A

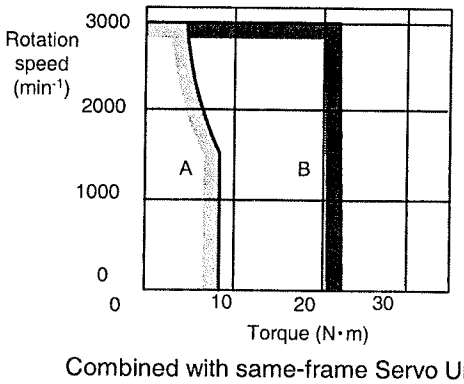



Combined with same-frame Servo Unit

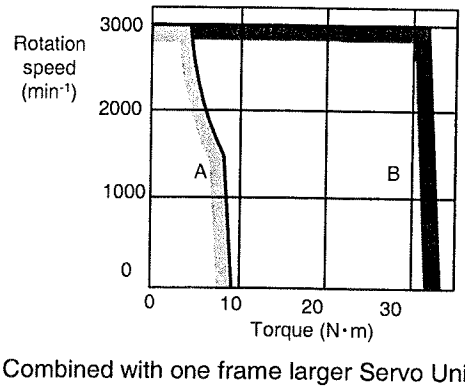



Combined with one frame larger Servo Unit

### ■ SGMKS-13A□A




Combined with same-frame Servo Unit



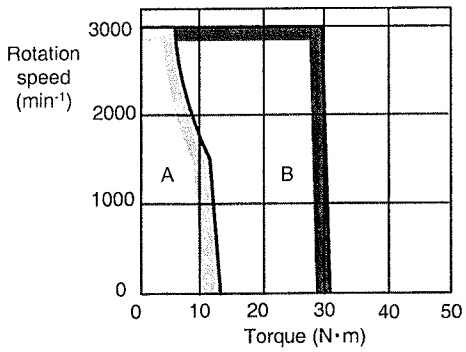

Combined with one frame larger Servo Unit

A: Continuous operation

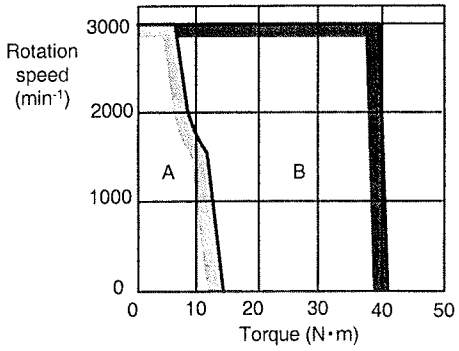
B: Repetitive operation

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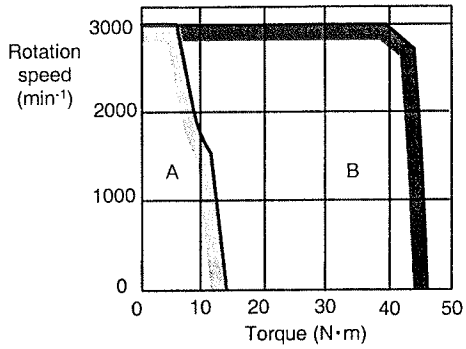
## ■ SGMKS-20A□A




Combined with same-frame Servo Unit



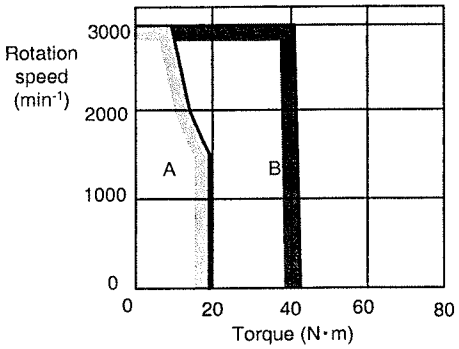

Combined with one frame larger Servo Unit



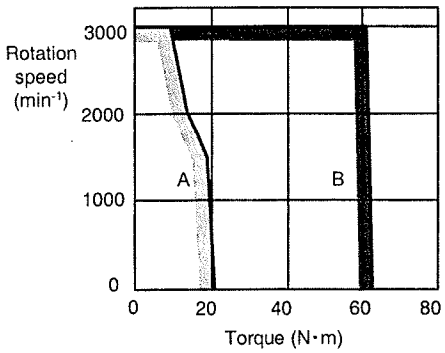

Combined with two frames larger Servo Unit

A: Continuous operation
B: Repetitive operation

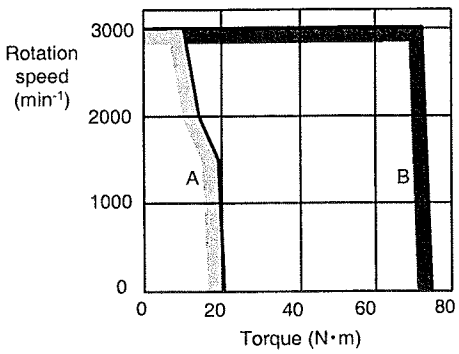
## ■ SGMKS-30A□A




Combined with same-frame Servo Unit




Combined with one frame larger Servo Unit

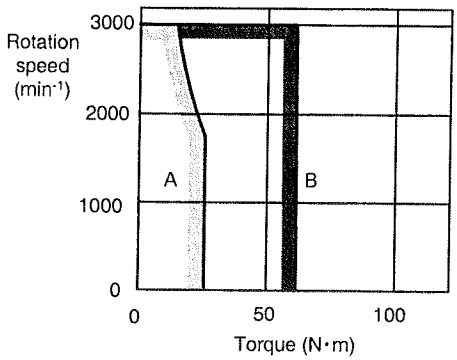



Combined with two frames larger Servo Unit

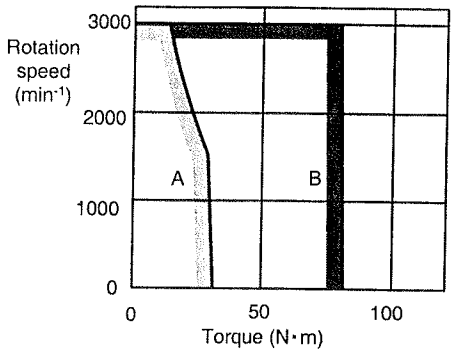
A: Continuous operation
B: Repetitive operation

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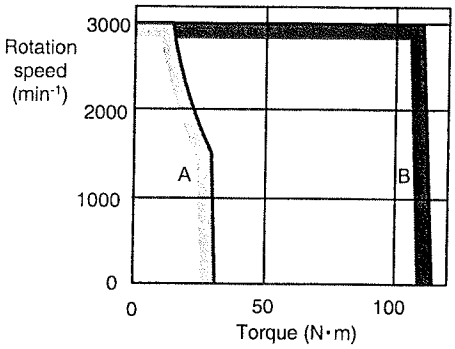
## ■ SGMKS-44A□A




Combined with same-frame Servo Unit



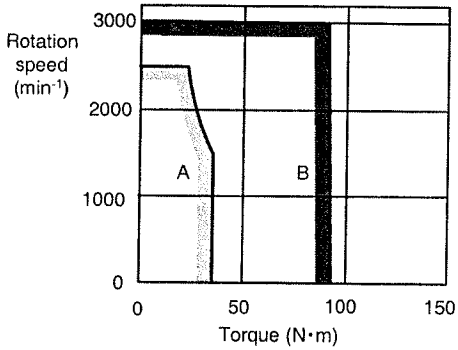

Combined with one frame larger Servo Unit



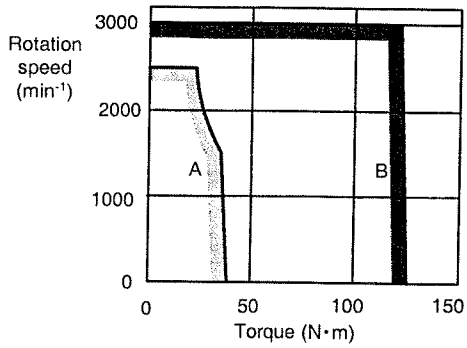

Combined with two frames larger Servo Unit

A: Continuous operation
B: Repetitive operation

## ■ SGMKS-55A□A




Combined with same-frame Servo Unit

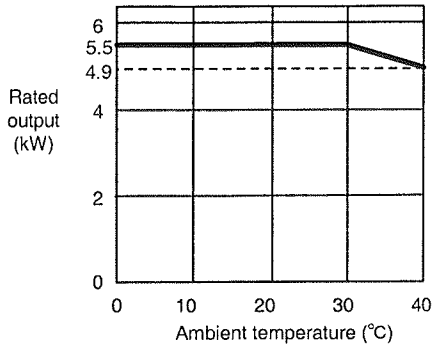



Combined with one frame larger Servo Unit

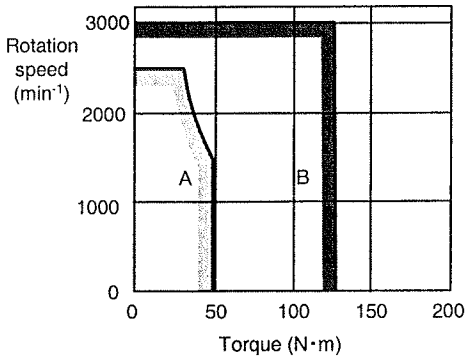
A: Continuous operation
B: Repetitive operation

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When used in ambient temperature above 30°C, the rated output decreases as shown in the figure below.



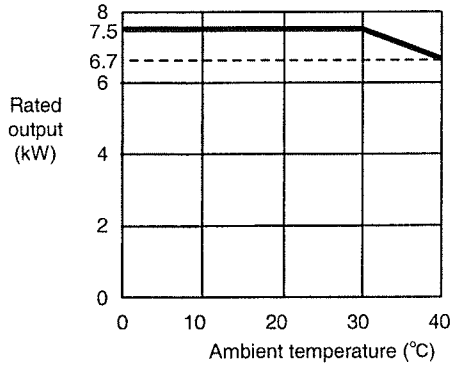

## ■ SGMKS-75A□A




A: Continuous operation
B: Repetitive operation

Combined with same-frame Servo Unit

When used in ambient temperature above 30°C, the rated output decreases as shown in the figure below.



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## 3.1.5 Installation Location

The SGMKS Servomotor is designed for use indoors.

Use it in an environment that satisfies the following conditions.

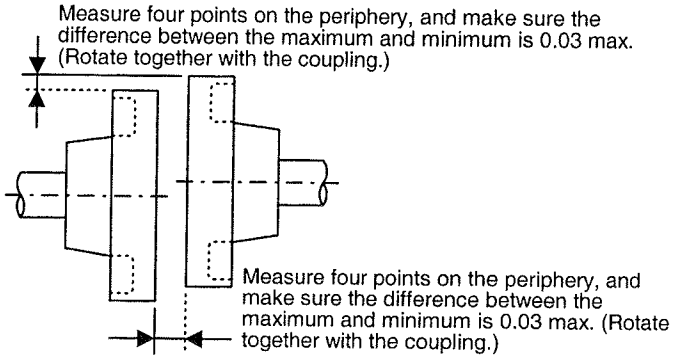
- An indoor location with no corrosive or explosive gases.
- A location with good ventilation and low levels of dust, dirt and humidity
- A location with ambient temperature within 0 to 40°C.
- A location with relative humidity between 20% and 80%, and no condensation.
- A location that allows easy inspection and cleaning.

## 3.1.6 Installation Direction

The SGMKS Servomotor can be installed either horizontally or vertically.

## 3.1.7 Machine Coupling

Make sure that the center of the Servomotor axis and the center of the machine axis are aligned when coupling. Install the Servomotor so that the centering is within the precision shown in the figure below.




IMPORTANT

- Insufficient centering may cause vibration and damage the bearing.
- Do not subject the axis to direct impact when installing the coupling. This may damage the encoder installed on the end of the axis opposite to the load.

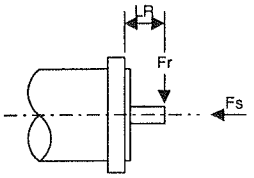
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## 3.1.8 Shaft Extension Load

Design the machine system so that the thrust load and radial load on the Servomotor shaft extension during operation satisfy the tolerance values in the table below.

The allowable radial loads shown in the list are the maximum loads that can be applied to the output shaft extension.

Table 3.1 Servomotor Allowable Radial Load and Thrust Load[1]

| Motor model SGMKS- | Allowable radial load Fr [N(kgf)] | Allowable thrust load Fs [N(kgf)] | LR [mm] | Reference diagram |
|---|---|---|---|---|
| 05A□A | 490(50) | 98(10) | 58 |  |
| 09A□A | 490(50) | 98(10) | | |
| 13A□A | 686 (70) | 343(35) | | |
| 20A□A | 1176(120) | 490(50) | 79 | |
| 30A□A | 1470(150) | 490(50) | | |
| 44A□A | 1470(150) | 490(50) | | |
| 55A□A | 1764(180) | 588(60) | 113 | |
| 75A□A | 1764(180) | 588(60) | | |





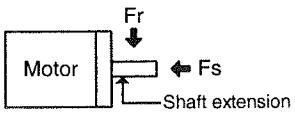

[1] Thrust load, radial load

Thrust load (Fs)

The load applied to the shaft extension in the direction parallel to the axial center.

Radial load (Fr)

The load applied to the shaft extension in the direction perpendicular to the axial center.

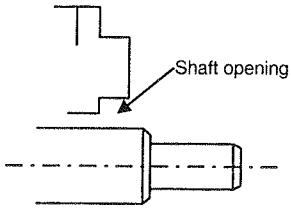


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## 3.1.9 Oil or Water Countermeasures

Measures can be taken to protect the motor when it is used in locations that are subject to drops of water or oil. To ensure sealing around the shaft opening[1], order a motor equipped with an oil seal.

Also, install so that the connector faces downward.







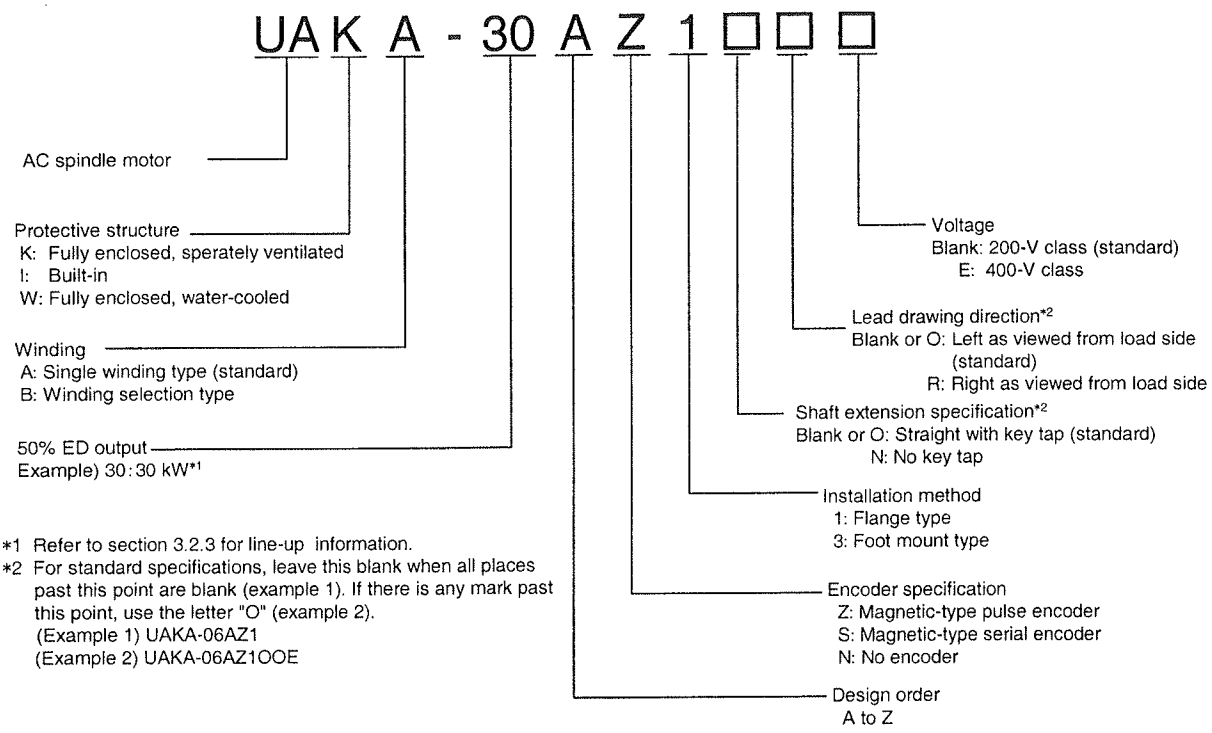
[1] Shaft opening

The part of the shaft that protrudes from the bearing.

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# 3.2 Spindle Motor

## 3.2.1 Spindle Motor Model Number

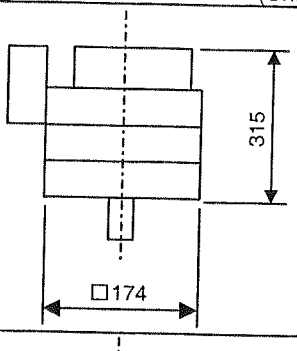
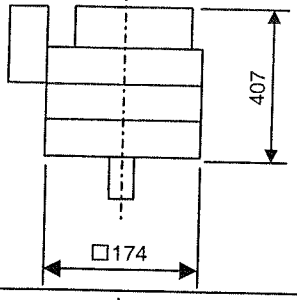
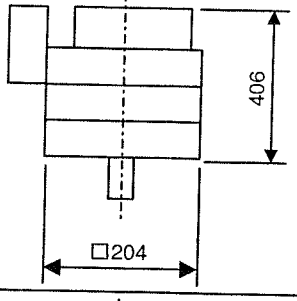
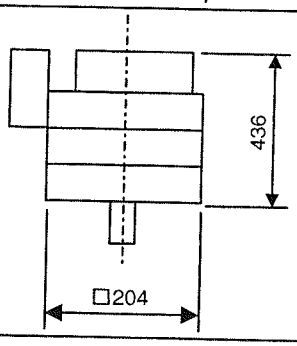



*1 Refer to section 3.2.3 for line-up information.
*2 For standard specifications, leave this blank when all places past this point are blank (example 1). If there is any mark past this point, use the letter "O" (example 2).
(Example 1) UAKA-06AZ1
(Example 2) UAKA-06AZ1OOE

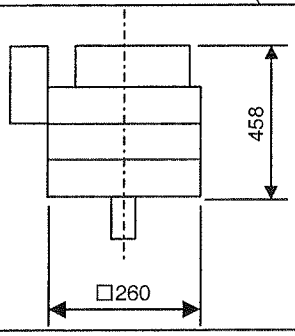
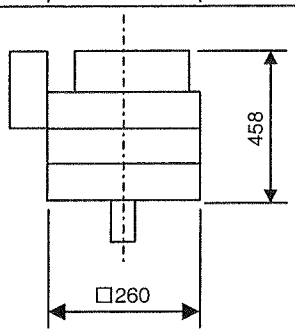
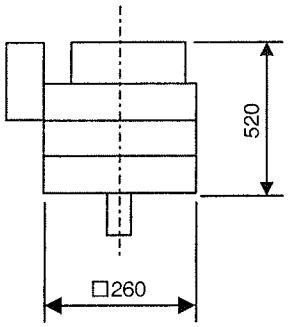
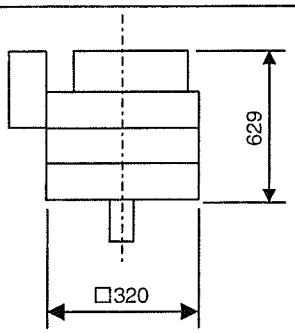
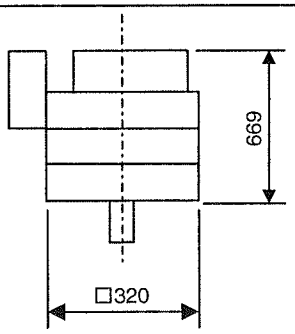
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## 3.2.2 Spindle Motor Dimensions

The dimensions in the following table are approximate. For detailed design dimensions, inquire about the dimensions for each model.

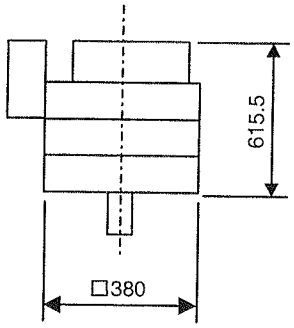
| Capacity (kW) 50%ED/cont | UAKA (Unit: mm) |
|---|---|
| 3.7/2.2 |  |
| 5.5/3.7 |  |
| 7.5/5.5 |  |
| 11/7.5 |  |

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| Capacity (kW) 50%ED/cont | UAKA (Unit: mm) |
|---|---|
| 15/11 |  |
| 18.5/15 |  |
| 22/18.5 |  |
| 30/22 |  |
| 37/30 |  |

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### 3.2.2 Spindle Motor Dimensions

| Capacity (kW) 50%ED/cont | UAKA (Unit: mm) |
|---|---|
| 45/37 |  |

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## 3.2.3 Spindle Motor Characteristics

### ■ Single Winding Series (200-V Specifications)

| Model | | Single winding series | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A-04 | A-06 | A-08 | A-11 | A-15 | A-19 | A-22 | A-30 | A-37 | A-45 |
| S3 50% ED | kW | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 |
| S1 Continuous rating | kW | 2.2 | 3.7 | 5.5 | 7.5 | — | — | — | 22 | 30 | — |
| Continuous rated torque | N·m | 14.0 | 23.5 | 35.0 | 47.7 | — | — | — | 183 | 249 | — |
| Base rotation speed | $min^{-1}$ | 1500 | | | | | | | 1150 | | — |
| Maximum rotation speed | $min^{-1}$ | 8000 | | | 6000 | | | | 4500 | | — |
| Moment of inertia $(GD^2/4)x\ 10^{-3}$ | $kgm^2$ | 6.6 | 14 | 21 | 26 | — | — | — | 231 | 266 | — |
| Vibration | μm | V5 | | | | | | | V10 | | — |
| Noise | dB(A) | 75 max. | | | | | | | 80 max. | | — |
| Approx. weight | kg | 29 | 47 | 52 | 59 | — | — | — | 198 | 230 | — |
| Cooling method | | Fully enclosed, separately ventilated type | | | | | | | | | |
| Enclosure rating | | IP44 (IEC34-5) | | | | | | | | | |
| Cooling fan motor | | Three-phase 200 V 50/60 Hz, 220 V 50/60 Hz, 230 V 60 Hz | | | | | | | | | |
| Encoder | | Standard: Magnetic-type pulse encoder (1024 P/R)<br>Semi-standard: Magnetic-type serial transmission, high-resolution encoder (17-bit) | | | | | | | | | |
| Installation | | Flange: IM B5, IM V1 (output shaft facing horizontal, vertically downward), Foot-mount: IM B3 (floor mounted) (Ref.: IEC 34-7) | | | | | | | | | |
| Overload capacity | | 209% of S1 rating for 10 s | 200% of S1 rating for 10 s | 180% of S1 rating for 10 s | 200% of S1 rating for 10 s | — | — | — | 200%of S1 rating for 10 s | 180% of S1 rating for 10 s | — |
| Insulation | | F-class | | | | | | | | | |
| Ambient temperature, humidity | | 0 to 40°C, 95% RH max. (with no condensation) | | | | | | | | | |
| Bearing lubricant | | Grease | | | | | | | | | |

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## ■ Winding Selection Series (200-V Specifications)

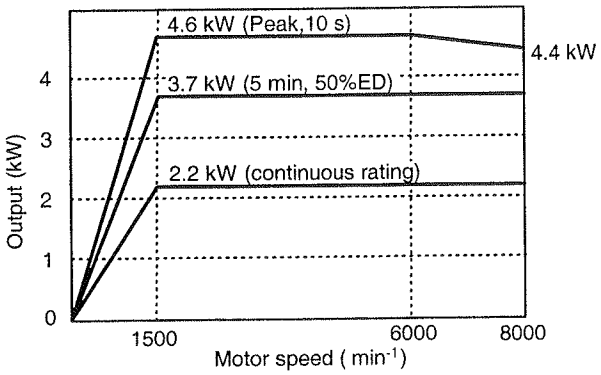
| Model | | Winding Selection Series | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | B-06 | B-08 | B-11 | B-15 | B-19 | B-22 | B-30 |
| S3 50% ED | kW | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |
| S1 Continuous rating | kW | — | — | — | — | 15 | 18.5 | — |
| Continuous rating torque | N·m | — | — | — | — | 249 | 307 | — |
| Base rotation speed | $min^{-1}$ | — | | | — | 575 | | — |
| Maximum rotation speed | $min^{-1}$ | — | | | — | 4500 | | — |
| Moment of inertia $(GD^2/4) \times 10^{-3}$ | $kgm^2$ | — | — | — | — | 231 | 266 | — |
| Vibration | μm | — | | | — | V10 | | — |
| Noise | dB(A) | — | | | — | 80 max. | | — |
| Approx. weight | kg | — | — | — | — | 214 | 250 | — |
| Cooling method | | Fully enclosed, separately ventilated type | | | | | | |
| Enclosure rating | | IP44 (IEC34-5) | | | | | | |
| Cooling fan motor | | 3-phase, 200 V 50/60 Hz, 220 V 50/60 Hz, 230 V 60 Hz | | | | | | |
| Encoder | | Standard: Magnetic pulse encoder (1024 P/R)<br>Semi-standard: Magnetic serial transmission, high-resolution encoder (17-bit) | | | | | | |
| Installation | | Flange: IM B5, IM V1 (output shaft facing horizontal, vertically downward), Foot-mount: IM B3 (floor mounted) (Ref.: IEC 34-7) | | | | | | |
| Overload capacity | Low-speed winding | — | | | | 120% of S3 rating for 10 s | | — |
| | High-speed winding | — | | | | 200% of S1 rating for 10 s | | — |
| Insulation | | F-class | | | | | | |
| Ambient temperature, humidity | | 0 to 40°C, 95% RH max. (with no condensation) | | | | | | |
| Bearing lubricant | | Grease | | | | | | |

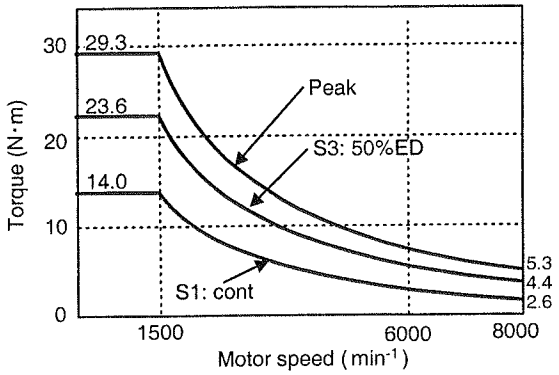
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## 3.2.4 Spindle Motor Output Characteristics

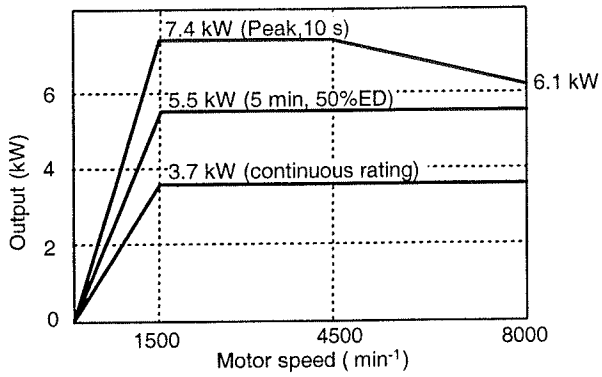
### ■ Single Winding Series

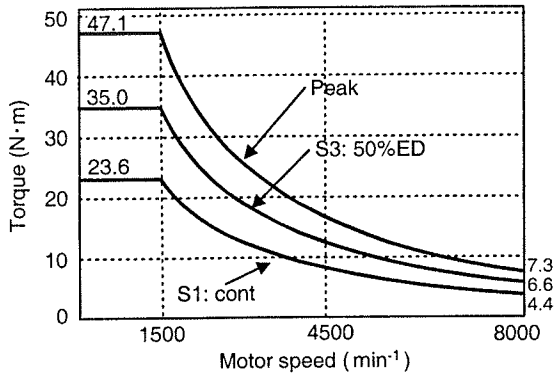
#### 3.7/2.2 kW



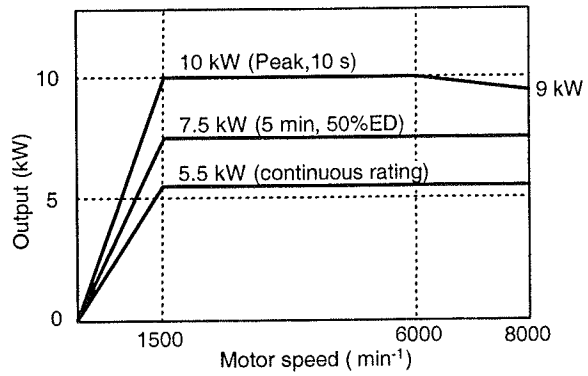



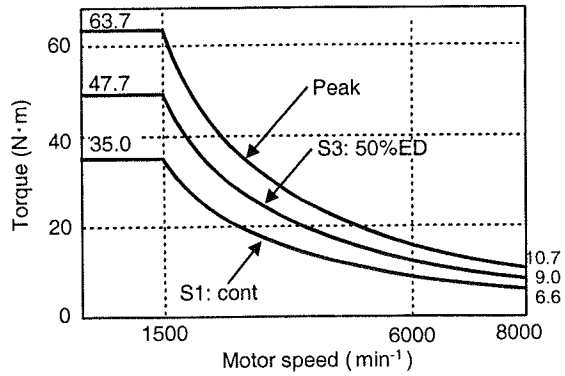

#### 5.5/3.7 kW



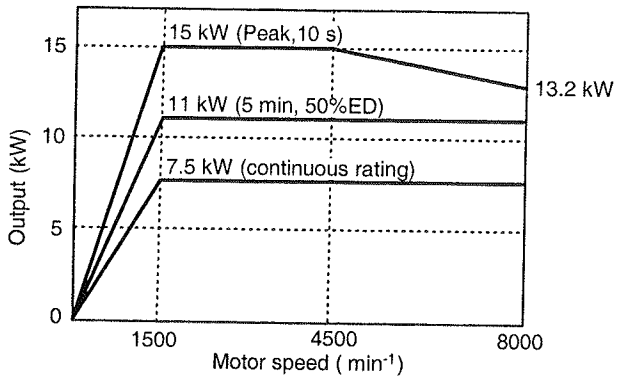

#### 7.5/5.5 kW

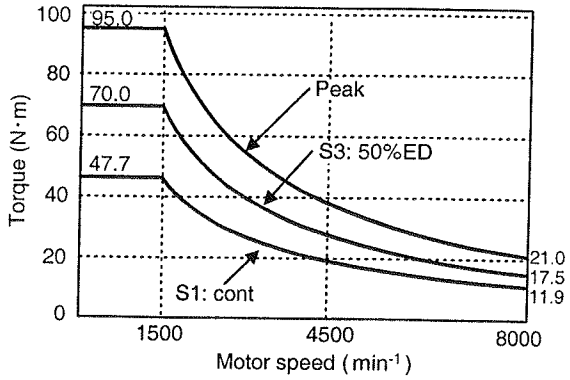


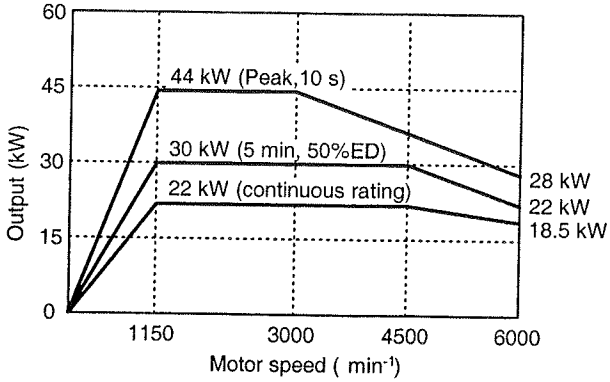
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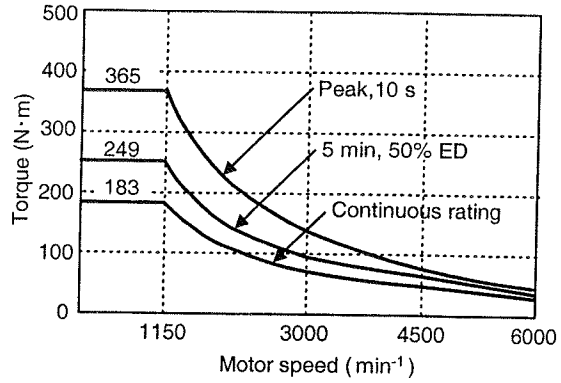
## 11/7.5 kW



