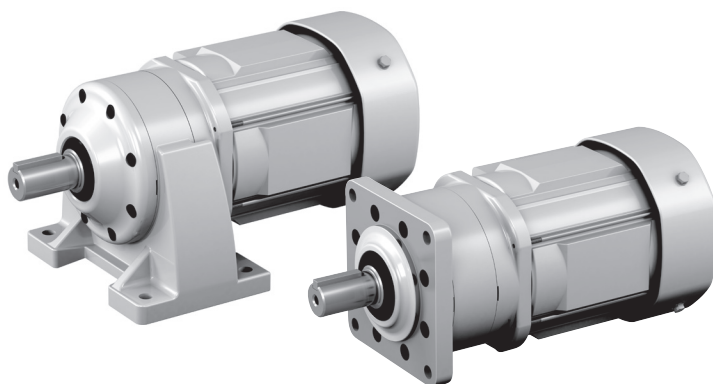


ALTAX[®] NEO



<<CAUTION>>

- The product should be handled by an experienced and skilled personnel.
Read the maintenance manual thoroughly before using the product.
- The maintenance manual should be delivered to a customer who uses the product.
- Make sure the maintenance manual should be stored securely.

Introduction: Safety 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.
After reading, 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.






- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be performed by trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- In the case of disassembly, assembly or overhaul of this device, contact the nearest authorized service station.
- When using the equipment in conjunction with **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 protecting device for human safety should be installed to prevent accidents resulting in personal injury, death, or damage to the equipment due to running out of control or falling.
- When the unit is to be used for an elevator or lifter, install a safety protecting device on the elevator side to prevent falling; otherwise, personal injury, death, or damage to the equipment may result.

Introduction: How to Refer to the Maintenance Manual, Table of Contents

This maintenance manual is common for “gearmotors”, “reducers”.

The symbols shown below appear in the upper right or left corner of each page to indicate the classification. Please read the applicable pages.

On **Common** pages, symbols identify distinctions between specific specifications.

Specifications	All Specifications Are Common	Gearmotor		Reducer
		Without brake	With brake	
Symbol	Common			

Contents

Introduction: Safety Precautions	1
Introduction: Reading the Maintenance Manual, Table of Contents	2
1. Inspection Upon Delivery	3
2. Storage	7
3. Transport	8
4. Installation	9
5. Coupling with Other Machines	11
6. Wiring	13
7. Operation	33
8. Daily Inspection and Maintenance	36
9. Troubleshooting	54
10. Construction Drawings	56
11. Warranty	59

⚠ DANGER

- 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 nameplate

Verify the items listed below upon receiving the product. If a nonconformity or problem is found, please contact with your nearest agent, distributor, or sales office.

- [1] Does the information on the nameplate conform to what you ordered?
- [2] Was any part broken during transport?
- [3] Are all bolts and nuts tightened firmly?

1-1 Reading the Nameplates

There are two main types of nameplates: type 1 and type 2. Representative examples are shown below. Please observe them by type.

When contacting the company, please provide [1] Gearmotor or reducer type/specification symbol, [2] Reduction ratio, and [3] Production number (Serial number).

- Nameplate Type 1: Gear Unit and Motor Unit Are Combined.

[1] Gearmotor type (see P4)/
specification symbol (see P5) Note: 1

[2] Reduction Ratio

- Motor capacity

- Motor characteristics

- Brake for motor with brake
Current value

[3] Serial number

- Motor type (see P6)

- Brake for motor with brake
(see P6)

- Motor frame size

- Brake torque
for motor with brake

Figure 1-1 Gearmotor nameplate (type 1)

- Nameplate Type 2: Separate Nameplates for Gear Unit and Motor Unit.

[1] Gearmotor, Reducer Type (see P4)/
specification symbol (see P5) Note: 1

[2] Reduction Ratio

- Input capacity, speed

- Allowable output torque

[3] Serial number

- Motor capacity

- Motor characteristics

- Motor type (see P6)

- Brake type
for motor with brake
(see P6)

- Motor frame size

- Brake torque
for motor with brake

[3] Serial number

- Brake current value for motor with brake

(Gear unit nameplate)

(Motor unit nameplate)

Figure 1-2 Gearmotor, Reducer nameplate (type 2)

Note: 1. The specification symbol may not be on the nameplate.

2. The reducer has a nameplate only on the gear unit.

3. The motor may be supplied from Sumitomo Heavy Industries, Ltd.

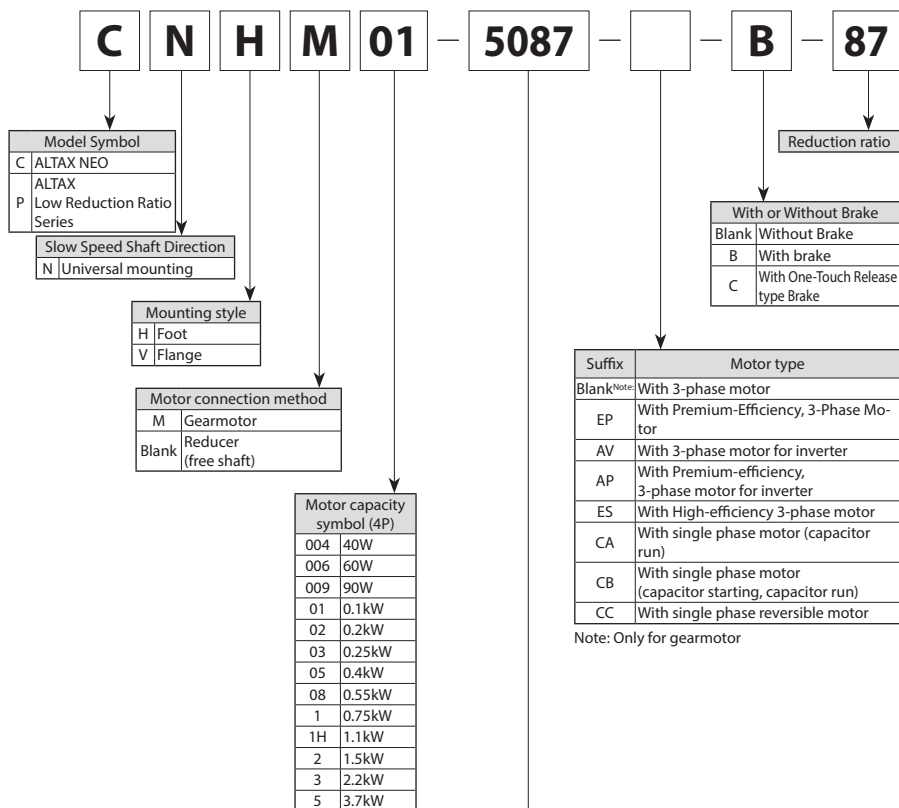
Common 1. Inspection upon Delivery

1-2 Lubrication Method

ALTAX NEO and ALTAX Low Reduction Ratio Series adopt grease lubrication and grease is applied when shipped from the factory, therefore lubrication is not needed and use out of the box.

1-3 Gearmotor, Reducer Type

Symbol meanings are shown below. Please confirm that the type matches the order.



Frame Size							
ALTAX NEO	CYCLO mechanism, single reduction type	5067 506H	5077	5087	5097	5107	5117 5127
	Traction drive	-	507R	508R	509R	510R	-
	CYCLO mechanism, single reduction type + Traction drive	-			5097DR	5107DR	5117DR 5127DR 5127DS
	CYCLO mechanism, double reduction type	-			5097DA	5107DA	5117DA 5127DA
ALTAX Low Reduction Ratio Series	Planetary gear mechanism	5081 5082 5083	5093		5103		5113

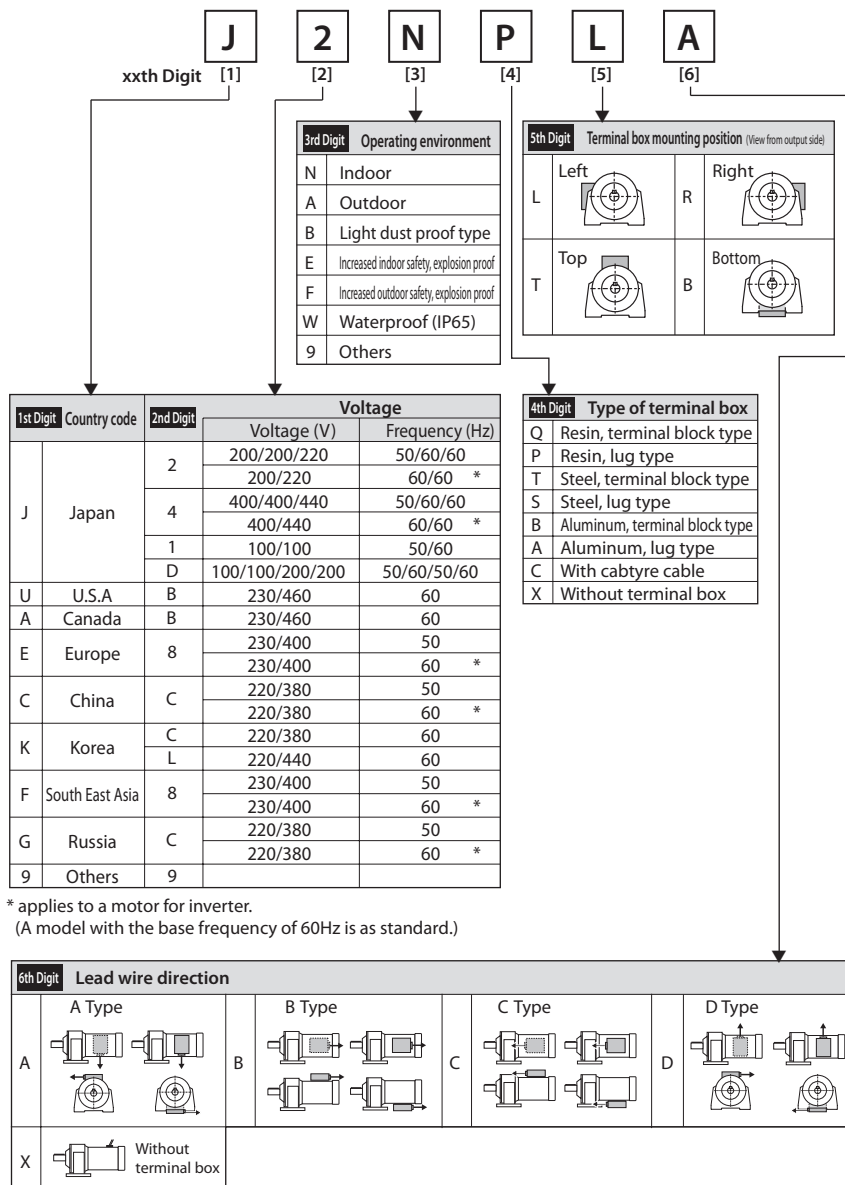
1. Inspection upon Delivery



1-4 Gearmotor Specification Symbol

Symbol meanings are shown below. Please confirm that the type matches the order.

A specification symbol is described on the nameplate when a customer specified at its order.

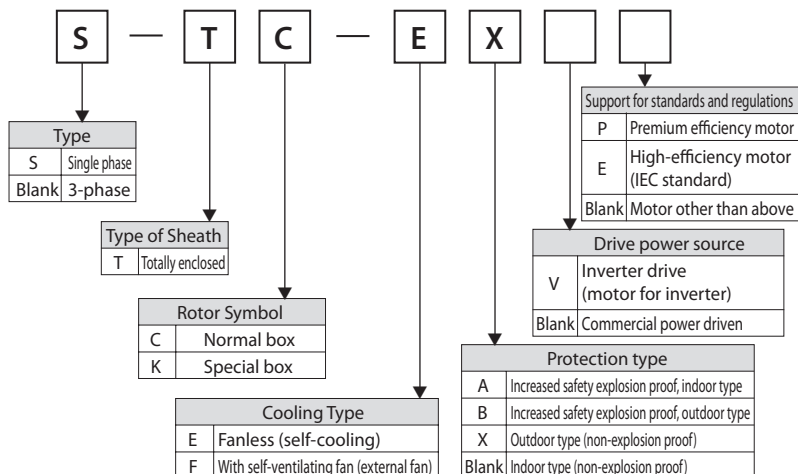




1. Inspection upon Delivery

1-5 Motor Type

Symbol meanings are shown below. Please confirm that the specification matches the order.



1-6 Brake Type

Table 1-1 shows the relationship between standard brake type and motor type and capacity range.

Table 1-1 Brakes

Brake type	Motor Capacity (kW)					
	3-phase motor	Premium-Efficiency 3-phase motor	3-phase motor for inverter	Premium-efficiency, 3-phase motor for inverter	High-efficiency 3-phase motor	Single phase motor
MB-003	40W	-	-	-	-	40W
MB-005	60W	-	-	-	-	60W
MB-010	90W	-	-	-	-	90W
	0.1 (frame size 5067 only)					
FB-01A1	0.1	-	-	-	-	0.1
FB-02A1	0.2 0.25	-	0.1	-	-	0.2
FB-05A1	0.4	-	0.2	-	0.2	-
FB-1D	0.55	-	0.4	-	0.4	0.4
FB-1E	-	0.75	-	0.75	-	-
FB-1HE	-	1.1	-	-	-	-
FB-2E	-	1.5	-	1.5	-	-
FB-3E	-	2.2	-	2.2	-	-
FB-5E	-	3.7	-	3.7	-	-

Notes: 1. Brake type may differ from the types shown in Table 1-1 depending on specification.
Check the nameplate.

2. 3-phase motor 0.1kW frame size5067 is MB-010.

If this product is not for immediate use, note the following points when storing it.

2-1 Storage Location

Store the product indoors in a clean, dry location.

Do not store outdoors. Store in a location that is free of moisture, dust, extreme temperature changes, corrosive gases, etc.

2-2 Storage Time

- The storage time should be within one year.
- If the storage time exceeds one year, adherence to special rust prevention specifications is required. Please consult with us.
- If for export, adherence to export rust prevention specifications is required. Please consult with us.
- Standard rust prevention specifications
 - External rust prevention Rust prevention oil is applied when shipping from the factory. Check rust conditions every six months after shipment. Reapply the rust prevention process, if necessary.
 - Internal rust prevention Store in an ordinary factory or warehouse in an environment free of moisture, dust, extreme temperature changes, corrosive gases, etc.

2-3 Using after Storage

- Oil seals are affected by temperature, ultraviolet light and other ambient conditions and can easily degrade. After long storage periods, inspect before operation, and replace any degraded seals with new seals.
- At startup, check that there are no unusual noises, vibrations, temperature rises, or other symptoms. For motor with brakes, check that brakes work properly. If any abnormalities are found, immediately contact the nearest authorized service station.

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 unit. When a hanging bolt or hole is provided, be sure to use it. After mounting a unit to a machine, 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 unit. 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.

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, explosion fire, or damage to the equipment may result.
- In the case of an **Explosion proof motor**, use a motor that has specifications that are appropriate for a dangerous location (a location where gas or volatile vapor is present); otherwise explosion, ignition, electric shock, injury, fire, or equipment damage may result.

CAUTION

- Do not use the products for purposes other than those shown on the nameplate 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 or reducer that will hinder ventilation. Insufficient ventilation can cause excessive heat build-up that may result in burns or fire.
- Do not step on or hang from the gearmotor or reducer; otherwise injury may result.
- Do not touch the shaft end of the gearmotor or reducer, 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, machines for cleanroom and so on, vulnerable to oil contamination, install an oil pan or other such device to cope with oil leakage due to breakdown or failure; otherwise, oil leakage may damage products.

4-1 Installation Location

Ambient temperature: -10 to +40°C

Ambient humidity: Maximum 85%

Altitude: Maximum 1,000 m

Atmosphere: No corrosive or volatile gases, no steam

Dust-free, well-ventilated area.

Installation location: Indoor type: Indoors (area with minimal dust, no contact with water)

Outdoor type: Indoors or outdoors (area with little contact with rain water)

Waterproof type: Protection class IP65 (dust-tight water-jet resistant type)

The product is resistant to water jet from a jet nozzle from any directions.

The product is not allowed to use under water or high water pressure.

