MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO

**MODEL**

# HG-MR
# HG-KR
# HG-SR

SERVO MOTOR INSTRUCTION MANUAL (Vol. 3)

B

# ● Safety Instructions ●

Please read the instructions carefully before using the equipment.

Do not attempt to install, operate, maintain or inspect the equipment until you have read through this Instruction Manual and appended documents carefully and can use the equipment correctly. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.
In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

| | |
|---|---|
| ⚠ WARNING | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury. |
| ⚠ CAUTION | Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage. |

Note that the CAUTION level may lead to a serious consequence according to conditions.
Please follow the instructions of both levels because they are important to personnel safety.
What must not be done and what must be done are indicated by the following diagrammatic symbols.

| | |
|---|---|
| ⃠ | Indicates what must not be done. For example, "No Fire" is indicated by  . |
| ● | Indicates what must be done. For example, grounding is indicated by  . |

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".
After reading this Instruction Manual, keep it accessible to the operator.

## 1. To prevent electric shock, note the following

### ⚠ WARNING

- Before wiring and inspections, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- Any person who is involved in wiring and inspection should be fully competent to do the work.
- Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connections of the power supply terminals.

## 2. To prevent fire, note the following

### ⚠ CAUTION

- Install the servo motor on incombustible material. Installing it directly or close to combustibles will lead to a fire.
- Provide an adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo motor.

## 3. To prevent injury, note the following

### ⚠ CAUTION

- Only the voltage specified in the Instruction Manual should be applied to each terminal. Otherwise, a burst, damage, etc. may occur.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- The servo motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with them.
- The surface temperature of the servo motor may exceed 100 ˚C depending on its mounting and operating conditions.
- During operation, never touch the rotor of the servo motor. Otherwise, it may cause injury.

## 4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a malfunction, injury, electric shock, etc.

### (1) Transportation and installation

### ⚠ CAUTION

- Transport the products correctly according to their mass.
- Use the eyebolt of the servo motor for the transportation purpose only. Do not use the eyebolts to transport the servo motor when it is mounted on a machine.

# ⚠ CAUTION

- ●Stacking in excess of the specified number of product packages is not allowed.
- ●Do not carry the servo motor by holding the cables, shaft, encoder, or connector.
- ●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- ●Do not get on or put heavy load on the equipment.
- ●The equipment must be installed in the specified direction.
- ●Do not install or operate the servo amplifier and servo motor which have been damaged or have any parts missing.
- ●Do not block intake and exhaust areas of the servo motor with a cooling fan. Otherwise, it may cause a malfunction.
- ●Do not drop or strike the servo motor. Isolate it from all impact loads.
- ●Securely fix the servo motor to the machine. If being attached insecurely, the servo motor may come off during operation.
- ●The geared servo motor must be installed in the specified direction to prevent oil leakage.
- ●When handling the servo motor, be careful about the edged parts such as the corners of the servo motor.
- ●Be sure to measure the motor vibration level with the servo motor mounted to the machine when checking the vibration level. A great vibration may cause the early damage of a bearing, encoder, brake, and reducer. The great vibration may also cause the poor connector connection or bolt looseness.
- ●For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform with a measurement device, and then check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the servo motor.
- ●Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the servo motor during operation.
- ●Never hit the servo motor or shaft, especially when coupling the servo motor to the machine. Otherwise, the encoder may malfunction.
- ●Do not subject the servo motor shaft to more than the permissible load. Otherwise, the shaft may break.
- ●When you keep or use the equipment, please fulfill the following environment.

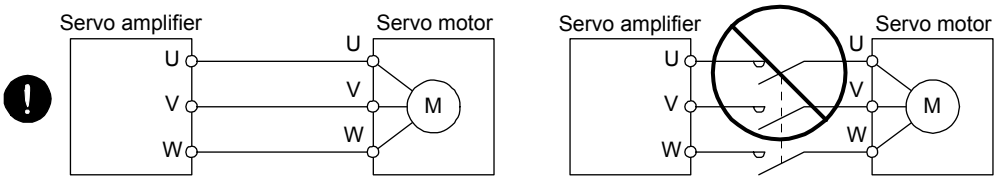
| Item | | Environment |
|---|---|---|
| Ambient temperature | Operation | 0 °C to 40 °C (non-freezing) |
| | Storage | -15 °C to 70 °C (non-freezing) |
| Ambient humidity | Operation | 80 %RH or less (non-condensing) |
| | Storage | 90 %RH or less (non-condensing) |
| Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt |
| Altitude | | Max. 1000 m above sea level |
| Vibration resistance (Note) | HG-MR Series/HG-KR Series | X, Y: 49 $m/s^2$ |
| | HG-SR51/HG-SR81/ HG-SR52/HG-SR102/ HG-SR152 | X, Y: 24.5 $m/s^2$ |
| | HG-SR121/HG-SR201/ HG-SR202/HG-SR352 | X: 24.5 $m/s^2$ Y: 49 $m/s^2$ |
| | HG-SR301/HG-SR421/ HG-SR502/HG-SR702 | X: 24.5 $m/s^2$ Y: 29.4 $m/s^2$ |

Note. Except the geared servo motor.

## (2) Wiring

### ⚠ CAUTION

- ●Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- ●Do not install a power capacitor, surge killer, or radio noise filter (FR-BIF option) on the servo amplifier output side.
- ●To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and servo motor.
- ●Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.




- ●Do not connect AC power supply directly to the servo motor. Otherwise, it may cause a malfunction.
- ●When the cable is not tightened enough to the terminal block, the cable or terminal block may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.

## (3) Test run and adjustment

### ⚠ CAUTION

- ●Before operation, check the parameter settings. Improper settings may cause some machines to operate unexpectedly.
- ●Never adjust or change the parameter values extremely as it will make operation unstable.

## (4) Usage

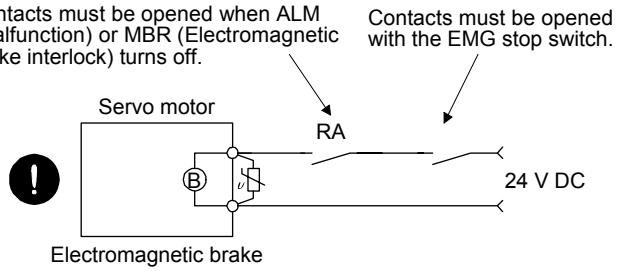
### ⚠ CAUTION

- ●Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- ●Do not scratch the coated surface with hard objects nor clean the coated surface with an organic solvent. Doing so may scuff the surface.
- ●Do not disassemble, repair, or modify the equipment.
- ●Use the servo amplifier with the specified servo motor.
- ●The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking.
- ●For such reasons as service life and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side.

## (5) Corrective actions

### ⚠ CAUTION

- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an electromagnetic brake or external brake to prevent the condition.
- Configure an electromagnetic brake circuit so that it is activated also by an external EMG stop switch.




- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.

## (6) Storage

### ⚠ CAUTION

- Note the followings when storing the servo motor for an extended period of time (guideline: three or more months).
- Always store the servo motor indoors in a clean and dry place.
- If it is stored in a dusty or damp place, make adequate provision, e.g. cover the whole product.
- If the insulation resistance of the winding decreases, check how to store the equipment.
- Though the servo motor is rust-proofed before shipment using paint or rust prevention oil, rust may be produced depending on the storage conditions or storage period.
  If the servo motor is to be stored for longer than six months, apply rust prevention oil again especially to the machined surfaces of the shaft, etc.
- Before using the product after storage for an extended period of time, hand-turn the servo motor output shaft to confirm that nothing is wrong with the servo motor. When the servo motor is equipped with an electromagnetic brake, make the above check after releasing the electromagnetic brake with the brake power supply.
- When the product has been stored for an extended period of time, contact your local sales office.

## (7) General instruction

- To illustrate details, the equipment in the diagrams of this Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Specifications and Instruction Manual.

# ● DISPOSAL OF WASTE ●

Please dispose a servo motor and other options according to your local laws and regulations.

«U.S. customary units»

U.S. customary units are not shown in this manual. Convert the values if necessary according to the following table.

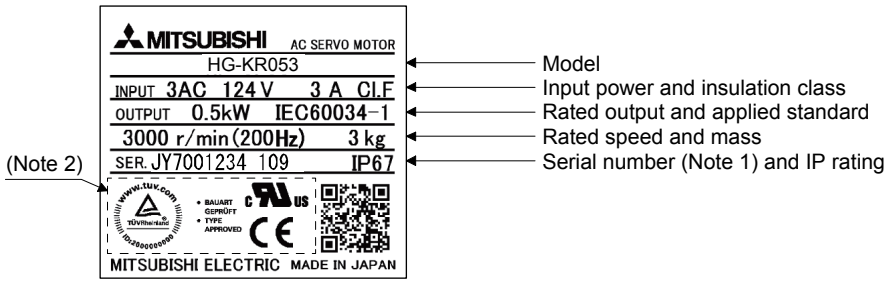
| Quantity | SI (metric) unit | U.S. customary unit |
|---|---|---|
| Mass | 1 [kg] | 2.2046 [lb] |
| Length | 1 [mm] | 0.03937 [in] |
| Torque | 1 [N•m] | 141.6 [oz•in] |
| Moment of inertia | 1 [(× $10^{-4}$ kg•$m^2$)] | 5.4675 [oz•$in^2$] |
| Load (thrust load/axial load) | 1 [N] | 0.2248 [lbf] |
| Temperature | N [°C] × 9/5 + 32 | N [°F] |

CONTENTS

# MEMO

# 1. INTRODUCTION

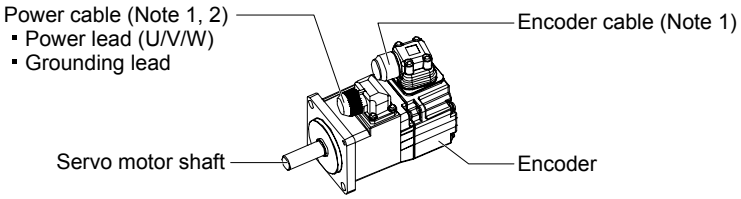
## 1.1 Rating plate




Note 1. Production year and month of the servo motor are indicated in a serial number on the rating plate.
The year and month are indicated by the last two digits of the year and one digit of the month [1 to 9, X(10), Y(11), and Z(12)].
For January 2012, the Serial No. is like, "SER. _ _ _ _ _ _ _ _ _ 121".
2. Products approved by Certification Bodies are marked. The marks depends on the Certification Bodies.

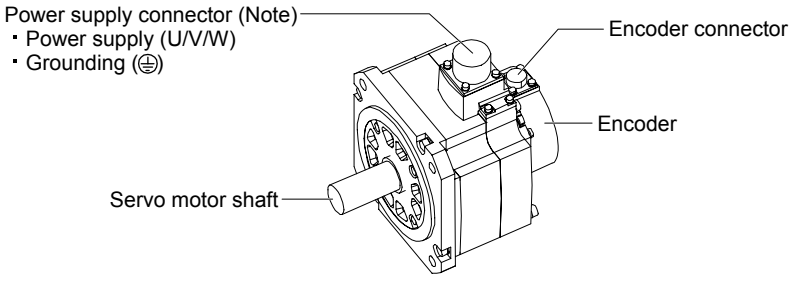
## 1.2 Parts identification

### (1) HG-MR series/HG-KR series servo motor




Note 1. The encoder cable and power supply cable are options.
2. An electromagnetic brake cable is separately required for the servo motor with an electromagnetic brake.

### (2) HG-SR series servo motor




Note. The servo motor with an electromagnetic brake has the electromagnetic brake connector separately.

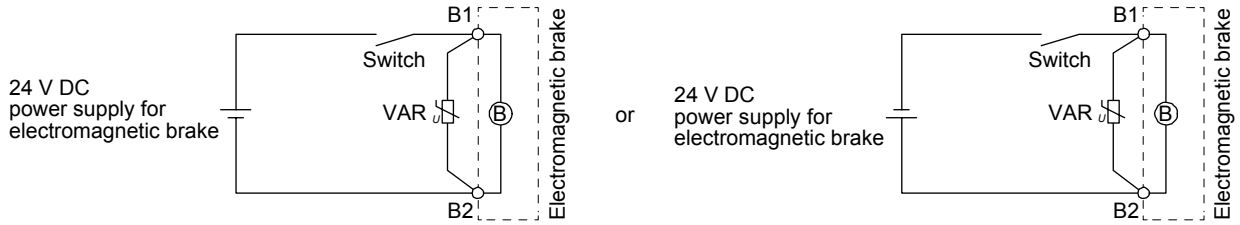
1.3 Electromagnetic brake

| | |
|---|---|
| ⚠CAUTION | ●The electromagnetic brake is provided to prevent a drop at a power failure or servo alarm occurrence during vertical drive or to hold a shaft at a stop. Do not use it for normal braking (including braking at servo-lock).<br>●The electromagnetic brake has a time lag. Use the electromagnetic brake so that servo motor control starts after the electromagnetic brake has completely opened. Be sure to check the time lag of the braking with a real machine.<br>●Configure an electromagnetic brake circuit so that it is activated also by an external EMG stop switch.<br>●For details of the circuit configuration and timing chart, refer to the Servo Amplifier Instruction Manual.<br>●While the electromagnetic brake is opened, the motor may be raised to high temperature regardless of driving.<br>●The life will be shorten under sudden acceleration/deceleration conditions. |

The servo motor with an electromagnetic brake can be used to prevent a drop in vertical lift applications or to ensure double safety at an emergency stop, for example. When operating the servo motor, supply power to the electromagnetic brake to release the brake. Switching power off enables the brake.

(1) Electromagnetic brake power supply

Prepare the following power supply for use with the electromagnetic brake only. The electromagnetic brake terminals (B1 and B2) have no polarity.




The surge absorber (VAR) must be installed between B1 and B2. For the selection and example of surge absorbers, refer to "Electromagnetic brake characteristic" in the chapter of each servo motor series.

When you use a diode for a surge absorber, the electromagnetic braking time will be longer.

(2) Sound generation

Though the brake lining may rattle during operation, it poses no functional problem.

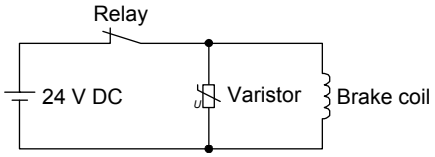
If braking sounds, it may be improved by setting the machine resonance suppression filter in the servo amplifier parameters. For details, refer to the servo amplifier instruction manual.

(3) Selection of surge absorbers for electromagnetic brake circuit

The following shows an example how to select a varistor with a surge absorber.

(a) Selection conditions

| Item | Condition |
|---|---|
| Electromagnetic brake specification | R [Ω]: Resistance<br>L [H]: Inductance<br>Vb [V]: Power supply voltage |
| Desired suppression voltage | Vs [V] or less |
| Durable surge application time | N times |




(b) Tentative selection and verification of surge absorber

1) Maximum allowable circuit voltage of varistor

Tentatively select a varistor whose maximum allowable voltage is larger than Vb [V].

2) Brake current (Ib)

$$Ib = \frac{Vb}{R} \text{ [A]}$$

3) Energy (E) generated by brake coil

$$E = \frac{L \times Ib^2}{2} \text{ [J]}$$

4) Varistor limit voltage (Vi)

From the energy (E) generated in the brake coil and the varister characteristic diagram, calculate the varistor limit voltage (Vi) when the brake current (Ib) flows into the tentatively selected varistor during opening of the circuit.

Vi is favorable when the varistor limit voltage (Vi) [V] is smaller than the desired suppressed voltage (Vs) [V].

If Vi is not smaller than Vs, reselect a varistor or improve the withstand voltage of devices.

5) Surge current width (τ)

Given that the varistor absorbs all energies, the surge current width (τ) will be as follows.

$$\tau = \frac{E}{Vi \times Ib} \text{ [S]}$$

6) Examining surge life of varister

From the varistor characteristic diagram, the guaranteed current value (Ip) in which the number of the surge application life is N at the surge current width (τ). Calculate the guaranteed current value (Ip) ratio to brake current (Ib).

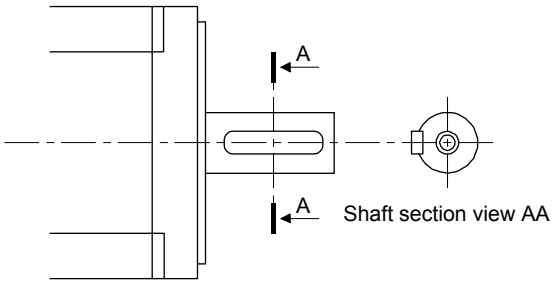
If an enough margin is ensured for Ip/Ib, the number of the surge application life N [time] can be considered as favorable.

(4) Others

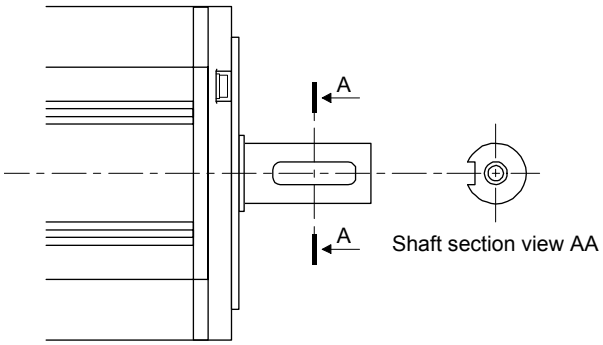
A leakage magnetic flux will occur at the shaft end of the servo motor equipped with an electromagnetic brake. Note that chips, screws and other magnetic substances are attracted.

1.4 Servo motor shaft shapes

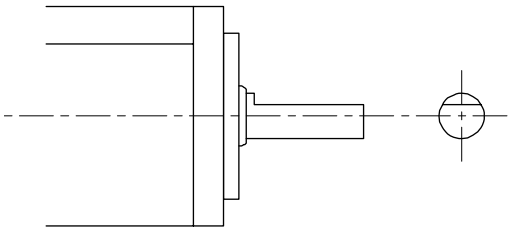
In addition to the straight shaft, the key shaft and D cut shaft are available as the servo motor shafts.
The key shaft and D cut shaft cannot be used in frequent start/stop applications.
Since we cannot warrant the servo motor against fracture and similar accidents attributable to a loose key, use a friction coupling, etc. when coupling the shaft with a machine.
The shaft shape of the standard servo motor changes depending on the series and capacity. Refer to the chapter of the servo motor series.
The key shaft (with single pointed key) applies to only the geared servo motor for precision application.



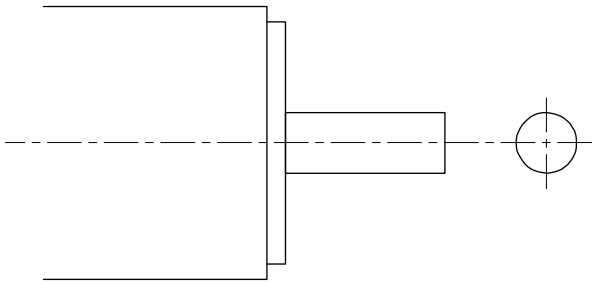

Key shaft (with 2 round end key)



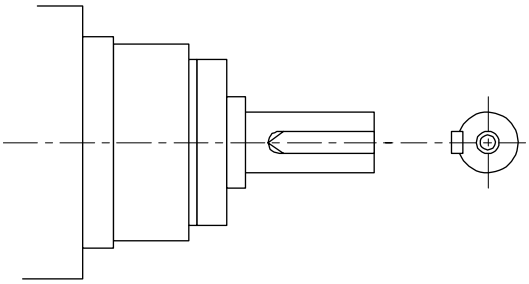

Key shaft (without key)



D cut shaft



Straight shaft



Key shaft (with single pointed key)

# 2. INSTALLATION

⚠WARNING ●To prevent electric shock, ground each equipment securely.

⚠CAUTION

●Stacking in excess of the specified number of product packages is not allowed.
●Install the equipment on incombustible material. Installing it directly or close to combustibles will lead to a fire.
●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
●Do not get on or put heavy load on the equipment. Otherwise, it may cause injury.
●Use the equipment within the specified environmental range. For the environment, refer to the specifications of the servo motor series.
●Do not drop or strike the servo motor. Isolate it from all impact loads.
●Do not install or operate a faulty servo motor.
●Do not carry the servo motor by holding the cables, shaft, encoder, or connector. Otherwise, it may cause a malfunction or injury.
●Use the eyebolts of the servo motor to only transport it. Do not use the eyebolts to transport the servo motor when it is mounted on a machine.
●The geared servo motor must be mounted in the specified direction. Otherwise, it can leak oil, leading to a fire or malfunction.
●Securely fix the servo motor to the machine. If being attached insecurely, the servo motor may come off during operation, leading to injury.
●Be sure to measure the motor vibration level with the servo motor mounted on the machine when checking the vibration level. A great vibration may cause the early damage of a bearing, encoder, brake, and reducer. The great vibration may also cause the poor connector connection or bolt looseness.
●For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform with a measurement device to check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the servo motor.
●Never hit the servo motor or shaft, especially when coupling the servo motor to the machine. Otherwise, the encoder may malfunction.
●When coupling a load to the servo motor, do not use a rigid coupling. Doing so can cause the shaft to break and the bearing to wear out.
●Balance the load to the extent possible. Not doing so can cause vibration during servo motor operation or damage the bearings and encoder.
●Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the servo motor during operation.
●Do not subject the servo motor shaft to more than the permissible load. Otherwise, the shaft may break, leading to injury.
●When the product has been stored for an extended period of time, contact your local sales office.
●When handling the servo motor, be careful about the edged parts such as the corners of the servo motor.

# 2. INSTALLATION

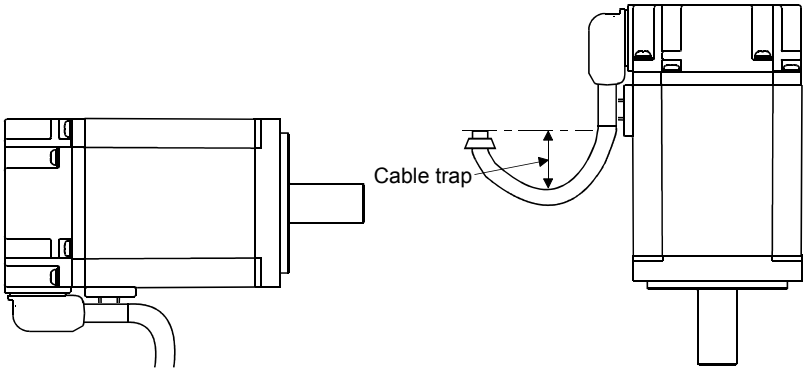
## 2.1 Mounting direction

(1) Standard servo motor

The following table indicates the mounting direction of the standard servo motor.

| Servo motor series | Mounting direction |
|---|---|
| HG-MR<br>HG-KR<br>HG-SR | May be installed in any direction. |

For mounting in the horizontal direction, it is recommended to set the connector section downward. When installing the servo motor vertically or obliquely, provide a connection and trap for the cable.




(2) Servo motor with an electromagnetic brake

The servo motor with an electromagnetic brake can also be installed in the same orientation as the standard servo motor. When the servo motor with an electromagnetic brake is installed with the shaft end at top, the brake plate may generate sliding sound but it is not a fault.

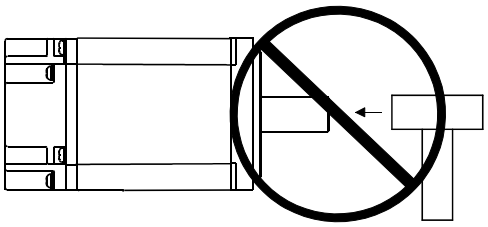
(3) Geared servo motors

The mounting direction of the geared servo motor differs depending on the reducer type. Be sure to mount it in the specified direction. Refer to the chapter of the servo motor series for details.

2.2 Load remove precautions

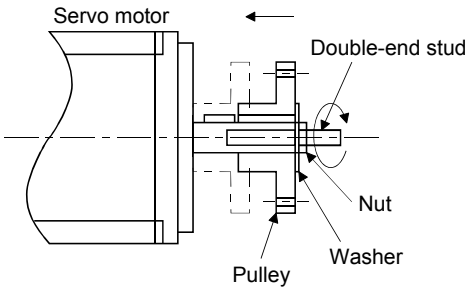
⚠CAUTION

●During assembling, the shaft end must not be hammered. Otherwise, the encoder may malfunction.



●Do not process the shaft to avoid damage to the encoder and bearing.

(1) When mounting a pulley to the servo motor with a key shaft, use the screw hole in the shaft end. To fit the pulley, first insert a double-end stud into the screw hole of the shaft, put a washer against the end face of the coupling, and insert and tighten a nut to force the pulley in.




(2) For the shaft without a key, use a friction coupling or the like.

(3) When removing the pulley, use a pulley remover to protect the shaft from hard load and or impact.

(4) To ensure safety, fit a protective cover or the like on the rotary area, such as the pulley, mounted to the shaft.

(5) When a threaded shaft end part is needed to mount a pulley on the shaft, please contact your local sales office.

(6) The direction of the encoder on the servo motor cannot be changed.

(7) When mounting the servo motor, use spring washers, etc. and fully tighten the bolts so that they do not become loose due to vibration.

2.3 Permissible load for the shaft

**⚠CAUTION** ●Do not use a rigid coupling as it may apply excessive bending load to the shaft of the servo motor, leading the shaft to break and the bearing to wear out.

For the permissible shaft load specific to the servo motor, refer to the chapter of the servo motor series.

(1) Use a flexible coupling and adjust the misalignment of the shaft to less than the permissible radial load.

(2) When using a pulley, sprocket or timing belt, select a diameter that will fit into the permissible radial load.

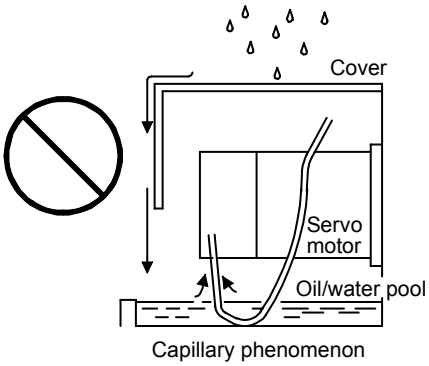
(3) Excess of the permissible load can cause the bearing life to reduce and the shaft to break.

(4) The load indicated in this section is static load in a single direction and does not include eccentric load. Make eccentric load as small as possible. Not doing so can cause the servo motor to be damaged.

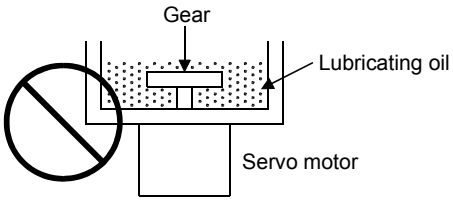
2.4 Protection from oil and water

Provide adequate protection to prevent foreign matter, such as oil from entering the servo motor shaft. When installing the servo motor, consider the items in this section.

(1) Do not use the servo motor with its cable soaked in oil or water.




(2) When the servo motor is to be installed with the shaft end at top, provide measures so that it is not exposed to oil and water entering from the machine side, gear box, etc.




(3) If oil such as coolant drops on the servo motor, the sealant, packing, cable and others may be affected depending on the oil type.

(4) In the environment where the servo motor is exposed to oil mist, oil, water, grease and/or like, a standard specifications servo motor may not be usable. Please contact your local sales office.

### 2.5 Cable

The power supply and encoder cables routed from the servo motor should be fixed to the servo motor to keep them unmovable. Otherwise, the cable may disconnect. In addition, do not modify the connectors, terminals and others at the ends of the cables.

### 2.6 Inspection items

**⚠WARNING**

- Before starting maintenance and/or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- To avoid an electric shock, only qualified personnel should attempt inspections. For repair and parts replacement, contact your local sales office.

**⚠CAUTION**

- Do not disassemble and/or repair the equipment on customer side.

It is recommended that the following points periodically be checked.

(1) Check the bearings, brake section, etc. for unusual noise.

(2) Check the cables and the like for scratches or cracks. Especially when the cable is movable, perform periodic inspection according to operating conditions.

(3) Check the servo motor shaft and coupling for misalignment.

(4) Check the power supply connector and encoder connector tightening screws for looseness.

### 2.7 Parts having service lives

Service lives of the following parts are listed below. However, the service lives vary depending on operation and environment. If any fault is found in the parts, they must be replaced immediately regardless of their service lives. For parts replacement, please contact your local sales office.

| Part name | Life guideline |
|---|---|
| Bearings | 20,000 hours to 30,000 hours |
| Encoder | 20,000 hours to 30,000 hours |
| Oil seal | 5000 hours |

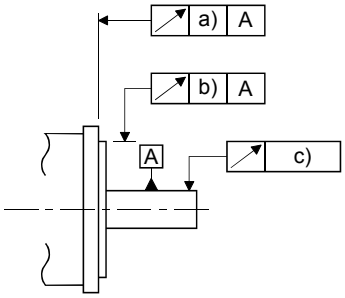
(1) Bearings
When the servo motor is run at rated speed under rated load, bearings should be exchanged in 20,000 to 30,000 hours as a guideline. This differs on the operating conditions. The bearings must also be changed if unusual noise or vibration is found during inspection.

(2) Oil seal (including oil seal used on the reducer)
Oil seals must be changed in 5,000 hours of operation at rated speed as a guideline. They must also be changed if oil leakage, etc. is found during inspection.
The functions have no problem even if an oil seal may sound during operation.

## 2.8 Machine accuracies

The following table indicates the machine accuracies of the servo motor around the output shaft and mounting. (except the optional products)

| Accuracy [mm] | Measuring position | Flange size | | | |
|---|---|---|---|---|---|
| | | 100 × 100 or less | 130 × 130 | 176 × 176 to 250 × 250 | 280 × 280 or more |
| Runout of flange surface to output shaft | a) | 0.05 | 0.06 | 0.08 | 0.08 |
| Runout of fitting OD of flange surface | b) | 0.04 | 0.04 | 0.06 | 0.08 |
| Runout of output shaft end | c) | 0.02 | 0.02 | 0.03 | 0.03 |



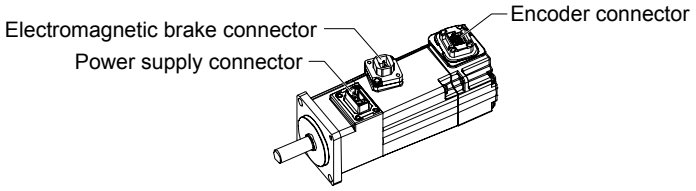
# 3. CONNECTORS USED FOR SERVO MOTOR WIRING

| POINT |
|---|
| ●The IP rating indicated is the connector's protection against ingress of dust and water when the connector is connected to a servo amplifier or servo motor. If the IP rating of the connector, servo amplifier and servo motor vary, the overall IP rating depends on the lowest IP rating of all components. |

## 3.1 Selection of connectors

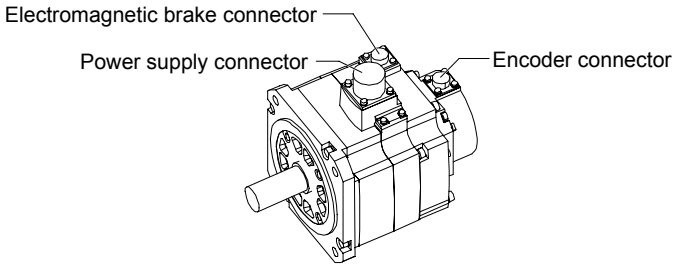
Use the connector configuration products given in the table as the connectors for connection with the servo motor. Refer to section 3.2 and 3.3 for the compatible connector configuration products.

(1) HG-MR series and HG-KR series




| Servo motor | Wiring connector | | |
|---|---|---|---|
| | For encoder | For power supply | For electromagnetic brake |
| HG-MR_<br>HG-KR_ | Connector configuration A | Connector configuration B | Connector configuration C |

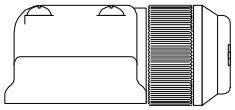
(2) HG-SR series




| Servo motor | Wiring connector | | |
|---|---|---|---|
| | For encoder | For power supply | For electromagnetic brake |
| HG-SR51/HG-SR81 | Connector configuration D | Connector configuration E | Connector configuration F |
| HG-SR52/HG-SR102/ HG-SR152 | | | |
| HG-SR121/HG-SR201/ HG-SR301 | | Connector configuration G | |
| HG-SR202/HG-SR352/ HG-SR502 | | | |
| HG-SR421 | | Connector configuration H | |
| HG-SR702 | | | |

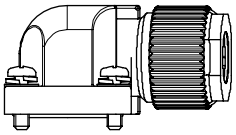
## 3.2 Wiring connectors (connector configurations A/B/C)

The connectors in this section comply with UL/CSA standards.



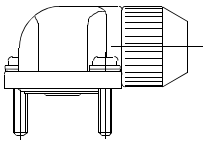
| Connector configuration | Feature | Connector | Crimping tool | Servo motor encoder connector (Note) |
|---|---|---|---|---|
| A<br>(for encoder) | IP65 | Connector: 2174053-1<br>(TE Connectivity) | For ground clip: 1596970-1<br>For REC. contact: 1596847-1<br>(TE Connectivity) | 1674339-1<br>(TE Connectivity) |

Note. The other side connector



| Connector configuration | Feature | Connector | Crimping tool | Servo motor power supply connector (Note) |
|---|---|---|---|---|
| B<br>(for power supply) | IP65 | Connector: KN4FT04SJ1-R<br>HOOD/SOCKET INSULATOR/<br>BUSHING/GROUND NUT<br>Contact: ST-TMH-S-C1B-100 (A534G)<br>(JAE) | CT160-3-TMH5B<br>(JAE) | JN4AT04NJ1<br>(JAE) |

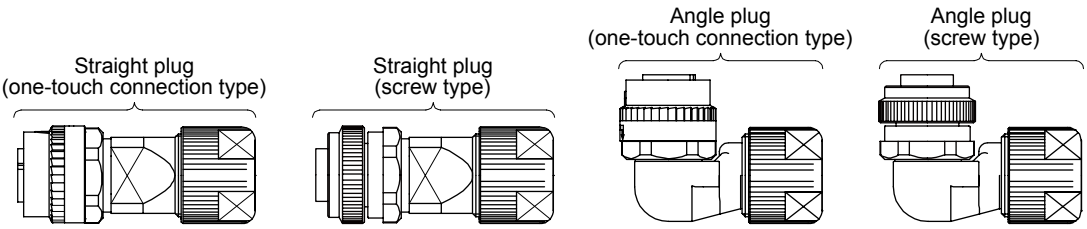
Note. The other side connector



| Connector configuration | Feature | Connector | Crimping tool | Servo motor electromagnetic brake connector (Note) |
|---|---|---|---|---|
| C<br>(for electromagnetic brake) | IP65 | Connector: JN4FT02SJ1-R<br>HOOD/SOCKET INSULATOR/<br>BUSHING/GROUND NUT<br>Contact: ST-TMH-S-C1B-100 (A534G)<br>(JAE) | CT160-3-TMH5B<br>(JAE) | JN4AT02PJ1<br>(JAE) |

Note. The other side connector

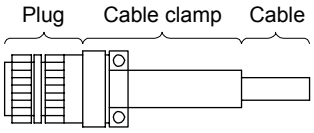
## 3.3 Wiring connectors (connector configurations D/E/F/G/H)

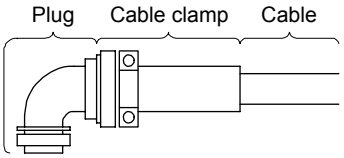



| Connector configuration | Feature | Plug (DDK) | | | | | Servo motor encoder connector (Note) |
|---|---|---|---|---|---|---|---|
| | | Type | Plug | Socket contact | Contact shape | Cable OD [mm] (reference) | |
| D (for encoder) | IP67 | Straight | CMV1-SP10S-M1 (one-touch connection type)<br>CMV1S-SP10S-M1 (screw type) | CMV1-#22ASC-S1-100 | Soldering type<br>Applicable wire size: AWG 20 or less | 5.5 to 7.5 | CMV1-R10P |
| | | | | CMV1-#22ASC-C1-100 | Crimping type<br>Applicable wire size: AWG 24 to 20<br>The crimping tool (357J-53162T) is required. | | |
| | | | | CMV1-#22ASC-C2-100 | Crimping type<br>Applicable wire size: AWG 28 to 24<br>The crimping tool (357J-53163T) is required. | | |
| | | | CMV1-SP10S-M2 (one-touch connection type)<br>CMV1S-SP10S-M2 (screw type) | CMV1-#22ASC-S1-100 | Soldering type<br>Applicable wire size: AWG 20 or less | 7.0 to 9.0 | |
| | | | | CMV1-#22ASC-C1-100 | Crimping type<br>Applicable wire size: AWG 24 to 20<br>The crimping tool (357J-53162T) is required. | | |
| | | | | CMV1-#22ASC-C2-100 | Crimping type<br>Applicable wire size: AWG 28 to 24<br>The crimping tool (357J-53163T) is required. | | |
| | | Angle | CMV1-AP10S-M1 (one-touch connection type)<br>CMV1S-AP10S-M1 (screw type) | CMV1-#22ASC-S1-100 | Soldering type<br>Applicable wire size: AWG 20 or less | 5.5 to 7.5 | |
| | | | | CMV1-#22ASC-C1-100 | Crimping type<br>Applicable wire size: AWG 24 to 20<br>The crimping tool (357J-53162T) is required. | | |
| | | | | CMV1-#22ASC-C2-100 | Crimping type<br>Applicable wire size: AWG 28 to 24<br>The crimping tool (357J-53163T) is required. | | |
| | | | CMV1-AP10S-M2 (one-touch connection type)<br>CMV1S-AP10S-M2 (screw type) | CMV1-#22ASC-S1-100 | Soldering type<br>Applicable wire size: AWG 20 or less | 7.0 to 9.0 | |
| | | | | CMV1-#22ASC-C1-100 | Crimping type<br>Applicable wire size: AWG 24 to 20<br>The crimping tool (357J-53162T) is required. | | |
| | | | | CMV1-#22ASC-C2-100 | Crimping type<br>Applicable wire size: AWG 28 to 24<br>The crimping tool (357J-53163T) is required. | | |

Note. The other side connector

# 3. CONNECTORS USED FOR SERVO MOTOR WIRING

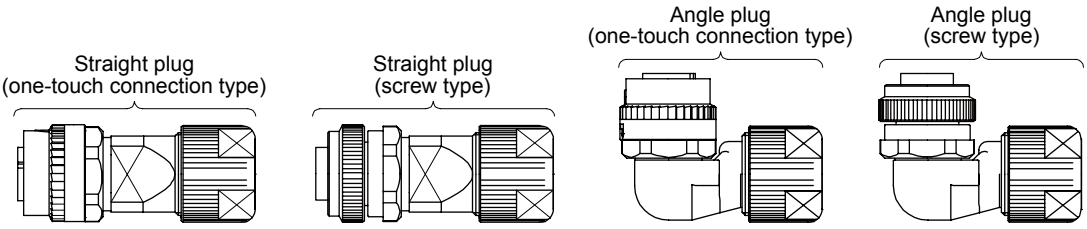



| Connector configuration | Feature | Plug (DDK) | | Cable clamp (DDK) | | Servo motor power supply connector (Note 2) |
|---|---|---|---|---|---|---|
| | | Type | Model | Cabel OD [mm] (reference) | Model | |
| E (for power supply) | IP67 EN compliant | Straight | CE05-6A18-10SD-D-BSS Applicable wire size: AWG 14 to 12 | 8.5 to 11 | CE3057-10A-2-D | MS3102A18-10P |
| | | | | 10.5 to 14.1 | CE3057-10A-1-D | |
| | | Angle | CE05-8A18-10SD-D-BAS Applicable wire size: AWG 14 to 12 | 8.5 to 11 | CE3057-10A-2-D | |
| | | | | 10.5 to 14.1 | CE3057-10A-1-D | |
| | (Note 1) General environment | Straight | D/MS3106B18-10S Applicable wire size: AWG 14 to 12 | 14.3 or less (bushing ID) | D/MS3057-10A | |
| | | Angle | D/MS3108B18-10S Applicable wire size: AWG 14 to 12 | | | |

Note 1. Not comply with EN.
2. The other side connector

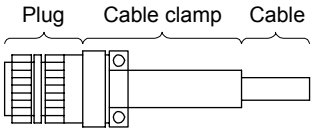
# 3. CONNECTORS USED FOR SERVO MOTOR WIRING

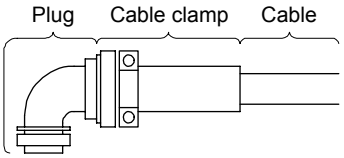



| Connector configuration | Feature | Plug (DDK) | | | | | Servo motor electromagnetic brake connector (Note) |
|---|---|---|---|---|---|---|---|
| | | Type | Plug | Socket contact | Contact shape | Cable OD [mm] (reference) | |
| F (for electromagnetic brake) | IP67 | Straight | CMV1-SP2S-S (one-touch connection type)<br>CMV1S-SP2S-S (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 4.0 to 6.0 | CMV1-R2P |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-SP2S-M1 (one-touch connection type)<br>CMV1S-SP2S-M1 (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 5.5 to 7.5 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-SP2S-M2 (one-touch connection type)<br>CMV1S-SP2S-M2 (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 7.0 to 9.0 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-SP2S-L (one-touch connection type)<br>CMV1S-SP2S-L (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 9.0 to 11.6 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | Angle | CMV1-AP2S-S (one-touch connection type)<br>CMV1S-AP2S-S (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 4.0 to 6.0 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-AP2S-M1 (one-touch connection type)<br>CMV1S-AP2S-M1 (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 5.5 to 7.5 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-AP2S-M2 (one-touch connection type)<br>CMV1S-AP2S-M2 (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 7.0 to 9.0 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |
| | | | CMV1-AP2S-L (one-touch connection type)<br>CMV1S-AP2S-L (screw type) | CMV1-#22BSC-S2-100 | Soldering type<br>Applicable wire size: AWG 16 or less | 9.0 to 11.6 | |
| | | | | CMV1-#22BSC-C3-100 | Crimping type<br>Applicable wire size: AWG 20 to 16<br>The crimping tool (357J-53164T) is required. | | |

Note. The other side connector

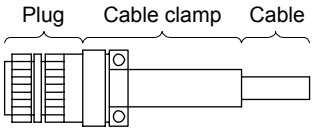
# 3. CONNECTORS USED FOR SERVO MOTOR WIRING

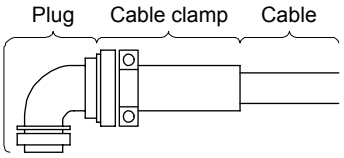



| Connector configuration | Feature | Plug (DDK) | | Cable clamp (DDK) | | Servo motor power supply connector (Note 2) |
|---|---|---|---|---|---|---|
| | | Type | Model | Cabel OD [mm] (reference) | Model | |
| G (for power supply) | IP67 EN compliant | Straight | CE05-6A22-22SD-D-BSS Applicable wire size: AWG 10 to 8 | 9.5 to 13 | CE3057-12A-2-D | MS3102A22-22P |
| | | | | 12.5 to 16 | CE3057-12A-1-D | |
| | | Angle | CE05-8A22-22SD-D-BAS Applicable wire size: AWG 10 to 8 | 9.5 to 13 | CE3057-12A-2-D | |
| | | | | 12.5 to 16 | CE3057-12A-1-D | |
| | (Note 1) General environment | Straight | D/MS3106B22-22S Applicable wire size: AWG 10 to 8 | 15.9 or less (bushing ID) | D/MS3057-12A | |
| | | Angle | D/MS3108B22-22S Applicable wire size: AWG 10 to 8 | | | |

Note 1. Not comply with EN.
2. The other side connector




| Connector configuration | Feature | Plug (DDK) | | Cable clamp (DDK) | | Servo motor power supply connector (Note 2) |
|---|---|---|---|---|---|---|
| | | Type | Model | Cabel OD [mm] (reference) | Model | |
| H (for power supply) | IP67 EN compliant | Straight | CE05-6A32-17SD-D-BSS Applicable wire size: AWG 6 to 4 | 22 to 23.8 | CE3057-20A-1-D | MS3102A32-17P |
| | | Angle | CE05-8A32-17SD-D-BAS Applicable wire size: AWG 6 to 4 | | | |
| | (Note 1) General environment | Straight | D/MS3106B32-17S Applicable wire size: AWG 6 to 4 | 23.8 or less (bushing ID) | D/MS3057-20A | |
| | | Angle | D/MS3108B32-17S Applicable wire size: AWG 6 to 4 | | | |

Note 1. Not comply with EN.
2. The other side connector

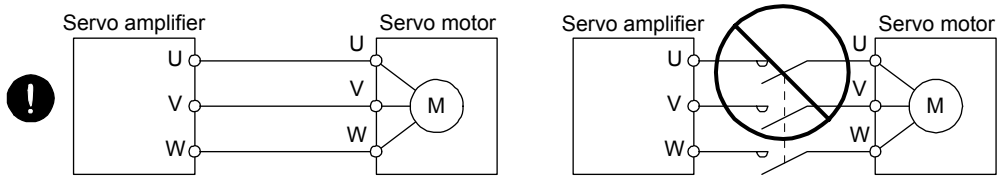
# 4. CONNECTION OF SERVO AMPLIFIER AND SERVO MOTOR

**⚠WARNING**

- Any person who is involved in wiring should be fully competent to do the work.
- Ground the servo motor securely.
- Do not attempt to wire the servo motor until it has been mounted. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connections of the power supply terminals.

**⚠CAUTION**

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly, resulting in injury.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- Do not install a power capacitor, surge killer or radio noise filter (FR-BIF option) with the power line of the servo motor.
- Do not modify the equipment.
- Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



# 4. CONNECTION OF SERVO AMPLIFIER AND SERVO MOTOR

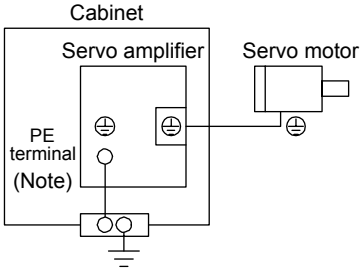
## 4.1 Connection instructions

| | |
|---|---|
| ⚠CAUTION | ●To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and servo motor.<br>●Do not connect AC power supply directly to the servo motor. Otherwise, it may cause a malfunction.<br>●Do not use the 24 V DC interface power supply for the electromagnetic brake. Always use the power supply designed exclusively for the electromagnetic brake. Otherwise, it may cause a malfunction. |

POINT

●Refer to chapter 5 for the selection of the encoder cable.
●Refer to the chapter of the servo motor series for the selection of a surge absorber for the electromagnetic brake.

For grounding, connect the grounding lead wire from the servo motor to the protective earth (PE) terminal of the servo amplifier, and then connect the wire from the servo amplifier to the ground via the protective earth of the cabinet. Do not connect the wire directly to the protective earth of the cabinet.




Note. The number of PE terminals of the servo amplifier differs depending on the amplifier types.

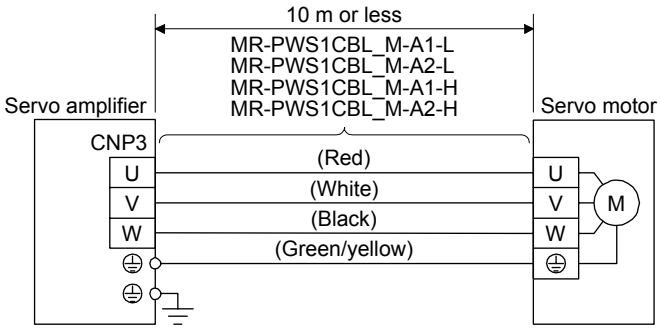
4.2 Wiring

4.2.1 HG-MR series/HG-KR series servo motor

(1) Connection with MR-J4 1-axis servo amplifier

(a) Servo motor power supply cable wiring diagrams

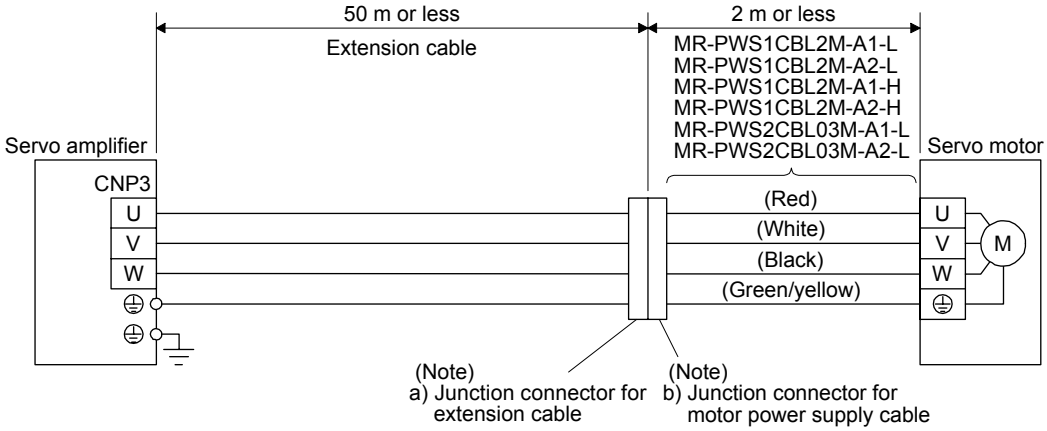
1) When cable length is 10 m or less




2) When cable length exceeds 10 m

When the cable length exceeds 10 m, fabricate an extension cable as shown below. In this case, the motor power supply cable should be within 2 m long.

Refer to section 4.3 for the wire used for the extension cable.

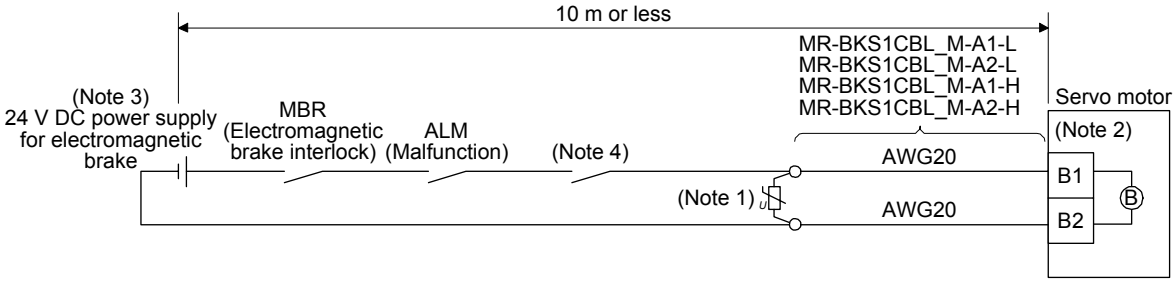



Note. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

| Junction connector | Description | IP rating |
|---|---|---|
| a) Junction connector for extension cable | Connector: RM15WTPZ-4P(71)<br>Cord clamp: JR13WCC-5(72)<br>(Hirose Electric) └Numeral changes depending on the cable OD. | IP65 |
| b) Junction connector for motor power supply cable | Connector: RM15WTJZ-4S(71)<br>Cord clamp: JR13WCC-8(72)<br>(Hirose Electric) └Numeral changes depending on the cable OD. | IP65 |

(b) Electromagnetic brake cable wiring diagrams

1) When cable length is 10 m or less



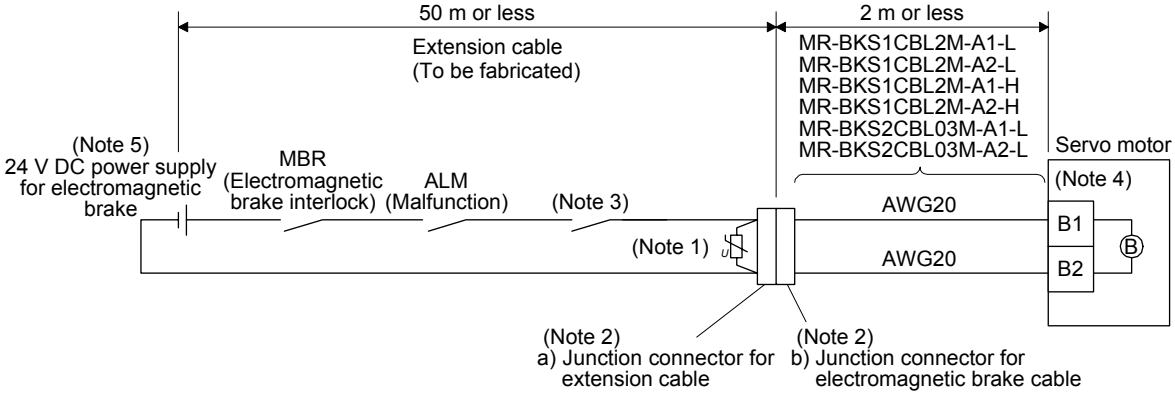

Note 1. Connect a surge absorber as close to the servo motor as possible.
2. There is no polarity in electromagnetic brake terminals (B1 and B2).
3. Do not use the 24 V DC interface power supply for the electromagnetic brake.
4. Create the circuit in order to shut off by interlocking with the emergency stop switch.

When fabricating the electromagnetic brake cable MR-BKS1CBL-_M-H, refer to section 5.4 and 5.5.

2) When cable length exceeds 10 m

When the cable length exceeds 10 m, fabricate an extension cable as shown below. In this case, the electromagnetic brake cable should be within 2 m.

Refer to section 4.3 for the wire used for the extension cable.




Note 1. Connect a surge absorber as close to the servo motor as possible.
2. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

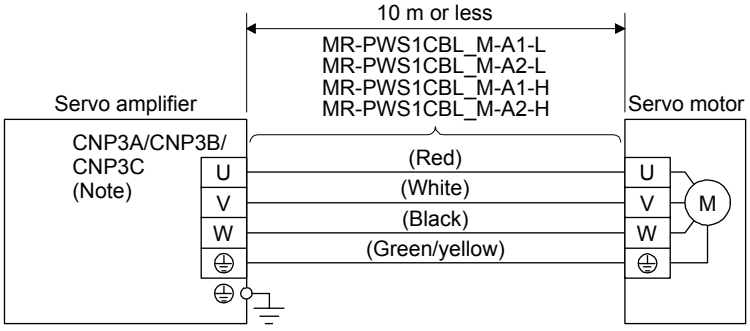
| Junction connector | Description | IP rating |
|---|---|---|
| a) Junction connector for extension cable | CM10-CR2P-*(DDK)<br>└ Wire size: S, M, L | IP65 |
| b) Junction connector for electromagnetic brake cable | CMV1-SP2S-*(DDK)<br>└ Wire size: S, M1, M2, L | IP65 |

3. Create the circuit in order to shut off by interlocking with the emergency stop switch.
4. There is no polarity in electromagnetic brake terminals (B1 and B2).
5. Do not use the 24 V DC interface power supply for the electromagnetic brake.

(2) Connection with MR-J4 multi-axis servo amplifier

(a) Servo motor power supply cable wiring diagrams

1) When cable length is 10 m or less

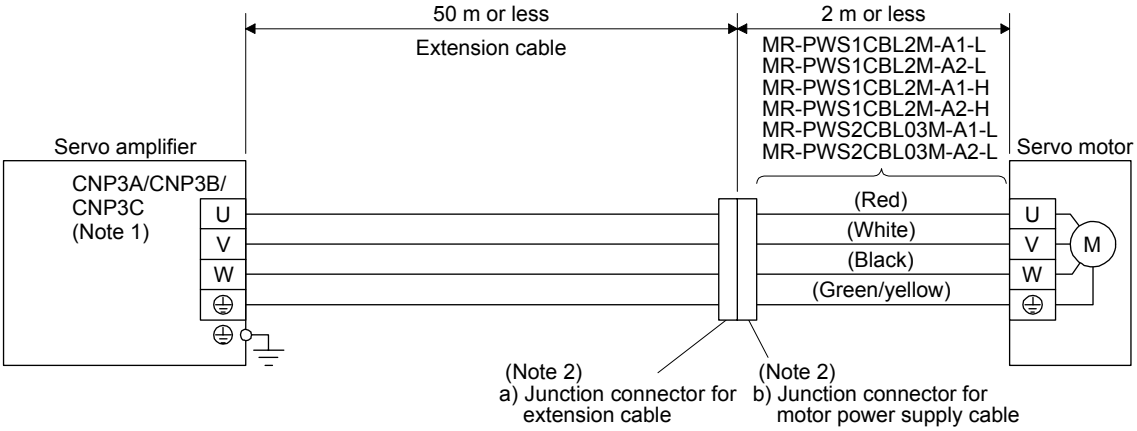



Note. CNP3 is for the MR-J4 3-axis servo amplifier.

2) When cable length exceeds 10 m

When the cable length exceeds 10 m, fabricate an extension cable as shown below. In this case, the motor power supply cable should be within 2 m long.

Refer to section 4.3 for the wire used for the extension cable.



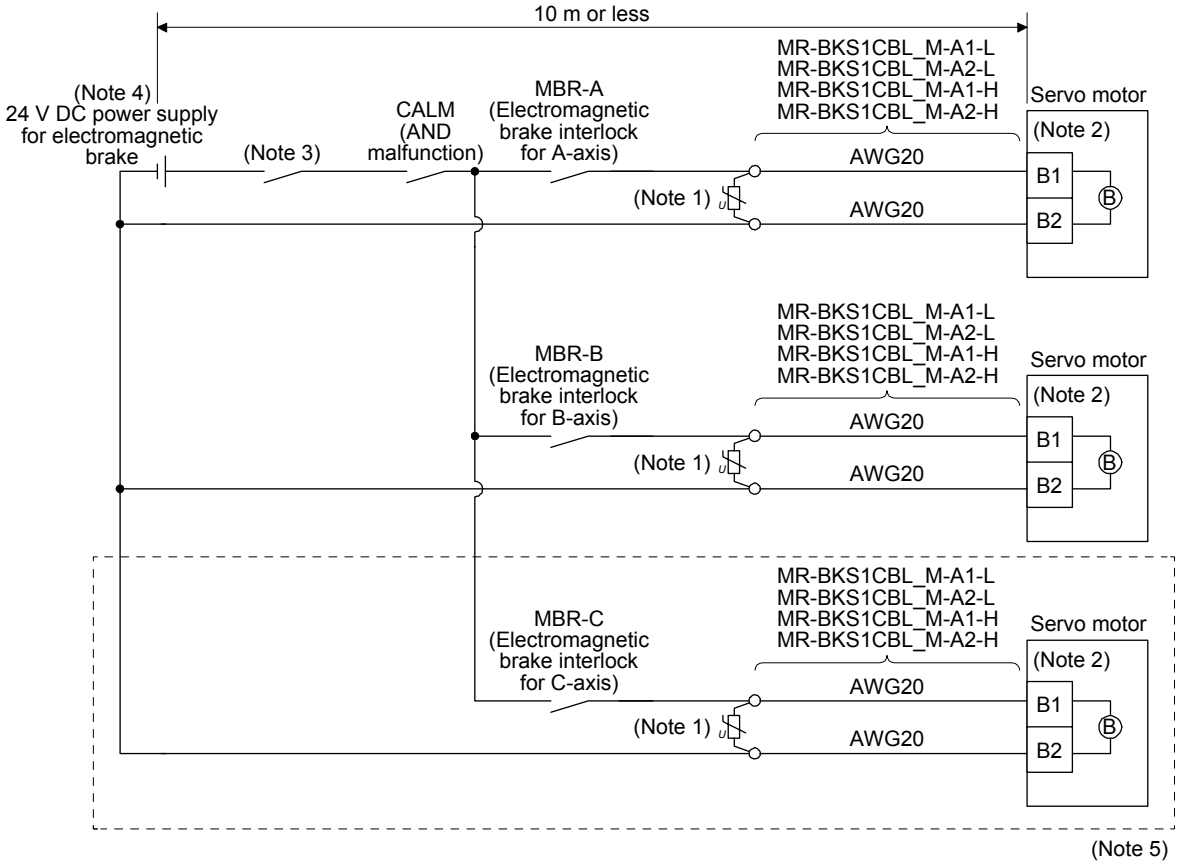

Note 1. CNP3 is for the MR-J4 3-axis servo amplifier.

2. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

| Junction connector | Description | IP rating |
|---|---|---|
| a) Junction connector for extension cable | Connector: RM15WTPZ-4P(71)<br>Cord clamp: JR13WCC-5(72)<br>(Hirose Electric) └Numeral changes depending on the cable OD. | IP65 |
| b) Junction connector for motor power supply cable | Connector: RM15WTJZ-4S(71)<br>Cord clamp: JR13WCC-8(72)<br>(Hirose Electric) └Numeral changes depending on the cable OD. | IP65 |

(b) Electromagnetic brake cable wiring diagrams

1) When cable length is 10 m or less



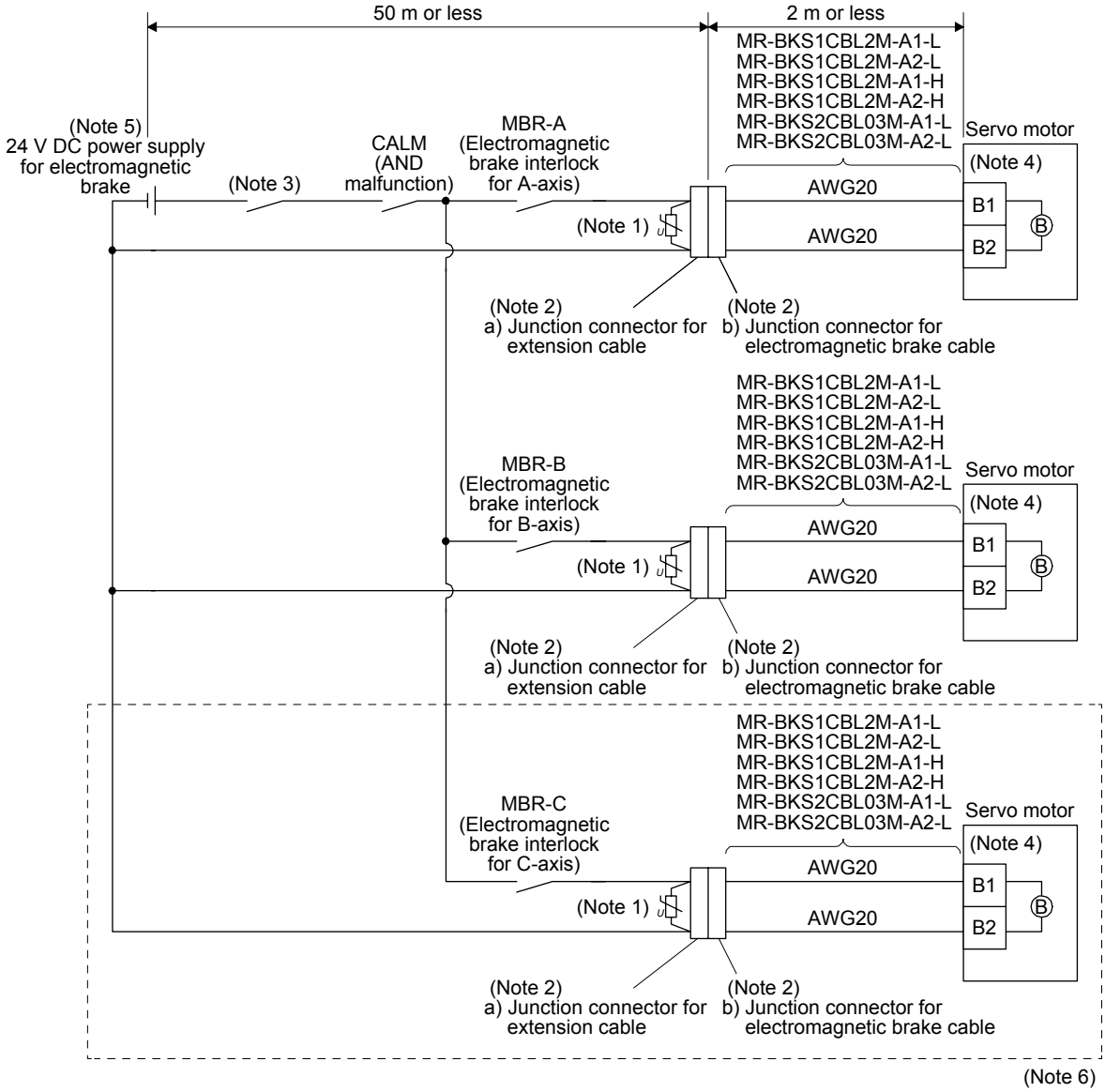

Note 1. Connect a surge absorber as close to the servo motor as possible.
2. There is no polarity in electromagnetic brake terminals (B1 and B2).
3. Create the circuit in order to shut off by interlocking with the emergency stop switch.
4. Do not use the 24 V DC interface power supply for the electromagnetic brake.
5. This connection is for the MR-J4 3-axis servo amplifier.

When fabricating the electromagnetic brake cable MR-BKS1CBL-_M-H, refer to section 5.4.

2) When cable length exceeds 10 m

When the cable length exceeds 10 m, fabricate an extension cable as shown below. In this case, the electromagnetic brake cable should be within 2 m.

Refer to section 4.3 for the wire used for the extension cable.




Note 1. Connect a surge absorber as close to the servo motor as possible.

2. Use of the following connectors is recommended when ingress protection (IP65) is necessary.

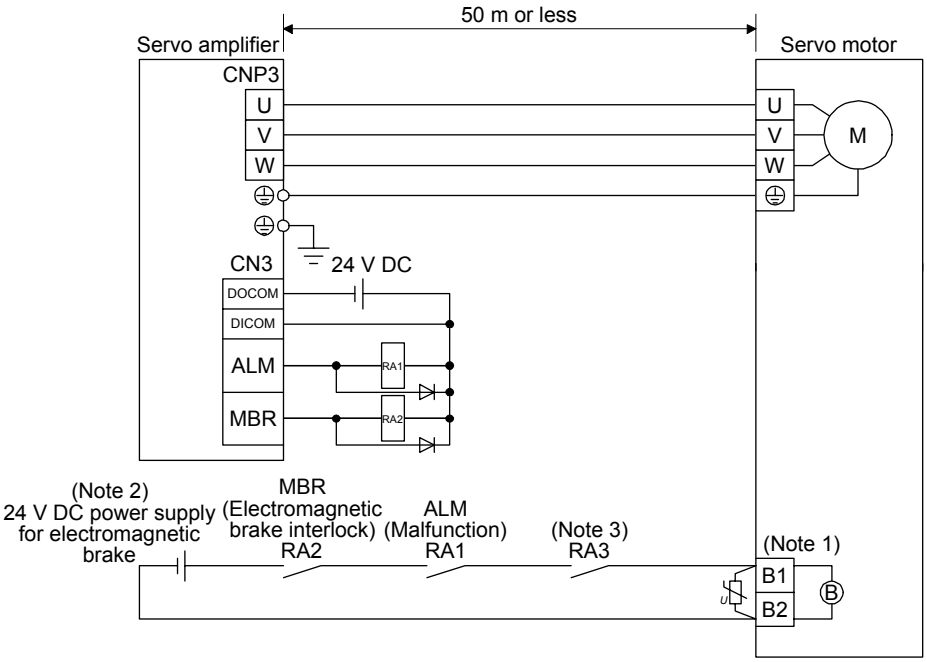
| Junction connector | Description | IP rating |
|---|---|---|
| a) Junction connector for extension cable | CM10-CR2P-*(DDK)<br>└ Wire size: S, M, L | IP65 |
| b) Junction connector for electromagnetic brake cable | CMV1-SP2S-*(DDK)<br>└ Wire size: S, M1, M2, L | IP65 |

3. Create the circuit in order to shut off by interlocking with the emergency stop switch.
4. There is no polarity in electromagnetic brake terminals (B1 and B2).
5. Do not use the 24 V DC interface power supply for the electromagnetic brake.
6. This connection is for the MR-J4 3-axis servo amplifier.

4.2.2 HG-SR series servo motor

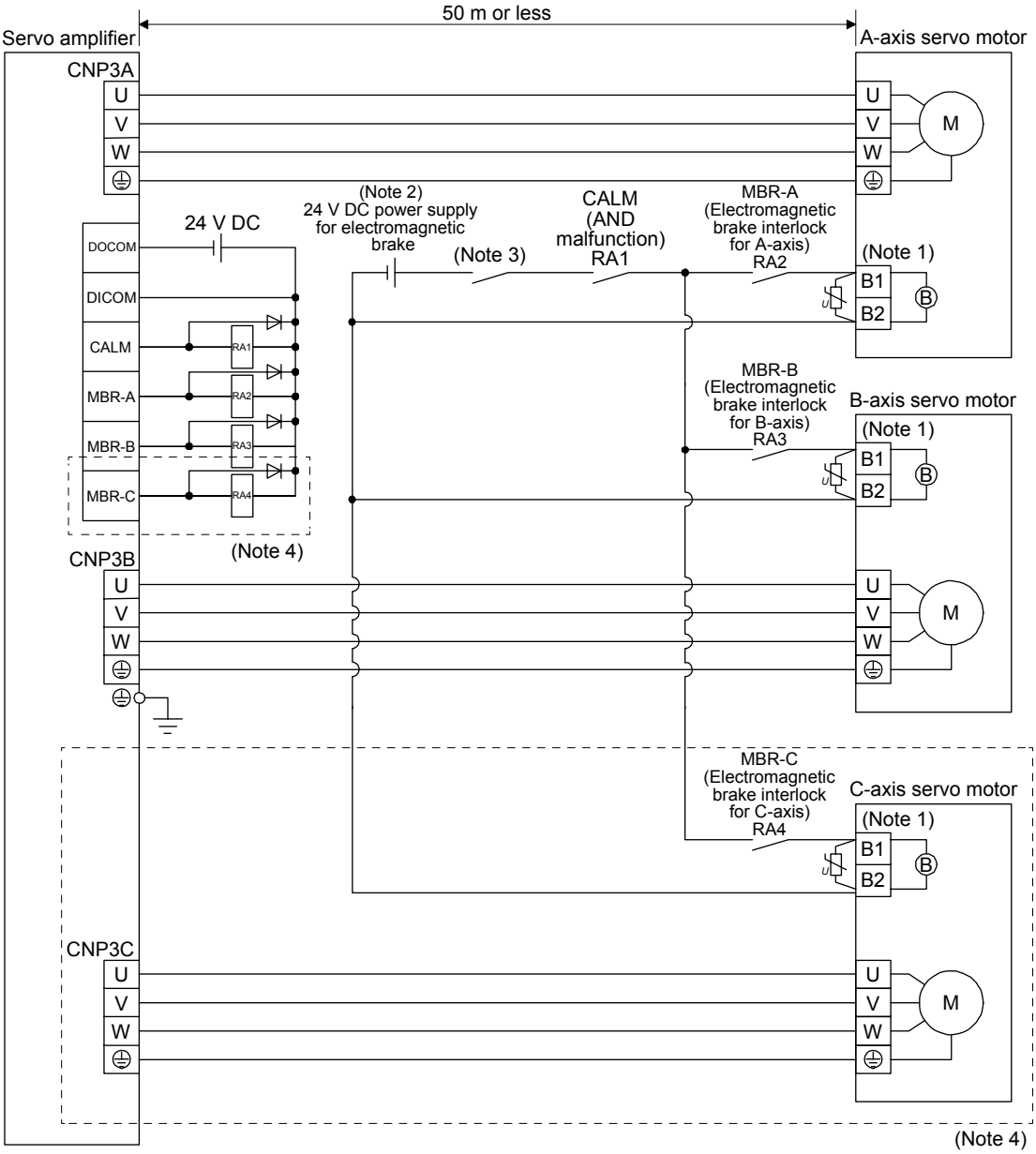
Refer to section 4.3 for the wires used for wiring.

(1) Connection with MR-J4 1-axis servo amplifier




Note 1. There is no polarity in electromagnetic brake terminals (B1 and B2).
2. Do not use the 24 V DC interface power supply for the electromagnetic brake.
3. Create the circuit in order to shut off by interlocking with the emergency stop switch.

(2) Connection with MR-J4 multi-axis servo amplifier




Note 1. There is no polarity in electromagnetic brake terminals (B1 and B2).
2. Do not use the 24 V DC interface power supply for the electromagnetic brake.
3. Create the circuit in order to shut off by interlocking with the emergency stop switch.
4. This connection is for the MR-J4 3-axis servo amplifier.

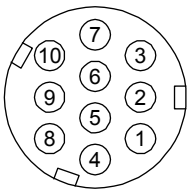
(3) Connectors

The connector fitting the servo motor is prepared as optional equipment. Refer to section 5 for details of the options. For types other than those prepared as optional equipment, refer to chapter 3.

| Servo motor | Servo motor-side connectors | | |
|---|---|---|---|
| | Encoder | Power supply | Electromagnetic brake |
| HG-SR52/HG-SR102/ HG-SR152 | CMV1-R10P (DDK) | MS3102A18-10P | CMV1-R2P (DDK) |
| HG-SR51/HG-SR81 | | | |
| HG-SR202/HG-SR352/ HG-SR502 | | MS3102A22-22P | |
| HG-SR121/HG-SR201/ HG-SR301 | | | |
| HG-SR702 | | MS3102A32-17P | |
| HG-SR421 | | | |

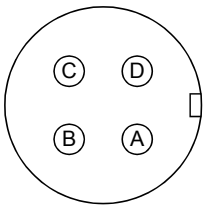
The followings show the encoder connector, power connector, and electromagnetic brake connector viewed from the connection side.

Encoder connector
CMV1-R10P



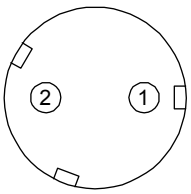

| Terminal No. | Signal |
|---|---|
| 1 | MR |
| 2 | MRR |
| 3 | |
| 4 | BAT |
| 5 | LG |
| 6 | |
| 7 | |
| 8 | P5 |
| 9 | |
| 10 | SHD |

Power supply connector
MS3102A18-10P
MS3102A22-22P
MS3102A32-17P




| Terminal No. | Signal |
|---|---|
| A | U |
| B | V |
| C | W |
| D | ⏚ (PE) |

Electromagnetic brake connector
CMV1-R2P




| Terminal No. | Signal |
|---|---|
| 1 | (Note) B1 |
| 2 | (Note) B2 |

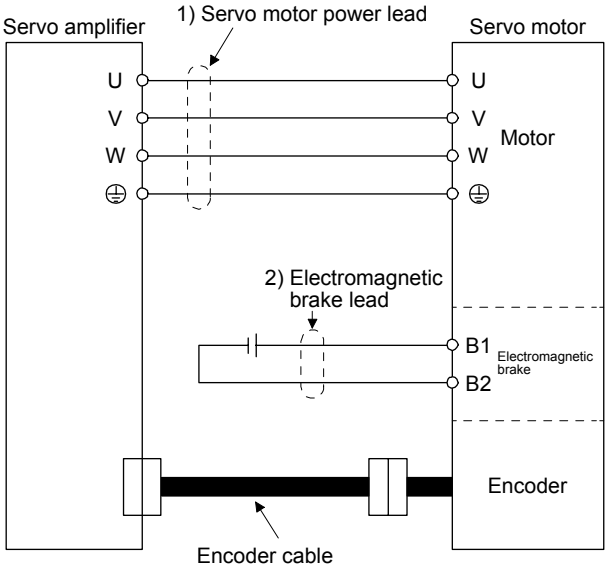
Note. For the motor with an electromagnetic brake, supply electromagnetic brake power (24 V DC). There is no polarity.

4.3 Selection example of wires

POINT

- Wires indicated in this section are separated wires. When using a cable for power line (U, V, and W) between the servo amplifier and servo motor, use a 600 V grade EP rubber insulated chloroprene sheath cab-tire cable (2PNCT). For selection of cables, refer to appendix 6.
- To comply with the UL/CSA standard, use the wires shown in appendix 9 for wiring. To comply with other standards, use a wire that is complied with each standard.
- Selection condition of wire size is as follows.
  Construction condition: One wire is constructed in the air.
  Wire length: 30 m or less

The following diagram shows the wires used for wiring. Use the wires given in this section or equivalent.



When using the 600 V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire)
Selection example of wire size when using HIV wires is indicated below.

Table 4.1 Wire size selection example 2 (HIV wire)

| Servo motor | Wires [$mm^2$] (Note 1) | |
|---|---|---|
| | 1) U/V/W/⏚ | 2) B1/B2 |
| HG-MR053 | 0.75 (AWG 18) (Note 1) | 0.5 (AWG 20) (Note 1) |
| HG-MR13 | | |
| HG-MR23 | | |
| HG-MR43 | | |
| HG-MR73 | | |
| HG-KR053 | | |
| HG-KR13 | | |
| HG-KR23 | | |
| HG-KR43 | | |
| HG-KR73 | | |
| HG-SR51 | 1.25 (AWG 16) | 1.25 (AWG 16) |
| HG-SR81 | | |
| HG-SR121 | 2(AWG14) | |
| HG-SR201 | | |
| HG-SR301 | 3.5(AWG12) | |
| HG-SR421 | 5.5 (AWG 10) (Note 2) | |
| HG-SR52 | 1.25 (AWG 16) | |
| HG-SR102 | | |
| HG-SR152 | 2 (AWG 14) | |
| HG-SR202 | | |
| HG-SR352 | 3.5 (AWG 12) | |
| HG-SR502 | 5.5 (AWG 10) (Note 2) | |
| HG-SR702 | 8 (AWG 8) (Note 2) | |

Note 1. It is for 10 m wire length. When fabricating an extension cable, use 1.25 $mm^2$ (AWG16).
2. Refer to each servo amplifier instruction manual for crimp terminals and crimping tools used for connection with the servo amplifier.

4.4 Servo amplifier terminal section

| POINT |
|---|
| ●For the sizes of wires used for wiring, refer to section 4.3.<br>●These connectors are not available for MR-J4 1-axis servo amplifier of 5 kW or more. |

To wire to the servo amplifier, use connectors packed with the amplifier or optional connectors.

(1) Connectors

(a) MR-J4-10_ to MR-J4-100_

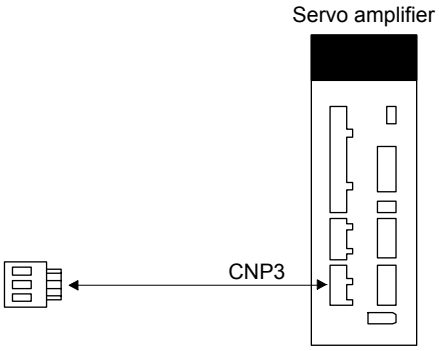



Table 4.2 Connector and applicable wire

| Connector | Receptacle assembly | Applicable wire | | Stripped length [mm] | Open tool | Manufacturer |
|---|---|---|---|---|---|---|
| | | Wire size | Insulator OD | | | |
| CNP3 | 03JFAT-SAXGDK-H7.5 | AWG 18 to 14 | 3.9 mm or less | 9 | J-FAT-OT | JST |

(b) MR-J4-200_/MR-J4-350_

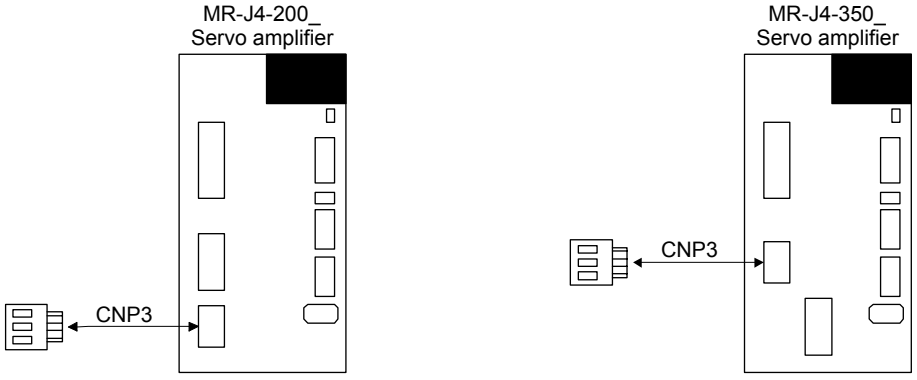
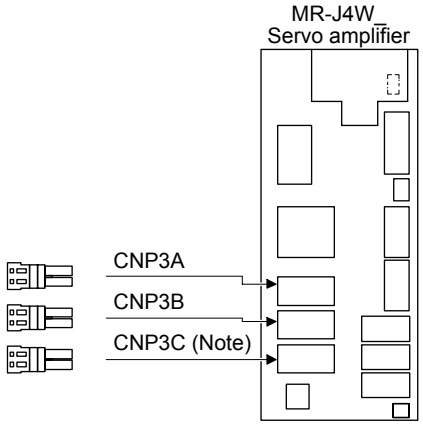



Table 4.3 Connector and applicable wire

| Connector | Receptacle assembly | Applicable wire | | Stripped length [mm] | Open tool | Manufacturer |
|---|---|---|---|---|---|---|
| | | Wire size | Insulator OD | | | |
| CNP3 | 03JFAT-SAXGFK-XL | AWG 16 to 10 | 4.7 mm or less | 11.5 | J-FAT-OT-EXL | JST |

(c) MR-J4W_ - _B




Note. This figure shows the MR-J4 3-axis servo amplifier.

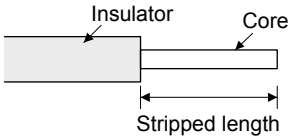
Table 4.4 Connector and applicable wire

| Connector | Receptacle assembly | Applicable wire size | Stripped length [mm] | Open tool | Manufacturer |
|---|---|---|---|---|---|
| CNP3A<br>CNP3B<br>CNP3C | 04JFAT-SAGG-G-KK | AWG 18 to 14 | 9 | J-FAT-OT-EXL | JST |

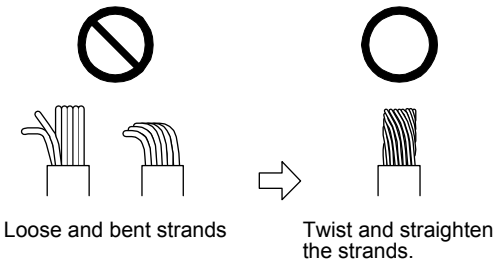
(2) Cable connection procedure

(a) Cable making

Refer to table 4.2, 4.3, and 4.4 for stripped length of cable insulator. The appropriate stripped length of cables depends on their type, etc. Set the length considering their status.




Twist strands slightly and straighten them as follows.

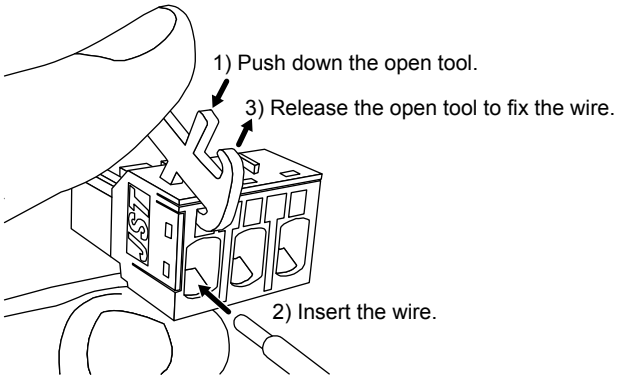


(b) Inserting wire

Insert the open tool as follows and push down it to open the spring. While the open tool is pushed down, insert the stripped wire into the wire insertion hole. Check the insertion depth so that the cable insulator does not get caught by the spring.

Release the open tool to fix the wire. Pull the wire lightly to confirm that the wire is surely connected.

The following shows a connection example of the CNP3 connector for 2 kW and 3.5 kW of MR-J4 1-axis servo amplifier.



# MEMO

# 5. WIRING OPTION

| | |
|---|---|
| ⚠WARNING | ●Before connecting any option, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier. |

| | |
|---|---|
| ⚠CAUTION | ●Use specified auxiliary equipment and options. Otherwise, it may cause a malfunction or fire. |

## 5.1 Cable/connector sets

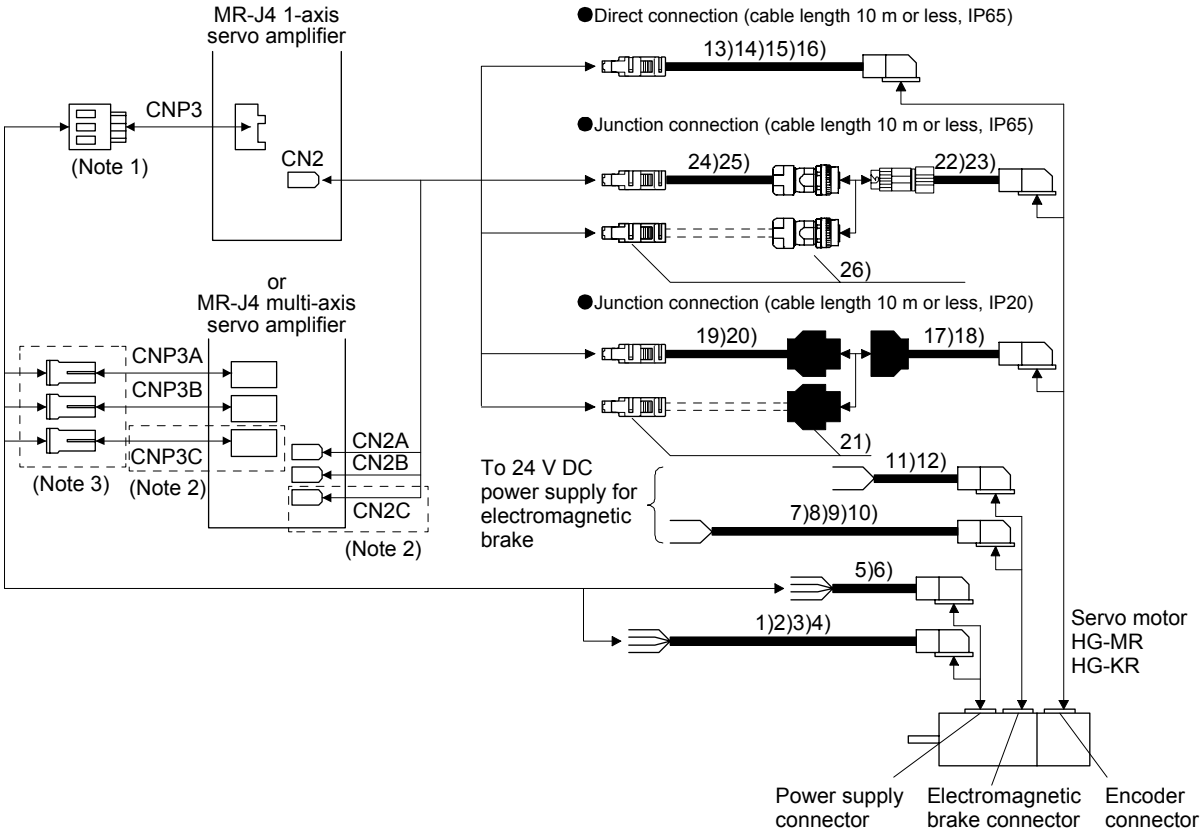
POINT

●The IP rating indicated is the cable's or connector's protection against ingress of dust and water when the cable or connector is connected to a servo amplifier or servo motor. If the IP rating of the cable, connector, servo amplifier and servo motor vary, the overall IP rating depends on the lowest IP rating of all components.

Purchase the cable and connector options indicated in this section.

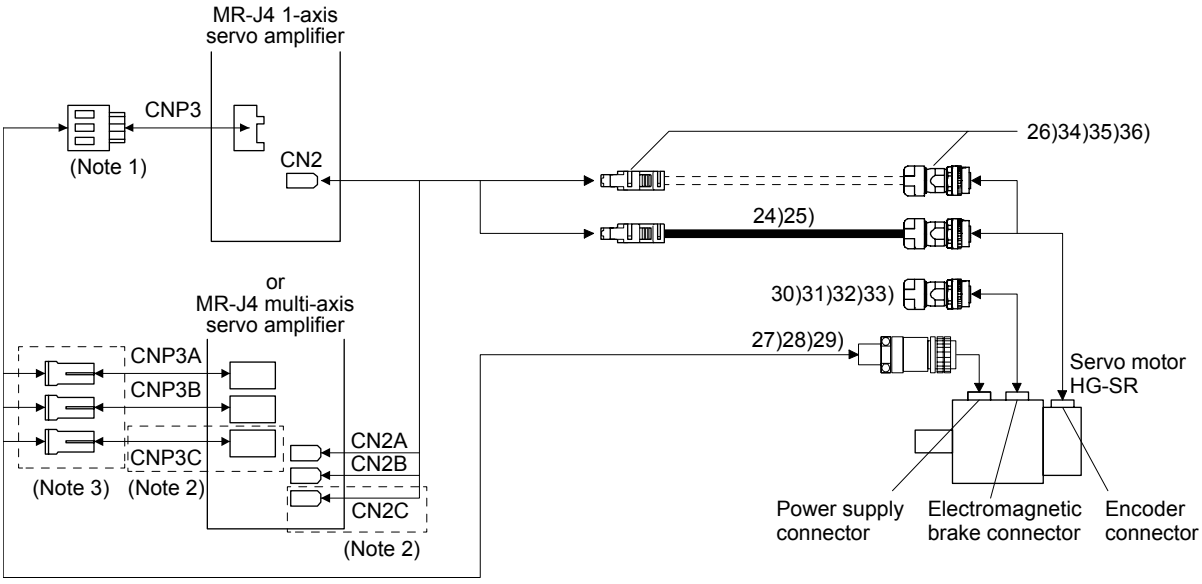
### 5.1.1 Combinations of cable/connector sets

(1) HG-MR series/HG-KR series servo motor



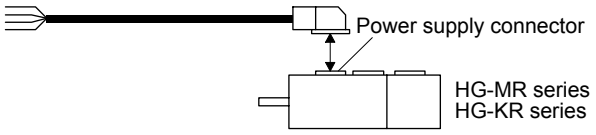
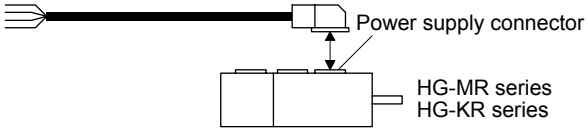
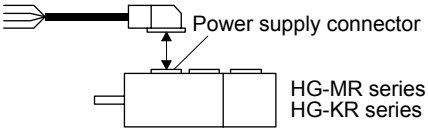
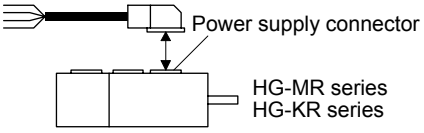
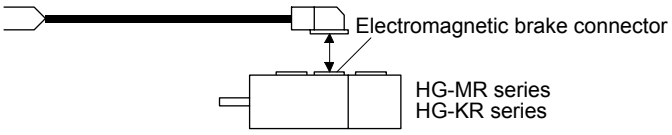
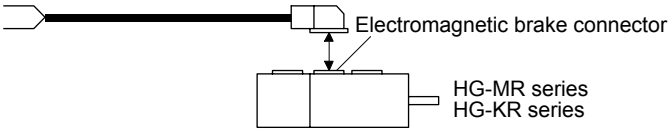

Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.
2. This connection is for the MR-J4 3-axis servo amplifier.
3. Refer to Appendix 7 for the crimp connector for CNP3_.

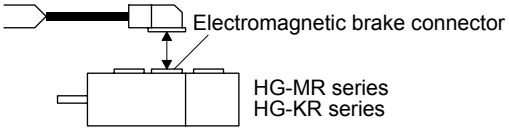
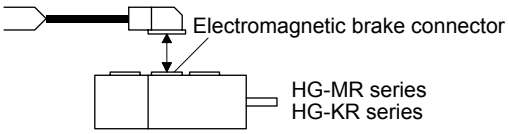
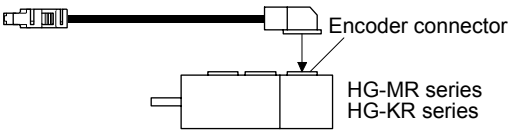
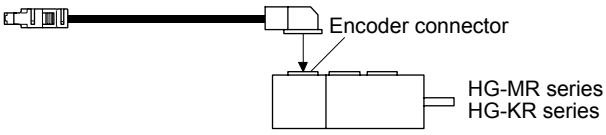
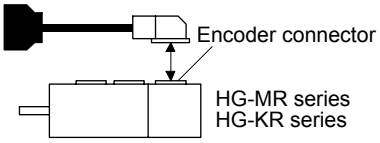
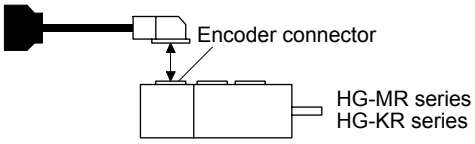
(2) HG-SR series servo motor

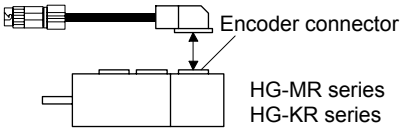
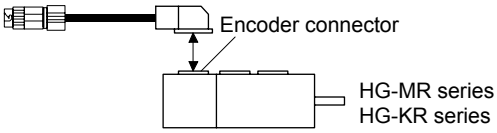
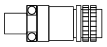
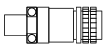
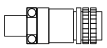



Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.
2. This connection is for the MR-J4 3-axis servo amplifier.
3. Refer to Appendix 7 for the crimp connector for CNP3_.

### 5.1.2 Cable and connector list

| No. | Name | Model | Description | Remarks |
|---|---|---|---|---|
| 1) | Motor power supply cable | MR-PWS1CBL_M-A1-L (Note)<br>Cable length:<br>2/5/10 m |  <br>Refer to section 5.3 for details. | IP65<br>Load-side lead<br>EN compliant |
| 2) | Servo motor power cable | MR-PWS1CBL_M-A1-H (Note)<br>Cable length:<br>2/5/10 m | | IP65<br>Load-side lead<br>Long bending life<br>EN compliant |
| 3) | Servo motor power cable | MR-PWS1CBL_M-A2-L (Note)<br>Cable length:<br>2/5/10 m |  <br>Refer to section 5.3 for details. | IP65<br>Opposite to load-side lead<br>EN compliant |
| 4) | Servo motor power cable | MR-PWS1CBL_M-A2-H (Note)<br>Cable length:<br>2/5/10 m | | IP65<br>Opposite to load-side lead<br>Long bending life<br>EN compliant |
| 5) | Servo motor power cable | MR-PWS2CBL03M-A1-L (Note)<br>Cable length:<br>0.3 m |  <br>Refer to section 5.3 for details. | IP55<br>Load-side lead<br>EN compliant |
| 6) | Servo motor power cable | MR-PWS2CBL03M-A2-L (Note)<br>Cable length:<br>0.3 m |  <br>Refer to section 5.3 for details. | IP55<br>Opposite to load-side lead<br>EN compliant |
| 7) | Electromagnetic brake cable | MR-BKS1CBL_M-A1-L<br>Cable length:<br>2/5/10 m |  <br>Refer to section 5.4 for details. | IP65<br>Load-side lead |
| 8) | Electromagnetic brake cable | MR-BKS1CBL_M-A1-H<br>Cable length:<br>2/5/10 m | | IP65<br>Load-side lead<br>Long bending life |
| 9) | Electromagnetic brake cable | MR-BKS1CBL_M-A2-L<br>Cable length:<br>2/5/10 m |  <br>Refer to section 5.4 for details. | IP65<br>Opposite to load-side lead |
| 10) | Electromagnetic brake cable | MR-BKS1CBL_M-A2-H<br>Cable length:<br>2/5/10 m | | IP65<br>Opposite to load-side lead<br>Long bending life |

| No. | Name | Model | Description | Remarks |
|---|---|---|---|---|
| 11) | Electromagnetic brake cable | MR-BKS2CBL03M-A1-L<br>Cable length: 0.3 m |  <br>Refer to section 5.4 for details. | IP55<br>Load-side lead |
| 12) | Electromagnetic brake cable | MR-BKS2CBL03M-A2-L<br>Cable length: 0.3 m |  <br>Refer to section 5.4 for details. | IP55<br>Opposite to load-side lead |
| 13) | Encoder cable | MR-J3ENCBL_M-A1-L (Note)<br>Cable length: 2/5/10 m |  | IP65<br>Opposite to load-side lead |
| 14) | Encoder cable | MR-J3ENCBL_M-A1-H (Note)<br>Cable length: 2/5/10 m | Refer to section 5.2 (1) for details. | IP65<br>Load-side lead<br>Long bending life |
| 15) | Encoder cable | MR-J3ENCBL_M-A2-L (Note)<br>Cable length: 2/5/10 m |  | IP65<br>Opposite to load-side lead |
| 16) | Encoder cable | MR-J3ENCBL_M-A2-H (Note)<br>Cable length: 2/5/10 m | Refer to section 5.2 (1) for details. | IP65<br>Opposite to load-side lead<br>Long bending life |
| 17) | Encoder cable | MR-J3JCBL03M-A1-L (Note)<br>Cable length: 0.3 m |  <br>Refer to section 5.2 (3) for details. | IP20<br>Load-side lead |
| 18) | Encoder cable | MR-J3JCBL03M-A2-L (Note)<br>Cable length: 0.3 m |  <br>Refer to section 5.2 (3) for details. | IP20<br>Opposite to load-side lead |
| 19) | Encoder cable | MR-EKCBL_M-L<br>Cable length: 20/30 m |  <br>HG-MR/HG-KR series<br>Refer to section 5.2 (2) for details. | IP20 |
| 20) | Encoder cable | MR-EKCBL_M-H<br>Cable length: 20/30/40/50 m | | IP20<br>Long bending life |
| 21) | Encoder connector set | MR-ECNM |  <br>HG-MR/HG-KR series<br>Refer to section 5.2 (2) for details. | IP20 |

| No. | Name | Model | Description | Remarks |
|---|---|---|---|---|
| 22) | Encoder cable | MR-J3JSCBL03M-A1-L (Note)<br>Cable length: 0.3 m |  <br>Refer to section 5.2 (4) for details. | IP65<br>Load-side lead |
| 23) | Encoder cable | MR-J3JSCBL03M-A2-L (Note)<br>Cable length: 0.3 m |  <br>Refer to section 5.2 (4) for details. | IP65<br>Load-side lead |
| 24) | Encoder cable | MR-J3ENSCBL_M-L (Note)<br>Cable length: 2/5/10/20/30 m |  <br>HG-KR/HG-MR/HG-SR series<br>Refer to section 5.2 (5) for details. | IP67<br>Standard bending life |
| 25) | Encoder cable | MR-J3ENSCBL_M-H (Note)<br>Cable length: 2/5/10/20/30/40/50 m | | IP67<br>Long bending life |
| 26) | Encoder connector set | MR-J3SCNS |   <br>HG-KR/HG-MR/HG-SR series<br>Refer to section 5.2 (5) for details. | IP67 |
| 27) | Power connector set | MR-PWCNS4 | Plug: CE05-6A18-10SD-D-BSS<br>Cable clamp: CE3057-10A-1-D (DDK)<br>Applicable cable<br>Applicable wire size: 2 $mm^2$ (AWG 14) to 3.5 $mm^2$ (AWG 12)<br>Cable OD: 10.5 mm to 14.1 mm |  <br>HG-SR51/HG-SR81/<br>HG-SR52/HG-SR102/<br>HG-SR152 | IP67<br>EN compliant |
| 28) | Power connector set | MR-PWCNS5 | Plug: CE05-6A22-22SD-D-BSS<br>Cable clamp: CE3057-12A-1-D (DDK)<br>Applicable cable<br>Applicable wire size: 5.5 $mm^2$ (AWG 10) to 8 $mm^2$ (AWG 8)<br>Cable OD: 12.5 mm to 16 mm |  <br>HG-SR121/HG-SR201/<br>HG-SR301/<br>HG-SR202/HG-SR352/<br>HG-SR502 | IP67<br>EN compliant |
| 29) | Power connector set | MR-PWCNS3 | Plug: CE05-6A32-17SD-D-BSS<br>Cable clamp: CE3057-20A-1-D (DDK)<br>Applicable cable<br>Applicable wire size: 14 $mm^2$ (AWG 6) to 22 $mm^2$ (AWG 4)<br>Cable OD: 22 mm to 23.8 mm |  <br>HG-SR421/<br>HG-SR702 | IP67<br>EN compliant |
| 30) | Electromagnetic brake connector set | MR-BKCNS1 (Note) | Straight plug: CMV1-SP2S-L<br>Socket contact: CMV1-#22BSC-S2-100 (DDK) |  <br>HG-SR series | IP67 |
| 31) | Electromagnetic brake connector set | MR-BKCNS1A (Note) | Angle plug: CMV1-AP2S-L<br>Socket contact: CMV1-#22BSC-S2-100 (DDK) |  <br>HG-SR series | IP67 |
| 32) | Electromagnetic brake connector set | MR-BKCNS2 | Straight plug: CMV1S-SP2S-L<br>Socket contact: CMV1-#22BSC-S2-100 (DDK) |  <br>HG-SR series | IP67 |

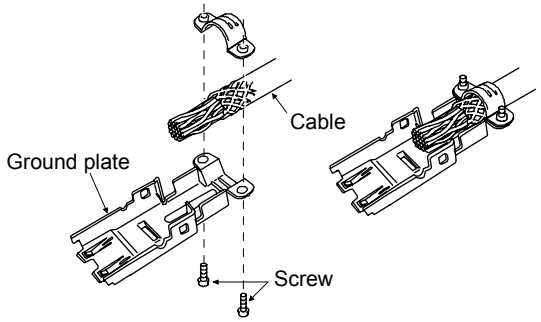
| No. | Name | Model | Description | Remarks |
|---|---|---|---|---|
| 33) | Electromagnetic brake connector set | MR-BKCNS2A | Angle plug: CMV1S-AP2S-L<br>Socket contact: CMV1-#22BSC-S2-100<br>(DDK)<br>  <br>HG-SR series | IP67 |
| 34) | Encoder Connector set | MR-ENCNS2 |   <br>HG-SR series<br>Refer to section 5.2 (5) for details. | IP67 |
| 35) | Encoder Connector set | MR-J3SCNSA (Note) |   <br>HG-SR series<br>Refer to section 5.2 (5) for details. | IP67 |
| 36) | Encoder Connector set | MR-ENCNS2A |   <br>HG-SR series<br>Refer to section 5.2 (5) for details. | IP67 |

Note. The cable and the connector set may contain different connectors but still usable.

5.2 Encoder cable/connector sets

POINT

●For CN2, CN2A, CN2B, and CN2C side connectors, securely connect the shielded external conductor of the cable to the ground plate and fix it to the connector shell.

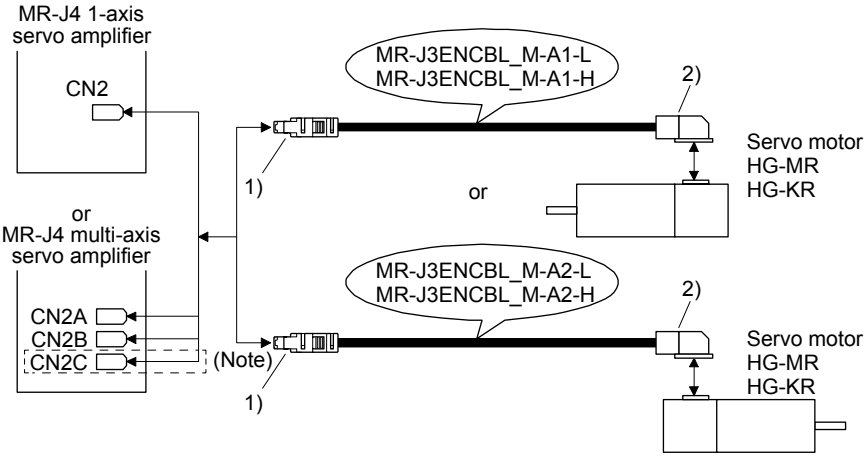



(1) MR-J3ENCBL_M-_-_

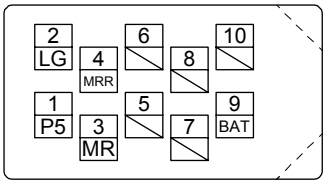
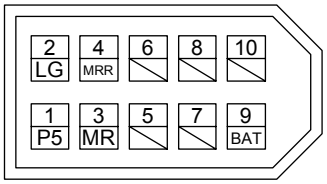
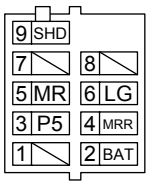
These cables are encoder cables for the HG-MR/HG-KR series servo motors. The numbers in the cable length field of the table indicate the symbol filling the underline "_" in the cable model. The cables of the lengths with the symbols are available.

| Cable model | Cable length | | | IP rating | Bending life | Application |
|---|---|---|---|---|---|---|
| | 2 m | 5 m | 10 m | | | |
| MR-J3ENCBL_M-A1-L | 2 | 5 | 10 | IP65 | Standard | Load-side lead for HG-MR/HG-KR servo motor |
| MR-J3ENCBL_M-A1-H | 2 | 5 | 10 | IP65 | Long bending life | |
| MR-J3ENCBL_M-A2-L | 2 | 5 | 10 | IP65 | Standard | Opposite to load-side lead for HG-MR/HG-KR servo motor |
| MR-J3ENCBL_M-A2-H | 2 | 5 | 10 | IP65 | Long bending life | |

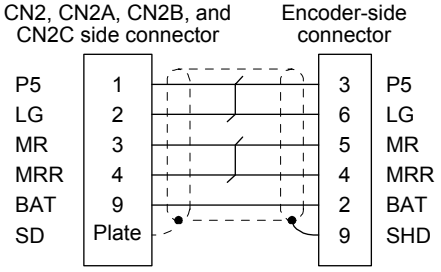
(a) Connection of servo amplifier and servo motor




Note. This connection is for the MR-J4 3-axis servo amplifier.

| Cable model | 1) CN2, CN2A, CN2B, and CN2C side connector | 2) Encoder-side connector |
|---|---|---|
| MR-J3ENCBL_M-A1-L<br>MR-J3ENCBL_M-A1-H<br>MR-J3ENCBL_M-A2-L<br>MR-J3ENCBL_M-A2-H | Receptacle: 36210-0100PL<br>Shell kit: 36310-3200-008<br>(3M or equivalent)<br>Connector set: 54599-1019<br>(Molex)<br>  <br><br>View seen from wiring side. (Note)<br>or<br>  <br><br>View seen from wiring side. (Note)<br>Note. Keep open the pins shown with ▨. Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally. | Connector: 2174053-1<br>Crimping tool for ground clip: 1596970-1<br>Crimping tool for receptacle contact: 1596847-1<br>(TE Connectivity)<br>  <br><br>View seen from wiring side. (Note)<br>Note. Keep open the pins shown with ▨. |

(b) Cable internal wiring diagram



(2) MR-EKCBL_M-_

POINT

●The following encoder cables are of four-wire type.
MR-EKCBL30M-L
MR-EKCBL30M-H
MR-EKCBL40M-H
MR-EKCBL50M-H
When using any of these encoder cables, select "four-wire type" referring the following table.

| Servo amplifier | Setting parameter | Setting value | Encoder cable communication method selection |
|---|---|---|---|
| MR-J4W_-_B | PC04 | 1 _ _ _ | Four-wire type |
| MR-J4-_B | | | |
| MR-J4-_A | PC22 | | |

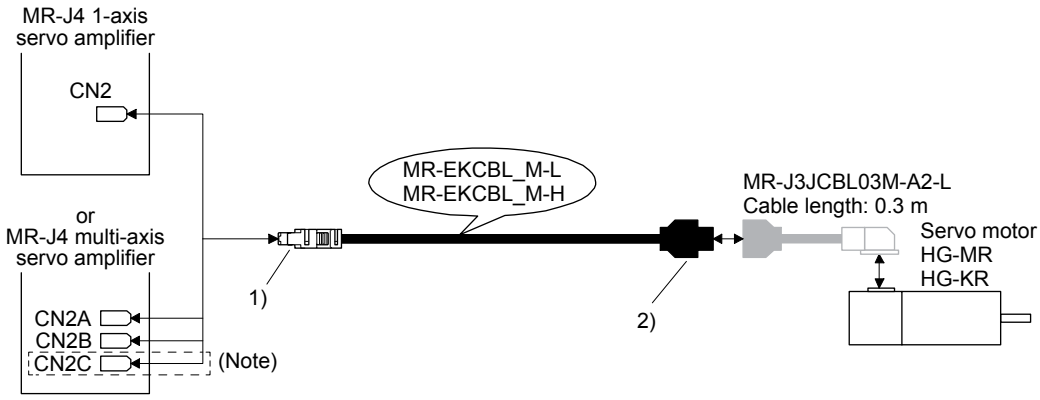
Incorrect setting will result in [AL. 16 Encoder initial communication error 1].

The servo amplifier and the servo motor cannot be connected by these cables alone. The servo motor-side encoder cable (MR-J3JCBL03M-_-L) is required.
The numbers in the cable length field of the table indicate the symbol filling the underline "_" in the cable model. The cables of the lengths with the symbols are available.

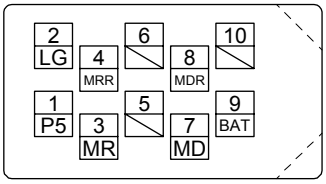
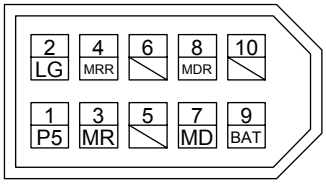
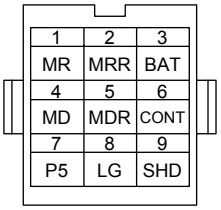
| Cable model | Cable length | | | | IP rating | Bending life | Application |
|---|---|---|---|---|---|---|---|
| | 20 m | 30 m | 40 m | 50 m | | | |
| MR-EKCBL_M-L | 20 | (Note) 30 | | | IP20 | Standard | For HG-MR/HG-KR servo motor<br>Use in combination with MR-J3JCBL03M-_-L. |
| MR-EKCBL_M-H | 20 | (Note) 30 | (Note) 40 | (Note) 50 | IP20 | Long bending life | |

Note. Four-wire type cable

(a) Connection of servo amplifier and servo motor

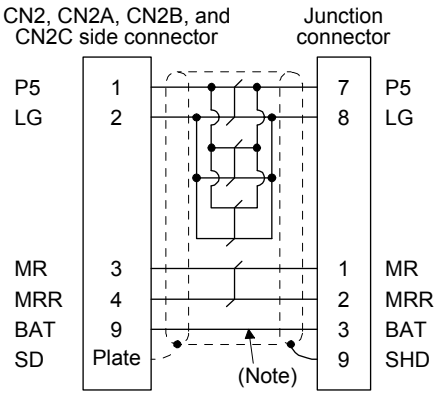



Note. This connection is for the MR-J4 3-axis servo amplifier.

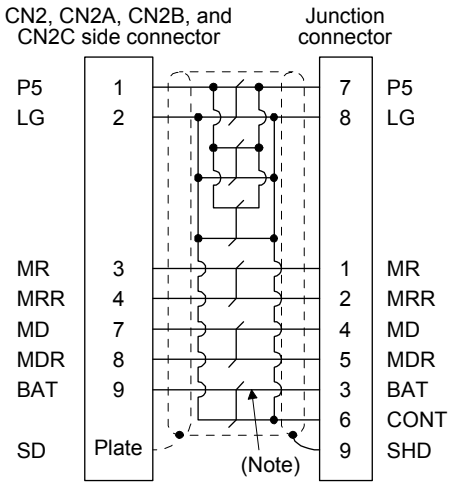
| Cable model | 1) CN2, CN2A, CN2B, and CN2C side connector | 2) Junction connector |
|---|---|---|
| MR-EKCBL_M-L<br>MR-EKCBL_M-H | Receptacle: 36210-0100PL<br>Shell kit: 36310-3200-008<br>(3M)<br>  <br>View seen from wiring side. (Note)<br>or<br>Connector set: 54599-1019<br>(Molex)<br>  <br>View seen from wiring side. (Note)<br>Note. Keep open the pins shown with ⊘. Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally. | Housing: 1-172161-9<br>Connector pin: 170359-1<br>Crimping tool: 91529-1<br>(TE Connectivity or equivalent)<br>Cable clamp: MTI-0002<br>(Toa Electric Industries)<br>  <br>View seen from wiring side. |

(b) Internal wiring diagram

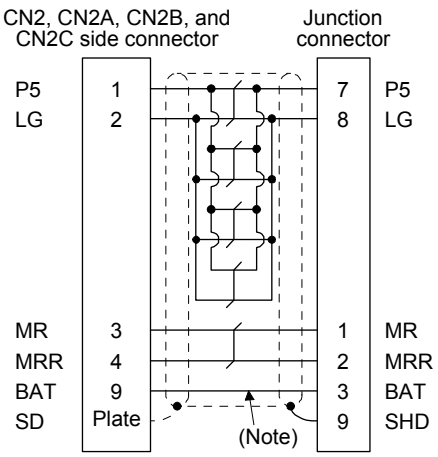
MR-EKCBL20M-L



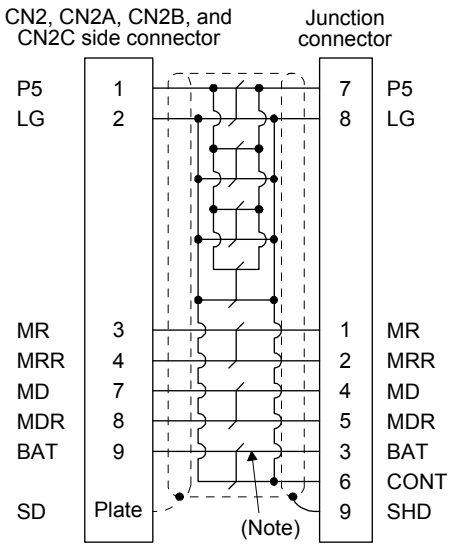

MR-EKCBL30M-L




MR-EKCBL20M-H




MR-EKCBL30M-H
MR-EKCBL40M-H
MR-EKCBL50M-H




Note. Always make connection for use in an absolute position detection system. Wiring is not necessary for use in an incremental system.