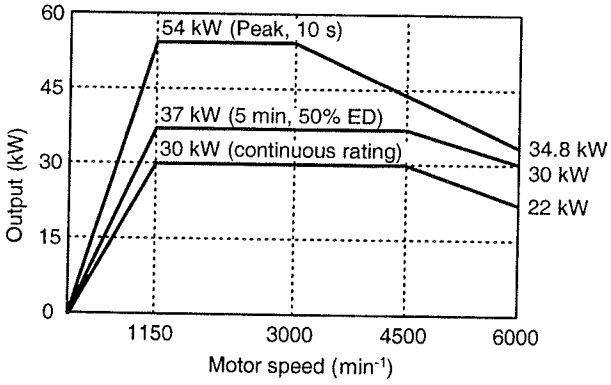



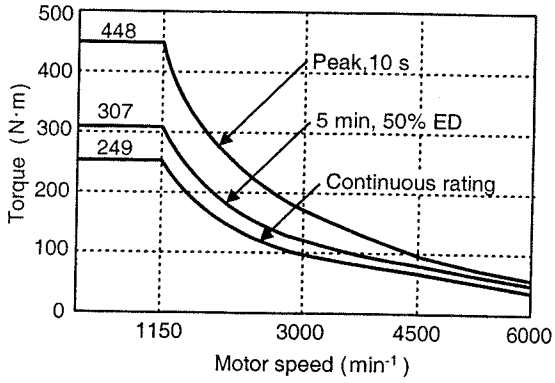

## 30/22 kW




## 37/30 kW

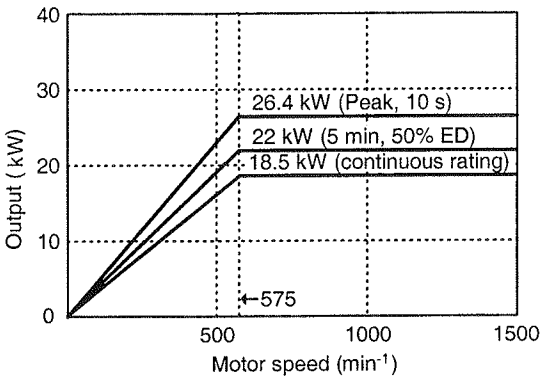


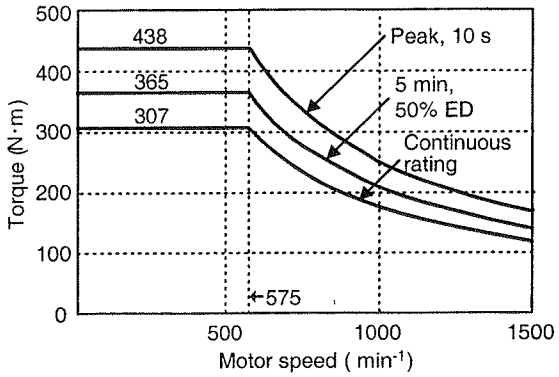



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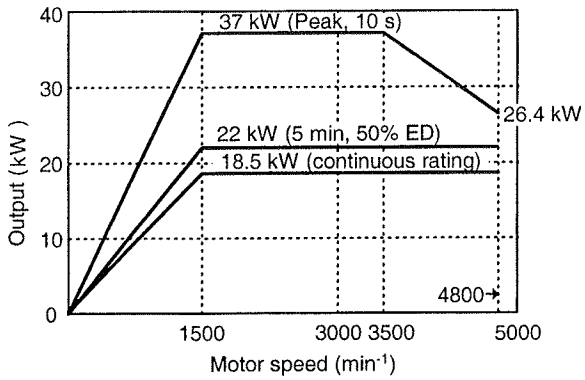
## ■ Winding Selection Series

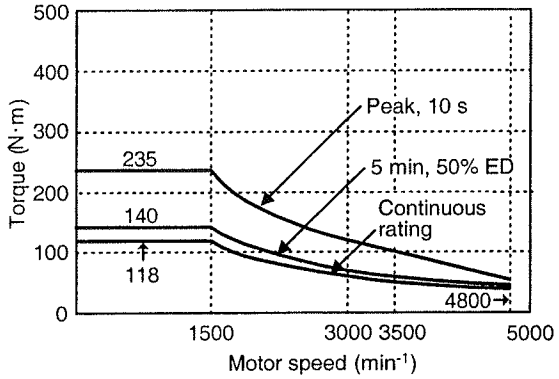
### 22/18.5 kW Low-speed Winding



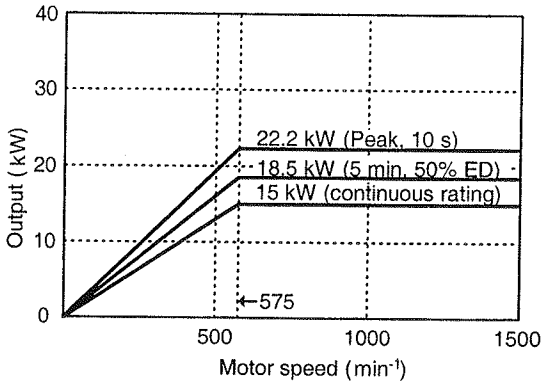

### 22/18.5 kW High-speed Winding

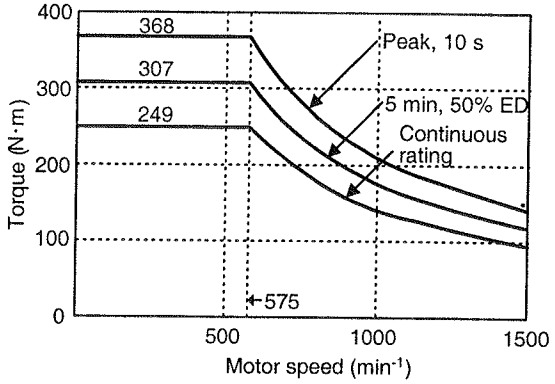


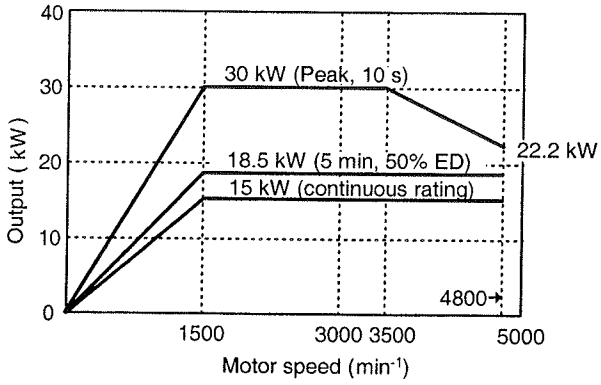
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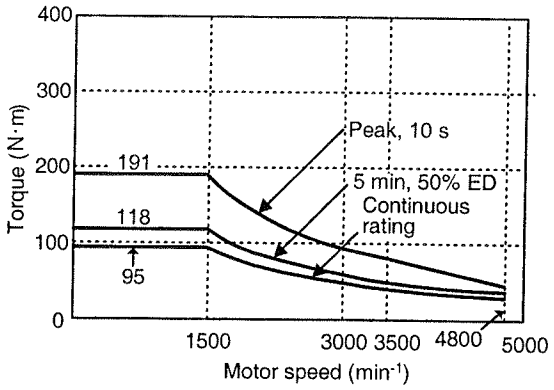
## 18.5 kW/15 kW Low-speed Winding




## 18.5 kW/15 kW High-speed Winding



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### 3.2.5 Installation Location

- Ensure that there is sufficient cooling air flowing to the cooling fan. Leave a minimum of 100 mm between the motor (the side opposite the load, i.e., the cooling exhaust side) and the machine.
  If there is not sufficient ventilation, the motor temperature protective function will be triggered even under the rated load.
- Provide a sturdy structure for the bed and foundation, or frame, holding the motor.
  In addition to the weight of the motor, the dynamic load during operating is applied to the bed, which can lead to vibration.
- The cooling system is designed so that the built-in fan sends air to the core of the unit.
  If dust or other material accumulates in the airflow path, the cooling capacity will be lowered and the motor temperature protective function will be triggered even under the rated load.

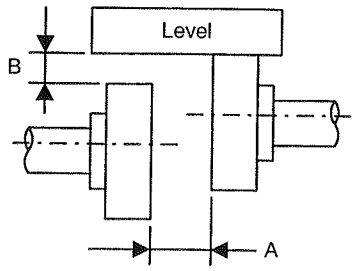
### 3.2.6 Installation Direction

- The flange shape allows installation with the motor output axis on the load to face either horizontally or vertically downward.
  If the unit is used with the output axis facing upward, an excessive load will be applied to the motor bearing, adversely affecting the service life of the unit.
- Install the foot-mount type with the foot facing downward and sitting on the floor.
  If the unit is suspended with the foot facing upward, an excessive load will be applied to the foot, adversely affecting the service life of the unit.
- When using with the output axis horizontal, install the unit so that the terminal box faces upward. If the unit is installed so that the terminal box faces to the side or downward, dirt and dust will easily enter the airflow port under the load-side bracket, leading to malfunction.

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## 3.2.7 Machine Coupling

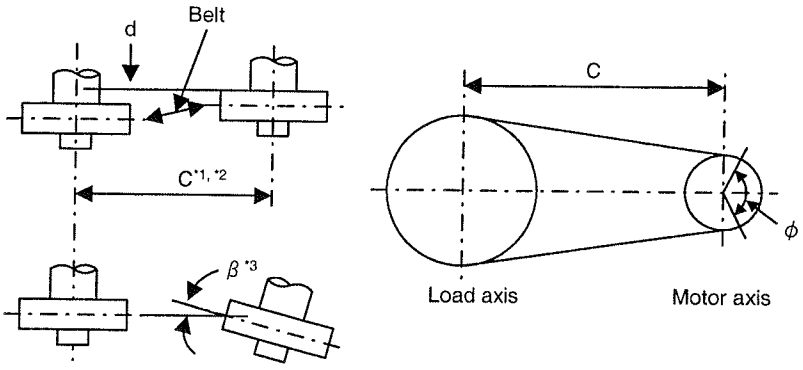
- When coupling directly, position the motor and machine so that the center of the motor axis and the center of the machine axis are precisely aligned.
  If necessary adjust by inserting a liner.
  If the axis centers are not aligned, excessive torsion will be applied to both the motor axis and the machine axis, adversely affecting the service life of the bearing and possibly leading to damage.




A: Width irregularity: 0.03 mm max.
B: Irregularity: 0.03 mm max.

Fig. 3.1 Motor-Machine Coupling Accuracy

- When coupling with a belt, make the motor axis and machine axis parallel, and make the line joining the centers of both pulleys and each of the axes perpendicular.
  There is a limit to the amount of radial load that can be applied to the end of the motor output axis. Make sure that you do not exceed the allowable radial load.
  If the perpendicularity of the belt is insufficient, vibration will result, leading to belt slippage. If a load in excess of the allowable radial load is applied to the motor output axis, it will place excessive force on the motor axis bearing and shorten the service life of the unit.
- Make the belt-pulley contact angle $\phi$ at least 140°.
  If the contact angle is too small, it will lead to belt slippage.




*1. When C is less than or equal to 1000 mm, d < 1 mm
*2. When C is more than 1000 mm, d / C < 1 / 1000
*3. β < 1 / 3°

Fig. 3.2 Belt Tension

- When coupling with a gear, make the motor axis and machine axis parallel, and ensure that the gear teeth mesh correctly in the center.
  If the gear teeth do not mesh correctly, it will cause gear noise.

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- When attaching a pulley or gear to the motor output axis, ensure proper balance. The timing balance is adjusted with a half key, which is 1/2 the thickness of the key shown in the external dimensions diagram (shaft diagram).
  Because the axis rotates at high speed, even a slight unbalance will cause vibration.

### 3.2.8 Oil or Water Countermeasures

Do not allow oil or water to contact the motor directly. If there is a possibility that oil or water will contact the motor, provide a protective cover. If soiled oil or water penetrates the inside of the motor, insulation will be lowered, possibly resulting in a ground fault.

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# 4

# Connection Diagram

This section describes the connections between machines.

4.1 Connection Diagram ..... 4-2

4.2 Locations of Connectors and Switches ..... 4-4

4.2.1 Converters ..... 4-4

4.2.2 Inverters ..... 4-6

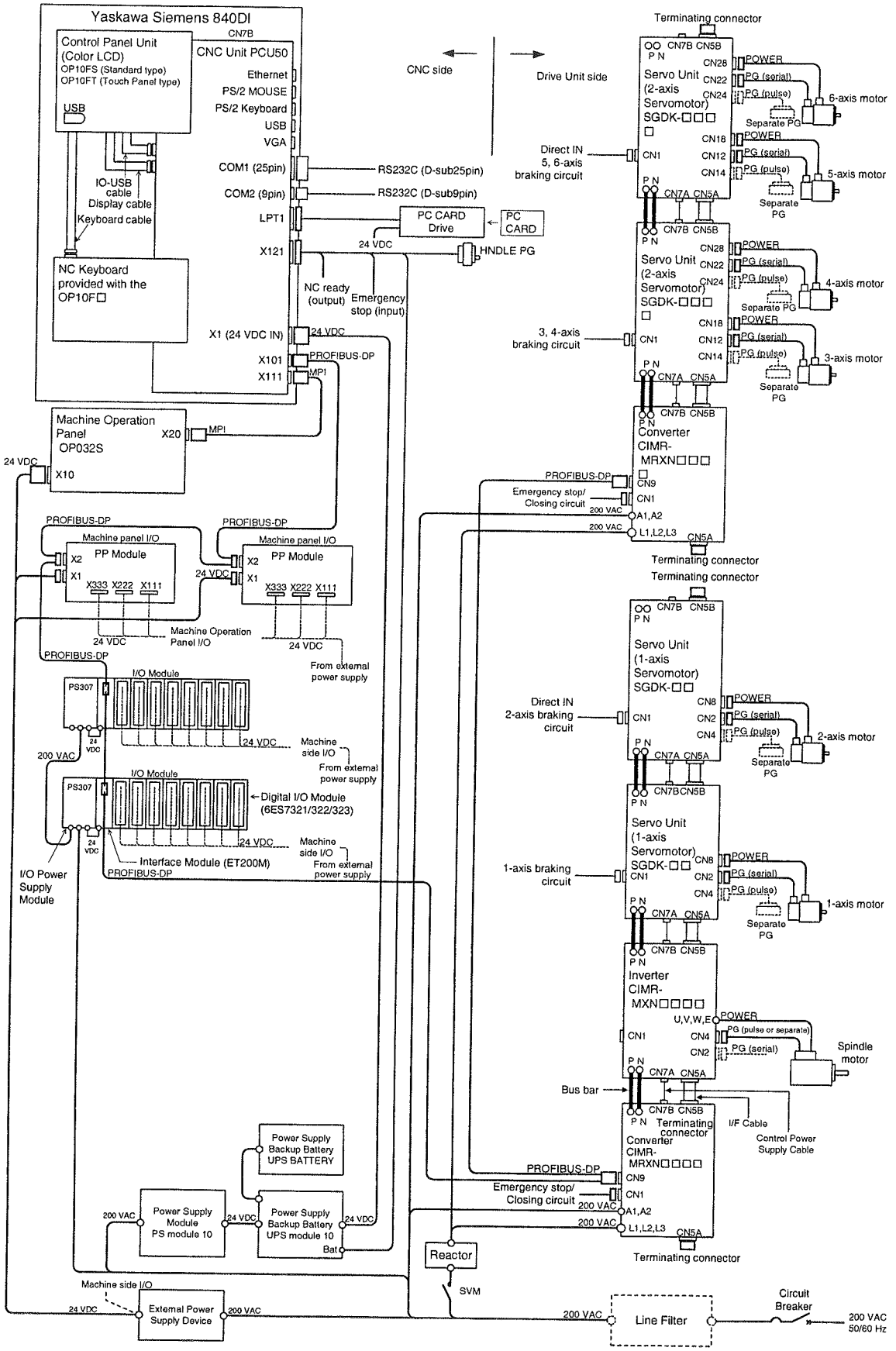
4.2.3 1-Axis Servo Units ..... 4-7

4.2.4 2-Axis Servo Unit ..... 4-9

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# 4.1 Connection Diagram

The following figure shows an example of connections between equipment for the CNC System.



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IMPORTANT

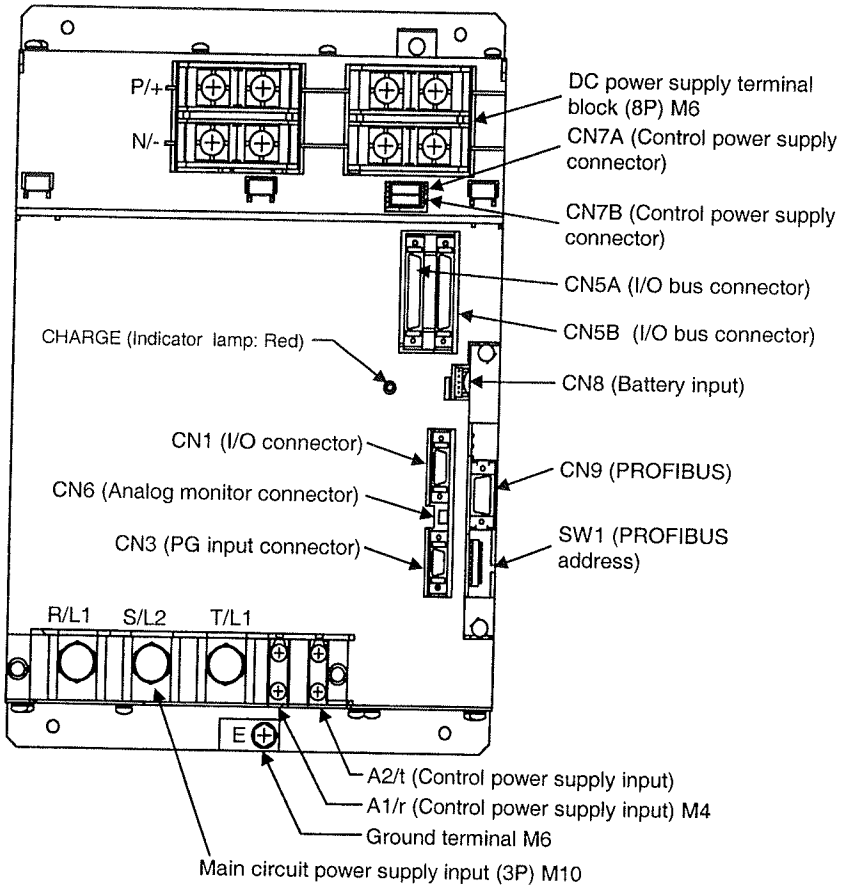
- Number of Axes
  Up to seven axes can be used per converter (including the main axis).
- External Power Supply Device
  The customer must supply an external power supply device with appropriate capacity to suit the design.
- Using a Standalone Encoder
  The standalone Encoder is an option for all Servo Units and Inverters.
- Systems using two converters must also connect two Emergency stop/Closing circuits.
- Brake Circuit
  Connect brakes only to axes that require them.
- Direct IN
  Connect a direct IN signal to only one Servo Unit in each Converter System.

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# 4.2 Locations of Connectors and Switches

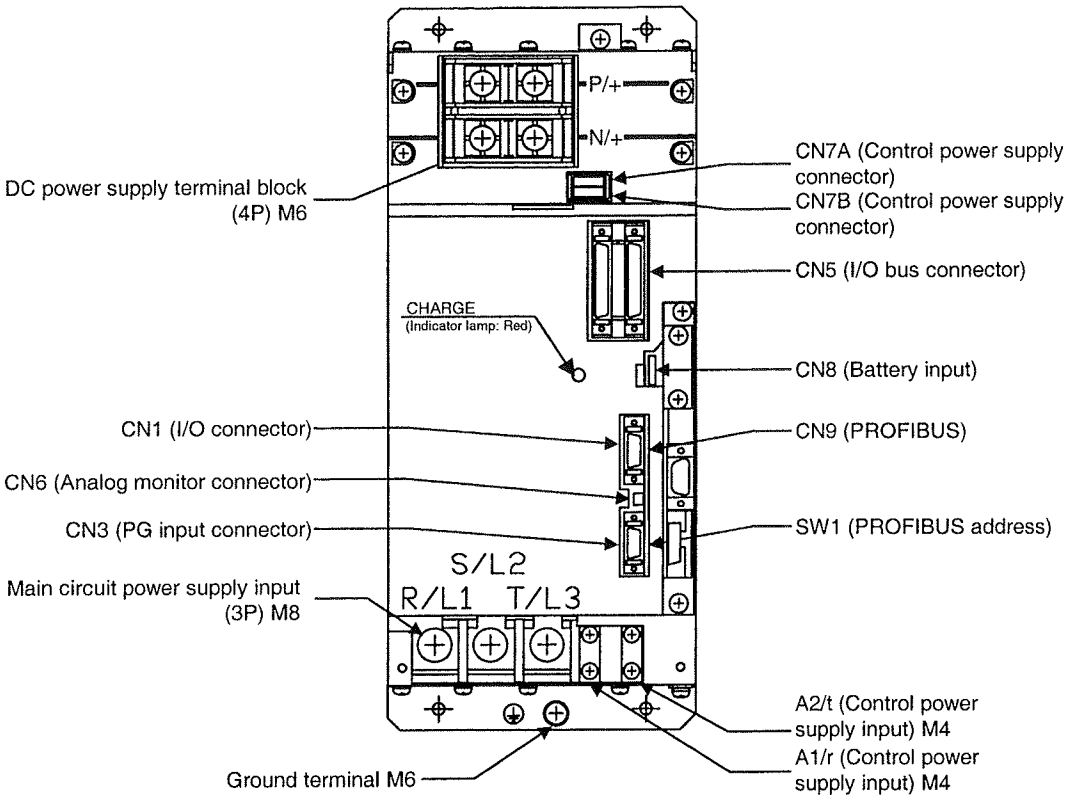
## 4.2.1 Converters

■ CIMR-MRXN20455A (45 kW), -MRXN2037 (37 kW)



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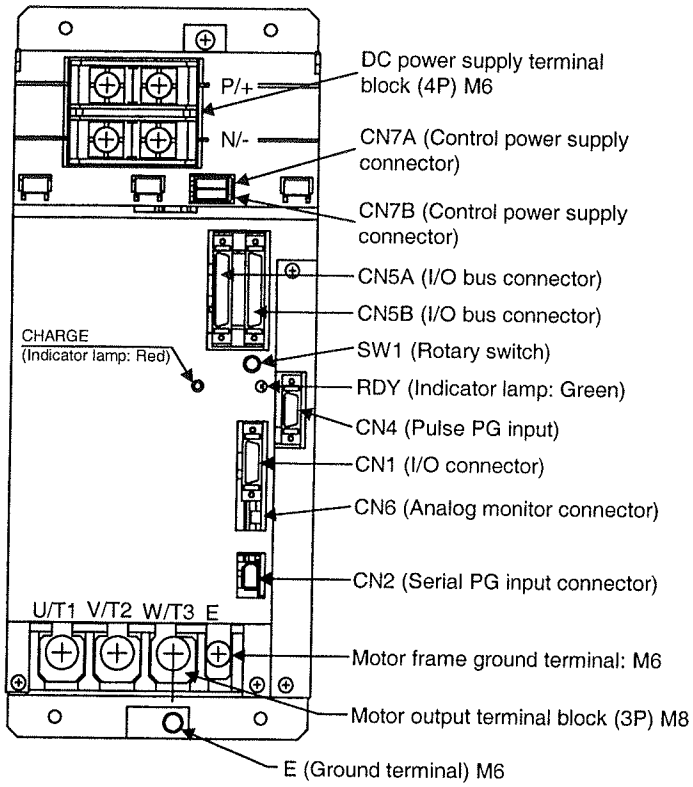
## ■ CIMR-MRXN20305A (30 kW), -MRXN20225A (22 kW), -MRXN20185A (18.5 kW), -MRXN20155A (15 kW)



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## 4.2.2 Inverters

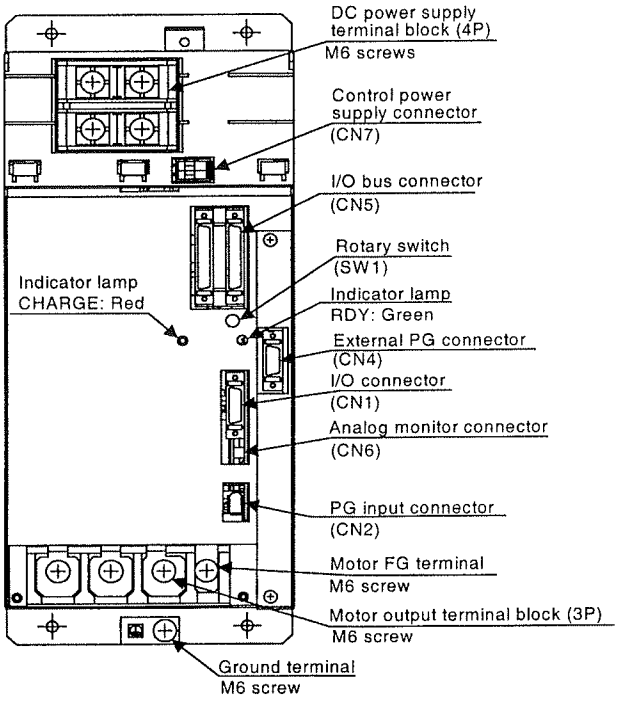
### ■ CIMR-MXN20305A (30 kW), -MXN20225A (22 kW), -MXN20185A (18.5 kW), -MXN20155A (15 kW)



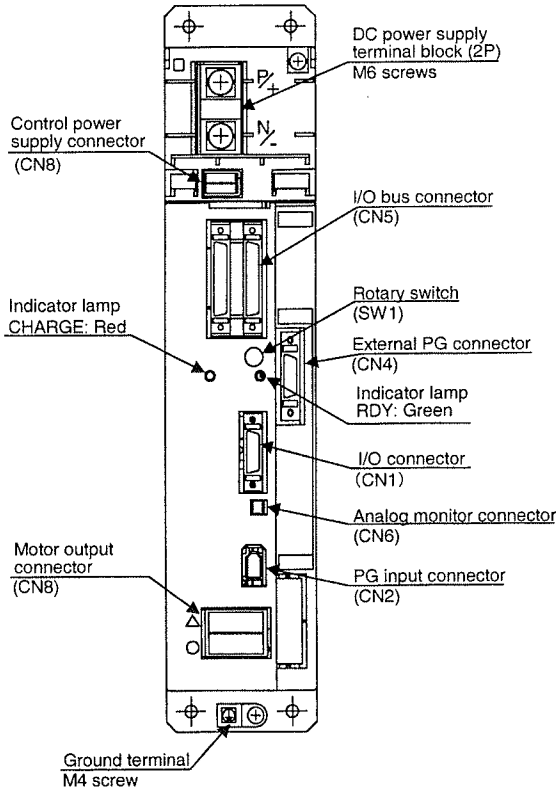
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## 4.2.3 1-Axis Servo Units

