

Motor

3-phase motor

Premium-Efficiency, 3-Phase Motor

AF motor for inverter

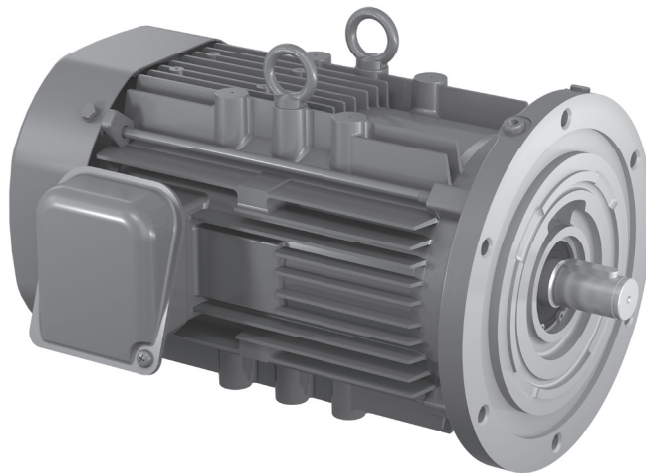
3-phase motor for inverter

Premium-efficiency, 3-phase motor for inverter

High-efficiency 3-phase motor

Single phase motor

Single phase reversible motor



<<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

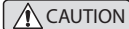
- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.). Thoroughly understand the machine, information about safety, and all precautions for correct operation. After reading, retain this manual for future reference.
- 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  CAUTION 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, otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- When the unit is to be used in a system for human transport, a protecting device for human safety should be installed to prevent chances of 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 it from 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 motor products and motor units of a gearmotor (except ASTERO).
See the maintenance manual of each model for handling the drive.

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1. Inspection upon Delivery

⚠ CAUTION

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

This is the manual only for the motor unit.

See the maintenance manual of each model for handling the drive.

1-1 Reading the Nameplates

Representative examples of a nameplate are shown below. Please observe them by type.

When contacting the company, please provide [1]. Gearmotor or reducer nomenclature, [2]. Reduction ratio, and [3]. Serial number.

(1) Nameplate of a motor (Ex.: Premium-efficiency, 3-phase motor)

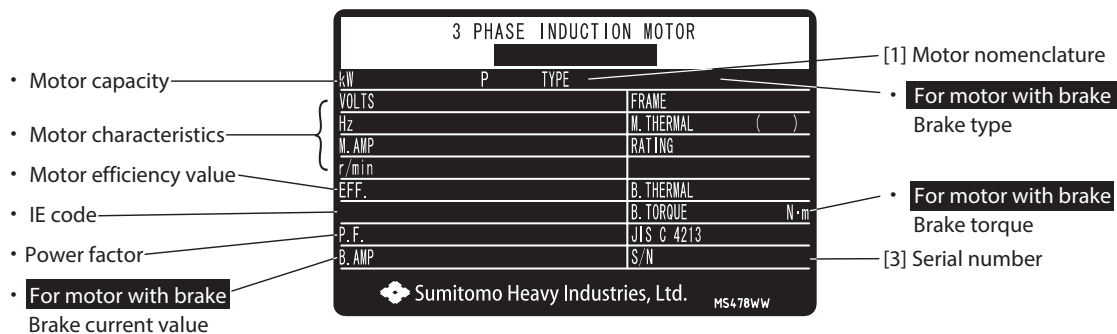


Figure 1-1 Motor nameplate

(2) Nameplate of a gearmotor unit (Ex.: CYCLO drive)

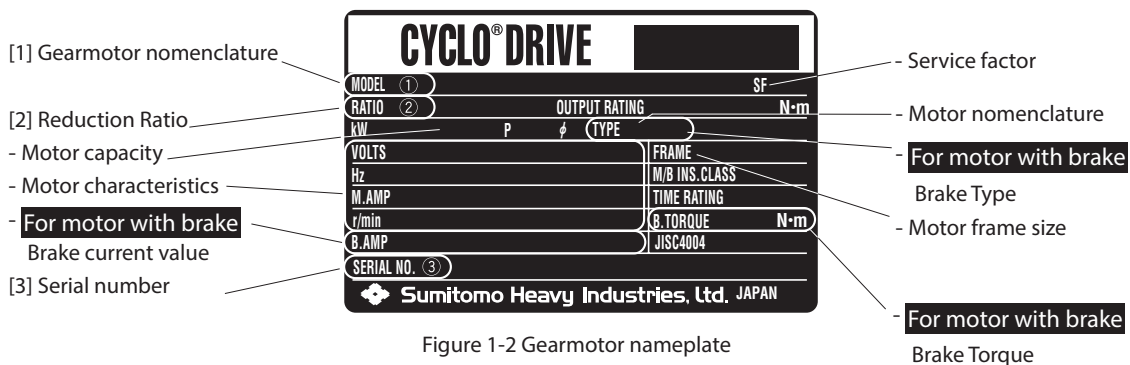
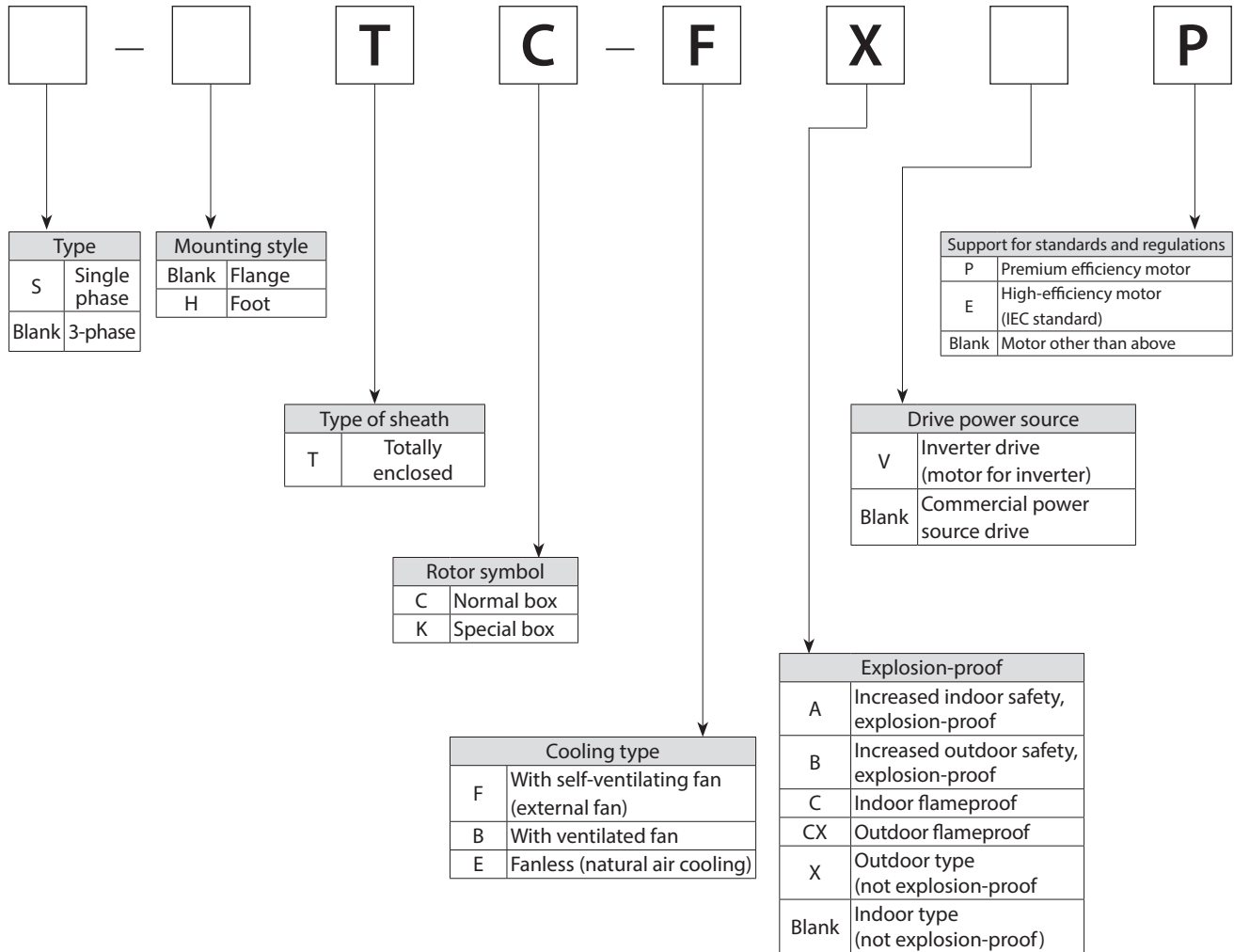


Figure 1-2 Gearmotor nameplate

1. Inspection upon Delivery

1-2 Motor Nomenclature

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



1. Inspection upon Delivery

1-3 Brake Type

Table 1-1 to 1-3 shows the relationship between standard brake type and motor type and capacity range.

Table 1-1 SB brakes and MB brakes

Brake Type	Applicable model/frame size	Motor capacity (W)	
		3-phase motor	Single phase motor
		4P	4P
SB-004	HYPONIC/01 03 05 07	15 25 40 60	15 25 40
MB-003	HYPONIC/17 1240	40	40
	PREST NEO		
	ALTAX NEO		
MB-005	HYPONIC/15 17 1240	60 90	60 90
	PREST NEO	60	60
	ALTAX NEO		
MB-010	ALTAX NEO/5067	90 100 *1	90

Table 1-2 FB brakes and ESB brakes

Brake Type	Motor Capacity (kW)						
	3-Phase Motor			AF motor for inverter 3-Phase Motor for inverter		High-efficiency 3-Phase Motor	Single phase motor
	4P	6P	4/8P	4P	6P	4P	4P
FB-01A1	0.1 *1	–	–	–	–	–	0.1
FB-02A1	0.2 0.25 *2	–	–	0.1	–	–	0.2
FB-05A1	0.4	–	–	0.2	–	0.2	–
FB-1D	0.55 0.75	0.4	0.4/0.2	0.4	–	0.4	0.4
FB-2D	1.1 1.5	–	–	0.75	–	0.75	–
FB-3D	2.2	0.75	0.75/0.375	1.5	–	1.1 1.5	–
FB-5B	3.0 3.7	1.5	1.5/0.75	2.2	–	2.2	–
FB-8B	5.5	2.2	2.2/1.1	3.7	–	3.0 3.7	–
FB-10B1	7.5	3.7	3.7/1.85	5.5	–	5.5	–
FB-15B1	11	5.5	5.5/2.75	7.5	3.7	7.5	–
FB-20	15	7.5 11	7.5/3.75 11/5.5	11	5.5 7.5	11 15	–
FB-30	18.5 22 30	15 18.5 22	15/7.5	15 18.5 22	11 15	18.5 22	–
ESB-250	37 45	30 37	22/11 30/15	30 37	18.5 22 30	30 37	–

Table 1-3 FB brakes and ESB brakes

Brake Type	Motor Capacity (kW)		
	Premium-efficiency, 3-phase motor		Premium- efficiency, 3-phase motor for inverter
	4P	6P	4P
FB-1E	0.75	–	0.75
FB-1HE	1.1	–	–
FB-2E	1.5	–	1.5
FB-3E	2.2	–	2.2
FB-4E	3.0	–	–
FB-5E	3.7	–	3.7
FB-8E	5.5	–	5.5
FB-10E	7.5	–	7.5
FB-15E	11	–	11
FB-20	15	11	15
FB-30	18.5 22 30	15 18.5 22	18.5 22
ESB-250	37 45	30 37	–

- Notes: 1. ALTAX NEO frame size 5067 3-phase motor
4P 0.1kW is MB-010.
2. HYPONIC Gearmotor, 3-phase motor 4P 0.25kW is FB-05A1.
3. Brake type may differ depending on specification.
Check the nameplate.

2. Storage

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 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.

3. Transportation

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 nameplate, 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.

4. Installation

DANGER

- Do not use a standard unit in an explosive atmosphere (which is likely to be filled with explosive gas or steam). Under such conditions, an explosion proof motor should be used; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- In the case of **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, or damage to the equipment may result.
- Since the inverter itself is not explosion-proof, in the case of an **When a flameproof motor is driven by an inverter** install an inverter in a place free from explosive gas; otherwise, explosion, ignition, electric shock, or damage to the equipment 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 products; otherwise, personal injury, or damage to the equipment may result.
- Do not touch the shaft end of the products, inside keyways, or the edge of the cooling fan with bare hands; otherwise, injury may result.

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)
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-proof, 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.

However, do not use **Outdoor** and **For a motor with ESB brake** in a direction other than the ordered mounting direction.

For the gearmotor, the mounting angle differs depending on the specification of a drive, therefore, see the maintenance manual for each model.

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

⚠ 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 output 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

- When wiring follows as shown on P15-45, the motor shaft rotates to the right as seen from the anti-load side.
- To cause reverse rotation of a 3-phase power source motor, reverse R and T in the connection diagram on P15, P16, and P22-27.
- To cause reverse rotation of a single phase power source motor, see the connection diagram on P19-21 and P40-43.
- For a gearmotor, the rotation direction of a gearmotor output shaft may differ from that of a motor shaft, and see the maintenance manual of each model.

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 fit is recommend.

(1) When using a coupling

The alignment accuracy (A, B, X) in figure 5-1 should be no greater than that shown in Table 5-1.

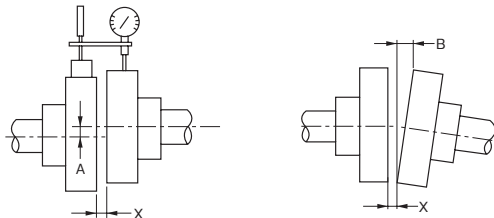


Figure 5-1

Table 5-1 Alignment Precision for Flexible Coupling

Allowable tolerance A	0.05mm or manufacturer-specified value
Allowable tolerance B	0.04mm or manufacturer-specified value
X	manufacturer-specified value

Note) See the maintenance manual for each gearmotor for the alignment accuracy.

(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 the motor. (See Figure 5-2)

(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 5-3)
- When using multiple V belts, use a matched set having the same length.

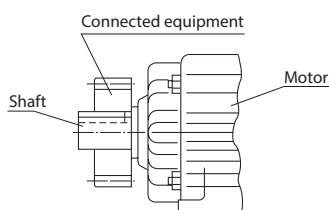


Figure 5-2

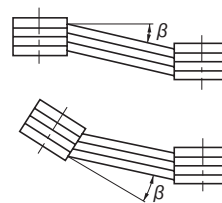


Figure 5-3

6. Wiring

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 when operating on the unit; 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 **explosion proof motor** shall conform to the facility's electrical codes, extension regulations and explosion-proofing guide, as well as the maintenance manual; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- **For a waterproof motor**, prevent the end of a cable, rectifier and capacitor from contacting water.

CAUTION

- When wiring, follow the facility's electrical codes and extension regulations; in order to prevent burning, electric shock, injury, and fire.
- 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.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- When using a **star-delta starter** select one with an electromagnetic switch on the primary side (3-contact point type); otherwise, fire 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 this the following measures are required.
 - Install an LCR filter or an AC reactor between the inverter and the motor
 - Enhance motor winding insulation
- **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, in order to prevent electric shock.
- **For a waterproof motor**, do not open the cap of a waterproof/dust-proof box; otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- For units **For 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 an explosion proof motor is driven by an inverter**, use one inverter for one motor. Use the approved inverter for the motor.
- When measuring the insulation resistance of **explosion proof motor**, confirm that there is no gas or explosive vapor in the vicinity, in order to prevent 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. (Manufacturing with a 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.

6-1 Removing and Attaching the Resin Terminal Box Cover

(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.

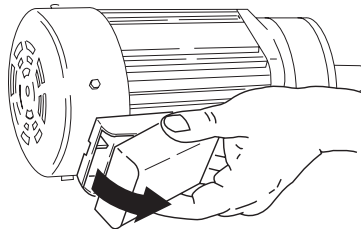


Figure 6-1

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 below.

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.

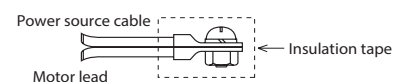


Figure 6-2

6. Wiring

6-5 Motor Wiring

Shows the pages for motor wiring diagrams.

Table 6-2 Without Brake

Power source	Motor type		Number of Poles	Capacity (kW)	Number of Lead Wires	Page	
						Direct Input from Commercial Power Source	Inverter Drive
3-phase	3-phase motor	Standard	4P	-7.5 11-	3 6	P15 P16	P17 P18
			6P	-3.7 5.5-	3 6	P15 P16	P17 P18
			4/8P	All	6	P16	—
		Increased safety, explosion-proof	4P	-7.5 11-	3 6	P15 P16	—
			6P	-7.5 11-	3 6	P15 P16	—
		Flameproof	4P	-22 30-	3 6	P15 P16	—
	6P		-22 30-	3 6	P15 P16	—	
	Premium-efficiency, 3-phase motor	4P	-3.7 5.5-	3 6	P15 P16	P17 P18	
		6P	All	6	P16	P18	
	AF motor for inverter 3-phase motor for inverter	Standard	4P	-5.5 7.5-22 30-	3 6 11	—	P17 P18 P18
			6P	-15 18.5-	6 11	—	P18
		Flameproof	4P	-15 22-	3 6	—	P17 P18
			Premium-efficiency, 3-phase motor for inverter	4P	-3.7 5.5-	3 6	—
	High-efficiency 3-phase motor	4P	-7.5 11-	3 6	P15 P16	P17 P18	
Single phase	Capacitor run		4P	-90W	3	P19	
	Capacitor starting		4P	0.1 0.2	4	P20	
	Capacitor starting Capacitor run		4P	0.1-	6	P21	

Table 6-3 With Brake (15–90W)

Power source	Applicable model/frame size	Number of poles	Capacity (W)	Brake Type	Number of lead wires	Page		
						One-Direction Rotation	Plugging Rotation	Inverter Drive
3-phase	HYPONIC/01 03 05 07	4P	15 25 40 60	SB-004	5	P22	P28	P34
	HYPONIC/17 1240		40	MB-003				
	PREST NEO							
	ALTAX NEO		60 90	MB-005				
	HYPONIC/15 17 1240							
	PREST NEO							
	ALTAX NEO		60	MB-010				
ALTAX NEO/5067	90 100 *1							
Single phase	HYPONIC/01 03 05 07	4P	15 25 40	SB-004	5	P40	P40	
	HYPONIC/17 1240		40	MB-003				
	PREST NEO							
	ALTAX NEO		60 90	MB-005				
	HYPONIC							
	PREST NEO							
	ALTAX NEO		60	MB-010				
	90							

Notes: 1. ALTAX NEO frame size 5067 3-phase motor 4P 0.1kW is MB-010.

2. Brake type may differ depending on specification. Check the nameplate.

3. For motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

6. Wiring

Table 6-4 With Brake (0.1kW or more)

Power source	Motor type	Number of Poles	Capacity (kW)	Brake Type	Number of lead wires	Page												
						One-Direction Rotation	Plugging Rotation	Inverter Drive										
3-phase	3-phase motor	4P	0.1 ^{*1}	FB-01A1	5	P23 P24	P29 P30	P35 P36										
			0.2 0.25 ^{*2}	FB-02A1														
			0.4	FB-05A1														
			0.55 0.75	FB-1D														
			1.1 1.5	FB-2D														
			2.2	FB-3D														
			3.0 3.7	FB-5B														
			5.5	FB-8B														
			7.5	FB-10B1														
		8	11	FB-15B1	P25	P31	P37											
			15	FB-20	P26	P32												
			18.5 22 30	FB-30														
			37 45	ESB-250				P27	P33	P38								
			6P	0.4				FB-1D	5	P23	P29	P35						
				0.75				FB-3D										
				1.5				FB-5B										
				2.2				FB-8B										
				3.7				FB-10B1										
	5.5	FB-15B1																
	8	7.5 11		FB-20	P25	P31	P37											
		15 18.5 22		FB-30	P26	P32												
		30 37		ESB-250	P27	P33		P38										
	Premium-efficiency, 3-phase motor	4P	0.75	FB-1E	5	P23 P24	P29 P30	P35 P36										
			1.1	FB-1HE														
			1.5	FB-2E														
			2.2	FB-3E														
			3.0	FB-4E														
			3.7	FB-5E														
			5.5	FB-8E														
			7.5	FB-10E														
			11	FB-15E														
		8	15	FB-20	P25	P31	P37											
			18.5 22 30	FB-30	P26	P32												
			37 45	ESB-250				P27	P33	P38								
			6P	11				FB-20	8	P26	P32	P37						
				15 18.5 22				FB-30										
				30 37				ESB-250					P27	P33	P38			
				AF motor for inverter 3-phase motor for inverter				4P					0.1	FB-02A1	5	-	-	P35 P36
													0.2	FB-05A1				
													0.4	FB-1D				
0.75	FB-2D																	
1.5	FB-3D																	
2.2	FB-5B																	
3.7	FB-8B																	
5.5	FB-10B1																	
7.5	FB-15B1																	
8	11	FB-20	P26		P32	P37												
	15 18.5 22	FB-30	13		-													
	30 37	ESB-250																
	6P	3.7					FB-15B1	8	-	-	P37							
		5.5 7.5					FB-20											
		11 15					FB-30											
		18.5 22 30					ESB-250					13	P39					
		Premium-efficiency, 3-phase motor for inverter					4P					0.75	FB-1E	5	-	-	P35 P36	
												1.5	FB-2E					
2.2				FB-3E														
3.7			FB-5E															
5.5			FB-8E															
7.5	FB-10E																	
11	FB-15E																	
15	FB-20																	
18.5 22	FB-30		8	P37														

Notes: 1. ALTAX NEO frame size 5067 3-phase motor 4P 0.1kW is MB-010.

2. HYPONIC Gearmotor, 3-phase motor 4P 0.25kW is FB-05A1.

3. Please consult with us for 4/8P.

4. Brake type may differ depending on specification. Check the nameplate.

5. For motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

6. Wiring

Table 6-5 With Brake (0.1kW or more)

Power source	Motor type	Number of Poles	Capacity (kW)	Brake Type	Number of lead wires	Page						
						One-Direction Rotation	Plugging Rotation	Inverter Drive				
3-phase	High-efficiency 3-phase motor	4P	0.2	FB-05A1	5	P23 P24	P29 P30	P35 P36				
			0.4	FB-1D								
			0.75	FB-2D								
			1.1 1.5	FB-3D								
			2.2	FB-5B								
			3.0 3.7	FB-8B								
			5.5	FB-10B1								
			7.5	FB-15B1								
			11 15	FB-20					8	P26 P27	P32 P33	P37 P38
			18.5 22	FB-30								
30 37	ESB-250											
Single phase	Capacitor starting Capacitor run	4P	0.1	FB-01A1	8	P42	P44	-				
			0.2	FB-02A1	8	P43	P45					
			0.4	FB-1D								

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

6. Wiring

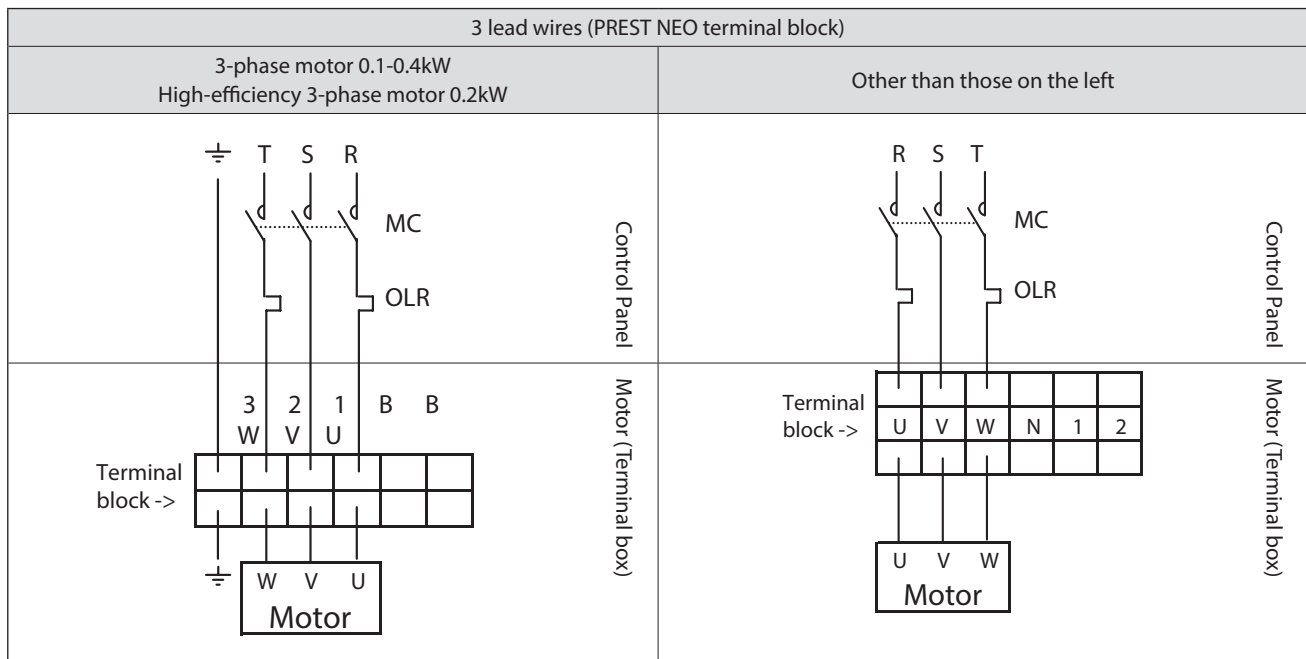
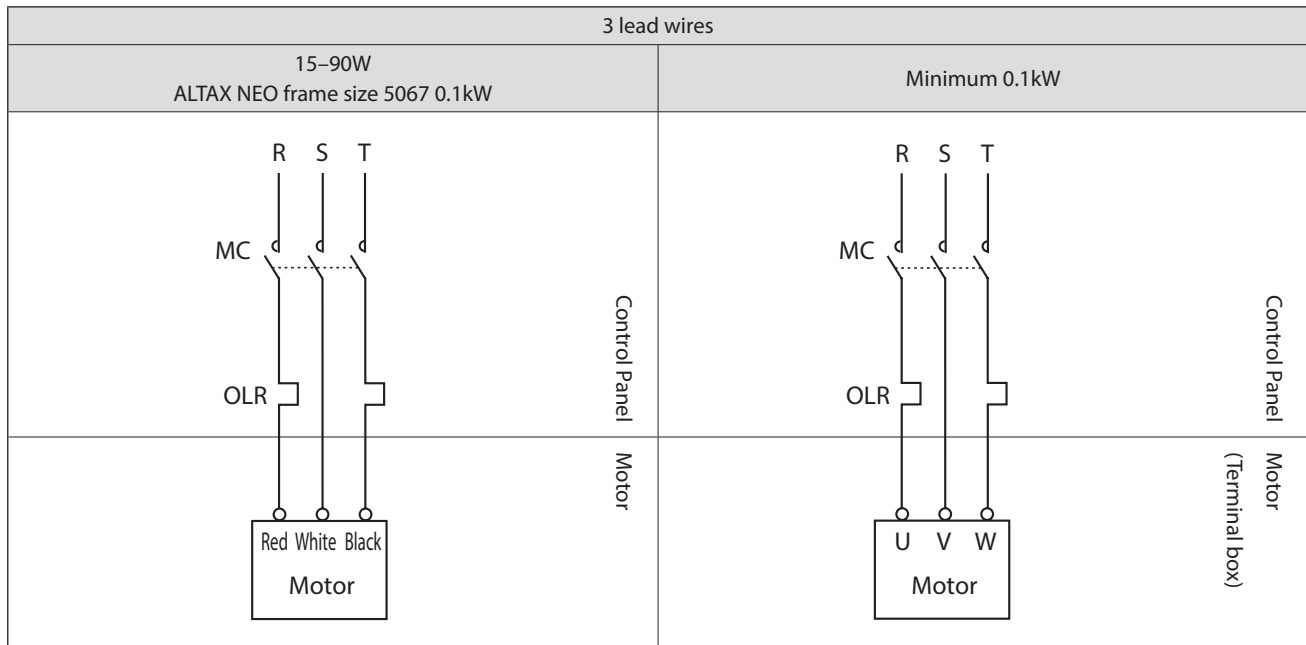
Shows motor wiring and standard specification for terminals and lead wires that are indicated by symbols.

■ 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.
- Do not open the cap of a waterproof/dust-proof box of a 15-90W waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- The terminal block is arrayed in two rows as shown in the above figure. Make sure that wiring of the motor power source is connected to the upper side on the above figure (on which symbols 1, 2, 3, U, V, W, and B are written; cable port side).