When fabricating the cable, use the wiring diagram corresponding to the length indicated below.

| Cable bending life | Applicable wiring diagram | |
|---|---|---|
| | Less than 30 m | 30 m to 50 m |
| Standard | MR-EKCBL20M-L | MR-EKCBL30M-L |
| Long bending life | MR-EKCBL20M-H | MR-EKCBL30M-H<br>MR-EKCBL40M-H<br>MR-EKCBL50M-H |

(c) When fabricating the encoder cable

When fabricating the cable, prepare the following parts, and fabricate it according to the wiring diagram in (b). Refer to section 5.5 for the specifications of the cable to use.

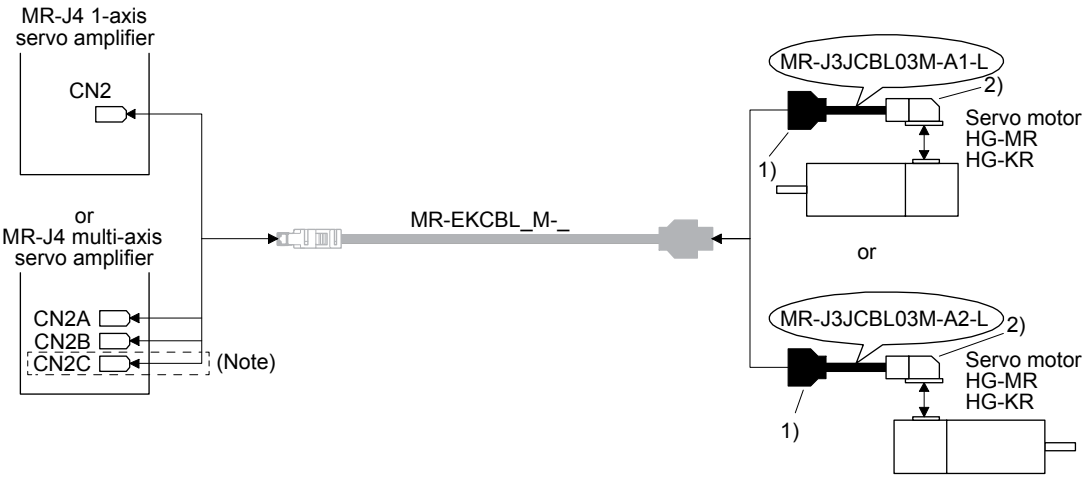
| Parts | Description | |
|---|---|---|
| Connector set | MR-ECNM | |
| |  <br>CN2, CN2A, CN2B, and CN2C side connector<br>Receptacle: 36210-0100PL<br>Shell kit: 36310-3200-008<br>(3M)<br>or<br>Connector set: 54599-1019<br>(Molex) |  <br>Encoder-side connector<br>Housing: 1-172161-9<br>Connector pin: 170359-1<br>(TE Connectivity or equivalent)<br>Cable clamp: MTI-0002<br>(Toa Electric Industries) |

(3) MR-J3JCBL03M-_-L

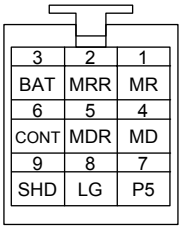
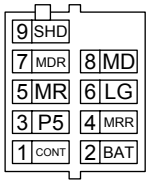
The servo amplifier and the servo motor cannot be connected by these cables alone. The servo motor-side encoder cable (MR-EKCBL_M-_) is required.

| Cable model | Cable length | IP rating | Bending life | Application |
|---|---|---|---|---|
| MR-J3JCBL03M-A1-L | 0.3 m | IP20 | Standard | Load-side lead for HG-MR/HG-KR servo motor<br>Use in combination with MR-EKCBL_M-_. |
| MR-J3JCBL03M-A2-L | | | | Opposite to load-side lead for HG-MR/HG-KR servo motor<br>Use in combination with MR-EKCBL_M-_. |

(a) Connection of servo amplifier and servo motor



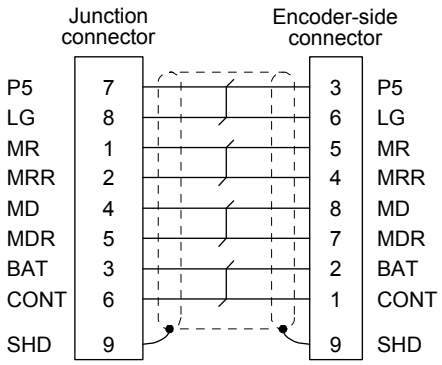

Note. This connection is for the MR-J4 3-axis servo amplifier.

| Cable model | 1) Junction connector | 2) Encoder-side connector |
|---|---|---|
| MR-J3JCBL03M-A1-L<br>MR-J3JCBL03M-A2-L | Housing: 1-172169-9<br>Contact: 1473226-1<br>Cable clamp: 316454-1<br>Crimping tool: 91529-1<br>(TE Connectivity)<br>  <br>View seen from wiring side. | Connector: 2174053-1<br>Crimping tool for ground clip: 1596970-1<br>Crimping tool for receptacle contact: 1596847-1<br>(TE Connectivity)<br>  <br>View seen from wiring side. |





(b) Internal wiring diagram

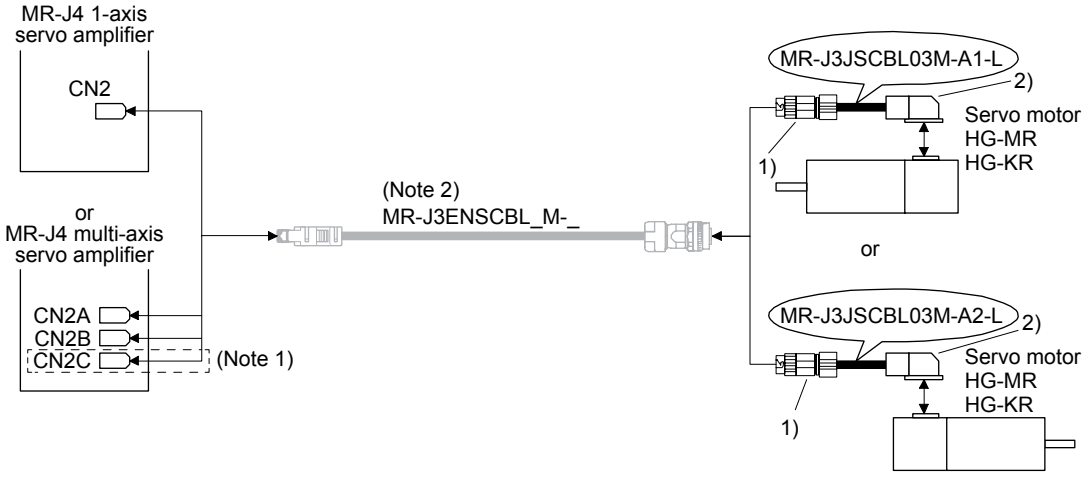


(4) MR-J3JSCBL03M-_-L

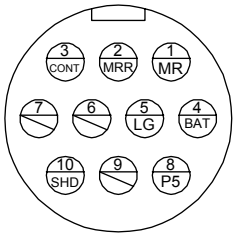
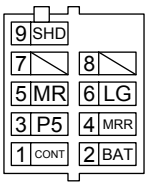
The servo amplifier and the servo motor cannot be connected by these cables alone. The servo motor-side encoder cable (MR-J3ENSCBL_M-_) is required.

| Cable model | Cable length | IP rating | Bending life | Application |
|---|---|---|---|---|
| MR-J3JSCBL03M-A1-L | 0.3 m | IP65 | Standard | For HG-KR/HG-MR servo motor<br>Load-side lead<br>Use in combination with MR-J3ENSCBL_M-_. |
| MR-J3JSCBL03M-A2-L | | | | For HG-KR/HG-MR servo motor<br>Opposite to load-side lead<br>Use in combination with MR-J3ENSCBL_M-_. |

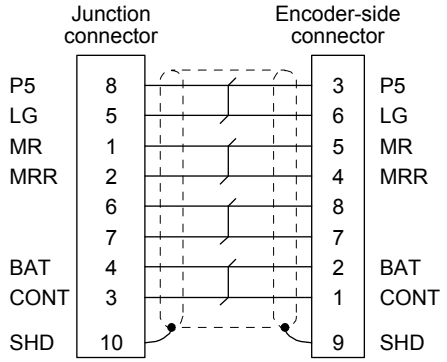
(a) Connection of servo amplifier and servo motor




Note 1. This connection is for the MR-J4 3-axis servo amplifier.
2. For details of this cable, refer to (5) in this section.

| Cable model | 1) Junction connector | 2) Encoder-side connector |
|---|---|---|
| MR-J3JSCBL03M-A1-L<br>MR-J3JSCBL03M-A2-L | Receptacle: CM10-CR10P-M<br>(DDK)<br>Applicable wire size: AWG 20 or less<br>  <br><br>View seen from wiring side. (Note)<br><br>Note. Keep open the pins shown with ⌓. | Connector: 2174053-1<br>Crimping tool for ground clip: 1596970-1<br>Crimping tool for receptacle contact: 1596847-1<br>(TE Connectivity)<br>  <br><br>View seen from wiring side. (Note)<br><br>Note. Keep open the pins shown with ⌓. |

(b) Internal wiring diagram

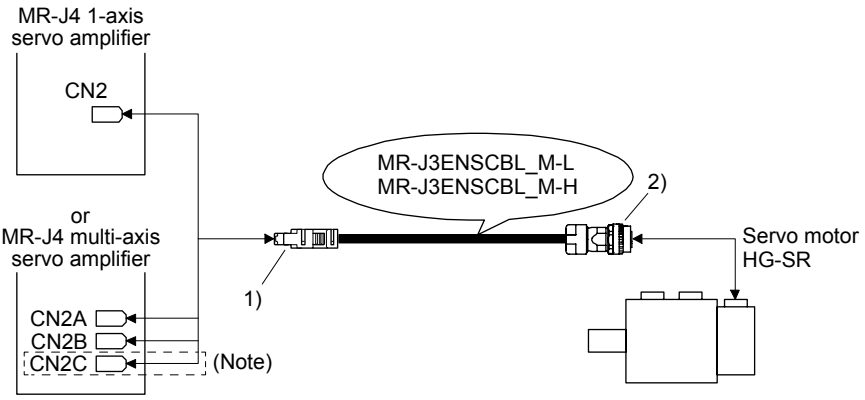



(5) MR-J3ENSCBL_M-_

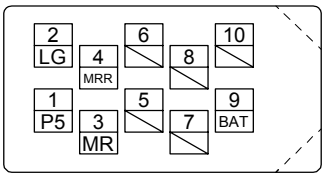
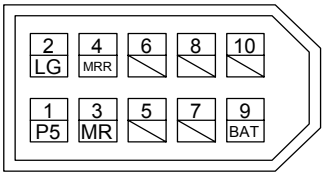
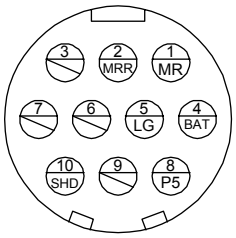
These cables are encoder cables for the HG-MR/HG-KR/HG-SR series servo motors. The numbers in the cable length field of the table indicate the symbol filling the underline "_" in the cable model. The cables of the lengths with the symbols are available.

| Cable model | Cable length | | | | | | | IP rating | Bending life | Application |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 m | 5 m | 10 m | 20 m | 30 m | 40 m | 50 m | | | |
| MR-J3ENSCBL_M-L | 2 | 5 | 10 | 20 | 30 | | | IP67 | Standard | For HG-MR/HG-KR/HG-SR series servo motor |
| MR-J3ENSCBL_M-H | 2 | 5 | 10 | 20 | 30 | 40 | 50 | IP67 | Long bending life | |

(a) Connection of servo amplifier and servo motor

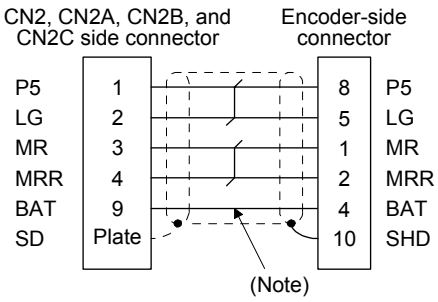



Note. This connection is for the MR-J4 3-axis servo amplifier.

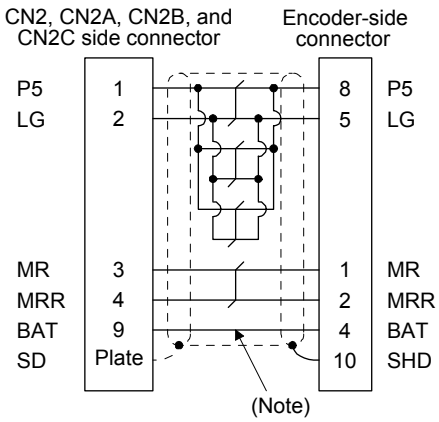
<table>
<tr><th>Cable model</th><th>1) CN2, CN2A, CN2B, and CN2C side connector</th><th>2) Encoder-side connector</th></tr>
<tr><td>MR-J3ENSCBL_M-L</td><td>Receptacle: 36210-0100PL<br>Shell kit: 36310-3200-008<br>(3M)<br>  <br><br>View seen from wiring side. (Note)<br><br>or<br><br>Connector set: 54599-1019<br>(Molex)<br>  <br><br>View seen from wiring side. (Note)<br><br>Note. Keep open the pins shown with ⊘. Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.</td><td rowspan="2"><table>
<tr><th rowspan="2">Cable length</th><th rowspan="2">Bending life</th><th colspan="2">Plug (DDK)</th></tr>
<tr><th>Straight plug</th><th>Socket contact</th></tr>
<tr><td rowspan="2">10 m or shorter</td><td>Long bending life</td><td rowspan="2">CMV1-SP10S-M1</td><td rowspan="2">CMV1-#22ASC-C1-100<br>Applicable wire size: AWG 24 to 20<br>Crimping tool:357J-53162T</td></tr>
<tr><td>Standard</td></tr>
<tr><td rowspan="2">20 m or longer</td><td>Long bending life</td><td rowspan="2">CMV1-SP10S-M2</td><td rowspan="2">CMV1-#22ASC-C2-100<br>Applicable wire size: AWG 28 to 24<br>Crimping tool:357J-53163T</td></tr>
<tr><td>Standard</td></tr>
</table><br>  <br><br>View seen from wiring side. (Note)<br><br>Note. Keep open the pins shown with ⊘.</td></tr>
<tr><td>MR-J3ENSCBL_M-H</td></tr>
</table>

(b) Cable internal wiring diagram

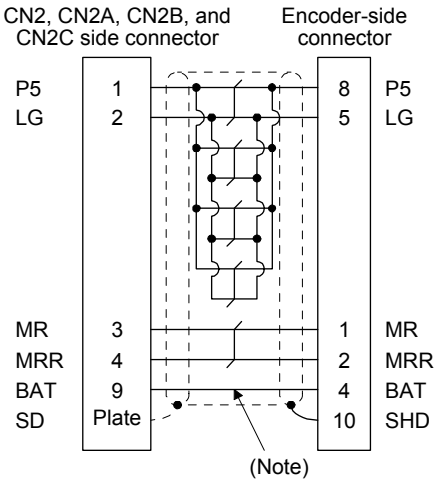
MR-J3ENSCBL2M-L
MR-J3ENSCBL5M-L
MR-J3ENSCBL10M-L
MR-J3ENSCBL2M-H
MR-J3ENSCBL5M-H
MR-J3ENSCBL10M-H




MR-J3ENSCBL20M-L
MR-J3ENSCBL30M-L




MR-J3ENSCBL20M-H
MR-J3ENSCBL30M-H
MR-J3ENSCBL40M-H
MR-J3ENSCBL50M-H




Note. Always make connection for use in an absolute position detection system. Wiring is not necessary for use in an incremental system.

(c) When fabricating the encoder cable

When fabricating the cable, prepare the following parts, and fabricate it according to the wiring diagram in (b). Refer to section 5.5 for the specifications of the used cable.

| Parts (Connector set) | Description | |
|---|---|---|
| | Servo amplifier side connector | Encoder-side connector (DDK) |
| MR-J3SCNS (one-touch connection type) (Note) |  <br>Receptacle: 36210-0100PL<br>Shell kit: 36310-3200-008<br>(3M)<br>or<br>Connector set: 54599-1019<br>(Molex) |  <br>Straight plug: CMV1-SP10S-M2<br>Socket contact: CMV1-#22ASC-S1-100<br>Applicable wire size: AWG 20 or less |
| MR-ENCNS2 (screw type) (Note) | |  <br>Straight plug: CMV1S-SP10S-M2<br>Socket contact: CMV1-#22ASC-S1-100<br>Applicable wire size: AWG 20 or less |
| MR-J3SCNSA (one-touch connection type) (Note) | |  <br>Angle plug: CMV1-AP10S-M2<br>Socket contact: CMV1-#22ASC-S1-100<br>Applicable wire size: AWG 20 or less |
| MR-ENCNS2A (screw type) (Note) | |  <br>Angle plug: CMV1S-AP10S-M2<br>Socket contact: CMV1-#22ASC-S1-100<br>Applicable wire size: AWG 20 or less |

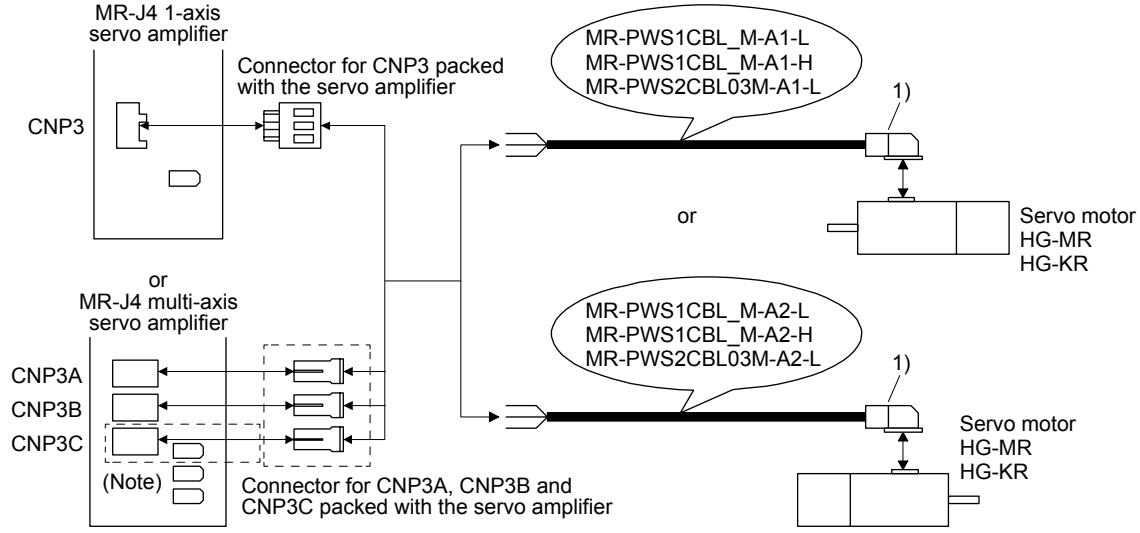
Note. Cable clamp and bushing for 5.5 mm to 7.5 mm and 7.0 mm to 9.0 mm of cable outer diameter are included.

5.3 Servo motor power cable

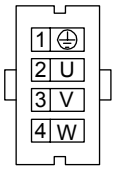
These cables are servo motor power cables for the HG-MR/HG-KR series servo motors.
The numbers in the cable length field of the table indicate the symbol filling the underline "_" in the cable model. The cables of the lengths with the symbols are available.
Refer to section 4.2.1 for wiring.

| Cable model | Cable length | | | | IP rating | Bending life | Application |
|---|---|---|---|---|---|---|---|
| | 0.3 m | 2 m | 5 m | 10 m | | | |
| MR-PWS1CBL_M-A1-L | | 2 | 5 | 10 | IP65 | Standard | Load-side lead for HG-MR/HG-KR servo motor |
| MR-PWS1CBL_M-A2-L | | 2 | 5 | 10 | IP65 | Standard | Opposite to load-side lead for HG-MR/HG-KR servo motor |
| MR-PWS1CBL_M-A1-H | | 2 | 5 | 10 | IP65 | Long bending life | Load-side lead for HG-MR/HG-KR servo motor |
| MR-PWS1CBL_M-A2-H | | 2 | 5 | 10 | IP65 | Long bending life | Opposite to load-side lead for HG-MR/HG-KR servo motor |
| MR-PWS2CBL03M-A1-L | 03 | | | | IP55 | Standard | Load-side lead for HG-MR/HG-KR servo motor |
| MR-PWS2CBL03M-A2-L | 03 | | | | IP55 | Standard | Opposite to load-side lead for HG-MR/HG-KR servo motor |

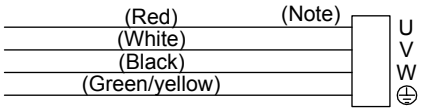
(1) Connection of servo amplifier and servo motor




Note. This connection is for the MR-J4 3-axis servo amplifier.

| Cable model | 1) Servo motor power-side connector | |
|---|---|---|
| MR-PWS1CBL_M-A1-L | Connector: KN4FT04SJ1-R<br>Hood, socket insulator<br>Bushing, ground nut<br>Contact: ST-TMH-S-C1B-100-(A534G)<br>Crimping tool: CT160-3-TMH5B<br>(JAE) |  <br>View seen from wiring side. |
| MR-PWS1CBL_M-A2-L | | |
| MR-PWS1CBL_M-A1-H | | |
| MR-PWS1CBL_M-A2-H | | |
| MR-PWS2CBL03M-A1-L | Connector: KN4FT04SJ2-R<br>Hood, socket insulator<br>Bushing, ground nut<br>Contact: ST-TMH-S-C1B-100-(A534G)<br>Crimping tool: CT160-3-TMH5B<br>(JAE) | |
| MR-PWS2CBL03M-A2-L | | |

(2) Internal wiring diagram



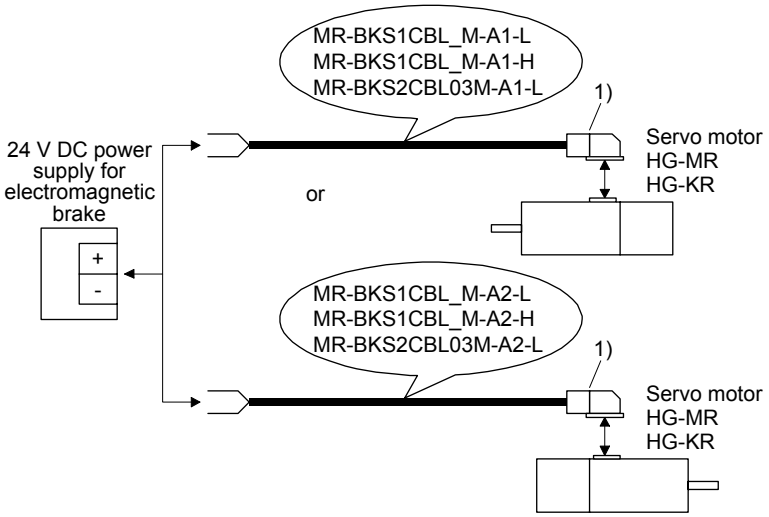

Note. These are not shielded cables.

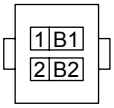
5.4 Electromagnetic brake cable

These cables are electromagnetic brake cables for the HG-MR/HG-KR series servo motors. The numbers in the cable length field of the table indicate the symbol filling the underline "_" in the cable model. The cables of the lengths with the symbols are available.
Refer to section 4.2.1 for wiring.

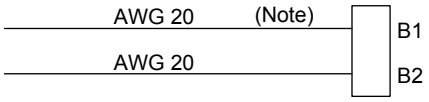
| Cable model | Cable length | | | | IP rating | Bending life | Application |
|---|---|---|---|---|---|---|---|
| | 0.3 m | 2 m | 5 m | 10 m | | | |
| MR-BKS1CBL_M-A1-L | | 2 | 5 | 10 | IP65 | Standard | Load-side lead for HG-MR/HG-KR servo motor |
| MR-BKS1CBL_M-A2-L | | 2 | 5 | 10 | IP65 | Standard | Opposite to load-side lead for HG-MR/HG-KR servo motor |
| MR-BKS1CBL_M-A1-H | | 2 | 5 | 10 | IP65 | Long bending life | Load-side lead for HG-MR/HG-KR servo motor |
| MR-BKS1CBL_M-A2-H | | 2 | 5 | 10 | IP65 | Long bending life | Opposite to load-side lead for HG-MR/HG-KR servo motor |
| MR-BKS2CBL03M-A1-L | 03 | | | | IP55 | Standard | Load-side lead for HG-MR/HG-KR servo motor |
| MR-BKS2CBL03M-A2-L | 03 | | | | IP55 | Standard | Opposite to load-side lead for HG-MR/HG-KR servo motor |

(1) Connection of power supply for electromagnetic brake and servo motor




| Cable model | 1) Connector for electromagnetic brake | |
|---|---|---|
| MR-BKS1CBL_M-A1-L | Connector: JN4FT02SJ1-R<br>Hood, socket insulator<br>Bushing, ground nut<br>Contact: ST-TMH-S-C1B-100-(A534G)<br>Crimping tool: CT160-3-TMH5B<br>(JAE) |  <br>View seen from wiring side. |
| MR-BKS1CBL_M-A2-L | | |
| MR-BKS1CBL_M-A1-H | | |
| MR-BKS1CBL_M-A2-H | | |
| MR-BKS2CBL03M-A1-L | Connector: JN4FT02SJ2-R<br>Hood, socket insulator<br>Bushing, ground nut<br>Contact: ST-TMH-S-C1B-100-(A534G)<br>Crimping tool: CT160-3-TMH5B<br>(JAE) | |
| MR-BKS2CBL03M-A2-L | | |

(2) Internal wiring diagram




Note. These are not shielded cables.

5.5 Wires for option cables

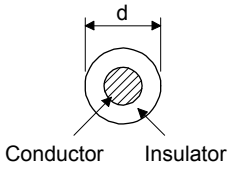
When fabricating a cable, use the wire models given in the following table or equivalent.

Table 5.1 Wires for option cables

| Type | Model | Length [m] | Core size | Number of cores | Characteristics of one core | | | (Note 2) Cable OD [mm] | Wire model (Manufacturer) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Structure [Wires/mm] | Conductor resistance [Ω/km] | (Note 1) Insulator OD d [mm] | | |
| Encoder cable | MR-J3ENCBL_M-A1-L<br>MR-J3ENCBL_M-A2-L | 2 to 10 | AWG 22 | 6 (3 pairs) | 7/0.26 | 53 or less | 1.18 | 7.1 | (Note 3)<br>VSVP 7/0.26 (AWG #22 or equivalent)-3P<br>KB-1655-2 (Bando Densen) |
| | MR-J3ENCBL_M-A1-H<br>MR-J3ENCBL_M-A2-H | 2 to 10 | AWG 22 | 6 (3 pairs) | 70/0.08 | 56 or less | 1.17 | 7.1 | (Note 3)<br>TPE・SVP 70/0.08 (AWG #22 or equivalent)-3P<br>KB-2237-2 (Bando Densen) |
| | MR-J3JCBL03M-A1-L<br>MR-J3JCBL03M-A2-L | 0.3 | AWG 26 | 8 (4 pairs) | 30/0.08 | 233 or less | 1.2 | 7.1 ± 0.3 | T/2464-1061/IIA-SB<br>4P×26AWG (Taiyo Cabletec) |
| | MR-EKCBL_M-L | 2 to 10 | AWG 28 | 4 (2 pairs) | 7/0.127 | 232 or less | 1.18 | 7.0 | (Note 3)<br>20276 composite 6-core shielded cable<br>Ban-gi-shi-16395-1 (Bando Densen) |
| | | | AWG 22 | 2 | 17/0.16 | 28.7 or less | 1.50 | | |
| | | 20・30 | AWG 23 | 12 (6 pairs) | 12/0.18 | 63.6 or less | 1.2 | 8.2 ± 0.3 | (Note 3)<br>20276 VSVPAWG#23×6P<br>KB-0492 (Bando Densen) |
| | MR-EKCBL_M-H | 2 to 10 | 0.2 $mm^2$ | 12 (6 pairs) | 40/0.08 | 105 or less | 0.88 | 7.2 | (Note 3) A14B2339 6P<br>(Junkosha) |
| | | 20 | AWG 24 | 12 (6 pairs) | 40/0.08 | 105 or less | 0.88 | 7.2 | (Note 3)<br>TPE・SVP 40/0.08 (AWG #24 or equivalent)-6P<br>KB-1928-2 (Bando Densen) |
| | | 30 to 50 | AWG 24 | 14 (7 pairs) | 40/0.08 | 105 or less | 0.88 | 8.0 | (Note 3)<br>TPE・SVP 40/0.08 (AWG #24 or equivalent)-7P<br>KB-1929-2 (Bando Densen) |
| | MR-J3JSCBL03M-A1-L<br>MR-J3JSCBL03M-A2-L | 0.3 | AWG 26 | 8 (4 pairs) | 7/0.16 | 146 or less | 1.0 | 7.1 ± 0.3 | (Note 3)<br>VSVP 7/0.16 (AWG #26 or equivalent)-4P<br>Ban-gi-shi-16822 (Bando Densen) |
| | MR-J3ENSCBL_M-L | 2 to 10 | AWG 22 | 6 (3 pairs) | 7/0.26 | 53 or less | 1.18 | 7.1 | (Note 3)<br>VSVP 7/0.26 (AWG #22 or equivalent)-3P<br>KB-1655-2 (Bando Densen) |
| | | 20/30 | AWG 23 | 12 (6 pairs) | 12/0.18 | 63.3 or less | 1.2 | 8.2 ± 0.3 | (Note 3)<br>20276 VSVPAWG#23×6P<br>KB-0492 (Bando Densen) |
| | MR-J3ENSCBL_M-H | 2 to 10 | AWG 22 | 6 (3 pairs) | 70/0.08 | 56 or less | 1.17 | 7.1 | (Note 3)<br>TPE・SVP 70/0.08 (AWG #22 or equivalent)-3P<br>KB-2237-2 (Bando Densen) |
| | | 20 to 50 | AWG 24 | 12 (6 pairs) | 40/0.08 | 105 or less | 0.88 | 7.2 | (Note 3)<br>TPE・SVP 40/0.08 (AWG #24 or equivalent)-6P<br>KB-1928-2 (Bando Densen) |

| Type | Model | Length [m] | Core size | Number of cores | Characteristics of one core | | | (Note 2) Cable OD [mm] | Wire model (Manufacturer) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Structure [Wires/mm] | Conductor resistance [Ω/km] | (Note 1) Insulator OD d [mm] | | |
| Servo motor power cable | MR-PWS1CBL_M-A1-L | 2 to 10 | AWG 18 | 4 | 34/0.18 | 21.8 or less | 1.71 | 6.2 ± 0.3 | (Note 4) HRZFEV-A (CL3) AWG 18 4 cores (Dyden) |
| | MR-PWS1CBL_M-A2-L | 2 to 10 | | | | | | | |
| | MR-PWS1CBL_M-A1-H | 2 to 10 | AWG 19 (0.75 mm$^{2)}$ | 4 | 150/0.08 | 29.1 or less | 1.63 | 5.7 ± 0.5 | (Note 4) RMFES-A (CL3X) AWG 19 4 cores (Dyden) |
| | MR-PWS1CBL_M-A2-H | 2 to 10 | | | | | | | |
| | MR-PWS2CBL03M-A1-L | 0.3 | AWG 19 | 4 | 30/0.18 | 25.8 or less | 1.64 | - | (Note 3, 5) J11B2330 UL10125 (Junkosha) |
| | MR-PWS2CBL03M-A2-L | 0.3 | | | | | | | |
| Electromagnetic brake cable | MR-BKS1CBL_M-A1-L | 2 to 10 | AWG 20 | 2 | 21/0.18 | 34.6 or less | 1.35 | 4.7 ± 0.1 | (Note 4) HRZFEV-A (CL3) AWG 20 2 cores (Dyden) |
| | MR-BKS1CBL_M-A2-L | 2 to 10 | | | | | | | |
| | MR-BKS1CBL_M-A1-H | 2 to 10 | AWG 20 | 2 | 110/0.08 | 39.0 or less | 1.37 | 4.5 ± 0.3 | (Note 4) RMFES-A (CL3X) AWG 20 2 cores (Dyden) |
| | MR-BKS1CBL_M-A2-H | 2 to 10 | | | | | | | |
| | MR-BKS2CBL03M-A1-L | 0.3 | AWG 20 | 2 | 19/0.203 | 32.0 or less | 1.42 | - | (Note 3, 5) J11B2331 UL10125 (Junkosha) |
| | MR-BKS2CBL03M-A2-L | 0.3 | | | | | | | |

Note 1. The following shows the detail of d.




2. Standard OD. Max. OD is about 10% greater.
3. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch
4. Purchase from Taisei Co., Ltd.
5. These models consist with solid wires. Specify the color, separately.

# MEMO

# 6. HG-MR SERIES/HG-KR SERIES

This chapter provides information on the servo motor specifications and characteristics. When using the HG-MR/HG-KR series servo motor, always read the Safety Instructions in the beginning of this manual and chapters 1 to 5, in addition to this chapter.

## 6.1 Model code definition

The following describes what each block of a model name indicates. Not all combinations of the symbols are available.

HG−KR13BJG1D

| Series | Feature |
|---|---|
| HG-MR | Ultra-Low inertia/Small capacity |
| HG-KR | Low inertia/Small capacity |

Rated output

| Symbol | Rated output [kW] |
|---|---|
| 05 | 0.05 |
| 1 | 0.1 |
| 2 | 0.2 |
| 4 | 0.4 |
| 7 | 0.75 |

Rated speed
3000 [r/min]

Electromagnetic brake

| Symbol | Electromagnetic brake |
|---|---|
| None | None |
| B | With |

Shaft type

| Symbol | Shaft shape | HG-MR_ HG-KR_ |
|---|---|---|
| None | Standard (straight shaft) | 053 to 73 |
| (Note 1) K | Keyway shaft (with key) | 23 to 73 |
| (Note 1) D | D cut shaft | 053/13 |

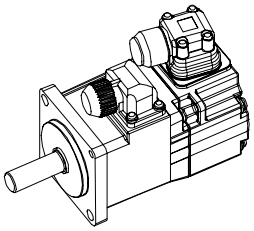
Reduction gear

| Symbol | Reduction gear |
|---|---|
| None | None |
| G1 | For general industrial machine (flange-mounting) |
| G5 | Flange-mounting flange output type for precision application |
| G7 | Flange-mounting shaft output type for precision application |

Oil seal

| Symbol | Oil seal |
|---|---|
| None | None |
| (Note 2) J | With |

Appearance



Note 1. The special shaft applies to the standard servo motor and servo motor with an electromagnetic brake. However, the key shaft (with key) also applies to the servo motor with flange-mounting shaft output type reduction gear for precision application.
2. The servo motors with an oil seal are available as optional products. For details, contact your local sales office.

## 6.2 Combination list of servo motors and servo amplifiers

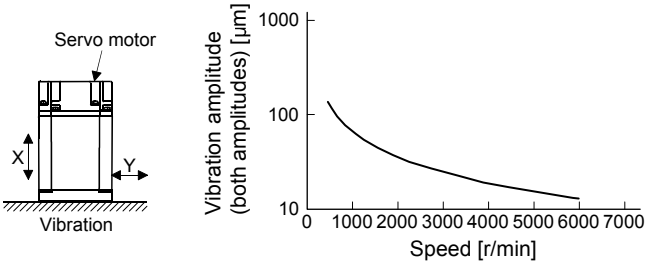
| Servo motor | Servo amplifier | | |
|---|---|---|---|
| | MR-J4 1-axis | MR-J4 2-axis | MR-J4 3-axis |
| HG-MR053 | MR-J4-10_ | MR-J4W2-22B<br>MR-J4W2-44B | MR-J4W3-222B<br>MR-J4W3-444B |
| HG-MR13 | | | |
| HG-MR23 | MR-J4-20_ | | |
| HG-MR43 | MR-J4-40_ | MR-J4W2-44B<br>MR-J4W2-77B<br>MR-J4W2-1010B | MR-J4W3-444B |
| HG-MR73 | MR-J4-70_ | MR-J4W2-77B<br>MR-J4W2-1010B | |
| HG-KR053 | MR-J4-10_ | MR-J4W2-22B<br>MR-J4W2-44B | MR-J4W3-222B<br>MR-J4W3-444B |
| HG-KR13 | | | |
| HG-KR23 | MR-J4-20_ | | |
| HG-KR43 | MR-J4-40_ | MR-J4W2-44B<br>MR-J4W2-77B<br>MR-J4W2-1010B | MR-J4W3-444B |
| HG-KR73 | MR-J4-70_ | MR-J4W2-77B<br>MR-J4W2-1010B | |

## 6.3 Standard specifications

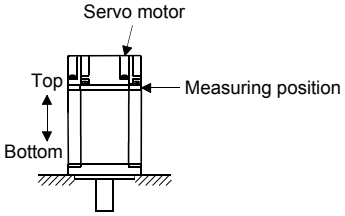
### 6.3.1 Standard specifications list

| Item \ Servo motor | | | HG-MR series (ultra-low inertia/small capacity) | | | | | HG-KR series (low inertia/small capacity) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 053(B) | 13(B) | 23(B) | 43(B) | 73(B) | 053(B) | 13(B) | 23(B) | 43(B) | 73(B) |
| Power supply capacity | | | Refer to "Power supply equipment capacity and generated loss of servo amplifiers" in Servo Amplifier Instruction Manual. | | | | | | | | | |
| Continuous running duty (Note 1) | Rated output | [kW] | 0.05 | 0.1 | 0.2 | 0.4 | 0.75 | 0.05 | 0.1 | 0.2 | 0.4 | 0.75 |
| | Rated torque | [N•m] | 0.16 | 0.32 | 0.64 | 1.3 | 2.4 | 0.16 | 0.32 | 0.64 | 1.3 | 2.4 |
| Maximum torque (Note 10) | | [N•m] | 0.48 | 0.95 | 1.9 | 3.8 | 7.2 | 0.56 | 1.1 | 2.2 | 4.5 | 8.4 |
| Rated speed (Note 1) | | [r/min] | 3000 | | | | | 3000 | | | | |
| Maximum speed (Note 10) | | [r/min] | 6000 | | | | | 6000 | | | | |
| Instantaneous permissible speed (Note 10) | | [r/min] | 6900 | | | | | 6900 | | | | |
| Power rate at continuous rated torque | Standard | [kW/s] | 15.6 | 33.8 | 46.9 | 114.2 | 97.3 | 5.63 | 13.0 | 18.3 | 43.7 | 45.2 |
| | With an electromagnetic brake | [kW/s] | 11.3 | 28.0 | 37.2 | 98.8 | 82.1 | 5.37 | 12.1 | 16.7 | 41.3 | 41.6 |
| Rated current | | [A] | 1.0 | 0.9 | 1.5 | 2.6 | 5.8 | 0.9 | 0.8 | 1.3 | 2.6 | 4.8 |
| Maximum current | | [A] | 3.1 | 2.5 | 5.3 | 9.0 | 20 | 3.2 | 2.5 | 4.6 | 9.1 | 17.2 |
| Moment of inertia J (Note 3) | Standard | [× $10^{-4}$ kg•$m^2$] | 0.0162 | 0.0300 | 0.0865 | 0.142 | 0.586 | 0.0450 | 0.0777 | 0.221 | 0.371 | 1.26 |
| | With an electromagnetic brake | [× $10^{-4}$ kg•$m^2$] | 0.0224 | 0.0362 | 0.109 | 0.164 | 0.694 | 0.0472 | 0.0837 | 0.243 | 0.393 | 1.37 |
| Recommended load to motor inertia ratio (Note 2, 10) | | | 35 times or less | 32 times or less | | | | 17 times or less | | 26 times or less | 25 times or less | 17 times or less |
| Speed/position detector | | | 22-bit encoder common to absolute position/incremental systems (resolution per servo motor revolution: 4194304 pulses/rev) | | | | | | | | | |
| Oil seal | | | None | None (Note 11) | | | | None | None (Note 11) | | | |
| Insulation class | | | 130(B) | | | | | | | | | |
| Structure | | | Totally-enclosed, natural-cooling (IP rating: IP65 (Note 4, 9)) | | | | | | | | | |
| Environment | Ambient temperature | Operation | 0 °C to 40 °C (non-freezing) | | | | | | | | | |
| | | Storage | -15 °C to 70 °C (non-freezing) | | | | | | | | | |
| | Ambient humidity | Operation | 80 %RH or less (non-condensing) | | | | | | | | | |
| | | Storage | 90 %RH or less (non-condensing) | | | | | | | | | |
| | Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt | | | | | | | | | |
| | Altitude | | Max. 1000 m above sea level | | | | | | | | | |
| | Vibration resistance (Note 6) | | X, Y: 49 $m/s^2$ | | | | | | | | | |
| Vibration rank (Note 7) | | | V10 | | | | | | | | | |
| Permissible load for the shaft (Note 8, 10) | L | [mm] | 25 | | 30 | | 40 | 25 | | 30 | | 40 |
| | Radial | [N] | 88 | | 245 | | 392 | 88 | | 245 | | 392 |
| | Thrust | [N] | 59 | | 98 | | 147 | 59 | | 98 | | 147 |
| Mass (Note 3) | Standard | [kg] | 0.34 | 0.54 | 0.91 | 1.4 | 2.8 | 0.34 | 0.54 | 0.91 | 1.4 | 2.8 |
| | With an electromagnetic brake | [kg] | 0.54 | 0.74 | 1.3 | 1.8 | 3.8 | 0.54 | 0.74 | 1.3 | 1.8 | 3.8 |

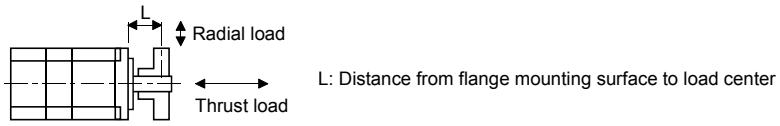
Note 1. When the power supply voltage drops, the output and the rated speed cannot be guaranteed.
2. If the load to motor inertia ratio exceeds the indicated value, contact your local sales office.
3. Refer to the dimensions for the geared servo motor.
4. Except for the shaft-through portion.
5. In the environment where the servo motor is exposed to oil mist, oil, or water, the servo motor of the standard specifications may not be usable. Please contact your local sales office.
6. The following figure shows the vibration directions. The value is the one at the part that indicates the maximum value (normally the opposite to load-side bracket). When the servo motor stops, fretting is likely to occur at the bearing. Therefore, suppress the vibration to about half of the permissible value. Note that this does not apply to the geared servo motor.




7. V10 indicates that the amplitude of a single servo motor is 10 μm or less. The following figure shows the servo motor mounting position for measurement and the measuring position.




8. The following shows permissible load for the shaft. Do not subject the shaft to load greater than the value in the specifications list. The value assumes that the load is applied independently.



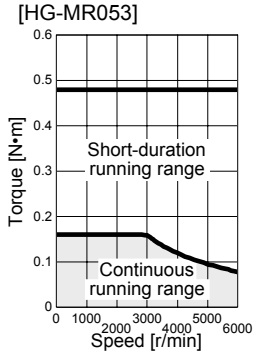

9. For the geared servo motor, the reduction gear area is IP44-equivalent.
10. Refer to section 6.6 for the geared servo motor.
11. The servo motors with an oil seal are available as optional products. For details, contact your local sales office.

### 6.3.2 Torque characteristics

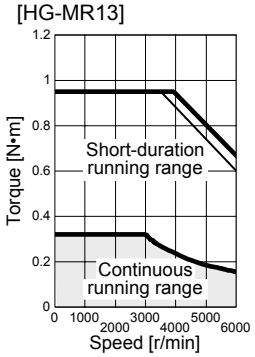
> POINT
>
> ●When unbalanced torque is generated, such as in a vertical lift machine, it is recommended that the unbalanced torque of the machine be kept at 70% or less of the motor's rated torque.

When the power supply input of the servo amplifier are 3-phase 200 V AC or 1-phase 230 V AC, the torque characteristic is indicated by the heavy line. For the 1-phase 200 V AC power supply, part of the torque characteristic is indicated by the thin line.

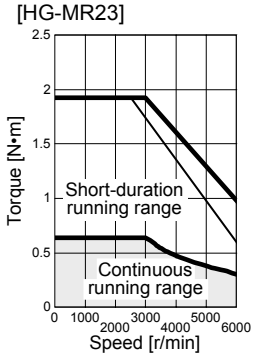
[HG-MR053]



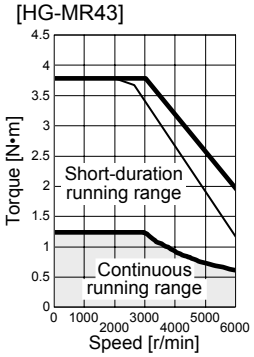

[HG-MR13]



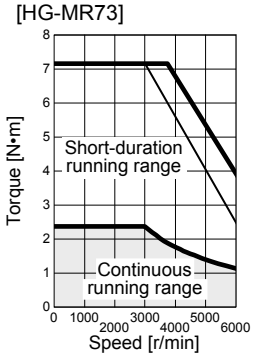

[HG-MR23]



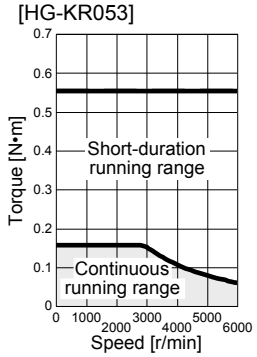

[HG-MR43]



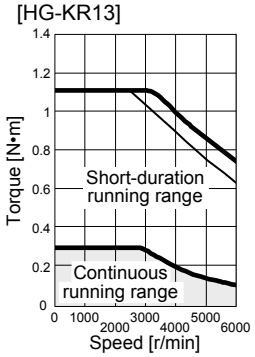

[HG-MR73]



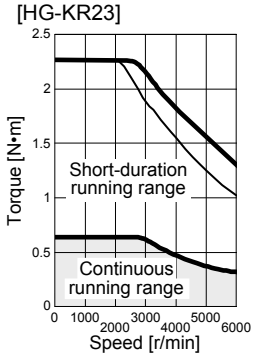

[HG-KR053]



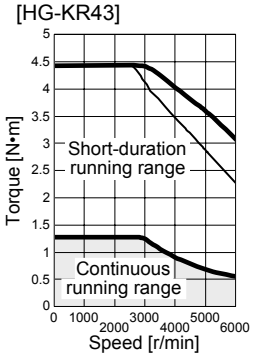

[HG-KR13]



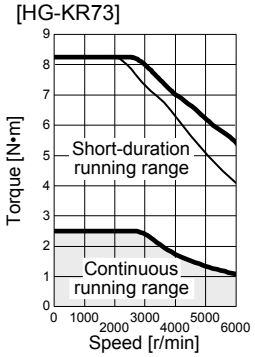

[HG-KR23]




[HG-KR43]




[HG-KR73]



## 6.4 Electromagnetic brake characteristics

⚠CAUTION

- The electromagnetic brake is provided to prevent a drop at a power failure or servo alarm occurrence during vertical drive or to hold a shaft at a stop. Do not use it for normal braking (including braking at servo-lock).
- Before performing the operation, be sure to confirm that the electromagnetic brake operates properly.
- The operation time of the electromagnetic brake differs depending on the power supply circuit you use. Be sure to check the operation delay time with a real machine.

The characteristics of the electromagnetic brake provided for the servo motor with an electromagnetic brake are indicated below.

| Item \ Servo motor | | HG-MR Series/HG-KR Series | | | | |
|---|---|---|---|---|---|---|
| | | 053B | 13B | 23B | 43B | 73B |
| Type (Note 1) | | Spring actuated type safety brake | | | | |
| Rated voltage (Note 4) | | 24 V DC $^{0}_{-10\%}$ | | | | |
| Power consumption | [W] at 20 °C | 6.3 | | 7.9 | | 10 |
| Coil resistance (Note 6) | [Ω] | 91.0 | | 73.0 | | 57.0 |
| Inductance (Note 6) | [H] | 0.15 | | 0.18 | | 0.13 |
| Brake static friction torque | [N•m] | 0.32 | | 1.3 | | 2.4 |
| Release delay time (Note 2) | [s] | 0.03 | | 0.03 | | 0.04 |
| Braking delay time (Note 2) [s] | DC off | 0.01 | | 0.02 | | 0.02 |
| Permissible braking work | Per braking [J] | 5.6 | | 22 | | 64 |
| | Per hour [J] | 56 | | 220 | | 640 |
| Brake looseness at servo motor shaft (Note 5) | [degrees] | 2.5 | | 1.2 | | 0.9 |
| Brake life (Note 3) | Number of brakings [times] | 20000 | | | | |
| | Work per braking [J] | 5.6 | | 22 | | 64 |
| Selection example of surge absorbers to be used (Note 7, 8) | For the suppressed voltage 125 V | TND20V-680KB | | | | |
| | For the suppressed voltage 350 V | TND10V-221KB | | | | |

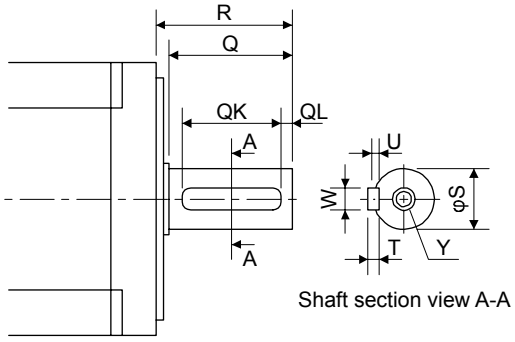
Note 1. There is no manual release mechanism. When it is necessary to hand-turn the servo motor shaft for machine centering, etc., use a separate 24 V DC power supply to release the brake electrically.
2. The value for initial on gap at 20 °C.
3. The brake gap will increase as the brake lining wears, but the gap is not adjustable.
The brake life indicated is the number of braking cycles after which adjustment will be required.
4. Always prepare a power supply exclusively used for the electromagnetic brake.
5. These are initial values. These are not guaranteed values.
6. These values are measured values and not guaranteed values.
7. Select the electromagnetic brake control relay properly, considering the characteristics of the electromagnetic brake and surge absorber.
8. Manufactured by Nippon Chemi-Con Corporation.

## 6.5 Servo motors with special shafts

The servo motors with special shafts indicated by the symbols (K and D) in the table are available. K and D are the symbols included in the servo motor model names. Refer to section 6.6.2 (4) for geared servo motors with special shaft.

| Servo motor | Shaft shape | |
|---|---|---|
| | Key shaft (with key) | D cut shaft |
| HG-MR053(B)_/HG-MR13(B)_/<br>HG-KR053(B)_/HG-KR13(B)_ | | D |
| HG-MR23(B)_/HG-MR43(B)_/<br>HG-MR73(B)_/<br>HG-KR23(B)_/HG-KR43(B)_/<br>HG-KR73(B)_ | K | |

### 6.5.1 Key shaft (with 2 round end key)



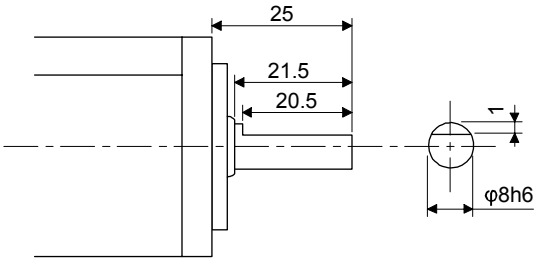

Shaft section view A-A

Variable dimension table [Unit: mm]

| Servo motor | Variable dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | S | R | Q | W | QK | QL | U | T | Y |
| HG-MR23(B)K<br>HG-MR43(B)K<br>HG-KR23(B)K<br>HG-KR43(B)K | 14h6 | 30 | 26 | 5 | 20 | 3 | 3 | 5 | M4 Screw hole depth 15 |
| HG-MR73(B)K<br>HG-KR73(B)K | 19h6 | 40 | 36 | 6 | 25 | 5 | 3.5 | 6 | M5 Screw hole depth 20 |

### 6.5.2 D cut shaft

[Unit: mm]



6.6 Geared servo motors

> **⚠CAUTION** ●For the geared servo motor, transport it in the same status as in the installation method. Tipping it over can cause oil leakage.

> **POINT**
> ●Geared servo motors are not included in the HG-MR series.

Servo motors are available with a reducer designed for general industrial machines compliant and precision applications compliant.
Servo motors with an electromagnetic brake are also available.

6.6.1 For general industrial machines compliant (G1)

(1) Reduction ratio
The following table indicates the reduction ratios and actual reduction ratios of the geared servo motor for general industrial machines compliant.

| Servo motor | Nominal reduction ratio | Actual reduction ratio |
|---|---|---|
| HG-KR053(B)G1 | 1/5 | 9/44 |
| | 1/12 | 49/576 |
| | 1/20 | 25/484 |
| HG-KR13(B)G1 | 1/5 | 9/44 |
| | 1/12 | 49/576 |
| | 1/20 | 25/484 |
| HG-KR23(B)G1 | 1/5 | 19/96 |
| | 1/12 | 961/11664 |
| | 1/20 | 513/9984 |
| HG-KR43(B)G1 | 1/5 | 19/96 |
| | 1/12 | 961/11664 |
| | 1/20 | 7/135 |
| HG-KR73(B)G1 | 1/5 | 1/5 |
| | 1/12 | 7/87 |
| | 1/20 | 625/12544 |

(2) Specifications

<table>
<tr><th colspan="2">Item</th><th colspan="5">Description</th></tr>
<tr><td colspan="2">Mounting method</td><td colspan="5">Flange mounting</td></tr>
<tr><td colspan="2">Mounting direction</td><td colspan="5">In any directions</td></tr>
<tr><td colspan="2" rowspan="3">Lubrication method</td><td colspan="5">Grease lubrication (already packed)</td></tr>
<tr><td rowspan="2">Packed with</td><td rowspan="2">50 W/100 W</td><td>200 W/400 W<br>1/12, 1/20</td><td>750 W<br>1/12</td><td>200 W/400 W<br>1/5</td><td>750 W<br>1/5, 1/20</td></tr>
<tr><td>Mobilplex 46 Exxon Mobil</td><td colspan="2">Molynoc AP2<br>JX Nippon Oil & Energy</td><td colspan="2">Mobil Grease SP<br>Exxon Mobil</td></tr>
<tr><td colspan="2">Output shaft rotating direction</td><td colspan="5">Same as the servo motor output shaft direction.</td></tr>
<tr><td colspan="2">Backlash (Note 3)</td><td colspan="5">60 minutes or less at reducer output shaft</td></tr>
<tr><td colspan="2">Permissible load inertia moment ratio (converted into equivalent value on servo motor shaft) (Note 1)</td><td colspan="5">50 W/100 W/750 W: 5 times or less<br>200 W/400 W: 7 times or less</td></tr>
<tr><td colspan="2">Maximum torque</td><td colspan="5">Three times of the servo motor rated torque</td></tr>
<tr><td colspan="2">Maximum speed<br>(at servo motor shaft)</td><td colspan="5">4500 r/min (permissible instantaneous speed: 5175 r/min)</td></tr>
<tr><td colspan="2">IP rating (reducer area)</td><td colspan="5">IP44 equivalent</td></tr>
<tr><td colspan="2">Reducer efficiency (Note 2)</td><td colspan="5">45% to 75%</td></tr>
</table>

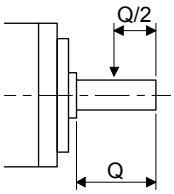
Note 1. If the above indicated value is exceeded, please contact your local sales office.

2. The reduction gear efficiency differs depending on the reduction ratio. Also, it changes depending on the operating conditions such as the output torque, speed and rotation, temperature, etc. The numerical value in the table is a typical value in the rated torque, rated speed and rotation and typical temperature, and not a guaranteed value.

3. The backlash can be converted: 1 min = 0.0167 °

(3) Permissible loads of servo motor shaft

The permissible radial load in the table is the value measured at the center of the reduction gear output shaft.




Q: Length of axis (Refer to section 6.8.3, 6.8.4.)

| Servo motor | Reduction ratio | Permissible load (Note) | |
|---|---|---|---|
| | | Permissible radial load [N] | Permissible thrust load [N] |
| HG-KR053(B)G1 | 1/5 | 150 | 200 |
| | 1/12 | 240 | 320 |
| | 1/20 | 370 | 450 |
| HG-KR13(B)G1 | 1/5 | 150 | 200 |
| | 1/12 | 240 | 320 |
| | 1/20 | 370 | 450 |
| HG-KR23(B)G1 | 1/5 | 330 | 350 |
| | 1/12 | 710 | 720 |
| | 1/20 | 780 | 780 |
| HG-KR43(B)G1 | 1/5 | 330 | 350 |
| | 1/12 | 710 | 720 |
| | 1/20 | 760 | 760 |
| HG-KR73(B)G1 | 1/5 | 430 | 430 |
| | 1/12 | 620 | 620 |
| | 1/20 | 970 | 960 |

Note. Do not subject the shaft to load greater than the value.
The value in the table assumes that the load is applied independently.

6.6.2 For precision applications compliant (G5/G7)

(1) Reduction ratio

The symbols (11B, 14A, 20A, and 32A) in the following table indicate the model numbers of the reduction gears assembled to the servo motors. Servo motors with a reduction gear having the indicated reduction gear model numbers are available. The reducer model number indicates _ _ _ of the reducer model HPG-_ _ _-05.

| Servo motor | Reduction ratio | | | | | |
|---|---|---|---|---|---|---|
| | 1/5 | 1/9 | 1/11 | 1/21 | 1/33 | 1/45 |
| HG-KR053(B)G5<br>HG-KR053(B)G7 | 11B/14A | 11B | 14A | | | |
| HG-KR13(B)G5<br>HG-KR13(B)G7 | 11B/14A | | 14A | | 20A | |
| HG-KR23(B)G5<br>HG-KR23(B)G7 | 14A | | 14A | | 20A | |
| HG-KR43(B)G5<br>HG-KR43(B)G7 | 14A | | 20A | | 32A | |
| HG-KR73(B)G5<br>HG-KR73(B)G7 | 20A | | 20A | | 32A | |

(2) Specifications

| Item | | Description |
|---|---|---|
| Mounting method | | Flange mounting |
| Mounting direction | | In any directions |
| Lubrication method | | Grease lubrication (already packed) |
| | Packed with | Harmonic grease SK-2<br>(Harmonic Drive Systems) |
| Output shaft rotating direction | | Same as the servo motor output shaft direction. |
| Backlash (Note 3) | | 3 minutes or less at reducer output shaft |
| Permissible load inertia moment ratio (when converting into the servo motor shaft)<br>(Note 1) | | 50 W/100 W/750 W: 10 times or less<br>200 W/400 W: 14 times or less |
| Maximum torque | | Three times of the servo motor rated torque |
| Maximum speed<br>(servo motor shaft) | | 6000 r/min (permissible instantaneous speed: 6900 r/min) |
| IP rating (reduction gear area) | | IP44 equivalent |
| Reducer efficiency<br>(Note 2) | | 50 W (reducer model No. 14A): 22% to 41%<br>50 W (reducer model No. 11B)/100 W/200 W/400 W/750 W: 58% to 87% |

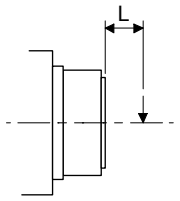
Note 1. If the above indicated value is exceeded, please contact your local sales office.

2. The reducer efficiency differs depending on the reduction ratio. Also, it changes depending on the operating conditions such as the output torque, speed and rotation, temperature, etc. The numerical value in the table is a typical value in the rated torque, rated speed and rotation and typical temperature, and not a guaranteed value.

3. The backlash can be converted: 1 min = 0.0167 °

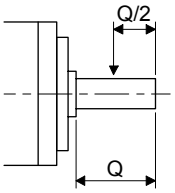
(3) Permissible loads of servo motor shaft

The radial load point of a precision reduction gear is as shown below.




L: Distance between reduction gear end face and load center

Flange-mounting flange output type for precision application (G5)




Q: Length of axis (Refer to section 6.8.7, 6.8.8.)

Flange-mounting shaft output type for precision application (G7)

| Servo motor | Reduction ratio | Reduction gear model number | Permissible load (Note) | | |
|---|---|---|---|---|---|
| | | | Radial load point L [mm] | Permissible radial load [N] | Permissible thrust load [N] |
| HG-KR053(B)G5<br>HG-KR053(B)G7 | 1/5 | 11B | 17 | 93 | 431 |
| | 1/5 | 14A | 23 | 177 | 706 |
| | 1/9 | 11B | 17 | 111 | 514 |
| | 1/11 | 14A | 23 | 224 | 895 |
| | 1/21 | | 23 | 272 | 1087 |
| | 1/33 | | 23 | 311 | 1244 |
| | 1/45 | | 23 | 342 | 1366 |
| HG-KR13(B)G5<br>HG-KR13(B)G7 | 1/5 | 11B | 17 | 93 | 431 |
| | 1/5 | 14A | 23 | 177 | 706 |
| | 1/11 | | 23 | 224 | 895 |
| | 1/21 | | 23 | 272 | 1087 |
| | 1/33 | 20A | 32 | 733 | 2581 |
| | 1/45 | | 32 | 804 | 2833 |
| HG-KR23(B)G5<br>HG-KR23(B)G7 | 1/5 | 14A | 23 | 177 | 706 |
| | 1/11 | | 23 | 224 | 895 |
| | 1/21 | 20A | 32 | 640 | 2254 |
| | 1/33 | | 32 | 733 | 2581 |
| | 1/45 | | 32 | 804 | 2833 |
| HG-KR43(B)G5<br>HG-KR43(B)G7 | 1/5 | 14A | 23 | 177 | 706 |
| | 1/11 | 20A | 32 | 527 | 1856 |
| | 1/21 | | 32 | 640 | 2254 |
| | 1/33 | 32A | 57 | 1252 | 4992 |
| | 1/45 | | 57 | 1374 | 5478 |
| HG-KR73(B)G5<br>HG-KR73(B)G7 | 1/5 | 20A | 32 | 416 | 1465 |
| | 1/11 | | 32 | 527 | 1856 |
| | 1/21 | 32A | 57 | 1094 | 4359 |
| | 1/33 | | 57 | 1252 | 4992 |
| | 1/45 | | 57 | 1374 | 5478 |

Note. Do not subject the shaft to load greater than the value.

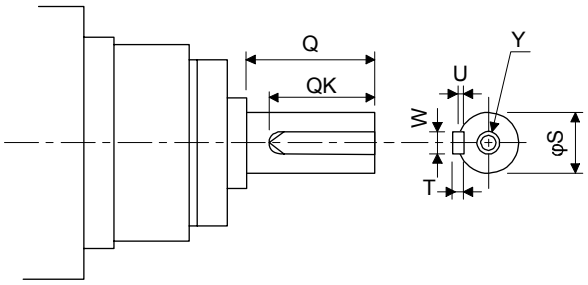
The value in the table assumes that the load is applied independently.

(4) Servo motor with special shaft

Servo motors with special shafts having keyway (with single pointed keys) are available for the flange-mounting shaft output type for precision applications compliant (G7).

[Unit: mm]

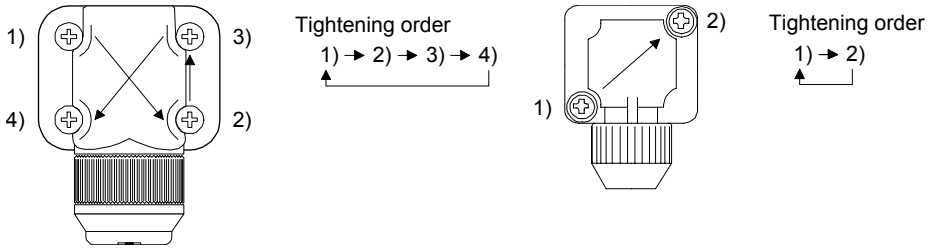
| Servo motor | Reduction gear model number | Q | φS | W | T | QK | U | Y |
|---|---|---|---|---|---|---|---|---|
| HG-KR_(B)G7K | 11B | 20 | 10h7 | 4 | 4 | 15 | 2.5 | M3 screw hole depth 6 |
| | 14A | 28 | 16h7 | 5 | 5 | 25 | 3 | M4 screw hole depth 8 |
| | 20A | 42 | 25h7 | 8 | 7 | 36 | 4 | M6 screw hole depth 12 |
| | 32A | 82 | 40h7 | 12 | 8 | 70 | 5 | M10 screw hole depth 20 |



6.7 Mounting connectors

If the connector is not fixed securely, it may come off or may not produce a splash-proof effect during operation.
To achieve the IP rating IP65, pay attention to the following points and install the connectors.

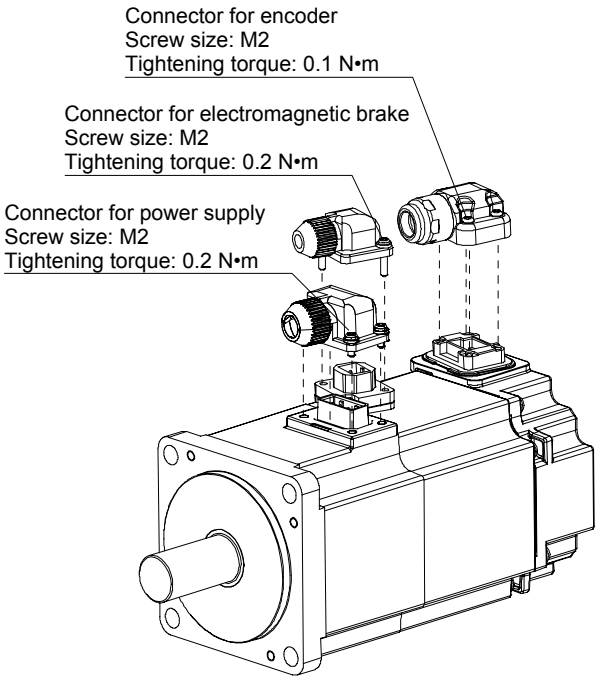
(1) When screwing the connector, hold the connector still and gradually tighten the screws in a crisscross pattern.




Connector for power supply, connector for encoder

Connector for electromagnetic brake

(2) Tighten the screws evenly. Tightening torques are as indicated below.




(3) The servo motor fitting part of each connector is provided with a splash-proof seal (O ring). When mounting a connector, use care to prevent the seal (O ring) from dropping and being pinched. If the seal (O ring) has dropped or is pinched, a splash-proof effect is not produced.

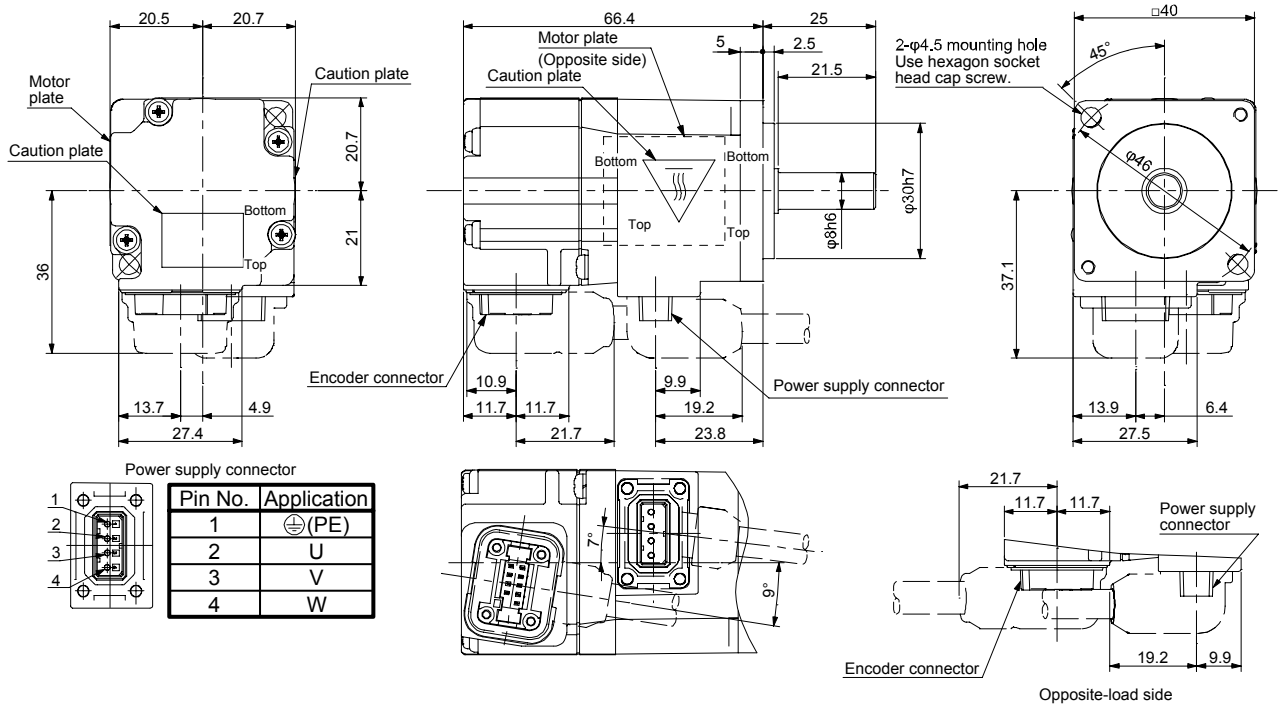
## 6.8 Dimensions

Moment of inertia on the table is the value calculated by converting the total value of moment of inertia for servo motor, reducer, and electromagnetic brake with servo motor shaft.
When running the cables to the load side, take care to avoid interference with the machine. The dimensions without tolerances are general tolerance.
The outer frame of the reducer is a material surface such as casting. Its actual dimensions may be 1 mm to 3 mm larger than the drawing dimensions. Design the machine-side with allowances.

### 6.8.1 Standard (without an electromagnetic brake, without a reducer)

| Model | Output [W] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-MR053 | 50 | 0.0162 | 0.34 |
| HG-KR053 | 50 | 0.0450 | 0.34 |

[Unit: mm]

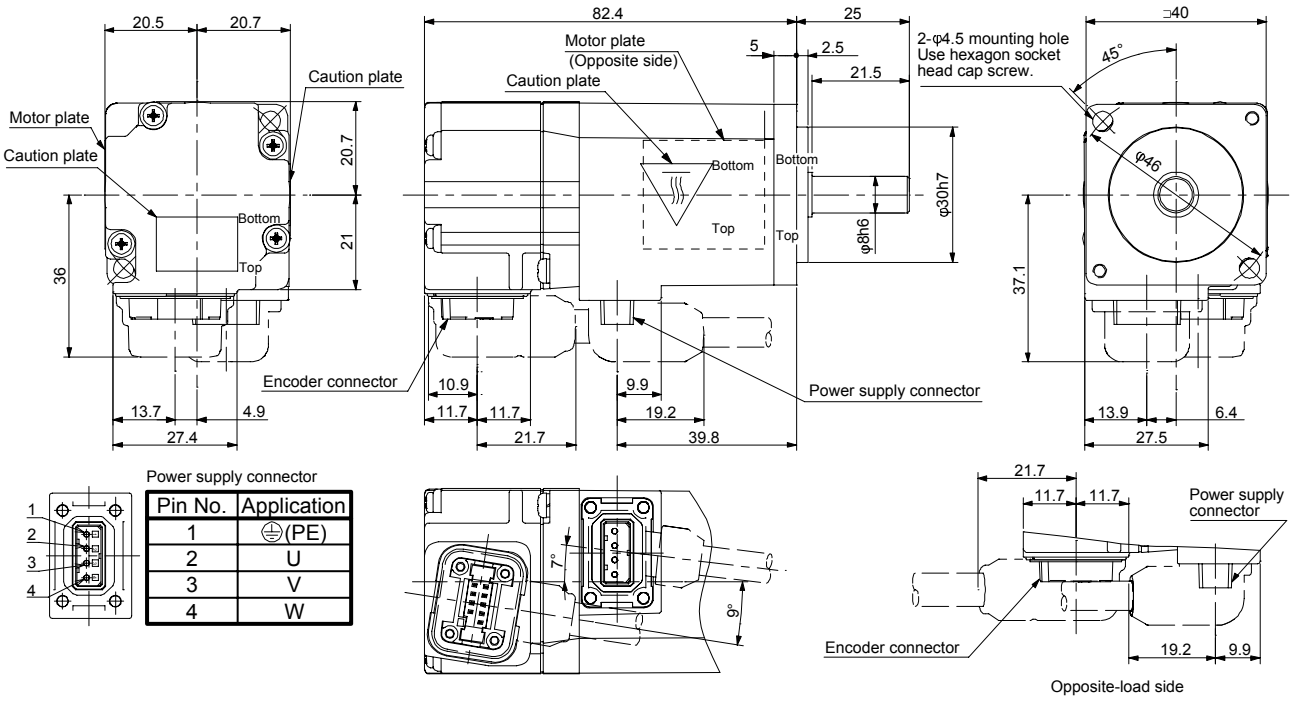



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38021C BC38016C

| Model | Output [W] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-MR13 | 100 | 0.0300 | 0.54 |
| HG-KR13 | 100 | 0.0777 | 0.54 |

[Unit: mm]

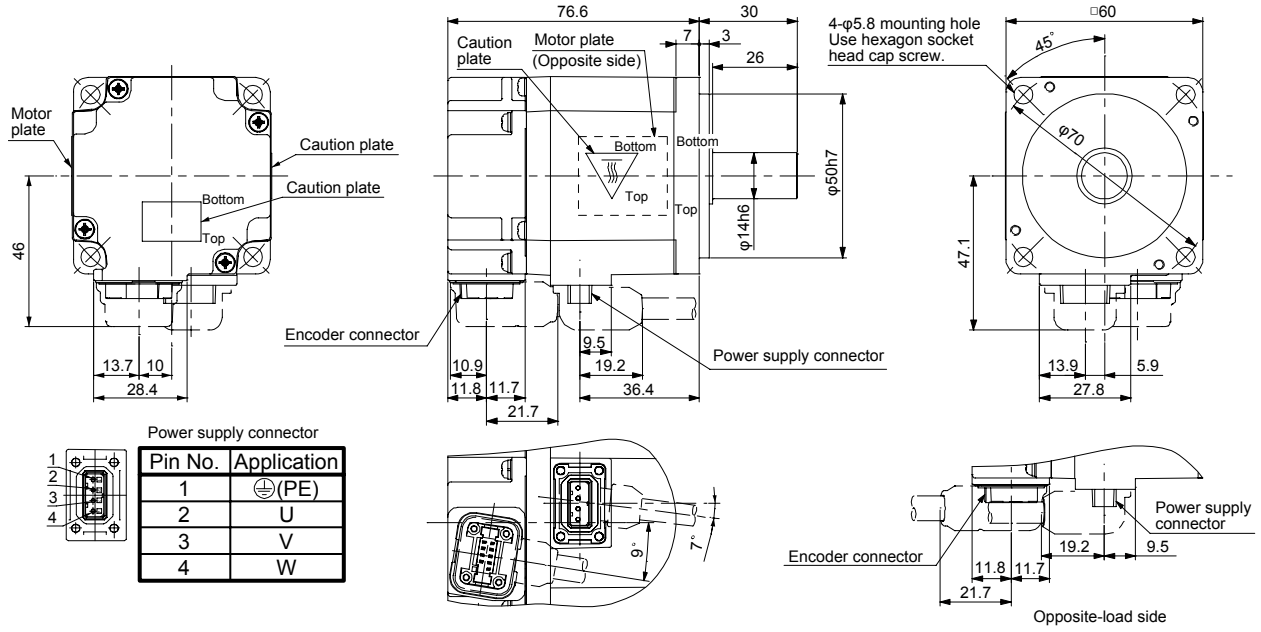



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38022C BC38017C

| Model | Output [W] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-MR23 | 200 | 0.0865 | 0.91 |
| HG-KR23 | 200 | 0.221 | 0.91 |

[Unit: mm]

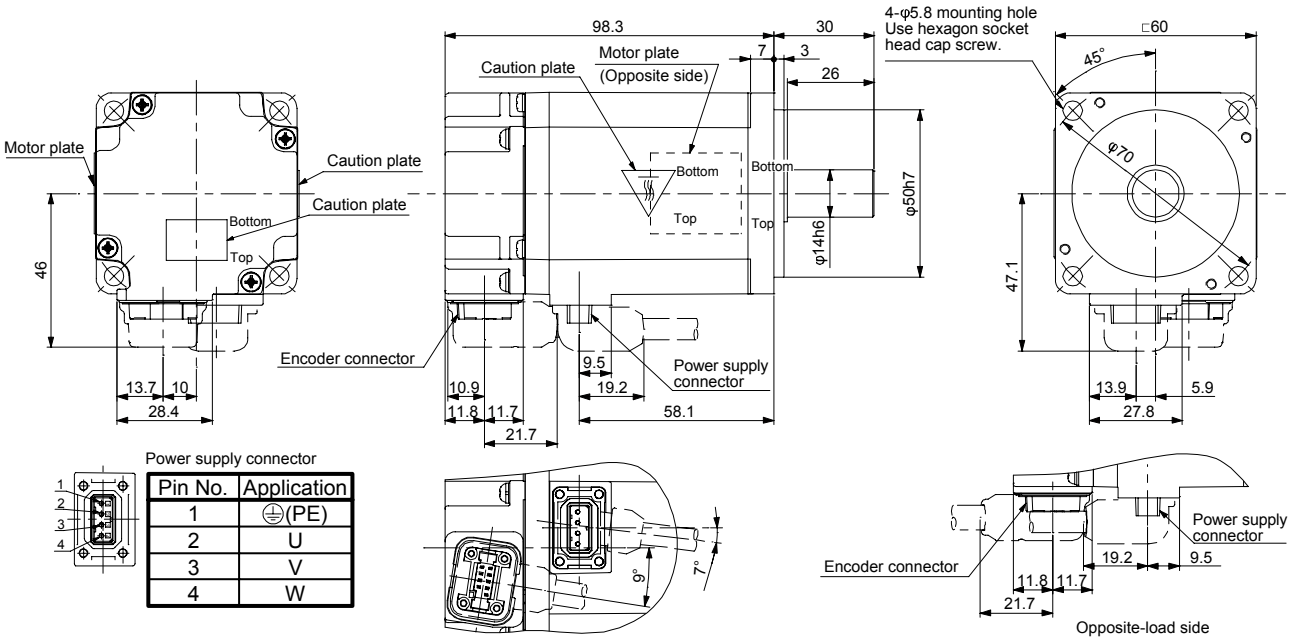



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38023B BC38018B

| Model | Output [W] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-MR43 | 400 | 0.142 | 1.4 |
| HG-KR43 | 400 | 0.371 | 1.4 |

[Unit: mm]

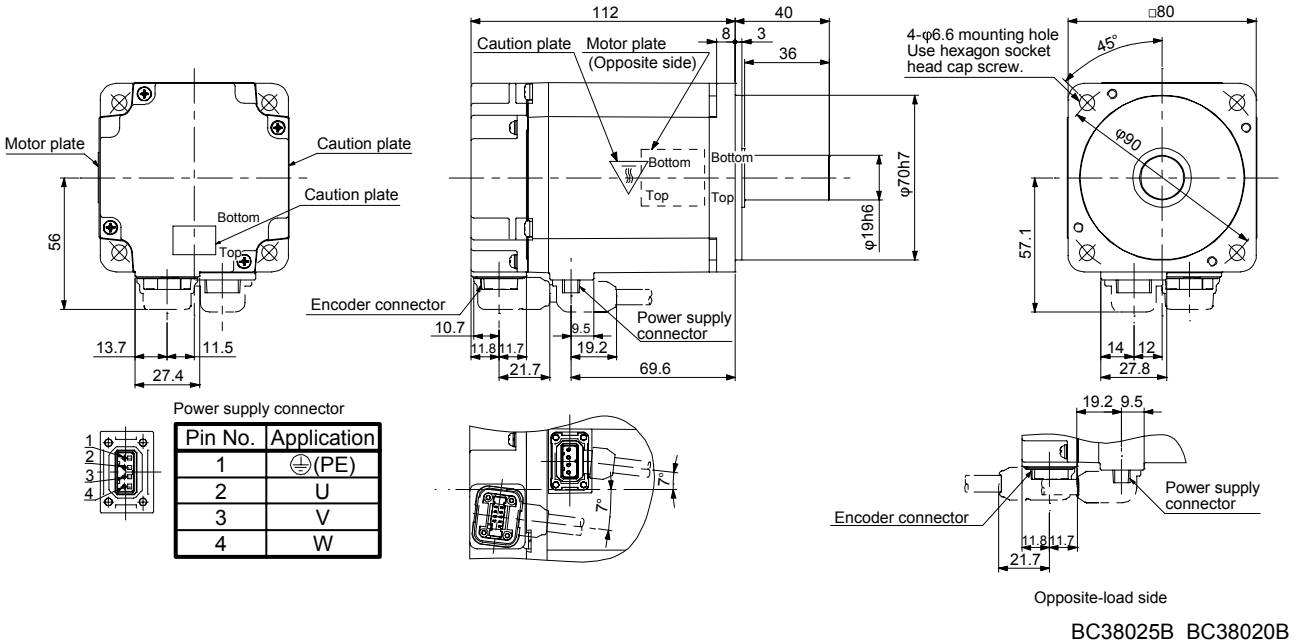



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38024B BC38019B

| Model | Output [W] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-MR73 | 750 | 0.586 | 2.8 |
| HG-KR73 | 750 | 1.26 | 2.8 |

[Unit: mm]



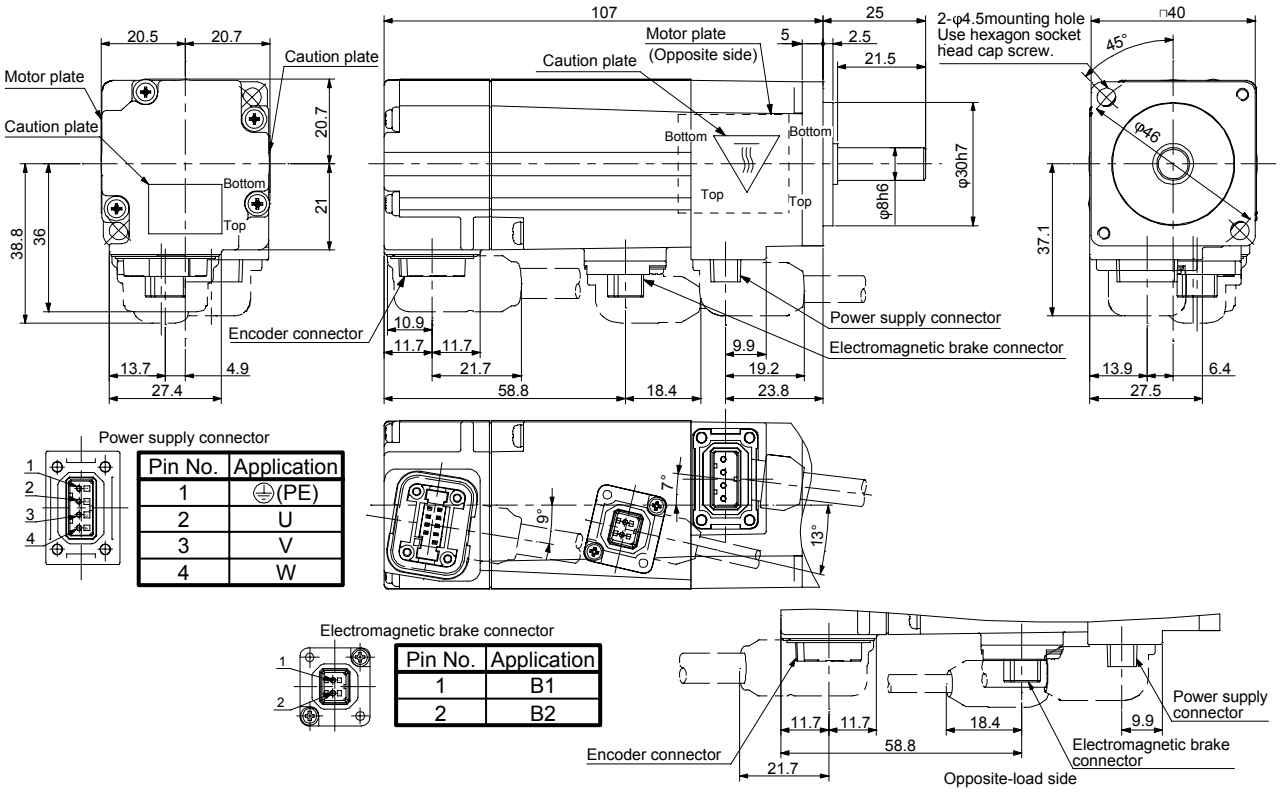

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38025B BC38020B

### 6.8.2 With an electromagnetic brake

| Model | Output [W] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-MR053B | 50 | 0.32 | 0.0224 | 0.54 |
| HG-KR053B | 50 | 0.32 | 0.0472 | 0.54 |

[Unit: mm]




Power supply connector

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

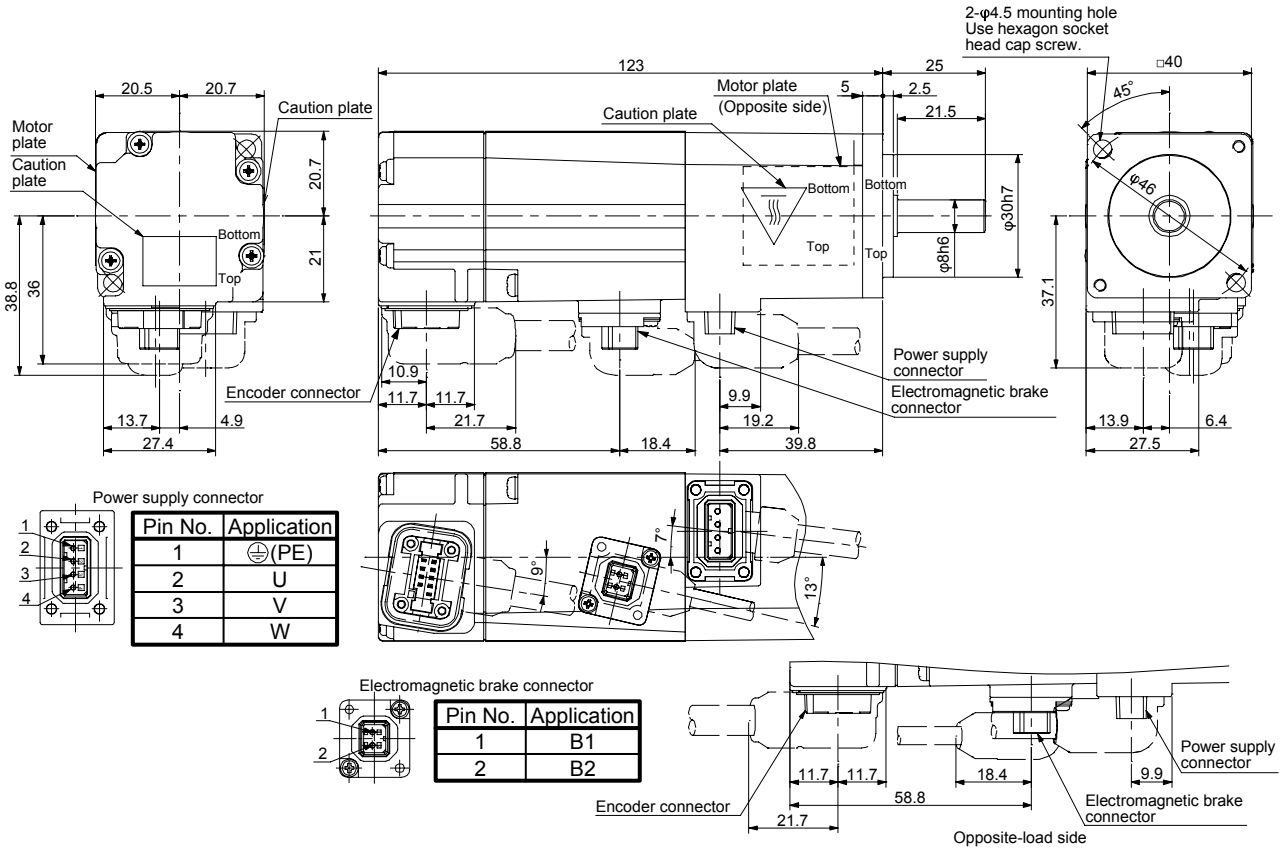
Electromagnetic brake connector

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

BC38180A BC38175A

| Model | Output [W] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-MR13B | 100 | 0.32 | 0.0362 | 0.74 |
| HG-KR13B | 100 | 0.32 | 0.0837 | 0.74 |

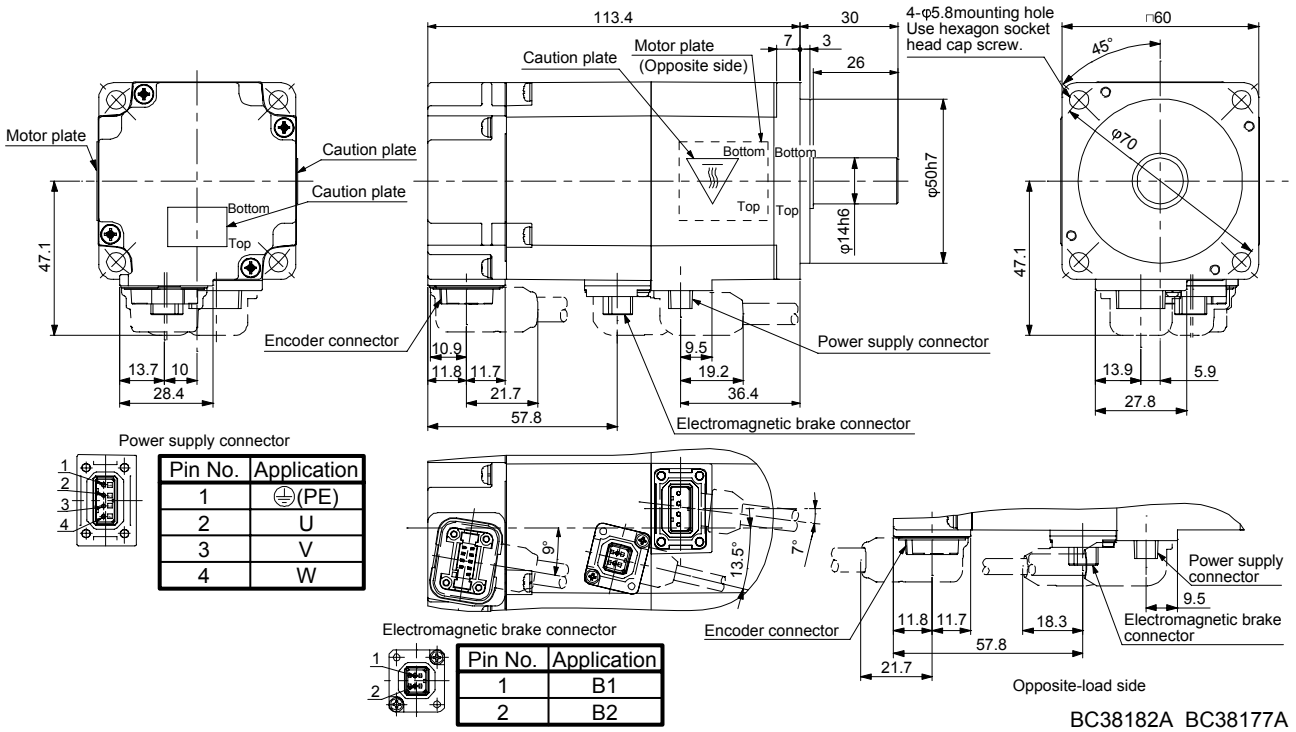
[Unit: mm]




BC38181A BC38176A

| Model | Output [W] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-MR23B | 200 | 1.3 | 0.109 | 1.3 |
| HG-KR23B | 200 | 1.3 | 0.243 | 1.3 |

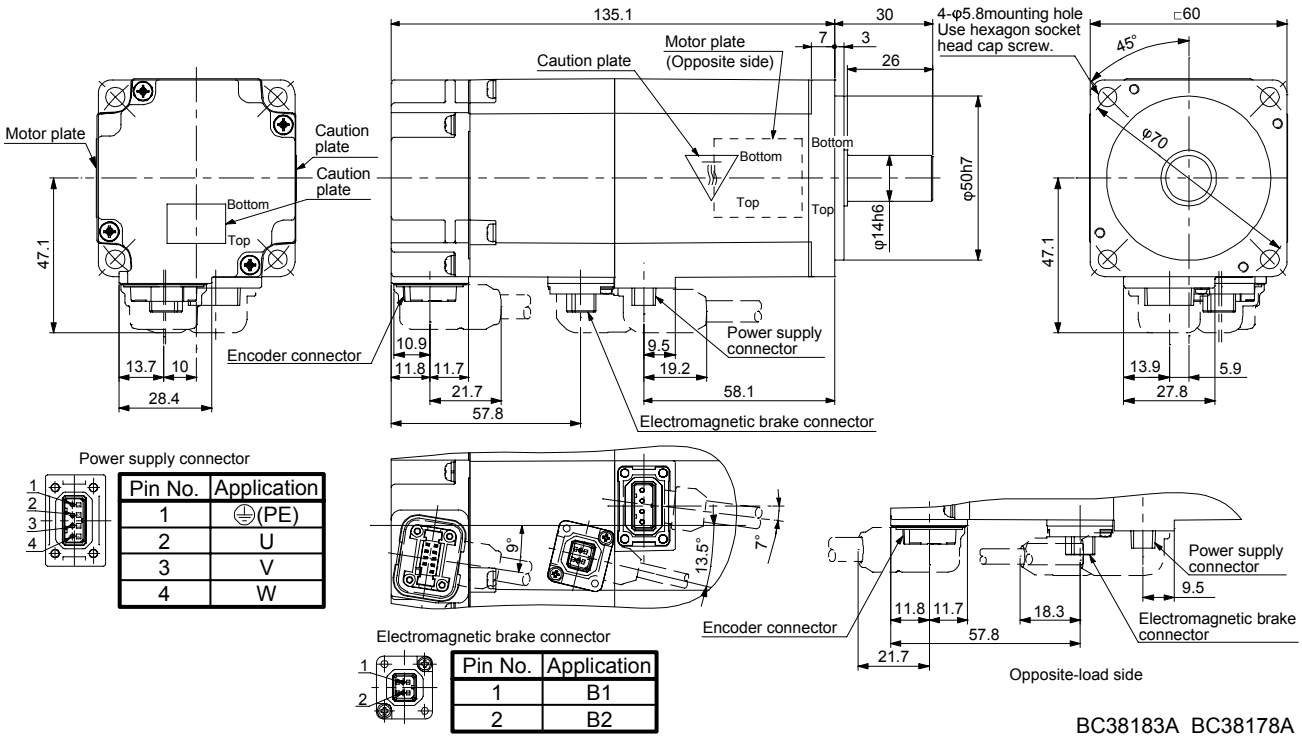
[Unit: mm]




BC38182A BC38177A

| Model | Output [W] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-MR43B | 400 | 1.3 | 0.164 | 1.8 |
| HG-KR43B | 400 | 1.3 | 0.393 | 1.8 |

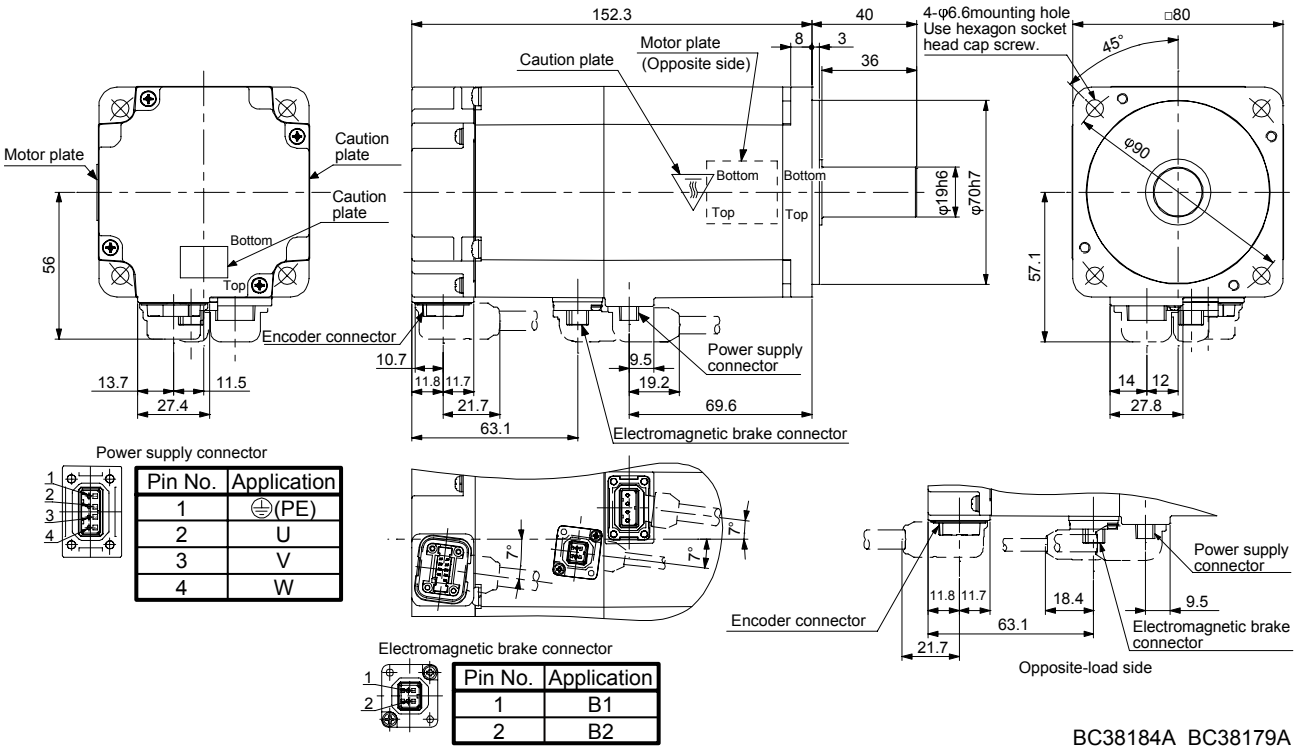
[Unit: mm]




BC38183A BC38178A

| Model | Output [W] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-MR73B | 750 | 2.4 | 0.694 | 3.8 |
| HG-KR73B | 750 | 2.4 | 1.37 | 3.8 |

[Unit: mm]

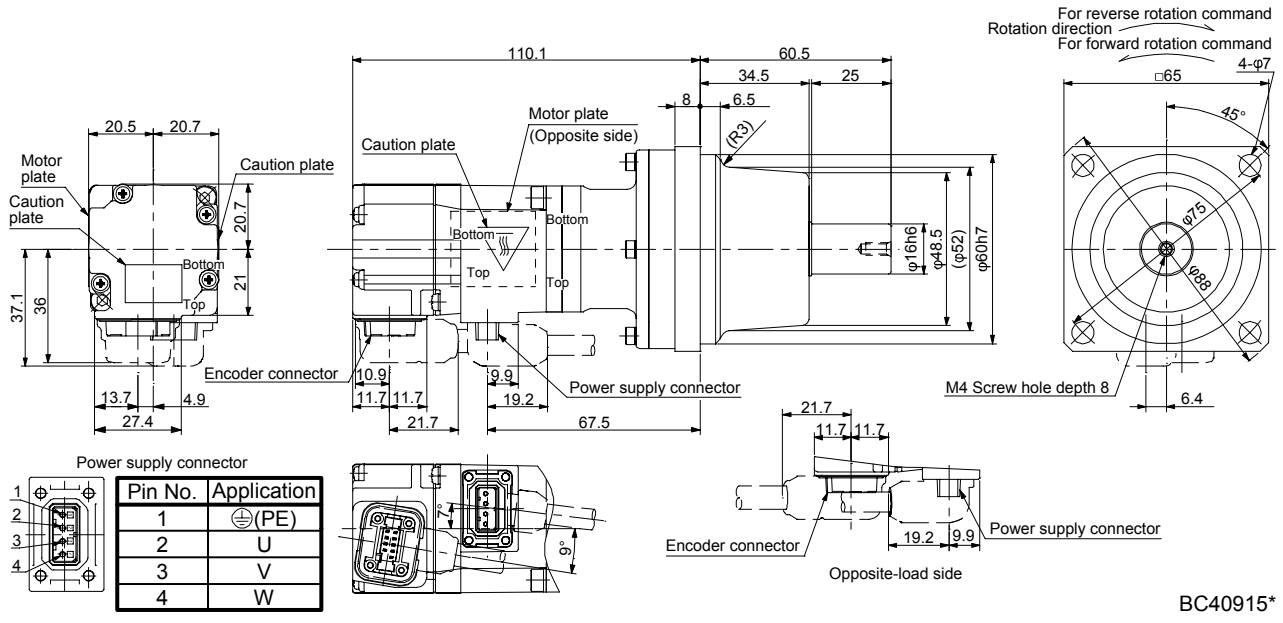



BC38184A BC38179A

### 6.8.3 For general industrial machine with a reducer (without an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G1 | 50 | K6505 | 1/5 (9/44) | 0.0820 | 1.4 |

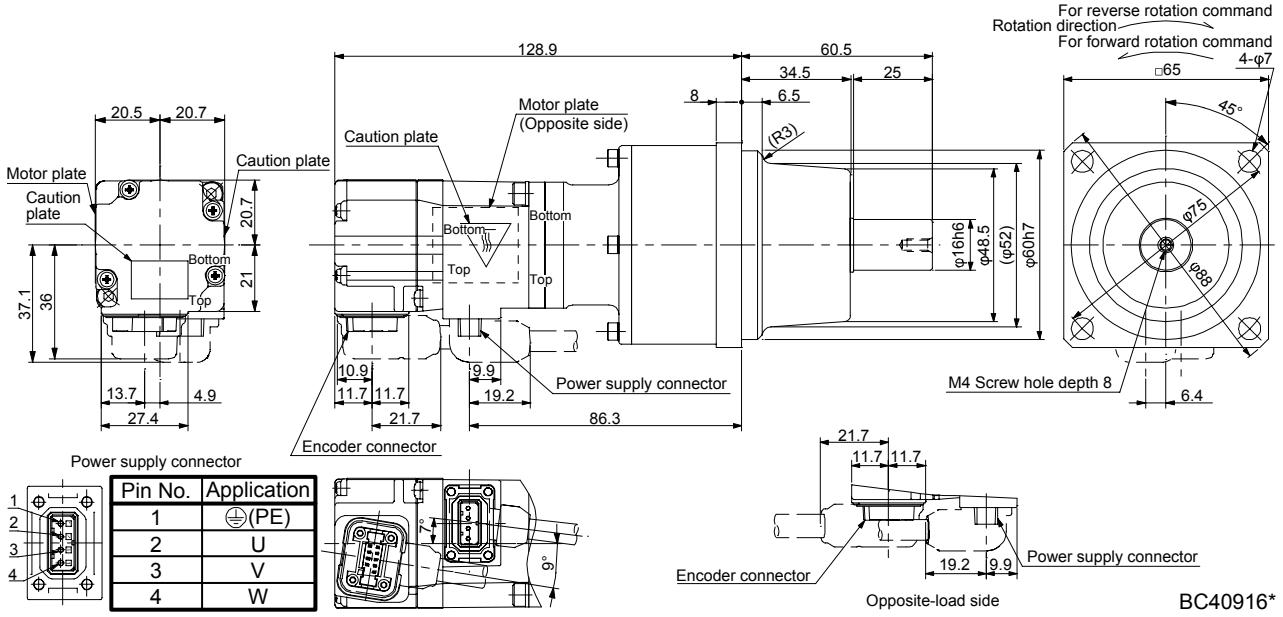
[Unit: mm]




BC40915*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G1 | 50 | K6512 | 1/12 (49/576) | 0.104 | 1.8 |
| HG-KR053G1 | 50 | K6520 | 1/20 (25/484) | 0.0860 | 1.8 |

[Unit: mm]



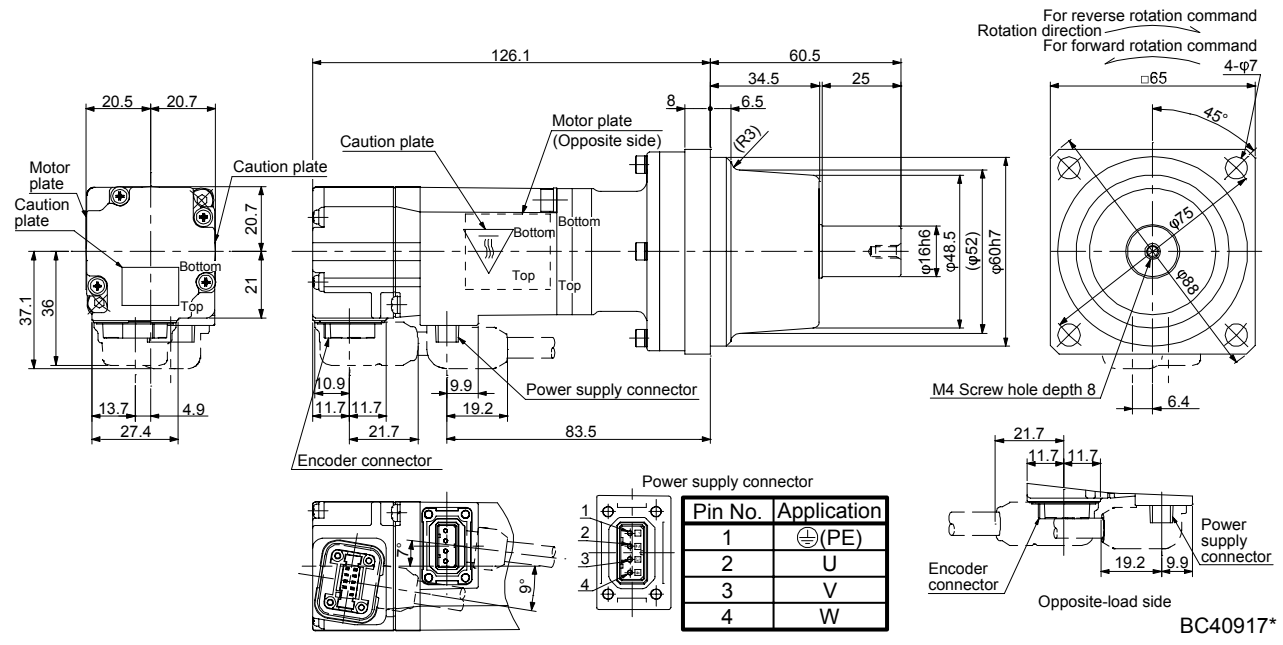

Power supply connector

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40916*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G1 | 100 | K6505 | 1/5 (9/44) | 0.115 | 1.6 |

[Unit: mm]



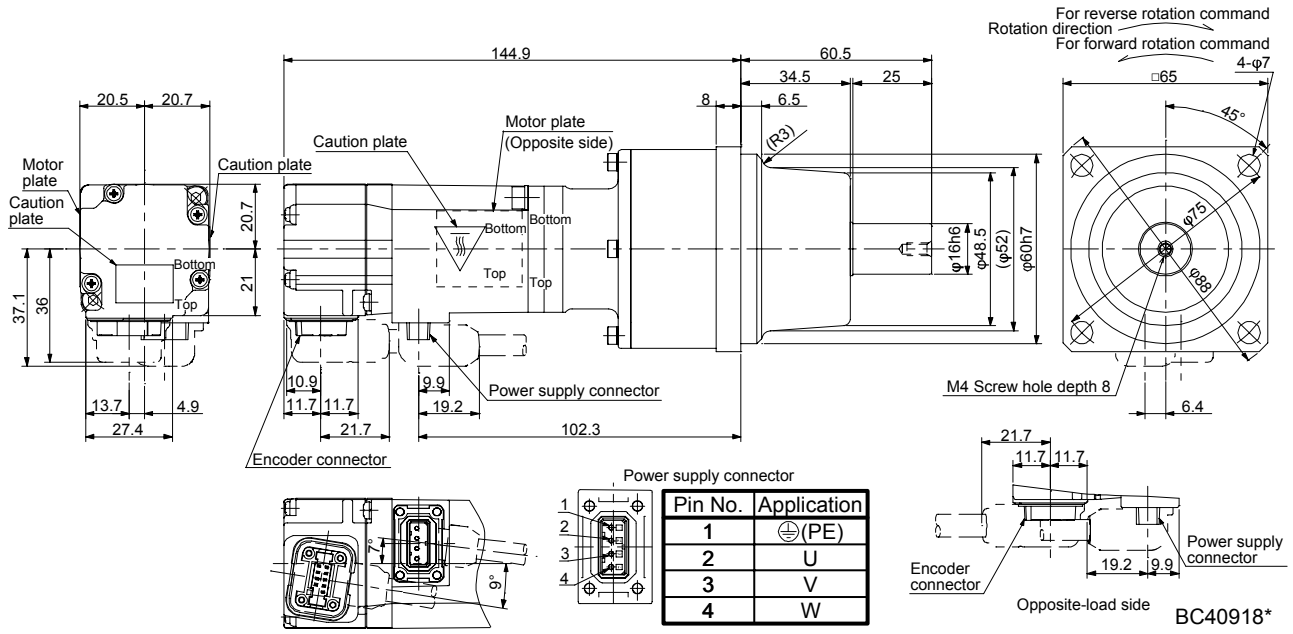

Power supply connector

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40917*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G1 | 100 | K6512 | 1/12 (49/576) | 0.137 | 2.0 |
| HG-KR13G1 | 100 | K6520 | 1/20 (25/484) | 0.119 | 2.0 |

[Unit: mm]

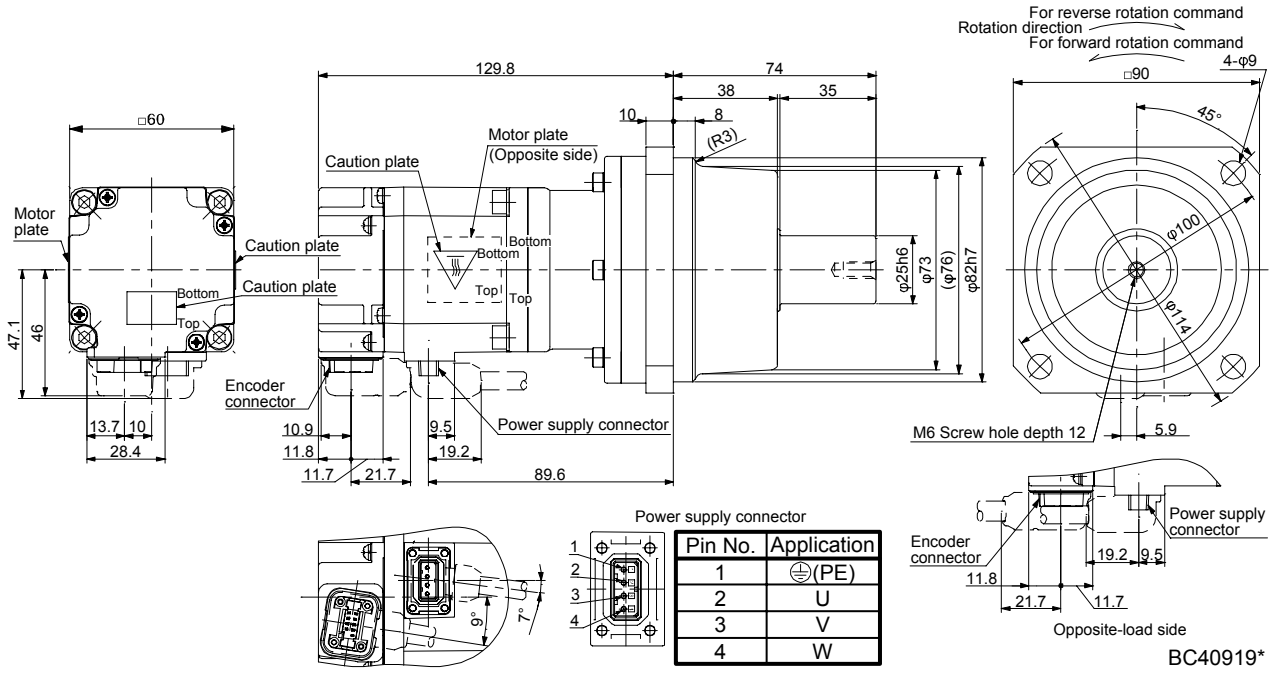



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40918*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G1 | 200 | K9005 | 1/5 (19/96) | 0.375 | 3.3 |

[Unit: mm]

