

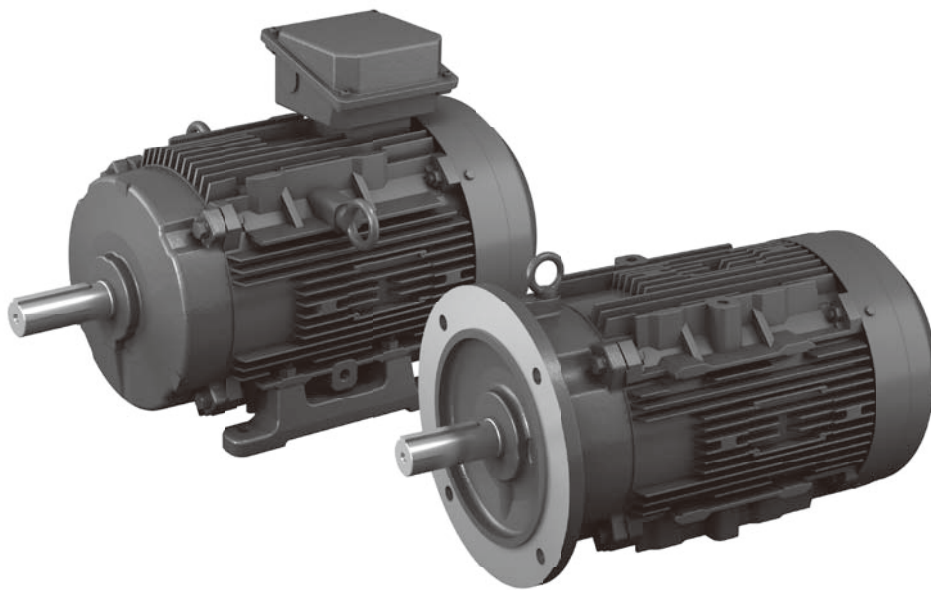
# Overseas Specification Motors

**3-Phase Motor**

**Premium-Efficiency, 3-Phase Motor**

**AF Motor for Inverter**

**3-Phase Motor for Inverter**



## 《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.

◆ Sumitomo Heavy Industries, Ltd.

◆ Sumitomo Heavy Industries Gearbox Co., Ltd.



# 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. 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, dangerous situations or serious injury and/or death.



Improper handling may result in physical damage, dangerous situations or serious 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 maintenance with disassembly of this device, contact the nearest authorized service station.
- 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 stand-alone motor products for overseas and motor units of a gearmotor for overseas (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

In the case of a gearmotor, there are separate nameplates on the gear section and the motor.  
When contacting the company, please provide [1]. Gearmotor or motor nomenclature, [2]. Reduction ratio, and [3]. Serial number.

### (1) Nameplate of a Gearmotor Unit (Example: CYCLO Drive)

[1] Gearmotor nomenclature

[2] Reduction ratio

- Service factor

- Input capacitance, motor speed

- Allowable output torque

[3] Serial number

CYCLO DRIVE®		
MODEL (1)		
RATIO (2)		
SERVICE FACTOR		
INPUT	kW	r/min
OUTPUT TORQUE N·m		
SERIAL NO. (3)		
Sumitomo Heavy Industries, Ltd. JAPAN		

Figure 1-1 Gearmotor Nameplate

# 1. Inspection Upon Delivery

## (2) For USA

(e.g.: Premium-efficiency, 3-phase motor)




3 PHASE INDUCTION MOTOR		 	
HP	POLES	FRAME	TYPE
MODEL		CC305B	
VOLTS	ENCLOSURE TEFC		
Hz	M/B INS. CLASS		
M. AMP	DUTY		
RPM	S. F. DESIGN		
P. F.	MAX. AMB °C		
CODE	B. TORQUE FT-LB		
B. AMP	FACTORY		
NEMA NOM. EFF.	S/N		
 <b>Sumitomo Heavy Industries, Ltd.</b>			
MS930WW			

Figure 1-2 For USA/UL, NEMA Spec. Nameplate

## (3) For Canada

(e.g.: Premium-efficiency, 3-phase motor)


3 PHASE INDUCTION MOTOR			
HP	POLES	TYPE	
VOLTS	FRAME		
Hz	M/B INS. CLASS		
M. AMP	S. F.		
RPM	MAX. AMB °C		
P. F.	ENCLOSURE		
B. AMP	B. TORQUE FT-LB		
DUTY	NOM. EFF.		
MANUF. NO.			
 <b>SM Cyclo of Canada, Ltd.</b>			
Energy Verified 174647			

Figure 1-3 For Canada/CSA Spec. Nameplate

## (4) For Europe, Southeast Asia (excluding Singapore), China (minimum 1.5kW)

(e.g.: Premium-efficiency, 3-phase motor)



3 PHASE INDUCTION MOTOR			
kW	P	TYPE	
VOLTS	FRAME		
Hz	M.THERMAL ( )		
M. AMP	RATING		
r/min	CONNECTION		
EFF.	B.THERMAL		
	B.TORQUE N·m		
P.F.	IEC 60034-1		
B. AMP	S/N		
 <b>Sumitomo Heavy Industries, Ltd.</b>			
6-1, Asahi-Cho, Obu City, Aichi, Japan MS120WW			

Figure 1-4 For Europe, Southeast Asia, China /CE Marking Spec. Nameplate

## (5) For China (maximum 1.1kW)

(e.g.: 3-phase motor)

三相异步电动机			
额定功率 kW	极数	型号	
额定电压 V	机座		
额定频率 Hz	电动机绝缘等级		
额定电流 A	工作制		
额定转速 r/min	接线		
效率 %	制动器绝缘等级		
	制动器转矩 N·m		
功率因数	GB 12350-2009		
制动器额定电流 A	製造日期		
制造编号 No.			
 <b>Sumitomo Heavy Industries, Ltd.</b>			
住友重機械工業株式会社 MQ978WW			

Figure 1-5 For China/CCC Spec. Nameplate

## (6) For Singapore

(e.g.: Premium-efficiency, 3-phase motor)



3 PHASE INDUCTION MOTOR			
kW	P	TYPE	
VOLTS	M. THERMAL ( )		
Hz	RATING		
M. AMP	CONNECTION		
r/min	B. TYPE		
P. F.	B. THERMAL		
B. AMP	B. TORQUE N·m		
IE CODE	100%	75%	50%
EFF.	IEC 60034-1		
	S/N		
 <b>Sumitomo Heavy Industries, Ltd.</b>			
6-1, Asahi-Cho, Obu City, Aichi, Japan MT504WW			

Figure 1-6 For Singapore/CE Marking Spec. Nameplate

## (7) For Russia

(e.g.: Premium-efficiency, 3-phase motor)



3 PHASE INDUCTION MOTOR			
kW	P	TYPE	
VOLTS	FRAME		
Hz	M.THERMAL ( )		
M. AMP	RATING		
r/min	CONNECTION		
EFF.	B.THERMAL		
	B.TORQUE N·m		
P.F.	IEC 60034-1		
B. AMP	S/N		
 <b>Sumitomo Heavy Industries, Ltd.</b>			
MT262WW			

Figure 1-7 For Russia/EAC Spec. Nameplate

## (8) For South Korea

(e.g.: Premium-efficiency, 3-phase motor)


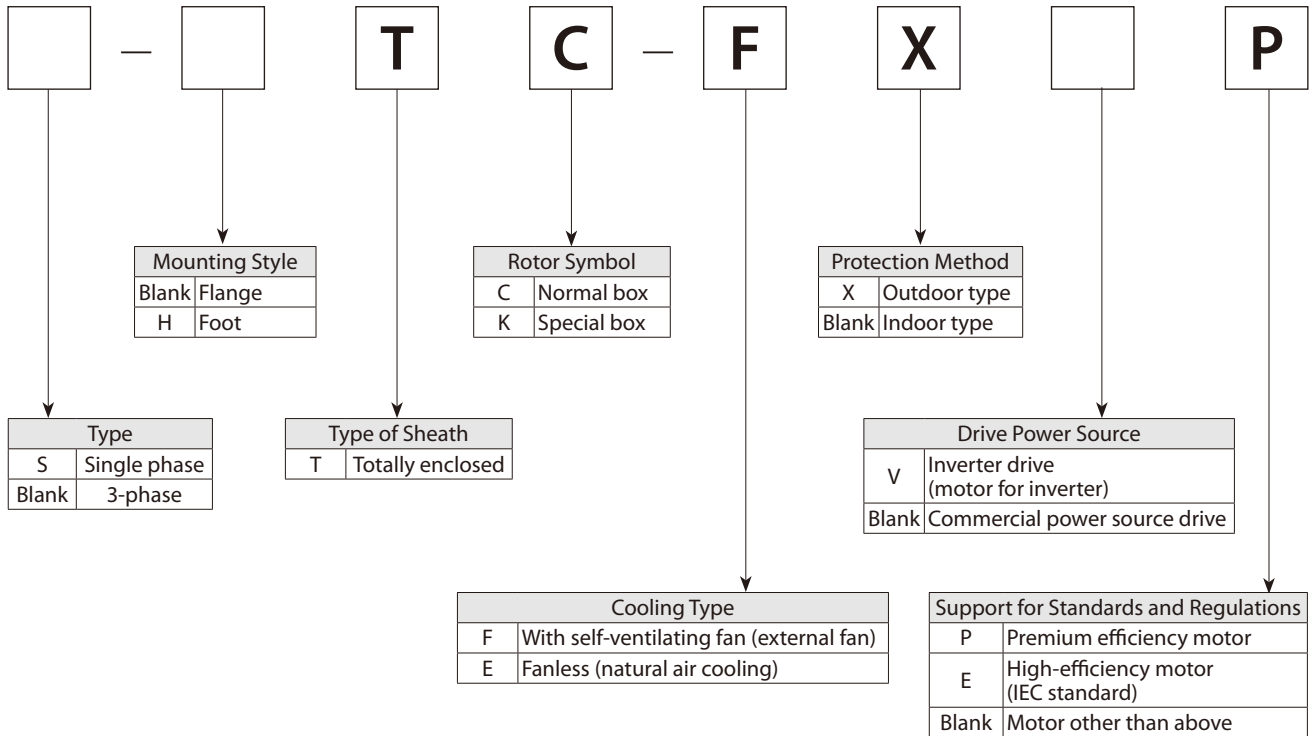
3 PHASE INDUCTION MOTOR			
kW	P	TYPE	
VOLTS	FRAME		
Hz	M.THERMAL ( )		
M. AMP	RATING		
r/min	CONNECTION		
EFF.	B.THERMAL		
	B.TORQUE N·m		
P.F.	IEC 60034-1		
B. AMP	S/N		
 <b>Sumitomo Heavy Industries, Ltd.</b>			
MS124WW			