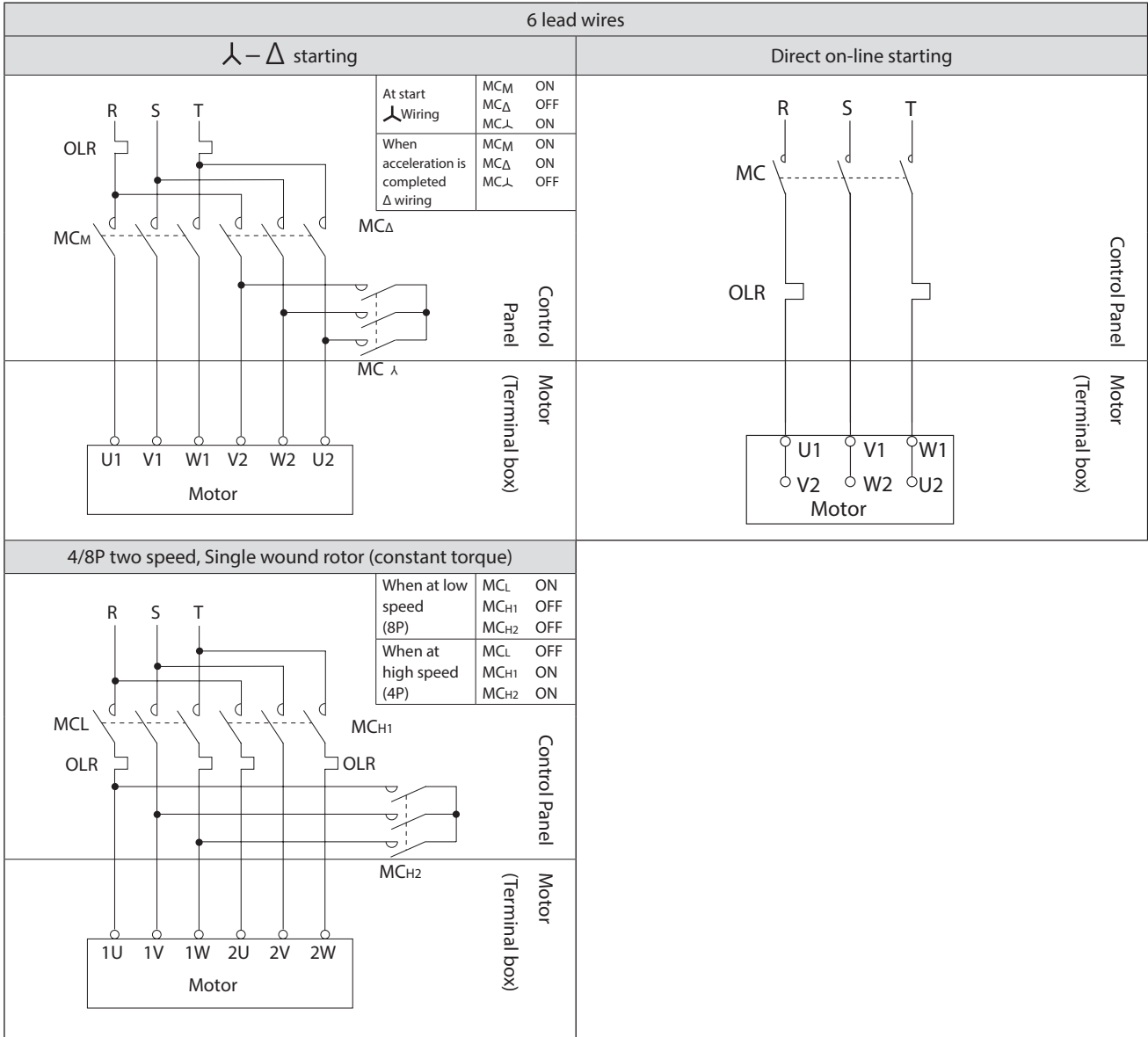
6. Wiring

■ 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

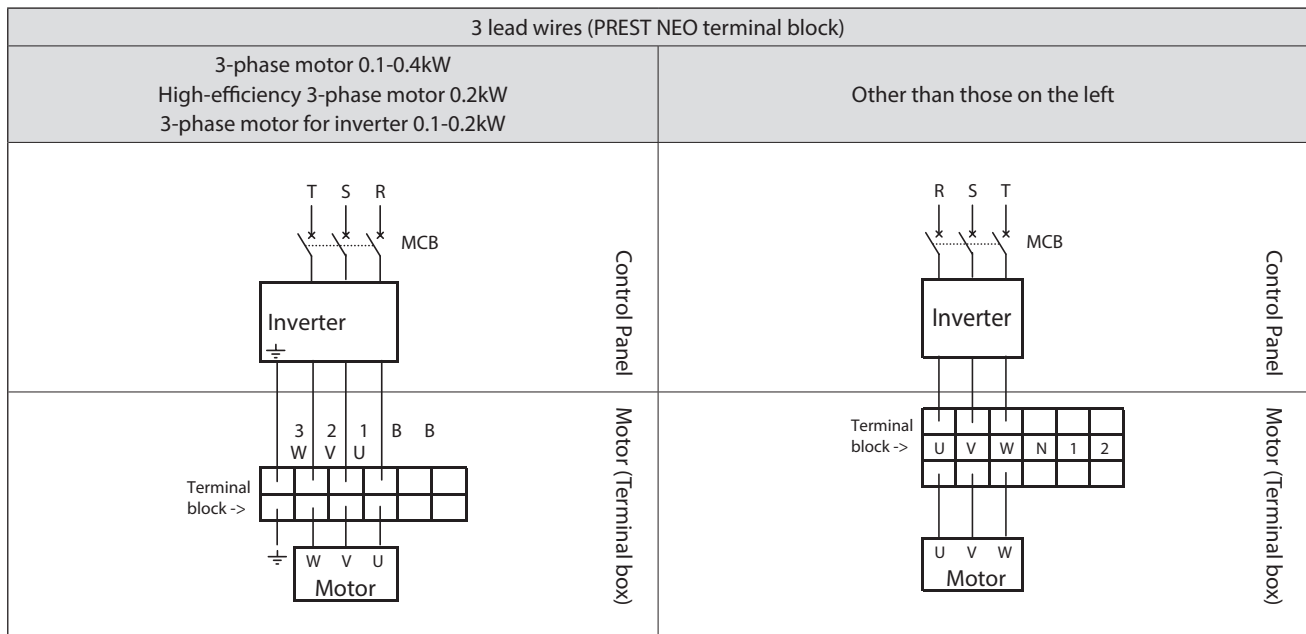
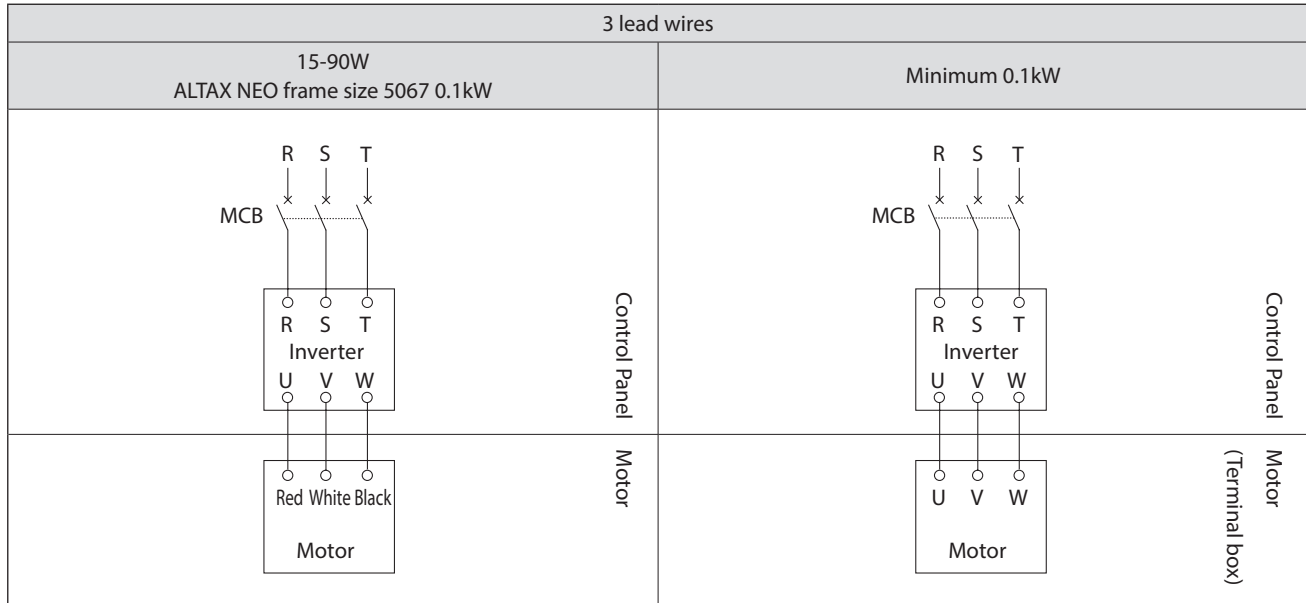
Premium-Efficiency, 3-Phase Motor

AF motor for inverter

3-phase motor for inverter

Premium-efficiency, 3-phase motor for inverter

High-efficiency 3-phase motor



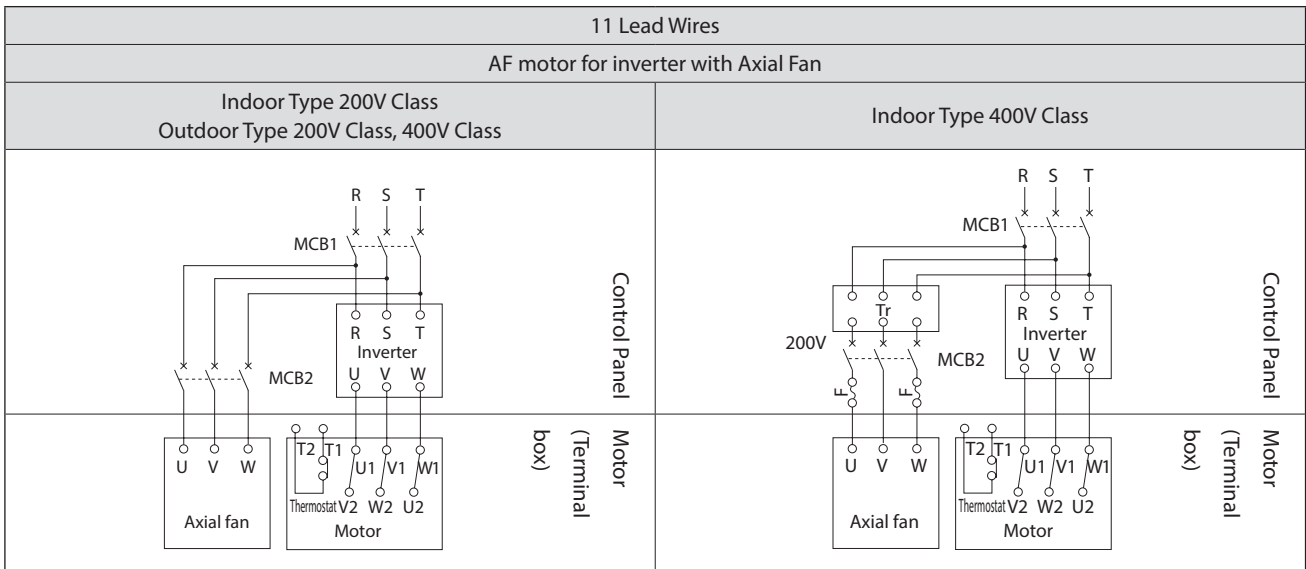
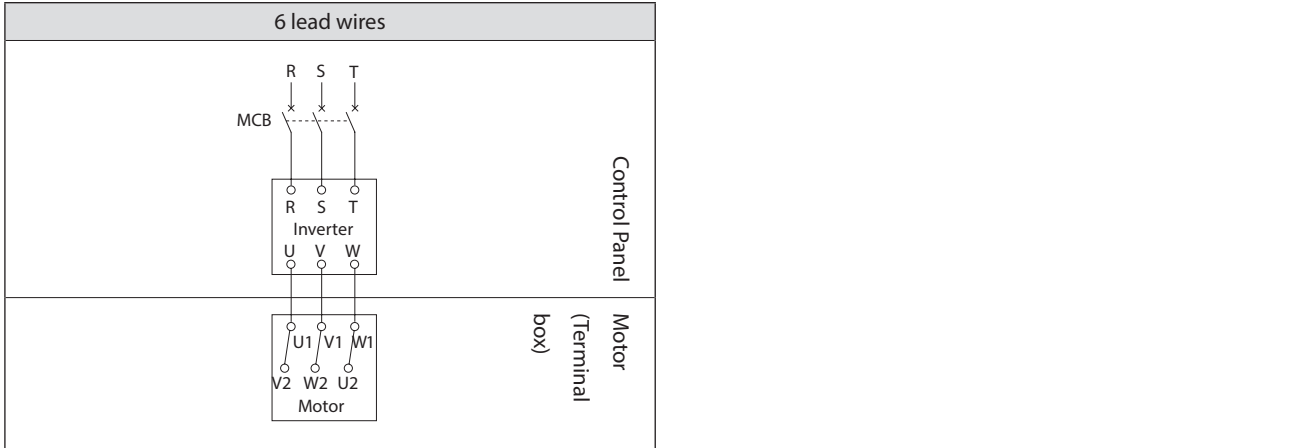
MCB: Breaker for wiring—Customer to prepare.

- 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.
- Do not open the cap of a waterproof/dust-proof box of a 15-90W waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- The terminal block is arrayed in two rows as shown in the above figure. Make sure that wiring of the motor power source is connected to the upper side on the above figure (on which symbols 1, 2, 3, U, V, W, and B are written; cable port side).

6. Wiring

■ Without brake. Inverter drive

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



MCB: Breaker for wiring
 Tr: Transformer capacity 250–600VA, Secondary voltage 200–220V
 F: Fuse 3–5A

} 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.

In the case of **axial fans (totally enclosed, ventilated types)**, note the following items.

- Also connect a power source to the axial fan.
 - For an indoor type 400V class, the axial fan power source voltage will be 200V class. For special specifications, specifications may differ from the above. Check the manufacturing specifications.
 - Connect the fan so that it rotates in the same direction as that shown on the nameplate for direction of rotation. (Normally, the air from the fan will blow in a direction from the anti-load side to the load side.)
 - When the motor is shut down for a long period, also shut down the axial fan motor.
 - Wire the mounted thermostat.
 - Thermostat specification: Terminal symbols: T1, T2 and P1, P2 Operating function: Normal close (b contact point)
 Operating temperature: 135°C (for thermal class 155 (F)) Maximum current: DC 24V, 18A; AC 230V,
- 13A

■ Without brake. Single phase power source

Single phase motor

Single phase reversible motor

		Capacitor run 15-90W	
		100V class	200V class
Operates rotating in one direction	Control Panel		
	Motor		
Plugging operation	<p>Switch the above SW for plugging rotation. (Use a reversible motor when an immediate plugging rotation is required.)</p>		

MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

SW: Plugging 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 for wiring.

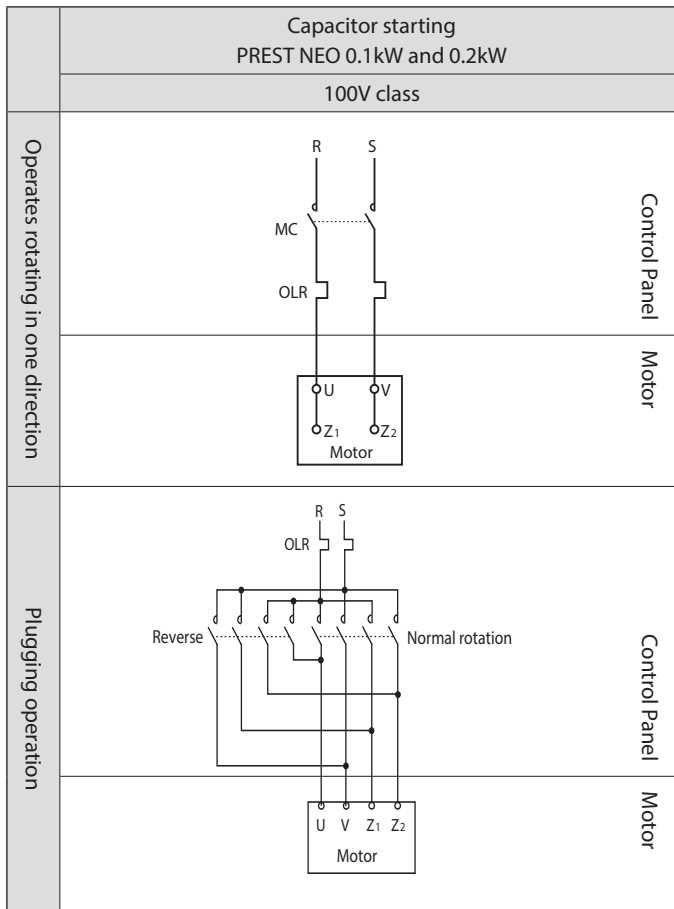
- Do not open the cap of a waterproof/dust-proof box of a waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.

- The capacitor is not waterproof for a waterproof motor.

6. Wiring

■ Without brake. Single phase power source

Single phase motor



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

Electromagnetic contactor for normal and reverse rotation

Customer to prepare.

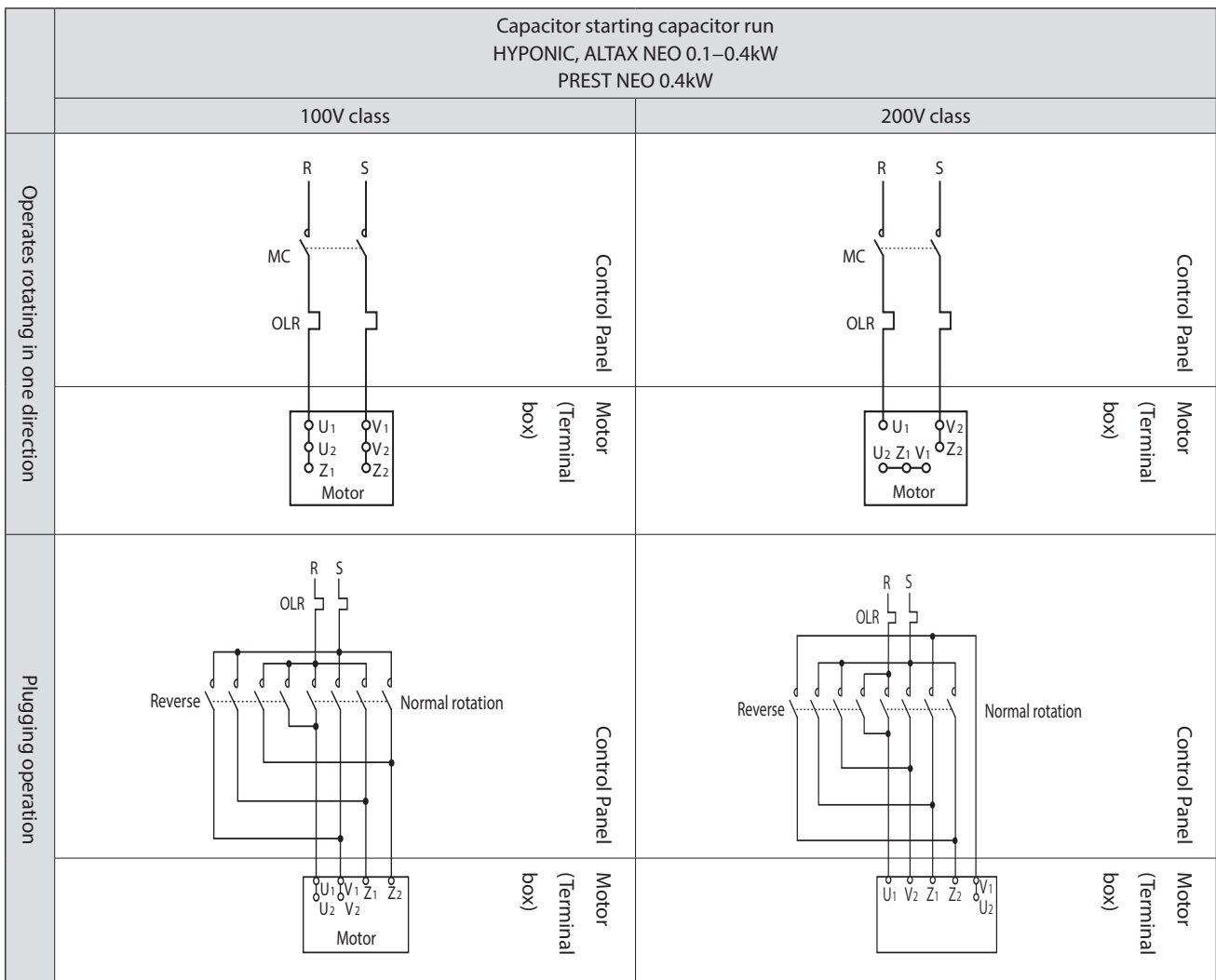
-This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

- Reverse Z1 and Z2 after the motor stopped to rotate the motor reversely in one-direction rotation.

- The capacitor is secured on the motor frame.

■ Without brake. Single phase power source

Single phase motor



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

Electromagnetic contactor for normal and reverse rotation

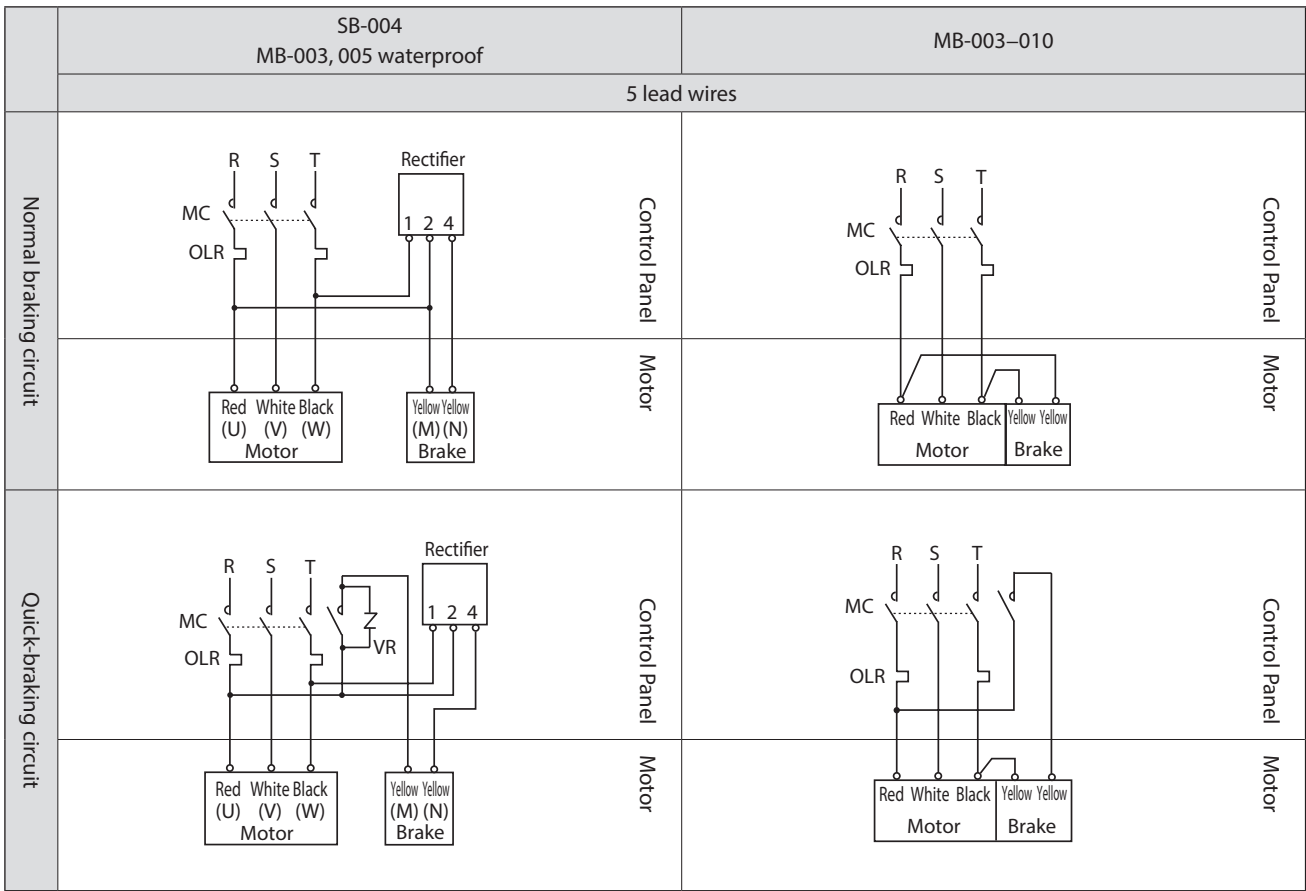
Customer to prepare.

- 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
 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 P5 or Table 7-2 on P48.

- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-2 on P48 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 6-6 on P46.

- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

- SB-004 has a rectifier in place separately.

- A rectifier for MB-003 and 005 is built-in the brake unit. (However, the waterproof type is placed separately.)

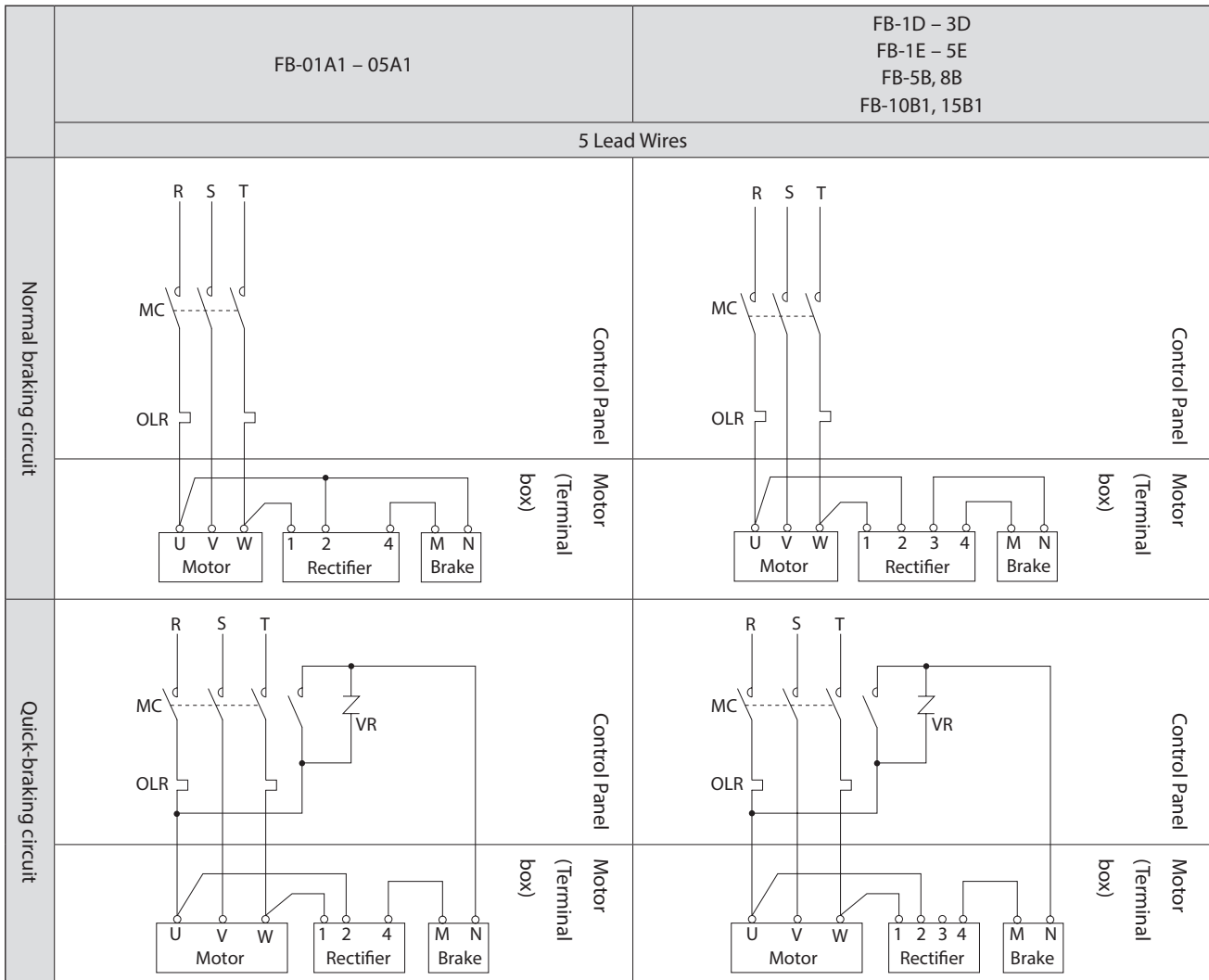
- A flag () is attached at the lead wire for the MB-003 and 005 waterproof 400V class.

- Do not open the cap of a waterproof/dust-proof box of a waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.

- The rectifier is not waterproof for a waterproof motor.

■ **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.)

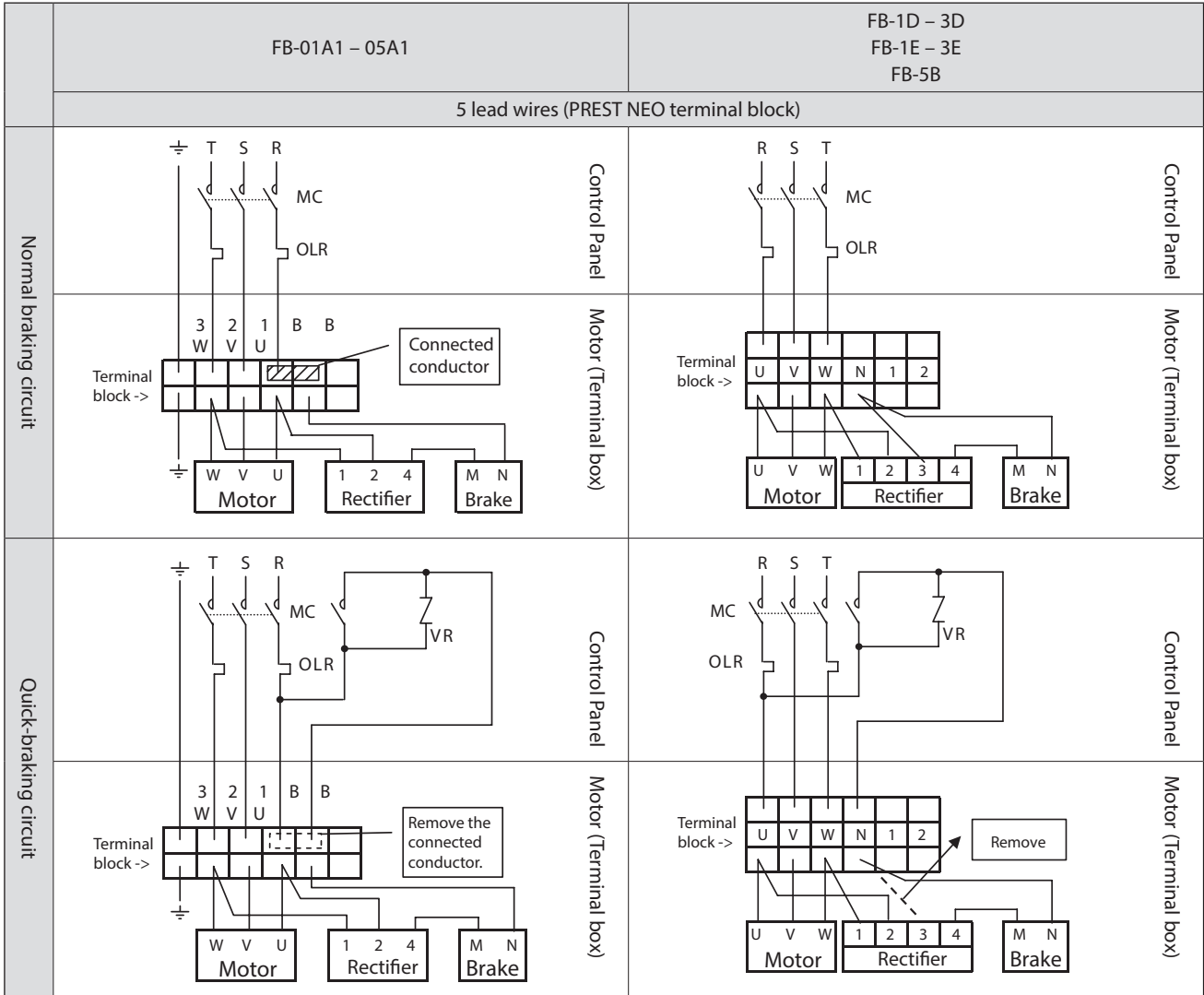
} Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.
- See P24 for PREST NEO.

6. Wiring

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

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



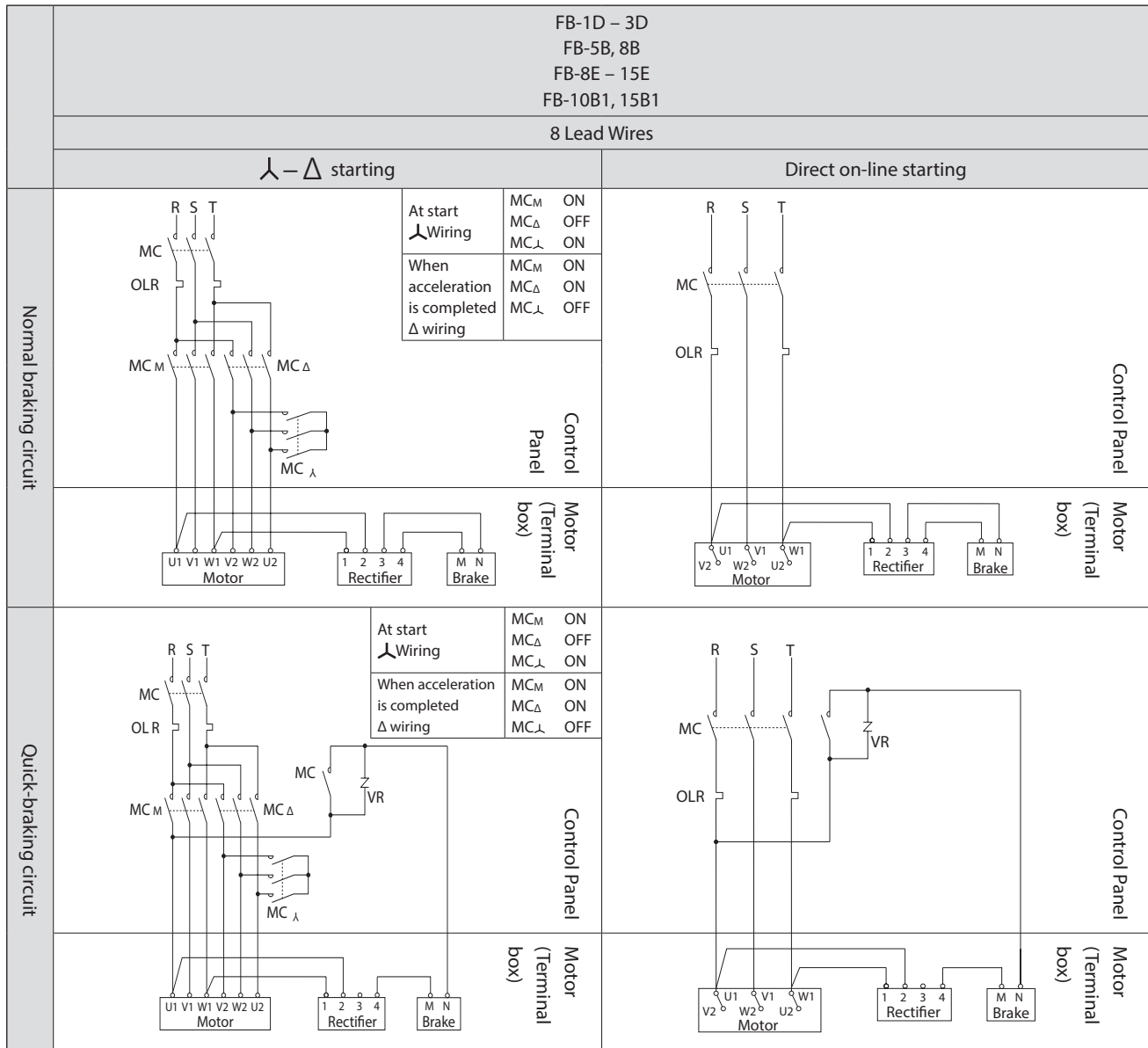
MC: Electromagnetic contactor
 OLR: Overload protection device or electronic thermal relay
 VR: Varistor (for protecting contact points, rectifier, etc.)

