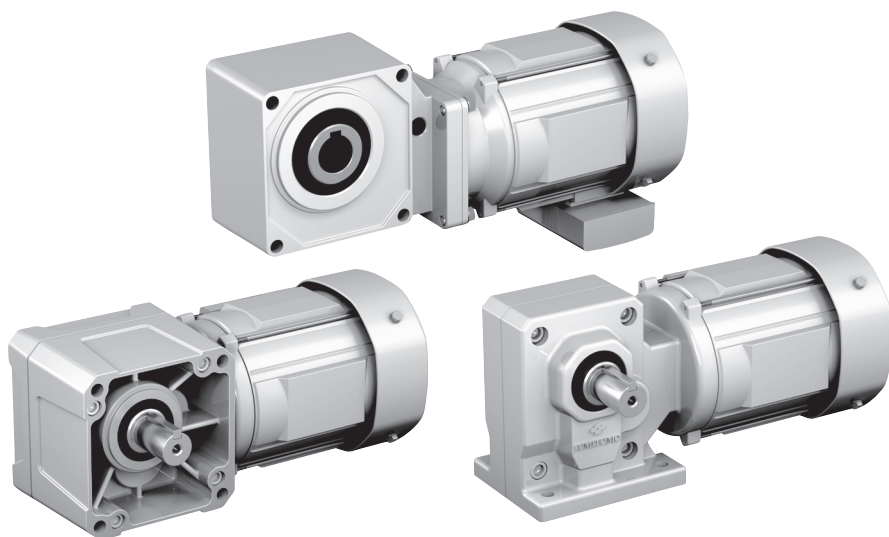


HYPONIC DRIVE®



《CAUTION》

- Gearmotors and reducers should be handled, installed, and maintained by trained technicians. Carefully read the instruction manual before use.
- A copy of this instruction manual should be sent to the actual user.
- This instruction manual should be retained by the user for future reference.

Operation and Maintenance Manual

Safety and Other Precautions


- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.). Thoroughly understand the machine, information about safety, and all precautions for correct operation. Retain this manual for future reference.
- Pay close attention to the “DANGER” and “CAUTION” warnings regarding safety and proper use.



: Improper handling may result in physical damage, serious personal injury and/or death.



: Improper handling may result in physical damage and/or personal injury.



Matters described in  may lead to serious danger depending on the situation. Be sure to observe important matters described herein.

DANGER


- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be performed by trained technicians; otherwise, electric shock, personal injury, fire, or damage to the equipment may result.
- When using the equipment in conjunction with **an explosion proof motor**, a technician with electrical expertise should supervise the transport, installation, plumbing, wiring, operation, maintenance and inspection of the equipment so as to avoid a potentially hazardous situation that may result in electrical shock, fire, explosion, personal injury and/or damage to the equipment.
- When the unit is to be used in a system for human, transport a protective device should be installed to minimize chances of accidents that may result in personal injury, death, or damage to the equipment.
- When the unit is to be used for an elevator, install a protective device on the elevator side to prevent it from falling; otherwise, personal injury, death, or damage to the equipment may result.

How to Refer to the Maintenance Manual

- This maintenance manual is common for Hyponic drives, gearmotors with brake (Brake motors). The symbols shown below appear in the upper right corner of each page to indicate the classification. Read the applicable pages. On **COMMON** pages, these symbols identify distinctions between gearmotors and reducers.

Specifications	Common specifications	Gearmotor	
		Without Brake	With Brake(Brakemotors)
Symbol	COMMON		

————— CONTENTS —————

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1. Inspection Upon Delivery

CAUTION

- Unpack the unit after verifying that it is positioned right side up; otherwise, injury may result.
- Verify that the unit received is in fact the one you ordered. Installing the wrong unit may result in personal injury or equipment damage.
- Do not remove the rating plate.

Verify the items listed below upon receiving the gearmotor. If a nonconformity or problem is found, contact our nearest agent, distributor, or sales office.

- (1) Does the information on the rating plate conform to what you ordered ?
- (2) Was there any part broken during transport ?
- (3) Are all bolts and nuts tightened firmly ?

1-1) How to Refer to the Rating Plate

There are two types of nameplates, Type I and Type II . Some typical plates are shown below; refer to the proper one.

When making an inquiry, advise us of ① the type of gearmotor/spec code, ② reduction ratio, and ③ serial No.

(1) Nameplate Type I : Nameplate indicating for a reducer and a motor together

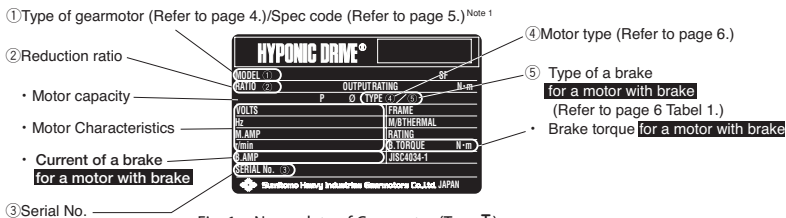


Fig. 1-a Nameplate of Gearmotor (Type I)

(2) Nameplate Type II : Individual nameplate indicating for a reducer and a motor separately

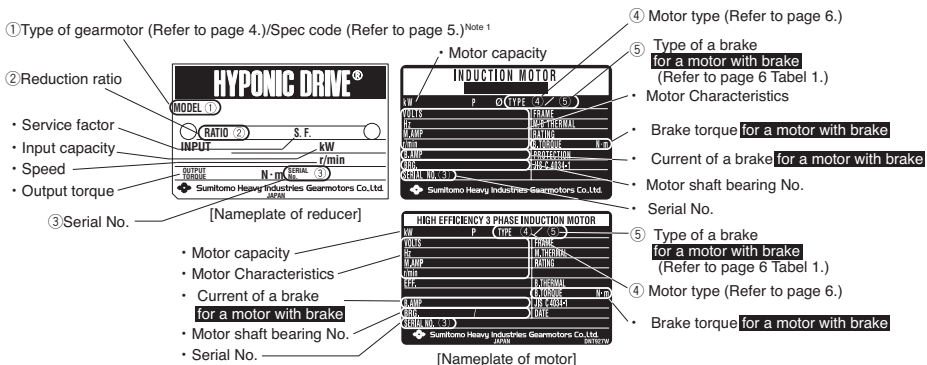


Fig. 1-b Nameplate of Gearmotor (Type II)

Note 1. Spec code is not necessarily indicated.

2. Nameplate of a motor is varied according to type of a motor.

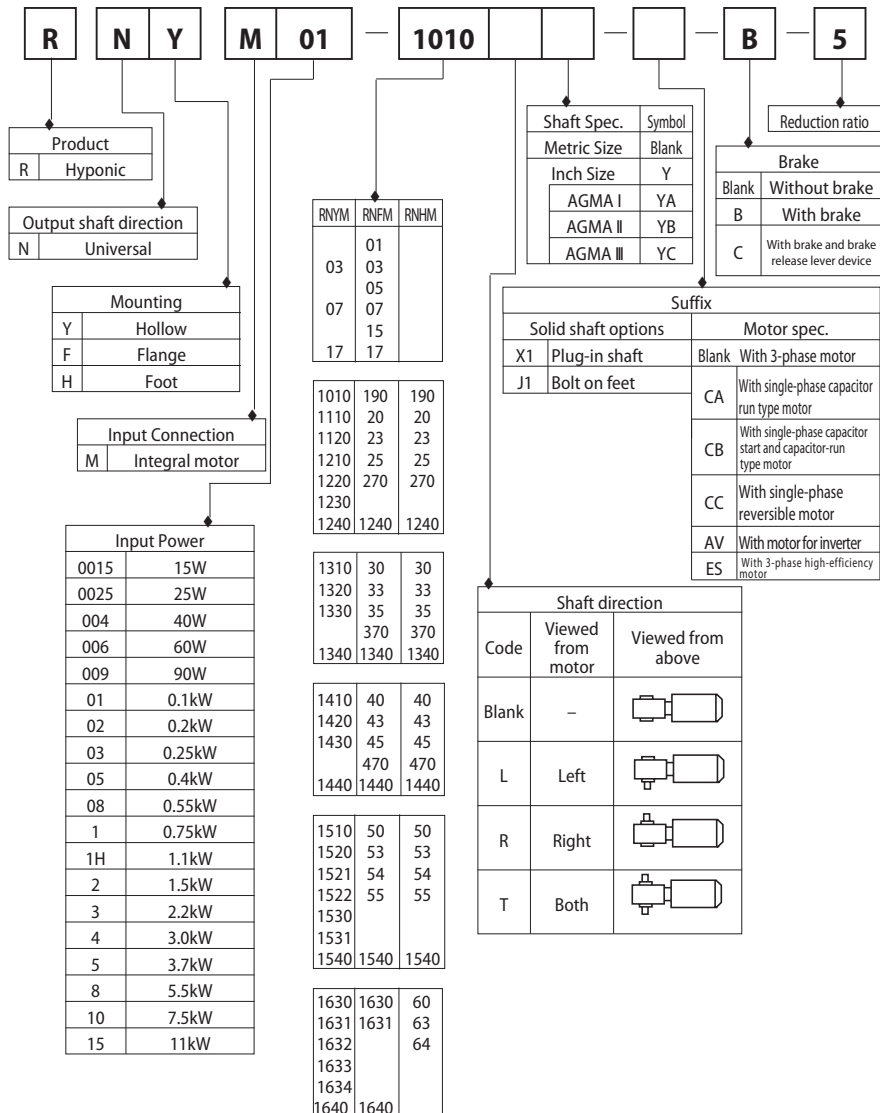
3. Motor meeting overseas standard is manufactured by Sumitomo Heavy Industries, Ltd.

1-2) Lubrication Method COMMON

All models of Hyponic drives, are grease-lubricated. They are grease-packed when shipped from our factory and arrive ready to operate.

1-3) Nomenclature of Gearmotor

Respective codes and Hyponic nomenclature are shown below. Please verify that the type of gearmotor you received conforms to what you ordered.

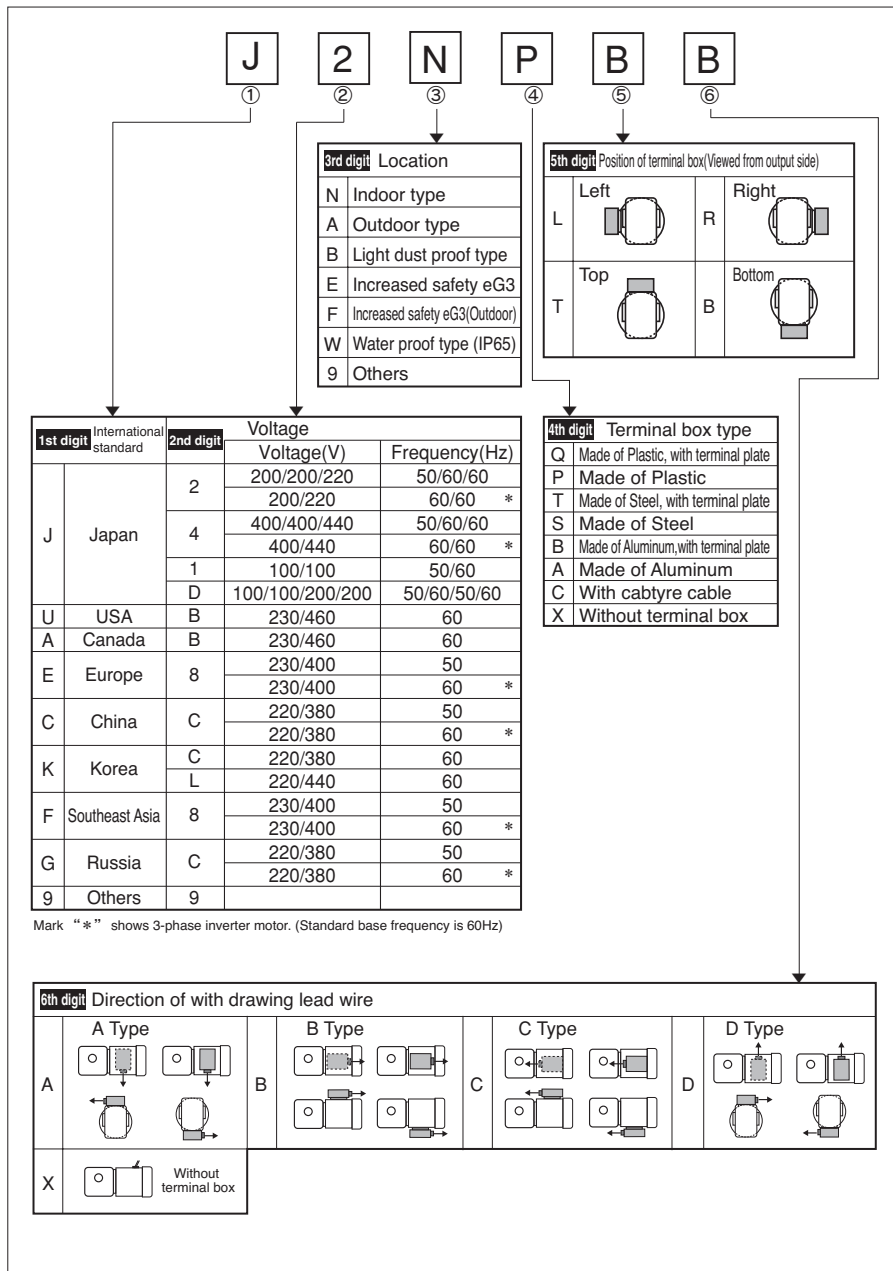




1-4) Spec cord of Gearmotor

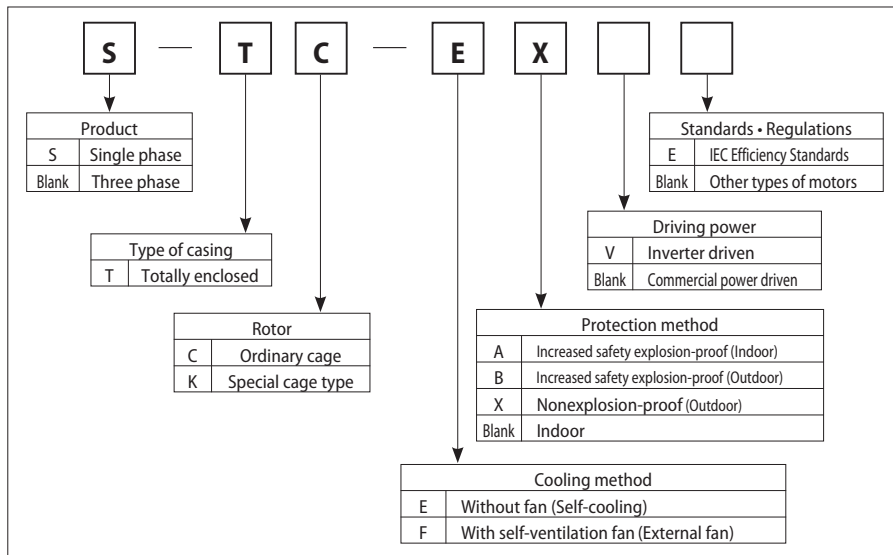
Respective codes and motor nomenclature are shown below. Please verify that the gearmotor type you received conforms to what you ordered.