### ■ SGDK-60AEA (6 kW), -75AEA (7.5 kW)

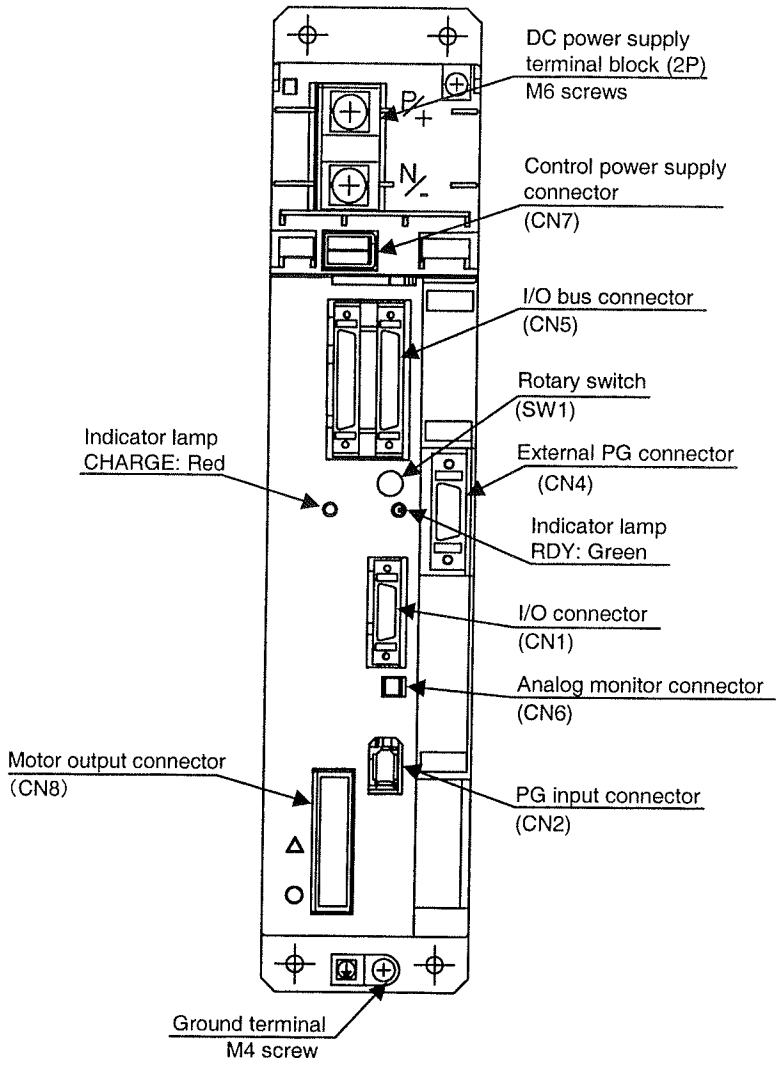



### ■ SGDK-50AEA (5 kW)



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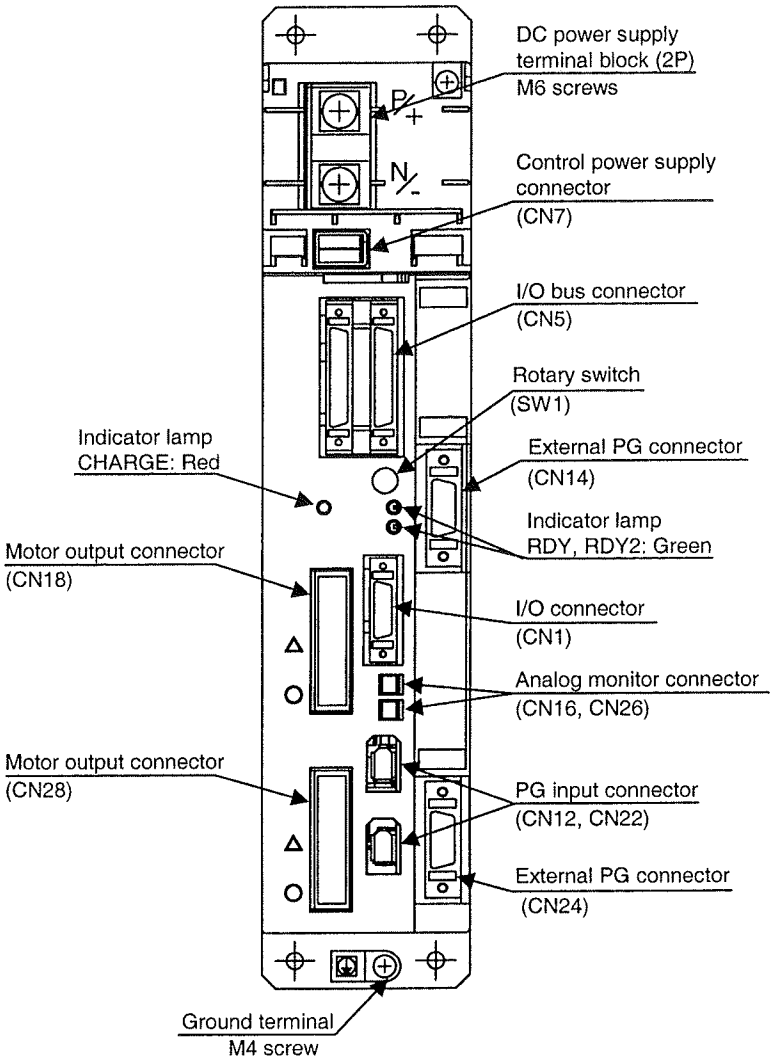
## ■ SGDK-05AEA (0.5kW), -10AEA (1 kW), -15AEA (1.5 kW), -20AEA (2 kW), -30AEA (3 kW)



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### 4.2.4 2-Axis Servo Unit

■ SGDK-0505AEA (0.5 kW), -1010AEA (1 kW), -1515AEA (1.5 kW), -2020AEA (2 kW) -3030AEA (3 kW)



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# 5

# Power Supply Connection

This section describes the power supply connection.

5.1 Converter Unit ..... 5-2
5.1.1 Power Supply Connection ..... 5-2
5.1.2 Wiring Specifications ..... 5-3
5.2 Power Supply ON/OFF Signal ..... 5-6

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# 5.1 Converter Unit

## 5.1.1 Power Supply Connection

The following figure shows the power supply connection for the Converter Unit.

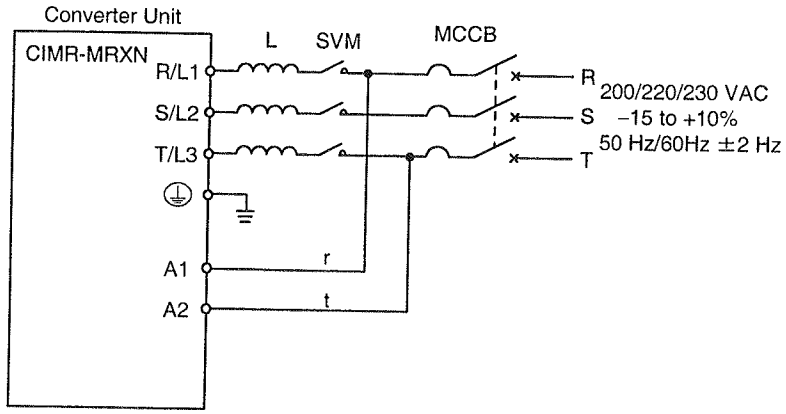



Fig. 5.1 Supplying Power to the Converter Unit

Table 5.1 Power Supply Specifications for Model Selection

| Converter model CIMR-MRXN2□□□ | Applicable capacity (kW) | Output capacity* (kW) | Power supply capacity (kVA) | Rated current (A) | | Reactor |
|---|---|---|---|---|---|---|
| | | | | Circuit breaker (MCCB) | Electromagnetic contactor (SVM) | Specification Code No. (L) |
| 3P7 | 3.7 | 2.2 | 7 | 30 | 20 | 10A 0.84 mH |
| | | 3.7 | | | | X10214 |
| 5P5 | 5.5 | 3.7 | 9 | 40 | 30 | 16A 0.56 mH |
| | | 5.5 | | | | X10215 |
| 7P5 | 7.5 | 5.5 | 12 | 50 | 40 | 23A 0.41 mH |
| | | 7.5 | | | | X10216 |
| 011 | 11 | 7.5 | 19 | 75 | 60 | 32A 0.28 mH |
| | | 11 | | | | X10217 |
| 015 | 15 | 11 | 24 | 100 | 75 | 46A 0.21 mH |
| | | 15 | | | | X10202 |
| 018 | 18.5 | 15 | 30 | 125 | 100 | 63A 0.17 mH |
| | | 18.5 | | | | X10203 |
| 022 | 22 | 18.5 | 36 | 150 | 125 | 77A 0.14 mH |
| | | 22 | | | | X10204 |
| 030 | 30 | 22 | 48 | 175 | 150 | 92A 0.10 mH |
| | | 30 | | | | X10205 |
| 037 | 37 | 30 | 60 | 250 | 200 | 120A 0.09 mH |
| | | 37 | | | | X010201 |
| 045 | 45 | 37 | 72 | 300 | 250 | 150A 0.07 mH |
| | | 45 | | | | X010199 |

* The output capacity is shown for two conditions.
Upper row: Continuous rating, Lower row: 50% ED

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## 5.1.2 Wiring Specifications

The following table shows the parts necessary for connecting the power line and control power source of the Converter.

| CIMR-MRXN20455A (45 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 8 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M10 | 17.7 to 22.5 | 50 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 30 |

| CIMR-MRXN20375A (37 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 8 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M10 | 17.7 to 22.5 | 30 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 30 |

| CIMR-MRXN20305A (30 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 4 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M8 | 8.9 to 10.7 | 22 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 22 |

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| CIMR-MRXN20225A (22 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 4 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M8 | 8.9 to 10.7 | 14 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 14 |

| CIMR-MRXN20185A (18.5 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 4 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M8 | 8.9 to 10.7 | 14 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 14 |

| CIMR-MRXN20155A (15 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 4 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M8 | 8.9 to 10.7 | 8 |
| A1/r, A2/t | M4 | 1.0 to 1.2 | 2 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 14 |

| CIMR-MRXN20115A (11 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 2 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M5 | 2.0 to 2.5 | 5.5 |
| A1/r, A2/t | M5 | 2.0 to 2.5 | 2 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

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| CIMR-MRXN27P55A (7.5 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 2 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M5 | 2.0 to 2.5 | 3.5 |
| A1/r, A2/t | M5 | 2.0 to 2.5 | 2 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

| CIMR-MRXN25P55A (5.5 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 2 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M5 | 2.0 to 2.5 | 3.5 |
| A1/r, A2/t | M5 | 2.0 to 2.5 | 2 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

| CIMR-MRXN23P75A (3.7 kW) | | | |
|---|---|---|---|
| Terminal symbol | Terminal screw | Screw tightening torque (N·m) | Recommended wire size 600-V cross-linked polyethylene wire (IC) 90°C ($mm^2$) |
| P/+, N/- | M6 × 2 | 2.94 | Use the special bus bar to connect. |
| R/L1, S/L2, T/L3 | M5 | 2.0 to 2.5 | 3.5 |
| A1/r, A2/t | M5 | 2.0 to 2.5 | 2 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

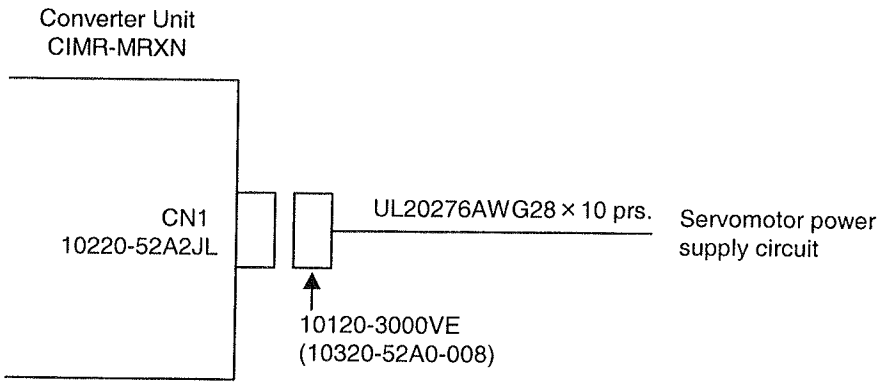
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# 5.2 Power Supply ON/OFF Signal

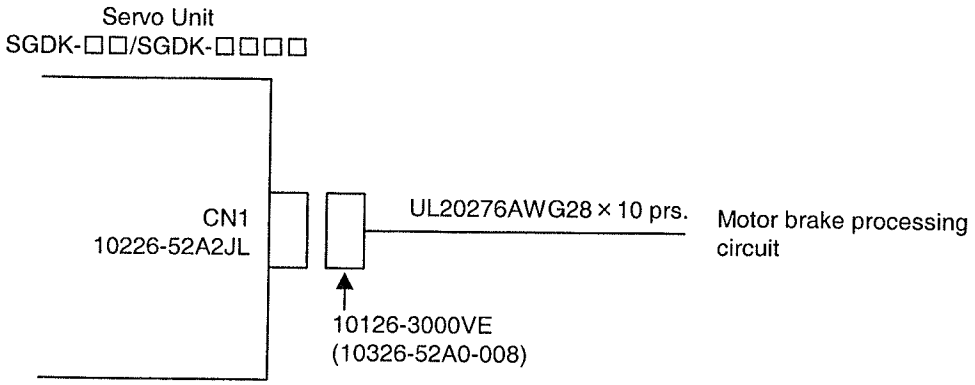
The connections for the Servomotor power supply ON (SVMX) output signal and brake release (BKX) output signal are shown below.

## ■ Connections Between Equipment

### Servomotor power supply ON (SVMX) output signal




### Brake release (BKX) output signal



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## ■ Detailed Connection Example

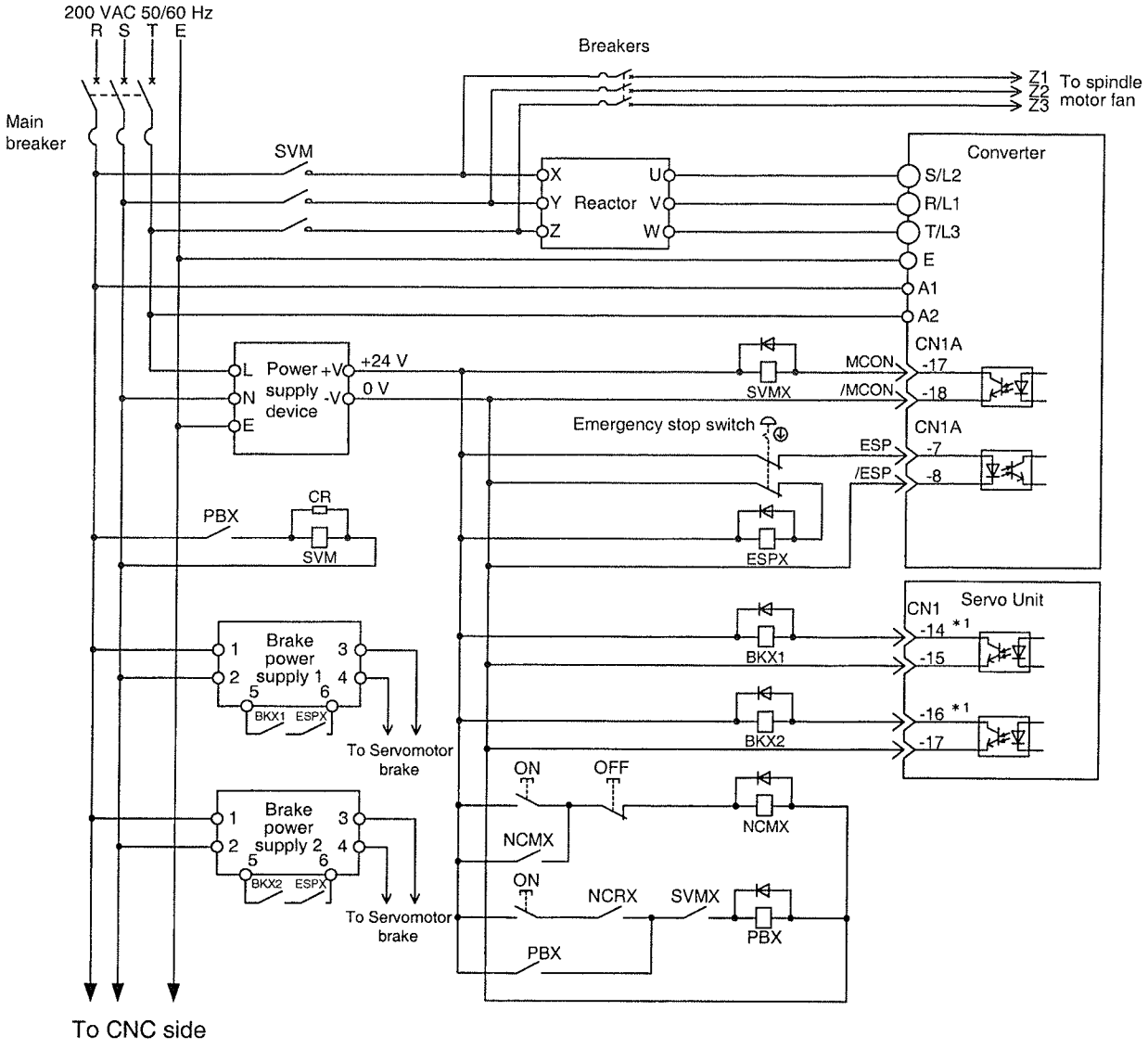



Fig. 5.2 Detailed Connection of SVMX Output Signal and BKK Output Signal

*1. The brake release output signal shown in the recommended circuit is an example of a 2-axis group Servo Unit.

- For a 1-axis Servo Unit, connect only to pins 14 and 15.
- For a 2-axis Servo Unit, connect the first axis to pins 14 and 15, and connect the second axis to pins 16 and 17.
- For a 3-axis Servo Unit, connect the third axis to pins 18 and 19.

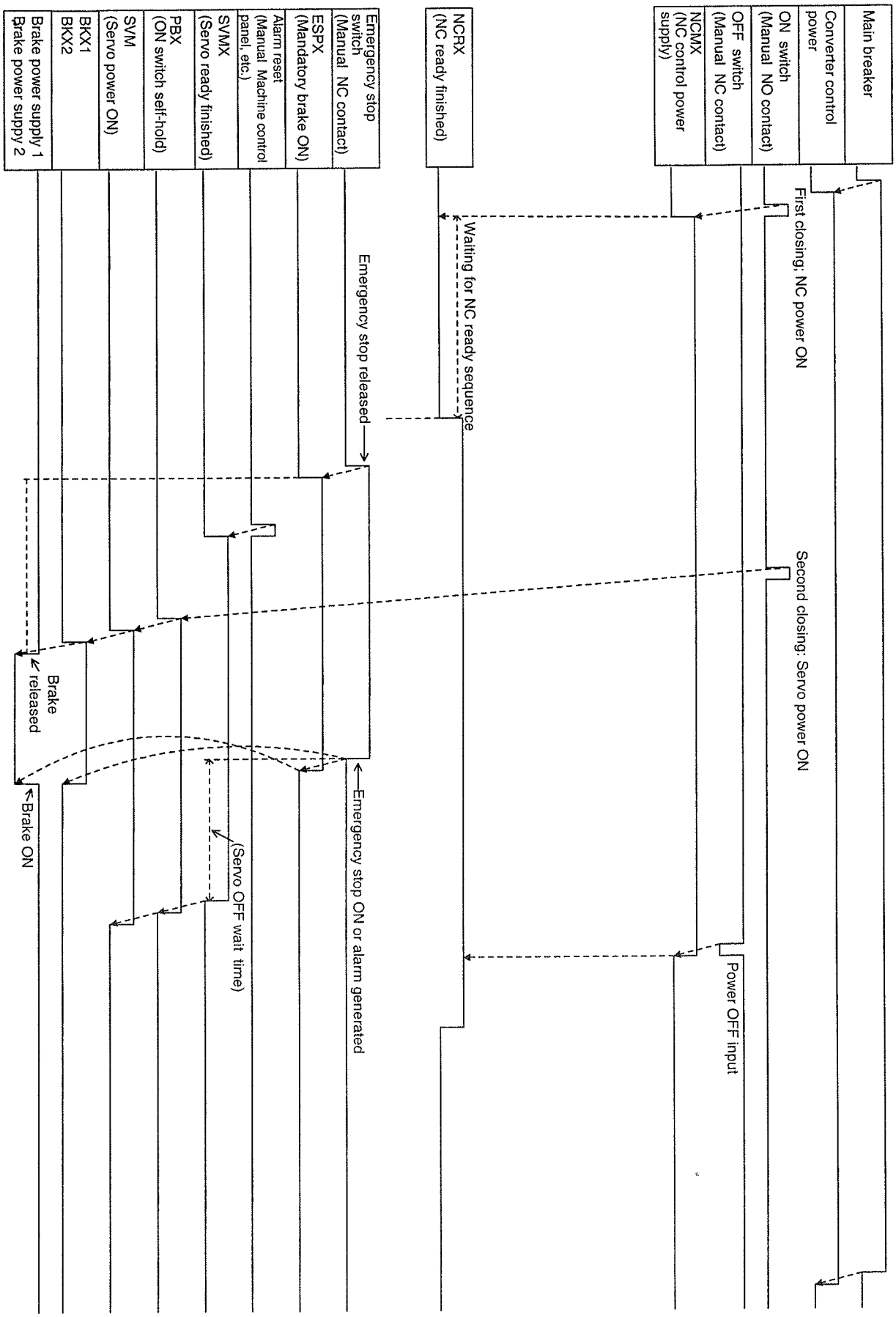
| Corresponding axis | Pin number |
|---|---|
| 1st axis | CN1-14 (+24-V Relay Coil)<br>CN1-15 (0 V) |
| 2nd axis | CN1-16 (+24-V Relay Coil)<br>CN1-17 (0 V) |
| 3rd axis | CN1-18 (+24-V Relay Coil)<br>CN1-19 (0 V) |

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- Use the signal from a Servo Unit connected to a motor with a brake for the brake release output signal.
- If necessary, add an interlock between the brake release output signal and BKX.
- The customer must supply the emergency stop switch.
- Use miniature relays (24-VDC) for the SVMX, ESPX, and BKX relays.
  Recommended product: OMRON LY-2

## ■ Power Supply ON/OFF Timing Chart




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# 6

# Peripheral Device Connections

This section describes the connections to the Drive Unit's peripheral equipment.


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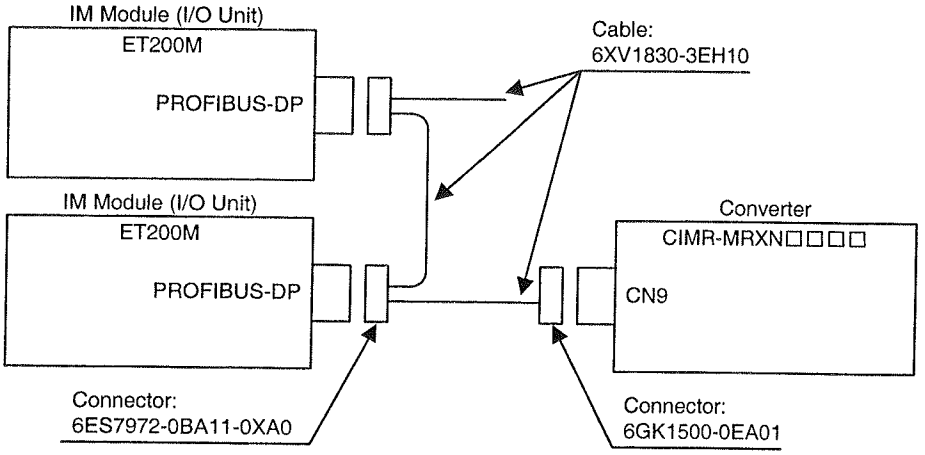
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# 6.1 PROFIBUS-DP

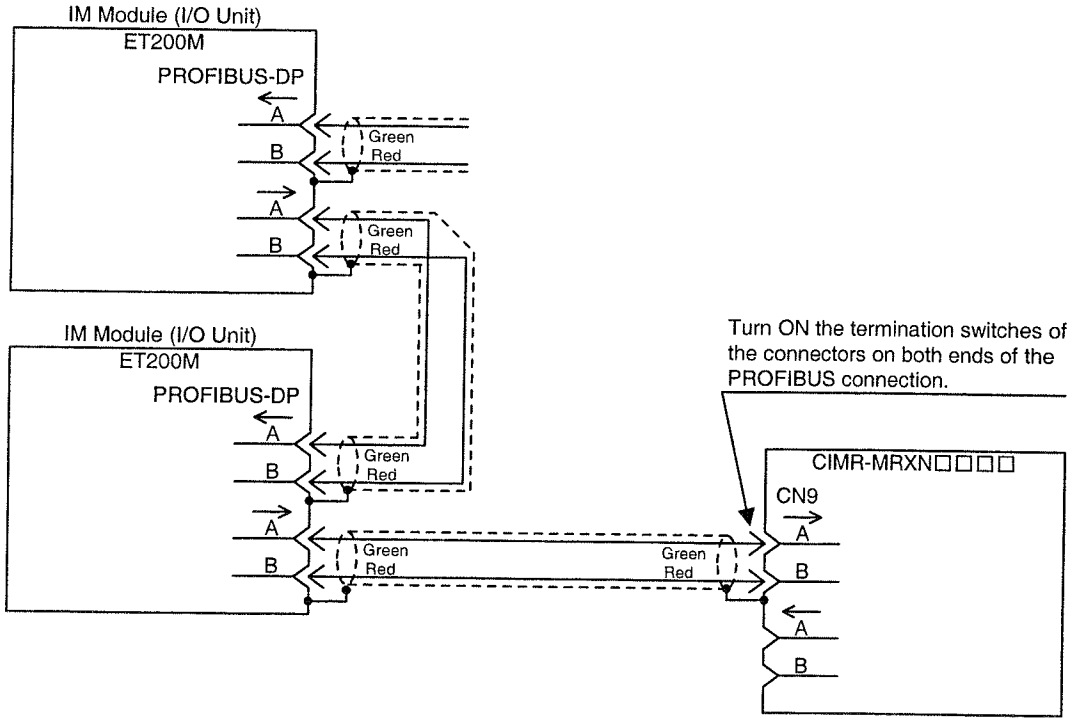
## 6.1.1 Connection between Machine Panel I/O, I/O, and Converter Unit

The following figure shows the connection of the IM Module (ET200M) and Converter Unit.

### ■ Connecting Betweeen Machines




### ■ Detailed Connection

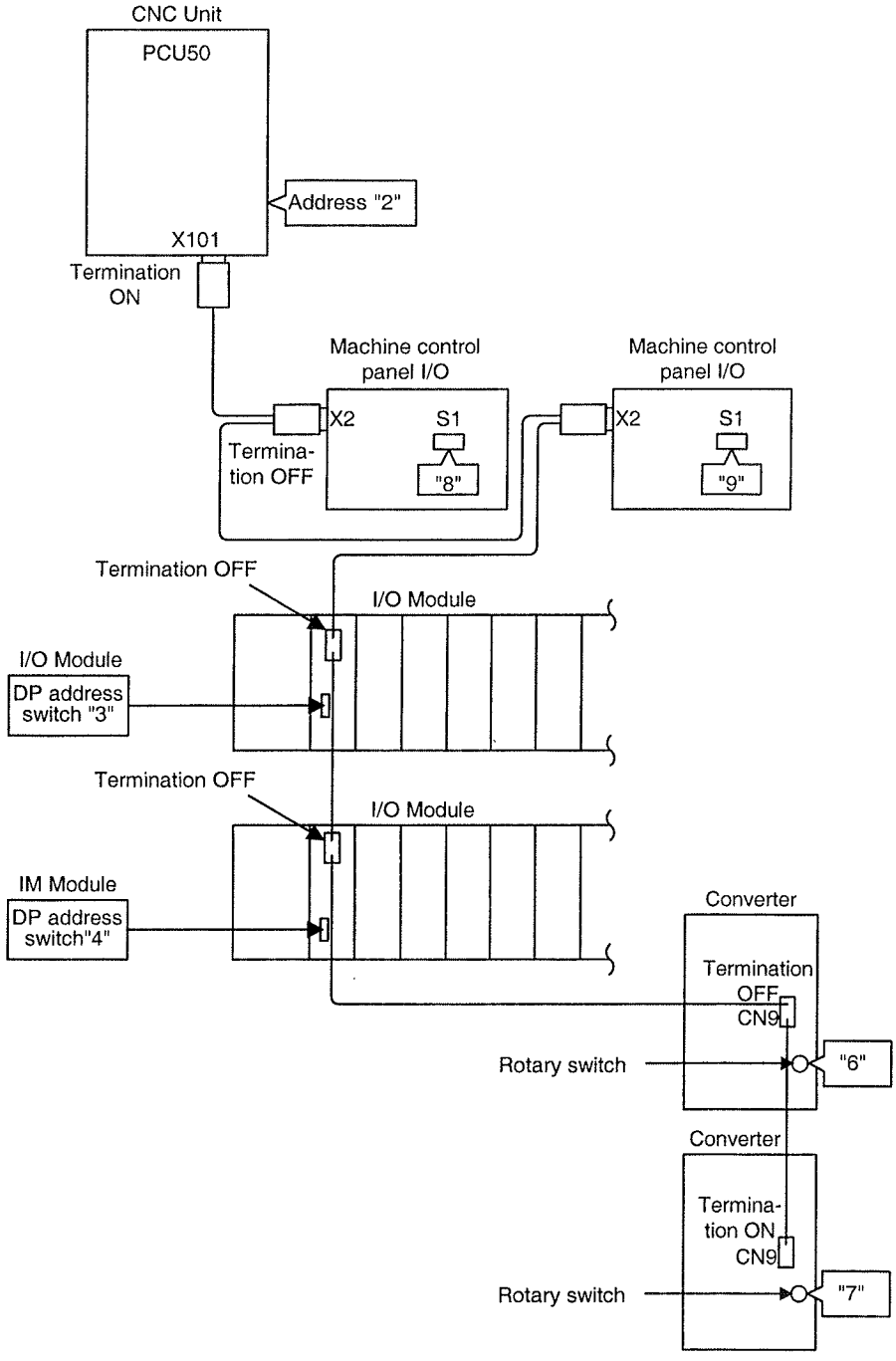


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## 6.1.2 PROFIBUS-DP Address and Termination Setting

The following figure shows examples of PROFIBUS-DP address and terminal settings.