Vibration: Maximum 1G

- Mounting in conditions other than the above requires adherence to optional specifications. Please consult with us.
- Drives built to specifications, such as explosion proofing, can be used in the specified mounting environments. However, concerning the connector to the machine used, implement measures based on the mounting environment.
- Mount in a location that enables easy operation, such as inspection and maintenance.
- Mount on a sufficiently rigid base.

4-2 Mounting Angle

There is no limit on a mounting angle.

Do not remove the motor's eye-bolt. In the rare case that it is removed, insert a bolt or other appropriate material into the screw hole to prevent water or other substances from entering the motor through the screw hole.

5. Coupling with Other Machines Common

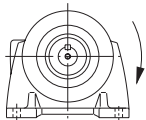
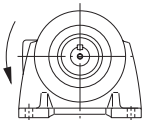
CAUTION

- 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 product alone (uncoupled), remove the key that is temporarily attached to the slow speed shaft; otherwise the key could fly off, and injury may result.
- Cover rotating parts; otherwise, injury may result.
- When coupling the product 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, injury may result because of misalignment.

5-1 Checking Rotational Direction

(1) For gearmotor

Table 5-1 shows the direction of slow speed shaft rotation when wiring is performed as on P16 – 30.
Table 5-1 Slow Speed Shaft Rotation Direction (Gearmotor)

Frame Size	ALTAX NEO		ALTAX Low Reduction Ratio Series
	5067, 506H, 5077, 5087 5097, 5107, 5117, 5127 5097DR, 5107DR, 5117DR 5127DR, 5127DS	507R, 508R 509R, 510R 5097DA, 5107DA 5117DA, 5127DA	5081, 5082 5083, 5093 5103, 5113
Slow speed shaft Rotation direction (Seen from load side)			

- Notes: 1. Switch the SW in the connection diagram on P18 and P26 to rotate a 40 to 90W single phase power source motor in reverse direction.
2. Reverse Z1 and Z2 in the connection diagram on P19 and P27-30 to rotate a 0.1 to 0.4kW single phase power source motor in reverse direction.
3. Reverse R and T in the connection diagram on P16 and P20-23 to rotate a 3-phase power source motor in reverse direction.

(2) For reducer

Table 5-2 Slow Speed Shaft Rotation Direction (Reducer)

Frame Size	ALTAX NEO		ALTAX Low Reduction Ratio Series
	5067, 5077, 5087 5097, 5107, 5117, 5127 5097DR, 5107DR 5117DR, 5127DR	507R, 508R 509R, 510R 5097DA, 5107DA 5117DA, 5127DA	5081, 5082 5083, 5093 5103, 5113
Slow speed shaft Rotation direction	Rotates in reverse direction as the high speed shaft.	Rotates in same direction as the high speed shaft.	

Common 5. Coupling with Other Machines

5-2 Mounting Connected Equipment

- When mounting connected equipment, do not apply impact or excessive axial load to the shaft. The bearing could be damaged, or the collar could come off.
- Shrinkage or shaft-end screw fit is recommended (see Figure 5-1).

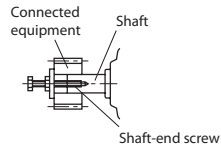


Figure 5-1

(1) When using a coupling

The alignment accuracy (A, B, X) in figure 5-2 should be no greater than that shown in Table 5-3.

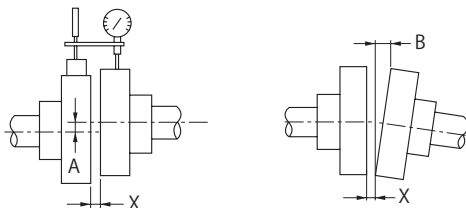


Figure 5-2

Table 5-3 Alignment Precision for Flexible Coupling

Allowable tolerance A	0.1 mm or manufacturer-specified value
Allowable tolerance B	0.1 mm or manufacturer-specified value
X	manufacturer-specified value

(2) When using chains, sprockets, or gears

- When using a chain, attach so that the chain tension angle is perpendicular to the shaft.
- Refer to the chain catalog or other reference for chain tension.
- Select a sprocket or gear pitch diameter that is at least three times the shaft diameter.
- The working load point of the sprocket or gear should go from the center of the shaft to this product.
(See Figure 5-3)

(3) When using a V belt

- Over-tightening the V belt will damage the shaft and bearing. Refer to the V belt catalog or other reference for V belt tension.
- The parallelism, eccentricity β of the two pulleys should be within $20'$. (See Figure 5-4)
- When using multiple V belts, use a matched set having the same length.

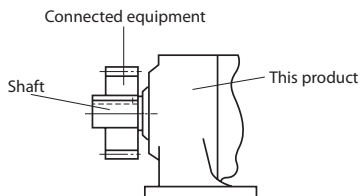


Figure 5-3

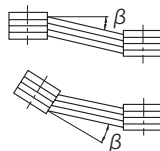


Figure 5-4



When using other manufacturer's motor, follow the operation manual for that motor.

This manual shows wiring for motors with Japanese standard specifications. Please consult with us for motors with overseas specifications.

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 diagram shown inside the terminal box or in the maintenance manual; otherwise, electric shock or fire may result.
- Do not forcibly bend, 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 motor** shall conform to the facility's electrical codes, extension regulations and explosion-proofing guide, as well as the maintenance manual; otherwise, electric shock, personal injury, explosion, fire or damage to the equipment may result.

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 protection 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, injury, and fire.
- Never touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- Voltage PWM inverters that use IGBT generate high-voltage surges at the motor terminals, which may degrade the insulation on the motor windings. In particular, if for example using a 400V class with long cables, a surge in excess of 1300V could be generated. Because of the following measures are required.
 - Install an LCR filter or and AC reactor between the inverter and the motor
 - Enhance motor winding insulation
- **When using a motor with brake**, do not turn on connection power to the brake coil when the motor is stopped. Otherwise coil burnout fire, may result. Also, mistaken wiring could damage the rectifier.
- When measuring the insulation resistance of an **explosion proof motor**, confirm that there is no gas or explosive vapor in the vicinity, in order to prevent possible explosion or ignition.
- If ambient temperature exceeds 60°C, place the rectifier in a location where the temperature is 60°C or less. In this case, always protect the entire rectifier with a cover. However, standard ambient temperature conditions for units with and without brakes is -10 to 40°C. (Manufacture to special specification is required for operation in an environment where ambient temperature exceeds 40°C.)
- Long cables cause large voltage drops. Select cables with appropriate diameter so that the voltage drop will no greater than 2%.
- After wiring **outdoor types and explosion proof types**, check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.
- **For a single phase motor**, do not take a starting capacitor as an operation capacitor when using it. Otherwise, the capacitor will be damaged.
- **For a single phase motor**, do not scratch a plastic film of the starting capacitor. Otherwise, electric shock may result.



6. Wiring

6-1 Removing and Attaching the Resin Terminal Box Cover

3-phase motor: 0.1–0.4kW, high-efficiency, 3-phase motor: 0.2kW, 3-phase motor for inverter: 0.1–0.2kW

(1) Removal

As shown in figure 6-1, to remove the cover, grab the sides of the terminal box, and pull it toward you.

(2) Attachment

Push the terminal box cover from above the terminal box case until a click is heard.

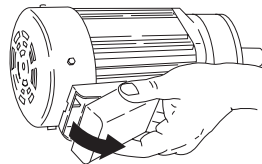


Figure 6-1

6-2 Measuring Insulation Resistance

When measuring insulation resistance, always disconnect the control panel and measure the motor alone.

Measure insulation resistance before wiring. Insulation resistance (R) is changed by a number of factors, including motor output, voltage, type of insulation, winding temperature, moisture, degree of fouling, time used, and amount of time test voltage is applied. However, normally, it must be above the values in Table 6-1.

Table 6-1 Values for Insulation Resistance

Motor voltage	Megohmmeter Voltage	Insulation Resistance (R)
Low-voltage electric motors of no more than 600V	500V	Minimum 1 MΩ

Reference: JEC -2100 contains the following equation:

$$R \geq \frac{\text{Rated Voltage (V)}}{\text{Rated output power (kW)} + 1,000} \quad (\text{M}\Omega)$$

$$R \geq \frac{\text{Rated Voltage (V)} + (\text{RPM}/3)}{\text{Rated output power (kW)} + 2,000} + 0.5 \quad (\text{M}\Omega)$$

Low insulation resistance is a sign that there is an insulation failure. Do not apply power. Consult an accredited service station.

6-3 Coordination of System Protection

- Use a wiring breaker for short circuit proofing.
- Use an overload protection device designed to handle currents that exceed the rated current on the nameplate.
- For **increased safety, explosion proof motors**, use an overload protection device capable of protecting the locked rotor current on the nameplate within the allowable locking time.

6-4 Connecting the Power Cable.

Connect the power cable and motor lead wire by clasping in a pressure connection terminal as shown in Figure 6-2.

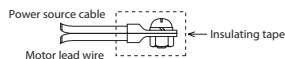


Figure 6-2



6-5 Motor Wiring

Shows the pages for motor wiring diagrams.

Table 6-2 Without Brake

Motor type		Capacity range (kW)	Number of lead wires	Page	
				Direct input from commercial power source	Inverter drive
3-phase motor	Standard	40W-0.55	3	P16	P17
	Increased safety, explosion proof	0.1 - 3.7	3	P16	-
Premium-Efficiency 3-phase motor		0.75 - 3.7	3	P16	P17
Premium-efficiency, 3-phase motor		0.1 - 0.4	3	-	P17
Premium-efficiency, 3-phase motor for inverter		0.75 - 3.7	3	-	P17
High-efficiency 3-phase motor		0.2 - 0.4	3	P16	P17
Single phase motor		40W-90W	3	P18	-
		0.1 - 0.4	6	P19	

Table 6-3 With Brake

Motor type	Capacity range (kW)	Brake type	Number of lead wires	Page		
				One-direction rotation	Both-direction Rotation	Inverter Drive
3-phase motor	40W	MB-003	5	P20	P22	P24
	60W	MB-005				
	90W	MB-010				
	0.1 <small>(Note) 2</small>					
	Frame size 5067 only					
	0.1			FB-01A1		
	0.2 0.25	FB-02A1				
Premium-Efficiency 3-phase motor	0.4	FB-05A1	5	P21	P23	P25
	0.55	FB-1D				
	0.75	FB-1E				
	1.1	FB-1HE		P21	P23	P25
	1.5	FB-2E				
	2.2	FB-3E				
	3.7	FB-5E				
Premium-efficiency, 3-phase motor	0.1	FB-02A1	5	-	-	P25
	0.2	FB-05A1				
	0.4	FB-1D				
Premium-efficiency, 3-phase motor for inverter	0.75	FB-1E	5	-	-	P25
	1.5	FB-2E				
	2.2	FB-3E				
	3.7	FB-5E				
High-efficiency 3-phase motor	0.2	FB-05A1	5	P21	P23	P25
	0.4	FB-1D				
Single phase motor	40W	MB-003	5	P26	P26	-
	60W	MB-005				
	90W	MB-010				
	0.1	FB-01A1	8	P27	P29	-
	0.2	FB-02A1				
	0.4	FB-1D		P28	P30	

Notes: 1. For motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

2. 3-phase motor 0.1kW frame size5067 is MB-010.



6. Wiring

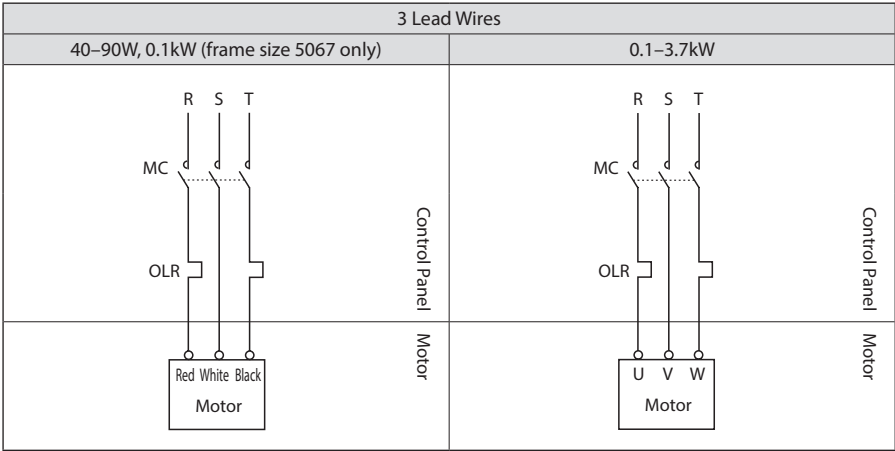
Shows motor wiring and standard specification for terminals and lead wires that are indicated by symbols.

■ Without brake. 3-phase power source

3-phase motor

Premium-Efficiency, 3-Phase Motor

High-efficiency 3-phase motor



MC : Electromagnetic contactor

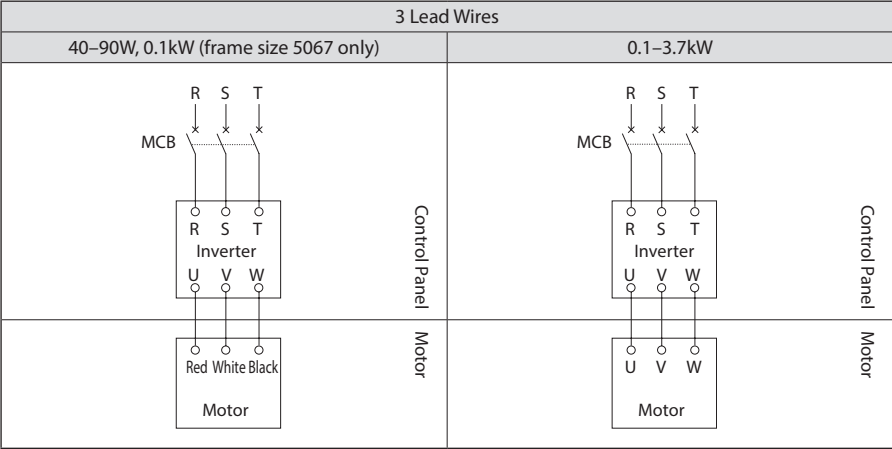
OLR : Overload protection device or electronic thermal relay

} Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

■ Without brake. Inverter drive

3-phase motor
Premium-Efficiency, 3-Phase Motor
3-phase motor for inverter
Premium-efficiency, 3-phase motor for inverter
High-efficiency 3-phase motor



MCB : Breaker for wiring – Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- The motor must be insulated to inverter-drive a 400V class 3-phase motor/high-efficiency 3-phase motor.

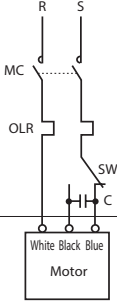
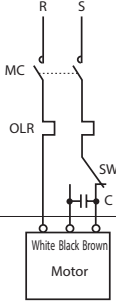


6. Wiring

■ Without brake. Single phase power source

Single phase motor

Single phase reversible motor

Capacitor run 40–90W			
100V class		200V class	
Operates rotating in one direction			
	Control Panel	Control Panel	Motor
Both-direction operation	Switch the above SW for both-direction rotation. (Use a reversible motor when an immediate both-direction rotation is required.)		

- MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

SW : Both-direction switch

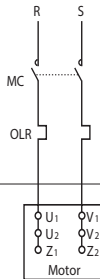
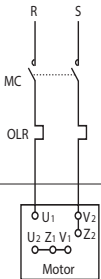
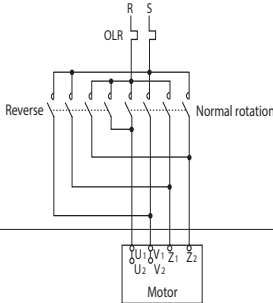
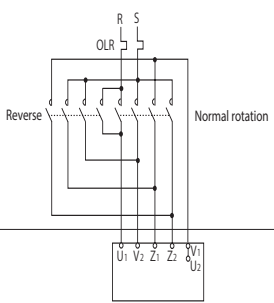
C : Capacitor (accessory)
- Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

- Use a capacitor bundled with the product (see Table 6-5 on P32) for wiring.