Notes : Because the spec cord is displayed when the customer directs it, it might not be written in the rating plate and statemen of delivery.



1-5) Type of Motor

Respective codes and motor nomenclature are shown below. Please verify that the gearmotor type you received conforms to what you ordered.



1-6) Brake Type

The types of brake and the relationship between the motor capacity and brake delay time are as follows:

Table 1-1 Brake Type (15W-90W)

Brake type	Frame size	Motor capacity		Brake delay time (sec)	
		3-phase motor	Single-phase motor	Normal braking action	Fast braking action
SB-004	01 03 05 07	15W 25W 40W 60W	15W 25W 40W	0.1-0.2	0.005-0.015
MB-003	17 1240	40W	40W	0.07-0.12	0.03-0.06
MB-005	15 17 1240	60W 90W	60W 90W		

Table 1-2 Brake Type (0.1kW-11kW)

Brake type	Motor capacity				Brake delay time (sec)		
	3-phase motor	3-phase inverter motor	3-phase efficiency motor	Single-phase motor	Normal braking action (Circuit for simultaneous turn-off) 3-phase motor 3-phase high efficiency motor Single-phase motor Single-phase reversible motor	Normal braking action (Circuit for independent turn-off) 3-phase inverter motor	Fast braking action
FB-01A1	0.1kW	-	-	0.1kW	0.15-0.2	-	0.015-0.02
FB-02A1	0.2kW	0.1kW	-	0.2kW		0.08-0.12	
FB-05A1	0.25kW 0.4kW	0.2kW	0.2kW	-	0.1-0.15	0.03-0.07	0.01-0.015
FB-1D	0.55kW 0.75kW	0.4kW	0.4kW	0.4kW	0.2-0.3	0.1-0.15	0.01-0.02
FB-2D	1.1kW 1.5kW	0.75kW	0.75kW	-			
FB-3D	2.2kW	1.5kW	1.1kW 1.5kW	-	0.3-0.4	0.15-0.2	0.025-0.04
FB-5B	3.0kW 3.7kW	2.2kW	2.2kW	-	0.4-0.5	0.2-0.25	
FB-8B	5.5kW	3.7kW	3.0kW 3.7kW	-	0.3-0.4	0.1-0.15	
FB-10B1	7.5kW	5.5kW	5.5kW	-	1.0-1.1	0.4-0.5	
FB-15B1	11kW	7.5kW	7.5kW	-	0.7-0.8	0.2-0.3	

Note: Type of a brake may not be shown in Table 1 according to the specification. Refer to a nameplate in such case.

2. Storage

When storing Hyponic drives for any extended period of time, consider the following important points:

2-1) Storage Location

Store the unit in a clean, dry place indoors.

· Avoid storage outdoors or in places with humidity, dust, sudden temperature changes or corrosive gas.

2-2) Storage Period

- (1) Storage period should be less than 1 year.
- (2) When the storage period exceeds 1 year, special rust prevention is necessary. Contact the factory for details.
- (3) Export models need export rust prevention. Contact the factory for details.

2-3) Use After Storage

- (1) Oil seals will deteriorate when exposed to high temperatures and UV rays. Inspect the oil seals before operation. Replace the oil seals after long-term storage if there is any sign of deterioration.
- (2) After starting the Hyponic drives or reducer, verify that there is no abnormal sound, vibration or heat built-up. If supplied as a brakemotor verify that the brake operates properly. If any anomaly is observed, contact our nearest agent, distributor or sales office.

3. Transport**DANGER**

- Do not stand directly under a unit suspended by a crane or other lifting mechanism; otherwise, injury or death may result.

**CAUTION**

- Exercise ample care so as not to drop the gearmotor or reducer. When a hanging bolt or hole is provided, be sure to use it. After mounting a cyclo unit to the equipment, do not hoist the entire machine using the hanging bolt or hole; otherwise, personal injury or damage to the equipment and/or lifting device may result.
- Before hoisting, refer to the rating plate, crate, outline drawing, catalog, etc. for the weight of the Hyponic drives or reducer. Never hoist a unit that exceeds the rating of the crane or other mechanism being used to lift it; otherwise, personal injury or damage to the equipment and/or lifting device may result.

4. Installation **DANGER**

- Do not use a standard unit in an explosive atmosphere (which is likely to be filled with explosive gas or steam). Under such conditions, an explosion-proof motor should be used; otherwise, electric shock, personal injury, fire, explosion, or damage to the equipment may result.

 **CAUTION**

- Do not use the Hyponic gearmotor for purposes other than those shown on the rating plate or in the manufacturing specifications; otherwise, electric shock, personal injury, or damage to the equipment may result.
- Do not place flammable objects around the gearmotor; otherwise, fire may result.
- Do not place any object around the gearmotor; that will hinder ventilation; otherwise, excessive heat may build-up and cause burns or even fire.
- Do not step on or hang from the gearmotor; otherwise injury may result.
- Do not touch the shaft end of the gearmotor, inside keyways, or the edge of the motor cooling fan with bare hands; otherwise, injury may result.
- When the unit is used in food processing applications vulnerable to oil contamination, install an oil pan or other such device to cope with oil leakage due to failure or breakdown; otherwise, oil leakage may damage products.

4-1) Installation Location

Ambient temperature:	-10°C to +40°C
Ambient humidity:	85% max.
Altitude:	1000 m max.
Ambient atmosphere:	There should be no corrosive gas, explosive gas, or steam. The location should be well ventilated without dust.
Installation location:	Indoors, with minimal dust and no water contact.

Water proof/Dust proof type

Note) IP65 is not available for underwater or high water pressured condition.

IP65: The IP indication that represents dust-proofing and water-proofing grades is prescribed by IEC529 and IEC34-5. "6" of IP65 represents a "perfect dust-proofing structure" that is the highest-grade protection from contact or entry of solids, while "5" represents protection from water, ensuring protection from water jets in all directions.

The motor has a structure that permits motor operation without any trouble even if it is exposed to water jets in all directions from a nozzle.

Test conditions: A nozzle of 6.3 mm in I.D. is placed at a distance of 3 m from the test piece and water jetted out of the nozzle under pressure of 30 kPa at the flow rate of 12.5 l/min is directed at the test piece in all directions for three minutes. After that, there should be no abnormality. The motor cannot be used underwater or in places exposed to high-pressure water jets.

- Units made to special specifications are necessary for installation under conditions other than the above.
- Units made according to the outdoor, explosion-proof or other specifications can be used under the specified conditions without any problem.
- Install units where inspection, maintenance, and other such operations can be easily carried out.
- Install units on a sufficiently rigid base.

4-2) Installation Angle

There is no restriction on the installation angle.

(For outdoor type gearmotors, standard installation angle is horizontal in the axial direction. Contact us for other axial directions.)

4-3) Flange mounting (RNFM series), Foot mounting (RNHM series)

Use bolt shown under Table 2. and refer to 5. coupling with other machines. (P14-18)

Table 2 Bolt Size

Series	Frame Size	Size of bolt
RNFM	01#, 03#	Hexagon socket head bolt M5
	05#, 07#, 15#, 17#, 190#	Hexagon socket head bolt M6
	20#, 23#, 25#, 270#, 1240#	Hexagon socket head bolt M8
	30#, 33#, 35#, 370#, 1340#	Hexagon socket head bolt M10
	40#, 43#, 45#, 470#	Hexagon socket head bolt M10
	50#, 53#, 54#, 55#, 56#, 1440#	Hexagon socket head bolt M12
	1540#	Hexagon socket head bolt M16
	1630#, 1631#, 1640#	Hexagon socket head bolt M20
RNHM	20#, 23#, 25#, 190#, 270#	Bolt M8
	30#, 33#, 35#, 370#, 1340#	Bolt M10
	40#, 43#, 45#, 470#, 1440#	Bolt M12
	50#, 53#, 54#, 55#, 1540#	Bolt M16
	60#, 63#, 64#	Bolt M20

4-4) Hollow shaft (RNYM series)

There are (1) Torque arm mounting and (2) Flange and On-bed mounting for Hollow shaft.

(1) Torque arm mounting

(a-1) How to set the shaft (03#, 07#, 17#, 1010#)

Apply molybdenum disulfide grease to the surface of a driven shaft and the inner surface of a hollow shaft. Then insert the Drive into the driven shaft.

If the fitting is too tight, lightly knock the end face of a hollow output shaft with a wooden hammer for smooth insertion. Do avoid knocking the casing. We recommend making a jig shown Fig 2. Using this jig, you can insert the Drive smoothly.

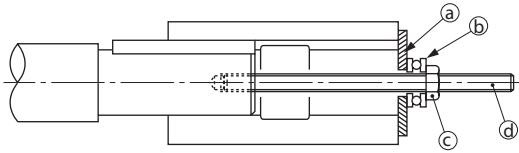


Fig.2 Jig

- (a)Spacer
- (b)Thrust Bearing
- (c)Nut
- (d)Bolt

The hollow shaft is made according to the tolerances of JIS H8. If you experience impact or notice a large radial load with the hollow shaft, further tighten the fitting between the hollow shaft and the driven shaft. (We recommend JIS js6 or k6 as the tolerance of a driven shaft.)

(b-1) Method to secure the reducer hollow bore on Customer's shaft (customer equipment side). (Fig.3-5)
(03#, 07#, 17#, 1010#)

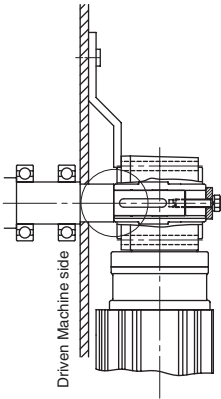


Fig.3 Fixed by spacer and plate

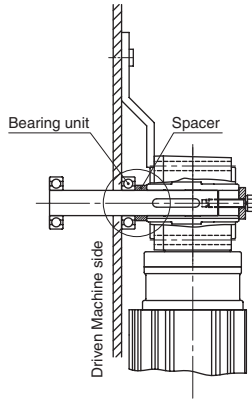


Fig.4 Fixed by end plate

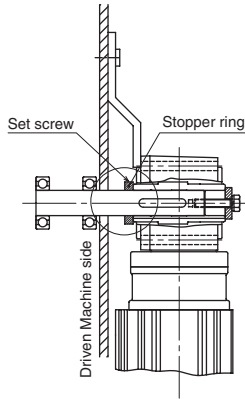


Fig.5 Fixed by set screw and stopper ring

Method to secure the reducer hollow bore on Customer's shaft (away from customer equipment). (Fig.6-7)

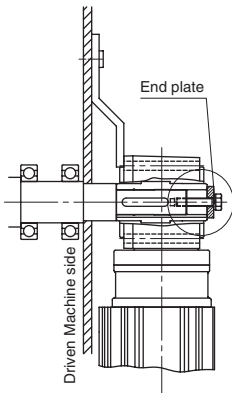


Fig.6 Fixed by spacer

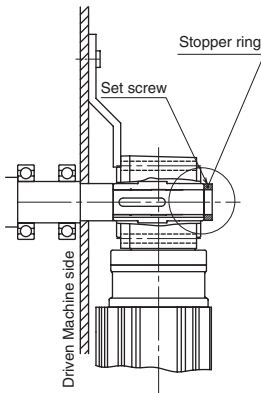


Fig.7 Fixed by set screw

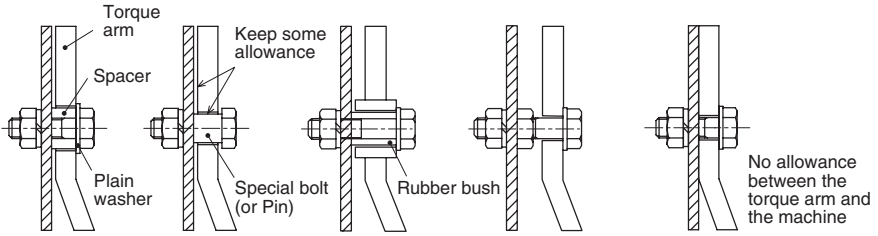
(c-1) How to set a torque arm (03#, 07#, 17#, 1010#)

Mount a torque arm on the driven machine side of the Drive casing. Use hexagon socket head bolts for mounting. (See Table 3 for bolt sizes.)

Torque arm anti-rotation stopper should be designed so as to allow movement of the torque arm to make sure that the contact surface between the Drive and shaft are free from excess force.

Don't fix the torque arm by anti-rotation bolts.

For such applications as requiring frequent start and stop or frequent reversing of the rotating direction, insert a rubber bushing between the torque arm and securing bolt (or spacer) in order to relax impact load.



(Adjust the allowance according to the movement of the machine.)

(Excessive force on the whirl stop bolt machine, and Hyponic may cause damage.)

Good example

Bad example

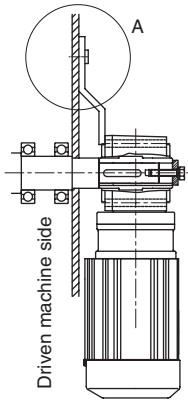


Fig.8 A-part securing methods

Table 3 Size of hexagon socket head bolt

Frame size	Bolt
03#	M5
07#, 17#, 1010#	M6

(d-1) How to remove the shaft (03#, 07#, 17#, 1010#)

Make sure that excess force does not act on Drive and shaft.

(a-2) How to set the shaft (1110#-1640#)

Apply molybdenum disulfide grease to the surface of a driven shaft and the inner surface of a hollow shaft. Then insert the Drive into the driven shaft.

If the fitting is too tight, lightly knock the end face of a hollow output shaft with a wooden hammer for smooth insertion. Do avoid knocking the casing. We recommend making a jig shown Fig 9. Using this jig, you can insert the Drive smoothly.

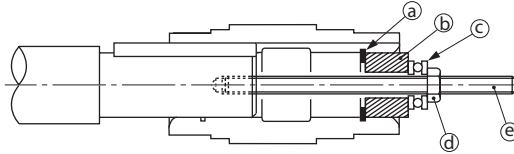


Fig.9 Jig

- (a).....plate
- (b).....Spacer
- (c).....Thrust Bearing
- (d).....Nut
- (e).....Bolt

The hollow shaft is made according to the tolerances of JIS H8. If you experience impact or notice a large radial load with the hollow shaft, further tighten the fitting between the hollow shaft and the driven shaft, (We recommend JIS js6 or k6 as the tolerance of a driven shaft.)