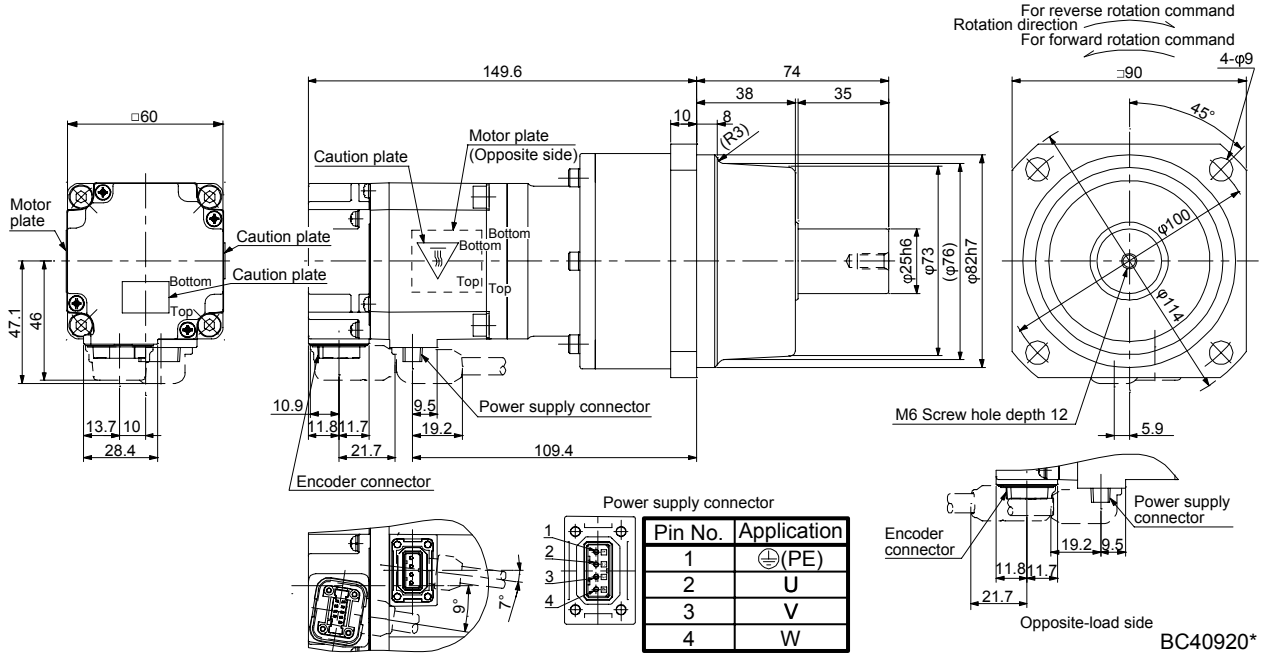



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40919*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G1 | 200 | K9012 | 1/12 (961/11664) | 0.418 | 3.9 |
| HG-KR23G1 | 200 | K9020 | 1/20 (513/9984) | 0.391 | 3.9 |

[Unit: mm]

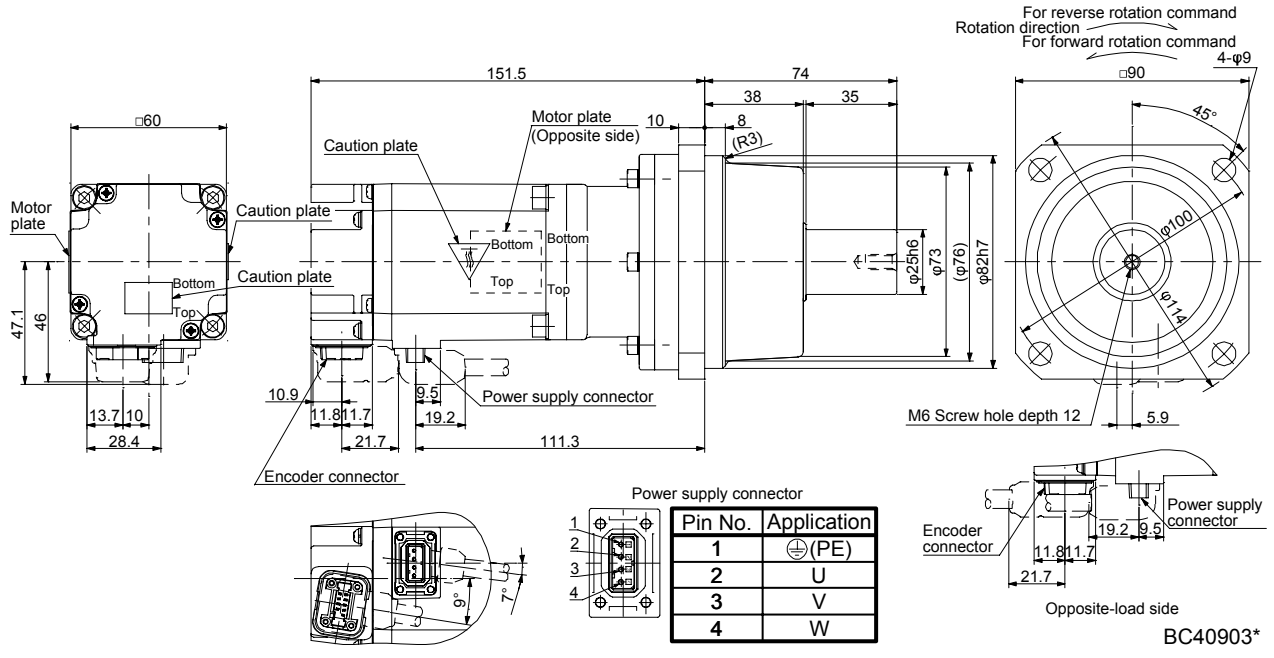



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40920*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G1 | 400 | K9005 | 1/5 (19/96) | 0.525 | 3.7 |

[Unit: mm]

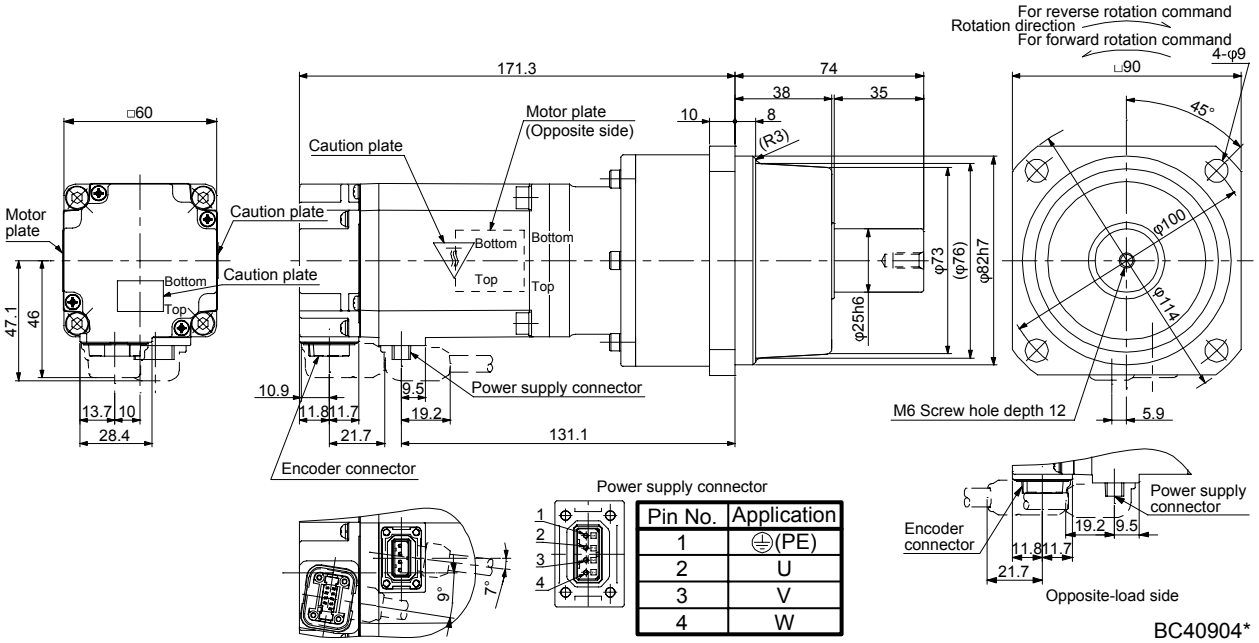



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40903*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G1 | 400 | K9012 | 1/12 (961/11664) | 0.568 | 4.3 |

[Unit: mm]

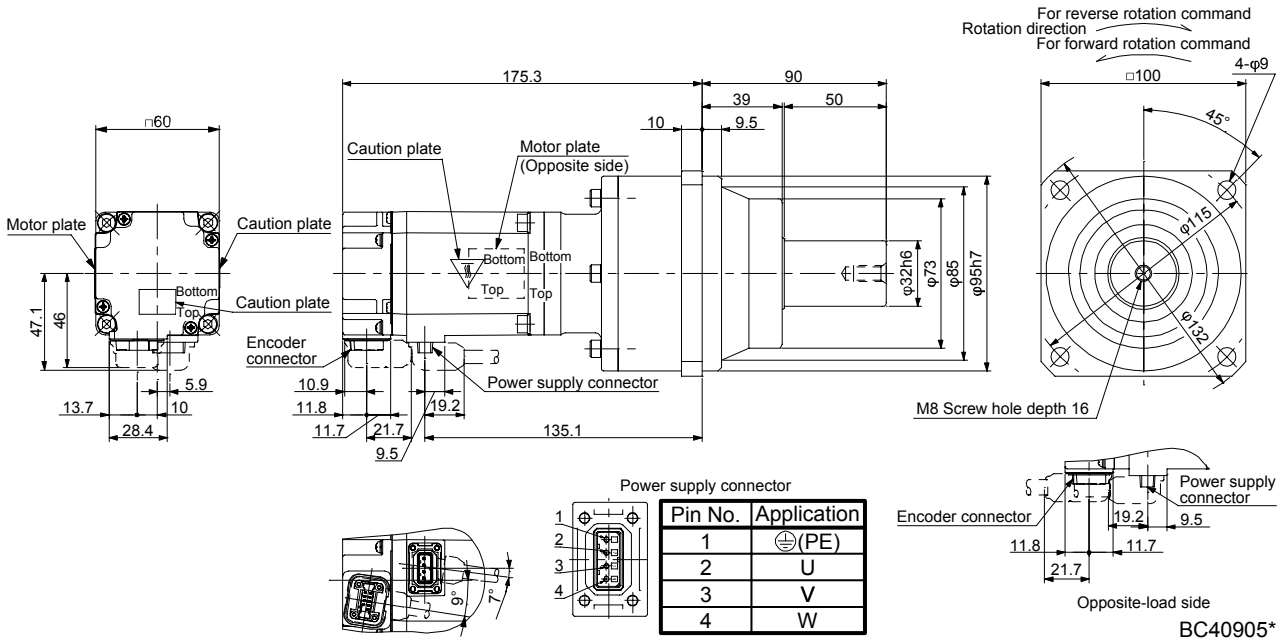



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40904*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G1 | 400 | K10020 | 1/20 (7/135) | 0.881 | 5.4 |

[Unit: mm]

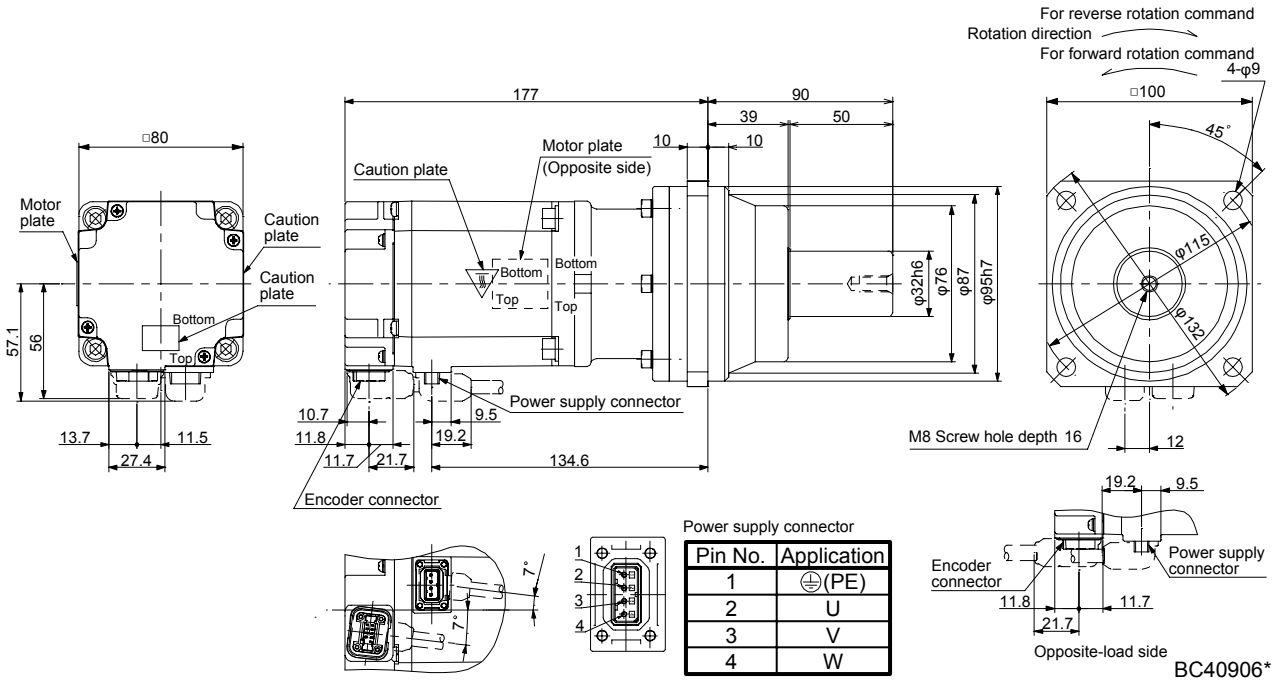



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40905*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G1 | 750 | K10005 | 1/5 (1/5) | 1.68 | 6.0 |

[Unit: mm]



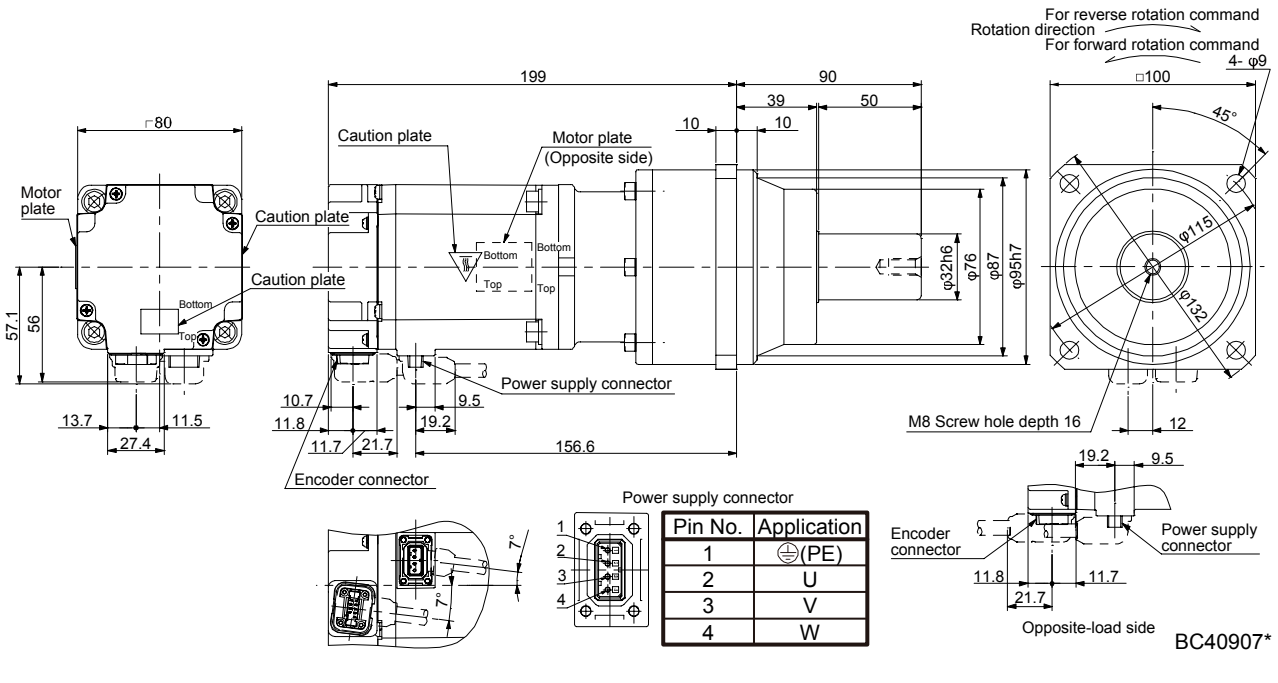

Power supply connector

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40906*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G1 | 750 | K10012 | 1/12 (7/87) | 2.35 | 7.1 |

[Unit: mm]



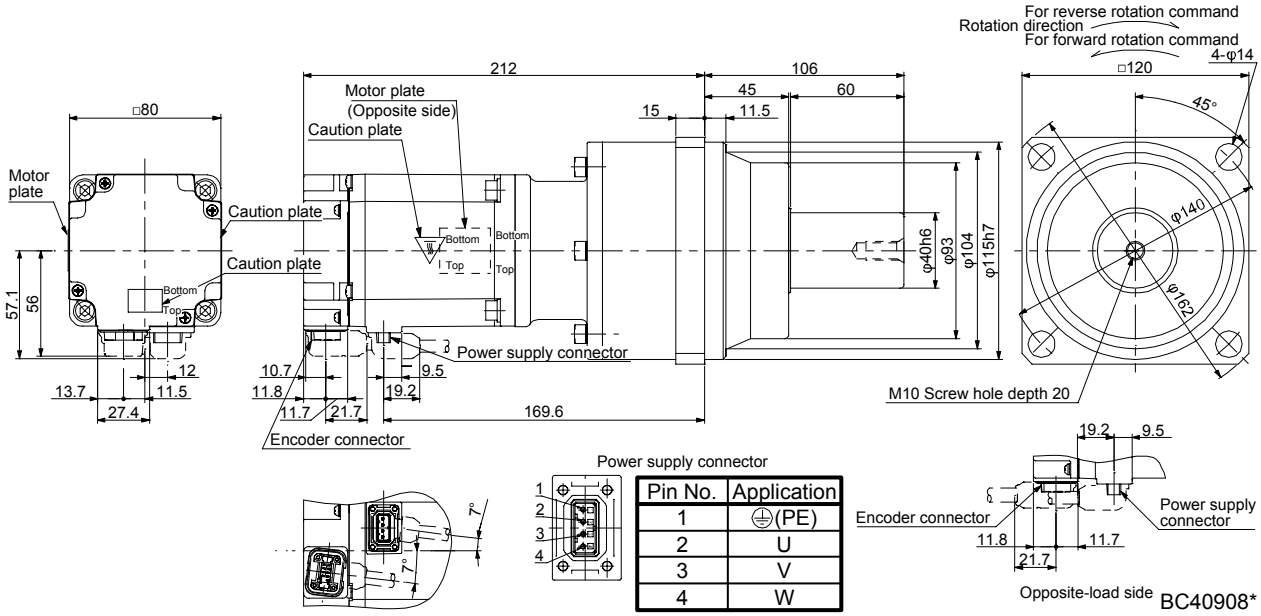

Power supply connector

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40907*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G1 | 750 | K12020 | 1/20 (625/12544) | 2.41 | 10 |

[Unit: mm]

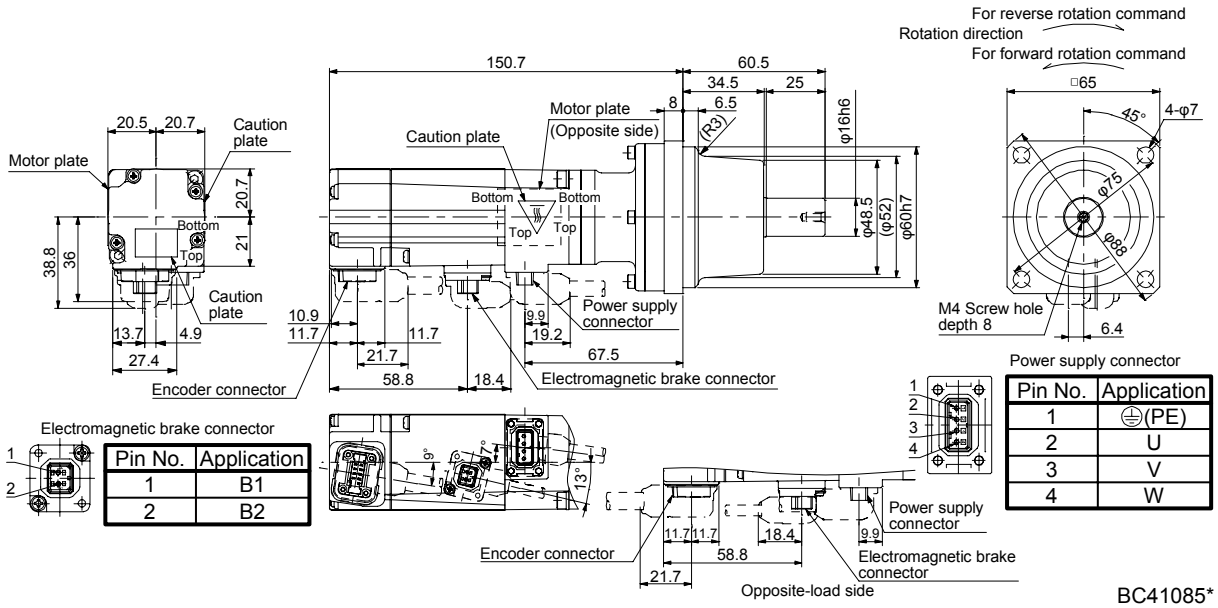



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

### 6.8.4 For general industrial machine with a reducer (with an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG1 | 50 | K6505 | 1/5 (9/44) | 0.32 | 0.0840 | 1.6 |

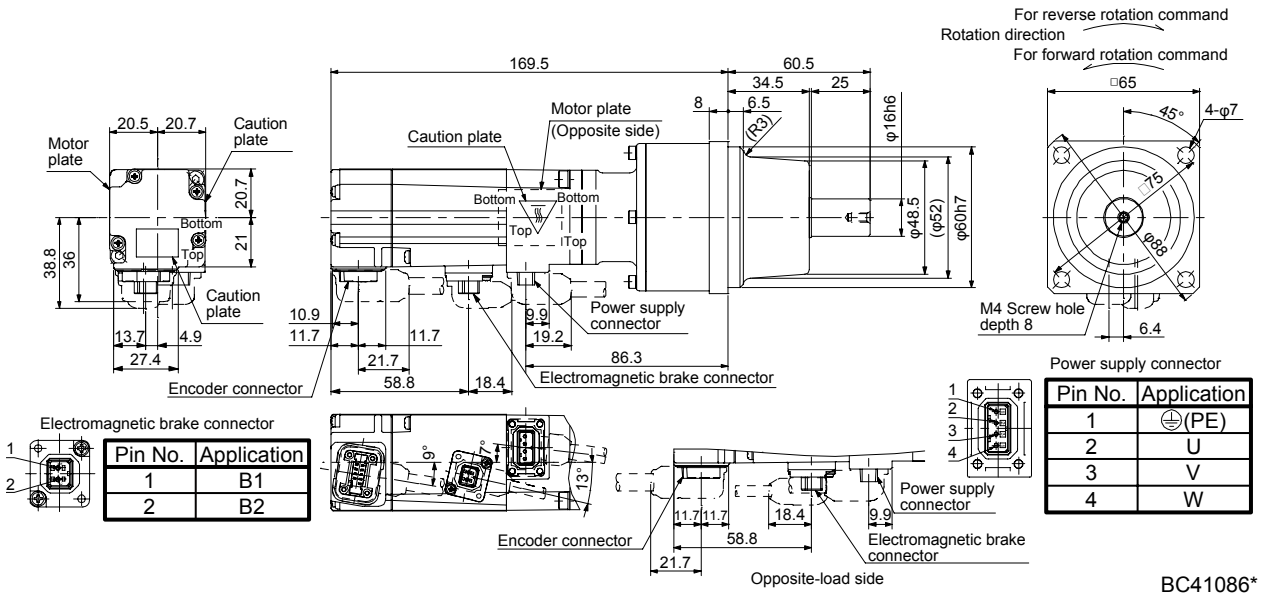
[Unit: mm]




BC41085*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG1 | 50 | K6512 | 1/12 (49/576) | 0.32 | 0.106 | 2.0 |
| HG-KR053BG1 | 50 | K6520 | 1/20 (25/484) | 0.32 | 0.0880 | 2.0 |

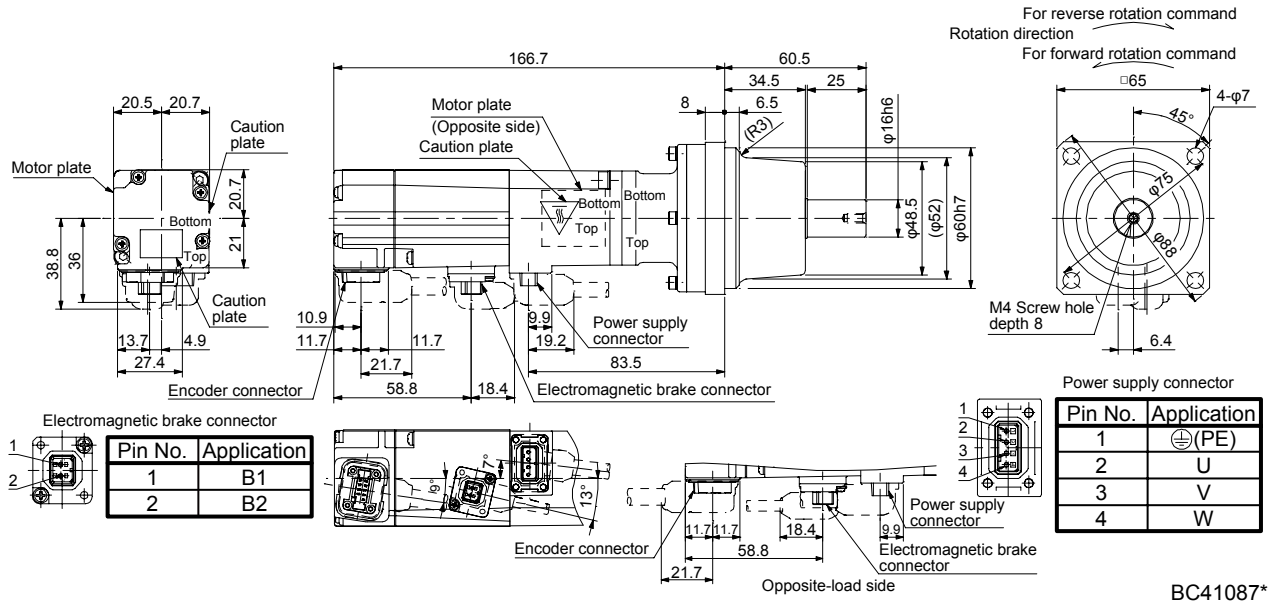
[Unit: mm]




BC41086*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG1 | 100 | K6505 | 1/5 (9/44) | 0.32 | 0.121 | 1.8 |

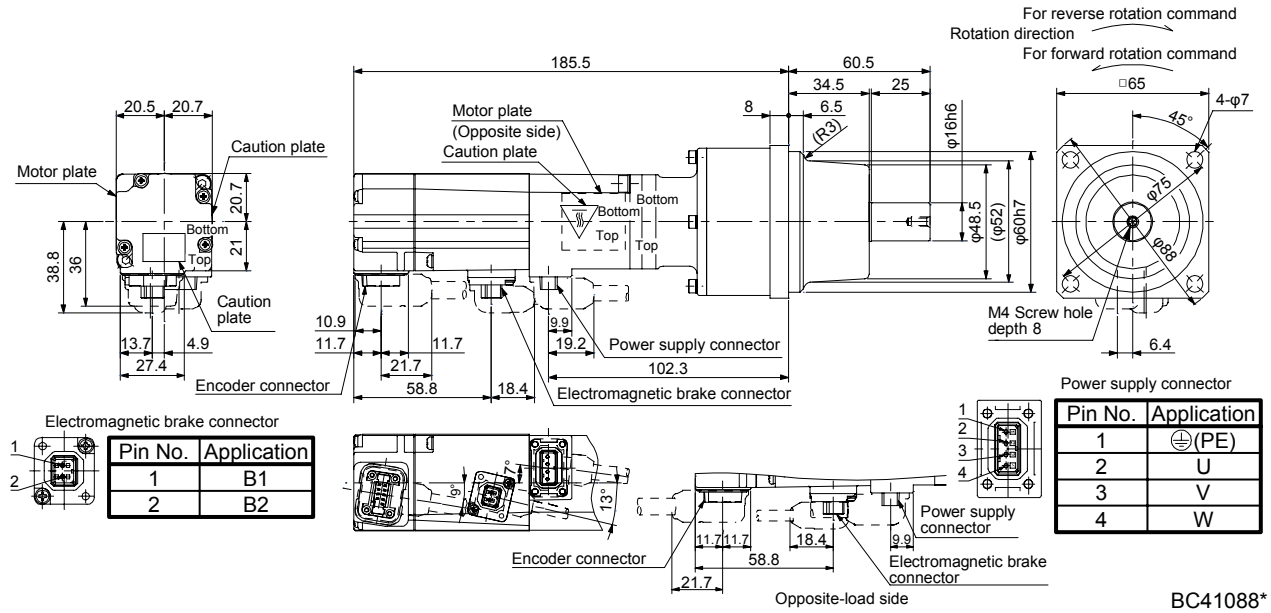
[Unit: mm]




BC41087*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG1 | 100 | K6512 | 1/12 (49/576) | 0.32 | 0.143 | 2.2 |
| HG-KR13BG1 | 100 | K6520 | 1/20 (25/484) | 0.32 | 0.125 | 2.2 |

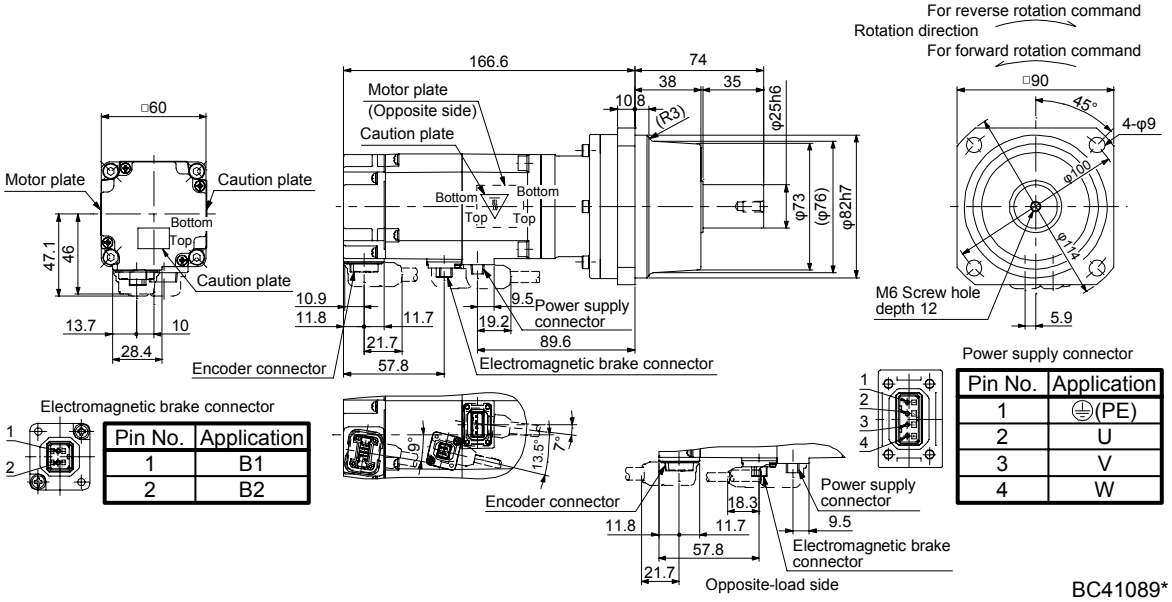
[Unit: mm]




BC41088*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG1 | 200 | K9005 | 1/5 (19/96) | 1.3 | 0.397 | 3.7 |

[Unit: mm]



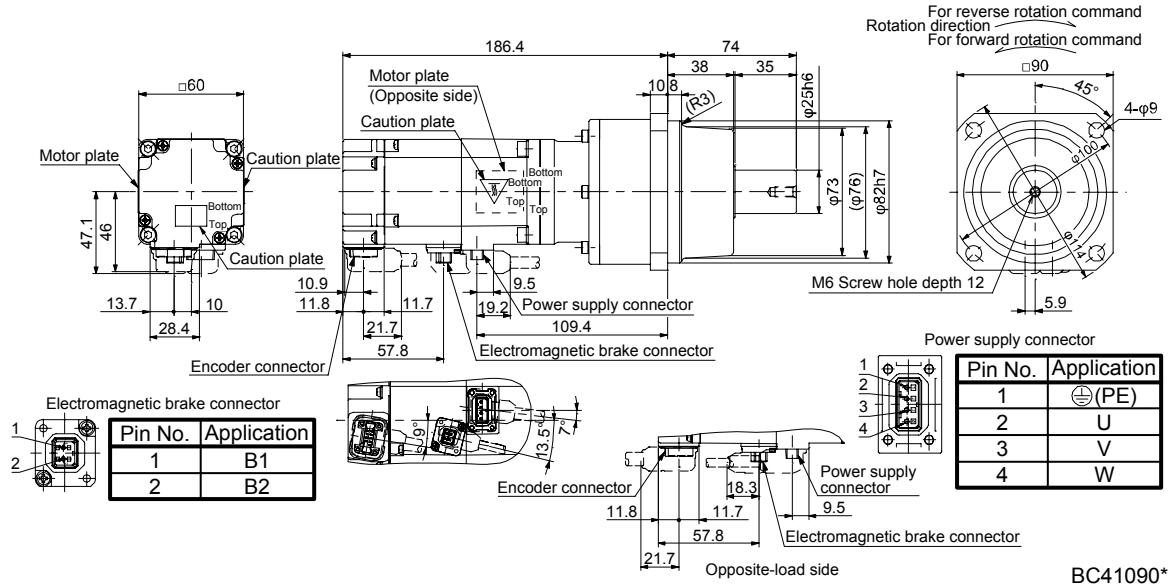

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41089*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG1 | 200 | K9012 | 1/12 (961/11664) | 1.3 | 0.440 | 4.3 |
| HG-KR23BG1 | 200 | K9020 | 1/20 (513/9984) | 1.3 | 0.413 | 4.3 |

[Unit: mm]



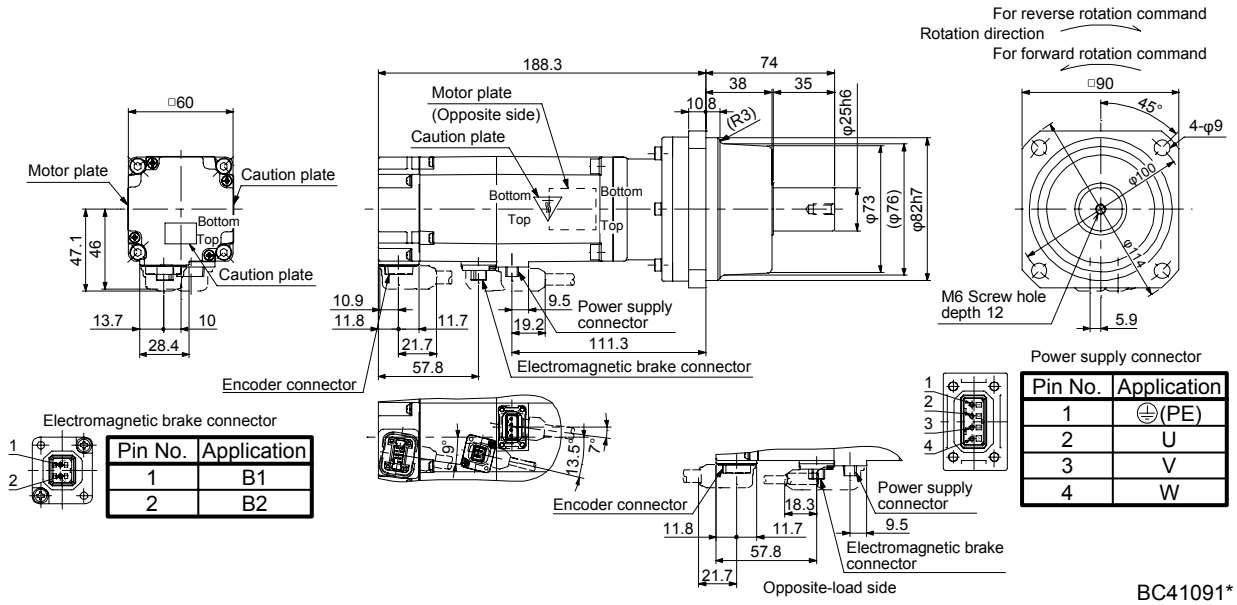

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41090*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG1 | 400 | K9005 | 1/5 (19/96) | 1.3 | 0.547 | 4.1 |

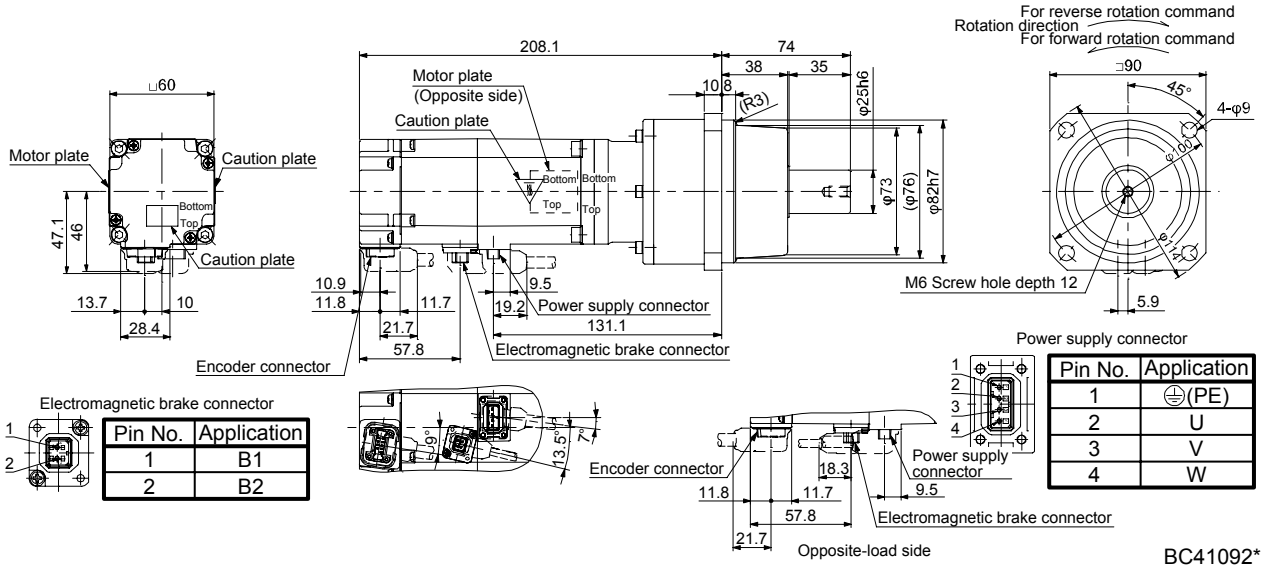
[Unit: mm]




BC41091*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG1 | 400 | K9012 | 1/12 (961/11664) | 1.3 | 0.590 | 4.7 |

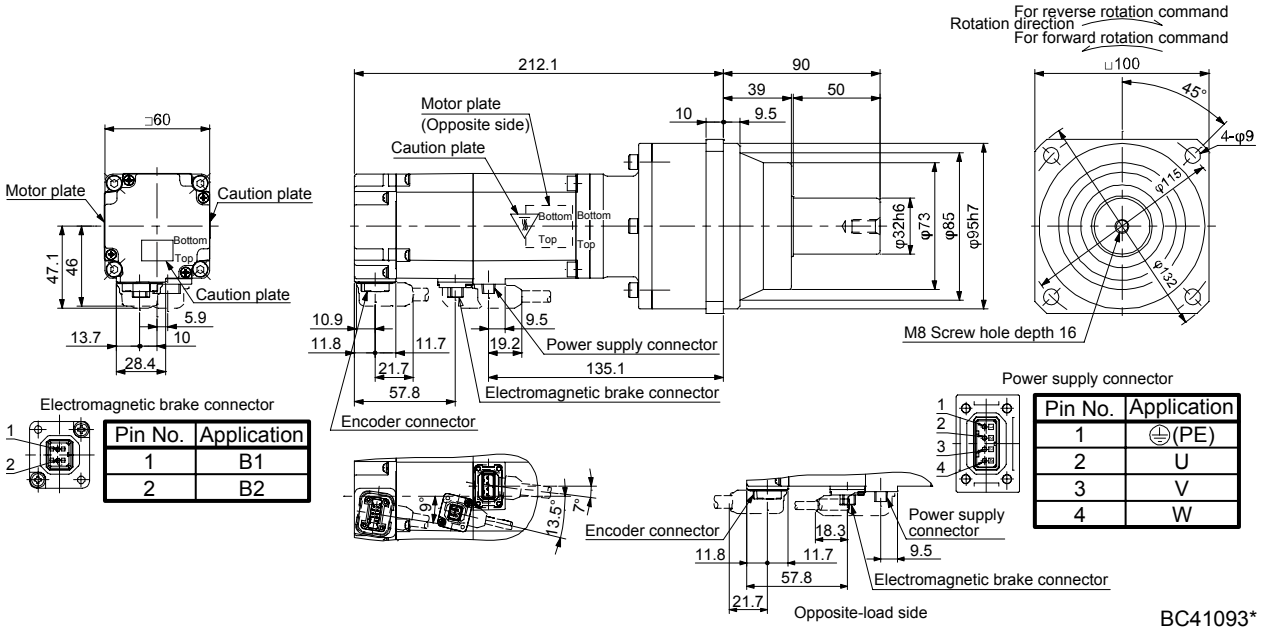
[Unit: mm]




BC41092*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG1 | 400 | K10020 | 1/20 (7/135) | 1.3 | 0.903 | 5.8 |

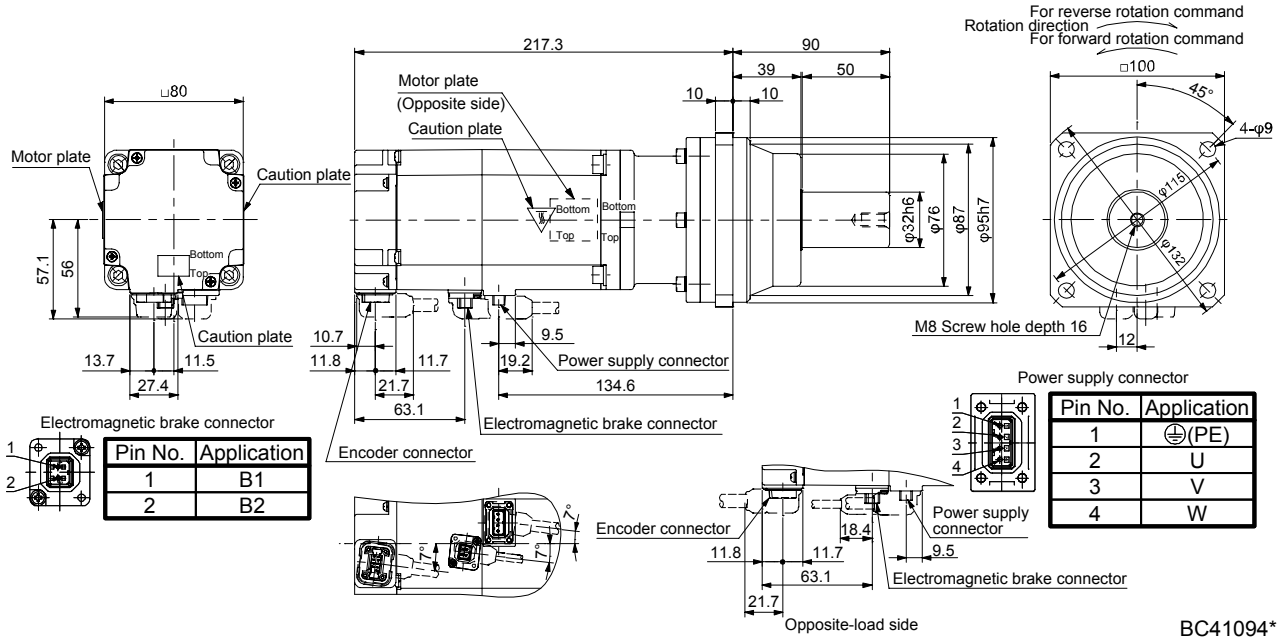
[Unit: mm]




BC41093*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG1 | 750 | K10005 | 1/5 (1/5) | 2.4 | 1.79 | 7.0 |

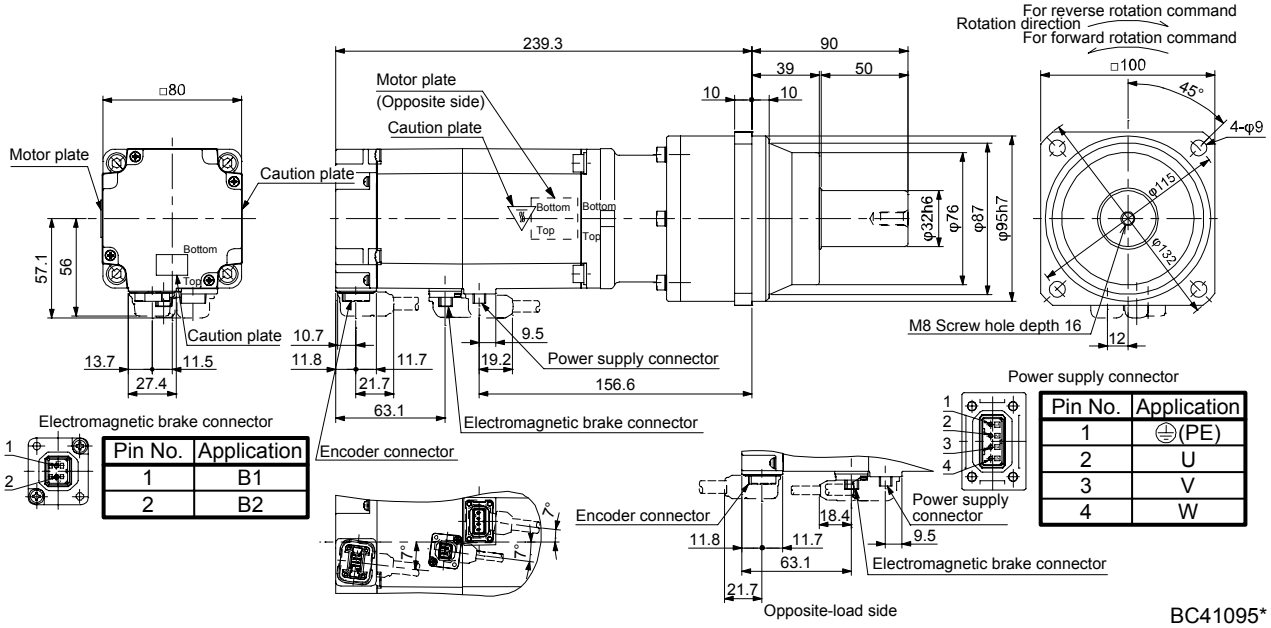
[Unit: mm]




BC41094*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG1 | 750 | K10012 | 1/12 (7/87) | 2.4 | 2.46 | 8.1 |

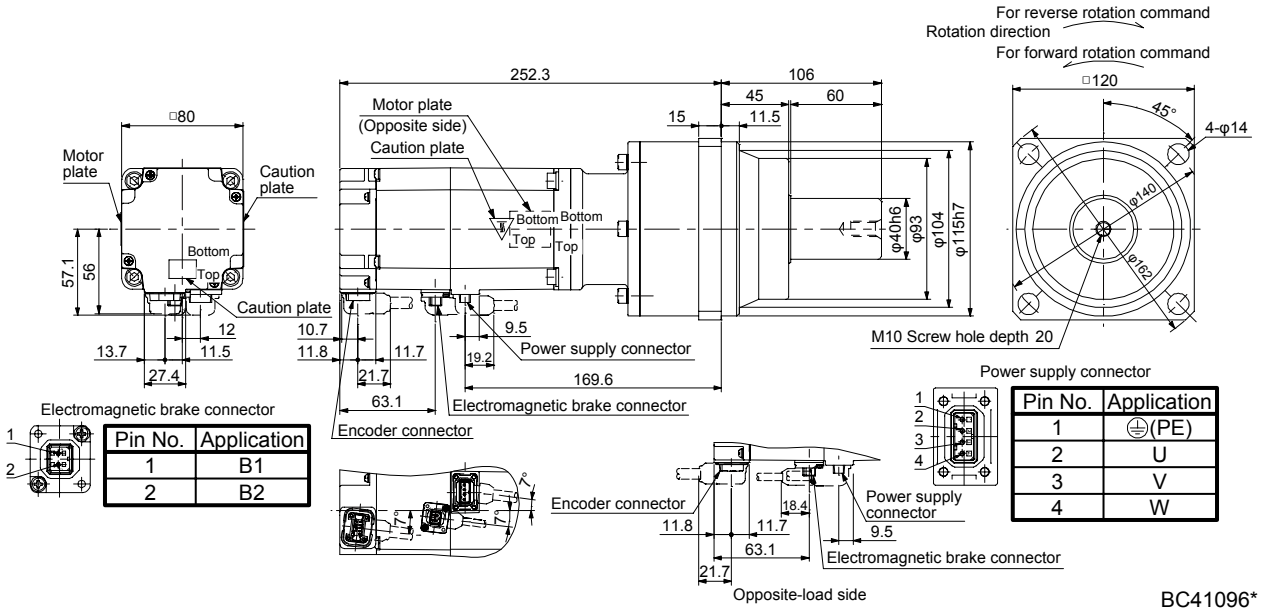
[Unit: mm]




BC41095*

| Model | Output [W] | Reducer model | Reduction ratio (actual reduction ratio) | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG1 | 750 | K12020 | 1/20 (625/12544) | 2.4 | 2.52 | 11 |

[Unit: mm]

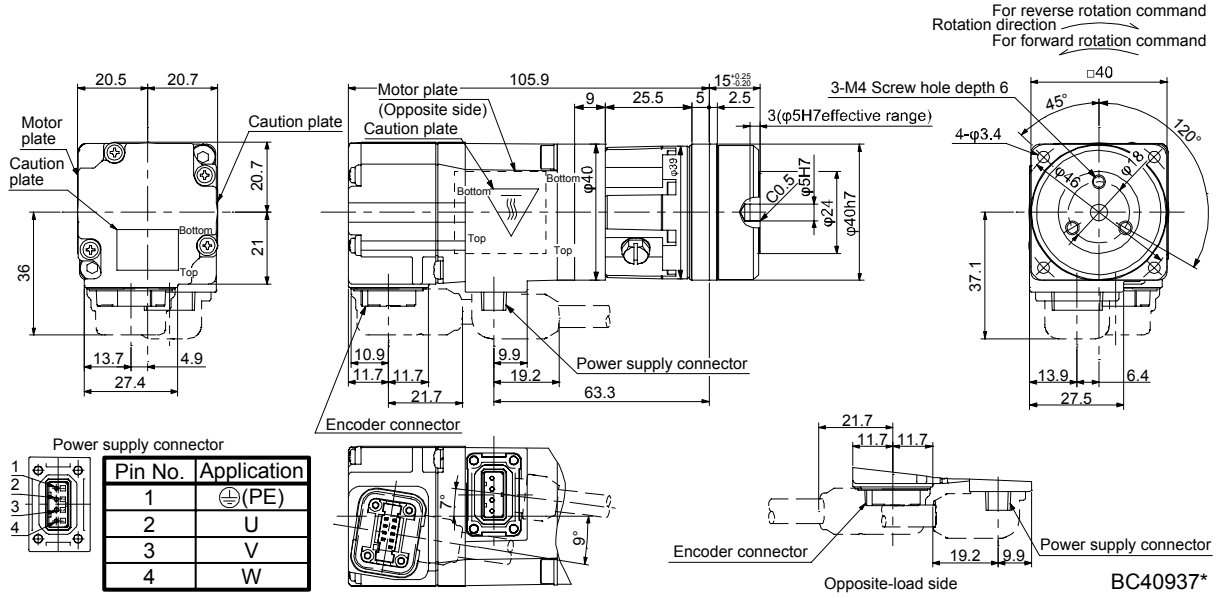



BC41096*

### 6.8.5 Flange-mounting flange output type for precision application compliant (without an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G5 | 50 | HPG-11B-05-F0ADG | 1/5 | 0.0485 | 0.55 |
| HG-KR053G5 | 50 | HPG-11B-09-F0ADG | 1/9 | 0.0475 | 0.56 |

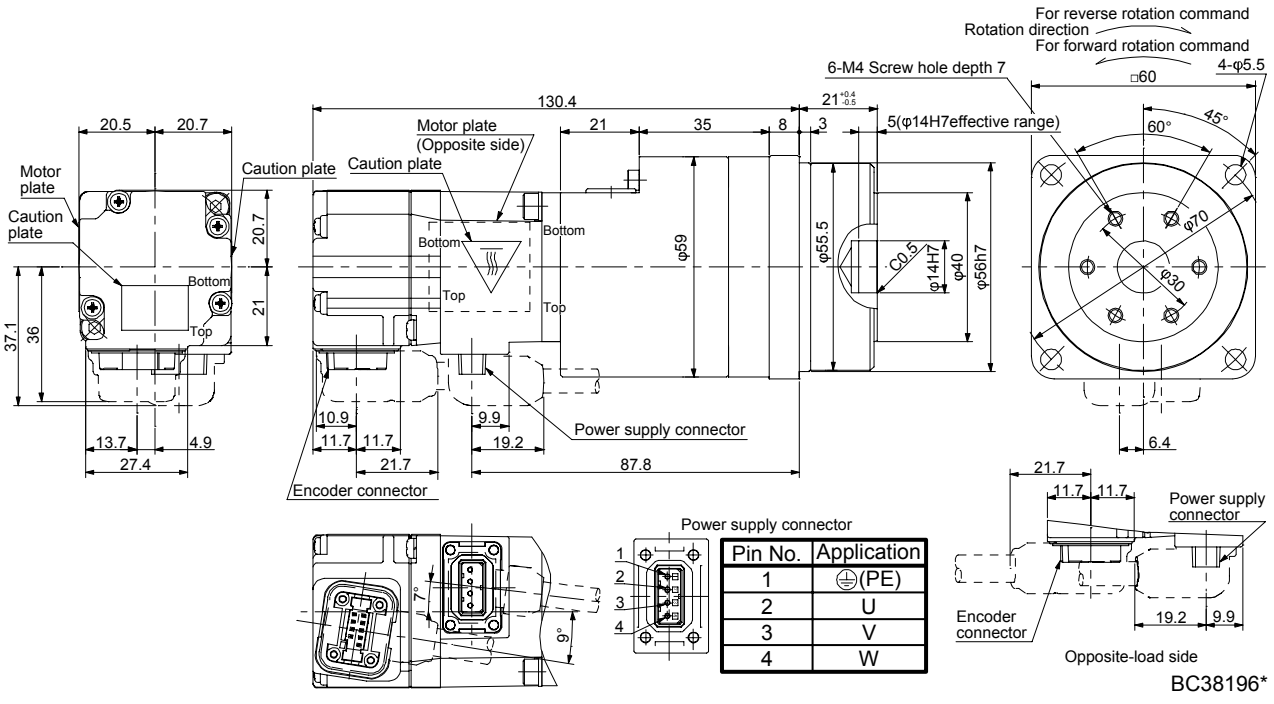
[Unit: mm]




| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G5 | 50 | HPG-14A-05-F0CBJS-S | 1/5 | 0.113 | 1.1 |
| HG-KR053G5 | 50 | HPG-14A-11-F0CBKS-S | 1/11 | 0.105 | 1.2 |
| HG-KR053G5 | 50 | HPG-14A-21-F0CBKS-S | 1/21 | 0.0960 | 1.2 |
| HG-KR053G5 | 50 | HPG-14A-33-F0CBLS-S | 1/33 | 0.0900 | 1.2 |
| HG-KR053G5 | 50 | HPG-14A-45-F0CBLS-S | 1/45 | 0.0900 | 1.2 |

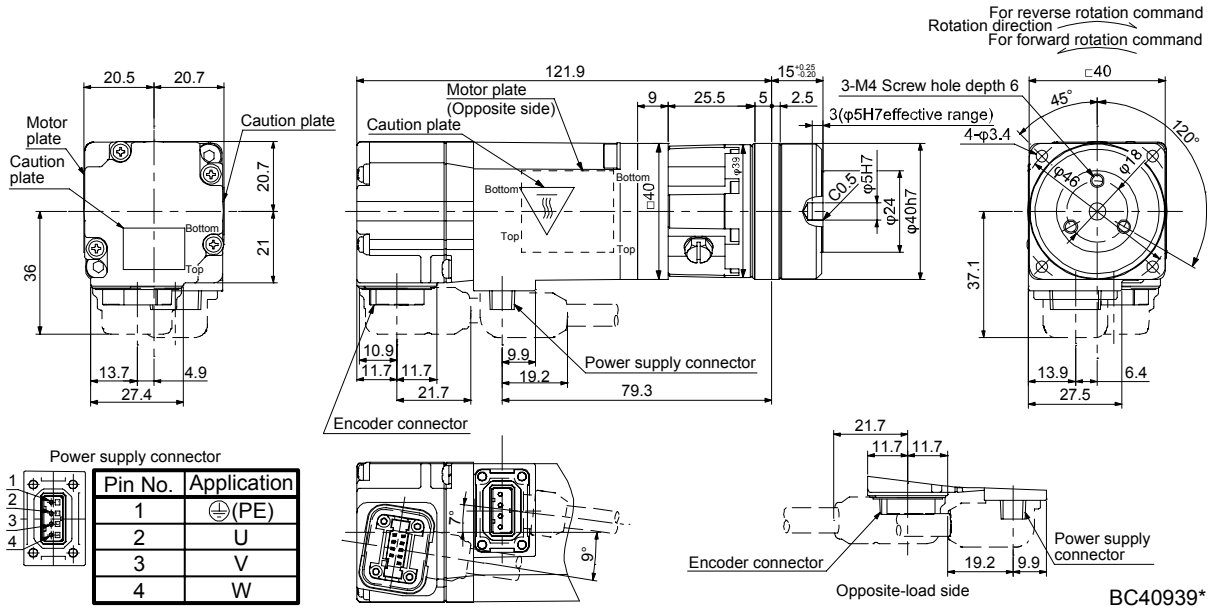
[Unit: mm]




| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G5 | 100 | HPG-11B-05-F0ADG | 1/5 | 0.0812 | 0.75 |

[Unit: mm]

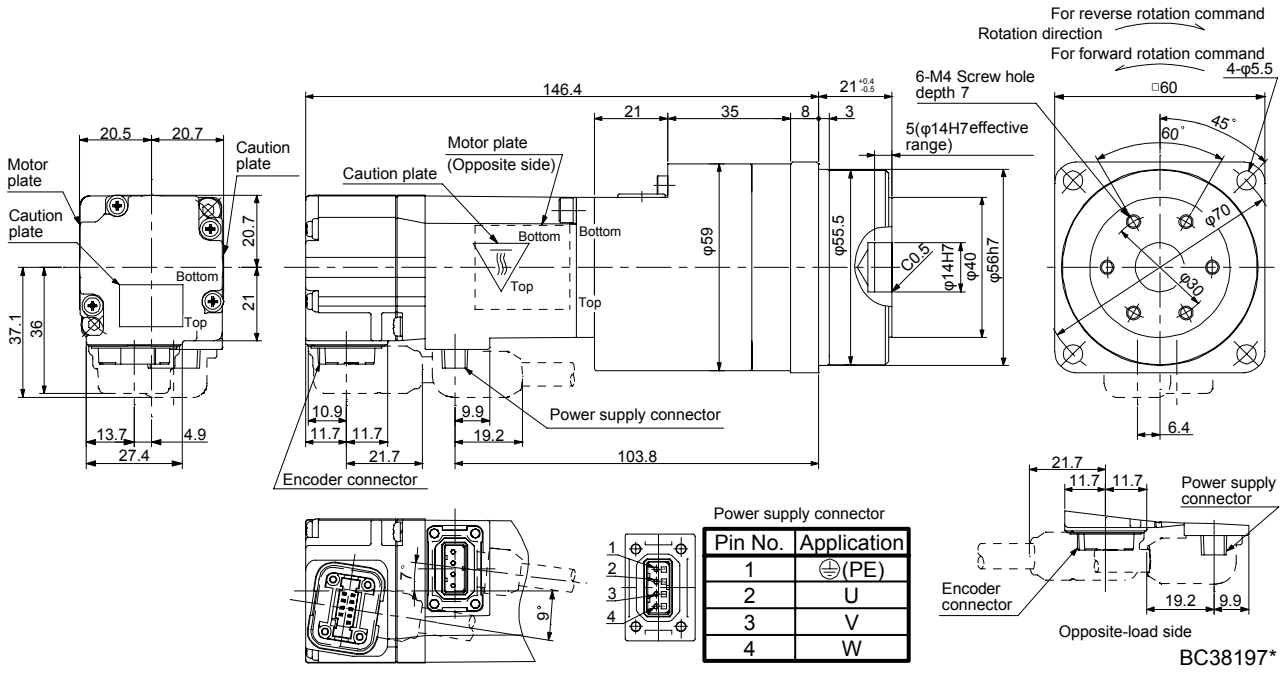



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40939*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G5 | 100 | HPG-14A-05-F0CBJS-S | 1/5 | 0.146 | 1.3 |
| HG-KR13G5 | 100 | HPG-14A-11-F0CBKS-S | 1/11 | 0.138 | 1.4 |
| HG-KR13G5 | 100 | HPG-14A-21-F0CBKS-S | 1/21 | 0.129 | 1.4 |

[Unit: mm]

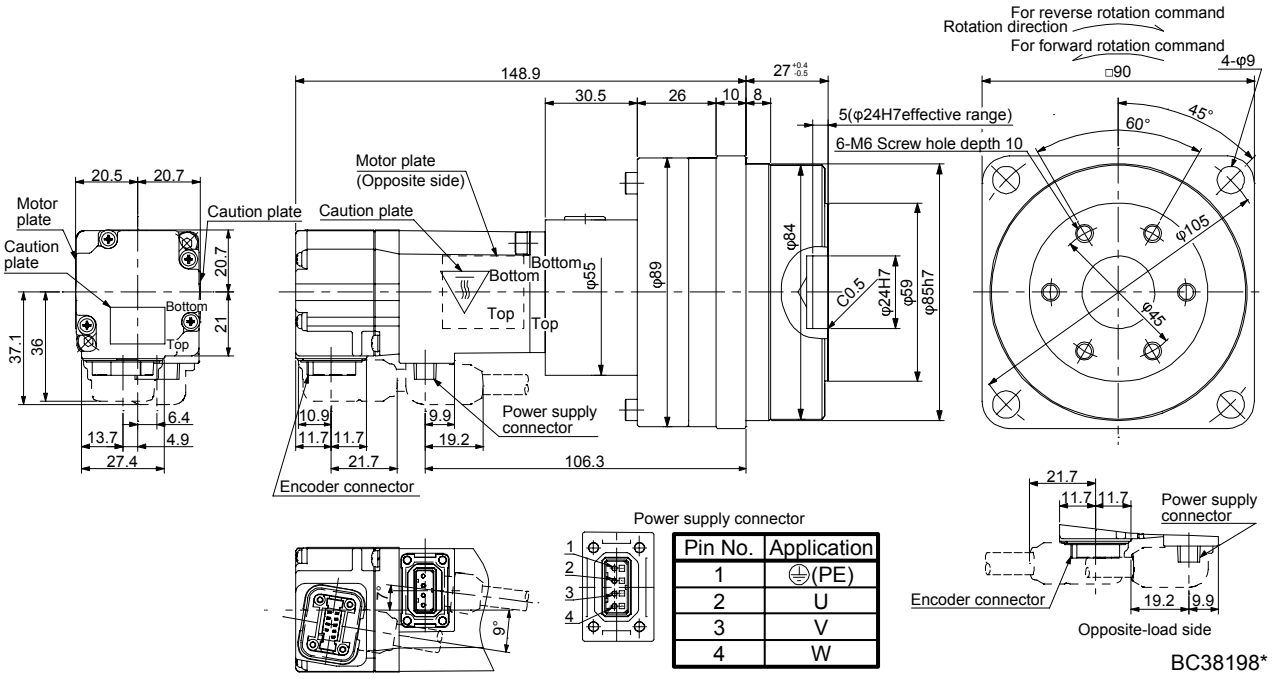



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38197*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G5 | 100 | HPG-20A-33-F0JMLAS-S | 1/33 | 0.140 | 2.6 |
| HG-KR13G5 | 100 | HPG-20A-45-F0JMLAS-S | 1/45 | 0.139 | 2.6 |

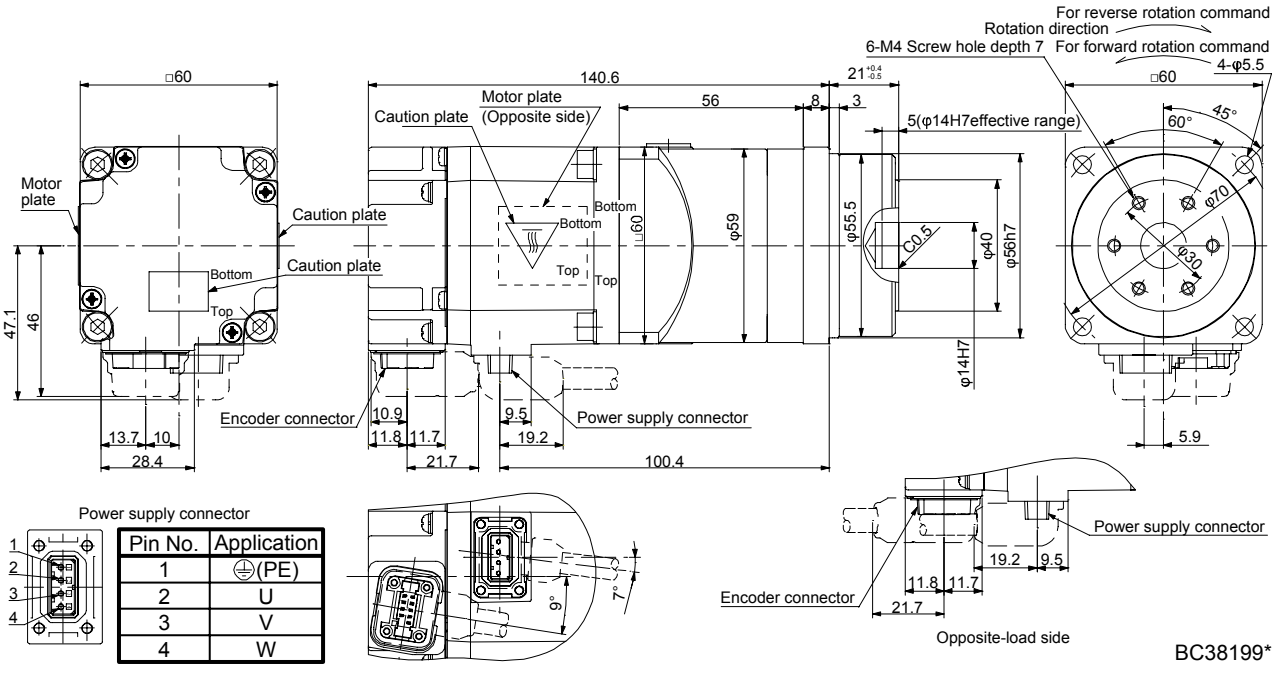
[Unit: mm]




BC38198*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G5 | 200 | HPG-14A-05-F0AZW-S | 1/5 | 0.422 | 1.8 |
| HG-KR23G5 | 200 | HPG-14A-11-F0AZX-S | 1/11 | 0.424 | 1.9 |

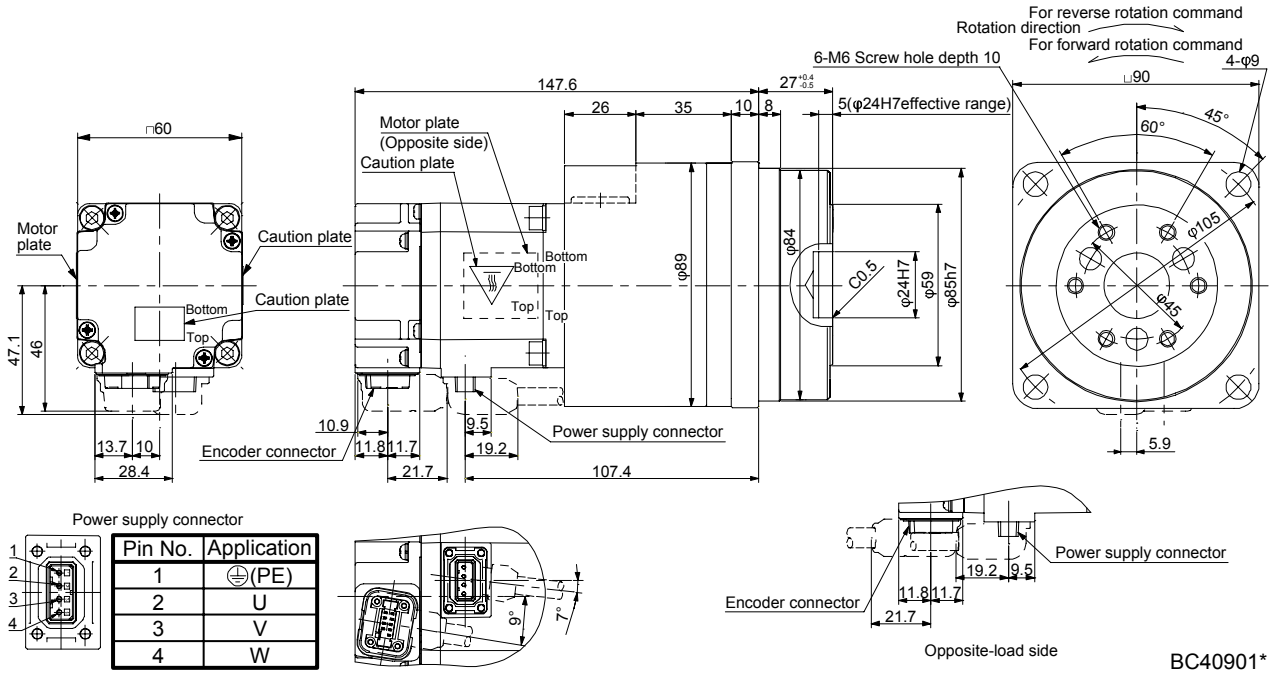
[Unit: mm]




BC38199*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G5 | 200 | HPG-20A-21-F0EKS-S | 1/21 | 0.719 | 3.4 |
| HG-KR23G5 | 200 | HPG-20A-33-F0ELS-S | 1/33 | 0.673 | 3.4 |
| HG-KR23G5 | 200 | HPG-20A-45-F0ELS-S | 1/45 | 0.672 | 3.4 |

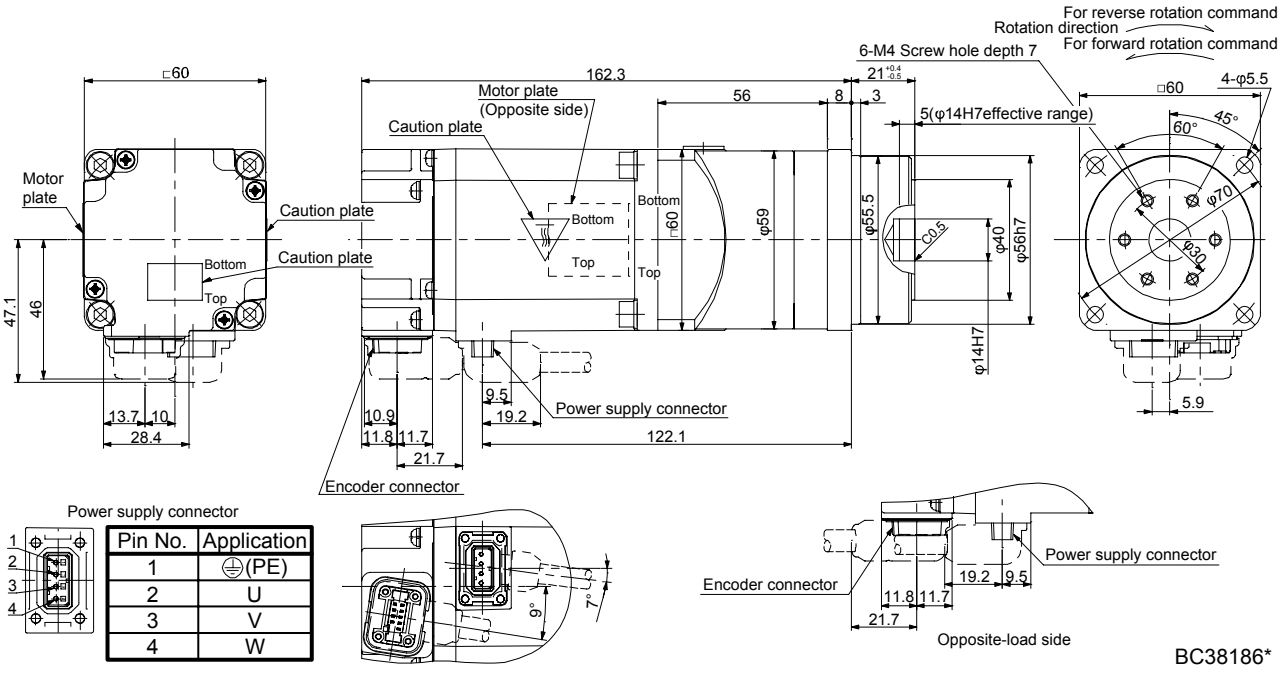
[Unit: mm]




BC40901*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G5 | 400 | HPG-14A-05-J2CBJS-S | 1/5 | 0.572 | 2.3 |

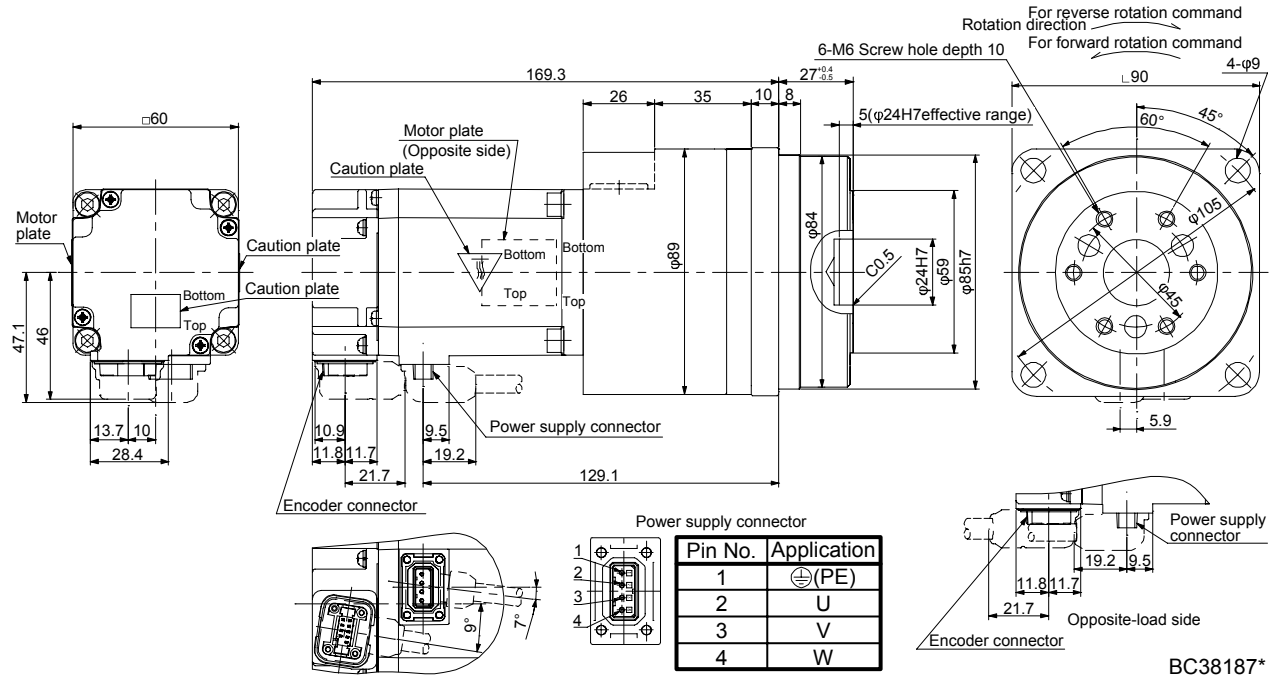
[Unit: mm]




BC38186*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G5 | 400 | HPG-20A-11-F0EKS-S | 1/11 | 0.947 | 3.9 |
| HG-KR43G5 | 400 | HPG-20A-21-F0EKS-S | 1/21 | 0.869 | 3.9 |

[Unit: mm]

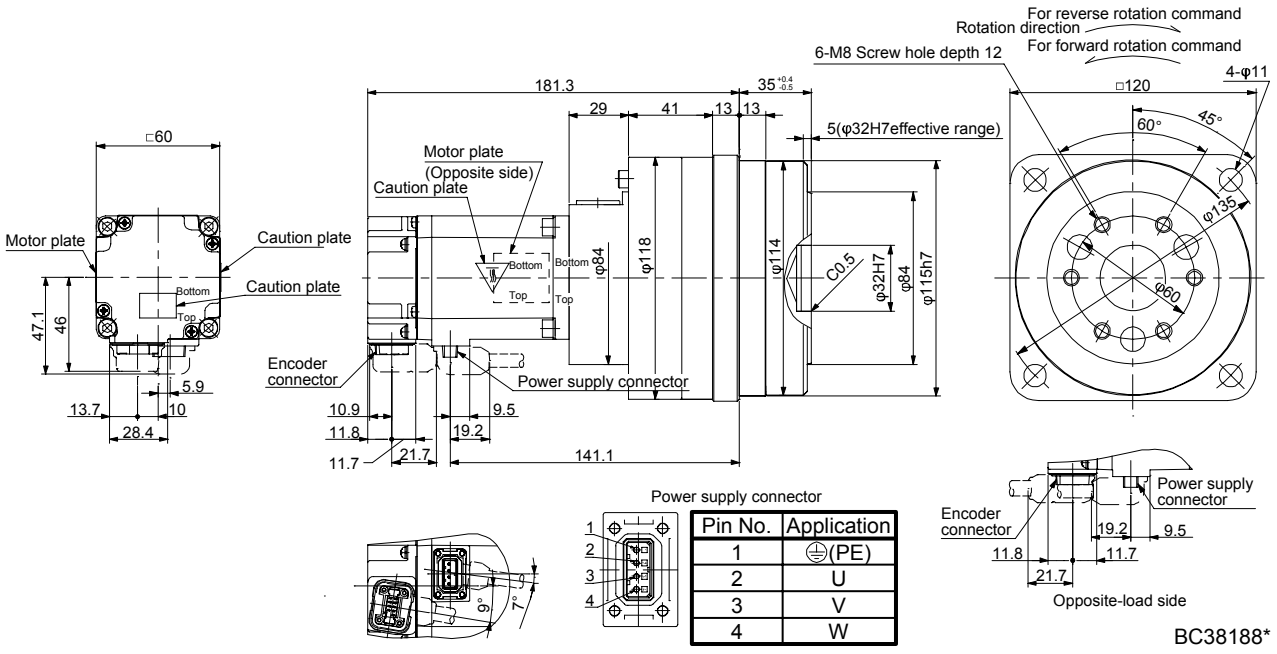



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38187*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G5 | 400 | HPG-32A-33-F0RLAS-S | 1/33 | 0.921 | 6.0 |
| HG-KR43G5 | 400 | HPG-32A-45-F0RLAS-S | 1/45 | 0.915 | 6.0 |

[Unit: mm]

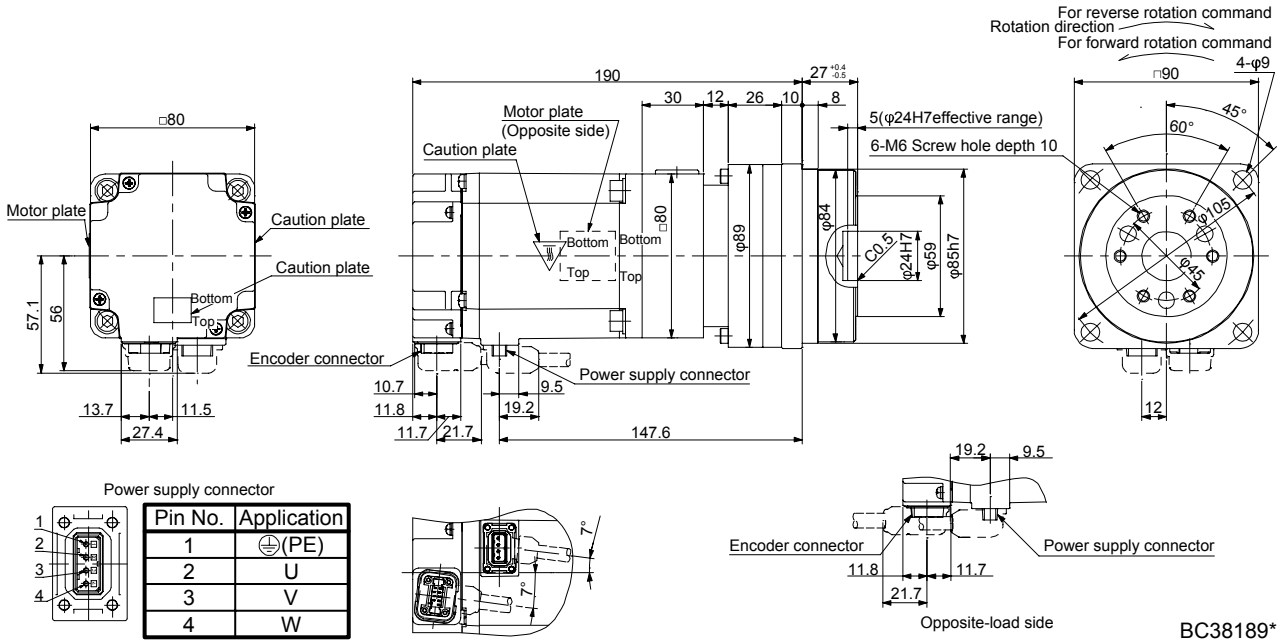



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38188*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G5 | 750 | HPG-20A-05-F0FEOS-S | 1/5 | 1.91 | 4.8 |
| HG-KR73G5 | 750 | HPG-20A-11-F0FEPS-S | 1/11 | 1.82 | 5.1 |

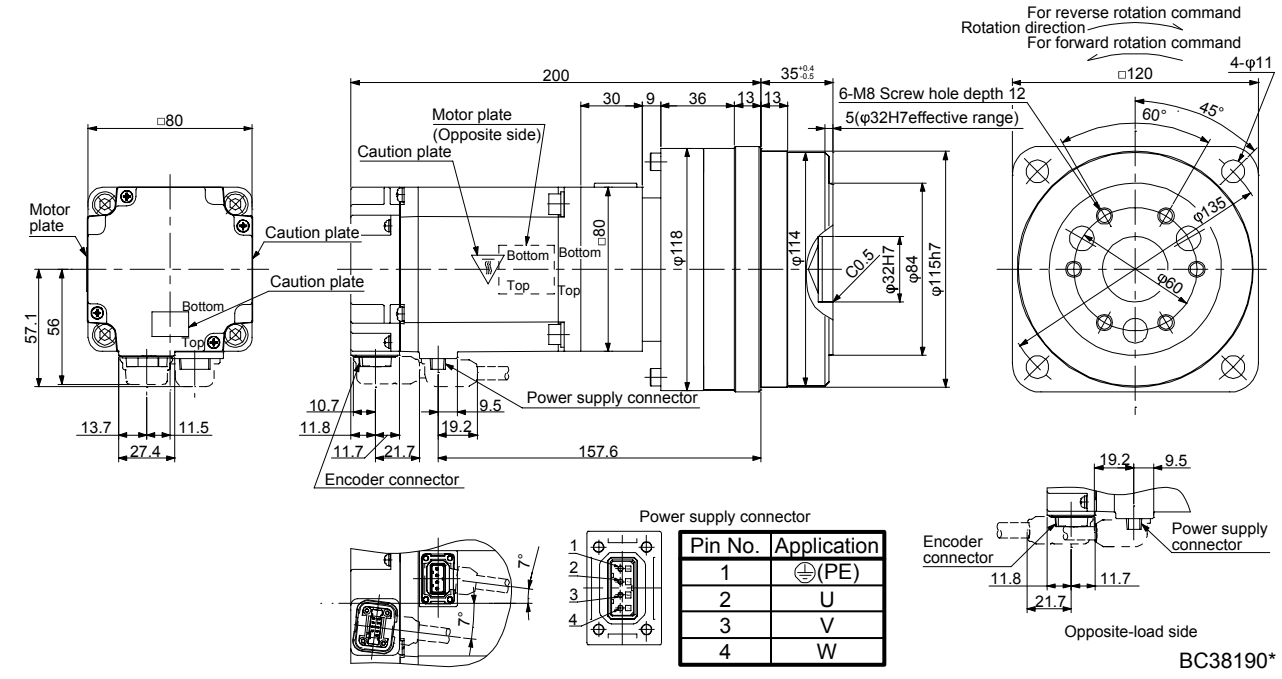
[Unit: mm]




BC38189*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G5 | 750 | HPG-32A-21-F0SEIS-S | 1/21 | 2.01 | 7.2 |
| HG-KR73G5 | 750 | HPG-32A-33-F0SEJS-S | 1/33 | 1.79 | 7.2 |
| HG-KR73G5 | 750 | HPG-32A-45-F0SEJS-S | 1/45 | 1.79 | 7.2 |

[Unit: mm]

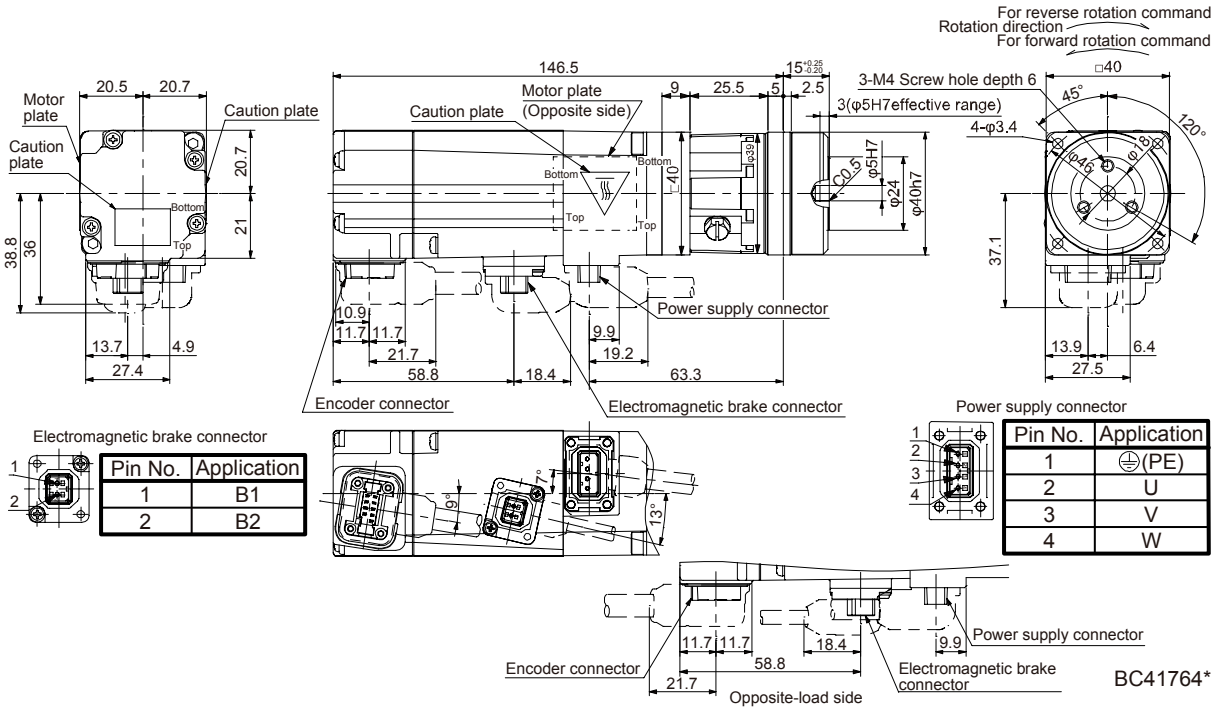



BC38190*

### 6.8.6 For precision application with flange mounting, flange output type reducer (with an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG5 | 50 | HPG-11B-05-F0ADG | 1/5 | 0.32 | 0.0507 | 0.75 |
| HG-KR053BG5 | 50 | HPG-11B-09-F0ADG | 1/9 | 0.32 | 0.0497 | 0.76 |

[Unit: mm]



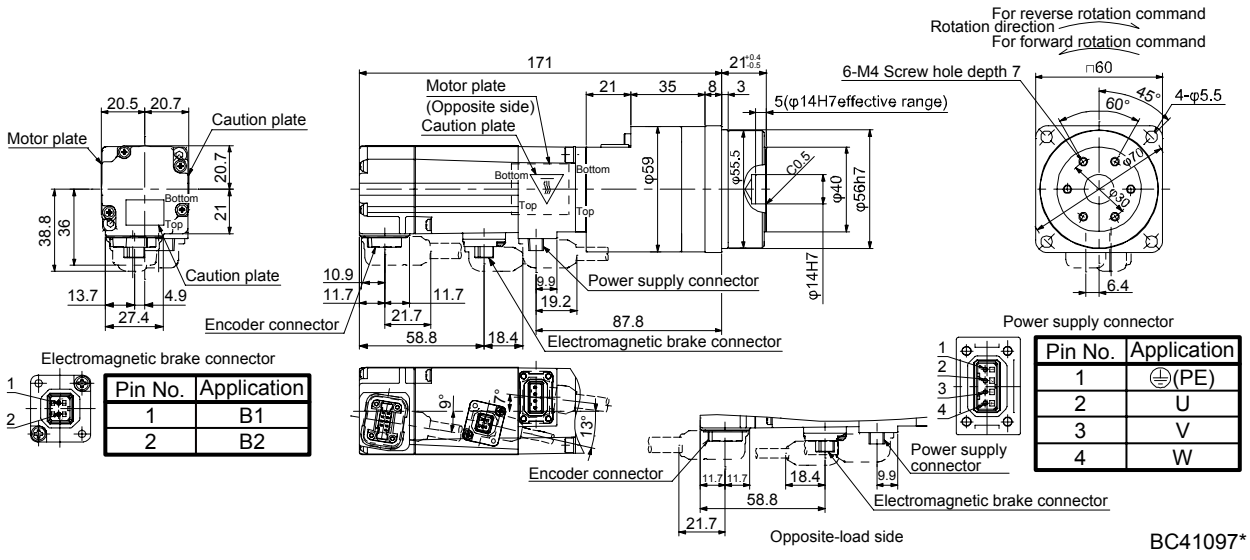

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41764*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG5 | 50 | HPG-14A-05-F0CBJS-S | 1/5 | 0.32 | 0.115 | 1.3 |
| HG-KR053BG5 | 50 | HPG-14A-11-F0CBKS-S | 1/11 | 0.32 | 0.107 | 1.4 |
| HG-KR053BG5 | 50 | HPG-14A-21-F0CBKS-S | 1/21 | 0.32 | 0.0980 | 1.4 |
| HG-KR053BG5 | 50 | HPG-14A-33-F0CBLS-S | 1/33 | 0.32 | 0.0920 | 1.4 |
| HG-KR053BG5 | 50 | HPG-14A-45-F0CBLS-S | 1/45 | 0.32 | 0.0920 | 1.4 |

[Unit: mm]



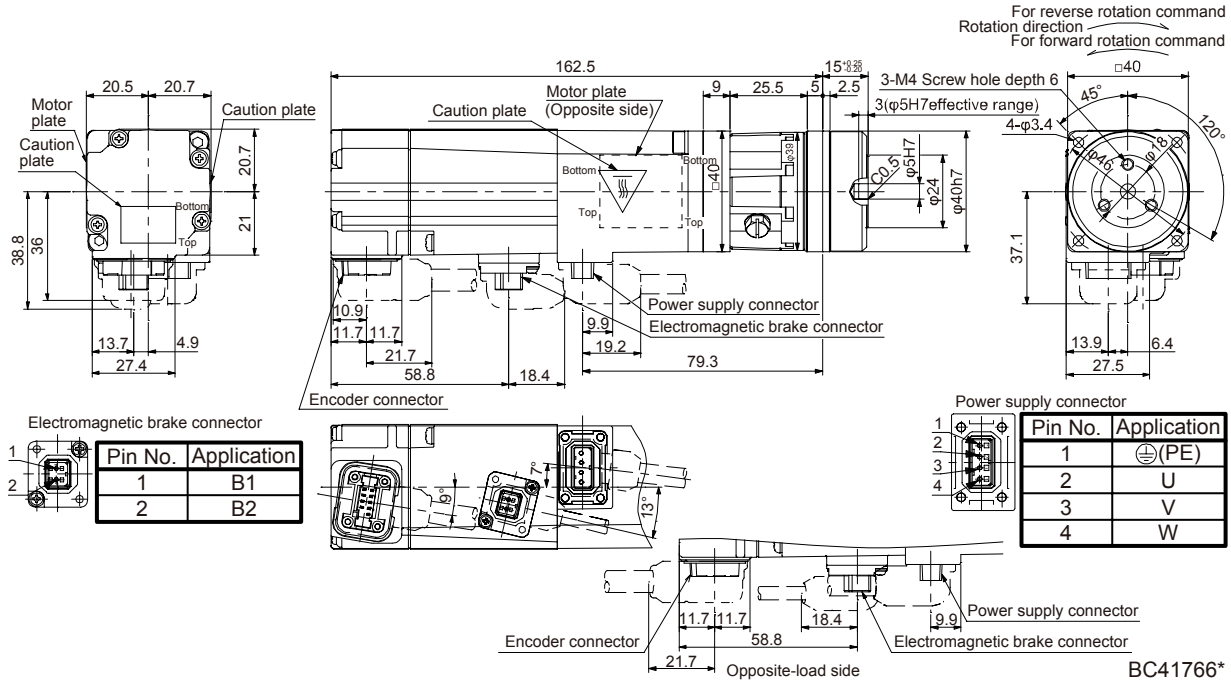

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41097*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG5 | 100 | HPG-11B-05-F0ADG | 1/5 | 0.32 | 0.0872 | 0.95 |

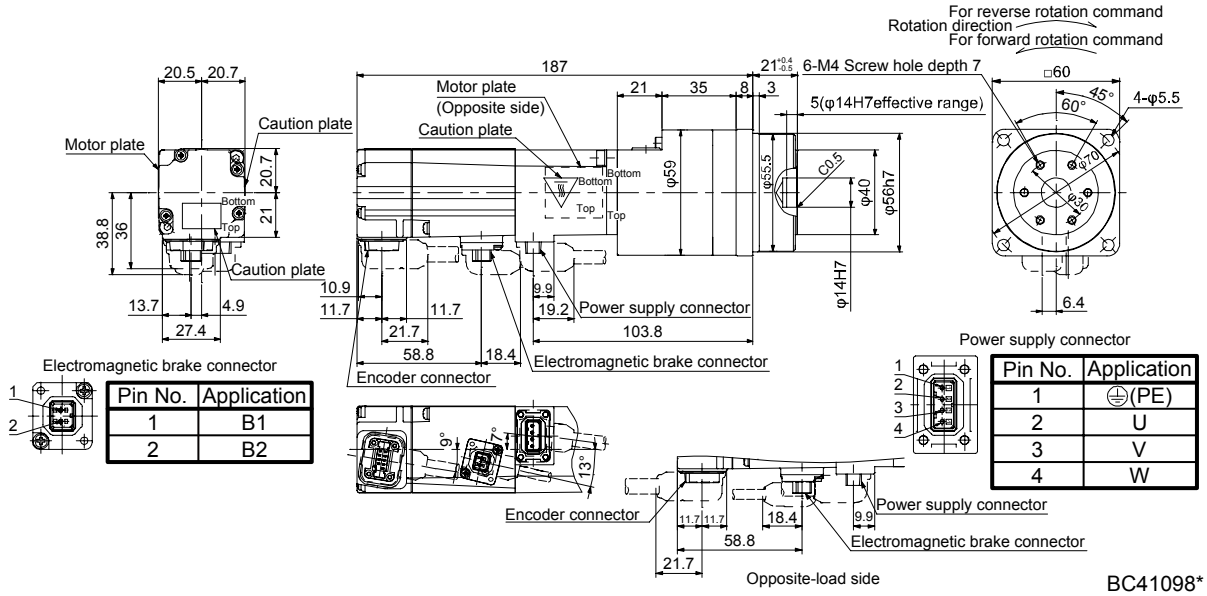
[Unit: mm]




BC41766*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG5 | 100 | HPG-14A-05-F0CBJS-S | 1/5 | 0.32 | 0.152 | 1.5 |
| HG-KR13BG5 | 100 | HPG-14A-11-F0CBKS-S | 1/11 | 0.32 | 0.144 | 1.6 |
| HG-KR13BG5 | 100 | HPG-14A-21-F0CBKS-S | 1/21 | 0.32 | 0.135 | 1.6 |

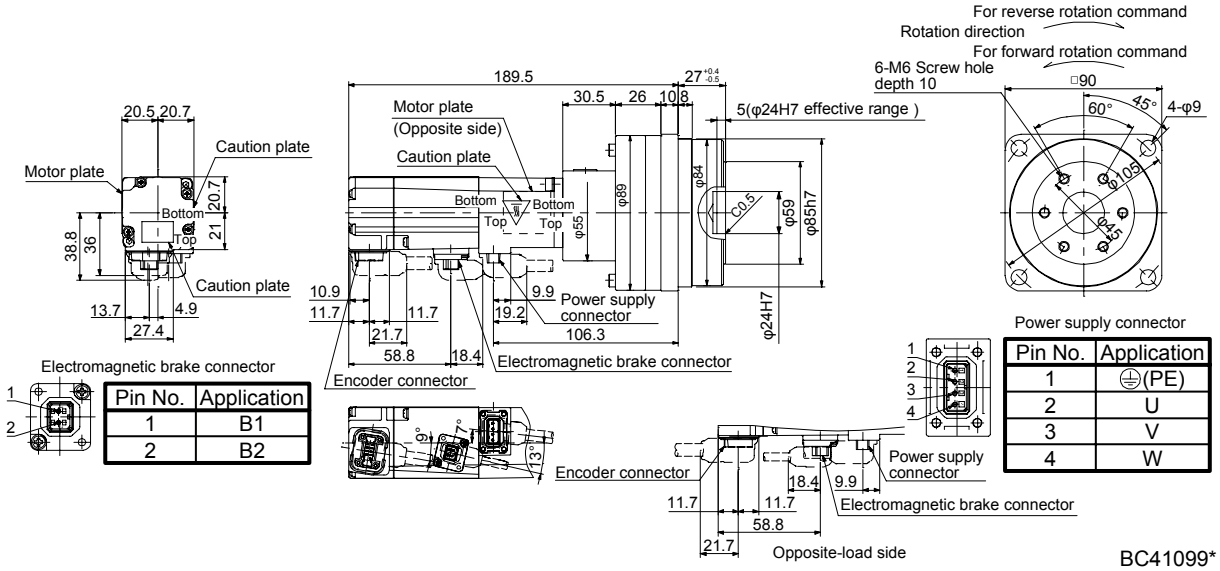
[Unit: mm]




BC41098*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG5 | 100 | HPG-20A-33-F0JMLAS-S | 1/33 | 0.32 | 0.146 | 2.8 |
| HG-KR13BG5 | 100 | HPG-20A-45-F0JMLAS-S | 1/45 | 0.32 | 0.145 | 2.8 |

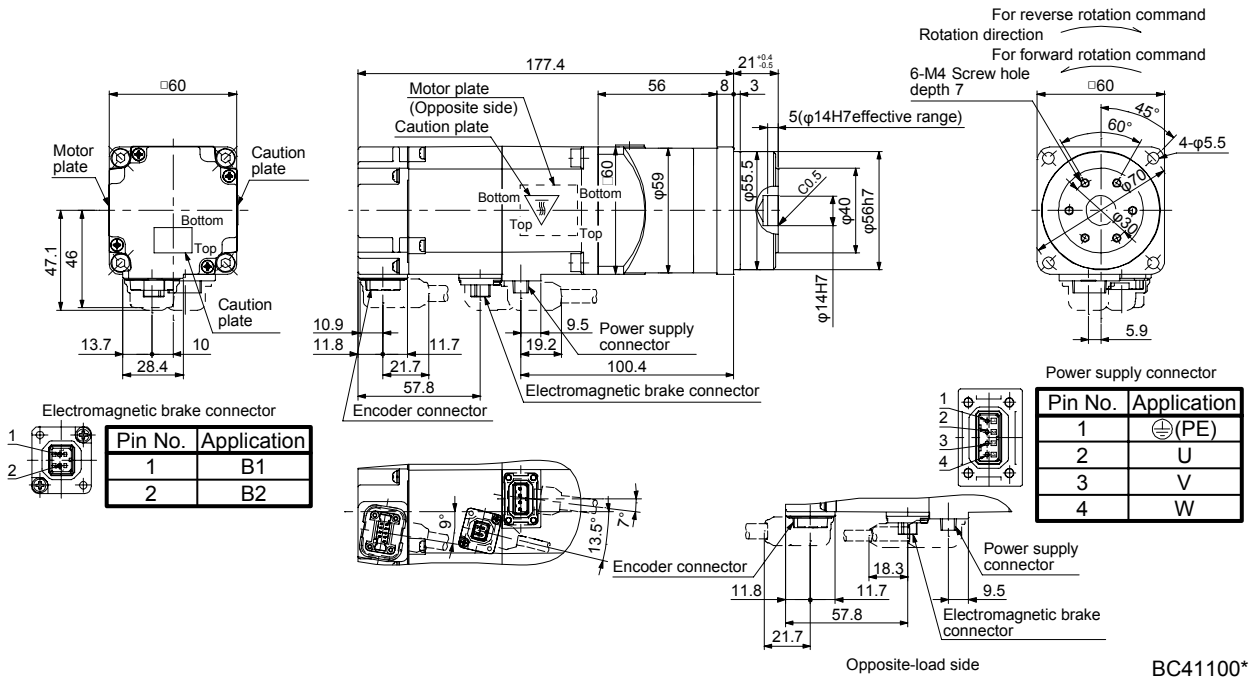
[Unit: mm]




BC41099*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG5 | 200 | HPG-14A-05-F0AZW-S | 1/5 | 1.3 | 0.444 | 2.2 |
| HG-KR23BG5 | 200 | HPG-14A-11-F0AZX-S | 1/11 | 1.3 | 0.446 | 2.3 |

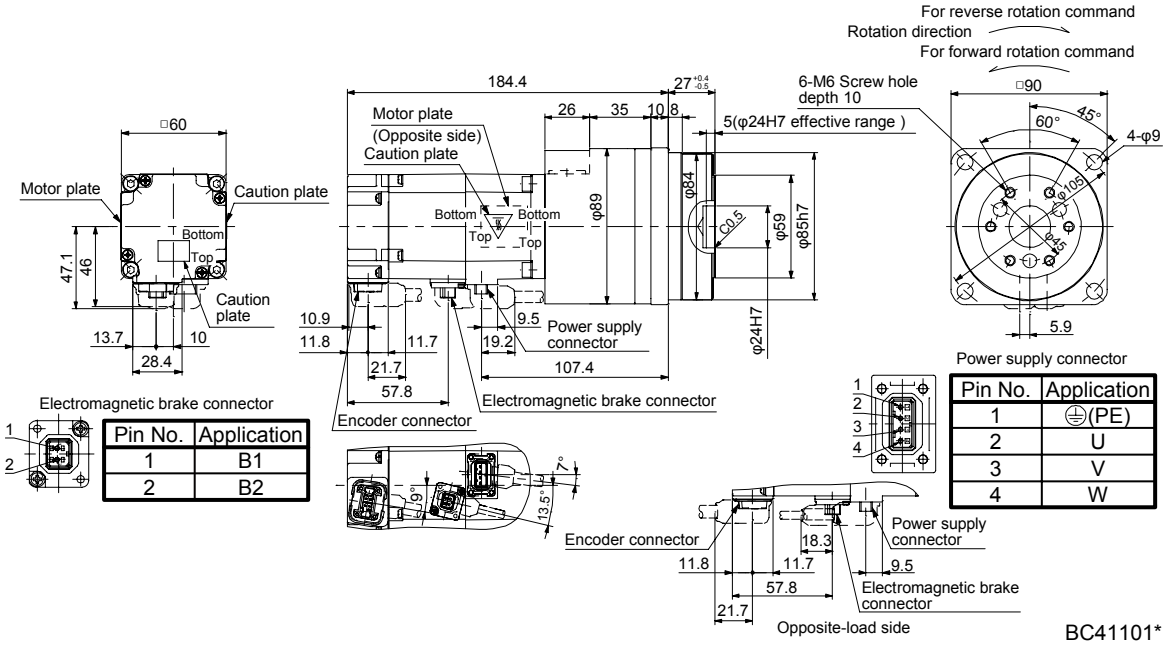
[Unit: mm]




BC41100*

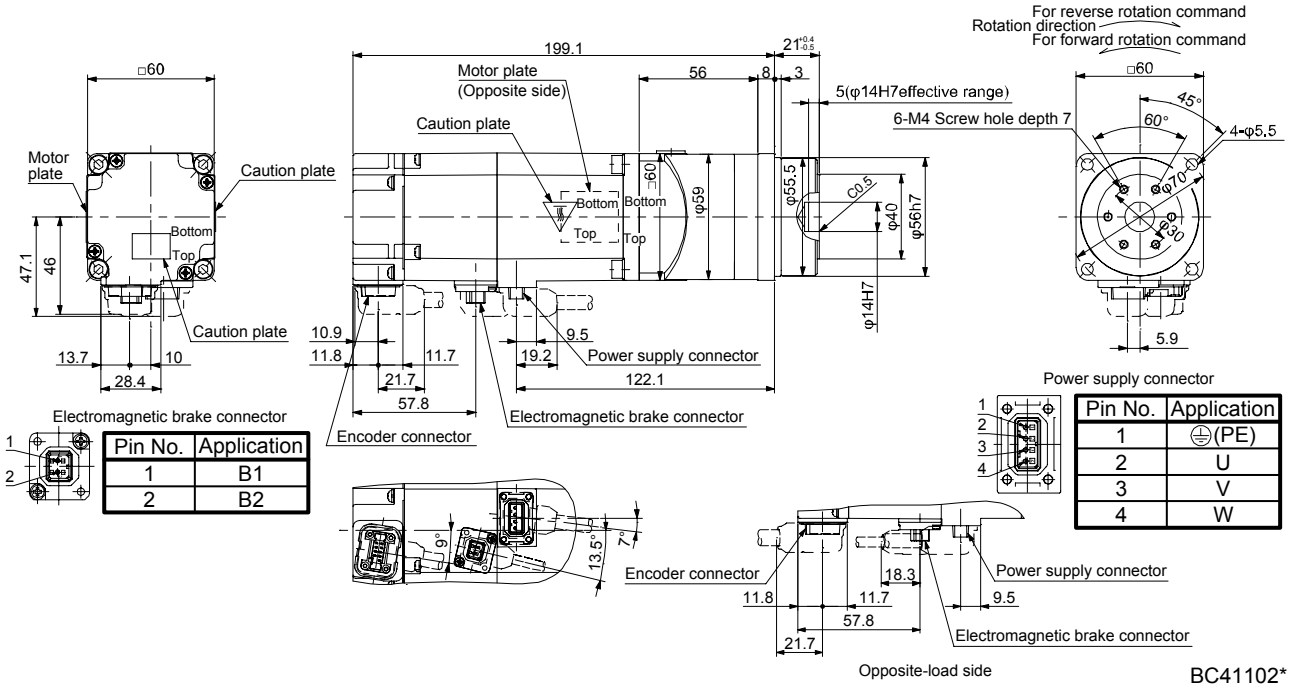
| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG5 | 200 | HPG-20A-21-F0EKS-S | 1/21 | 1.3 | 0.741 | 3.8 |
| HG-KR23BG5 | 200 | HPG-20A-33-F0ELS-S | 1/33 | 1.3 | 0.695 | 3.8 |
| HG-KR23BG5 | 200 | HPG-20A-45-F0ELS-S | 1/45 | 1.3 | 0.694 | 3.8 |

[Unit: mm]



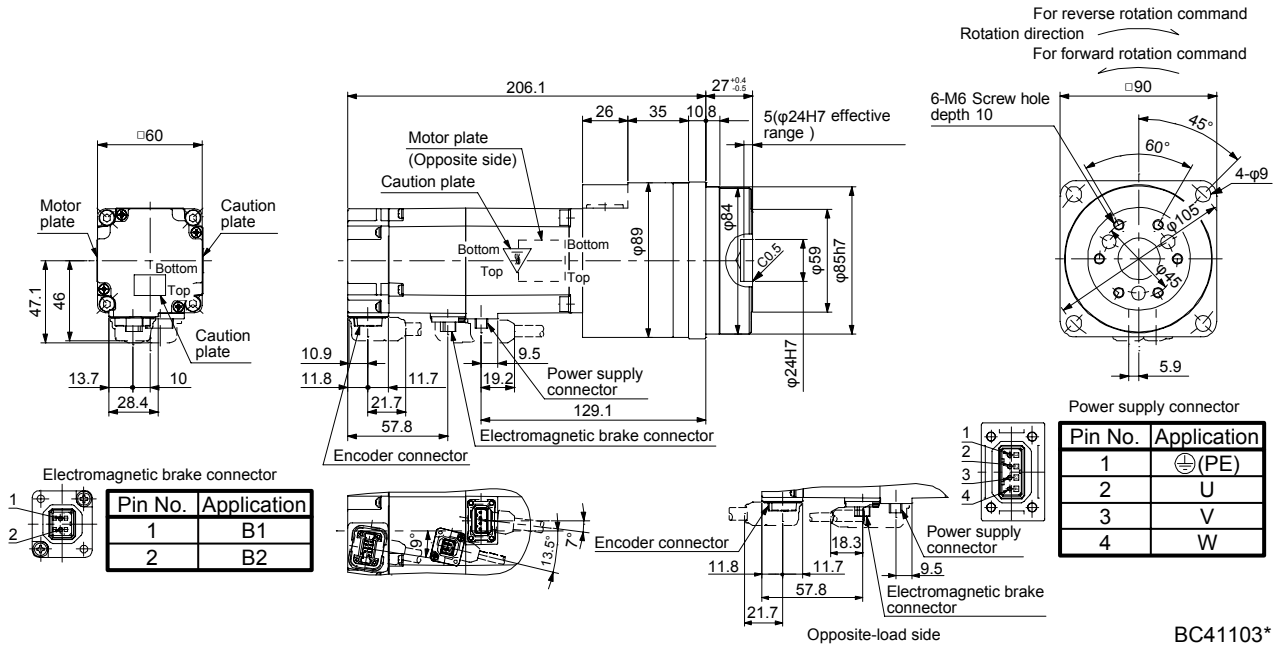

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG5 | 400 | HPG-14A-05-F0AZW-S | 1/5 | 1.3 | 0.594 | 2.7 |

[Unit: mm]



| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG5 | 400 | HPG-20A-11-F0EKS-S | 1/11 | 1.3 | 0.969 | 4.3 |
| HG-KR43BG5 | 400 | HPG-20A-21-F0EKS-S | 1/21 | 1.3 | 0.891 | 4.3 |

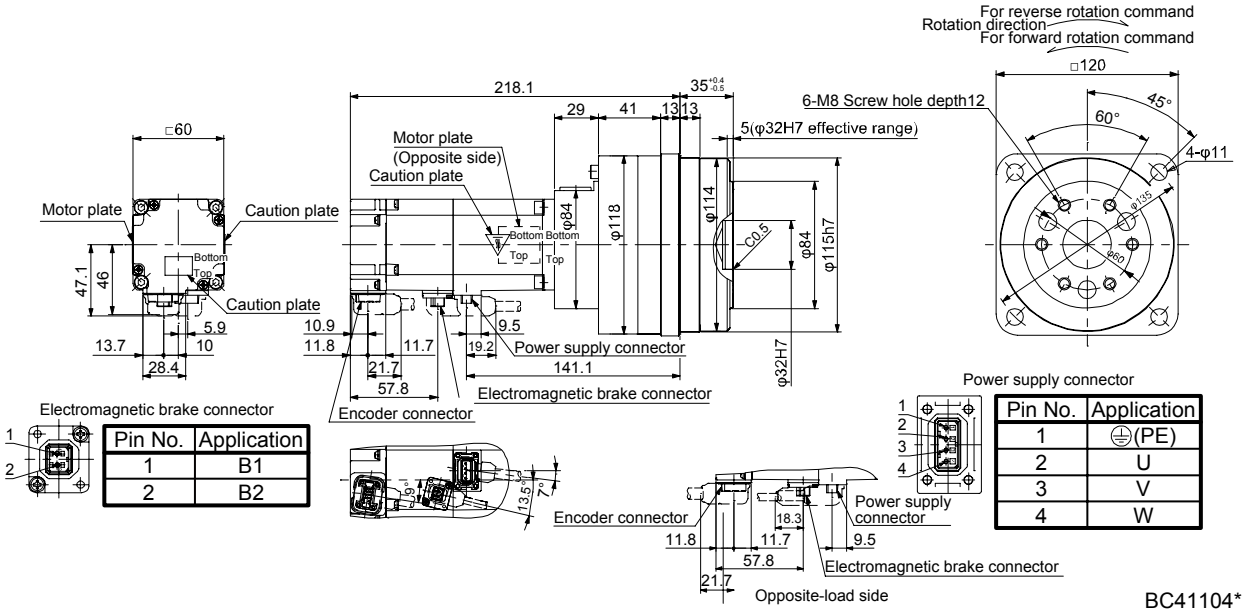
[Unit: mm]