} 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- The terminal block is arrayed in two rows as shown in the above figure. Make sure that wiring of the motor power source is connected to the upper side on the above figure (on which symbols 1, 2, 3, U, V, W, and B are written; cable port side).
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

■ **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.)

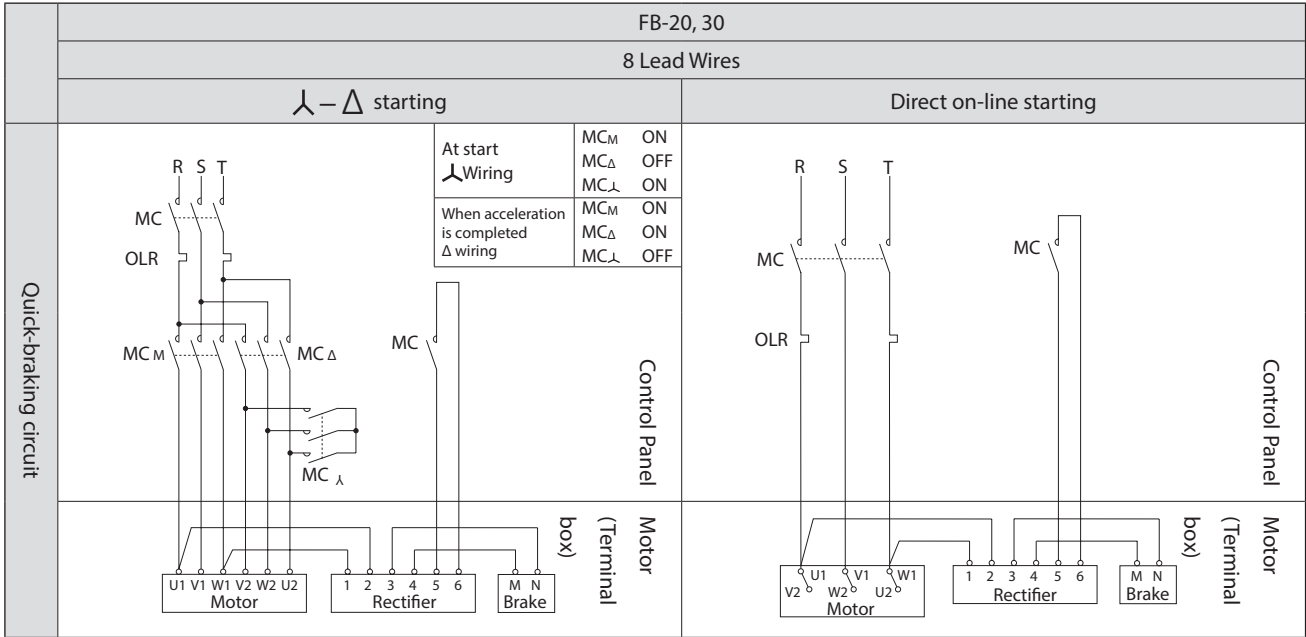
} Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.
- 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. Operates rotating in one direction.

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



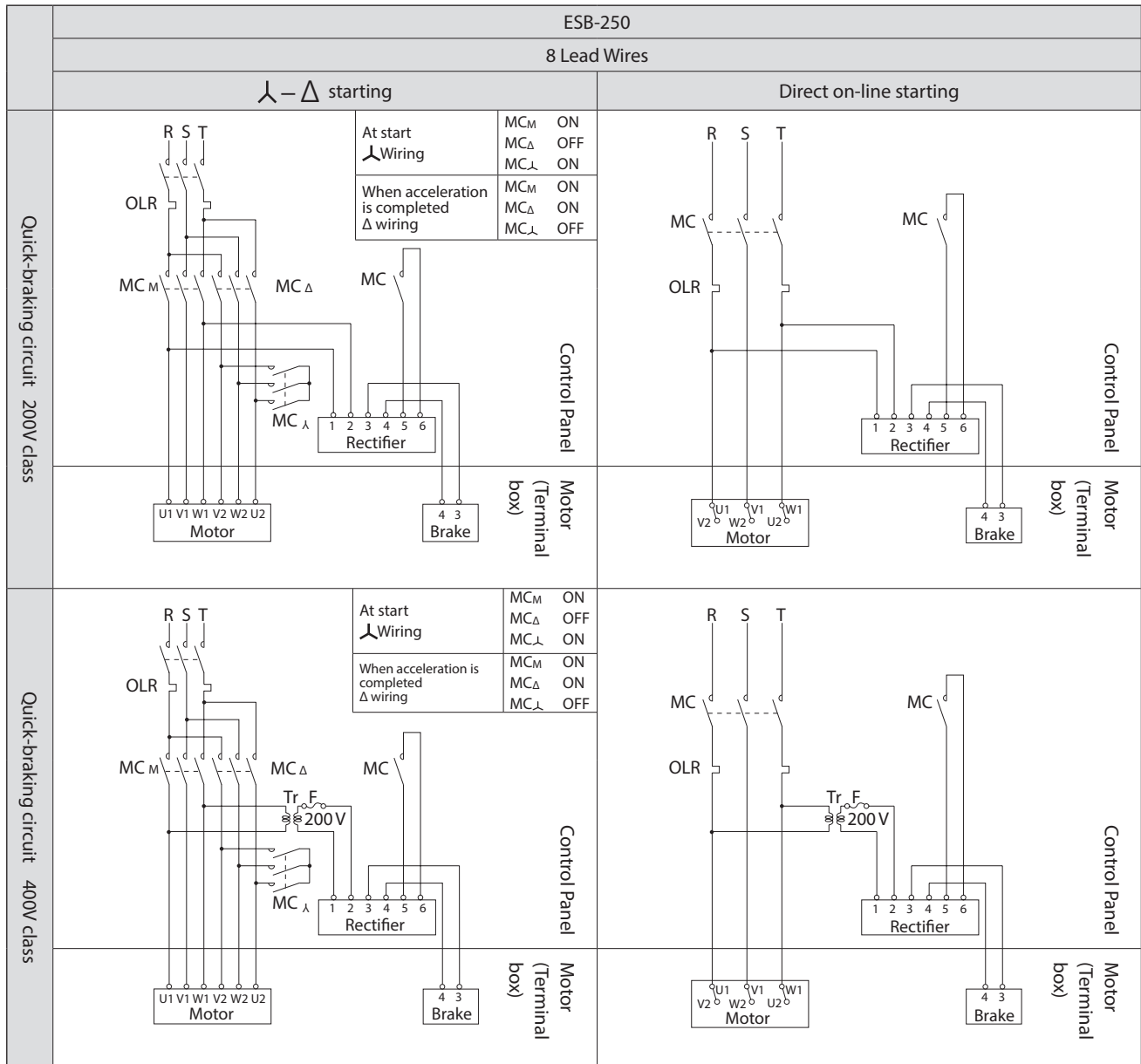
MC: Electromagnetic contactor
 OLR: Overload protection device or electronic thermal relay } Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.
- Shipped with a short circuit plate connecting rectifier terminals 5 and 6. Remove the short circuit plate when wiring.

6. Wiring

■ 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
 Tr: Transformer capacity 250-600VA, secondary voltage 200-220V
 F: Fuse 3-5A

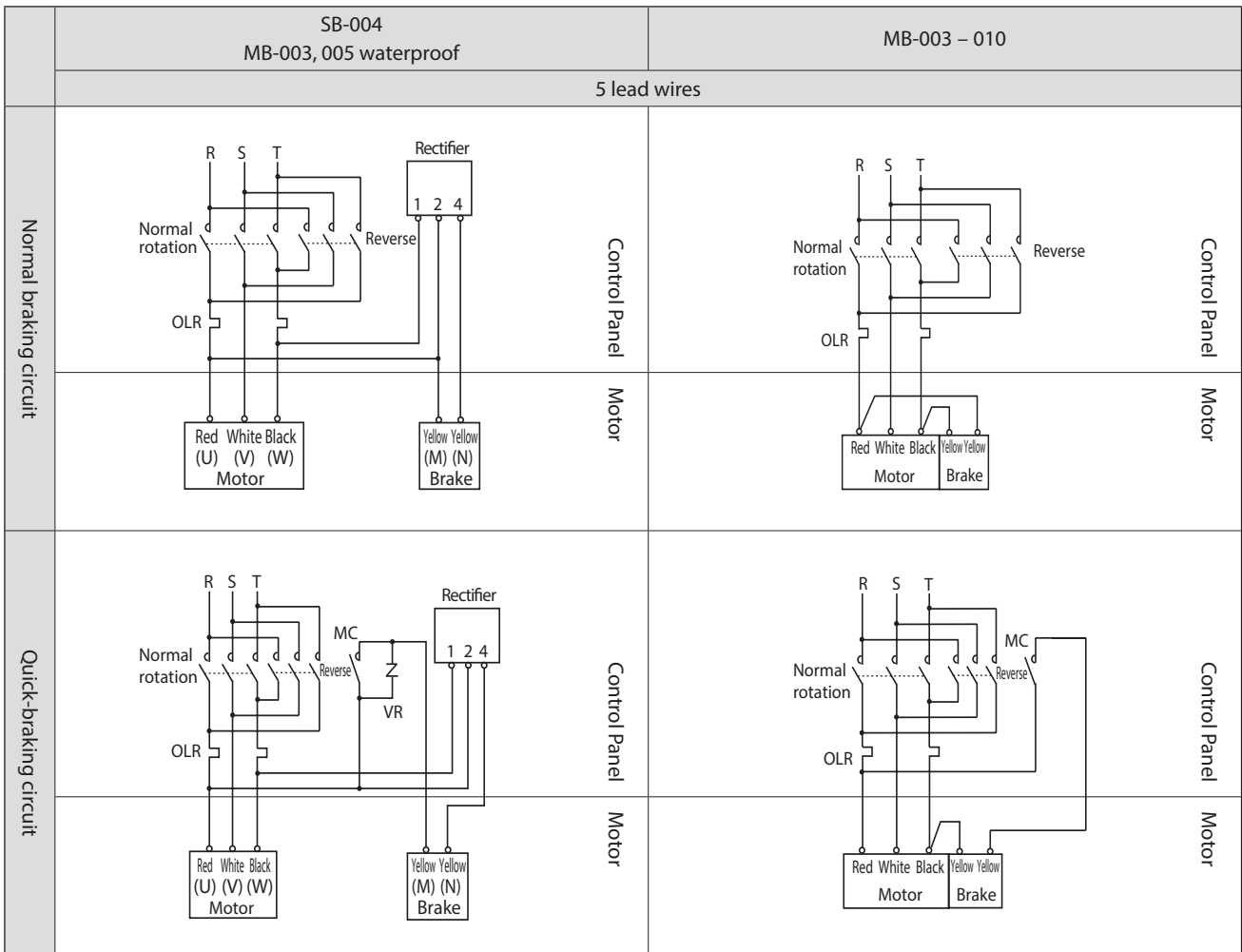
} Customer to prepare.

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- For brake types, see Table 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.
- Rectifiers are external to the main unit. Rectifiers are made for indoor use. Install in an area where they will not come into contact with water, etc.
- The brake unit is for 200V class. For 400V class power sources, prepare a 400V/200V transformer.

6. Wiring

■ With brake. 3-phase power source. Plugging operation

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.)

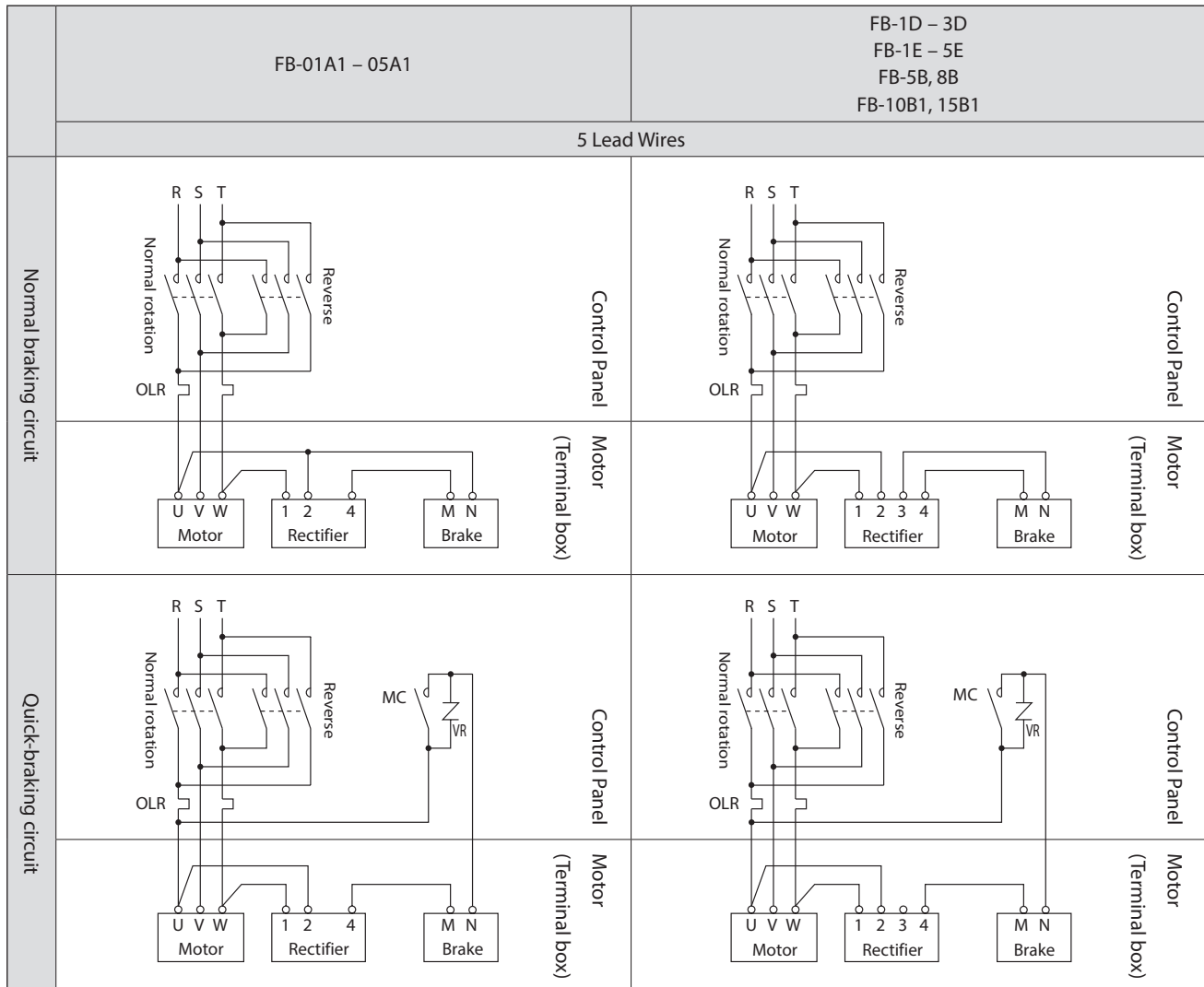
Customer to prepare.

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- For brake types, see Table 1-1 on P5 or Table 7-2 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
Table 7-2 on P48 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 6-6 on P46.
- For plugging operations using a quick-braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.

- SB-004 has a rectifier in place separately.
- A rectifier for MB-003 and 005 is built-in the brake unit. (However, the waterproof type is placed separately.)
- A flag () is attached at the lead wire for the MB-003 and 005 waterproof 400V class.
- Do not open the cap of a waterproof/dust-proof box of a waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- The rectifier is not waterproof for a waterproof motor.

■ With brake. 3-phase power source. Plugging 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.
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- 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 6-6 on P46.
- For plugging operations using a quick-braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.
- See P30 for PREST NEO.

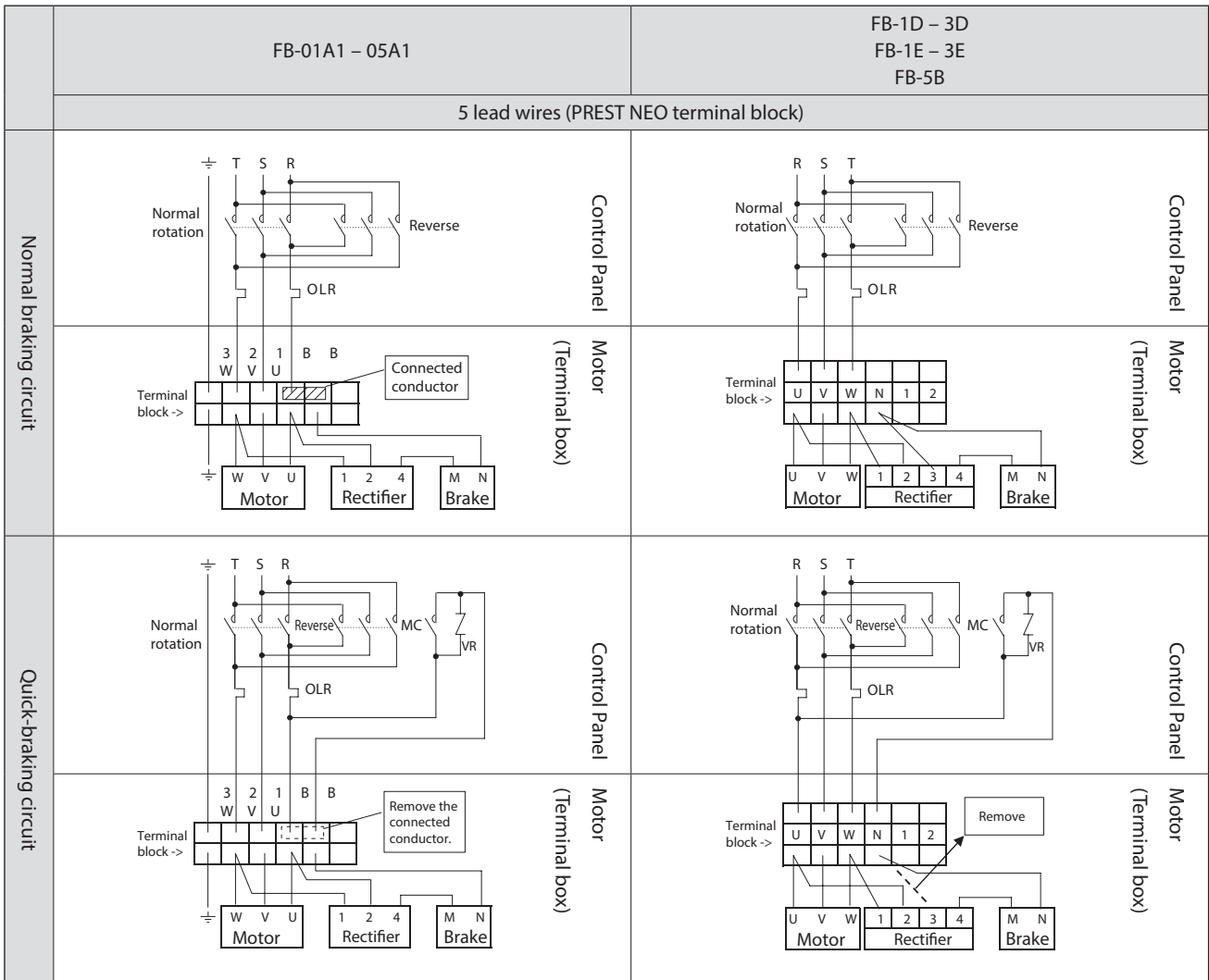
6. Wiring

■ With brake. 3-phase power source. Plugging 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.

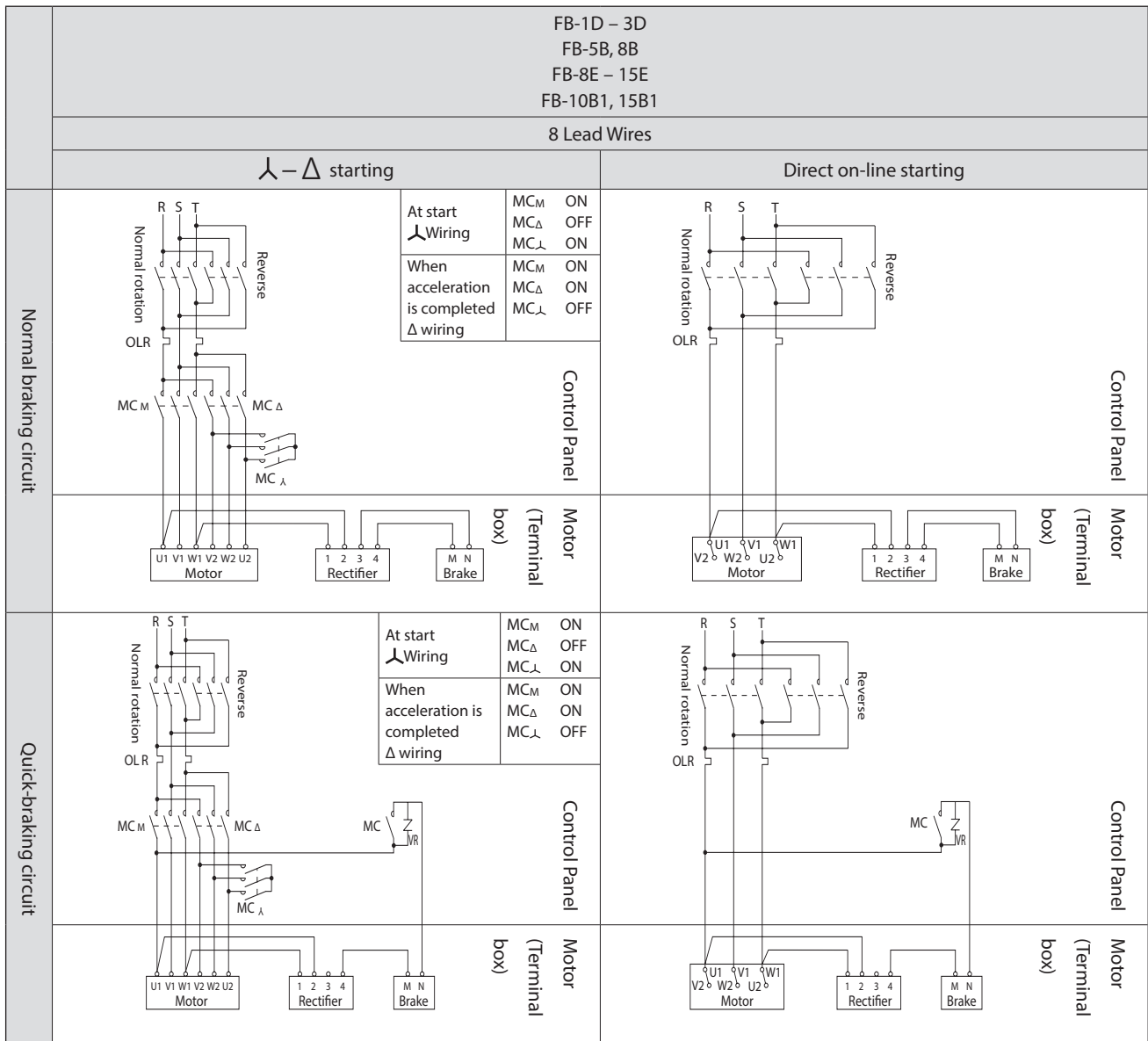
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
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- Brake action delay time is different between normal and quick-braking circuits.
Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.
- For plugging operations using a quick-braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.

■ With brake. 3-phase power source. Plugging 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.
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- 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 6-6 on P46.
- For plugging operations using a quick-braking circuit, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors.

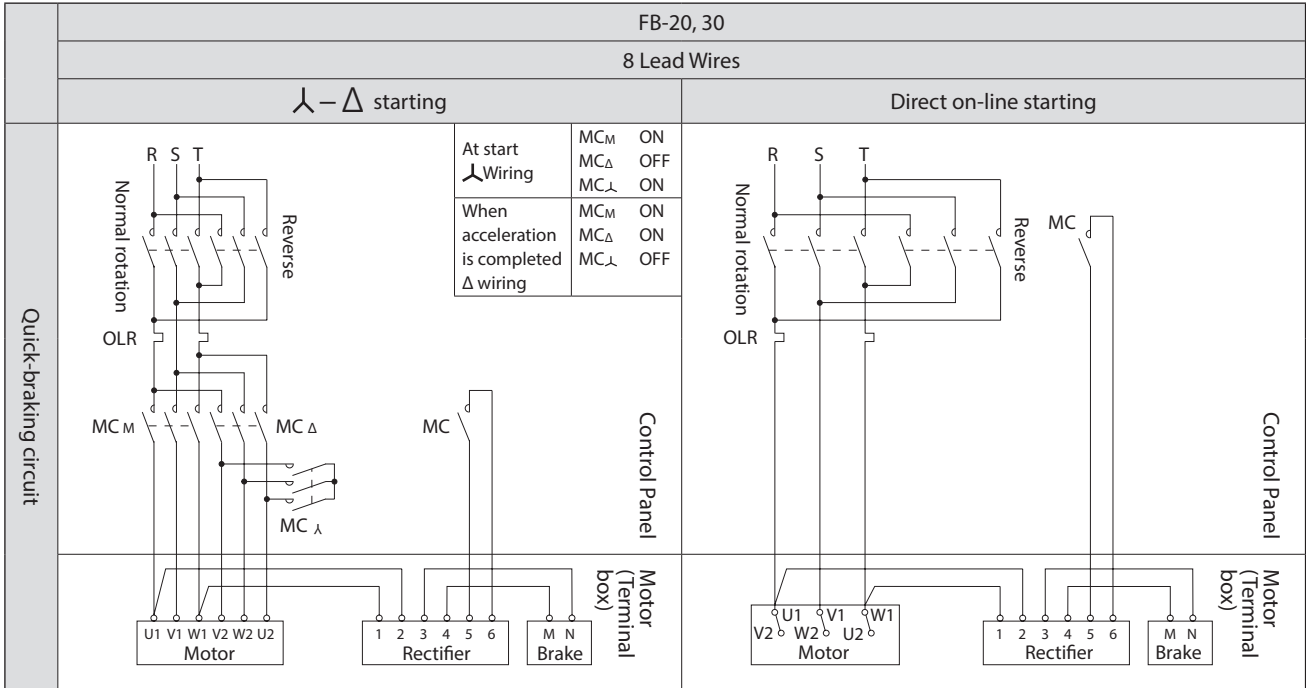
6. Wiring

■ With brake. 3-phase power source. Plugging 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
 } Customer to prepare.

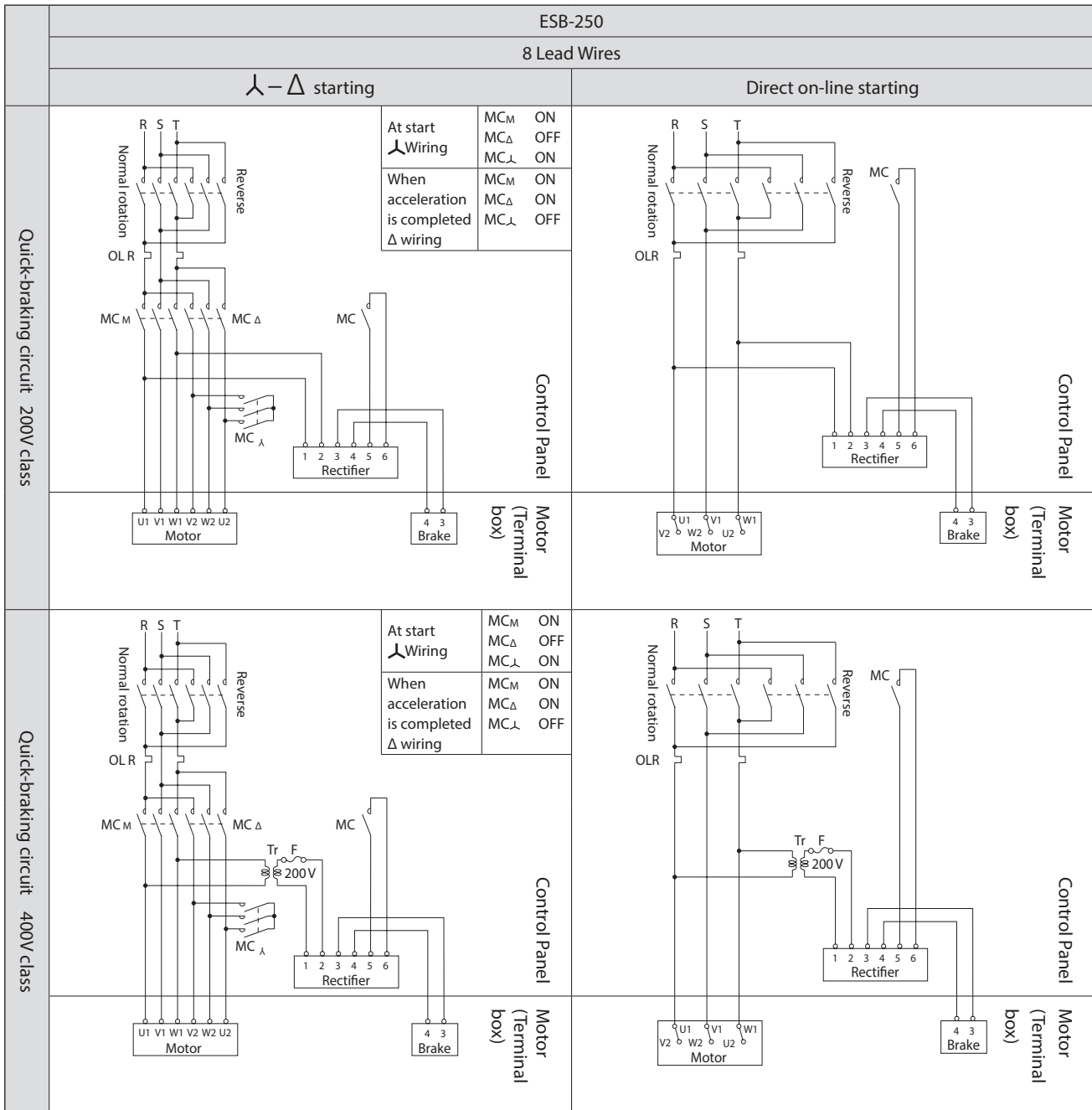
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- Shipped with a short circuit plate connecting rectifier terminals 5 and 6. Remove the short circuit plate when wiring.
- For plugging operations, gang the brake circuit's electromagnetic contactors to the motor's normal and reverse rotation electromagnetic contactors

■ With brake. 3-phase power source. Plugging 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

Tr: Transformer capacity 250–600VA, secondary voltage 200–220V

F: Fuse 3–5A

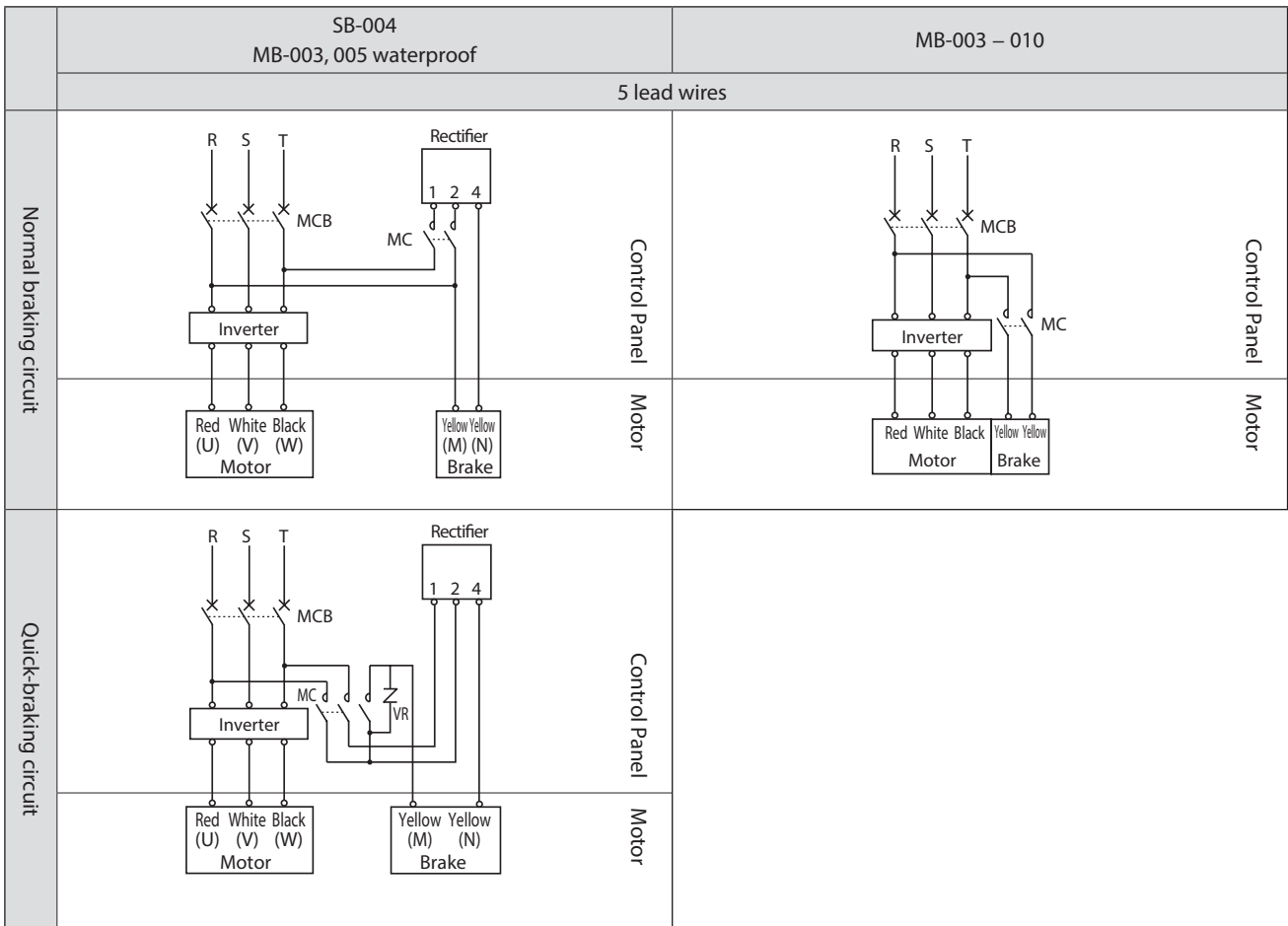
Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- Rectifiers are external to the main unit. Rectifiers are made for indoor use. Install in an area where they will not come into contact with water, etc.
- The brake unit is for 200V class. For 400V class power sources, prepare a 400V/200V transformer.
- For plugging operations, 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

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

— Customer to prepare.