(b-2) Method to secure the reducer hollow bore on Customer's shaft (customer equipment side). (Fig.10-12) (1110#-1640#)

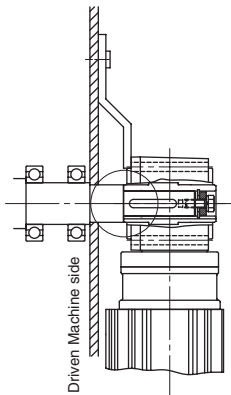


Fig.10 Fixed by spacer and plate

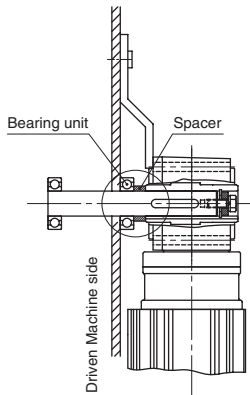


Fig.11 Fixed by end plate

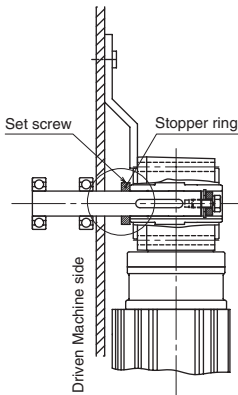


Fig.12 Fixed by set screw and stopper ring

Method to secure the reducer hollow bore on Customer's shaft (customer equipment side). (Fig.13–15)

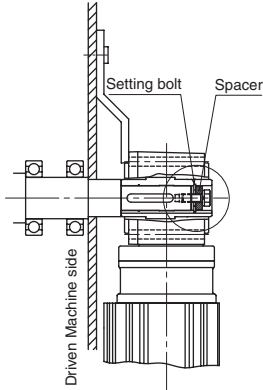


Fig.13 Fixed by stopping shaft

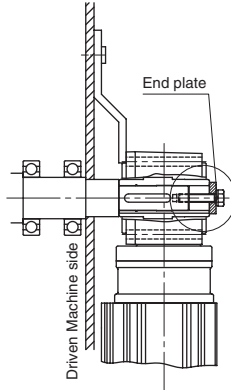


Fig.14 Fixed by spacer

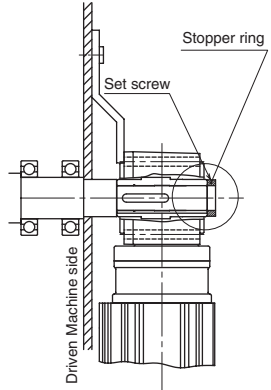


Fig.15 Fixed by set screw

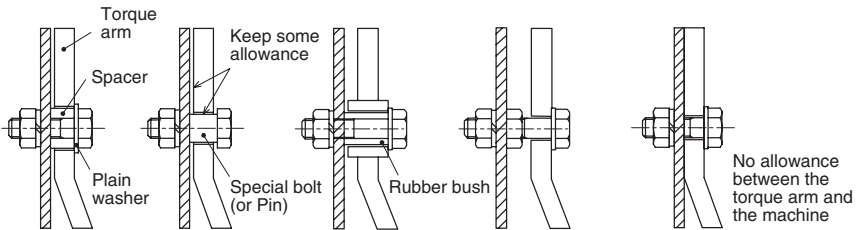
(c-2) How to set a torque arm (1110#-1640#)

Mount a torque arm on the driven machine side of the Drive casing. Use hexagon socket head bolts for mounting. (See Table 4 for bolt sizes.)

Torque arm anti-rotation stopper should be designed so as to allow movement of the torque arm to make sure that the contact surface between the Drive and shaft are free from excess force.

Don't fix the torque arm by anti-rotation bolts.

For such applications as requiring frequent start and stop or frequent reversing of the rotating direction, insert a rubber bushing between the torque arm and securing bolt (or spacer) in order to relax impact load.



(Adjust the allowance according to the movement of the machine.)

(Excessive force on the whirl stop bolt, machine, and Hyponic may cause damage.)

Good example

Bad example

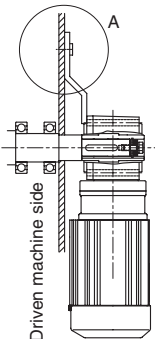


Fig.16 A-part securing methods

Table 4 Size of hexagon socket head bolt

Frame size	Bolt
1110#, 1120#	M6
1210#, 1220#, 1230#, 1240#	M8
1310#, 1320#, 1330#, 1340#, 1410#, 1510#	M10
1420#, 1430#, 1440#, 1520#, 1521#, 1522#, 1634#	M12
1530#, 1531#, 1540#	M16
1630#, 1631#, 1632#, 1633#, 1640#	M20

(d-2) How to remove the shaft (1110#-1640#)

Make sure that excess force does not act on the Drive and shaft. Using a jig as shown in Fig. 17 will facilitate removal of the shaft.

Parts for setting, securing or removing the shaft should be prepared by the user.

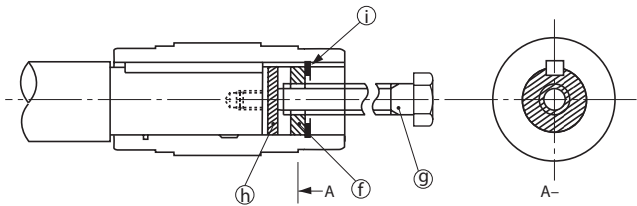
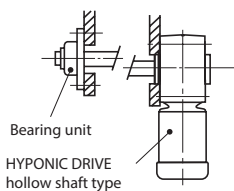


Fig.17 Removing Jig

- (f)Spacer
- (g)Bolt
- (h)Plate
- (i)Shaft retaining c-ring

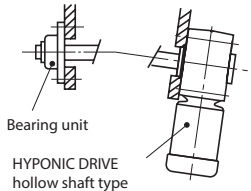
(2) Flange and On-bed mounting (Standard)

When installing the Drive, pay attention to the alignment between the Drive and shaft to be driven so that the Drive is free from excess force.



(The concentricity between the shaft and spigot joint is out of allowable range.)

Bad example



(The shaft centerline is not positioned at right angles to the flange.)

Bad example

Fig.18 Flange coupling

5. Coupling with Other Machines**CAUTION**

- Confirm the rotation direction before coupling the unit with the driven machine. Incorrect rotation direction may cause personal injury or damage to the equipment.
- When operating the gearmotor alone (uncoupled), remove the key that is temporarily attached to the output shaft; otherwise, personal injury may result.
- Cover the rotating parts; otherwise, personal injury may result.
- When coupling the gearmotor with a load, check that the centering, the belt tension and parallelism of the pulleys are within the specified limits. When the unit is directly coupled with another machine, check that the direct coupling accuracy is within the specified limits. When a belt is used for coupling the unit with another machine, check the belt tension. Correctly tighten bolts on the pulley and coupling before operation; otherwise, personal injury may result because of misalignment.

5-1) Confirming Rotation Direction

Figure 19-21 shows the rotation direction of the output shaft when wires are connected as shown in Fig. 28-32 on page24-34.

Fig.19 Rotation direction of slow speed shaft (RNYM Series)

Frame size	Reduction ratio	
03#,07#	5, 80, 100, 120, 160, 200, 240	7.5, 10, 12, 15, 20, 25, 30, 40, 50, 60
17#	5, 7.5, 10, 12, 80, 100, 120, 150, 200, 240	15, 20, 25, 30, 40, 50, 60
1010#,1110#,1210# 1310#,1410#,1510#	—	5,7,10
1120#,1220#,1320# 1420#,1520#	5, 7, 10, 12, 15, 20, 25, 30, 40, 50, 60	—
1521#	5, 7, 10, 12, 15, 20, 25	—
1522#	5, 7, 10, 12, 15	—
1230#,1330# 1430#,1530#	—	80, 100, 120, 150, 200, 240
1531#	—	40, 50, 60, 80
1630#	—	80, 100, 120
1631#	—	150, 200, 240
1632#	30	40, 50
1633#	20, 25	30, 40
1634#	5, 7, 10, 12, 15	20, 25
1240#,1340#,1440# 1540#,1640#	300, 360, 480, 600, 720, 900, 1200, 1440	—
Rotation direction		

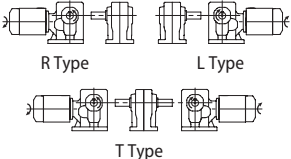
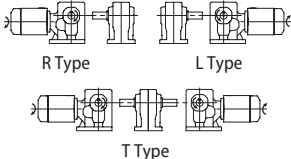
- Change over the SW shown in Fig.29, 32 to reverse the rotation of **15-90W Single-phase motor, Single-phase reversible motor**
- Change the positions of R and T shown in Fig.28, 30 to reverse the rotation of **3-phase motor, 3-phase high efficiency motor**

Fig.20 Rotation direction of slow speed shaft (RNFM Series)

Frame size	Reduction ratio	
01#,03#,05#,07#	5, 80, 100, 120, 160, 200, 240	7.5, 10, 12, 15, 20, 25, 30, 40, 50, 60
15#,17#	5, 7.5, 10, 12, 80, 100, 120, 150, 200, 240	15, 20, 25, 30, 40, 50, 60
190#	5	7.5, 10, 15, 20, 30, 40, 50, 60
20#	10, 15, 20, 25, 30, 40, 50, 60	80, 100, 120
23#	10, 15, 20, 25, 30	40, 50, 60
25#	—	150, 200, 240
270#	5, 7.5, 10, 15, 20	30
30#	—	80, 100, 120
33#	10, 15, 20, 25, 30	40, 50, 60
35#	—	150, 200, 240
370#	5, 7.5, 10, 15, 20	30
40#	—	80, 100, 120
43#	10, 15, 20, 25, 30	40, 50, 60
45#	—	150, 200, 240
470#	5, 7.5, 10, 15, 20	30
50#	—	80, 100, 120
53#, 54#	10, 15, 20, 30	40, 50, 60, 80
55#	—	150, 200, 240
1630#	—	80, 100, 120
1631#	—	150, 200, 240
1240#,1340#,1440# 1540#,1640#	300, 360, 480, 600, 720, 900, 1200, 1440	—
Rotation direction		

- Change over the SW shown in Fig.29, 32 to reverse the rotation of **15-90W Single-phase motor, Single-phase reversible motor.**
- Change the positions of R and T shown in Fig.28, 30 to reverse the rotation of **3-phase motor, 3-phase high efficiency motor.**

Fig.21 Rotation direction of slow speed shaft (RNHM Series)

Frame size	Reduction ratio	
190#	7.5, 10, 15, 20, 30, 40, 50, 60	5
20#	10, 15, 20, 25, 30, 40, 50, 60	80, 100, 120
23#	10, 15, 20, 25, 30	40, 50, 60
25#	—	150, 200, 240
270#	5, 7.5, 10, 15, 20	30
30#	—	80, 100, 120
33#	10, 15, 20, 25, 30	40, 50, 60
35#	—	150, 200, 240
370#	5, 7.5, 10, 15, 20	30
40#	—	80, 100, 120
43#	10, 12, 15, 20, 25, 30	40, 50, 60
45#	—	150, 200, 240
470#	5, 7.5, 10, 15, 20	30
50#	—	80, 100, 120
53#,54#	10, 15, 20, 30	40, 50, 60, 80
55#	—	150, 200, 240
60#	—	80, 100, 120
63#	10, 15, 20, 30	40, 50
64#	10, 15, 20	30, 40
1340#,1440#,1540#	—	300, 360, 480, 600, 720, 900, 1200, 1440
Rotation direction	 <p>R Type L Type</p> <p>T Type</p>	 <p>R Type L Type</p> <p>T Type</p>

- Change over the SW shown in Fig.29, 32 to reverse the rotation of **15-90W Single-phase motor, Single-phase reversible motor.**
- Change the positions of R and T shown in Fig.28, 30 to reverse the rotation of **3-phase motor, 3-phase high efficiency motor.**

5-2) Coupling Installation

- When installing a coupling, do not impact or apply excessive thrust load to the shaft; otherwise, the bearing may be damaged.
- Thermal shrinking or end cap screws are recommended for mounting (Fig.22).

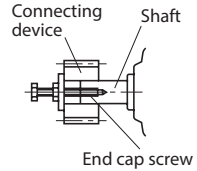


Fig.22

(1) When using a Coupling

The accuracy of the dimensions (A,B,and X) shown in Fig.23 should be within the tolerance shown in Table 5.

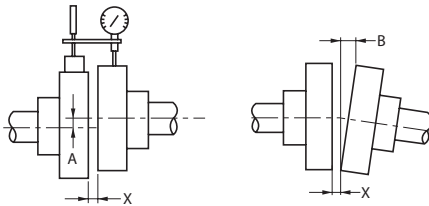


Fig.23

Table 5 Centering accuracy of flexible coupling

A Dimension Tolerance	0.1mm or manufacturer's specification
B Dimension Tolerance	0.1mm or manufacturer's specification
X dimension	manufacturer's specification

(2) When using a Chain Sprocket and Gear

- The chain tension angle should be perpendicular to the shaft.
- Refer to the chain catalog for the chain tension.
- Select sprockets and gears whose pitch diameter are three times the shaft diameter or greater.
- Install sprocket and gears so that their point of load application will be closer to the gearmotor side with respect to the length of the shaft. (Fig.24)

(3) When using a V-belt

- Excessive V-belt tension will damage the shaft and bearing. Refer to the V-belt catalog for proper tension.
- The parallelism and eccentricity (β) between two pulleys should be within $20'$. (Fig25)
- Use a matched set with the same circumferential length when more than one belt is to be installed.

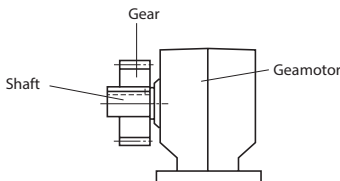


Fig.24

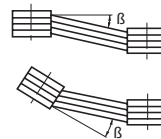


Fig.25

6. Wiring

- Wiring for **SUMITOMO standard motor** is shown below. Refer to the respective instruction manual when using another manufacturer,s motor.

**DANGER**

- Do not handle the unit when cables are live. Be sure to turn off the power; otherwise, electric shock may result.
- Connect a power cable to the unit according to the connection diagram shown inside the terminal box or in the maintenance manual; otherwise, electric shock or fire may result.
- Do not forcibly curve, pull, or clamp the power cable and lead wires; otherwise, electric shock or fire may result.
- Correctly ground the grounding bolt; otherwise, electric shock may result.
- The lead-in condition of an **explosion-proof type motor** shall conform to the facility's electrical codes extension regulations, and explosion-proofing guide, as well as the maintenance manual; otherwise, explosion, electric shock, personal injury, fire or damage to the equipment may result.
- Do not wet by water for electrical parts like cable connector, rectifier or capacitor, even for **water-proof type**

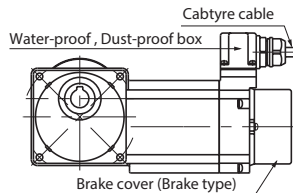
⚠ CAUTION

- When wiring, follow the facility's electrical codes and extension regulations; otherwise, burning, electric shock, injury, or fire may result.
- The motor is not equipped with a protective device. However, it is compulsory to install an overload protector according to facility electrical codes. It is recommended to install other protective devices (earth leakage breaker, etc.), in addition to an overload protector, in order to prevent burning, electric shock, personal injury, and fire.
- Connecting method is shown below. Insulates the connecting point using insulating tape.