■ Without brake. Single phase power source

Single phase motor

Capacitor starting capacitor run 0.1–0.4kW			
100V class		200V class	
Operates rotating in one direction	 <div>Control Panel</div> <div>Motor (Terminal box)</div>	 <div>Control Panel</div> <div>Motor (Terminal box)</div>	
Both-direction operation	 <div>Control Panel</div> <div>Motor (Terminal box)</div>	 <div>Control Panel</div> <div>Motor (Terminal box)</div>	

MC: Electromagnetic contactor
OLR: Overload protection device or electronic thermal relay
Electromagnetic contactor for normal and reverse rotation

Customer to prepare.

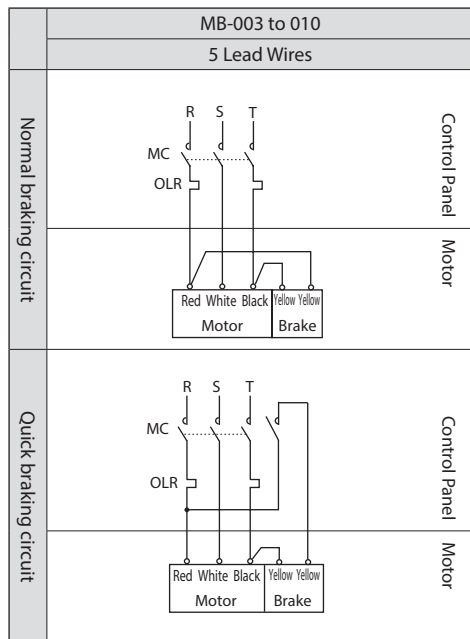
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- Reverse Z1 and Z2 after the motor stopped to rotate the motor reversely in one-direction rotation.
- The capacitor is built-in the terminal box.



6. Wiring

■ With brake. 3-phase power source. Operates rotating in one direction.

3-phase motor



MC: Electromagnetic contactor

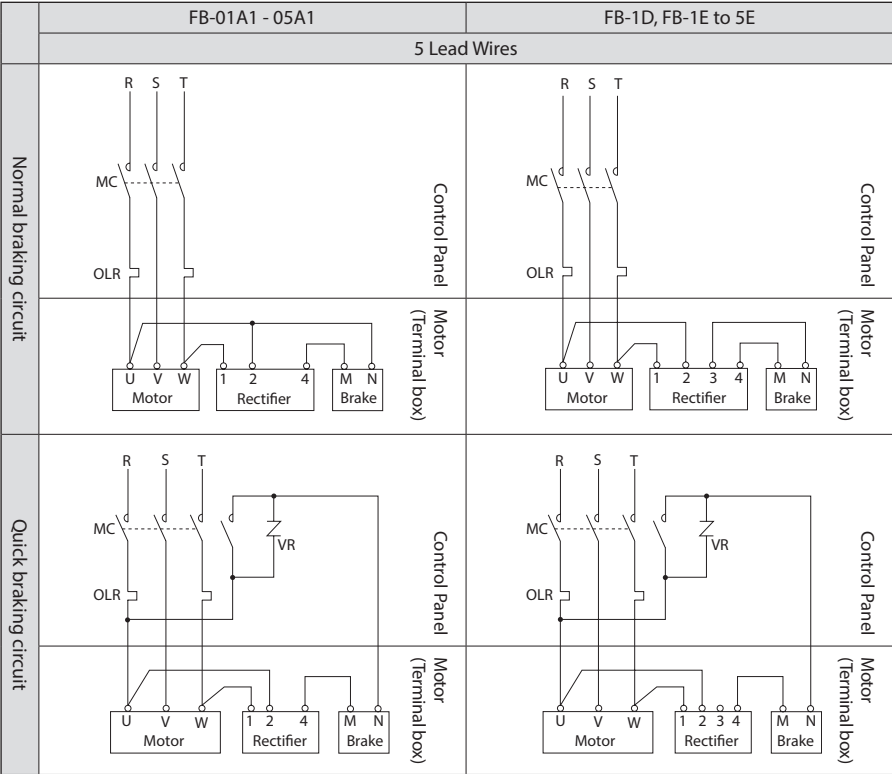
OLR: Overload protection device or electronic thermal relay

Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-2 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors for quick braking circuits, see Table 6-4 on P31.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.
- A rectifier is built-in the brake unit.

■ With brake. 3-phase power source. Operates rotating in one direction.

3-phase motor
Premium-Efficiency, 3-Phase Motor
High-efficiency 3-phase motor



MC : Electromagnetic contactor
OLR : Overload protection device or electronic thermal relay
VR : Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

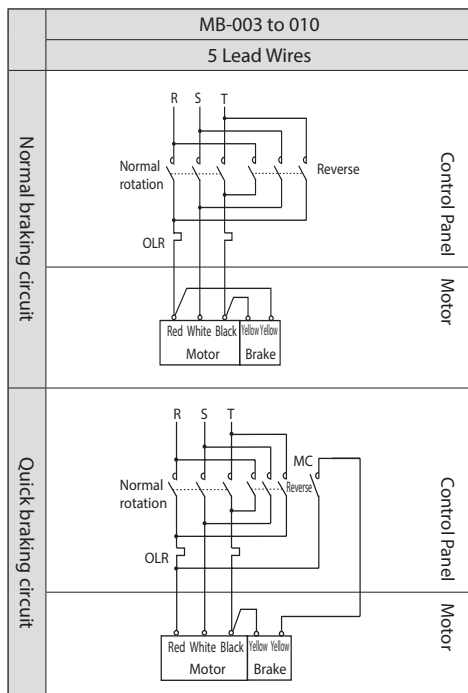
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.



6. Wiring

■ With brake. 3-phase power source. Both-direction operation

3-phase motor



Electromagnetic contactor for normal and reverse rotation

MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

— Customer to prepare.

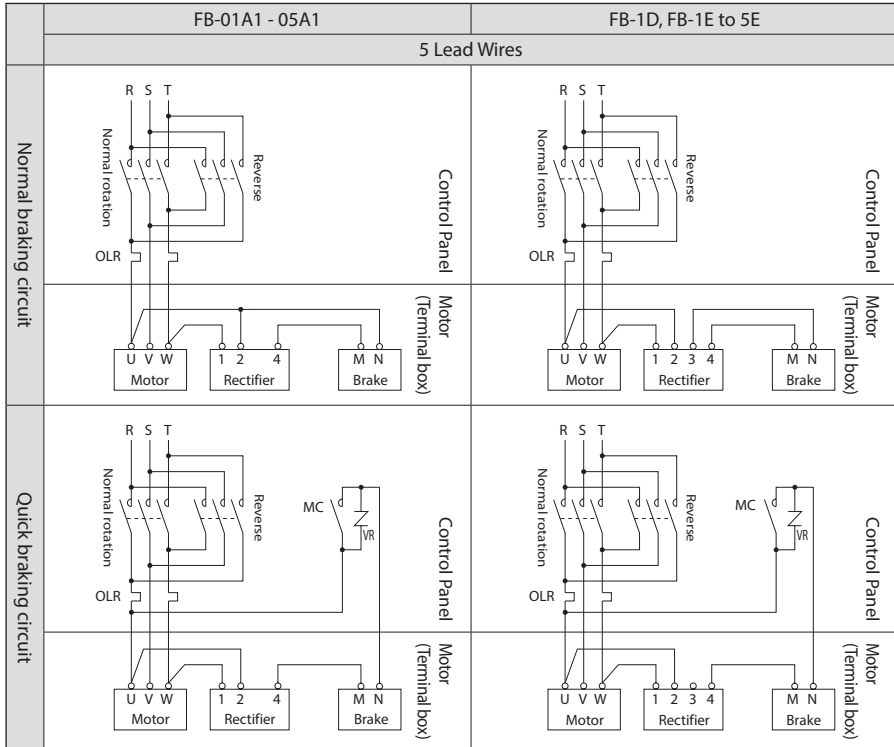
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-2 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors for quick braking circuits, see Table 6-4 on P31.
- For both-direction operations using a quick braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.
- A rectifier is built-in the brake unit.

■ With brake. 3-phase power source. Both-direction operation

3-phase motor

Premium-Efficiency, 3-Phase Motor

High-efficiency 3-phase motor



Electromagnetic contactor for normal and reverse rotation

MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

VR : Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

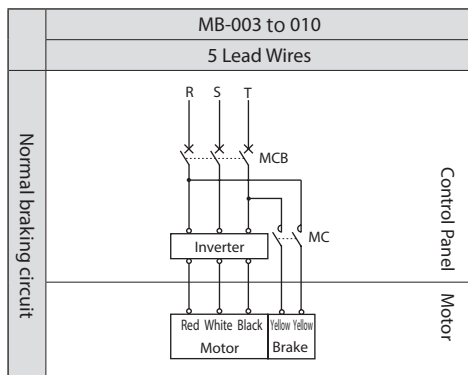
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For both-direction operations using a quick braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.



6. Wiring

■ With Brake. Inverter Drive

3-phase motor



MC : Electromagnetic contactor
MCB : Breaker for wiring

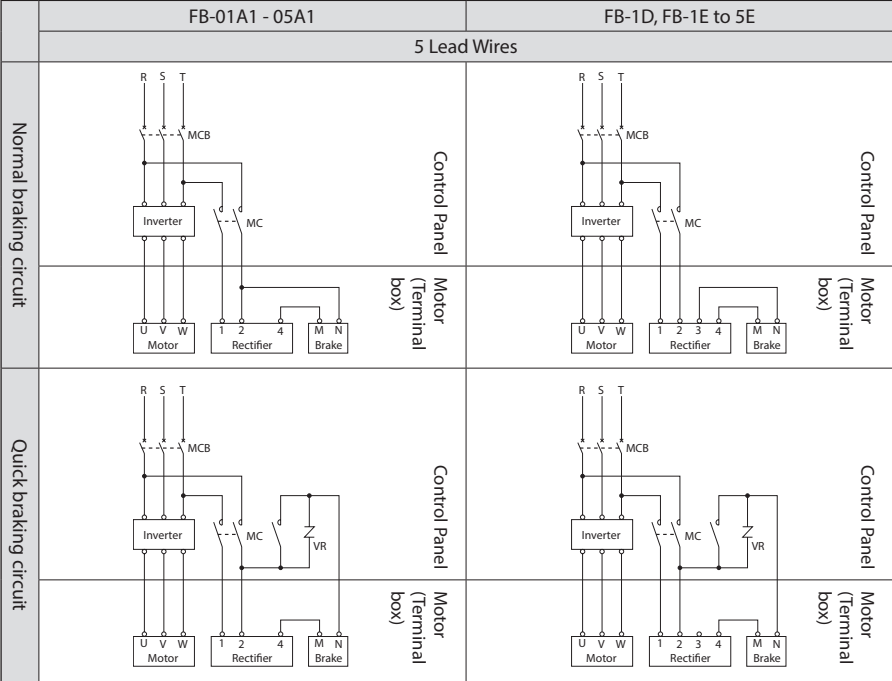
} Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Table 7-2 on P35 shows action delay time.

- Always use the inverter's power source side for the brake power source.
- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.
- A rectifier is built-in the brake unit.

■ With Brake. Inverter Drive

3-phase motor
Premium-Efficiency, 3-Phase Motor
3-phase motor for inverter
Premium-efficiency, 3-phase motor for inverter
High-efficiency 3-phase motor



MC : Electromagnetic contactor
MCB : Breaker for wiring
VR : Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
 - For brake types, see Table 1-1 on P6.
 - The motor must be insulated to inverter-drive a 400V class 3-phase motor/high-efficiency 3-phase motor.
 - Brake action delay time is different between normal and quick braking circuits.
Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
 - Use a quick braking circuit to improve hoisting equipment and stopping precision.
 - Use a quick braking circuit when a phase-advancing capacitor is mounted.
 - For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
-
- Always use the inverter's power source side for the brake power source.
 - Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.



6. Wiring

■ With brake. Single phase power source

Single phase motor

Single phase reversible motor

MB-003 to 010			
Capacitor run			
100V class		200V class	
Normal braking circuit		Control Panel	Motor
		Control Panel	
Quick braking circuit		Control Panel	Motor
		Control Panel	

MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

SW : Both-direction switch

C : Capacitor (accessory)

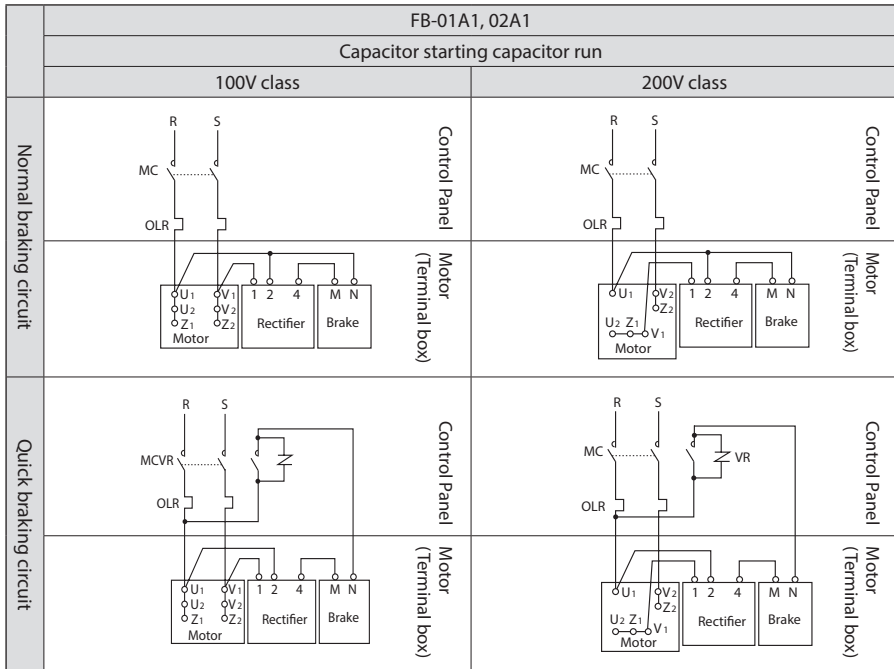
Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Use a capacitor bundled with the product (see Table 6-5 on P32) for wiring.
- Brake action delay time is different between normal and quick braking circuits. Table 7-2 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors for quick braking circuits, see Table 6-4 on P31.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

- Switch the above SW for both-direction rotation. (Use a reversible motor when an immediate both-direction rotation is required.)
- A rectifier is built-in the brake unit.

■ With brake. Single phase power source. Operates rotating in one direction.

Single phase motor



MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

VR : Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

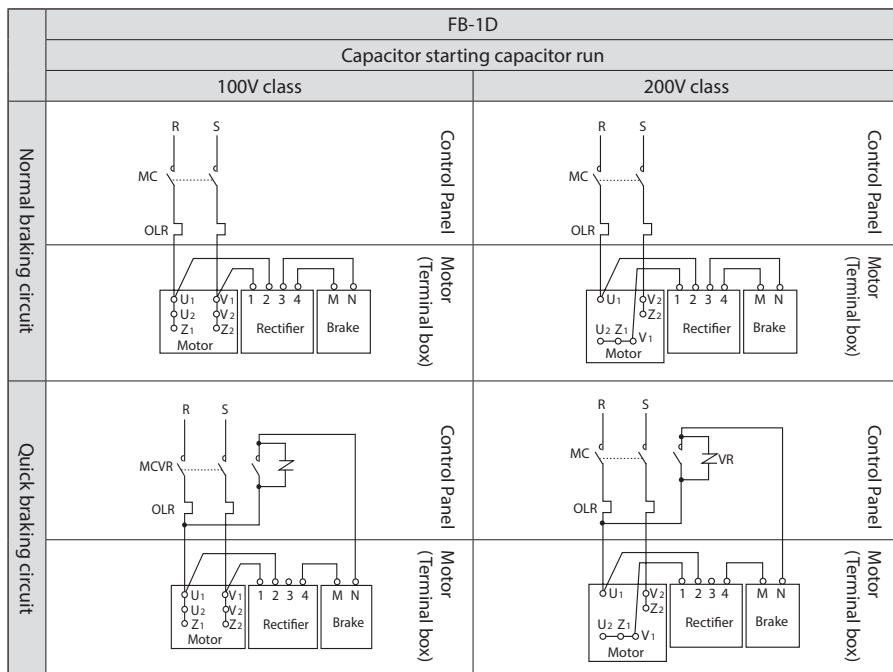
- Reverse Z1 and Z2 after the motor stopped to rotate the motor reversely.
- The capacitor is built-in the terminal box.