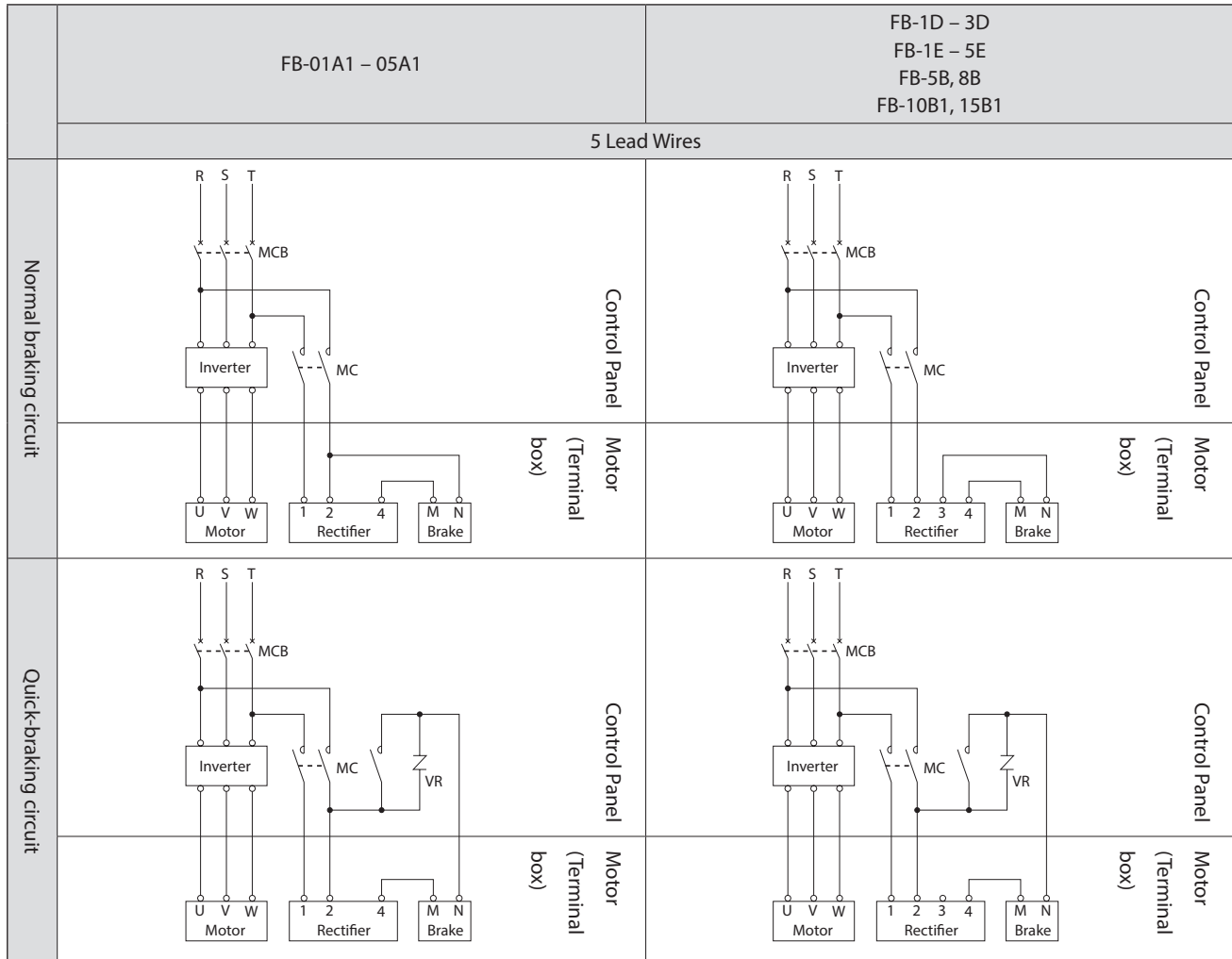
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P5 or Table 7-2 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
Table 7-2 on P48 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 6-6 on P46.

- 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.

- SB-004 has a rectifier in place separately.
- A rectifier for MB-003 and 005 is built-in the brake unit. (However, the waterproof type is placed separately.)
- A flag () is attached at the lead wire for the MB-003 and 005 waterproof 400V class.
- Do not open the cap of a waterproof/dust-proof box of a waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- The rectifier is not waterproof for a waterproof motor.

■ With Brake. Inverter Drive

3-phase motor
 Premium-Efficiency, 3-Phase Motor
 AF motor for inverter
 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.

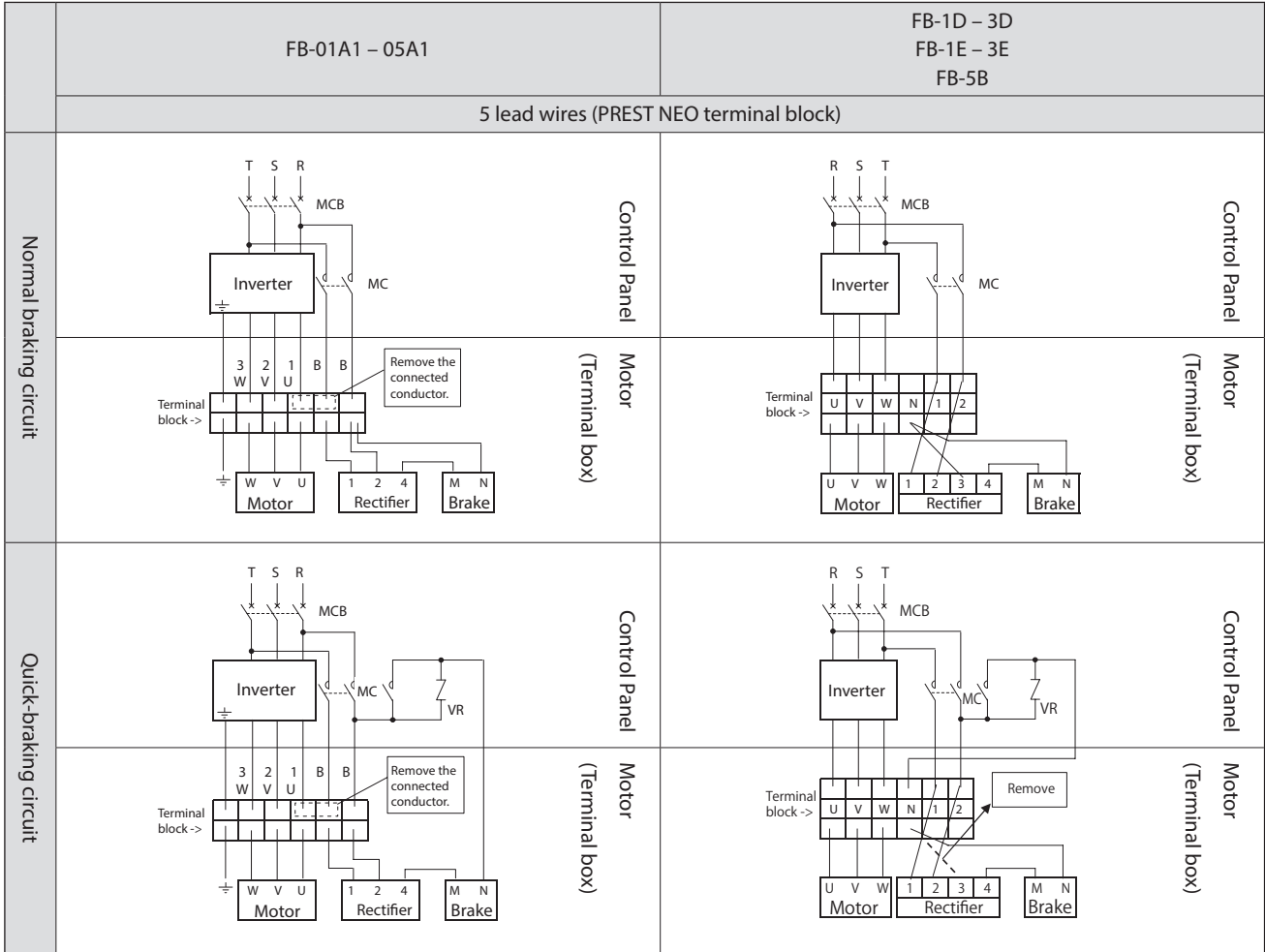
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- The motor must be insulated to inverter-drive a 400V class 3-phase motor/high-efficiency 3-phase motor.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.
- See P24 for PREST NEO.

- 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. 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.)

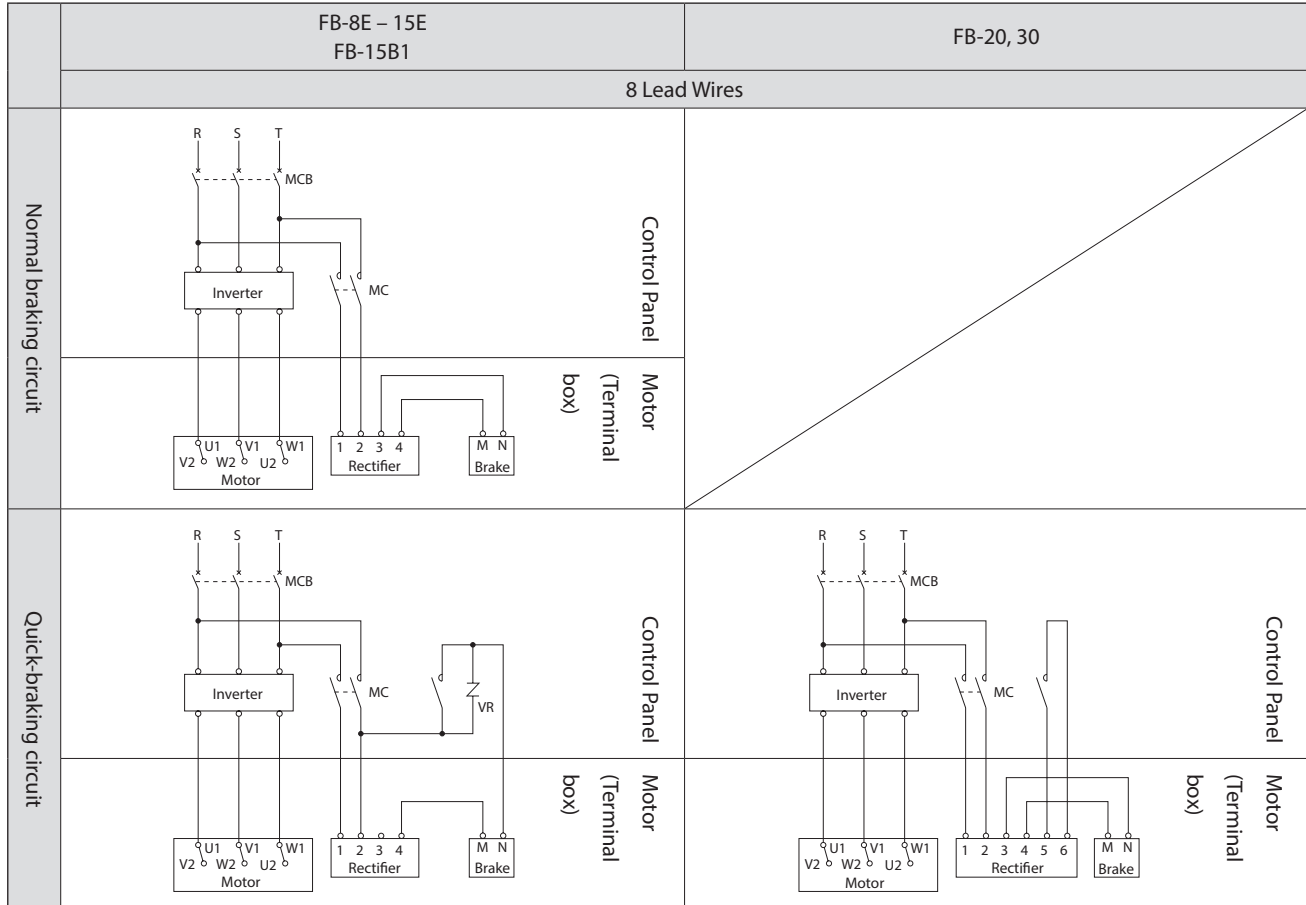
} Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- The motor must be insulated to inverter-drive a 400V class 3-phase motor/high-efficiency 3-phase motor.
- The terminal block is arrayed in two rows as shown in the above figure. Make sure that wiring of the motor power source is connected to the upper side on the above figure (on which symbols 1, 2, 3, U, V, W, and B are written; cable port side).
- Brake action delay time is different between normal and quick-braking circuits. Table 7-3 on P48 and Table 7-4 on P49 show 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 6-6 on P46.

- 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.

■ With Brake. Inverter Drive

3-phase motor
 Premium-Efficiency, 3-Phase Motor
 AF motor for inverter
 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- 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 P48 and Table 7-4 on P49 show 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 6-6 on P46.

- Use FB-20, 30 with quick braking circuits.
- FB-20, 30 are shipped with a short circuit plate connecting terminals 5 and 6. Remove the short circuit plate when wiring.

- 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.

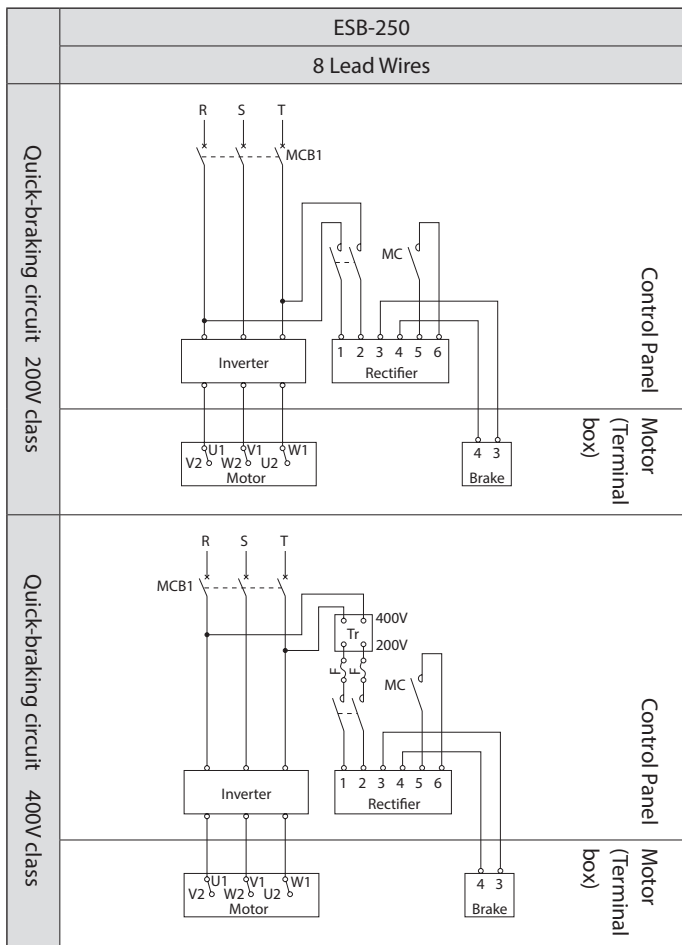
6. Wiring

■ With Brake. Inverter Drive

3-phase motor

Premium-Efficiency, 3-Phase Motor

High-efficiency 3-phase motor



MC: Electromagnetic contactor

MCB: Breaker for wiring

Tr: Transformer capacity 250-600VA, secondary voltage 200-220V

F: Fuse 3-5A

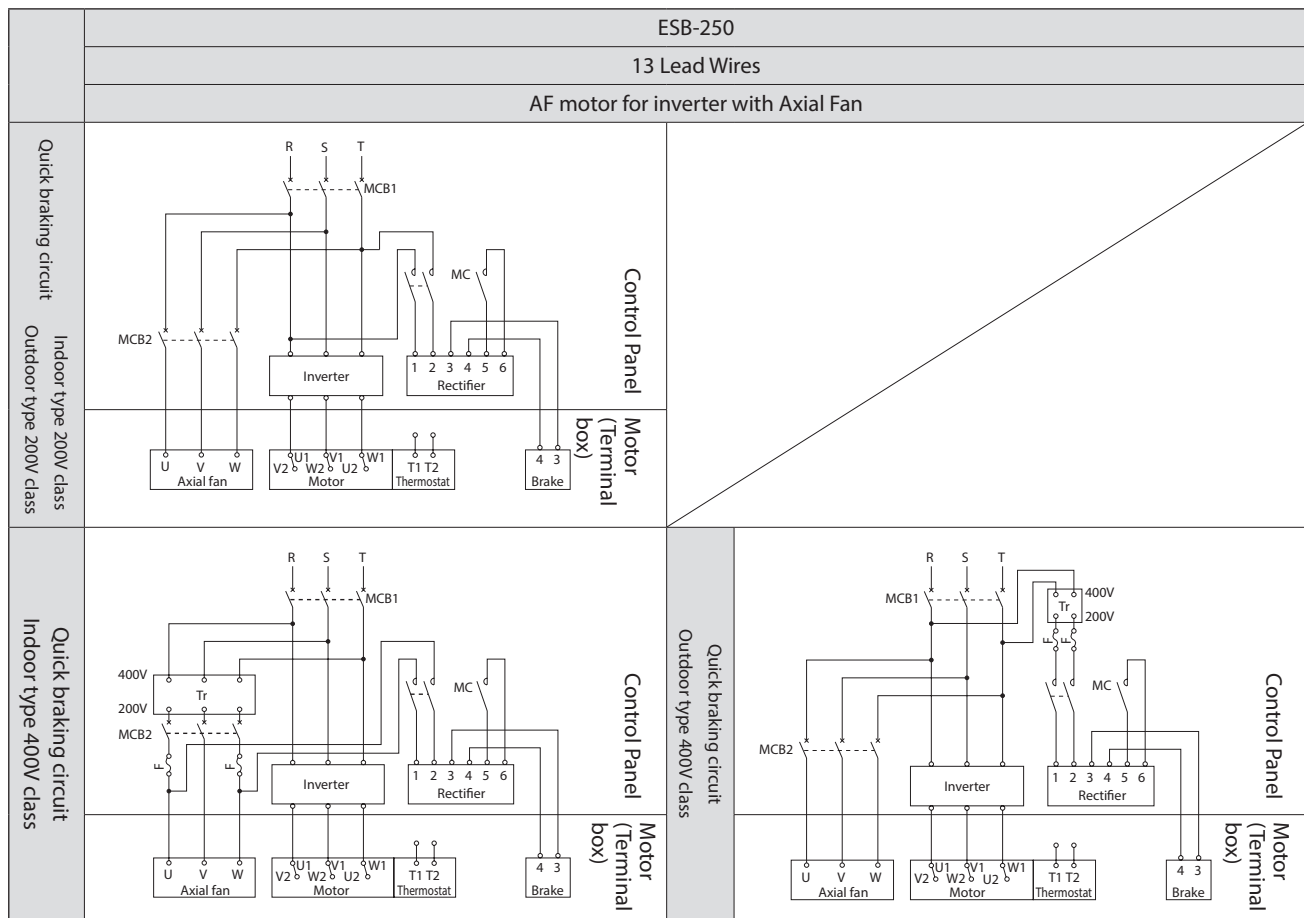
Customer to prepare.

- 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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- The motor must be insulated to inverter-drive a 400V class 3-phase motor/high-efficiency 3-phase motor.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- Rectifiers are external to the main unit. Rectifiers are made for indoor use. Install in an area where they will not come into contact with water, etc.
- The brake unit is for 200V class. For 400V class power sources, prepare a 400V/200V transformer.

- 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.

■ With Brake. Inverter Drive

AF motor for inverter



MC: Electromagnetic contactor

MCB: Breaker for wiring

Tr: Transformer capacity 250-600VA, secondary voltage 200-220V

F: Fuse 3-5A

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 1-2 and 1-3 on P5 or Table 7-3 on P48 and Table 7-4 on P49.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-6 on P46.
- Rectifiers are external to the main unit. Rectifiers are made for indoor use. Install in an area where they will not come into contact with water, etc.
- The brake unit is for 200V class. For 400V class power sources, prepare a 400V/200V transformer.

- 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.

In the case of **axial fans (totally enclosed, ventilated types)**, note the following items.

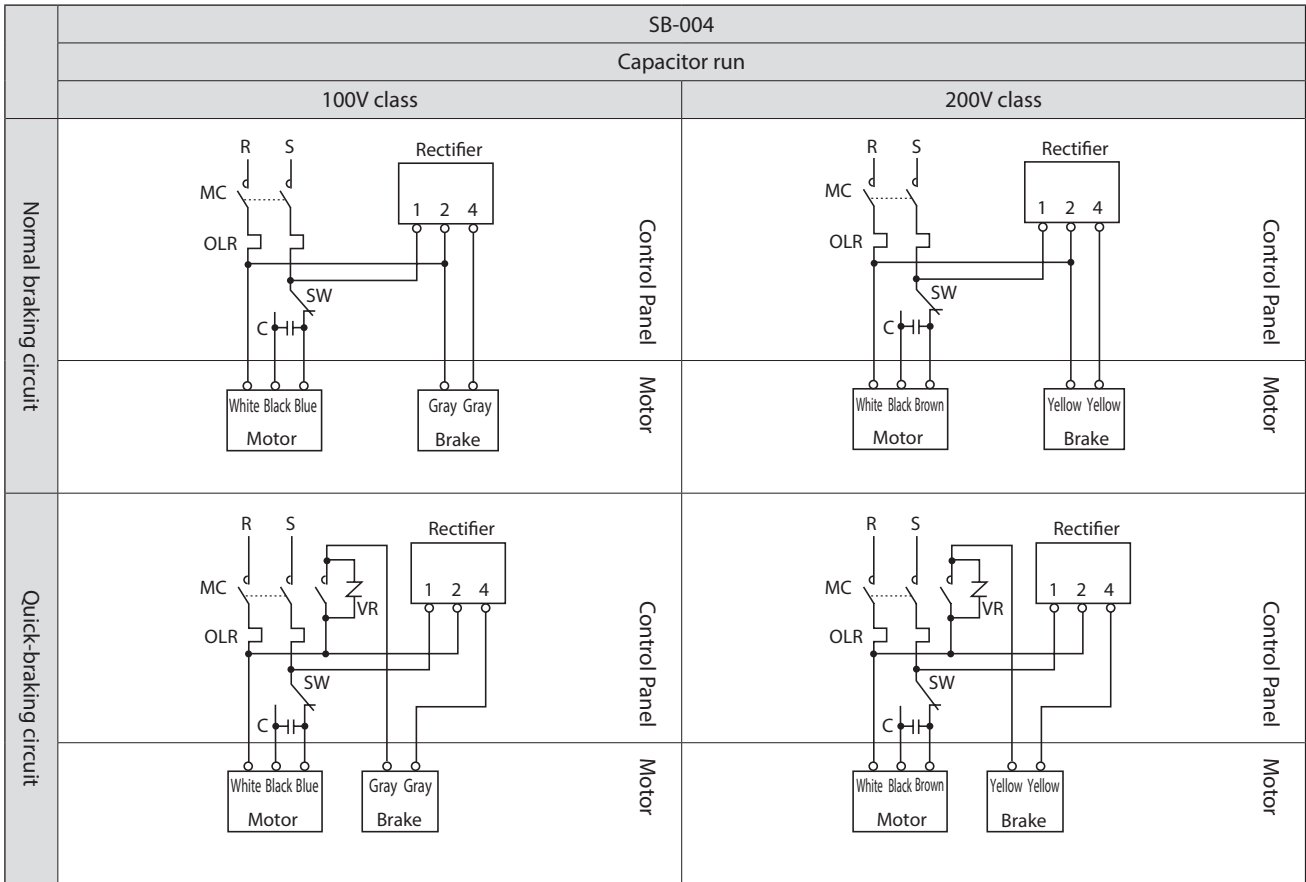
- Also connect a power source to the axial fan.
- For an indoor type 400V class, the axial fan power source voltage will be 200V class.
- For special specifications, specifications may differ from the above. Check the manufacturing specifications.
- Connect the fan so that it rotates in the same direction as that shown on the nameplate for direction of rotation.
(Normally, the air from the fan will blow in a direction from the anti-load side to the load side.)
- When the motor is shut down for a long period, also shut down the axial fan motor.
- Wire the mounted thermostat.
- Thermostat specification: Terminal symbols: T1, T2 and P1, P2 Operating function: Normal close (b contact point)
Operating temperature: 135°C (for thermal class 155 (F)) Maximum current: DC 24V, 18A; AC 230V, 13A

6. Wiring

■ With brake. Single phase power source

Single phase motor

Single phase reversible motor



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

SW: Plugging switch

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

C: Capacitor (accessory)

— Customer to prepare.

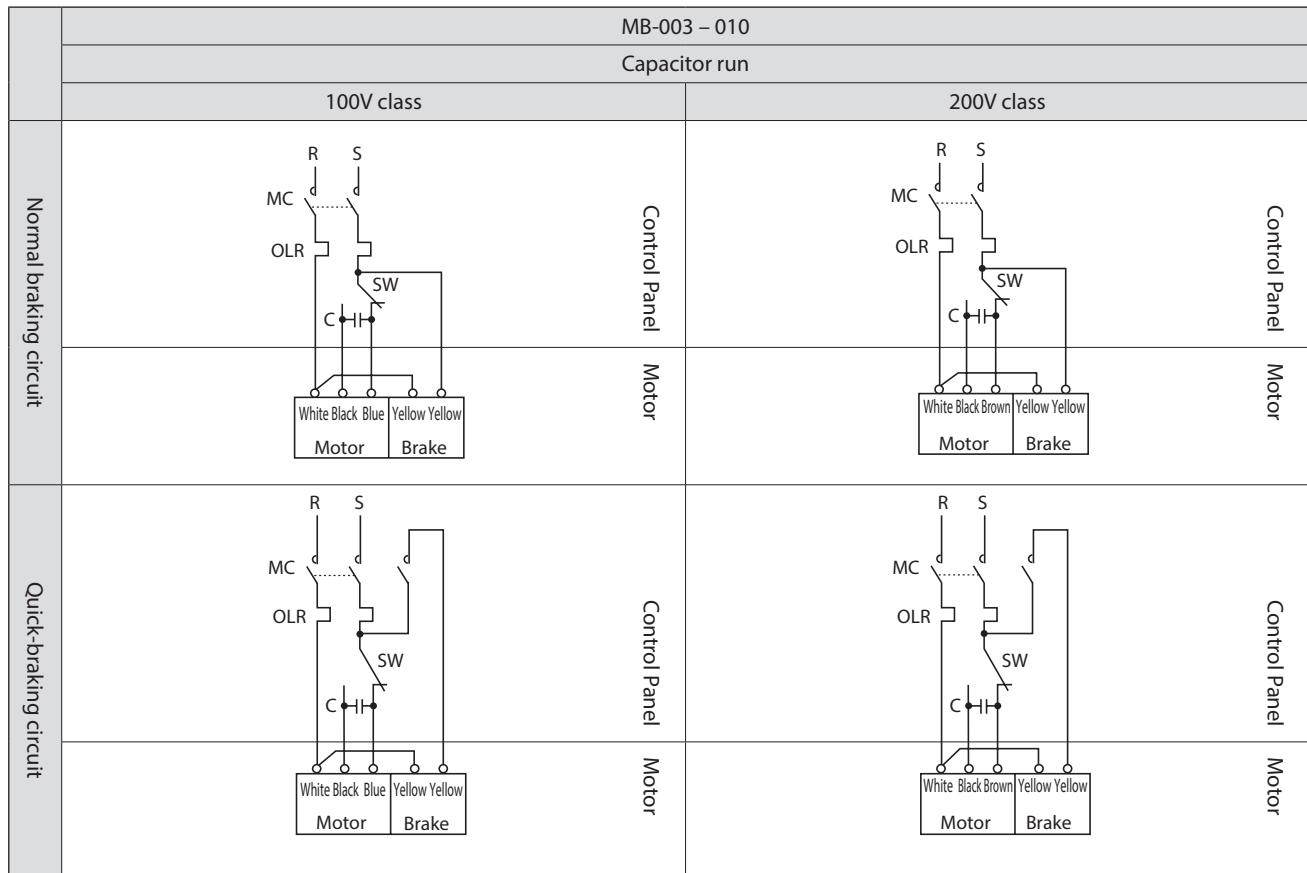
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P5 or Table 7-2 on P48.
- Use a capacitor bundled with the product for wiring.
- Brake action delay time is different between normal and quick-braking circuits. Table 7-2 on P48 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 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

- Switch the above SW for plugging rotation. (Use a reversible motor when an immediate plugging rotation is required.)
- A rectifier is placed separately.
- Do not open the cap of a waterproof/dust-proof box of a waterproof motor. Otherwise, waterproof/dust-proof effects will be lost and electric shock, damage, and fire may result.
- The capacitor/rectifier is not waterproof for a waterproof motor.