- Never touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- When measuring the insulation resistance of an **explosion-proof type motor**, confirm that there is no gas, steam, or other explosive substance in the vicinity, in order to prevent possible explosion or ignition.
- When using a **400V-class inverter** to drive the motor, mount a suppresser filter or reactor on the inverter side, or provide reinforced insulation on the motor side; otherwise, dielectric breakdown may cause fire or damage to the equipment.
- For **brakemotors**, install a rectifier in a place where the temperature is 60°C or below; if the ambient temperature exceeds 60°C, be sure to use a cover for protection.
- For **single-phase motors**, exercise care so as not to mistake the starting capacitor for the operation capacitor. The starting capacitor if will be broken used for operation.
- For **single-phase motors**, exercise care so as not to damage the vinyl cover of the starting capacitor, otherwise electric shock may result.
- Do not open water-proof dust-proof box for **water-proof type**, other wise electrical shock, fire or damage to the equipment, may result.

Fig.26



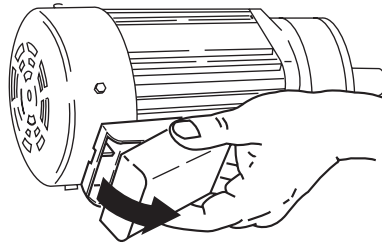
- For **brake motors**, do not electrify a brake coil continuously when a motor is stopping; otherwise, a brake coil may burn and fire may result.

- Long cables cause voltage to drop. Select cables with appropriate diameter so that the voltage drop will be less than 2%.
- **After wiring outdoor and explosion-proof type motors**, check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.

6-1) Attaching/Detaching The Terminal Box Cover

(1) Detaching

As shown in Fig. 27, hold both sides of the terminal box and pull it towards you. The cover will detach.



(2) Attaching

Fig.27

Press the terminal box cover to the terminal box case until it snaps into place.

6-2) Measuring Insulation Resistance

- When measuring the insulation resistance, disconnect the motor from the control panel. Check the motor separately.

Measure the insulation resistance before wiring. The insulation resistance (R) varies according to the motor output, voltage, type of insulation, coil temperature, humidity, dirt, period of operation, test electrification time, etc. Usually, the insulation resistance exceeds the values shown in Table 6.

Table 6 Insulation resistance

Megohmmeter voltage	Insulation resistance (R)
500V	1M(Ω) or more

Reference: The following equations are shown in JEC-2100.

$$R (> \text{ or } =) = \frac{\text{Rated voltage (V)}}{\text{Rated output (kW)} + 1000} \quad (\text{M}\Omega)$$

$$R (> \text{ or } =) = \frac{\text{Rated voltage (V)} + \text{Speed (rpm)} / 3}{\text{Rated output (kW)} + 2000} + 0.5 \quad (\text{M}\Omega)$$

A drop in insulation resistance may be attributed to poor insulation. In that case, do not turn on the power. Contact our nearest agent, distributor, or sales office.

6-3) Protection Coordination

- (1) Use a molded case circuit breaker for protection against short circuit.
- (2) Use an overload protection device that protects the unit against asurge of electric current exceeding that shown on the rating plate.
- (3) For an **explosion-proof type motor**, use an overload protector that can protect the unit within the allowable binding hour by means of the locked rotor current shown on the rating plate.

6-4) Single-phase motor, Single-phase reversible motor Capacitor Specification

Table 7 15-90W Single-phase motor Capacitor Specification

Motor voltage	Capacitor voltage resistance	Motor type	Motor capacity (W)	Frame size	Capacitor capacity (μ F)
100V	220V	Induction	15	01#, 03#	5
			25	01#, 03#	7
			40	05#, 07#	12
			40	17#, 1240#	14
			60	17#, 1240#	18
			90	15#, 17#, 1240#	25
		Reversible	15	01#, 03#	6
			25	01#, 03#	10
			40	05#, 07#	14
			40	17#, 1240#	16
			60	17#, 1240#	22
			90	15#, 17#, 1240#	32
200V	440V	Induction	40	17#, 1240#	3.5
			60	17#, 1240#	4.5
			90	15#, 17#, 1240#	6.5
		Reversible	40	17#, 1240#	4
			60	17#, 1240#	5.5
			90	15#, 17#, 1240#	8

Table 8 0.1-0.4kW Capacitor start and run type Single phase motor Capacitor Specification

Motor voltage	Motor capacity (W)	For starting		For operation	
		Capacitor capacity (μ F)	Capacitor voltage resistance (V)	Capacitor capacity (μ F)	Capacitor voltage resistance (V)
100V/200V	0.1	60	125	10	230
	0.2	100	125	30	230
	0.4	200	125	40	230



6-5) Motor (without brake) Connection

Fig.28 shows the 3-phase motor, 3-phase high efficiency motor, 3-phase inverter motor (without brake) connection and the standard specifications for terminal codes.

Fig.28-a In a case of three lead wires

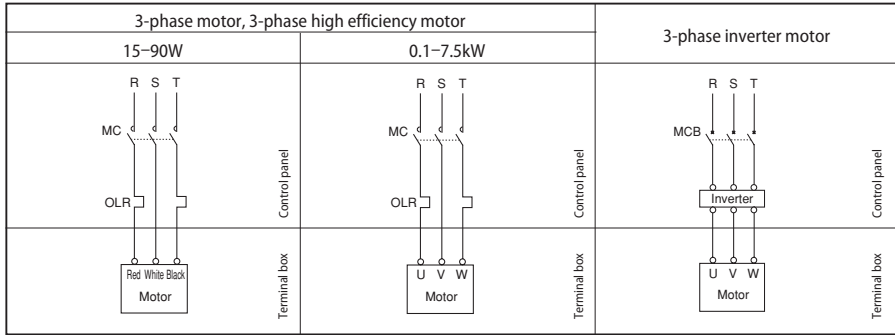
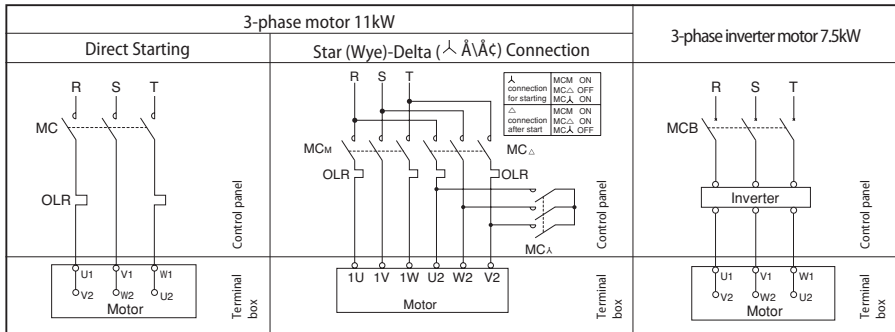


Fig.28-b In a case of six lead wires



MC: Electromagnetic contactor
 OLR: Overload relay or thermal relay
 VR: Varistor (protector element)

} These should be furnished by the customer.

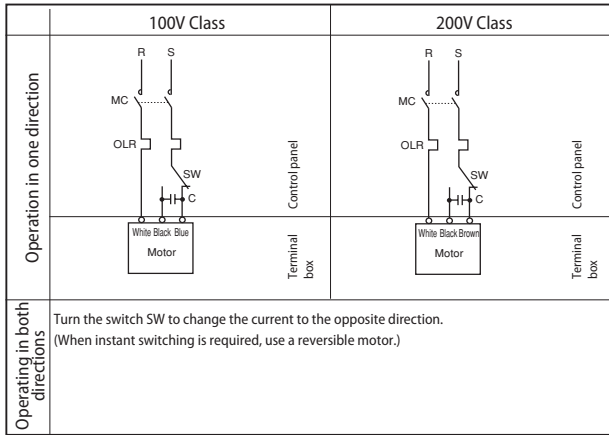
- This drawing shows for a motor based on standard specification for Japanese market.
 Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.

6. Wiring



Fig.29 shows the **Single-phase motor, Single-phase reversible motor (without brake)** connection and the standard specifications.

Fig.29-a In a case of capacitor run type 15W-90W



MC: Electromagnetic contactor
 OLR: Overload relay or thermal relay
 SW: Rotation shifting switch

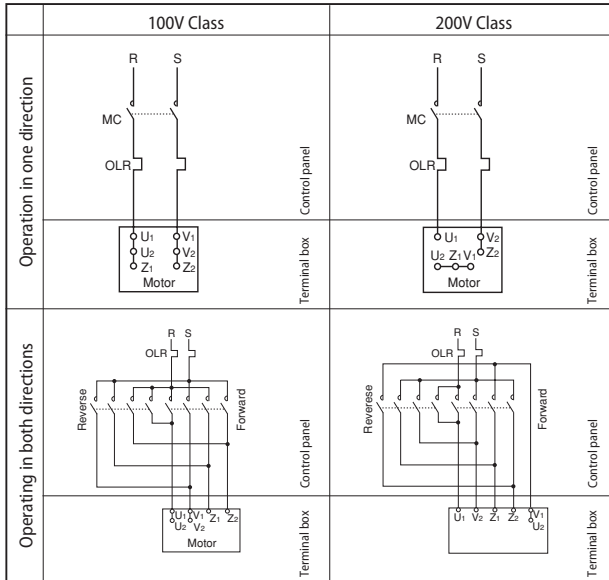
These should be furnished by the customer.

C: Capacitor — Accessory

- For **15W-90W capacitor run type**, connect the accessory capacitor. (See Table 7 on page 23 for the capacitor.)
- Do not open water-proof dust-proof box for **water-proof type**, otherwise electrical shock, fire or damage to the equipment may result.
- A capacitor is not water-proofed for **water-proof type**.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.



Fig.29-b In a case of capacitor start and capacitor-run type 0.1kW-0.4kW



MC: Electromagnetic contactor
 OLR: Overload relay or thermal relay
 Rotation shifting switch

These should be furnished by the customer.

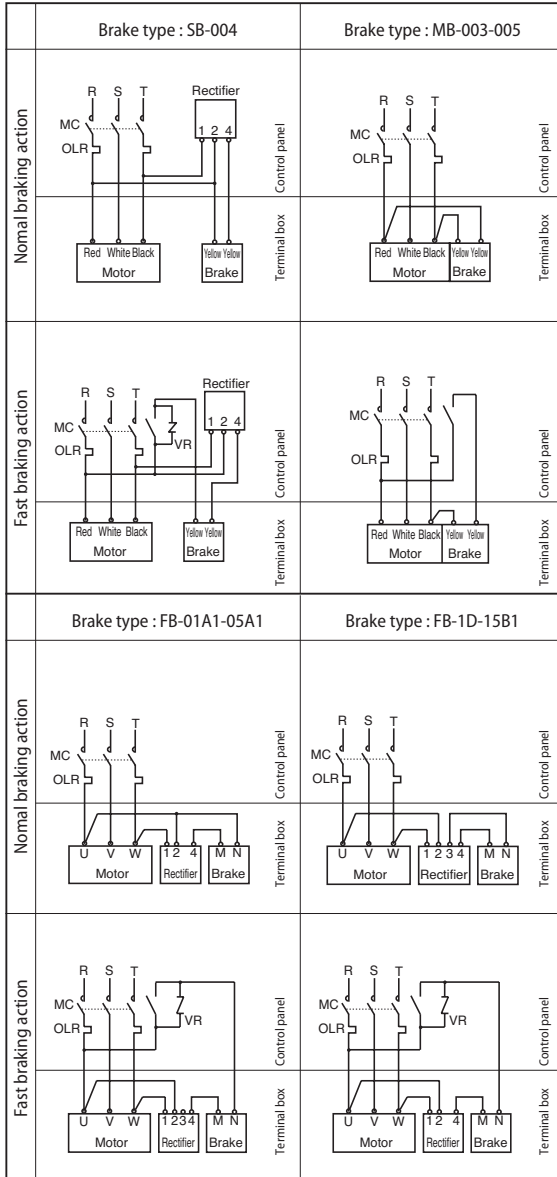
- Connection to Z1 and Z2 shall be exchanged with each other when reverse rotation is necessary if the motor is provided only for rotation in one direction.
- A capacitor is built in the terminal box of capacitor start and capacitor-run type 0.1kW-0.4kW.
- Do not open water-proof dust-proof box for **water-proof type**, otherwise electrical shock, fire or damage to the equipment may result.
- A capacitor is not water-proofed for **water-proof type**.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.



6-6) Motor with brake Connection

Fig.30 shows the 3-phase motor, 3-phase high efficiency motor with brake connection and the standard specifications for terminal codes.

Fig.30-a For operating in one directions (In a case of three lead wires)



Note 1: A rectifier is supplied separately for SB-004.
 Note 2: A rectifier is built in the brake of motors for MB-003-MB005. (A rectifier is supplied separately for water-proof type.)
 Note 3: Do not open water-proof dust-proof box for water-proof type , otherwise electrical shock, fire or damage to the equipment may result.
 Note 4: A rectifier is not water-proofed for water-proof type .

MC : Electromagnetic contactor
 OLR : Overload relay or thermal relay
 VR : Varistor (Protector element)

These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC200V-230V	AC380V-460V
Rated voltage of varistor	AC260V-300V	AC510V
Voltage of varistor	430V-470V	820V
Rated power of varistor	SB-004, FB-01A1, 02A1, 05A1	0.25Watt or more 0.4Watt or more
	FB-1D	0.4Watt or more 0.6Watt or more
	FB-2D, 3D, 5B, 8B	0.6Watt or more 1.0Watt or more
	FB-10B1, 15B1	1.0Watt or more 1.0Watt or more

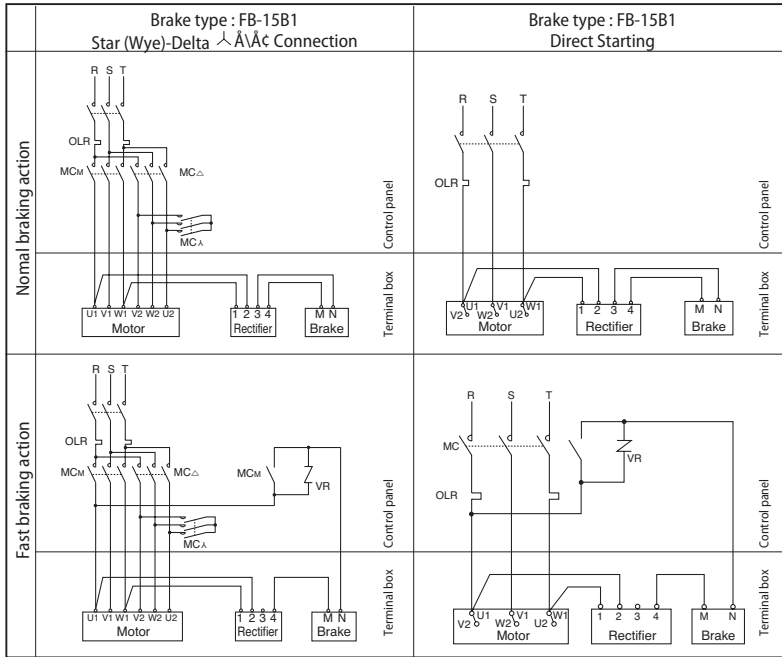
Varistor is optionally available at Sumitomo.

- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

- Refer to page 6 table 1-1, 1-2 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.



Fig.30-b For operating in one directions (In a case of six lead wires)



- Refer to page 6 table 1-2 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.