6. Wiring

■ With brake. Single phase power source. Operates rotating in one direction.

Single phase motor



MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

VR : Varistor (for protecting contact points, rectifier, etc.)

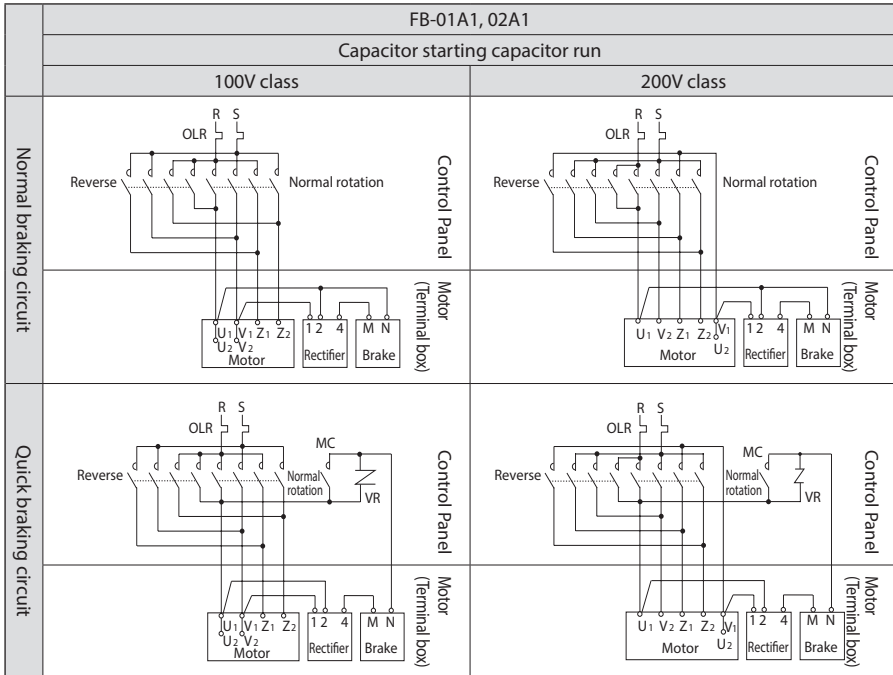
Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

- Reverse Z1 and Z2 after the motor stopped to rotate the motor reversely.
- The capacitor is built-in the terminal box.

■ With brake. Single phase power source. Both-direction operation

Single phase motor



Electromagnetic contactor for normal and reverse rotation

MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

VR : Varistor (protection element)

Customer to prepare.

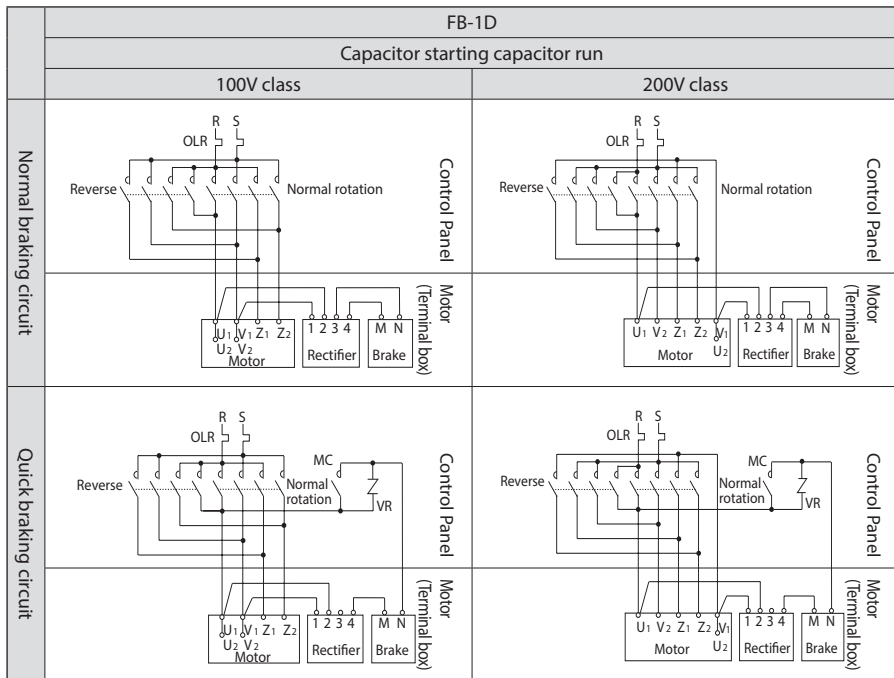
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For both-direction operations using a quick braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.
- The capacitor is built-in the terminal box.



6. Wiring

■ With brake. Single phase power source. Both-direction operation

Single phase motor



Electromagnetic contactor for normal and reverse rotation

MC : Electromagnetic contactor

OLR : Overload protection device or electronic thermal relay

VR : Varistor (protection element)

Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P6.
- Brake action delay time is different between normal and quick braking circuits. Table 7-3 on P35 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick braking circuits, see Table 6-4 on P31.
- For both-direction operations using a quick braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.
- The capacitor is built-in the terminal box.



6-6 Points to Note when Using a Quick Braking Circuit

When using brakes with quick braking circuits, take note of the following items.

- Connect a varistor (protection element) to protect the quick braking circuit contact points from surge voltage generated by the brake action.
- Wire the quick braking circuit contact points to the brake power source secondary side contacts. Contact points might not be protected.
- For information on using an alternating current electromagnetic contactor for contact points for quick braking circuits, see Table 6-4.

If multiple contact points are required, note the following issues.

- Connect electromagnetic contactor contact points in serial. (See Figure 6-3)
- Connect the varistor (VR) as close to the unit as possible. (See Figure 6-3)

Table 6-4. Type for parts recommended when using a quick braking circuit (when using an alternating current electromagnetic contactor).

AC voltage	Brake type	Recommended Contactor Type			Recommended Contactor		Recommended Varistor (For Protecting Contactor Contact Points)			
		Made by Fuji Electric FA Components & Systems Co., Ltd.	Made by Mitsubishi Electric Corporation		Contact Point Capacity (DC-13 class)		Varistor type	Maximum Allowable Circuit Voltage	Varistor voltage	Rated power
200V 220V	MB-003	SC-05	Serial contact points: 1 (0.7A)	S-N11 or S-N12	DC110V	Minimum 0.4A	—	—	—	—
	MB-005					TND07V-471KB00AAA0	AC300V	470V (423-517V)	0.25W	
	MB-010									
	FB-01A1									
	FB-02A1									
	FB-05A1									
	FB-1D									
	FB-1E									
	FB-1HE									Serial contact points: 2 (3.0A)
FB-2E	Serial contact points: 3 (4.0A)	S-N18	Serial contact points: 3 (5.0A)	Minimum 3.0A						
FB-3E										
FB-5E										
400V 440V	MB-003	SC-05	Serial contact points: 1 (0.25A)	S-N11 or S-N12	DC220V	Minimum 0.2A	—	—	—	—
	MB-005		TND10V-821KB00AAA0			AC510V	820V (738-902V)	0.4W		
	MB-010									
	FB-01A1									
	FB-02A1									
	FB-05A1									
	FB-1D									
	FB-1E									
	FB-1HE								Serial contact points: 3 (2.0A)	Serial contact points: 3 (2.0A)
FB-2E	S-N18	Minimum 1.5A								
FB-3E										
FB-5E										

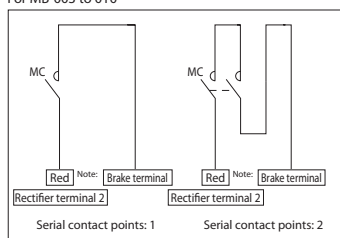


6. Wiring

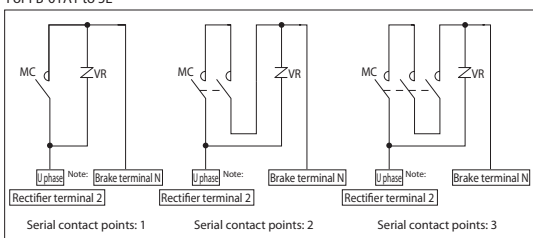
- This recommended contactor type is for Fuji Electric FA Components & Systems Co., Ltd. and Mitsubishi Electric Corporation contactors. Products from other manufacturers are also allowable if they have equivalent capabilities.
- Recommended contactor contact point capacity indicates the case where durability regarding electronic opening and closing (service life) is approximately 2 million times.
- Of the recommended contactors, the Mitsubishi Electric Corporation S-N11 has one auxiliary contact point; the S-N18 has none. This applies if, for inverter drive or other reasons, two or more auxiliary contact points are required. (Other connectors in Table 6-4 have two or more auxiliary contact points.)
- This recommended varistor type is for Nippon Chemi-Con Corporation varistors. Products from other manufacturers are also allowable if they have equivalent capabilities.
- A varistor for a single phase 100V is the same as the one for a single phase 200V.

Figure 6-3 Examples of Contact Point Connections with Quick Braking Circuits

For MB-003 to 010



For FB-01A1 to 5E



Note: For inverter drives, connect to the R phase (power source side).

6-7 Capacitor Specification of a Single Phase Power Source Motor

Table 6-5 Capacitor Run 40–90W (Accessory)

Motor			Capacitor for operation	
Voltage (V)	Type	Capacity (W)	Capacity range (μF)	Pressure resistance (V)
100	Single phase	40	14	220
		60	18	
		90	25	
	Single phase Reversible	40	16	
		60	22	
		90	32	
200	Single phase	40	3.5	440
		60	4.5	
		90	6.5	
	Single phase Reversible	40	4	
		60	5.5	
		90	8	

Table 6-6 Capacitor Starting Capacitor Run 0.1–0.4kW (Built-in the Terminal Box)

Motor		Capacitor for starting		Capacitor for operation	
Voltage (V)	Capacity (kW)	Capacity range (μF)	Pressure resistance (V)	Capacity range (μF)	Pressure resistance (V)
100/200	0.1	60	125	10	230
	0.2	100		20	
	0.4	200		40	

DANGER

- Do not approach or touch rotating parts (slow speed shaft, etc.) during operation; otherwise 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 prevent electric shock.
- Do not operate the machine while the brake is released by the manual brake release bolt; otherwise, falling, going out of control, or damage to the equipment may result.
- Do not use a single phase motor for applications in which more than the maximum torque may possibly be loaded on the motor. Otherwise, overdrive in reverse rotation may result.
- When a single phase motor than a reversible motor is rotated in reverse direction, make sure to stop the motor before rotating it in reverse direction. Otherwise, overdrive in the same direction may result.

CAUTION

- Do not put fingers or foreign objects into the opening of the gearmotor or reducer; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The gearmotor or reducer becomes very hot during operation. Touching the unit may result in burns.
- 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 load rating; otherwise, personal injury, or damage to the equipment may result.
- Do not touch the current-carrying part of the starting capacitor of a single phase motor until it is discharged fully. Otherwise, electric shock may result.

7-1 Items to Check Before Operation

After installation and wiring are completed, check the following items before operating.

- Is the wiring correct?
- Is the unit properly coupled with the driven machine?
- Are mounting bolts tightened firmly?
- Is the direction of rotation as required?

After confirming these items, operate without a load and gradually apply a load. Check the items shown in Table 7-1.

7-2 Items to Check During Operation

Table 7-1 Items to Check During Operation

Is abnormal sound or vibration generated?	<ul style="list-style-type: none">- Is the housing deformed because the installation surface is not flat?- Is insufficient rigidity of the installation base generating resonance?- Is the shaft center aligned with the driven machine?- Is the vibration of the driven machine transmitted to the gearmotor or reducer?
Is the surface temperature abnormally high?	<ul style="list-style-type: none">- Is the voltage rise or drop substantial?- Is the ambient temperature too high?- Does the current flowing to the gearmotor exceed the rated current shown on the nameplate?

If any abnormalities are found, immediately stop operation and contact the nearest authorized service station.

7-3 Brake Torque and Activation Delay Time

The table below shows standard specification brake types, their brake torque, and their relationship to brake activation delay time.

Table 7-2 Brake Torque and Activation Delay Time

Brake type	Motor Capacity (kW)							Brake activation delay time (sec)		
	3-phase Motor	Premium-Efficiency 3-phase motor	Premium-efficiency, 3-phase motor	Premium-efficiency, 3-phase motor for inverter	High-efficiency 3-phase motor	Single phase Motor	Brake Torque (Dynamic Friction Torque) (N-m)	Normal braking circuit (Simultaneous turn-off circuit)	Premium-efficiency, Normal braking circuit (Separate turn-off circuit)	Quick braking circuit
MB-003	40W	—	—	—	—	40W	0.3	0.07 -	0.03 -	0.03 -
MB-005	60W	—	—	—	—	60W	0.5	0.12	0.06	0.06
MB-010	90W	—	—	—	—	90W	1.0	0.1 - 0.15	0.05 - 0.08	0.05 - 0.08
	0.1 (frame size 5067 only)									
FB-01A1	0.1	—	—	—	—	0.1	1.0	0.15 -	0.08 -	0.015 -
FB-02A1	0.2 0.25	—	0.1	—	—	0.2	2.0	0.2	0.12	0.02
FB-05A1	0.4	—	0.2	—	0.2	—	4.0	0.1 - 0.15	0.03 - 0.07	0.01 - 0.015
FB-1D	0.55	—	0.4	—	0.4	0.4	7.5	0.2 - 0.3	0.1 - 0.15	0.01 - 0.02
FB-1E	—	0.75	—	0.75	—	—	7.5	0.25 - 0.45	0.15 - 0.25	0.01 - 0.03
FB-1HE	—	1.1	—	—	—	—	11	0.45 - 0.65	0.25 - 0.35	
FB-2E	—	1.5	—	1.5	—	—	15	0.35 - 0.55	0.15 - 0.25	
FB-3E	—	2.2	—	2.2	—	—	22	0.75 - 0.95	0.4 - 0.5	0.02 - 0.04
FB-5E	—	3.7	—	3.7	—	—	40	1.1 - 1.3	0.4 - 0.5	

Notes: 1. Brake type may differ depending on specification. Check the nameplate.

2. Brake torque will change according to operating environment, operating conditions, the condition of the friction surface, etc. In particular, brake torque may not be at the prescribed level for initial operation, and after a long period of inactivity. In such a case turn the brake on and off under as light load as possible to contact the brake's friction surfaces.
3. Brake activation delay time will change according to the brake's wiring circuit. Select the optimum circuit for the application.

Common 8. Daily Inspection and Maintenance

DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power when operating on the unit; otherwise, electric shock may result.
- Do not approach or touch any rotating parts (output shaft, etc.) during run-time maintenance or inspection of the unit; loose clothing may become caught in these rotating parts and cause serious injury or death.
- Customers must not disassemble or modify **explosion-proof motors**; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- The lead-in condition of an **explosion-proof motors**, shall conform to the facilities electrical codes, extension regulations, and explosion-proofing guide, as well as the maintenance manual; Additionally, do not open the terminal box cover while operating. otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- Do not operate the machine while the brake is released by the manual brake release bolt; otherwise, falling, going out of control, or damage to the equipment may result.

CAUTION



- Do not put fingers or foreign objects into the opening of the gearmotor or reducer; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The gearmotor or reducer becomes very hot during operation. Touching the unit with bare hands may result in serious burns.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- Do not operate the unit without a safety cover (removed during inspection) in place to shield rotating parts; otherwise loose clothing may become caught in these rotating parts and cause serious injury or death.
- Promptly identify and correct, according to instructions in this maintenance manual, any abnormalities observed during operation. Do not operate until the cause for the abnormality is understood, and the abnormality is corrected.
- Do not operate damaged gearmotors or reducers; otherwise, injury, fire, or damage to the equipment may result.
- We cannot assume any responsibility for damage or injury resulting from an unauthorized modification by a customer, as it is outside the scope of the warranty.
- Dispose of gearmotor or reducer lubricant as general industrial waste.
- When measuring the insulation resistance of an **explosion-proof motors**, confirm that there is no gas or other vaporized explosive substance around the unit in order to prevent explosion or ignition.
- Changing brake linings requires experience. Consult with the nearest authorized service station.
- Brake torque will change with operation environment and conditions, the condition of the friction surface, and other factors. In particular, brake torque may not be at the prescribed level for initial operation, and after a long period of inactivity. In such a case turn the brake on and off under as light load as possible to contact the brake's friction surfaces.