Figure 1-8 For South Korea/KS Spec. 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

The relationship between the standard brake type and the type and capacity of the motor is as follows:

Table 1-1 SB Brake and MB Brakes

Brake Type	Applicable Model/Frame Size	Motor Capacity (W)
		3-Phase Motor
		4P
SB-004	HYPONIC/01 03 05 07	15 25 40 60
MB-003	HYPONIC/17 1240	40
	PREST NEO	
	ALTAX NEO	
MB-005	HYPONIC/15 17 1240	60 90
	PREST NEO	60
	ALTAX NEO	
MB-010	ALTAX NEO	90

Table 1-2 FB Brakes and ESB Brakes

Brake Type	Motor Capacity (kW)		
	3-Phase Motor	Premium-Efficiency, 3-Phase Motor	AF Motor for Inverter 3-Phase Motor for Inverter
	4P	4P	4P
FB-01A	0.1 (1/8)	-	-
FB-02A	0.2 (1/4) 0.25 (1/3) <sup>*1</sup>	-	0.1 (1/8)
FB-05A	0.4 (1/2)	-	0.2 (1/4)
FB-1D	0.55 (3/4) 0.75	-	0.4 (1/2)
FB-1E	-	0.75 (1)	-
FB-1HE	-	1.1 (1.5)	-
FB-2D	1.1 1.5	-	0.75
FB-2E	-	1.5 (2)	-
FB-3D	2.2	-	1.5
FB-3E	-	2.2 (3)	-
FB-4E	-	3.0	-
FB-5B	3.0 3.7	-	2.2
FB-5E	-	3.7 (5)	-
FB-8B	5.5	-	3.7
FB-8E	-	5.5 (7.5)	-
FB-10B1	7.5	-	5.5
FB-10E	-	7.5 (10)	-
FB-15B1	11	-	7.5
FB-15E	-	11 (15)	-
FB-20	15	15 (20)	11
FB-30	18.5 22 30	18.5 (25) 22(30) 30(40)	15 18.5 22
ESB-250 (Horizontal Type) ESB-250-2 (Vertical Type)	37 45	37 45	-

Note: 1. HYPONIC Gearmotor, 3-phase motor 4P 0.25kW is FB-05A.

2. 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 Storage Period

- The storage period of the product should not be more than one year.
  - Before the product is shipped from the factory, it is coated with rust preventive oil. Once every 6 months after the product is shipped, check the machined surfaces for rusting, and if necessary, apply rust preventive oil once again.
- If it is necessary to use rust preventive oil that conforms to special specifications because the product is to be exported or stored for at least 1 year etc., please contact us.

### 2-3 Using after Storage

- Oil seals are affected by temperature, ultraviolet light and other ambient conditions and can easily degrade. After long storage periods, inspect before operation, and replace any degraded seals with new seals.
- Measure the insulation resistance of the motor (see P12) and check it.
- 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. Transport

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#### 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 when handling 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. There is a risk of the product dropping or toppling over, or of the hoisting attachment becoming damaged, resulting in possible injury or damage to the product.
- 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. There is a risk of the product dropping or toppling over, or of the hoisting attachment becoming damaged, resulting in possible injury or damage to the product.
- Use a suitable hoisting attachment, check to ensure that the eye bolts and nuts are not loose, and then hoist the product.

## 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.

## 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 products; otherwise, fire may result.
- Do not place any object around the products 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 dust 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 type** 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 there is a risk of injury due to scattering the broken pieces or of damage to the products.

## 5-1 Checking Rotational Direction

- If the wiring is carried out as indicated in P15 to 43, the motor shaft will rotate clockwise as seen from the anti-load side when the product is destined for South Korea, and will rotate counterclockwise when the product is destined for another country.
- To cause reverse rotation of a 3-phase power source motor, reverse L1 and L3 or R and T in the connection diagram.
- 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.

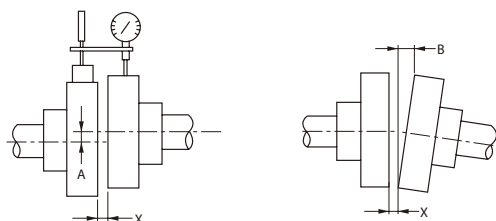


Figure 5-1

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.
- The pitch circle of the sprocket and gear shall be more than three times of 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  $\beta$  of the two pulleys should be within  $20^\circ$ . (See Figure 5-3)
- When using multiple V-belts, use a matched set having the same circumferential length.

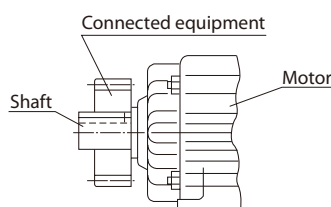


Figure 5-2

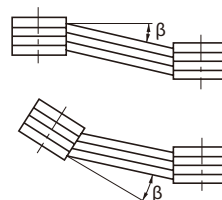


Figure 5-3

### DANGER

- Do not handle the unit when power is turned on. 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.

### CAUTION

- When wiring, follow the facility's regulations and electrical codes; otherwise, burning, electric shock, injury, and fire may result.
- The motor is not equipped with a protection device. However, it is compulsory to install an overload protector according to facility electrical codes. It is recommended to install other protective devices (earth leakage circuit 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. Especially such as when the cable is long in the 400V class, a surge voltage over 1300V occurs. Therefore, in this case, install an LCR filter, AC reactor, etc. between the inverter and motor to inhibit the surge voltage.
- **For motor with brake**, do not turn on connection power to the brake coil when the motor is stopped. Otherwise coil burn-out fire may result. Also, mistaken wiring could damage the rectifier.
- 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 be no greater than 2%.
- After wiring **outdoor types**, check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.

# 6. Wiring

## 6-1 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.

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

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

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

## 6-2 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.

## 6-3 Connecting the Power Cable.

Connect the power cable and motor lead wire by clasping in a pressure connection terminal as shown in Figure 6-1.

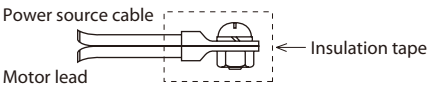


Figure 6-1

## 6-4 Motor Wiring

Shows the pages for motor wiring diagrams.

Table 6-2 Without Brake

Power Source	Motor Type	Capacity (kW)	Page	
			Direct Input from Commercial Power Source	Inverter Drive
For USA/UL, NEMA For Canada/CSA	3-Phase Motor	1/8 - 3/4HP	P15	P16
	Premium-Efficiency, 3-Phase Motor	1 - 75HP	P15	
	AF Motor for Inverter 3-Phase Motor for Inverter	1/8 - 1/2HP	-	
For Europe/CE Marking For Singapore/CE Marking For Southeast Asia/CE Marking For China/CCC, CE Marking For Russia/EAC	3-Phase Motor	15W - 3.7kW	P23	P25
		5.5 - 55kW	P24	
	Premium-Efficiency, 3-Phase Motor	0.75 - 3.7kW	P23	
		5.5 - 55kW	P24	
	AF Motor for Inverter 3-Phase Motor for Inverter	0.1 - 22kW	-	
For South Korea/KS	Premium-Efficiency, 3-Phase Motor	0.75 - 3.7kW	P34	P36
		5.5 - 55kW	P34 P35	

Table 6-3 With Brake (15–90W)

Power Source	Motor Type	Capacity (kW)	Brake Type	Motor Type	
				Direct Input from Commercial Power Source	Inverter Drive
For USA/UL, NEMA For Canada/CSA	3-Phase Motor	1/8 - 3/4HP	FB-01A - FB-05A FB-1D	P17 P18	P20 P21
	Premium-Efficiency, 3-Phase Motor	1 - 5HP	FB-1E - FB-5E	P17	P20
		7.5 - 15HP	FB-8E - FB-15E	P18	P21
		20 - 40HP	FB-20, FB-30	P19	P22
For Europe/CE Marking For Singapore/CE Marking For Southeast Asia/CE Marking For China/CCC, CE Marking For Russia/EAC	AF Motor for Inverter 3-Phase Motor for Inverter	1/8 - 1/2HP	FB-02A, FB-05A FB-1D	-	P20
	3-Phase Motor	15 - 90W	SB-004 MB-003 - MB-005	P26	P30
		0.1 - 3.7kW	FB-01A - FB-05A FB-1D - FB-3D FB-5B	P27	P31
		5.5 - 11kW	FB-8B FB-10B1, FB-15B1	P28	P32
		15 - 45kW	FB-20, FB-30 ESB-250, ESB-250-2	P29	P33
	Premium-Efficiency, 3-Phase Motor	0.75 - 3.7kW	FB-1E - FB-5E	P27	P31
		5.5 - 11kW	FB-8E - FB-15E	P28	P32
		15 - 45kW	FB-20, FB-30 ESB-250, ESB-250-2	P29	P33
	AF Motor for Inverter 3-Phase Motor for Inverter	0.1 - 2.2kW	FB-02A, FB-05A FB-1D - FB-3D FB-5B	-	P31
		3.7 - 7.5kW	FB-8B FB-10B1, FB-15B1	-	P32
		11 - 22kW	FB-20, FB-30	-	P33
For South Korea/KS	Premium-Efficiency, 3-Phase Motor	0.75 - 3.7kW	FB-1E - FB-5E	P37 P38	P41 P42
		5.5 - 11kW	FB-8E - FB-15E	P37 P39	
		15 - 30kW	FB-20, FB-30	P40	P43

Note: 1. For the relationship between the standard brake type and the type and capacity of the motor refer to P6.  
2. For matters other than the above, please make inquiries to us.