### ■ Connection Example



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## ■ CNC Unit Address Setting

The CNC Unit address ("2") is fixed. There is no hardware setting.

## ■ Machine Control Panel I/O

Set DIP switch S1 on the circuit board to a setting between 3 and 32, making sure that it is not the same setting as any other unit.

## ■ I/O Module

Set the DP address switch (DIP switch) on the Interface Module (IM Module: ET200M) to a setting between 3 and 32, making sure that it is not the same setting as any other unit.

## ■ Converter

Set the DIP switch to a setting between 3 and 32, making sure that it is not the same setting as any other unit.

## ■ Termination Setting

Set the termination switch on the PROFIBUS-DP connector as shown in the table below.

| Device position | Termination switch setting |
|---|---|
| CNC Unit | ON |
| Units positioned in the middle | OFF |
| Units positioned at both ends | ON |

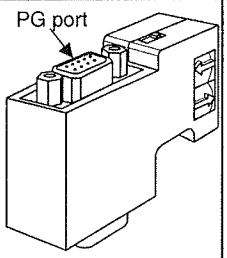
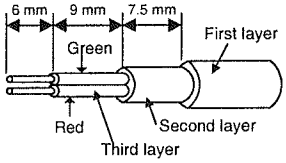
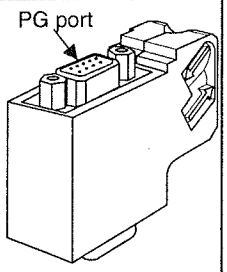
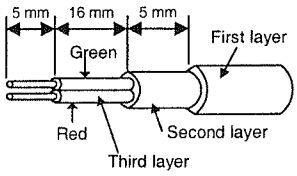
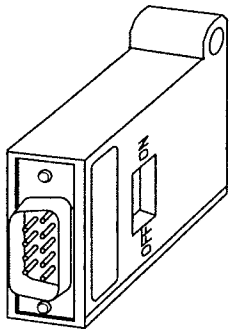
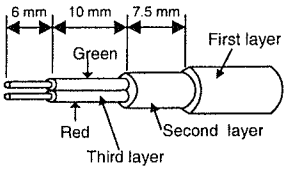



- Do not set any units to 0, 1, or 2 (except for the CNC).
- The maximum number of addresses for a PROFIBUS-DP used with the YS840DI is 32.
- Refer to the *YS840DI Maintenance Manual Serviceman Handbook* (NCSIE-SP02-19) for instructions on setting addresses by software.

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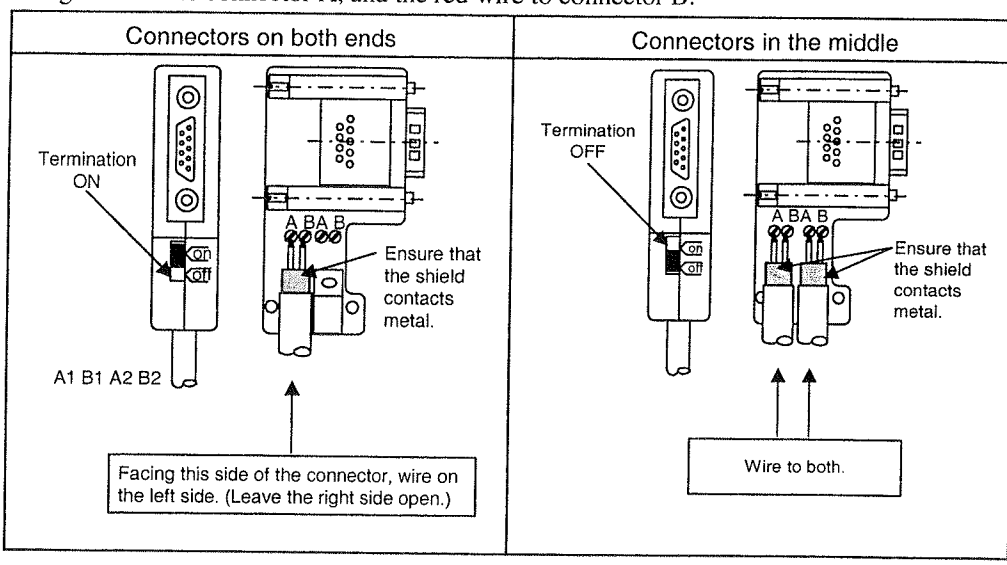
## 6.1.3 Wiring Specifications

The following table shows the cables and connectors to be used for PROFIBUS-DP connection.

| Type | Model | Configuration | Cable processing | Applicable equipment | Connector |
|---|---|---|---|---|---|
| Vertical wiring type | • 6ES7 972-0BA11-0XA0 without PG port<br>• 6ES7 972-0BB11-0XA0 with PG port |  | <br>6XV1830-3EH10 Cable | • CNC Unit<br>• Contro panel I/O<br>• ET200M | • X101<br>• X2<br>• PROFIBUS-DP |
| 35-degree wiring type | • 6ES7 972-0BA40-0XA0 without PG port<br>• 6ES7 972-0BB40-0XA0 with PG port |  | <br>6XV1830-3EH10 Cable | • CNC Unit<br>• Contro panel I/O<br>• ET200M | • X101<br>• X2<br>• PROFIBUS-DP |
| Horizontal wiring type | 6GK1 500-0EA0 |  | <br>6XV1830-3EH10 Cable | Converter | CN9 |

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There is one green third layer and one red third layer in the PROFIBUS-DP cable. Connect the green wire to connector A, and the red wire to connector B.




Note: This figure shows a vertical wiring type with no PG port as an example. The PG port is a connector that allows continuous, multiple PROFIBUS-DP connection. Ordinarily select types without the PG port.

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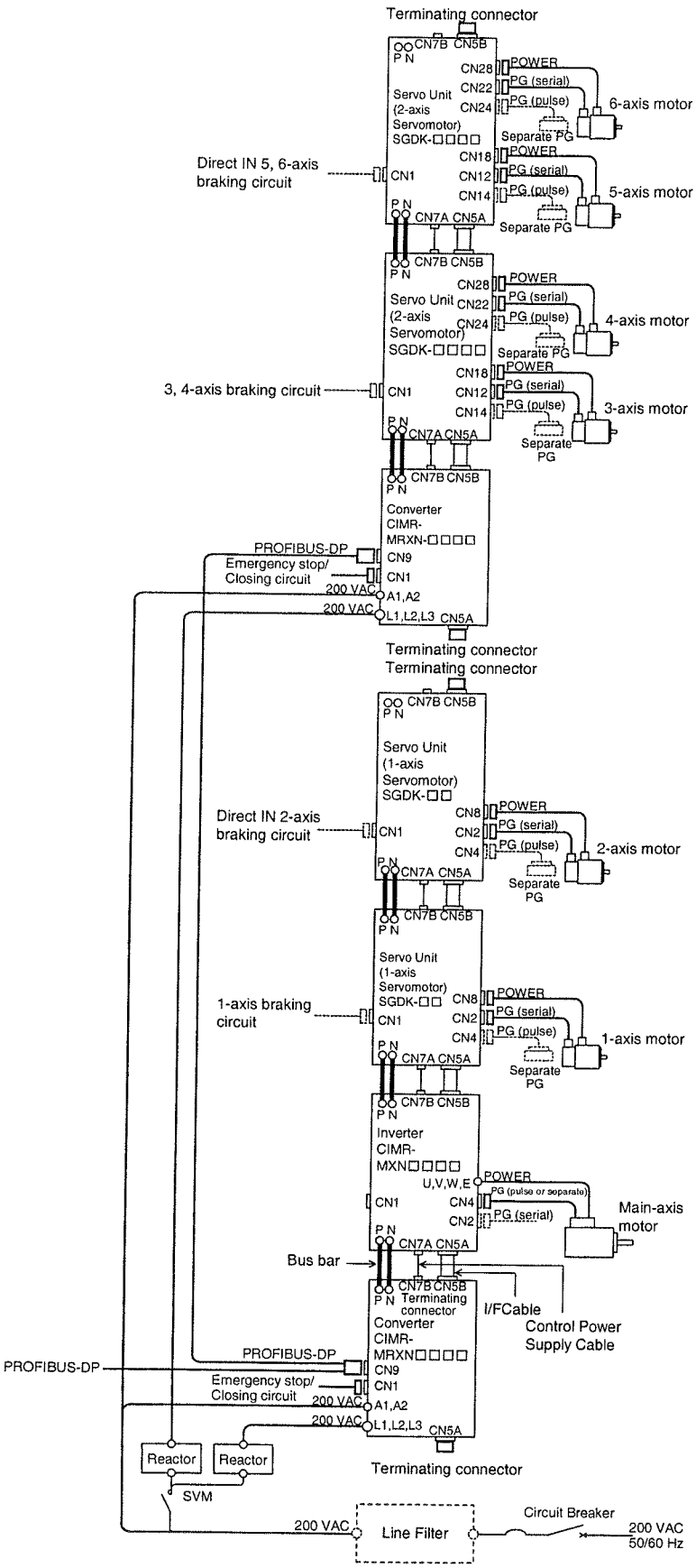
# 6.2 SERVOPACK

## 6.2.1 Connection between Devices

An example of a SERVOPACK (Servo Unit, Inverter, Converter) connection is given by the following connection diagram.

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### 6.2.1 Connection between Devices




INFO

Use cable clamp fittings to ground the outer shield coverings of the signal cables to the ground plate (for all signal cables except the PROFIBUS-DP cable).

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## 6.2.2 Detailed Connection

The following diagram shows the detailed SERVOPACK connection.

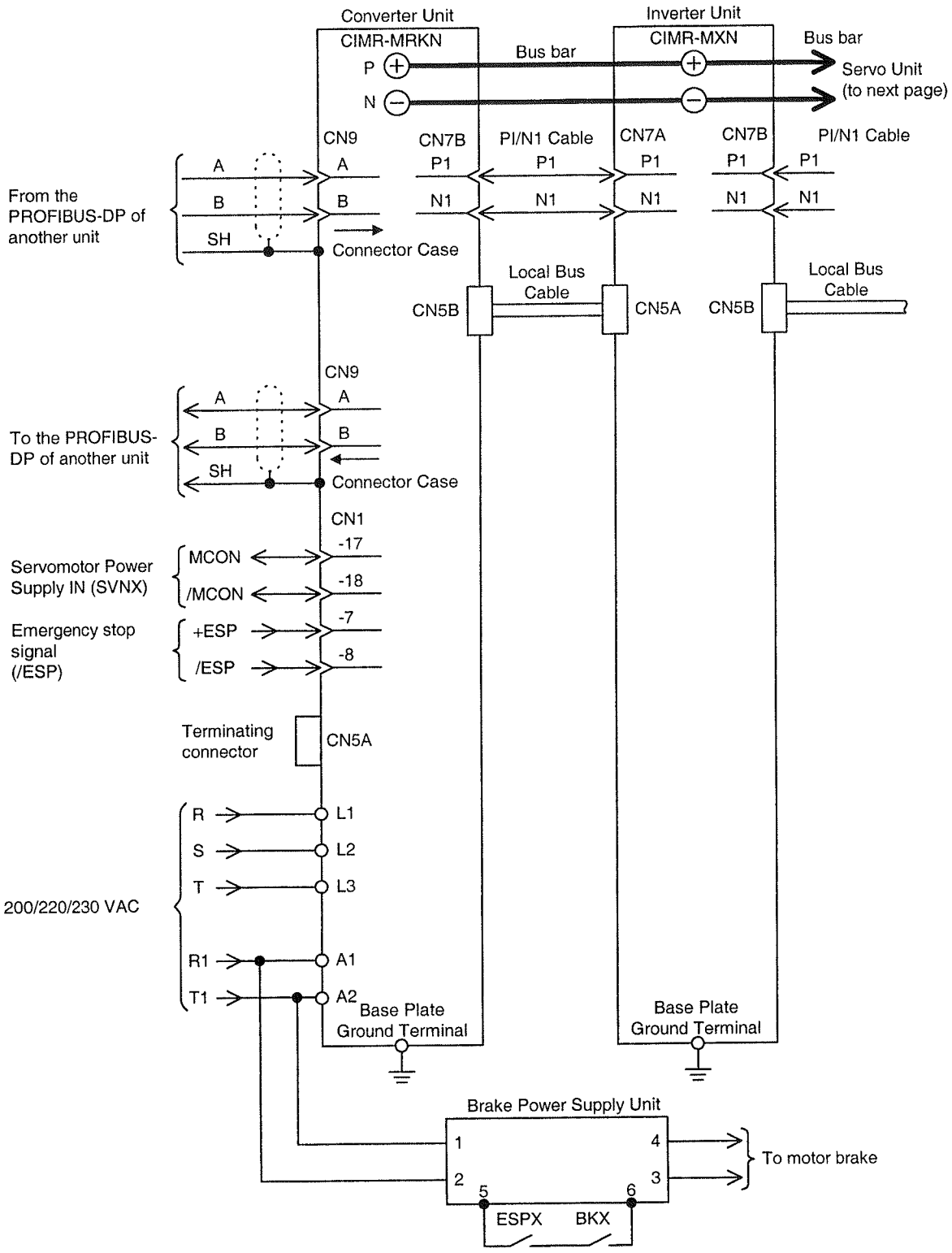
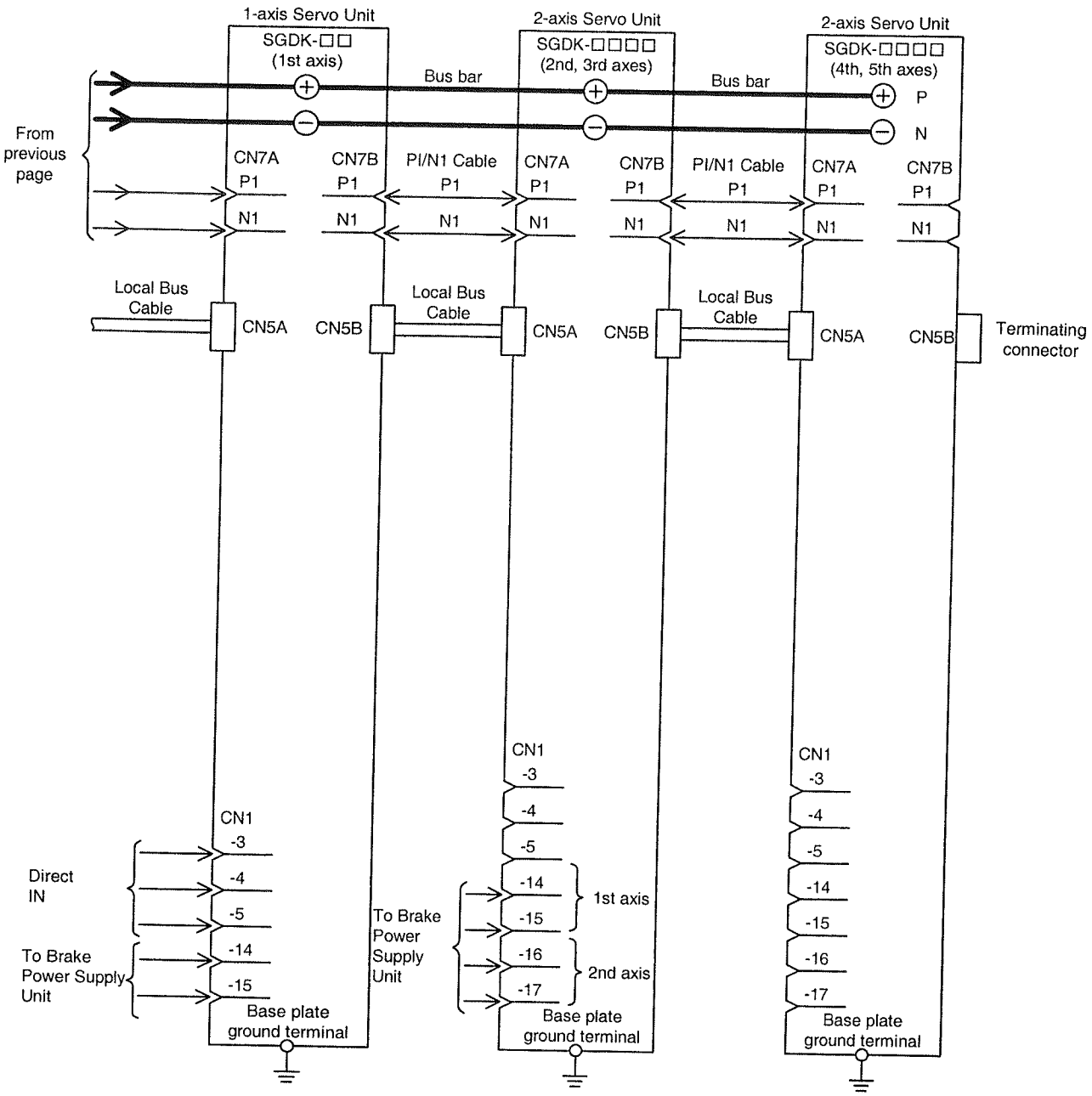



Fig. 6.1 Detailed Connection of CNC Unit and SERVOPACK

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Note: A brake release signal must be provided for Servo Units that are connected to brake-equipped motors.

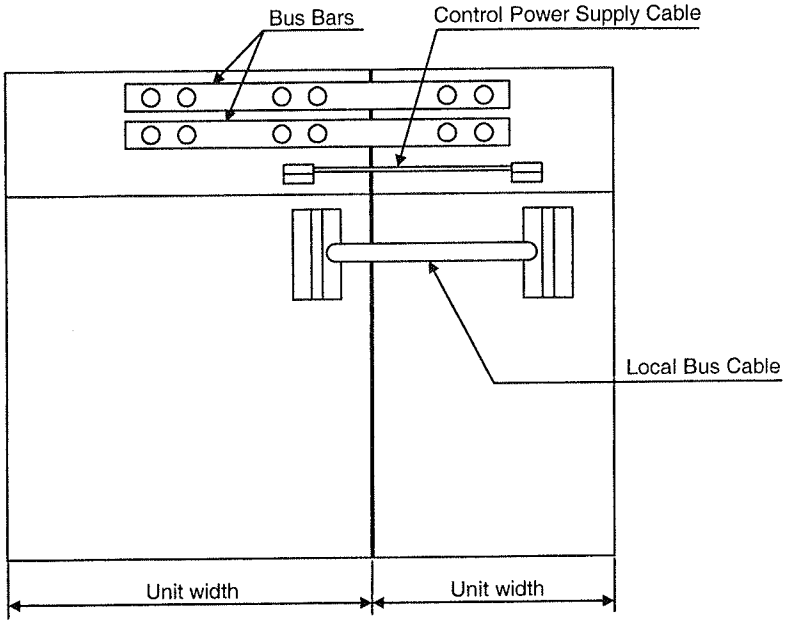
Fig. 6.2 Detailed Connection of CNC Unit and SERVOPACK

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## 6.2.3 Wiring Specifications

### ■ SERVOPACK Connection Parts

The SERVOPACK connection parts consist of special cables and bus bars for connecting the Converter Unit, Inverter Unit, and Servo Unit.



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Select from the table below to match the width dimension of the equipment being used.

| Connection parts | Unit width combination* | | Model |
|---|---|---|---|
| | Left-side unit width | Right-side unit width | |
| Bus Bar | For internal connection of 250-mm width unit | | JZSP-CGB02-1 |
| | 250 mm | 150 mm | JZSP-CGB02-2 |
| | | 75 mm | JZSP-CGB02-4 |
| | 150 mm | 150 mm | JZSP-CGB02-3 |
| | | 75 mm | JZSP-CGB02-5 |
| | 75 mm | 75 mm | JZSP-CGB02-6 |
| | 150 mm | 250 mm | JZSP-CGB02-7 |
| | 75 mm | 250 mm | JZSP-CGB02-8 |
| | | 150 mm | JZSP-CGB02-9 |
| Control Power Supply Cable<br>CN7A, CN7B | 250 mm | 150 mm | JZSP-CNB00-1 |
| | | 75 mm | JZSP-CNB00-2 |
| | 150 mm | 150 mm | JZSP-CNB00-1 |
| | | 75 mm | JZSP-CNB00-2 |
| | 75 mm | 75 mm | JZSP-CNB00-2 |
| | 150 mm | 250 mm | JZSP-CNB00-4 |
| | 75 mm | 250 mm | JZSP-CNB00-4 |
| | | 150 mm | JZSP-CNB00-1 |
| | For top/bottom connection (length 1 m) | | JZSP-CNB00-3 |
| Local Bus Cable<br>CN5A, CN5B | 250 mm | 150 mm | JZSP-CNS90-1 |
| | | 75 mm | JZSP-CNS90-2 |
| | 150 mm | 150 mm | JZSP-CNS90-1 |
| | | 75 mm | JZSP-CNS90-2 |
| | 75 mm | 75 mm | JZSP-CNS90-2 |
| | 150 mm | 250 mm | JZSP-CNS90-5 |
| | 75 mm | 250 mm | JZSP-CNS90-5 |
| | | 150 mm | JZSP-CNS90-1 |
| | For top/bottom connection (length 1 m) | | JZSP-CNS90-4 |
| Terminating Resistance Connector<br>CN5A, CN5B | ——— | ——— | JZSP-CNS90-9 |

* The unit widths given in this table are approximate.
The precise dimensions are as follows:
250 mm → 248 mm
150 mm → 148 mm
75 mm → 74 mm

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## ■ Common Connectors

Common connectors are those that can be used regardless of the capacity.

| Connector No. | Converter | Inverter | Servo Unit |
|---|---|---|---|
| CN1 | Connector: 10120-3000VE<br>Housing: 10320-52A0-008<br>(Mfd. by SUMITOMO 3M) | Connector: 10126-3000VE<br>Housing: 10326-52A0-008<br>(Mfd. by SUMITOMO 3M) | Connector: 10126-3000VE<br>Housing: 10326-52A0-008<br>(Mfd. by SUMITOMO 3M) |
| CN2<br>CN12<br>CN22 | ——— | JZSP-CMP9-1 (soldering)<br>(Mfd. by Yaskawa Siemens) | JZSP-CMP9-1 (soldering)<br>(Mfd. by Yaskawa Siemens) |
| CN4<br>CN14<br>CN24 | ——— | Connector: 10120-3000VE<br>Housing: 10320-52A0-008<br>(Mfd. by SUMITOMO 3M) | Connector: 10120-3000VE<br>Housing: 10320-52A0-008<br>(Mfd. by SUMITOMO 3M) |
| CN9 | 6GK1500-0EA01<br>(Mfd. by Yaskawa Siemens) | ——— | ——— |

## ■ Servomotor Power Connector (1-axis and 2-axis Servo Units)

The model number of the Servomotor Power Connector varies according to the capacity.

| Connector No. | 7.5 kW, 6 kW | 5 kW | 3 kW, 2 kW, 1.5 kW, 1 kW | 0.5 kW |
|---|---|---|---|---|
| Terminal block | U, V, W: M6<br>FG: M6 | ——— | ——— | ——— |
| CN8<br>CN18<br>CN28 | ——— | Connector: 1-917807-2<br>Contact: 1318697-6<br>(Mfd. by AMP) | Connector: 1-179958-4<br>Contact: 316041-2<br>(Mfd. by AMP) | Connector: 1-179958-4<br>Contact: 316040-2<br>(Mfd. by AMP) |

## ■ Servomotor Power Connector (3-axis Servo Unit)

| Connector No. | 1 kW, 0.5 kW |
|---|---|
| CN18<br>CN28<br>CN38 | Connector: 1-178128-4<br>Contact: 353717-2<br>(Mfd. By AMP) |

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## ■ Terminal Block Tightening Torque

The screw size and tightening torque for the P/+ and N/- terminals are the same for all SERVOPACKs.

Use the special bus bar for connection.

- Terminal screw size: M6
- Tightening torque: 2.94 N·m

The screw size, screw tightening torque, and recommended wire size for the terminal blocks of the Inverter and Servo Unit are as follows.

| Inverter CIMR-MXN20455A (45 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M10 | 17.7 to 22.5 | 60 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 30 |

| Inverter CIMR-MXN20375A (37 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M10 | 17.7 to 22.5 | 50 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 30 |

| Inverter CIMR-MXN20305A (30 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M8 | 8.9 to 10.7 | 38 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 22 |

| Inverter CIMR-MXN20225A (22 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M8 | 8.9 to 10.7 | 22 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 22 |

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| Inverter CIMR-MXN20185A (18 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M8 | 8.9 to 10.7 | 22 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 14 |

| Inverter CIMR-MXN20155A (15 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M8 | 8.9 to 10.7 | 14 |
| Motor FG terminal ⏚ | M6 | 4.0 to 4.9 | 14 |
| Ground terminal ⏚ | M6 | 4.0 to 4.9 | 14 |

| Inverter CIMR-MXN20115A (11 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M5 | 2.0 to 2.5 | 8 |
| Motor FG terminal ⏚ | M5 | 2.0 to 2.5 | 14 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

| Inverter CIMR-MXN27P55A (7.5 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | M5 | 2.0 to 2.5 | 5.5 |
| Motor FG terminal ⏚ | M5 | 2.0 to 2.5 | 14 |
| Ground terminal ⏚ | M5 | 2.0 to 2.5 | 8 |

| Inverter CIMR-MXN25P55A (5.5 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | Connector connection | - | 3.5 |
| Motor FG terminal ⏚ | Connector connection | - | 8 |
| Ground terminal ⏚ | M4 | 1.0 to 1.2 | 8 |

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| Inverter CIMR-MXN23P75A (3.7 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V cross-linked polyethelene wire (IC) 90°C ($mm^2$) |
| U/T1, V/T2, W/T3 | Connector connection | - | 3.5 |
| Motor FG terminal ⏚ | Connector connection | - | 8 |
| Ground terminal ⏚ | M4 | 1.0 to 1.2 | 5.5 |

| Servo Unit SGDK-75AEA (7.5 kW), -60AEA (6.0 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | M6 | 3.1 | 14 |
| Ground terminal ⏚ | M6 | 3.1 | 2 |

| Servo Unit SGDK-50AEA (5.0 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 5.5 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

| Servo Unit SGDK-30AEA (3.0 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 5.5 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

| Servo Unit SGDK-20AEA (2.0 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 3.5 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

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| Servo Unit SGDK-15AEA (1.5 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 3.5 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

| Servo Unit SGDK-10AEA (1.0 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 3.5 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

| Servo Unit SGDK-05AEA(0.5 kW) | | | |
|---|---|---|---|
| Terminal code | Terminal screw | Screw tightening torque (N·m) | Recommended wire size |
| | | | 600-V special heat-resistant vinyl wire (HIV) 75°C ($mm^2$) |
| U, V, W, FG | Connector connection | - | 2 |
| Ground terminal ⏚ | M4 | 1.1 | 2 |

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## 6.2.4 Setting Inverter and Servo Unit Rotary Switches

Each Servo Unit and Inverter is equipped with a rotary switch for setting the PROFIBUS slot information. Set these switches as described below.

- Set one number per axis, starting with 0 and increasing in order.
- When using a Servo Unit with two axes, numbers are required for the two axes, but there is only one rotary switch. In this case, setting the number "2," for example, will take up both numbers 2 and 3. Accordingly, set the next unit to number "4." Also, set the rotary switches for Servo Units with two axes to even numbers (0, 2, 4, etc.).
- Numbers from 0 to 6 can be set for the units connected to one Converter. As long as the numbers are not duplicated, the units do not have to be positioned so that the numbers of the rotary switches are in order.




When a setting is incorrect, the LED on the PROFIBUS connector of the Converter will illuminate in red. When the setting is correct, this LED illuminates in green.

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# 6.3 Servomotor

## ■ For Motors with a Built-in Encoder

This is the same for incremental and absolute encoders.

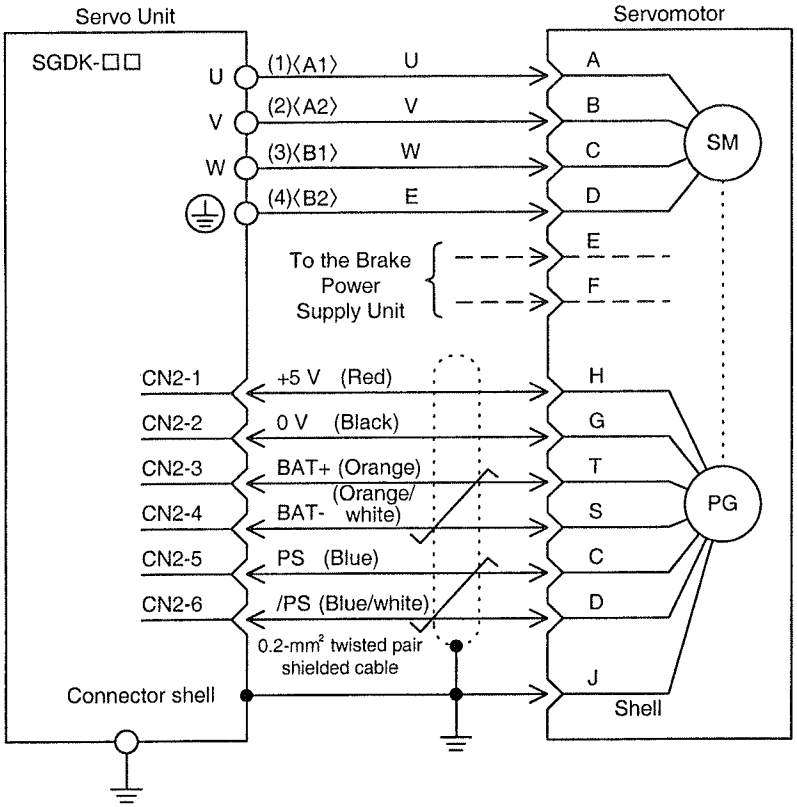



Fig. 6.3 Servomotor Connection (for Motors with a Built-in Encoder)

For Servomotors with a holding brake, connect the cable from the Brake Power Supply Unit to the connector E and F terminals on the motor.