8. Daily Inspection and Maintenance Common

8-1 Daily Inspection

Make certain to carry out daily inspections in accordance with Table 8-1. Neglecting inspections is a source of trouble.

Table 8-1 Daily Inspection

Inspection item	Inspection detail
Current value  	Is the current no greater than the rated value shown on the nameplate?
Noise	Are there unusual noises, or are there extreme changes in the noises?
Vibration	Is there abnormally large vibration? Are there extreme changes?
Surface temperature	Is surface temperature unusually high? Has there been a sudden rise? (Temperature rises during operation will differ according to model and type. However, in case the difference between the gear unit surface temperature and the environment temperature should be approximately 40°C, there is no particular trouble if fluctuation is slight.)
Grease leaks	Is grease leaking from the gear unit? Are the oil seal sliding surfaces corroded?
Mounting bolts	Are the mounting bolts loose?
Chain, V-belt	Are the chain or V-belt loose?

- For a motor with the capacity of 90W or less and a traction drive (a model with letter "R" or "S" attached to the end of the frame size), the current value of the motor may stay high temporarily due to increased viscosity of grease for the gear unit or motor bearing grease during cold winter. There are no concerns of burnout of a motor even if the current may exceed the rated current for 5 to 15 minutes in a no load operation.

Considerations may be needed for the current value setting of an overload protection device, including an electronic thermal relay and selection of an inverter capacity range. Consult us for details.

- If any problems are found in a daily inspection, follow "9. Troubleshooting" (on P54 and 55) to take appropriate actions. If these actions do not remedy the issue, immediately contact the nearest authorized service station.

8-2 Main Unit Maintenance

- Because long-life grease is used for gear, it can run for a long time without replenishment, overhauling after approximately 20,000 hours or 3 to 5 years will further increase lifetime.
Contact the nearest authorized service station regarding overhaul.
- Oil seals have a lifetime. During long use natural degradation and frictional wear will reduce effectiveness. Reducer operating conditions and ambient environment will cause lifetime to widely vary. Given normal operation, (uniform load, running 10 hours per day, normal temperature) as a guideline it is recommended to change them every 1 to 3 years. If the sliding surfaces of oil seals or V-rings show signs of wear or corrosion, replace them with new ones. Sliding surfaces are made of carbon steel, so rain water, condensation and other factors could cause rust to form and spread. Because this could lead to oil seal damage, take on-going rust prevention measures.
- If stop and start are frequent, mounting bolts (or nuts) may come loose. Periodically check for looseness as this is a source of miss-alignment, oil leakages, and load unbalance.



8. Daily Inspection and Maintenance

8-3 Brake Maintenance and Inspection

DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power when operating on the unit; otherwise, electric shock may result.
- When using for lifting, do not release the brake while a load is suspended; otherwise it could fall, causing an accident.
- Do not operate the machine while the brake is released by the manual brake release bolt; otherwise, falling, going out of control, or damage to the equipment may result.
- Before operation turn power on and off to check brake action; otherwise falling or running out of control could occur.
- Do not bring water or oils in contact with the brake. Brake torque degradation could cause falling or running out of control.

CAUTION

- After gap inspection and adjustment do not operate with the fan cover removed. otherwise loose clothing may become caught in these rotating parts and cause serious injury or death.
- Changing brake linings requires experience. Consult with the nearest authorized service station.

Given normal operation conditions, brake mechanical lifetime is quite long at 2 million times. These conditions include the moment of inertia for the load being no greater than the moment of inertia for the brakemotor. However, please periodically inspect the brake gap (G). The brake lining wears after long hours of running time, making it impossible for the brake to release. When 2 million times is exceeded, wear and damage to mechanical parts may cause dropping or overdrive problems.

8-4 Brake Construction and Gap Inspection and Adjustment

- The brake is spring activated (power-off type).
- The brake lining wears after long hours of operating the brake, making it impossible for the brake to release. Therefore please periodically inspect the brake gap (G).
- If on inspection the gap is close to the limit, adjust the gap.
- In FB brakes a shock absorber is inserted between the stationary core and the armature plate to reduce the noise that results from the braking action.

When inspecting be careful that the gap gauge, other measuring tool or anything else does not damage the shock absorber or cause it to fall out.

There is danger that if the shock absorber is damaged or falls out, brake noise will increase and the brake will not function properly.

Table 8-2 Pages Containing Information on Brake Construction and Gap Inspection and Adjustment

Brake type	Indoor	Outdoor
MB-003, 005, 010	P39	—
FB-01A1, 02A1, 05A1	P40	P46
FB-1D	P41	P47
FB-1E	P42	P48
FB-1HE, 2E	P43	P49
FB-3E	P44	P50
FB-5E	P45	P51



■ MB-003, 005, 010 (Indoor type)

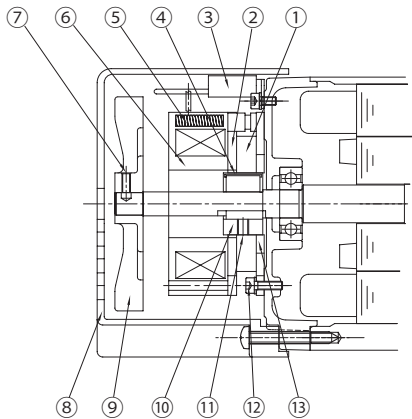


Figure 8-1

Code	Part Name
1	Brake Lining
2	Armature plate
3	Rectifier
4	Leaf spring
5	Torque spring
6	Stationary core
7	Fan set screw
8	Cover
9	Fan (mounted for single phase 60 and 90W only)
10	Boss
11	Boss set screw
12	Brake mounting bolt
13	Fixed plate

- Gap Inspection

- (1) Remove cover [8].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [2], and measure the gap. Measure in 3 locations around the circumference.
- (3) The brake lining must be replaced if the gap value is close to the limit.
(Gap adjustment is not allowed.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.05 - 0.25	0.35



8. Daily Inspection and Maintenance

■ FB-01A1, 02A1, 05A1 (Indoor type)

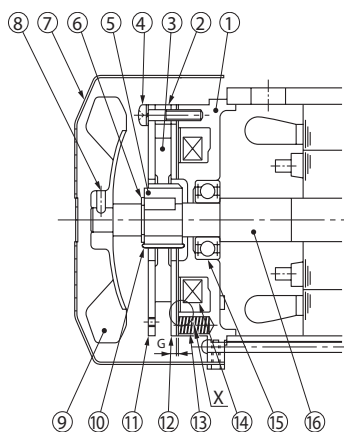
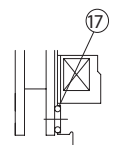


Figure 8-2



Details on Part X

Code	Part Name
1	Stationary core
2	Spacer
3	Brake Lining
4	Attachment bolt
5	Boss
6	Shaft-retaining C-ring
7	Cover
8	Fan set screw
9	Fan
10	Leaf spring
11	Fixed plate
12	Armature plate
13	Spring
14	Electromagnetic coil
15	Bearing
16	Motor shaft
17	Shock absorber

Note: FB-01A1 of a 3-phase motor
0.1kW does not have [8] and [9].

- Gap Inspection

- (1) Remove the cover [7].
- (2) Insert a gap gauge between the stationary core [1] and the armature plate [12], and measure the gap. Measure in 3 locations around the circumference.
- (3) Adjustment is required if the gap value is close to the limit.

- Gap Adjustment

- (1) Remove the cover [7].
- (2) Loosen the fan set screw [8] and remove the fan [9].
- (3) Slightly loosen the attachment bolts [4] and rotate the fixed plate [11] counterclockwise, as far as it will go. Then tighten the attachment bolts [4]. After tightening, measure the gap (G) and check to see if the gap value is between the required value and the limit. (This operation will reduce the gap by 0.3 mm.)
- (4) Turn the power on and off to check brake action.
- (5) Attach the fan [9] and cover [7]. Use a fan set screw [8] coated with Three Bond TB2365 (Sumitomo part number EW444WW-01), and tighten to a torque of 0.3 - 0.5 N·m.

Note: If the optional brake release bolt is installed, disassemble after removing the release bolt.

Gap Value G (mm)	
Required value (original value)	Limit value
0.2 - 0.35	0.5

■ FB-1D (Indoor Type)

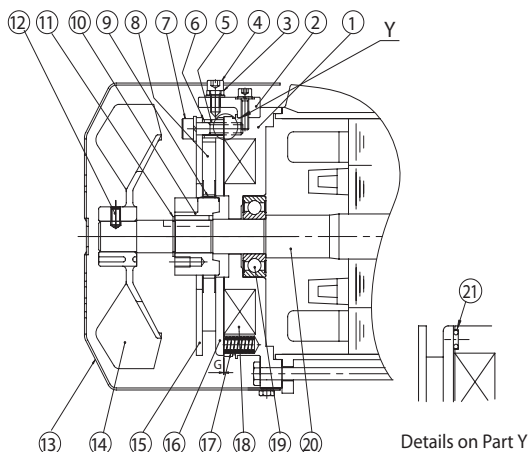


Figure 8-3

Code	Part Name
1	Stationary core
2	Brake release
3	Manual release protection spacer
4	Brake release bolt
5	Spacer
6	Gap adjusting shims
7	Attachment bolt
8	Brake Lining
9	Leaf spring
10	Boss
11	Shaft-retaining C-ring
12	Fan set screw
13	Cover
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Bearing
20	Motor shaft
21	Shock absorber

- Gap Inspection

- Remove the brake release bolt [4] and the manual release prevention spacer [3].
- Remove the cover [13].
- Insert a gap gauge between the stationary core [1] and the armature plate [16] and measure the gap. Measure in 3 locations around the circumference.
- Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.2 - 0.25 mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.3 - 0.4	0.6

- Gap Adjustment

- Remove the brake release bolt [4] and the manual release prevention spacer [3].
- Remove the cover [13].
- Remove the fan set screw [12] and remove the fan [14].
- Loosen the attachment bolts [7] and remove the spacers [5], gap adjustment shims [6], attachment bolts [7] and fixed plate [15] as a set. When removing the attachment bolts [7] only, make sure not to fall the gap adjustment shims [6] or the shock absorber [21].
- The gap adjustment shims [6] have a thickness of 0.2 - 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [5], gap adjustment shims [6], attachment bolts [7] and the fixed plate [15] as a set.
- Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- Turn the power on and off to check brake action.
- Attach the fan [14], fan set screw [12] and cover [13]. Use a fan set screw [12] coated with Three Bond TB2365 (Sumitomo part number EW445WW-01), and tighten to a torque of 0.85 - 1.05 N·m. Finally, attach the brake release bolt [4] and the manual release prevention spacer [3].



8. Daily Inspection and Maintenance

■ FB-1E (Indoor Type)

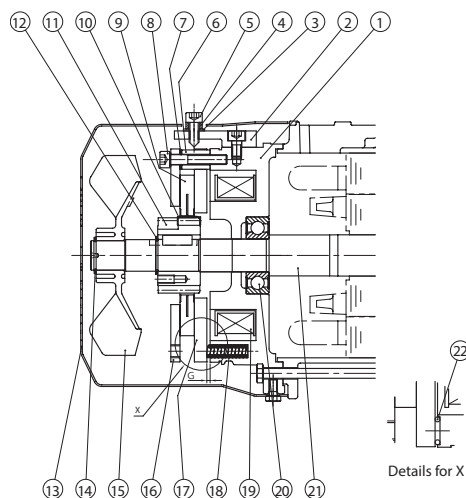


Figure 8-4

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Spacer
7	Gap adjusting shims
8	Attachment bolt
9	Brake Lining
10	Leaf spring
11	Boss
12	Shaft-retaining C-ring
13	Cover
14	Shaft-retaining C-ring
15	Fan
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Ball bearings
21	Motor shaft
22	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- (4) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.2 - 0.25 mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.6

- Gap Adjustment

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Loosen the attachment bolts [8] and remove the spacers [6], gap adjustment shims [7], attachment bolts [8] and fixed plate [16] as a set. When removing the attachment bolts [8] make certain not to omit the gap adjustment shims [7] or the shock absorber [22].
- (5) The gap adjustment shims [7] have a thickness of 0.2 - 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [6], gap adjustment shims [7], attachment bolts [8] and the fixed plate [16] as a set.
- (6) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (7) Turn the power on and off to check brake action.
- (8) Attach the fan [15], shaft-retaining C-ring [14] and cover [13].
- (9) Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].

■ FB-1HE, 2E (Indoor Type)

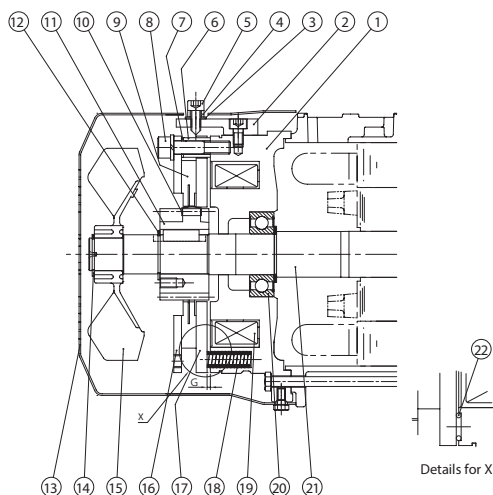


Figure 8-5

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Spacer
7	Gap adjusting shims
8	Attachment bolt
9	Brake Lining
10	Leaf spring
11	Boss
12	Shaft-retaining C-ring
13	Cover
14	Shaft-retaining C-ring
15	Fan
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Ball bearings
21	Motor shaft
22	Shock absorber

- Gap Inspection

- Remove the brake release bolt [5] and the manual release prevention spacer [4].
- Remove the cover [13].
- Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.35 - 0.45mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.75

- Gap Adjustment

- Remove the brake release bolt [5] and the manual release prevention spacer [4].
- Remove the cover [13].
- Remove the shaft-retaining C-ring [14], and remove the fan [15].
- Loosen the attachment bolts [8] and remove the spacers [6], gap adjustment shims [7], attachment bolts [8] and fixed plate [16] as a set. When removing the attachment bolts [8] make certain not to omit the gap adjustment shims [7] or the shock absorber [22].
- The gap adjustment shims [7] have a thickness of 0.35 - 0.45mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [6], gap adjustment shims [7], attachment bolts [8] and the fixed plate [16] as a set.
- Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- Turn the power on and off to check brake action.
- Attach the fan [15], shaft-retaining C-ring [14] and cover [13].
- Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].



8. Daily Inspection and Maintenance

■ FB-3E (Indoor Type)

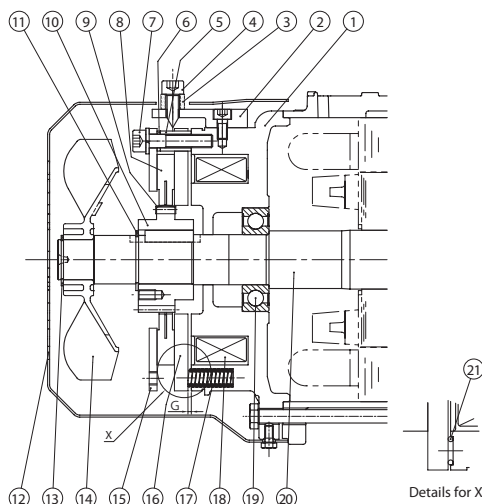


Figure 8-6

Code	Part Name
1	Stationary core
2	Brake release
3	Manual release prevention spacer
4	Brake release bolt
5	Spacer
6	Gap adjusting shims
7	Attachment bolt
8	Brake Lining
9	Leaf spring
10	Boss
11	Shaft-retaining C-ring
12	Cover
13	Shaft-retaining C-ring
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearings
20	Motor shaft
21	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [12].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [16] and measure the gap. Measure in 3 locations around the circumference.
- (4) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.45 - 0.55mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.85

- Gap Adjustment

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [12].
- (3) Remove the shaft-retaining C-ring [13] and the fan [14].
- (4) Loosen the attachment bolts [7] and remove the spacers [5], gap adjustment shims [6], attachment bolts [7] and fixed plate [15] as a set. When removing the attachment bolts [7] make certain not to omit the gap adjustment shims [6] or the shock absorber [21].
- (5) The gap adjustment shims [6] have a thickness of 0.45 - 0.55 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [5], gap adjustment shims [6], attachment bolts [7] and fixed plate [15] as a set.
- (6) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (7) Turn the power on and off to check brake action.
- (8) Attach the fan [14], shaft-retaining C-ring [13] and cover [12].
- (9) Finally, attach the brake release bolt [4] and the manual release prevention spacer [3].