# 6. Wiring

## 6-5 Internal Wiring of Overseas Specification Motors

### ■ For USA/UL, NEMA

	1/8 - 5HP×4P	7.5 - 75HP×4P
	9 Lead Wires	
	230V, 460V 60Hz	
	Y Wiring	Δ Wiring
Without Brake		
With Brake		

### ■ For Canada/CSA

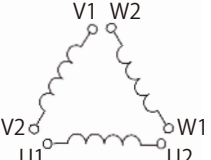
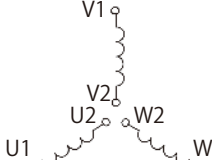
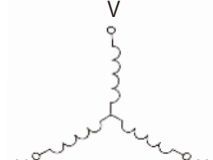
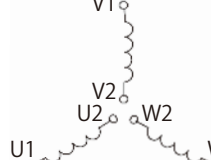
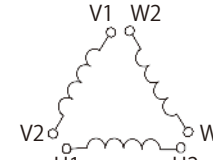
	1/8 - 5HP×4P (Excluding 1/2HP)	1/2HP×4P 7.5 - 75HP×4P	1/8 - 5HP×4P	7.5 - 75HP×4P
	9 Lead Wires		3 Lead Wires	
	230V, 460V 60Hz		575V 60Hz	
	Y Wiring	Δ Wiring	Y Wiring	Δ Wiring
Without Brake				
With Brake				

Terminal symbols: U, V, W -> Without brake 1, 2, 3 ...9; With brake T1, T2, T3 ...T9

### ■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

15 - 90W×4P	0.1 - 3.7kW×4P		5.5 - 55kW×4P	
3 Lead Wires	6 Lead Wires		6 Lead Wires	
200V, 220V, 380V 50Hz	220V, 230V, 240V 50Hz	380V, 400V, 415V 50Hz	380V, 400V, 415V 50Hz	
Y Wiring	Δ Wiring	Y Wiring	Y Wiring (At start)	Δ Wiring (When acceleration is completed)

### ■ For South Korea/KS

0.75 - 55kW × 4P		0.75 - 3.7kW×4P	5.5 - 55kW×4P	
6 Lead Wires		3 Lead Wires	6 Lead Wires	
220V 60Hz	380V 60Hz	440V 60Hz		
Δ Wiring	Y Wiring	Y Wiring	Y Wiring (At start)	Δ Wiring (When accelera- tion is completed)
				

Note: The number of lead wires does not include the number of lead wires (two) for the brake in the case of a motor with a brake.

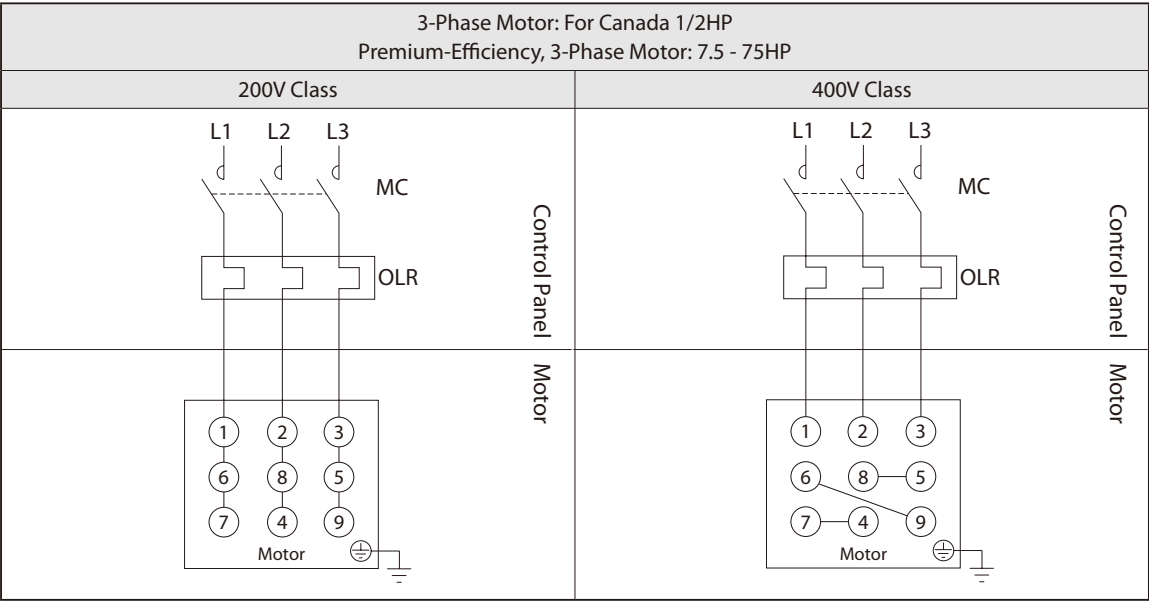
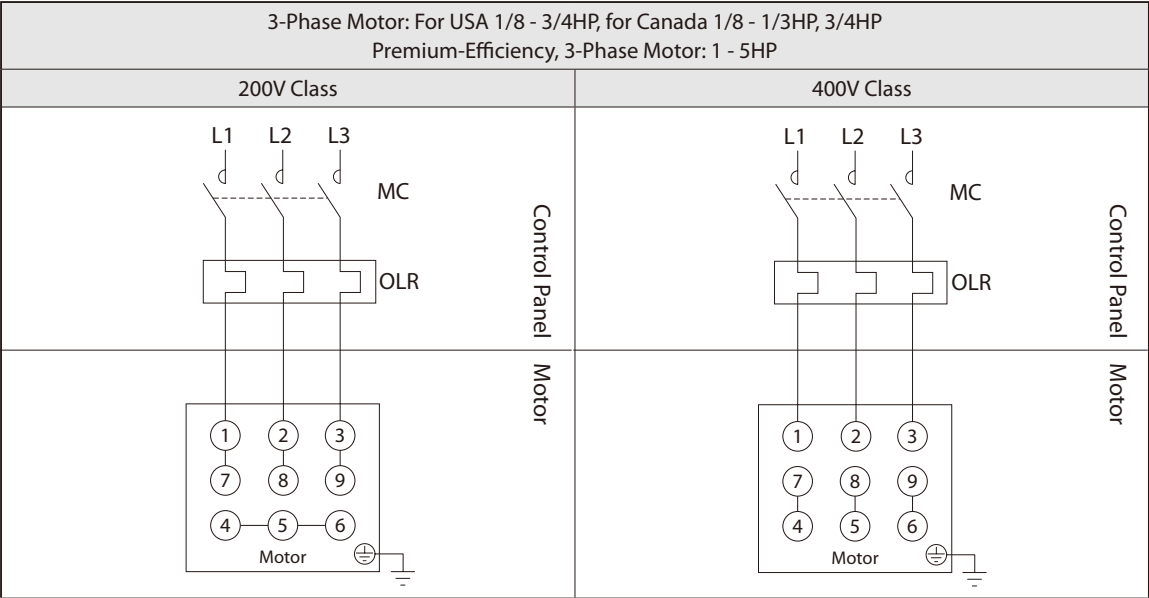


These diagrams indicate the standard specifications of the motor wiring and also the symbols for the terminals and lead wires.

6-6 Wiring of Overseas Specification Motors

■ For USA/UL, NEMA; Canada/CSA

Without Brake, 3-Phase Power Source



MC: Electromagnetic contactor  
OLR: Overload protection device or electronic thermal relay

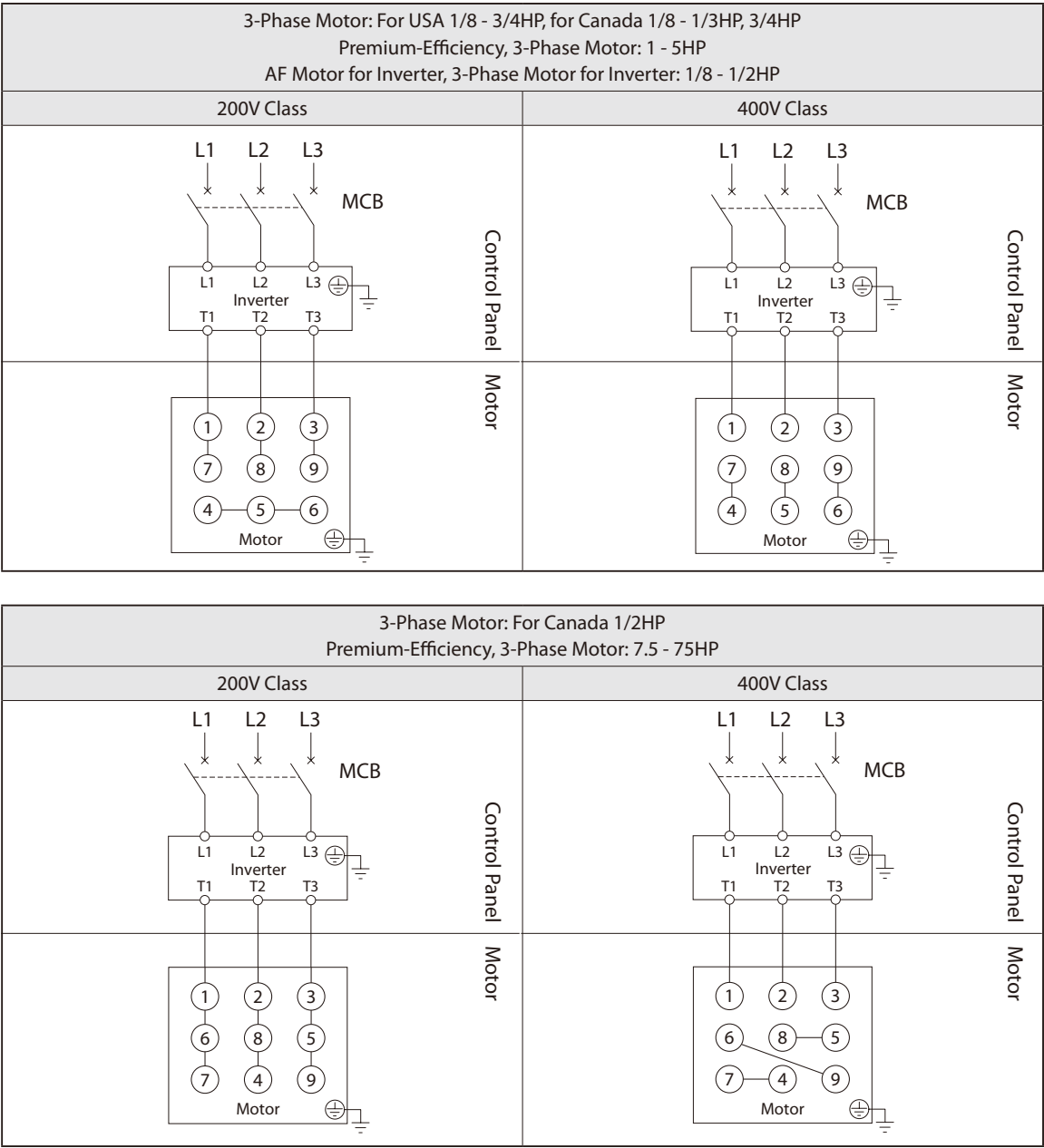
} Customer to prepare.

The motor terminals of 3-wire specifications for Canada are ① , ② and ③ only.