■ With brake. Single phase power source

Single phase motor

Single phase reversible motor



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

SW: Plugging switch

C: Capacitor (accessory)

Customer to prepare.

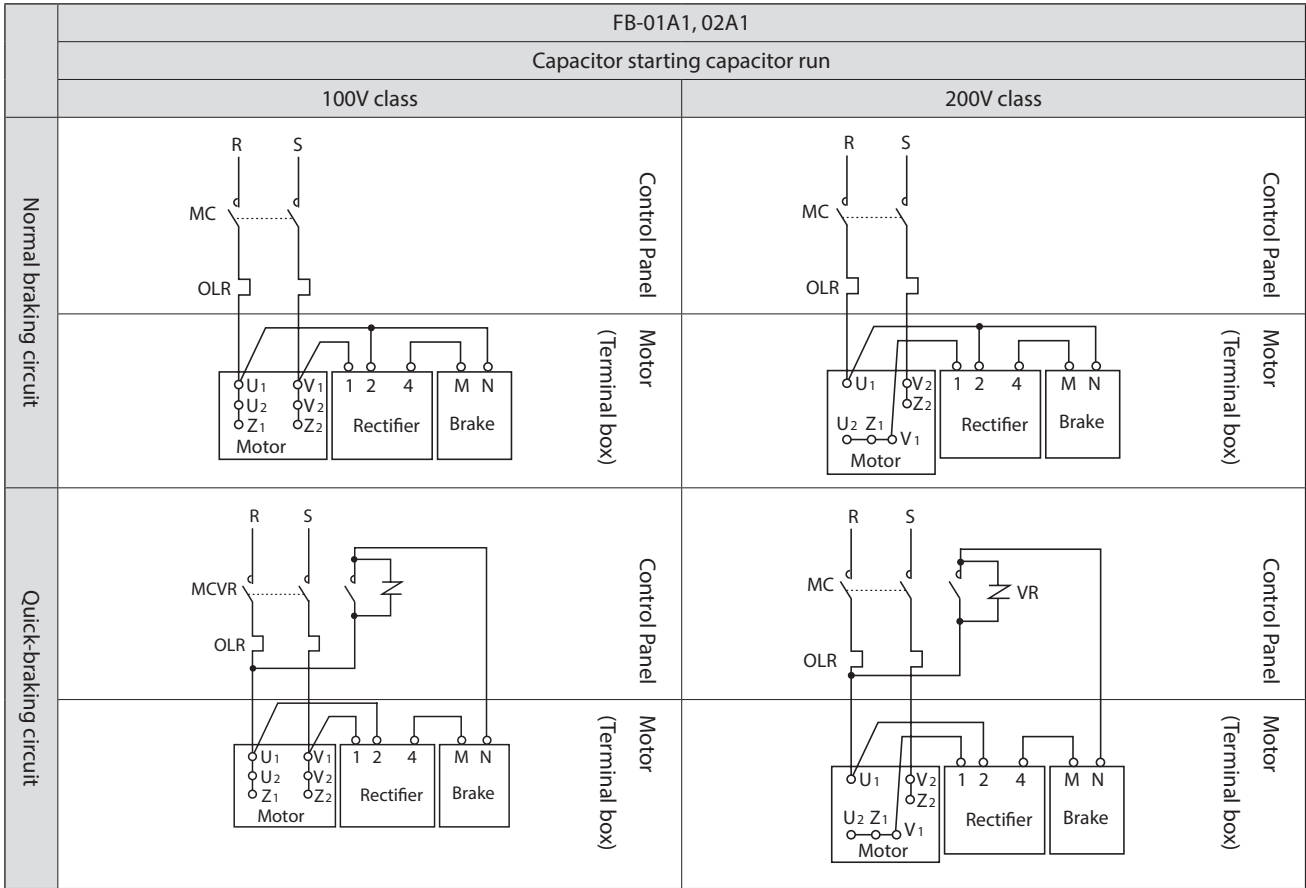
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-1 on P5 or Table 7-2 on P48.
- Use a capacitor bundled with the product for wiring.
- Brake action delay time is different between normal and quick-braking circuits. Table 7-2 on P48 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 6-6 on P46.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

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

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.)

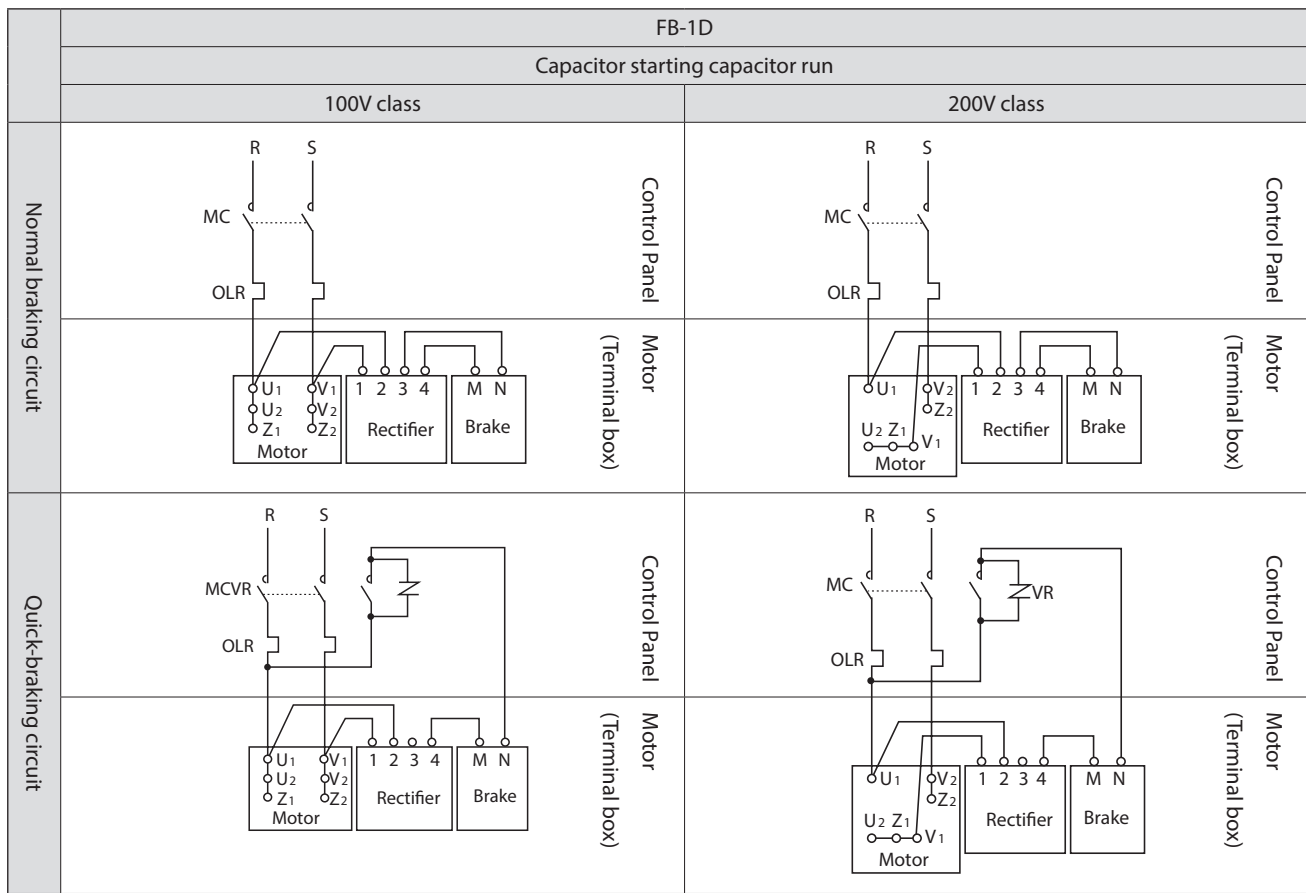
} Customer to prepare.

- 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 1-2 on P5 or Table 7-3 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 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 6-6 on P46.
- 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. 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.

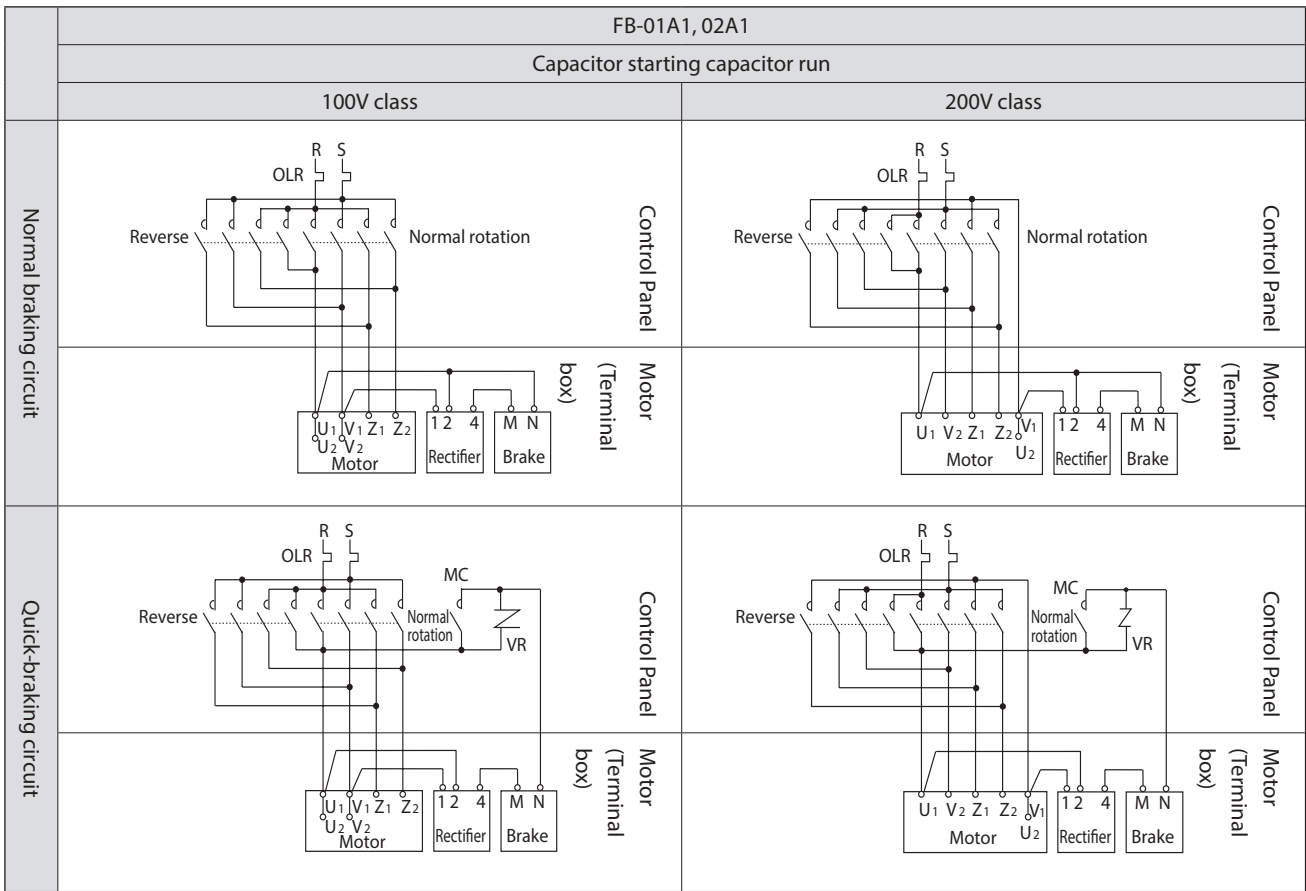
- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- For brake types, see Table 1-2 on P5 or Table 7-3 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 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 6-6 on P46.
- 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. Plugging operation

Single phase motor



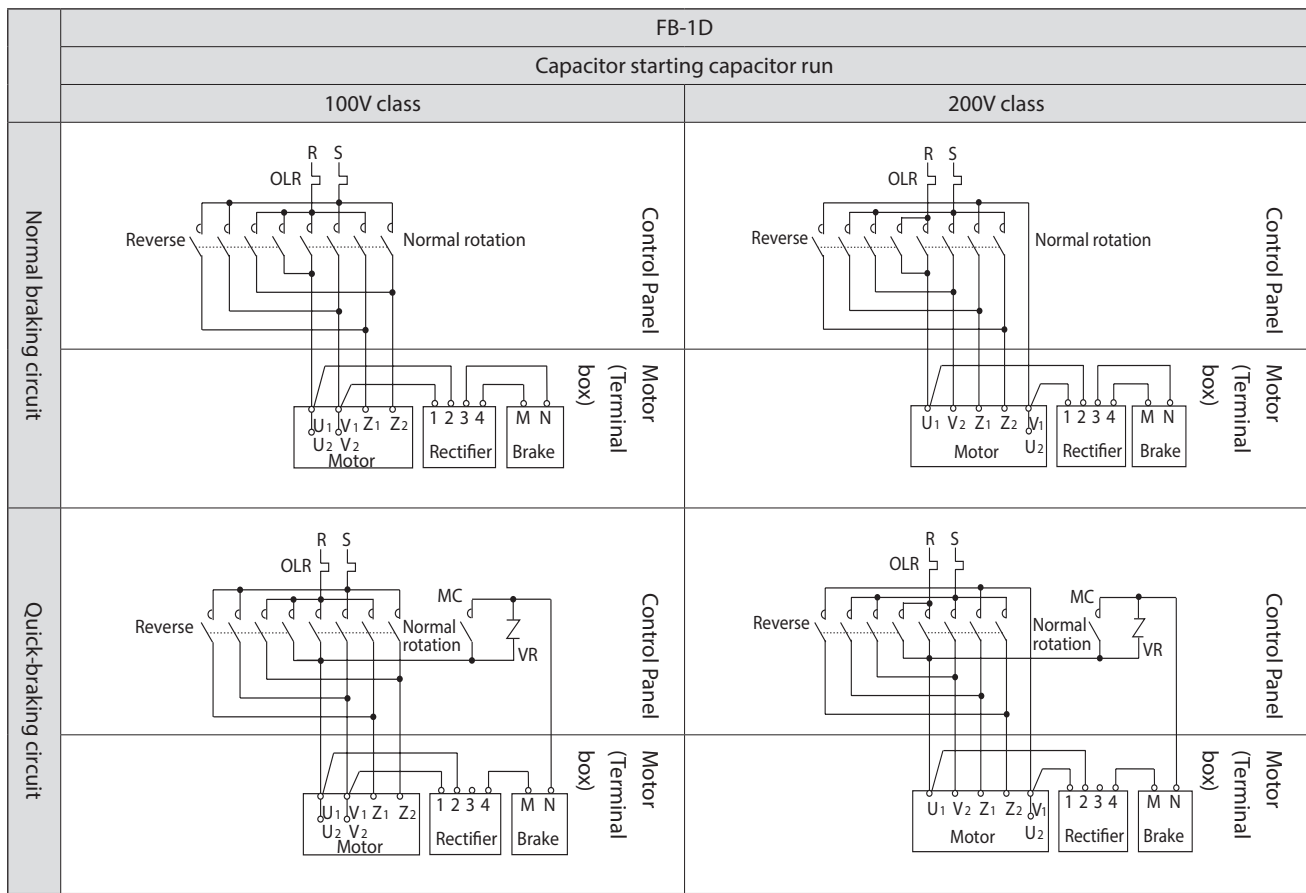
Electromagnetic contactor for normal and reverse rotation
 MC: Electromagnetic contactor
 OLR: Overload protection device or electronic thermal relay
 VR: Varistor (protection element)

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 1-2 on P5 or Table 7-3 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 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 6-6 on P46.
- For plugging 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.

■ With brake. Single phase power source. Plugging 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 1-2 on P5 or Table 7-3 on P48.
- Brake action delay time is different between normal and quick-braking circuits.
 Table 7-3 on P48 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 6-6 on P46.
- For plugging 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

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 6-6.

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

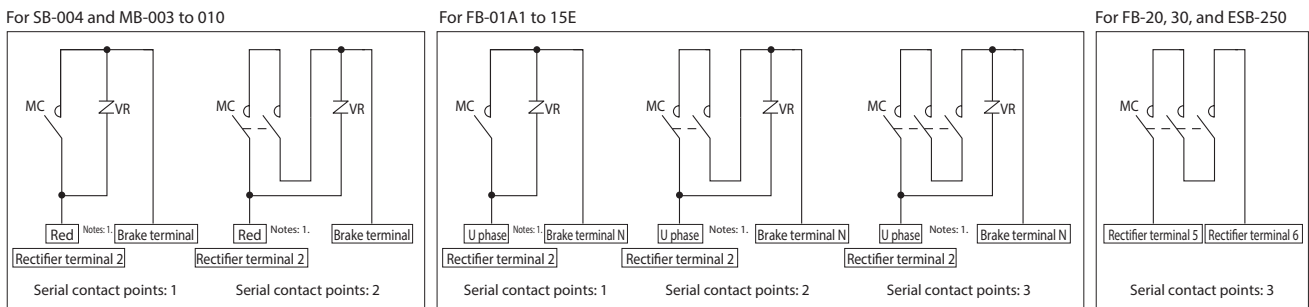
- Connect electromagnetic contactor contact points in serial. (See Figure 6-3)
- Connect the varistor (VR) as close to the unit as possible. (See Figure 6-3)

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

AC voltage	Brake Type	Recommended Contactor Nomenclature				Recommended Contactor	Recommended Varistor (For Protecting Contactor Contact Points)					
		Made by Fuji Electric FA Components & Systems Co., Ltd.	Made by Mitsubishi Electric Corporation	Serial contact points	Serial contact points		Varistor nomenclature	Maximum Allowable Circuit Voltage	Varistor voltage	Power rating		
200V 220V	SB-004	SC-05	Serial contact points: 1 (0.7A)	S-N11 or S-N12	Serial contact points: 1 (1.2A)	DC110V	Minimum 0.4A	TND07V-471KB00AAA0	AC300V	470V (423-517V)	0.25W	
	MB-003							-	-	-		
	MB-005							-	-	-		
	MB-010							-	-	-		
	FB-01A1							-	-	-		
	FB-02A1							-	-	-		
	FB-05A1							-	-	-		
	FB-1D, 1E							-	-	-		
	FB-1HE							-	-	-		
	FB-2D, 2E							-	-	-		
	FB-3D, 3E	-	-	-								
	FB-4E	-	-	-								
	FB-5B, 5E	-	-	-								
	FB-8B, 8E	-	-	-								
	FB-10B1, 10E	-	-	-								
FB-15B1, 15E	SC-5-1	Serial contact points: 3 (10A)	S-N20 or S-N21	Serial contact points: 3 (10.0A)	DC110V	Minimum 1.5A	TND14V-471KB00AAA0	AC300V	470V (423-517V)	0.6W		
FB-20							-	-	-			
FB-30							-	-	-			
ESB-250							-	-	-			
MB-003							-	-	-			
MB-005	SC-05	Serial contact points: 1 (0.25A)	S-N11 or S-N12	Serial contact points: 2 (0.5A)	DC220V	Minimum 0.2A	-	-	-	-		
MB-010							-	-	-			
FB-01A1							-	-	-			
FB-02A1							-	-	-			
FB-05A1							-	-	-			
FB-1D, 1E							-	-	-			
FB-1HE							-	-	-			
FB-2D, 2E							-	-	-			
FB-3D, 3E							-	-	-			
FB-4E							-	-	-			
FB-5B, 5E	-	-	-									
FB-8B, 8E	-	-	-									
FB-10B1, 10E	-	-	-									
FB-15B1, 15E	-	-	S-N20 or S-N21	Serial contact points: 3 (4.0A)	DC220V	Minimum 1.0A	TND10V-821KB00AAA0	AC510V	820V (738-902V)	1.0W		
FB-20							-				-	-
FB-30							-				-	-
ESB-250							-				-	-
MB-003							-				-	-

- This recommended contactor nomenclature 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 (for FB-30, ESB-250, approximately 1 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 6-6 have two or more auxiliary contact points.)
- This recommended varistor nomenclature 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.
- In the FB-20, 30, and ESB250, a varistor for protecting the connector contact points is built in to the rectifier.

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



Notes: 1. For inverter drives, connect to the R phase (power source side).

2. A motor with the MB brake does not have a rectifier's terminal 2 and a varistor (VR).

⚠ DANGER

- Do not approach or touch rotating parts (output 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, otherwise, electric shock 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 product; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The gearmotor or reducer becomes very hot during operation. Be careful not to touch with hands or body. otherwise, burns may result.
- If any abnormality occurs during operation, stop operation immediately; otherwise, electric shock, personal injury, or fire may result.
- Do not operate the unit in excess of the load rating; otherwise, personal injury, or damage to the equipment 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?

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. Operation

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 SB brakes and MB brakes

Brake type	Applicable model/frame size	Motor capacity (W)		Brake torque (Dynamic friction torque) (N·m)	Brake activation delay time (sec)		
		3-phase motor	Single phase motor		Normal braking circuit (Simultaneous turn-off circuit)	Normal braking circuit for inverter circuit (Separate turn-off circuit)	Quick-braking circuit
		4P	4P				
SB-004	HYPONIC/01 03 05 07	15 25 40 60	15 25 40	0.4	0.1 – 0.2	0.08 – 0.12	0.005 – 0.015
MB-003	HYPONIC/17 1240	40	40	0.3	0.07 – 0.12	0.03 – 0.06	0.03 – 0.06
	PREST NEO ALTAX NEO						
MB-005	HYPONIC/15 17 1240	60 90	60 90	0.5			
	PREST NEO ALTAX NEO						
	60	60					
MB-010	ALTAX NEO/5067	90 100 ^{*1}	90	1.0	0.1 – 0.15	0.05 – 0.08	0.05 – 0.08

Table 7-3 FB brakes and ESB brakes

Brake type	Motor Capacity (kW)							Brake torque (Dynamic friction torque) (N·m)	Brake activation delay time (sec)		
	3-phase motor			AF motor for inverter 3-Phase Motor for inverter		High-efficiency 3-Phase Motor	Single phase motor		Normal braking circuit (Simultaneous turn-off circuit)	Normal braking circuit for inverter circuit (Separate turn-off circuit)	Quick-braking circuit
	4P	6P	4/8P	4P	6P	4P	4P				
FB-01A1	0.1 ^{*1}	–	–	–	–	–	0.1	1.0	0.15 – 0.2	0.08 – 0.12	0.015 – 0.02
FB-02A1	0.2 0.25 ^{*2}	–	–	0.1	–	–	0.2	2.0			
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 0.75	0.4	0.4/0.2	0.4	–	0.4	0.4	7.5	0.2 – 0.3	0.1 – 0.15	0.01 – 0.02
FB-2D	1.1 1.5	–	–	0.75	–	0.75	–	15			
FB-3D	2.2	0.75	0.75/0.375	1.5	–	1.1 1.5	–	22	0.3 – 0.4	0.15 – 0.2	
FB-5B	3.0 3.7	1.5	1.5/0.75	2.2	–	2.2	–	37	0.4 – 0.5	0.2 – 0.25	
FB-8B	5.5	2.2	2.2/1.1	3.7	–	3.0 3.7	–	55	0.3 – 0.4	0.1 – 0.15	
FB-10B1	7.5	3.7	3.7/1.85	5.5	–	5.5	–	75	1.0 – 1.1	0.4 – 0.5	0.025 – 0.04
FB-15B1	11	5.5	5.5/2.75	7.5	3.7	7.5	–	110	0.7 – 0.8	0.2 – 0.3	
FB-20	15	7.5 11	7.5/3.75 11/5.5	11	5.5 7.5	11 15	–	150	–	–	0.06 – 0.14
	18.5	–	–	–	–	–	–	190	–	–	0.03 – 0.11
	22	15 18.5 22	15/7.5	15	11	–	–	220			
30	–	–	18.5 22	15	18.5 22	–	200				
ESB-250	–	–	22/11	–	–	–	–	220	–	–	0.065
	37	–	–	30	–	30	–	250			
	45	30	30/15	37	18.5 22	37	–	300			
	–	37	–	–	30	–	–	370			

- Notes: 1. Altax NEO frame size 5067 3-phase motor 4P 0.1kW is MB-010.
 2. HYPONIC Gearmotor, 3-phase motor 4P 0.25kW is FB-05A1.
 3. Brake type may differ depending on specification. Check the nameplate.
 4. 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.
 5. Brake activation delay time will change according to the brake's wiring circuit. Select the optimum circuit for the application.

7. Operation

Table 7-4 FB brakes and ESB brakes

Brake Type	Motor Capacity (kW)			Brake torque (Dynamic friction torque) (N·m)	Brake activation delay time (sec)		
	Premium-efficiency, 3-phase motor		Premium- efficiency, 3-phase motor for inverter		Normal braking (Simultaneous turn-off circuit)	Normal braking circuit for inverter (Separate turn-off circuit)	Quick-braking circuit
	4P	6P	4P				
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-4E	3.0	–	–	30	0.65 – 0.85	0.3 – 0.4	
FB-5E	3.7	–	3.7	40	1.1 – 1.3	0.4 – 0.5	
FB-8E	5.5	–	5.5	55	1.0 – 1.2	0.3 – 0.4	
FB-10E	7.5	–	7.5	80	1.8 – 2.0	0.6 – 0.7	
FB-15E	11	–	11	110	1.6 – 1.8	0.5 – 0.6	
FB-20	15	11	15	150	–	–	0.06 – 0.14
FB-30	–	15	–	220	–	–	0.03 – 0.11
	18.5	18.5	18.5	190			
	22	22	22	220			
	30	–	–	200			
ESB-250	37	–	–	266	–	–	0.065
	45	30	–	320			
	–	37	–	372			

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.

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 motor**; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- The lead-in condition of an **explosion proof motor**, 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. Do not touch the product with bare hands. Otherwise, burns may result.
- 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.
- Supply/discharge grease to/from the motor bearing according to the maintenance manual instructions. Avoid contact with rotating parts; otherwise, injury may result.
- 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 the product as general industrial waste.
- 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 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.

8-1 Daily Inspection

Make certain to carry out daily inspection 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?
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 an ALTAX NEO 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 and 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.
Please consult with us for details.
- If any problems are found in a daily inspection, follow "9. Troubleshooting" (on P91 and 92) to take appropriate actions. If these actions do not remedy the issue, immediately contact the nearest authorized service station.

8. Daily Inspection and Maintenance

8-2 Motor Bearing Maintenance

Bearing type and maintenance technique will vary according to motor frame size. When maintaining, confirm the bearing type by referring to the nameplate and Table 8-2.

Table 8-2 Bearing Types

Bearing type	Specified Motor (Frame Size)		Remarks
	Load Side	Anti-Load Side	
Sealed bearing	frame size 160 and lower frame size 180 and higher, CYCLO frame size 6225 and lower	All frame sizes	Not constructed for filling or draining grease
Open bearing	frame size 180 and higher, CYCLO frame size 6235 and higher	—	With grease fitting and grease discharge plug

(1) Sealed Bearing Maintenance

Although it will depend on operation conditions, overhauling after approximately 20,000 hours or 3 to 5 years will further increase lifetime.

Contact the nearest authorized service station regarding overhaul.

(2) Open Bearing Maintenance

Check the bearing number on the nameplate, and replenish grease in accordance with Table 8-3.

Table 8-3 Open Bearing Grease Replenishment Intervals and Replenishment Quantity

Bearing Number	Replenishment Quantity (g)	Grease Replenishment Interval (Interval (h) for Speeds (r/min))					
		720r/min	870r/min	980r/min	1165r/min	1450r/min	1750r/min
6314	40	8500	7000	6000	5000	3500	2500
6315	45	8500	6500	6000	4500	3500	2500
6316	50	8000	6500	5500	4500	3000	2500
6317	55	7500	6000	5000	4000	3000	2000
6318	60	7000	5500	5000	4000	2500	2000
6319	65	7000	5500	4500	3500	2500	1500
6320	70	6500	5000	4500	3500	2000	1500
6321	75	6000	5000	4000	3000	2000	1500
6322	80	6000	4500	4000	3000	2000	1000
6324	100	5500	4000	3500	2500	1500	1000
6412	40	8500	7000	6000	5000	3500	3000
6413	45	8000	6500	6000	4500	3500	2500
6414	55	8000	6500	5500	4500	3000	2500
NU314	40	4000	3500	3000	2500	1500	1000
NU315	45	4000	3000	3000	2000	1500	1000
NU316	50	4000	3000	2500	2000	1500	1000
NU317	55	3500	3000	2500	2000	1500	1000
NU318	60	3500	2500	2500	2000	1000	1000
NU319	65	3500	2500	2000	1500	1000	
NU320	70	3000	2500	2000	1500	1000	
NU321	75	3000	2500	2000	1500	1000	
NU322	80	3000	2000	2000	1500	1000	
NU324	100	2500	2000	1500	1000		

- The replenishment quantity is the quantity to insert at each interval.
- Even in the case of intermittent operation, replenish grease approximately every 3 years.
- If the machine is rested for a long time, replenish grease immediately after resuming operation.

8. Daily Inspection and Maintenance

(3) Recommended Grease for Open Bearings

Table 8-4 Recommended Grease

Ambient Temperature °C	Open Bearing	
	Thermal Class 130 (B)	Thermal Class 155 (F)
	Mobil	Shell
-10 to 40	UNIREX N2	Shell Stamina Grease RL2

Avoid using grease other than that listed in Table 8-4.

(4) Procedures for Filling and Discharging Grease for Open Bearings

See the constructions in Figure 8-1 and Figure 10-2 on P93.

[1] Remove the discharge port plug, and discharge the old grease. While the machine is running replenish with new grease through the grease fitting.

(Grease change will be incomplete if replenishing is done while the machine is stopped.)

[2] Run the machine for approximately 10 minutes after the grease is inserted. Then fasten the discharge port plug.

- Overfilling could cause the bearing to overheat, grease to leak and other problems. Be careful.
- Do not think that it is allowable to replenish with a large quantity to extend the replenishment interval.
- Please maintain the machine properly. Neglecting replenishment when resuming operation, or periodic replenishment when the machine is operating could lead to abnormal wear, bearing noise, bearing burnout, and other problems.

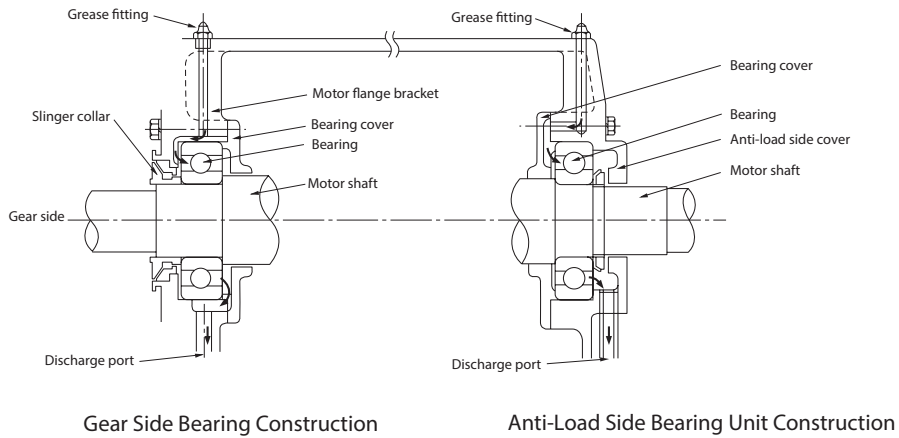


Figure 8-1 Open Bearing Unit Construction

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 (1 million times for FB-30, ESB-250). 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 (1 million times for FB-30, ESB-250), 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 some 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.