■ FB-5E (Indoor Type)

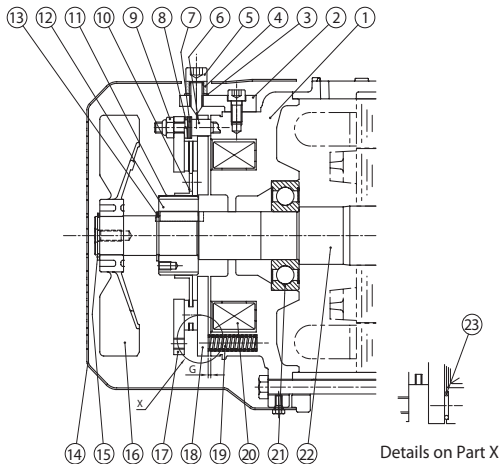


Figure 8-7

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Stud bolt
7	Adjusting washer
8	Spring washer
9	Gap adjusting nut
10	Brake Lining
11	Leaf spring
12	Boss
13	Shaft-retaining C-ring
14	Cover
15	Shaft-retaining C-ring
16	Fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [14].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [18] and measure the gap. Measure in 3 locations around the circumference.
- (4) Adjustment is required if the gap value is close to the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.35 - 0.45	1.0

- Gap Adjustment

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [14].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [18] and rotate to the right the gap adjusting nuts [9] that are attached to ends of the stud bolts [6]. If large adjustments to the gap are not possible, decrease the number of adjusting washers [7]. There are 3 gap adjusting nuts [9]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (4) Turn the power on and off to check brake action.
- (5) Attach the cover [14].
- (6) Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].



8. Daily Inspection and Maintenance

■ FB-01A1, 02A1, 05A1 (Outdoor type)

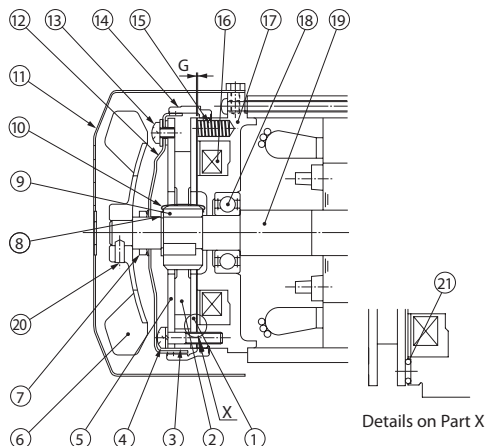


Figure 8-8

- Gap Inspection

- (1) Remove the cover ([11]).
- (2) Loosen the fan set screw [20] and remove the fan [6].
- (3) Remove the waterproof seal [14].
- (4) Insert a gap gauge between the stationary core [17] and the armature plate [1], and measure the gap. Measure in 3 locations around the circumference.
- (5) Adjustment is required if the gap value is close to the limit.

- Gap Adjustment

- (1) Remove the cover ([11]).
- (2) Loosen the fan set screw [20] and remove the fan [6].
- (3) Remove the waterproof seal [14].
- (4) Pull off the V-ring [7].
- (5) Remove the waterproof cover attachment bolts [13], and remove the waterproof cover [12].
- (6) Slightly loosen the attachment bolts [4] and rotate the fixed plate [5] counter clockwise, as far as it will go. Then tighten the attachment bolts [4]. After tightening, measure the gap (G) and check to see if the gap value is between the required value and the limit.
(This operation will reduce the gap by 0.3 mm.)
- (7) Attach the waterproof cover [12] using the attachment bolts [13]. Attach the waterproof cover [12] so that the gap (A) between its hole and the motor shaft [19] is nearly uniform around the circumference.
- (8) Clean the surface of the waterproof seal [14] to remove impurities.
- (9) As shown in the construction drawings, install the waterproof seal [14] between the stationary core [17] and the waterproof cover [12]. Insert the waterproof seal [14] with its arrow mark pointing toward the load side. (Align the hole in the waterproof seal [14] for the release bolt with the position of the release bolt.) Attach the waterproof seal [14] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [17]. Otherwise water could leak in.
- (10) Turn the power on and off to check brake action.
- (11) Attach the V-ring [7]. Wipe off the lip and surface near the lip of the V-ring [7], lightly coat the lip surface with grease and attach. Observe the attaching dimension (B = 4.5mm).
- (12) Attach the fan [7] and cover [11]. Use a fan set screw [20] coated with Three Bond TB2365 (Sumitomo part number EW444WW-01), and tighten to a torque of 0.3 - 0.5 N-m.

Note: If the optional brake release bolt is installed, disassemble after removing the release bolt.

Code	Part Name
1	Armature plate
2	Brake Lining
3	Spacer
4	Attachment bolt
5	Fixed plate
6	Fan
7	V-ring
8	Shaft retaining C-ring
9	Boss
10	Leaf spring
11	Cover
12	Waterproof cover
13	Waterproof cover attachment bolts
14	Waterproof seal
15	Spring
16	Electromagnetic coil
17	Stationary core
18	Bearing
19	Motor shaft
20	Fan set screw
21	Shock absorber

Note: FB-01A1 of a 3-phase motor 0.1kW does not have [6], [7] and [20].

Gap Value G (mm)	
Required value (original value)	Limit value
0.2 - 0.35	0.5



■ FB-1D (Outdoor type)

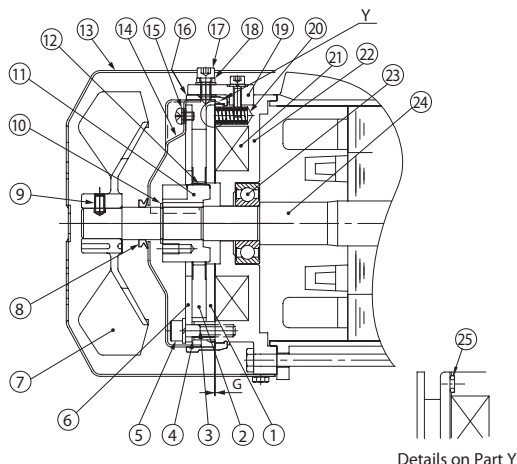


Figure 8-9

- Gap Inspection

- (1) Remove the brake release bolt [17] and the manual release prevention spacer [18].
- (2) Remove the cover [13].
- (3) Loosen the fan set screw [9] and remove the fan [7].
- (4) Remove the brake release [19]. (2 Places)
- (5) Remove the waterproof seal [16].
- (6) Insert a gap gauge between the stationary core [22] and the armature plate [1], and measure the gap. Measure in 3 locations around the circumference.
- (7) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.2–0.25 mm.
Adjustment cannot be made at a lower value.)

- Gap Adjustment

- (1) Remove the brake release bolt [17] and the manual release prevention spacer [18].
- (2) Remove the cover [13].
- (3) Loosen the fan set screw [9] and remove the fan [7].
- (4) Pull off the V-ring [8].
- (5) Remove the brake release [19]. (2 Places)
- (6) Remove the waterproof seal [16].
- (7) Remove the waterproof cover attachment bolts [15], and remove the waterproof cover [14].
- (8) Loosen the attachment bolts [5] and remove the spacers [3], gap adjusting shims [4], attachment bolts [5], fixed plate [6] as a set. When removing the attachment bolts only, make sure not to fall the gap adjustment shims [4] and the shock absorber [25].
- (9) The gap adjusting shims [4] have a thickness of 0.2 - 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [3], gap adjustment shims [4], attachment bolts [5] and the fixed plate [6] as a set.
- (10) Check the gap G, and readjust the shims if there is a large difference between it and the required value.
- (11) Attach the waterproof cover [14] using the attachment bolts [15]. Attach the waterproof cover [14] so that the gap (A) between its hole and the motor shaft [24] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction drawings, install the waterproof seal [16] between the stationary core [22] and the waterproof cover [14]. Then attach the brake release [19]. Insert the waterproof seal [16] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [16] for the release bolt with the position of release bolt [17]. Attach the waterproof seal [16] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [22]. Otherwise water could leak in.
- (14) Turn the power on and off to check brake action.
- (15) Attach the V-ring [8]. Wipe off the lip and surface near the lip of V-ring [8], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 4.5mm).
- (16) Attach the fan [7] and cover [13]. Use a fan set screw [9] coated with Three Bond TB2365 (Sumitomo part number EW445WW-01), and tighten to a torque of 0.85 - 1.05 N·m. Finally, attach the brake release bolt [17] and the manual release prevention spacer [18].

Code	Part Name
1	Armature plate
2	Brake Lining
3	Spacer
4	Gap adjusting shims
5	Attachment bolt
6	Fixed plate
7	Fan
8	V-ring
9	Fan set screw
10	Shaft retaining C-ring
11	Boss
12	Leaf spring
13	Cover
14	Waterproof cover
15	Waterproof cover attachment bolts
16	Waterproof seal
17	Brake release bolt
18	Manual release protection spacer
19	Brake release
20	Spring
21	Electromagnetic coil
22	Stationary core
23	Bearing
24	Motor shaft
25	Shock absorber

Gap Value G (mm)	
Required value (original value)	Limit value
0.3 - 0.4	0.6





8. Daily Inspection and Maintenance

■ FB-1E (Outdoor Type)

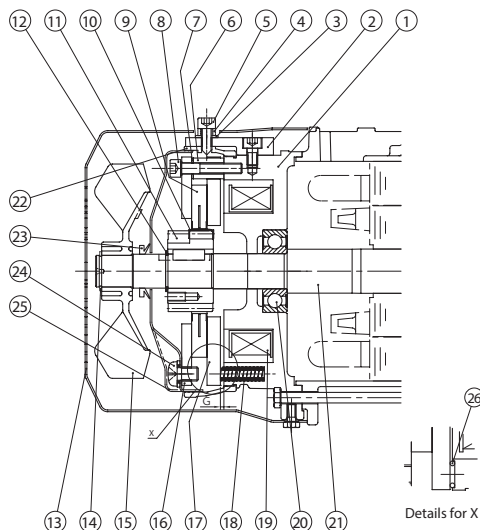


Figure 8-10

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Spacer
7	Gap adjusting shims
8	Attachment bolt
9	Brake Lining
10	Leaf spring
11	Boss
12	Shaft-retaining C-ring
13	Cover
14	Shaft-retaining C-ring
15	Fan
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Ball bearings
21	Motor shaft
22	Waterproof seal
23	V-ring
24	Waterproof cover attachment bolts
25	Waterproof cover
26	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.2 - 0.25 mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.6



- Gap Adjustment

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Pull off the V-ring [23].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (6) Remove the waterproof cover attachment bolts [24], and remove the waterproof cover [25].
- (7) Loosen the attachment bolts [8] and remove the spacers [6], gap adjustment shims [7], attachment bolts [8] and fixed plate [16] as a set. When removing the attachment bolts [8] make certain not to omit the gap adjustment shims [7] or the shock absorber [26].
- (8) The gap adjustment shims [7] have a thickness of 0.2 - 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [6], gap adjustment shims [7], attachment bolts [8] and the fixed plate [16] as a set.
- (9) Check the gap G, and readjust the shims if there is a large difference between it and the required value.
- (10) Attach the waterproof cover [25] using the waterproof cover attachment bolts [24]. At this time align the cutout area on the side of the waterproof cover [25] with the brake release bolt [5]. Attach the waterproof cover [25] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (11) Clean the surface of the waterproof seal [22] to remove impurities.
- (12) As shown in the construction drawings, install the waterproof seal [22] between the stationary core [1] and the waterproof cover [25]. Then attach the brake release [2]. Insert the waterproof seal [22] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [22] for the brake release bolt with the position of the release bolt [5]. Attach the waterproof seal [22] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. (Be careful that the waterproof seal [22] does not meander. Otherwise water could leak in.)
- (13) Turn the power on and off to check brake action.
- (14) Attach the V-ring [23]. Wipe off the lip and surface near the lip of the V-ring [23], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 6mm).
- (15) Attach the fan [15], shaft-retaining C-ring [14] and cover [13].
- (16) Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].



■ FB-1HE, 2E (Outdoor Type)

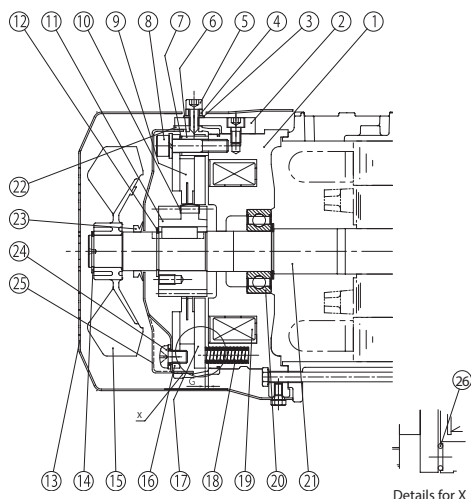


Figure 8-11

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Spacer
7	Gap adjusting shims
8	Attachment bolt
9	Brake Lining
10	Leaf spring
11	Boss
12	Shaft-retaining C-ring
13	Cover
14	Shaft-retaining C-ring
15	Fan
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Ball bearings
21	Motor shaft
22	Waterproof seal
23	V-ring
24	Waterproof cover attachment bolts
25	Waterproof cover
26	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.35 - 0.45mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.75



- Gap Adjustment

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Pull off the V-ring [23].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (6) Remove the waterproof cover attachment bolts [24], and remove the waterproof cover [25].
- (7) Loosen the attachment bolts [8] and remove the spacers [6], gap adjustment shims [7], attachment bolts [8] and fixed plate [16] as a set. When removing the attachment bolts [8] make certain not to omit the gap adjustment shims [7] or the shock absorber [26].
- (8) The gap adjustment shims [7] have a thickness of 0.35 - 0.45mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [6], gap adjustment shims [7], attachment bolts [8] and the fixed plate [16] as a set.
- (9) Check the gap G, and readjust the shims if there is a large difference between it and the required value.
- (10) Attach the waterproof cover [25] using the waterproof cover attachment bolts [24]. At this time align the cutout area on the side of the waterproof cover [25] with the brake release bolt [5]. Attach the waterproof cover [25] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (11) Clean the surface of the waterproof seal [22] to remove impurities.
- (12) As shown in the construction drawings, install the waterproof seal [22] between the stationary core [1] and the waterproof cover [25]. Then attach the brake release [2]. Insert the waterproof seal [22] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [22] for the brake release bolt with the position of the release bolt [5]. Attach the waterproof seal [22] so that its protrusion fits snugly around the entire circumference of the groove of the stationary core [1]. (Be careful that the waterproof seal [22] does not meander. Otherwise water could leak in.)
- (13) Turn the power on and off to check brake action.
- (14) Attach the V-ring [23]. Wipe off the lip and surface near the lip of the V-ring [23], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 6mm).
- (15) Attach the fan [15], shaft-retaining C-ring [14] and cover [13].
- (16) Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].