# 6. Wiring

■ For USA/UL, NEMA; Canada/CSA

Without Brake, Inverter Drive



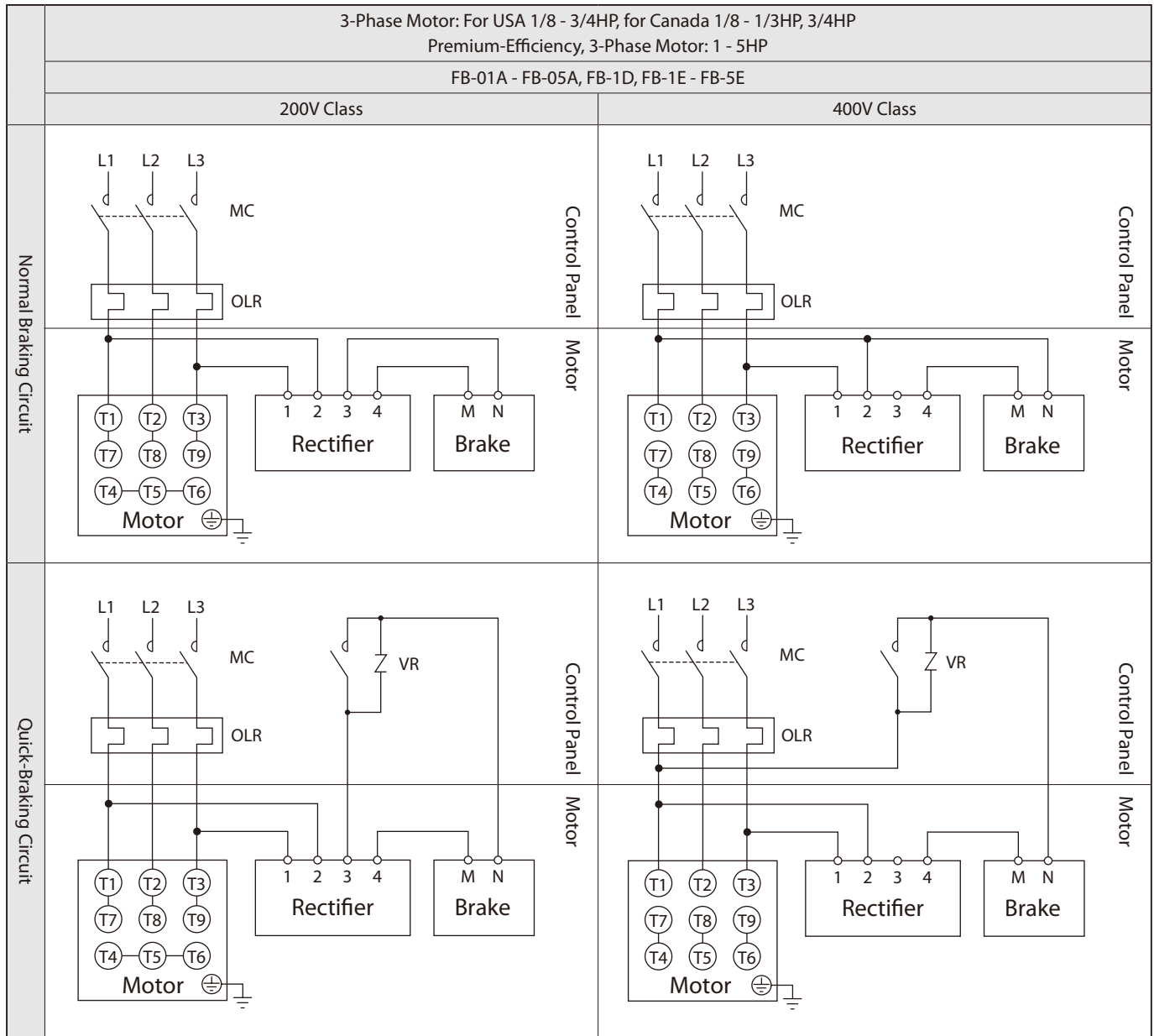
MCB: Breaker for wiring — Customer to prepare.

- The motor must be insulated to inverter-drive a 400V class or higher voltage 3-phase motor.

# 6. Wiring

## ■ For USA/UL, NEMA; Canada/CSA

Without Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

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

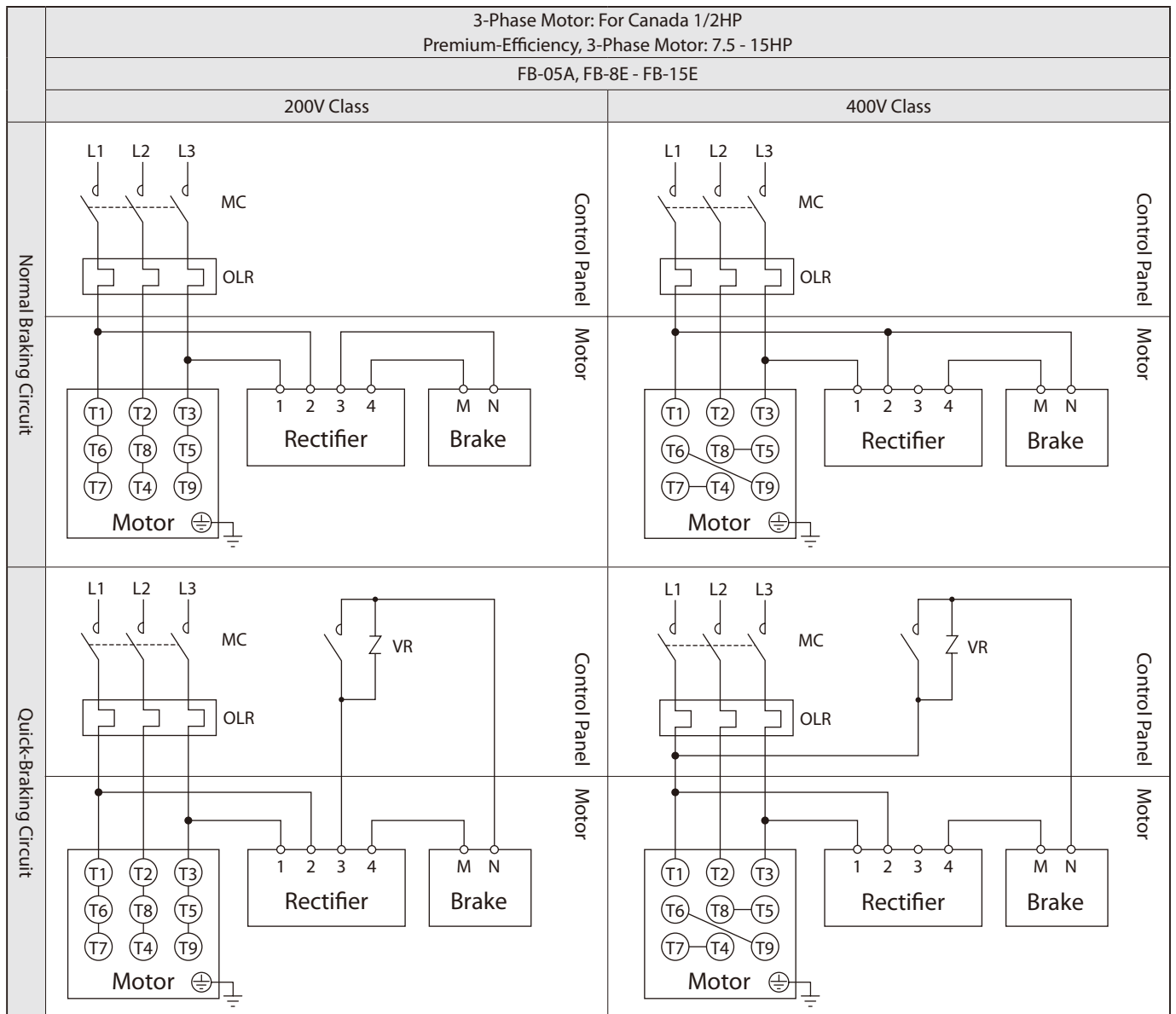
Customer to prepare.

- The motor terminals of 3-wire specifications for Canada are (T1) (T2) (T3) only.
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

# 6. Wiring

## ■ For USA/UL, NEMA; Canada/CSA

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

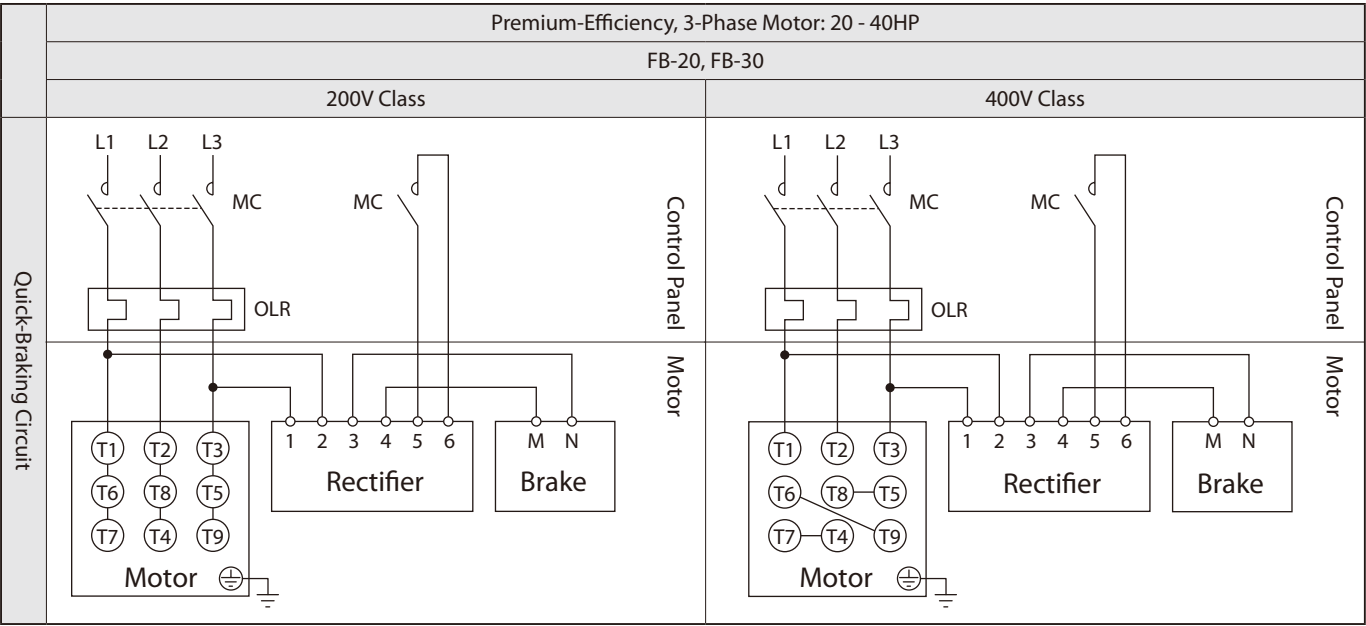
VR: Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