Relevant brakes
 FB-01A1 – 05A1, FB-1D – 3D (for PREST NEO and ALTAX NEO only)
 FB-1E – 4E (for all types)
 FB-5E (for ALTAX NEO only)

Table 8-5 Pages Containing Information on Brake Construction and Gap Inspection and Adjustment

Brake Type	Indoor	Outdoor type/waterproof
SB-004	P54	P71
MB-003, 005, 010	P55	P72
FB-01A1, 02A1, 05A1	P56	P73
FB-1D	P57	P74
FB-1E	P58	P75
FB-1HE, 2E	P59	P76
FB-2D	P60	P77
FB-3D	P61	P78
FB-3E, 4E	P62	P79
FB-5B, 8B	P63	P80
FB-5E, 8E	P64	P81
FB-10B1, 15B1	P65	P82
FB-10E, 15E	P66	P83
FB-20	P67	P84
FB-30	P68	P85
ESB-250	P69	P86

8. Daily Inspection and Maintenance

(1) Indoor type

■ SB-004 (Indoor type)

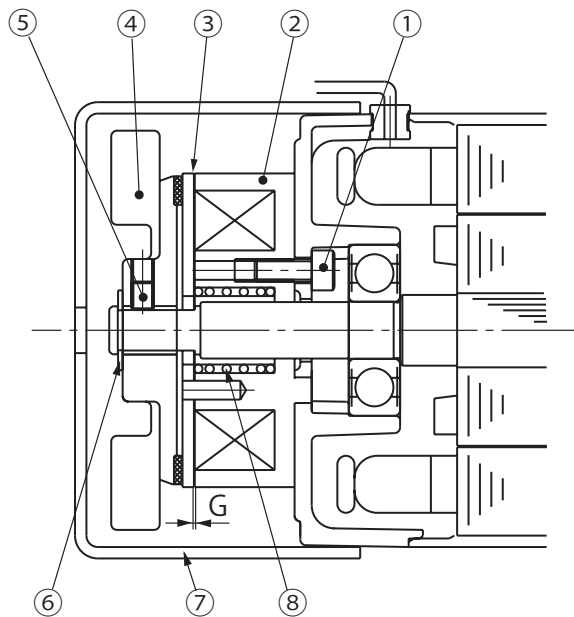


Figure 8-2

Code	Part Name
1	Brake mounting bolt
2	Stationary core
3	Armature plate
4	Lining with fan
5	Set screw
6	Retaining ring
7	Cover
8	Torque spring

- Gap Inspection

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

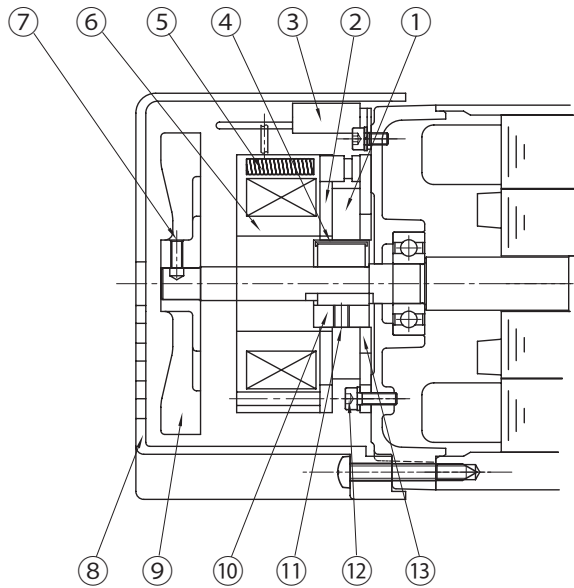
Gap value G (mm)	
Required value (original value)	Limit value
0.15 – 0.25	0.4

- Gap Adjustment

- (1) Remove the cover [7].
- (2) Loosen the set screw [5]. (Anti-loose locking is provided.)
- (3) Insert a gap gauge between the stationary core [2] and the armature plate [3] to adjust to a specified gap.
- (4) Apply a locking agent to the set screw [5] to fix the lining with fan [4].
- (5) Attach the cover [7].

8. Daily Inspection and Maintenance

■ MB-003, 005, 010 (Indoor type)



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

Figure 8-3

- 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)

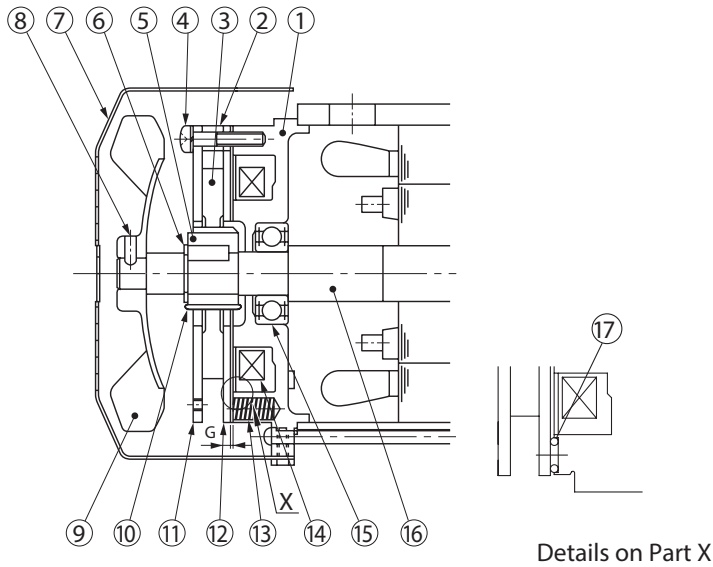


Figure 8-4

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	Cooling fan
10	Leaf spring
11	Fixed plate
12	Armature plate
13	Spring
14	Electromagnetic coil
15	Bearing
16	Motor shaft
17	Shock absorber

- Notes: 1. FB-01A1 of a 3-phase motor 0.1kW does not have [8] and [9].
 2. [17] is provided only to PREST NEO and ALTAX NEO.

- Gap Inspection

- Remove the cover [7].
- 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.
- Adjustment is required if the gap value is near the limit.

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

- Gap Adjustment

- Remove the cover [7].
- Loosen the fan set screw [8] and remove the fan [9].
- 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.)
- Turn the power on and off to check brake action.
- 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.

8. Daily Inspection and Maintenance

■ FB-1D (Indoor Type)

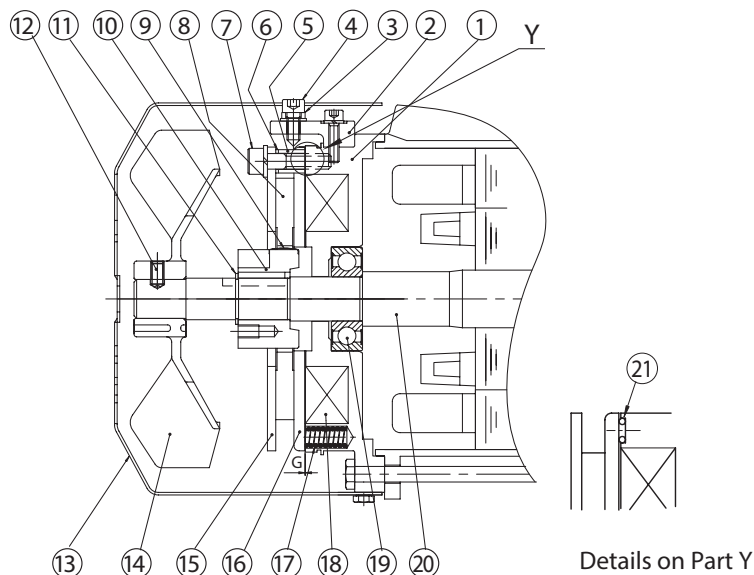


Figure 8-5

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	Cooling fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Bearing
20	Motor shaft
21	Shock absorber

Notes: [21] is provided only to PREST NEO and ALTAX NEO.

- 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)

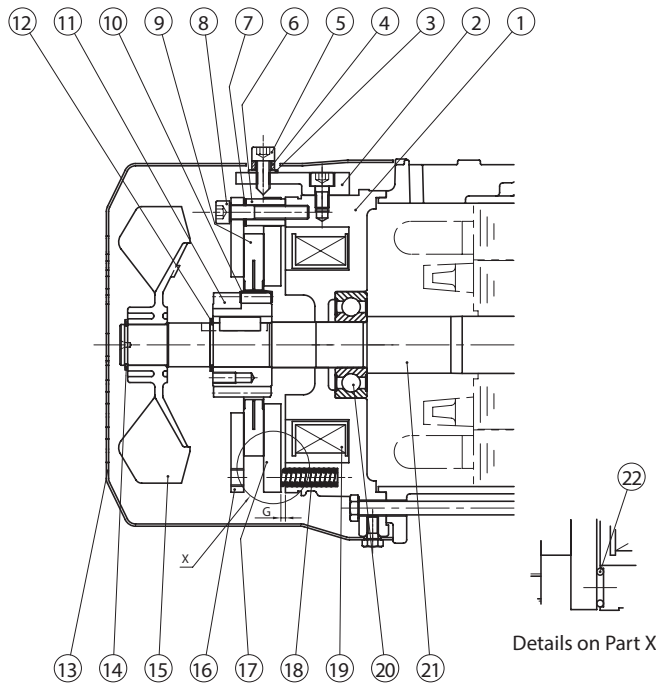


Figure 8-6

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	Cooling 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 near the limit.

(Gap adjustment shim thickness is approximately 0.2 – 0.25 mm. Adjustment cannot be made at a lower value.)

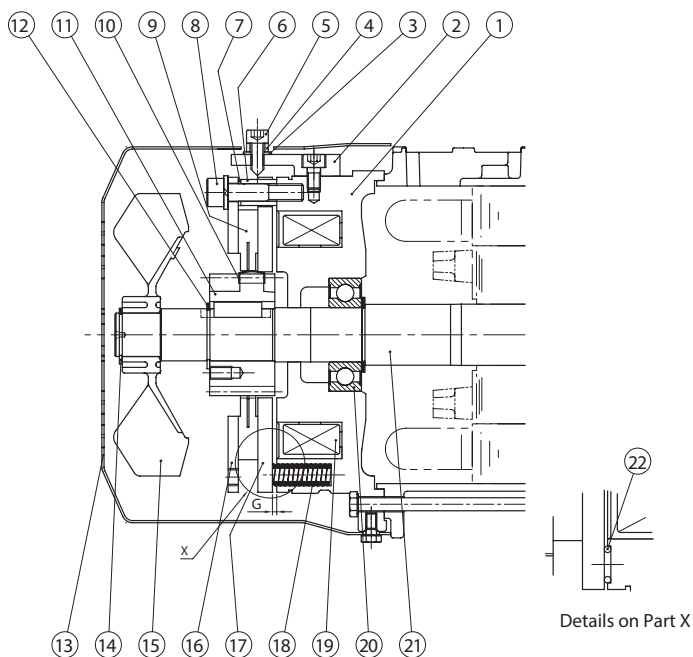
Gap Value G (mm)	
Required value (original value)	Limit value
0.25 – 0.35	0.6

- 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].

8. Daily Inspection and Maintenance

■ FB-1HE, 2E (Indoor Type)



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	Cooling fan
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Ball bearings
21	Motor shaft
22	Shock absorber

Figure 8-7

- 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 near 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) 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 0.35 – 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.
- (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].

8. Daily Inspection and Maintenance

■ FB-2D (Indoor type)

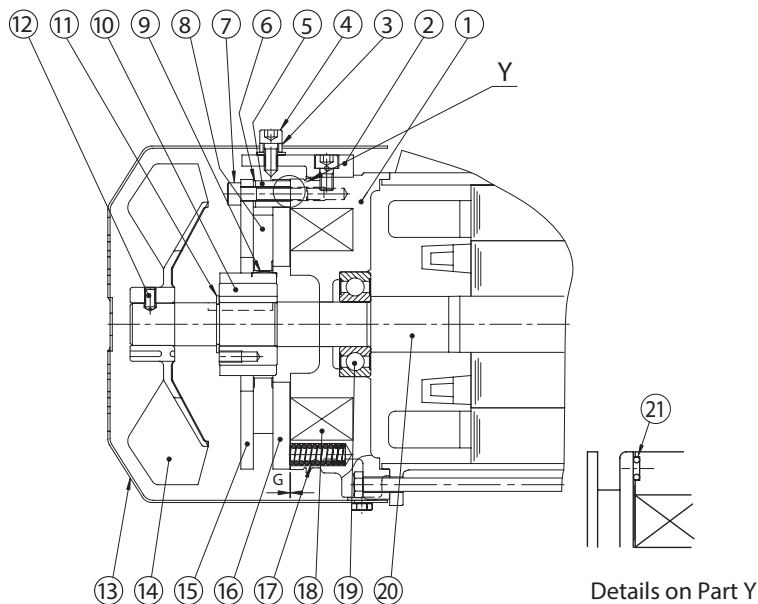


Figure 8-8

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	Cooling fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Bearing
20	Motor shaft
21	Shock absorber

Notes: [21] is provided only to PREST NEO and ALTAX NEO.

- Gap Inspection

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [13].
- (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 near 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

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [13].
- (3) Remove the fan set screw [12] and remove 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] only, make sure not to fall the gap adjustment shims [6] or the shock absorber [21].
- (5) 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.
- (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], 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-3D (Indoor type)

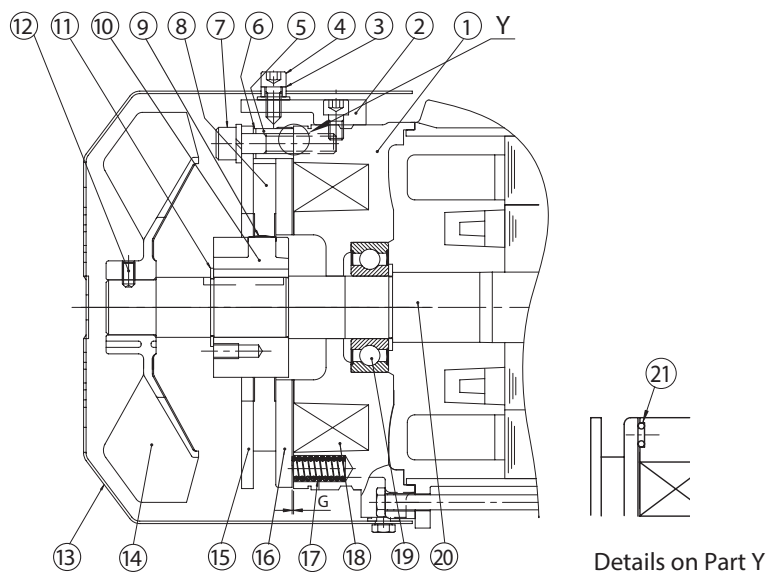


Figure 8-9

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	Cooling fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Bearing
20	Motor shaft
21	Shock absorber

Notes: [21] is provided only to PREST NEO and ALTAX NEO.

- Gap Inspection

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [13].
- (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 near 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	0.7

- Gap Adjustment

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [13].
- (3) Remove the fan set screw [12] and remove 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] only, make sure not to fall the gap adjustment shims [6] or the shock absorber [21].
- (5) 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.
- (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], 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-3E, 4E (Indoor Type)

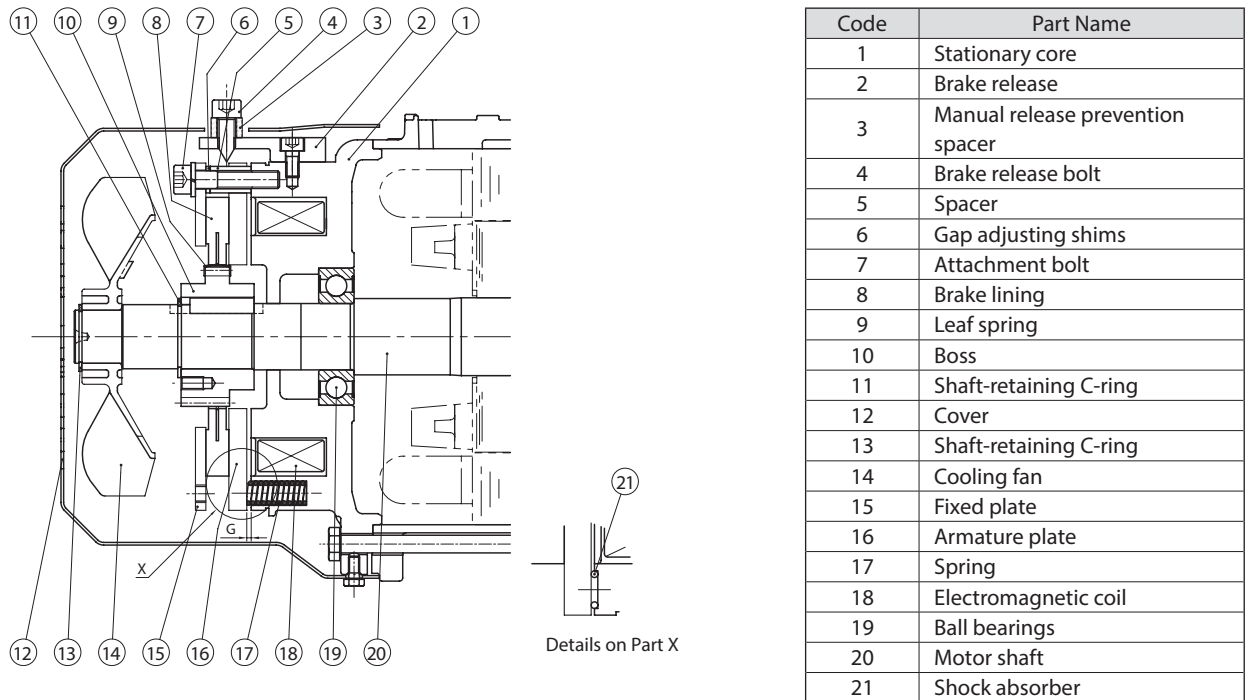


Figure 8-10

- 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 near the limit.

(Gap adjustment shim thickness is approximately 0.45 – 0.55mm. Adjustment cannot be made at a lower value.)

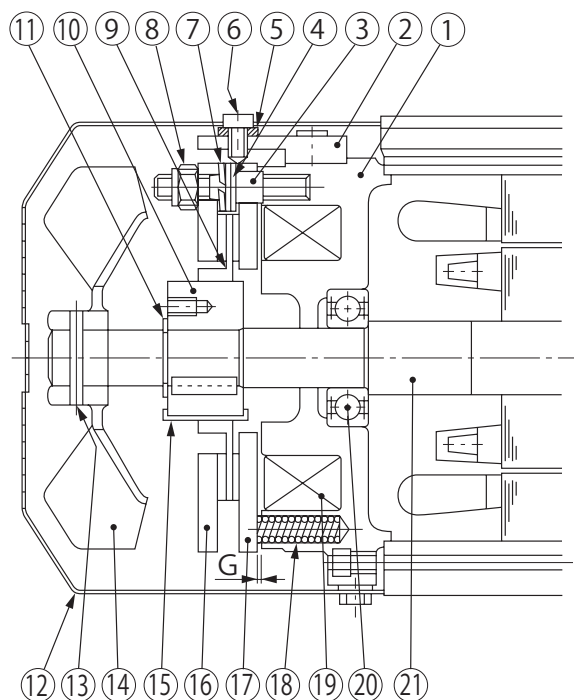
Gap Value G (mm)	
Required value (original value)	Limit value
0.25 – 0.35	0.85

- 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].

8. Daily Inspection and Maintenance

■ FB-5B, 8B (Indoor type)



Code	Part Name
1	Stationary core
2	Brake release
3	Stud bolt
4	Adjusting washer
5	Manual release protection spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft-retaining C-ring
12	Cover
13	Spring pin
14	Cooling fan
15	Leaf spring
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Bearing
21	Motor shaft

Figure 8-11

- Gap Inspection

(1) Remove the brake release bolt [6] and the manual release prevention spacer [5].

(2) Remove the cover [12].

(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.

(The stationary core [1] has a demagnetizing plate attached. The gap is a dimension between the demagnetizing plate and the armature plate [17].)

(4) Adjustment is required if the gap value is close to the limit.

Gap value G (mm)	
Required value (original value)	Limit value
0.4 – 0.5	1.0

- Gap Adjustment

(1) Remove the brake release bolt [6] and the manual release prevention spacer [5].

(2) Remove the cover [12].

(3) Insert a gap gauge between the stationary core [1] and the armature plate [17] and rotate to the right the gap adjusting nuts [8] that are attached to ends of the stud bolts [3]. If the gap is too large to adjust, decrease the number of adjustment washers [4]. There are 3 gap adjusting nuts [8]. 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 [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].

8. Daily Inspection and Maintenance

■ FB-5E, 8E (Indoor type)

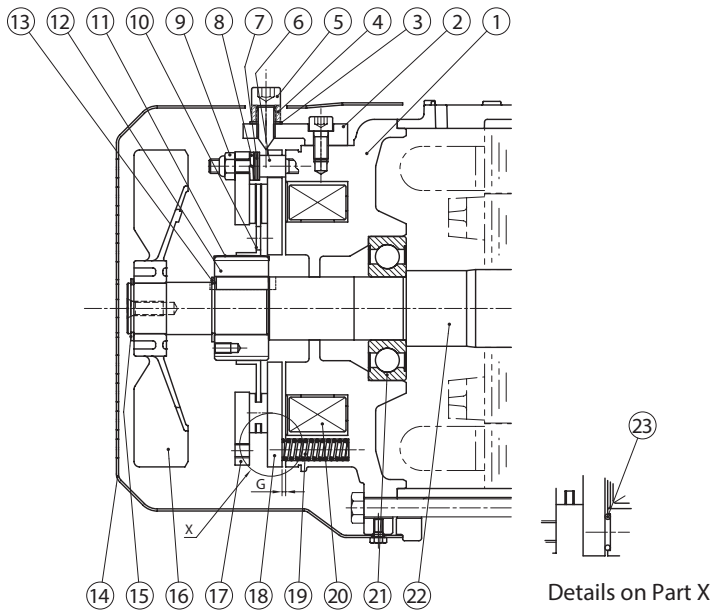


Figure 8-12

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	Cooling fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	Shock absorber

Notes: [23] is provided only to FB-5E of ALTAX NEO.

- 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 near 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-10B1, 15B1 (Indoor type)

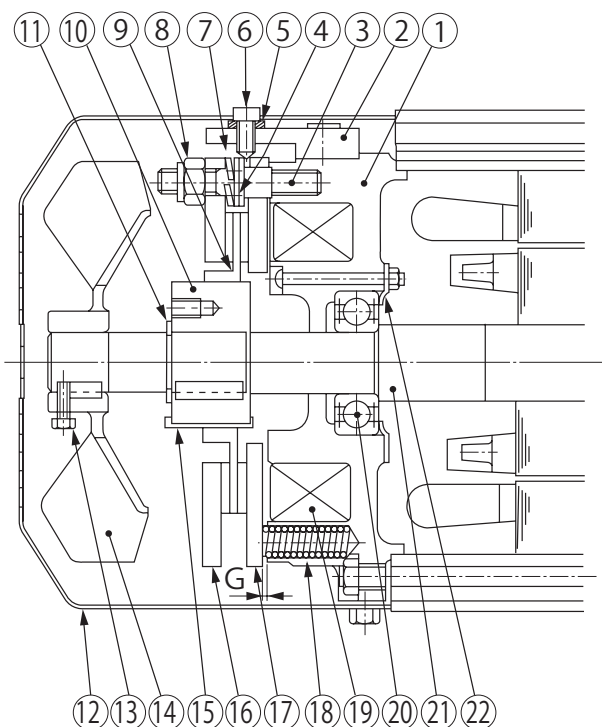


Figure 8-13

Code	Part Name
1	Stationary core
2	Brake release
3	Stud bolt
4	Adjusting washer
5	Manual release protection spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft-retaining C-ring
12	Cover
13	Fan set screw
14	Cooling fan
15	Leaf spring
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Bearing
21	Motor shaft
22	Bearing cover

- Gap Inspection

- Remove the brake release bolt [6] and the manual release prevention spacer [5].
- Remove the cover [12].
- 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.
(The stationary core [1] has a demagnetizing plate attached. The gap is a dimension between the demagnetizing plate and the armature plate [17].)
- Adjustment is required if the gap value is close to the limit.

Gap value G (mm)	
Required value (original value)	Limit value
0.4 – 0.5	1.2

- Gap Adjustment

- Remove the brake release bolt [6] and the manual release prevention spacer [5].
- Remove the cover [12].
- Insert a gap gauge between the stationary core [1] and the armature plate [17] and rotate to the right the gap adjusting nuts [8] that are attached to ends of the stud bolts [3]. If the gap is too large to adjust, decrease the number of adjustment washers [4]. There are 3 gap adjusting nuts [8]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- Turn the power on and off to check brake action.
- Attach the cover [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].

8. Daily Inspection and Maintenance

■ FB-10E, 15E (Indoor Type)

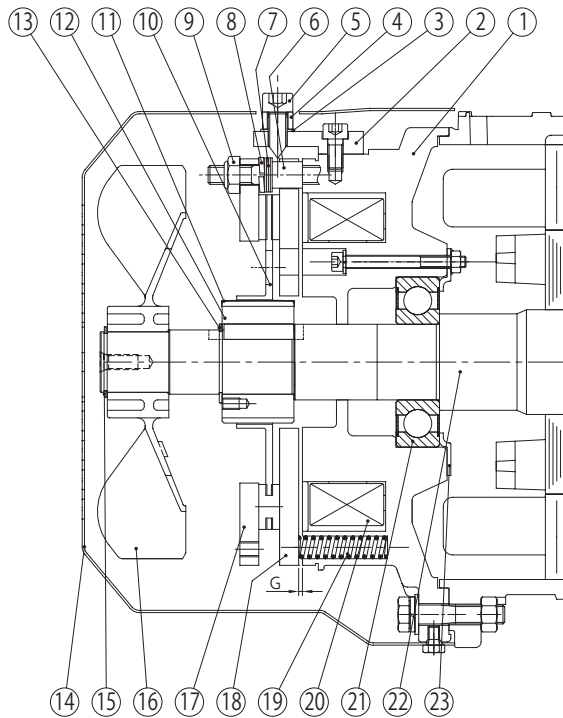


Figure 8-14

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	Cooling fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	Bearing cover

- 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 near the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.35 – 0.45	1.2

- 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 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-20 (Indoor Type)

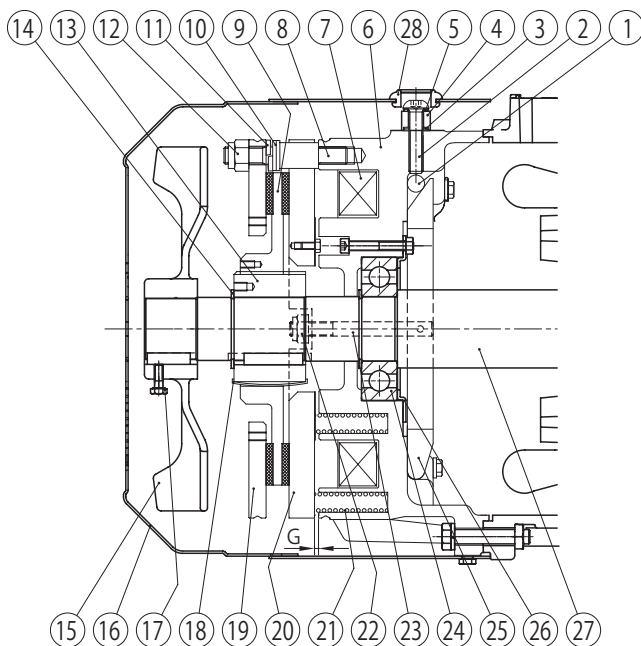


Figure 8-15

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release prevention spacer
5	Seal washer
6	Stationary core
7	Electromagnetic coil
8	Stud bolt
9	Brake lining
10	Adjusting washer
11	Spring washer
12	Gap adjusting nut
13	Boss
14	Shaft-retaining C-ring
15	Cooling fan
16	Cover
17	Fan set screw
18	Leaf spring
19	Fixed plate
20	Armature plate
21	Spring
22	Nut
23	Tap-end stud
24	Ball bearings
25	Release lever
26	Bearing cover
27	Motor shaft
28	Grommet

- Gap Inspection

- (1) Remove the grommet [28] and cover [16].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [20], and measure the gap. Measure in 3 locations around the circumference.
- (3) Adjustment is required if the gap value is near the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.6 – 0.7	1.5

- Gap Adjustment

- (1) Remove the grommet [28] and cover [16].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [20] and rotate to the right the gap adjusting nuts [12] that are attached to ends of the stud bolts [8]. If large adjustments to the gap are not possible, decrease the number of adjusting washers [10]. There are 3 gap adjusting nuts [12]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (3) Turn the power on and off to check brake action.
- (4) Attach the cover [16] and grommet [28].

8. Daily Inspection and Maintenance

■ FB-30 (Indoor Type)

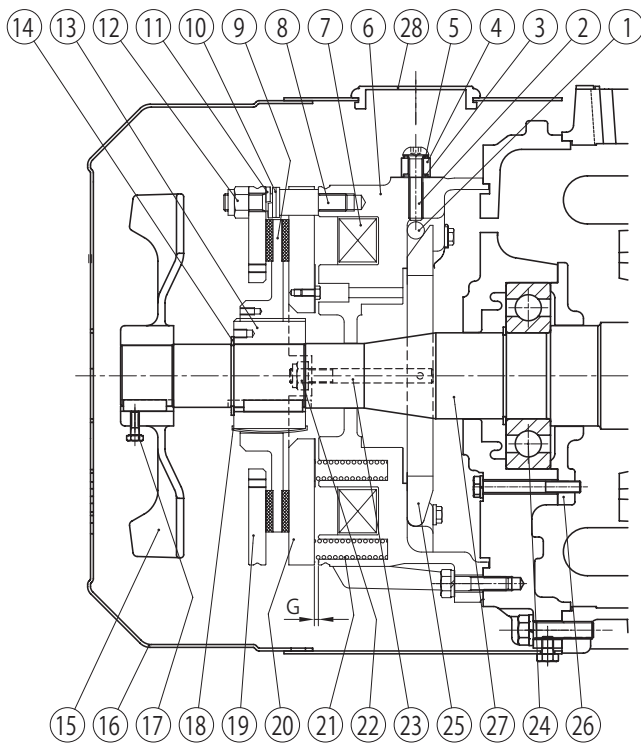


Figure 8-16

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release prevention spacer
5	Seal washer
6	Stationary core
7	Electromagnetic coil
8	Stud bolt
9	Brake lining
10	Adjusting washer
11	Spring washer
12	Gap adjusting nut
13	Boss
14	Shaft-retaining C-ring
15	Cooling fan
16	Cover
17	Fan set screw
18	Leaf spring
19	Fixed plate
20	Armature plate
21	Spring
22	Nut
23	Tap-end stud
24	Ball bearings
25	Release lever
26	Bearing cover
27	Motor shaft
28	Grommet

- Gap Inspection

- (1) Remove the grommet [28] and cover [16].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [20], and measure the gap. Measure in 3 locations around the circumference.
- (3) Adjustment is required if the gap value is near the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.6 – 0.7	1.5

- Gap Adjustment

- (1) Remove the grommet [28] and cover [16].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [20] and rotate to the right the gap adjusting nuts [12] that are attached to ends of the stud bolts [8]. If large adjustments to the gap are not possible, decrease the number of adjusting washers [10]. There are 3 gap adjusting nuts [12]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (3) Turn the power on and off to check brake action.
- (4) Attach the cover [16] and grommet [28].

8. Daily Inspection and Maintenance

■ ESB-250 (Indoor Type)

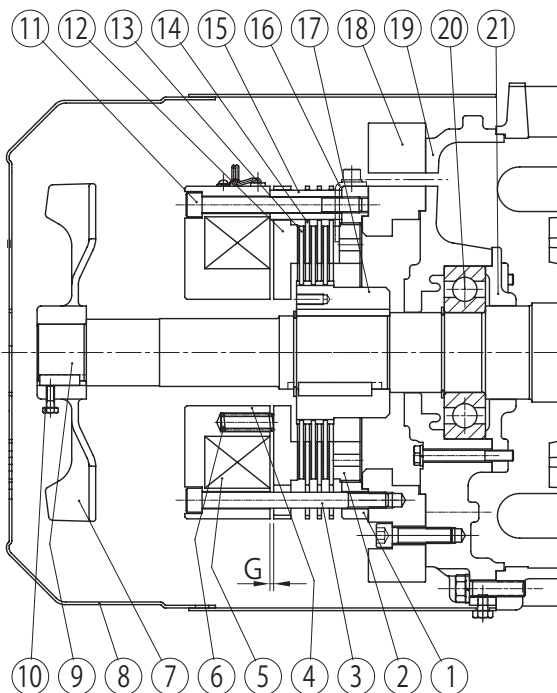


Figure 8-17

Code	Part Name
1	Center ring
2	Gap adjusting screw
3	Attachment bolt
4	Field
5	Brake coil
6	Actuating spring
7	Cooling fan
8	Cover
9	Motor shaft
10	Fan set screw
11	Lock bolt
12	Armature
13	Inner disc
14	Outer disc
15	Spacer bush
16	Stopper
17	Hub
18	Brake adapter plate
19	Opposite drive end cover
20	Opposite drive end bearing
21	Opposite drive end bearing cover

Notes: 1. Motor configuration differs for ventilated types.