BC41103*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG5 | 400 | HPG-32A-33-F0RLAS-S | 1/33 | 1.3 | 0.943 | 6.4 |
| HG-KR43BG5 | 400 | HPG-32A-45-F0RLAS-S | 1/45 | 1.3 | 0.937 | 6.4 |

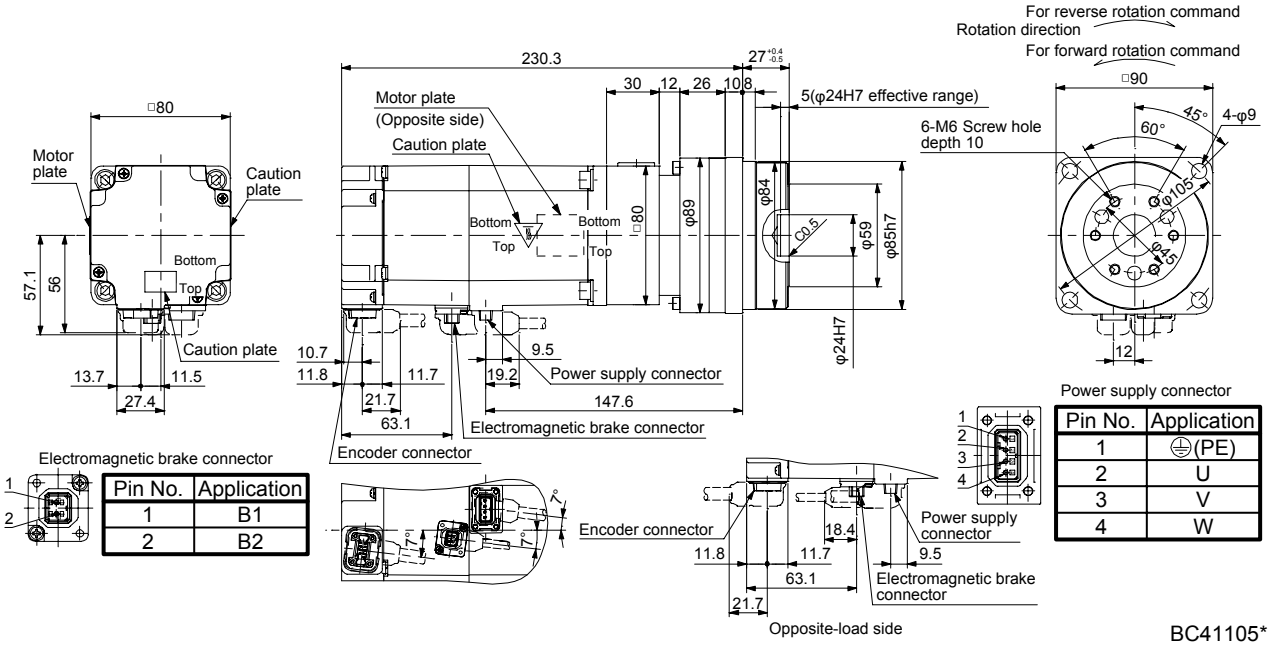
[Unit: mm]




BC41104*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG5 | 750 | HPG-20A-05-F0FEOS-S | 1/5 | 2.4 | 2.02 | 5.8 |
| HG-KR73BG5 | 750 | HPG-20A-11-F0FEPS-S | 1/11 | 2.4 | 1.93 | 6.1 |

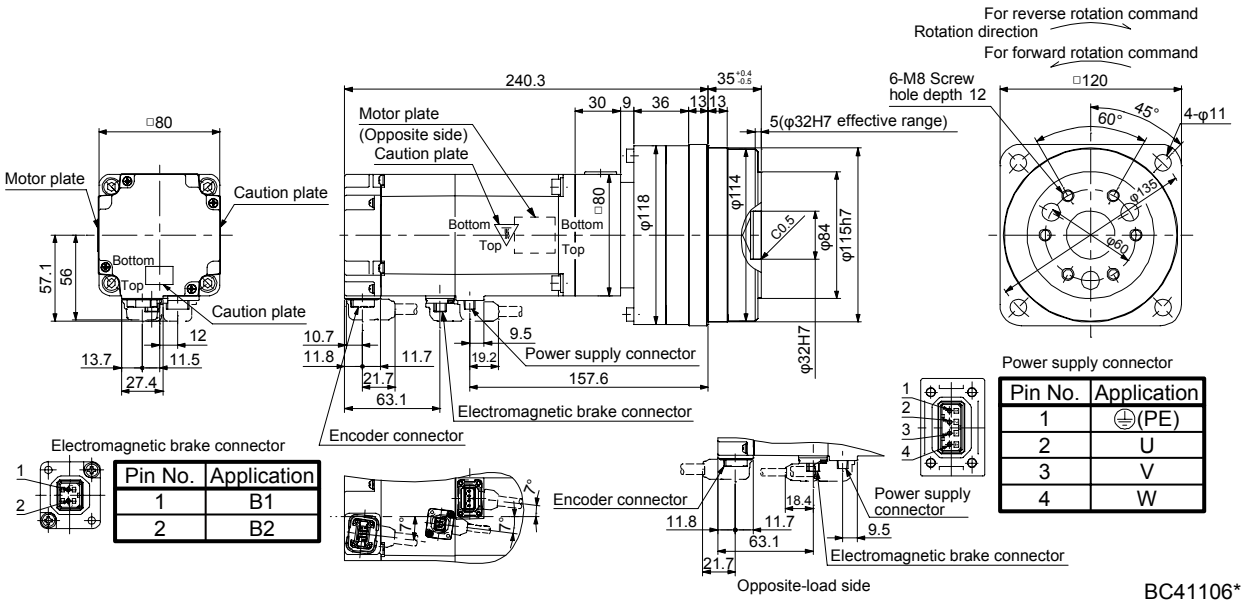
[Unit: mm]




BC41105*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG5 | 750 | HPG-32A-21-F0SEIS-S | 1/21 | 2.4 | 2.12 | 8.2 |
| HG-KR73BG5 | 750 | HPG-32A-33-F0SEJS-S | 1/33 | 2.4 | 1.90 | 8.2 |
| HG-KR73BG5 | 750 | HPG-32A-45-F0SEJS-S | 1/45 | 2.4 | 1.90 | 8.2 |

[Unit: mm]

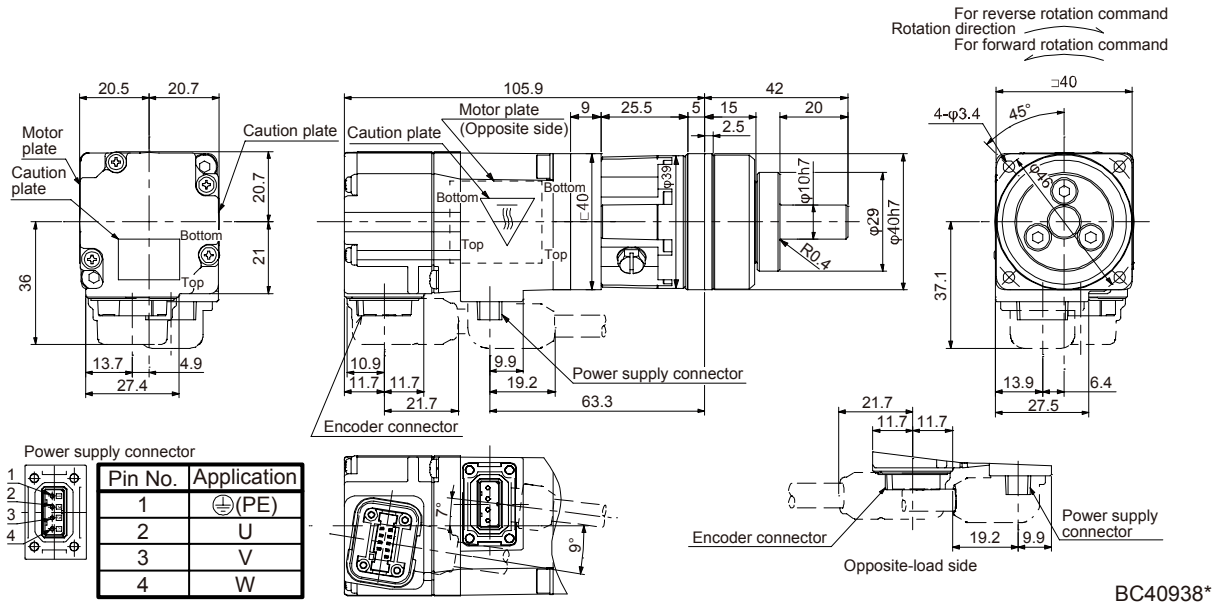



BC41106*

6.8.7 For precision application with flange mounting, shaft output type reducer (without an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G7 | 50 | HPG-11B-05-F20ADG | 1/5 | 0.0512 | 0.58 |
| HG-KR053G7 | 50 | HPG-11B-09-F20ADG | 1/9 | 0.0492 | 0.58 |

[Unit: mm]

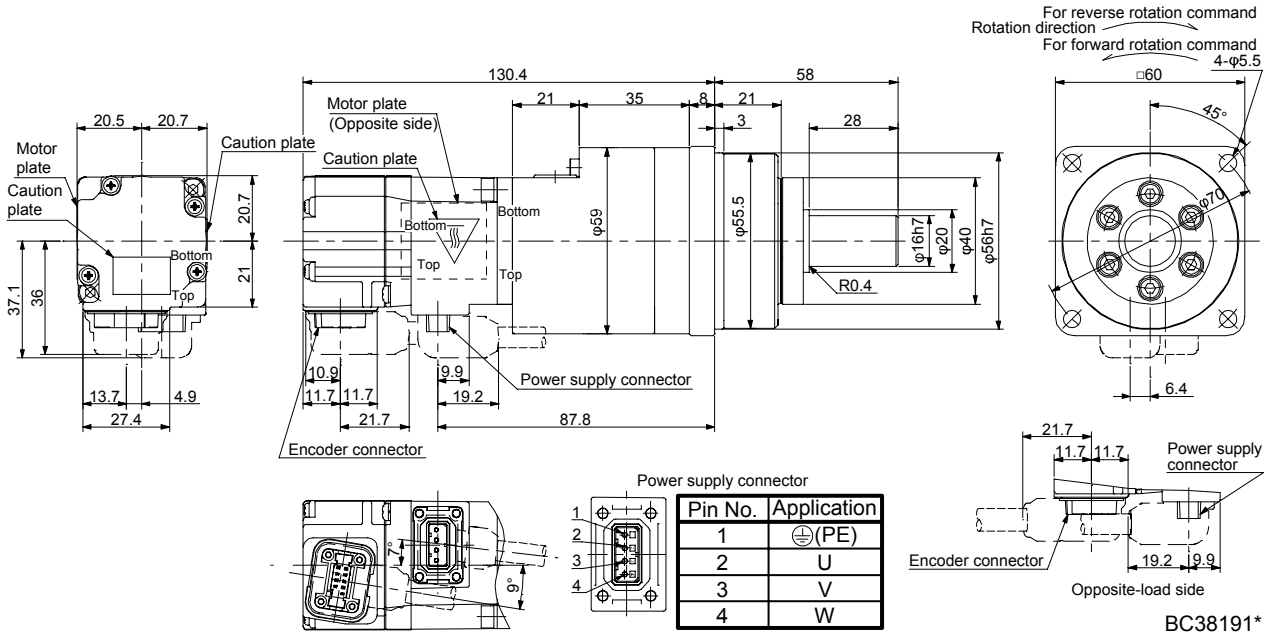



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40938*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR053G7 | 50 | HPG-14A-05-J2CBJS-S | 1/5 | 0.119 | 1.2 |
| HG-KR053G7 | 50 | HPG-14A-11-J2CBKS-S | 1/11 | 0.106 | 1.3 |
| HG-KR053G7 | 50 | HPG-14A-21-J2CBKS-S | 1/21 | 0.0960 | 1.3 |
| HG-KR053G7 | 50 | HPG-14A-33-J2CBLS-S | 1/33 | 0.0900 | 1.3 |
| HG-KR053G7 | 50 | HPG-14A-45-J2CBLS-S | 1/45 | 0.0900 | 1.3 |

[Unit: mm]

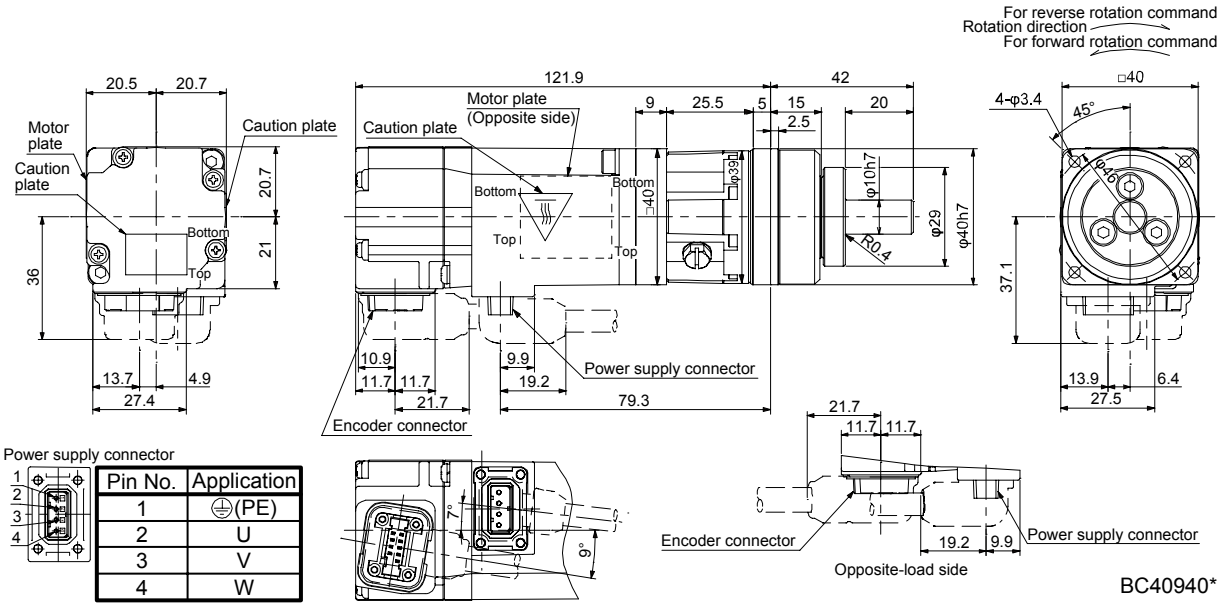



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC38191*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G7 | 100 | HPG-11B-05-J20ADG | 1/5 | 0.0839 | 0.78 |

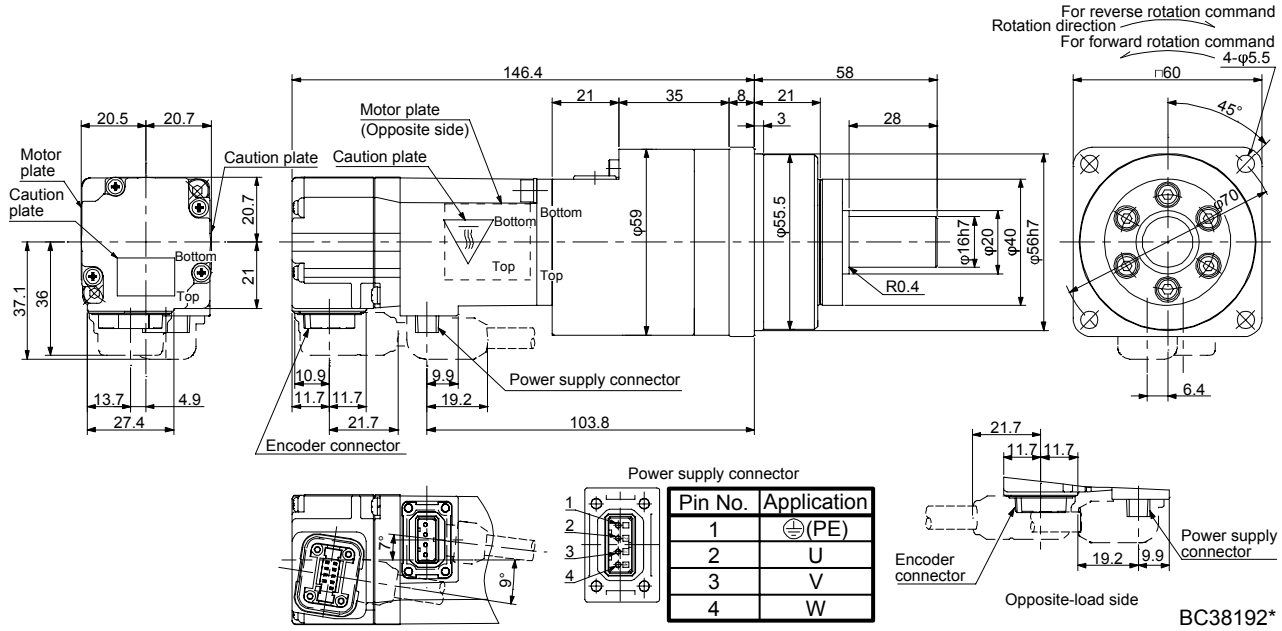
[Unit: mm]




BC40940*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G7 | 100 | HPG-14A-05-J2CBJS-S | 1/5 | 0.152 | 1.4 |
| HG-KR13G7 | 100 | HPG-14A-11-J2CBKS-S | 1/11 | 0.139 | 1.5 |
| HG-KR13G7 | 100 | HPG-14A-21-J2CBKS-S | 1/21 | 0.129 | 1.5 |

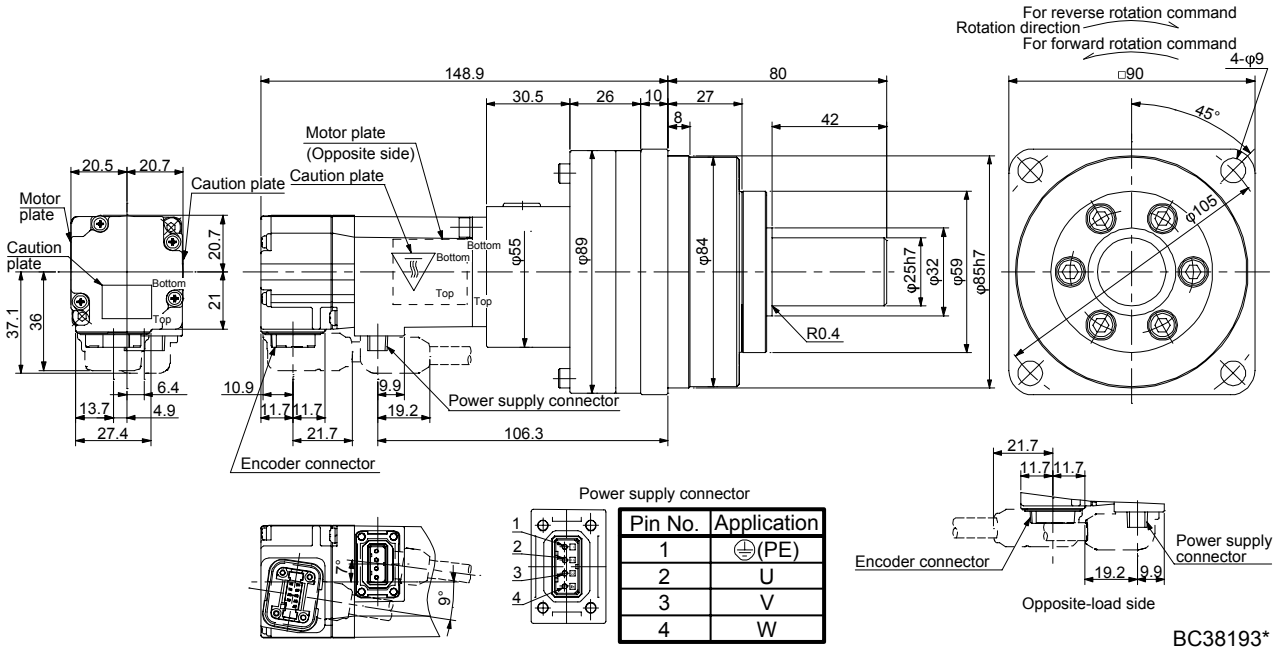
[Unit: mm]




BC38192*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR13G7 | 100 | HPG-20A-33-J2JMLAS-S | 1/33 | 0.141 | 3.0 |
| HG-KR13G7 | 100 | HPG-20A-45-J2JMLAS-S | 1/45 | 0.139 | 3.0 |

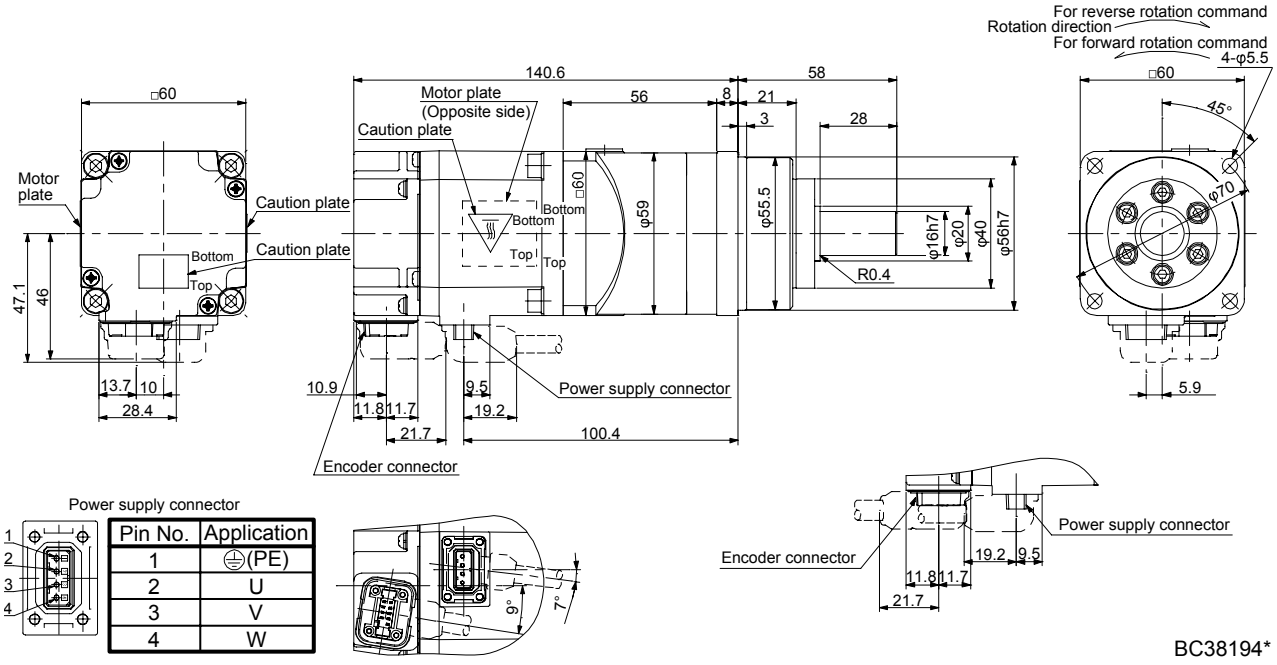
[Unit: mm]




BC38193*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G7 | 200 | HPG-14A-05-J2AZW-S | 1/5 | 0.428 | 1.9 |
| HG-KR23G7 | 200 | HPG-14A-11-J2AZX-S | 1/11 | 0.424 | 2.0 |

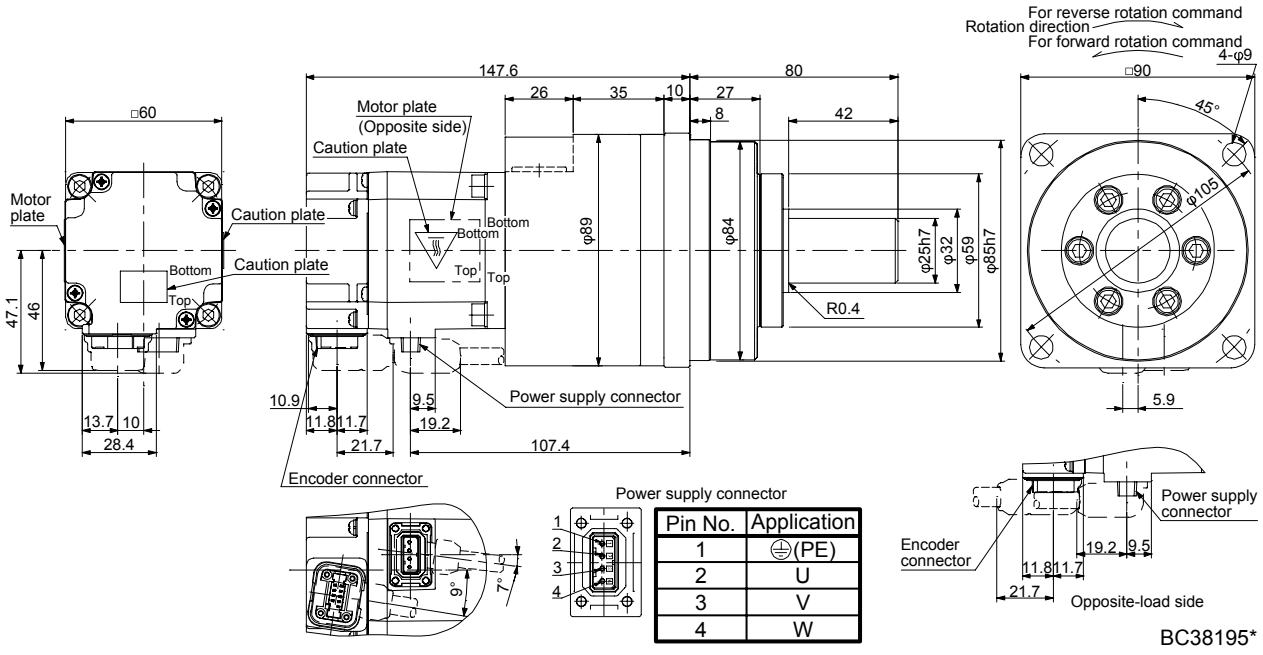
[Unit: mm]




BC38194*

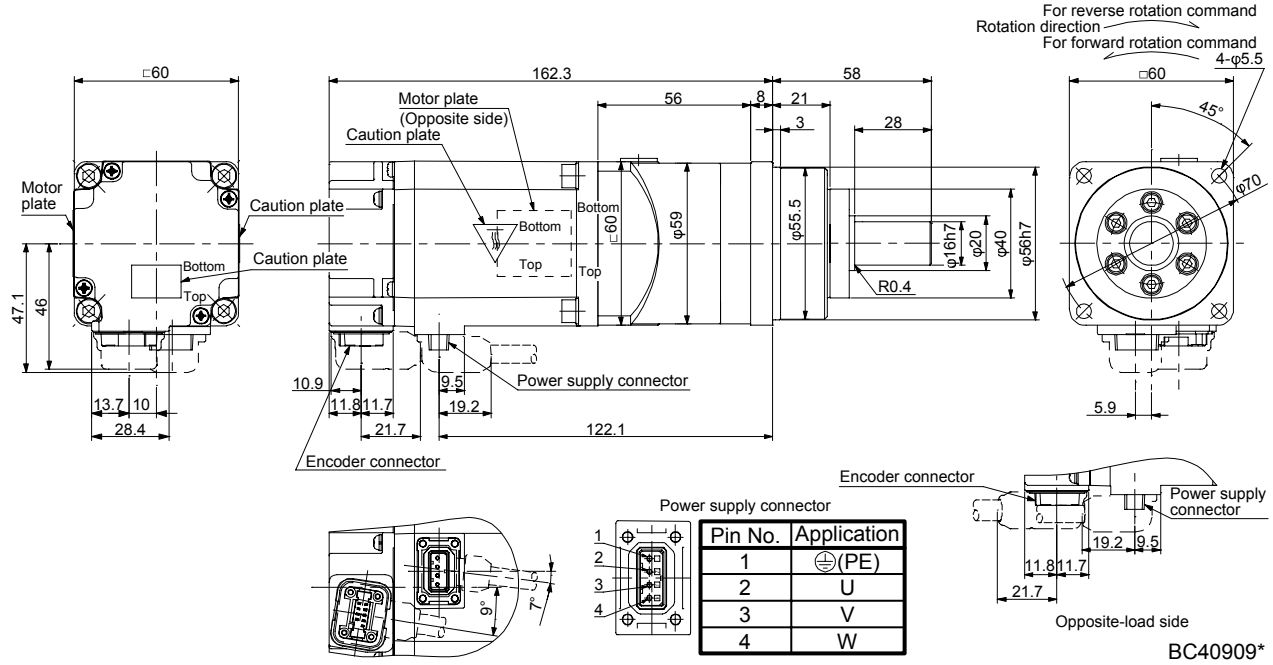
| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR23G7 | 200 | HPG-20A-21-J2EKS-S | 1/21 | 0.721 | 3.8 |
| HG-KR23G7 | 200 | HPG-20A-33-J2ELS-S | 1/33 | 0.674 | 3.8 |
| HG-KR23G7 | 200 | HPG-20A-45-J2ELS-S | 1/45 | 0.672 | 3.8 |

[Unit: mm]



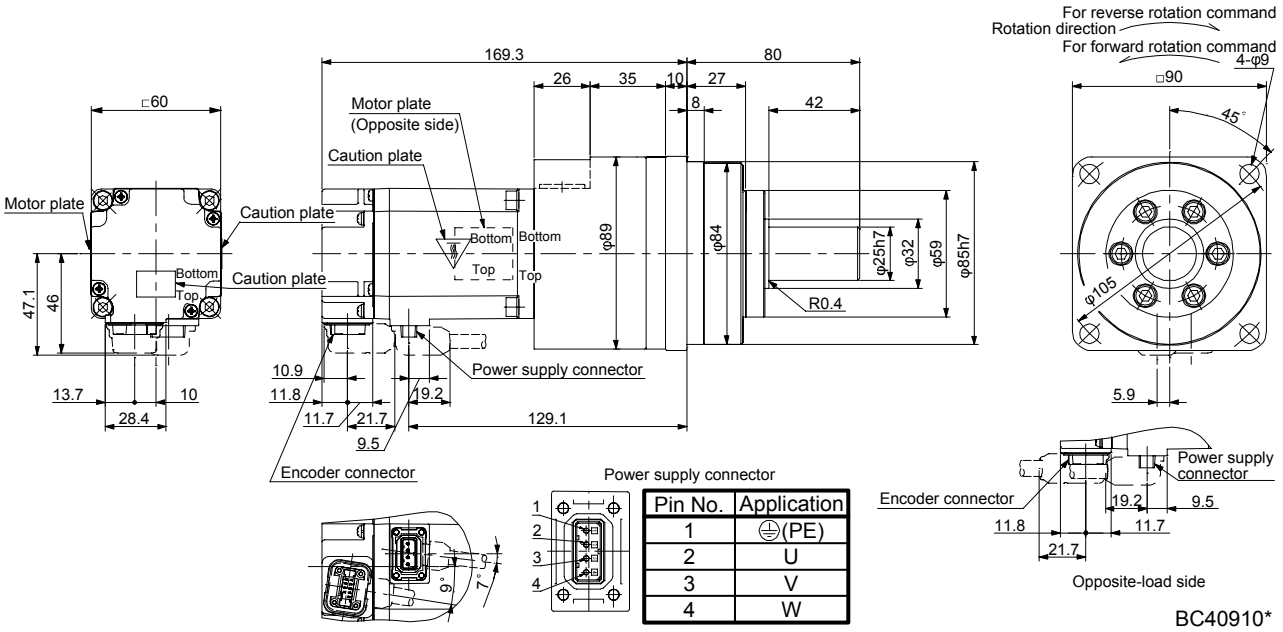

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G7 | 400 | HPG-14A-05-J2AZW-S | 1/5 | 0.578 | 2.4 |

[Unit: mm]



| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G7 | 400 | HPG-20A-11-J2EKS-S | 1/11 | 0.955 | 4.3 |
| HG-KR43G7 | 400 | HPG-20A-21-J2EKS-S | 1/21 | 0.871 | 4.3 |

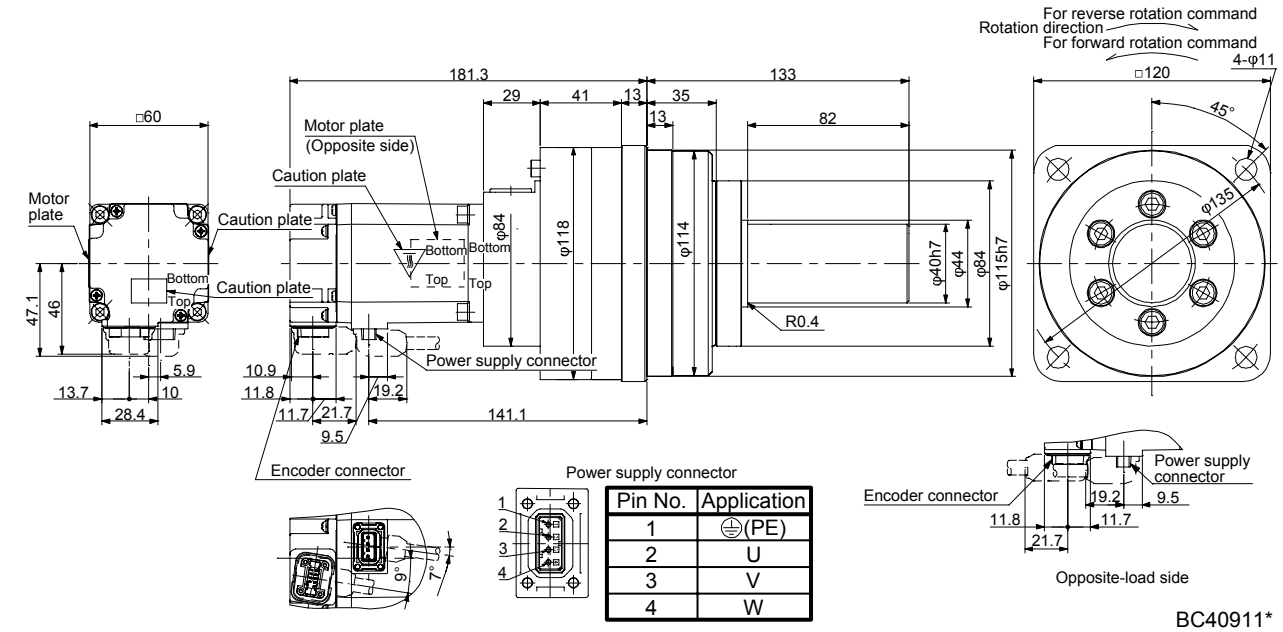
[Unit: mm]




BC40910*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR43G7 | 400 | HPG-32A-33-J2RLAS-S | 1/33 | 0.927 | 7.4 |
| HG-KR43G7 | 400 | HPG-32A-45-J2RLAS-S | 1/45 | 0.918 | 7.4 |

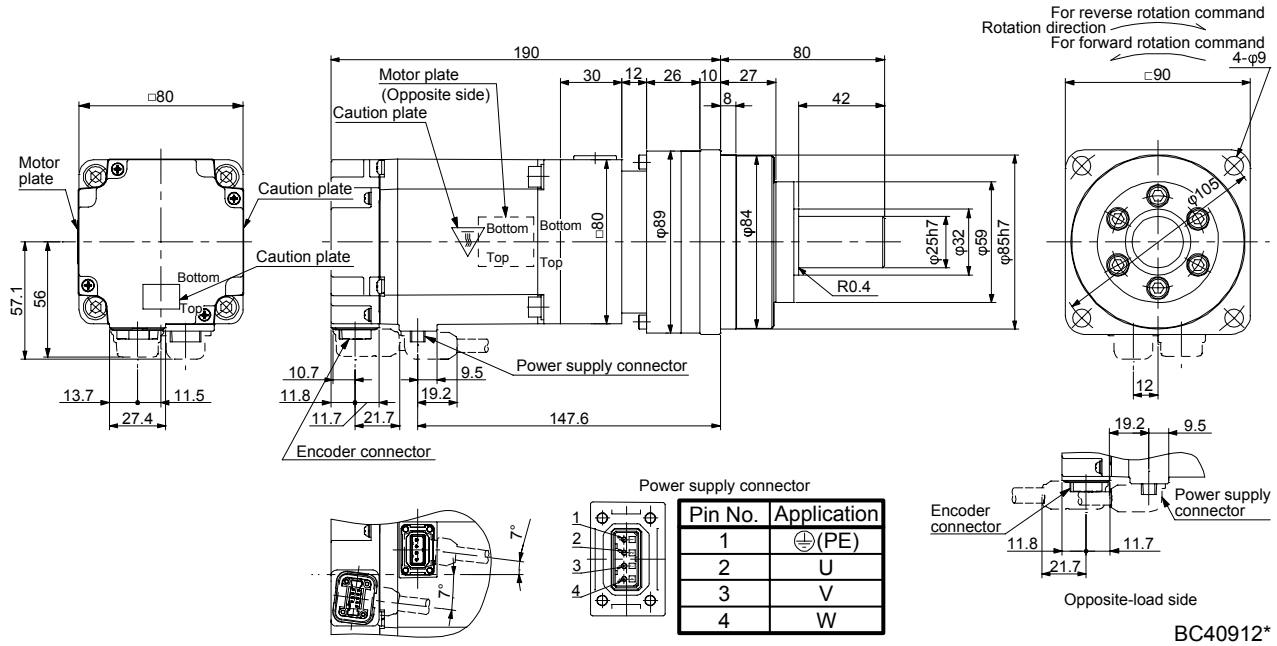
[Unit: mm]




BC40911*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G7 | 750 | HPG-20A-05-J2FEOS-S | 1/5 | 1.95 | 5.2 |
| HG-KR73G7 | 750 | HPG-20A-11-J2FEPS-S | 1/11 | 1.83 | 5.5 |

[Unit: mm]

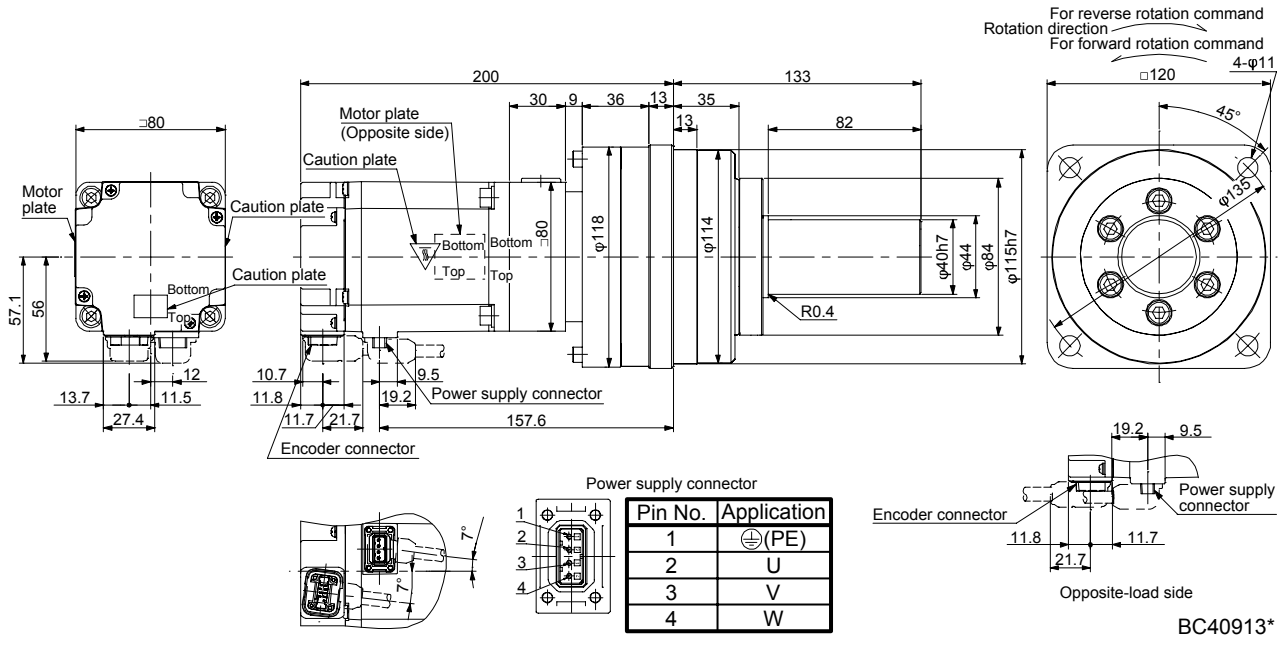



| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40912*

| Model | Output [W] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-KR73G7 | 750 | HPG-32A-21-J2SEIS-S | 1/21 | 2.03 | 8.6 |
| HG-KR73G7 | 750 | HPG-32A-33-J2SEJS-S | 1/33 | 1.80 | 8.6 |
| HG-KR73G7 | 750 | HPG-32A-45-J2SEJS-S | 1/45 | 1.79 | 8.6 |

[Unit: mm]



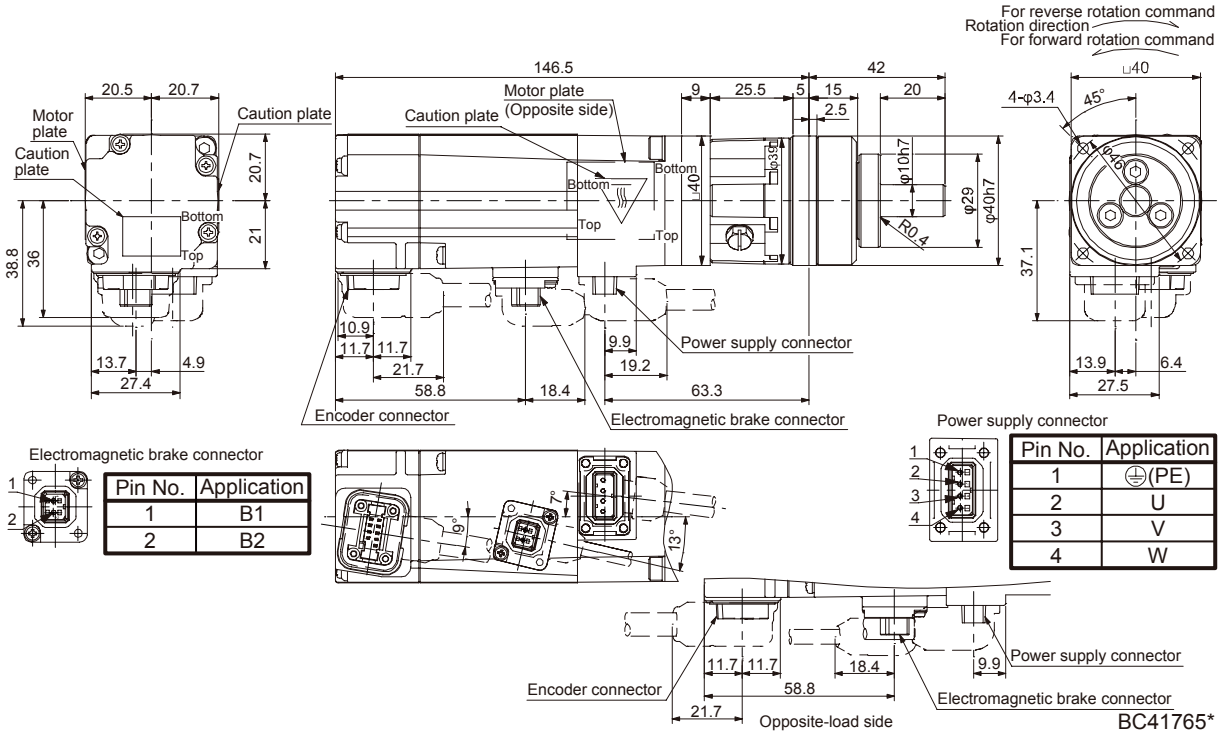

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC40913*

### 6.8.8 Flange-mounting shaft output type for precision application compliant (with an electromagnetic brake)

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG7 | 50 | HPG-11B-05-J20ADG | 1/5 | 0.32 | 0.0534 | 0.78 |
| HG-KR053BG7 | 50 | HPG-11B-09-J20ADG | 1/9 | 0.32 | 0.0514 | 0.78 |

[Unit: mm]

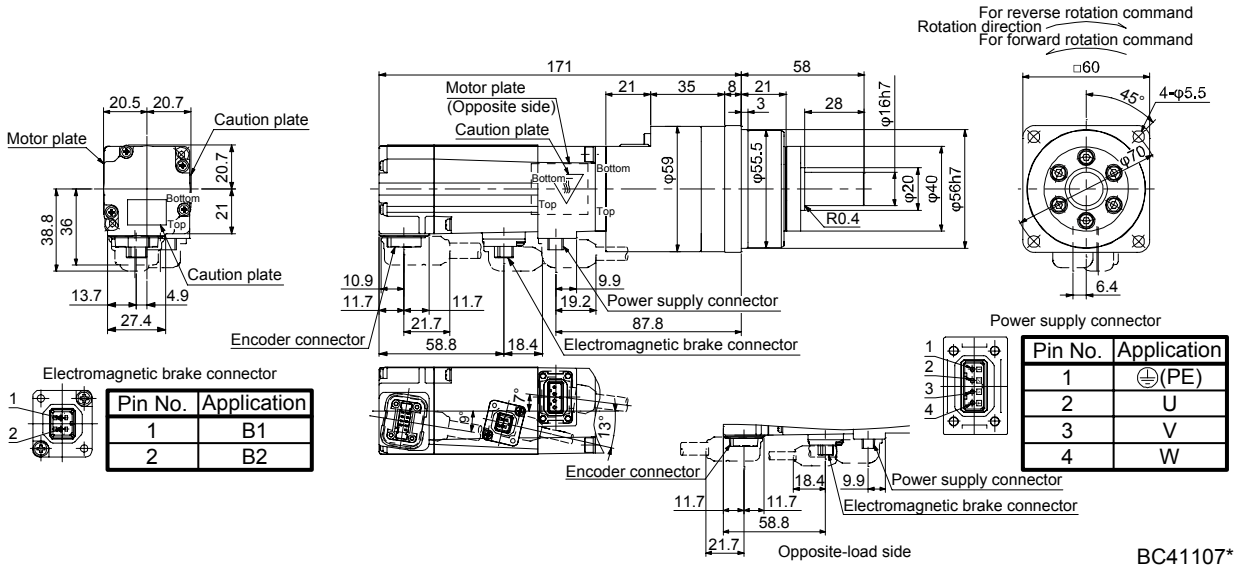



| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR053BG7 | 50 | HPG-14A-05-J2CBJS-S | 1/5 | 0.32 | 0.121 | 1.4 |
| HG-KR053BG7 | 50 | HPG-14A-11-J2CBKS-S | 1/11 | 0.32 | 0.108 | 1.5 |
| HG-KR053BG7 | 50 | HPG-14A-21-J2CBKS-S | 1/21 | 0.32 | 0.0980 | 1.5 |
| HG-KR053BG7 | 50 | HPG-14A-33-J2CBLS-S | 1/33 | 0.32 | 0.0920 | 1.5 |
| HG-KR053BG7 | 50 | HPG-14A-45-J2CBLS-S | 1/45 | 0.32 | 0.0920 | 1.5 |

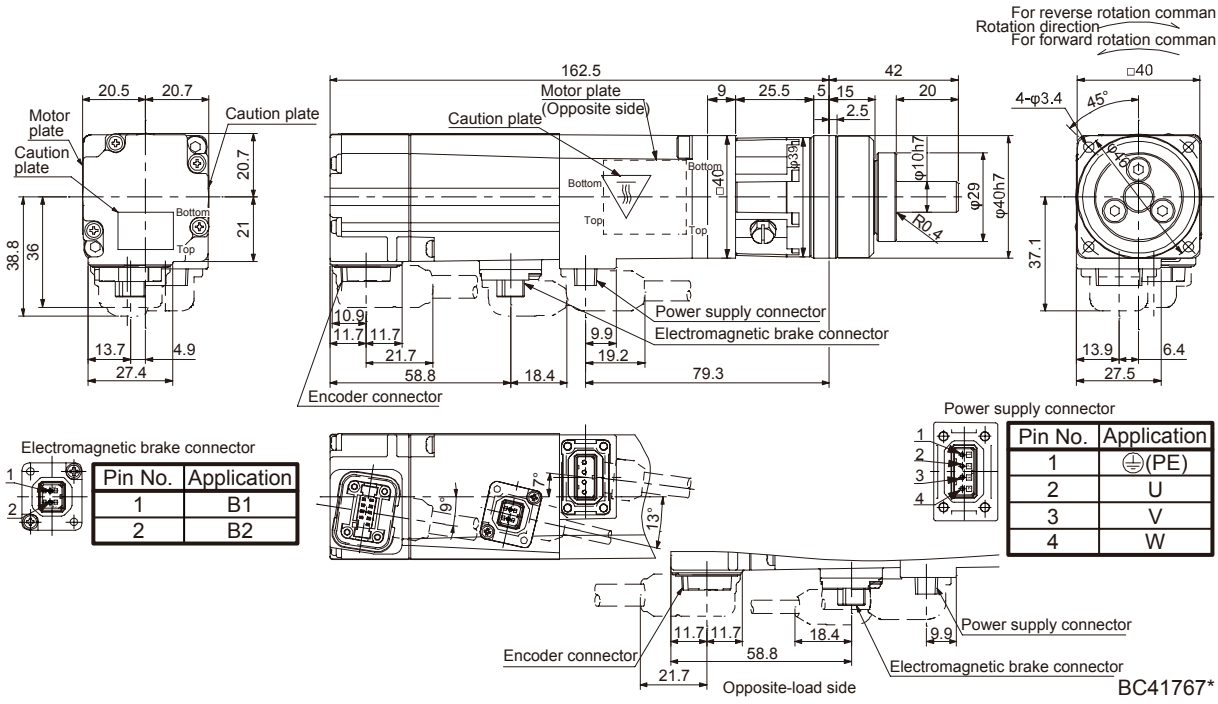
[Unit: mm]




BC41107*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG7 | 50 | HPG-11B-05-J20ADG | 1/5 | 0.32 | 0.0899 | 0.98 |

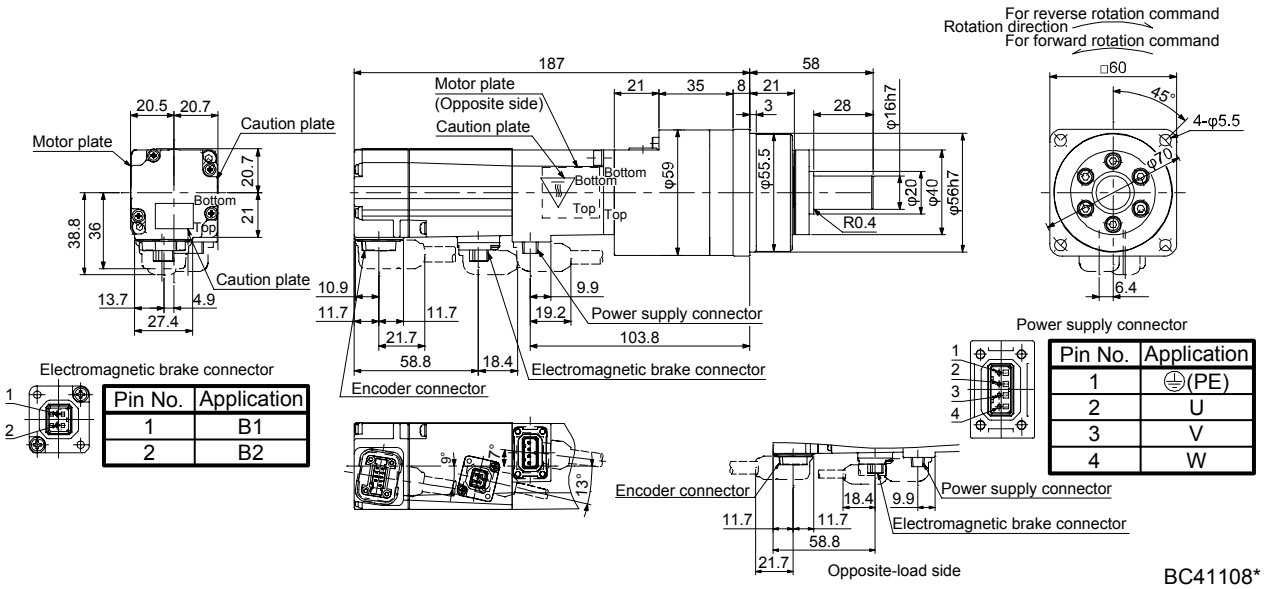
[Unit: mm]




BC41767*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG7 | 100 | HPG-14A-05-J2CBJS-S | 1/5 | 0.32 | 0.158 | 1.6 |
| HG-KR13BG7 | 100 | HPG-14A-11-J2CBKS-S | 1/11 | 0.32 | 0.145 | 1.7 |
| HG-KR13BG7 | 100 | HPG-14A-21-J2CBKS-S | 1/21 | 0.32 | 0.135 | 1.7 |

[Unit: mm]



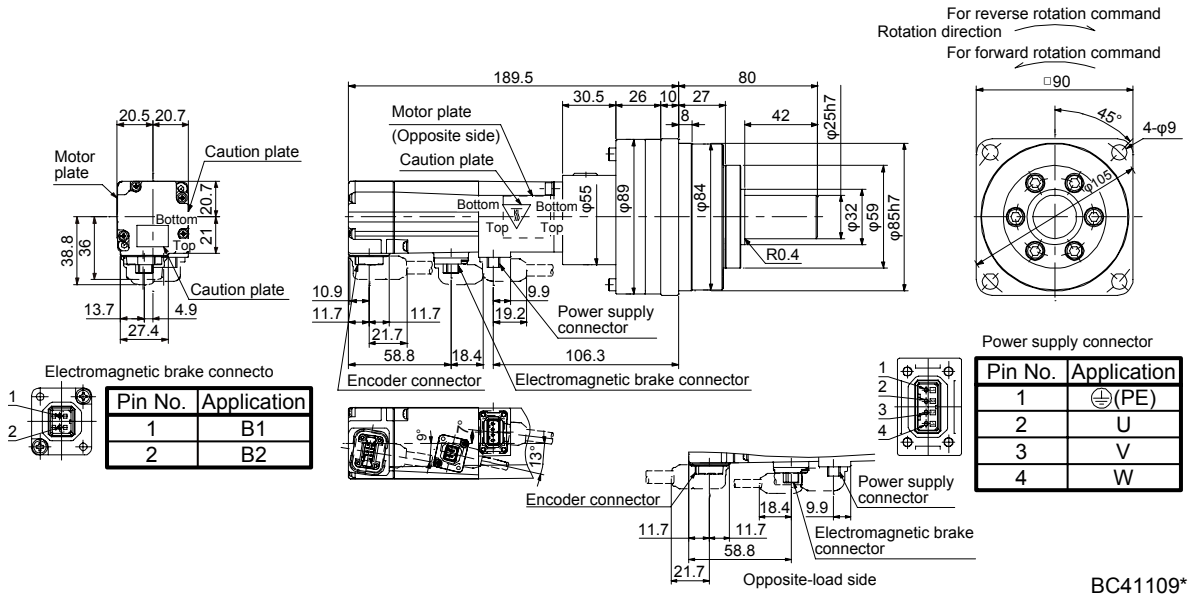

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41108*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR13BG7 | 100 | HPG-20A-33-J2JMLAS-S | 1/33 | 0.32 | 0.147 | 3.2 |
| HG-KR13BG7 | 100 | HPG-20A-45-J2JMLAS-S | 1/45 | 0.32 | 0.145 | 3.2 |

[Unit: mm]



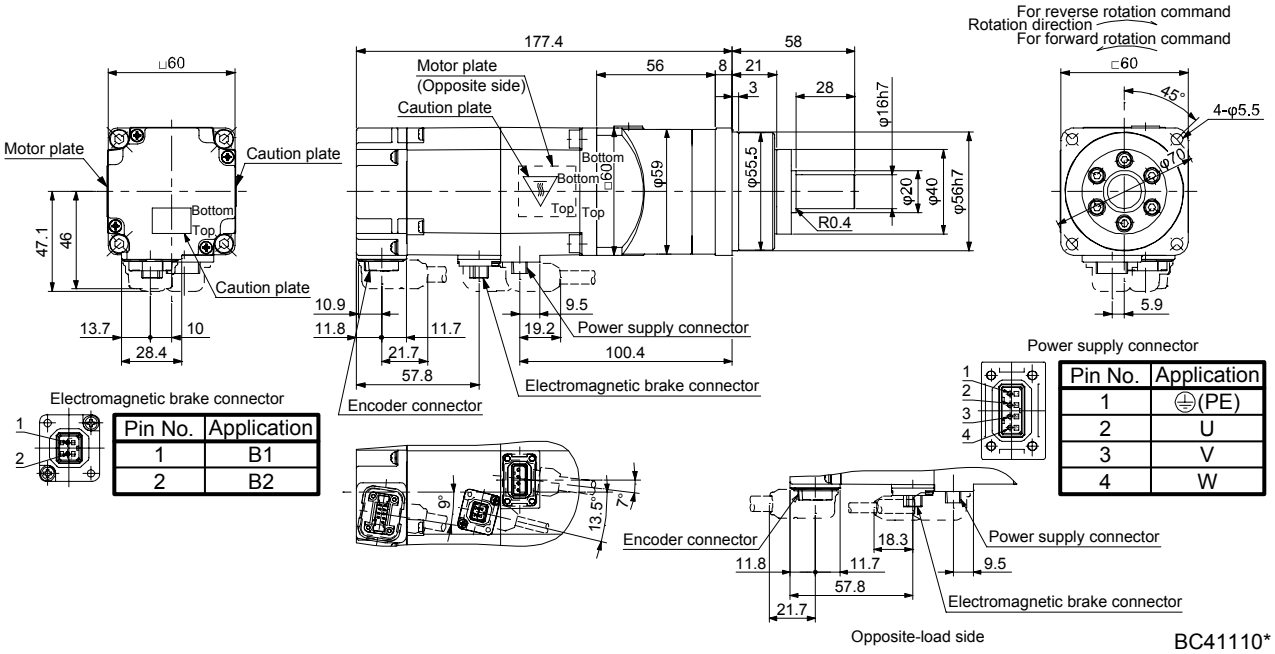

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41109*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG7 | 200 | HPG-14A-05-J2AZW-S | 1/5 | 1.3 | 0.450 | 2.3 |
| HG-KR23BG7 | 200 | HPG-14A-11-J2AZX-S | 1/11 | 1.3 | 0.446 | 2.4 |

[Unit: mm]



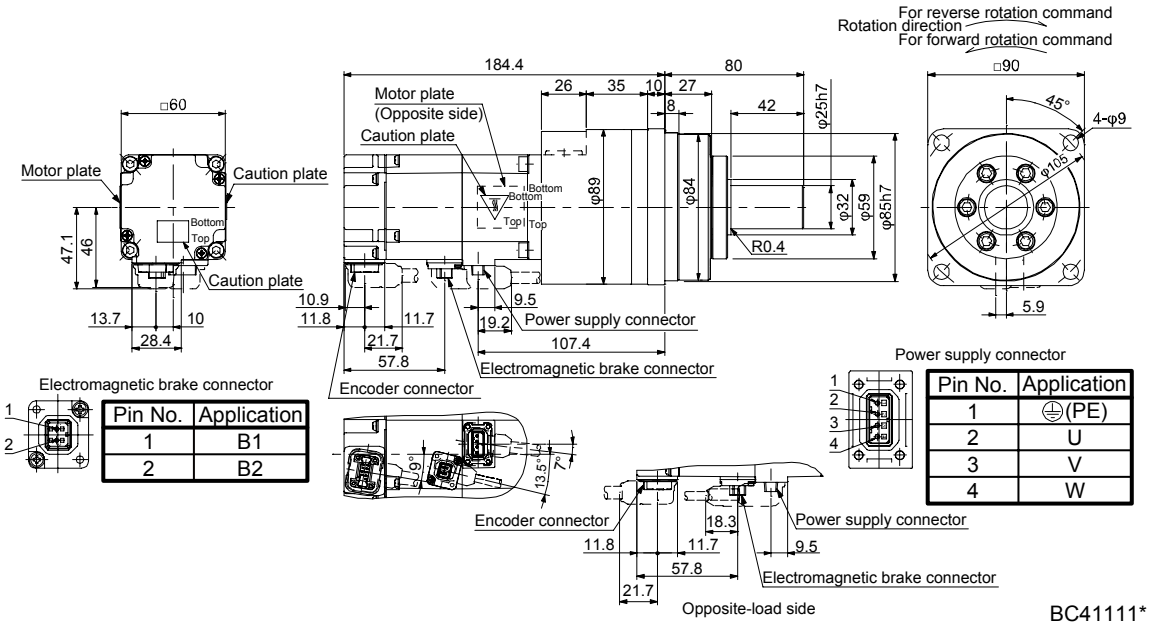

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41110*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR23BG7 | 200 | HPG-20A-21-J2EKS-S | 1/21 | 1.3 | 0.743 | 4.2 |
| HG-KR23BG7 | 200 | HPG-20A-33-J2ELS-S | 1/33 | 1.3 | 0.696 | 4.2 |
| HG-KR23BG7 | 200 | HPG-20A-45-J2ELS-S | 1/45 | 1.3 | 0.694 | 4.2 |

[Unit: mm]



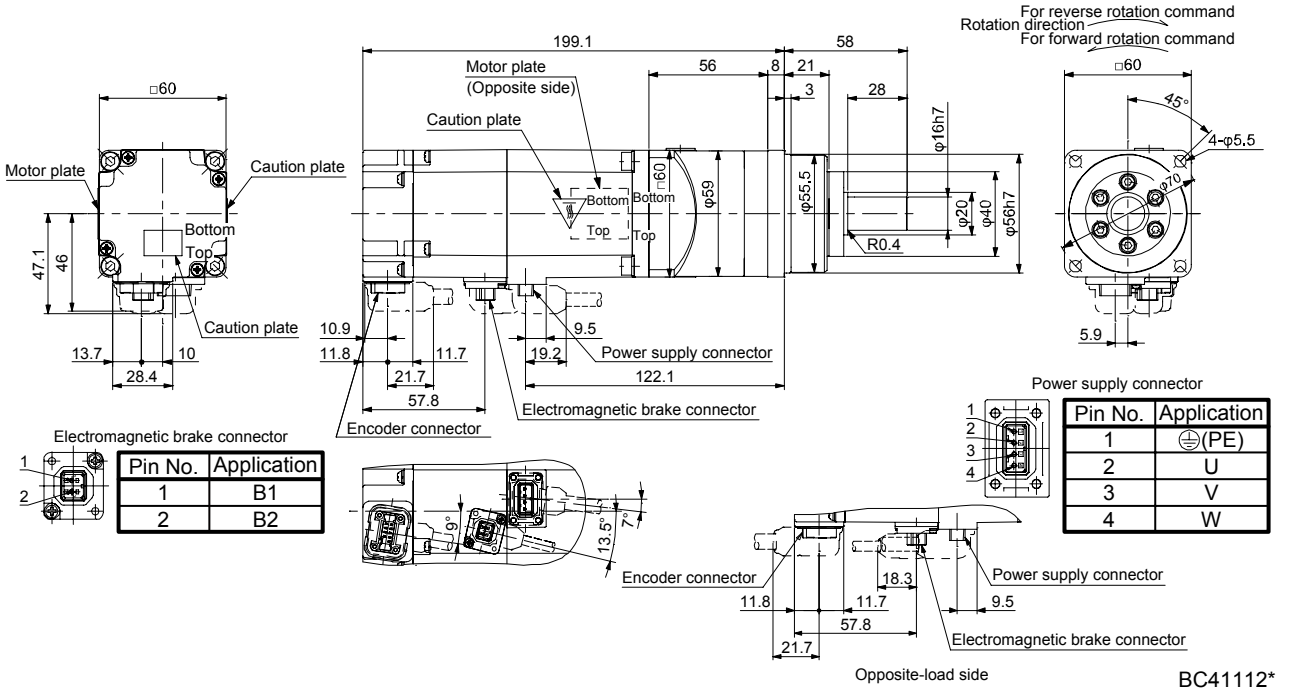

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41111*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG7 | 400 | HPG-14A-05-J2AZW-S | 1/5 | 1.3 | 0.600 | 2.8 |

[Unit: mm]



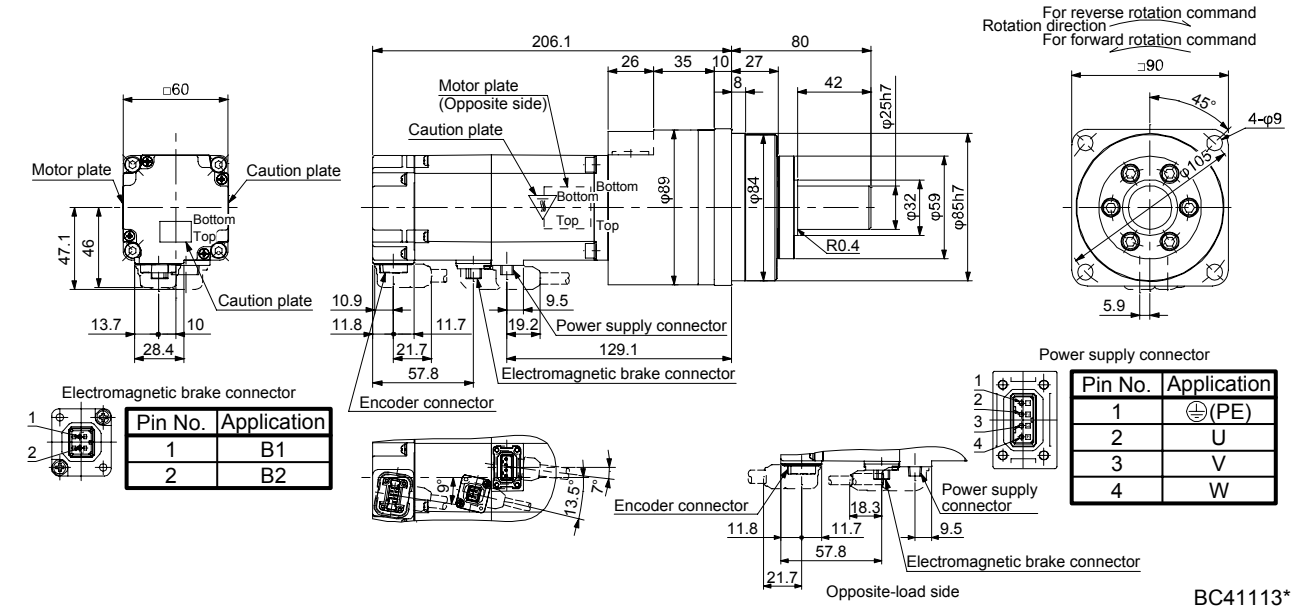

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41112*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG7 | 400 | HPG-20A-11-J2EKS-S | 1/11 | 1.3 | 0.977 | 4.7 |
| HG-KR43BG7 | 400 | HPG-20A-21-J2EKS-S | 1/21 | 1.3 | 0.893 | 4.7 |

[Unit: mm]



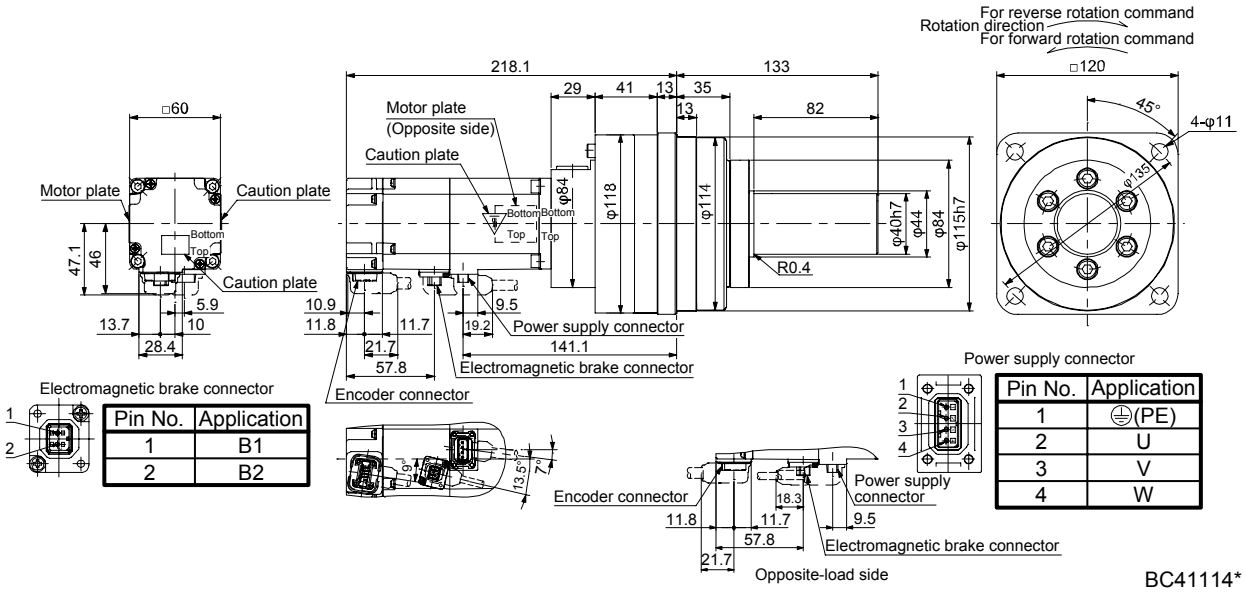

| Pin No. | Application |
|---|---|
| 1 | B1 |
| 2 | B2 |

| Pin No. | Application |
|---|---|
| 1 | ⏚(PE) |
| 2 | U |
| 3 | V |
| 4 | W |

BC41113*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR43BG7 | 400 | HPG-32A-33-J2RLAS-S | 1/33 | 1.3 | 0.949 | 7.8 |
| HG-KR43BG7 | 400 | HPG-32A-45-J2RLAS-S | 1/45 | 1.3 | 0.940 | 7.8 |

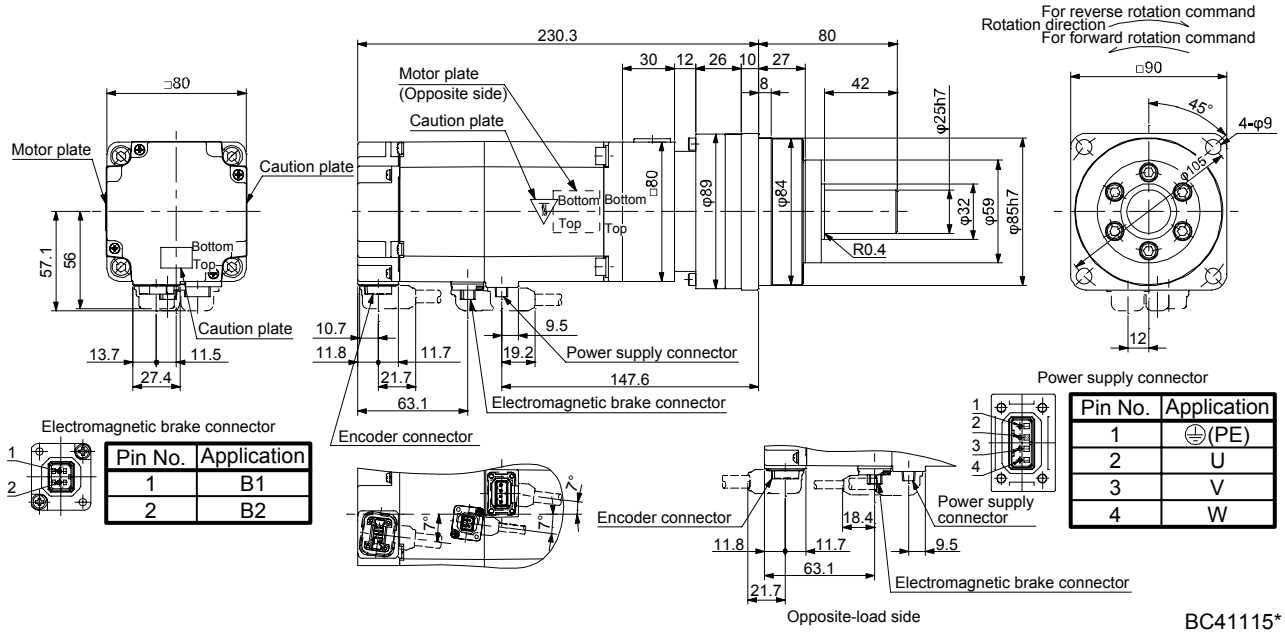
[Unit: mm]




BC41114*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG7 | 750 | HPG-20A-05-J2FEOS-S | 1/5 | 2.4 | 2.06 | 6.2 |
| HG-KR73BG7 | 750 | HPG-20A-11-J2FEPS-S | 1/11 | 2.4 | 1.94 | 6.5 |

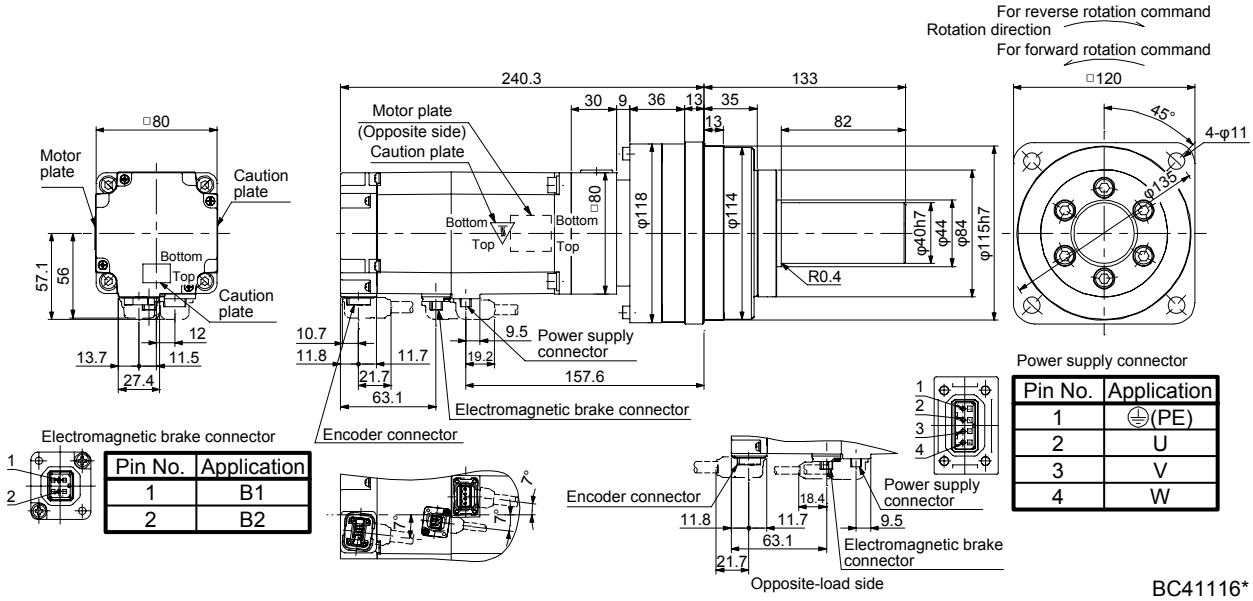
[Unit: mm]




BC41115*

| Model | Output [W] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-KR73BG7 | 750 | HPG-32A-21-J2SEIS-S | 1/21 | 2.4 | 2.14 | 9.6 |
| HG-KR73BG7 | 750 | HPG-32A-33-J2SEJS-S | 1/33 | 2.4 | 1.91 | 9.6 |
| HG-KR73BG7 | 750 | HPG-32A-45-J2SEJS-S | 1/45 | 2.4 | 1.90 | 9.6 |

[Unit: mm]




BC41116*

# MEMO

# 7. HG-SR SERIES

This chapter provides information on the servo motor specifications and characteristics. When using the HG-SR series servo motor, always read the Safety Instructions in the beginning of this manual and chapters 1 to 5, in addition to this chapter.

## 7.1 Model code definition

The following describes what each block of a model name indicates. Not all combinations of the symbols are available.

HG－SR 5 2 B J G 1 K

Series

Rated output

| Symbol | Rated output [kW] | 1000 [r/min] | 2000 [r/min] |
|---|---|---|---|
| 5 | 0.5 | ○ | ○ |
| 8 | 0.85 | ○ | |
| 10 | 1.0 | | ○ |
| 12 | 1.2 | ○ | |
| 15 | 1.5 | | ○ |
| 20 | 2.0 | ○ | ○ |
| 30 | 3.0 | ○ | |
| 35 | 3.5 | | ○ |
| 42 | 4.2 | ○ | |
| 50 | 5.0 | | ○ |
| 70 | 7.0 | | ○ |

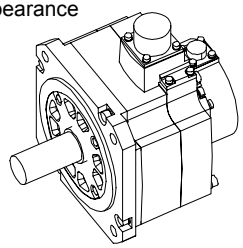
Rated speed

| Symbol | Speed [r/min] |
|---|---|
| 1 | 1000 |
| 2 | 2000 |

Shaft type

| Symbol | Shaft shape |
|---|---|
| None | Standard (straight shaft) |
| K | (Note 1) Keyway shaft (with key) |

Appearance



Reduction gear

| Symbol | Reduction gear |
|---|---|
| None | None |
| G1 | For general industrial machine (flange-mounting) |
| G1H | For general industrial machine (foot-mounting) |
| G5 | Flange-mounting flange output type for precision application |
| G7 | Flange-mounting shaft output type for precision application |

Oil seal

| Symbol | Oil seal |
|---|---|
| None | None |
| (Note 2) J | With |

Electromagnetic brake

| Symbol | Electromagnetic brake |
|---|---|
| None | None |
| B | With |

Note 1. Key is not included.
2. The servo motors with an oil seal are available as optional products. For details, contact your local sales office.

7.2 Combination list of servo motors and servo amplifiers

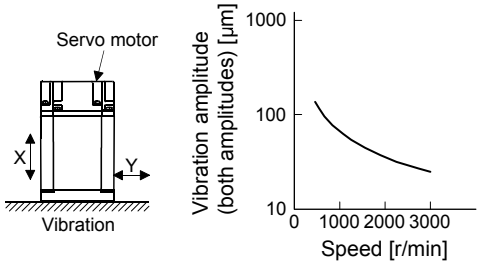
| Servo motor | Servo amplifier | |
|---|---|---|
| | MR-J4 1-axis | MR-J4 2-axis |
| HG-SR51 | MR-J4-60_ | MR-J4W2-77B<br>MR-J4W2-1010B |
| HG-SR81 | MR-J4-100_ | MR-J4W2-1010B |
| HG-SR121 | MR-J4-200_ | |
| HG-SR201 | | |
| HG-SR301 | MR-J4-350_ | |
| HG-SR421 | MR-J4-500_ | |
| HG-SR52 | MR-J4-60_ | MR-J4W2-77B<br>MR-J4W2-1010B |
| HG-SR102 | MR-J4-100_ | MR-J4W2-1010B |
| HG-SR152 | MR-J4-200_ | |
| HG-SR202 | | |
| HG-SR352 | MR-J4-350_ | |
| HG-SR502 | MR-J4-500_ | |
| HG-SR702 | MR-J4-700_ | |

## 7.3 Standard specifications

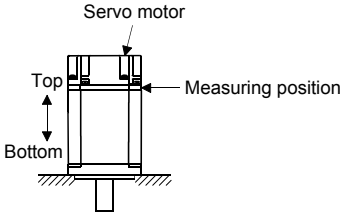
### 7.3.1 Standard specifications list

| Item \ Servo motor | | | HG-SR 1000 r/min series (Compatible with 3-phase 200 V AC, medium inertia/medium capacity) | | | | | | HG-SR 2000 r/min series (Compatible with 3-phase 200 V AC, medium inertia/medium capacity) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 51(B) | 81(B) | 121 (B) | 201 (B) | 301 (B) | 421 (B) | 52(B) | 102 (B) | 152 (B) | 202 (B) | 352 (B) | 502 (B) | 702 (B) |
| Power supply capacity | | | Refer to "Power supply equipment capacity and generated loss of servo amplifiers" in Servo Amplifier Instruction Manual. | | | | | | | | | | | | |
| Continuous running duty (Note 1) | Rated output | [kW] | 0.5 | 0.85 | 1.2 | 2.0 | 3.0 | 4.2 | 0.5 | 1.0 | 1.5 | 2.0 | 3.5 | 5.0 | 7.0 |
| | Rated torque | [N•m] | 4.8 | 8.1 | 11.5 | 19.1 | 28.6 | 40.1 | 2.4 | 4.8 | 7.2 | 9.5 | 16.7 | 23.9 | 33.4 |
| Maximum torque (Note 10) | | [N•m] | 14.3 | 24.4 | 34.4 | 57.3 | 85.9 | 120 | 7.2 | 14.3 | 21.5 | 28.6 | 50.1 | 71.6 | 100 |
| Rated speed (Note 1) | | [r/min] | 1000 | | | | | | 2000 | | | | | | |
| Maximum speed (Note 10) | | [r/min] | 1500 | | | | | | 3000 | | | | | | |
| Instantaneous permissible speed (Note 10) | | [r/min] | 1725 | | | | | | 3450 | | | | | | |
| Power rate at continuous rated torque | Standard | [kW/s] | 19.7 | 41.2 | 28.1 | 46.4 | 82.3 | 107 | 7.85 | 19.7 | 32.1 | 19.5 | 35.5 | 57.2 | 74.0 |
| | With an electromagnetic brake | [kW/s] | 16.5 | 36.2 | 23.2 | 41.4 | 75.3 | 99.9 | 6.01 | 16.5 | 28.2 | 16.1 | 31.7 | 52.3 | 69.4 |
| Rated current | | [A] | 2.8 | 5.2 | 7.1 | 9.4 | 13 | 19 | 2.9 | 5.6 | 9.4 | 9.6 | 14 | 22 | 26 |
| Maximum current | | [A] | 9.0 | 16.6 | 22.7 | 30.1 | 41.6 | 60.8 | 9.0 | 17.4 | 29.1 | 30.7 | 44.8 | 70.4 | 83.2 |
| Moment of inertia J (Note 3) | Standard | [× $10^{-4}$ kg•$m^2$] | 11.6 | 16.0 | 46.8 | 78.6 | 99.7 | 151 | 7.26 | 11.6 | 16.0 | 46.8 | 78.6 | 99.7 | 151 |
| | With an electromagnetic brake | [× $10^{-4}$ kg•$m^2$] | 13.8 | 18.2 | 56.5 | 88.2 | 109 | 161 | 9.48 | 13.8 | 18.2 | 56.5 | 88.2 | 109 | 161 |
| Recommended load to motor inertia ratio (Note 2, 10) | | | 17 times or less | | 15 times or less | | | | 17 times or less | | 15 times or less | | | | |
| Speed/position detector | | | 22-bit encoder common to absolute position/incremental systems (resolution per servo motor revolution: 4194304 pulses/rev) | | | | | | | | | | | | |
| Oil seal | | | None (Note 11) | | | | | | | | | | | | |
| Insulation class | | | 155(F) | | | | | | | | | | | | |
| Structure | | | Totally-enclosed, natural-cooling (IP rating: IP67 (Note 4, 9)) | | | | | | | | | | | | |
| Environment (Note 5) | Ambient temperature | Operation | 0 °C to 40 °C (non-freezing) | | | | | | | | | | | | |
| | | Storage | -15 °C to 70 °C (non-freezing) | | | | | | | | | | | | |
| | Ambient humidity | Operation | 80 %RH or less (non-condensing) | | | | | | | | | | | | |
| | | Storage | 90 %RH or less (non-condensing) | | | | | | | | | | | | |
| | Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt | | | | | | | | | | | | |
| | Altitude | | Max. 1000 m above sea level | | | | | | | | | | | | |
| | Vibration resistance (Note 6) | | X, Y: 24.5 $m/s^2$ | | X: 24.5 $m/s^2$ Y: 49 $m/s^2$ | | X: 24.5 $m/s^2$ Y: 29.4 $m/s^2$ | | X, Y: 24.5 $m/s^2$ | | | X: 24.5 $m/s^2$ Y: 49 $m/s^2$ | | X: 24.5 $m/s^2$ Y: 29.4 $m/s^2$ | |
| Vibration rank (Note 7) | | | V10 | | | | | | | | | | | | |
| Permissible load for the shaft (Note 8) | L | [mm] | 55 | | 79 | | | | 55 | | | 79 | | | |
| | Radial | [N] | 980 | | 2058 | | | | 980 | | | 2058 | | | |
| | Thrust | [N] | 490 | | 980 | | | | 490 | | | 980 | | | |
| Mass (Note 3) | Standard | [kg] | 6.2 | 7.3 | 11 | 16 | 20 | 27 | 4.8 | 6.2 | 7.3 | 11 | 16 | 20 | 27 |
| | With an electromagnetic brake | [kg] | 8.2 | 9.3 | 17 | 22 | 26 | 33 | 6.7 | 8.2 | 9.3 | 17 | 22 | 26 | 33 |

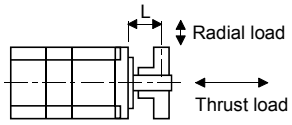
Note 1. When the power supply voltage drops, the output and the rated speed cannot be guaranteed.
2. If the load to motor inertia ratio exceeds the indicated value, contact your local sales office.
3. Refer to the dimensions for the geared servo motor.
4. Except for the shaft-through portion.
5. In the environment where the servo motor is exposed to oil mist, oil, or water, the servo motor of the standard specifications may not be usable. Please contact your local sales office.
6. The following figure shows the vibration directions. The value is the one at the part that indicates the maximum value (normally the opposite to load-side bracket). When the servo motor stops, fretting is likely to occur at the bearing. Therefore, suppress the vibration to about half of the permissible value.




7. V10 indicates that the amplitude of a single servo motor is 10 μm or less. The following figure shows the servo motor mounting position for measurement and the measuring position.




8. The following shows permissible load for the shaft. Do not subject the shaft to load greater than the value in the specifications list. The value assumes that the load is applied independently.




L: Distance from flange mounting surface to load center

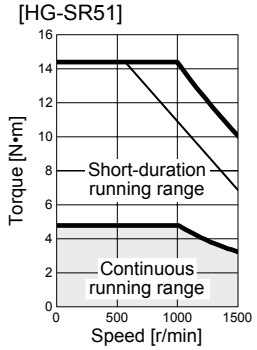
9. For the geared servo motor, the reduction gear area is IP44-equivalent.
10. Refer to section 7.6 for the geared servo motor.
11. The servo motors with an oil seal are available as optional products. For details, contact your local sales office.

### 7.3.2 Torque characteristics

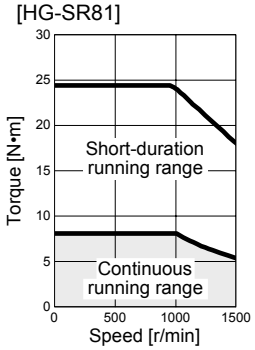
> POINT
>
> ●When unbalanced torque is generated, such as in a vertical lift machine, it is recommended that the unbalanced torque of the machine be kept at 70% or less of the motor's rated torque.

When the power supply input of the servo amplifier are 3-phase 200 V AC or 1-phase 230 V AC, the torque characteristic is indicated by the heavy line. For the 1-phase 200 V AC power supply, part of the torque characteristic is indicated by the thin line. HG-SR51 and HG-SR52 support single-phase power supply.

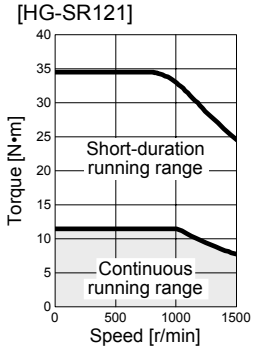
[HG-SR51]



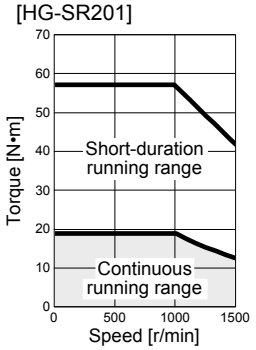

[HG-SR81]



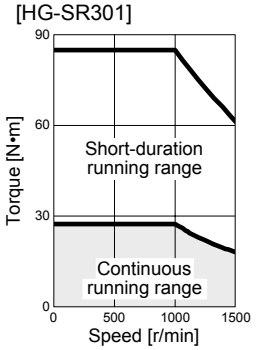

[HG-SR121]



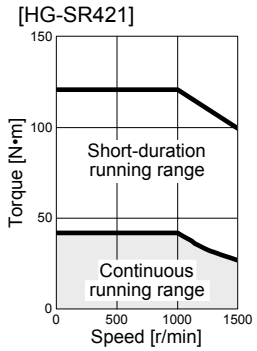

[HG-SR201]



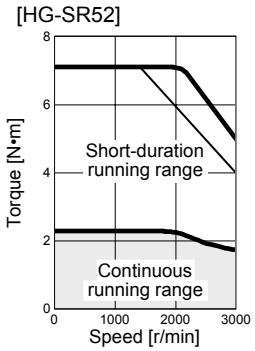

[HG-SR301]



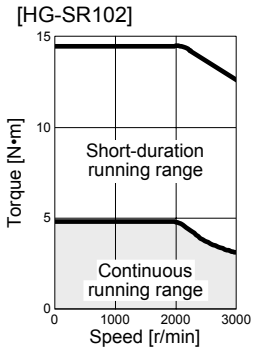

[HG-SR421]



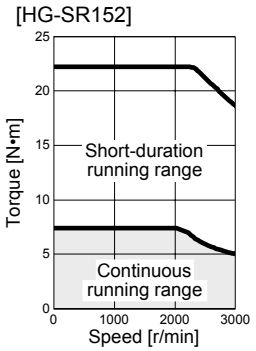

[HG-SR52]



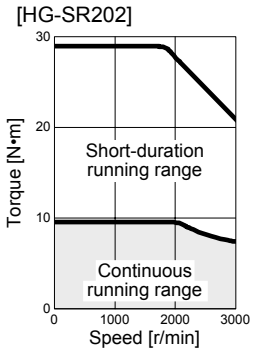

[HG-SR102]



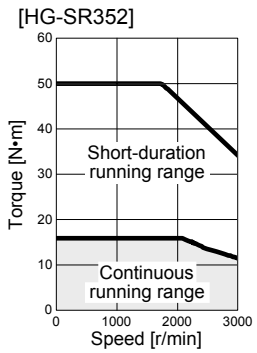

[HG-SR152]



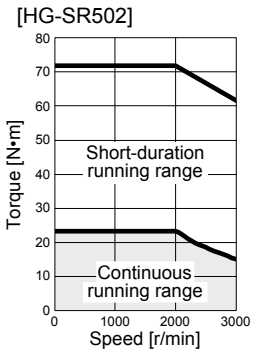

[HG-SR202]



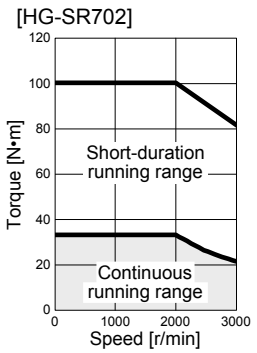

[HG-SR352]




[HG-SR502]




[HG-SR702]



7.4 Electromagnetic brake characteristics

⚠CAUTION

- The electromagnetic brake is provided to prevent a drop at a power failure or servo alarm occurrence during vertical drive or to hold a shaft at a stop. Do not use it for normal braking (including braking at servo-lock).
- Before operating the servo motor, be sure to confirm that the electromagnetic brake operates properly.
- The operation time of the electromagnetic brake differs depending on the power supply circuit you use. Be sure to check the operation delay time with a real machine.

The characteristics of the electromagnetic brake provided for the servo motor with an electromagnetic brake are indicated below.

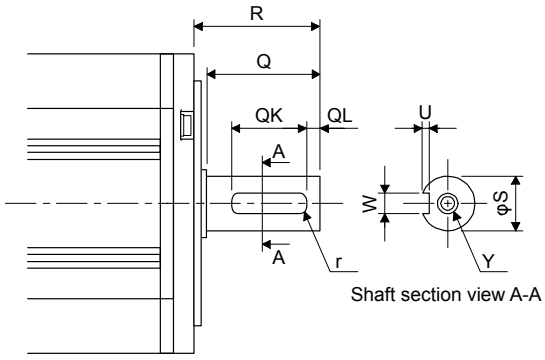
| Item \ Servo amplifier | | HG-SR51B/HG-SR81B/ HG-SR52B/HG-SR102B/ HG-SR152B | HG-SR121B/HG-SR201B/ HG-SR301B/HG-SR421B/ HG-SR202B/HG-SR352B/ HG-SR502B/HG-SR702B |
|---|---|---|---|
| Type (Note 1) | | Spring actuated type safety brake | |
| Rated voltage (Note 4) | | 24 V DC $^{0}_{-10\%}$ | |
| Power consumption [W] at 20 °C | | 20 | 34 |
| Coil resistance (Note 6) [Ω] | | 29.0 | 16.8 |
| Inductance (Note 6) [H] | | 0.80 | 1.10 |
| Brake static friction torque [N•m] | | 8.5 | 44 |
| Release delay time (Note 2) [s] | | 0.04 | 0.1 |
| Braking delay time (Note 2) [s] | DC off | 0.03 | 0.03 |
| Permissible braking work | Per braking [J] | 400 | 4500 |
| | Per hour [J] | 4000 | 45000 |
| Brake looseness at servo motor shaft (Note 5) [degrees] | | 0.2 to 0.6 | 0.2 to 0.6 |
| Brake life (Note 3) | Number of brakings [times] | 20000 | 20000 |
| | Work per braking [J] | 200 | 1000 |
| Selection example of surge absorbers to be used (Note 7, 8) | For the suppressed voltage 125 V | TND20V-680KB | |
| | For the suppressed voltage 350 V | TND10V-221KB | |

Note 1. There is no manual release mechanism. When it is necessary to hand-turn the servo motor shaft for machine centering, etc., use a separate 24 V DC power supply to release the brake electrically.
2. The value for initial on gap at 20 °C.
3. The brake gap will increase as the brake lining wears, but the gap is not adjustable.
The brake life indicated is the number of braking cycles after which adjustment will be required.
4. Always prepare a power supply exclusively used for the electromagnetic brake.
5. These are initial values. These are not guaranteed values.
6. These values are measured values and not guaranteed values.
7. Select the electromagnetic brake control relay properly, considering the characteristics of the electromagnetic brake and surge absorber.
8. Manufactured by Nippon Chemi-Con Corporation.

7.5 Servo motors with special shafts

The servo motors with special shafts indicated by the symbol (K) in the table is available. K is the symbol attached to the servo motor model names.

| Servo motor | Shaft shape |
|---|---|
| | Key shaft (without key) |
| HG-SR_(B)K | K |




Key shaft (without key)

Variable dimension table [Unit: mm]

| Servo motor | Variable dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | S | R | Q | W | QK | QL | U | r | Y |
| HG-SR51(B)K/ HG-SR81(B)K/ HG-SR52(B)K/ HG-SR102(B)K/ HG-SR152(B)K | 24h6 | 55 | 50 | $8^{0}_{-0.036}$ | 36 | 5 | $4^{+0.2}_{0}$ | 4 | M8 Screw hole depth 20 |
| HG-SR121(B)K/ HG-SR201(B)K/ HG-SR301(B)K/ HG-SR421(B)K/ HG-SR202(B)K/ HG-SR352(B)K/ HG-SR502(B)K/ HG-SR702(B)K | $35^{+0.010}_{0}$ | 79 | 75 | $10^{0}_{-0.036}$ | 55 | 5 | $5^{+0.2}_{0}$ | 5 | M8 Screw hole depth 20 |

## 7.6 Geared servo motors

> **⚠CAUTION**
> - Geared servo motors must be mounted in the specified direction. Otherwise, it can leak oil, leading to a fire or malfunction.
> - For the geared servo motor, transport it in the same status as in the installation method. Tipping it over can cause oil leakage.

Servo motors are available with a reducer designed for general industrial machines compliant and precision applications compliant.
Servo motors with an electromagnetic brake are also available.

### 7.6.1 For general industrial machines compliant (G1/G1H)

(1) Reduction ratio

The following table indicates the reduction ratios and reducer frame numbers of the geared servo motor for general industrial machines compliant.

| Servo motor | Reduction ratio | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1/6 | 1/11 | 1/17 | 1/29 | 1/35 | 1/43 | 1/59 |
| HG-SR52(B)G1(H) | 6100 | | | | 6120 | | |
| HG-SR102(B)G1(H) | 6120 | | | | | 6130 | 6160 |
| HG-SR152(B)G1(H) | 6120 | | | 6130 | | 6160 | |
| HG-SR202(B)G1(H) | 6120 | | | 6165 | | | |
| HG-SR352(B)G1(H) | 6135 | | | 6165 | | 6175 | |
| HG-SR502(B)G1(H) | 6165 | | | 6180 | | | 6185 |
| HG-SR702(B)G1(H) | 6165 | 6170 | | 6180 | | 6195 | |

(2) Specifications

| Item | | Description |
|---|---|---|
| Mounting method | | Refer to (2) (b) in this section. |
| Mounting direction | | Refer to (2) (b) in this section. |
| Lubrication method | | Refer to (2) (b)/(c) in this section. |
| | Recommended products (Note 1) | Refer to (2) (c) in this section. |
| Output shaft rotating direction | | Opposite direction to the servo motor output shaft |
| Backlash (Note 5) | | 40 minutes to 2 ° at reducer output shaft (Note 4) |
| Permissible load inertia moment ratio (when converting into the servo motor shaft) (Note 2) | | 4 times or less |
| Maximum torque | | Three times of the servo motor rated torque |
| Maximum speed (servo motor shaft) | | Refer to (2) (a) in this section. |
| IP rating (reducer area) | | IP44 equivalent |
| Reducer efficiency (Note 3) | | 85% to 94% |

Note 1. Already packed with grease.
2. If the above indicated value is exceeded, please contact your local sales office.
3. The reducer efficiency differs depending on the reduction ratio. Also, it changes depending on the operating conditions such as the output torque, speed and rotation, temperature, etc. The numerical value in the table is a typical value in the rated torque, rated speed and rotation and typical temperature, and not a guaranteed value.
4. These values are design values and not guaranteed values.
5. The backlash can be converted: 1 min = 0.0167 °

(a) Maximum speed

| Servo motor | Reduction ratio | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1/6 | 1/11 | 1/17 | 1/29 | 1/35 | 1/43 | 1/59 |
| HG-SR52(B)G1(H) | | | | | | | |
| HG-SR102(B)G1(H) | | 3000 r/min (permissible instantaneous speed: 3450 r/min) | | | | | |
| HG-SR152(B)G1(H) | | | | | | | |
| HG-SR202(B)G1(H) | | | | | | | |
| HG-SR352(B)G1(H) | | | | 2000 r/min (permissible instantaneous speed: 2300 r/min) | | | |
| HG-SR502(B)G1(H) | | | | | | | |
| HG-SR702(B)G1(H) | | | | | | | |

(b) Lubrication method and mounting direction

Oil lubrication cannot be used in applications where the servo motor will move. Specify grease lubrication.

For grease lubrication, the reducer is already grease-packed. For oil lubrication, pack the reducer with oil on the customer side.

| Mounting direction | Shaft any direction | | Shaft horizontal | | Shaft downward | | Shaft upward | |
|---|---|---|---|---|---|---|---|---|
| Reducer model | CNHM | CNVM | CHHM | CHVM | CVHM | CVVM | CWHM | CWVM |
| Reducer frame No. | (Foot-mounting) | (Flange-mounting) | (Foot-mounting) | (Flange-mounting) | (Foot-mounting) | (Flange-mounting) | (Foot-mounting) | (Flange-mounting) |
| 6100 | Grease | Grease | | | | | | |
| 6120 | Grease | Grease | | | | | | |
| 6130/6135 | | | (Note) Oil | (Note) Oil | (Note) Oil | (Note) Oil | Grease | Grease |
| 6160/6165 | | | (Note) Oil | (Note) Oil | (Note) Oil | (Note) Oil | Grease | Grease |
| 6170/6175 | | | Oil | Oil | Oil | Oil | | |
| 6180/6185 | | | Oil | Oil | Oil | Oil | | |
| 6195 | | | Oil | Oil | Oil | Oil | | |

Note. Grease-lubricated type is also available as optional products.

(c) Recommended lubricants

1) Grease

Albania Grease RA (Shell)

2) Lubricating oil

| POINT |
|---|
| ●Since the oil-lubricated models are shipped without oil, make sure to fill oil up to the upper red line of the oil gauge before operation. |

| Ambient temperature [°C] | COSMO OIL | JX Nippon Oil & Energy | Idemitsu Kosan | Shell | Esso | Exxon Mobil | Japan Energy |
|---|---|---|---|---|---|---|---|
| -10 to 5 | COSMO GEAR SE68 | BONNOC M68 DIAMOND GEAR LUBE SP68 | DAPHNE SUPER GEAR OIL 68 | Omala Oils 68 | SPARTAN EP68 | Mobilgear 626 (ISOVG68) | JOMO Reductus 68 |
| 0 to 35 | COSMO GEAR SE100/150 | BONNOC M100/150 DIAMOND GEAR LUBE SP100/150 | DAPHNE SUPER GEAR OIL 100/150 | Omala Oils 100/150 | SPARTAN EP100/150 | Mobilgear 627/629 (ISOVG100/150) | JOMO Reductus 100/150 |
| 30 to 50 | COSMO GEAR SE200/320/460 | BONNOC M200 to 460 DIAMOND GEAR LUBE SP220 to 460 | | Omala Oils 200 to 460 | SPARTAN EP220 to 460 | Mobilgear 630 to 634 (ISOVG220 to 460) | JOMO Reductus 200 to 460 |

Lubricating oil fill amount

| Reducer frame No. | Fill amount [L] | |
|---|---|---|
| | Horizontal type | Vertical type |
| 6130/6135 | 0.7 | 1.1 |
| 6160/6165 | 1.4 | 1.0 |
| 6170/6175 | 1.9 | 1.9 |
| 6180/6185 | 2.5 | 2.0 |
| 6195 | 4.0 | 2.7 |

(b) Changing intervals

1) Grease

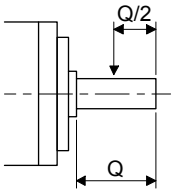
Maintenance-free. (Limited to the case where the grease-lubricated type is standard)

2) Lubricating oil

| Changing intervals | Operation hours per day | |
|---|---|---|
| | Less than 10 hours | 10 hours to 24 hours |
| First time | 500 hours | |
| Second time and later | Half year | 2500 hours |

(3) Permissible loads of servo motor shaft

The permissible radial load in the table is the value measured at the center of the reducer output shaft.




Q: Length of axis (Refer to section 7.7.3 to 7.7.6.)

| Servo motor | Reduction ratio | Reducer frame No. | Permissible load (Note) | |
|---|---|---|---|---|
| | | | Permissible radial load [N] | Permissible thrust load [N] |
| HG-SR52(B)G1(H) | 1/6 | 6100 | 2058 | 1470 |
| | 1/11 | | 2391 | 1470 |
| | 1/17 | | 2832 | 1470 |
| | 1/29 | | 3273 | 1470 |
| | 1/35 | 6120 | 5253 | 2940 |
| | 1/43 | | 5253 | 2940 |
| | 1/59 | | 5880 | 2940 |
| HG-SR102(B)G1(H) | 1/6 | 6120 | 2842 | 2352 |
| | 1/11 | | 3273 | 2764 |
| | 1/17 | | 3646 | 2940 |
| | 1/29 | | 4410 | 2940 |
| | 1/35 | | 5253 | 2940 |
| | 1/43 | 6130 | 6047 | 3920 |
| | 1/59 | 6160 | 9741 | 6860 |
| HG-SR152(B)G1(H) | 1/6 | 6120 | 2842 | 2352 |
| | 1/11 | | 3273 | 2764 |
| | 1/17 | | 3646 | 2940 |
| | 1/29 | 6130 | 5135 | 3920 |
| | 1/35 | | 6047 | 3920 |
| | 1/43 | 6160 | 8555 | 6860 |
| | 1/59 | | 9741 | 6860 |
| HG-SR202(B)G1(H) | 1/6 | 6120 | 2842 | 2352 |
| | 1/11 | | 3273 | 2764 |
| | 1/17 | | 3646 | 2940 |
| | 1/29 | 6165 | 7291 | 6860 |
| | 1/35 | | 8555 | 6860 |
| | 1/43 | | 8555 | 6860 |
| | 1/59 | | 9741 | 6860 |

| Servo motor | Reduction ratio | Reducer frame No. | Permissible load (Note) | |
|---|---|---|---|---|
| | | | Permissible radial load [N] | Permissible thrust load [N] |
| HG-SR352(B)G1(H) | 1/6 | 6135 | 3332 | 3920 |
| | 1/11 | | 3871 | 3920 |
| | 1/17 | | 4420 | 3920 |
| | 1/29 | 6165 | 7291 | 6860 |
| | 1/35 | | 8555 | 6860 |
| | 1/43 | 6175 | 11662 | 9800 |
| | 1/59 | | 13132 | 9800 |
| HG-SR502(B)G1(H) | 1/6 | 6165 | 5448 | 5000 |
| | 1/11 | | 5488 | 6292 |
| | 1/17 | | 6468 | 6860 |
| | 1/29 | 6180 | 13426 | 13720 |
| | 1/35 | | 16072 | 13720 |
| | 1/43 | | 16072 | 13720 |
| | 1/59 | 6185 | 16072 | 13720 |
| HG-SR702(B)G1(H) | 1/6 | 6165 | 7526 | 5000 |
| | 1/11 | 6170 | 7526 | 8085 |
| | 1/17 | | 8683 | 9673 |
| | 1/29 | 6180 | 13426 | 13720 |
| | 1/35 | | 16072 | 13720 |
| | 1/43 | 6195 | 22540 | 19600 |
| | 1/59 | | 22540 | 19600 |

Note. Do not subject the shaft to load greater than the value.

The value in the table assumes that the load is applied independently.

7.6.2 For precision applications compliant (G5/G7)

(1) Reduction ratio

The symbols (20A, 30A, 50A) in the following table indicate the model numbers of the reduction gears assembled to the servo motors. Geared servo motors having the indicated reducer model numbers are available. The reducer model number indicates _ _ _ of the reducer model HPG-_ _ _-05.

| Servo motor | Reduction ratio | | | | |
|---|---|---|---|---|---|
| | 1/5 | 1/11 | 1/21 | 1/33 | 1/45 |
| HG-SR52(B)G5<br>HG-SR52(B)G7 | 20A | | 32A | | |
| HG-SR102(B)G5<br>HG-SR102(B)G7 | 20A | 32A | | 50A | |
| HG-SR152(B)G5<br>HG-SR152(B)G7 | 20A | 32A | 50A | | |
| HG-SR202(B)G5<br>HG-SR202(B)G7 | 32A | | 50A | | |
| HG-SR352(B)G5<br>HG-SR352(B)G7 | 32A | 50A | | | |
| HG-SR502(B)G5<br>HG-SR502(B)G7 | 50A | | | | |
| HG-SR702(B)G5<br>HG-SR702(B)G7 | 50A | | | | |

(2) Specifications

| Item | | Description |
|---|---|---|
| Mounting method | | Flange mounting |
| Mounting direction | | In any directions |
| Lubrication method | | Grease lubrication (already packed) |
| | Packed with | Reducer model number 20A, 32A: Harmonic grease SK-2 (Harmonic Drive Systems)<br>Reducer model number 50A: Epiknock grease AP(N)2 (JX Nippon Oil & Energy) |
| Output shaft rotating direction | | Same as the servo motor output shaft direction. |
| Backlash (Note 3) | | 3 minutes or less at reducer output shaft |
| Permissible load to motor inertia ratio (when converting into the servo motor shaft) (Note 1) | | 10 times or less |
| Maximum torque | | Three times of the servo motor rated torque |
| Maximum speed (servo motor shaft) | | 3000 r/min (permissible instantaneous speed: 3450 r/min) |
| IP rating (reducer area) | | IP44 equivalent |
| Reducer efficiency (Note 2) | | 77% to 92% |

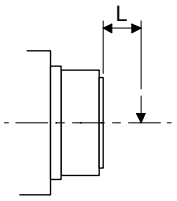
Note 1. If the above indicated value is exceeded, please contact your local sales office.

2. The reducer efficiency differs depending on the reduction ratio. Also, it changes depending on the operating conditions such as the output torque, speed and rotation, temperature, etc. The numerical value in the table is a typical value in the rated torque, rated speed and rotation and typical temperature, and not a guaranteed value.

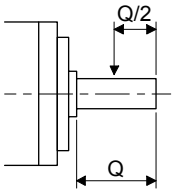
3. The backlash can be converted: 1 min = 0.0167 °

(3) Permissible loads of servo motor shaft

The radial load point of a precision reducer is as shown below.




L: Distance between reduction gear end face and load center




Q: Length of axis (Refer to section 7.7.9, 7.7.10.)

Flange-mounting flange output type for precision application (G5)

Flange-mounting shaft output type for precision application (G7)

| Servo motor | Reduction ratio | Reducer model number | Radial load point L [mm] | Permissible load (Note) | |
|---|---|---|---|---|---|
| | | | | Permissible radial load [N] | Permissible thrust load [N] |
| HG-SR52(B)G5 HG-SR52(B)G7 | 1/5 | 20A | 32 | 416 | 1465 |
| | 1/11 | | 32 | 527 | 1856 |
| | 1/21 | 32A | 57 | 1094 | 4359 |
| | 1/33 | | 57 | 1252 | 4992 |
| | 1/45 | | 57 | 1374 | 5478 |
| HG-SR102(B)G5 HG-SR102(B)G7 | 1/5 | 20A | 32 | 416 | 1465 |
| | 1/11 | 32A | 57 | 901 | 3590 |
| | 1/21 | | 57 | 1094 | 4359 |
| | 1/33 | 50A | 62 | 2929 | 10130 |
| | 1/45 | | 62 | 3215 | 11117 |
| HG-SR152(B)G5 HG-SR152(B)G7 | 1/5 | 20A | 32 | 416 | 1465 |
| | 1/11 | 32A | 57 | 901 | 3590 |
| | 1/21 | 50A | 62 | 2558 | 8845 |
| | 1/33 | | 62 | 2929 | 10130 |
| | 1/45 | | 62 | 3215 | 11117 |
| HG-SR202(B)G5 HG-SR202(B)G7 | 1/5 | 32A | 57 | 711 | 2834 |
| | 1/11 | | 57 | 901 | 3590 |
| | 1/21 | 50A | 62 | 2558 | 8845 |
| | 1/33 | | 62 | 2929 | 10130 |
| | 1/45 | | 62 | 3215 | 11117 |
| HG-SR352(B)G5 HG-SR352(B)G7 | 1/5 | 32A | 57 | 711 | 2834 |
| | 1/11 | 50A | 62 | 2107 | 7285 |
| | 1/21 | | 62 | 2558 | 8845 |
| HG-SR502(B)G5 HG-SR502(B)G7 | 1/5 | 50A | 62 | 1663 | 5751 |
| | 1/11 | | 62 | 2107 | 7285 |
| HG-SR702(B)G5 HG-SR702(B)G7 | 1/5 | 50A | 62 | 1663 | 5751 |

Note. Do not subject the shaft to load greater than the value.

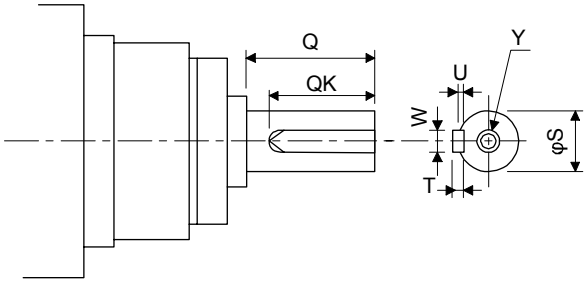
The value in the table assumes that the load is applied independently.

(4) Servo motor with special shaft

Servo motors with special shafts having keyway (with single pointed keys) are available for the flange-mounting shaft output type for precision applications compliant (G7).

[Unit: mm]

| Servo motor | Reducer model number | Q | φS | W | T | QK | U | Y |
|---|---|---|---|---|---|---|---|---|
| HG-SR_(B)G7K | 20A | 42 | 25h7 | 8 | 7 | 36 | 4 | M6 screw hole depth 12 |
| | 32A | 82 | 40h7 | 12 | 8 | 70 | 5 | M10 screw hole depth 20 |
| | 50A | 82 | 50h7 | 14 | 9 | 70 | 5.5 | |



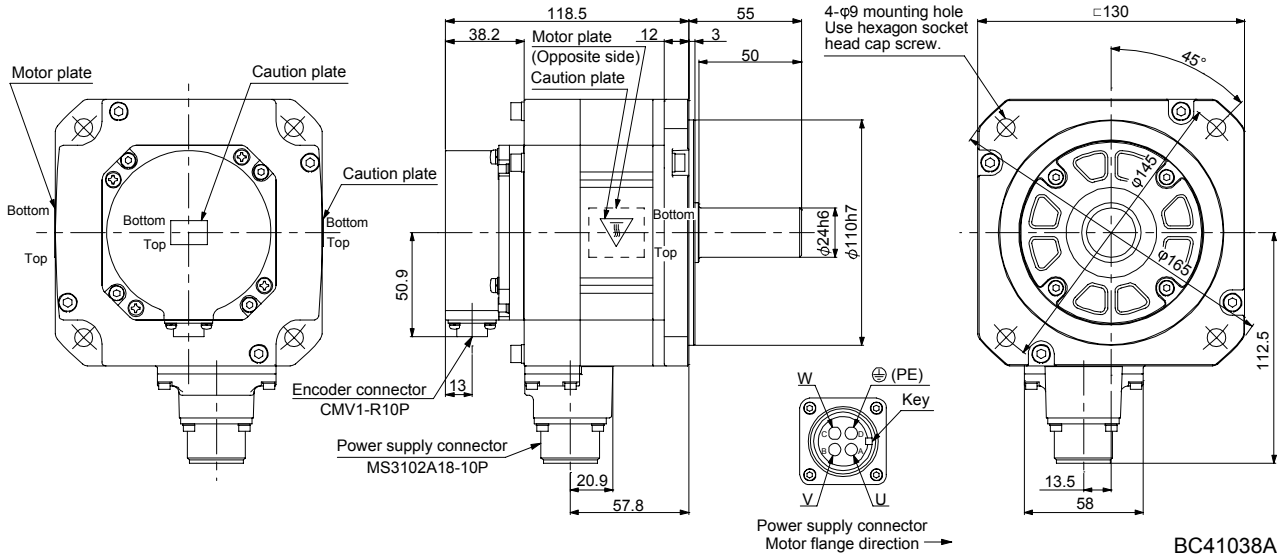
## 7.7 Dimensions

Moment of inertia on the table is the value calculated by converting the total value of moment of inertia for servo motor, reducer, and electromagnetic brake with servo motor shaft.
The dimensions without tolerances are general tolerance.
The outer frame of the reducer is a material surface such as casting. Its actual dimensions may be 1 mm to 3 mm larger than the drawing dimensions. Design the machine-side with allowances.