- The motor terminals of 3-wire specifications for Canada are (T1) (T2) (T3) only.
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

■ For USA/UL, NEMA; Canada/CSA

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



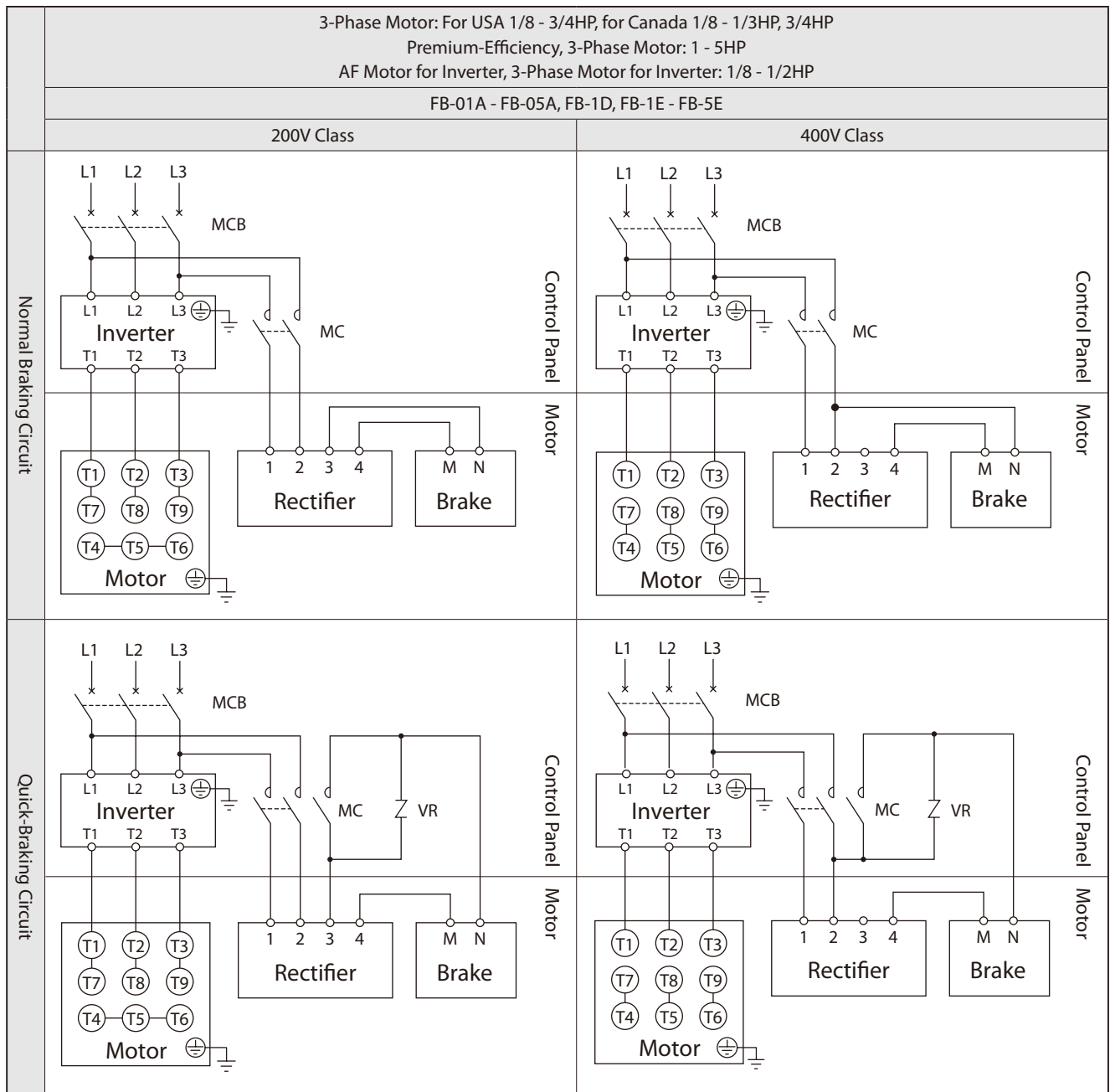
MC: Electromagnetic contactor  
OLR: Overload protection device or electronic thermal relay  
Customer to prepare.

- The motor terminals of 3-wire specifications for Canada are T1 T2 T3 only.
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
  - Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-4 on P44.
  - 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

## ■ For USA/UL, NEMA; Canada/CSA

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

Customer to prepare.

The motor terminals of 3-wire specifications for Canada are (T1) (T2) (T3) only.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.

- The motor must be insulated to inverter-drive a 400V class or higher voltage 3-phase motor.

- Brake action delay time is different between normal and quick-braking circuits.

Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.

- Use a quick-braking circuit to improve hoisting equipment and stopping precision.

- Use a quick braking circuit when a phase-advancing capacitor is mounted.

- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.

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

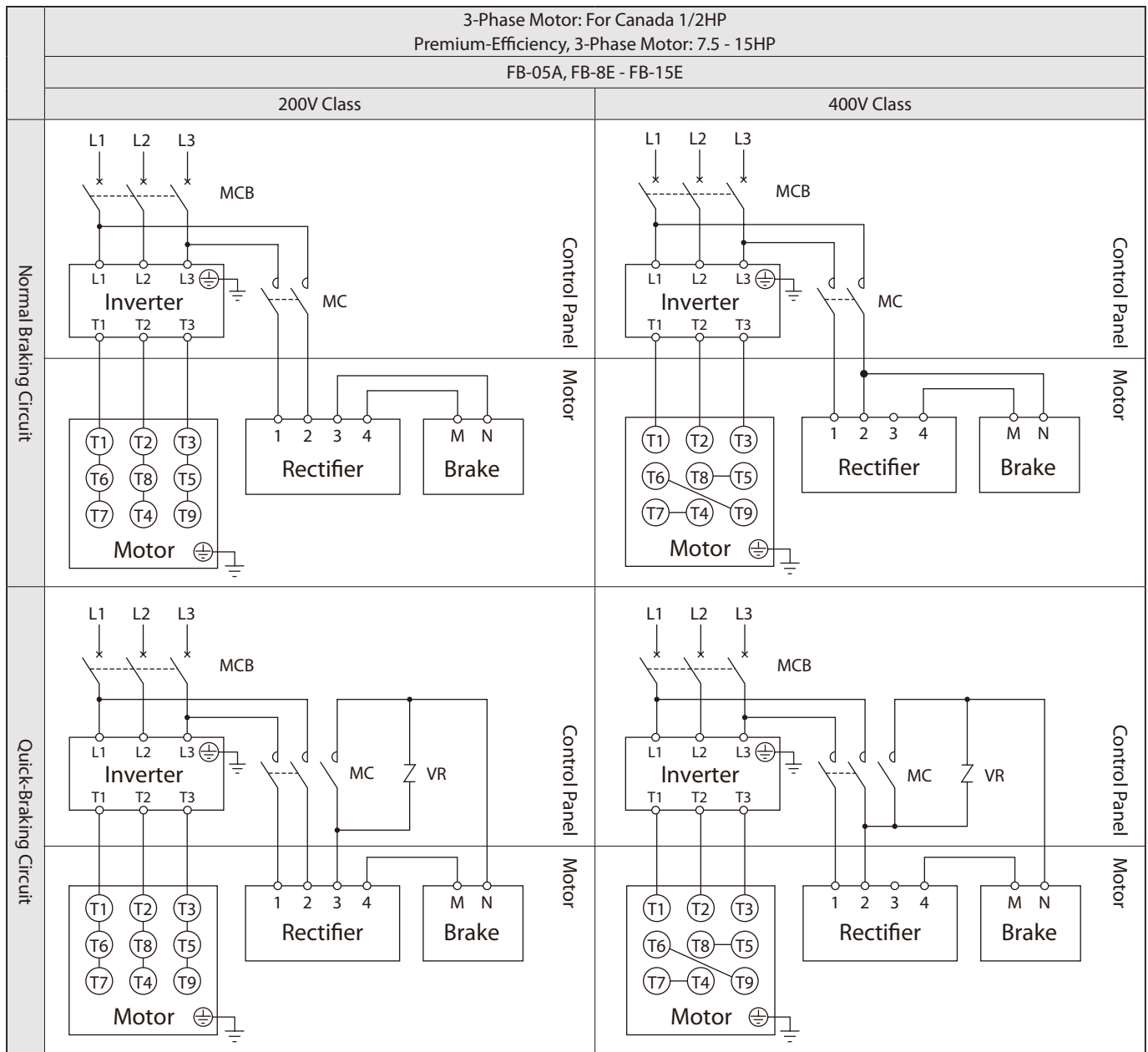
- Always use the inverter's power source side for the brake power source.

- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.

# 6. Wiring

## ■ For USA/UL, NEMA; Canada/CSA

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

Customer to prepare.

The motor terminals of 3-wire specifications for Canada are (T1) (T2) (T3) only.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.

- The motor must be insulated to inverter-drive a 400V class or higher voltage 3-phase motor.

- Brake action delay time is different between normal and quick-braking circuits.

Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.

- Use a quick-braking circuit to improve hoisting equipment and stopping precision.

- Use a quick braking circuit when a phase-advancing capacitor is mounted.

- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.