---

INFO

The numbers inside parentheses ( ) are for connector type Servo Units of 3 kW or less.

The numbers inside angle brackets 〈 〉 are for connector type 5-kW Servo Units.

For detailed information, refer to *A.1 Servomotor Main Circuits Cables*.

---

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## ■ For Separate Feedback Units

The following wiring is necessary when connecting separate Feedback Units.

This is restricted, however, to Yaskawa Feedback Units of the same specifications.

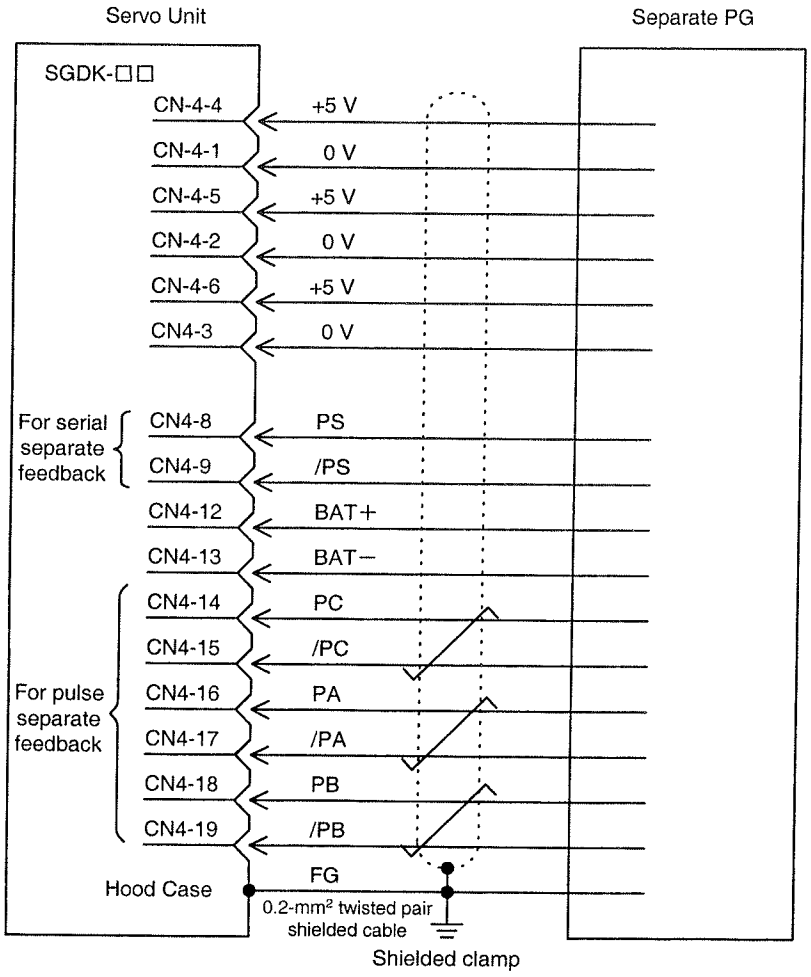



Fig. 6.4 Servomotor Connection (for Separate Feedback Units)

INFO

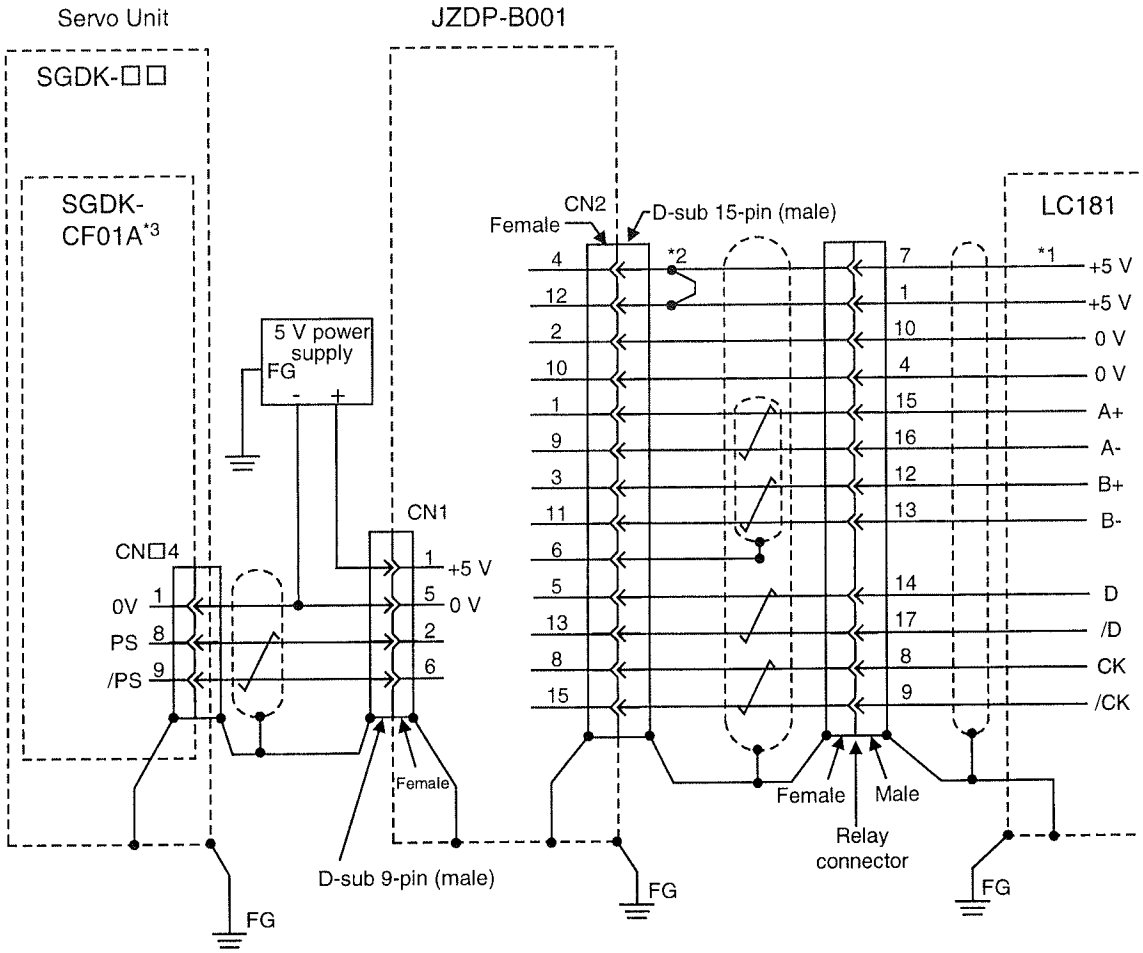
- Only one type of separate PG, serial or pulse, can be connected.
- For 2-axis Servo Units, the connection is CN14 or CN24.

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## ■ Connection Example for EnDat Interface Separate Feedback Unit

This is an example of using the JZDP-B001 Serial Conversion Unit supplied by Yaskawa to connect the LC181 shielded type absolute length measurement system manufactured by Heidenhain.

For information on the relay connector between the JZDP-B001 and the LC181, refer to the LC181 data.




*1. The +5V is JZDP-B001, LC181 input, and must be between 4.75 V and 5.25 V.
Select cables that will suit the current consumption of 300 mA for the JZDP-B001 and 300 mA for the LC181.

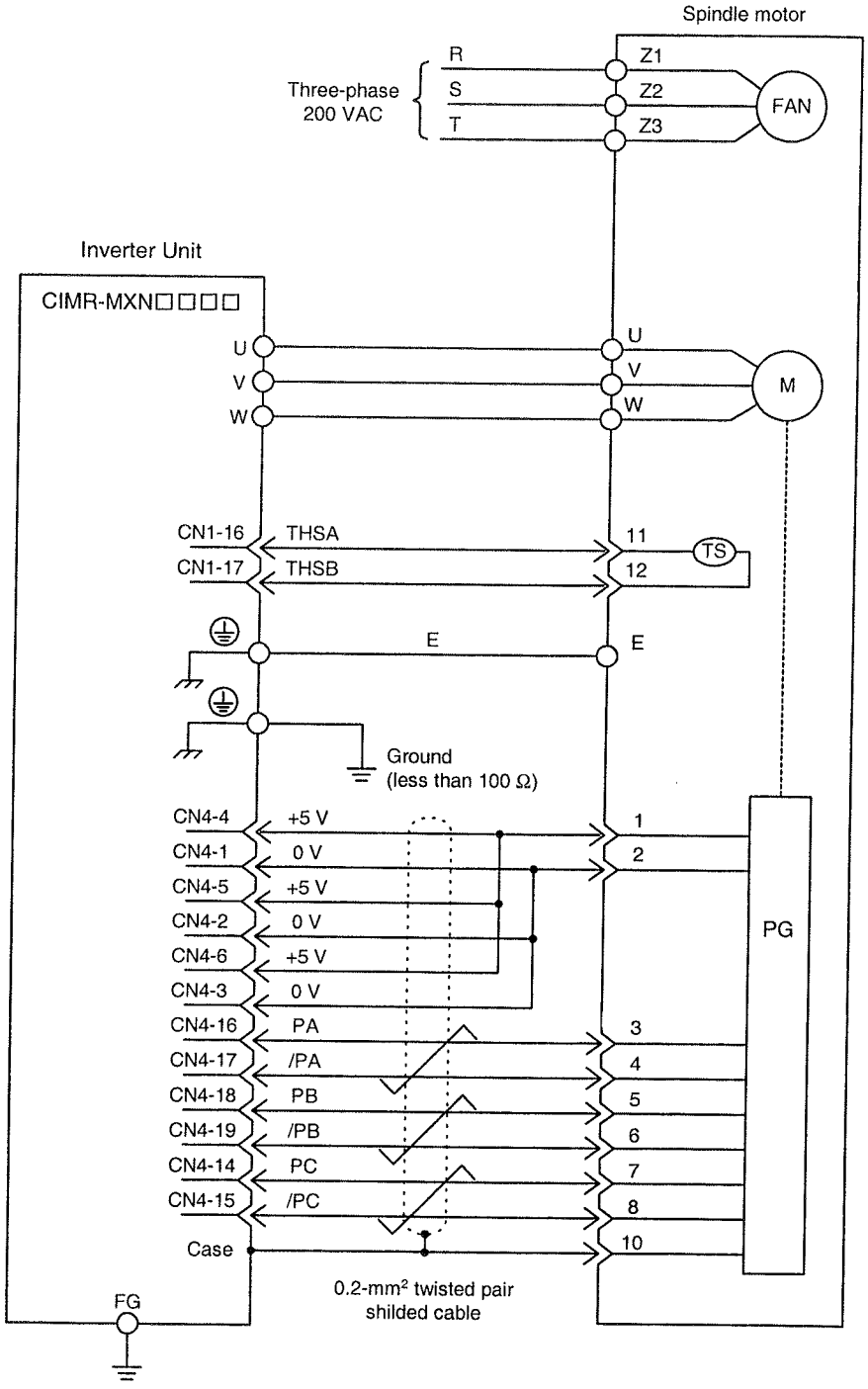
*2. Short-circuit pins 4 and 12 of CN2 inside the JZDP-B001 connector.

*3. External PG card (Optional)

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# 6.4 Spindle Motor

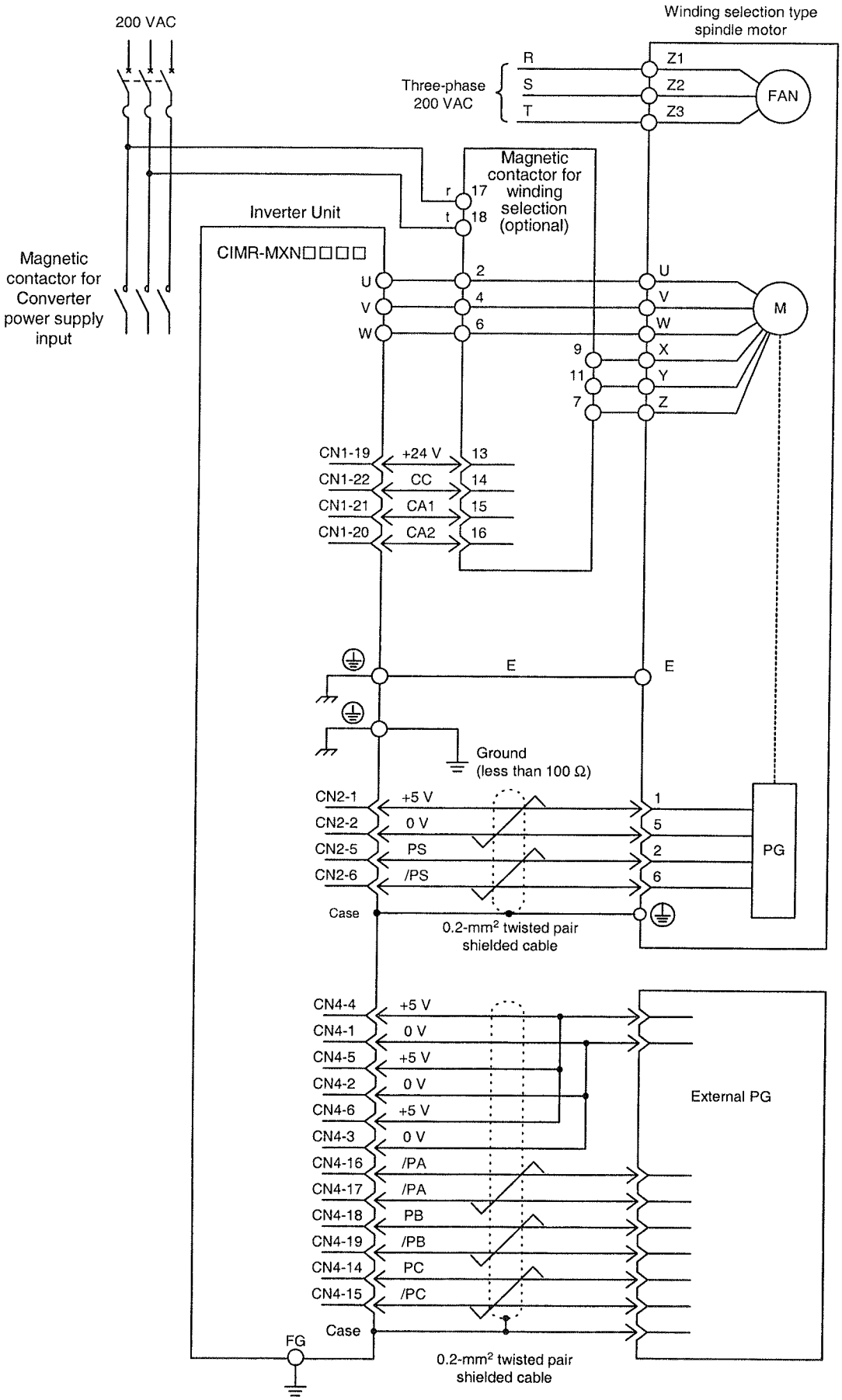
## 6.4.1 Motor Pulse Encoder Connection




INFO Wire the cable shield to the connector case, and be sure to leave CN4-7 and CN4-20 open.

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## 6.4.2 Connection between Motor Serial Encoder and External PG



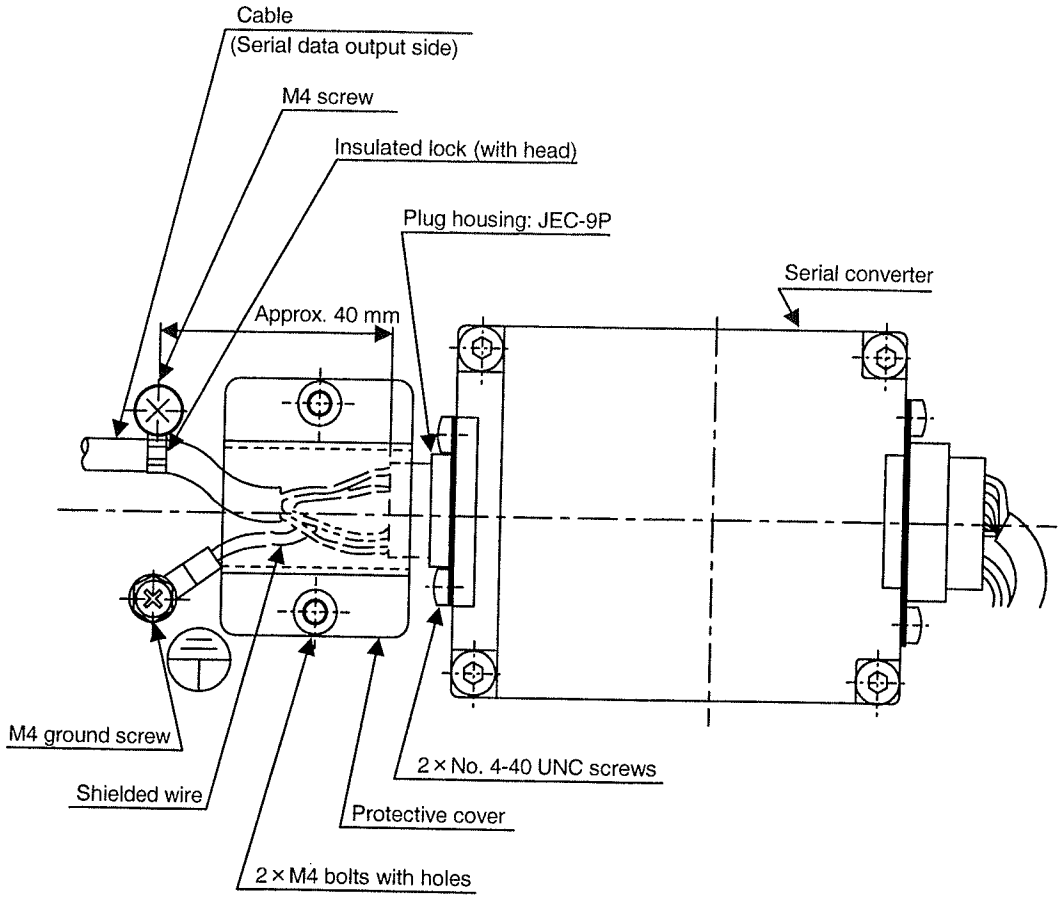
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INFO

- Wire the cable shield to the connector case, and be sure to leave CN4-7 and CN4-20 open.
- Do not connect the power supply for switchable winding (r, t) to the secondary side of the electromagnetic contactor used for the Converter power supply input.

## 6.4.3 Serial Encoder Connection in the Motor Terminal Box

The manufacturing specifications for the motor-side connector on the cable for the serial encoder built into the motor, and the connection method inside the spindle terminal box are shown below.




*1. When tightening the No. 4-40 UNC screws, the location makes it difficult to insert the screwdriver. Be careful not to tighten at an angle.

*2. When securing the cable with the insulated lock, do not apply force to the cable or the connection part of the plug housing.

Note 1. Make sure that the signal wires and shielded wires are not pinched in the protective cover edge.

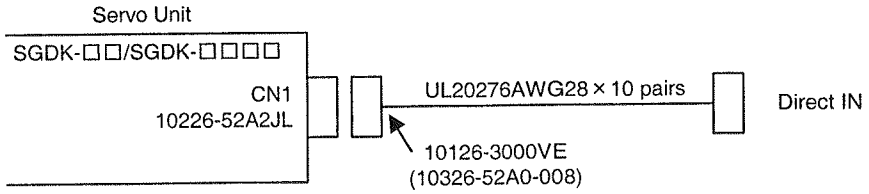
2. The standing depth of the M4 screw is 7 mm.

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# 6.5 Direct IN Signal

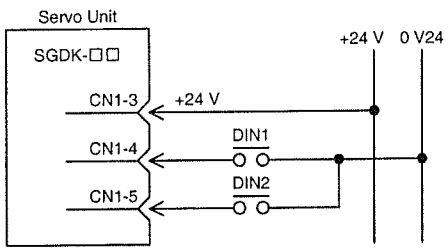
The Direct IN signal can be used for two input signals.
Connect the Direct IN signal to only one of the Servo Units.
If the Direct IN signal is connected to multiple Servo Units, it will not function correctly.
The use of shielded cables is recommended.

## ■ Connection between Equipment

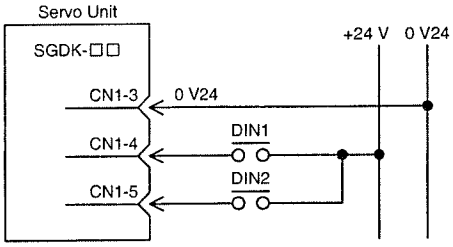



## ■ Detailed Connection

### Servo Unit




24-V common connection




0-V common connection

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# A

# Cable Assembly

A.1 Servomotor Main Circuit Cables ..... A-2
A.2 Servomotor Encoder Cables ..... A-5
A.3 Servomotor Connectors ..... A-8
A.4 Servo Unit/External Pulse Encoder Cables ..... A-12
A.5 Spindle Motor Cable ..... A-14
A.6 Spindle Motor Encoder Connectors ..... A-16

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# A.1 Servomotor Main Circuit Cables

## ■ Recommended Wire Size

| Servomotor capacity SGMKS- | Power cable (U, V, W, E) | Brake cable |
|---|---|---|
| 05 | HIV 2.0 $mm^2$ or larger | HIV1.25 $mm^2$ or larger |
| 09 | HIV 3.5 $mm^2$ or larger | |
| 13 | | |
| 20 | | |
| 30 | HIV 5.5 $mm^2$ or larger | |
| 44 | | |
| 55 | HIV 14 $mm^2$ or larger | |
| 75 | | |

Note 1. Wire size selection conditions: Rated current flowing to the three lead wires at an ambient temperature of 40°C.

2. Use special heat-resistant vinyl wire for the motor power line.
Because ordinary vinyl wire quickly deteriorates when the ambient temperature (panel interior temperature) is high, it becomes unusable in a relatively short time.

3. When bundling wires and placing them into a hard vinyl tube or metal duct, the reduction rate of the wires' allowable current must be considered.

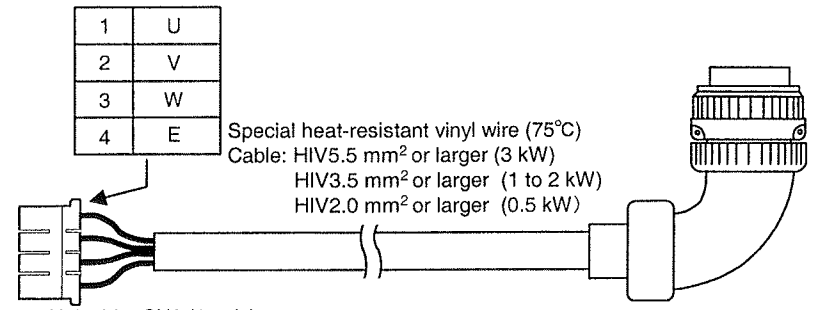
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## ■ 0.5- to 3.0-kW Cables

Use for the following Servo Units.

| 1-axis | 2-axis | 3-axis |
|---|---|---|
| SGDK-05AEA (0.5 kW) | SGDK-0505AEA (0.5 kW) | SGDK-050505AEA (0.5kW) |
| SGDK-10AEA (1.0 kW) | SGDK-1010AEA (1.0 kW) | SGDK-101010AEA (1.0 kW) |
| SGDK-15AEA (1.5 kW) | SGDK-1515AEA (1.5 kW) | — |
| SGDK-20AEA (2.0 kW) | SGDK-2020AEA (2.0 kW) | — |
| SGDK-30AEA (3.0 kW) | SGDK-3030AEA (3.0 kW) | — |

Use one of the following cables per motor.



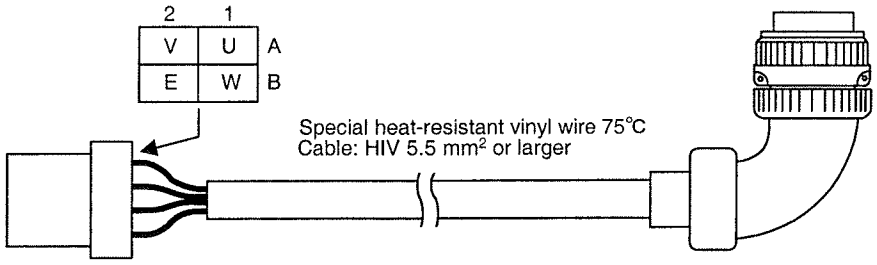

| | |
|---|---|
| Plug connector | 1-179958-4 (AMP) |
| Contact | 316041-2 (1 to 3 kW)<br>316040-2 (0.5 kW) |

Refer to *A.3 Servomotor Connectors* for details about the motor side.

Servo Unit side: CN18, CN28, CN38 (3-axis)

| | |
|---|---|
| Plug connector | 1-178128-4 (AMP) |
| Contact | 353717-2 |

## ■ SGDK-50AEA (5-kW) Cable



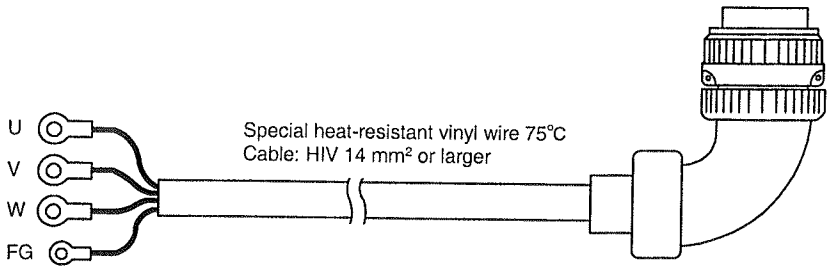

Servo Unit side: CN8 (1-axis)

| | |
|---|---|
| Plug connector | 1-917807-2 (AMP) |
| Contact | 1318697-6 |

Refer to *A.3 Servomotor Connectors* for details about the motor side.

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## ■ SGDK-60AEA (6-kW), SGDK-75AEA (7.5-kW) Cable




Servo Unit side

| | |
|---|---|
| U, V, W terminal | M6 crimp terminal |
| FG terminal | M6 crimp terminal |

Refer to *A.3 Servomotor Connectors* for details about the motor side.

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# A.2 Servomotor Encoder Cables

The encoder cable serves to connect the encoder that is installed on the motor with the Servo Unit.

The model numbers and appearances of the encoder cables are shown below. Provide the model number when purchasing cables.

## ■ Cables with Connectors on Both Ends for the Servo Unit and Servomotor Sides

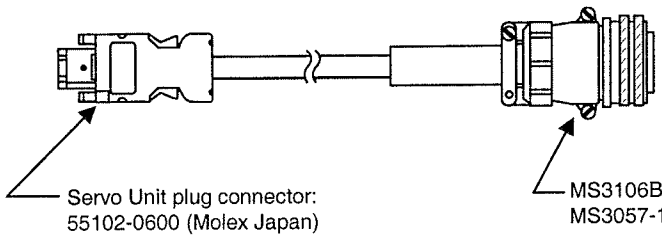
The cable model numbers are listed in the following table.

Cables with Connectors on Both Ends for the Servo Unit and Servomotor Sides

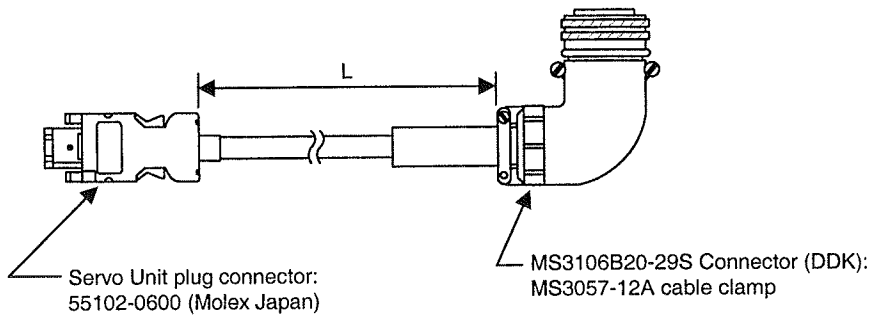
| Applicable Servomotor | | Cable model | Length (L) |
|---|---|---|---|
| SGMKS Servomotor | With straight plug | JZSP-CMP01-03 | 3 m |
| | | JZSP-CMP01-05 | 5 m |
| | | JZSP-CMP01-10 | 10 m |
| | | JZSP-CMP01-15 | 15 m |
| | | JZSP-CMP01-20 | 20 m |
| | With L-shaped plug | JZSP-CMP02-03 | 3 m |
| | | JZSP-CMP02-05 | 5 m |
| | | JZSP-CMP02-10 | 10 m |
| | | JZSP-CMP02-15 | 15 m |
| | | JZSP-CMP02-20 | 20 m |

External dimensions are shown below.