### 7.7.1 Standard (without an electromagnetic brake, without a reducer)

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR52 | 0.5 | 7.26 | 4.8 |

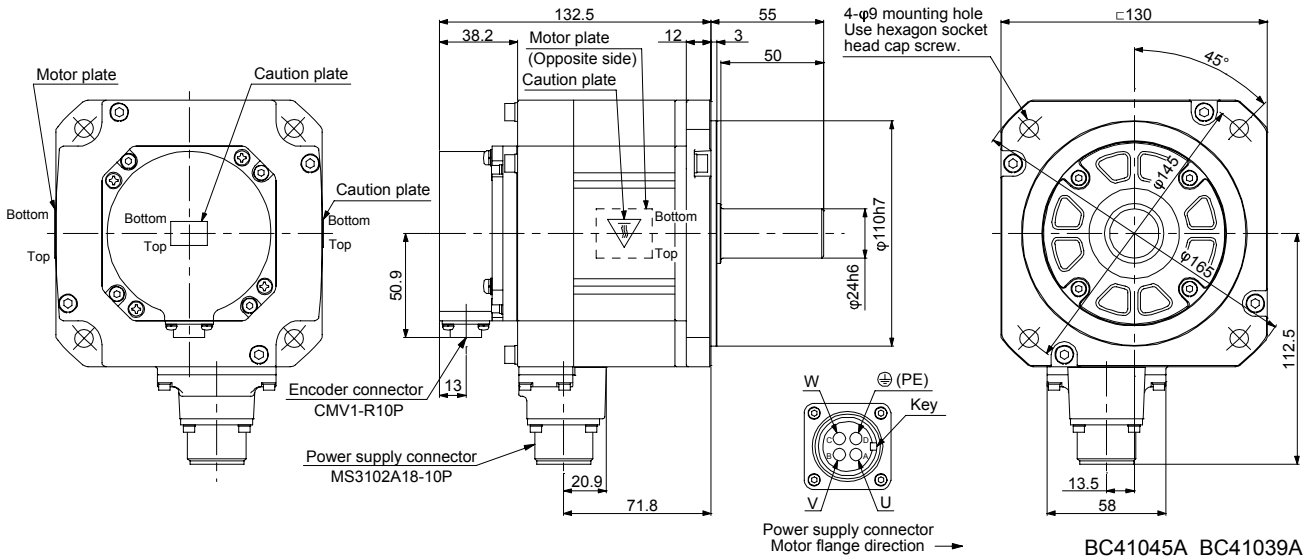
[Unit: mm]




BC41038A

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR51 | 0.5 | 11.6 | 6.2 |
| HG-SR102 | 1.0 | 11.6 | 6.2 |

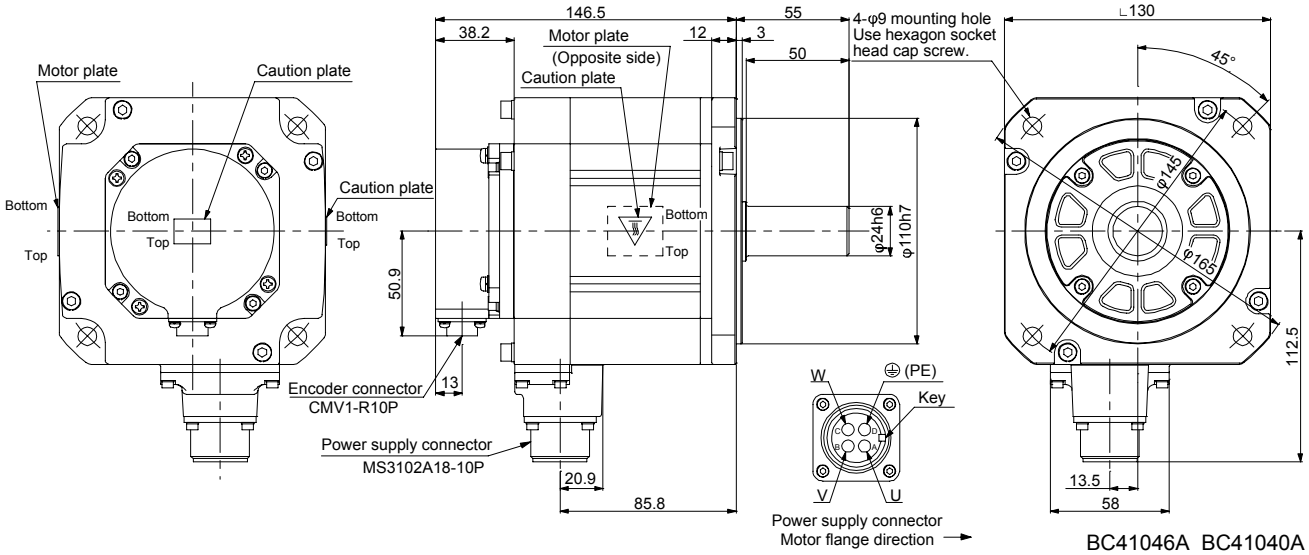
[Unit: mm]




BC41045A BC41039A

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR81 | 0.85 | 16.0 | 7.3 |
| HG-SR152 | 1.5 | 16.0 | 7.3 |

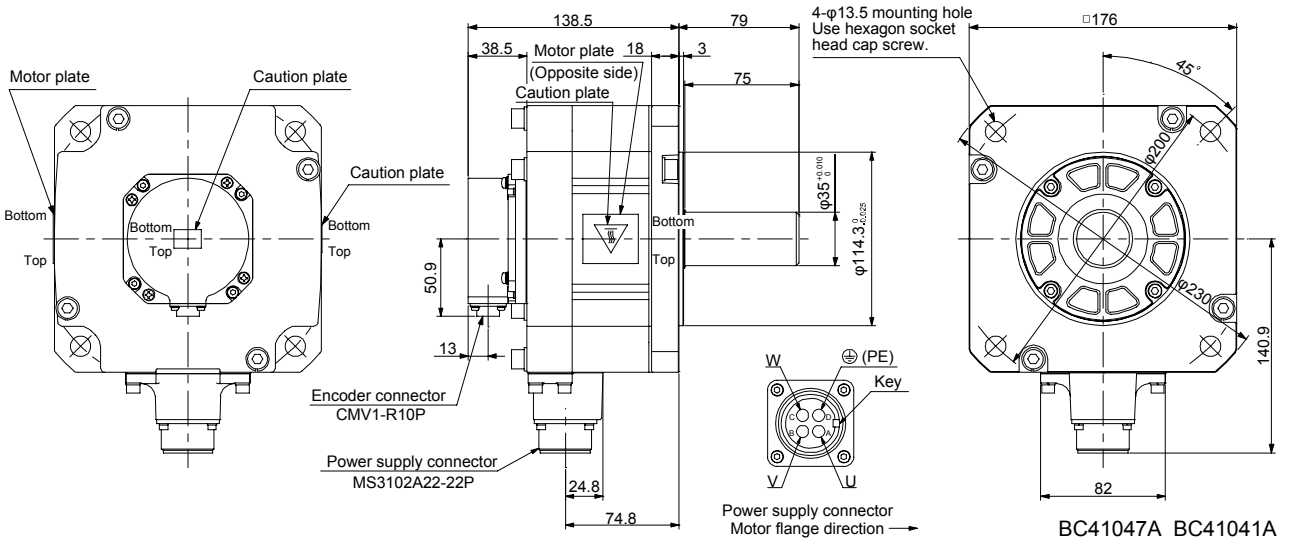
[Unit: mm]




BC41046A BC41040A

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR121 | 1.2 | 46.8 | 11 |
| HG-SR202 | 2.0 | 46.8 | 11 |

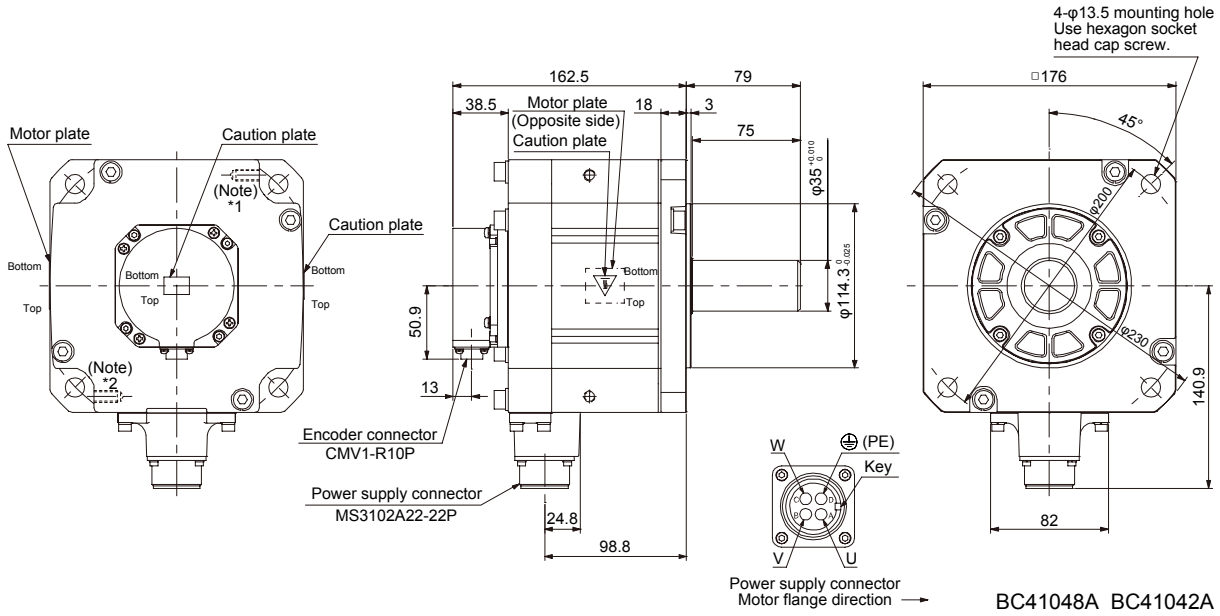
[Unit: mm]




BC41047A BC41041A

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR201 | 2.0 | 78.6 | 16 |
| HG-SR352 | 3.5 | 78.6 | 16 |

[Unit: mm]

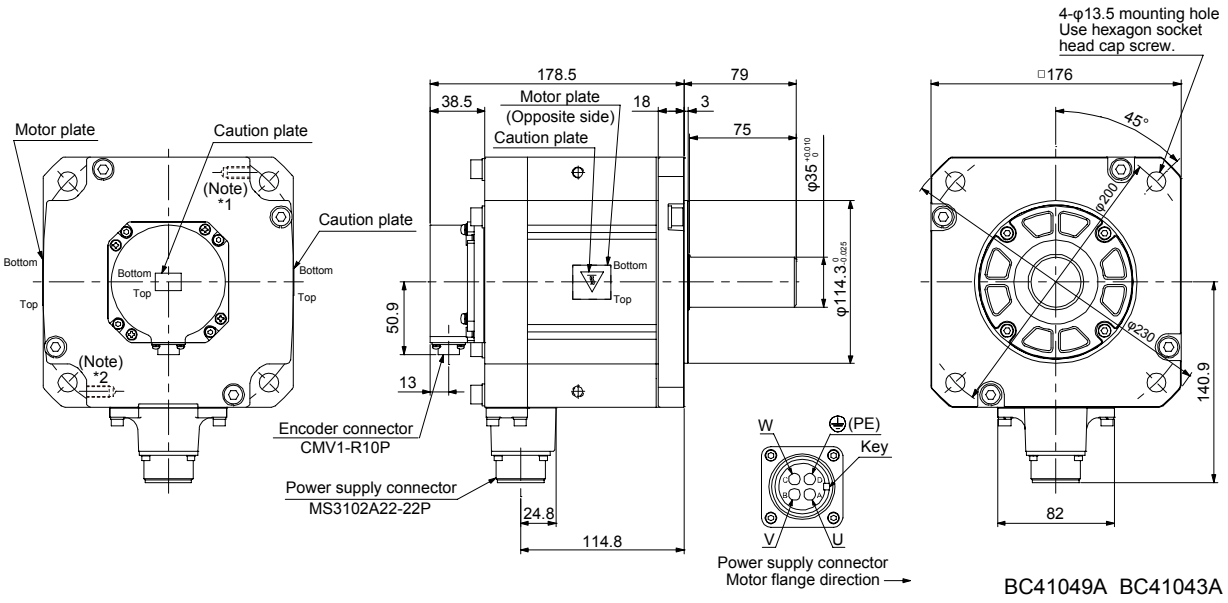



BC41048A BC41042A

Note. *1 and *2 are screw hole for eyebolt (M8).

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR301 | 3.0 | 99.7 | 20 |
| HG-SR502 | 5.0 | 99.7 | 20 |

[Unit: mm]

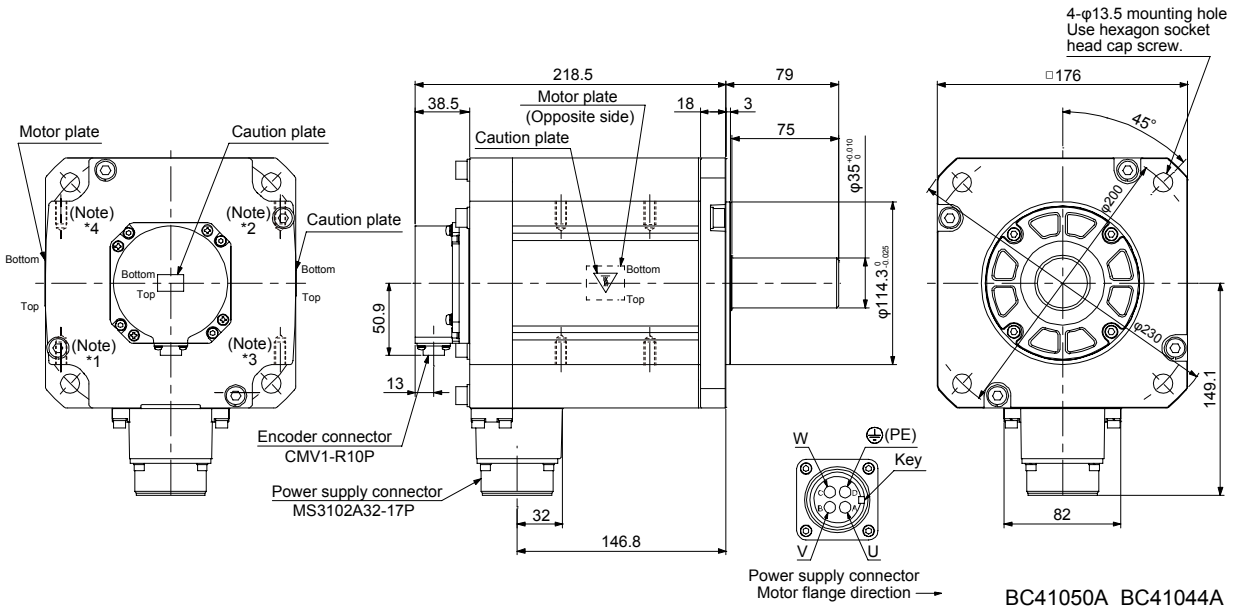



BC41049A BC41043A

Note. *1 and *2 are screw hole for eyebolt (M8).

| Model | Output [kW] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|
| HG-SR421 | 4.2 | 151 | 27 |
| HG-SR702 | 7.0 | 151 | 27 |

[Unit: mm]



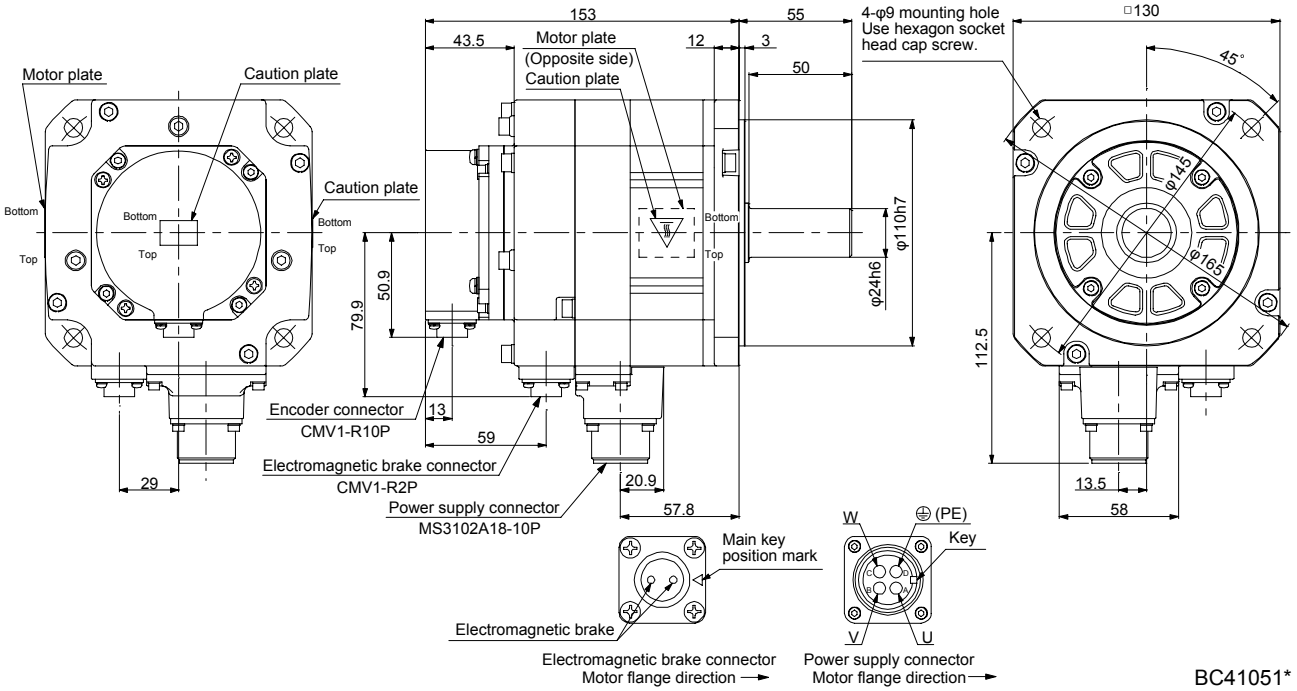

BC41050A BC41044A

Note. *1, *2, *3 and *4 are screw hole for eyebolt (M8).

### 7.7.2 With an electromagnetic brake

| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR52B | 0.5 | 8.5 | 9.48 | 6.7 |

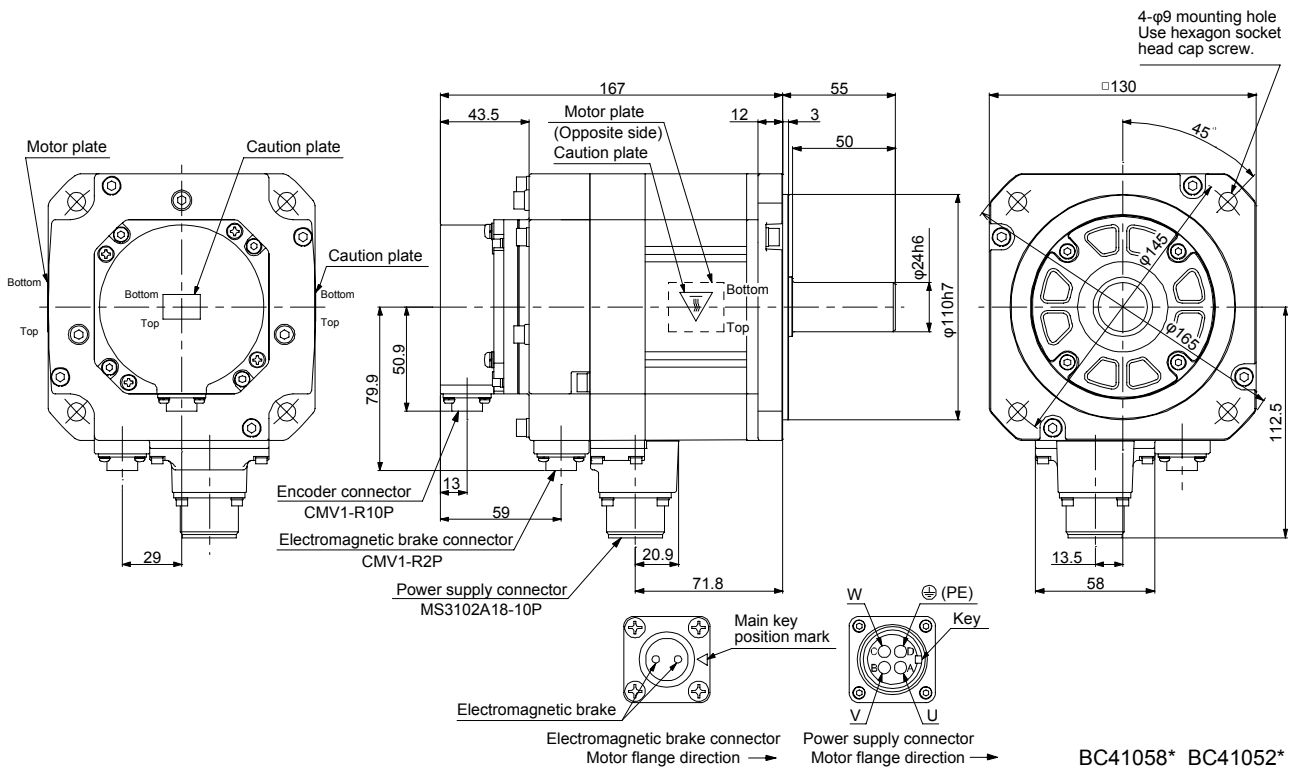
[Unit: mm]




BC41051*

| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR51B | 0.5 | 8.5 | 13.8 | 8.2 |
| HG-SR102B | 1.0 | 8.5 | 13.8 | 8.2 |

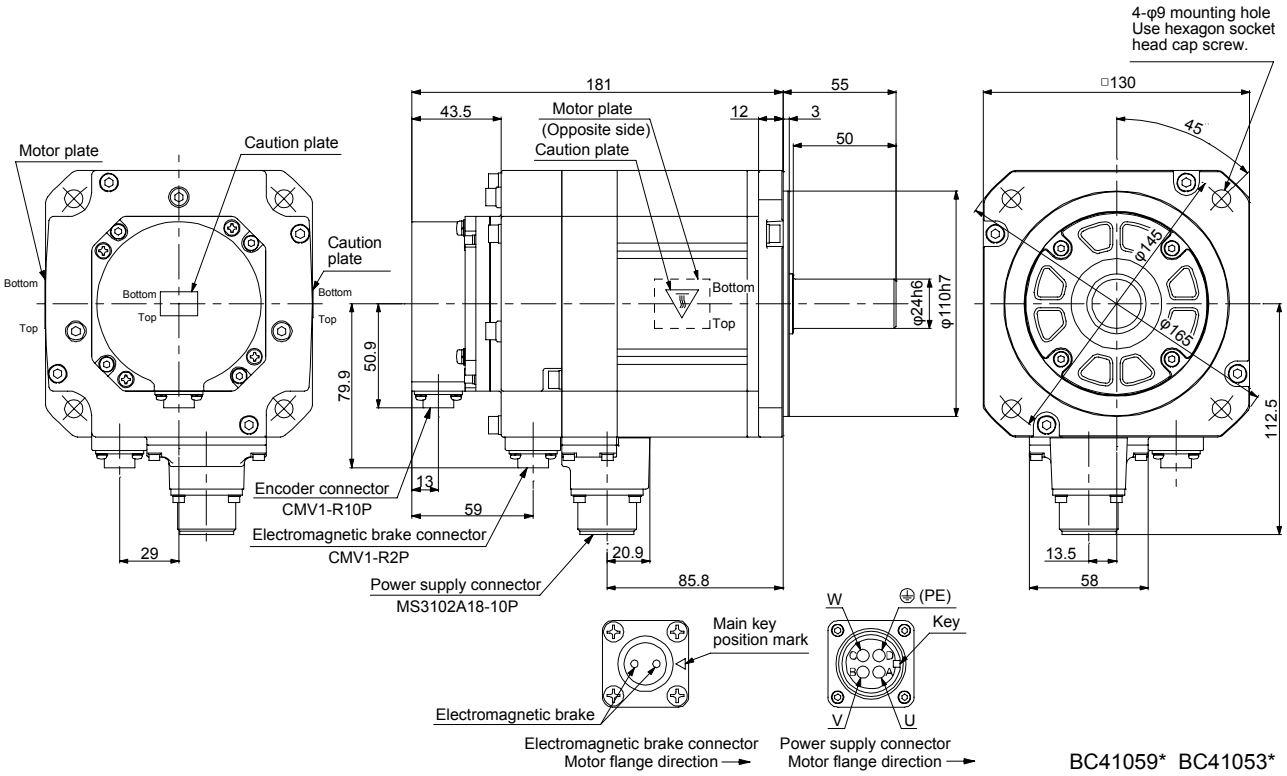
[Unit: mm]




BC41058* BC41052*

| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR81B | 0.85 | 8.5 | 18.2 | 9.3 |
| HG-SR152B | 1.5 | 8.5 | 18.2 | 9.3 |

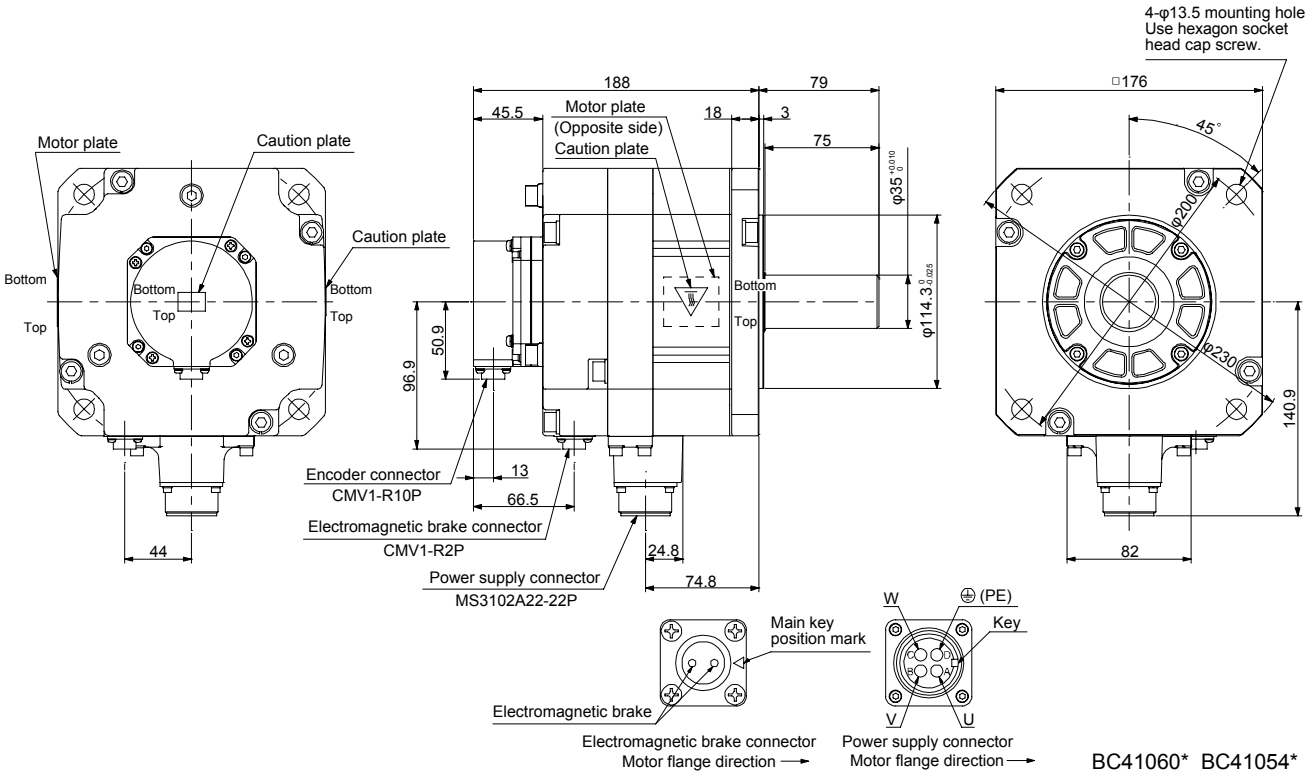
[Unit: mm]




BC41059* BC41053*

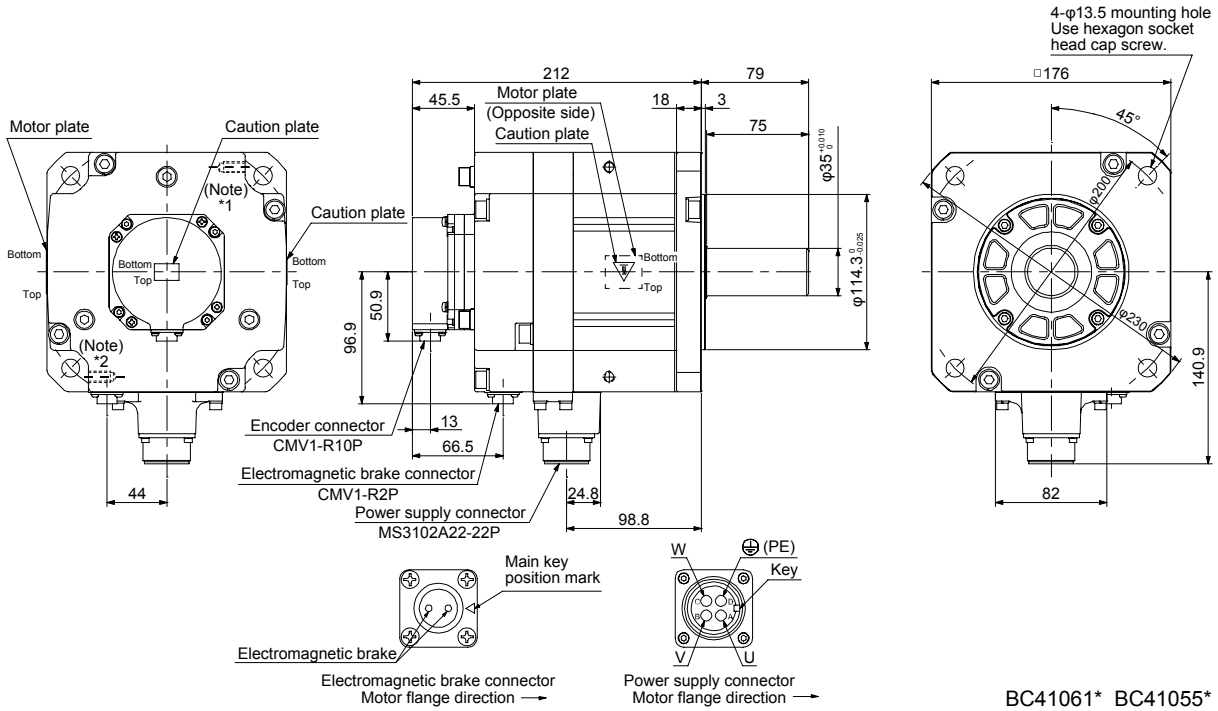
| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR121B | 1.2 | 44 | 56.5 | 17 |
| HG-SR202B | 2.0 | 44 | 56.5 | 17 |

[Unit: mm]



| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR201B | 2.0 | 44 | 88.2 | 22 |
| HG-SR352B | 3.5 | 44 | 88.2 | 22 |

[Unit: mm]

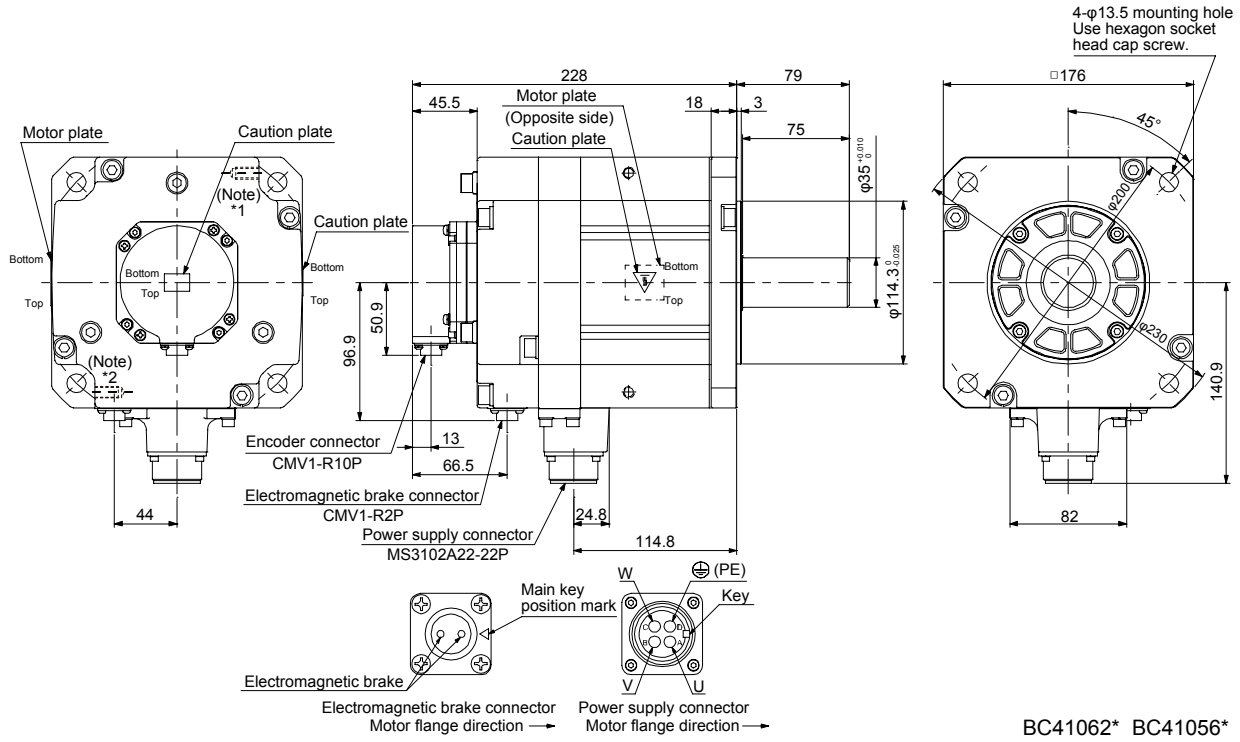



BC41061* BC41055*

Note. *1 and *2 are screw hole for eyebolt (M8).

| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR301B | 3.0 | 44 | 109 | 26 |
| HG-SR502B | 5.0 | 44 | 109 | 26 |

[Unit: mm]

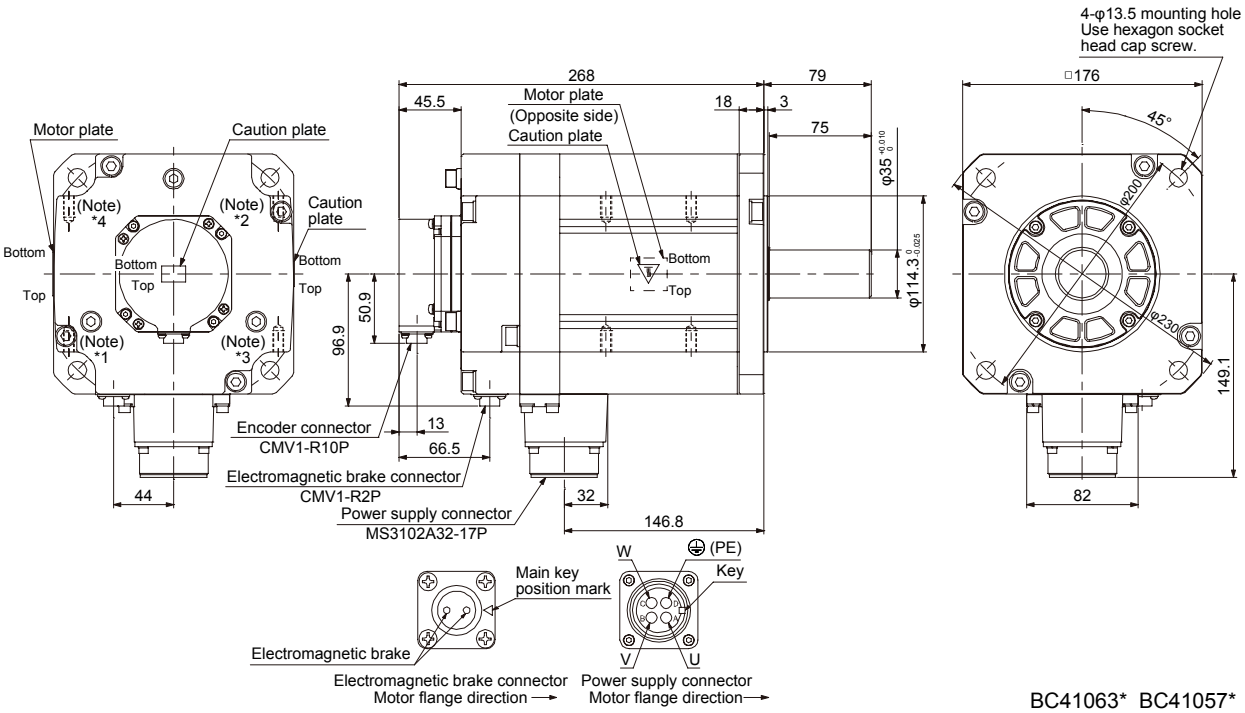



BC41062* BC41056*

Note. *1 and *2 are screw hole for eyebolt (M8).

| Model | Output [kW] | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|
| HG-SR421B | 4.2 | 44 | 161 | 33 |
| HG-SR702B | 7.0 | 44 | 161 | 33 |

[Unit: mm]



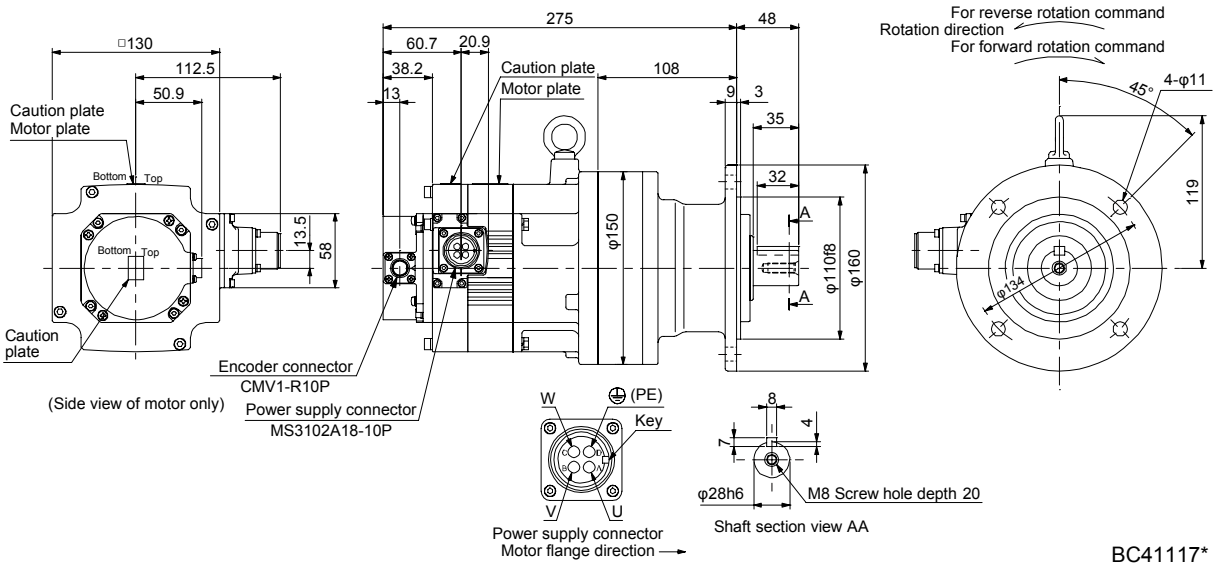

BC41063* BC41057*

Note. *1, *2, *3 and *4 are screw hole for eyebolt (M8).

### 7.7.3 For general industrial machine with a reducer (without an electromagnetic brake)

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G1 | 0.5 | CNVM-6100 | 1/6 | 8.08 | 18 |
| HG-SR52G1 | 0.5 | | 1/11 | 7.65 | 18 |
| HG-SR52G1 | 0.5 | | 1/17 | 7.53 | 18 |
| HG-SR52G1 | 0.5 | | 1/29 | 7.47 | 18 |

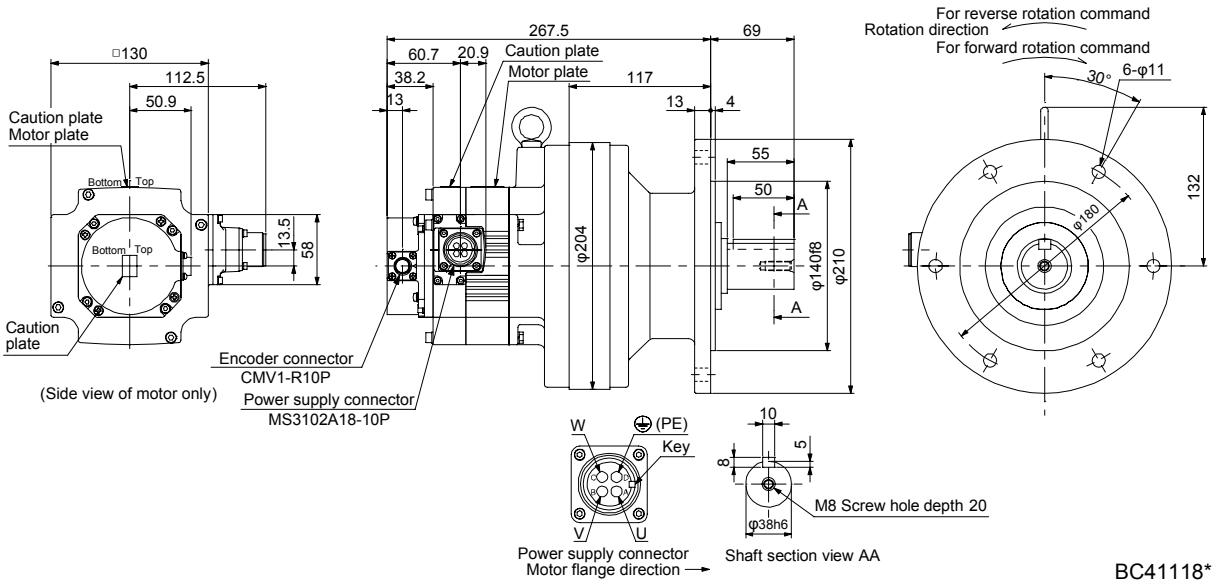
[Unit: mm]




BC41117*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G1 | 0.5 | CNVM-6120 | 1/35 | 8.26 | 27 |
| HG-SR52G1 | 0.5 | | 1/43 | 8.22 | 27 |
| HG-SR52G1 | 0.5 | | 1/59 | 8.18 | 27 |

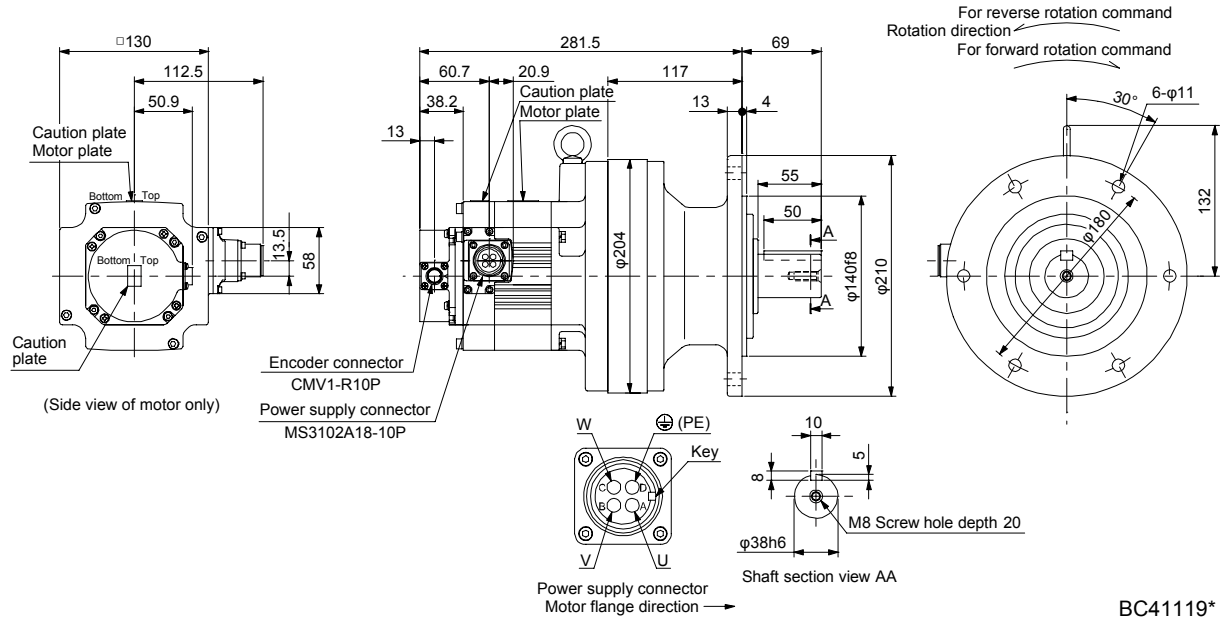
[Unit: mm]




BC41118*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1 | 1.0 | CNVM-6120 | 1/6 | 14.8 | 30 |
| HG-SR102G1 | 1.0 | | 1/11 | 13.3 | 30 |
| HG-SR102G1 | 1.0 | | 1/17 | 12.9 | 30 |
| HG-SR102G1 | 1.0 | | 1/29 | 12.6 | 30 |
| HG-SR102G1 | 1.0 | | 1/35 | 12.6 | 30 |

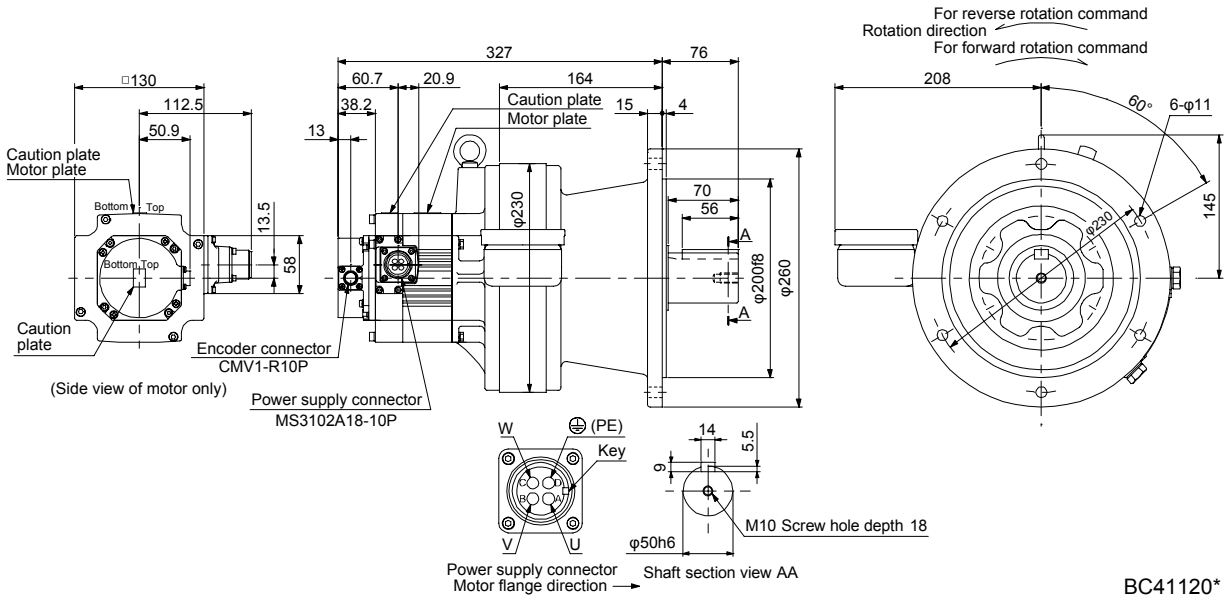
[Unit: mm]




BC41119*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1 | 1.0 | CHVM-6130 | 1/43 | 13.8 | 49 |

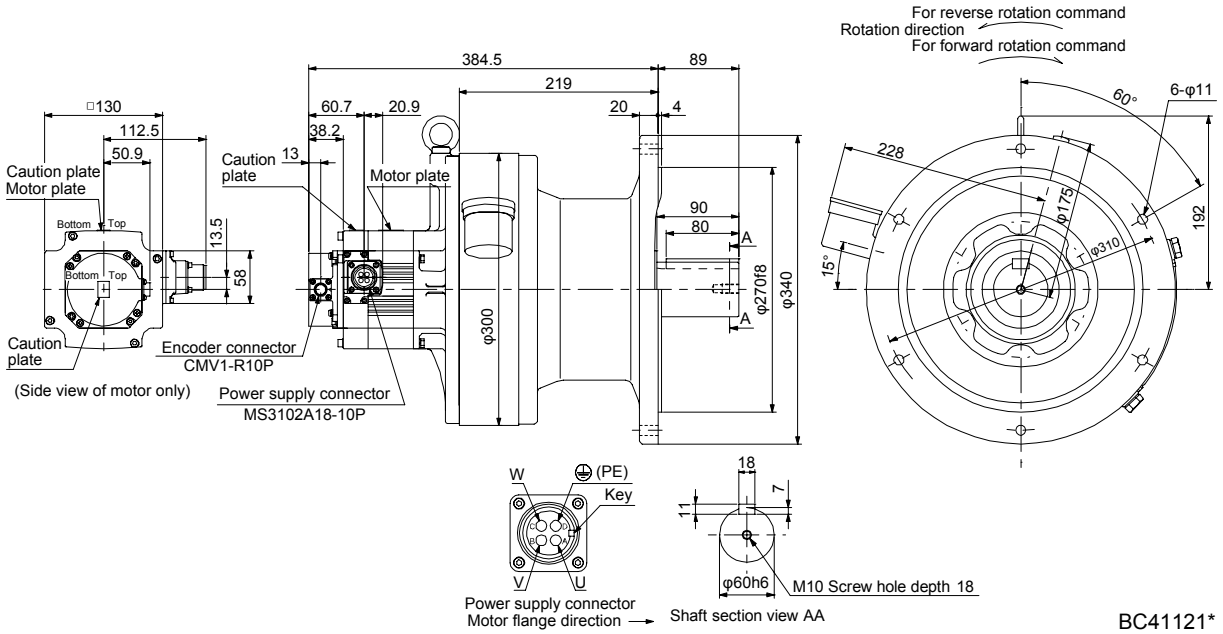
[Unit: mm]




BC41120*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1 | 1.0 | CHVM-6160 | 1/59 | 19.1 | 81 |

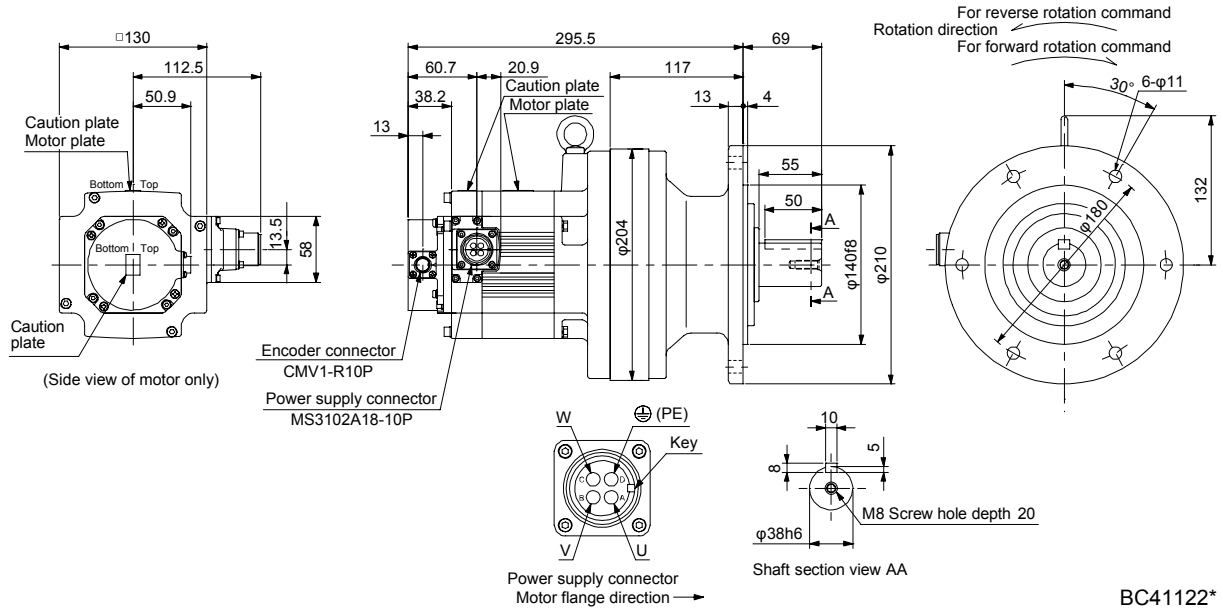
[Unit: mm]




BC41121*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1 | 1.5 | CNVM-6120 | 1/6 | 19.2 | 31 |
| HG-SR152G1 | 1.5 | | 1/11 | 17.7 | 31 |
| HG-SR152G1 | 1.5 | | 1/17 | 17.3 | 31 |

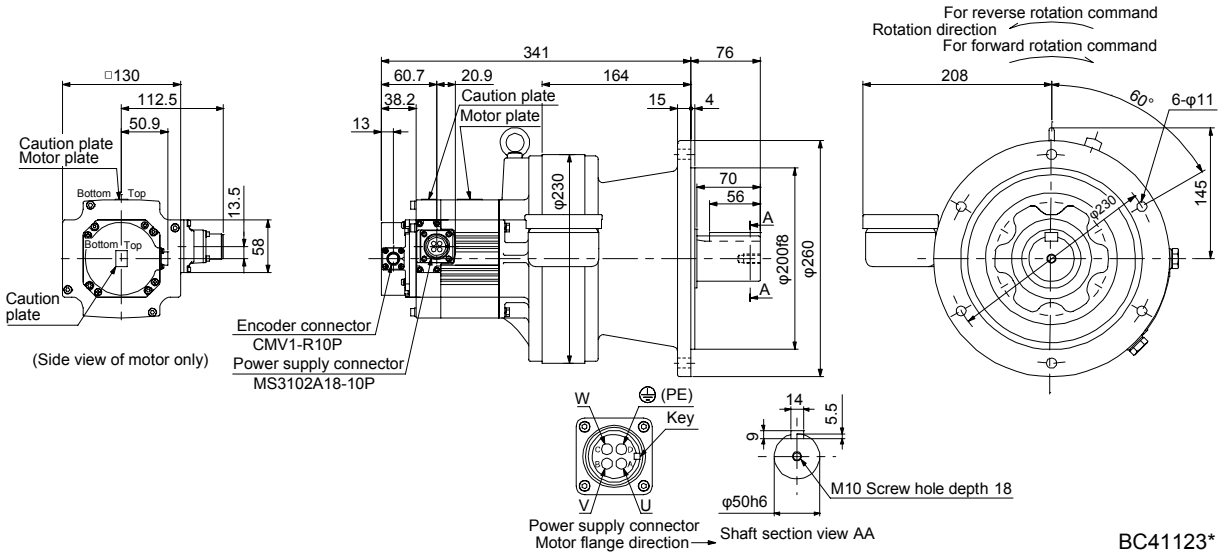
[Unit: mm]




BC41122*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1 | 1.5 | CHVM-6130 | 1/29 | 18.4 | 50 |
| HG-SR152G1 | 1.5 | | 1/35 | 18.3 | 50 |

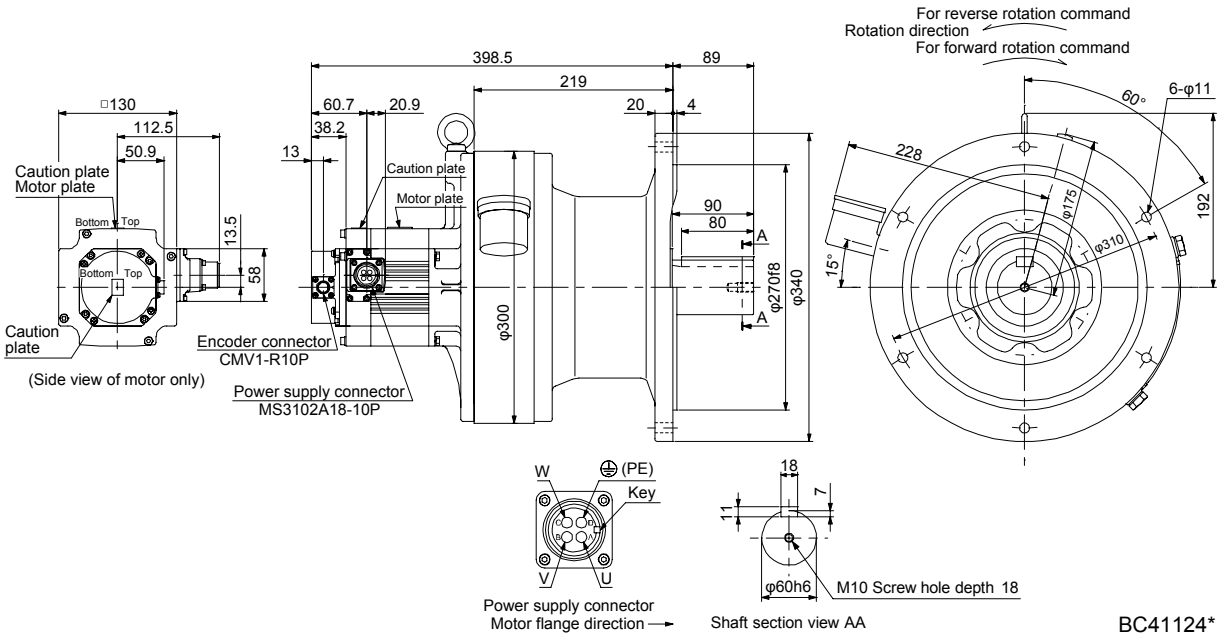
[Unit: mm]




BC41123*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1 | 1.5 | CHVM-6160 | 1/43 | 23.6 | 82 |
| HG-SR152G1 | 1.5 | | 1/59 | 23.5 | 82 |

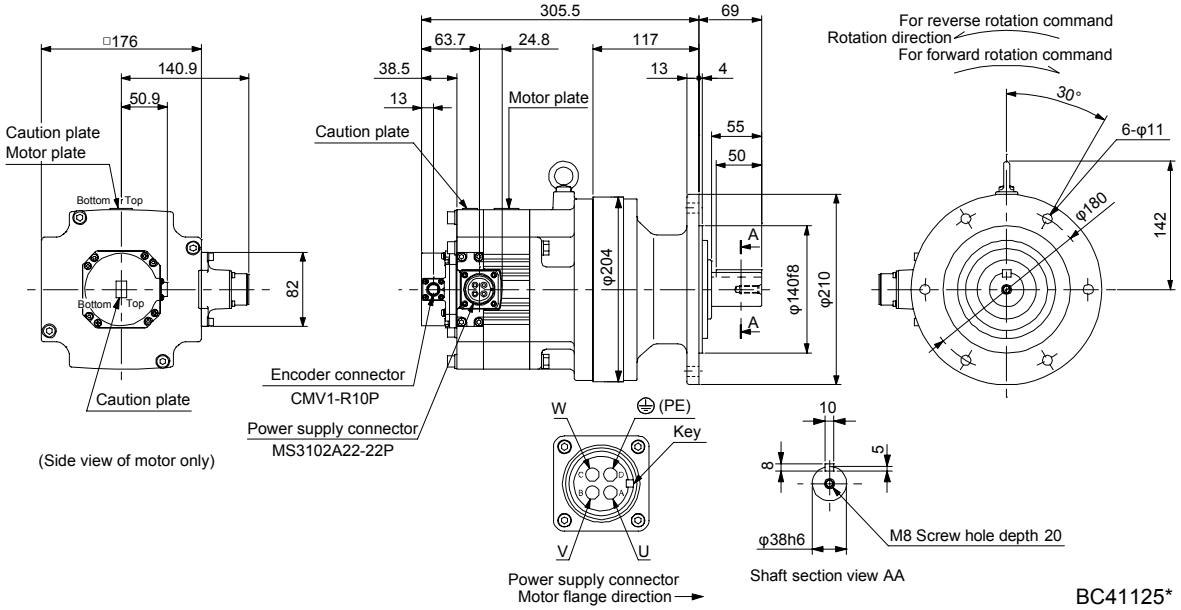
[Unit: mm]




BC41124*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G1 | 2.0 | CNVM-6120 | 1/6 | 50.0 | 36 |
| HG-SR202G1 | 2.0 | | 1/11 | 48.4 | 36 |
| HG-SR202G1 | 2.0 | | 1/17 | 48.1 | 36 |

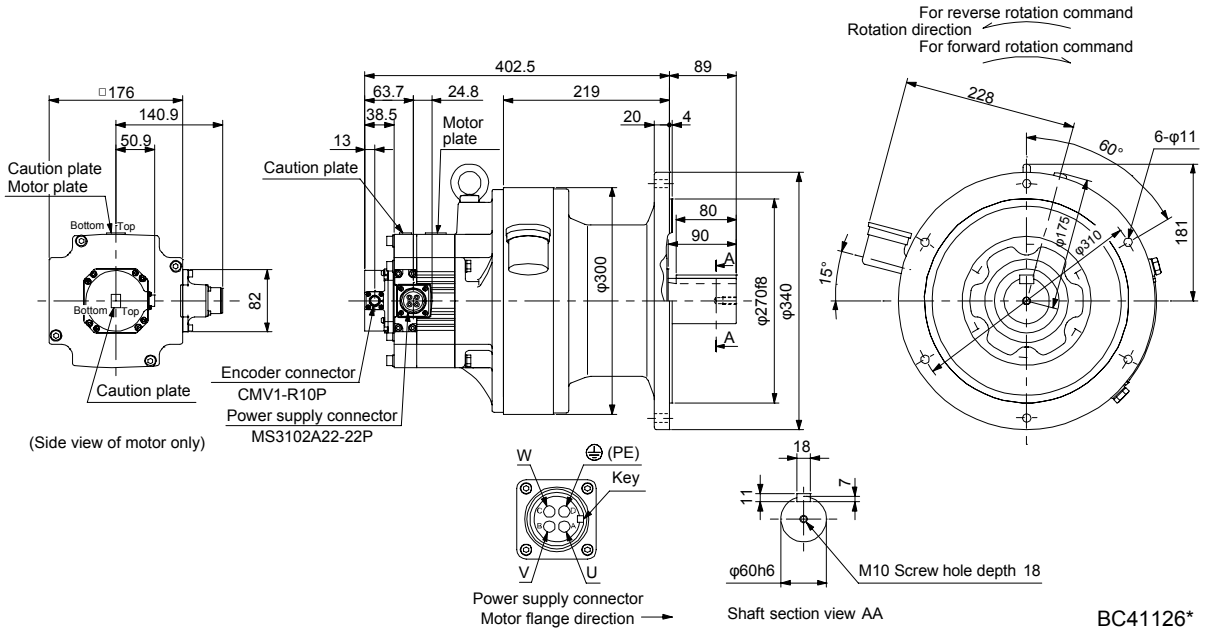
[Unit: mm]




BC41125*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G1 | 2.0 | CHVM-6165 | 1/29 | 54.8 | 87 |
| HG-SR202G1 | 2.0 | | 1/35 | 54.5 | 87 |
| HG-SR202G1 | 2.0 | | 1/43 | 54.3 | 87 |
| HG-SR202G1 | 2.0 | | 1/59 | 54.2 | 87 |

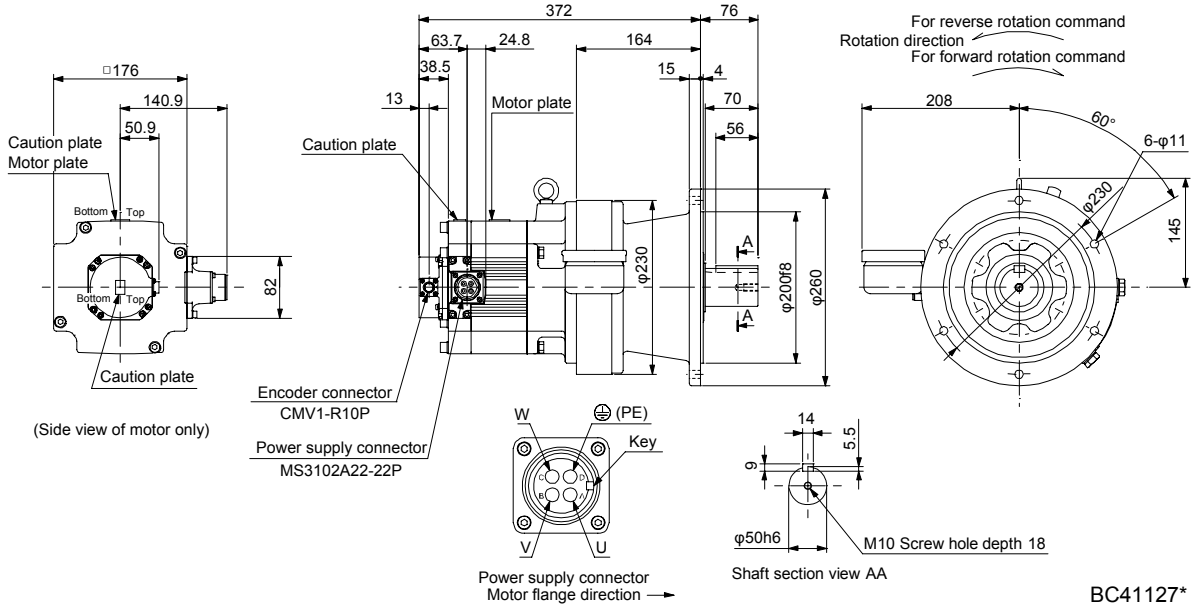
[Unit: mm]




BC41126*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1 | 3.5 | CHVM-6135 | 1/6 | 87.1 | 60 |
| HG-SR352G1 | 3.5 | | 1/11 | 82.8 | 60 |
| HG-SR352G1 | 3.5 | | 1/17 | 81.5 | 60 |

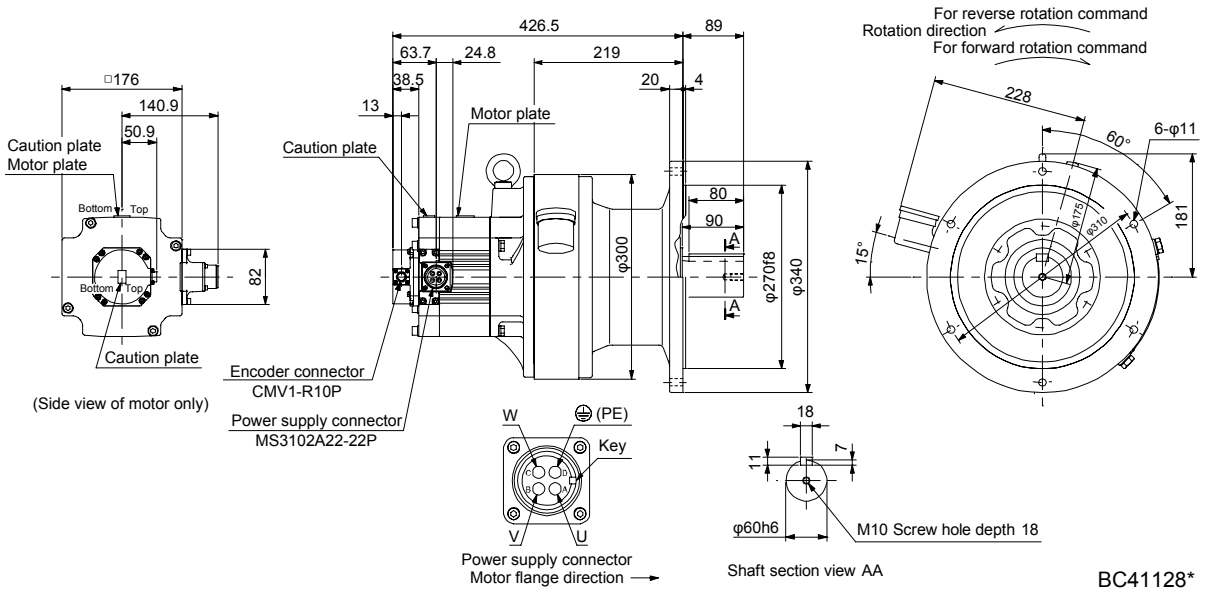
[Unit: mm]




BC41127*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1 | 3.5 | CHVM-6165 | 1/29 | 86.6 | 92 |
| HG-SR352G1 | 3.5 | | 1/35 | 86.3 | 92 |

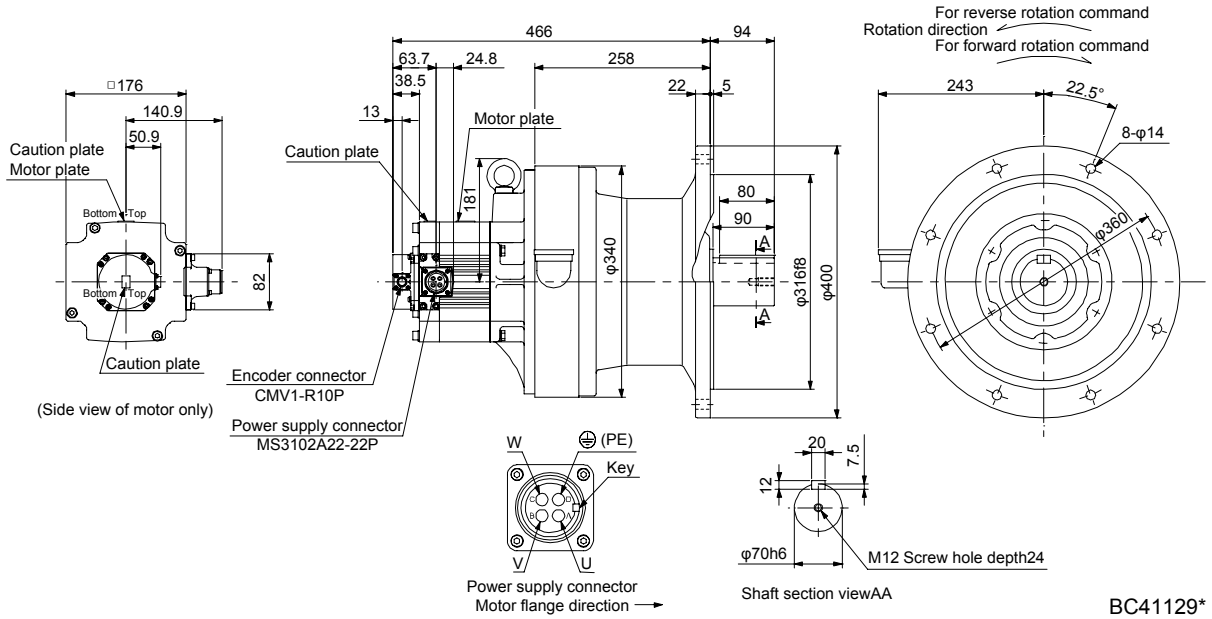
[Unit: mm]




BC41128*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1 | 3.5 | CHVM-6175 | 1/43 | 105 | 134 |
| HG-SR352G1 | 3.5 | | 1/59 | 104 | 134 |

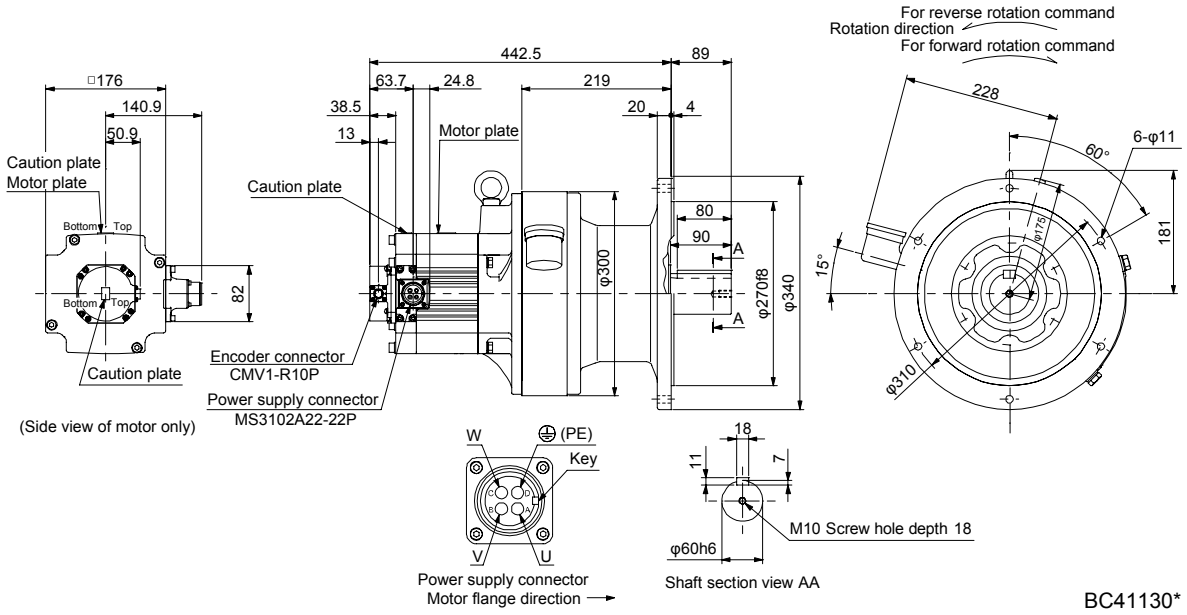
[Unit: mm]




BC41129*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1 | 5.0 | CHVM-6165 | 1/6 | 126 | 96 |
| HG-SR502G1 | 5.0 | | 1/11 | 114 | 96 |
| HG-SR502G1 | 5.0 | | 1/17 | 110 | 96 |

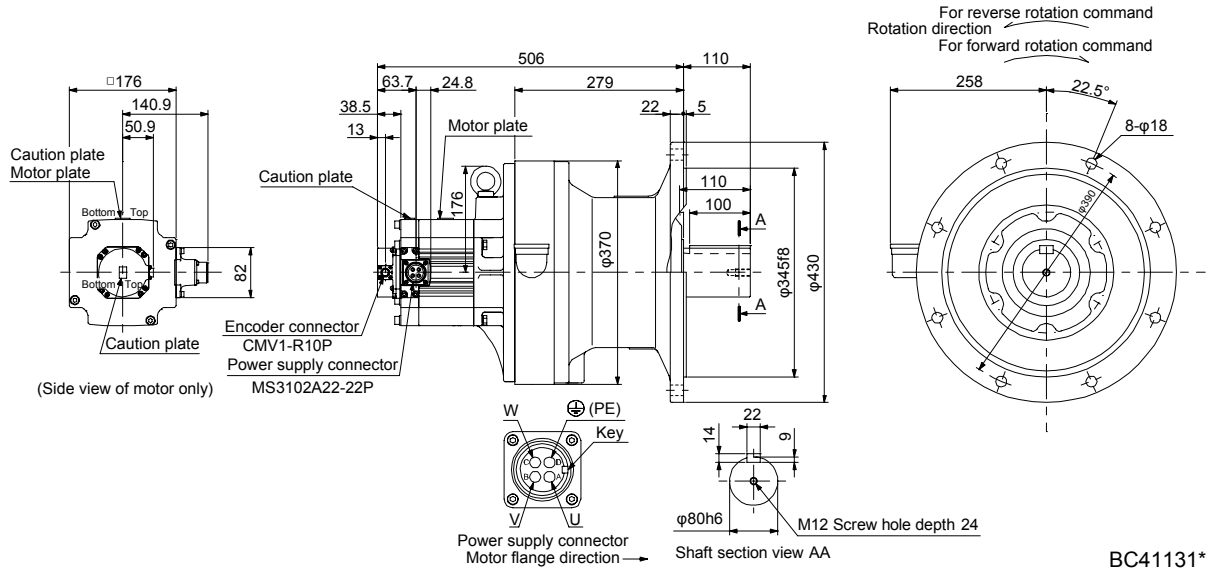
[Unit: mm]




BC41130*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1 | 5.0 | CHVM-6180 | 1/29 | 141 | 165 |
| HG-SR502G1 | 5.0 | | 1/35 | 140 | 165 |
| HG-SR502G1 | 5.0 | | 1/43 | 139 | 165 |

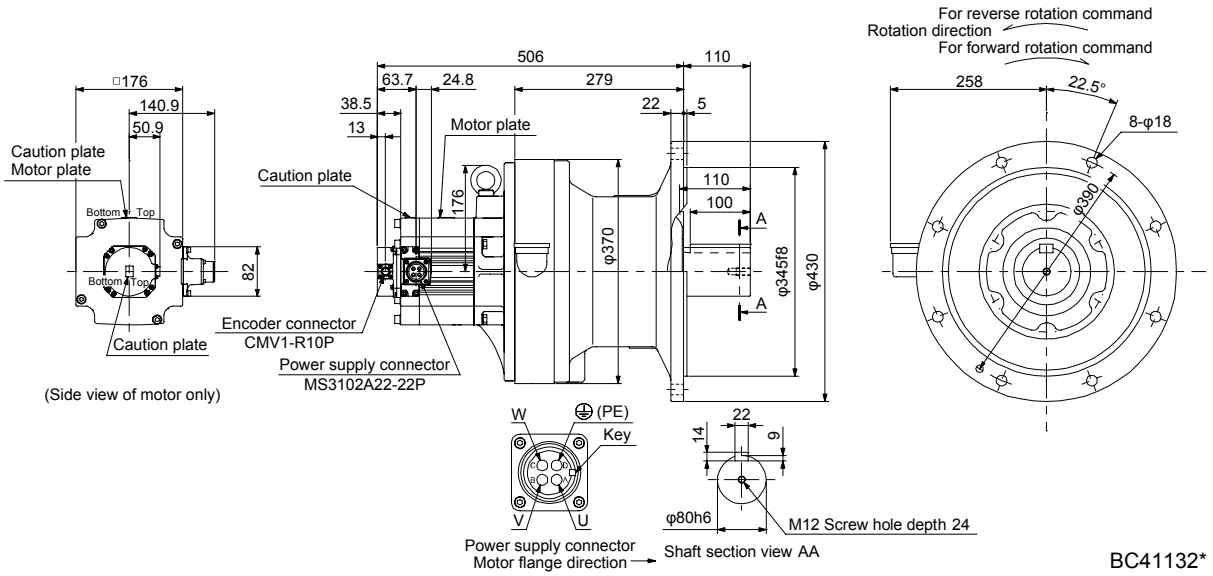
[Unit: mm]




BC41131*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1 | 5.0 | CHVM-6185 | 1/59 | 138 | 165 |

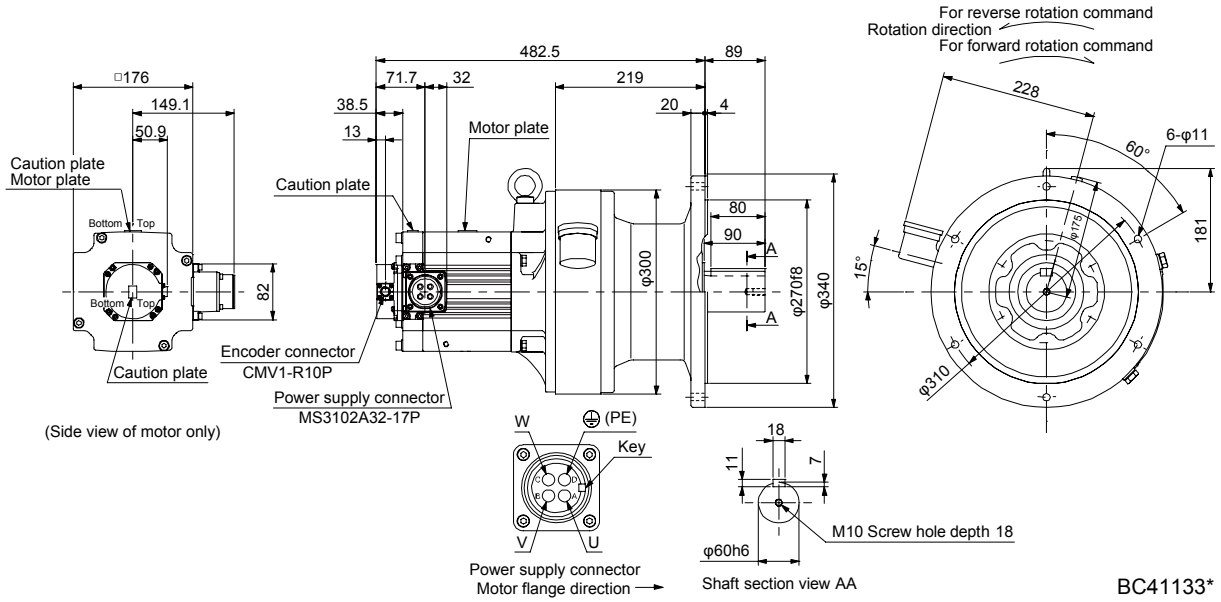
[Unit: mm]




BC41132*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1 | 7.0 | CHVM-6165 | 1/6 | 177 | 103 |

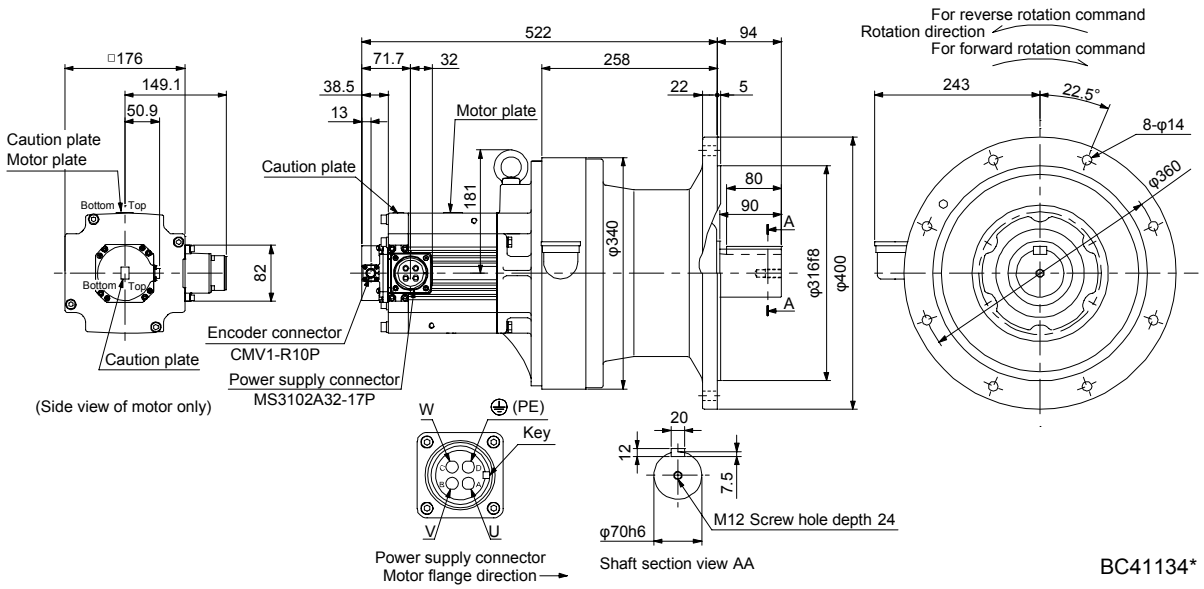
[Unit: mm]




BC41133*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1 | 7.0 | CHVM-6170 | 1/11 | 190 | 145 |
| HG-SR702G1 | 7.0 | | 1/17 | 182 | 145 |

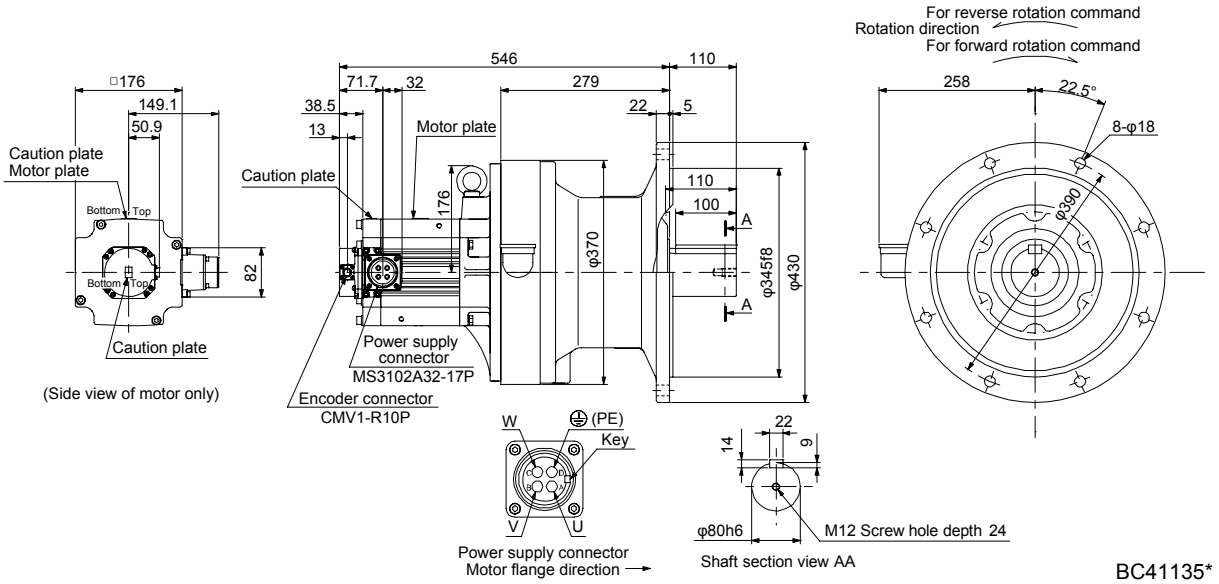
[Unit: mm]




BC41134*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1 | 7.0 | CHVM-6180 | 1/29 | 192 | 172 |
| HG-SR702G1 | 7.0 | | 1/35 | 192 | 172 |

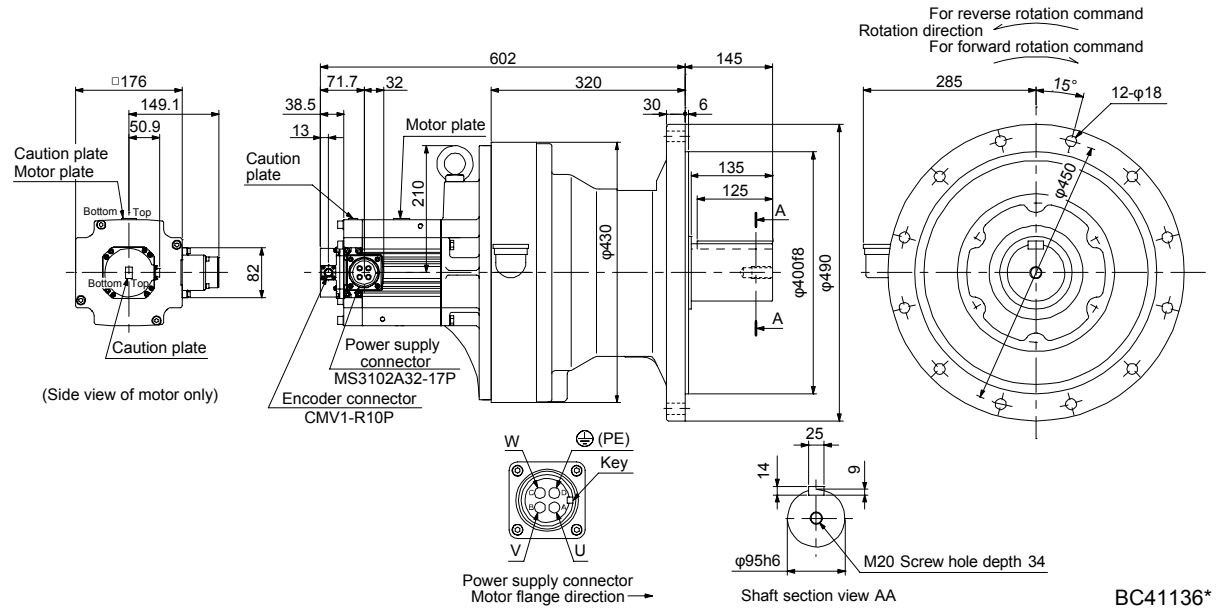
[Unit: mm]




BC41135*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1 | 7.0 | CHVM-6195 | 1/43 | 267 | 240 |
| HG-SR702G1 | 7.0 | | 1/59 | 266 | 240 |

[Unit: mm]

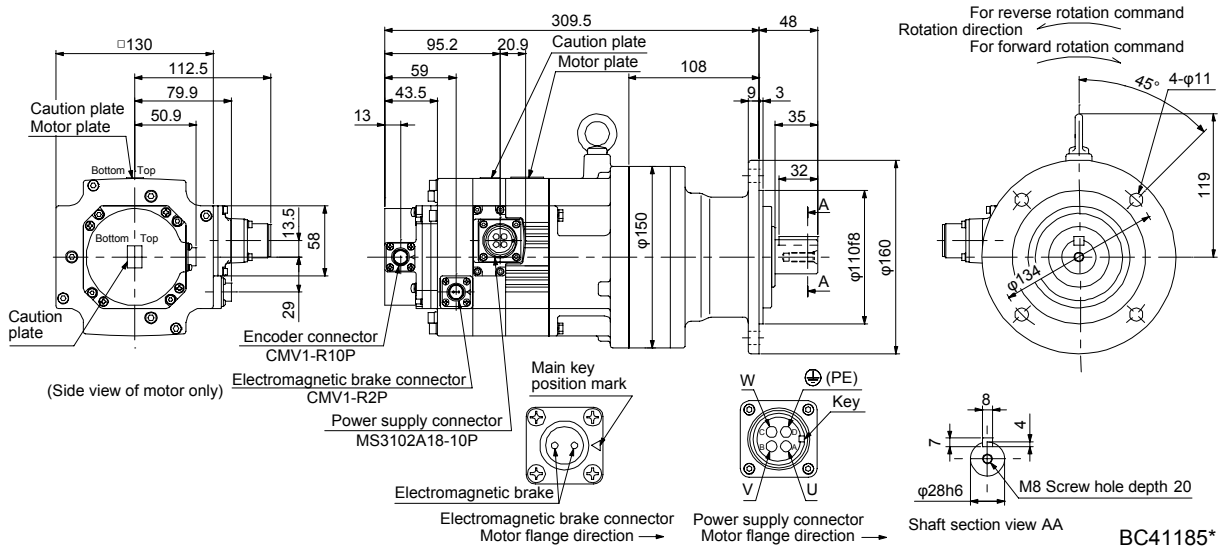



BC41136*

### 7.7.4 For general industrial machine with a reducer (with an electromagnetic brake)

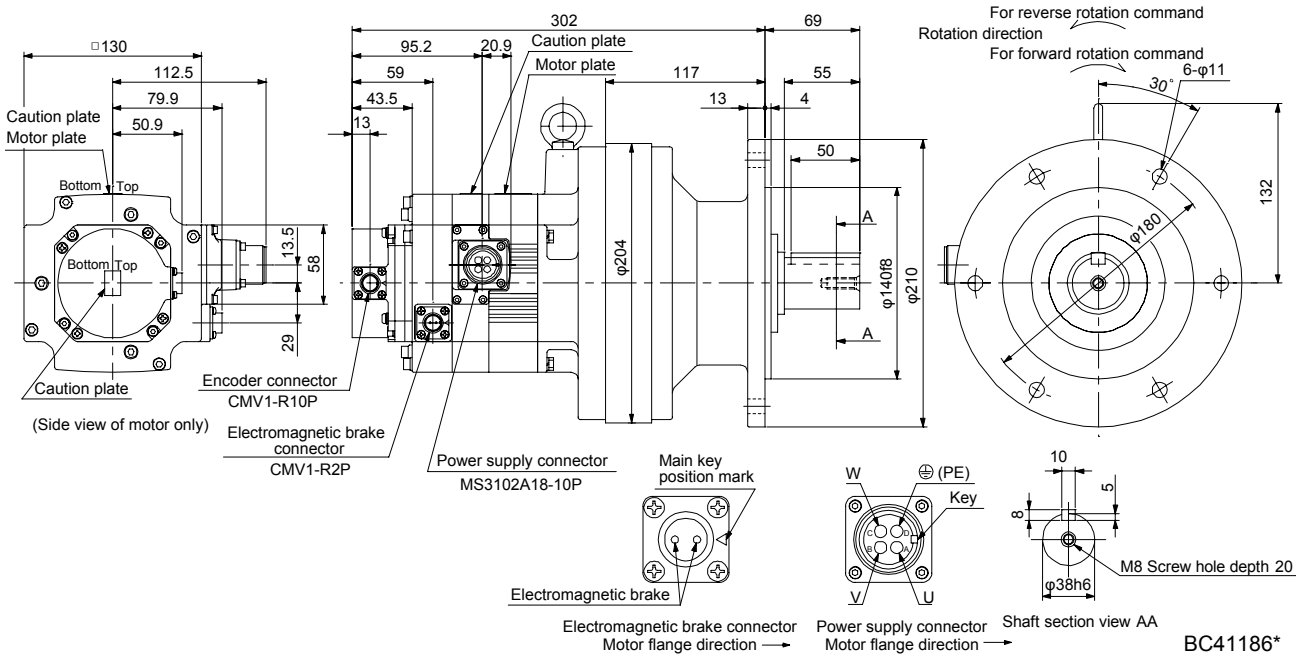
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG1 | 0.5 | CNVM-6100 | 1/6 | 8.5 | 10.3 | 20 |
| HG-SR52BG1 | 0.5 | | 1/11 | 8.5 | 9.85 | 20 |
| HG-SR52BG1 | 0.5 | | 1/17 | 8.5 | 9.73 | 20 |
| HG-SR52BG1 | 0.5 | | 1/29 | 8.5 | 9.67 | 20 |

[Unit: mm]



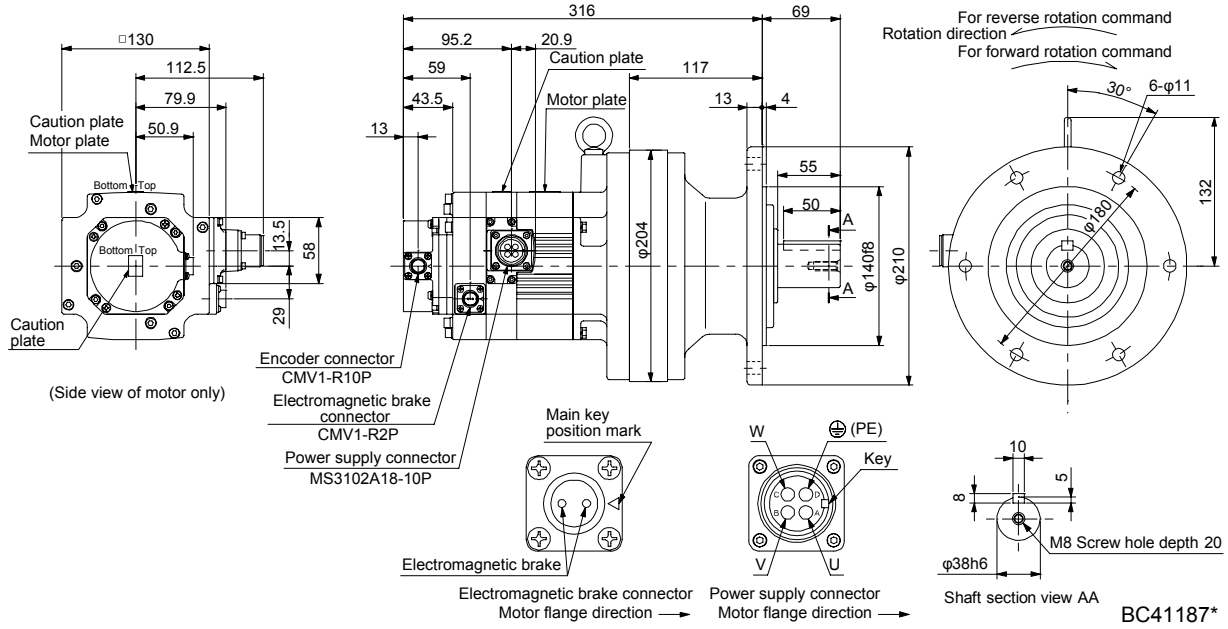

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG1 | 0.5 | CNVM-6120 | 1/35 | 8.5 | 10.5 | 29 |
| HG-SR52BG1 | 0.5 | | 1/43 | 8.5 | 10.4 | 29 |
| HG-SR52BG1 | 0.5 | | 1/59 | 8.5 | 10.4 | 29 |

[Unit: mm]



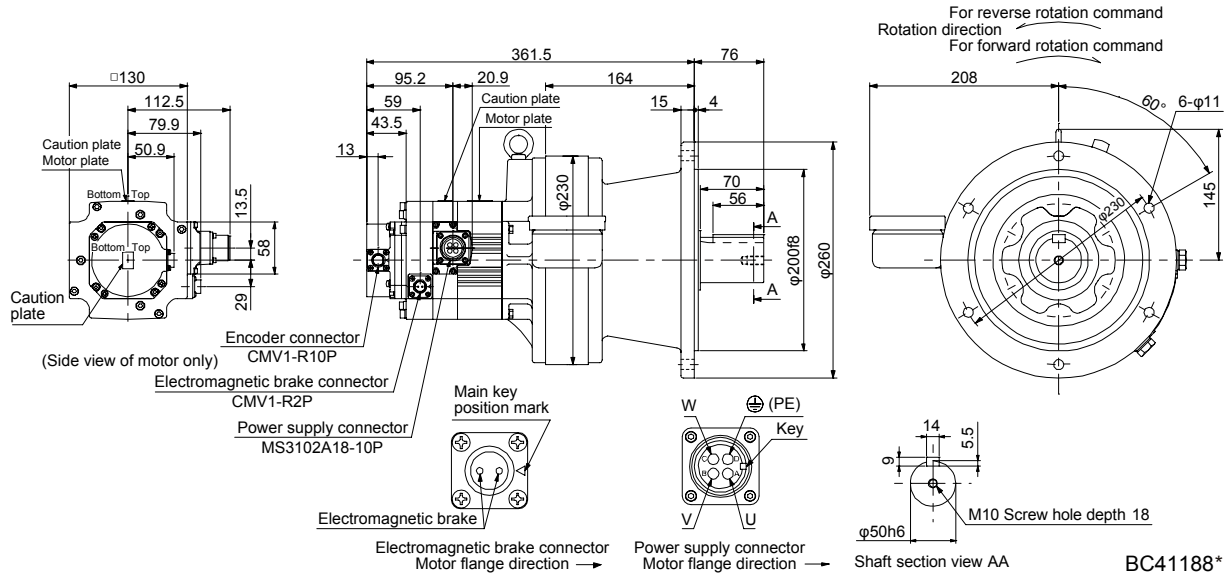
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1 | 1.0 | CNVM-6120 | 1/6 | 8.5 | 17.0 | 32 |
| HG-SR102BG1 | 1.0 | | 1/11 | 8.5 | 15.5 | 32 |
| HG-SR102BG1 | 1.0 | | 1/17 | 8.5 | 15.1 | 32 |
| HG-SR102BG1 | 1.0 | | 1/29 | 8.5 | 14.8 | 32 |
| HG-SR102BG1 | 1.0 | | 1/35 | 8.5 | 14.8 | 32 |

[Unit: mm]



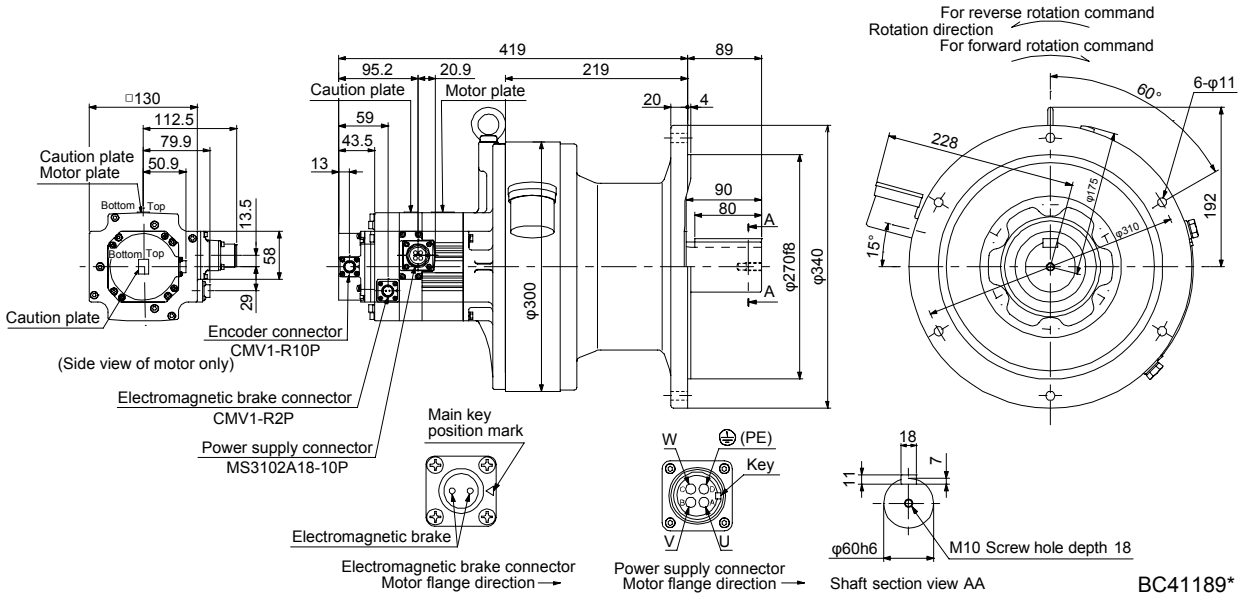

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1 | 1.0 | CHVM-6130 | 1/43 | 8.5 | 16.0 | 51 |

[Unit: mm]



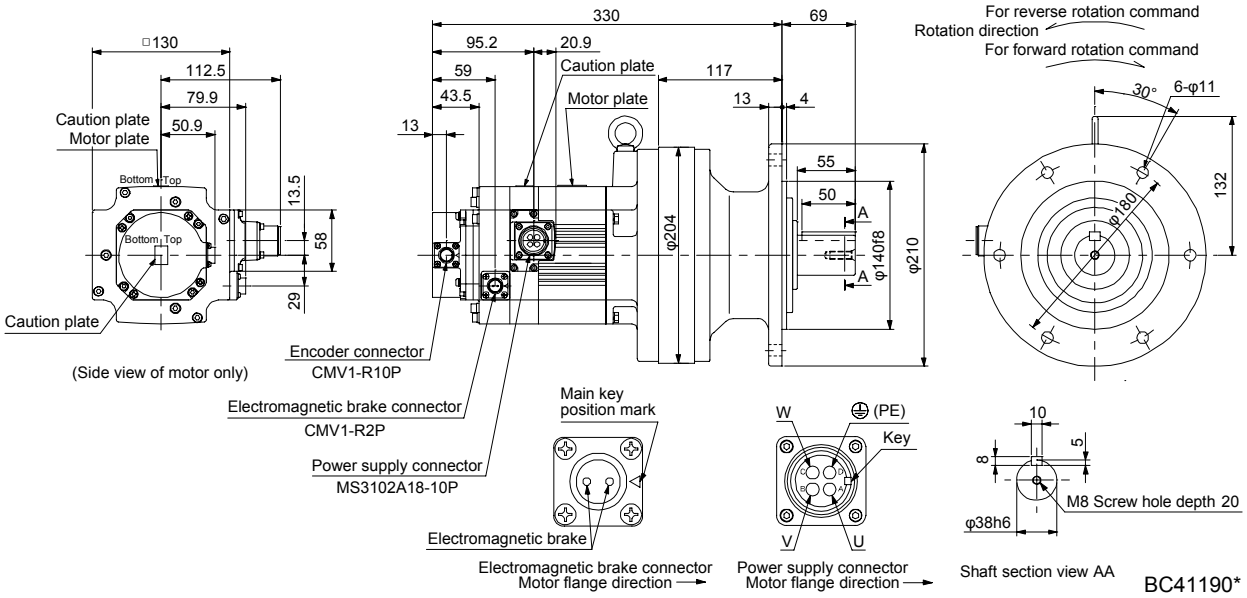
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1 | 1.0 | CHVM-6160 | 1/59 | 8.5 | 21.3 | 83 |

[Unit: mm]



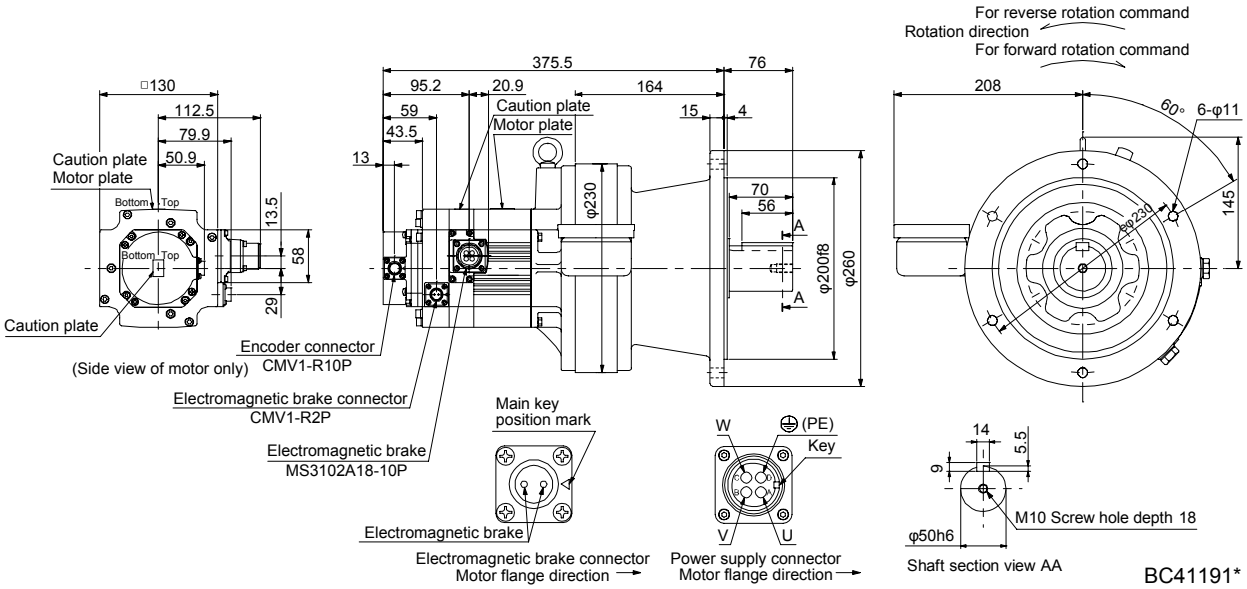

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1 | 1.5 | CNVM-6120 | 1/6 | 8.5 | 21.4 | 33 |
| HG-SR152BG1 | 1.5 | | 1/11 | 8.5 | 19.9 | 33 |
| HG-SR152BG1 | 1.5 | | 1/17 | 8.5 | 19.5 | 33 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1 | 1.5 | CHVM-6130 | 1/29 | 8.5 | 20.6 | 52 |
| HG-SR152BG1 | 1.5 | | 1/35 | 8.5 | 20.5 | 52 |

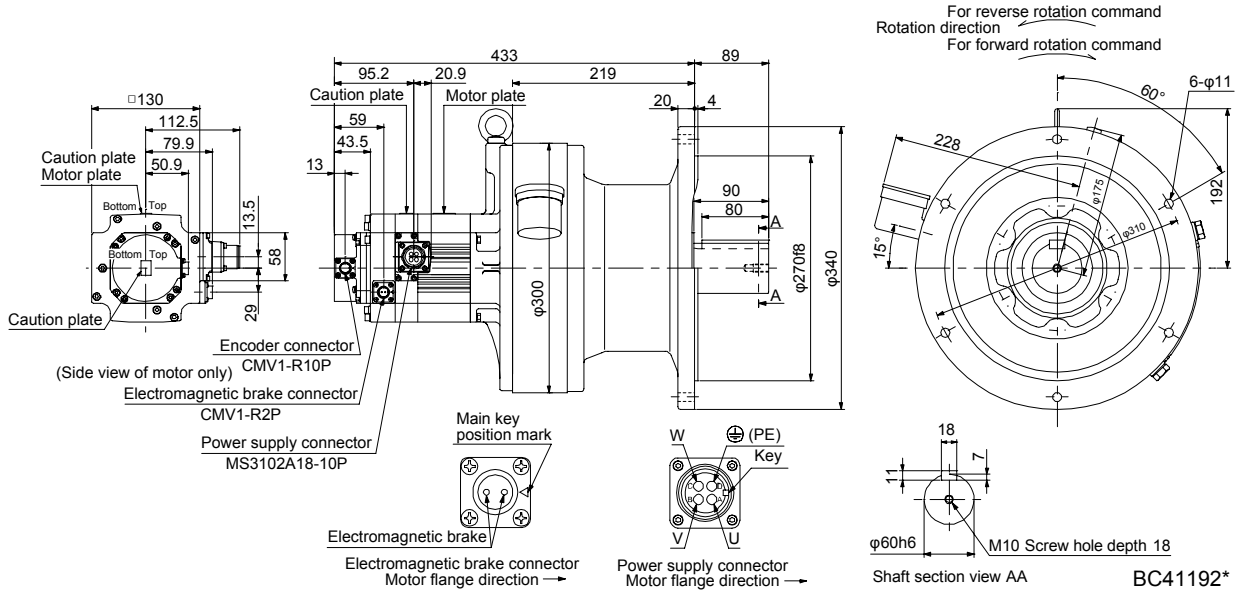
[Unit: mm]




BC41191*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1 | 1.5 | CHVM-6160 | 1/43 | 8.5 | 25.8 | 84 |
| HG-SR152BG1 | 1.5 | | 1/59 | 8.5 | 25.7 | 84 |

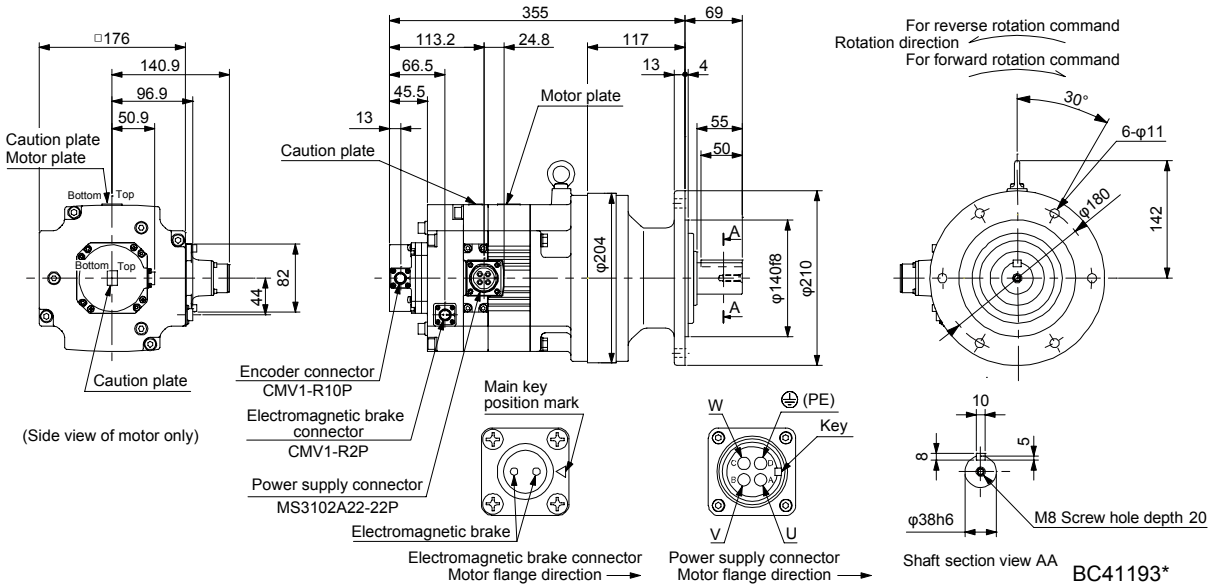
[Unit: mm]