MC : Electromagnetic contactor
 OLR : Overload relay or thermal relay
 VR : Varistor (Protector element)

} These should be furnished by the customer.

Varistor (VR) Capacity

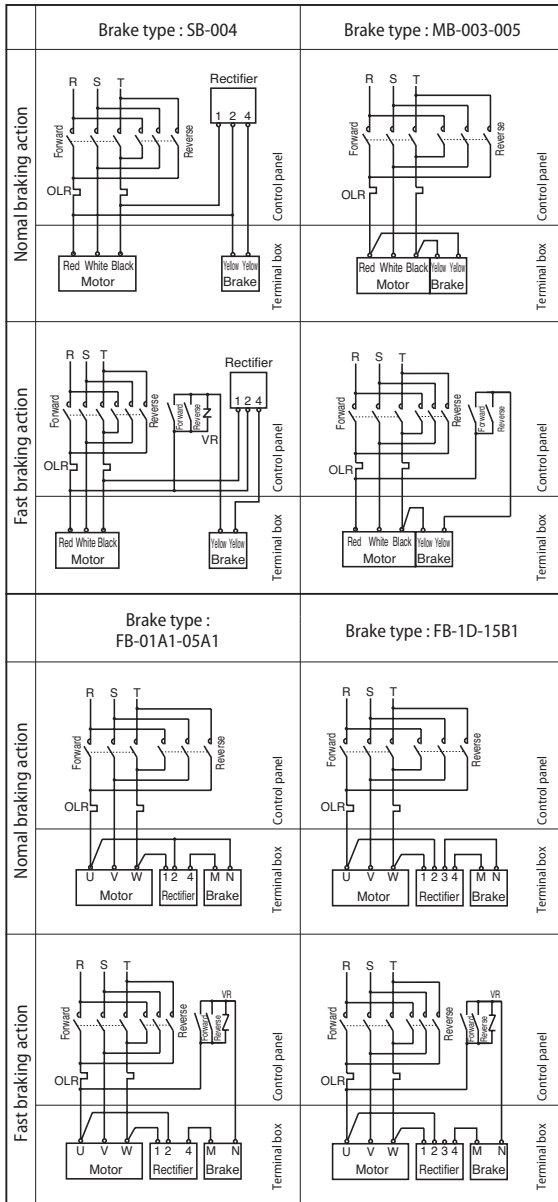
Input power	AC200V-230V	AC380V-460V
Rated voltage of varistor	AC260V-300V	AC510V
Voltage of varistor	430V-470V	820V
Rated power of varistor	FB-15B1 1.0Watt or more	1.0Watt or more

Varistor is optionally available at Sumitomo.

- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.



Fig.30-c For operating in both directions (In a case of three lead wires)



Note 1: A rectifier is supplied separately for SB-004.
 Note 2: A rectifier is built in the brake of motors for MB-003-MB005. (A rectifier is supplied separately for water-proof type.)
 Note 3: Do not open water-proof dust-proof box for water-proof type, otherwise electrical shock, fire or damage to the equipment may result.
 Note 4: Rectifier, capacitor are not water-proofed for water-proof type.

Rotation shifting switch
 OLR : Overload relay or thermal relay
 VR : Varistor (Protector element)

These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC200V~230V	AC380V~460V	
Rated voltage of varistor	AC260V~300V	AC510V	
Voltage of varistor	430V~470V	820V	
Rated power of varistor	SB-004, FB-01A1, 02A1, 05A1	0.25Watt or more	0.4Watt or more
	FB-1D	0.4Watt or more	0.6Watt or more
	FB-2D, 3D, 5B, 8B	0.6Watt or more	1.0Watt or more
	FB-10B1, 15B1	1.0Watt or more	1.0Watt or more

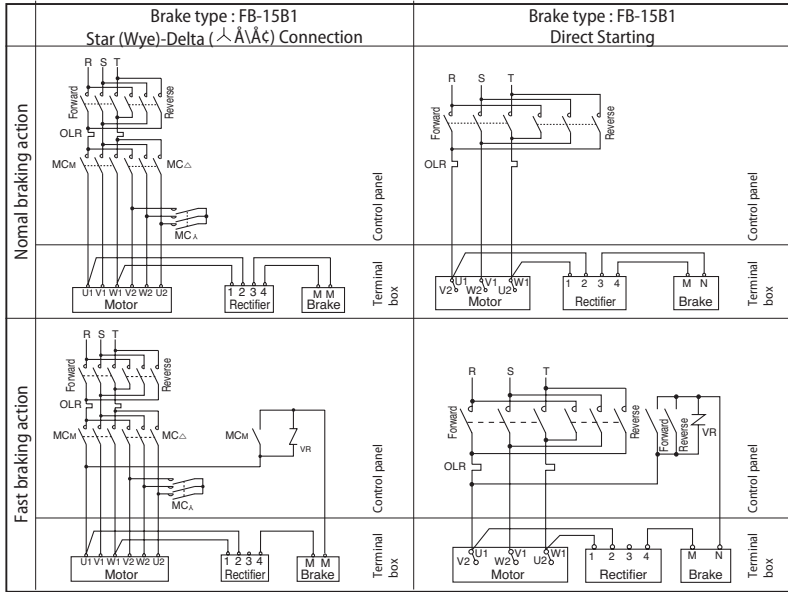
Varistor is optionally available at Sumitomo.

- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

- Refer to page 6 table 1-1, 1-2 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.



Fig.30-d For operating in both directions (In a case of six lead wires)



- Refer to page 6 table 1-2 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.

Rotation shifting switch
 MC : Electromagnetic contactor
 OLR : Overload relay or thermal relay
 VR : Varistor (Protector element)

} These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC200V-230V	AC380V-460V
Rated voltage of varistor	AC260V-300V	AC510V
Voltage of varistor	430V-470V	820V
Rated power of varistor	FB-15B1	
	1.0Watt or more	1.0Watt or more

Varistor is optionally available at Sumitomo.

- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.



Fig.31 shows the **Inverter motor with brake** connection and the standard specifications for terminal codes.

Fig.31-a For inverter driven (In a case of three lead wires)

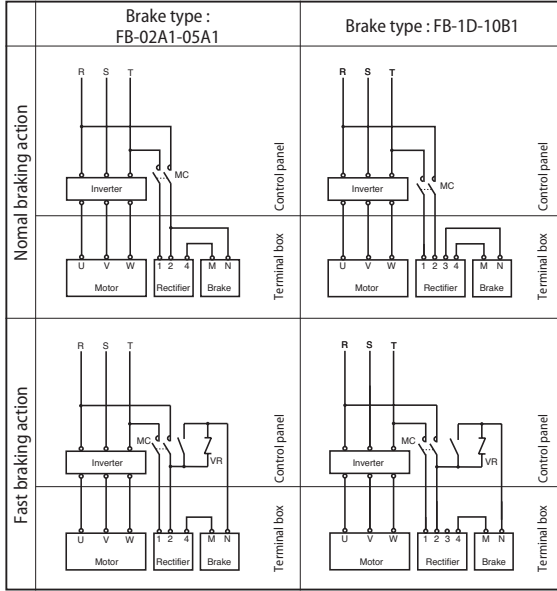
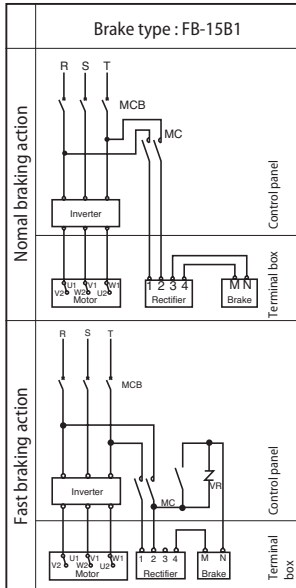


Fig.31-b For inverter driven (In a case of six lead wires)



MC : Electromagnetic contactor
 VR : Varistor (Protector element) } These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC200V-230V	AC380V-460V
Rated voltage of varistor	AC260V-300V	AC510V
Voltage of varistor	430V-470V	820V
Rated power of varistor		
FB-02A1,05A1	0.25Watt or more	0.4Watt or more
FB-1D	0.4Watt or more	0.6Watt or more
FB-2D, 3D, 5B, 8B	0.6Watt or more	1.0Watt or more
FB-10B1,15B1	1.0Watt or more	1.0Watt or more

Varistor is optionally available at Sumitomo.

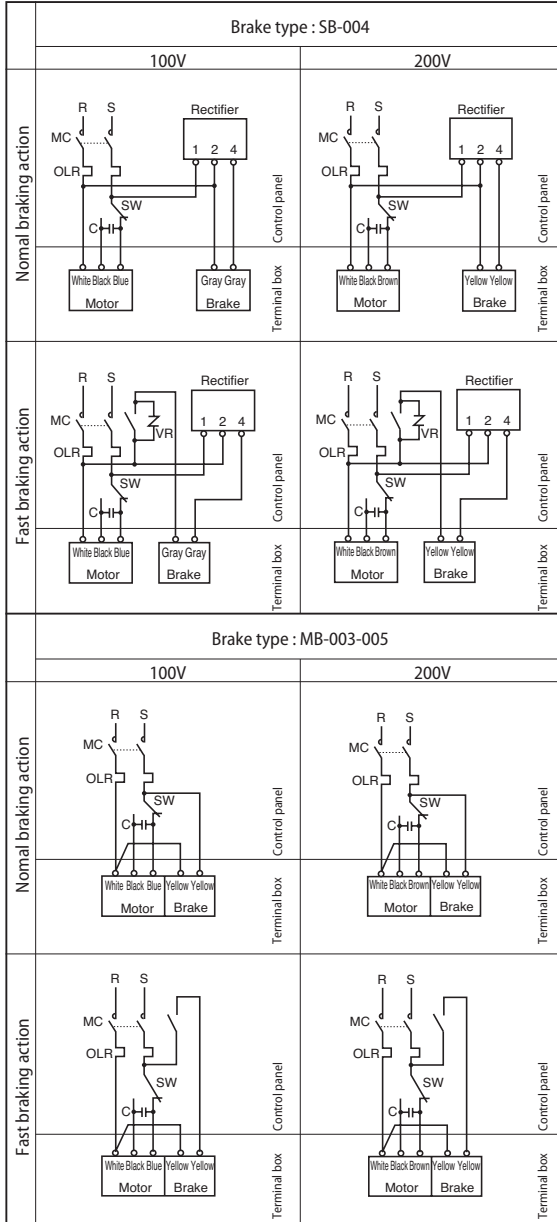
- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

- Refer to page 6 table 1-2 for brake type.
- For Three-Phase Motors and Three-Phase High Efficiency Motor to be driven by Inverters, please refer to the wiring diagram for inverter motor.
- Insulation suitable for a motor is necessary in inverter drive with 3-phase 400V motor or 3-phase 400V high efficiency motor.
- Inverter can not be applied to MB brake type (excl. water-proof type) due to a built-in rectifier into brake.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.
- Refer to connection diagram on the motor when sharing power supply.



Fig.32 shows the **Single-phase motor with brake** connection and the standard specifications.

Fig.32-a-1 For operating in one directions (In a case of capacitor run type 15W-90W)



- Note 1: A rectifier is supplied separately for SB-004.
- Note 2: A rectifier is built in the brake of motors for MB-003-MB005. (A rectifier is supplied separately for water-proof type.)
- Note 3: Turn the switch SW to change the current of 15-90W motors to the opposite direction. (When instant switching is required, use a reversible motor.)
- Note 4: Do not open water-proof dust-proof box for water-proof type, otherwise electrical shock, fire or damage to the equipment may result.
- Note 5: Rectifier, capacitor are not water-proofed for water-proof type.
- Note 6: Connect the accessory capacitor.

- MC : Electromagnetic contactor
 - OLR : Overload relay or thermal relay
 - SW : Rotation shifting switch
 - VR : Varistor (Protector element)
 - C : Capacitor (Accessory)
- These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC100V, 200V
Rated voltage of varistor	AC260V-300V
Voltage of varistor	430V-470V
Rated power of varistor	0.25Watt or more

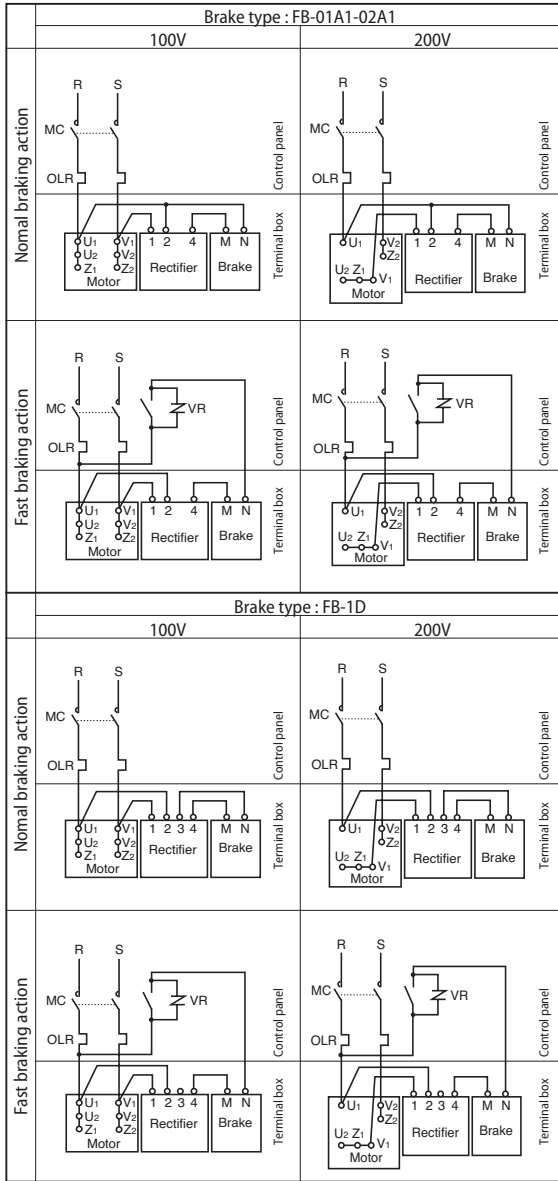
Varistor is optionally available at Sumitomo.

- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

- Refer to page 6 table 1-1 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.



Fig.32-a-2 For operating in one directions (In a case of capacitor start and capacitor-run type 0.1kW-0.4kW)



Note: Connection to Z1 and Z2 shall be exchanged with each other when reverse rotation is necessary if the motor is provided only for rotation in one direction.

- MC : Electromagnetic contactor
 - OLR : Overload relay or thermal relay
 - VR : Varistor (Protector element)
- These should be furnished by the customer.

Varistor (VR) Capacity

Input power	AC100V, 200V
Rated voltage of varistor	AC260V-300V
Voltage of varistor	430V-470V
Rated power of varistor	FB-01A1, 02A1 0.25Watt or more
	FB-1D 0.4Watt or more

Varistor is optionally available at Sumitomo.