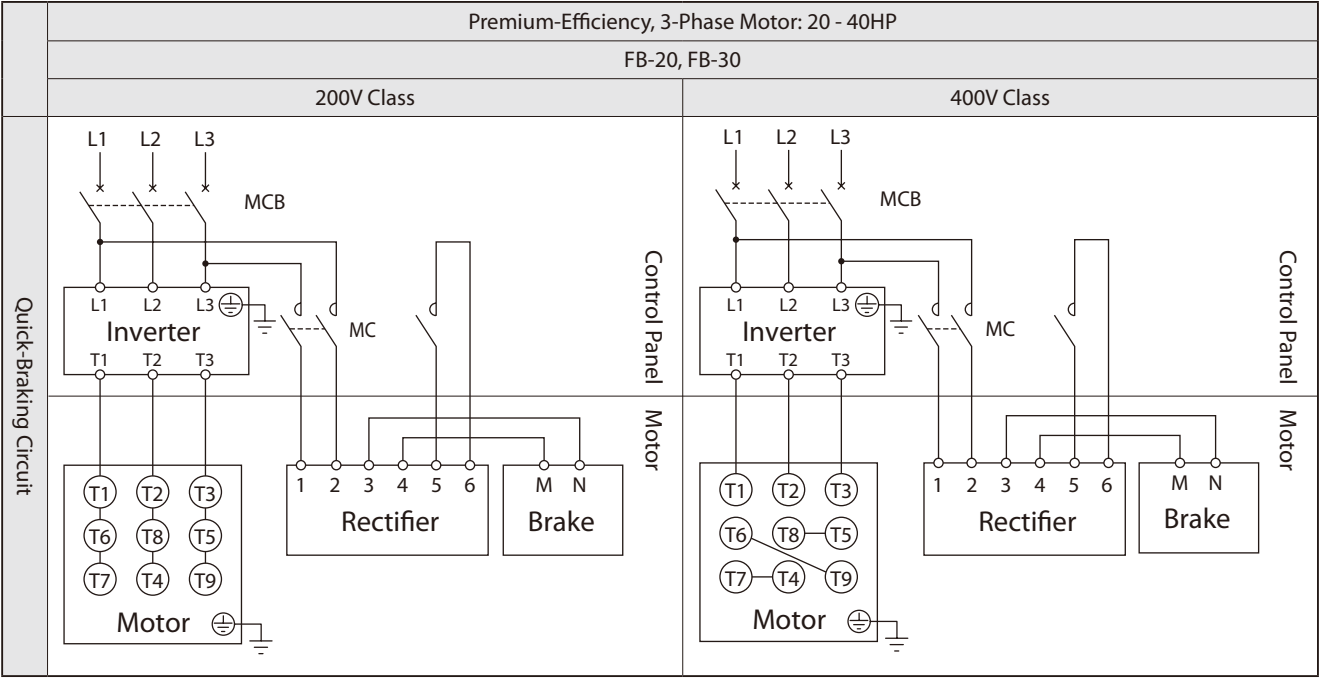
- Always use the inverter's power source side for the brake power source.

- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.

# 6. Wiring

■ For USA/UL, NEMA; Canada/CSA

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

Customer to prepare.

- The motor terminals of 3-wire specifications for Canada are T1 T2 T3 only.
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.

- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-4 on P44.

- Shipped with a short circuit plate connecting rectifier terminals 5 and 6. Remove the short circuit plate when wiring.

- Always use the inverter's power source side for the brake power source.

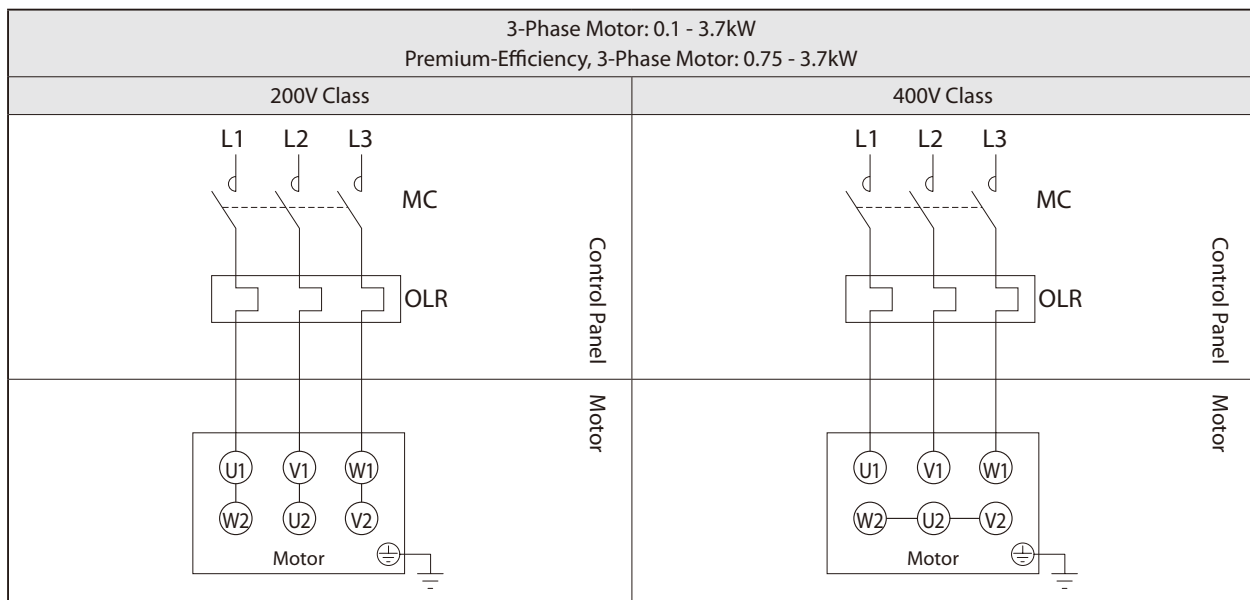
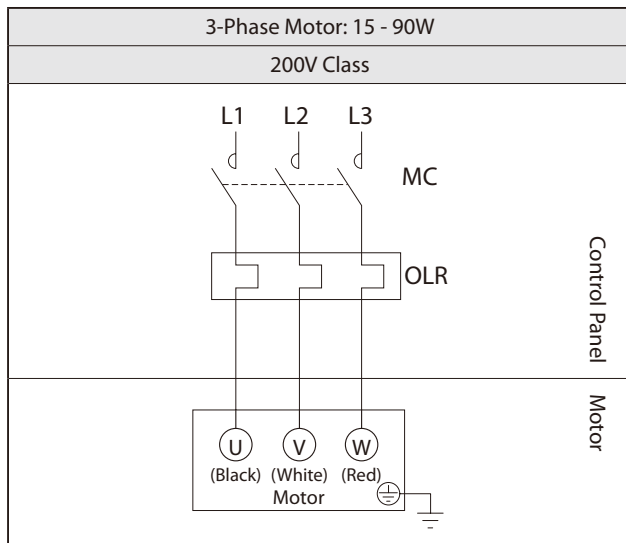
- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.



## 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

### Without Brake, 3-Phase Power Source



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

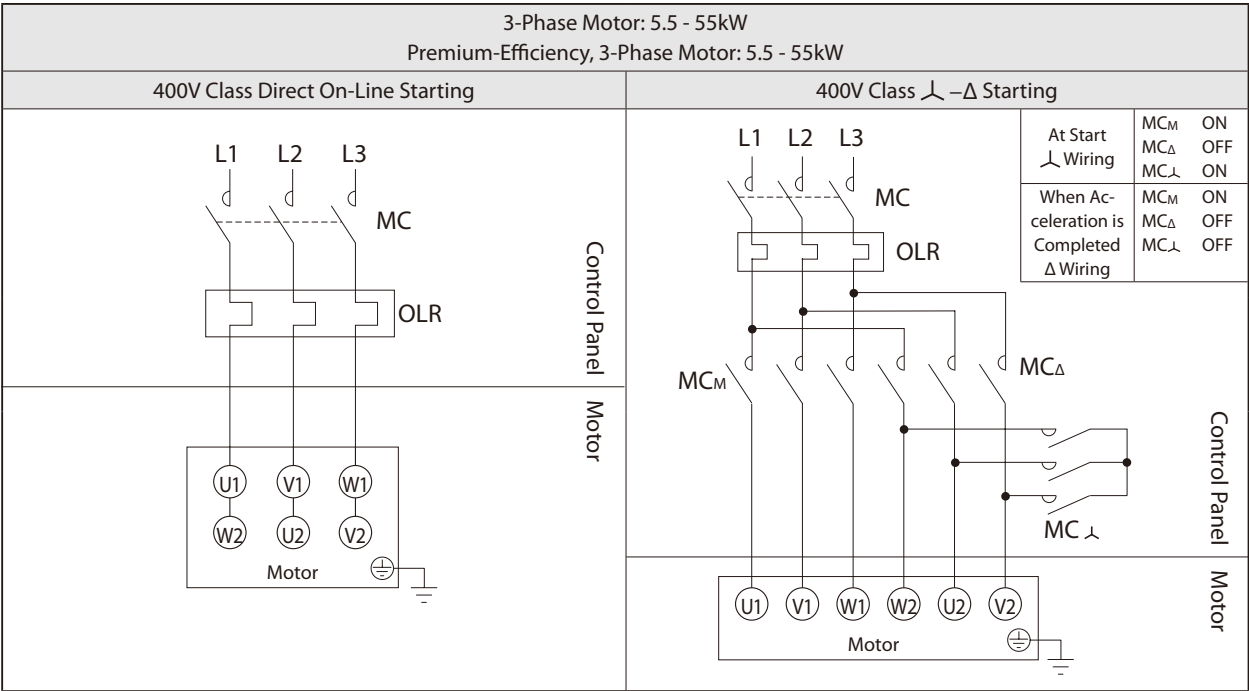
— Customer to prepare.

A motor rated at 15 to 90 W for China has black, white and red lead wires.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