BC41192*

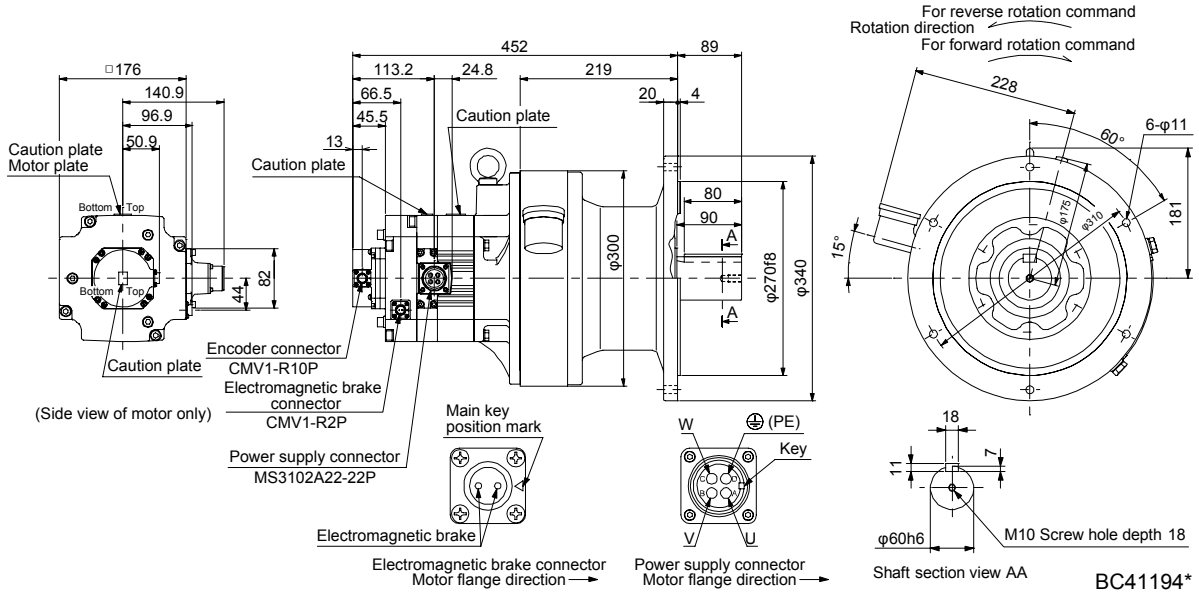
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG1 | 2.0 | CNVM-6120 | 1/6 | 44 | 59.4 | 42 |
| HG-SR202BG1 | 2.0 | | 1/11 | 44 | 57.8 | 42 |
| HG-SR202BG1 | 2.0 | | 1/17 | 44 | 57.5 | 42 |

[Unit: mm]



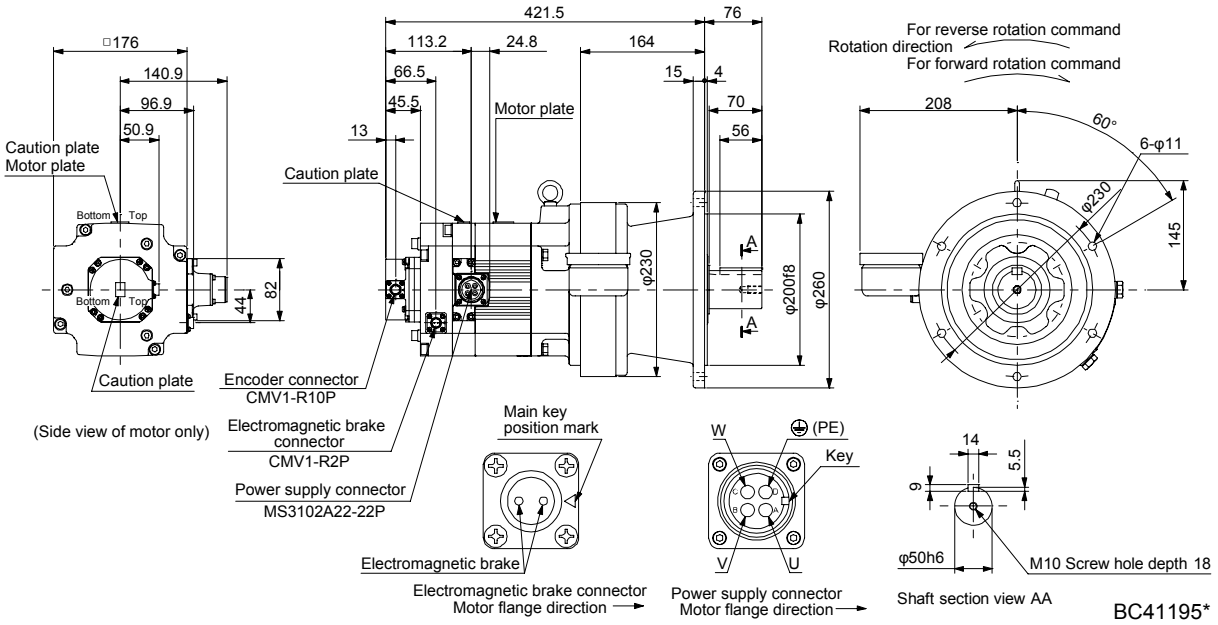

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG1 | 2.0 | CHVM-6165 | 1/29 | 44 | 64.2 | 93 |
| HG-SR202BG1 | 2.0 | | 1/35 | 44 | 63.9 | 93 |
| HG-SR202BG1 | 2.0 | | 1/43 | 44 | 63.7 | 93 |
| HG-SR202BG1 | 2.0 | | 1/59 | 44 | 63.6 | 93 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1 | 3.5 | CHVM-6135 | 1/6 | 44 | 96.5 | 66 |
| HG-SR352BG1 | 3.5 | | 1/11 | 44 | 92.2 | 66 |
| HG-SR352BG1 | 3.5 | | 1/17 | 44 | 90.9 | 66 |

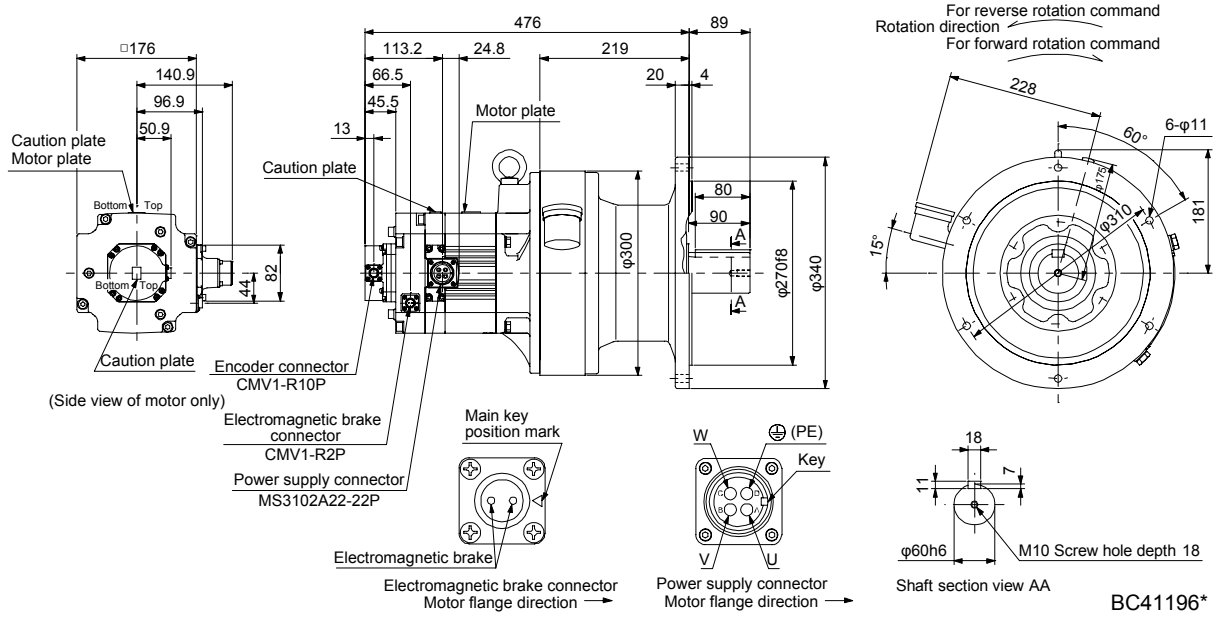
[Unit: mm]




BC41195*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1 | 3.5 | CHVM-6165 | 1/29 | 44 | 96.0 | 98 |
| HG-SR352BG1 | 3.5 | | 1/35 | 44 | 95.7 | 98 |

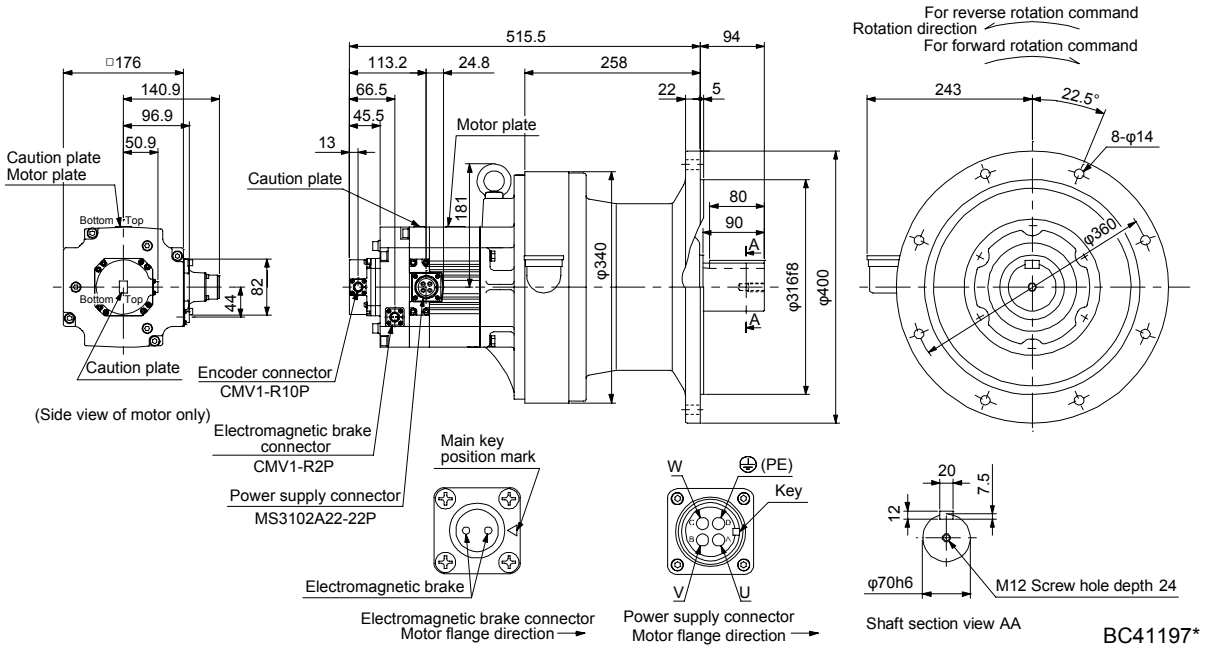
[Unit: mm]




BC41196*

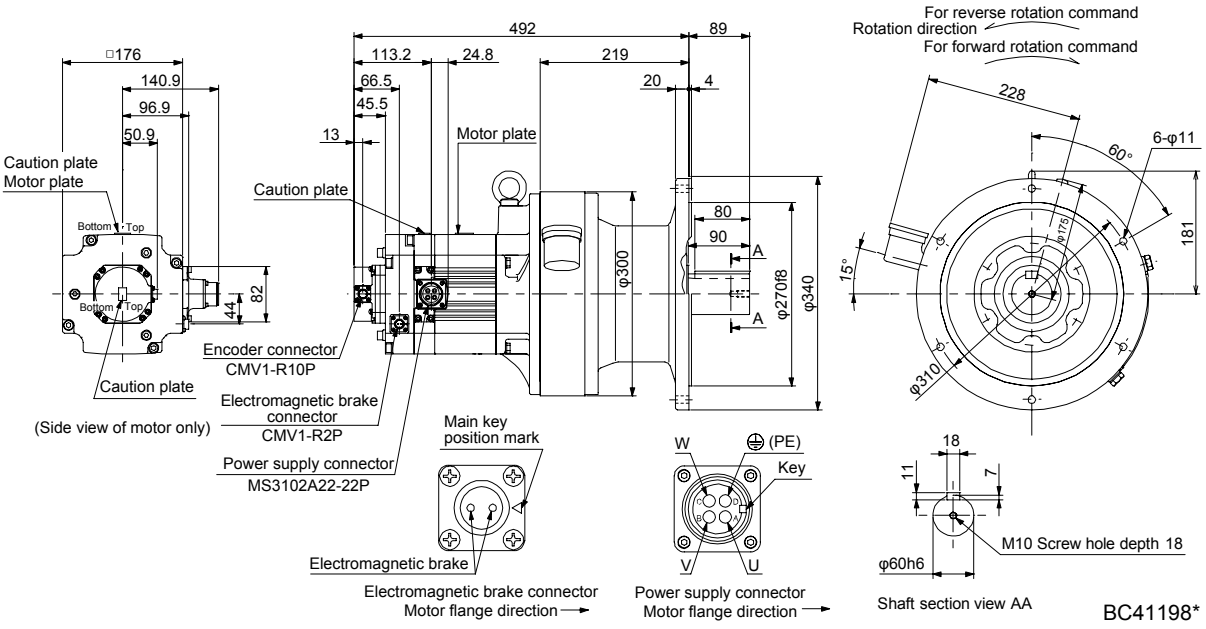
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1 | 3.5 | CHVM-6175 | 1/43 | 44 | 114 | 140 |
| HG-SR352BG1 | 3.5 | | 1/59 | 44 | 113 | 140 |

[Unit: mm]



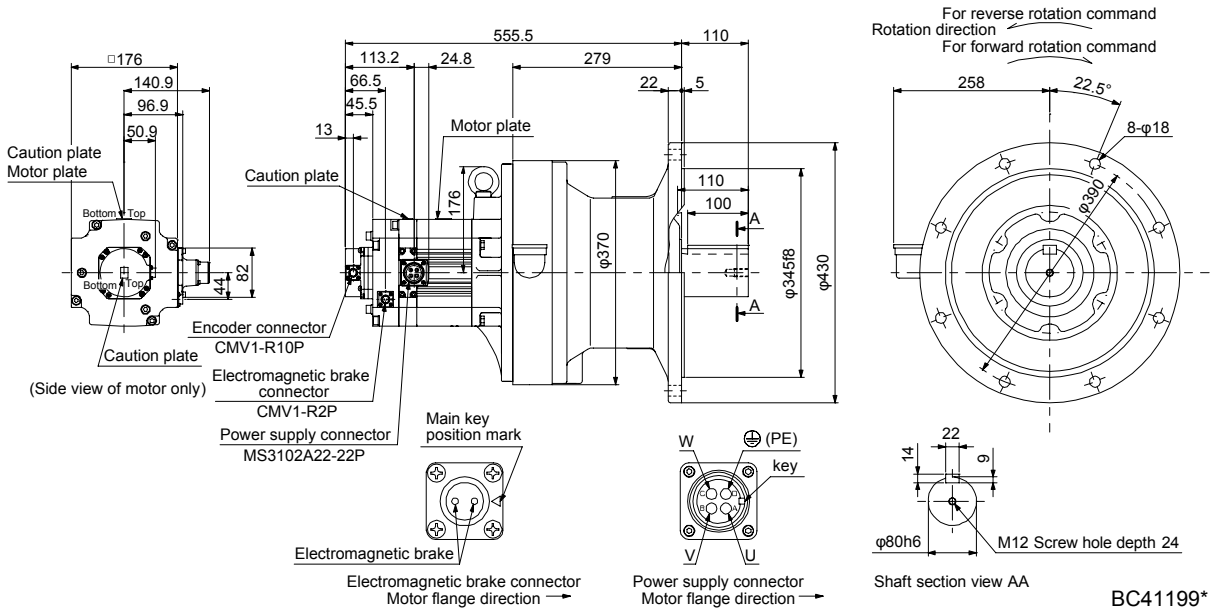

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1 | 5.0 | CHVM-6165 | 1/6 | 44 | 135 | 102 |
| HG-SR502BG1 | 5.0 | | 1/11 | 44 | 123 | 102 |
| HG-SR502BG1 | 5.0 | | 1/17 | 44 | 119 | 102 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1 | 5.0 | CHVM-6180 | 1/29 | 44 | 150 | 171 |
| HG-SR502BG1 | 5.0 | | 1/35 | 44 | 150 | 171 |
| HG-SR502BG1 | 5.0 | | 1/43 | 44 | 149 | 171 |

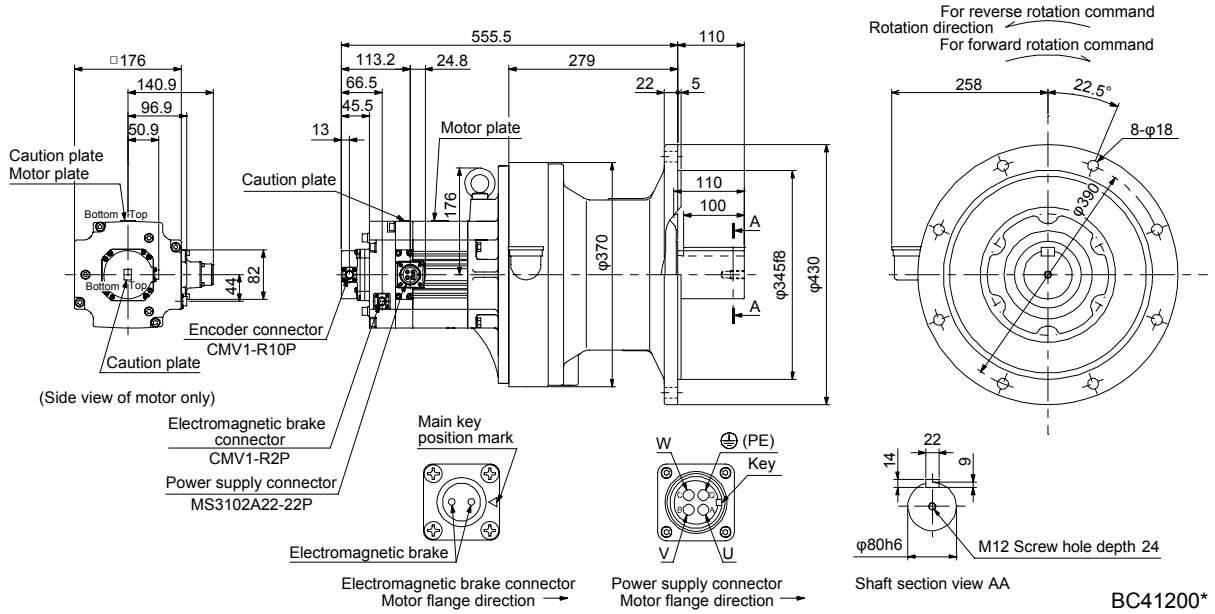
[Unit: mm]




BC41199*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1 | 5.0 | CHVM-6185 | 1/59 | 44 | 147 | 171 |

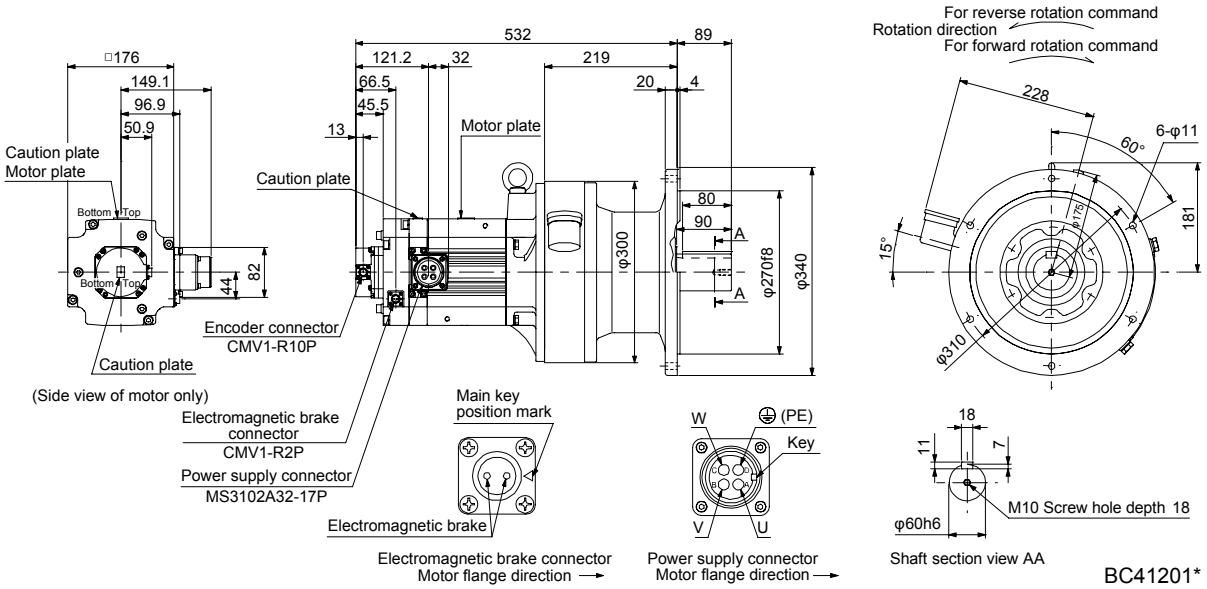
[Unit: mm]




BC41200*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1 | 7.0 | CHVM-6165 | 1/6 | 44 | 187 | 109 |

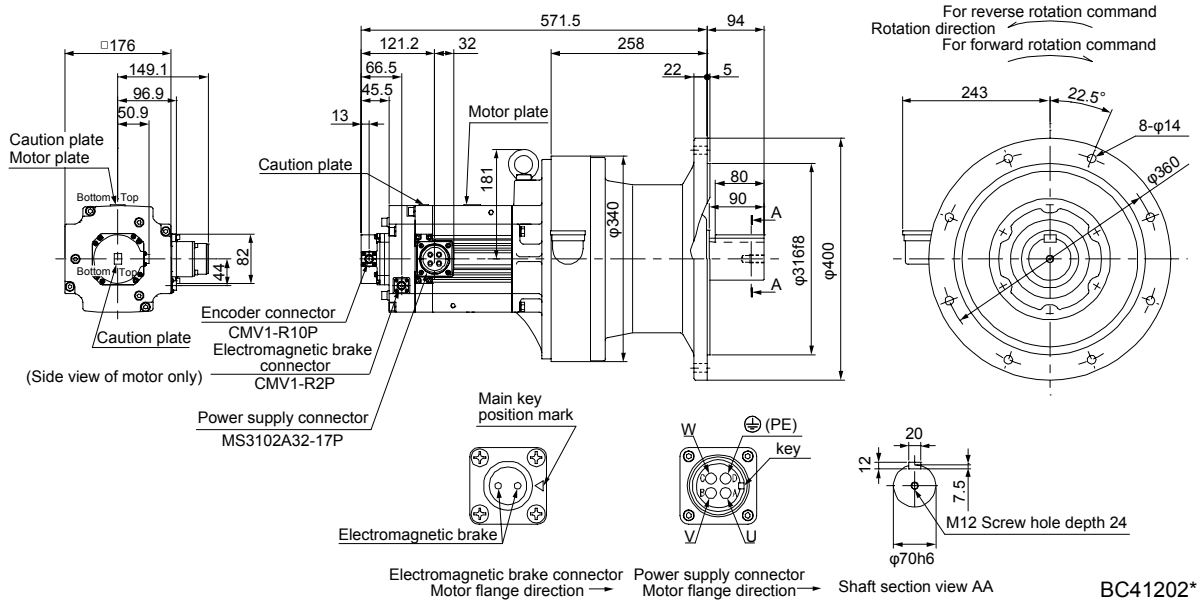
[Unit: mm]




BC41201*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1 | 7.0 | CHVM-6170 | 1/11 | 44 | 199 | 151 |
| HG-SR702BG1 | 7.0 | | 1/17 | 44 | 192 | 151 |

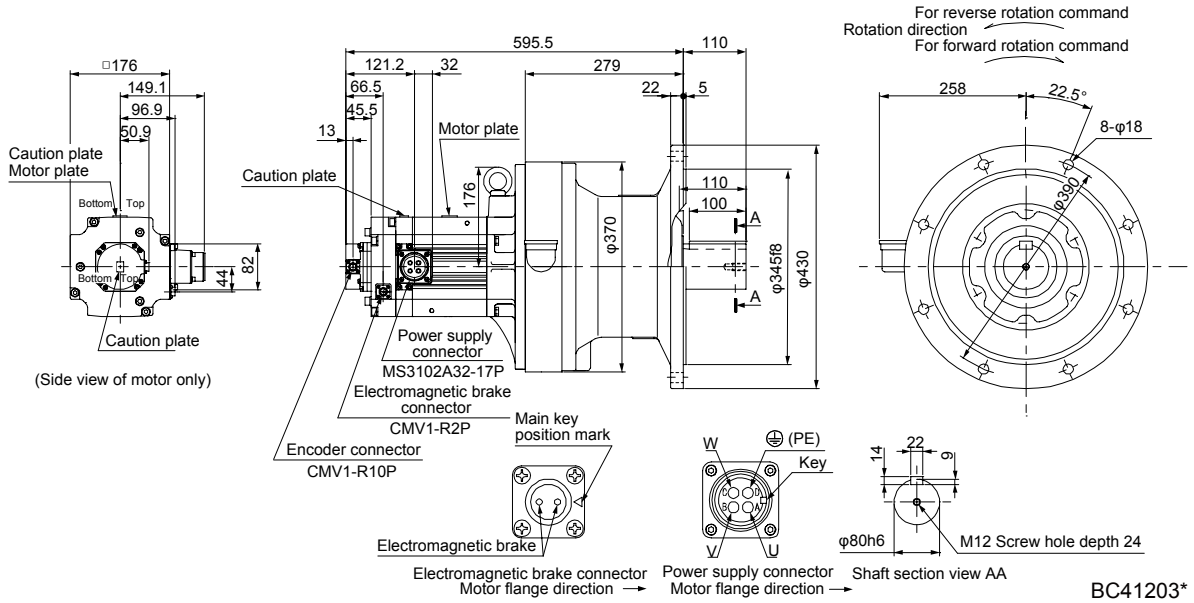
[Unit: mm]




BC41202*

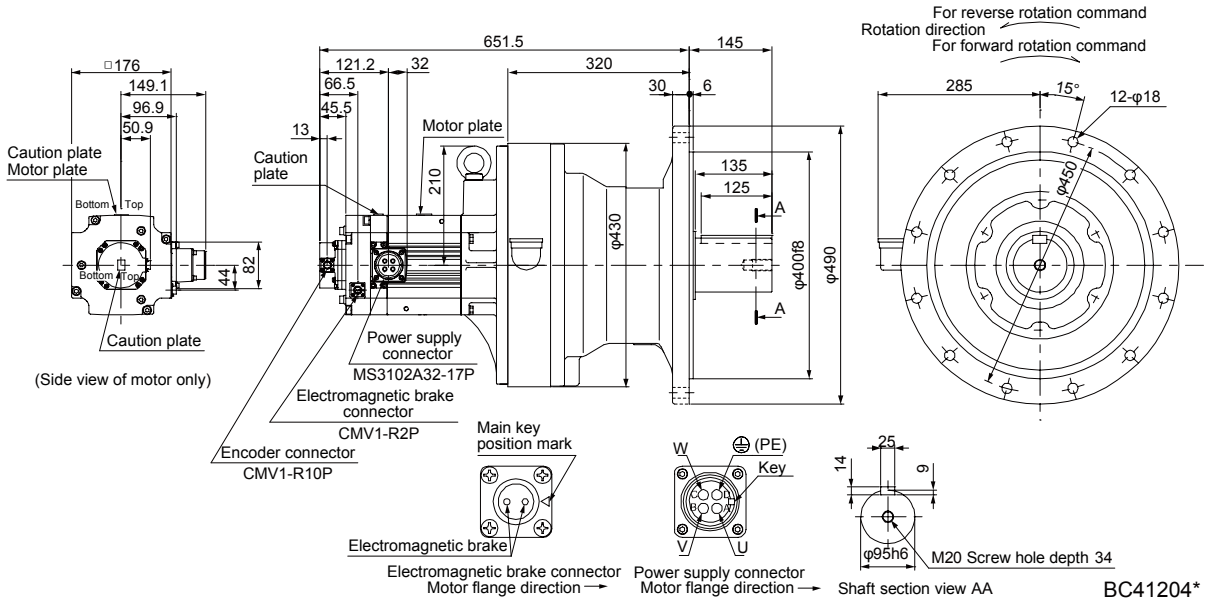
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1 | 7.0 | CHVM-6180 | 1/29 | 44 | 202 | 178 |
| HG-SR702BG1 | 7.0 | | 1/35 | 44 | 201 | 178 |

[Unit: mm]




| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1 | 7.0 | CHVM-6195 | 1/43 | 44 | 277 | 246 |
| HG-SR702BG1 | 7.0 | | 1/59 | 44 | 275 | 246 |

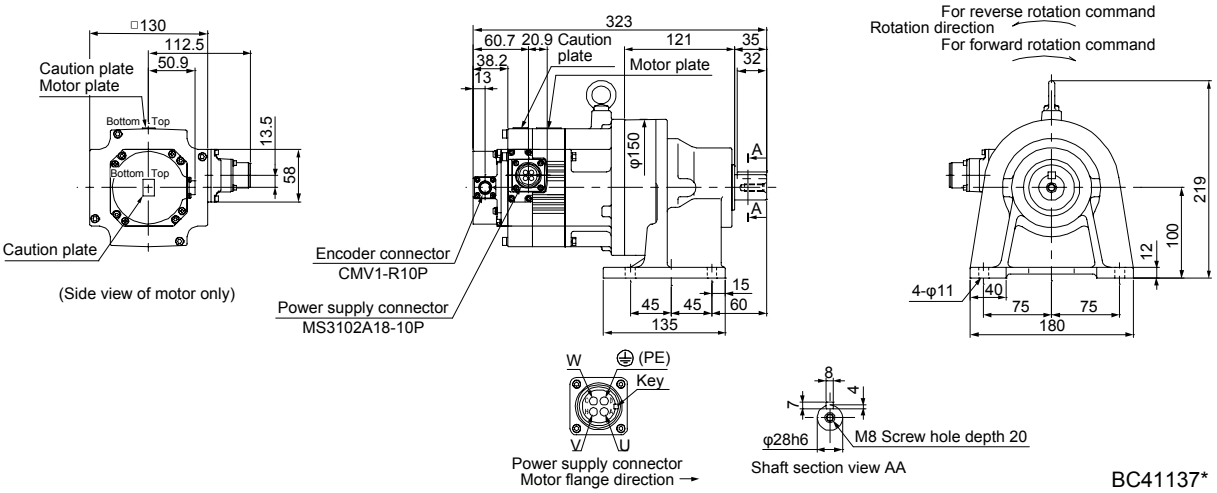
[Unit: mm]



### 7.7.5 For general industrial machine with a reducer (foot-mounting/without an electromagnetic brake)

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G1H | 0.5 | CNHM-6100 | 1/6 | 8.08 | 20 |
| HG-SR52G1H | 0.5 | | 1/11 | 7.65 | 20 |
| HG-SR52G1H | 0.5 | | 1/17 | 7.53 | 20 |
| HG-SR52G1H | 0.5 | | 1/29 | 7.47 | 20 |

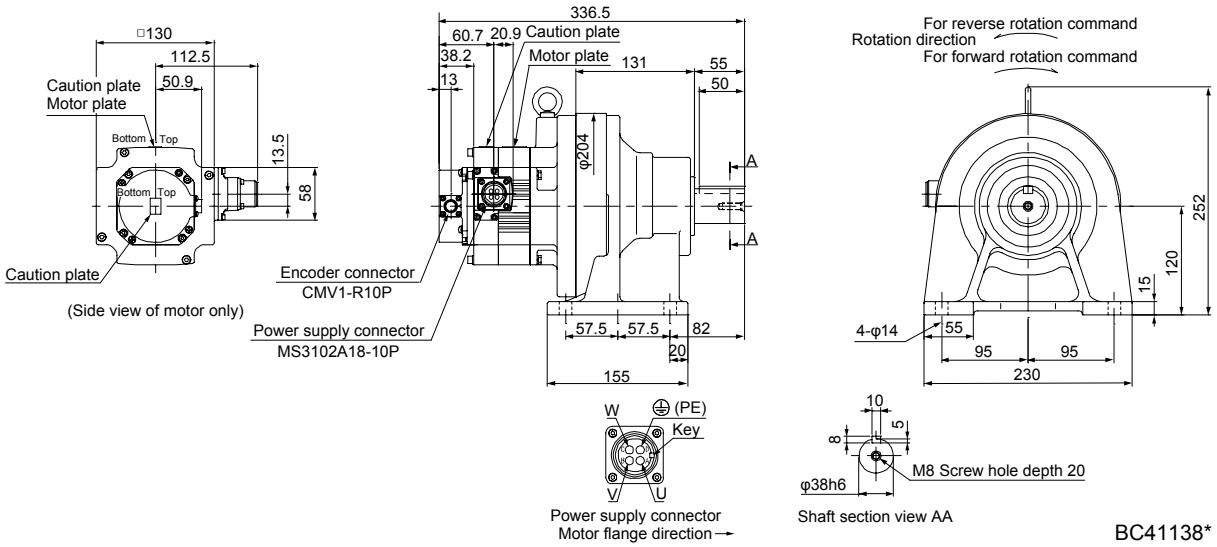
[Unit: mm]




BC41137*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G1H | 0.5 | CNHM-6120 | 1/35 | 8.26 | 28 |
| HG-SR52G1H | 0.5 | | 1/43 | 8.22 | 28 |
| HG-SR52G1H | 0.5 | | 1/59 | 8.18 | 28 |

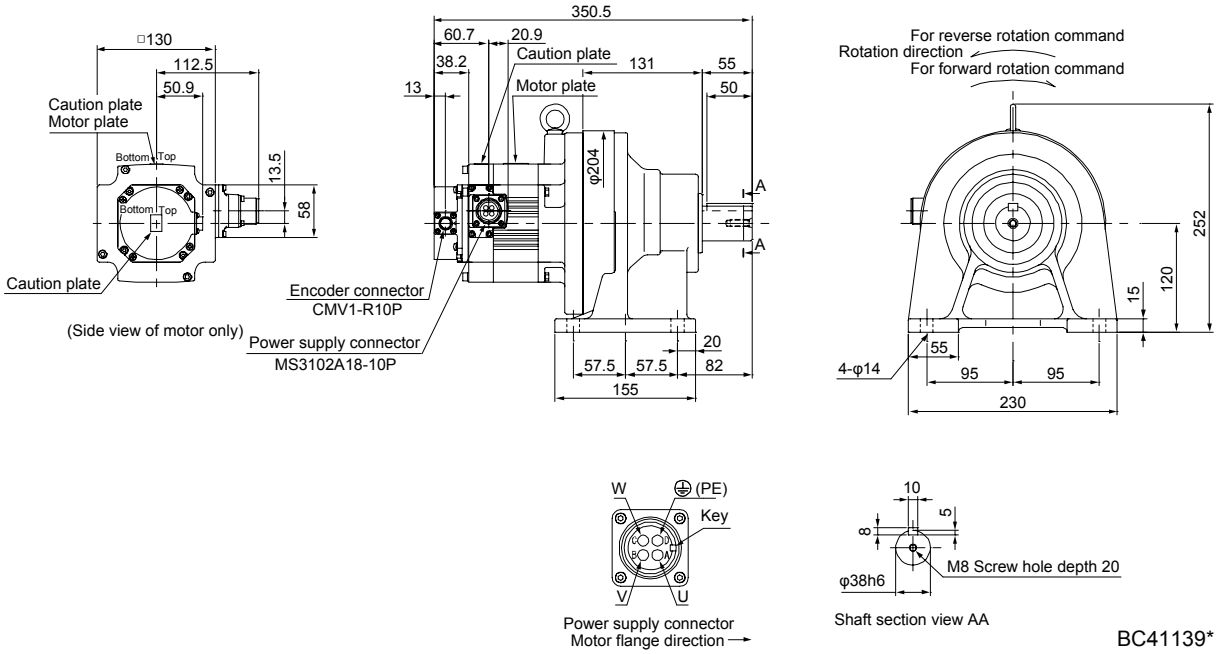
[Unit: mm]




BC41138*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1H | 1.0 | CNHM-6120 | 1/6 | 14.8 | 31 |
| HG-SR102G1H | 1.0 | | 1/11 | 13.3 | 31 |
| HG-SR102G1H | 1.0 | | 1/17 | 12.9 | 31 |
| HG-SR102G1H | 1.0 | | 1/29 | 12.6 | 31 |
| HG-SR102G1H | 1.0 | | 1/35 | 12.6 | 31 |

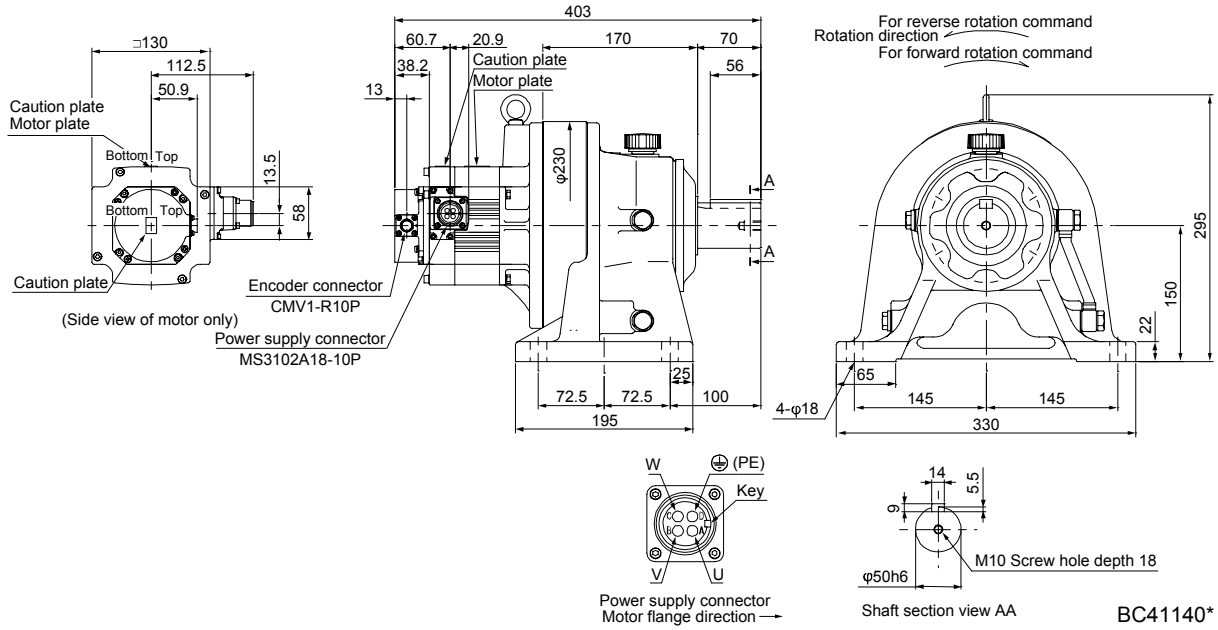
[Unit: mm]




BC41139*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1H | 1.0 | CHHM-6130 | 1/43 | 13.8 | 50 |

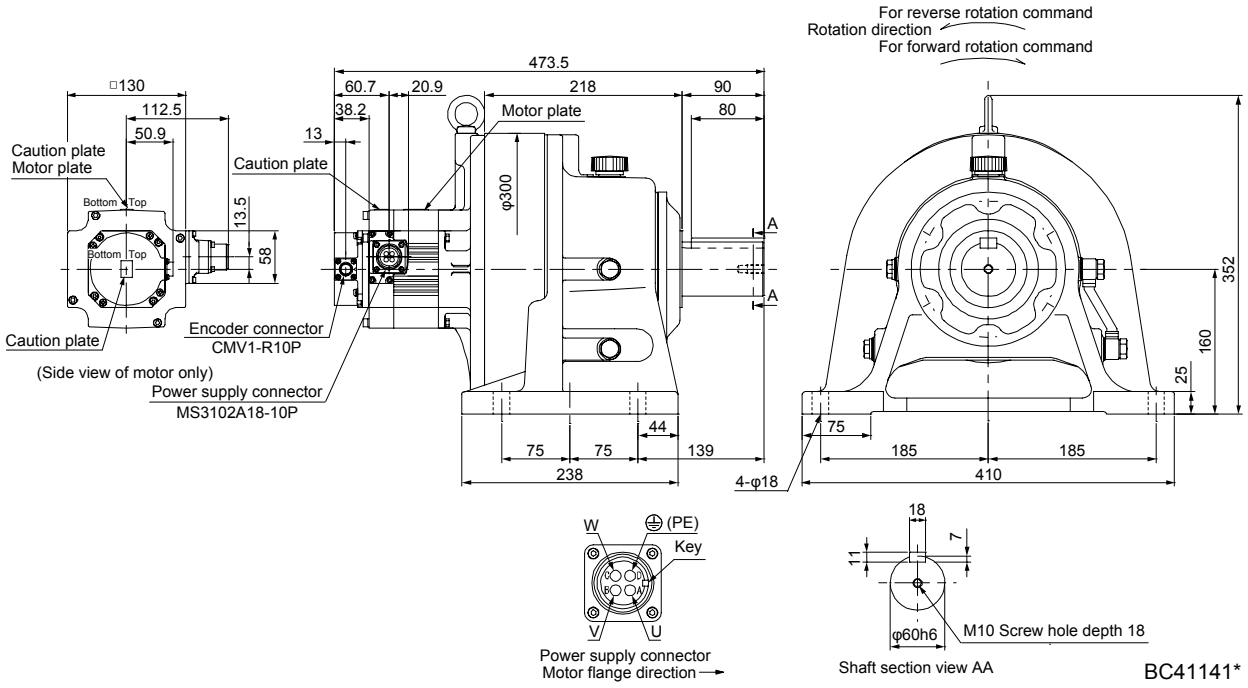
[Unit: mm]




BC41140*

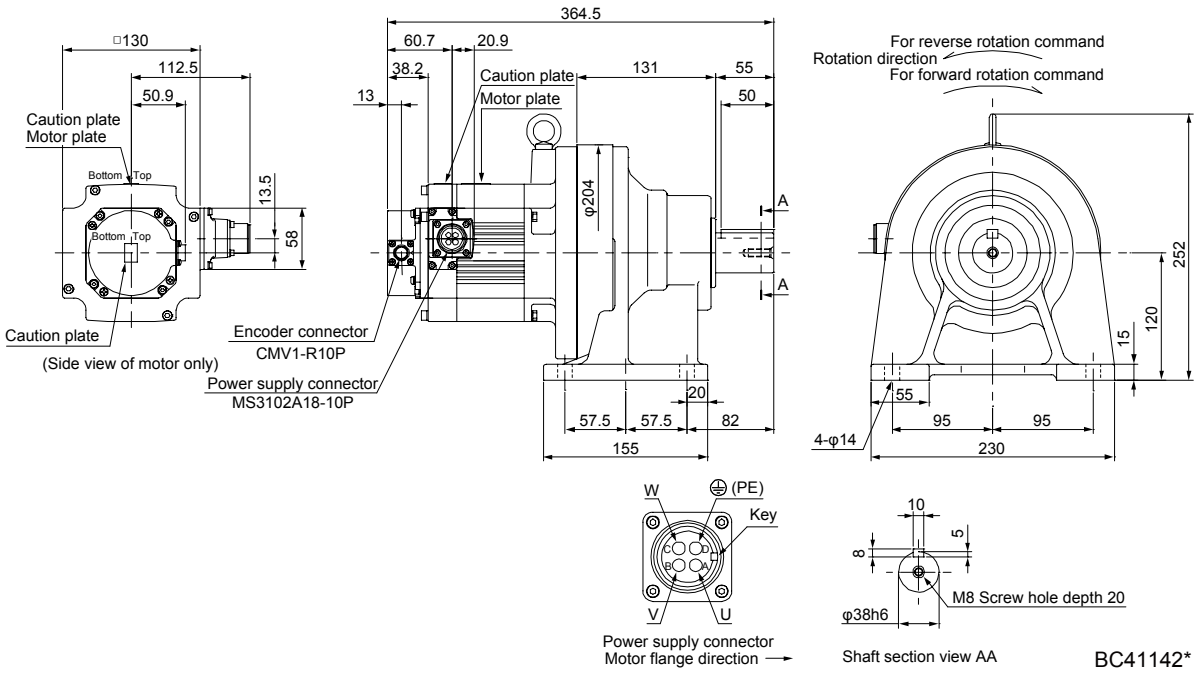
| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G1H | 1.0 | CHHM-6160 | 1/59 | 19.1 | 86 |

[Unit: mm]



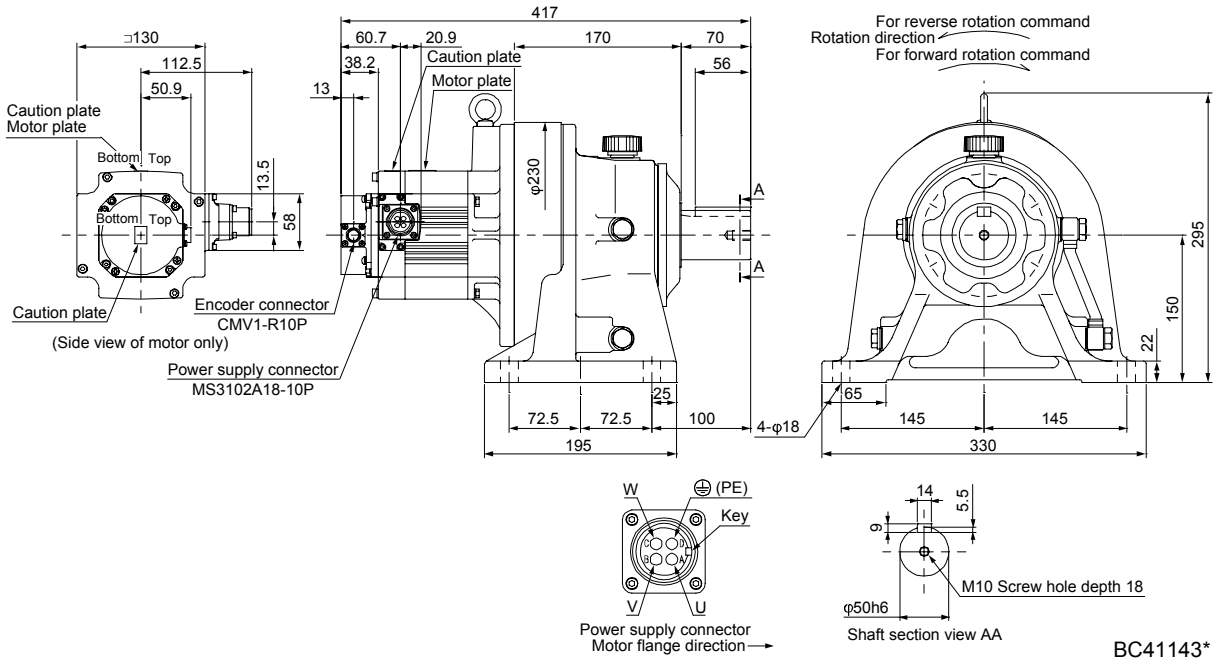

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1H | 1.5 | CNHM-6120 | 1/6 | 19.2 | 32 |
| HG-SR152G1H | 1.5 | | 1/11 | 17.7 | 32 |
| HG-SR152G1H | 1.5 | | 1/17 | 17.3 | 32 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1H | 1.5 | CHHM-6130 | 1/29 | 18.4 | 51 |
| HG-SR152G1H | 1.5 | | 1/35 | 18.3 | 51 |

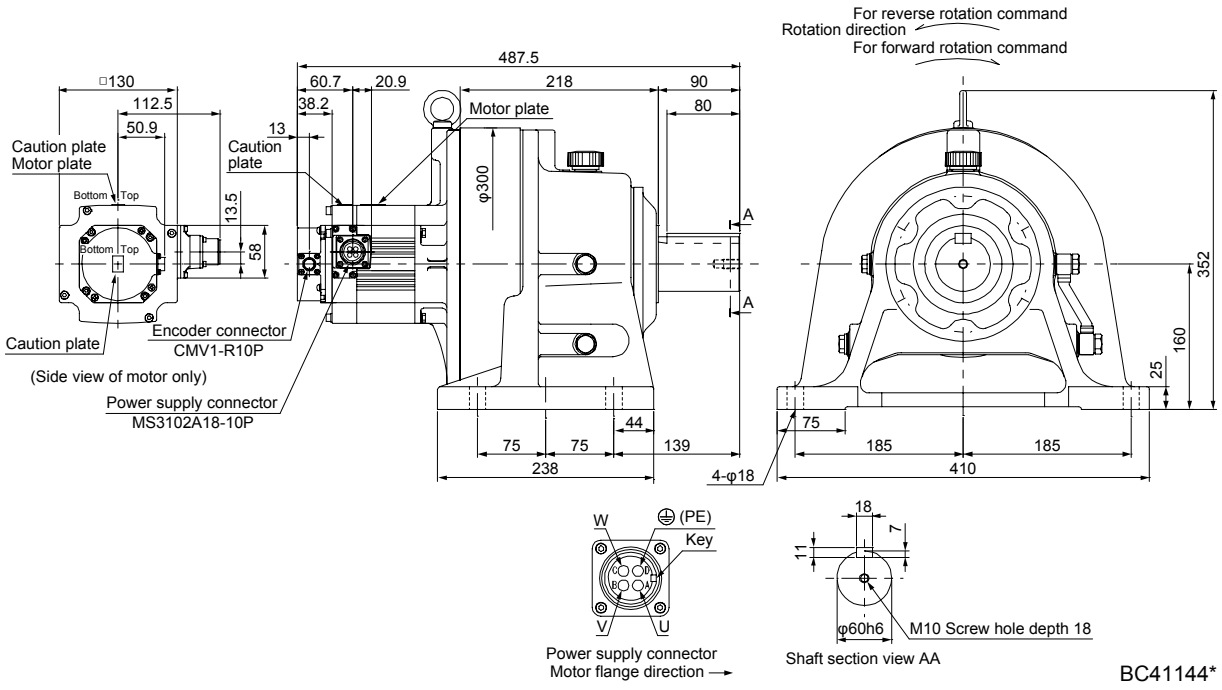
[Unit: mm]




BC41143*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G1H | 1.5 | CHHM-6160 | 1/43 | 23.6 | 87 |
| HG-SR152G1H | 1.5 | | 1/59 | 23.5 | 87 |

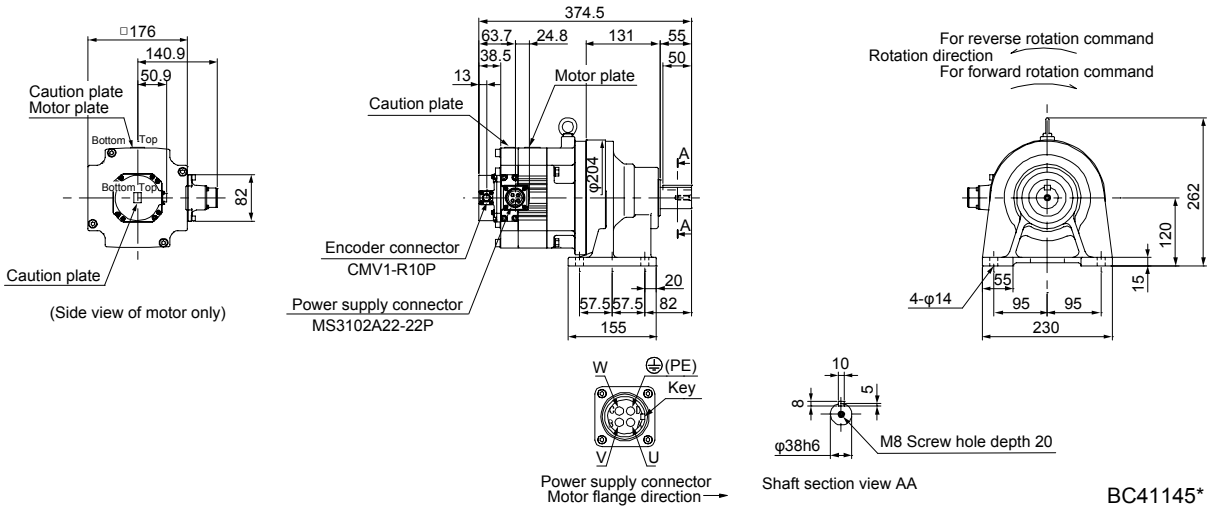
[Unit: mm]




BC41144*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G1H | 2.0 | CNHM-6120 | 1/6 | 50.0 | 37 |
| HG-SR202G1H | 2.0 | | 1/11 | 48.4 | 37 |
| HG-SR202G1H | 2.0 | | 1/17 | 48.1 | 37 |

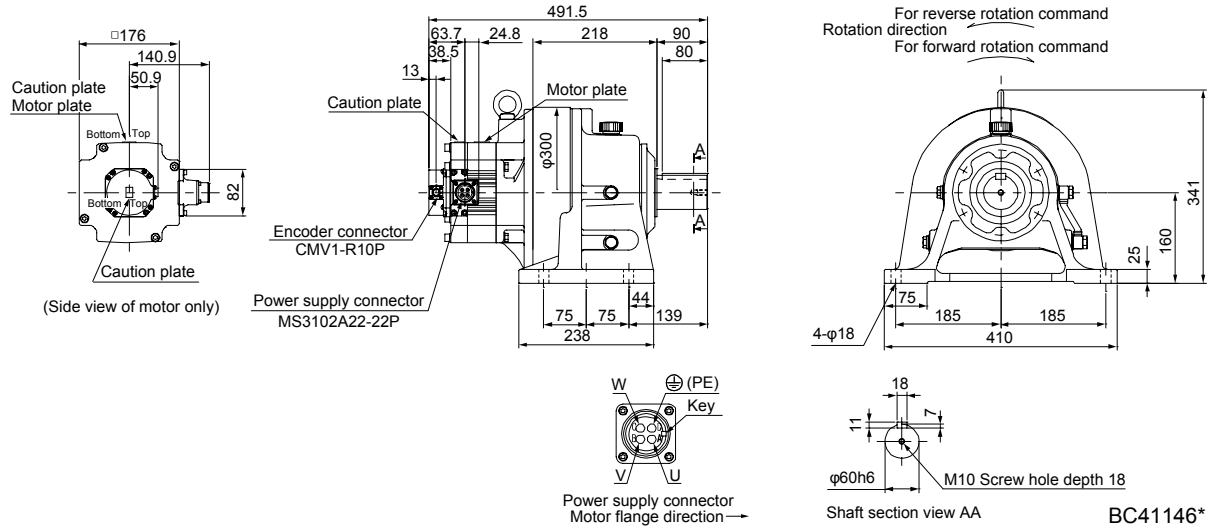
[Unit: mm]




BC41145*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G1H | 2.0 | CHHM-6165 | 1/29 | 54.8 | 92 |
| HG-SR202G1H | 2.0 | | 1/35 | 54.5 | 92 |
| HG-SR202G1H | 2.0 | | 1/43 | 54.3 | 92 |
| HG-SR202G1H | 2.0 | | 1/59 | 54.2 | 92 |

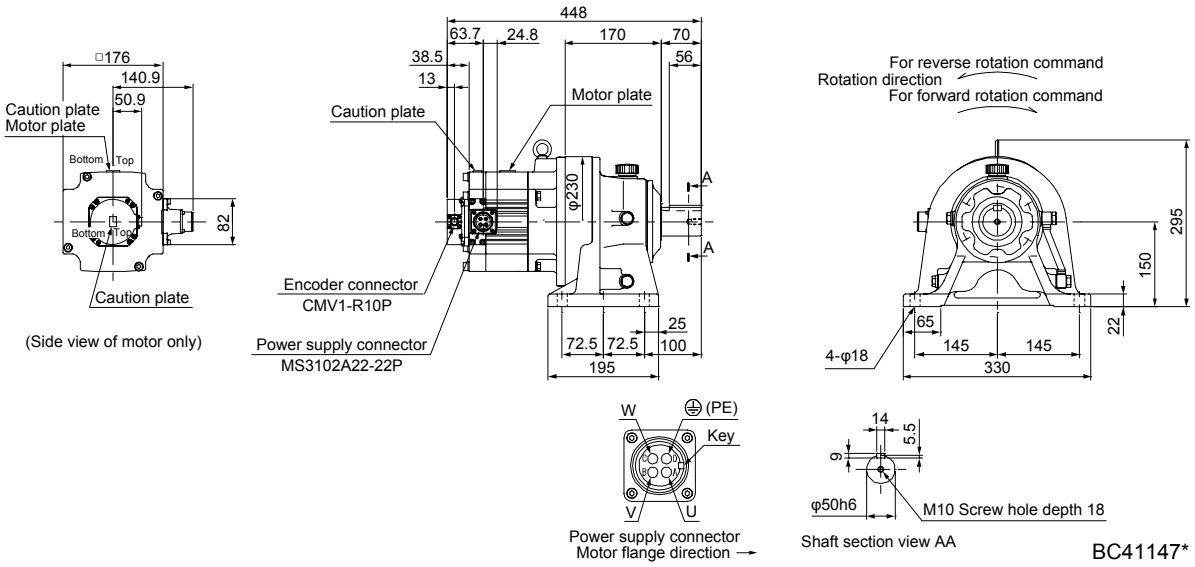
[Unit: mm]




BC41146*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1H | 3.5 | CHHM-6135 | 1/6 | 87.1 | 61 |
| HG-SR352G1H | 3.5 | | 1/11 | 82.8 | 61 |
| HG-SR352G1H | 3.5 | | 1/17 | 81.5 | 61 |

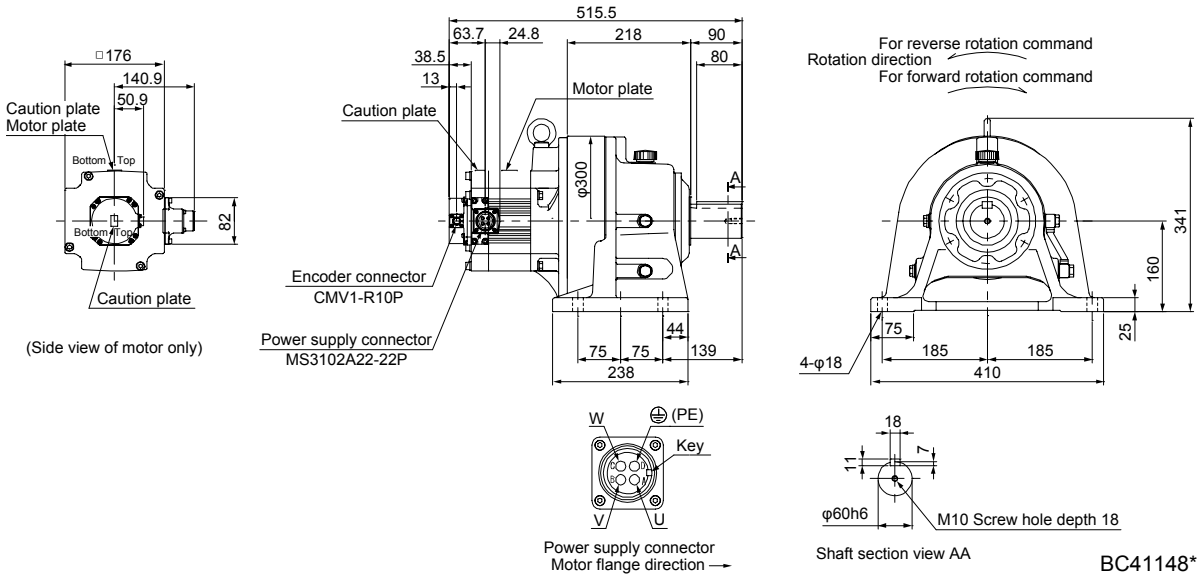
[Unit: mm]




BC41147*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1H | 3.5 | CHHM-6165 | 1/29 | 86.6 | 97 |
| HG-SR352G1H | 3.5 | | 1/35 | 86.3 | 97 |

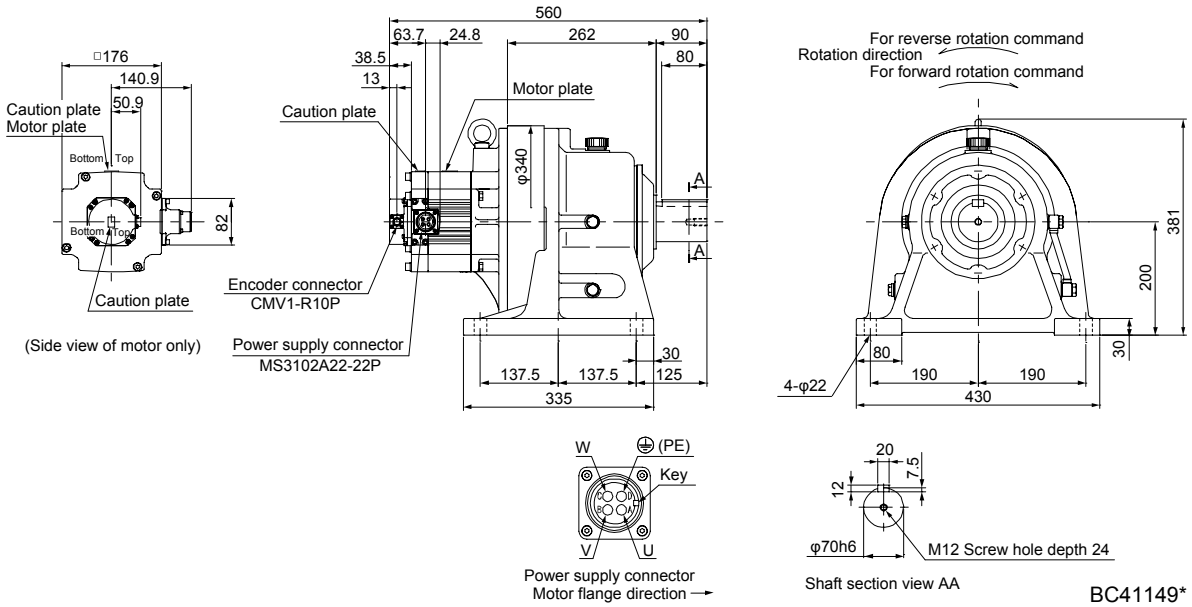
[Unit: mm]




BC41148*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G1H | 3.5 | CHHM-6175 | 1/43 | 105 | 137 |
| HG-SR352G1H | 3.5 | | 1/59 | 104 | 137 |

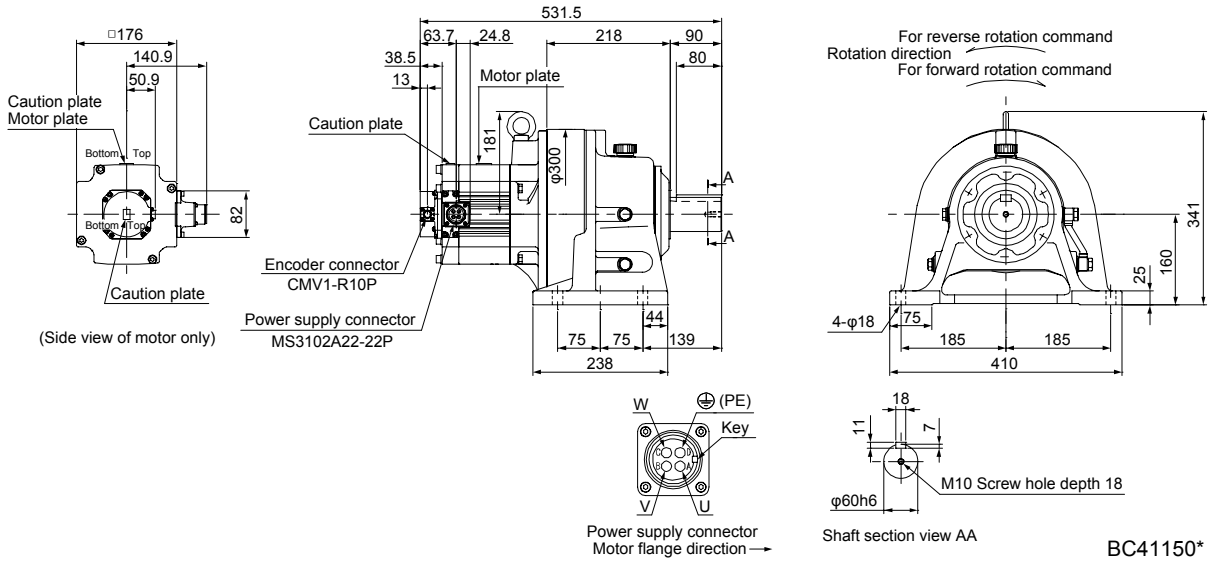
[Unit: mm]




BC41149*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1H | 5.0 | CHHM-6165 | 1/6 | 126 | 101 |
| HG-SR502G1H | 5.0 | | 1/11 | 114 | 101 |
| HG-SR502G1H | 5.0 | | 1/17 | 110 | 101 |

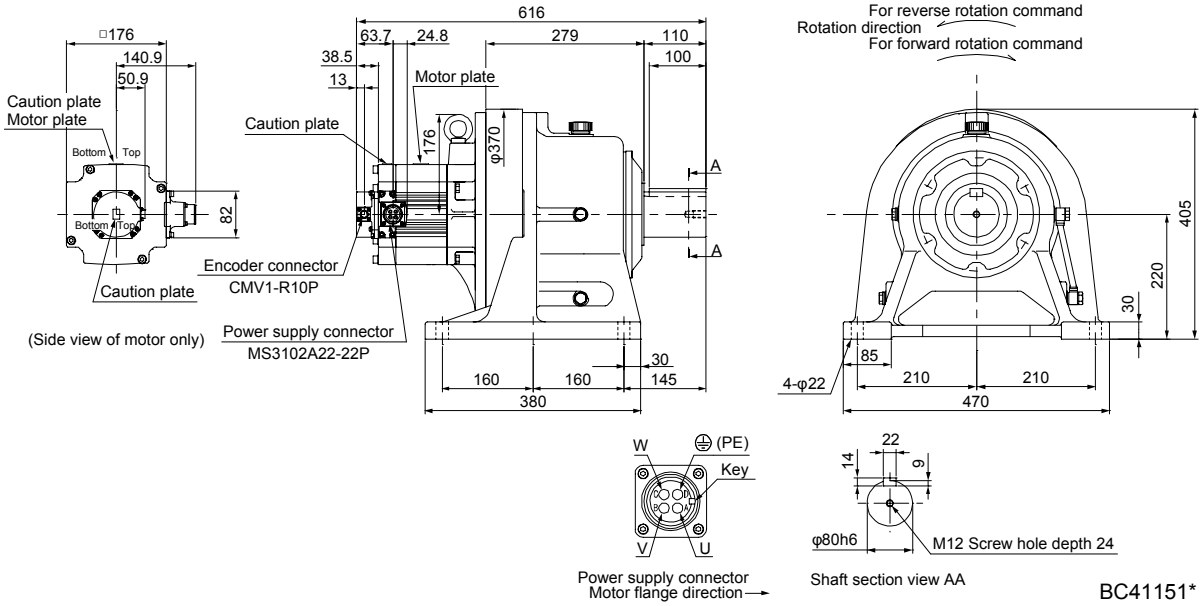
[Unit: mm]




BC41150*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1H | 5.0 | CHHM-6180 | 1/29 | 141 | 178 |
| HG-SR502G1H | 5.0 | | 1/35 | 140 | 178 |
| HG-SR502G1H | 5.0 | | 1/43 | 139 | 178 |

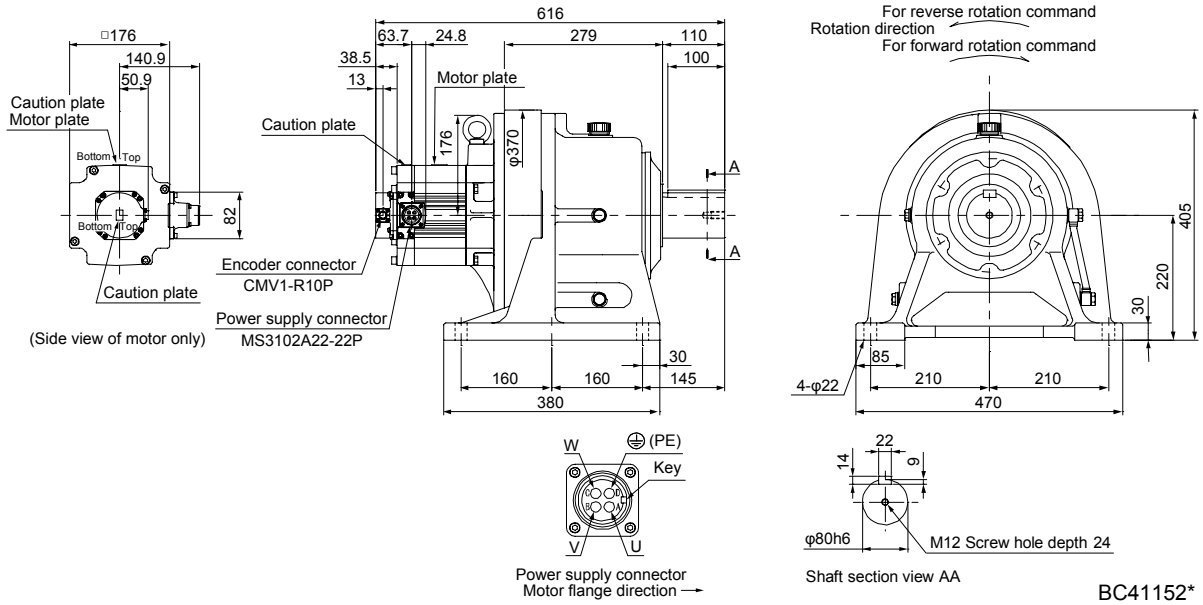
[Unit: mm]




BC41151*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G1H | 5.0 | CHHM-6185 | 1/59 | 138 | 178 |

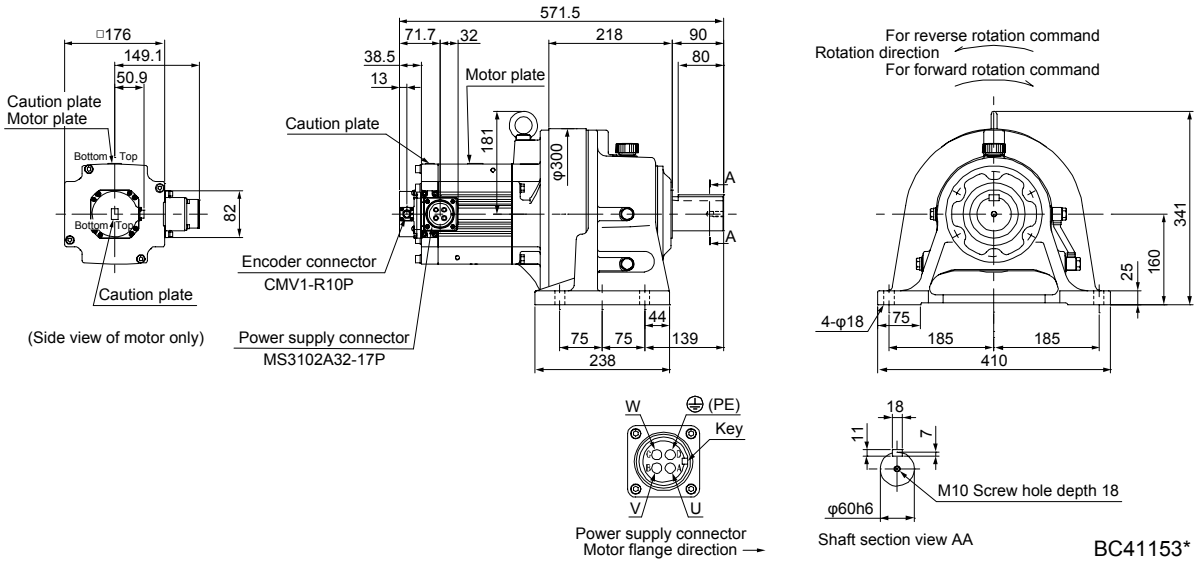
[Unit: mm]




BC41152*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1H | 7.0 | CHHM-6165 | 1/6 | 177 | 108 |

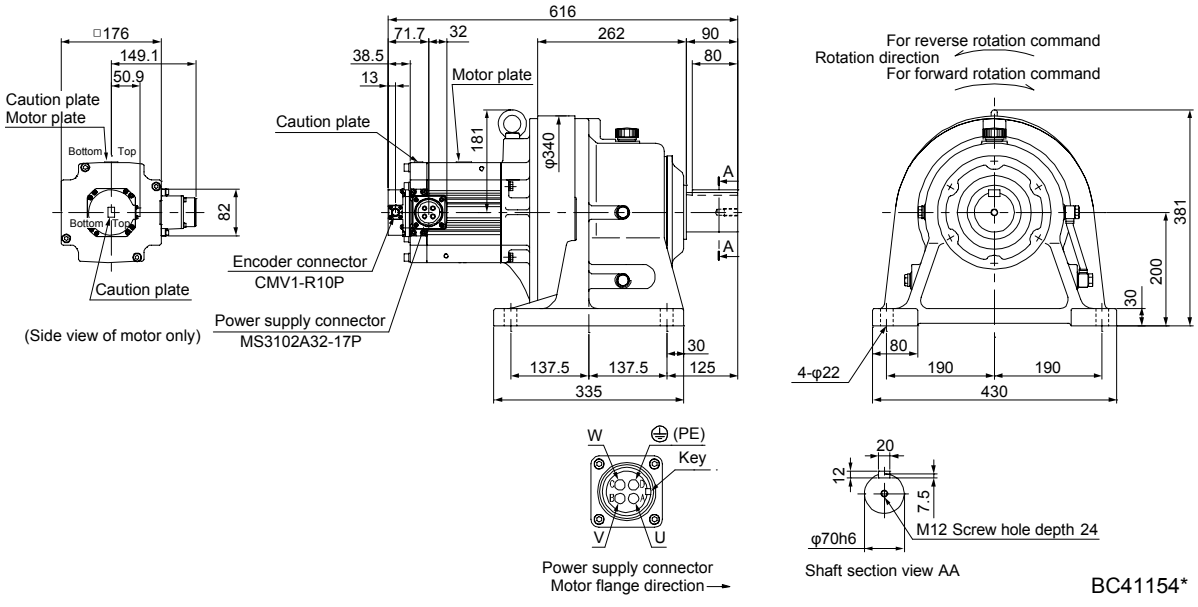
[Unit: mm]




BC41153*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1H | 7.0 | CHHM-6170 | 1/11 | 190 | 148 |
| HG-SR702G1H | 7.0 | | 1/17 | 182 | 148 |

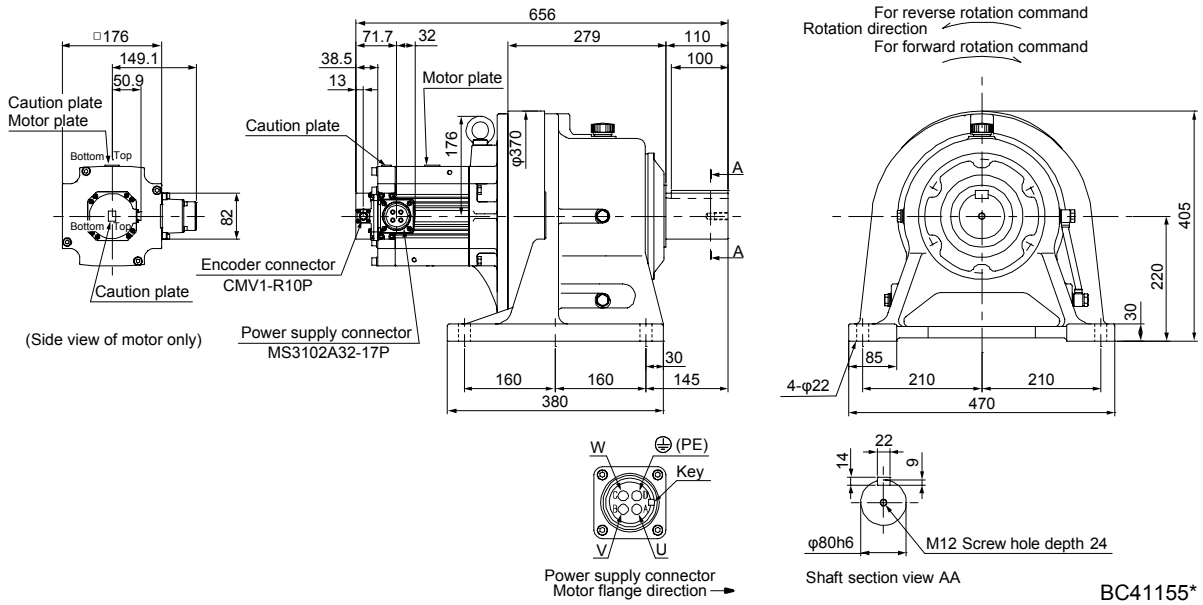
[Unit: mm]




BC41154*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1H | 7.0 | CHHM-6180 | 1/29 | 192 | 185 |
| HG-SR702G1H | 7.0 | | 1/35 | 192 | 185 |

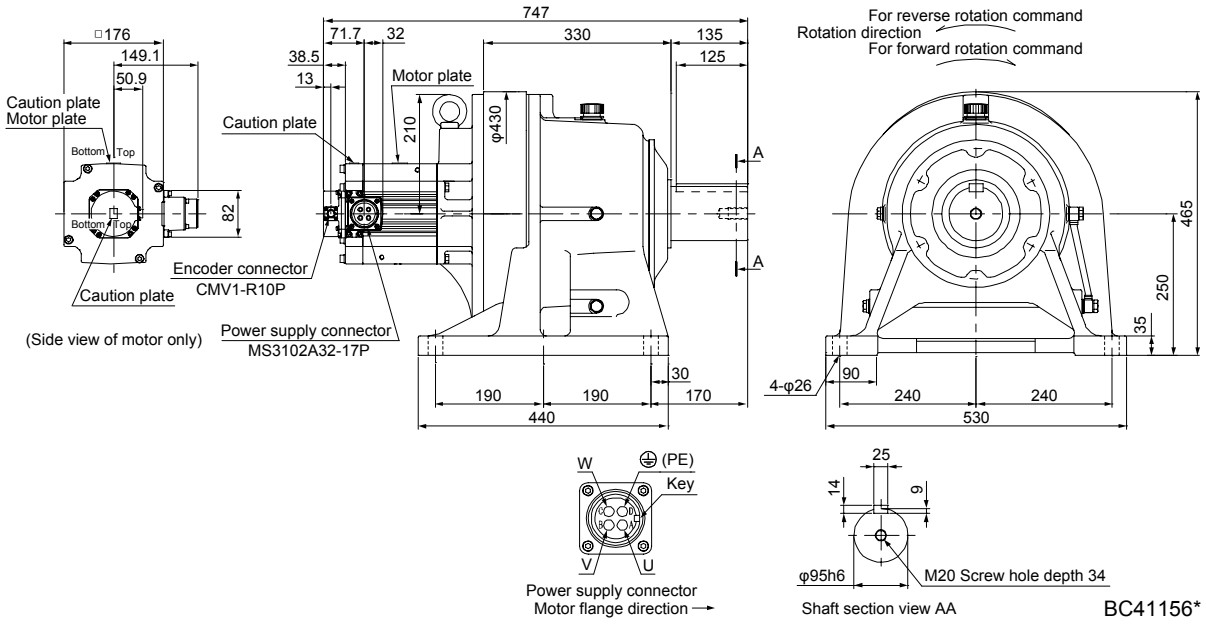
[Unit: mm]




BC41155*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G1H | 7.0 | CHHM-6180 | 1/43 | 267 | 256 |
| HG-SR702G1H | 7.0 | | 1/59 | 266 | 256 |

[Unit: mm]

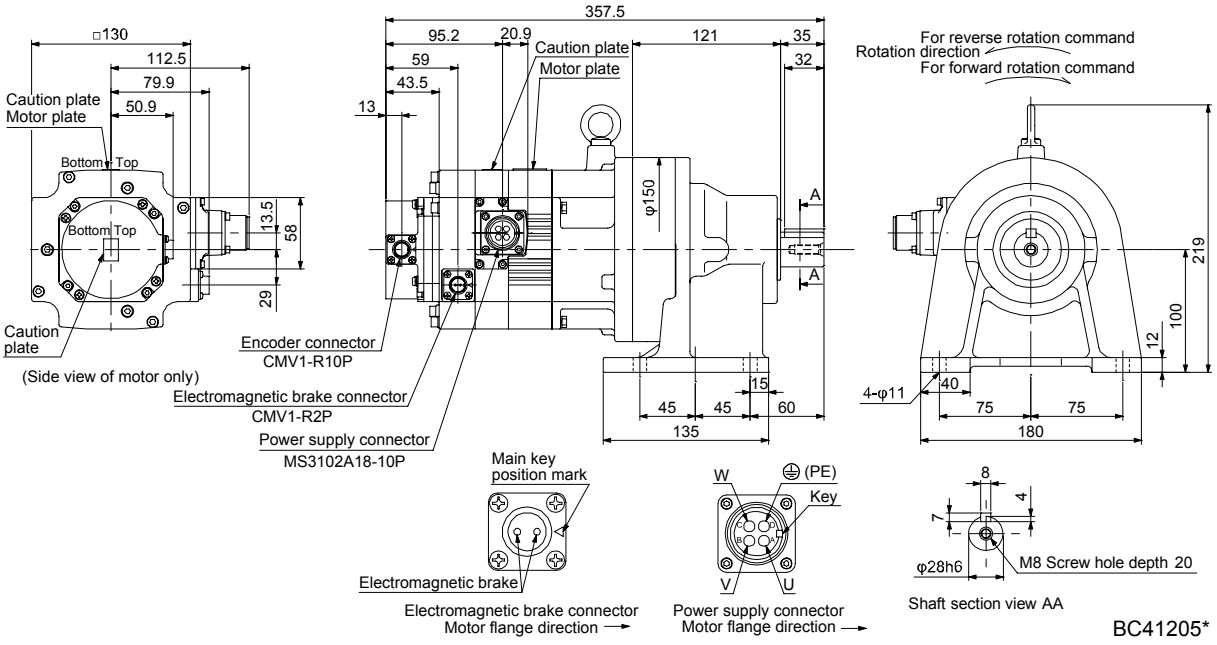



BC41156*

## 7.7.6 For general industrial machine with a reducer (foot-mounting/with an electromagnetic brake)

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG1H | 0.5 | CNHM-6100 | 1/6 | 8.5 | 10.3 | 22 |
| HG-SR52BG1H | 0.5 | | 1/11 | 8.5 | 9.85 | 22 |
| HG-SR52BG1H | 0.5 | | 1/17 | 8.5 | 9.73 | 22 |
| HG-SR52BG1H | 0.5 | | 1/29 | 8.5 | 9.67 | 22 |

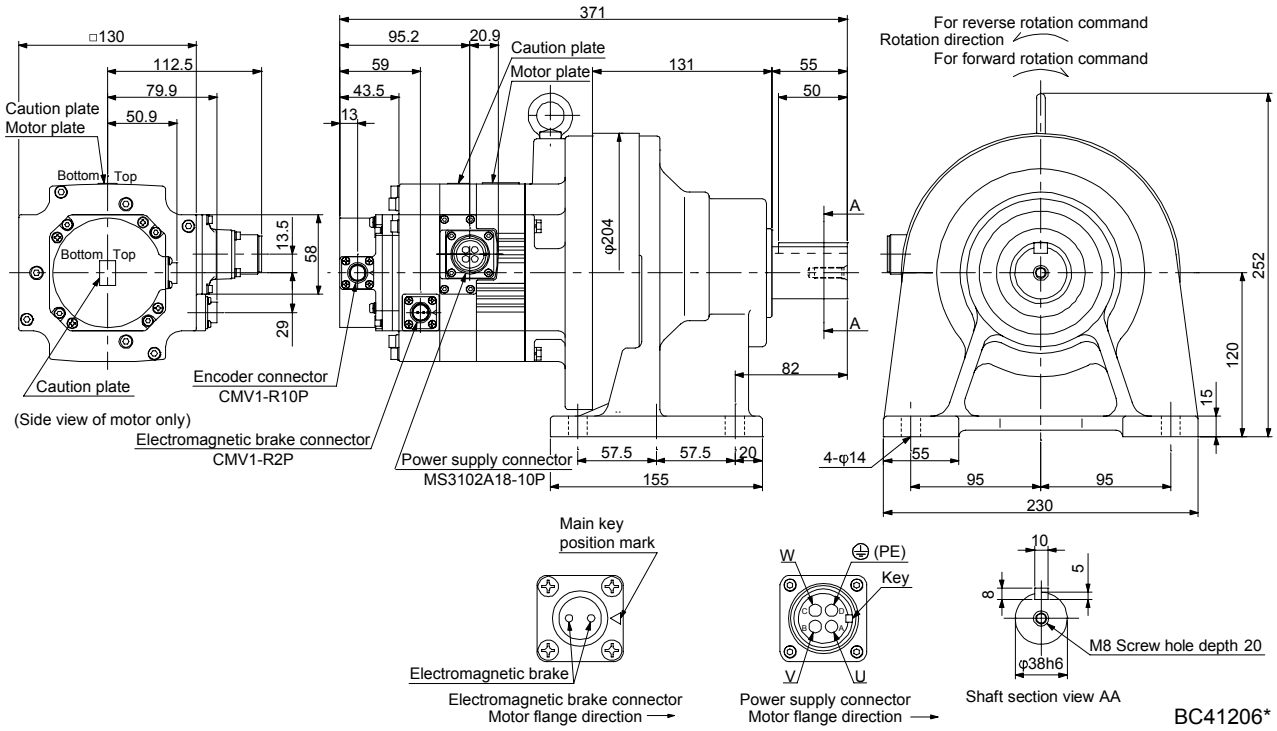
[Unit: mm]




BC41205*

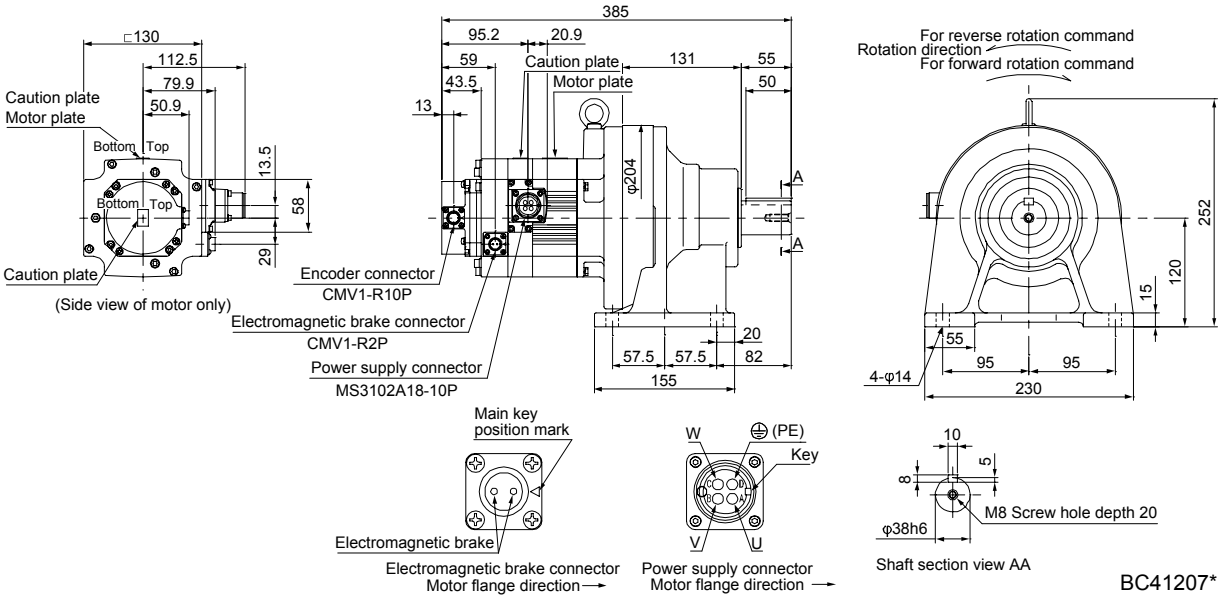
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG1H | 0.5 | CNHM-6120 | 1/35 | 8.5 | 10.5 | 30 |
| HG-SR52BG1H | 0.5 | | 1/43 | 8.5 | 10.4 | 30 |
| HG-SR52BG1H | 0.5 | | 1/59 | 8.5 | 10.4 | 30 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1H | 1.0 | CNHM-6120 | 1/6 | 8.5 | 17.0 | 33 |
| HG-SR102BG1H | 1.0 | | 1/11 | 8.5 | 15.5 | 33 |
| HG-SR102BG1H | 1.0 | | 1/17 | 8.5 | 15.1 | 33 |
| HG-SR102BG1H | 1.0 | | 1/29 | 8.5 | 14.8 | 33 |
| HG-SR102BG1H | 1.0 | | 1/35 | 8.5 | 14.8 | 33 |

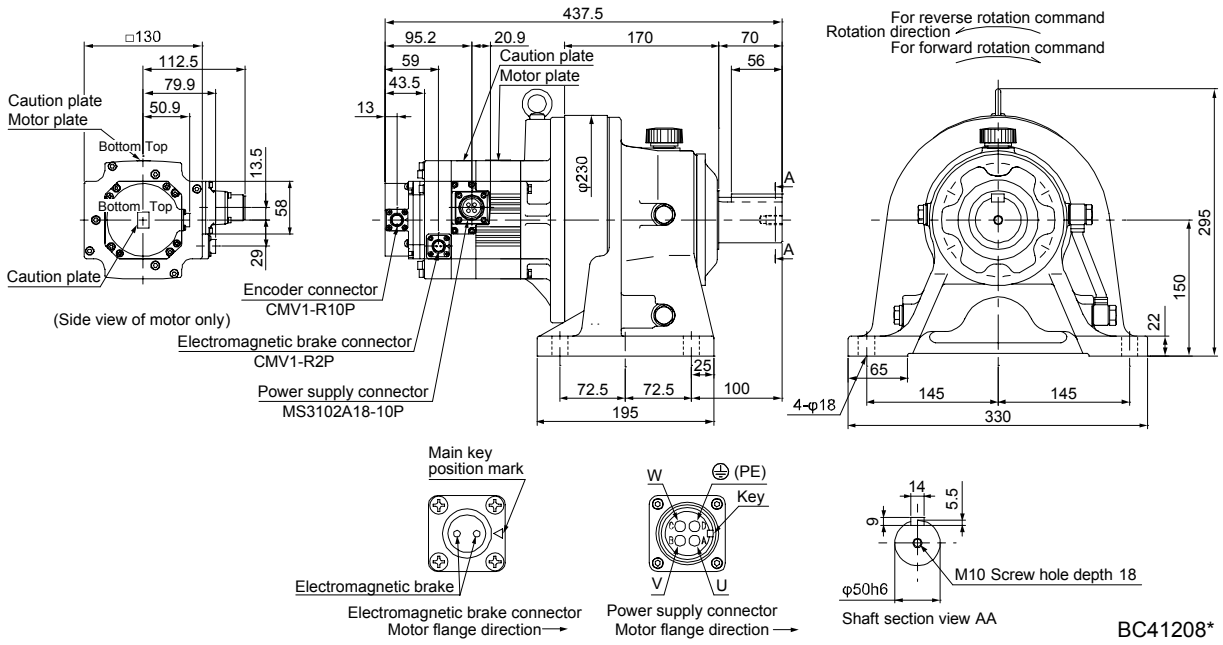
[Unit: mm]




BC41207*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1H | 1.0 | CHHM-6130 | 1/43 | 8.5 | 16.0 | 52 |

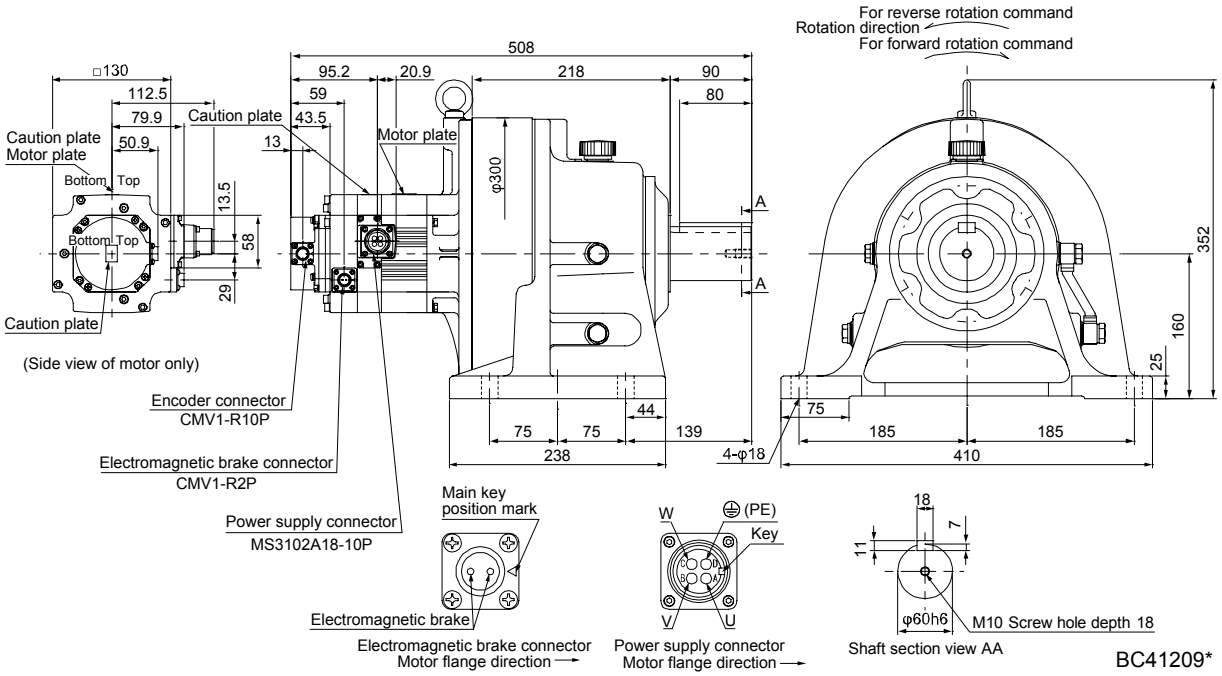
[Unit: mm]




BC41208*

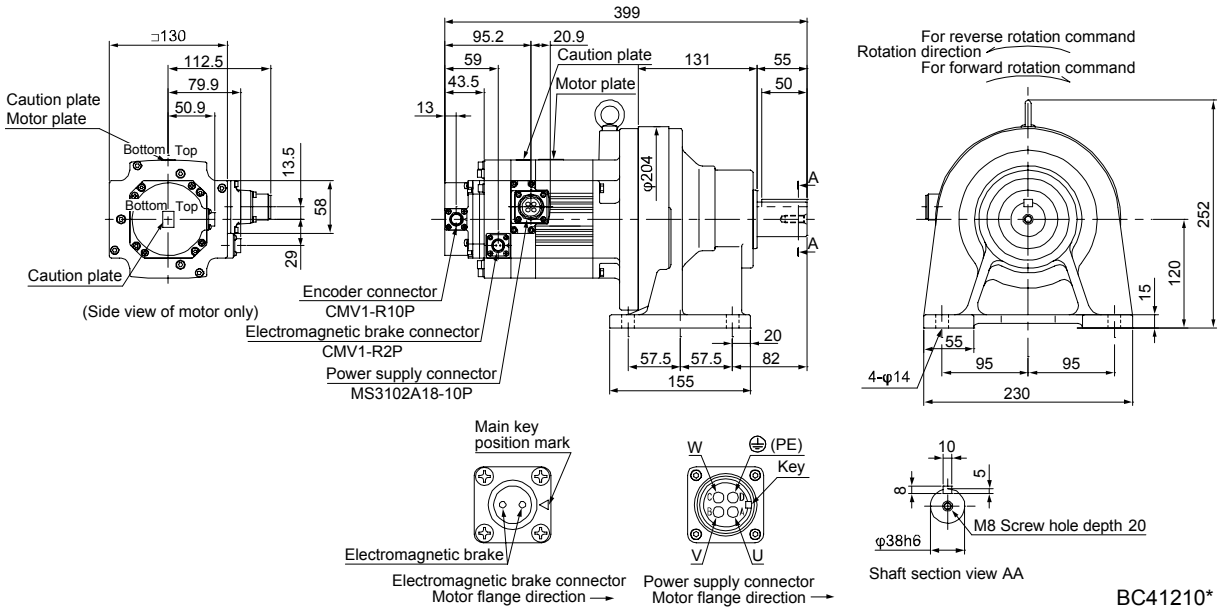
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG1H | 1.0 | CHHM-6160 | 1/59 | 8.5 | 21.3 | 88 |

[Unit: mm]



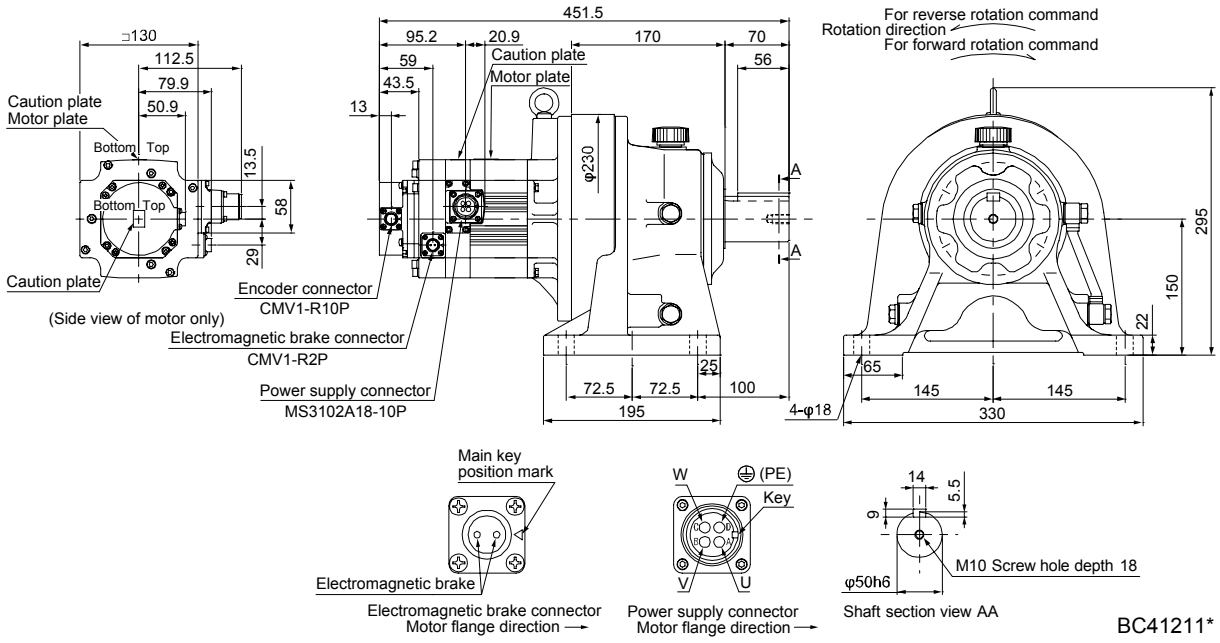

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1H | 1.5 | CNHM-6120 | 1/6 | 8.5 | 21.4 | 34 |
| HG-SR152BG1H | 1.5 | | 1/11 | 8.5 | 19.9 | 34 |
| HG-SR152BG1H | 1.5 | | 1/17 | 8.5 | 19.5 | 34 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1H | 1.5 | CHHM-6130 | 1/29 | 8.5 | 20.6 | 53 |
| HG-SR152BG1H | 1.5 | | 1/35 | 8.5 | 20.5 | 53 |

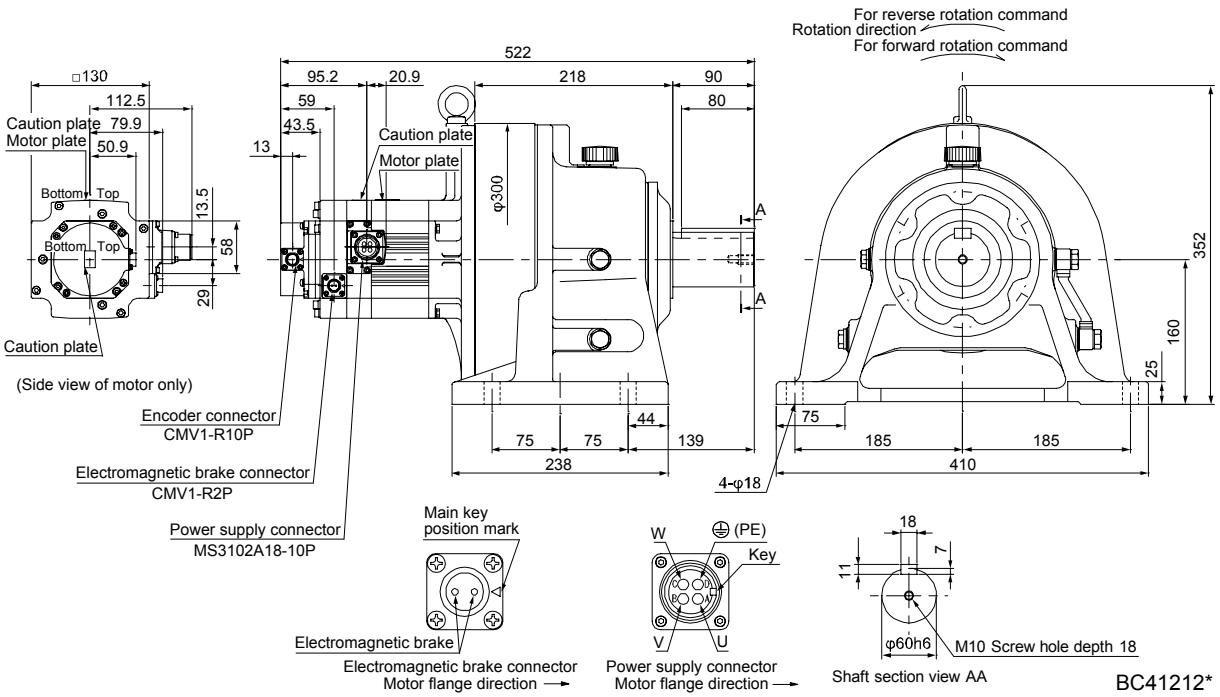
[Unit: mm]




BC41211*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG1H | 1.5 | CHHM-6160 | 1/43 | 8.5 | 25.8 | 89 |
| HG-SR152BG1H | 1.5 | | 1/59 | 8.5 | 25.7 | 89 |

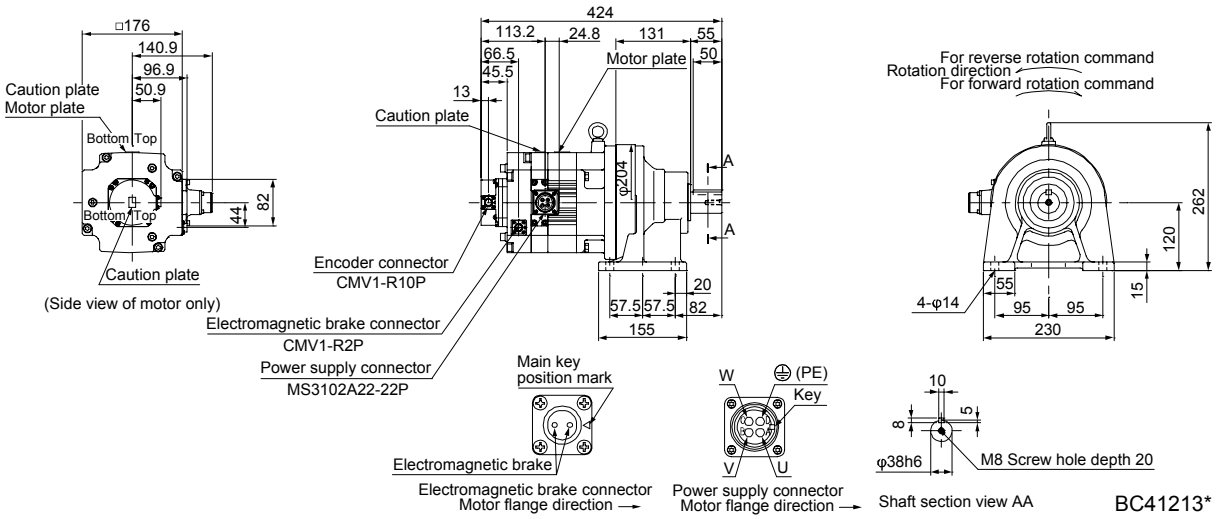
[Unit: mm]




BC41212*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG1H | 2.0 | CNHM-6120 | 1/6 | 44 | 59.4 | 43 |
| HG-SR202BG1H | 2.0 | | 1/11 | 44 | 57.8 | 43 |
| HG-SR202BG1H | 2.0 | | 1/17 | 44 | 57.5 | 43 |

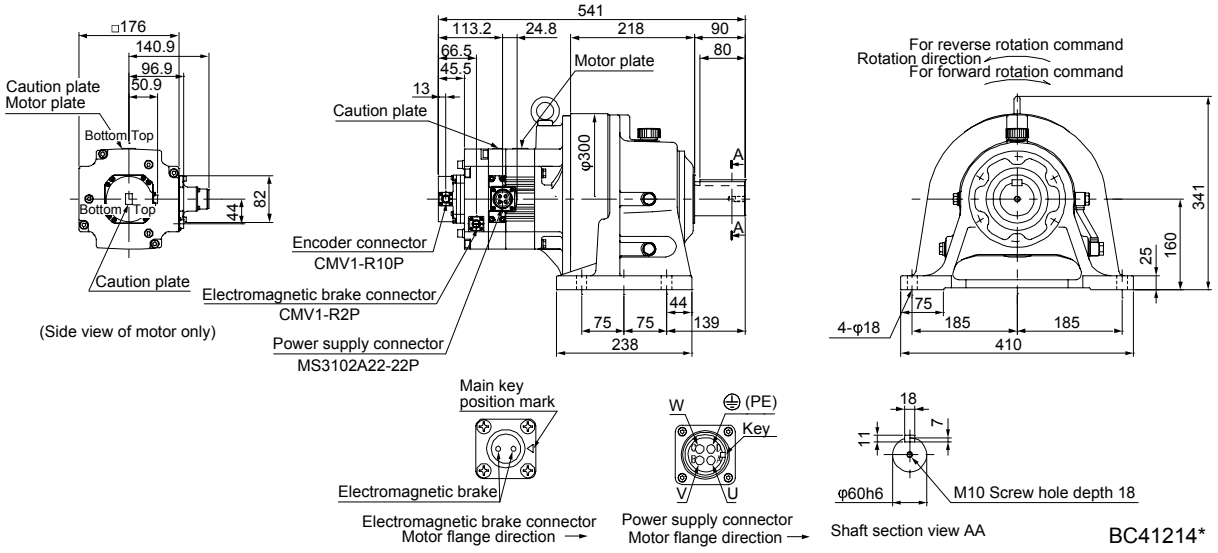
[Unit: mm]




BC41213*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG1H | 2.0 | CHHM-6165 | 1/29 | 44 | 64.2 | 98 |
| HG-SR202BG1H | 2.0 | | 1/35 | 44 | 63.9 | 98 |
| HG-SR202BG1H | 2.0 | | 1/43 | 44 | 63.7 | 98 |
| HG-SR202BG1H | 2.0 | | 1/59 | 44 | 63.6 | 98 |

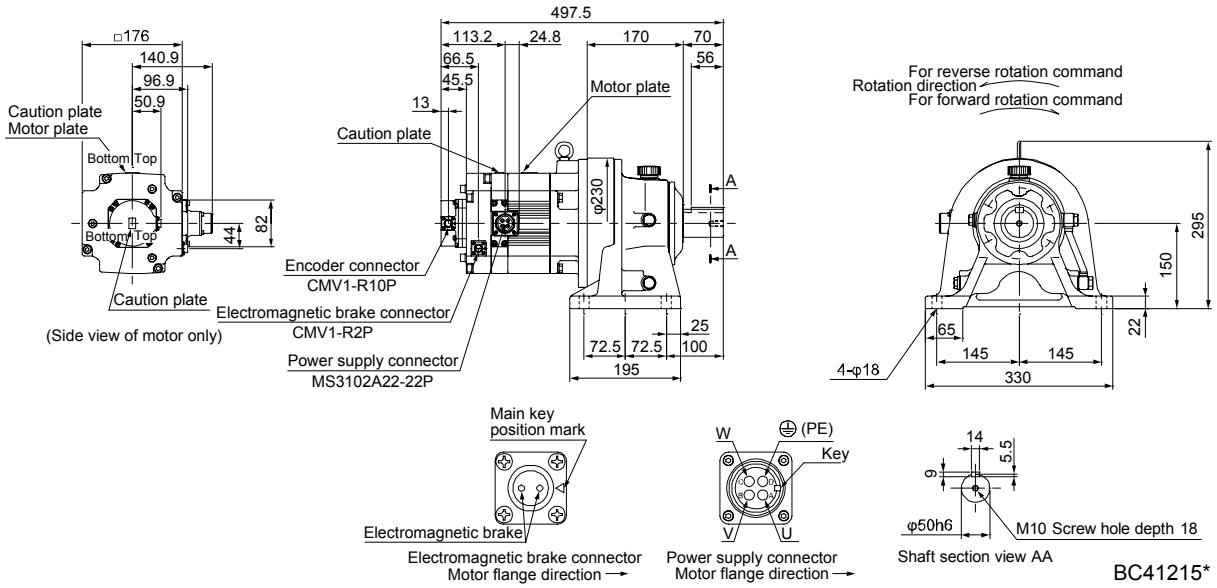
[Unit: mm]




BC41214*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1H | 3.5 | CHHM-6135 | 1/6 | 44 | 96.5 | 67 |
| HG-SR352BG1H | 3.5 | | 1/11 | 44 | 92.2 | 67 |
| HG-SR352BG1H | 3.5 | | 1/17 | 44 | 90.9 | 67 |

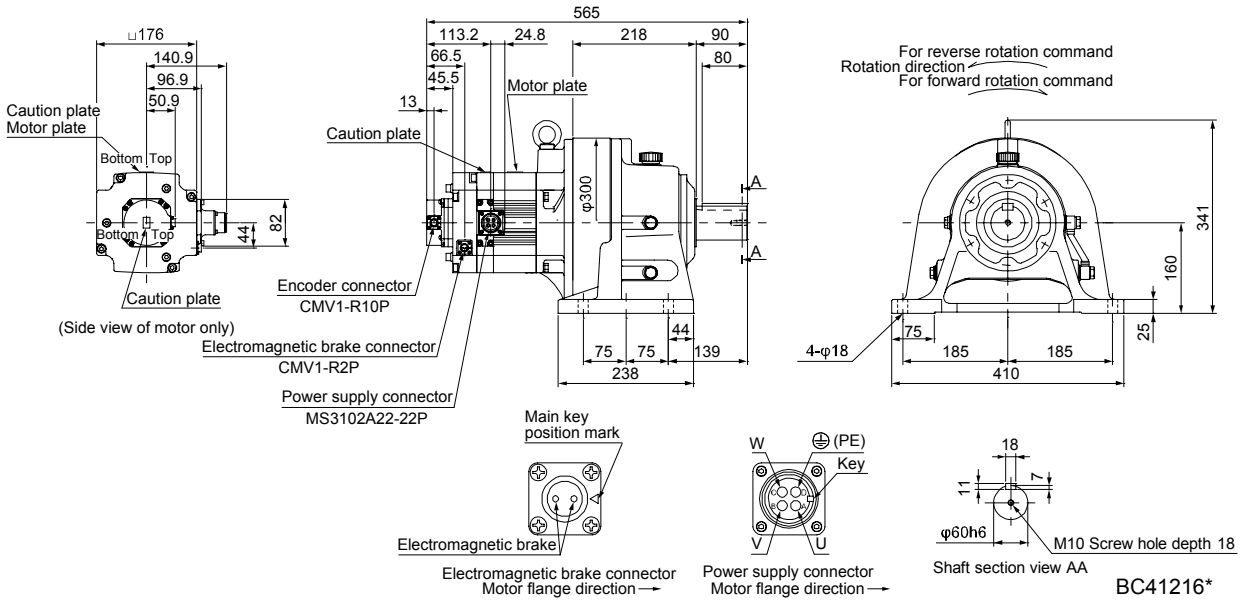
[Unit: mm]




BC41215*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1H | 3.5 | CHHM-6165 | 1/29 | 44 | 96.0 | 103 |
| HG-SR352BG1H | 3.5 | | 1/35 | 44 | 95.7 | 103 |