2. There are 3 of [13][14] for horizontal types, and 2 for vertical types.

Items	Specifications	
Rated input voltage	AC200/220V 50/60Hz	
Maximum input voltage	AC240V 50/60Hz	
Minimum input voltage	AC170V 50/60Hz	
Standard output voltage	Instantaneous voltage	DC180V (for AC200V input)
	Steady voltage	DC90V (for AC200V input)
Maximum output current	DC1.8A (Steady output)	
Over excitation time	0.4 – 1.2 sec	
Insulation resistance	100MΩ or larger (When measured with 1000V megohmmeter)	
Insulation withstand voltage	AC2000V for one time or more	
Maximum frequency	Inching (When on-time 1.2 sec or less):	8 cycles/min
	Constant (When on-time exceeds 1.2 sec):	30 cycles/min
Allowable ambient temperature	- 20°C to 60°C	

■ ESB-250 Accessory Rectifier (DC power supply unit)

Model HD-110M3

Outline Drawing

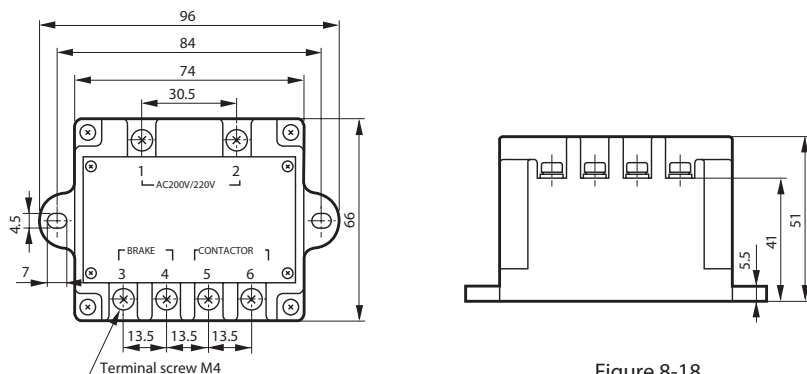
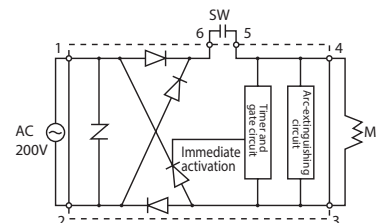


Figure 8-18

Internal Circuit (Diagram)



Notes: 1. Model HD-110M3 is an indoor model. Take care to avoid water, etc.

2. Transformer is necessary for operation with 400V class power source. Secondary voltage is 200 – 220V.

8. Daily Inspection and Maintenance

- Gap Inspection

- (1) Remove cover [8].
- (2) Insert a gap gauge between the field [4] and the armature [12] and measure the gap. Measure in 4 locations around the circumference.
- (3) Adjustment is required if the gap value is near the limit.

Gap value G (mm)	
Required value (original value)	Limit value
0.7	2.0

- Gap Adjustment

- (1) Manually release the brake following the procedure on P90.
- (2) Loosen the stopper [16] on the periphery of the center ring [1], and remove. This will free the gap adjusting screws [2]. (See Figure 8-19)
- (3) Insert the gap adjusting bar (customer to prepare an angle plate. See Figure 8-21) from between the outer disc [14] and the center ring [1] into a hole for a gap adjusting screw [2]. Rotating to the left as seen from the field [4] side, will narrow the gap. (See Figure 8-20)
- (4) Six attachment bolts [3] and lock bolts [11] alternately pass through the space between the outer disc [14] and the center ring [1]. Rotating the gap adjusting bar will contact these bolts. There are 8 equally distributed holes for gap adjusting screws [2]. Adjust the gap G to the required value by repeating (3) each time the gap adjusting bar contacts a bolt.
- (5) Select the point where hole and screw hole are closest to the required gap and attach the stopper [16] there.
- (6) After returning the manual brake release to its original state, turn power on and off to check brake action.
- (7) Attach the fan [7] and cover [8]. At this time coat the fan set screw [10] with Three Bond TB2365.

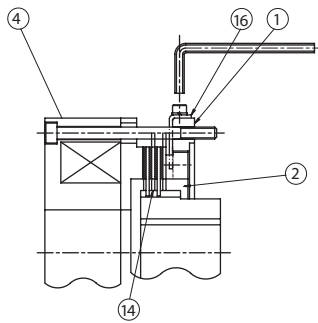


Figure 8-19

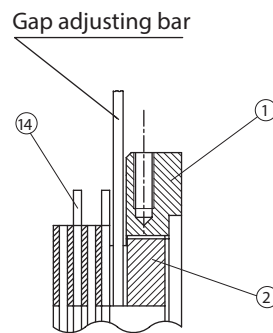


Figure 8-20

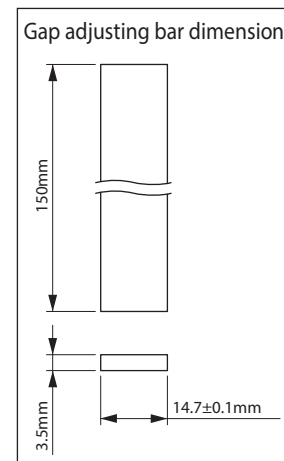
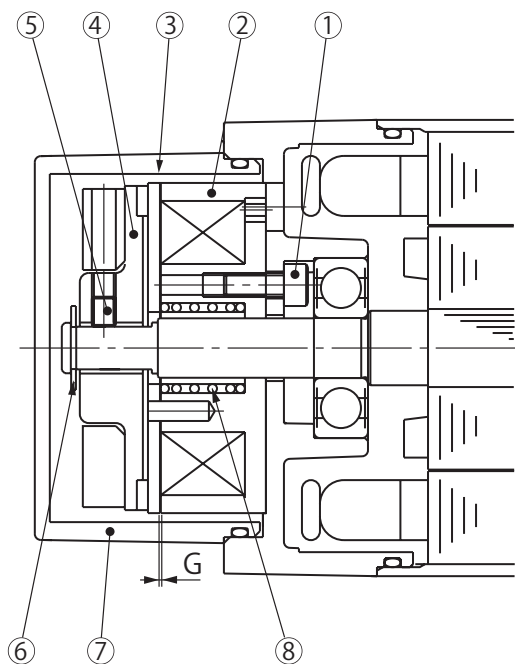


Figure 8-21

8. Daily Inspection and Maintenance

(2) Outdoor type/waterproof

■ SB-004 (Waterproof)



Code	Part Name
1	Brake mounting bolt
2	Stationary core
3	Armature plate
4	Lining with fan
5	Set screw
6	Retaining ring
7	Cover
8	Torque spring

Figure 8-22

- Gap Inspection

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

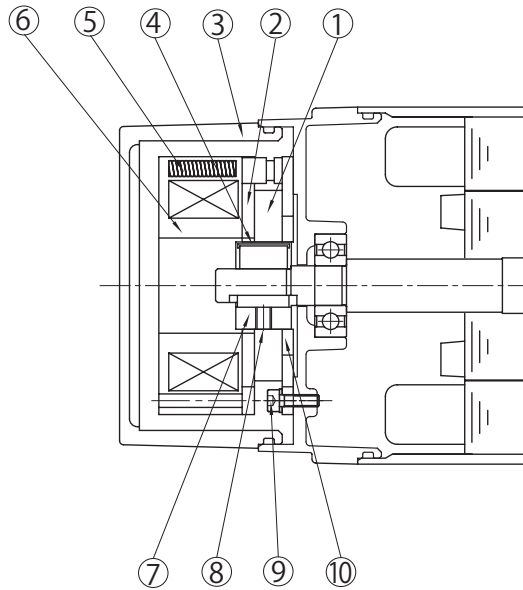
Gap value G (mm)	
Required value (original value)	Limit value
0.15 – 0.25	0.4

- Gap Adjustment

- (1) Remove the cover [7].
- (2) Loosen the set screw [5]. (Anti-loose locking is provided.)
- (3) Insert a gap gauge between the stationary core [2] and the armature plate [3] to adjust to a specified gap.
- (4) Apply a locking agent to the set screw [5] to fix the lining with fan [4].
- (5) Attach the cover [7]. (Make sure that O-rings are not damaged. If damaged, replace them with new ones.)

8. Daily Inspection and Maintenance

■ MB-003, 005, 010 (Waterproof)



Code	Part Name
1	Brake lining
2	Armature plate
3	Cover
4	Leaf spring
5	Torque spring
6	Stationary core
7	Boss
8	Boss set screw
9	Brake mounting bolt
10	Fixed plate

Figure 8-23

- Gap Inspection

- (1) Remove the cover [3].
- (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 (Outdoor type)

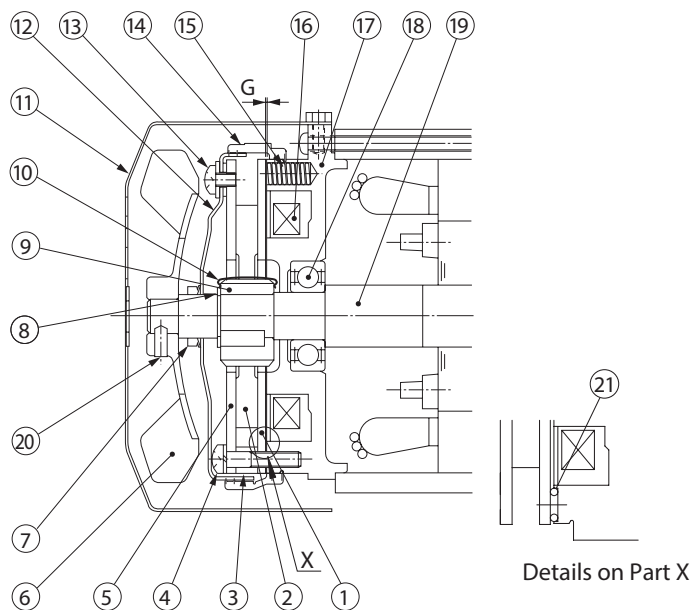


Figure 8-24

Code	Part Name
1	Armature plate
2	Brake lining
3	Spacer
4	Attachment bolt
5	Fixed plate
6	Cooling 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

Notes: 1. FB-01A1 of a 3-phase motor 0.1kW does not have [6], [7], and [20].

2. [21] is provided only to PREST NEO and ALTAX NEO.

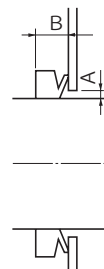
- Gap Inspection

- (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 near the limit.

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

- 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 diagram, 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.

8. Daily Inspection and Maintenance

■ FB-1D (Outdoor type)

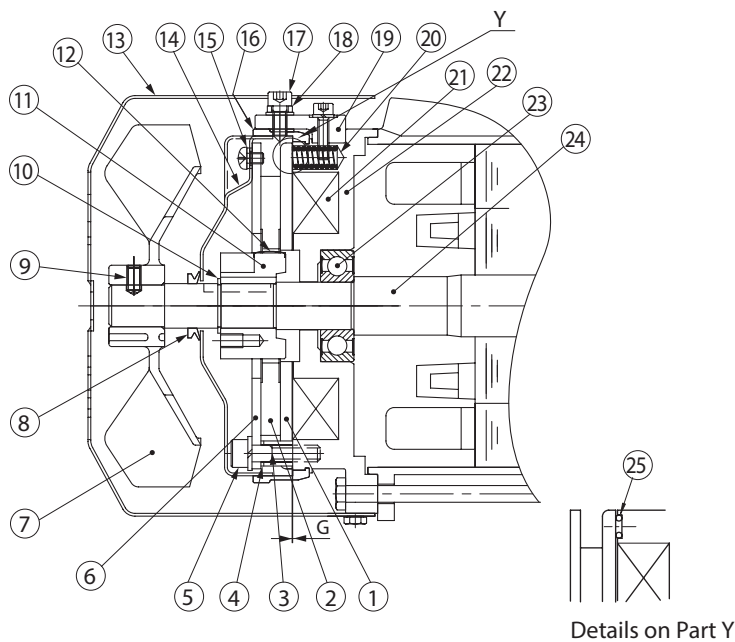


Figure 8-25

Code	Part Name
1	Armature plate
2	Brake lining
3	Spacer
4	Gap adjusting shims
5	Attachment bolt
6	Fixed plate
7	Cooling 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

Notes: [25] is provided only to PREST NEO and ALTAX NEO.

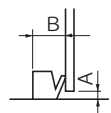
Gap Value G (mm)	
Required value (original value)	Limit value
0.3 – 0.4	0.6

- 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 near 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 [14] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction diagram, 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].



8. Daily Inspection and Maintenance

■ FB-1E (Outdoor Type)

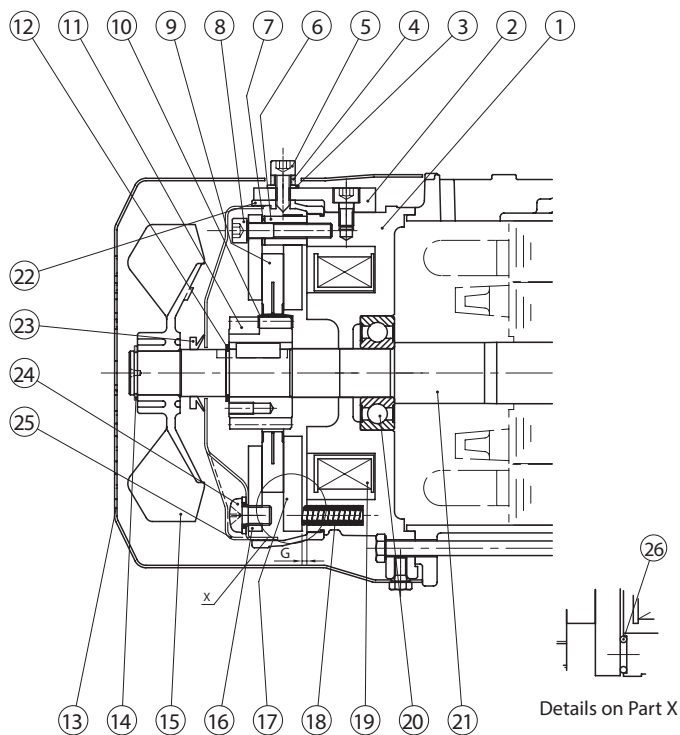


Figure 8-26

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	Cooling 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

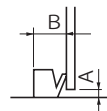
- Gap Inspection

- (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 near 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 diagram, 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].



8. Daily Inspection and Maintenance

■ FB-1HE, 2E (Outdoor Type)

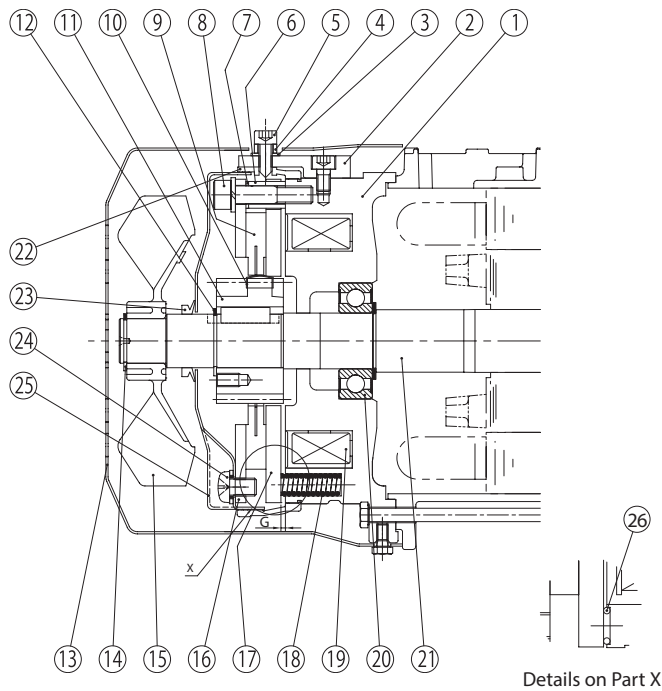


Figure 8-27

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	Cooling 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

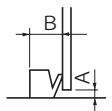
- Gap Inspection

- 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].
- Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- 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 near 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].
- Pull off the V-ring [23].
- Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- Remove the waterproof cover attachment bolts [24], and remove the waterproof cover [25].
- 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].
- 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 it and the required value.
- 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.
- Clean the surface of the waterproof seal [22] to remove impurities.
- As shown in the construction diagram, 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.)
- Turn the power on and off to check brake action.
- 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).
- 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-2D (Outdoor type)

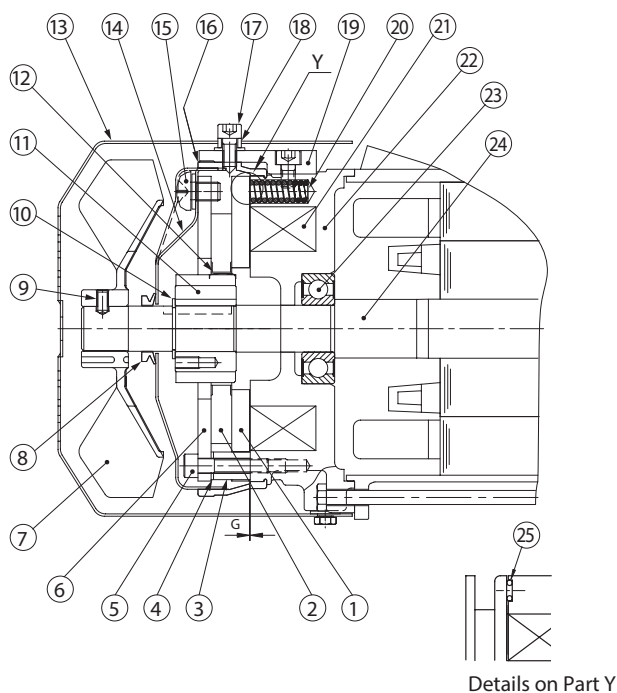


Figure 8-28

Code	Part Name
1	Armature plate
2	Brake lining
3	Spacer
4	Gap adjusting shims
5	Attachment bolt
6	Fixed plate
7	Cooling 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

Notes: [25] is provided only to PREST NEO and ALTAX NEO.

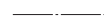
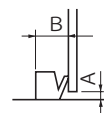
- Gap Inspection

- (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 near 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

- (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 [14] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction diagram, 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=6mm).
- (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].



8. Daily Inspection and Maintenance

■ FB-3D (Outdoor type)

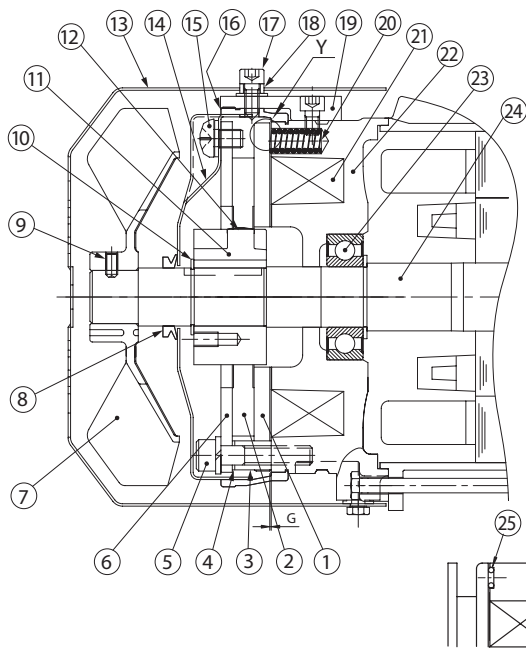


Figure 8-29

Details on Part Y

Code	Part Name
1	Armature plate
2	Brake lining
3	Spacer
4	Gap adjusting shims
5	Attachment bolt
6	Fixed plate
7	Cooling 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

Notes: [25] is provided only to PREST NEO and ALTAX NEO.

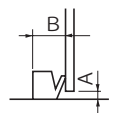
- Gap Inspection

- (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 near 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	0.7

- 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 [14] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction diagram, 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 = 6mm).
- (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].



8. Daily Inspection and Maintenance

■ FB-3E, 4E (Outdoor type)

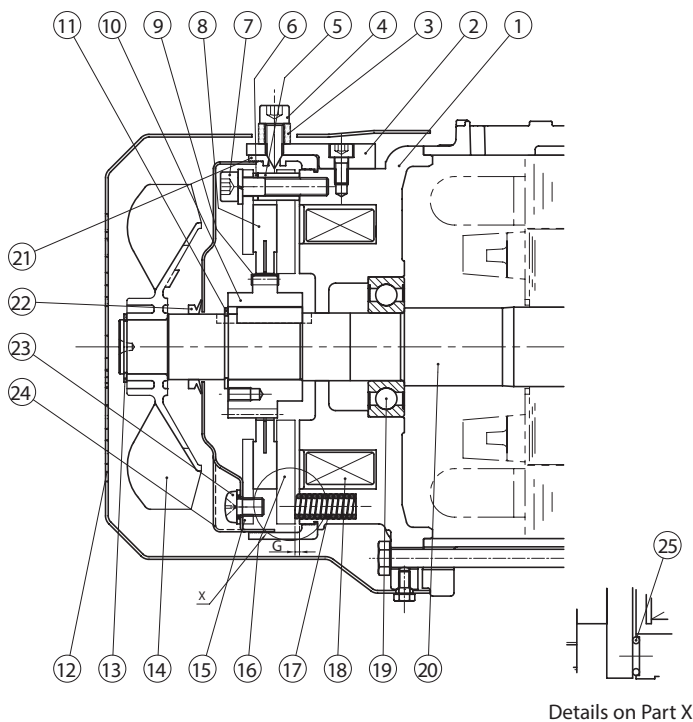


Figure 8-30

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	Cooling 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

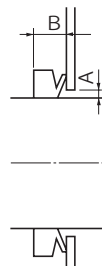
- Gap Inspection

- (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 near 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 diagram, 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].



8. Daily Inspection and Maintenance

■ FB-5B, 8B (Outdoor type)

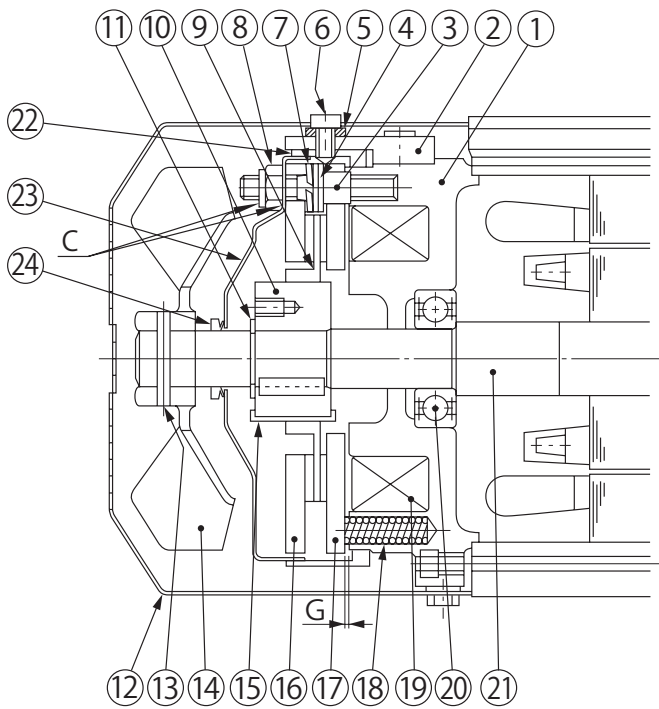


Figure 8-31

Code	Part Name
1	Stationary core
2	Brake release
3	Stud bolt
4	Adjusting washer
5	Manual release protection spacer
6	Brake release bolt
7	Spring washer
8	Gap adjusting nut
9	Brake lining
10	Boss
11	Shaft-retaining C-ring
12	Cover
13	Spring pin
14	Cooling fan
15	Leaf spring
16	Fixed plate
17	Armature plate
18	Spring
19	Electromagnetic coil
20	Bearing
21	Motor shaft
22	Waterproof seal
23	Waterproof cover
24	V-ring

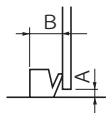
- Gap Inspection

- (1) Remove the brake release bolt [6] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Remove the spring pin [13] and remove the fan [14].
- (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. (The stationary core [1] has a demagnetizing plate attached. The gap is a dimension between the demagnetizing plate and the armature plate [17].)
- (6) Adjustment is required if the gap value is close to the limit.

Gap value G (mm)	
Required value (original value)	Limit value
0.4 – 0.5	1.0

- Gap Adjustment

- (1) Remove the brake release bolt [6] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Remove the spring pin [13] and remove the fan [14].
- (4) Pull off the V-ring [24].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (6) Insert a gap gauge between the stationary core [1] and the armature plate [17] and rotate to the right the gap adjusting nuts [8] that are attached to ends of the stud bolts [3]. If the gap too large to adjust, decrease the number of adjustment washers [4]. There are 3 gap adjusting nuts [8]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (7) Attach the waterproof cover [23] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform. (Only when the waterproof cover [23] has been removed)
- (8) Clean the surface of the waterproof seal [22] to remove impurities.
- (9) As shown in the construction diagram, install the waterproof seal [22] between the stationary core [1] and the waterproof cover [23]. Then attach the brake release [2]. Align the hole in the waterproof seal [22] for the brake release bolt with the position of the release bolt [6], then attach along the edge of the waterproof cover [23] or the machined surfaces around the stationary core [1]. (Be careful that the waterproof seal [22] does not meander. Otherwise water could leak in.)
- (10) Turn the power on and off to check brake action.
- (11) 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).
- (12) Thoroughly coat the gap (C) between the gap adjusting nuts [8], the stud bolts [3] and the waterproof cover [23] with waterproof adhesive (Three Bond 1102).
- (13) Attach the fan [14] and the cover [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].



8. Daily Inspection and Maintenance

■ FB-5E, 8E (Outdoor type)

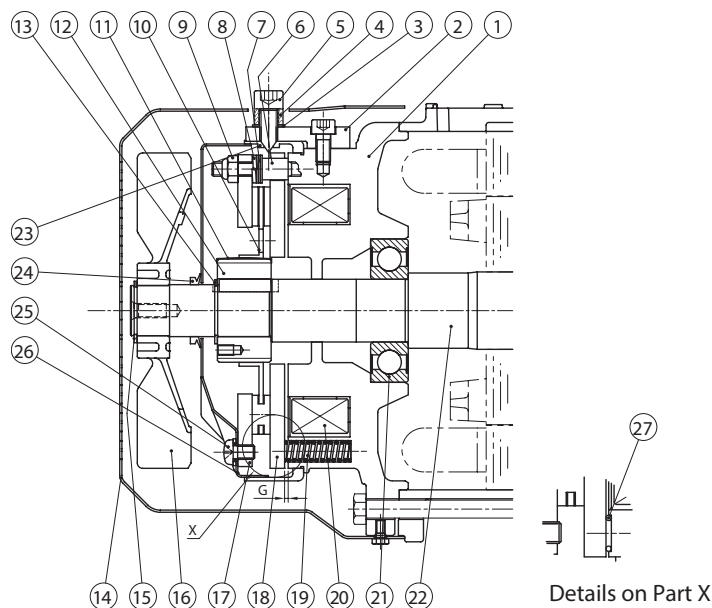


Figure 8-32

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	Cooling 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

Notes: [27] is provided only to FB-5E of ALTAX NEO.

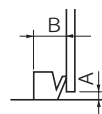
Gap Value G (mm)	
Required value (original value)	Limit value
0.35 – 0.45	1.0

- 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 near 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 diagram, 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].



8. Daily Inspection and Maintenance

■ FB-10B1, 15B1 (Outdoor type)

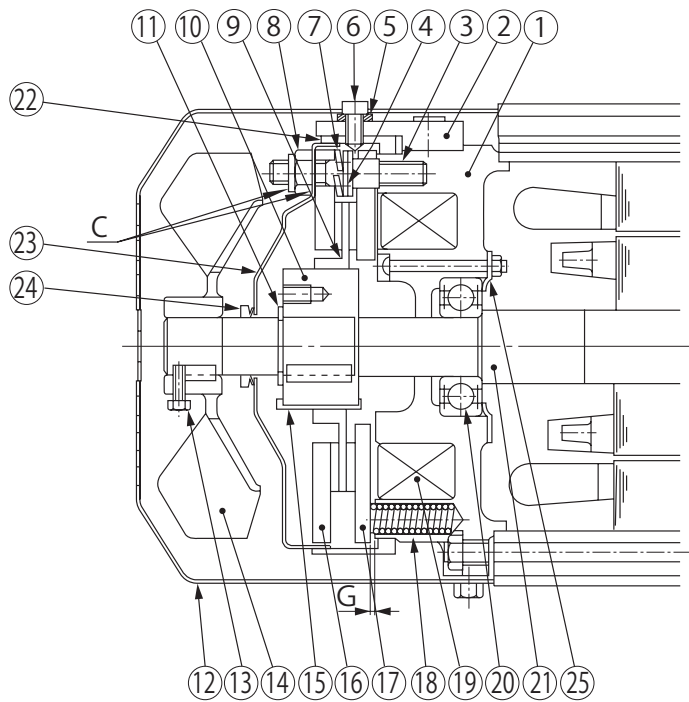


Figure 8-33

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

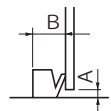
- Gap Inspection

- (1) Remove the brake release bolt [6] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Loosen the fan set screw [13] and remove the fan [14].
- (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.
(The stationary core [1] has a demagnetizing plate attached. The gap is a dimension between the demagnetizing plate and the armature plate [17].)
- (6) Adjustment is required if the gap value is close to the limit.

Gap value G (mm)	
Required value (original value)	Limit value
0.4 – 0.5	1.2

- Gap Adjustment

- (1) Remove the brake release bolt [6] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Loosen the fan set screw [13] and remove the fan [14].
- (4) Pull off the V-ring [24].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (6) Insert a gap gauge between the stationary core [1] and the armature plate [17] and rotate to the right the gap adjusting nuts [8] that are attached to ends of the stud bolts [3]. If the gap too large to adjust, decrease the number of adjustment washers [4]. There are 3 gap adjusting nuts [8]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (7) Attach the waterproof cover [23] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
(Only when the waterproof cover [23] has been removed)
- (8) Clean the surface of the waterproof seal [22] to remove impurities.
- (9) As shown in the construction diagram, install the waterproof seal [22] between the stationary core [1] and the waterproof cover [23]. Then attach the brake release [2]. Align the hole in the waterproof seal [22] for the brake release bolt with the position of the release bolt [6], then attach along the edge of the waterproof cover [23] or the machined surfaces around the stationary core [1]. (Be careful that the waterproof seal [22] does not meander. Otherwise water could leak in.)
- (10) Turn the power on and off to check brake action.
- (11) 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).
- (12) Thoroughly coat the gap (C) between the gap adjusting nuts [8], the stud bolts [3] and the waterproof cover [23] with waterproof adhesive (Three Bond 1102).
- (13) Attach the fan [14] and the cover [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].