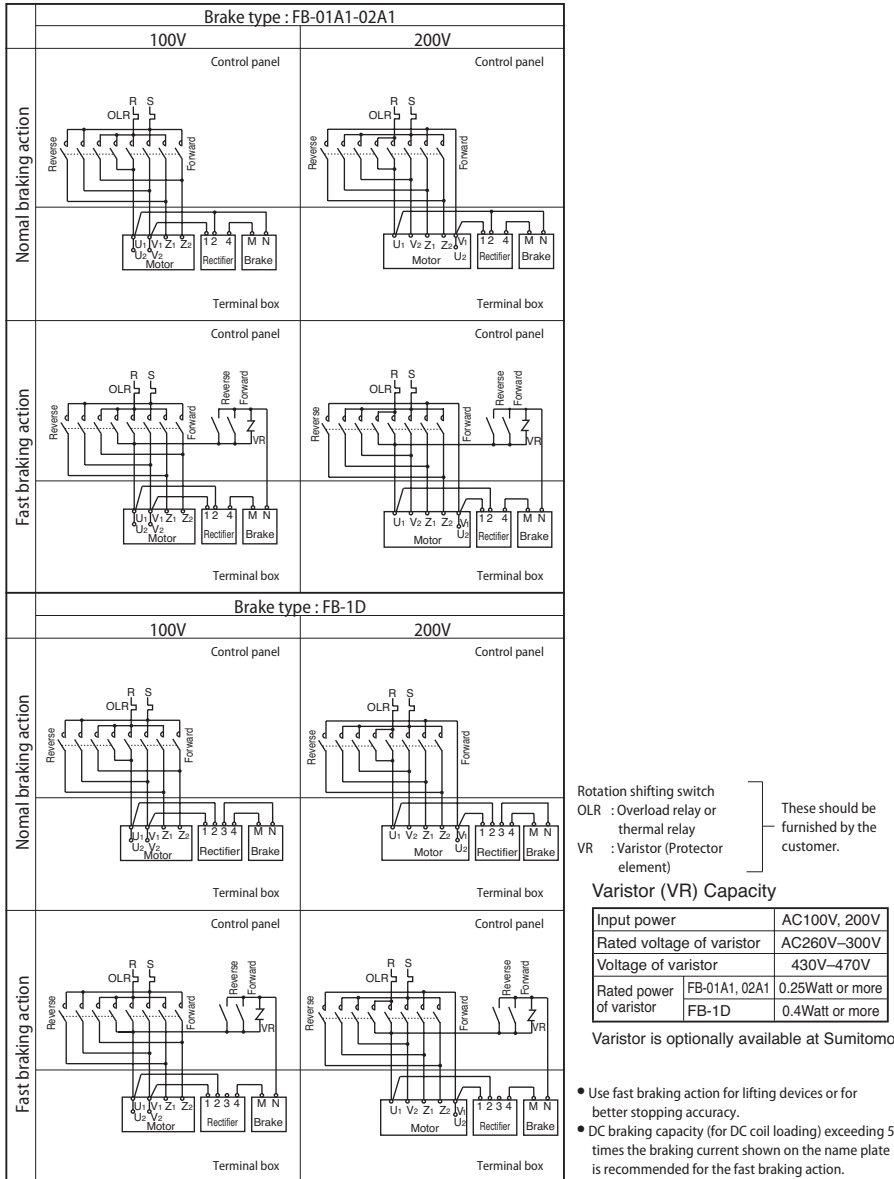
- Use fast braking action for lifting devices or for better stopping accuracy.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

• Refer to page 6 table 1-2 for brake type.

• This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.

6. Wiring

Fig.32-b-1 For operating in both directions (In a case of capacitor start and capacitor-run type 0.1kW-0.4kW)



- Refer to page 6 table 1-2 for brake type.
- This drawing shows for a motor based on standard specification for Japanese market. Motor based on overseas standard shall be referred to us.



Table 9 Varistor (VR) Capacity

Input power		AC200V–230V	AC380V–460V
Rated voltage of varistor		AC260V–AC300V	AC510V
Voltage of varistor		430V–470V	820V
Rated power of varistor	Brake type	SB-004, FB-01A1, 02A1, 05A1	0.25Watt or more
		FB-1D	0.4Watt or more
		FB-2D, 3D, 5B, 8B	0.6Watt or more
		FB-10B1, 15B1	1.0Watt or more

- The brake delay time of the normal braking action is different from that of the fast braking action. Table 1 on page 6 shows the delay time. Use a circuit that meets your requirements.
- DC braking capacity (for DC coil loading) exceeding 5 times the braking current shown on the name plate is recommended for the fast braking action.

- Use fast braking action for lifting devices or for better stopping accuracy.
- Use fast braking action when a leading capacitor is used.

· For 15W–90W single-phase capacitor run type motor, connect the accessory capacitor, (see Table 7 on page 23 for the capacitor.)

- Pay attention to the following items **when driving an inverter**

- For the inverter-driven motor with a brake, use the primary-side power supply for braking as shown in Fig.31, and synchronize the braking operation with the ON/OFF operation of the unit.
- For the inverter-driven motor with a brake, interlocking with the inverter is necessary to engage/release the MC. Refer to the inverter maintenance manual or guide.
- During the low speed running, the mechanical life might be in danger of being shortened by reducing the cooling ability.
- When it happens, please reduce the time that brake's power is on.

7. Operation**DANGER**

- Do not approach or touch rotating parts (output shaft, etc.) during operation; loose clothing may become caught in these rotating parts and cause serious injury or death.
- When the power supply is interrupted, be sure to turn off the power switch. Unexpected resumption of power may cause electric shock, personal injury, or damage to the equipment.
- Do not operate the unit with the terminal box cover removed. Return the terminal box cover to the original position after maintenance in order to electric shock.
- Do not open the terminal box cover when power is supplied to an **explosion-proof type motor** prevent otherwise, explosion, ignition, electric shock, personal injury, fire, or damage to the equipment may result.
- For **motors equipped with brakes** do not operate with brakes released by the manual loosening bolt, otherwise the motor may fall or go out of control.
- Do not use of **single-phase motor** if there is possibility of loaded more than motor rated torque, otherwise the motor may go out of control.

**CAUTION**

- Do not put fingers or foreign objects into the opening of the gearmotor otherwise electric shock, personal injury, fire, or damage to the equipment may result.
- The gearmotor becomes very hot during operation. Do not touch or come in contact with the unit; otherwise, burns may result.
- If any abnormality occurs during operation, stop operation immediately; otherwise, electric shock, personal injury, or fire may result.
 - Do not operate the unit in excess of the rating; otherwise, personal injury or damage to the equipment may result.
 - Do not touch the charging portion of the starting capacitor of a **single-phase motor** until the capacitor has discharged completely, otherwise electric shock may result.
 - When reversing the rotation of a **single-phase motor other than a reversible** motor, be sure to stop the motor before reversing the rotation, otherwise the rotation may not be successfully reversed, and the motor may go out of control.

After the unit is installed and properly wired, check the following before operating.

- (1) Is the wiring correct ?
- (2) Is the unit properly coupled with the driven ?
- (3) Are foundation bolts tightened firmly ?
- (4) Is the direction of rotation as required ?

After confirming these items, conduct initial break-in without a load; then gradually apply a load.

Check the items shown in Table 10 on page 37.

Table 10 Items to check during initial start - up and break - in period

Is abnormal sound or vibration generated ?	(1) Is the housing deformed because the installation surface is not flat ? (2) Is insufficient rigidity of the installation base generating excessive noise ? (3) Is the shaft center aligned with the driven machine ? (4) Is the vibration of the driven machine transmitted to the gearmotor ?
Is the surface temperature of the gearmotor or reducer abnormally high ?	(1) Is the voltage rise or drop substantial ? (2) Is the ambient temperature too high ? (3) Does the current flowing to the gearmotor exceed the rated current shown on the rating plate ?

- If any abnormality is found, stop operation and contact our nearest agent, distributor, or sales office.
- In the initial operation or right after exchange of the brake lining, specified braking torque might not be outputted. When this happens, under the least loading, turn the power switch on and off to rub the friction sides together.
- Because of the brake structure, rubbing noise of the lining might be made, which has no problems with the performance.

8. Daily Inspection and Maintenance



DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power; otherwise, electric shock may result.
- Do not approach or touch any rotating parts (output shaft, etc.) during maintenance or inspection of the unit; loose clothing may become caught in these rotating parts and cause serious injury or death.
- Customers shall not disassemble or modify **explosion-proof type motors**; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- The lead-in condition of an **explosion-proof type motor** shall conform to the facilities electrical codes, extension regulations and explosion-proofing guide, as well as the maintenance manual; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.




CAUTION

- Do not put fingers or foreign objects into the opening of the gearmotor otherwise, electric shock, personal injury, fire, or damage to the equipment may result.
- The gearmotor becomes very hot during operation. Touching the unit with bare hands may result in serious burns.
- Do not touch the terminal when measuring insulation resistance; otherwise, electric shock may result.
- Promptly identify and correct, according to instructions in this manual, any abnormalities observed during operation. Do not operate until abnormality is corrected.
- Do not use damaged gearmotors; otherwise, personal injury, fire, or damage to the equipment may result.
- We can not assume any responsibility for damage or injury resulting from an unauthorized modification by a customer.
- Dispose gearmotor, lubricant as general industrial waste.
- When measuring the insulation resistance of an **explosion-proof type motor**, confirm that there is no gas, steam, or other explosive substance around the unit in order to prevent, explosion or ignition.

- The gear section is filled with long-life grease that allows it to operate for extended periods without replenishment. However, overhaul the gear section every 20,000 hours or 3 to 5 years to ensure long service life.
- Sealing effect of an oil seal will be deteriorated due to natural degradation and wear as its life during long term operation.
Life time of an oil seal varies substantially depending on service condition and ambient environment for the reducer.
It is recommendable that oil seal is changed every one to three years as a guide for normal operation. (Under uniform load, room temperature and 10 hours operation per day)
In addition, oil seal and V-ring should be changed with new one when wear and/or rust are found on the sliding surface of it.
As sliding surface is carbon steel, it may get rusted due to rainwater or condensation and damage an oil seal. Therefore periodical rust prevention is required.
- Overhauling the gearmotor or reducer requires specific skills. Be sure to use a workshop specified by Sumitomo for overhaul.

To ensure proper and continued optimum operation, use Table 11 to perform daily inspections.

Table 11 Daily Inspection

Inspection item	Details of inspection
Electric current	Is the current below the rated current shown on the rating plate ?
Noise	Is there abnormal sound ? Is there sudden change in sound ?
Vibration	Is there excessive vibration ? Does vibration change suddenly ?
Surface temperature	Is the surface temperature abnormally high ? Does the surface temperature rise suddenly ? (The temperature rise during operation differs according to the model. When the difference between the temperature of the gear surface and the ambient temperature is approx. 40°C degrees, there will be no problem if there is no fluctuation.)
Grease leakage	Does oil or grease leak from the gear section ?
Foundation bolt	Are foundation bolts loose ?
Chain and V-belt	Are chain and V-belt loose ?
Brake 	Is the brake lining abraded ? (After operation for an extended period of time, the brake lining becomes abraded.) (Check the brake gap occasionally, following instructions in section 9, Brake Inspection / Maintenance (p.40-48).)

When any abnormality is found during the daily inspection, take corrective measures according to Section 10, Troubleshooting (pages 50 and 51.) If the abnormality cannot be eliminated, contact our nearest agent, distributor, or sales office.



9. Brake Maintenance

- This section discusses the operation and maintenance of the **sumitomo brake**. (When using **another manufacturer's brake**, please refer to their maintenance manual.)
- Refer to Brake operation manual (Cat.No.MM0202E) for FB-01A1, 02A1, 05A1, 1D, 2D, 3D, 5B, 8B,10B1 and 15B1 outdoor type.



DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power; otherwise, electric shock may result.
- When the motor is used for lifting, do not release the brake while a load is lifted, otherwise the load may fall, leading to an accident.
- Do not operate the motor with the brake released by the manual loosening bolt, otherwise the motor may fall or go out of control.
- Turn on and off the power to check the braking operation before starting the motor, otherwise the motor may fall or go out of control.
- Do not allow water or grease to collect on the brake, otherwise the motor may fall or go out of control due to a drop in the brake torque.



CAUTION

- After inspection and/or adjustment of the gap, do not operate the motor without replacing the fan cover; otherwise loose clothing may become caught in rotating parts and cause serious injury.
- Replacing the brake lining requires specific skills. Be sure to use a workshop specified by sumitomo for brake replacement.

- The mechanical life of the FB brake is 2,000,000 times, but periodically check the brake gap G. After use for an extended period of time, the brake lining will be abraded, making it impossible to release the brake. When the brake is used for more than 2,000,000 times, the motor may fall or go out of control because of the abrasion or breakage of mechanical parts.
- In the initial operation or right after exchange of the brake lining, specified braking torque might not be outputted. When this happens, under the least loading, turn the power switch on and off to rub the friction sides together.



9-1) Construction and Operation

Figs. 33-42 show the construction of the brake. A spring is used for braking operation (nonexcitation operation type).

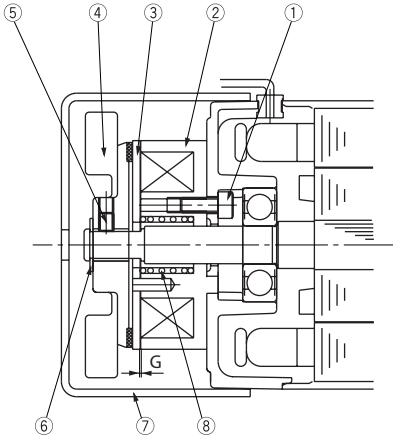


Fig.33 SB-004

No.	Part name
1	Brake restraining bolt
2	Stationary
3	Armature plate
4	Lining with fan
5	Setting bolt
6	Retaning ring
7	Cover
8	Torque spring

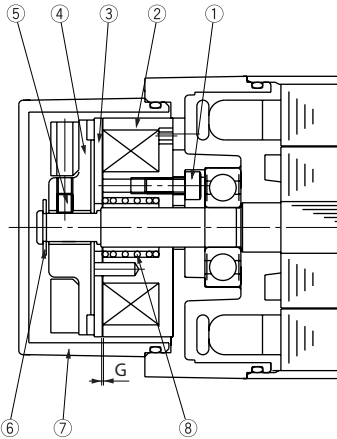


Fig.34 SB-004
(water-proof type)

No.	Part name
1	Brake restraining bolt
2	Stationary
3	Armature plate
4	Lining with fan
5	Setting bolt
6	Retaning ring
7	Cover
8	Torque spring

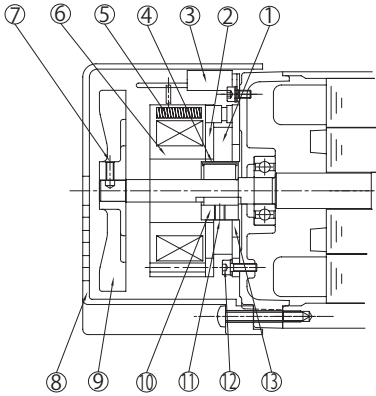


Fig.35 MB-003_005

No.	Part name
1	Brake lining
2	Armature plate
3	Rectifier
4	Leaf spring
5	Torque spring
6	Stationary
7	Fan set bolt
8	Cover
9	Fan (provided for single-phase 60,90W)
10	Boss
11	Boss setting bolt
12	Brake restraining bolt
13	Fixed plate

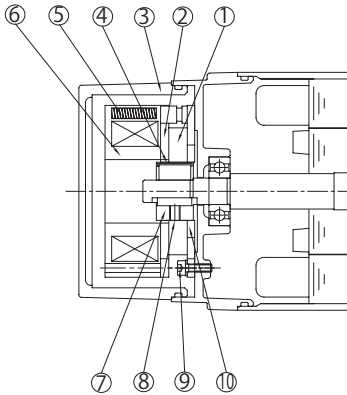


Fig.36 MB-003_005 (Water-proof type)

No.	Part name
1	Brake lining
2	Armature plate
3	Cover
4	Leaf spring
5	Torque spring
6	Stationary
7	Boss
8	Boss setting bolt
9	Brake restraining bolt
10	Fixed plate

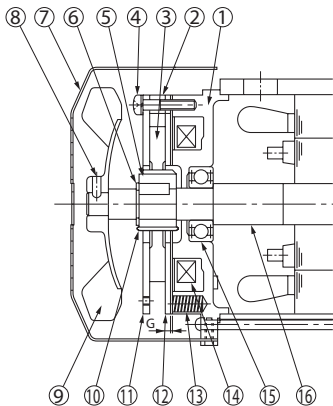


Fig.37 FB-01A1_02A1_05A1

No.	Part name
1	Stationary core
2	Spacer
3	Brake lining
4	Assembling bolt
5	Boss
6	Shaft retaining C-ring
7	Cover
8	Fan set bolt
9	Fan
10	Leaf spring
11	Fixed plate
12	Armature plate
13	Spring
14	Electromagnetic coil
15	Ball bearing
16	Motor shaft

FB-01A1 for 3-phase motor 0.1kW does not apply to No.8,9.