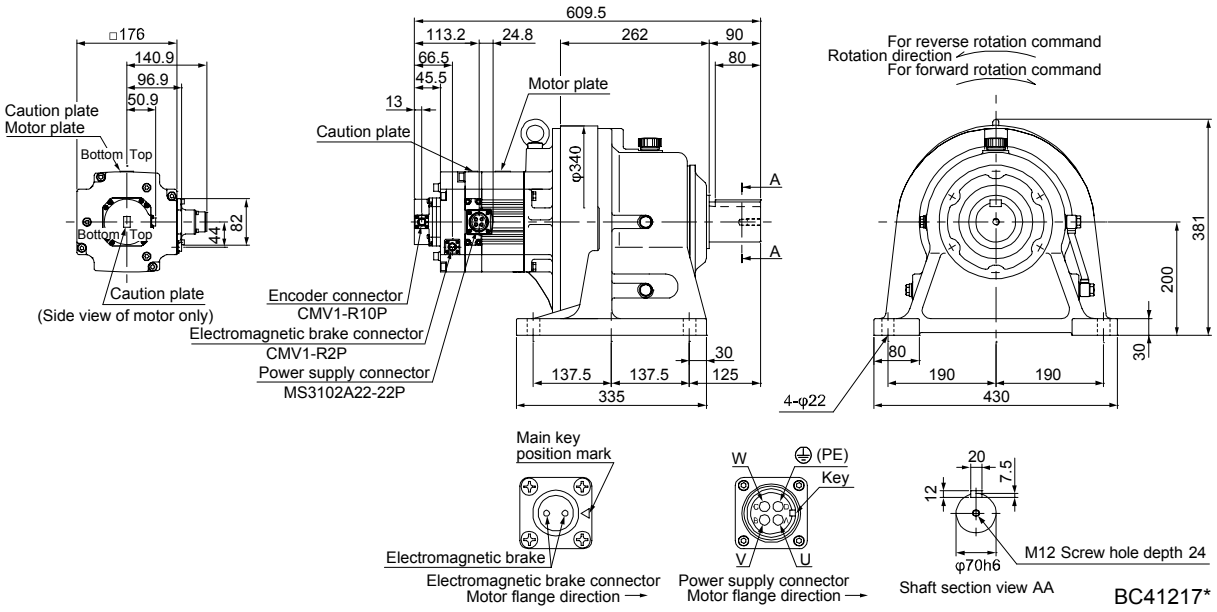
[Unit: mm]




BC41216*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG1H | 3.5 | CHHM-6175 | 1/43 | 44 | 114 | 143 |
| HG-SR352BG1H | 3.5 | | 1/59 | 44 | 113 | 143 |

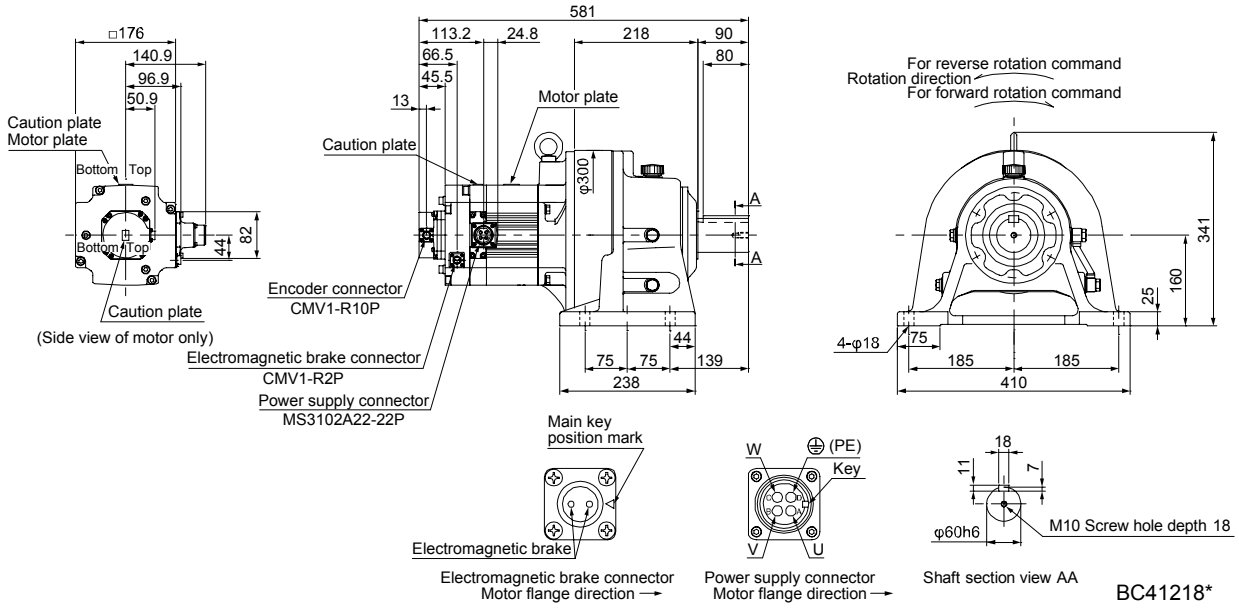
[Unit: mm]




BC41217*

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1H | 5.0 | CHHM-6165 | 1/6 | 44 | 135 | 107 |
| HG-SR502BG1H | 5.0 | | 1/11 | 44 | 123 | 107 |
| HG-SR502BG1H | 5.0 | | 1/17 | 44 | 119 | 107 |

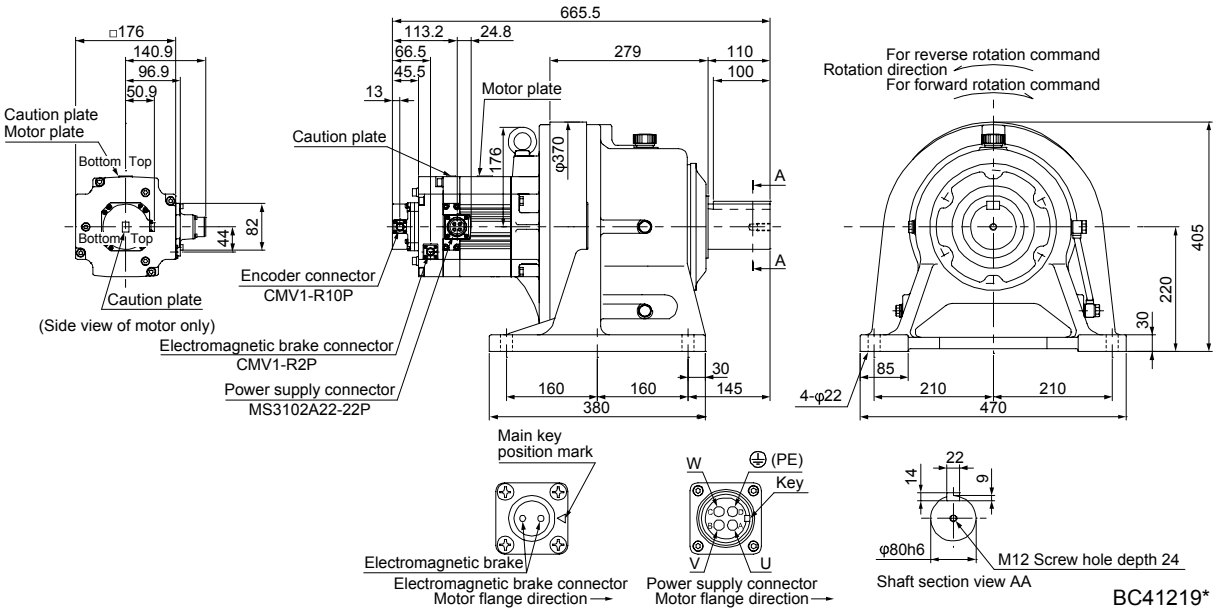
[Unit: mm]




BC41218*

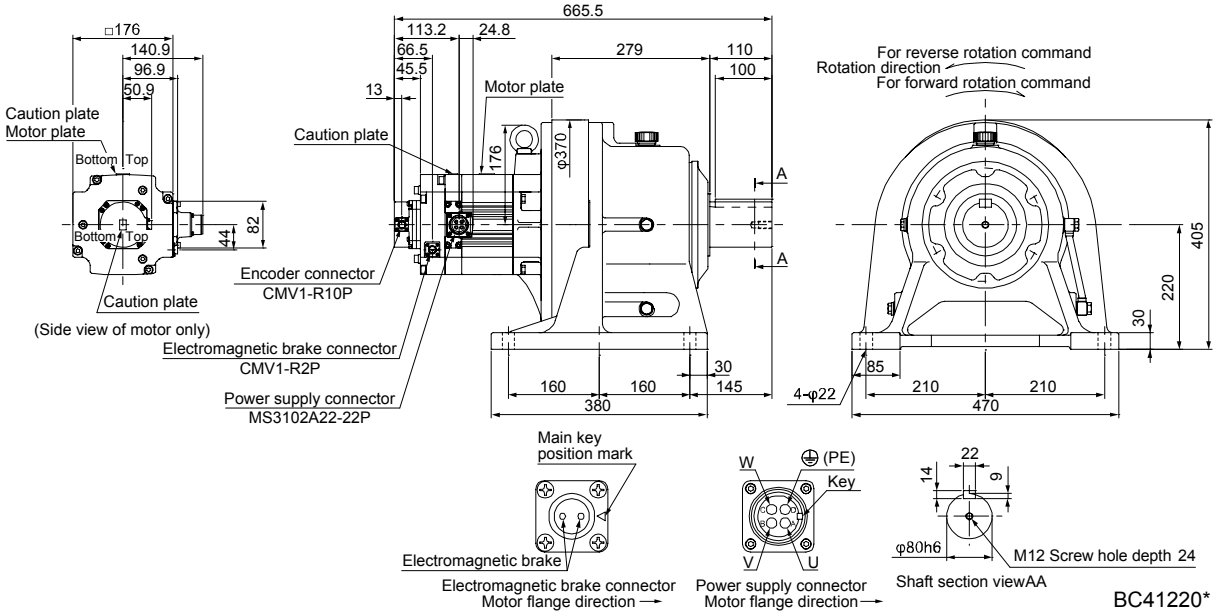
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1H | 5.0 | CHHM-6180 | 1/29 | 44 | 150 | 184 |
| HG-SR502BG1H | 5.0 | | 1/35 | 44 | 150 | 184 |
| HG-SR502BG1H | 5.0 | | 1/43 | 44 | 149 | 184 |

[Unit: mm]



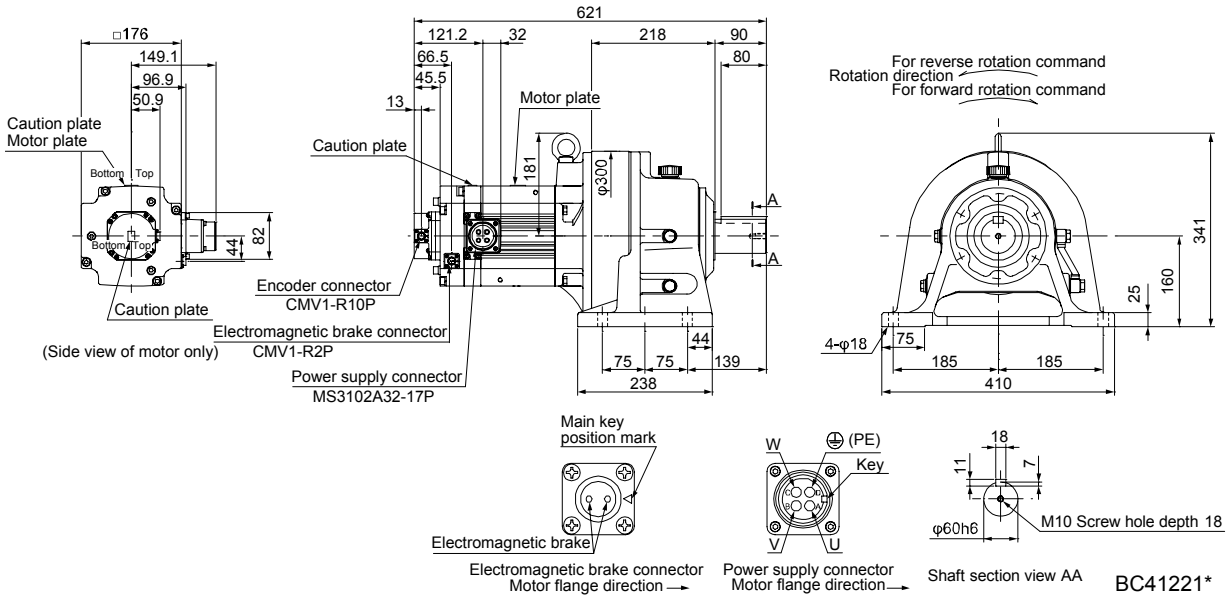

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG1H | 5.0 | CHHM-6185 | 1/59 | 44 | 147 | 184 |

[Unit: mm]



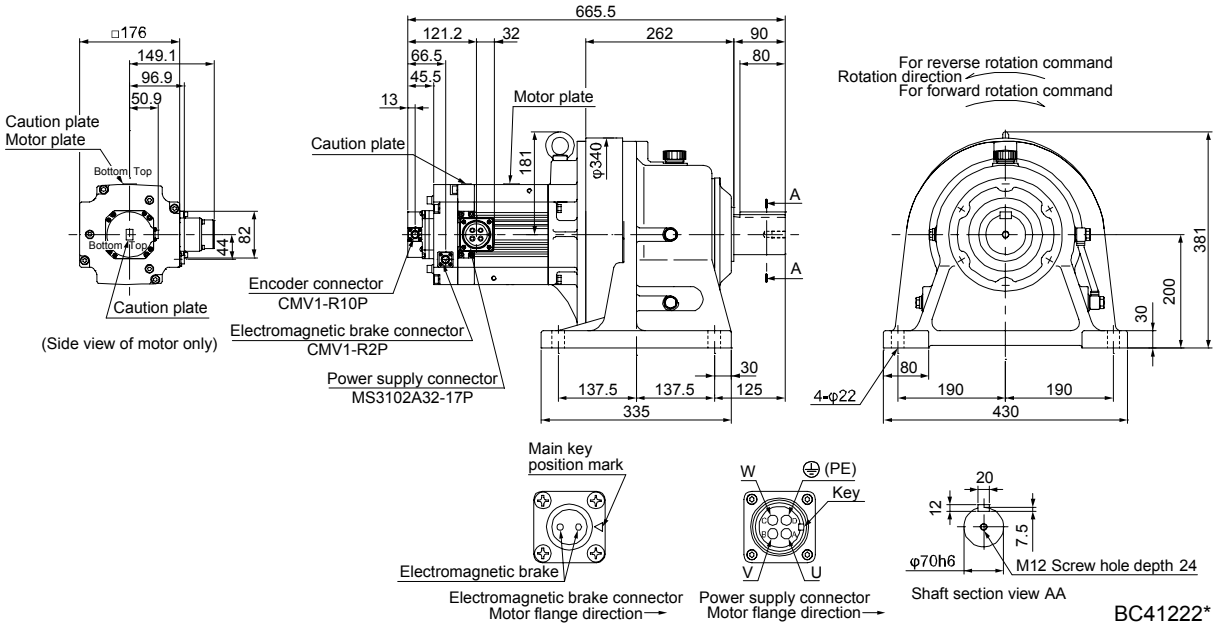
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1H | 7.0 | CHHM-6165 | 1/6 | 44 | 187 | 114 |

[Unit: mm]



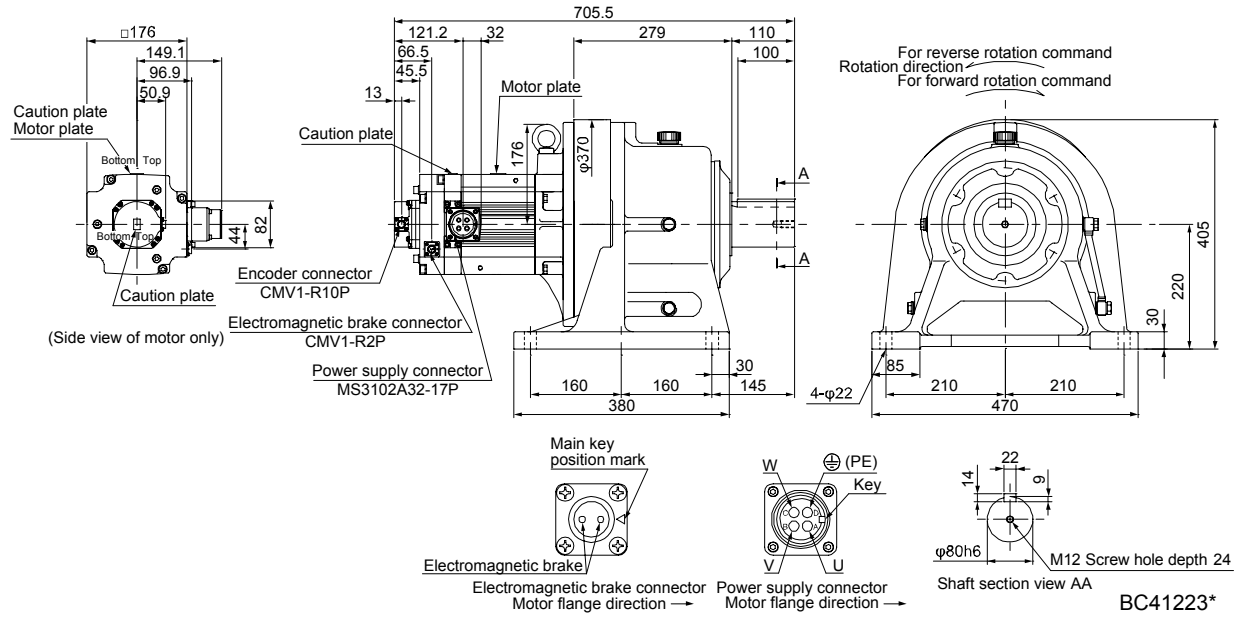

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1H | 7.0 | CHHM-6170 | 1/11 | 44 | 199 | 154 |
| HG-SR702BG1H | 7.0 | | 1/17 | 44 | 192 | 154 |

[Unit: mm]



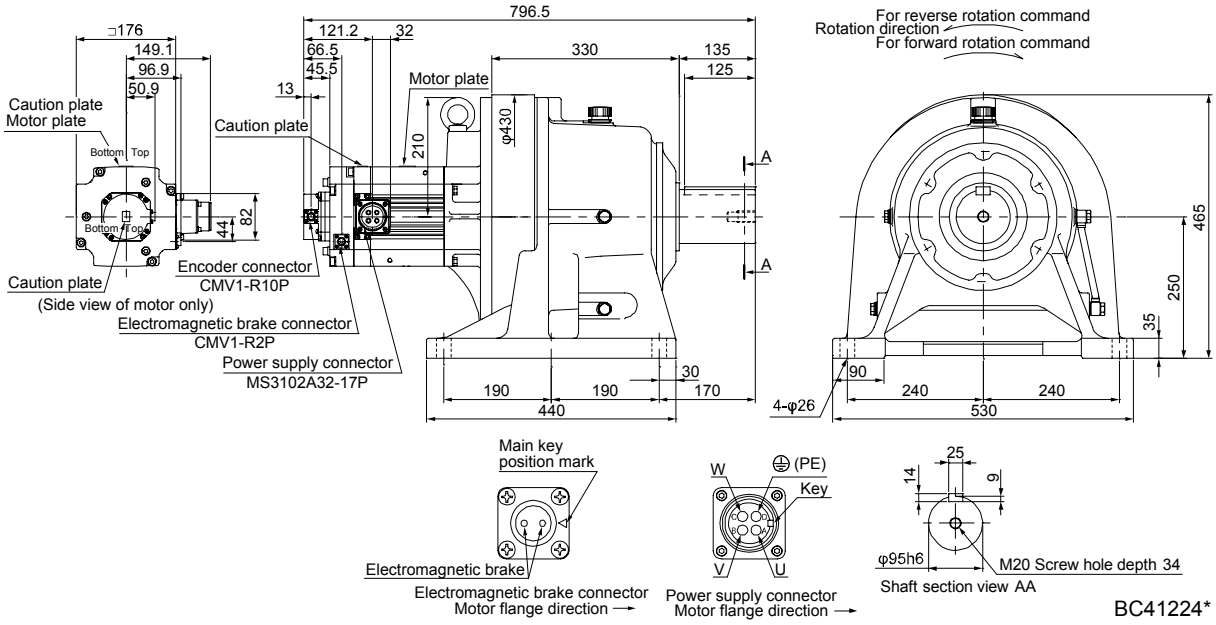
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1H | 7.0 | CHHM-6180 | 1/29 | 44 | 202 | 191 |
| HG-SR702BG1H | 7.0 | | 1/35 | 44 | 201 | 191 |

[Unit: mm]




| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG1H | 7.0 | CHHM-6195 | 1/43 | 44 | 277 | 262 |
| HG-SR702BG1H | 7.0 | | 1/59 | 44 | 275 | 262 |

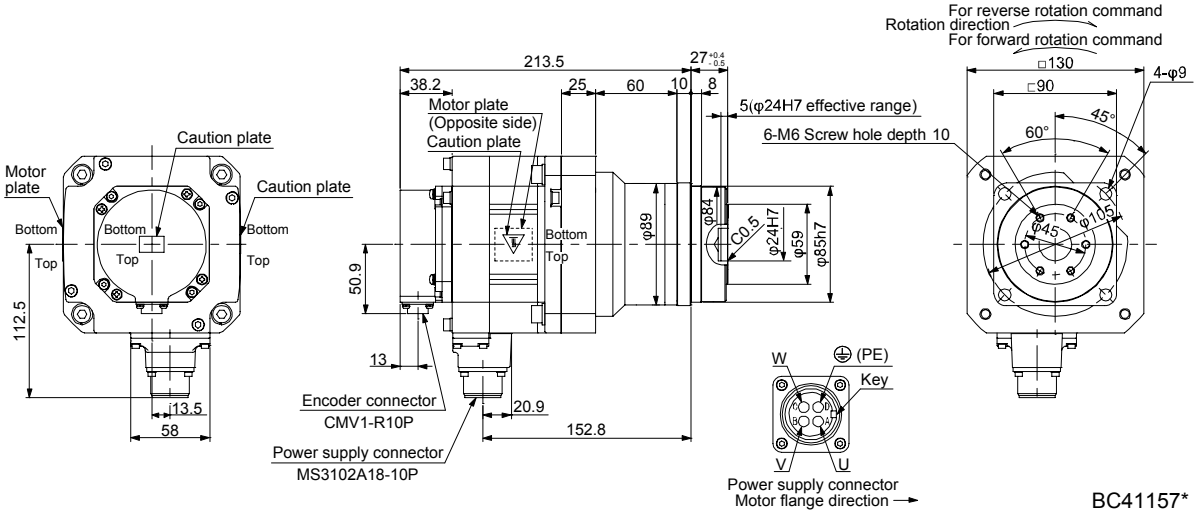
[Unit: mm]



### 7.7.7 Flange-mounting flange output type for precision application compliant (without an electromagnetic brake)

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G5 | 0.5 | HPG-20A-05-F0KSAWS-S | 1/5 | 7.91 | 7.6 |
| HG-SR52G5 | 0.5 | HPG-20A-11-F0KSAXS-S | 1/11 | 7.82 | 7.8 |

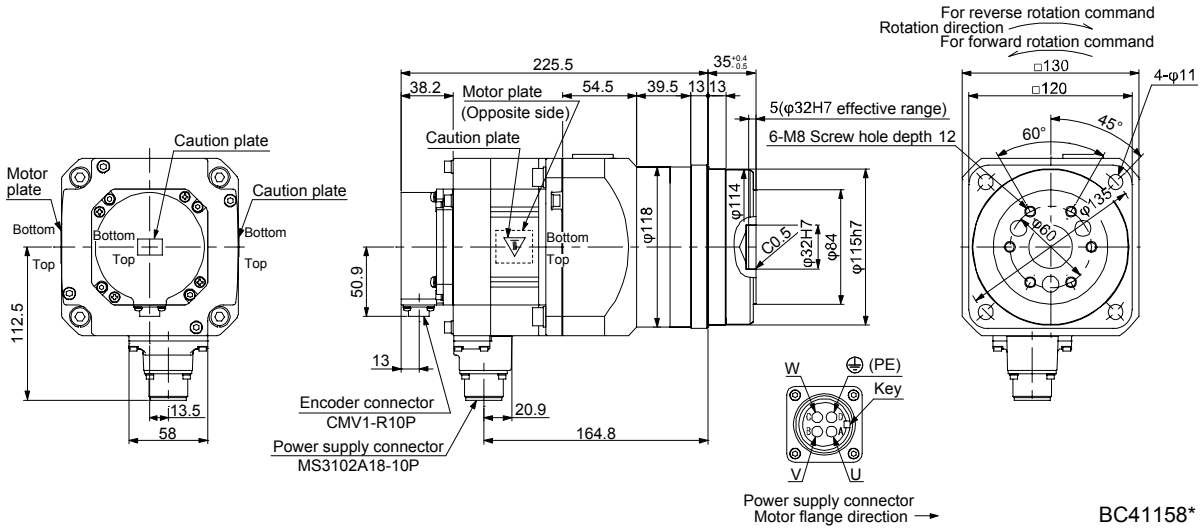
[Unit: mm]




BC41157*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G5 | 0.5 | HPG-32A-21-F0MCSYS-S | 1/21 | 10.2 | 12 |
| HG-SR52G5 | 0.5 | HPG-32A-33-F0MCSZS-S | 1/33 | 9.96 | 12 |
| HG-SR52G5 | 0.5 | HPG-32A-45-F0MCSZS-S | 1/45 | 9.96 | 12 |

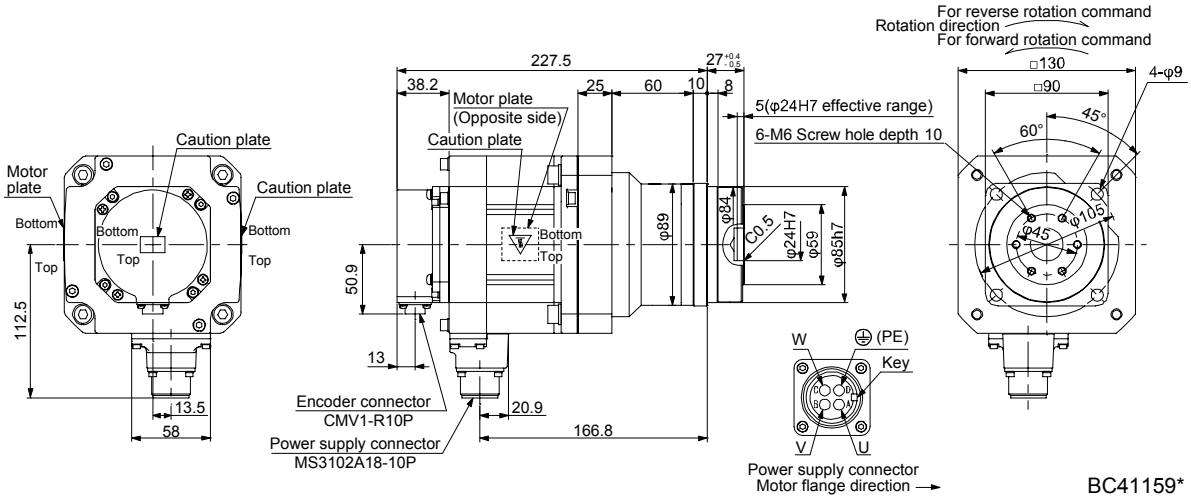
[Unit: mm]




BC41158*

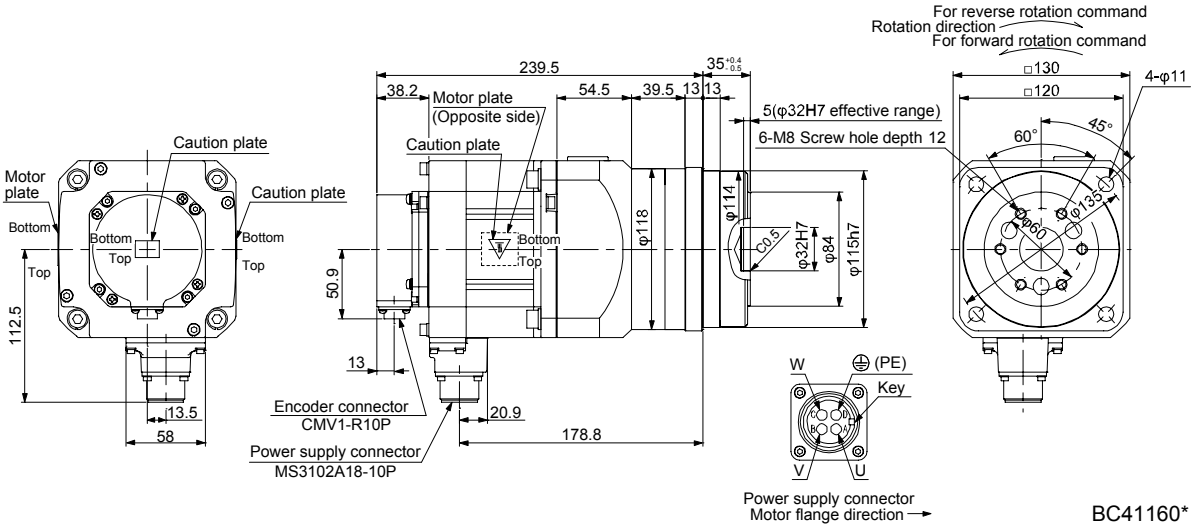
| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G5 | 1.0 | HPG-20A-05-F0KSAWS-S | 1/5 | 12.3 | 9.0 |

[Unit: mm]



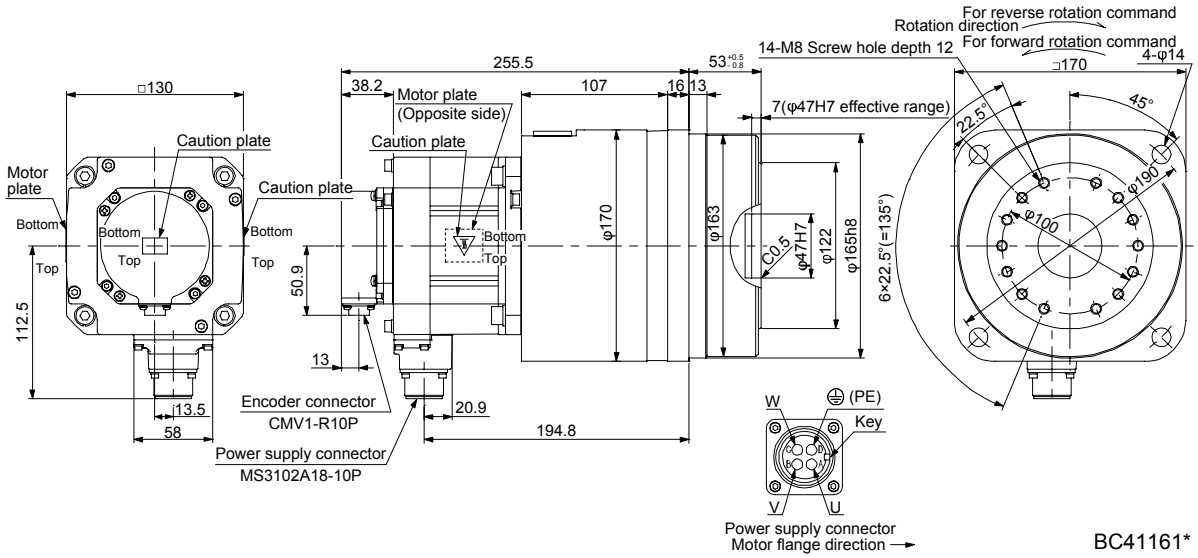

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G5 | 1.0 | HPG-32A-11-F0MCSPS-S | 1/11 | 14.9 | 13 |
| HG-SR102G5 | 1.0 | HPG-32A-21-F0MCSYS-S | 1/21 | 14.5 | 13 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G5 | 1.0 | HPG-50A-33-F0AABC-S | 1/33 | 16.3 | 23 |
| HG-SR102G5 | 1.0 | HPG-50A-45-F0AABC-S | 1/45 | 16.2 | 23 |

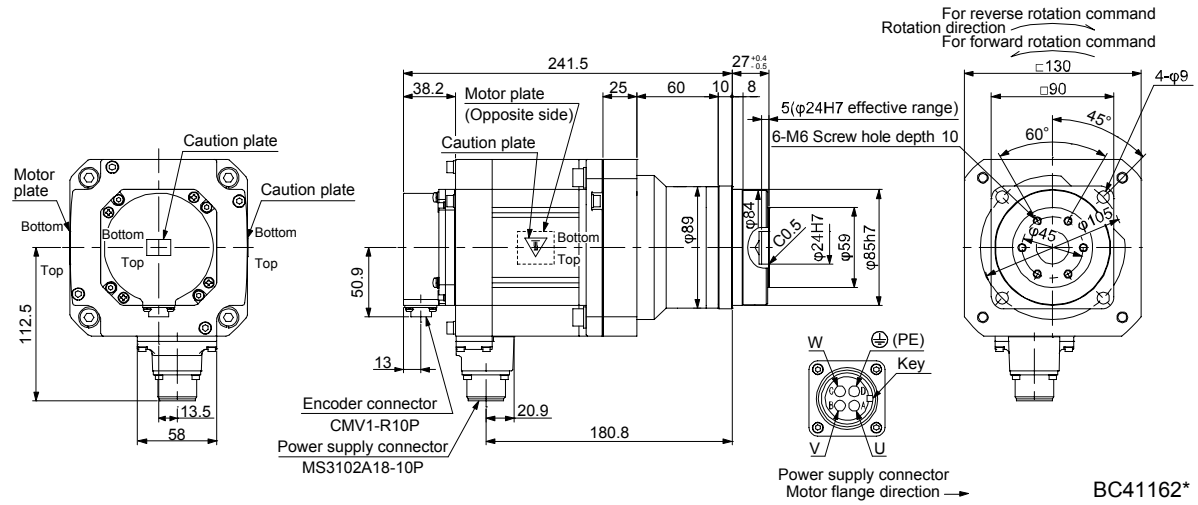
[Unit: mm]




BC41161*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G5 | 1.5 | HPG-20A-05-F0KSAWS-S | 1/5 | 16.7 | 11 |

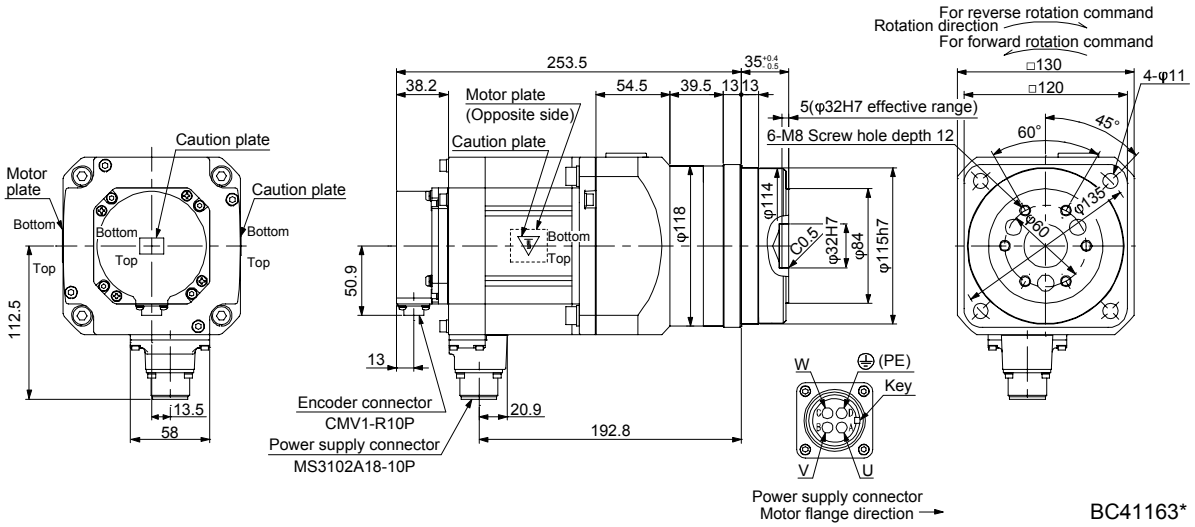
[Unit: mm]




BC41162*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G5 | 1.5 | HPG-32A-11-F0MCSPS-S | 1/11 | 19.3 | 14 |

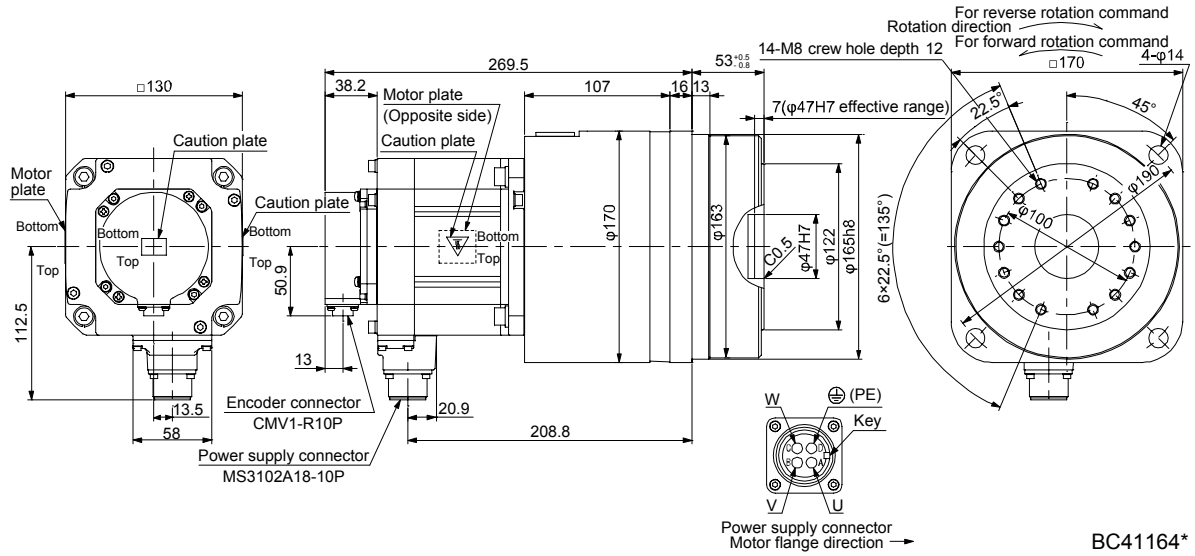
[Unit: mm]




BC41163*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G5 | 1.5 | HPG-50A-21-F0AABC-S | 1/21 | 21.7 | 24 |
| HG-SR152G5 | 1.5 | HPG-50A-33-F0AABC-S | 1/33 | 20.7 | 24 |
| HG-SR152G5 | 1.5 | HPG-50A-45-F0AABC-S | 1/45 | 20.6 | 24 |

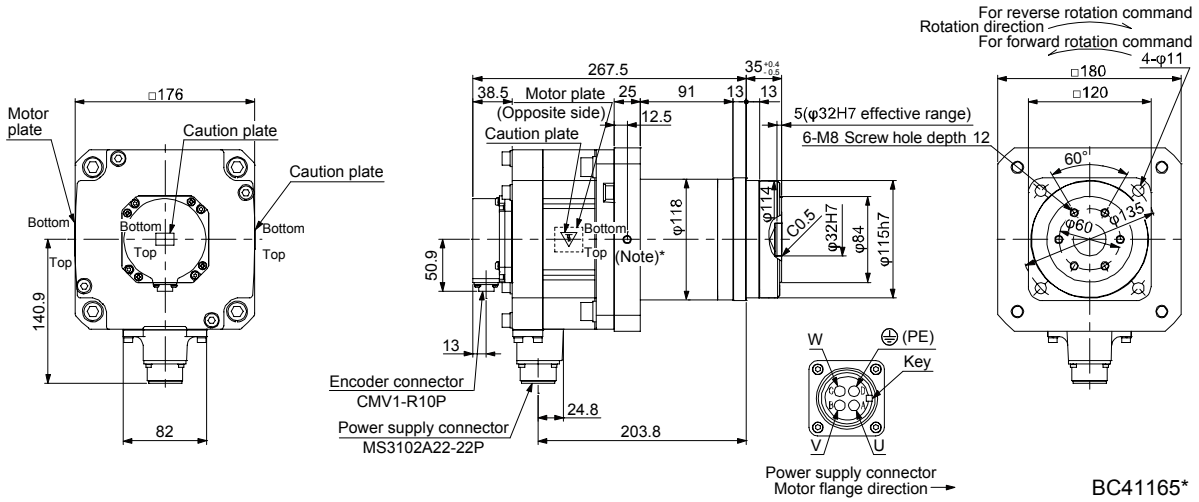
[Unit: mm]




BC41164*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G5 | 2.0 | HPG-32A-05-F0PBZI-S | 1/5 | 51.4 | 19 |
| HG-SR202G5 | 2.0 | HPG-32A-11-F0PBZJ-S | 1/11 | 51.2 | 19 |

[Unit: mm]

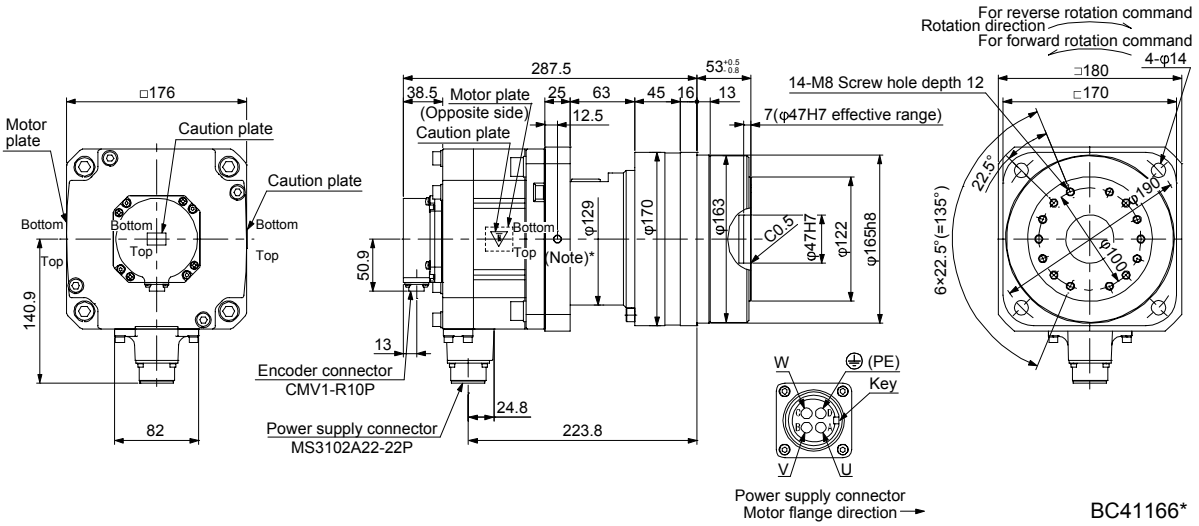



BC41165*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G5 | 2.0 | HPG-50A-21-F0BBDF-S | 1/21 | 53.2 | 29 |
| HG-SR202G5 | 2.0 | HPG-50A-33-F0BBDF-S | 1/33 | 52.2 | 29 |
| HG-SR202G5 | 2.0 | HPG-50A-45-F0BBDF-S | 1/45 | 52.2 | 29 |

[Unit: mm]

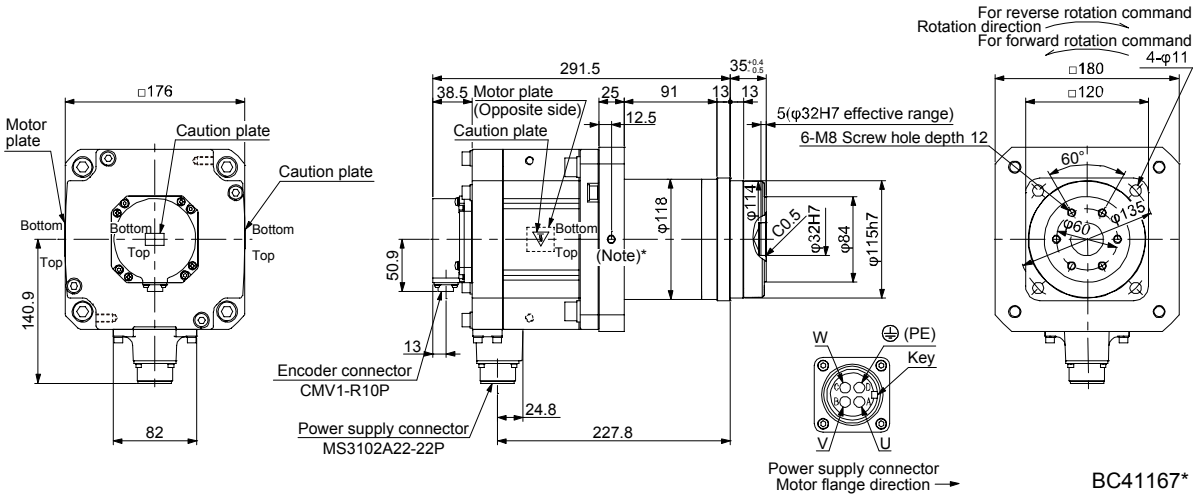



BC41166*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G5 | 3.5 | HPG-32A-05-F0PBZI-S | 1/5 | 83.2 | 24 |

[Unit: mm]

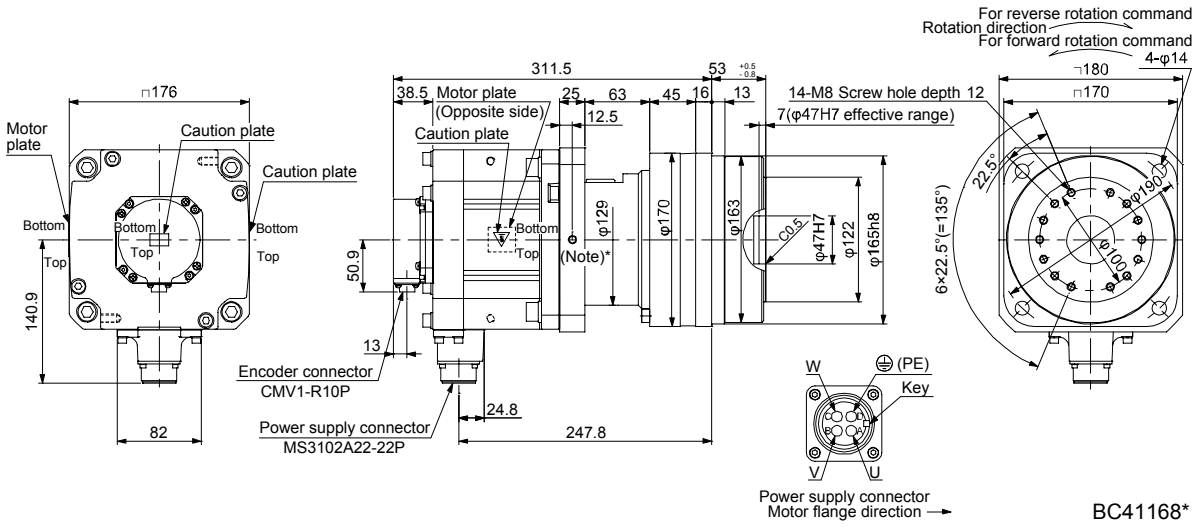



BC41167*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G5 | 3.5 | HPG-50A-11-F0BBDF-S | 1/11 | 86.7 | 34 |
| HG-SR352G5 | 3.5 | HPG-50A-21-F0BBDF-S | 1/21 | 85.0 | 34 |

[Unit: mm]

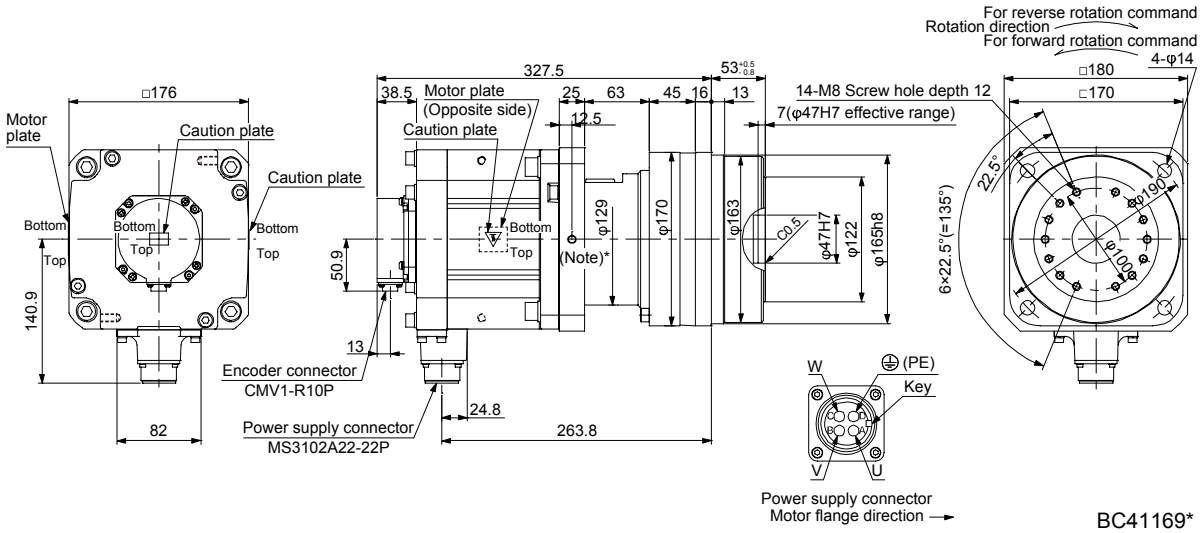



BC41168*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G5 | 5.0 | HPG-50A-05-F0BBCF-S | 1/5 | 110 | 36 |
| HG-SR502G5 | 5.0 | HPG-50A-11-F0BBDF-S | 1/11 | 108 | 38 |

[Unit: mm]

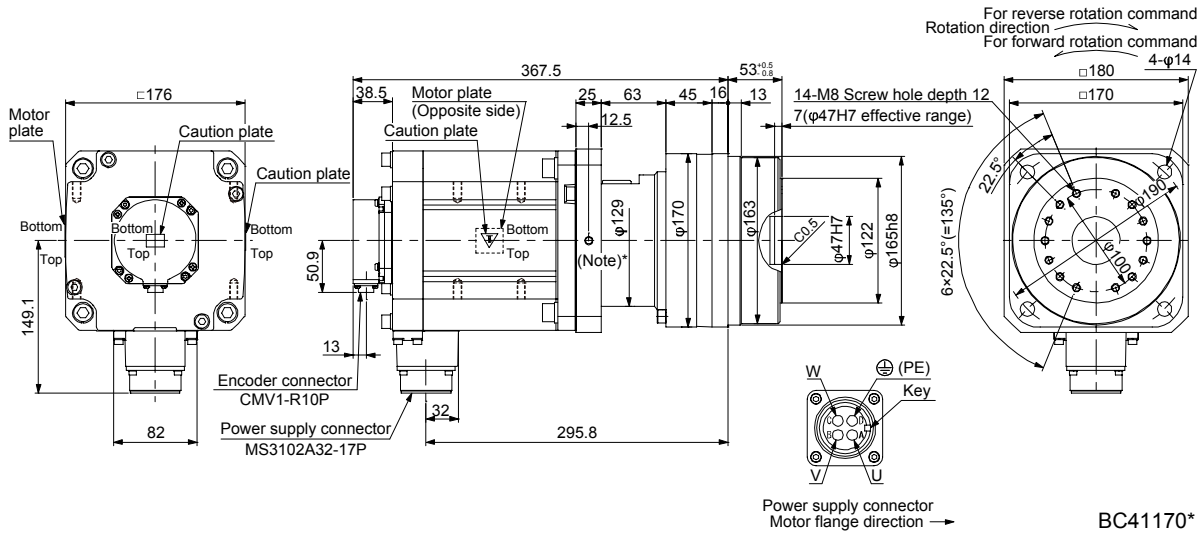



BC41169*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G5 | 7.0 | HPG-50A-05-F0BBCF-S | 1/5 | 161 | 43 |

[Unit: mm]



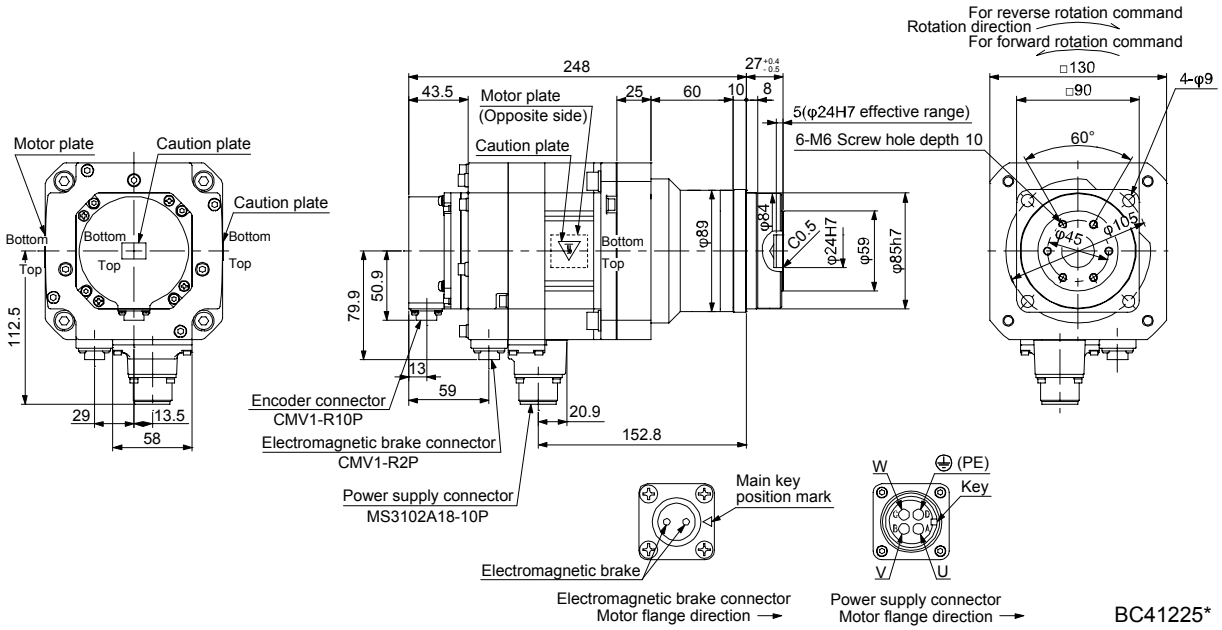

BC41170*

Note. * is a screw hole for eyebolt (M8).

### 7.7.8 For precision application with flange mounting, flange output type reducer (with an electromagnetic brake)

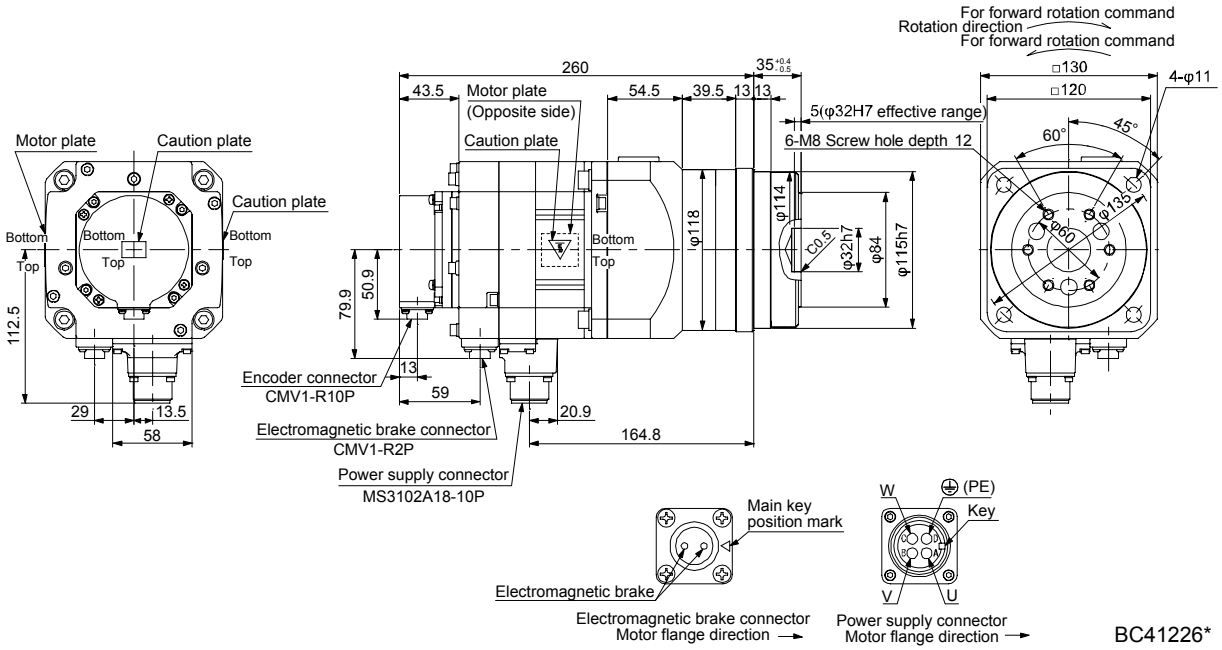
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG5 | 0.5 | HPG-20A-05-F0KSAWS-S | 1/5 | 8.5 | 10.1 | 9.5 |
| HG-SR52BG5 | 0.5 | HPG-20A-11-F0KSAXS-S | 1/11 | 8.5 | 10.0 | 9.7 |

[Unit: mm]



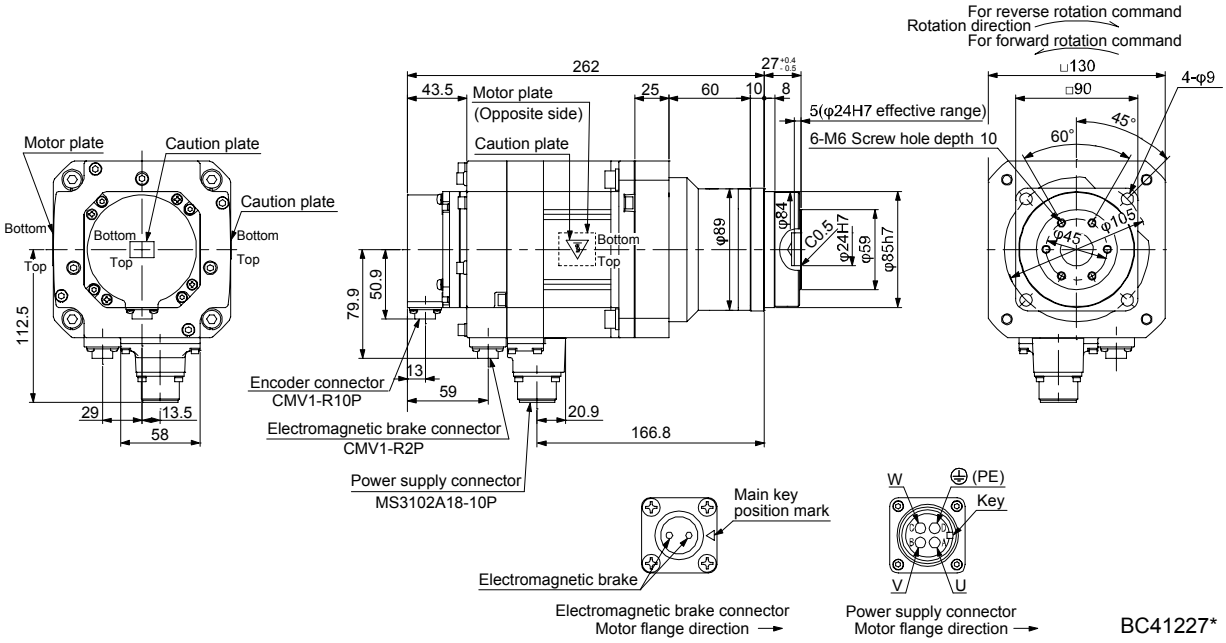

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG5 | 0.5 | HPG-32A-21-F0MCSYS-S | 1/21 | 8.5 | 12.4 | 14 |
| HG-SR52BG5 | 0.5 | HPG-32A-33-F0MCSZS-S | 1/33 | 8.5 | 12.2 | 14 |
| HG-SR52BG5 | 0.5 | HPG-32A-45-F0MCSZS-S | 1/45 | 8.5 | 12.2 | 14 |

[Unit: mm]



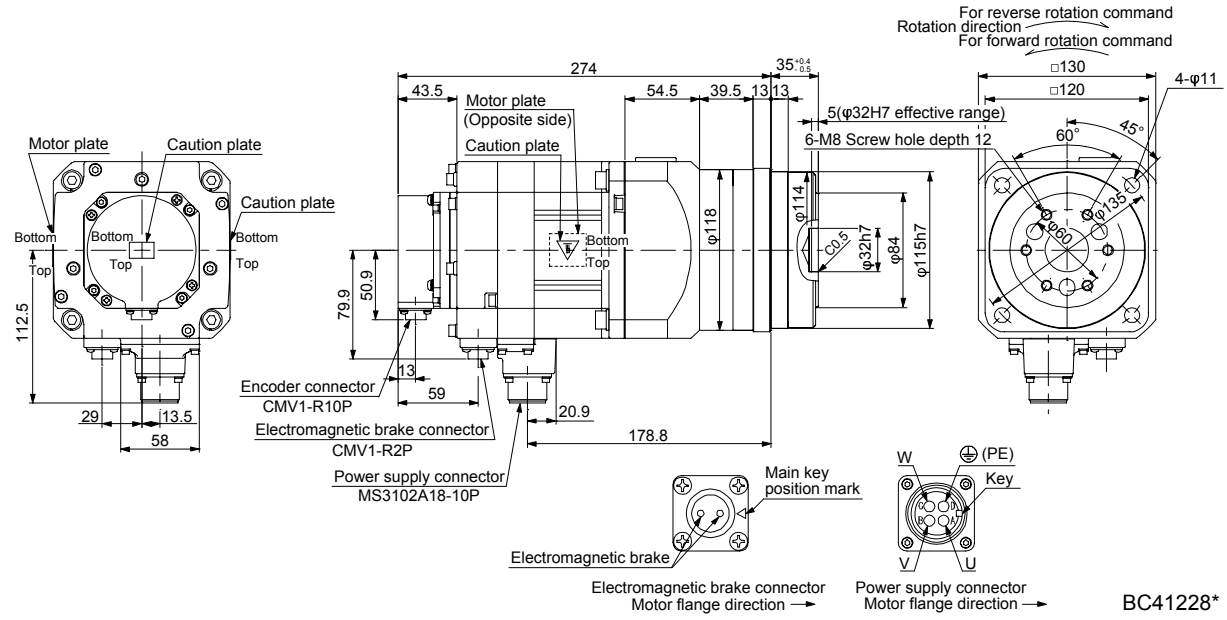
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [$\times 10^{-4}$ kg•m$^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG5 | 1.0 | HPG-20A-05-F0KSAWS-S | 1/5 | 8.5 | 14.5 | 11 |

[Unit: mm]



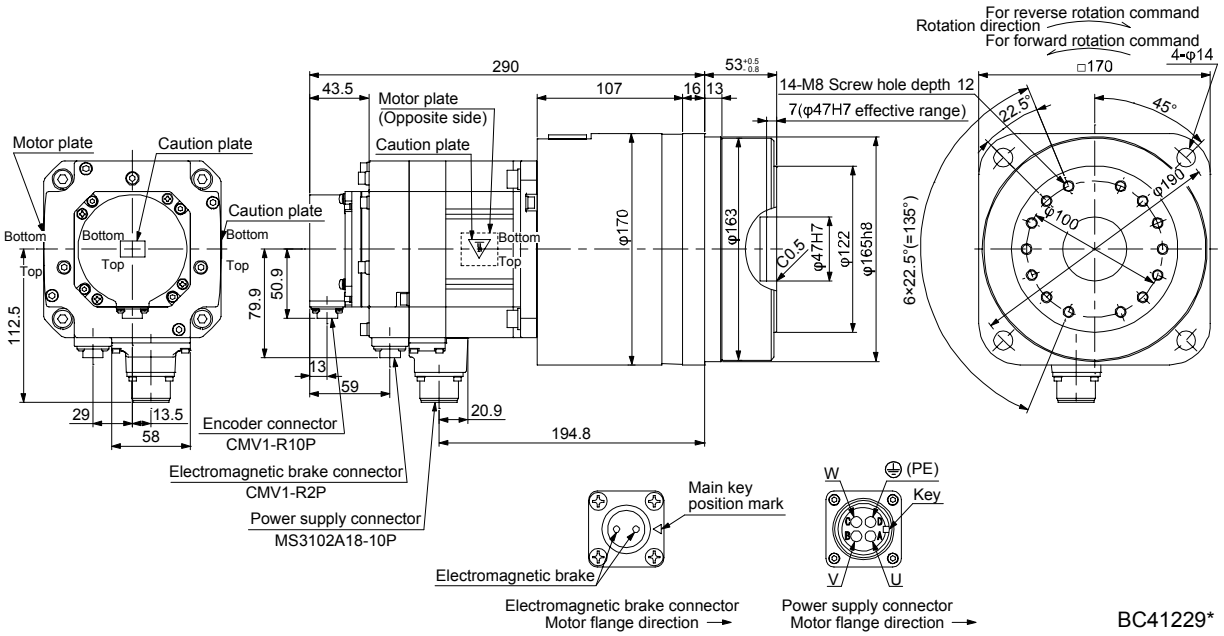

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [$\times 10^{-4}$ kg•m$^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG5 | 1.0 | HPG-32A-11-F0MCSPS-S | 1/11 | 8.5 | 17.1 | 15 |
| HG-SR102BG5 | 1.0 | HPG-32A-21-F0MCSYS-S | 1/21 | 8.5 | 16.7 | 15 |

[Unit: mm]



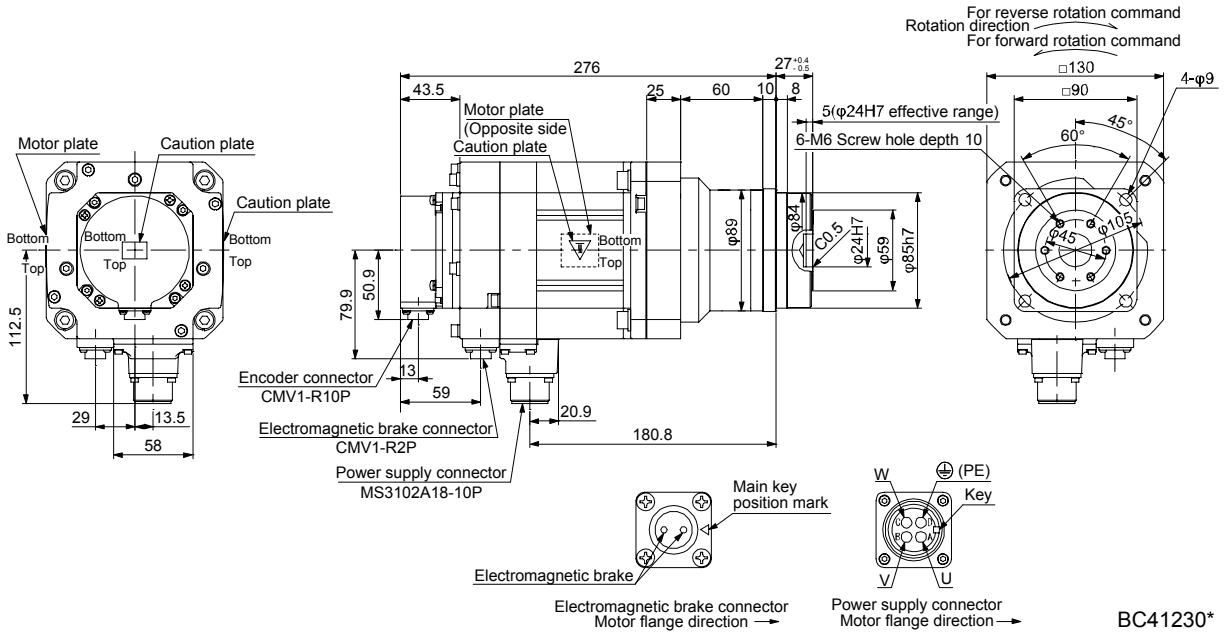
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG5 | 1.5 | HPG-50A-33-F0AABC-S | 1/33 | 8.5 | 18.5 | 25 |
| HG-SR102BG5 | 1.5 | HPG-50A-45-F0AABC-S | 1/45 | 8.5 | 18.4 | 25 |

[Unit: mm]



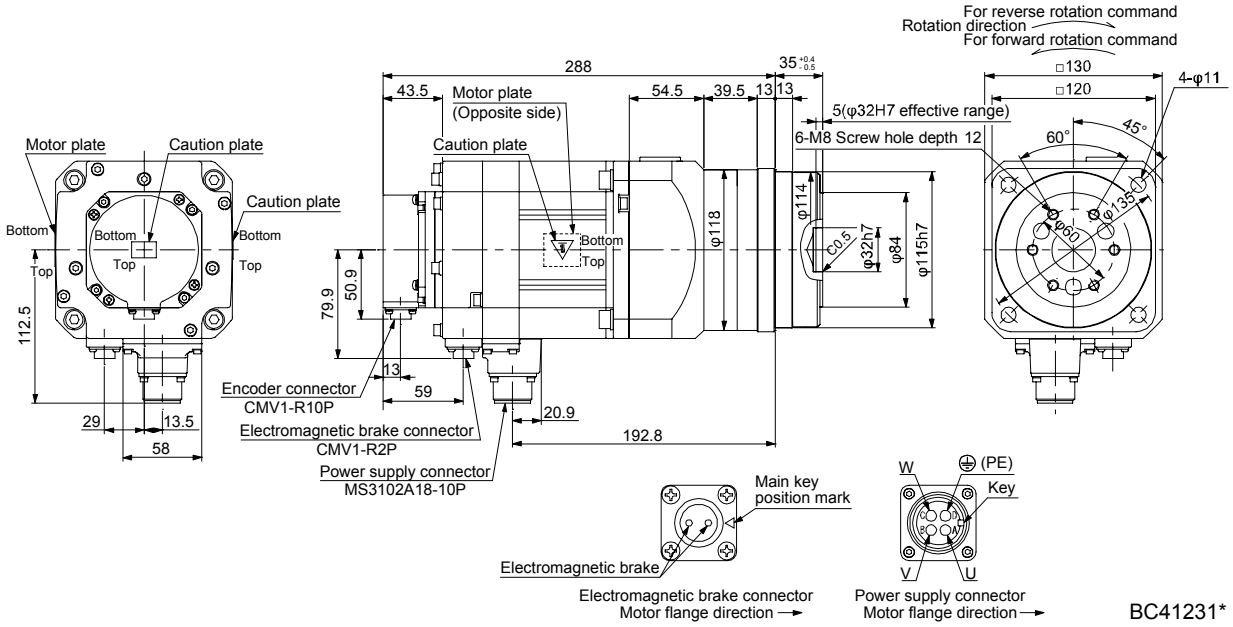

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG5 | 1.5 | HPG-20A-05-F0KSAWS-S | 1/5 | 8.5 | 18.9 | 13 |

[Unit: mm]



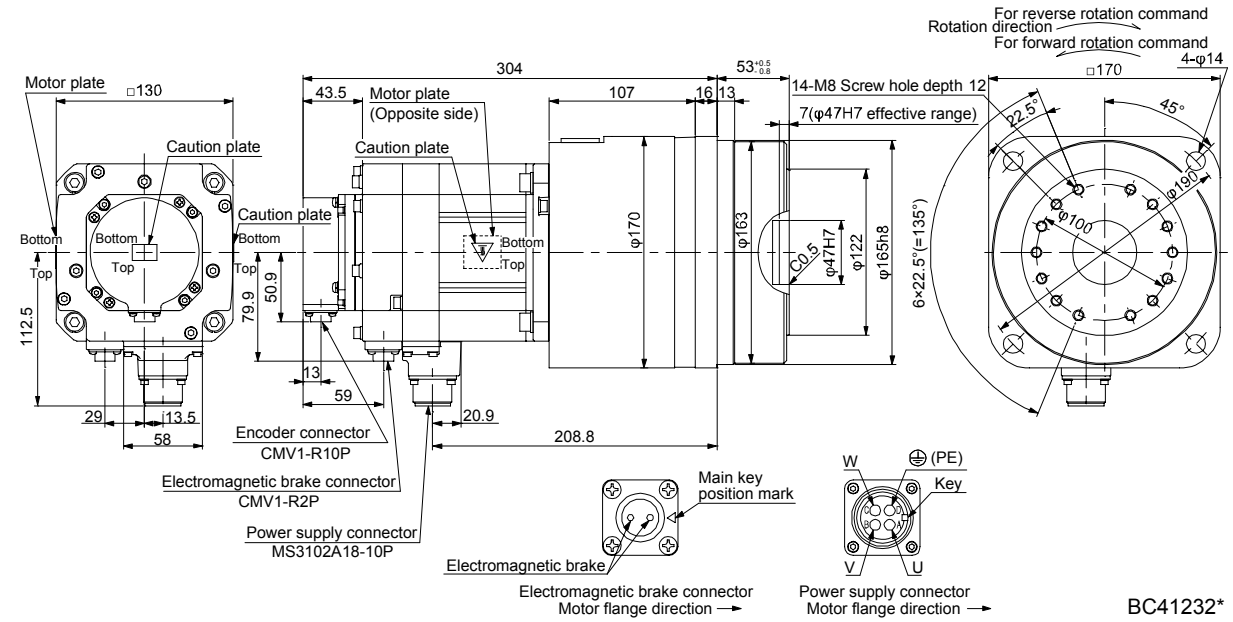
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG5 | 1.5 | HPG-32A-11-F0MCSPS-S | 1/11 | 8.5 | 21.5 | 16 |

[Unit: mm]



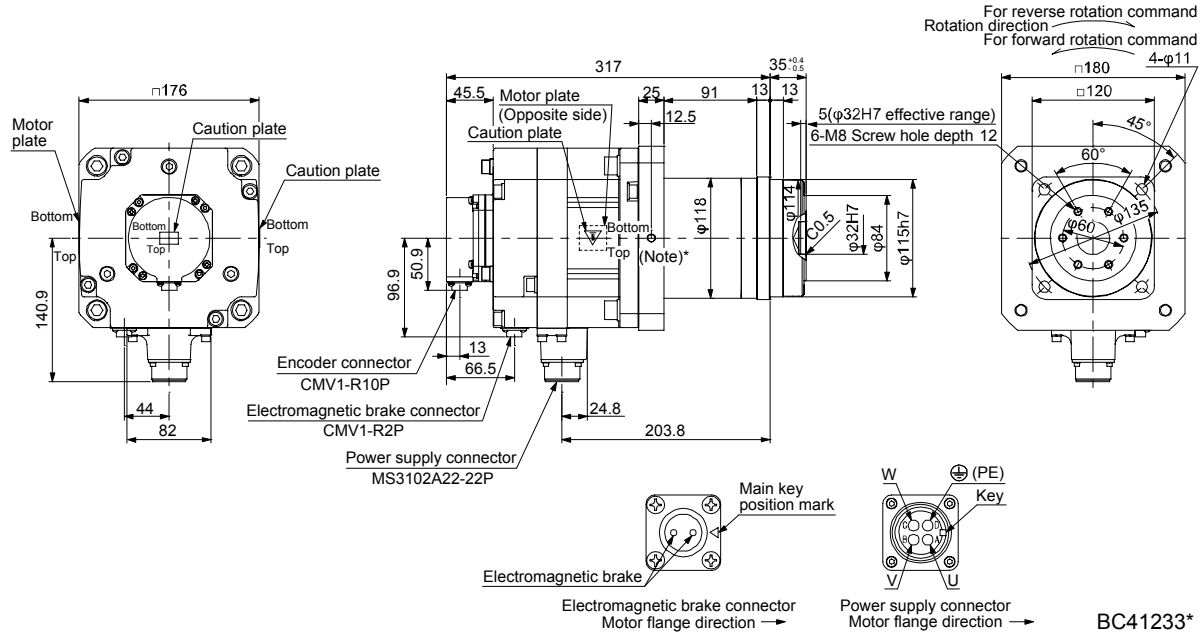

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG5 | 1.5 | HPG-50A-21-F0AABC-S | 1/21 | 8.5 | 23.9 | 26 |
| HG-SR152BG5 | 1.5 | HPG-50A-33-F0AABC-S | 1/33 | 8.5 | 22.9 | 26 |
| HG-SR152BG5 | 1.5 | HPG-50A-45-F0AABC-S | 1/45 | 8.5 | 22.8 | 26 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG5 | 2.0 | HGP-32A-05-F0PBZI-S | 1/5 | 44 | 61.1 | 25 |
| HG-SR202BG5 | 2.0 | HGP-32A-11-F0PBZJ-S | 1/11 | 44 | 60.9 | 25 |

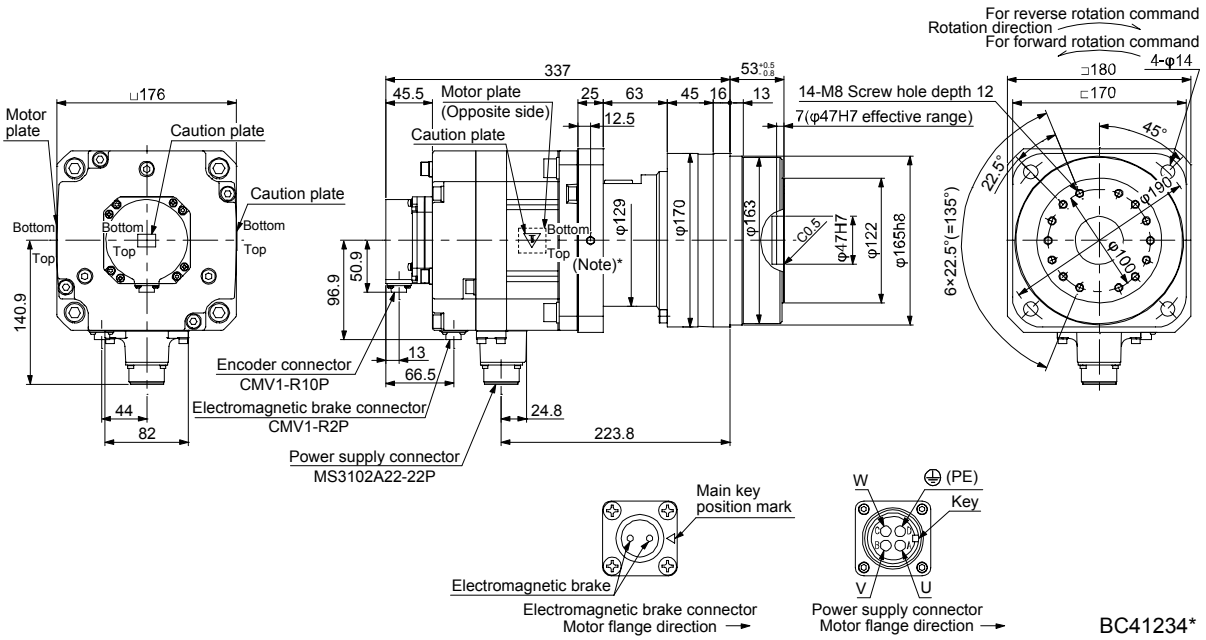
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG5 | 2.0 | HPG-50A-21-F0BBDF-S | 1/21 | 44 | 62.9 | 35 |
| HG-SR202BG5 | 2.0 | HPG-50A-33-F0BBDF-S | 1/33 | 44 | 61.9 | 35 |
| HG-SR202BG5 | 2.0 | HPG-50A-45-F0BBDF-S | 1/45 | 44 | 61.9 | 35 |

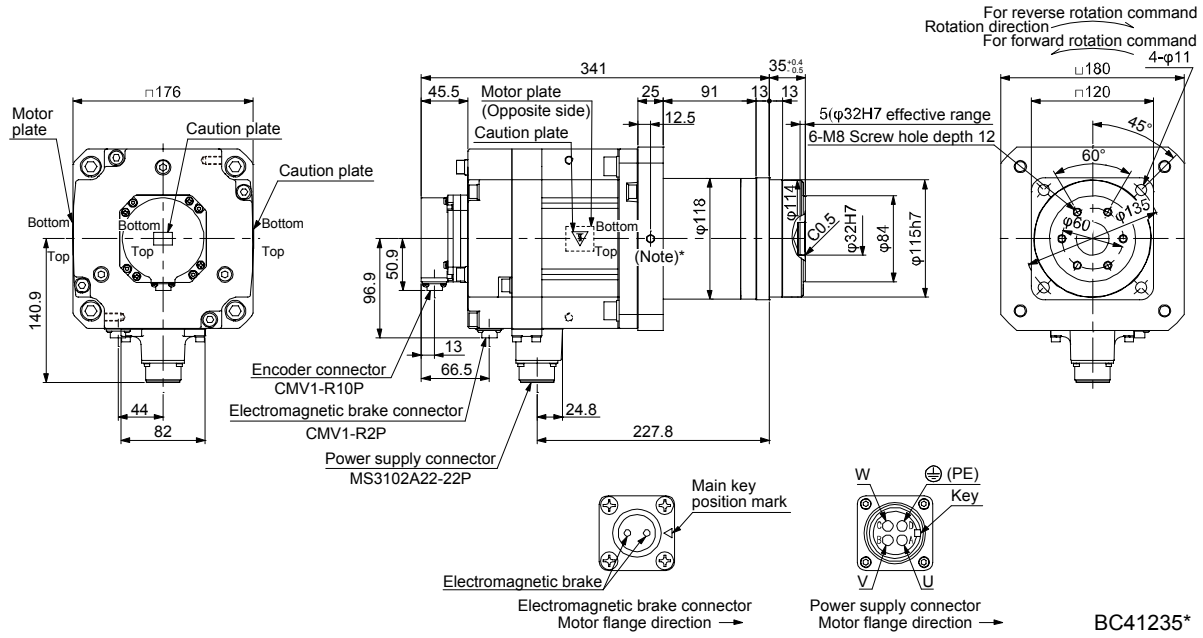
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG5 | 3.5 | HPG-32A-05-F0PBZI-S | 1/5 | 44 | 92.8 | 30 |

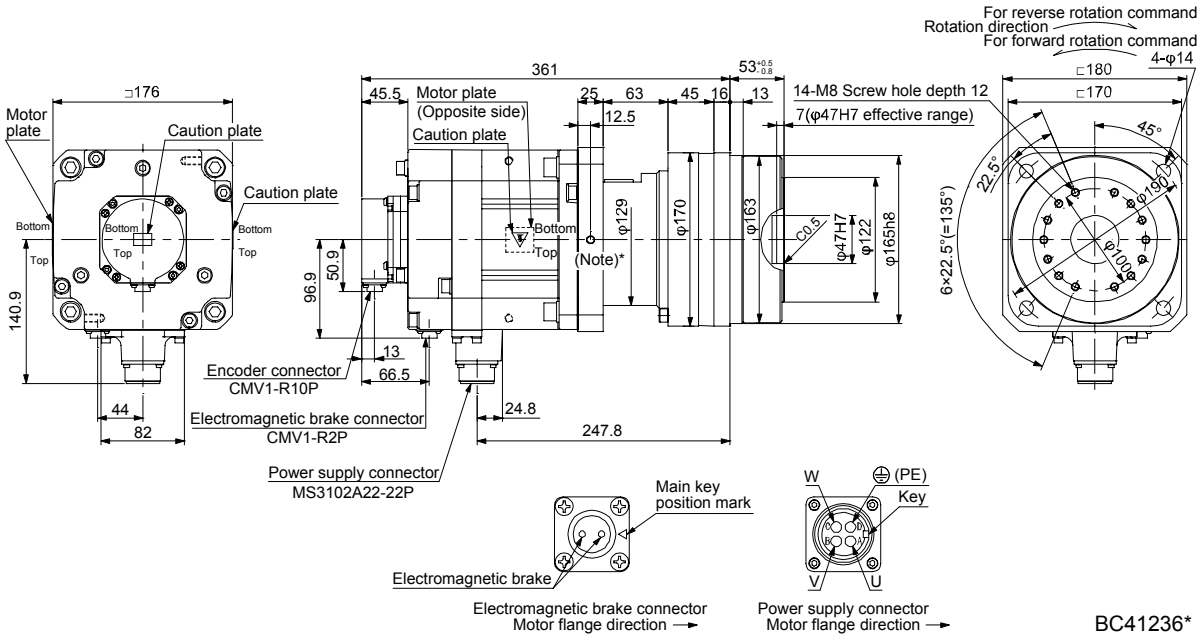
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG5 | 3.5 | HPG-50A-11-F0BBDF-S | 1/11 | 44 | 96.3 | 40 |
| HG-SR352BG5 | 3.5 | HPG-50A-21-F0BBDF-S | 1/21 | 44 | 94.6 | 40 |

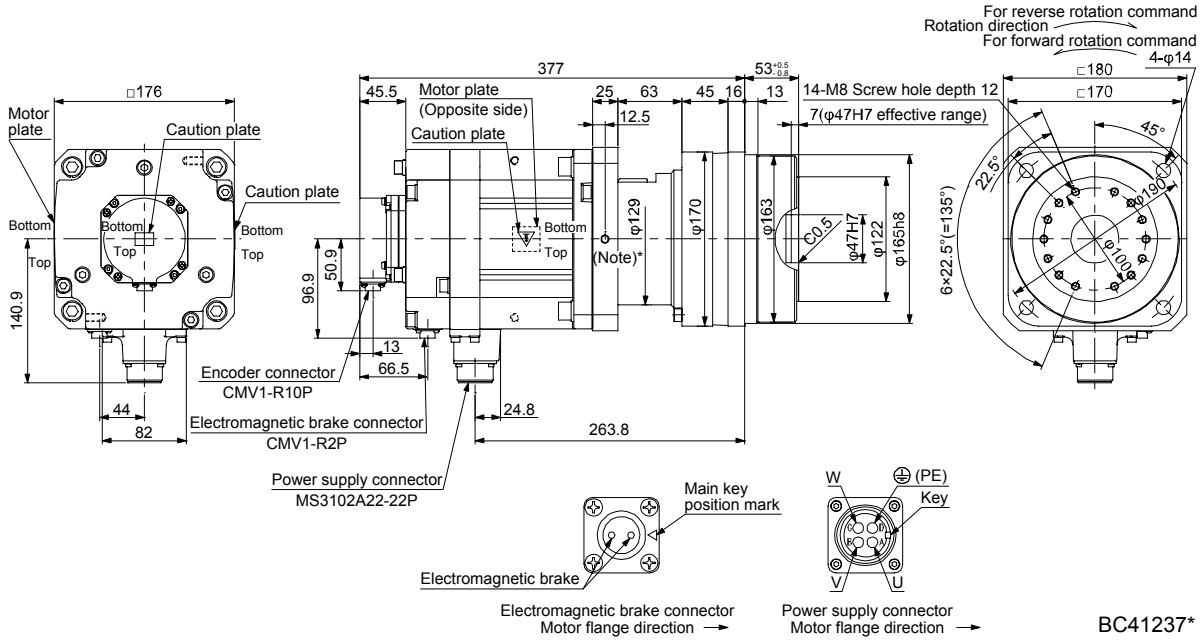
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG5 | 5.0 | HPG-50A-05-F0BBCF-S | 1/5 | 44 | 119 | 42 |
| HG-SR502BG5 | 5.0 | HPG-50A-11-F0BBDF-S | 1/11 | 44 | 117 | 44 |

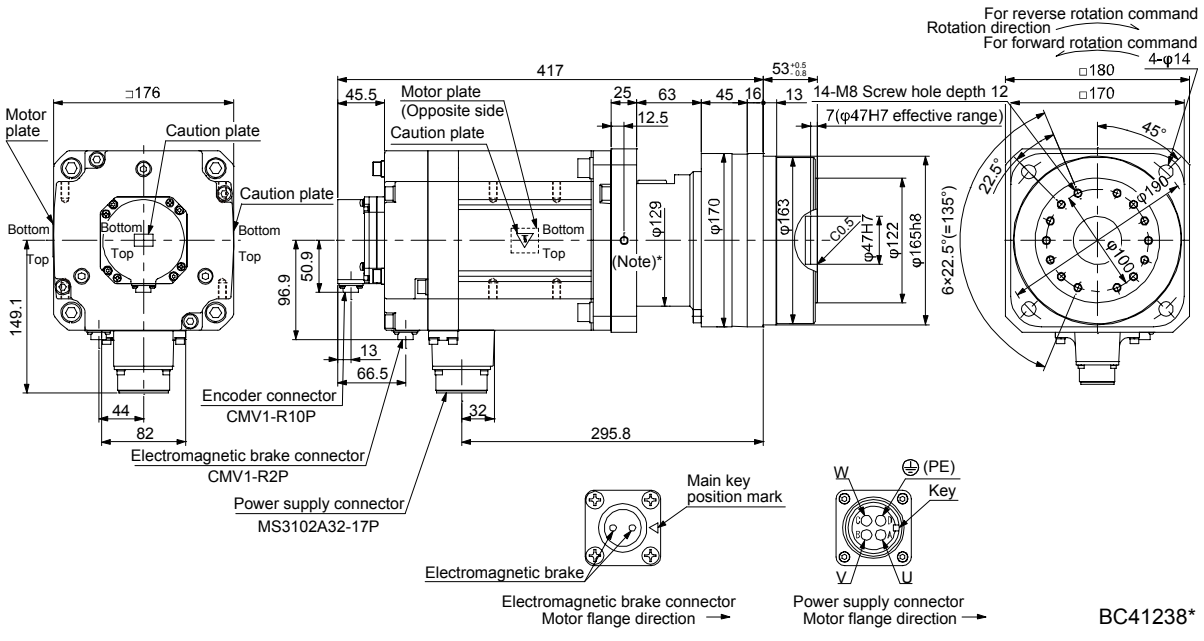
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG5 | 7.0 | HPG-50A-05-F0BBCF-S | 1/5 | 44 | 171 | 49 |

[Unit: mm]

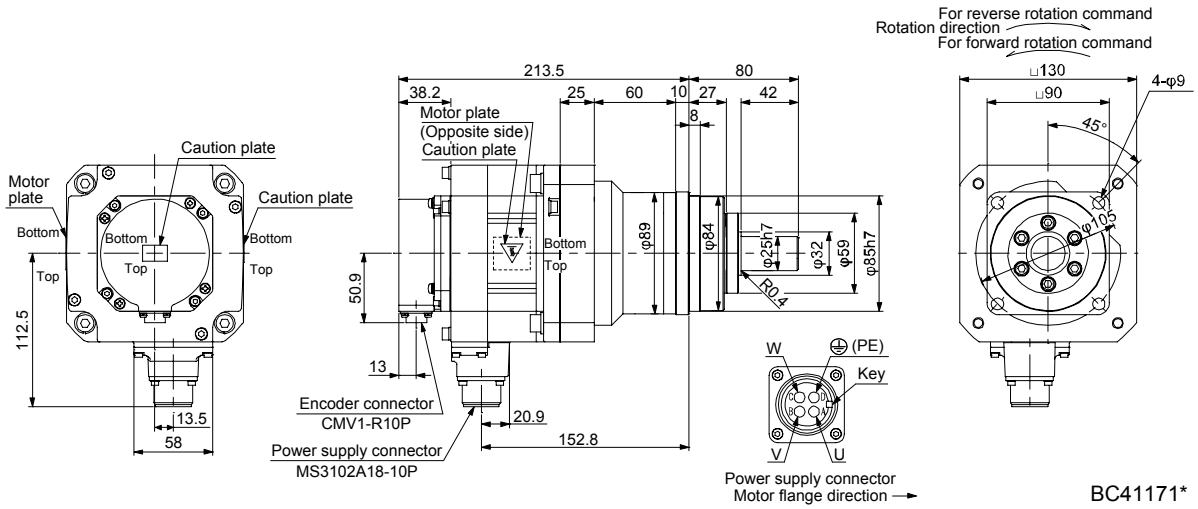



Note. * is a screw hole for eyebolt (M8).

7.7.9 For precision application with flange mounting, shaft output type reducer (without an electromagnetic brake)

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G7 | 0.5 | HPG-20A-05-J2KSAWS-S | 1/5 | 7.95 | 8.0 |
| HG-SR52G7 | 0.5 | HPG-20A-11-J2KSAXS-S | 1/11 | 7.82 | 8.2 |

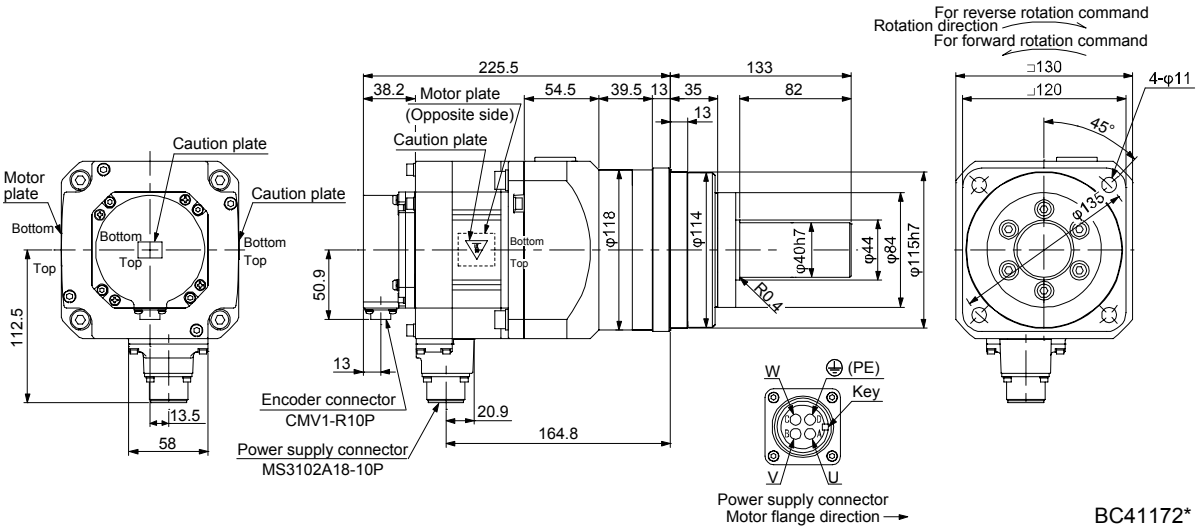
[Unit: mm]




BC41171*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR52G7 | 0.5 | HPG-32A-21-J2MCSYS-S | 1/21 | 10.2 | 13 |
| HG-SR52G7 | 0.5 | HPG-32A-33-J2MCSZS-S | 1/33 | 9.96 | 13 |
| HG-SR52G7 | 0.5 | HPG-32A-45-J2MCSZS-S | 1/45 | 9.96 | 13 |

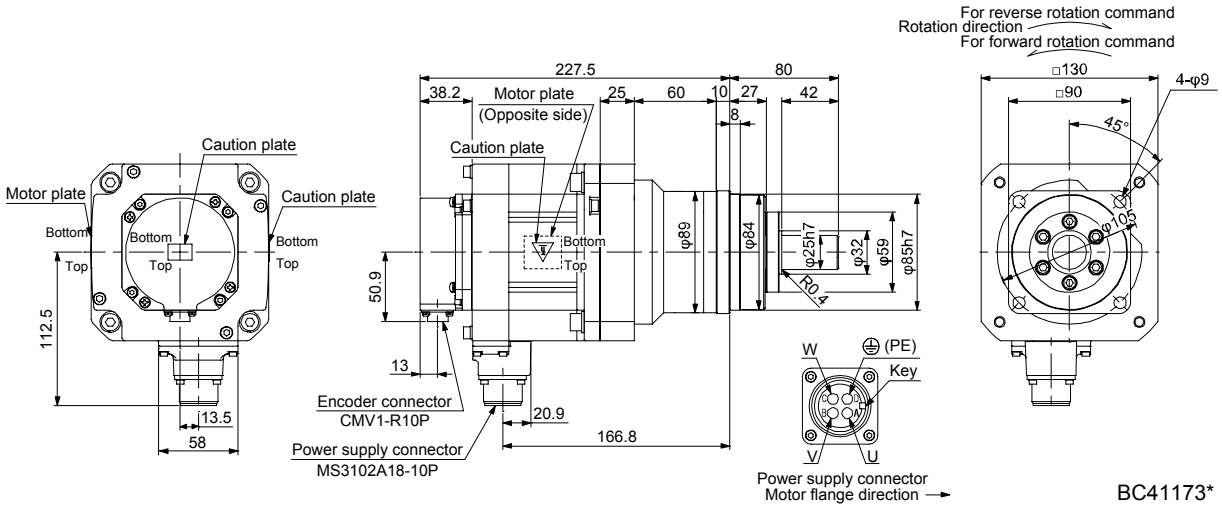
[Unit: mm]




BC41172*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G7 | 1.0 | HPG-20A-05-J2KSAWS-S | 1/5 | 12.3 | 9.4 |

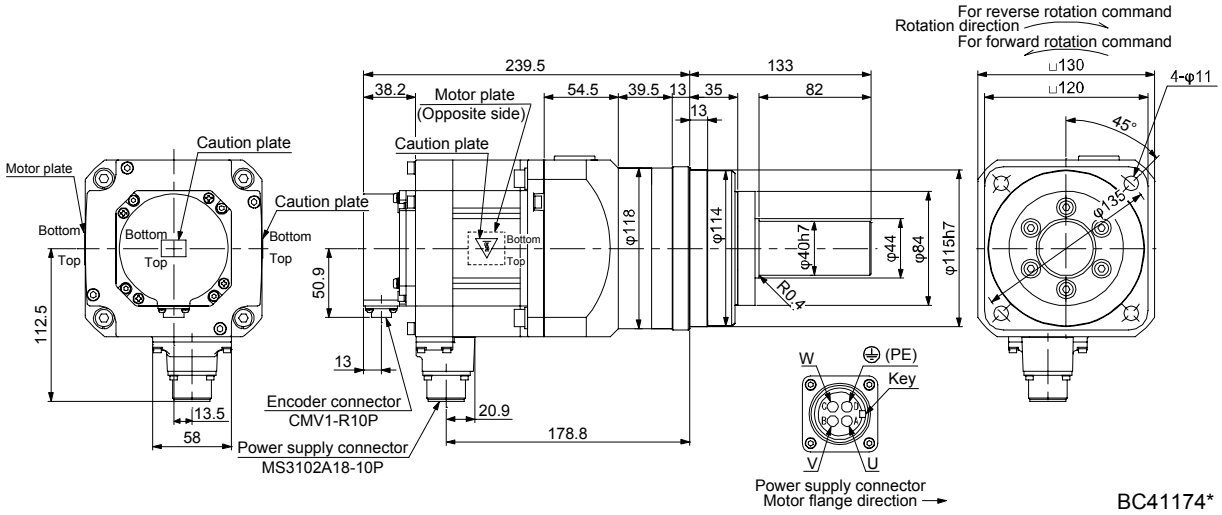
[Unit: mm]




BC41173*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G7 | 1.0 | HPG-32A-11-J2MCSPS-S | 1/11 | 15.0 | 15 |
| HG-SR102G7 | 1.0 | HPG-32A-21-J2MCSYS-S | 1/21 | 14.5 | 15 |

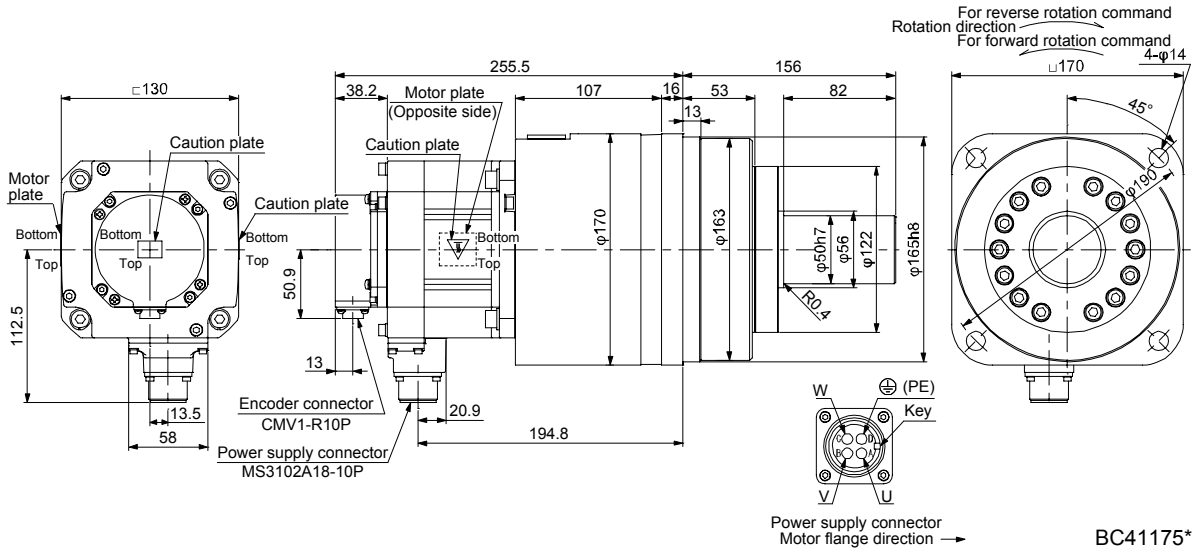
[Unit: mm]




BC41174*

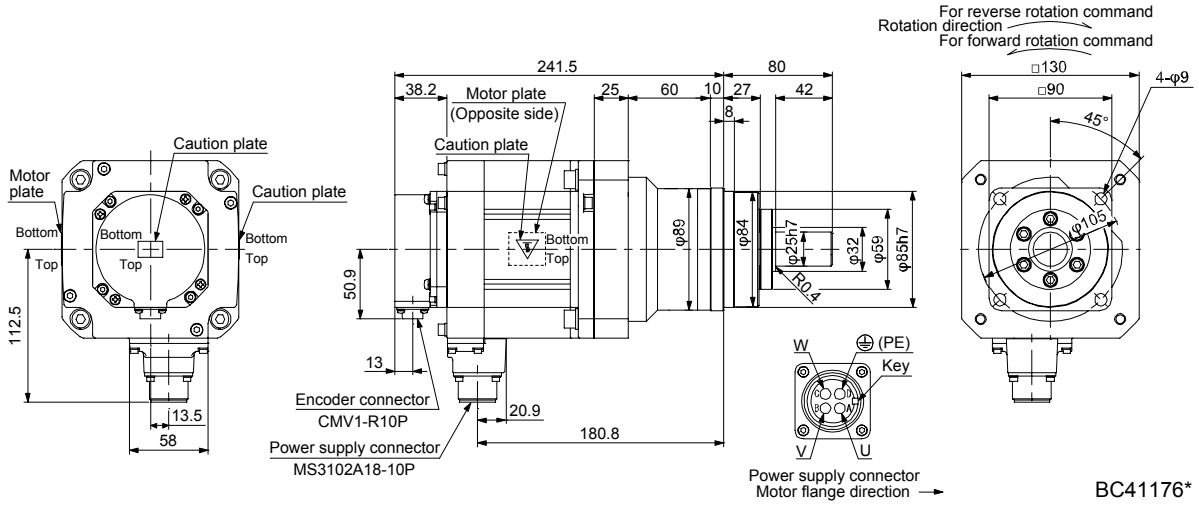
| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR102G7 | 1.0 | HPG-50A-33-J2AABC-S | 1/33 | 16.3 | 26 |
| HG-SR102G7 | 1.0 | HPG-50A-45-J2AABC-S | 1/45 | 16.3 | 26 |

[Unit: mm]



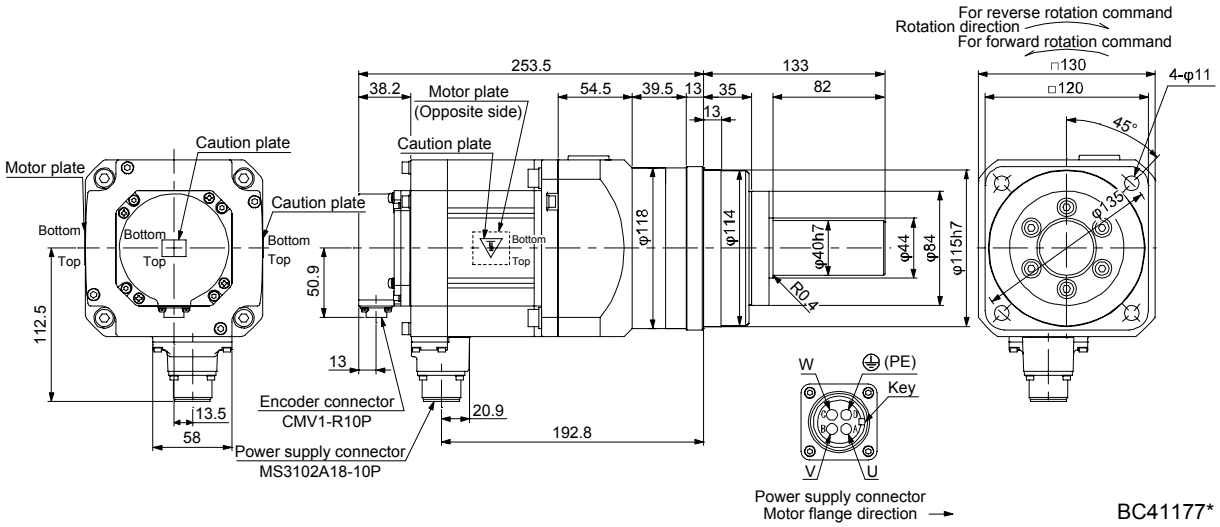

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G7 | 1.5 | HPG-20A-05-J2KSAWS-S | 1/5 | 16.7 | 11 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G7 | 1.5 | HPG-32A-11-J2MCSPS-S | 1/11 | 19.4 | 16 |

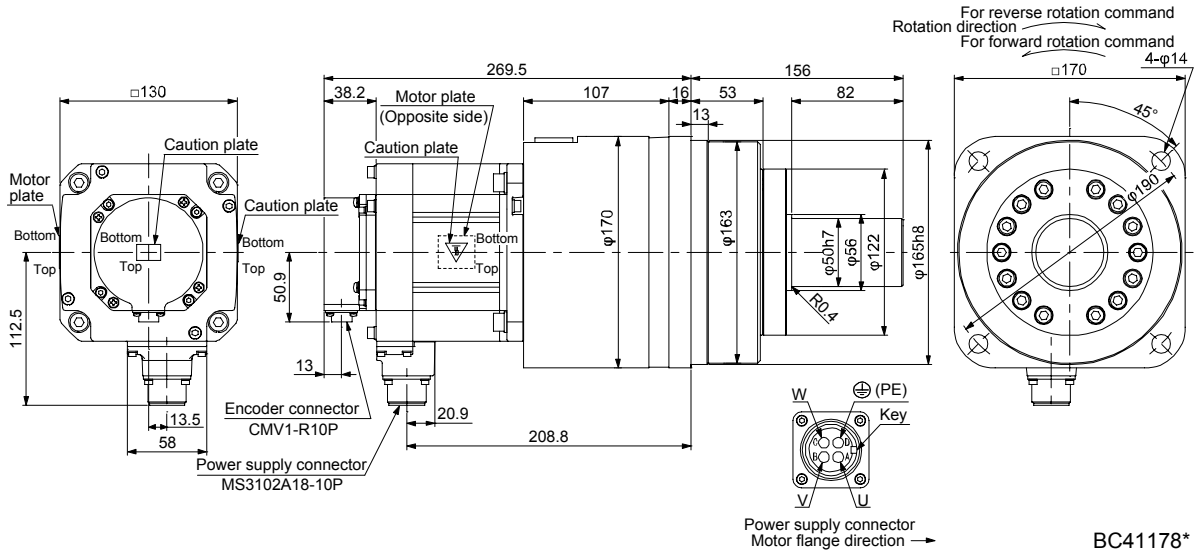
[Unit: mm]




BC41177*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR152G7 | 1.5 | HPG-50A-21-J2AABC-S | 1/21 | 21.7 | 27 |
| HG-SR152G7 | 1.5 | HPG-50A-33-J2AABC-S | 1/33 | 20.7 | 27 |
| HG-SR152G7 | 1.5 | HPG-50A-45-J2AABC-S | 1/45 | 20.7 | 27 |

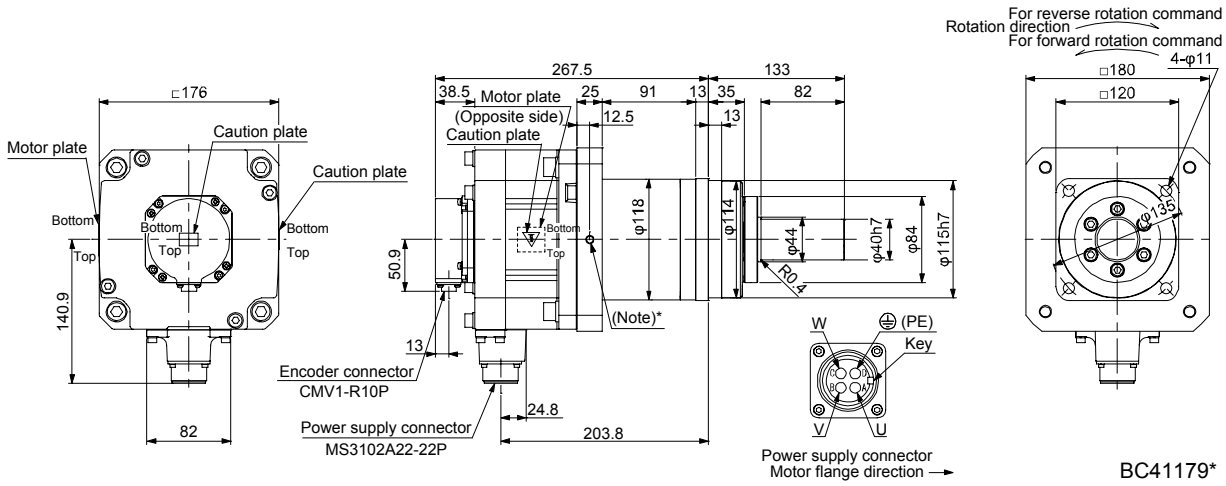
[Unit: mm]




BC41178*

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G7 | 2.0 | HPG-32A-05-J2PBZI-S | 1/5 | 51.7 | 20 |
| HG-SR202G7 | 2.0 | HPG-32A-11-J2PBZJ-S | 1/11 | 51.3 | 21 |

[Unit: mm]

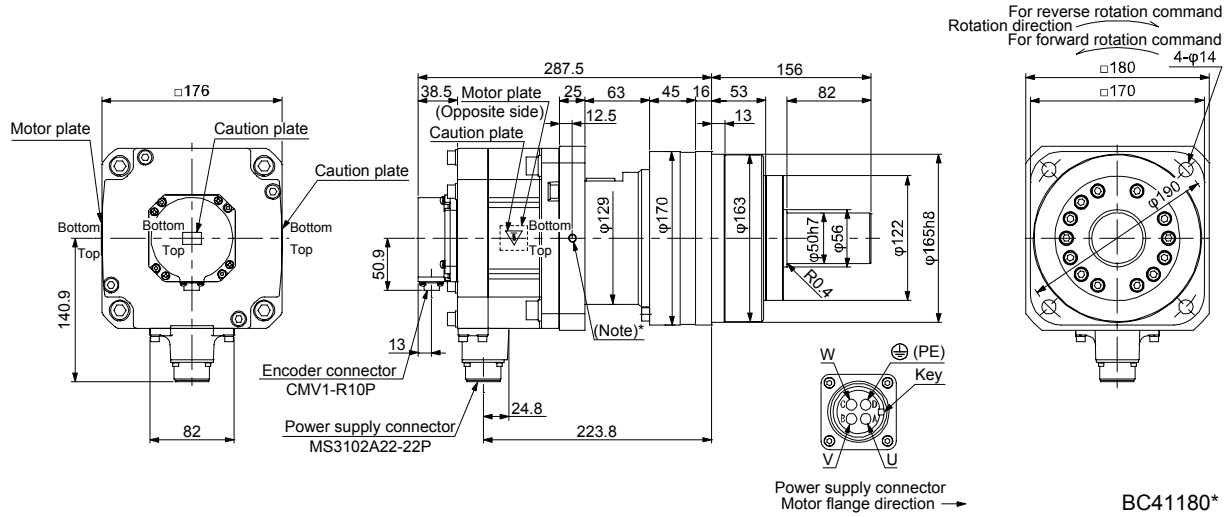



BC41179*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR202G7 | 2.0 | HPG-50A-21-J2BBDF-S | 1/21 | 53.3 | 32 |
| HG-SR202G7 | 2.0 | HPG-50A-33-J2BBDF-S | 1/33 | 52.2 | 32 |
| HG-SR202G7 | 2.0 | HPG-50A-45-J2BBDF-S | 1/45 | 52.2 | 32 |

[Unit: mm]

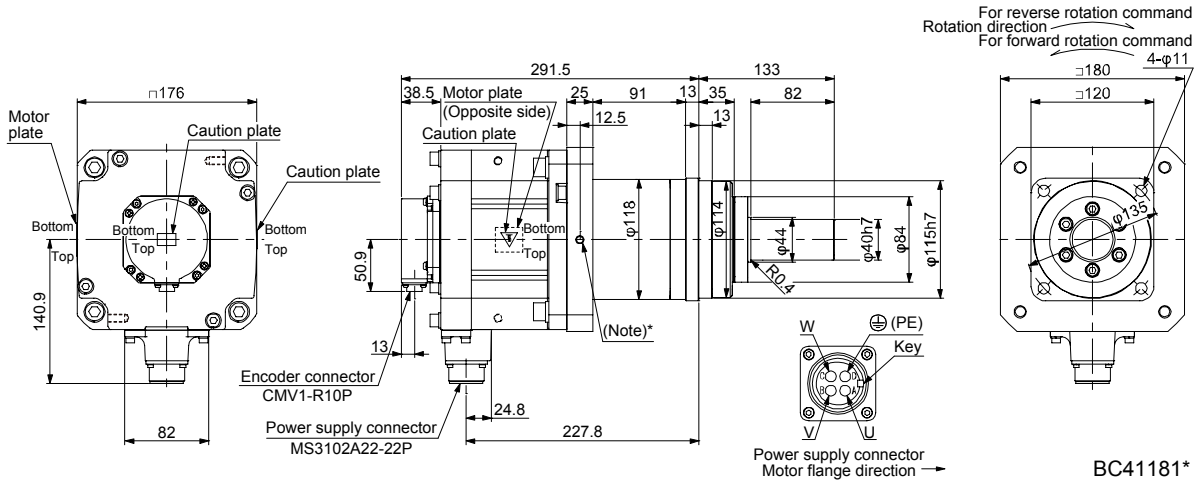



BC41180*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G7 | 3.5 | HPG-32A-05-J2PBZI-S | 1/5 | 83.5 | 25 |

[Unit: mm]

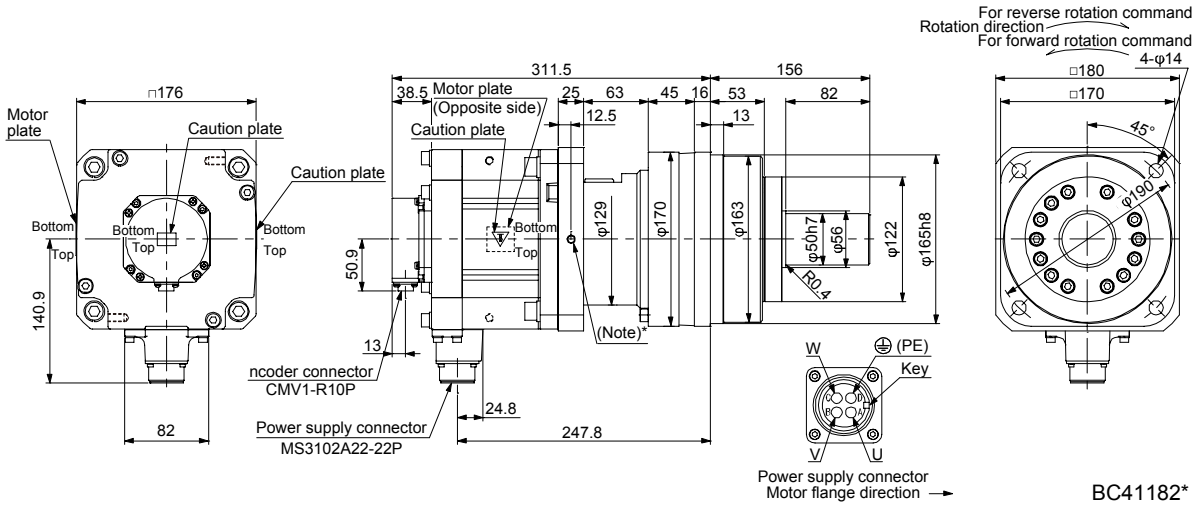



BC41181*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR352G7 | 3.5 | HPG-50A-11-J2BBDF-S | 1/11 | 87.0 | 37 |
| HG-SR352G7 | 3.5 | HPG-50A-21-J2BBDF-S | 1/21 | 85.1 | 37 |

[Unit: mm]

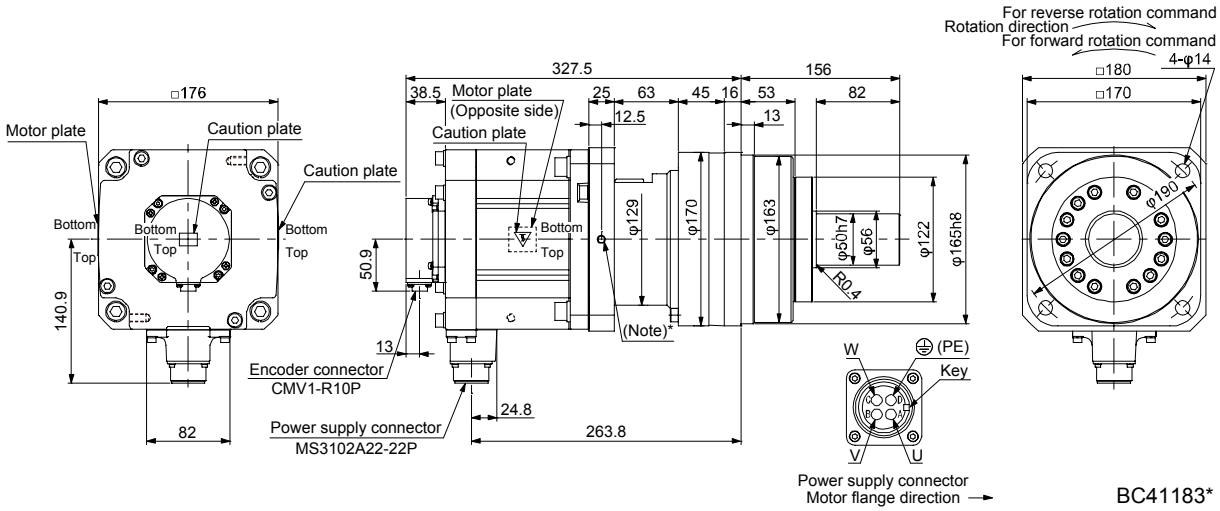



BC41182*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR502G7 | 5.0 | HPG-50A-05-J2BBCF-S | 1/5 | 111 | 39 |
| HG-SR502G7 | 5.0 | HPG-50A-11-J2BBDF-S | 1/11 | 108 | 41 |

[Unit: mm]

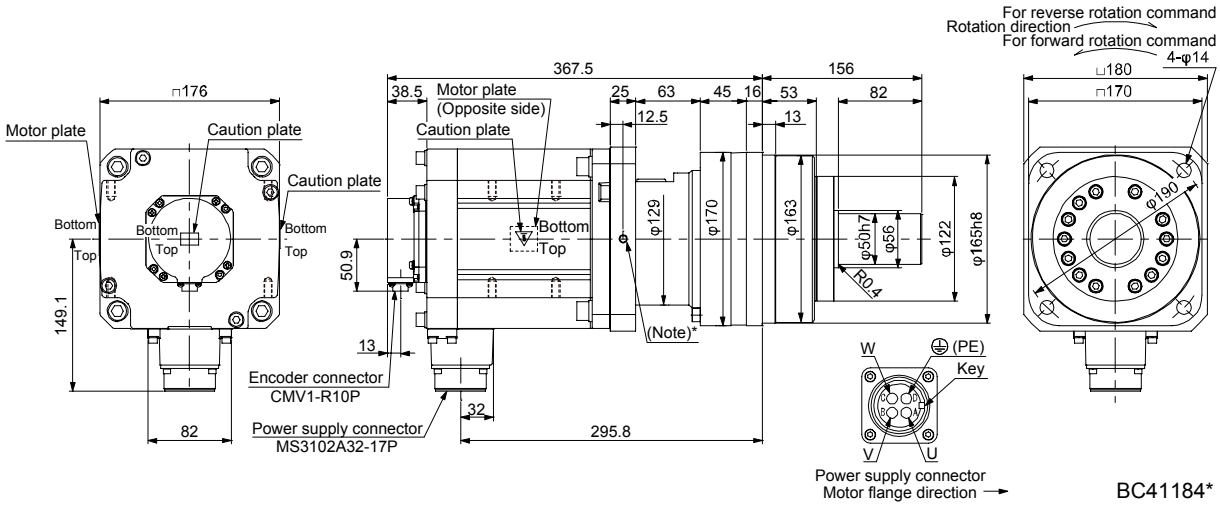



BC41183*

Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|
| HG-SR702G7 | 7.0 | HPG-50A-05-J2BBCF-S | 1/5 | 163 | 46 |

[Unit: mm]



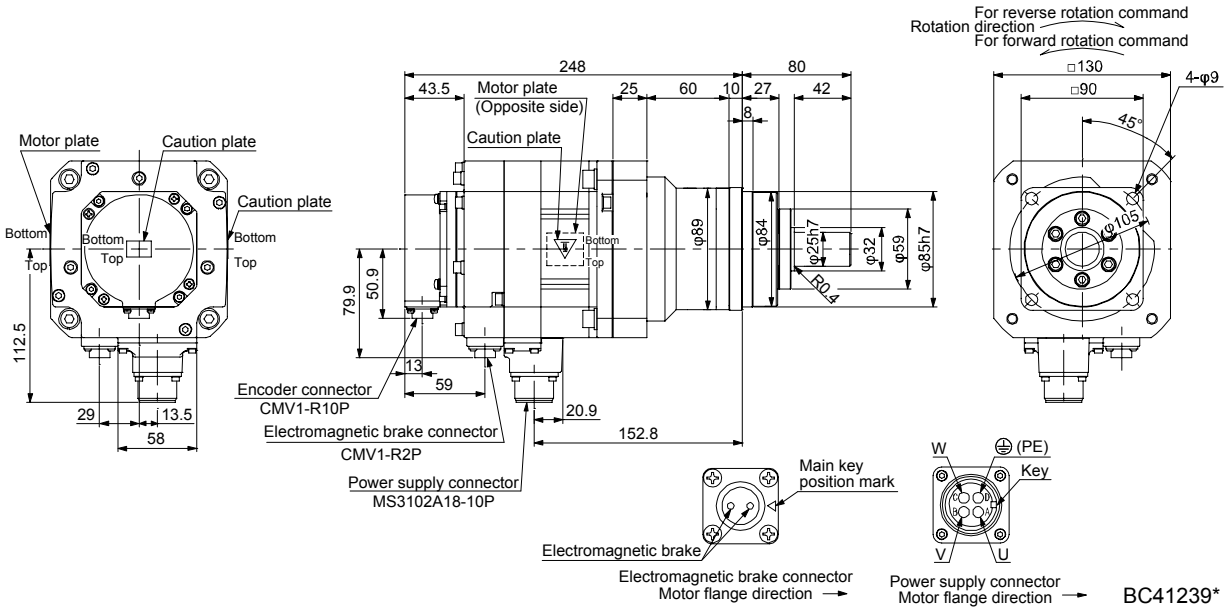

BC41184*

Note. * is a screw hole for eyebolt (M8).