■ FB-3E (Outdoor Type)

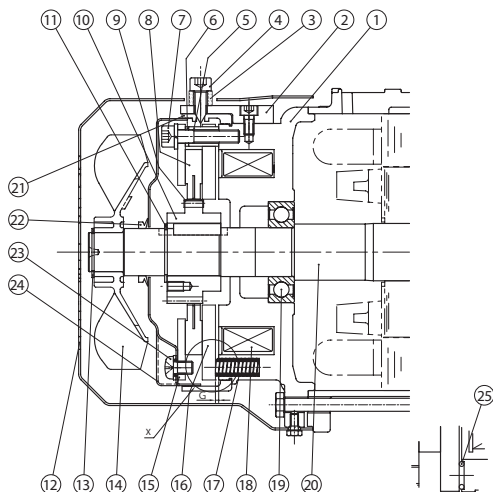


Figure 8-12

Details for X

Code	Part Name
1	Stationary core
2	Brake release
3	Manual release prevention spacer
4	Brake release bolt
5	Spacer
6	Gap adjusting shims
7	Attachment bolt
8	Brake Lining
9	Leaf spring
10	Boss
11	Shaft-retaining C-ring
12	Cover
13	Shaft-retaining C-ring
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearings
20	Motor shaft
21	Waterproof seal
22	V-ring
23	Waterproof cover attachment bolts
24	Waterproof cover
25	Shock absorber

- Gap Inspection

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Remove the shaft-retaining C-ring [13] and the fan [14].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [21].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [16] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is close to the limit.
(Gap adjustment shim thickness is approximately 0.45 - 0.55mm. Adjustment cannot be made at a lower value.)

Gap Value G (mm)	
Required value (original value)	Limit value
0.25 - 0.35	0.85



- Gap Adjustment

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Remove the shaft-retaining C-ring [13] and the fan [14].
- (4) Pull off the V-ring [22].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [21].
- (6) Remove the waterproof cover attachment bolts [23], and remove the waterproof cover [24].
- (7) Loosen the attachment bolts [7] and remove the spacers [5], gap adjustment shims [6], attachment bolts [7] and fixed plate [15] as a set. When removing the attachment bolts [7] make certain not to omit the gap adjustment shims [6] or the shock absorber [25].
- (8) The gap adjustment shims [6] have a thickness of 0.45 - 0.55 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [5], gap adjustment shims [6], attachment bolts [7] and fixed plate [15] as a set.
- (9) Check the gap G, and readjust the shims if there is a large difference between it and the required value.
- (10) Attach the waterproof cover [24] using the waterproof cover attachment bolts [23]. At this time align the cutout area on the side of the waterproof cover [24] with the brake release bolt [4]. Attach the waterproof cover [24] so that the gap (A) between its hole and the motor shaft [20] is nearly uniform.
- (11) Clean the surface of the waterproof seal [21] to remove impurities.
- (12) As shown in the construction drawings, install the waterproof seal [21] between the stationary core [1] and the waterproof cover [24]. Then attach the brake release [2]. Align the hole in the waterproof seal [21] for the brake release bolt with the position of the release bolt [4]. Attach the waterproof seal [21] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. (Be careful that the waterproof seal [21] does not meander. Otherwise water could leak in.)
- (13) Turn the power on and off to check brake action.
- (14) Attach the V-ring [22]. Wipe off the lip and surface near the lip of the V-ring [22], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 6mm).
- (15) Attach the fan [14], shaft-retaining C-ring [13] and cover [12].
- (16) Finally, attach the brake release bolt [4] and the manual release prevention spacer [3].



■ FB-5E (Outdoor Type)

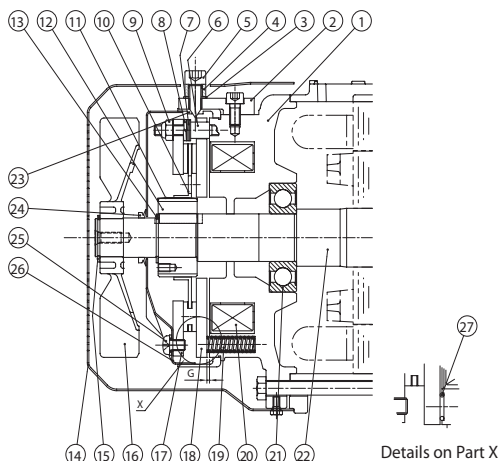


Figure 8-13

- Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [14].
- (3) Remove the shaft-retaining C-ring [15] and the fan [16].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [23].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [18] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is close to the limit.

- Gap Adjustment

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [14].
- (3) Remove the shaft-retaining C-ring [15] and the fan [16].
- (4) Pull off the V-ring [24].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [23].
- (6) Remove the waterproof cover attachment bolts [25], and remove the waterproof cover [26].
- (7) Insert a gap gauge between the stationary core [1] and the armature plate [18] and rotate to the right the gap adjusting nuts [9] that are attached to ends of the stud bolts [6]. If the gap is large, and adjustments are not possible, decrease the number of adjustment washers [7]. There are 3 adjusting nuts [9]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (8) Attach the waterproof cover [26] using the waterproof cover attachment bolts [25]. At this time align the cutout area on the side of the waterproof cover [26] with the brake release bolt [5]. Attach the waterproof cover [26] so that the gap (A) between its hole and the motor shaft [22] is nearly uniform.
- (9) Clean the surface of the waterproof seal [23] to remove impurities.
- (10) As shown in the construction drawings, install the waterproof seal [23] between the stationary core [1] and the waterproof cover [26]. Then attach the brake release [2]. Align the hole in the waterproof seal [23] for the brake release bolt with the position of the release bolt [5]. Next, attach along the machined surfaces around the stationary core [1]. Be careful that the waterproof seal [23] does not meander. Otherwise water could leak in.)
- (11) Turn the power on and off to check brake action.
- (12) Attach the V-ring [24]. Wipe off the lip and surface near the lip of the V-ring [24], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 6mm).
- (13) Attach the fan [16], shaft-retaining C-ring [15] and cover [14].
- (14) Finally, attach the brake release bolt [5] and the manual release prevention spacer [4].

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release prevention spacer
5	Brake release bolt
6	Stud bolt
7	Adjusting washer
8	Spring washer
9	Gap adjusting nut
10	Brake Lining
11	Leaf spring
12	Boss
13	Shaft-retaining C-ring
14	Cover
15	Shaft-retaining C-ring
16	Fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	Waterproof seal
24	V-ring
25	Waterproof cover attachment bolts
26	Waterproof cover
27	Shock absorber

Gap Value G (mm)	
Required value (original value)	Limit value
0.35 - 0.45	1.0





8. Daily Inspection and Maintenance

8-5 Changing the Brake Lining

If the following conditions occur ask the nearest authorized service station to exchange the brake linings with new ones.

(1) FB-1D, 1E - 5E

When the thickness of brake lining reaches the use limit thickness in Table 8-3



(2) MB-003-010

When the gap reaches the limit (see P39)

(3) FB-01A1-05A1

When the brake gap still reaches the limit after the gap adjustment (see P40 and 46)

Table 8-3 Brake Lining Dimensions

Brake type	Brake Lining Dimension drawing	Original thickness	Usable Thickness Limit
		t_0 (mm)	t_0 (mm)
MB-003, 005, 010		7.0	—
FB-01A1, 02A1, 05A1			6.0
FB-1D		8.8	7.8
FB-1E			8.0
FB-1HE, 2E		10.4	8.4
FB-3E		10	6.0
FB-5E			

- Brake torque may not be at the prescribed level during initial operation. In such case, turn motor and brake power on and off under the lightest possible load, to rub the brake lining friction surfaces.
- When changing the brake lining, change the boss and leaf springs (for FB-5E, include the gap adjusting nuts) as a set.
- After 2 million or more cycles of operation, or after 10 years or more have passed since shipment from the factory, inspect to check whether continued operation is possible, even if the lining is not at the usable thickness limit.
- Check the following items concerning the condition of each mechanical part.
 - Are the linings split or chipped?
 - Is there any peeling or gap between the lining and the disc?
 - Does the lining spline unit exhibit any cracking, chipping, or stepped wear?
 - Is there any stepped wear on the surfaces around the stud bolts or armature plate?
- Change the brake lining, even if it has not reached the usable thickness limit, if 10 or more years have elapsed since the manufacturing date and the brake is used outdoors or in a high-humidity environment, or if it is stored or rested for a long period of time.

8-6 Changing the V-Ring and Waterproof Seal (Outdoor Type)

V-rings and waterproof seals degrade over the years, losing their waterproofing abilities. As a guideline contact the nearest authorized service station every 3 years. If the sliding surfaces of oil seals or V-rings show signs of wear or corrosion, replace them with new ones. Sliding surfaces are made of carbon steel, so rain water, condensation and other factors could cause rust to form and spread. Because this could lead to oil seal damage, take on-going rust prevention measures.



8-7 Manually Releasing the Brake

■ FB-1D, 1E-5E (FB-01A1-05A1 are options)

To manually release the brake with the power off, operate the brake release mechanism as shown below.

- (1) First remove the brake release bolts from the 2 opposing angles and remove the release prevention spacers. Reinsert the bolts and rotate with a hexagonal wrench to release the brake. Be careful not to over rotate the brake release bolts. (Rotate the brake release bolts while checking to see if the brake is released. (See Figures 8-14, 8-15)
- (2) After releasing the brake, to return it to its original condition, for safety, return the manual release prevention spacers that were removed in (1) to their original positions. (See Figure 8-15)
- (3) This table show brake release bolt sizes.

Brake type	Bolt size
FB-01A1, 02A1, 05A1, 1D	M5
FB-1E, 1HE, 2E	M6
FB-3E	M8
FB-5E	M10

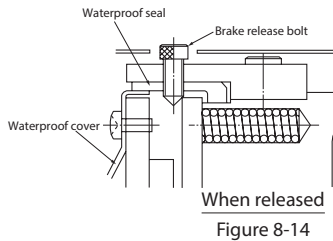


Figure 8-14

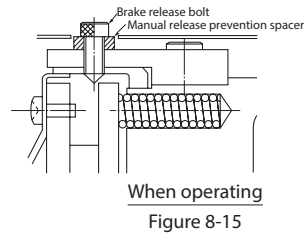


Figure 8-15

Note: Indoor types do not come with waterproof seals or waterproof covers.

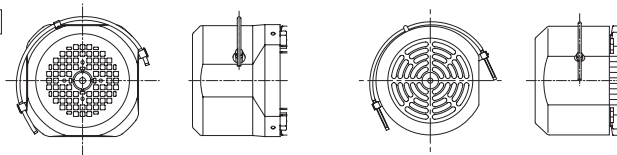
■ One-Touch Release Lever Type (Optional)

Do the following to release the brake using the one-touch release lever type.

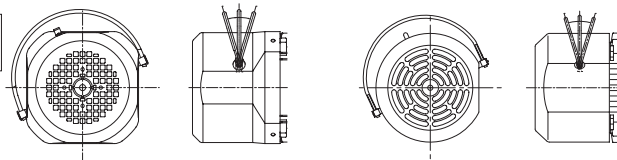
All you need to do to release the brake is push the release lever over. (See Figure 8-16)

- (1) To release the brake, pull the release lever out of the holder, and push it toward the load or anti-load side. (Some specifications do not allow pushing the release lever toward the load side.) Be careful not to push the lever too far. Pushing the lever too far could damage the brake. (Push the release lever while checking to see if the brake is released.)
- (2) When operating the motor make certain to return the lever to its original position and set it inside the holder. Start operation after confirming that the brake operates properly.

When operating



When brake is manually released



Premium-efficiency motor

Other than premium-efficiency motor

Figure 8-16

Common 9. Troubleshooting

If any abnormal condition occurs, refer to Table 9-1, 9-2 and promptly take appropriate measures.
If these actions do not remedy the issue, immediately contact the nearest authorized service station.

Table 9-1 Troubleshooting

Problem			Cause	Correction	
The motor will not operate under no load			Power failure	Contact the electric power company.	
			Defective electric circuit	Check the circuit.	
			Blown fuse	Replace the fuse.	
			Protective device is engaged	Fix the problem and recover.	
			Load locking	Check the load and safety device.	
			Poor switch contact	Adjust the contact unit.	
			Motor stator coil disconnect	Confer with authorized service station.	
			Bearing damage	Confer with authorized service station.	
			A governor switch is defective (0.1–0.4kW single phase motor)	Confer with authorized service station.	
			A capacitor is damaged (single phase motor)	Confer with authorized service station.	
			3-phase is functioning as single-phase	Check the power supply with a voltmeter. Check the motor, transformer coil, contactor, fuse, etc. and repair or replace them.	
			Friction surface of brake is corroded	Request brake cleaning from an authorized service station.	
The motor rotates without a load but the slow speed shaft does not rotate.			Incorrect brake gap adjustment	Re-adjust brake gap. (See P40–51)	
The motor rotates without a load but the slow speed shaft does not rotate.			Damage to gear unit due to overloading of gears, etc.	Confer with authorized service station.	
The slow speed shaft turns with no load	When a load is applied	The switch overheats	Insufficient switch capacity	Replace with specified fuse.	
			Overload	Decrease the load to the specified value.	
		Fuse tripping	Insufficient fuse capacity	Replace with specified fuse.	
			Overload	Decrease the load to the specified value.	
			A governor switch is defective (0.1–0.4kW single phase motor)	Confer with authorized service station.	
		The speed will not increase and the motor is overheating.	Voltage drop	Contact the electric power company.	
			Overload	Decrease the load to the specified value.	
			A capacitor capacity range is low (single phase motor)	Confer with authorized service station.	
			Short-circuited motor stator coil	Confer with authorized service station.	
		It stops.	The key is not inserted	Insert key.	
			Bearing burnout	Confer with authorized service station.	
			Poor adjustment of protection device	Adjust the protection device.	
		The motor runs in the reverse direction.		Wiring error	Change the connection.
		Fuse tripping	The lead wire is short circuited.	Confer with authorized service station.	
			Poor contact between motor and starter	Make good connection.	
		Excessive temperature rise			Overload
Voltage drop or rise	Contact the electric power company.				
A governor switch is defective (0.1–0.4kW single phase motor)	Confer with authorized service station.				
A capacitor for operation range is low (single phase motor)	Confer with authorized service station.				
The ambient temperature is high	Improve the ventilation method.				
Damaged bearing	Confer with authorized service station.				
Abnormal wear of reducer parts due to overload, etc.	Confer with authorized service station.				

9. Troubleshooting **Common**

Table 9-2 Troubleshooting

Problem		Cause	Correction
Grease leaks	Blot or drip of a small amount of oil or grease at seal section of high speed or slow speed shaft.	Grease applied to the oil seal seeps out at first.	Wipe off around the oil seal, and observe.
	Leakage of grease from high speed or slow speed shaft section	Damaged oil seal or maybe damaged shaft (or collar)	Confer with authorized service station.
	Leakage of grease from the contact surfaces of frame size and casing, etc.	Loose fastener bolts	Tighten fastener bolts correctly.
	Leakage of grease into motor	Oil seal damage	Confer with authorized service station.
Abnormal sound Excessive vibration		Dust and foreign matter in bearings, or damaged bearings	Confer with authorized service station.
		Reducer parts grinding on foreign matter	Confer with authorized service station.
		Reducer parts are damaged	Confer with authorized service station.
		Warping of case because the installation surface is not flat	Make the installation base flat or make adjustment using liners, etc.
		Resonance due to insufficient rigidity of the installation base	Reinforce the installation base to increase rigidity.
		Nonalignment of the center of axle with driven machine	Align the center of axle.
		Transmission of vibration from the driven machine	Individually operate the product to check the source of the sound.
Abnormal motor sounds		Foreign objects have entered	Confer with authorized service station.
		Bearing damage	Confer with authorized service station.
		Improper brake gap adjustment	Adjust the brake gap. (See P40 - 51)
		Brake lining wear	Request brake lining replacement from an authorized service station.
		Brake unit electromagnetic coil burnout	Confer with authorized service station.
		Rectifier damage	Confer with authorized service station.
		A leaf spring in the brake boss unit has come off or is damaged	Confer with authorized service station.
		A governor switch is defective (0.1~0.4kW single phase motor)	Confer with authorized service station.
Brake is ineffective	Does not activate	Forgot to restore the brake release bolt to its original position	Restore the release bolt.
		Improper adjustment after disassembly	Request authorized service station to re-adjust.
	Slips (Braking takes a long time)	Not using the quick braking circuit	Change to quick braking circuit. (See P20 - 30)
		Foreign objects in brake lining unit, oil adhesion	Request cleaning from authorized service station.
		Brake lining wear	Adjust the brake gap. Request brake lining replacement from an authorized service station.
		Brake gap not uniform	Adjust the brake gap.
		Overload	Decrease the load to the specified value.
		Brake release bolt not sufficiently restored	Restore the release bolt.
	Intermittent Tripping	Overcurrent shut-off	Sudden speed changes Increase the time for speed changes.
		Overcurrent due to ground fault	Extreme load fluctuation Decrease load fluctuation.
		Direct current overcurrent	Ground fault on output side Take measures to prevent ground fault.
		Regenerative overvoltage shut-off	Short on output side Take measures to prevent short. Inspect wiring.
		Thermal operation	Increase the time for speed reduction. Decrease brake frequency.
			Decrease the load to the specified value.