Without Brake, 3-Phase Power Source



MC: Electromagnetic contactor

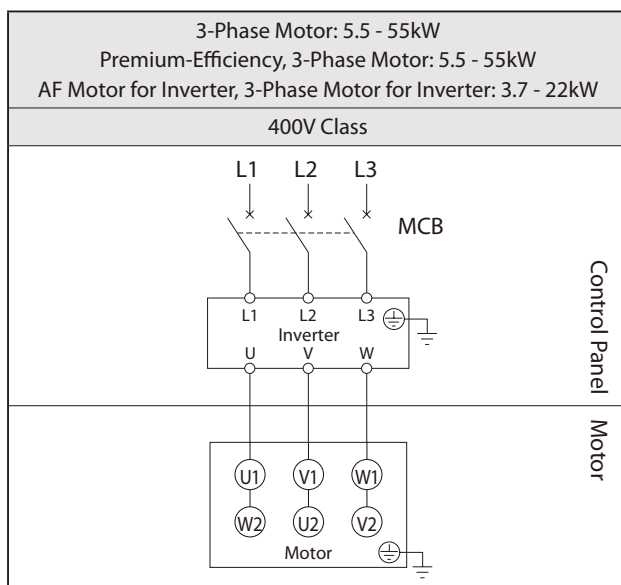
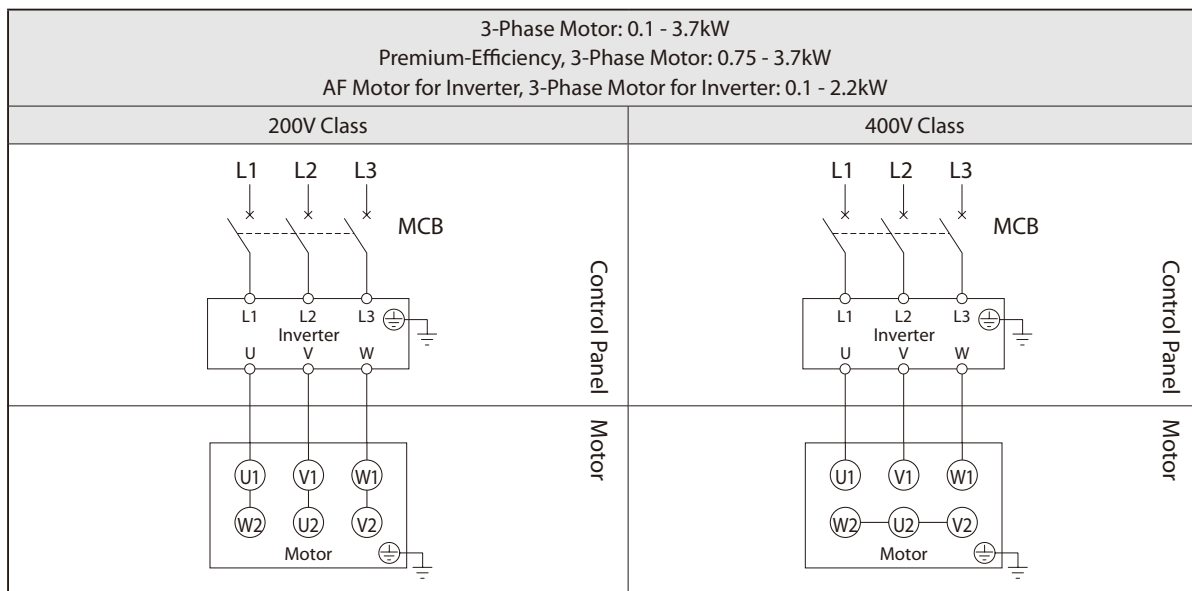
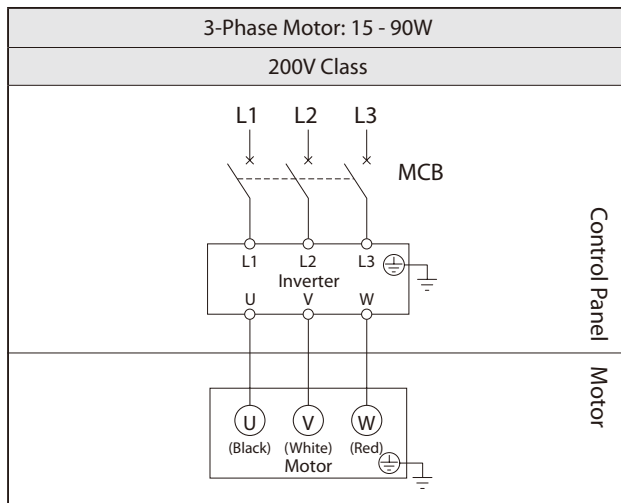
OLR: Overload protection device or electronic thermal relay

Customer to prepare.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

Without Brake, Inverter Drive



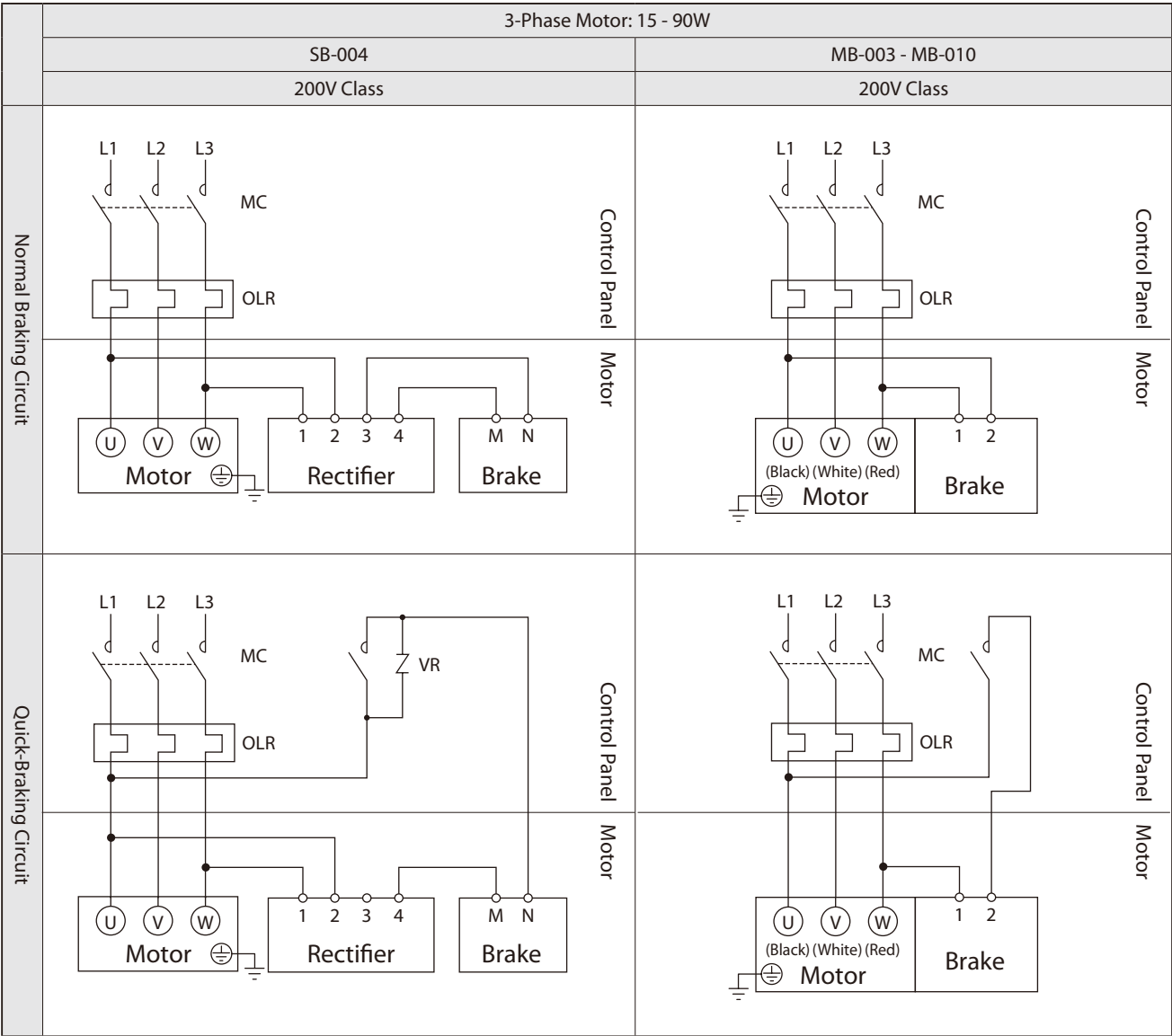
MCB: Breaker for wiring — Customer to prepare.

A motor rated at 40 to 90 W for China has black, white and red lead wires.  
- The motor must be insulated to inverter-drive a 400V class 3-phase motor.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



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

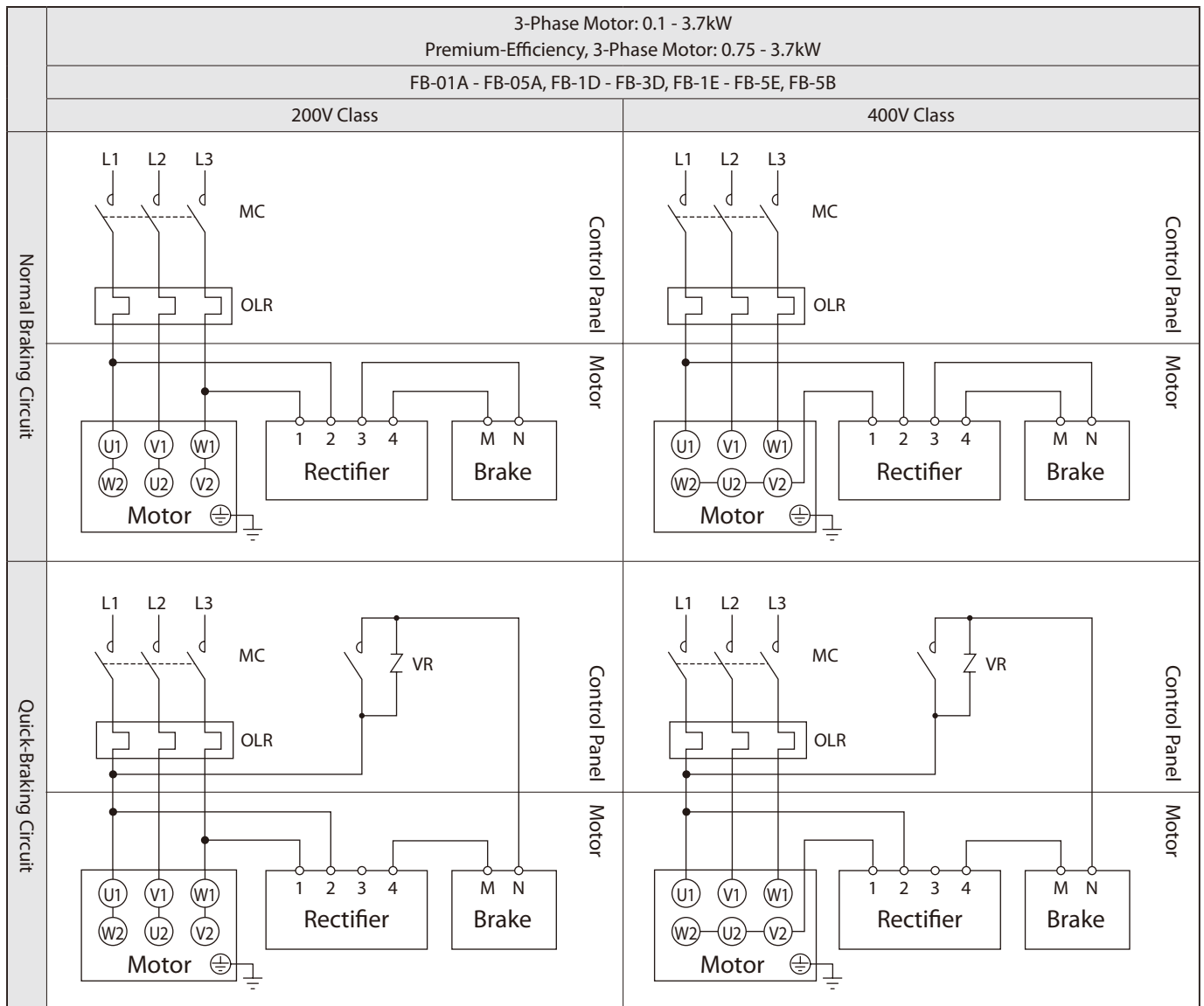
} Customer to prepare.