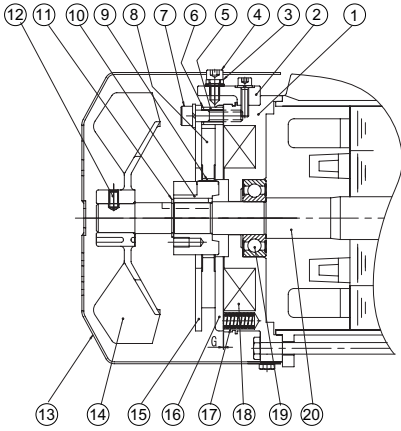


Fig.38 **FB-1D**

No.	Part name
1	Stationary core
2	Release fitting
3	Manual release prevention spacer
4	Brake release bolt
5	Spacer
6	Gap adjusting shim
7	Assembly bolt
8	Brake lining
9	Leaf spring
10	Boss
11	Shaft retaining C-ring
12	Fan set bolt
13	Cover
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearing
20	Motor shaft

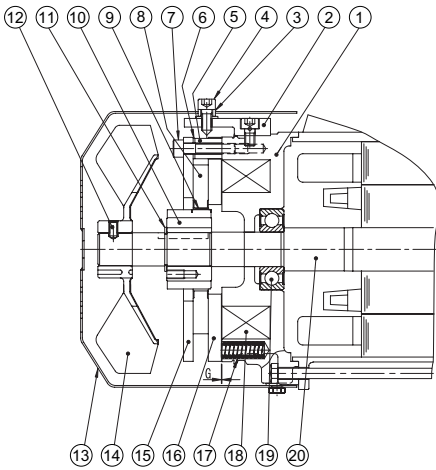


Fig.39 **FB-2D**

No.	Part name
1	Stationary core
2	Release fitting
3	Manual release prevention spacer
4	Brake release bolt
5	Spacer
6	Gap adjusting shim
7	Assembly bolt
8	Brake lining
9	Leaf spring
10	Boss
11	Shaft retaining C-ring
12	Fan set bolt
13	Cover
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearing
20	Motor shaft

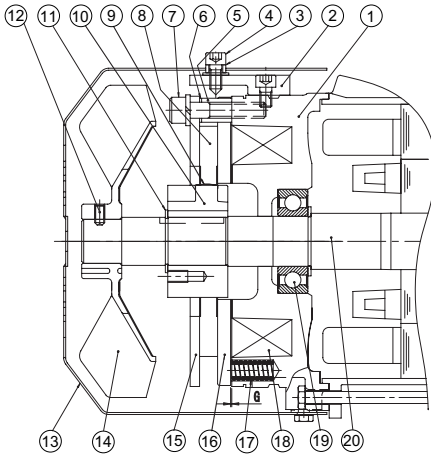


Fig.40 **FB-3D**

No.	Part name
1	Stationary core
2	Release fitting
3	Stud bolt
4	Adjusting washer
5	Manual release prevention spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft retaining C-ring
12	Cover
13	Spring pin
14	Fan
15	Leaf spring
16	Fixed plate
17	Armature core
18	Spring
19	Electromagnetic coil
20	Ball bearing
21	Motor shaft

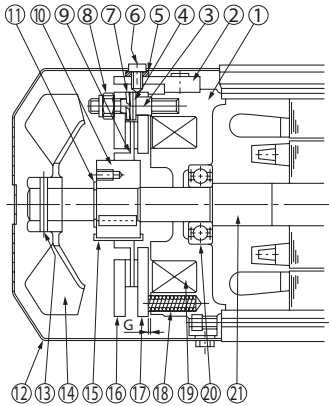
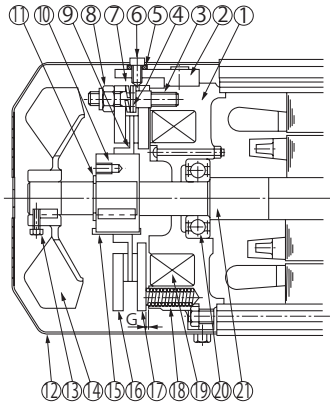


Fig.41 **FB-5B, 8B**

No.	Part name
1	Stationary core
2	Release fitting
3	Stud bolt
4	Adjusting washer
5	Manual release prevention spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft retaining C-ring
12	Cover
13	Spring pin
14	Fan
15	Leaf spring
16	Fixed plate
17	Armature core
18	Spring
19	Electromagnetic coil
20	Ball bearing
21	Motor shaft



No.	Part name
1	Stationary core
2	Release fitting
3	Stud bolt
4	Adjusting washer
5	Manual release prevention spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft retaining C-ring
12	Cover
13	Fan set bolt
14	Fan
15	Leaf spring
16	Fixed plate
17	Armature core
18	Spring
19	Electromagnetic coil
20	Ball bearing
21	Motor shaft

Fig.42 **FB-10B1, 15B1**



9-2) Manual Release Operation of Brake (FB-1D-15B1, FB-01A1-05A1 are options.)

To manually release the brake without turning on the power, operate the brake release device as follows:

- (1) Remove the brake release bolts arranged diagonal to each other, and remove the spacer. Then screw in the bolts with a hexagon wrench, and the brake will be released. Be careful not to turn the brake release bolts excessively. (Check to see if the brake is released, while turning the brake release bolts.) (See Fig.43.)
- (2) To return to the original state after releasing the bolts, re-install the spacer, which was removed in step (1), to the original position for safety. (See Fig.44.)

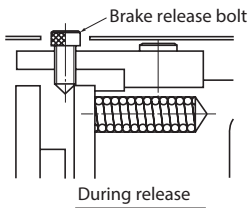


Fig.43

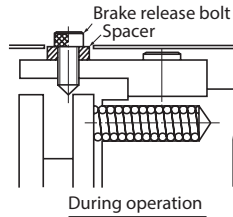


Fig.44

9-3) Gap Inspection

When the brake is used for a long time, the brake lining becomes abraded and the brake cannot be released. Periodically check the gap G as follows :

- (1) Remove the cover.
- (2) Insert the feeler gauge between the stationary and armature cores to measure the gap. When the gap is near the limit shown in Table 12, adjustment is necessary. Measure three points along the circumference. (Gap of MB-003, 005 can not be adjusted. The minimum thickness of the gap adjusting shim for FB-1D-3D is 0.2-0.25mm.)

Table 12 Brake Gap

Type of brake	Gap G (mm)	
	Specification (Initial value)	Limit
SB-004	0.15-0.25	0.4
MB-003 MB-005	0.05-0.25	0.35
FB-01A1 FB-02A1 FB-05A1	0.2-0.35	0.5
FB-1D FB-2D	0.3-0.4	0.6
FB-3D		0.7
FB-5B FB-8B	0.4-0.5	1.0
FB-10B1 FB-15B1	0.4-0.5	1.2



9-4) Gap Adjustment

When the gap nears the limit shown in Table 12 on page 39, follow these steps to, adjust the gap. (Gap of MB-003, 005 can not be adjusted.)

[SB-004] (See Fig.33, 34 on page 41)

- (1) Remove cover (7).
- (2) Slightly loosen set bolt (5). (locking agent was done)
- (3) Adjust gap G by inserting the feeler gauge between the stationary core (2) and armature core (3).
- (4) Apply a locking agent to set bolt (5) and fixed lining fan.
- (5) Install cover (7). (For water proof-type. Please check no crack on O-ring. If any, please exchange.)

[FB-01A1, 02A1, 05A1] (See Fig.37 on page 42)

- (1) Remove cover (7).
- (2) Slightly loosen assembly bolt (4), and turn fixed plate (11) counterclockwise to the maximum. Then tighten the assembly bolt. After tightening, measure the gap G, and confirm that it is between the specification and limit. (After this operation, the gap will decrease by approx. 0.3mm.)
- (3) After adjusting the gap, check the brake's performance by turning the system power on and off a few times.
- (4) Install cover (7).

[FB-1D] (See Fig.38 on page 43)

- (1) Remove assemble bolt (4) and manual release prevention spacer (3).
- (2) Remove cover (13).
- (3) Remove fan set bolt (12), and remove fan (14).
- (4) Loosen assembly bolt (7), and remove spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set. Be careful not to remove assembly bolt (7) alone; otherwise, gap adjusting shim (6) will drop.
- (5) Gap adjusting shim (6) is approx. 0.2–0.25mm thick. Reduce the number of shims according to the amount of abrasion, and reassemble spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set.
- (6) Check the gap G, and if it is substantially different from the specification, readjust the shim.
- (7) After adjusting the gap, check the brakes performance by turning the system power on and off a few times.
- (8) Install fan (14), fan set bolt (12), and cover (13). Apply a locking agent to the fan set bolt at that time. Finally, install release bolt (4) and spacer (5).
Then install assemble bolt (4) and manual release prevention spacer (3).



[FB-2D] (See Fig.39 on page 43)

- (1) Remove assemble bolt (4) and manual release prevention spacer (3).
- (2) Remove cover (13).
- (3) Remove fan set bolt (12), and remove fan (14).
- (4) Loosen assembly bolt (7), and remove spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set. Be careful not to remove assembly bolt (7) alone; otherwise, gap adjusting shim (6) will drop.
- (5) Gap adjusting shim (6) is approx. 0.2–0.25mm thick. Reduce the number of shims according to the amount of abrasion, and reassemble spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set.
- (6) Check the gap G, and if it is substantially different from the specification, readjust the shim.
- (7) After adjusting the gap, check the brakes performance by turning the system power on and off a few times.
- (8) Install fan (14), fan set bolt (12), and cover (13). Apply a locking agent to the fan set bolt at that time. Finally, install release bolt (4) and spacer (5).
Then install assemble bolt 4 and manual release prevention spacer (3).

[FB-3D] (See Fig.40 on page 44)

- (1) Remove assemble bolt (4) and manual release prevention spacer (3).
- (2) Remove cover (13).
- (3) Remove fan set bolt (12), and remove fan (14).
- (4) Loosen assembly bolt (7), and remove spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set. Be careful not to remove assembly bolt (7) alone; otherwise, gap adjusting shim (6) will drop.
- (5) Gap adjusting shim (6) is approx. 0.2–0.25mm thick. Reduce the number of shims according to the amount of abrasion, and reassemble spacer (5), gap adjusting shim (6), assembly bolt (7), and fixed plate (15) together as a set.
- (6) Check the gap G, and if it is substantially different from the specification, readjust the shim.
- (7) After adjusting the gap, check the brakes performance by turning the system power on and off a few times.
- (8) Install fan (14), fan set bolt (12), and cover (13). Apply a locking agent to the fan set bolt at that time. Finally, install release bolt 4 and spacer (5).
Then install assemble bolt 4 and manual release prevention spacer (3).





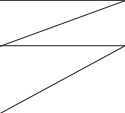

[FB-5B, 8B, 10B1 and 15B1] (See Fig.38 on page 41, Fig. 42 on page 45)

- (1) Remove assemble bolt 6 and manual release prevention spacer 5.
 - (2) Remove cover !2.
 - (3) Insert the feeler gauge between stationary core 1 and armature core !7, and turn clockwise the gap adjusting nut 8 attached to the end of stud bolt 3. When adjustment is impossible due to an excessively large gap, reduce the number of adjusting washers 4. Alternately turn the adjusting nuts, arranged at three locations around the circumference, so that all three gaps will be as specified in Table 12.
 - (4) After adjusting the gap, check the brake's performance by turning the system power on and off a few times.
 - (5) Install cover !2.
- Then install assemble bolt 6 and manual release prevention spacer 5.

9-5) Brake Lining Replacement

When the thickness of the brake lining has reached the limit shown in Table 13 (When the brake gap has reached the limit shown in Table 12 on page 46 for MB-003, 005. When the brake gap has reached the limit shown in Table 12 on page 46 after gap adjustment in for FB-01A1, 02A1, 05A1.), Contact Sumitomo for brake lining replacement.

Table 13 Brake Lining Dimension

Brake Type	Brake Lining Dimension	Initial Thickness	Thickness Limit	
		to (mm)	to (mm)	
SB-004		5.0	4.6	
MB-003 MB-005		7.0		
FB-01A1 FB-02A1 FB-05A1		7.0		
FB-1D		7.0		6.0
FB-2D		8.8		7.8
FB-3D		9.0		8.0
FB-5B, 8B		10	6.0	
FB-10B1, 15B1		11	7.0	

9-6) Change of V-ring and waterproof seal (in a case of outdoor type)

Inspect a V-ring and waterproof seal every three years as a guide because waterproof effect is deteriorated due to aging degradation, and etc.

Consult with the nearest certified service shop when something defective on waterproof is found by inspection.

In addition, V-ring should be changed with new one when wear and/or rust are found on the sliding surfaces of it.

As sliding surface is carbon steel, it may get rusted due to rainwater or condensation and damage an oil seal and V-ring. Therefore periodical rust prevention is required.

10. Troubleshooting

If any abnormality is found in the gearmotor, refer to Table 14 below and take appropriate measures as soon as possible. If the abnormality cannot be eliminated, contact our nearest agent, dealer or sales office.