• Servomotor cable with straight plug




• Servomotor cable with L-shaped plug



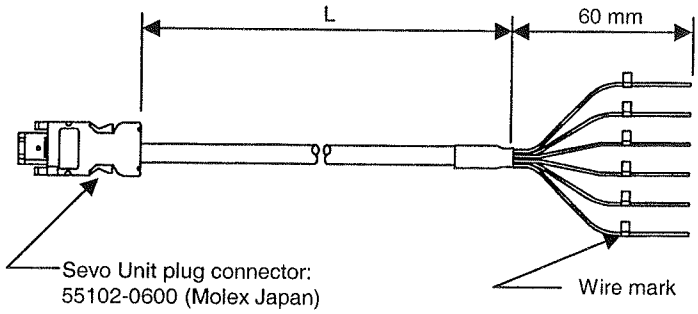
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## ■ Cables for Servo Unit (with Connector) and Encoder (Split Lead)

Types of Cables for Servo Unit (with Connector) and Encoder (Split Lead)

| Cable model | Length (L) |
|---|---|
| JZSP-CMP03-03 | 3 m |
| JZSP-CMP03-05 | 5 m |
| JZSP-CMP03-10 | 10 m |
| JZSP-CMP03-15 | 15 m |
| JZSP-CMP03-20 | 20 m |

External dimensions are shown below.

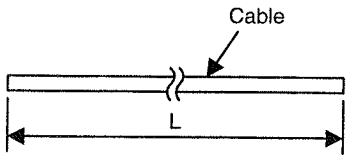



## ■ Cable Wire Material

The types and specifications of encoder cable wire material are described below. Types and model numbers are given in the following table.

Table A.1 Types of Cable Wire Material

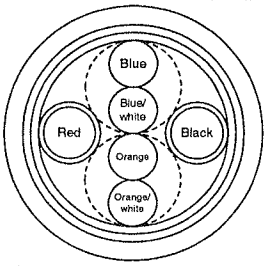
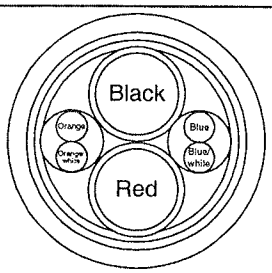
| Cable type | Cable model | Length (L) |
|---|---|---|
| Standard encoder cables<br>For wiring lengths of up to 20 m | JZSP-CMP09-05 | 5 m |
| | JZSP-CMP09-10 | 10 m |
| | JZSP-CMP09-15 | 15 m |
| | JZSP-CMP09-20 | 20 m |
| 50-m encoder cables<br>For wiring lengths of up to 50 m | JZSP-CMP19-30 | 30 m |
| | JZSP-CMP19-40 | 40 m |
| | JZSP-CMP19-50 | 50 m |



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The applicable cable specifications are listed in the table below for encoder cables (wire material). These cables are not supplied with the SERVOPACK or Servomotor. They must be purchased separately.

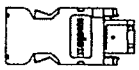
Table A.2 Applicable Cable Specifications

| Cable specifications | Wiring length: 20 m (max.) | Wiring length: 50 m (max.) |
|---|---|---|
| General specifications | T/20276-SB<br>AWG22 × 2C + AWG24 × 2P | T/20276-SB<br>AWG16 × 2C + AWG26 × 2P |
| Finished shape | 6.8-mm dia. | 6.8-mm dia. |
| Inner construction and lead colors |  |  |
| Standard length | 5 m, 10 m, 15 m, 20 m | 30 m, 40 m, 50 m |

## ■ Connector Kit

This part is for connecting the encoder of the Servo Unit or Servomotor.

Table A.3 Connector Kit Type

| Type | Connector Kit model | Connector Kit part |
|---|---|---|
| Plug (solder type) for the Servo Unit encoder connector (CN2) | JZSP-CMP9-1 |  |

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# A.3 Servomotor Connectors

## ■ Servomotor Connectors

There are two types of detector and motor connectors: the standard connector and the IP67 connector. The standard connector is not splash resistant.
The connectors also vary for Servomotors without holding brake and Servomotors with holding brake.

### Standard Connectors (without brake)

Table A.4 SGMKS Connectors for Servomotors without Brake

| Applicability | | | Receptacle | L-shaped plug* | Straight plug* | Cable clamp* |
|---|---|---|---|---|---|---|
| Main circuit connectors | Motor model number SGMKS- | 05A□A<br>09A□A<br>13A□A | MS3102A18-10P | MS3108B18-10S | MS3106B18-10S | MS3057-10A |
| | | 20A□A<br>30A□A<br>44A□A | MS3102A22-22P | MS3108B22-22S | MS3106B22-22S | MS3057-12A |
| | | 55A□A<br>75A□A | MS3102A32-17P | MS3108B32-17S | MS3106B32-17S | MS3057-20A |
| Encoder connectors | | | MS3102A-29P | MS3108B20-29S | MS3106B20-29S | MS3057-12A |

Motor side / Cable side

* A cable clamp and either an L-shaped plug or a straight plug must be provided by the customer.

### Standard Connectors (with brake)

Table A.5 SGMKS Connectors for Servomotors with Brake

| Applicability | | | Receptacle | L-shaped plug* | Straight plug* | Cable clamp* |
|---|---|---|---|---|---|---|
| Main circuit connectors | Motor model number SGMKS- | 05A□A<br>09A□A<br>13A□A | MS3108B18-10P | MS3108B20-15S | MS3106B20-15S | MS3057-12A |
| | | 20A□A<br>30A□A<br>44A□A | MS3102A24-10P | MS3108B24-10S | MS3106B24-10S | MS3057-16A |
| Encoder connectors | | | MS3102A-29P | MS3108B20-29S | MS3106B20-29S | MS3057-12A |

Motor side / Cable side

* A cable clamp and either an L-shaped plug or a straight plug must be provided by the customer.

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## IP67 Connectors (without brake)

Table A.6 SGMKS Connectors for Servomotors without Brake

| Applicability | | | Receptacle model | Plug-only model*3 | End Bell or Back Shell *1, *3 | | Cable clamp model*3 | Manufacturer |
|---|---|---|---|---|---|---|---|---|
| | | | | | Angle (L-shaped) model | Straight model | | |
| Main-circuit connectors | Motor model number SGMKS- | 05A□A<br>09A□A<br>13A□A | CE05-2A18-10PD | MS3106A18-10S (D190) | CE-18BA-S | CE02-18BS-S | CE3057-10A-□*2 | DDK |
| | | 20A□A<br>30A□A<br>44A□A | JL04HV-2E22-22PE-B | JL04V-6A22-22SE | JL04-22EBL | JL04-22EB | JL04-2022CK (14) | Japan Aviation Electronics Ind, Ltd. |
| | | 55A□A<br>75A□A | JL04V-2E32-17PE-B | JL04V-6A32-17SE | Use a flexible conduit. | Use a flexible conduit. | Use a flexible conduit. | Japan Aviation Electronics Ind, Ltd. |
| Encoder connectors | | | 97F3102E20-29P | MS3106A20-29S (D190) | CE-20BA-S | CE02-20BS-S | CE3057-12A□*2 | DDK |

Motor side　　Cable side

*1. End Bell is the name of a product manufactured by Japan Aviation Electronics Ind, Ltd., and Back Shell is the name of a product manufactured by DDK.

*2. Select the character for the box (□) in the Cable Clamp model numbers according to the lead wire diameter.

*3. A cable clamp and either an L-shaped plug or a straight plug must be provided by the customer.

Note 1. The same detector connector is used for all motors.

2. In order to provide an IP67 protective structure, use a plug, End Bell, Back Shell, and cable clamp from the table above.

3. For information on an applicable flexible conduit, contact the conduit manufacturer.

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## IP67 Connectors (with brake)

Table A.7 SGMKS Connectors for Servomotors with Brake

| Applicability | | | Receptacle model | Plug-only model*3 | End Bell or Back Shell*1, *3 | | Cable clamp model*3 | Manufacturer |
|---|---|---|---|---|---|---|---|---|
| | | | | | Angle (L-shaped) model | Straight model | | |
| Main-circuit connectors | Motor model number SGMKS- | 05A□A<br>09A□A<br>13A□A | JL04V-2E20-15PE-B | JL04V-6A20-15SE | JL04-20EBL | JL04-20EB | JL04-2022CK (14) | Japan Aviation Electronics Ind, Ltd. |
| | | 20A□A<br>30A□A<br>44A□A | JL04-2E24-10PE-B | JL04V-6A24-10SE | JL04-24BL | JL04-24EB | JL04-2428CK (17) | Japan Aviation Electronics Ind, Ltd. |
| Encoder connectors | | | 97F3102E20-29P | MS3106A20-29S (D190) | CD-20BA-S | CE02-20BS-S | CD3507-12A-□*2 | DDK |

Motor side

Cable side

*1. End Bell is the name of a product manufactured by Japan Aviation Electronics Ind, Ltd., and Back Shell is the name of a product manufactured by DDK.

*2. Select the character for the box (□) in the Cable Clamp model numbers according to the lead wire diameter.

*3. A cable clamp and either an L-shaped plug or a straight plug must be provided by the customer.

Note 1. The same detector connector is used for all motors.

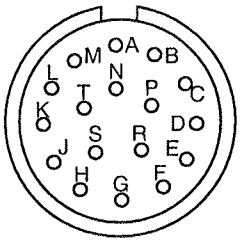
2. In order to provide an IP67 protective structure, use a plug, End Bell, Back Shell, and cable clamp from the table above.

3. For information on an applicable flexible conduit, contact the conduit manufacturer.

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## ■ Servomotor Connector Pin Arrangement

### Encoder Connector Wiring Specifications (Serial Encoder)




Receptacle: MS3102A20-29P

Applicable plug (to be provided by customer)

Plug: MS3108B20-29S

Cable clamp: MS3057-12A

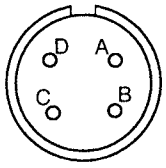
- For an absolute encoder

| | | | |
|---|---|---|---|
| A | — | K | — |
| B | — | L | — |
| C | PS | M | — |
| D | /PS | N | — |
| E | — | P | — |
| F | — | R | — |
| G | PG0V | S | BAT– |
| H | PG5V | T | BAT+ |
| J | FG (frame ground) | — | — |

- For an incremental encoder

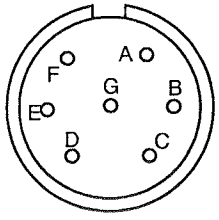
| | | | |
|---|---|---|---|
| A | — | K | — |
| B | — | L | — |
| C | PS | M | — |
| D | /PS | N | — |
| E | — | P | — |
| F | — | R | — |
| G | PG0V | S | — |
| H | PG5V | T | — |
| J | FG (frame ground) | — | — |

### Main-circuit Connector Wiring Specifications (without Brake)




| | |
|---|---|
| A | U phase |
| B | V phase |
| C | W phase |
| D | FG (frame ground) |

### Main-circuit Connector Wiring Specifications (with Brake)




| | | | |
|---|---|---|---|
| A | U phase | E | Brake terminal |
| B | V phase | F | Brake terminal |
| C | W phase | G | Not used. |
| D | FG (frame ground) | — | — |

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# A.4 Servo Unit/External Pulse Encoder Cables

The connectors and cables used to connect the Servo Unit to an external pulse encoder are described below.

Serial encoder cables are the same as those for the Servomotor encoder.

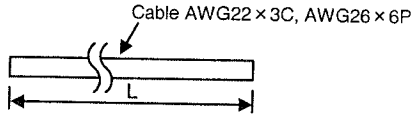
## ■ Connector Kit (for CN4)

| Connector Kit model | Connector Kit parts list | | | |
|---|---|---|---|---|
| | Connector | | Case | |
| | Model | Qty. | Model | Qty. |
| DE9406973 | 10120-3000VE* | 1 | 10320-52A0-008* | 1 |

* Mfd. by SUMITOMO 3M

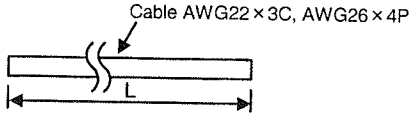
## ■ Absolute Pulse Encoder Cables

| Cable model | L (mm ) |
|---|---|
| DP8409123-1 | $3000\ ^{+100}_{0}$ |
| DP8409123-2 | $5000\ ^{+100}_{0}$ |
| DP8409123-3 | $10000\ ^{+500}_{0}$ |
| DP8409123-4 | $15000\ ^{+500}_{0}$ |
| DP8409123-5 | $20000\ ^{+500}_{0}$ |




## ■ Incremental Pulse Encoder Cables

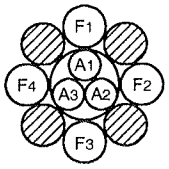
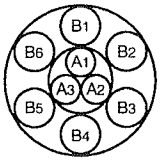
| Cable model | L (mm) |
|---|---|
| B9400064-1 | $3000\ ^{+100}_{0}$ |
| B9400064-2 | $5000\ ^{+100}_{0}$ |
| B9400064-3 | $10000\ ^{+500}_{0}$ |
| B9400064-4 | $15000\ ^{+500}_{0}$ |
| B9400064-5 | $20000\ ^{+500}_{0}$ |



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## Cable Wire Material

The applicable cable specifications for pulse encoder cables are shown below.

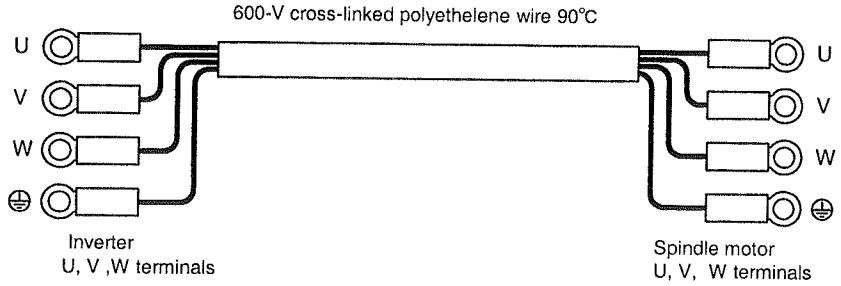
| Cable specifications | Incremental encoder | Absolute encoder |
|---|---|---|
| General specifications | Composite KQVV-SW<br>AWG22 × 3C, AWG26 × 4P | Composite KQVV-SW<br>AWG22 × 3C, AWG26 × 6P |
| Finished shape | 7.5-mm dia. | 8.0-mm dia. |
| Inner construction and lead colors | <br>A1: Red<br>A2: Black<br>A3: Green/yellow<br>F1: Blue-white/blue Twisted pair<br>F2: Yellow-White/yellow Twisted pair<br>F3: Green-White/green Twisted pair<br>F4: Orange-White/orange Twisted pair | <br>A1: Red<br>A2: Black<br>A3: Green/yellow<br>B1: Blue-white/blue Twisted pair<br>B2: Yellow-White/yellow Twisted pair<br>B3: Green-White/green Twisted pair<br>B4: Orange-White/orange Twisted pair<br>B5: Purple-White/purple Twisted pair<br>B6: Grey-White/grey Twisted pair |
| Standard length | 3 m, 5 m, 10 m, 15 m, 20 m | |

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# A.5 Spindle Motor Cable

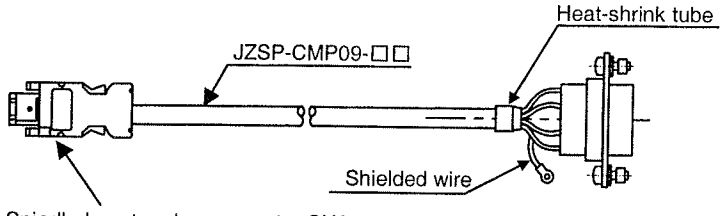
The size of the crimp-style terminals (power, fan) and encoder connector for the spindle motor are different according to the motor.
For details, refer to the motor drawing.

## ■ Spindle Motor Power Cable




For Inverter wire and terminal sizes, see the table for terminal block tightening torque in Section *6.2.3 Wiring Specifications*.

## ■ Spindle Motor Serial Encoder Cable




Spindle motor encoder connector

| | |
|---|---|
| Plug housing | JEC-9P (JST) |
| Pin contact | J-SP114C (JST) |
| No. 4-40 UNC screw | 2×J-SL-1C (JST) |
| E-ring | 2×J-ER (JST) |

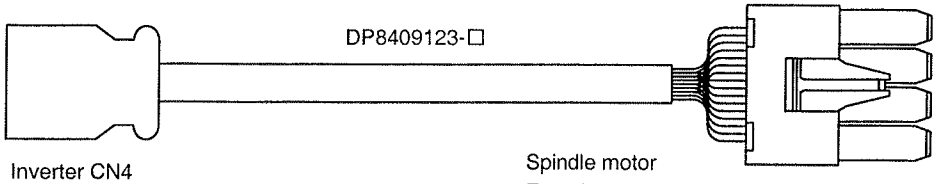
Separate caulking tool required.

For the serial encoder cable, use the same one that is used for the Servomotor encoder cable. For details, see the item on cable wire material in *A.2. Servomotor Encoder Cables*.
Observe the following precautions in wiring.

- Bundle the necessary number of shielded wires for the round terminal being used, and cover with a tube.
- Cut off the unused signal wires or shielded wires at the end of the sheath.
- Gather the cut signal wires or shielded wires so that they do not protrude from the heat-shrink tube.
- Make the part of the signal wire not covered by the shield 40 mm or less.

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## ■ Spindle Motor Pulse Encoder Cable



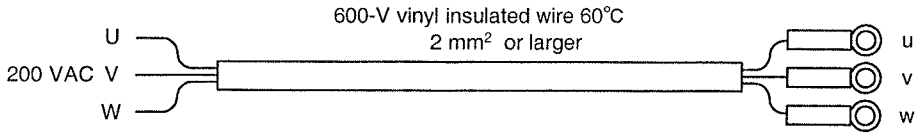

Inverter CN4
Connector: 10120-3000VE
Housing: 10320-52A0-008 (SUMITOMO 3M)

Spindle motor
Encoder connector

| | |
|---|---|
| Plug housing | MLP-12 (JST) |
| Socket contact | LLF-01T-1.3×11 (JST)<br>(Pin Nos. 1 to 9, 11, 12)<br>LLF-41T-1.3×1 (JST)<br>(Pin No. 10) |
| Special tool | YC-202 (JST) |

The pulse encoder cable is the same as that for the Servo Unit external pulse encoder (absolute). For details, refer to the item on cable wire material in *Appendix A.4*.

## ■ Fan Motor Cable for UAKA-30A□□, -37A□□, UAKB-15A□□

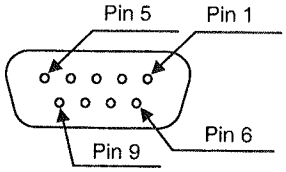



Spindle motor fan terminal

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# A.6 Spindle Motor Encoder Connectors

## ■ Spindle Motor Serial Encoder Pin Arrangement



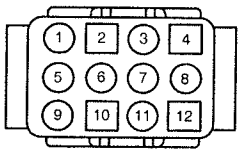

Connector: 17LE-13090-27 (DDK)
Applicable connector: JEC-9P (JST)
Cover set: J-C9-1C (JST)
Pin contact: J-SP114C (JST for AWG20 to 24)

Special tools
Pin crimping tool: YRS-440 (JST)
Pin pulling tool: DEJ-03 (JST)

| Pin No. | Signal |
|---|---|
| 1 | +5 V |
| 2 | S-phase output |
| 3 | Open |
| 4 | Open |
| 5 | 0 V |
| 6 | / S-phase output |
| 7 | Open |
| 8 | Open |
| 9 | Open |

Note: Do not use open pins.

## ■ Spindle Motor Pulse Encoder Pin Arrangement




ML connector (MLR-12)

Applicable plug housing: MLP-12

Socket contact
・LLF-01T-1.3×11
(Pin Nos. 1 to 9, 11, 12)
・LLF-41T-1.3×1 (Pin No. 10)

| No. | Name | No. | Name |
|---|---|---|---|
| 1 | +5 V | 7 | PC |
| 2 | 0 V | 8 | /PC |
| 3 | PA | 9 | FG (Frame ground) |
| 4 | /PA | 10 | SS (Shielded) |
| 5 | PB | 11 | TS |
| 6 | /PB | 12 | |

Note 1. Pin Nos. 11 and 12 are for the thermistor signal wires from the motor.

2. The slash (/) in front of PA, PB, and PC indicate inverted signals.

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# B

# Dimensions and Specifications


B.1 Brake Power Supply Unit ..... B-2

B.2 Noise Filter ..... B-4

B.3 Magnetic Contactor for Winding Selection ..... B-8

B.4 AC Reactor ..... B-10

B.5 Pulse Generator for Spindle ..... B-12

B.6 Converter ..... B-13

B.7 Inverter ..... B-17

B.8 1-Axis Servo Unit ..... B-19

B.9 2-Axis Servo Unit ..... B-25

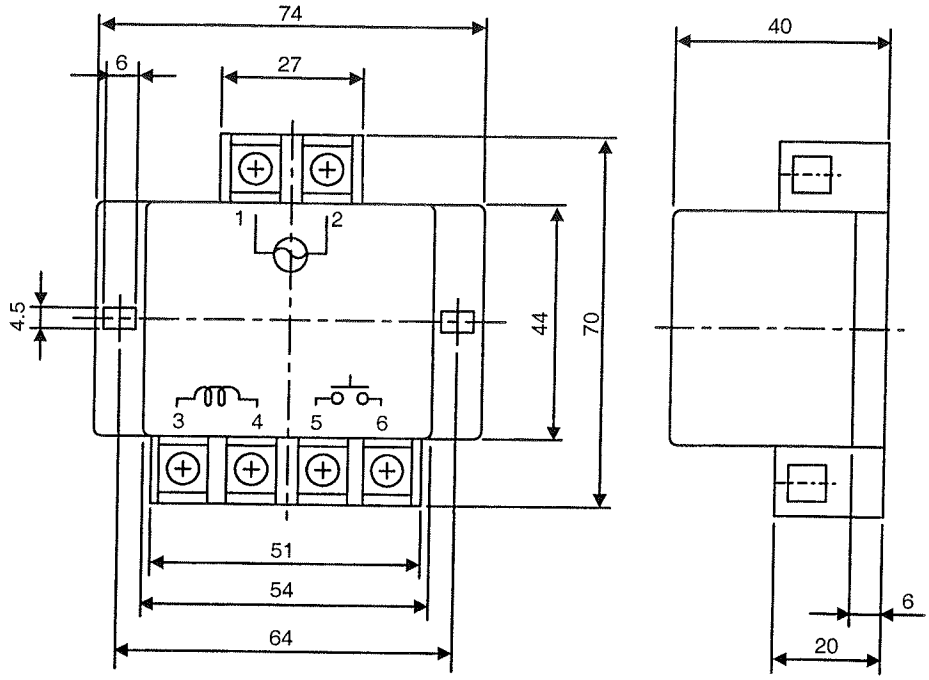
B.10 3-Axis Servo Unit ..... B-27

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# B.1 Brake Power Supply Unit

## B.1.1 Dimension Diagram

■ OPR109F, OPR109A




Note 1. Do not short-circuit output terminal numbers 3 and 4.

2. Tighten the terminal block screws securely.

3. A protective element is built-in. There is no need to install an external one.

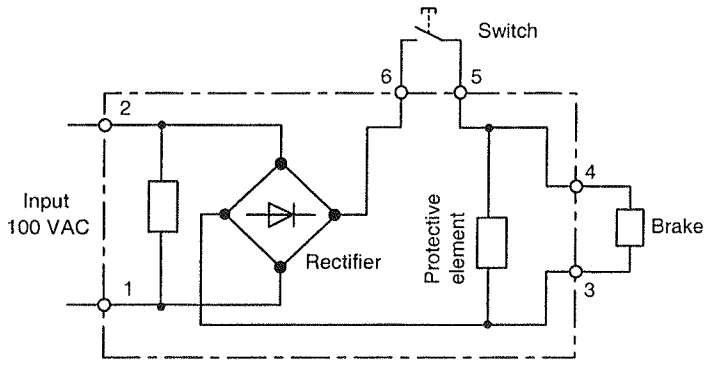
4. The contacts used for numbers 5 and 6 must be a DC switching type with a switching capacity 5 to 10 times the rated current of the breaker that is used.

| Model | Rectification | Frequency (Hz) | AC input voltage (AC) (V) | DC output voltage (DC) (V) | DC output current (A) | Approximate mass (kg) |
|---|---|---|---|---|---|---|
| OPR109A | Single-phase, half-bridge type | 50/60 | 200 | 90 | 1 | 0.1 |
| OPR109F | Single-phase, full-bridge type | 50/60 | 100 | 90 | 1 | 0.1 |

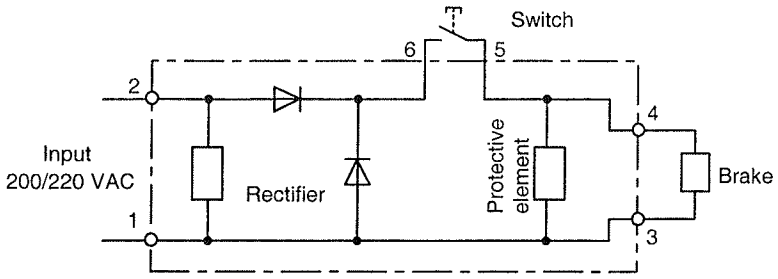
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## B.1.2 Circuit Diagrams

### ■ OPR109F




### ■ OPR109A

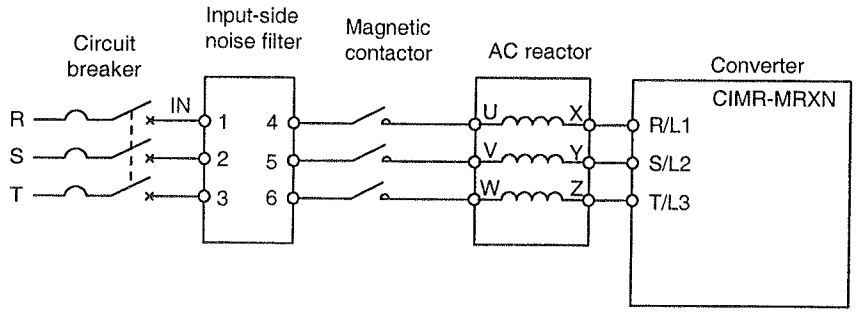


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# B.2 Noise Filter

## B.2.1 Connection Example

The noise filter suppresses the high-frequency noise that is generated by the Inverter and relayed to the power supply.




Note: Do not connect the input-side noise filter to the output side (motor side).

## B.2.2 Specifications

There are three types of input-side filters: standard, EMC-compliant, and simple. Select the type from the table below according to the Converter capacity.

| Capacity | Standard | | | |
|---|---|---|---|---|
| | Model | Code No. | Qty. | Current |
| 3.7 kW | FN258L-30-07 | FIL001064 | 1 | 30 A |
| 5.5 kW | FN258L-42-07 | FIL001065 | 1 | 42 A |
| 7.5 kW | FN258L-55-07 | FIL001066 | 1 | 55 A |
| 11 kW | FN258L-75-34 | FIL001067 | 1 | 75 A |
| 15 kW | FN258L-100-35 | FIL001068 | 1 | 100 A |
| 18.5 kW | FN258L-130-35 | FIL001069 | 1 | 130 A |
| 22 kW | FN258L-180-07 | FIL001070 | 1 | 180 A |
| 30 kW | FN359P-250-99 | FIL001071 | 1 | 250 A |
| 37 kW | FN359P-250-99 | FIL001071 | 1 | 250 A |
| 45 kW | FN359P-300-99 | FIL001072 | 1 | 300 A |

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| Capacity | EMC-compliant | | |
|---|---|---|---|
| | Model | Qty. | Current |
| 3.7 kW | FS5973-35-07 | 1 | 35 A |
| 5.5 kW | FS5973-35-07 | 1 | 35 A |
| 7.5 kW | FS5973-60-07 | 1 | 60 A |
| 11 kW | FS5973-60-07 | 1 | 60 A |
| 15 kW | FS5973-100-07 | 1 | 100 A |
| 18.5 kW | FS5973-130-35 | 1 | 130 A |
| 22 kW | FS5973-160-40 | 1 | 160 A |
| 30 kW | FS5973-240-37 | 1 | 240 A |
| 37 kW | FS5973-240-37 | 1 | 240 A |
| 45 kW | Under development | – | – |

| Capacity | Simple | | | |
|---|---|---|---|---|
| | Model | Code No. | Qty. | Current |
| 3.7 kW | LNFD-2303 HY | 72600-D2303HY | 1 | 30 A |
| 5.5 kW | LNFD-2303 HY | 72600-D2303HY | 1 | 30 A |
| 7.5 kW | LNFD-2303 HY | 72600-D2303HY | 2 | 60 A |
| 11 kW | LNFD-2303 HY | 72600-D2303HY | 2 | 60 A |
| 15 kW | LNFD-2303 HY | 72600-D2303HY | 3 | 90 A |
| 18.5 kW | LNFD-2303 HY | 72600-D2303HY | 4 | 120 A |
| 22 kW | — | — | — | — |
| 30 kW | — | — | — | — |
| 37 kW | — | — | — | — |
| 45 kW | — | — | — | — |

Note: When using multiple filters, connect them in parallel.