10. Construction Drawings

10-1 Construction (CYCLO mechanism, single reduction type)

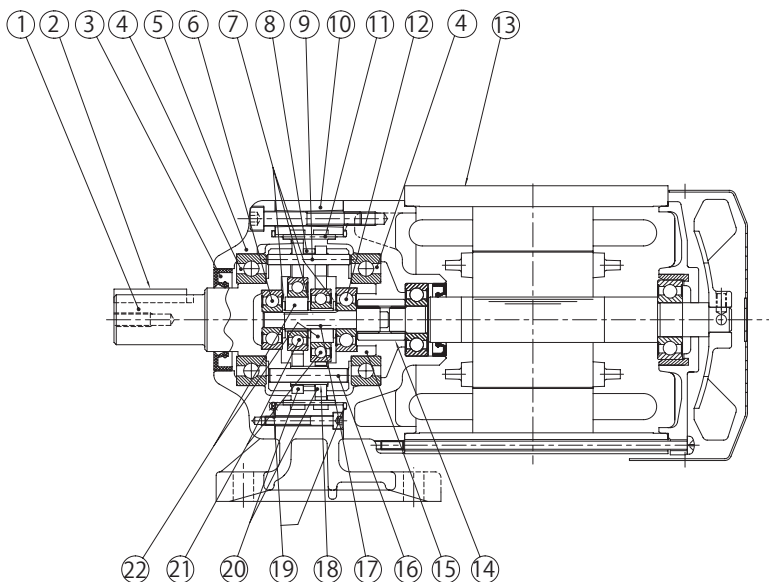


Figure 10-1 Type CNHM, CYCLO Mechanism, Single Reduction Type (Ex.: Frame Size 5087)

Table10-1 Gearmotor, Principal Parts

Code	Part Name	Code	Part Name	Code	Part Name	Code	Part Name
1	Slow speed shaft (Output shaft)	7	Spacer ring	13	Motor	19	O-ring
2	Key	8	Spacer ring	14	Joint spline	20	Cycloid disc
3	Oil seal	9	Slow speed shaft pin	15	Carrier	21	Bearing
4	Bearing	10	Foot mount frame	16	Carrier pin	22	Eccentric article
5	Cover	11	Ring gear pin	17	Center shaft		
6	Bearing	12	Bearing	18	Carrier pin pipe		



10-2 Construction (traction drive)

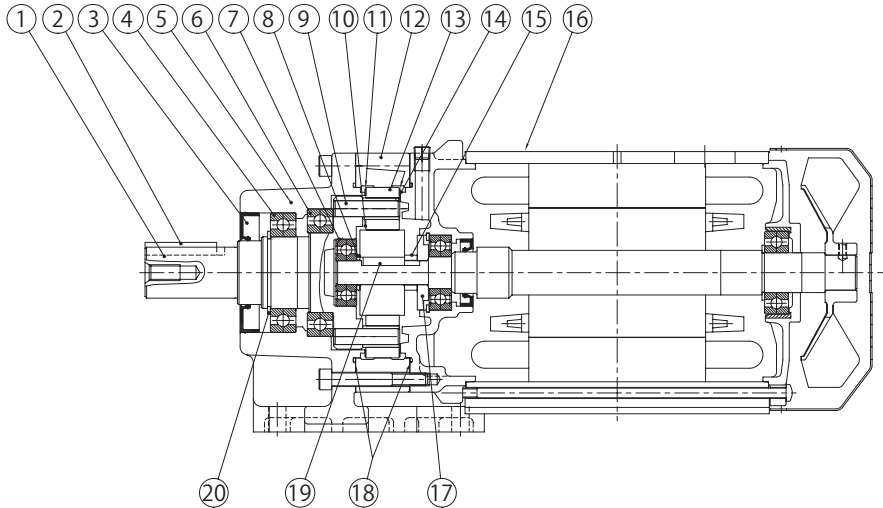


Figure 10-2 Type CNHM, Traction Drive (Ex.: Frame Size 510R)

Table10-2 Gearmotor, Principal Parts

Code	Part Name	Code	Part Name	Code	Part Name	Code	Part Name
1	Slow speed shaft (Output shaft)	7	Bearing	13	Planetary roller	19	Key
2	Key	8	Spacer ring	14	Slow speed shaft roller	20	Retaining ring
3	Oil seal	9	Slow speed shaft pin	15	Spacer ring		
4	Bearing	10	Sun roller	16	Motor		
5	Horizontal casing	11	Washer	17	Oil slinger		
6	Bearing	12	Ring roller	18	O-ring		



10. Construction Drawings

10-3 Construction (Planetary Gear Mechanism)

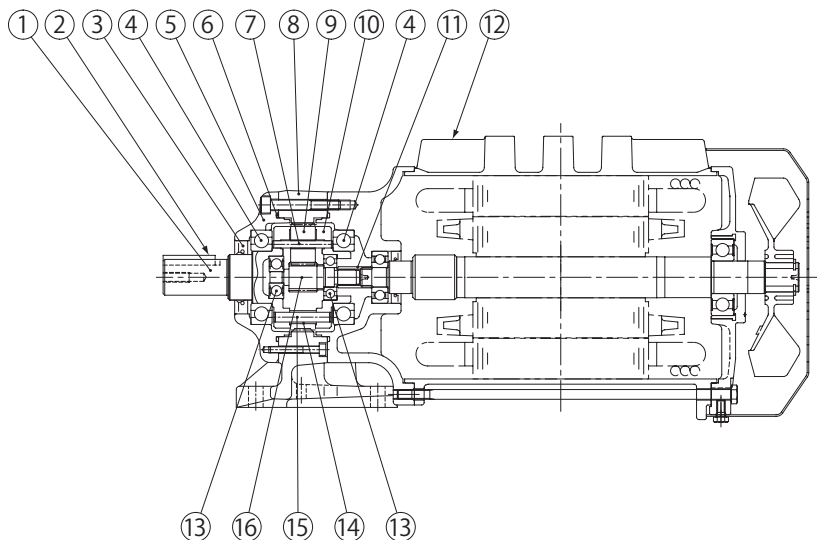


Figure 10-3 Type PNHM, Pin punch Gear Mechanism (Ex., Frame Size 5083)

Table10-3 Gearmotor, Principal Parts

Code	Part Name	Code	Part Name	Code	Part Name	Code	Part Name
1	Slow speed shaft (Output shaft)	5	Cover	9	Planetary gear	13	Bearing
2	Key	6	O-ring	10	Carrier	14	Carrier pin pipe
3	Oil seal	7	Slow speed shaft pin	11	Joint spline	15	Carrier pin
4	Bearing	8	Foot mount internal gear	12	Motor	16	Sun gear

The scope of our warranty for our products is limited to the range of our manufacture.
Warranty (period and contents)

Warranty Period	The warranty period for the Products shall be earlier, 18 months after the shipment of the Products from the seller's works factory, or 12 months after starting operation, whichever is first.
Warranty Conditions	<p>In the event that any problem or damage to the Product arises during the "Warranty Period" from defects in the Product whenever the Product is properly installed and combined with the Buyer's equipment or machines, maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agree upon in writing between the Seller and the Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product, without charge, at a designated facility, except as stipulated in the "Warranty Exclusions" described below.</p> <p>However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.</p>
Warranty Exclusions	<p>Notwithstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by:</p> <ol style="list-style-type: none"> 1. installation, connection, combination or integration of the Product in or to the other equipment or machine that is rendered by any person or entity other than the Seller; 2. insufficient maintenance or improper operation by the Buyer or its customers, such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller; 3. improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications, or use of lubricating oil in the Product that is not recommended by the Seller; 4. Any problem or damage to any equipment or machine to which the Product is installed, connected or combined, or on any specifications particular to the Buyer or its customers; 5. Any changes, modifications, improvements or alterations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller; 6. Any parts in the Product that are supplied or designated by the Buyer or its customers; 7. Earthquake, fire, flood, sea-breeze, gas, thunder, acts of God or any other reasons beyond the control of the Seller; 8. Normal wear and tear, or deterioration of the Product's parts, such as bearings, oil-seals; 9. Any other troubles, problems or damage to the Product that are not attributable to the Seller.

Worldwide Locations

U.S.A

Sumitomo Machinery Corporation of America (SMA)
4200 Holland Blvd. Chesapeake, VA 23323, U.S.A.
TEL (1)757-485-3355 FAX (1)757-485-7490

Canada

SM Cyclo of Canada, Ltd. (SMC)
1453 Cornwall Road, Oakville, Canada ON L6L 7T5
TEL (1)905-469-1050 FAX (1)905-469-1055

Mexico

SM Cyclo de Mexico, S.A. de C.V. (SMME)
Av. Desarrollo 541, Col. Finsa, Guadalupe,
Nuevo León, México, CP67132
TEL (52)81-8144-5130 FAX (52)81-8144-5130

Brazil

Sumitomo Industrias Pesadas do Brasil Ltda. (SHIB)
Rodovia do Acucar (SP-075) Km 26
Itu, Sao Paulo, Brasil
TEL (55)11-4886-1000 FAX (55)11-4886-1000

Chile

SM-Cyclo de Chile Ltda. (SMCH)
San Pablo 3507, Quinta Normal, Santiago, Chile
TEL (56)2-892-7000 FAX (56)2-892-7001

Argentina

SM-Cyclo de Argentina S.A. (SMAR)
Ing. Delpini, 2236 Area de Promocion el Triangulo,
Partido Malvinas Argentinas Grand Bourg,
Buenos Aires, Argentina B1615KGB
TEL (54)3327-45-4095 FAX (54)3327-45-4099

Guatemala

SM Cyclo de Guatemala Ensambladora, Ltda. (SMGT)
Parque Industrial Unisur, 0 Calle B 19-50 Zona 3,
Bodega D-1 Delta Bárcenas en Villa Nueva, Guatemala
TEL (502)6648-0500 FAX (502)6631-9171

Colombia

SM Cyclo Colombia, S.A.S. (SMCO)
Carrera 11, No.93A-53, Office 203, Bogotá, Colombia
TEL (57)1-3000673

Germany

Sumitomo (SHI) Cyclo Drive Germany GmbH (SCG)
Cyclostraße 92, 85229 Markt Indersdorf, Germany
TEL (49)8136-66-0 FAX (49)8136-5771

Austria

Sumitomo (SHI) Cyclo Drive Germany GmbH (SCG)
SCG Branch Austria Office
Gruentalstraße 30A, 4020 Linz, Austria
TEL (43)732-330958 FAX (43)732-331978

Belgium

Sumitomo (SHI) Cyclo Drive Germany GmbH (SCG)
SCG Branch Benelux Office
Heikneuterlaan 23, 3010 Kessel-Lo, Leuven, Belgium
TEL (32)16-60-83-11 FAX (32)16-60-16-39

France

SM-Cyclo France SAS (SMFR)
8 Avenue Christian Doppler, 77700 Serris, France
TEL (33)164171717 FAX (33)164171718

Italy

SM-Cyclo Italy Srl (SMIT)
Via dell'Artigianato 23, 20010 Cornaredo (MI), Italy
TEL (39)293-481101 FAX (39)293-481103

Spain

SM-Cyclo Iberia, S.L.U. (SMIB)
C/Landabari No. 3, 6° B, 48940 Leioa, Vizcaya, Spain
TEL (34)9448-05389 FAX (34)9448-01550

Sweden

SM-Cyclo Scandinavia AB (SMSC)
Industrigatan 21B, 234 35 Lomma, Sweden
TEL (46)40220030

United Kingdom

SM-Cyclo UK Ltd. (SMUK)
Unit 29, Bergen Way, Sutton Fields Industrial Estate,
Kingston upon Hull, HU7 0YQ, East Yorkshire,
United Kingdom
TEL (44)1482-790340 FAX (44)1482-790321

Turkey

SM Cyclo Turkey Güç Aktarım Sis. Tic. Ltd. Sti. (SMTR)
Büyükdere Çayırbaşı Cd. Dede Yusuf Sk. No: 11,
34453 Sarıyer İstanbul, Turkey
TEL (90)216-384-4482 FAX (90)216-384-4482

China

Sumitomo (SHI) Cyclo Drive China, Ltd. (SCT)
11F, SMEG Plaza, No. 1386 Hongqiao Road,
Changning District, Shanghai, China (P.C. 200336)
TEL (86)21-3462-7877 FAX (86)21-3462-7922

Hong Kong

SM-Cyclo of Hong Kong Co., Ltd. (SMHK)
Rm 1301, CEO Tower, 77 Wing Hong Street,
Cheung Sha Wan, Kowloon, Hong Kong
TEL (852)2460-1881 FAX (852)2460-1882

Korea

Sumitomo (SHI) Cyclo Drive Korea, Ltd. (SCK)
Royal Bldg. 9F Rm. 913, 5 Danju-Dong, Chongro-Ku,
Seoul, Korea 110-721
TEL (82)2-730-0151 FAX (82)2-730-0156

Taiwan

Tatung SM-Cyclo Co., Ltd. (TSC)
22 Chungshan N. Road 3rd., Sec. Taipei, Taiwan 104,
R.O.C.
TEL (886)2-2595-7275 FAX (886)2-2595-5594

Singapore

Sumitomo (SHI) Cyclo Drive Asia Pacific Pte. Ltd. (SCA)
15 Kwong Min Road, Singapore 628718
TEL (65)6591-7800 FAX (65)6863-4238

Philippines

Sumitomo (SHI) Cyclo Drive Asia Pacific Pte. Ltd. (SCA)
Philippines Branch Office
B2B Granville Industrial Complex, Carmona,
Cavite 4116, Philippines
TEL (63)2-584-4921 FAX (63)2-584-4922
TEL (63)46-430-3591
TEL (63)46-438-20579 - 81

Vietnam

SM-Cyclo (Vietnam) Co., Ltd. (SMVN)
Factory 2B, Lot K1-2-5, Road No. 2-3-5A,
Le Minh Xuan Industrial Park, Binh Chanh Dist.,
HCMC, Vietnam
TEL (84)8-3766-3709 FAX (84)8-3766-3710

Malaysia

SM-Cyclo (Malaysia) Sdn. Bhd. (SMMA)
No.7C, Jalan Anggerik Mokara 31/56, Kota Kemuning,
Selkysen 31, 40460 Shah Alam, Selangor Darul Ehsan,
Malaysia
TEL (60)3-5121-0455 FAX (60)3-5121-0578

Indonesia

PT. SM-Cyclo Indonesia (SMID)
Jalan Sungkai Blok F 25 No. 09 K, Delta Silicon 5,
Lippo Cikarang, Bekasi 17530, Indonesia
TEL (62)21-2961-2100 FAX (62)21-2961-2211

Thailand

SM-Cyclo (Thailand) Co., Ltd. (SMTH)
1 Empire Tower, Unit 2103-4, 21st Floor, South Sathorn
Road, Yannawa, Sathorn, Bangkok 10120, Thailand
TEL (66)2670-0998 FAX (66)2670-0999

Australia

Sumitomo (SHI) Hansen Australia Pty. Ltd. (SHAU)
181 Power St, Glendenning, NSW 2761, Australia
TEL (61)2-9208-3000 FAX (61)2-9208-3050

India

Sumi-Cyclo Drive India Private Limited (SMIN)
Survey No. 130, Hissa No. 02, Jeevan Nagar,
Off Mumbai-Bangalore Bypass, Tathawade,
Pune - 411033, India
TEL (91)20-6674-2900 FAX (91)20-6674-2901

Japan

Sumitomo Heavy Industries, Ltd. (SHI)
ThinkPark Tower, 1-1 Osaki 2-chome, Shinagawa-ku,
Tokyo 141-6025, Japan
TEL (81)3-6737-2511 FAX (81)3-6866-5160

Specifications, dimensions, and other items are subject to change without prior notice.