Table 14 Troubleshooting

Type of Trouble		Cause	Remedy	
The motor does not run in the unloaded condition.		Power failure	Contact the power supply company.	
		Defective electric circuit	Check the defective portion of electric circuit.	
		Fusing	Replace the fuse.	
		Safety device at work	Eliminate a cause of incorrect safety device actuation.	
		Locking of the load	Check and investigate the load and the safety device.	
		Poor contact of switch	Adjust the contact.	
		Disconnection of motor stator wiring	Consult with the certified service shop.	
		Broken bearing	Consult with the certified service shop.	
		Defective cover switch (0.1—0.4kW single-phase motor)	Consult with the certified service shop.	
		Broken capacitor (single-phase motor)	Consult with the certified service shop.	
	Three-phase motor acting as single-phase motor (3-phase motor)	Check the power source using a voltmeter. Repair or replace the motor, transformer coils, contactors and fuses.		
	Brake: Rust on friction surface	Consult with the certified service shop.		
	Brake: Poor gap adjustment	Fine adjustment of brake gap. (P. 46—49)		
The motor works but the output shaft does not work.		Defective gear drives due to overloading etc.	Consult with the certified service shop.	
The output shaft rotates without loading, but	When loaded	Switch is overheated.	Insufficient switch capacity Overloading	Replace the switch with one having the specified capacity. Reduce the load to the specified level.
		Fuse is cut.	Insufficient fuse capacity Overloading	Replace the fuse with one having a specified capacity. Reduce the load to the specified level.
	Rotating speed does not increase and overheated.		Defective governor switch (0.1—0.4kW single-phase motor)	Consult with the certified service shop.
			Voltage drop Overloading	Consult with the power supply company. Reduce the load to the specified level.
	Motor stops.	Drop in capacitance (single-phase motor)	Consult with the certified service shop.	
		Short circuit of motor stator winding	Consult with the certified service shop.	
		The key is not set on the shaft Burned bearing	Set the key. Consult with the certified service shop.	
		Defective adjustment of the safety device	Adjust the safety device.	
	The motor rotates reversely.		Wrong connection	Connect correctly.
	Disconnected fuse.	Short-circuit of the lead wire	Consult with the certified service shop.	
		Poor connection of the motor with the starter	Connect firmly.	
	Excessive rise in temperature	Overloading	Reduce the load to a specified level.	
Increased or decreased voltage		Consult with the power supply company.		
Defective governor switch (in 0.1—0.4kW single-phase motor)		Consult with the certified service shop.		
Deteriorated condenser capacity (single-phase motor)		Consult with the certified service shop.		
Ambient temperature is too high. Failure due to overloading to shaft and gear		Improve the ventilation method. Consult with the certified service shop.		

Table 14 Troubleshooting

Type of Trouble		Cause	Remedy
Grease leakage	Ooze of grease from an oil seal.	Ooze of lubricating grease from an oil seal at an early stage of operation.	Wipe up grease or replace an oil seal when grease leakage cannot be protected.
	Grease leakage from the output section	Damaged oil seal.	Consult with the certified service shop.
	Grease leakage from the casing seam	Slacked bolts.	Tighten the bolts or consult with the certified service shop.
Abnormal noise or excessive vibration		Damaged gear.	Consult with the certified service shop.
		Distortion of the housing due to rough bed surface.	Flatten the bed surface or adjust the bed with the liner.
		Resonance resulting from insufficient rigidity of the bed.	Improve rigidity of the bed by reinforcement.
		Misalignment of connecting shafts.	Realign or use flexible coupling.
		Vibration transferred from the connected machine.	Detect vibration sources by running the gearmotor independently.
Abnormal noise in the motor		Foreign substances inside the motor.	Eliminate the foreign substances.
		Damaged bearing.	Consult with the certified service shop.
		Improper brake gap adjustment.	Adjust the brake gap. (Refer to page 46–49)
		Worn brake lining.	Replace the brake lining. (Refer to page 49)
		Burned magnetic coil in the brake assembly.	Consult with the certified service shop.
		Failure of the rectifier	Replace the rectifier.
		Disengagement or failure of leaf spring in the brake boss.	Consult with the certified service shop.
		Defective governor switch (0.10.4kW single-phase motor)	Consult with the certified service shop.
Ineffective braking function	Brake does not work.	Releasing bolt not returned to the original position.	Return the bolt to the original position and readjust the gap.
	The brake slips. Braking response is slow.	A fast braking circuit is not working.	Shift to the fast braking action (Refer to page 27–34)
		Foreign substances or oil are adhered to the brake lining.	Consult with the certified service shop.
		Worn brake lining.	Adjust the brake gap or consult with the certified service shop.
		Uneven brake gap.	Adjust the brake gap.
		Overloading.	Reduce the load or apply a larger brake frame.
		Insufficient recovery of the releasing bolt.	Reset the releasing bolt to the original position and readjust the gap.
Inverter tripping	Shut-off due to overcurrent	Sudden acceleration / deceleration	Make the acceleration / deceleration time longer.
		Sudden change in load	Decrease the load.
	Grounding overcurrent	Grounding on the output side	Make correction to eliminate grounding
	DC overcurrent	Short - circuiting on the output side	Make correction to eliminate short -circuiting. Check cables.
	Shut-off due to regenerative overvoltage	Sudden deceleration	Make the deceleration time longer. Reduce the braking frequency.
	Thermal relay operation	Overloading	Decrease the load to the specified value.

11. Construction Drawings

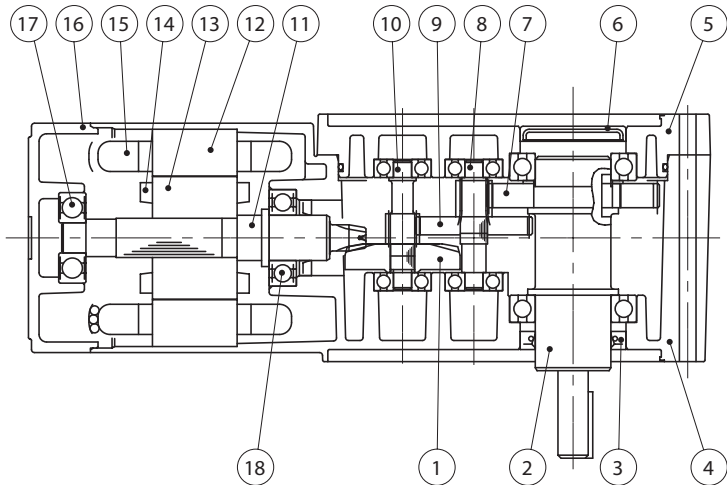


Fig.44 RNFM0025-03L-240

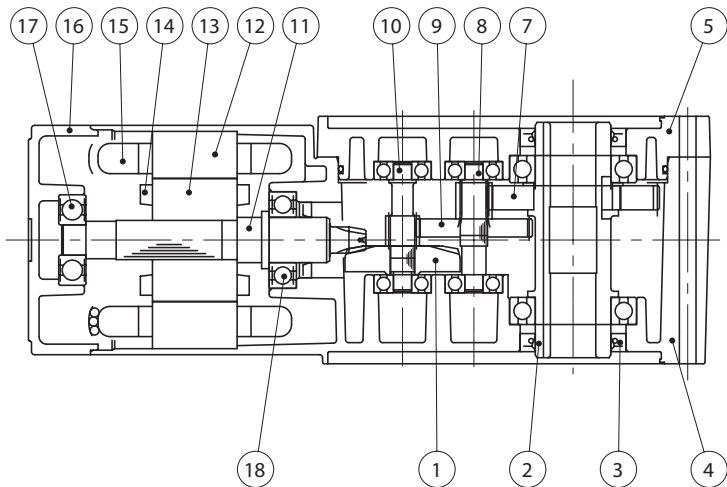


Fig.45 RNYM0025-03-240

No.	Part name	No.	Part name	No.	Part name
1	Hypoid gear	7	Gear	13	Rotor core
2	Output shaft	8	Pinion shaft	14	Rotor conductor short circuit ring
3	Oil seal	9	Gear	15	Stator windings
4	Casing	10	Pinion shaft	16	End bracket
5	Cover	11	Hypoid pinion shaft	17	Bearing metal
6	Seal cap	12	Stationary core	18	Bearing metal

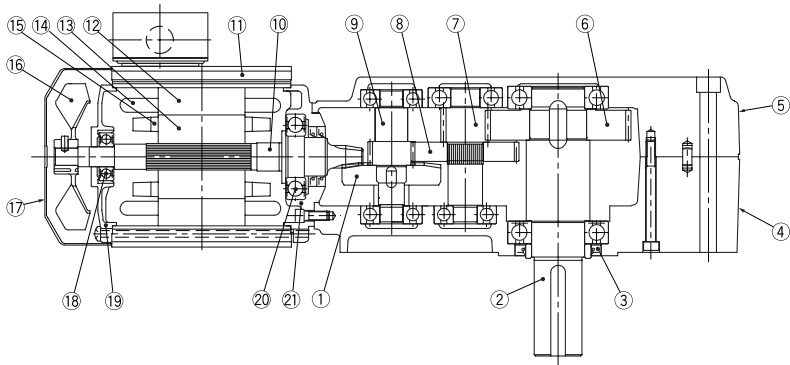


Fig.46 RNFM1-50R-120

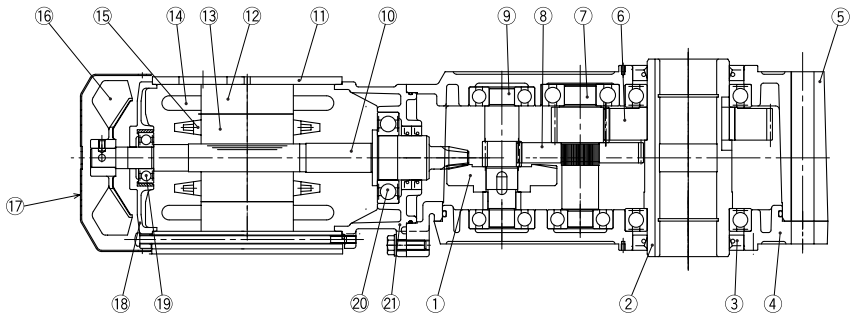


Fig.47 RNYM1-1530-120

No.	Part name	No.	Part name	No.	Part name
1	Hypoid gear	8	Gear	15	Rotor conductor short circuiting ring
2	Output shaft	9	Pinion shaft	16	Fan
3	Oil seal	10	Hypoid pinion shaft	17	Fan cover
4	Case (1)	11	Motor frame	18	End bracket
5	Case (2)	12	Stationary core	19	Bearing metal
6	Gear	13	Rotor core	20	Bearing metal
7	Pinion shaft	14	Stator windings	21	Cyclo flange bracket

12. Warranty

Product

Company warrants that (i) all new equipment and parts (collectively, "Equipment") sold by Company will conform to printed drawings and specification sheets issued by Company and (ii) are free of defects in material and workmanship for the time period shown in Table 1. The warranty period commences on the date of shipment of the Equipment by Company. If, within the warranty period, Company receives from Buyer written notice of any alleged defect in any of the Equipment and, if the Equipment is found by Company not to conform with these warranties (after Buyer has provided Company a reasonable opportunity to perform any appropriate tests on the allegedly defective Equipment), Company will, at its sole option and expense, either repair or replace the Equipment. In all instances, Company reserves the right to require Buyer to deliver the Equipment for repair or replacement to a designated service center and require Buyer to pay all charges for inbound and outbound transportation and for services of any kind, diagnostic or otherwise, excepting only the direct and actual cost of Equipment repair or replacement. Warranty coverage is limited to parts and labor and does not include travel and other expenses. Buyer applications and use of the Equipment may require installation of safety features. Buyer is responsible for furnishing and installing guards or other safety equipment needed to protect operating personnel, even though such equipment may not be furnished by Company with the Equipment purchased. Equipment supplied, but not manufactured, by Company is warranted only to the extent of the original manufacturer's warranty.

Repair

Company further warrants that any part of the Equipment actually repaired or replaced by Company or a designated service center is free from defects in material or workmanship for the time period shown in Table 1, commencing on the date of shipment of the repaired or replaced part of the Equipment.

General

These exclusive warranties do not cover and Company makes no further warranty with respect to:

- Failures not reported to Company within the warranty period specified in Table 1.
- Failures or damages resulting from misapplication, abuse, improper installation or abnormal conditions of temperature, dirt or corrosive matter.
- Failures resulting from operation, either intentional or otherwise, above rated capacities or in an otherwise improper manner.
- Equipment that has been, in any way, tampered with or altered by anyone other than an authorized representative of Company or a designated service center.
- Equipment damaged in shipment or otherwise without the fault of Company.
- Expenses incurred by Buyer in attempt to repair or rework allegedly defective Equipment.
- Losses, costs, expenses, liabilities and damages (including loss of use or profits, any liabilities of Buyer to its customers or third persons) and all other incidental and consequential damages, whether direct or indirect and whether or not resulting from or contributed to by the default or negligence of Company, its agents, employees and subcontractors, and designated service centers, must be claimed as the result of the use or failure of the Equipment.
- In no event will the life of the warranty against defects, workmanship or repair exceed the time period shown in Table 1. COMPANY MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSES OR ANY OTHER WARRANTY. IN PARTICULAR, BUT WITHOUT LIMITING THE GENERALITY OF THIS EXCLUSION, IF THE EQUIPMENT IS MADE TO BUYER'S SPECIFICATIONS, COMPANY DOES NOT WARRANT THE ADEQUACY OF SUCH SPECIFICATIONS OR THAT THE EQUIPMENT WILL PERFORM IN ACCORDANCE WITH SUCH SPECIFICATIONS.

The warranties of these Conditions herein may not be modified or extended, except in writing signed by an authorized officer of Company. Company does not warrant any equipment of any other manufacturer designated or specified by Buyer.

Table 1 - Product Warranty

Product	Warranty Period After Shipment	Components Excluded
Cyclo® Speed Reducers and Gearmotors	2 Years	Bearings and Seals
Cyclo® Bevel Buddybox Speed Reducers and Gearmotors	2 Years	Bearings and Seals
Cyclo® Helical Buddybox Speed Reducers and Gearmotors	2 Years	Bearings and Seals
Fine Cyclo® Speed Reducers	2 Years	Bearings and Seals
Beier® Variator Mechanical Adjustable Speed Reducers	2 Years	Bearings and Seals
Hyponic® Speed Reducers and Gearmotors	2 Years	Bearings and Seals
Hedcon® Double Enveloping Worm Gear Speed Reducers	2 Years	Bearings and Seals
Helical Shaft Mount Speed Reducers	2 Years	Bearings and Seals
Rhytax®	2 Years	Bearings and Seals
IB Series Servo Gearheads	1 Year	Bearings and Seals
Astero Gearmotors	1 Year	Bearings and Seals
Variable Frequency Inverters	1 Year	—
Paramax® Right Angle Spiral Bevel Gear and Parallel Shaft Helical Gear Speed Reducers	2 Years	Bearings and Seals
Compower Planetary Speed Reducers	1 Year	Bearings and Seals
Hansen UniMiner	2 Years	Bearings and Seals
Hansen P4	2 Years	Bearings and Seals
Parts	1 Year	—
Repairs	1 Year	Bearings and Seals

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