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# B.2.3 Dimension Diagrams

## ■ Standard Type

The dimensions of the standard noise filters are shown below. (Unit: mm)

| Model | Diagram No. | A | B | C | D | E | F | G | H | J | L | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FN258L-30-07 | 1 | 335 | 150±1 | 60 | 305 | 320 | 35 | 6.5 | 400 | 1±0.1 | 9 | M5 | AWG10 |
| FN258L-42-07 | 1 | 329 | 185±1 | 70 | 300 | 314 | 45 | 6.5 | 500 | 1.5 | 12 | M6 | AWG8 |
| FN258L-55-07 | 1 | 329 | 185±1 | 80 | 300 | 314 | 55 | 6.5 | 500 | 1.5 | 12 | M6 | AWG6 |
| FN258L-75-34 | 2 | 329 | 220 | 80 | 300 | 314 | 55 | 6.5 | — | 1.5 | — | M6 | — |
| FN258L-100-35 | 2 | 379±1.5 | 220 | 90±0.8 | 350±1.2 | 364 | 65 | 6.5 | — | 1.5 | — | M10 | — |
| FN258L-130-35 | 2 | 439±1.5 | 240 | 110±0.8 | 400±1.2 | 414 | 80 | 6.5 | — | 3 | — | M10 | — |
| FN258L-180-07 | 3 | 438±1.5 | 240 | 110±0.8 | 400±1.2 | 413 | 80 | 6.5 | 500 | 4 | 15 | M10 | 50 mm² |
| FN359P-250-99 | 4 | Dimensions are shown in diagram. | | | | | | | | | | | |
| FN359P-300-99 | | | | | | | | | | | | | |

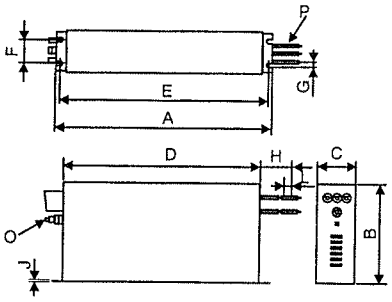



Diagram 1

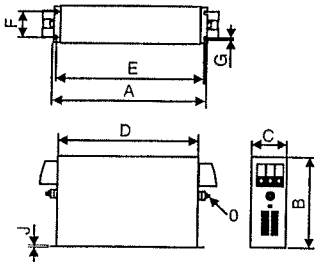



Diagram 2

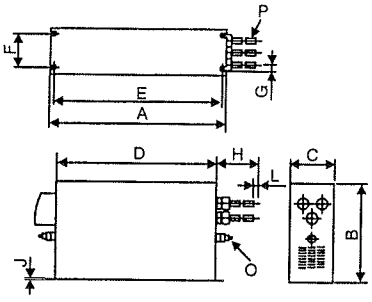



Diagram 3

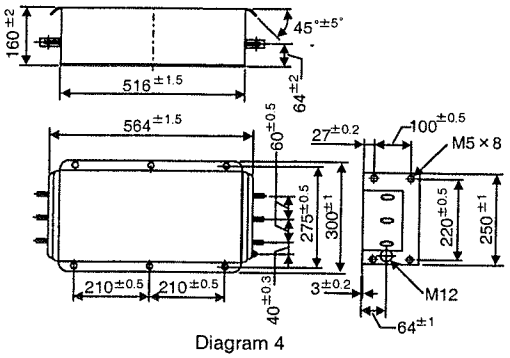


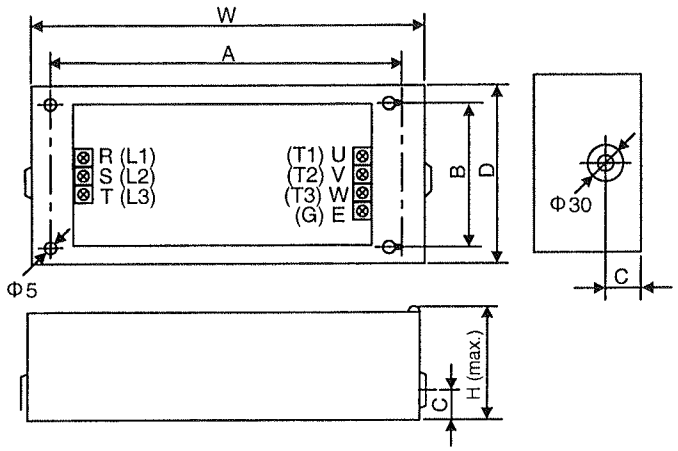

Diagram 4

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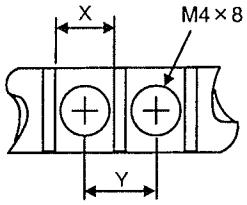
## ■ Simplified Type

The dimensions of the simplified noise filters are shown below. (Unit: mm)

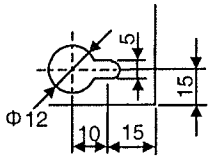
| Model | Noise filter | | | | | | Terminal block | | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | W | D | H | A | B | C | X | Y | |
| LFND-2303HY | 240 | 125 | 100 | 210 | 95 | 33 | 10 | 13 | 1.6 |




Note: The external drawing shows a 3-phase model.




Detailed view of terminal block




Mounting screws: 4-M4 × 10

Detailed view of mounting hole

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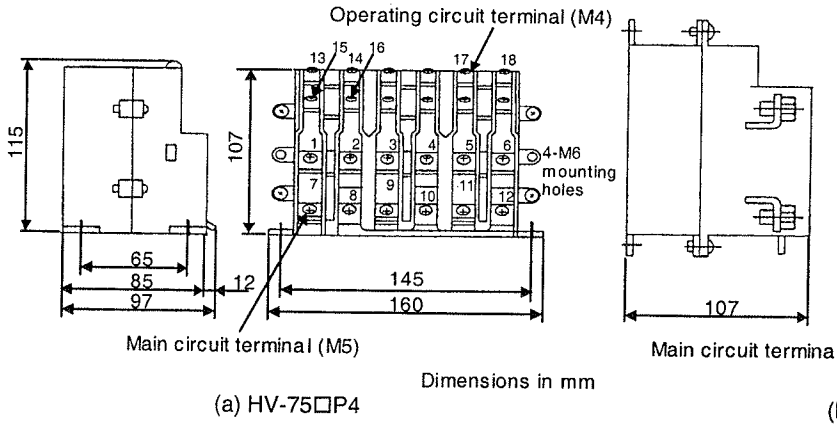
# B.3 Magnetic Contactor for Winding Selection

The specifications for the magnetic contactor for winding selection are shown below.

## ■ Ratings and Specifications

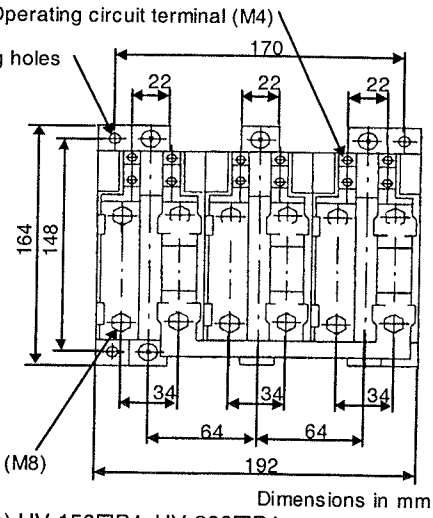
| Model | Standard | HV-75AP4 | HV-150AP4 | HV-200AP4 |
|---|---|---|---|---|
| | IPM motor | HV-75BP4 | HV-150BP4 | HV-200BP4 |
| Contact form | | Three main NO contacts, three main NC contacts and one auxiliary NO contact | | |
| Rated insulation voltage | | 600 V | | |
| Rated ON current | Continuous | 75 A | 150 A | 200 A |
| | 30 minutes | 87 A | 175 A | 226 A |
| Interrupting current capacity | 220 V | 200 A | 400 A | 400 A |
| Switching frequency | | 600 times/h | | |
| Mechanical life | | 5,000,000 operations | | |
| Electromagnetic coil rating | | 200 V 50/60 Hz, 220 V 50/60 Hz, 230 V 60 Hz | | |
| Mass | | 2.5 kg | 5.0 kg | 5.0 kg |
| Ambient temperature | | −10 to 55°C | | |
| Humidity | | 10% to 95% RH (with no condensation) | | |
| Inverter capacity | 200 V class | 3.7 to 15 kW | 18.5 to 30 kW | 37 kW |

## ■ Dimension Diagrams




Dimensions in mm

(a) HV-75□P4




Dimensions in mm

(b) HV-150□P4, HV-200□P4

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## ■ Terminal Description

Terminal names and operating statuses are shown below.

| Terminal | Name | Operating status | |
|---|---|---|---|
| 13-14 | Selection signal | +24 V (low-speed winding) | 0 V (high-speed winding) |
| 1-2<br>3-4<br>5-6 | Three main NC contacts | OFF | ON |
| 7-8<br>9-10<br>11-12 | Three main NO contacts | ON | OFF |
| 15-16 | One auxiliary NO contact | OFF | ON |
| 17-18 | 200-V power supply | — | — |

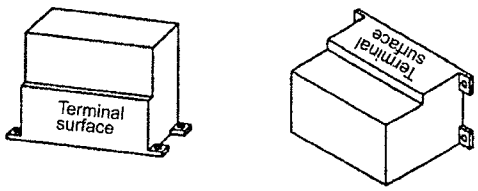
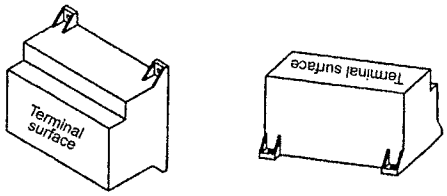
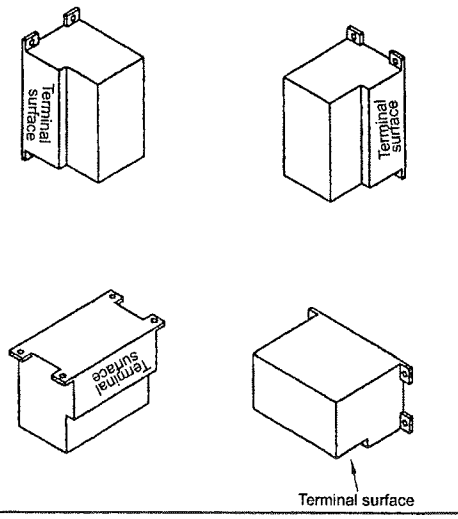
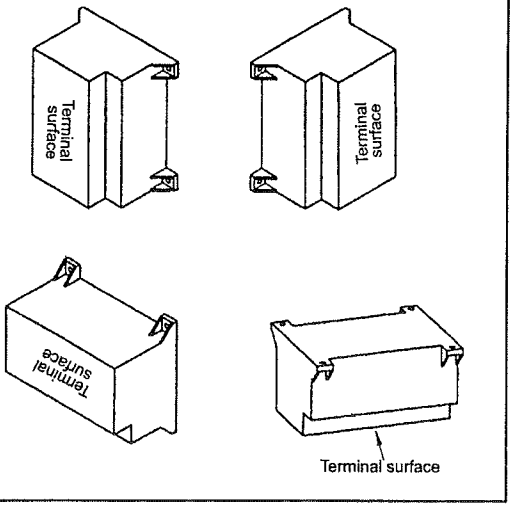



(a) HV-□□□AP4 (Std.)　　(b) HV-□□□ BP4 (IPM motor)

Fig. B.1 Main Circuit Contact Configuration

## ■ Mounting Direction

Use the diagram below to determine mounting direction.

| Mounting | HV-75□P4 | HV-150□P4, HV-200□P4 |
|---|---|---|
| Possible |  |  |
| Not possible |  |  |

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# B.4 AC Reactor

## ■ Specifications

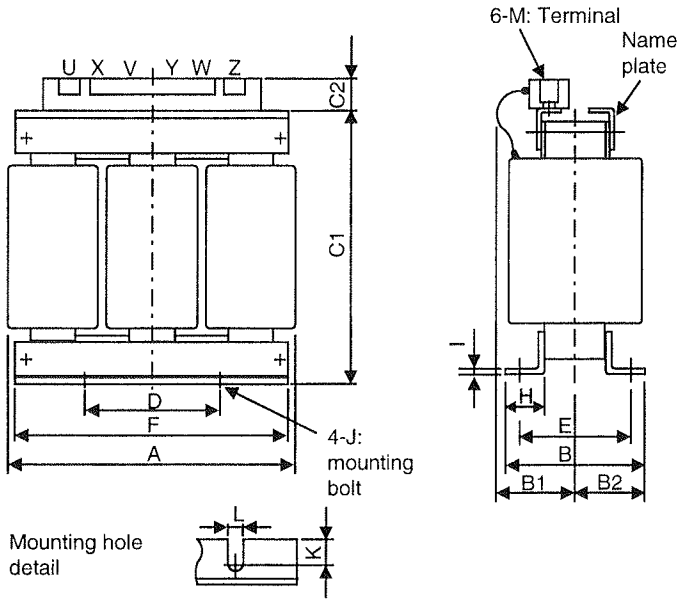
| Converter capacity | Reactor code | Time rating | Circuit voltage (V) | Frequency (Hz) | Rated current (A) | Inductance (mH) | Insulation class | Approx. mass (kg) |
|---|---|---|---|---|---|---|---|---|
| 45 kW | X010199 | 100% continuous | 230 | 50/60 | 150 | 0.07 | B | 34 |
| 37 kW | X010201 | 100% continuous | 230 | 50/60 | 120 | 0.09 | F | 16 |
| 30 kW | X010205 | 100% continuous | 230 | 50/60 | 92 | 0.1 | H | 12 |
| 22 kW | X010204 | 100% continuous | 230 | 50/60 | 77 | 0.14 | H | 12 |
| 18.5 kW | X010203 | 100% continuous | 230 | 50/60 | 63 | 0.17 | H | 8 |
| 15 kW | X010202 | 100% continuous | 230 | 50/60 | 46 | 0.21 | H | 8 |
| 11 kW | X10217 | 100% continuous | 230 | 50/60 | 32 | 0.28 | F | 6 |
| 7.5 kW | X10216 | 100% continuous | 230 | 50/60 | 23 | 0.41 | F | 4 |
| 5.5 kW | X10215 | 100% continuous | 230 | 50/60 | 16 | 0.56 | F | 3 |
| 3.7 kW | X10214 | 100% continuous | 230 | 50/60 | 10 | 0.84 | F | 2.5 |

## ■ Dimensions

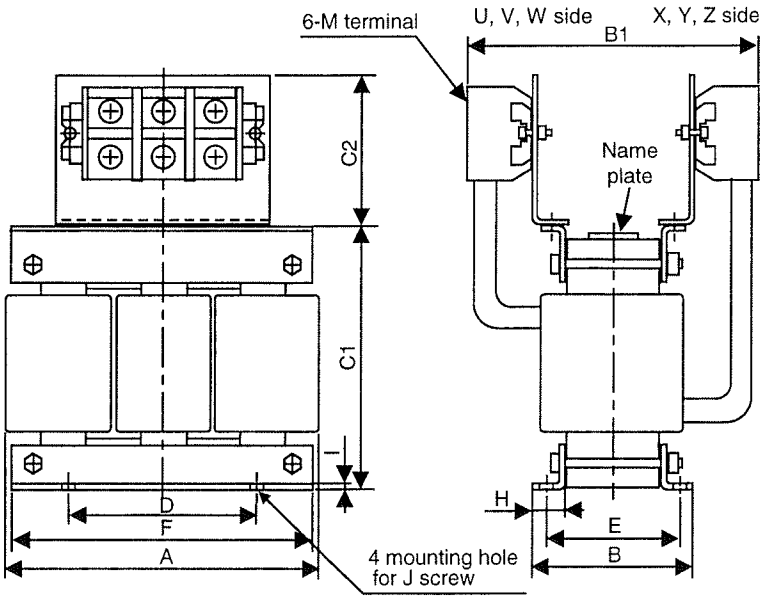
| Converter capacity | Reactor code | Diagram No. | Dimensions (mm) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A (Max.) | B | B1 (Max.) | B2 | C1 | C2 | D | E | F | I | J | K | L | M | H |
| 3.7 kW | X10214 | 1 | 120 | 71 | 45 | 35.5 | 95±3 | 25 | 40 | 50 | 105 | 2.3 | M6 | — | 7 | M4 | 20 |
| 5.5 kW | X10215 | 1 | 135 | 88 | 55 | 44 | 105±5 | 25 | 50 | 70 | 130 | 3.2 | M6 | — | 7 | M4 | 22 |
| 7.5 kW | X10216 | 1 | 130 | 98 | 65 | 49 | 105±5 | 36 | 50 | 80 | 130 | 3.2 | M6 | — | 7 | M5 | 22 |
| 11 kW | X10217 | 1 | 160 | 105 | 70 | 52.5 | 125±5 | 36 | 75 | 85 | 160 | 2.3 | M6 | — | 7 | M5 | 25 |
| 15 kW | X010202 | 1 | 180 | 100 | 80 | 50 | 150±5 | 40 | 75 | 80 | 180 | 2.3 | M6 | 10 | 7 | M6 | 25 |
| 18.5 kW | X010203 | 1 | 180 | 100 | 85 | 50 | 150±5 | 45 | 75 | 80 | 180 | 2.3 | M6 | 10 | 7 | M6 | 25 |
| 22 kW | X010204 | 1 | 210 | 102 | 90 | 51 | 170±5 | 45 | 75 | 80 | 205 | 3.2 | M6 | 12 | 7 | M6 | 25 |
| 30 kW | X010205 | 1 | 210 | 102 | 95 | 51 | 170±5 | 47 | 75 | 80 | 205 | 3.2 | M6 | 12 | 7 | M8 | 25 |
| 37 kW | X010201 | 2 | 210 | 116 | 230 | — | 175±5 | 130 | 75 | 95 | 205 | 2.3 | M6 | — | — | M10 | 25 |
| 45 kW | X010199 | 2 | 245 | 156 | 275 | — | 206±5 | 120 | 150 | 140 | 240 | 3.2 | M8 | — | — | M10 | 25 |

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## Diagram 1 (Converter capacity: 3.7 kW to 30 kW)



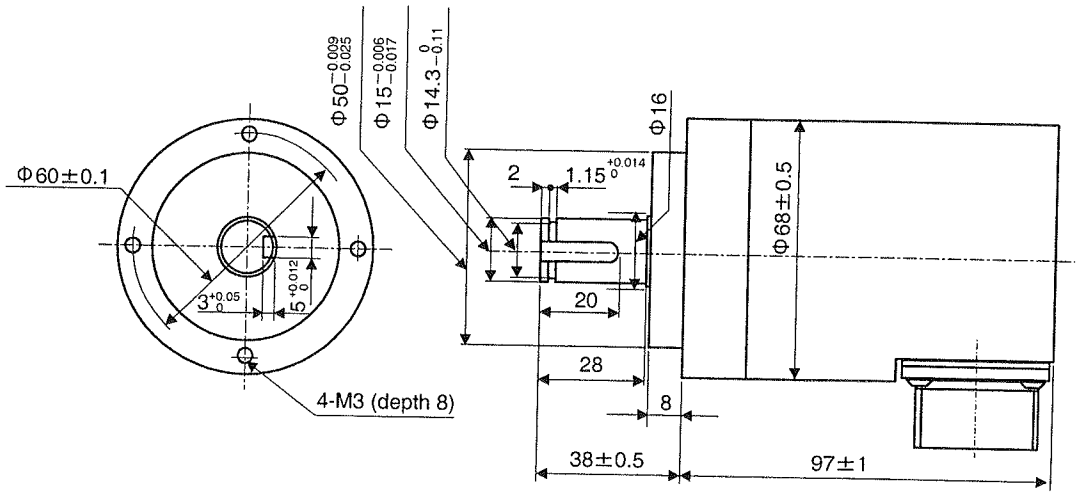

## Diagram 2 (Converter capacity: 37 kW, 45 kW)



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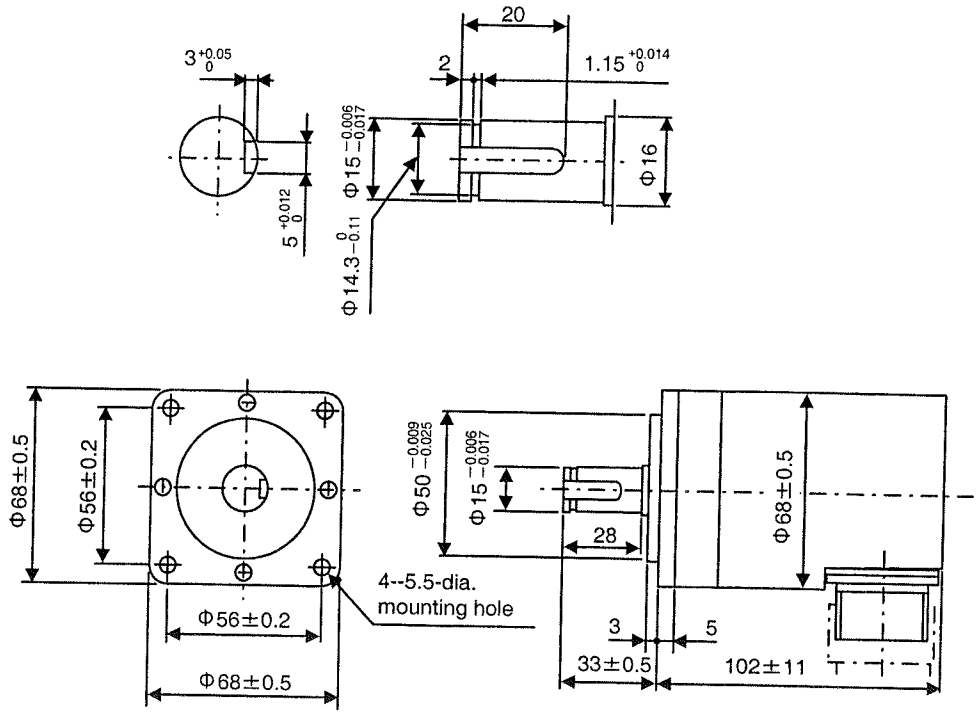
# B.5 Pulse Generator for Spindle

## ■ NE-1024-2MD-11 (6000 min$^{-1}$)




Dimensions in mm

## ■ NE-1024-2MDF-068-11 (6000 min$^{-1}$)
## NE-1024-2MDF-068-12 (8000 min$^{-1}$)



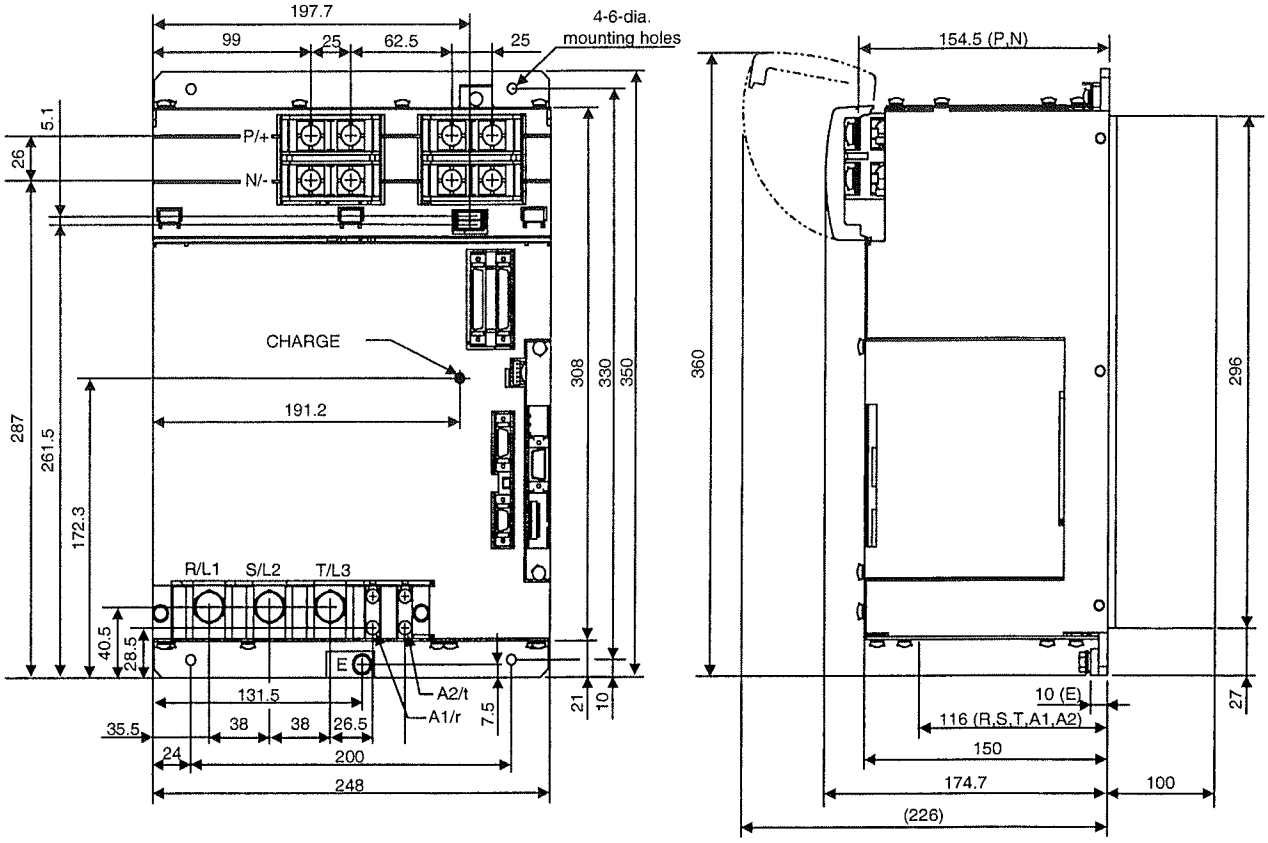

Dimensions in mm

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# B.6 Converter

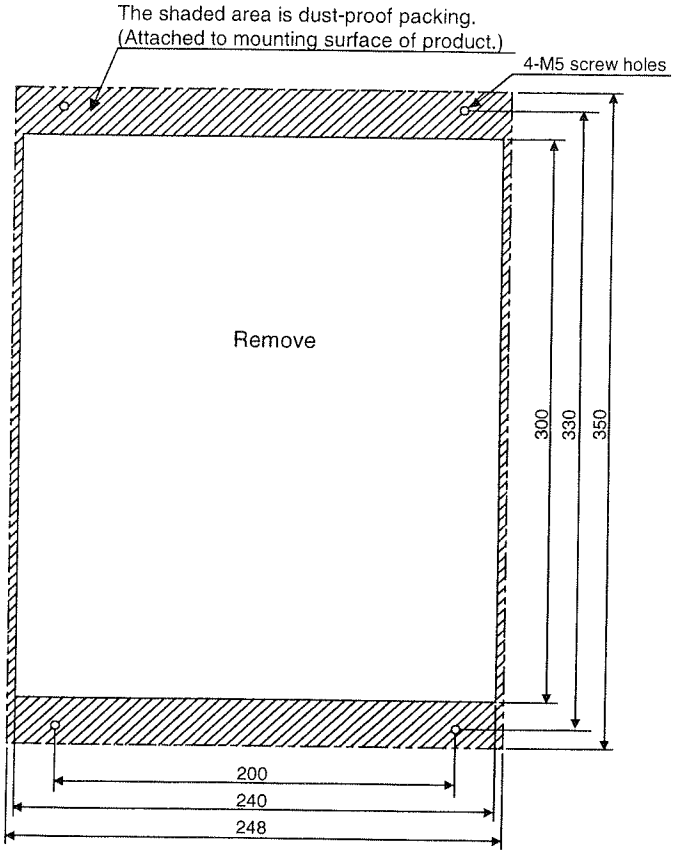
## B.6.1 CIMR-MRXN2045, -MRXN2037 (45 kW, 37 kW)

■ Dimension Diagram



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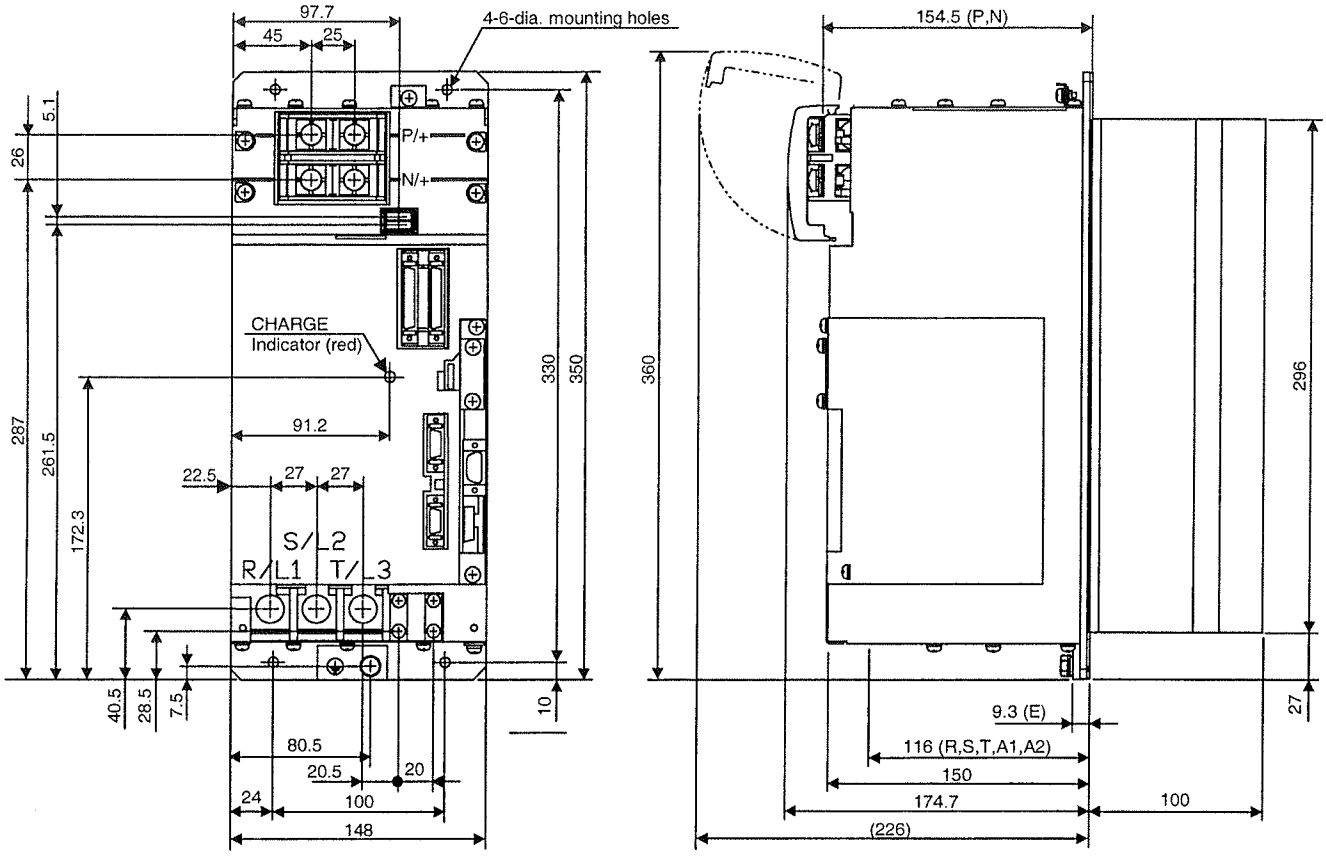
## ■ Panel-cut