8. Daily Inspection and Maintenance

■ FB-10E, 15E (Outdoor type)

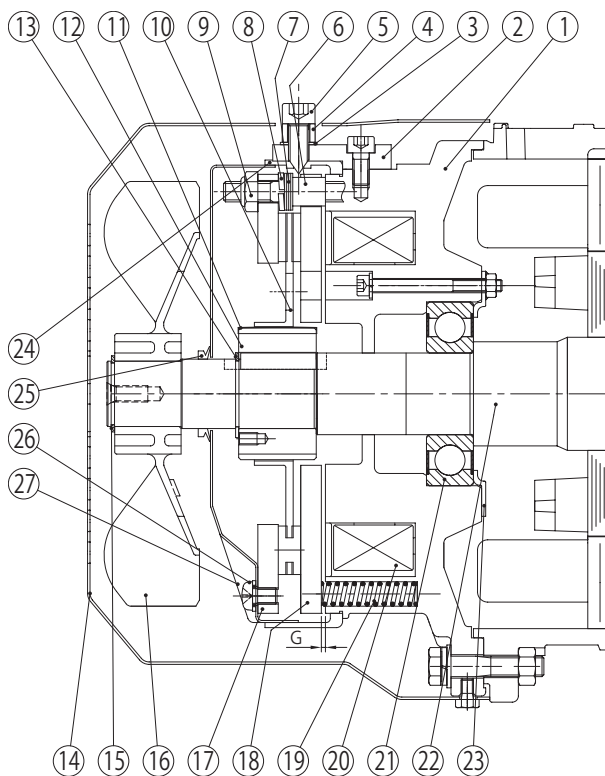


Figure 8-34

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	Cooling fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	Bearing cover
24	Waterproof seal
25	V-ring
26	Waterproof cover attachment bolts
27	Waterproof cover

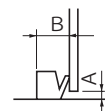
- Gap Inspection

- (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 [24].
- (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 near the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.35 – 0.45	1.2

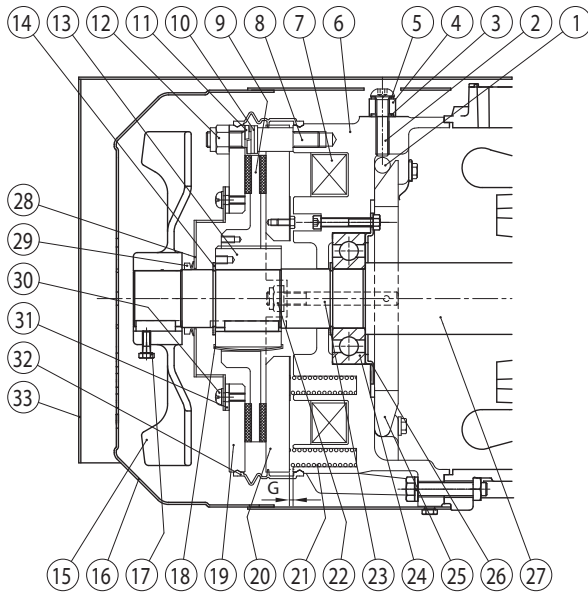
- Gap Adjustment

- (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 [25].
- (5) Remove the brake release [2] (2 locations) and remove the waterproof seal [24].
- (6) Remove the waterproof cover attachment bolts [26], and remove the waterproof cover [27].
- (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 [27] using the waterproof cover attachment bolts [26]. At this time align the cutout area on the side of the waterproof cover [27] with position of the brake release bolt [5]. Attach the waterproof cover [27] so that the gap (A) between its hole and the motor shaft [22] is nearly uniform.
- (9) Clean the surface of the waterproof seal [24] to remove impurities.
- (10) As shown in the construction diagram, install the waterproof seal [24] between the stationary core [1] and the waterproof cover [27]. Then attach the brake release [2]. Align the hole in the waterproof seal [24] 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 [24] 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 [25], 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].



8. Daily Inspection and Maintenance

■ FB-20 (Outdoor Type)



Note) The outdoor cover [33] for an outdoor type specification has a different shape.

Figure 8-35

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release prevention spacer
5	Seal washer
6	Stationary core
7	Electromagnetic coil
8	Stud bolt
9	Brake lining
10	Adjusting washer
11	Spring washer
12	Gap adjusting nut
13	Boss
14	Shaft-retaining C-ring
15	Cooling fan
16	Cover
17	Fan set screw
18	Leaf spring
19	Fixed plate
20	Armature plate
21	Spring
22	Nut
23	Tap-end stud
24	Ball bearings
25	Release lever
26	Bearing cover
27	Motor shaft
28	Waterproof cover
29	V-ring
30	Waterproof cover attachment bolts
31	Waterproof cover gasket
32	Waterproof seal
33	Outdoor cover

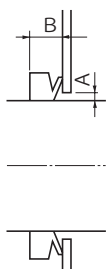
- Gap Inspection

- (1) Remove the outdoor cover [33] and the cover [16].
- (2) Loosen the fan set screw [17] and remove the fan [15].
- (3) Remove the waterproof seal [13].
- (4) Insert a gap gauge between the stationary core [6] and the armature plate [20], and measure the gap. Measure in 3 locations around the circumference.
- (5) Adjustment is required if the gap value is near the limit.

- Gap Adjustment

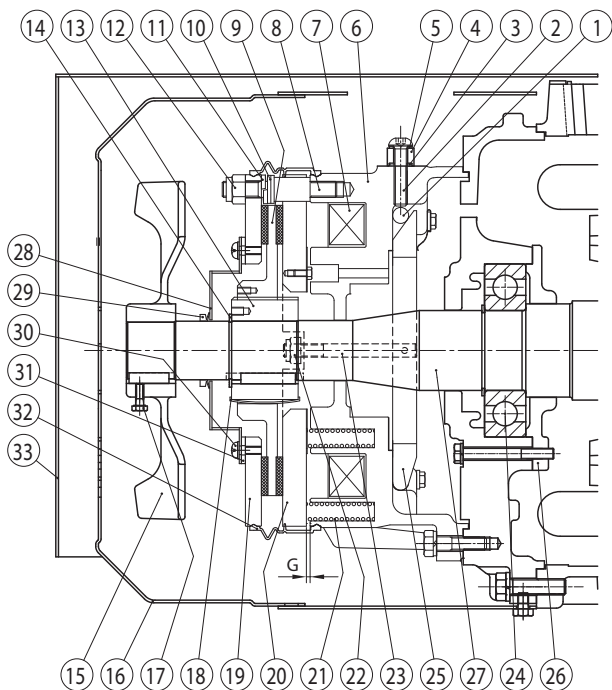
- (1) Remove the outdoor cover [33] and the cover [16].
- (2) Loosen the fan set screw [17] and remove the fan [15].
- (3) Pull off the V-ring [29].
- (4) Remove the waterproof seal [32].
- (5) Insert a gap gauge between the stationary core [6] and the armature plate [20] and rotate to the right the gap adjusting nuts [12] that are attached to ends of the stud bolts [8]. If large adjustments to the gap are not possible, decrease the number of adjusting washers [10]. There are 3 gap adjusting nuts [12]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (6) Turn the power on and off to check brake action.
- (7) Attach the waterproof cover [28] so that the gap (A) between its hole and the motor shaft [27] is nearly uniform. (Only when the waterproof cover [28] has been removed)
- (8) Clean the surface of the waterproof seal [32] to remove impurities.
- (9) As shown in the construction diagram, install the waterproof seal [32] between the stationary core [6] and the fixed plate [19]. (Be careful that the waterproof seal [32] does not meander. Otherwise water could leak in.)
- (10) Attach the V-ring [29]. Wipe off the lip and surface near the lip of V-ring [29], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 7mm).
- (11) Thoroughly coat the gap (C) between the gap adjusting nuts [12], the stud bolts [8] and the fixed plate [19] with waterproof adhesive (Three Bond 1102).
- (12) Attach the fan [15], cover [16] and outdoor cover [33].

Gap Value G (mm)	
Required value (original value)	Limit value
0.6 – 0.7	1.5



8. Daily Inspection and Maintenance

■ FB-30 (Outdoor Type)



Note) The outdoor cover [33] for an outdoor type specification has a different shape.

Figure 8-36

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release prevention spacer
5	Seal washer
6	Stationary core
7	Electromagnetic coil
8	Stud bolt
9	Brake lining
10	Adjusting washer
11	Spring washer
12	Gap adjusting nut
13	Boss
14	Shaft-retaining C-ring
15	Cooling fan
16	Cover
17	Fan set screw
18	Leaf spring
19	Fixed plate
20	Armature plate
21	Spring
22	Nut
23	Tap-end stud
24	Ball bearings
25	Release lever
26	Bearing cover
27	Motor shaft
28	Waterproof cover
29	V-ring
30	Waterproof cover attachment bolts
31	Waterproof cover gasket
32	Waterproof seal
33	Outdoor cover

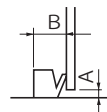
- Gap Inspection

- (1) Remove the outdoor cover [33] and the cover [16].
- (2) Loosen the fan set screw [17] and remove the fan [15].
- (3) Remove the waterproof seal [32].
- (4) Insert a gap gauge between the stationary core [6] and the armature plate [20], and measure the gap. Measure in 3 locations around the circumference.
- (5) Adjustment is required if the gap value is near the limit.

- Gap Adjustment

- (1) Remove the outdoor cover [33] and the cover [16].
- (2) Loosen the fan set screw [17] and remove the fan [15].
- (3) Pull off the V-ring [29].
- (4) Remove the waterproof seal [32].
- (5) Insert a gap gauge between the stationary core [6] and the armature plate [20] and rotate to the right the gap adjusting nuts [12] that are attached to ends of the stud bolts [8]. If large adjustments to the gap are not possible, decrease the number of adjusting washers [10]. There are 3 gap adjusting nuts [12]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (6) Turn the power on and off to check brake action.
- (7) Attach the waterproof cover [28] so that the gap (A) between its hole and the motor shaft [27] is nearly uniform. (Only when the waterproof cover [28] has been removed)
- (8) Clean the surface of the waterproof seal [32] to remove impurities.
- (9) As shown in the construction diagram, install the waterproof seal [32] between the stationary core [6] and the fixed plate [19]. (Be careful that the waterproof seal [32] does not meander. Otherwise water could leak in.)
- (10) Attach the V-ring [29]. Wipe off the lip and surface near the lip of V-ring [29], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B = 7mm).
- (11) Thoroughly coat the gap (C) between the gap adjusting nuts [12], the stud bolts [8] and the fixed plate [19] with waterproof adhesive (Three Bond 1102).
- (12) Attach the fan [15], cover [16] and outdoor cover [33].

Gap Value G (mm)	
Required value (original value)	Limit value
0.6 – 0.7	1.5



8. Daily Inspection and Maintenance

■ ESB-250 (Outdoor Type)

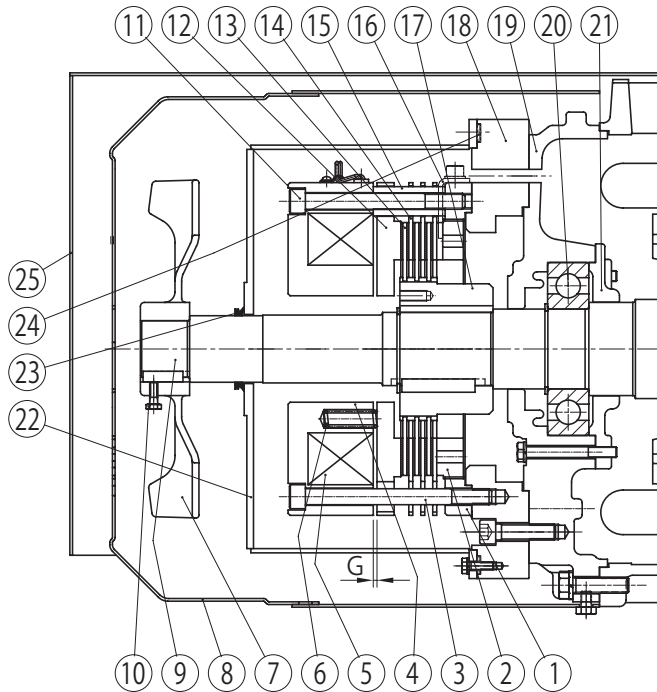


Figure 8-37

Code	Part Name
1	Center ring
2	Gap adjusting screw
3	Attachment bolt
4	Field
5	Brake coil
6	Actuating spring
7	Cooling fan
8	Cover
9	Motor shaft
10	Fan set screw
11	Lock bolt
12	Armature
13	Inner disc
14	Outer disc
15	Spacer bush
16	Stopper
17	Hub
18	Brake adapter plate
19	Opposite drive end cover
20	Opposite drive end bearing
21	Opposite drive end bearing cover
22	Brake cover
23	V-ring
24	Brake cover gasket
25	Outdoor cover

Notes: 1. Motor configuration differs for ventilated types.

2. There are 3 of [13][14] for horizontal types, and 2 for vertical types.

3. The outdoor cover [25] for the vertical types has a different shape.

Items	Specifications	
Rated input voltage	AC200/220V 50/60Hz	
Maximum input voltage	AC240V 50/60Hz	
Minimum input voltage	AC170V 50/60Hz	
Standard output voltage	Instantaneous voltage	DC180V (for AC200V input)
	Steady voltage	DC90V (for AC200V input)
Maximum output current	DC1.8A (Steady output)	
Over excitation time	0.4 – 1.2 sec	
Insulation resistance	100MΩ or larger (When measured with 1000V megohmmeter)	
Insulation withstand voltage	AC2000V for one time or more	
Maximum frequency	Inching (When on-time 1.2 sec or less):	8 cycles/min
	Constant (When on-time exceeds 1.2 sec):	30 cycles/min
Allowable ambient temperature	– 20 °C to 60 °C	

■ ESB-250 Accessory Rectifier (DC power supply unit)

Model HD-110M3

Outline Drawing

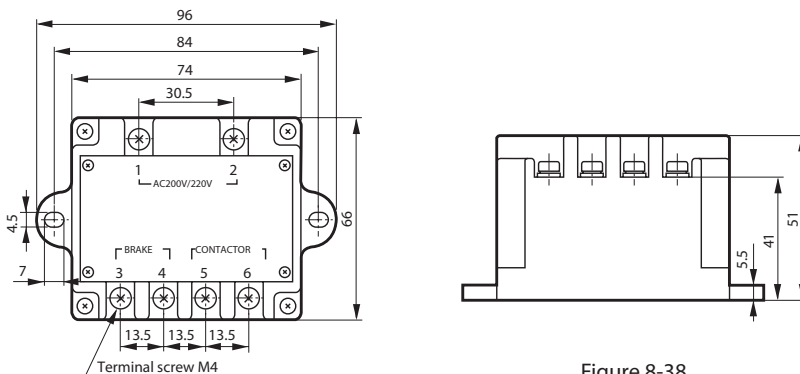
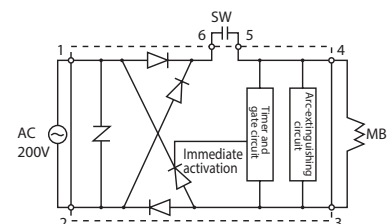


Figure 8-38

Internal Circuit (Diagram)



Notes: 1. Model HD-110M3 is an indoor model. Take care to avoid water, etc.

2. Transformer is necessary for operation with 400V class power source. Secondary voltage is 200 – 220V.

8. Daily Inspection and Maintenance

- Gap Inspection

- (1) Remove the outdoor cover [25] and the cover [8].
- (2) Loosen the fan set screw [10] and remove the fan [7].
- (3) Pull off the V-ring [23] and remove the brake cover [22].
- (4) Insert a gap gauge between the field [4] and the armature [12] and measure the gap. Measure in 4 locations around the circumference.
- (5) Adjustment is required if the gap value is near the limit.

Gap Value G (mm)	
Required value (original value)	Limit value
0.7	2.0

- Gap Adjustment

- (1) Manually release the brake following the procedure on P90.
- (2) Loosen the stopper [16] on the periphery of the center ring [1], and remove. This will free the gap adjusting screws [2]. (See Figure 8-39)
- (3) Insert the gap adjusting bar (customer to prepare an angle plate. See Figure 8-41) from between the outer disc [14] and the center ring [1] into a hole for a gap adjusting screw [2]. Rotating to the left as seen from the field [4] side, will narrow the gap. (See Figure 8-40)
- (4) Six attachment bolts [3] and lock bolts [11] alternately pass through the space between the outer disc [14] and the center ring [1]. Rotating the gap adjusting bar will contact these bolts. There are 8 equally distributed holes for gap adjusting screws [2]. Adjust the gap G to the required value by repeating (3) each time the gap adjusting bar contacts a bolt.
- (5) Select the point where hole and screw hole are closest to the required gap and attach the stopper [16] there.
- (6) After returning the manual brake release to its original state, turn power on and off to check brake action.
- (7) Attach the brake cover [22], V-ring [23], fan [7], fan set screw [10], cover [8] and outdoor cover [25]. At this time coat the fan set screw [10] with Three Bond TB2365.

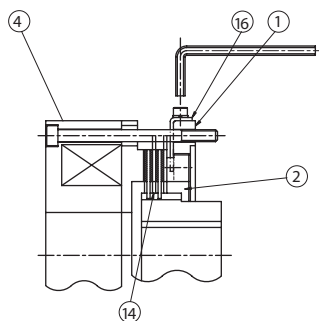


Figure 8-39

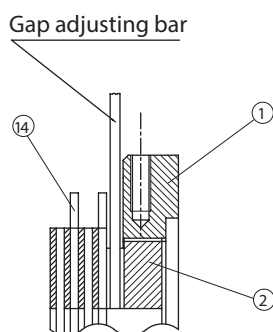


Figure 8-40

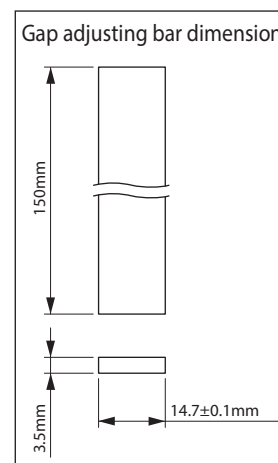


Figure 8-41

8. Daily Inspection and Maintenance

8-5 Changing the Brake Lining and Inner Disc

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

(1) SB-004, FB Brakes (excluding FB-01A1, 02A1, and 05A1), ESB-250

When the thickness of brake lining (SB-004, FB brake) or inner disc (ESB-250) reaches the use limit thickness in Table 8-5

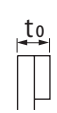

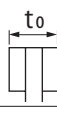
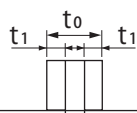
(2) MB-003, 005, 010

When the gap reaches the limit (see P55 and P72)

(3) FB-01A1, 02A1, 05A1

When the brake gap still reaches the limit after the gap adjustment (see P56 and P73)

Table 8-5 Brake Lining, Inner Disc Dimensions

Brake Type	Brake Lining Inner disc Dimension drawing	Original thickness		Usable Thickness Limit	
		t ₀ (mm)	t ₁ (mm)	t ₀ (mm)	t ₁ (mm)
SB-004		5.0		4.6	
MB-003, 005, and 010 FB-01A1, 02A1, 05A1 FB-1D		7.0		—	
FB-1E FB-2D		8.8	—	7.8	—
FB-1HE, 2E FB-3D		9.0		8.0	
FB-3E, 4E		10.4		8.4	
FB-5B, 8B FB-5E, 8E		10		6.0	
FB-10B1, 15B1 FB-10E, 15E FB-20, 30			11		7.0
	16			12	
ESB-250			6.0	1.5	3.6

- 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, replace the boss and leaf springs (for FB-5B – 15B1, 5E – 15E, 20, 30, the gap adjusting nuts are included) as a set.
- After 2 million or more cycles of operation, (for FB-30 and ESB-250 1 million cycles or more), 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. Daily Inspection and Maintenance

8-7 Manually Releasing the Brake

■ FB Brakes (excluding FB-20, 30) (FB-01A1 – 05A1 are options)

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

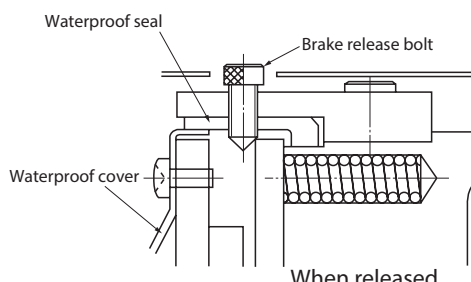
(1) First remove the brake release bolts from the 2 opposing angles and remove the release prevention spacers. Reinsert the bolts and rotate with a hexagonal wrench to release the brake. Be careful not to over rotate the brake release bolts. (Rotate the brake release bolts while checking to see if the brake is released. (See Figures 8-42, 8-43)

(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 8-43)

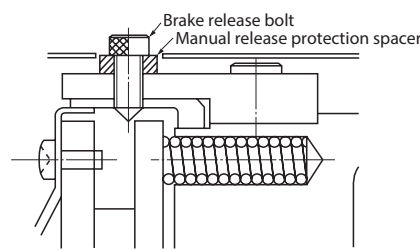
(3) This table show brake release bolt sizes.

Brake Type	Bolt size
FB-01A1, 02A1, 05A1 FB-1D	M5
FB-1E, 1HE, 2E FB-2D, 3D	M6
FB-3E, 4E FB-5B, 8B, 10B1, 15B1	M8
FB-5E, 8E, 10E, 15E	M10



When released

Figure 8-42



When operating

Figure 8-43

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

■ FB-20, 30

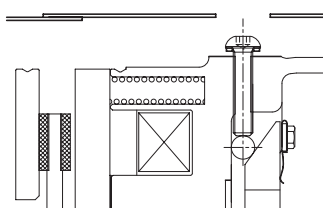
To manually release the brake with the power off, operate the brake release mechanism as shown below.

(See P67, 68, 84, and 85.)

(1) In the case of outdoor types, remove the lid on the window part of the outdoor cover [33]. Remove the grommet [28] (indoor type), remove the brake release bolt [2] using a hexagonal wrench (for an M8 hole bolt), and remove the rubber gasket [3] and the manual release prevention spacer [4]. The brake will release when you again rotate the bolt using the hexagonal wrench. Be careful not to over rotate the brake release bolt. (Rotate the brake release bolt [2] while checking to see if the brake is released.) (See Figure 8-44)

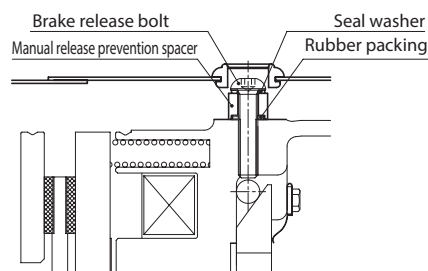
(2) After releasing the brake, to return it to its original condition, for safety, return the manual release prevention spacer and the rubber gasket [3] that were removed in (1) to their original positions, and firmly tighten the brake release bolt [2]. (See Figure 8-45) Next re-attach the grommet [28] (indoor type) in its original state. In the case of outdoor types, attach the lid on the window part of the outdoor cover [33] as it was before.

- Note that if the rubber gasket [3] and the seal washer [5] for the brake release bolt [2] unit are not attached when returning to the original state, dust-proofing and waterproofing capabilities will be lost. Also, firmly tighten the brake release bolt [2]. Otherwise waterproofing capability may be lost. Also make certain to return the grommet [28] (indoor type) or outdoor cover [33] window lid (outdoor type) to their original states.
- If the machine is operated when the brake release bolt has not been returned to its original position, in the worst case it is possible that the manual release would function before maximum gap is obtained, and the brake would cease to function. Therefore, make certain to always operate with the manual release prevention spacer attached.



When released

Figure 8-44



When operating

Figure 8-45

8. Daily Inspection and Maintenance

■ ESB-250

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

(See Figures 8-46 to 8-48, 8-17 on P69, and 8-37 on P86.)

- (1) In the case of outdoor types, remove outdoor cover [25]. Remove the cover [8], fan [7], and brake cover [22] (outdoor type).
- (2) Insert M12×65 hexagon socket head bolts (customer to prepare) through the manual releasing holes, to the field. (Note that if the hexagon socket head bolts are too long they will hit the outer disc and deform it.)
- (3) There are two manual release holes at opposing angles. Using a hexagonal wrench equally tighten the bolts in turn.
- (4) To release the brake, tighten the bolts until the armature and field stick together.
- (5) After returning the brake to its original state, attach the brake cover [22] (outdoor type), fan [7], and cover [8].

At this time coat the fan set screw [10] with Three Bond TB2365.

In the case of outdoor types, attach the outdoor cover as it was before.

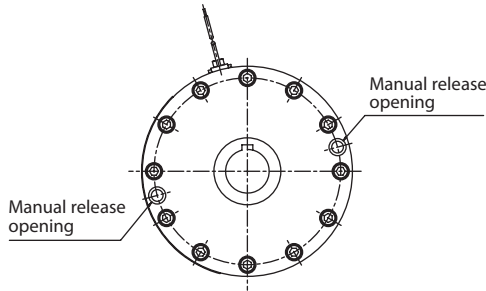


Figure 8-46

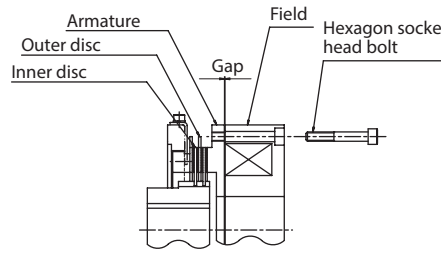


Figure 8-47

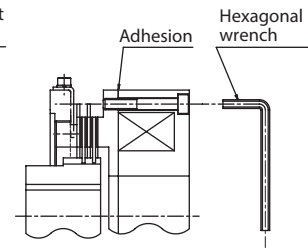


Figure 8-48

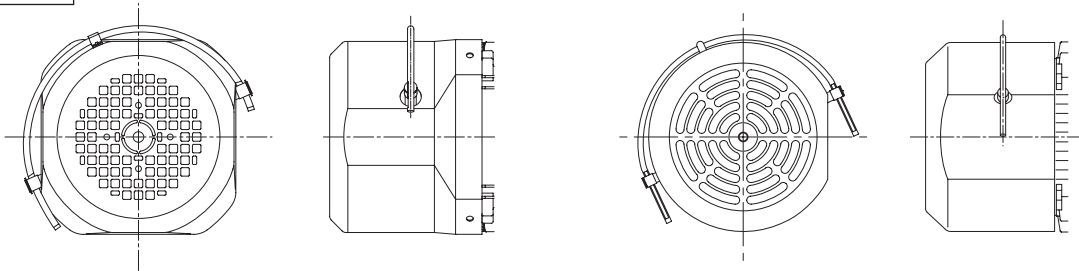
■ One-Touch Release Lever Method (Optional on all FB brakes except FB-20, 30)

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

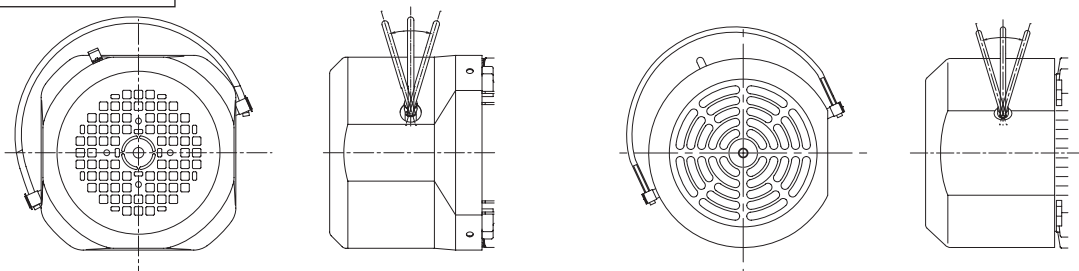
All you need to do to release the brake is push the release lever over. (See Figure 8-49)

- (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 8-49

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.
		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.
	Incorrect brake gap adjustment	Re-adjust brake gap. (See P54 – 87.)	
The slow speed shaft turns with no load	When a load is applied	The switch overheats	Insufficient switch capacity Replace with a specified switch.
			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.
	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.
			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 Decrease the load to the specified value.	
		Voltage drop or rise Contact the electric power company.	
		The ambient temperature is high Improve the ventilation method.	
		Damaged bearing Confer with authorized service station.	

9. Troubleshooting

Table 9-2 Troubleshooting

Problem		Cause	Correction
Abnormal sound Excessive vibration		Dust and foreign matter in bearings, or damaged bearings	Confer with authorized service station.
		Warping of housing 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 P54 – 87)
		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.
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 P22 – 45)
		Foreign objects or oil adhesion in brake lining unit	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.
Tripping inverter	Overcurrent shut-off	Sudden speed changes	Increase the time for speed changes.
		Extreme load fluctuation	Decrease load fluctuation.
	Overcurrent due to ground fault	Ground fault on output side	Take measures to prevent ground fault.
	Direct current overcurrent	Short on output side	Take measures to prevent short. Inspect wiring.
	Regenerative overvoltage shut-off	Sudden speed reduction	Increase the time for speed reduction. Decrease brake frequency.
	Thermal operation	Overload	Decrease the load to the specified value.

10. Construction Drawings

10-1 Motor Unit Construction Drawing (Ex.: CYCLO Drive, Direct Coupling)

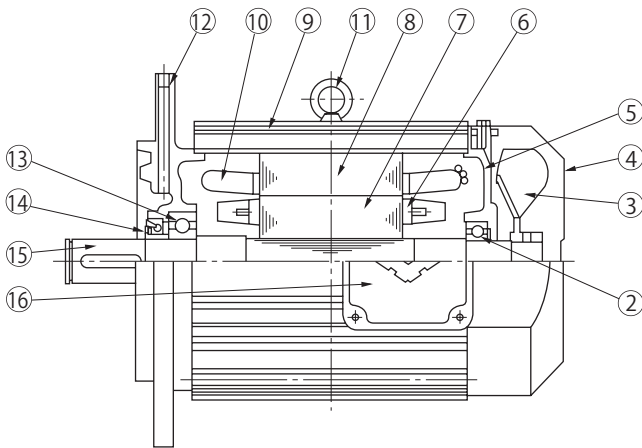


Figure 10-1 Example of Construction of 80–112M Frame size

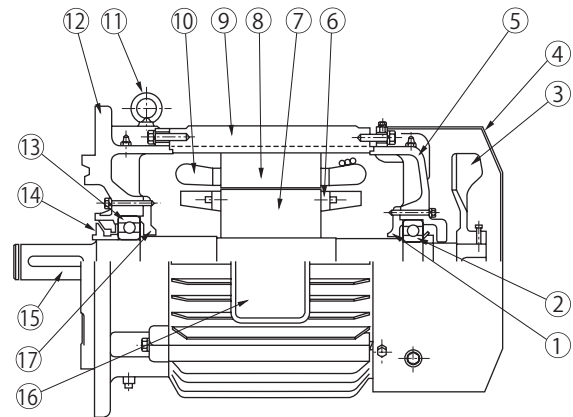


Figure 10-2 Example of Construction of Frame size 180 and above

Table 10-1 Principal Parts of Motor

Code	Parts Name	Code	Parts Name	Code	Parts Name
1	Bearing cover	7	Rotor core	13	Load side motor shaft bearing
2	Anti-load side motor shaft bearing	8	Stationary core	14	Slinger collar (Oil seal)
3	Cooling fan	9	Frame	15	Motor shaft
4	Fan cover	10	Stationary coil	16	Terminal box
5	Anti-load side cover	11	Eye-bolt	17	Bearing cover
6	Rotor conductor	12	Motor flange bracket		

11 Warranty

The scope of warranty of our delivered products is limited only to what we manufactured.

Warranty (period and description)

Period	The warranty period applies only to new products and represents 18 months after the shipment or 12 months after the actual operation, whichever is shorter.
Description	<p>If the product failed within the warranty period, during which despite a proper mounting, connection and maintenance & administration are followed according to the maintenance manual, and the product is properly run based on the specification on the catalog or under conditions agreed separately, we will repair or provide an alternative product at our discretion for free of charge, except the exclusions below.</p> <p>However, as far as the product is connected with customers' other devices, we will not indemnify those expenses on dismounting from/mounting on the devices, etc. and other associated construction expenses, transportation expenses and opportunity loss and operation loss the customers suffered from, and other indirect damages.</p>
Warranty exclusions	<p>The following items will be excluded from the warranty:</p> <ol style="list-style-type: none"> 1. A breakdown resulting from defects in the mounting of the product and connection with other devices, etc. 2. A breakdown resulting from insufficient maintenance & administration and improper handling of the product, including a case that the product is not stored according to our defined storage manual. 3. A breakdown resulting from operation which does not fall within our specification and other operation conditions and use status we hardly can know or a failure caused by the use of lubricant which we do not recommended. 4. A breakdown resulting from defects in or special specification of devices, etc. connected by customers. 5. A breakdown resulting from modification or reconstruction of the product. 6. A breakdown resulting from defects in parts supplied or specified by customers. 7. A breakdown caused by inevitable force including earthquake, fire, flood disaster, salt damage, gas damage, and lightning strike, etc. 8. Warranty of natural wear and tear, abrasion, and deterioration of such relevant consumable parts as a bearing and oil seal, etc. under normal usage. 9. A breakdown caused for reasons not attributable to each of the above item.

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