### 7.7.10 Flange-mounting shaft output type for precision application compliant (with an electromagnetic brake)

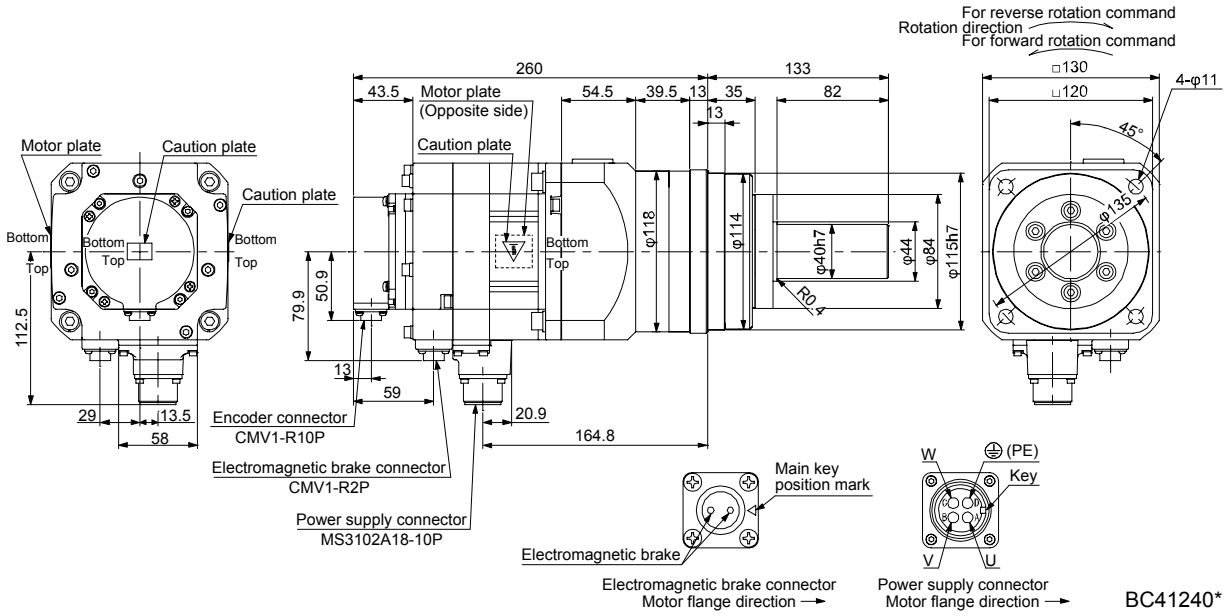
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [$\times 10^{-4}$ kg•m$^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG7 | 0.5 | HPG-20A-05-J2KSAWS-S | 1/5 | 8.5 | 10.2 | 9.9 |
| HG-SR52BG7 | 0.5 | HPG-20A-11-J2KSAXS-S | 1/11 | 8.5 | 10.0 | 11 |

[Unit: mm]



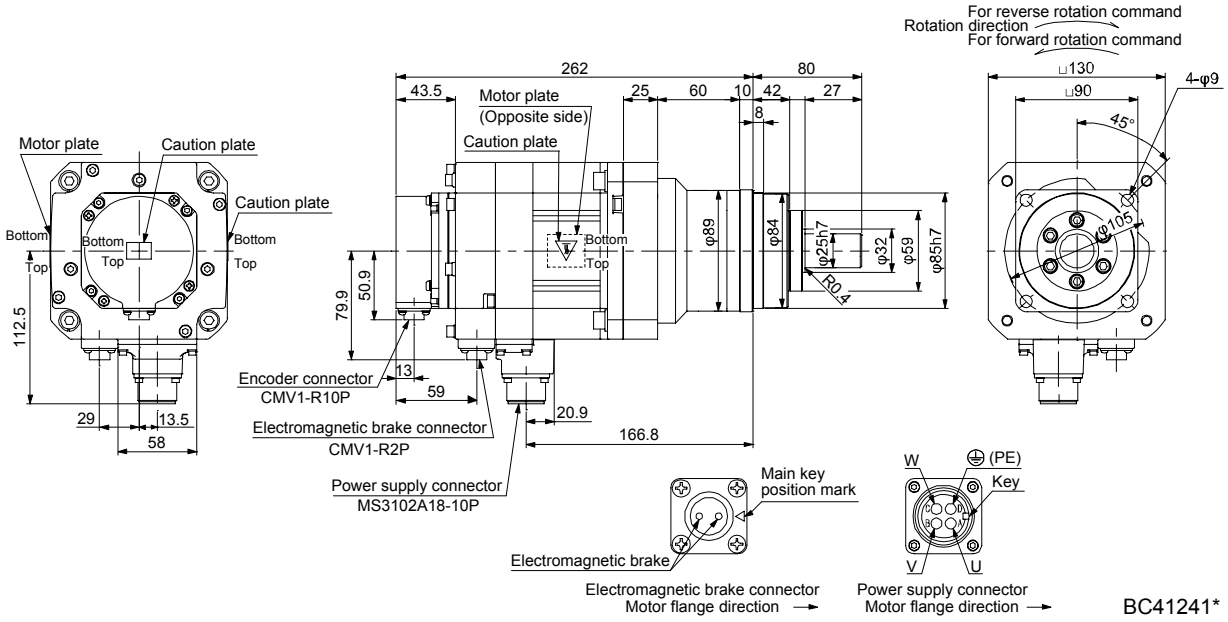

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [$\times 10^{-4}$ kg•m$^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR52BG7 | 0.5 | HPG-32A-21-J2MCSYS-S | 1/21 | 8.5 | 12.4 | 15 |
| HG-SR52BG7 | 0.5 | HPG-32A-33-J2MCSZS-S | 1/33 | 8.5 | 12.2 | 15 |
| HG-SR52BG7 | 0.5 | HPG-32A-45-J2MCSZS-S | 1/45 | 8.5 | 12.2 | 15 |

[Unit: mm]



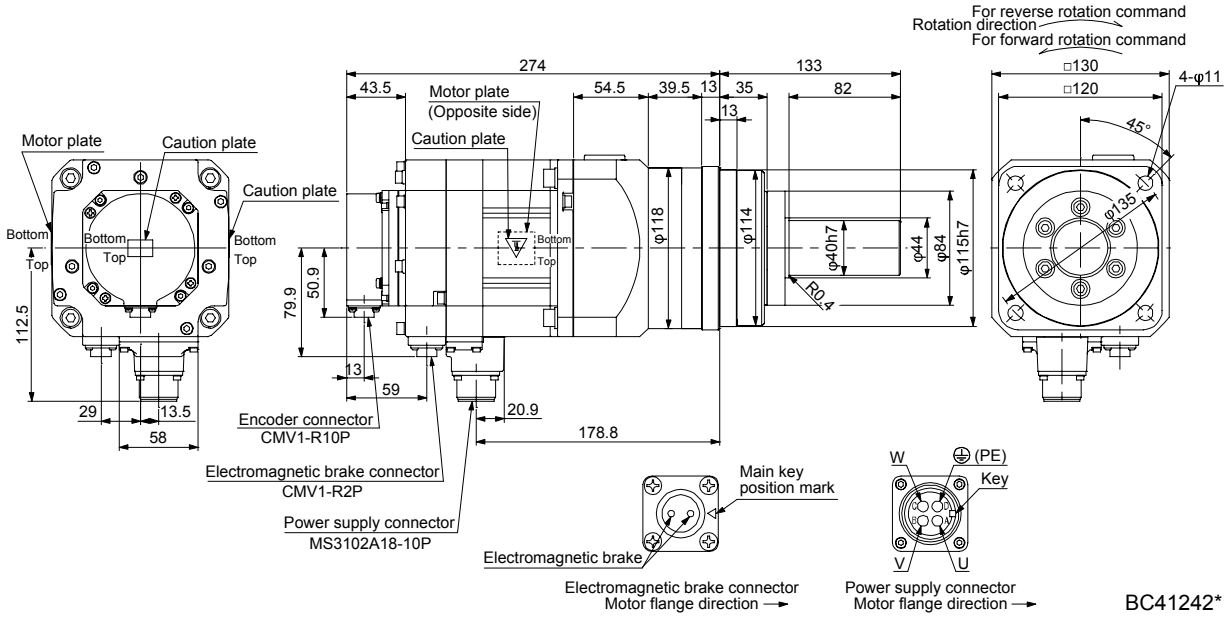
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG7 | 1.0 | HPG-20A-05-J2KSAWS-S | 1/5 | 8.5 | 14.5 | 12 |

[Unit: mm]



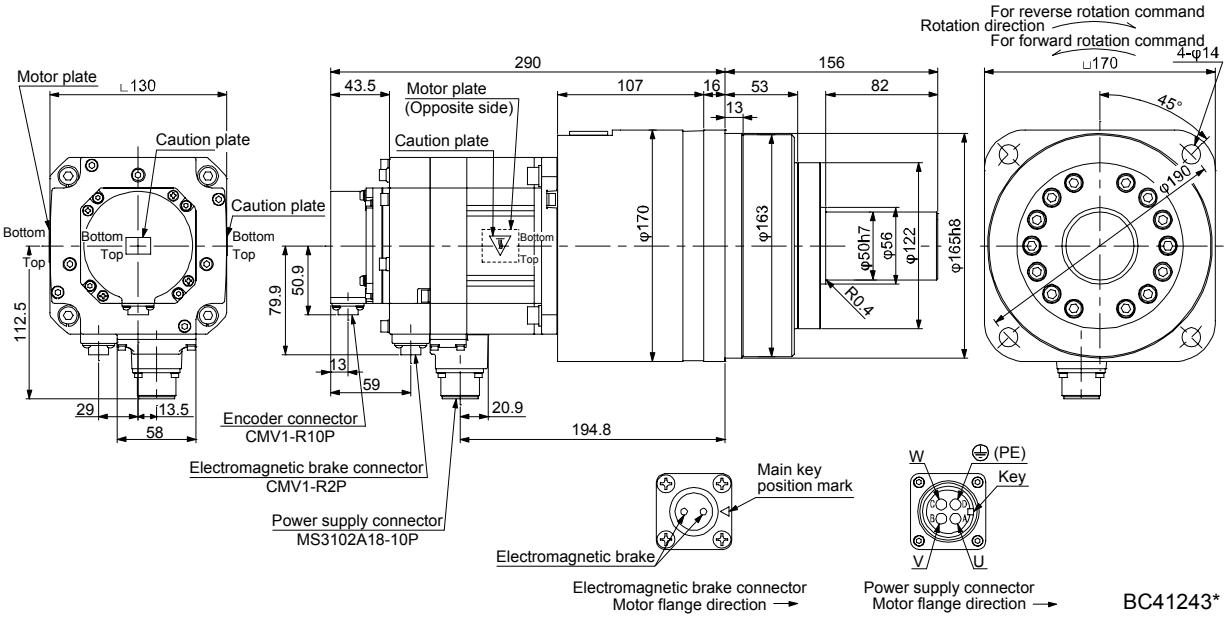

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG7 | 1.0 | HPG-32A-11-J2MCSPS-S | 1/11 | 8.5 | 17.2 | 17 |
| HG-SR102BG7 | 1.0 | HPG-32A-21-J2MCSYS-S | 1/21 | 8.5 | 16.7 | 17 |

[Unit: mm]



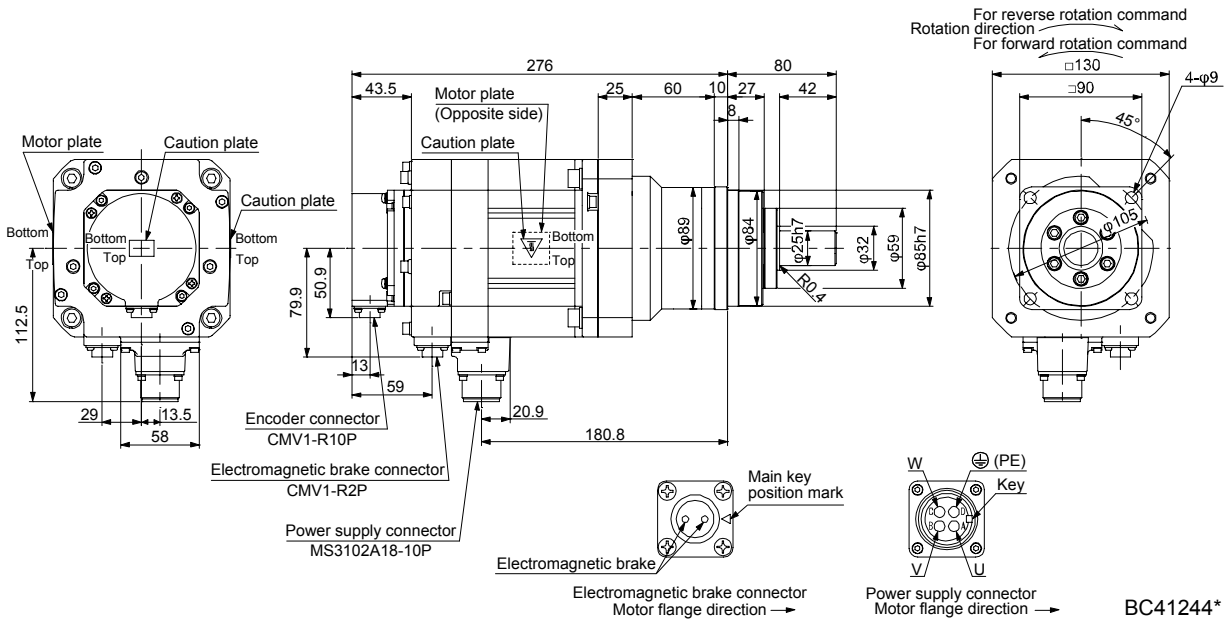
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR102BG7 | 1.0 | HPG-50A-33-J2AABC-S | 1/33 | 8.5 | 18.5 | 28 |
| HG-SR102BG7 | 1.0 | HPG-50A-45-J2AABC-S | 1/45 | 8.5 | 18.5 | 28 |

[Unit: mm]



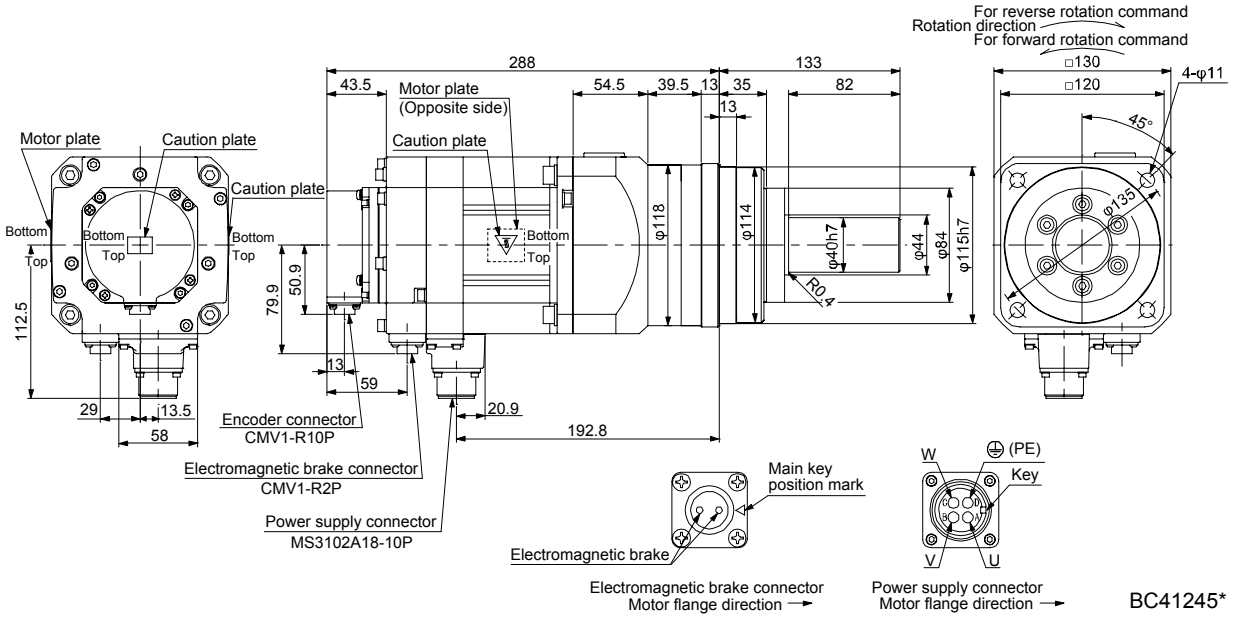

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG7 | 1.5 | HPG-20A-05-J2KSAWS-S | 1/5 | 8.5 | 18.9 | 13 |

[Unit: mm]



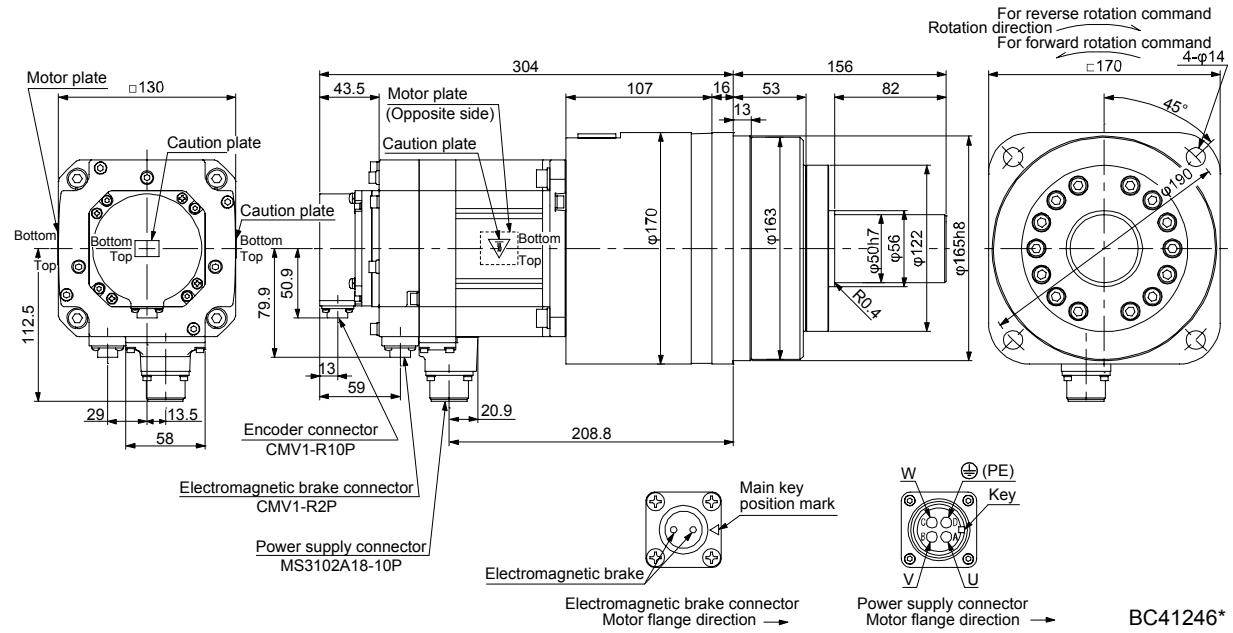
| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG7 | 1.5 | HPG-32A-11-J2MCSPS-S | 1/11 | 8.5 | 21.6 | 18 |

[Unit: mm]



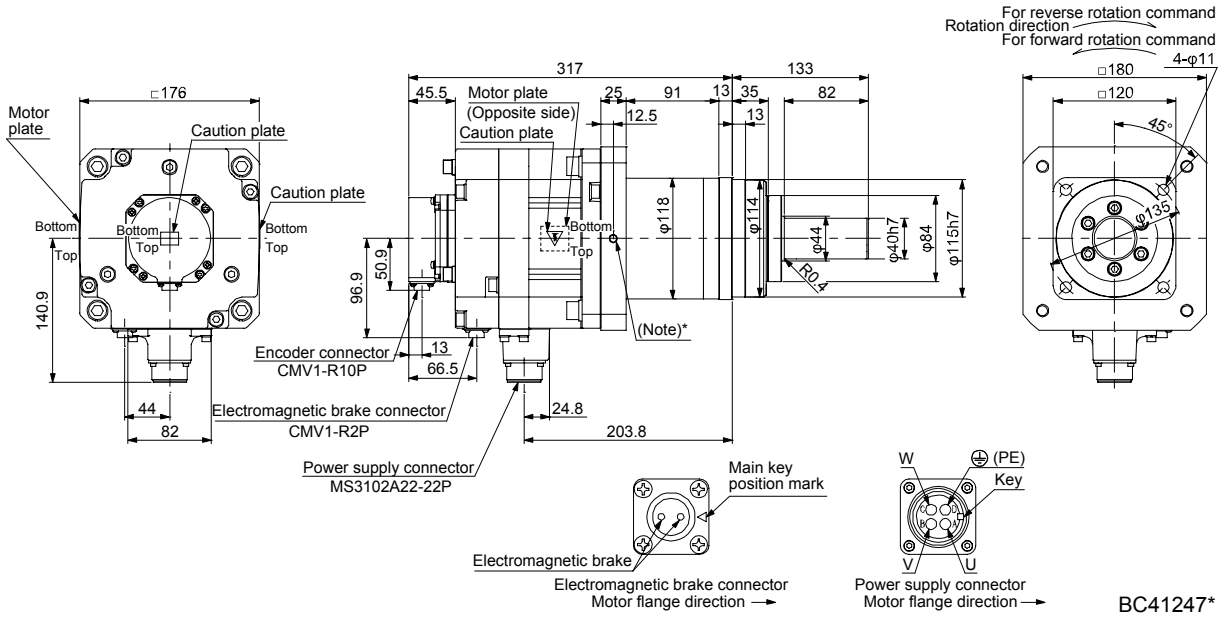

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR152BG7 | 1.5 | HPG-50A-21-J2AABC-S | 1/21 | 8.5 | 23.9 | 29 |
| HG-SR152BG7 | 1.5 | HPG-50A-33-J2AABC-S | 1/33 | 8.5 | 22.9 | 29 |
| HG-SR152BG7 | 1.5 | HPG-50A-45-J2AABC-S | 1/45 | 8.5 | 22.9 | 29 |

[Unit: mm]



| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG7 | 2.0 | HPG-32A-05-J2PBZI-S | 1/5 | 44 | 61.4 | 26 |
| HG-SR202BG7 | 2.0 | HPG-32A-11-J2PBZJ-S | 1/11 | 44 | 61.0 | 27 |

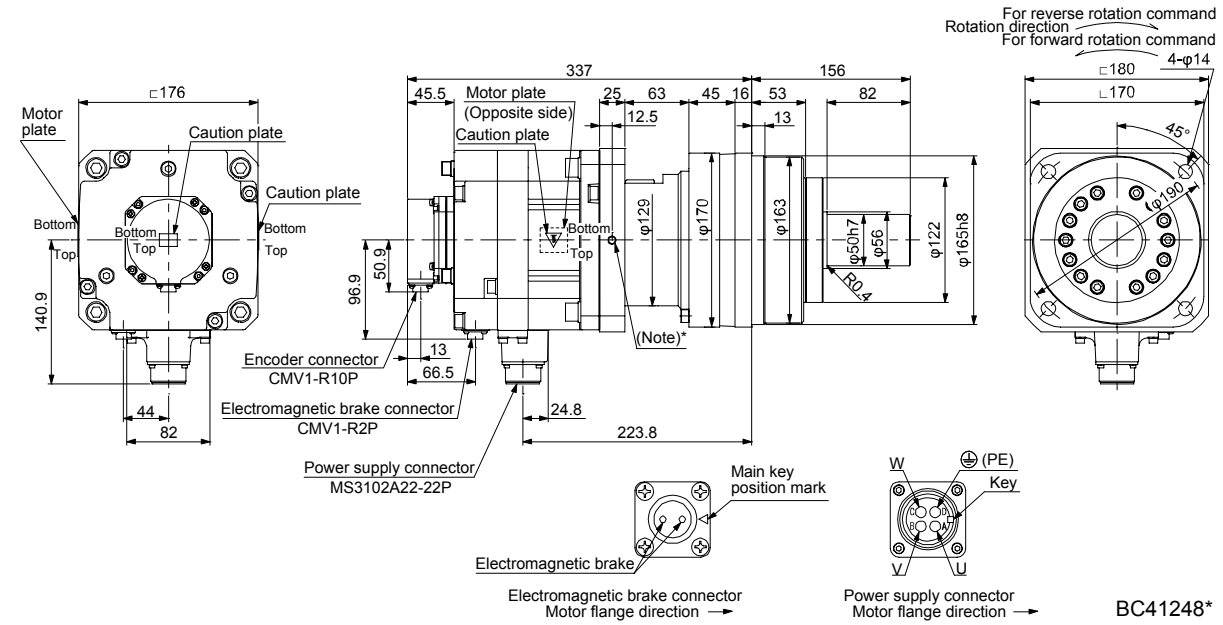
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR202BG7 | 2.0 | HPG-50A-21-J2BBDF-S | 1/21 | 44 | 63.0 | 38 |
| HG-SR202BG7 | 2.0 | HPG-50A-33-J2BBDF-S | 1/33 | 44 | 61.9 | 38 |
| HG-SR202BG7 | 2.0 | HPG-50A-45-J2BBDF-S | 1/45 | 44 | 61.9 | 38 |

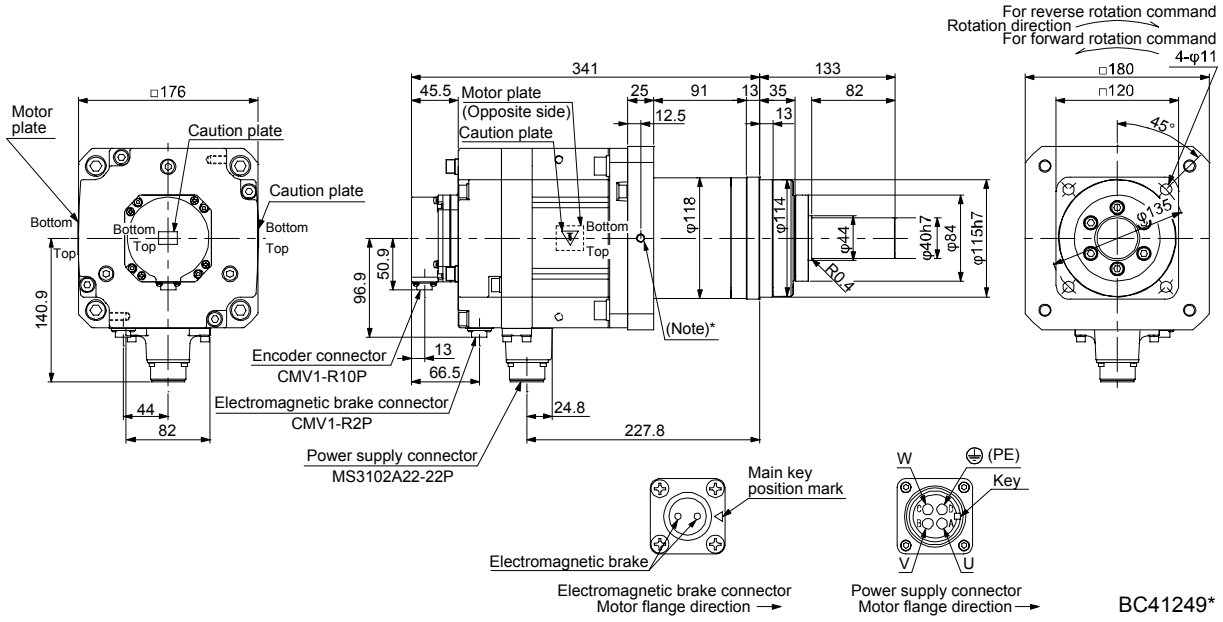
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG7 | 3.5 | HPG-32A-05-J2PBZI-S | 1/5 | 44 | 93.1 | 31 |

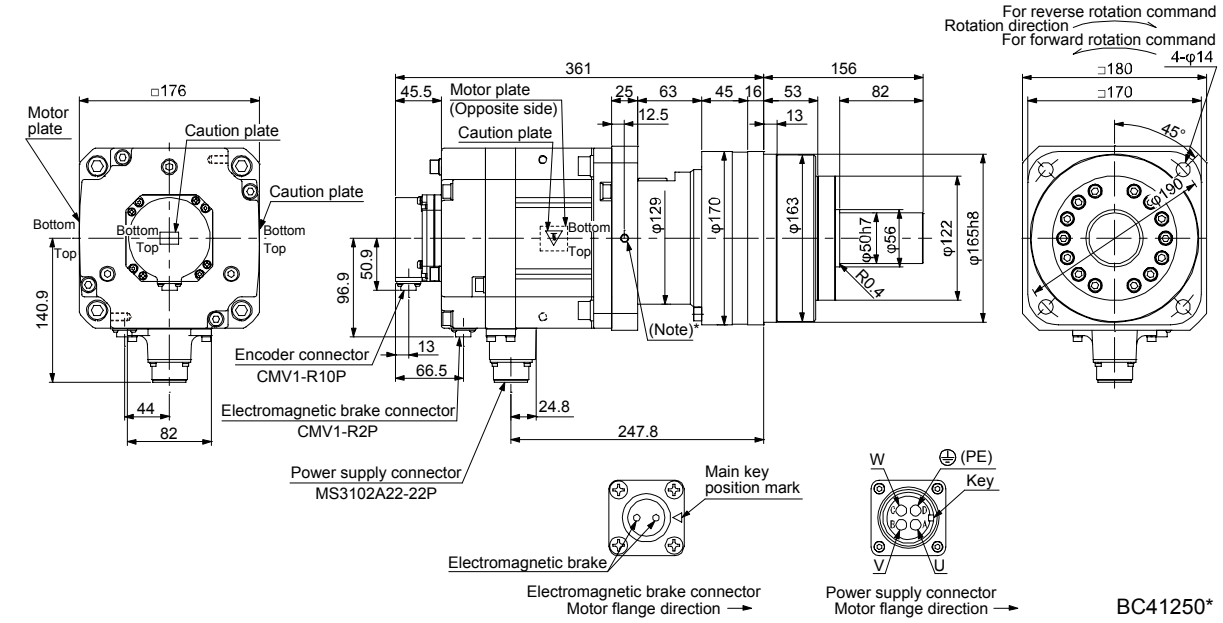
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR352BG7 | 3.5 | HPG-50A-11-J2BBDF-S | 1/11 | 44 | 96.6 | 43 |
| HG-SR352BG7 | 3.5 | HPG-50A-21-J2BBDF-S | 1/21 | 44 | 94.7 | 43 |

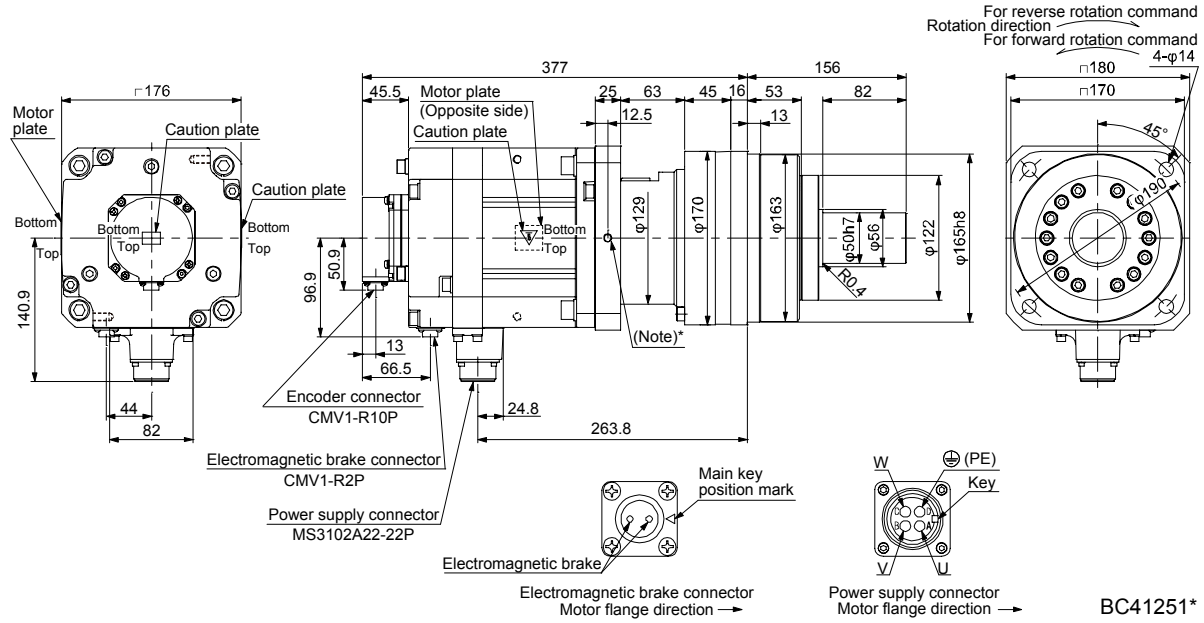
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR502BG7 | 5.0 | HPG-50A-05-J2BBCF-S | 1/5 | 44 | 121 | 45 |
| HG-SR502BG7 | 5.0 | HPG-50A-11-J2BBDF-S | 1/11 | 44 | 117 | 47 |

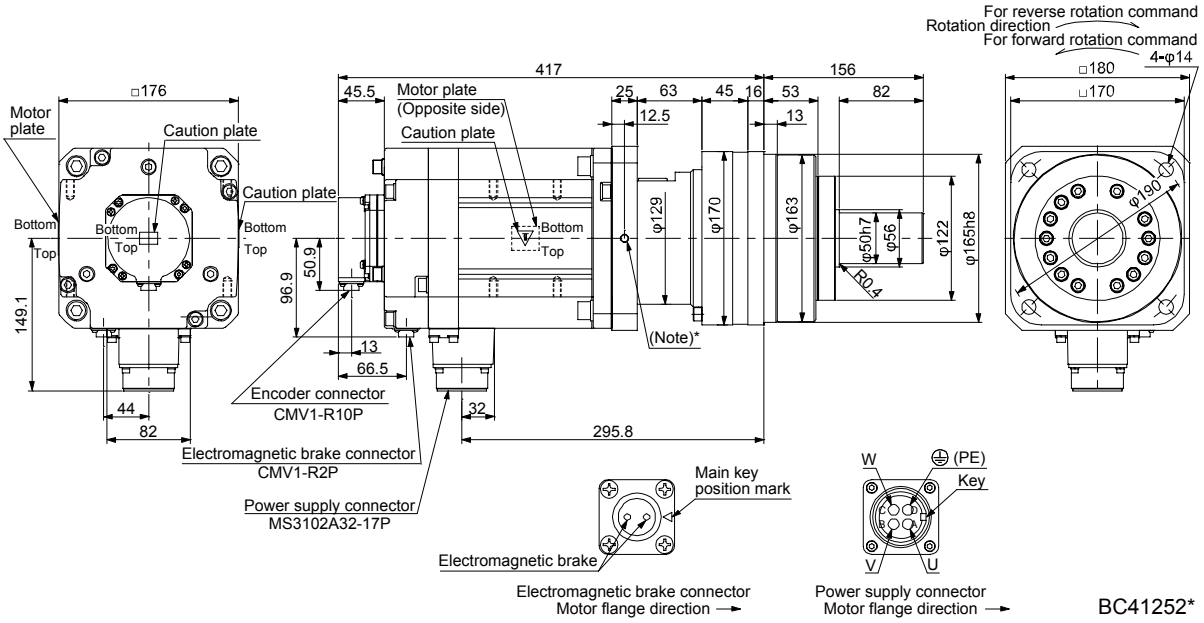
[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

| Model | Output [kW] | Reducer model | Reduction ratio | Brake static friction torque [N•m] | Moment of inertia J [× $10^{-4}$ kg•$m^2$] | Mass [kg] |
|---|---|---|---|---|---|---|
| HG-SR702BG7 | 7.0 | HPG-50A-05-J2BBCF-S | 1/5 | 44 | 173 | 52 |

[Unit: mm]




Note. * is a screw hole for eyebolt (M8).

# MEMO

## App. 1 Servo motor ID codes

| Servo motor series ID | Servo motor type ID | Servo motor encoder ID | Servo motor |
|---|---|---|---|
| 0101 | F053 | 0044 | HG-MR053 |
| | FF13 | | HG-MR13 |
| | FF23 | | HG-MR23 |
| | FF43 | | HG-MR43 |
| | FF73 | | HG-MR73 |
| 0111 | F053 | | HG-KR053 |
| | FF13 | | HG-KR13 |
| | FF23 | | HG-KR23 |
| | FF43 | | HG-KR43 |
| | FF73 | | HG-KR73 |
| 0121 | FF51 | | HG-SR51 |
| | FF81 | | HG-SR81 |
| | F121 | | HG-SR121 |
| | F201 | | HG-SR201 |
| | F301 | | HG-SR301 |
| | F421 | | HG-SR421 |
| | FF52 | | HG-SR52 |
| | F102 | | HG-SR102 |
| | F152 | | HG-SR152 |
| | F202 | | HG-SR202 |
| | F352 | | HG-SR352 |
| | F502 | | HG-SR502 |
| | F702 | | HG-SR702 |

## App. 2 Manufacturer list

Names given in the table are as of June 2012.

| Manufacturer | Contact |
|---|---|
| DDK | DDK Ltd. |
| TE Connectivity | TE Connectivity Ltd. Company |
| JAE | Japan Aviation Electronics Industry, Limited |
| JST | J.S.T. Mfg. Co., Ltd. |
| 3M | 3M |
| Molex | Molex |
| Hirose Electric | Hirose Electric Co., Ltd. |
| Toa Electric Industry | Toa Electric Industry Co. Ltd. |
| Taiyo Cabletec | Taiyo Cabletec Corporation |
| JX Nippon Oil & Energy | JX Nippon Oil & Energy Corporation |
| Idemitsu Kosan | Idemitsu Kosan Co., Ltd |
| Exxon Mobil | Exxon Mobil Corporation |
| Cosmo Oil | Cosmo Oil Co., Ltd. |
| Shell Oil | Shell Oil Company |
| Harmonic Drive Systems | Harmonic Drive Systems Inc. |

## App. 3 Compliance with the CE marking

### App. 3.1 What is CE marking?

The CE marking is mandatory and must be affixed to specific products placed on the European Union. When a product conforms to the requirements, the CE marking must be affixed to the product. The CE marking also applies to machines and equipment incorporating servos.

(1) EMC directive
The EMC directive applies to the servo motor alone. Therefore servo motor is designed to comply with the EMC directive. The EMC directive also applies to machines and equipment incorporating servo motors.

(2) Low voltage directive
The low voltage directive also applies to the servo motor alone. The servo motor is designed to comply with the low voltage directive.

### App. 3.2 For compliance

Be sure to perform an appearance inspection of every unit before installation. In addition, have a final performance inspection on the entire machine/system, and keep the inspection record.

(1) Wiring
Use wirings which complies with EN for the servo motor power. Complying EN products are available as options. Refer to chapter 5 for details of the options.

(2) Performing EMC tests
When EMC tests are run on a machine and device into which the servo motor and servo motor have been installed, it must conform to the electromagnetic compatibility (immunity/emission) standards after it has satisfied the operating environment and electrical equipment specifications.
For EMC directive conforming methods about servo amplifiers and servo motors, refer to the EMC Installation Guidelines (IB(NA)67310) and each Servo Amplifier Instruction Manual.

## App. 4 Compliance with UL/CSA standard

Use the UL/CSA standard-compliant model of servo motor. For the latest information of compliance, contact your local sales office.
Unless otherwise specified, the handling, performance, specifications, etc. of the UL/CSA standard-compliant models are the same as those of the standard models.

(1) Flange size

The servo motor is compliant with the UL/CSA standard when it is mounted on the flanges made of aluminum whose sizes are indicated in the following table.
The rated torque of the servo motor under the UL/CSA standard indicates the continuous permissible torque value that can be generated when it is mounted on the flange specified in this table and used in the environment of 0 °C to 40 °C ambient temperature. Therefore, to conform to the UL/CSA standard, mount the servo motor on a flange with a heat radiating effect equivalent to that of this flange.

| Flange size [mm] | Servo motor | |
|---|---|---|
| | HG-MR/HG-KR | HG-SR |
| 250 × 250 × 6 | 053/13/23 | |
| 250 × 250 × 12 | 43 | 51/81<br>52 to 152 |
| 300 × 300 × 12 | 73 | |
| 300 × 300 × 20 | | 121/201<br>202/352 |
| 650 × 650 × 35 | | 301/421<br>502/702 |

(2) Selection example of wires

To comply with the UL/CSA standard, use UL-approved copper wires rated at 75 °C for wiring.
The following table shows wires [AWG] rated at 75 °C.

| Servo motor | Wire [AWG] | |
|---|---|---|
| | 1) U/V/W/⏚ | 2) B1/B2 |
| HG-MR053 | 14 (Note 1) | 16 (Note 1) |
| HG-MR13 | | |
| HG-MR23 | | |
| HG-MR43 | | |
| HG-MR73 | | |
| HG-KR053 | | |
| HG-KR13 | | |
| HG-KR23 | | |
| HG-KR43 | | |
| HG-KR73 | | |
| HG-SR51 | 14 | 16 |
| HG-SR81 | | |
| HG-SR121 | | |
| HG-SR201 | | |
| HG-SR301 | 12 | |
| HG-SR421 | 10 (Note 2) | |
| HG-SR52 | 14 | |
| HG-SR102 | | |
| HG-SR152 | | |
| HG-SR202 | | |
| HG-SR352 | 12 | |
| HG-SR502 | 10 (Note 2) | |
| HG-SR702 | 8 (Note 2) | |

Note 1. For fabricating extension cables
2. Refer to each servo amplifier instruction manual for crimp terminals and crimping tools used for connection with the servo amplifier.

## App. 5 Calculation methods for designing

### 5.1 Specification symbol list

The following symbols are required for selecting the proper servo.

| | | | |
|---|---|---|---|
| $T_a$: Acceleration torque | [N•m] | g: Gravitational acceleration (9.8 [m/s$^2$]) | |
| $T_d$: Deceleration torque | [N•m] | μ: Friction coefficient | |
| $T_{Ma}$: Torque necessary for acceleration | [N•m] | π: Pi constant (3.14) | |
| $T_{Md}$: Torque necessary for deceleration | [N•m] | $P_f$: Number of feedback pulses in position control mode | [pulse/rev] |
| $T_{LH}$: Load torque converted into equivalent value on servo motor shaft during stop | [N•m] | f: Input pulse frequency in position control mode | [pps] |
| | [N•m] | $f_0$: Input pulse frequency during fast feed in position control mode | [pps] |
| $T_L$: Load torque converted into equivalent value on servo motor shaft | [N•m] | $t_{psa}$: Acceleration time constant of pulse frequency command in position control mode | [s] |
| $T_U$: Unbalanced torque | [N•m] | $t_{psd}$: Deceleration time constant of pulse frequency command in position control mode | [s] |
| $T_F$: Load friction torque | [N•m] | | |
| $T_B$: Brake static friction torque | [N•m] | $K_p$: Position loop gain 1 | [rad/s] |
| $T_{L0}$: Load torque on load shaft | [N•m] | $T_p$: Position control time constant (Tp = 1/Kp) | [s] |
| $T_{rms}$: Continuous effective load torque converted into equivalent value on servo motor shaft | [N•m] | ΔI: Feed per feedback pulses in position control mode Travel distance per pulse | [mm/pulse] |
| $J_L$: Load inertia moment converted into equivalent value on servo motor shaft | [kg•cm$^2$] | $\Delta l_0$: Feed per command pulse in position control mode Travel distance per command pulse | [mm/pulse] |
| $J_{L0}$: Load inertia moment on load shaft | [kg•cm$^2$] | l: Feed | [mm] |
| $J_M$: Servo motor's rotor inertia moment | [kg•cm$^2$] | P: Number of internal command pulses | [pulse] |
| N: Servo motor speed | [r/min] | $t_s$: Internal settling time | [s] |
| $N_0$: Servo motor speed during fast feed | [r/min] | $t_0$: Positioning time | [s] |
| $N_{L0}$: Load shaft speed during fast feed | [r/min] | $t_c$: Time at constant speed of servo motor in one cycle | [s] |
| V: Moving part speed | [mm/min] | tl: Stopping time in one cycle | [s] |
| $V_0$: Moving part speed during fast feed | [mm/min] | $\Delta_\varepsilon$: Positioning accuracy | [mm] |
| $P_B$: Ball screw lead | [mm] | ε: Number of droop pulses | [pulse] |
| $Z_1$: Number of gear teeth on servo motor shaft | | ΔS: Travel distance per servo motor revolution | [mm/rev] |
| $Z_2$: Number of gear teeth on load gear | | W: Mass | [kg] |
| n: Gear ratio $n = \frac{Z_2}{Z_1}$ | | $L_{max}$: Maximum coasting distance | [mm] |
| Speed reduced when n > 1, Speed increased when n < 1 | | | |
| η: Drive system efficiency | | | |

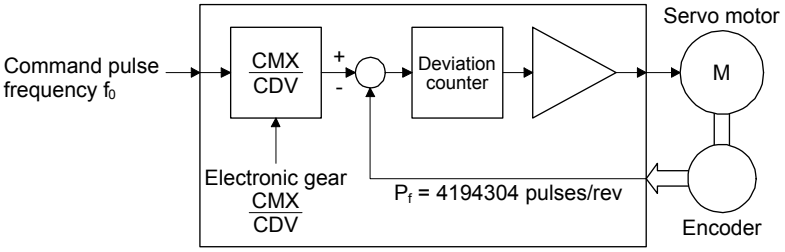
App. 5.2 Position resolution and electronic gear setting

Position resolution (travel distance per pulse Δl) is determined by travel distance per servo motor revolution ΔS and the number of encoder feedback pulses $P_f$, and is represented by Equation 5.1. As the number of feedback pulses depends on the servo motor series, refer to standard specifications in the chapter of each servo motor series.

$$\Delta l = \frac{\Delta S}{P_f} \quad \cdots\cdots (5.1)$$

Δl: Travel distance per pulse [mm/pulse]
ΔS: Travel distance per servo motor revolution [mm/rev]
$P_f$: Number of feedback pulses [pulse/rev]

Since Δl has the relation represented by equation 5.1, its value is fixed in the control system after the drive system and encoder have been determined. However, travel distance per command pulse can be set as desired using the parameters.




As shown above, command pulses are multiplied by CMX/CDV set in the parameters to be position control pulses. Travel distance per command pulse $\Delta l_0$ is expressed by Equation 5.2.

$$\Delta l_0 = \frac{\Delta S}{P_f} \bullet \frac{CMX}{CDV} = \Delta l \bullet \frac{CMX}{CDV} \quad \cdots\cdots (5.2)$$

CMX : Electronic gear (command pulse multiplication numerator)
CDV : Electronic gear (command pulse multiplication denominator)

Using the above relation, travel distance per command pulse can be set to a value without fraction.

[Setting example]
Find a parameter value for $\Delta l_0$ = 0.001 mm/pulse in a drive system where ball screw lead $P_B$ = 10 mm and reduction ratio 1/n = 1.
The encoder feedback pulses $P_f$ of the HG-KR = 4194304 pulses/rev.
Since ΔS = 10 mm/rev, the following is obtained according to equation 5.2.

$$\frac{CMX}{CDV} = \Delta l_0 \bullet \frac{P_f}{\Delta S} = 0.001 \bullet \frac{4194304}{10} = \frac{262144}{625}$$

Relation between position resolution Δl and overall accuracy
Positioning accuracy of machine is the sum of electrical errors and mechanical errors. Normally, provisions should be made so that positioning accuracy are not affected by electrical system errors. As a guideline, Equation 5.3 should be satisfied.

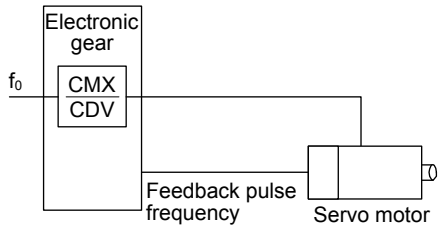
$$\Delta l < \left[\frac{1}{5} \sim \frac{1}{10}\right] \cdot \Delta\varepsilon \quad \cdots\cdots (5.3)$$

Δl: Travel distance per feedback pulse [mm/pulse]
Δε: Positioning accuracy [mm]

App. 5.3 Speed and command pulse frequency

The servo motor is run at a speed where the command pulses and feedback pulses are equivalent. Therefore, the command pulse frequency and feedback pulse frequency are equivalent. The following shows the relation including the parameter settings (CMX and CDV). (Refer to the following diagram.)

$$f_0 \cdot \frac{CMX}{CDV} = P_f \cdot \frac{N_0}{60} \quad \cdots\cdots (5.4)$$




$f_0$: Command pulse frequency [pps]
(differential line driver)
CMX: Electronic gear
(command pulse multiplication numerator)
CDV: Electronic gear
(command pulse multiplication denominator)
$N_0$: Servo motor speed [r/min]
$P_f$: Number of feedback pulses [pulse/rev]
($P_f$ = 4194304 for HG-KR)

According to equation 5.4, the following equations may be used to obtain the electronic gear and command pulse frequency to rotate the servo motor at $N_0$.

- Electronic gear

$$\frac{CMX}{CDV} = P_f \cdot \frac{N_0}{60} \cdot \frac{1}{f_0} \quad \cdots\cdots (5.5)$$

- Command pulse frequency

$$f_0 = P_f \cdot \frac{N_0}{60} \cdot \frac{CDV}{CMX} \quad \cdots\cdots (5.6)$$

[Setting example]
Obtain the command pulse frequency required to run the HG-KR at 3000 r/min.
The following result will be found according to equation 5.6.

$$f_0 = 4194304 \cdot \frac{N_0}{60} \cdot \frac{CDV}{CMX}$$

(Command pulse frequency)

$$= 4194304 \cdot \frac{3000}{60} \cdot 1$$

$$= 209715200 \text{ [pps]}$$

However, as the maximum input command pulse frequency in the differential line driver system is 4 Mpps for MR-J4 servo amplifier, 209715200 pps cannot be entered.
To run the servo motor at the speed of 3000 r/min at not more than 4 Mpps, the electronic gear setting must be changed. This electronic gear is found by equation 5.5.

$$\frac{CMX}{CDV} = 4194304 \cdot \frac{3000}{60} \cdot \frac{1}{4 \cdot 10^6}$$

(Electronic gear)

$$= \frac{32768}{625}$$

Therefore, the parameters are set to CMX = 32768 and CDV = 625.

5.4 Stopping characteristics

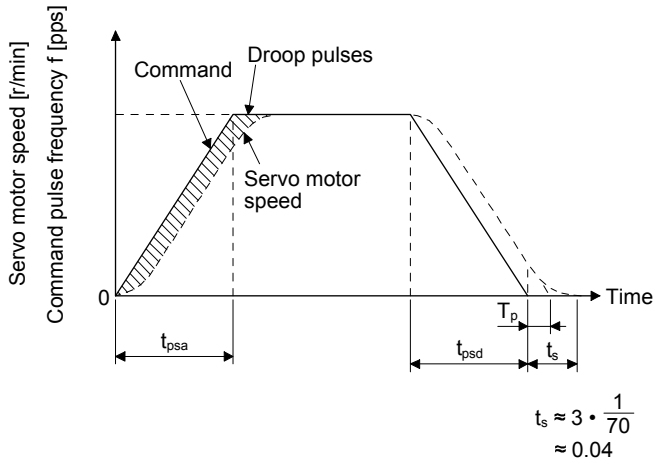
(1) Droop pulses (ε)

When you use a pulse train command to run the servo motor, the relation between the command pulse frequency and servo motor speed will be as follows. The difference between the command pulses and feedback pulses during acceleration are called droop pulses, which are accumulated in the servo amplifier deviation counter. Equation 5.7 defines a relation between the command pulse frequency (f) and position control gain 1 (Kp).

$$\varepsilon \approx \frac{f_0}{K_p} \text{ [pulse]} \quad \cdots\cdots (5.7)$$

Supposing that the value of position control gain 1 is 70 rad/s, the droop pulses during operation will be as follows at the command pulse frequency of 200 kpps according to equation 5.7.

$$\varepsilon \approx \frac{200 \bullet 10^3}{70} \approx 2858 \text{ [pulses]}$$



(2) Settling time ($t_s$) during linear acceleration/deceleration

Since droop pulses still exist regardless of zero command pulse, settling time ($t_s$) is required until the servo motor stops.

Set the operation pattern in consideration for the settling time.

The settling time ($t_s$) value is obtained according to equation 5.8.

$$t_s \approx 3 \cdot T_p$$

$$= 3 \cdot \frac{1}{K_p} [s] \quad \cdots\cdots (5.8)$$

*When $K_p$ = 70 [rad/s], $t_s \approx 0.04$ [s].(above diagram)

The settling time ($t_s$) indicates the time required for the servo motor to stop in the necessary positioning accuracy range. This does not always mean that the servo motor has stopped completely. Thus, especially when the servo motor is used in high-duty operation and positioning accuracy has no margin for travel distance per pulse ($\Delta l$), the value obtained by equation 5.8 must be increased.

The settling time ($t_s$) will vary with the moving part conditions. Especially when the load friction torque is large, movement may be unstable near the stopping position.

App. 5.5 Capacity selection

As a first step, confirm the load conditions and temporarily select the servo motor capacity.
Then, determine the operation pattern, calculate required torques according to the following equations, and check that the servo motor of the initially selected capacity may be used for operation .

(1) Initial selection of servo motor capacity
After calculating the load torque ($T_L$) and load moment of inertia ($J_L$), select a servo motor which will satisfy the following two relations.

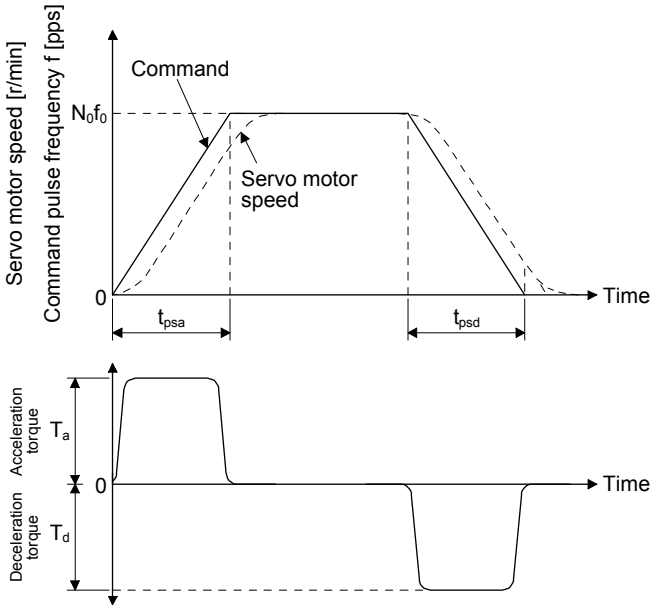
Servo motor rated torque > $T_L$
Servo motor $J_M$ > $J_L/m$

m = 3: High duty (more than 100 times/min.)
Settling time; 40 ms or less
m = 5: Middle frequency (60 times/min. to 100 times/min.)
Settling time; 100 ms or less
m = Permissible load moment of inertia: Low duty (less than 60 times/min.)
Settling time; more than 100 ms

Find the acceleration and deceleration torques and continuous effective load torque as described in (2) to make a final selection. For high-duty positioning, the load moment of inertia ($J_L$) value should be as small as possible.
If positioning is infrequent as in line control, the load moment of inertia ($J_L$) value may be slightly larger than in the above conditions.

(2) Acceleration and deceleration torques

The following equations are used to calculate the acceleration and deceleration torques in the following operation pattern.



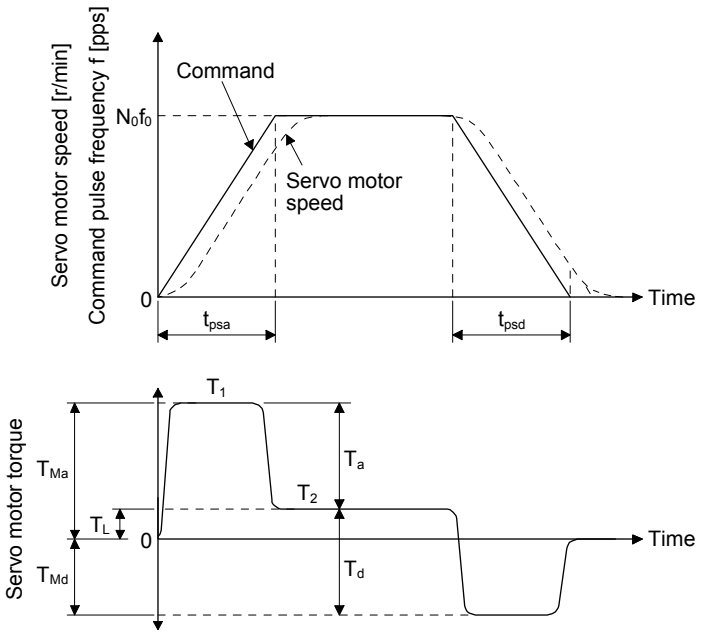

- Acceleration torque $T_a = \dfrac{(J_L + J_M) \cdot N_0}{9.55 \cdot 10^4} \cdot \dfrac{1}{t_{psa}}$ ..... (5.9)

- Deceleration torque $T_d = \dfrac{(J_L + J_M) \cdot N_0}{9.55 \cdot 10^4} \cdot \dfrac{1}{t_{psd}}$ ..... (5.10)

(3) Torques required for operation

| POINT |
| --- |
| ●For the gain adjustment, check that the machine operates below the maximum torque of the servo motor. It is recommended that generated torque during operation is under 90% of the maximum torque of the servo motor. |

Torques required for the servo motor are the highest during acceleration. If the servo motor torque found with equation 5.11 to 5.13 exceed the maximum torque, the motor will not accelerate as commands. Set the calculated value within the servo motor's maximum torque. Since a friction load is normally applied during deceleration, only the acceleration torque needs to be considered. In the regenerative mode, the value found by equation 5.13 is negative.




$T_1 = T_{Ma} = T_a + T_L$ ····· (5.11)

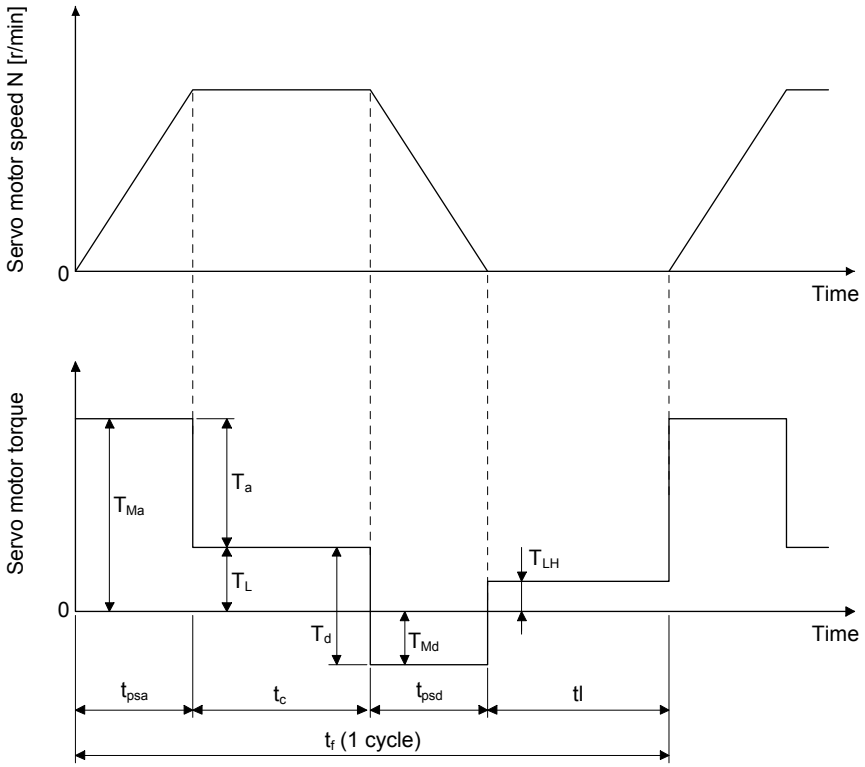
$T_2 = T_L$ ····· (5.12)

$T_3 = T_{Md} = -T_d + T_L$ ····· (5.13)

(4) Continuous effective load torque

If the torque required for the servo motor changes with time, the continuous effective load torque should be lower than the rated torque of the servo motor. There may be a servo motor torque delay at the start of acceleration or deceleration due to a delay in the control system. To simplify the calculation, however, it is assumed that constant acceleration and deceleration torques are applied during $t_{psa}$ and $t_{psd}$.

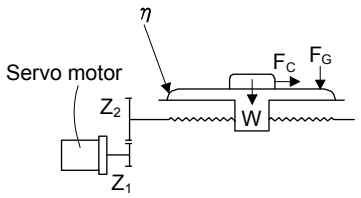
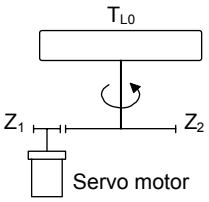
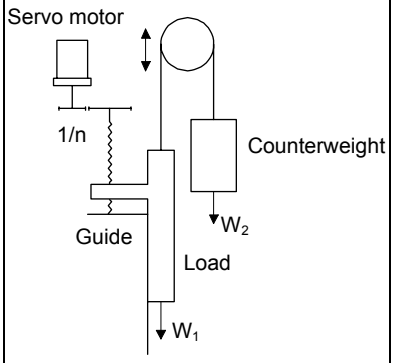
The following equation is used to calculate the continuous effective load torque in the following operation pattern. $T_{LH}$ indicates the torque applied during a servo motor stop. A large torque may be applied especially during a stop in vertical motion applications, and this must be fully taken into consideration. During vertical drive, the unbalanced torque $T_U$ will become $T_{LH}$.




$$T_{rms} = \sqrt{\frac{T_{Ma}^2 \cdot t_{psa} + T_L^2 \cdot t_c + T_{Md}^2 \cdot t_{psd} + T_{LH}^2 \cdot tl}{t_f}} \quad \cdots\cdots (5.14)$$

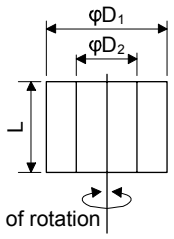
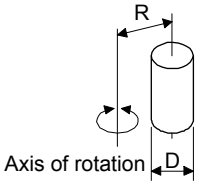
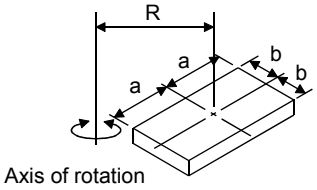
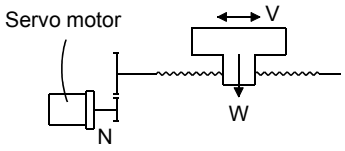
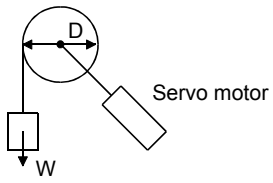
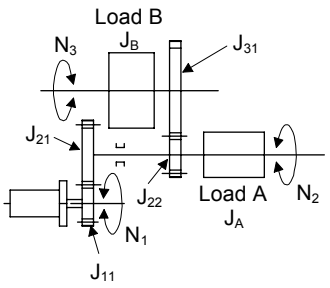
App. 5.6 Load torque equations

Typical load torque equations are indicated below.

| Type | Mechanism | Equation |
|---|---|---|
| Linear movement |  | $T_L = \frac{F}{2 \cdot 10^3 \cdot \pi \cdot \eta} \cdot \frac{V}{N} = \frac{F \cdot \Delta S}{2 \cdot 10^3 \cdot \pi \cdot \eta}$ ……(5.15)<br>F: Force in the axial direction of the machine in linear motion [N]<br>F in equation 5.15 is obtained with equation 5.16 when the table is moved, for example, as shown in the left diagram.<br>$F = F_c + \mu \cdot (W \cdot g + F_G)$ ……(5.16)<br>$F_c$: Force applied in the axial direction of the moving part [N]<br>$F_G$: Tightening force of the table guide surface [N]<br>W: Full mass of the moving part [kg] |
| Rotary movement |  | $T_L = \frac{1}{n} \cdot \frac{1}{\eta} \cdot T_{L0} + T_F$ ……(5.17)<br>$T_F$: Load friction torque converted into equivalent value on servo motor shaft [N•m] |
| Vertical movement |  | During rise<br>$T_L = T_U + T_F$ ……(5.18)<br>During fall<br>$T_L = -T_U \cdot \eta^2 + T_F$ ……(5.19)<br>$T_F$: Friction torque of the moving part [N•m]<br>$T_U = \frac{(W_1 - W_2) \cdot g}{2 \cdot 10^3 \cdot \pi \cdot \eta} \cdot \frac{V}{N} = \frac{(W_1 - W_2) \cdot g \cdot \Delta S}{2 \cdot 10^3 \cdot \pi \cdot \eta}$ ……(5.20)<br>$T_F = \frac{\mu(W_1 - W_2) \cdot g \cdot \Delta S}{2 \cdot 10^3 \cdot \pi \cdot \eta}$ ……(5.21)<br>$W_1$: Mass of load [kg]<br>$W_2$: Mass of counterweight [kg] |

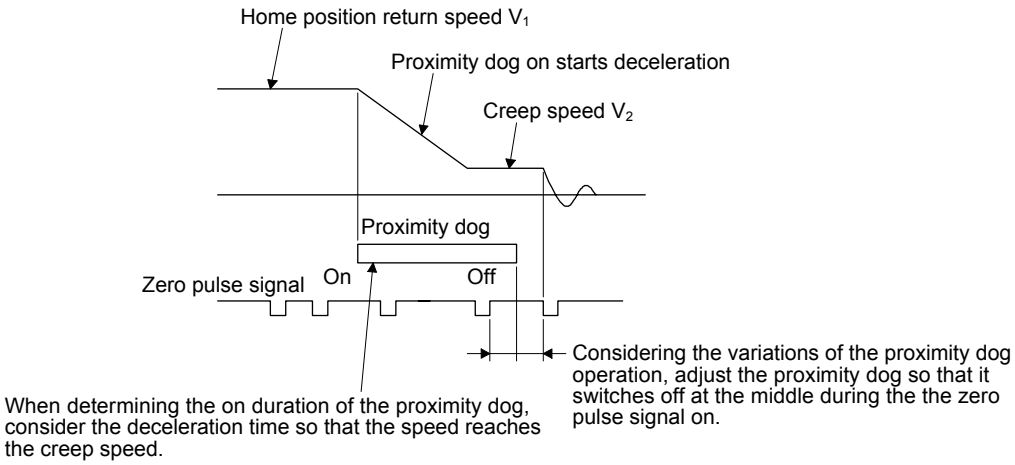
App. 5.7 Load moment of inertia equations

Typical load moment of inertia equations is indicated below.

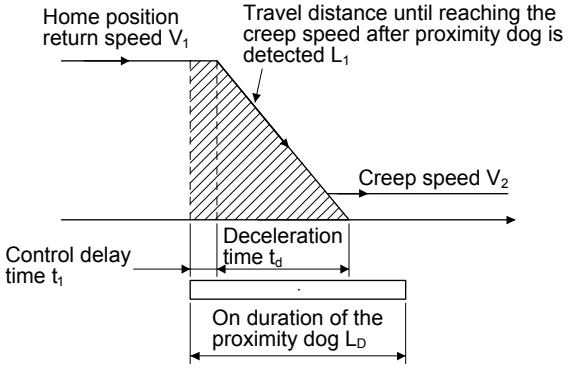
| Type | Mechanism | Equation |
|---|---|---|
| Cylinder | Axis of rotation is on the cylinder center<br>  | $J_{L0} = \frac{\pi \cdot \rho \cdot L}{32} \cdot (D_1^4 - D_2^4) = \frac{W}{8} \cdot (D_1^2 + D_2^2)$ ·····(5.22)<br>ρ: Cylinder material density [kg/cm$^3$]<br>L: Cylinder length [cm]<br>$D_1$: Cylinder outside diameter [cm]<br>$D_2$: Cylinder inside diameter [cm]<br>W: Cylinder mass [kg]<br><br>Reference data: material density<br>Iron: 7.8 • 10$^{-3}$ [kg/cm$^3$]<br>Aluminum: 2.7 • 10$^{-3}$ [kg/cm$^3$]<br>Copper: 8.96 • 10$^{-3}$ [kg/cm$^3$] |
| | Axis of rotation is on the cylinder center<br>  | $J_{L0} = \frac{W}{8} \cdot (D^2 + 8R^2)$ ·····(5.23) |
| Square block |  | $J_{L0} = W \cdot \left(\frac{a^2 + b^2}{3} + R^2\right)$ ·····(5.24)<br>W: Square block mass [kg]<br>a, b, R: Left diagram [cm] |
| Object which moves linearly |  | $J_L = W \cdot \left(\frac{V}{600 \cdot \omega}\right)^2 = W \cdot \left(\frac{1}{2 \cdot \pi \cdot N} \cdot \frac{V}{10}\right)^2 = W \cdot \left(\frac{\Delta S}{20 \cdot \pi}\right)^2$ ·····(5.25)<br>V: Speed of object which moves linearly [mm/min]<br>ΔS: Travel distance of object moving linearly per servo motor revolution [mm/rev]<br>W: Square block mass [kg] |
| Object that is hung with pulley |  | $J_L = W \cdot \left(\frac{D}{2}\right)^2 + J_P$ ·····(5.26)<br>JP: Pulley moment of inertia [kg•cm$^2$]<br>D: Pulley diameter [cm]<br>W: Square block mass [kg] |
| Converted load |  | $J_L = J_{11} + (J_{21} + J_{22} + J_A) \cdot \left(\frac{N_2}{N_1}\right)^2 + (J_{31} + J_B) \cdot \left(\frac{N_3}{N_1}\right)^2$ ·····(5.27)<br>$J_A$, $J_B$: Moment of inertia of load A, B [kg cm$^2$]<br>$J_{11}$ to $J_{31}$: Moment of inertia [kg•cm$^2$]<br>$N_1$ to $N_3$: Speed of each shaft [r/min] |

App. 5.8 Precautions for home position return

When a general positioning unit is used, the sequence of events is as shown in the following figure.




(1) When determining the on duration of the proximity dog, consider the delay time of the control section and the deceleration time so that the creep speed is attained. If the proximity dog signal switches off during deceleration, precise home position return cannot be performed.




Travel distance $L_1$ in the chart can be obtained by equation 5.28.

$$L_1 = \frac{1}{60} \cdot V_1 \cdot t_1 \cdot + \frac{1}{120} \cdot V_1 \cdot t_d \cdot \left\{1 - \left(\frac{V_2}{V_1}\right)^2\right\} + \frac{1}{60} \cdot V_1 \cdot T_P \quad \cdots\cdots (5.28)$$

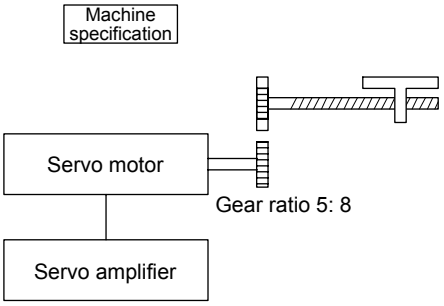
On duration of the proximity dog $L_D$ [mm] must be longer than $L_1$ obtained by equation 5.28, as indicated in equation 5.29.

$$L_D > L_1 \quad \cdots\cdots (5.29)$$

where,
$V_1$, $V_2$: As shown in the chart [mm/min]
$t_1$, $t_d$: As shown in the chart [s]
$L_1$: As shown in the chart [mm]
$L_D$: As shown in the chart [mm]

(2) Set the end (off position) of the proximity dog signal at the middle of two on positions (lows) of the zero pulse signal. If it is set near either on position of the zero pulse signal, the positioning unit is liable to misdetect the zero pulse signal. In this case, a fault will occur, e.g. the home position will shift by one revolution of the servo motor.

App. 5.9 Selection example




| | |
|---|---|
| Feed speed of moving part | $V_0$ = 30000 [mm/min] |
| Travel distance per command pulse | $\Delta l_0$ = 0.001 [mm/pulse] |
| Feed per cycle | l = 400 [mm] |
| Positioning time | $t_0$ = within 1 [s] |
| Number of feeds | 40 [times/min] |
| Operation cycle | $t_f$ = 1.5 [s] |
| Reduction ratio | 1/n = 5/8 |
| Moving part mass | W = 60 [kg] |
| Drive system efficiency | η = 0.8 |
| Friction coefficient | μ = 0.2 |
| Ball screw lead | $P_B$ = 16 [mm] |
| Ball screw diameter | $D_B$ = 20 [mm] |
| Ball screw length | $L_B$ = 500 [mm] |
| Gear diameter (servo motor shaft) | $D_{G1}$ = 25 [mm] |
| Gear diameter (load shaft) | $D_{G2}$ = 40 [mm] |
| Gear face width | $L_G$ = 10 [mm] |
| Number of feedback pulses | $P_f$ = 4194304 [pulses/rev] |

(1) Selection of control parameters

Setting of electronic gear (command pulse multiplication numerator/denominator)

There is the following relation between the electronic gear and command resolution $\Delta l_0$.

$$\Delta l_0 = \frac{P_B}{P_f \cdot n} \cdot \left(\frac{CMX}{CDV}\right)$$

When the above machining specifications are substituted in the above equation

$$0.001 = \frac{16}{4194304 \cdot 8/5} \cdot \frac{CMX}{CDV}$$

$$\frac{CMX}{CDV} = \frac{1}{1000} \cdot \frac{4194304 \cdot 8/5}{16} = \frac{262144}{625}$$

$\frac{CMX}{CDV}$ Acceptable as CMX/CDV is within 1/10 to 4000

(2) Servo motor speed

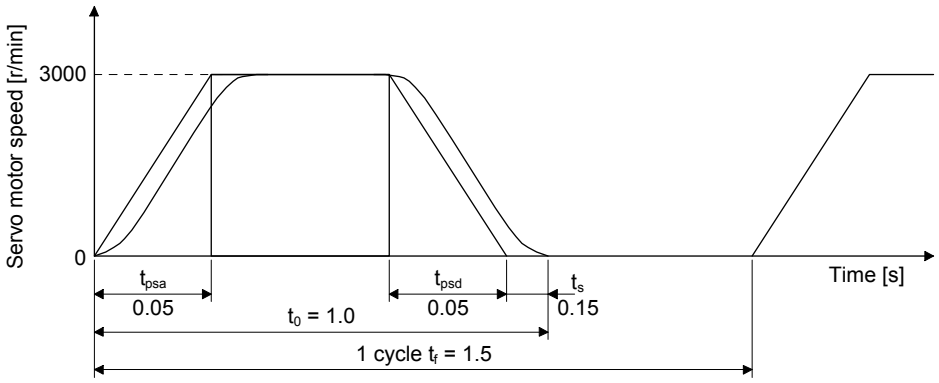
$$N_0 = \frac{V_0}{P_B} \cdot \frac{1}{1/n} = \frac{30000}{16} \cdot \frac{8}{5} = 3000 \text{ [r/min]}$$

(3) Acceleration/deceleration time constant

$$t_{psa} = t_{psd} = t_0 - \frac{l}{V_0/60} - t_s = 0.05 \text{ [s]}$$

$t_s$: Settling time (Here, this is assumed to be 0.15 s.)

(4) Operation pattern




(5) Load torque (converted into equivalent value on servo motor shaft)
Travel distance per servo motor revolution

$$\Delta S = P_B \cdot \frac{1}{n} = 16 \cdot \frac{5}{8} = 10 \text{ [mm]}$$

$$T_L = \frac{\mu \cdot W \cdot g \cdot \Delta S}{2 \cdot 10^3 \cdot \pi \cdot \eta} = \frac{0.2 \cdot 60 \cdot 9.8 \cdot 10}{2 \cdot 10^3 \cdot 3.14 \cdot 0.8} = 0.23 \text{ [N•m]}$$

(6) Load moment of inertia (converted into equivalent value on servo motor shaft)
Moving part

$$J_{L1} = W \cdot \left( \frac{\Delta S \cdot 10^{-3}}{2\pi} \right)^2 = 1.52 \cdot 10^{-4} \text{ [kg•m}^2\text{]}$$

Ball screw

$$J_{L2} = \frac{\pi \cdot \rho \cdot L_B}{32} \cdot D_B{}^4 \cdot \left( \frac{1}{n} \right)^2 = 0.24 \cdot 10^{-4} \text{ [kg•m}^2\text{]}$$

$\rho = 7.8 \cdot 10^3$ [kg/m$^3$] (iron)

Gear (servo motor shaft)

$$J_{L3} = \frac{\pi \cdot \rho \cdot L_G}{32} \cdot D_{G1}{}^4 = 0.03 \cdot 10^{-4} \text{ [kg•m}^2\text{]}$$

Gear (load shaft)

$$J_{L4} = \frac{\pi \cdot \rho \cdot L_G}{32} \cdot D_{G2}{}^4 \cdot \left( \frac{1}{n} \right)^2 = 0.08 \cdot 10^{-4} \text{ [kg•m}^2\text{]}$$

Full load moment of inertia (converted into equivalent value on servo motor shaft)

$$J_L = J_{L1} + J_{L2} + J_{L3} + J_{L4} = 1.9 \cdot 10^{-4} \text{ [kg•m}^2\text{]}$$

(7) Temporary selection of servo motor
Selection conditions

(a) Load torque < servo motor rated torque

(b) Full load moment of inertia < $J_R$ • moment of inertia of the servo motor
$J_R$: Recommended load to motor inertia ratio
According to above conditions, HG-KR23 (rated torque: 0.64 N•m, maximum torque: 2.2 N•m, moment of inertia: 0.221 • $10^{-4}$ kg•m$^2$) is selected temporarily.

(8) Acceleration/deceleration torque

Torque necessary for acceleration

$$T_{Ma} = \frac{(J_L+J_M) \cdot N_0}{9.55 \cdot 10^4 \cdot t_{psa}} + T_L = 1.56 \text{ [N•m]}$$

$J_M$: Moment of inertia of the servo motor

Torque necessary for deceleration

$$T_{Md} = \frac{-(J_L+J_M) \cdot N_0}{9.55 \cdot 10^4 \cdot t_{psd}} + T_L = -1.10 \text{ [N•m]}$$

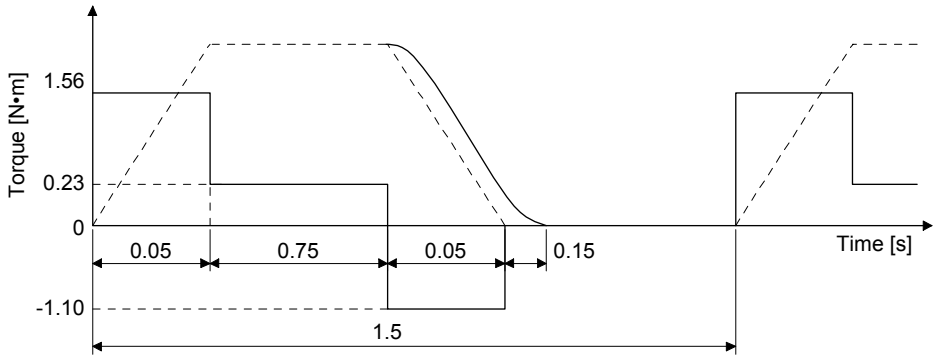
| |
|---|
| The torque required for the servo motor during acceleration/deceleration must be lower than the servo motor's maximum torque. |

(9) Continuous effective load torque

$$T_{rms} = \sqrt{\frac{T_{Ma}^2 \cdot t_{psa} + T_L^2 \cdot t_c + T_{Md}^2 \cdot t_{psd}}{t_f}} = 0.38 \text{ [N•m]}$$

| |
|---|
| The continuous effective load torque must be lower than the servo motor rated torque. |

(10) Torque pattern




(11) Selection results

The following servo motor and servo amplifier are selected as a result of the calculation.

Servo motor: HG-KR23

Servo amplifier: MR-J4-20A

(a) Electronic gear setting

CMX = 262144

CDV = 625

(b) During rapid feed

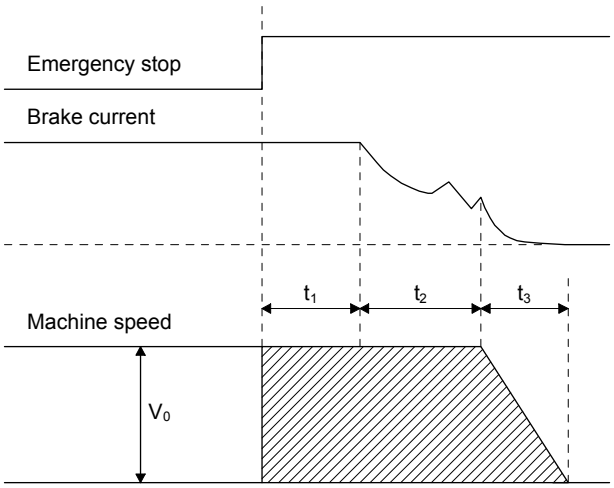
Servo motor speed $N_0$ = 3000 [r/min]

(c) Acceleration/deceleration time constant

$t_{psa} = t_{psd}$ = 0.05 [s]

App. 5.10 Coasting distance of electromagnetic brake

At an emergency stop, the servo motor with an electromagnetic brake stops as the following diagram. Here, the maximum coasting distance (during fast feed) $L_{max}$ will be the area shown with the diagonal line in the figure and can be calculated approximately with equation 5.30. The effect of the load torque is greater near the stopping area. When the load torque is large, the servo motor will stop faster than the value obtained in the equation.




$$L_{max} = \frac{V_0}{60} \cdot \left( t_1 + t_2 + \frac{t_3}{2} \right) \quad \cdots\cdots (5.30)$$

$L_{max}$: Maximum coasting distance [mm]
$V_0$: Machine's fast feed speed [mm/min]
$t_1$: Delay time of control section [s]
$t_2$: Braking delay time (Note) [s]
$t_3$: Braking time [s]

$$t_3 = \frac{(J_L + J_M) \cdot N_0}{9.55 \cdot 10^4 \cdot (T_L + 0.8 \cdot T_B)}$$

$J_L$: Load moment of inertia converted into equivalent value on servo motor shaft (Note) [kg•cm$^2$]
$J_M$: Servo motor rotor's inertia moment [kg•cm$^2$]
$N_0$: Servo motor speed during fast feed [r/min]
$T_L$: Load torque converted into equivalent value on servo motor shaft [N•m]
$T_B$: Brake static friction torque (Note) [N•m]

Note. Refer to the chapter of the servo motor series for $t_2$ and $T_B$. $J_L$ is moment of inertia of the machine at the servo motor shaft.

App. 5.11 Equation for calculating the electromagnetic brake workload

Calculate the brake workload Eb [J] at an emergency stop with the following equation.

$$Eb = \frac{(J_M + J_L) \cdot N^2}{182} \cdot 10^{-4}$$

N: Servo motor speed [r/min]
$J_M$: Servo motor rotor's inertia moment [kg•cm$^2$]
$J_L$: Load moment of inertia converted into equivalent value on servo motor shaft [kg•cm$^2$]

## App. 6 Selection example of servo motor power cable

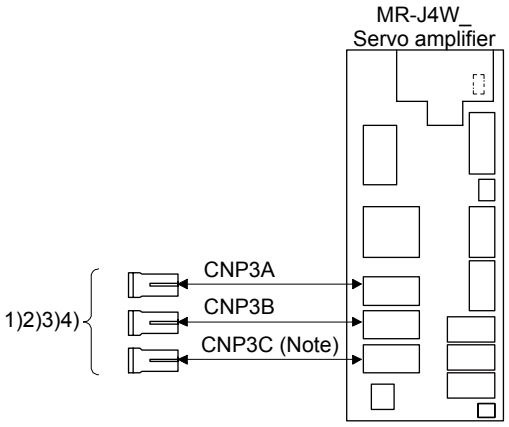
POINT

- Selection condition of wire size is as follows.
  Wire length: 30 m or less
- Some cables do not fit into the option or the recommended cable clamp. Select a cable clamp according to the cable diameter.

Selection example when using the 600 V grade EP rubber insulated chloroprene sheath cab-tire cable (2PNCT) for servo motor power (U, V, and W) is indicated below.

| Servo motor | Wire size [$mm^2$] |
|---|---|
| HG-SR52 | 1.25 |
| HG-SR102 | 1.25 |
| HG-SR152 | 2 |
| HG-SR202 | 2 |
| HG-SR352 | 3.5 |
| HG-SR502 | 5.5 |
| HG-SR702 | 8 |
| HG-SR51 | 1.25 |
| HG-SR81 | 1.25 |
| HG-SR121 | 2 |
| HG-SR201 | 2 |
| HG-SR301 | 3.5 |
| HG-SR421 | 5.5 |

## App. 7 Crimping connector for CNP3_




Note. This figure shows the 3-axis servo amplifier.

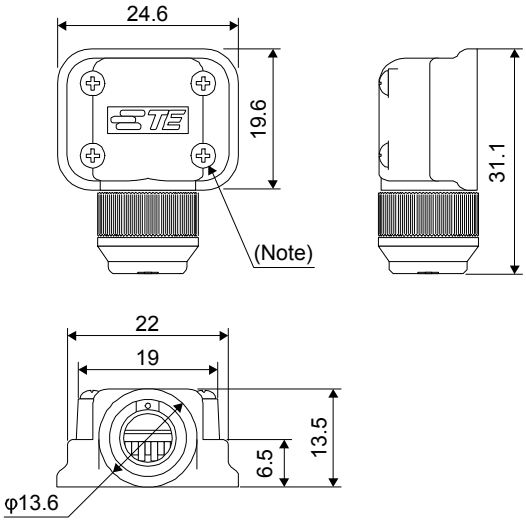
| No. | Name | Model | Description | Application |
|---|---|---|---|---|
| 1) | Connector set | MR-J3WCNP3-DL | The connector set is used for connecting to the servo amplifier directly using MR-PWS1CBL_M-_.<br>  <br>For CNP3A/CNP3B/CNP3C<br>Receptacle housing: F35FDC-04V-K<br>Receptacle contact: LF3F-41GF-P2.0<br>(JST)<br><br>Applicable wire<br>Wire size: 0.75 $mm^2$ (AWG 19) to 1.25 $mm^2$ (AWG 16)<br>Insulator OD: 1.8 mm to 2.8 mm<br>The crimping tool (YRF-880) is required. | Quantity: 1<br>For thin wire |
| 2) | Connector set | MR-J3WCNP3-DL-20P | | Quantity: 20<br>For thin wire |
| 3) | Connector set | MR-J3WCNP3-D2L | The connector set is used for connecting to the servo amplifier directly without using MR-PWS1CBL_M-_.<br>  <br>For CNP3A/CNP3B/CNP3C<br>Receptacle housing: F35FDC-04V-K<br>Receptacle contact: BF3F-71GF-P2.0<br>(JST)<br><br>Applicable wire<br>Wire size: 1.25 $mm^2$ (AWG 16) to 2.0 $mm^2$ (AWG 14)<br>Insulator OD: 2.4 mm to 3.4 mm<br>The crimping tool (YRF-1070) is required. | Quantity: 1<br>For thick wire |
| 4) | Connector set | MR-J3WCNP3-D2L-20P | | Quantity: 20<br>For thick wire |

## App. 8 Connector dimensions

The connector dimensions for wiring the servo motor are shown below.

(1) TE Connectivity
2174053-1

[Unit: mm]

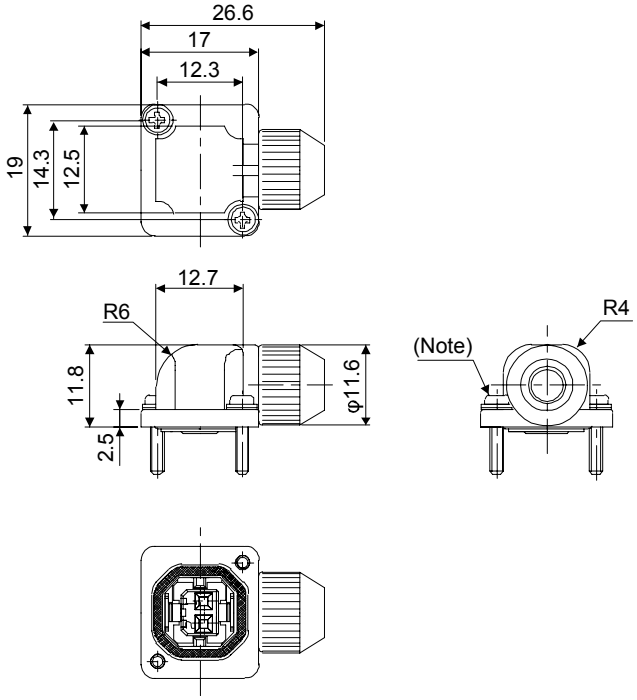



Note. The recommended screw tightening torque is 0.1 N•m.

Crimping tool: 1596970-1 (for ground clip)
1596847-1 (for receptacle contact)

(2) JAE
JN4FT02SJ1-R

[Unit: mm]

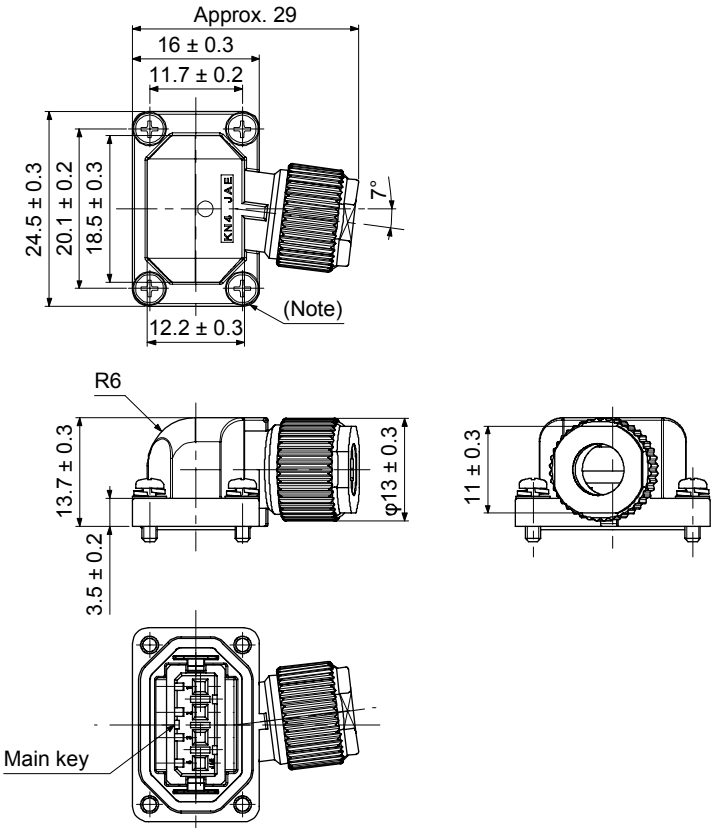



Note. The recommended screw tightening torque is 0.2 N•m.

Crimping tool: CT160-3-TMH5B

KN4FT04SJ1-R

[Unit: mm]




Note. The recommended screw tightening torque is 0.2 N•m.

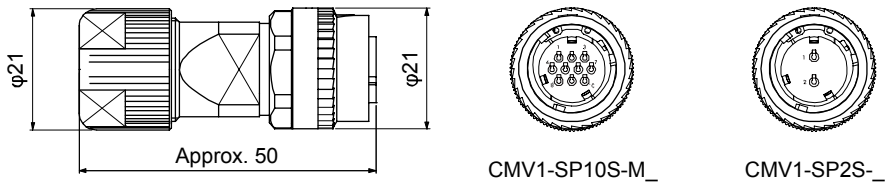
Crimping tool: CT160-3-TMH5B

(3) DDK

(a) CMV1-SP10S-M_/CMV1-SP2S-_

Refer to section 3.3 for details of crimping tools.

[Unit: mm]



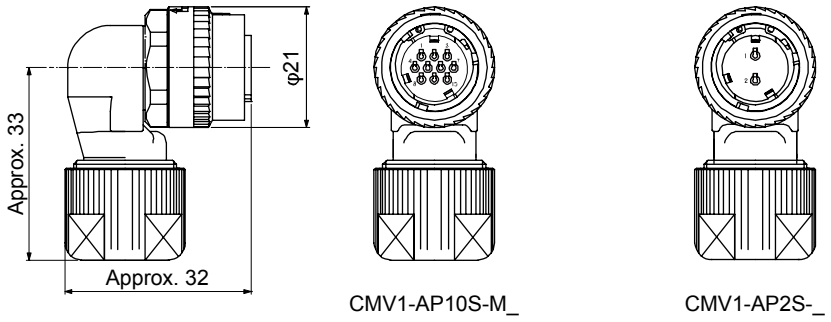

CMV1-SP10S-M_



CMV1-SP2S-_

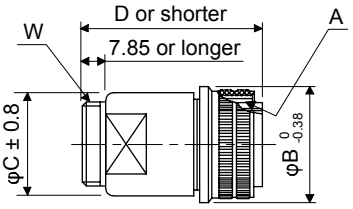
(b) CMV1-AP10S-M_/CMV1-AP2S-_
Refer to section 3.3 for details of crimping tools.

[Unit: mm]




(c) CE05-6A_-_SD-D-BSS

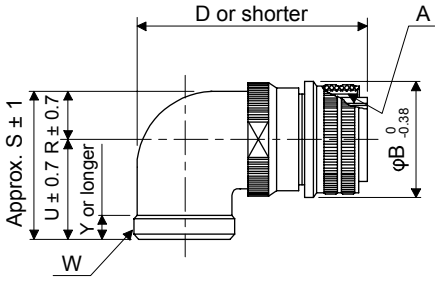
[Unit: mm]




| Model | A | B | C | D | W |
|---|---|---|---|---|---|
| CE05-6A18-10SD-D-BSS | 1 1/8-18UNEF-2B | 34.13 | 32.1 | 57 | 1-20UNEF-2A |
| CE05-6A22-22SD-D-BSS | 1 3/8-18UNEF-2B | 40.48 | 38.3 | 61 | 1 3/16-18UNEF-2A |
| CE05-6A32-17SD-D-BSS | 2-18UNS-2B | 56.33 | 54.2 | 79 | 1 3/4-18UNS-2A |

(d) CE05-8A_-_SD-D-BAS

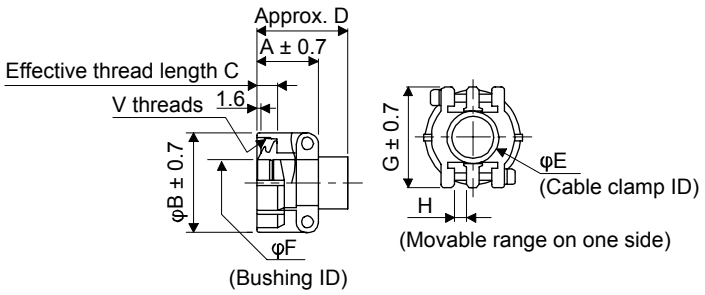
[Unit: mm]




| Model | A | B | D | W | R | U | S | Y |
|---|---|---|---|---|---|---|---|---|
| CE05-8A18-10SD-D-BAS | 1 1/8-18UNEF-2B | 34.13 | 69.5 | 1-20UNEF-2A | 13.2. | 30.2 | 43.4 | 7.5 |
| CE05-8A22-22SD-D-BAS | 1 3/8-18UNEF-2B | 40.48 | 75.5 | 1 3/16-18UNEF-2A | 16.3 | 33.3 | 49.6 | 7.5 |
| CE05-8A32-17SD-D-BAS | 2-18UNS-2B | 56.33 | 93.5 | 1 3/4-18UNS-2A | 24.6 | 44.5 | 61.9 | 8.5 |

(e) CE3057-_A-_-D

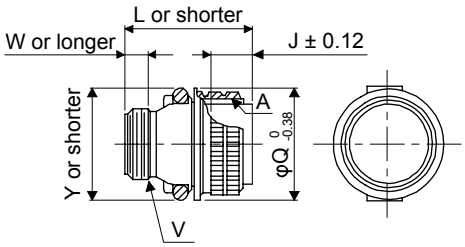
[Unit: mm]




| Model | Shell size | A | B | C | D | E | F | G | H | V | Bushing | Cable OD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CE3057-10A-1-D | 18 | 23.8 | 30.1 | 10.3 | 41.3 | 15.9 | 14.1 | 31.7 | 3.2 | 1-20UNEF-2B | CE3420-10-1 | 10.5 to 14.1 |
| CE3057-10A-2-D | | | | | | | 11.0 | | | | CE3420-10-2 | 8.5 to 11 |
| CE3057-12A-1-D | 22 | 23.8 | 35 | 10.3 | 41.3 | 19 | 16.0 | 37.3 | 4.0 | 1 3/16-18UNEF-2B | CE342012-1 | 12.5 to 16 |
| CE3057-12A-2-D | | | | | | | 13.0 | | | | CE342012-2 | 9.5 to 13 |
| CE3057-20A-1-D | 32 | 27.8 | 51.6 | 11.9 | 43 | 31.7 | 23.8 | 51.6 | 6.3 | 1 3/4-18UNS-2B | CE3420-20-1 | 22 to 23.8 |

(f) D/MS3106B_-_S

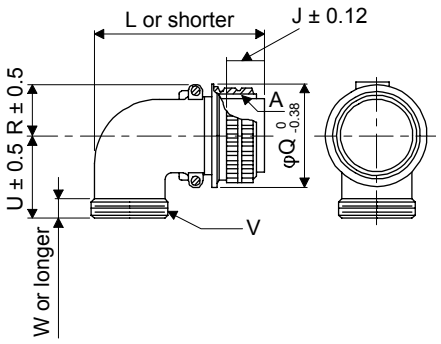
[Unit: mm]




| Model | A | J | L | Q | V | W | Y |
|---|---|---|---|---|---|---|---|
| D/MS3106B18-10S | 1 1/8-18UNEF | 18.26 | 52.37 | 34.13 | 1-20UNEF | 9.53 | 42 |
| D/MS3106B22-22S | 1 3/8-18UNEF | 18.26 | 56.57 | 40.48 | 1 3/16-18UNEF | 9.53 | 50 |
| D/MS3106B32-17S | 2-18UNS | 18.26 | 61.92 | 56.33 | 1 3/4-18UNS | 11.13 | 66 |

(g) D/MS3108B_-_S

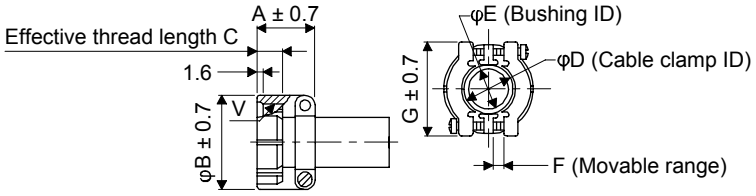
[Unit: mm]




| Model | A | J | L | Q | R | U | V | W |
|---|---|---|---|---|---|---|---|---|
| D/MS3108B18-10S | 1 1/8-18UNEF | 18.26 | 68.27 | 34.13 | 20.5 | 30.2 | 1-20UNEF | 9.53 |
| D/MS3108B22-22S | 1 3/8-18UNEF | 18.26 | 76.98 | 40.48 | 24.1 | 33.3 | 1 3/16-18UNEF-2A | 9.53 |
| D/MS3108B32-17S | 2-18UNS | 18.26 | 95.25 | 56.33 | 32.8 | 44.4 | 1 3/4-18UNS | 11.13 |

(h) D/MS3057-_A

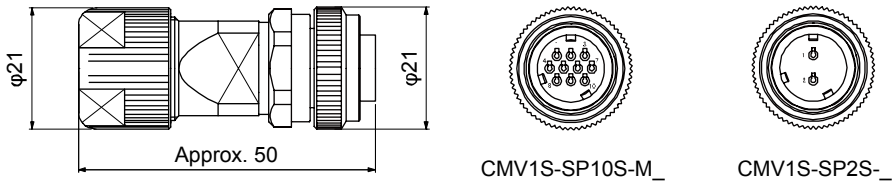
[Unit: mm]




| Model | Shell size | A | B | C | D | E | F | G | V | Bushing |
|---|---|---|---|---|---|---|---|---|---|---|
| D/MS3057-10A | 18 | 23.8 | 30.1 | 10.3 | 15.9 | 14.3 | 3.2 | 31.7 | 1-20UNEF | AN3420-10 |
| D/MS3057-12A | 22 | 23.8 | 35.0 | 10.3 | 19.0 | 15.9 | 4.0 | 37.3 | 1 3/16-18UNEF-2A | AN3420-12 |
| D/MS3057-20A | 32 | 27.8 | 51.6 | 11.9 | 31.7 | 23.8 | 6.3 | 51.6 | 1 3/4-18UNS | AN3420-20 |

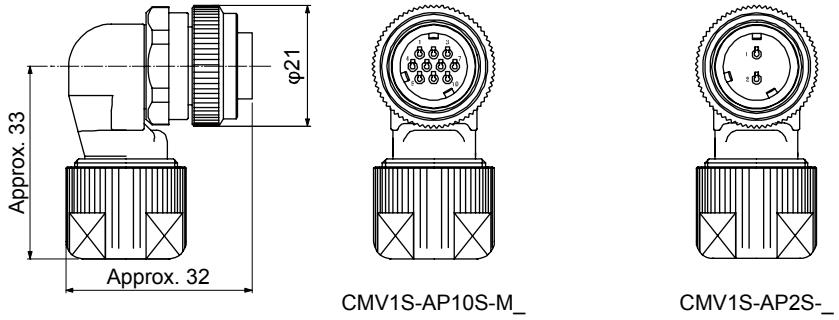
(i) CMV1S-SP10S-M_/CMV1S-SP2S-_
Refer to section 3.3 for details of crimping tools.

[Unit: mm]



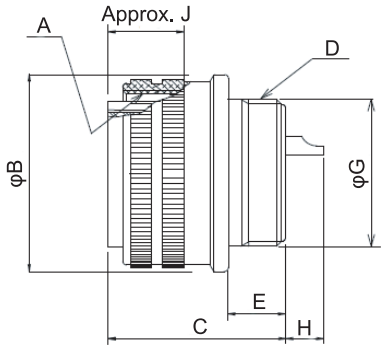
(j) CMV1S-AP10S-M_/CMV1S-AP2S-_
Refer to section 3.3 for details of crimping tools.

[Unit: mm]




(k) CE05-6A32-17SD-D

[Unit: mm]




| Model | A | B | C | D | E | G | H | J |
|---|---|---|---|---|---|---|---|---|
| CE05-6A32-17SD-D | 2-18UNS-2B | 56.33 | 37.0 | 1 7/8-16UN-2A | 13.14 | 45.3 | 9.2 | 19.4 |

REVISION

*The manual number is given on the bottom left of the back cover.

| Print Data | *Manual Number | Revision | |
|---|---|---|---|
| Mar. 2012 | SH(NA)030113-A | First edition | |
| Jun. 2012 | SH(NA)030113-B | 4. Additional instructions<br>(1) Transportation and installation | The part of table is changed. |
| | | Section 2.2 | The sentences are added to CAUTION. |
| | | Section 2.6 (2) | The sentences are added. |
| | | Section 5.1.2 | The sentences of Note are changed. |
| | | Section 6.3.1 | The part of table is changed. |
| | | Section 6.6.1 (2) | The part of table is changed. |
| | | Section 6.6.2 (2) | The part of table is changed. |
| | | Section 7.3.1 | The part of table is changed. |
| | | Section 7.6.1 (2) | The part of table is changed. |
| | | Section 7.6.2 (2) | The part of table is changed. |

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## Warranty

### 1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

### [Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

### [Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
- (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
- (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
- (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
- (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
- (v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
- (vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
- (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
- (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

### 2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

### 3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

### 4. Exclusion of responsibility for compensation against loss of opportunity, secondary loss, etc.

Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

### 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

### 6. Application and use of the Product

(1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.

(2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

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| MODEL | MOTOR INSTRUCTIONMANUAL(3SYU) |
| MODEL CODE | 1CW949 |

**MITSUBISHI ELECTRIC CORPORATION**

HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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Specifications subject to change without notice.