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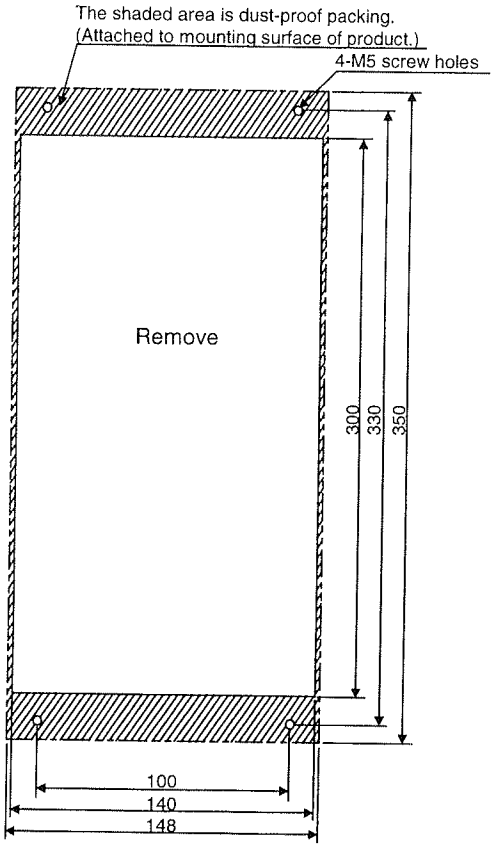
# B.6.2 CIMR-MRXN2015, -MRXN2018, -MRXN2022, -MRXN2030 (15 kW to 30 kW)

## ■ Dimension Diagram



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## ■ Panel-cut

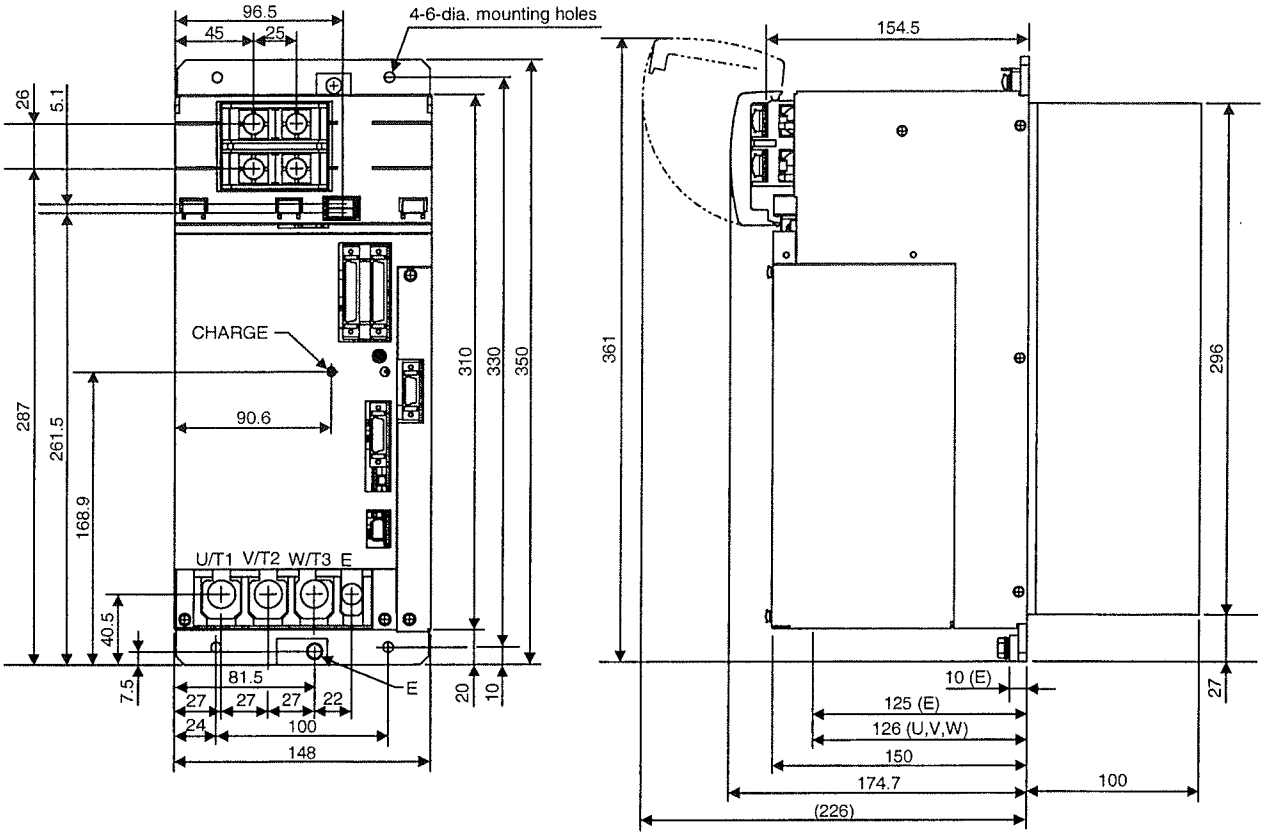


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# B.7 Inverter

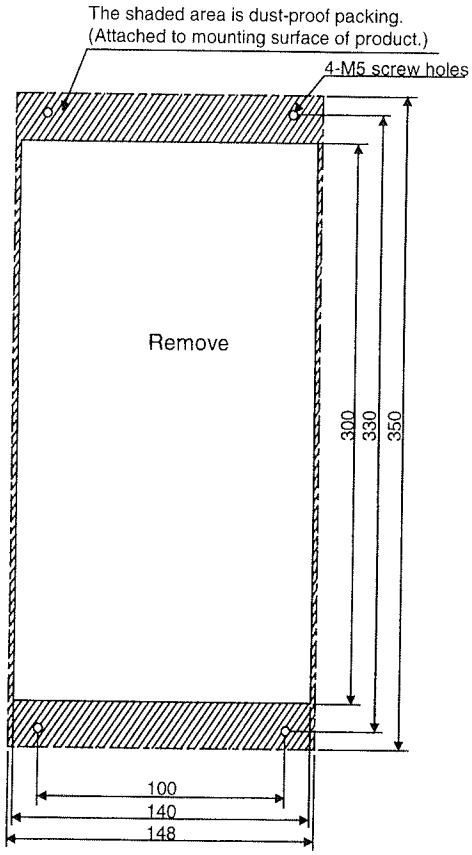
## B.7.1 CIMR-MXN2030, -MXN2015, -MXN2018, -MXN202 (15 kW to 30 kW)

■ Dimension Diagram



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## ■ Panel-cut

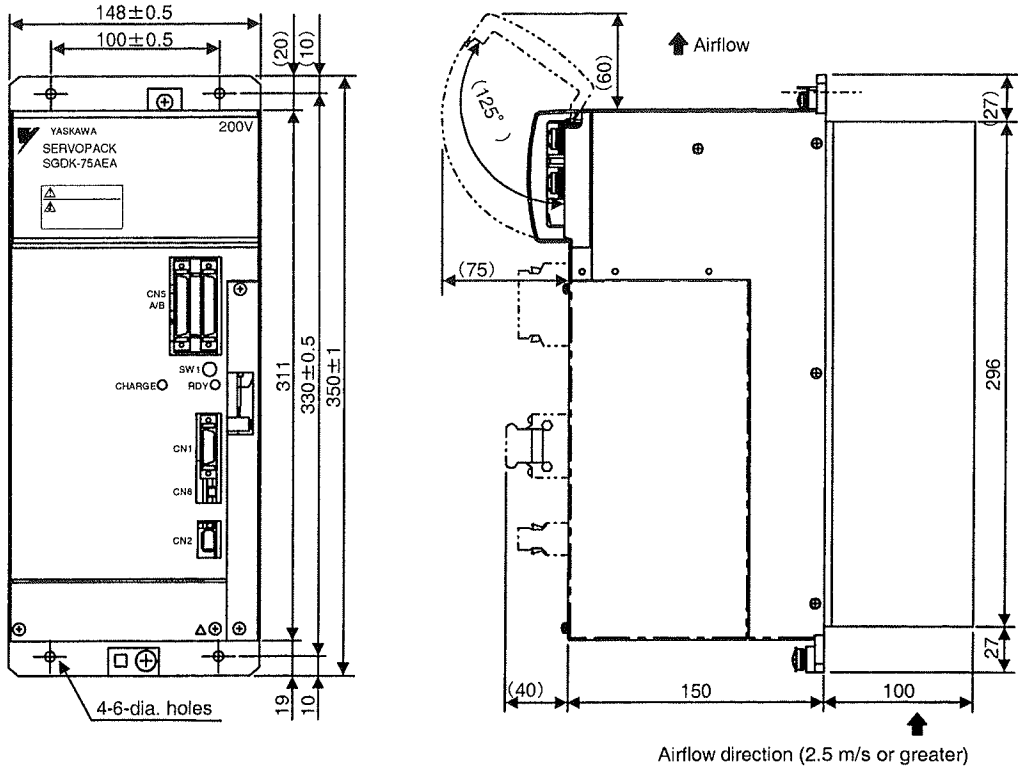


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# B.8 1-Axis Servo Unit

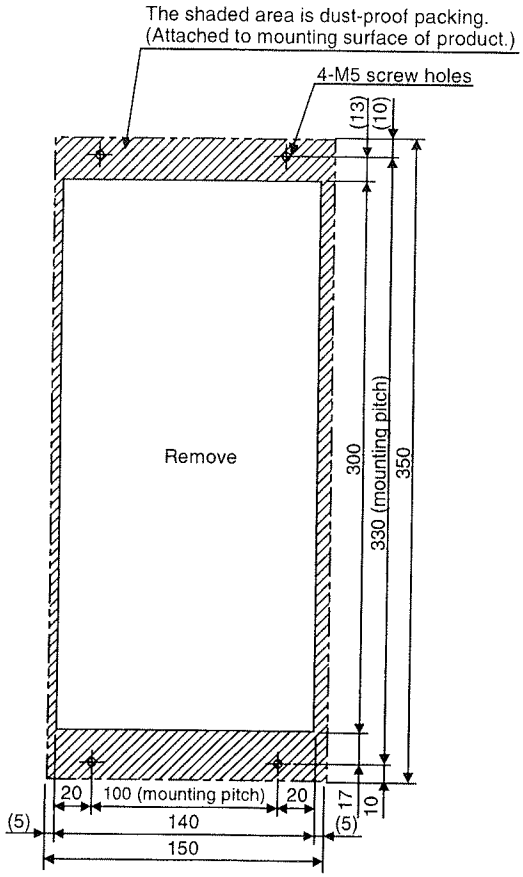
## B.8.1 SGDK-75AEA, -60AEA (7.5 kW, 6.0 kW)

### ■ Dimension Diagram



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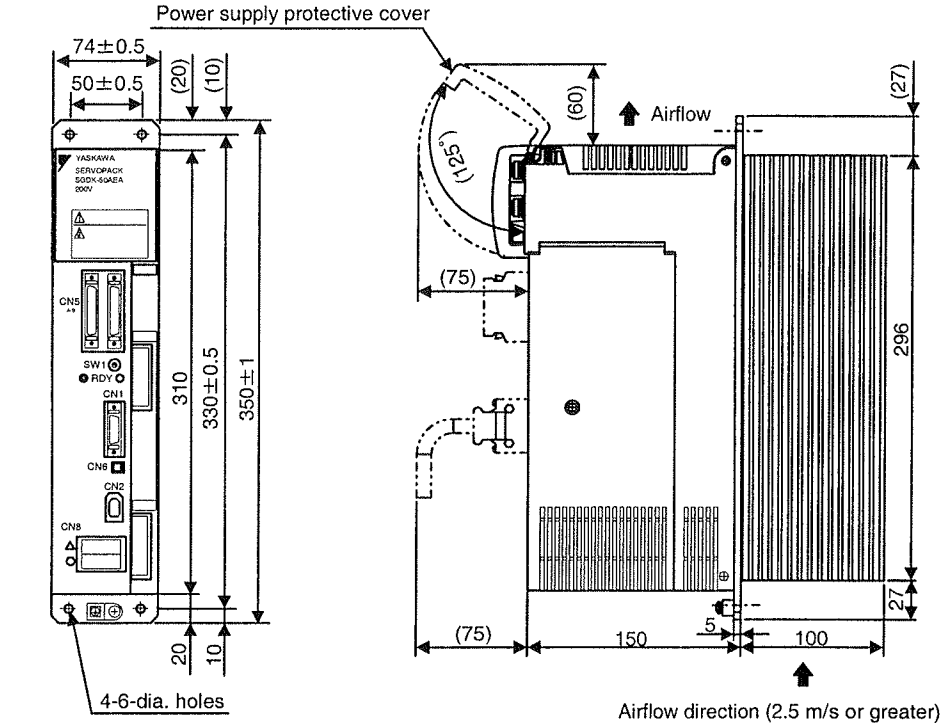
## ■ Panel-cut



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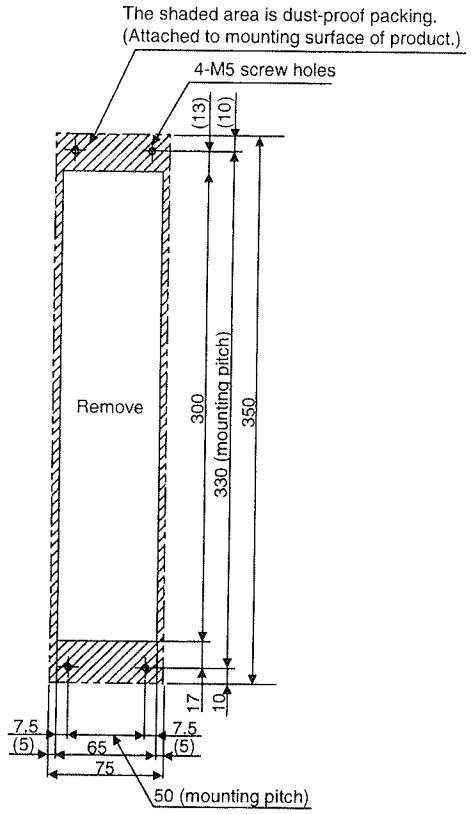
## B.8.2 SGDK-50AEA (5 kW)

### ■ Dimension Diagram



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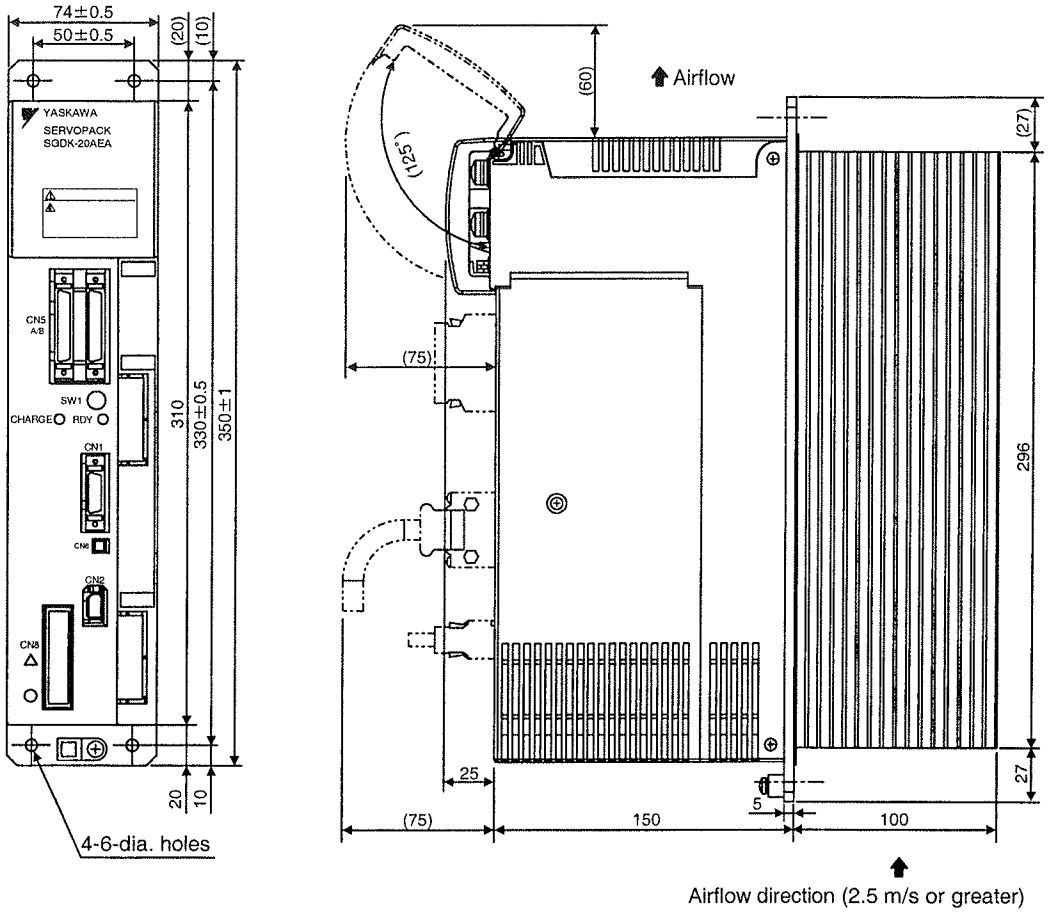
## ■ Panel-cut



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# B.8.3 SGDK-30AEA, -20AEA, -15AEA, -10AEA, -05AEA (3.0 kW to 0.5 kW)

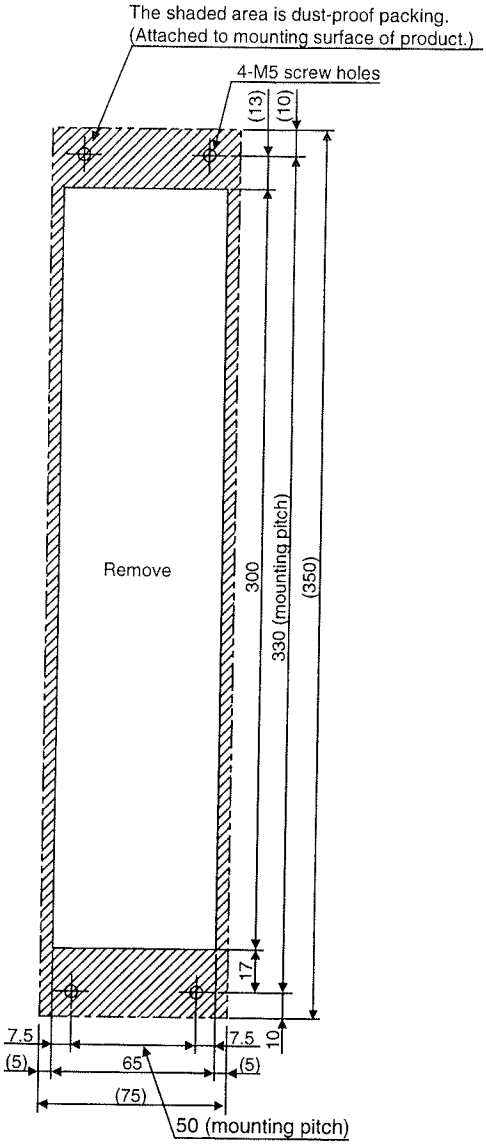
## ■ Dimension Diagram



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BRH-SGDK-30AEA, -20AEA, -15AEA, -10AEA, -05AEA (3.0 kW to 0.5 kW)

## ■ Panel-cut

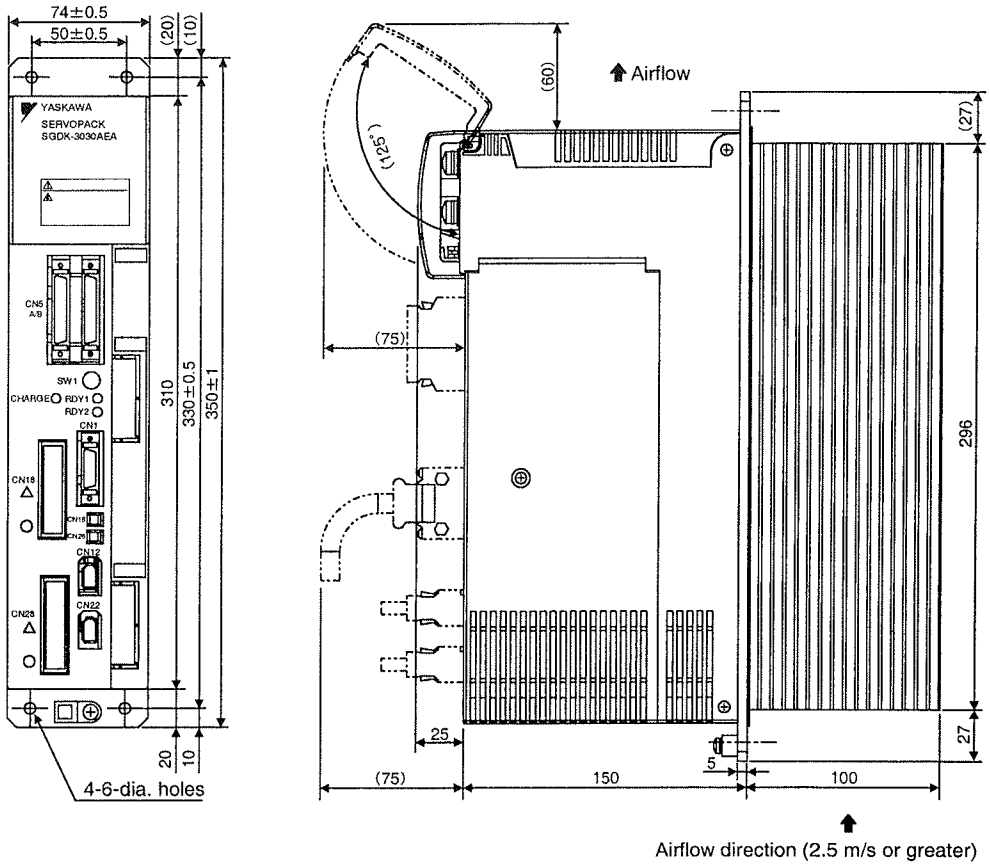


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# B.9 2-Axis Servo Unit

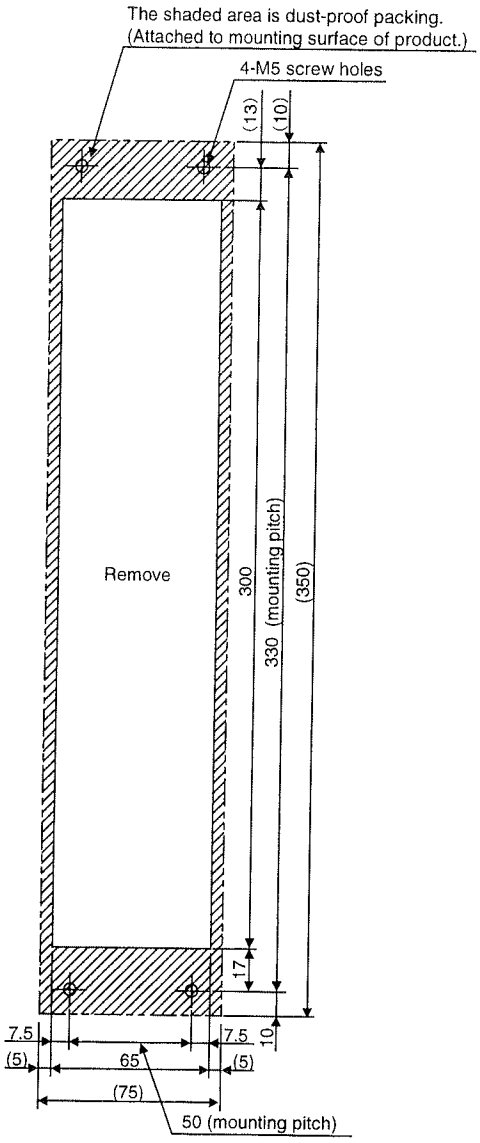
## B.9.1 SGDK-3030AEA, -2020AEA, -1515AEA, -1010AEA, -0505AEA (3 kW, 2 kW, 1.5 kW, 1 kW, 0.5 kW)

### ■ Dimension Diagram



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## ■ Panel-cut

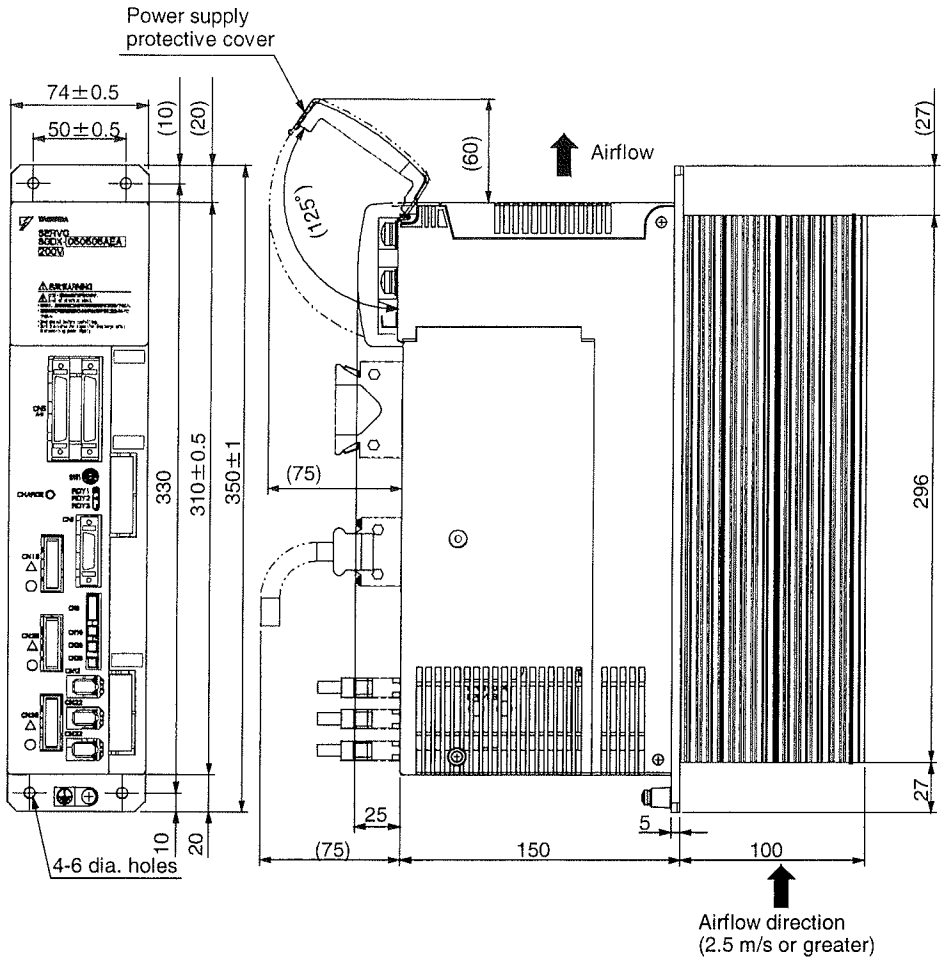


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# B.10 3-Axis Servo Unit

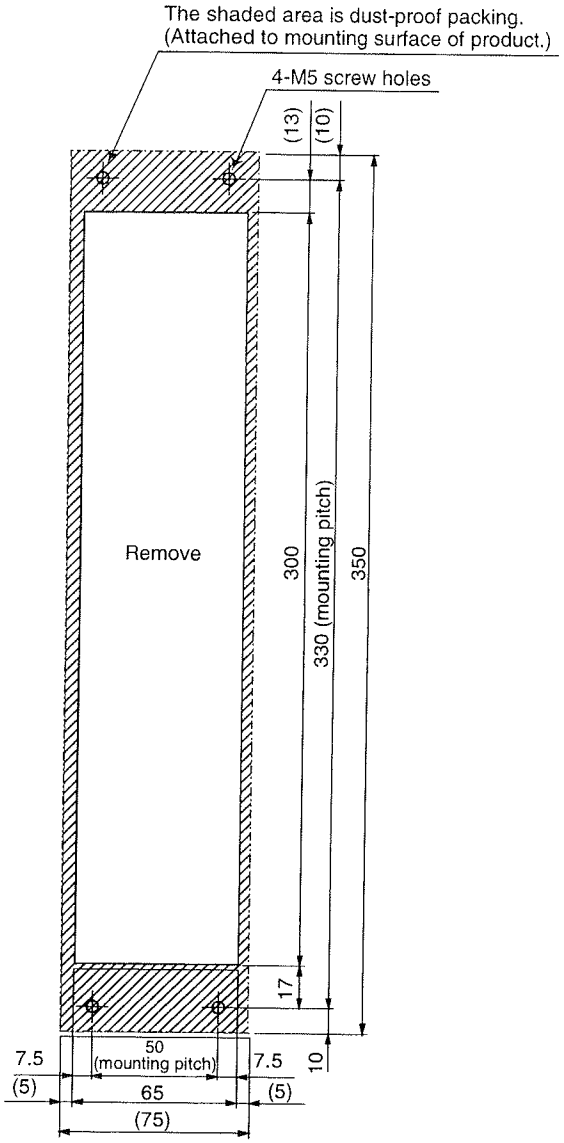
## B.10.1 SGDK-101010AEA, -050505AEA (1 kW, 0.5 kW)

### ■ Dimension Diagram



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## ■ Panel-cut



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