- For brake types, see Table 1-1 on P6 or Table 7-2 on P46.  
A motor rated at 40 to 90 W for China has black, white and red lead wires.  
- Brake action delay time is different between normal and quick-braking circuits.  
Table 7-2 on P46 shows action delay time. Choose the circuit that matches work requirements.  
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.  
- Use a quick braking circuit when a phase-advancing capacitor is mounted.  
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.  
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.  
- A rectifier for MB-003 to MB-010 is built-in the brake unit.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

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

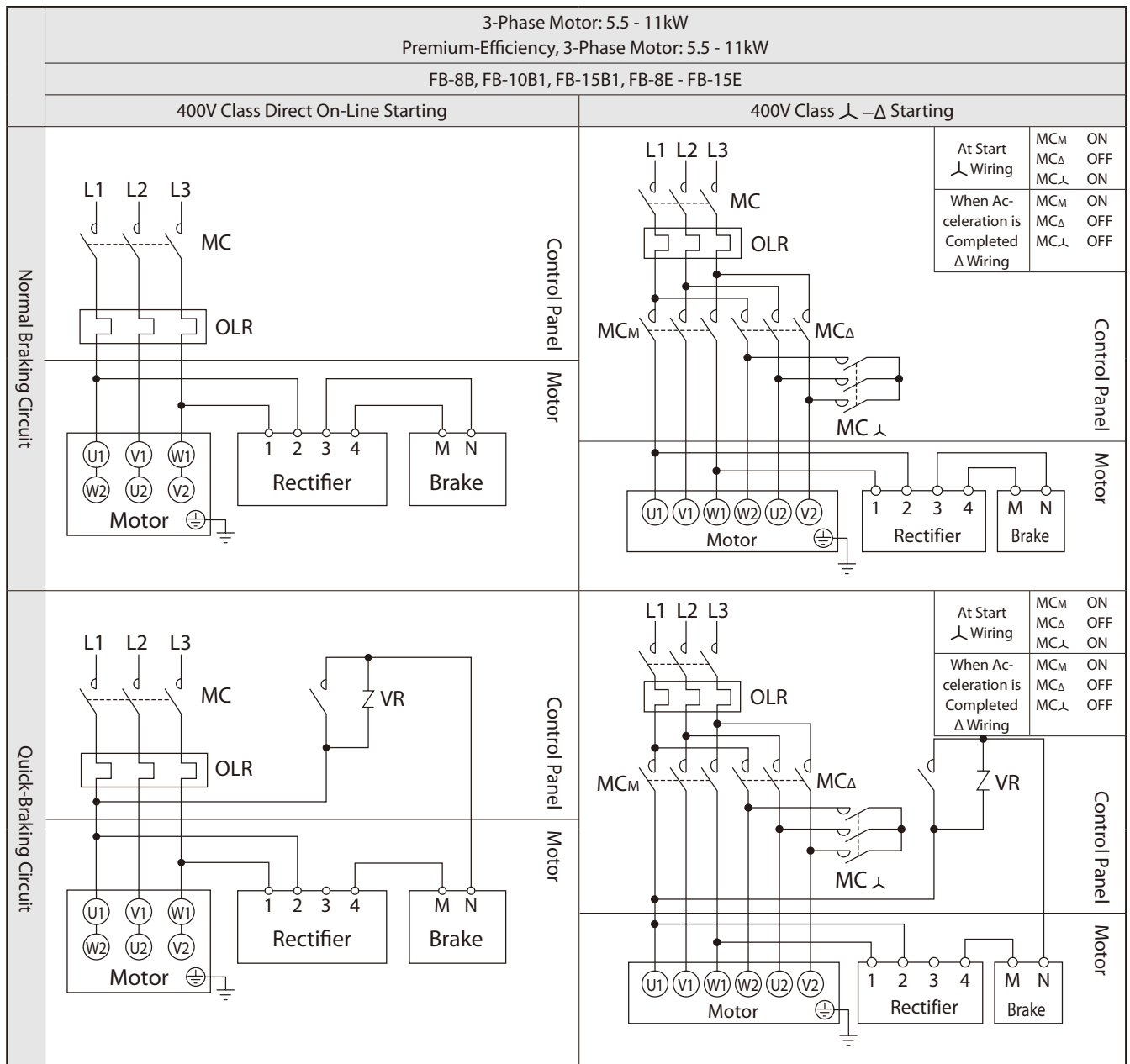
Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

## 6. Wiring

### ■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

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

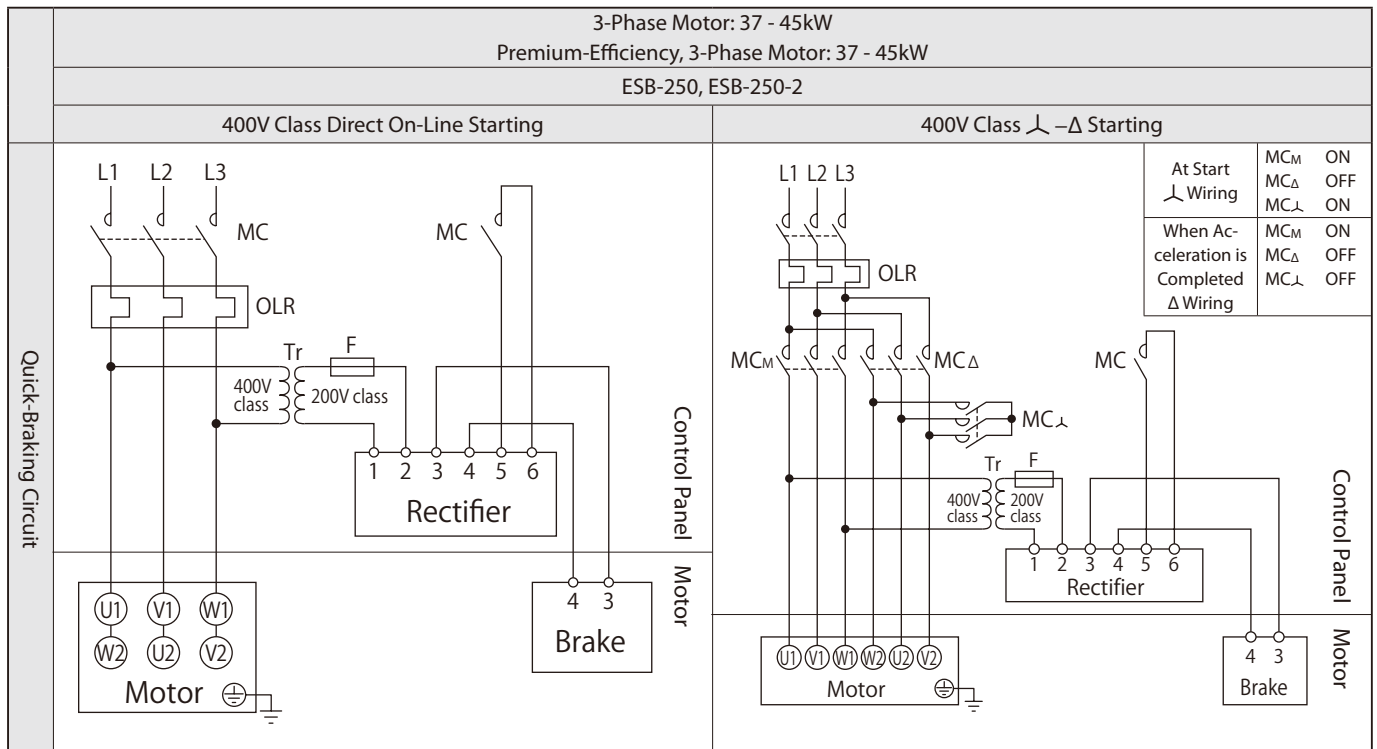
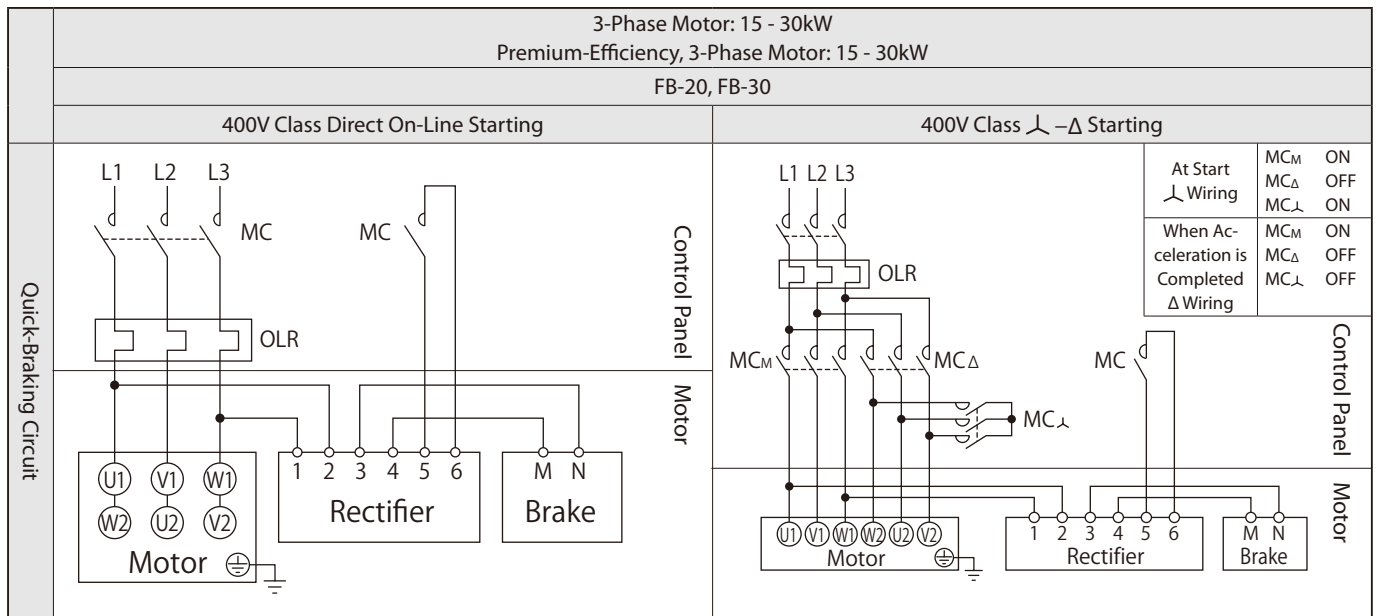
Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits. Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

# 6. Wiring

## ■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



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.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.

- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-4 on P44.

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

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

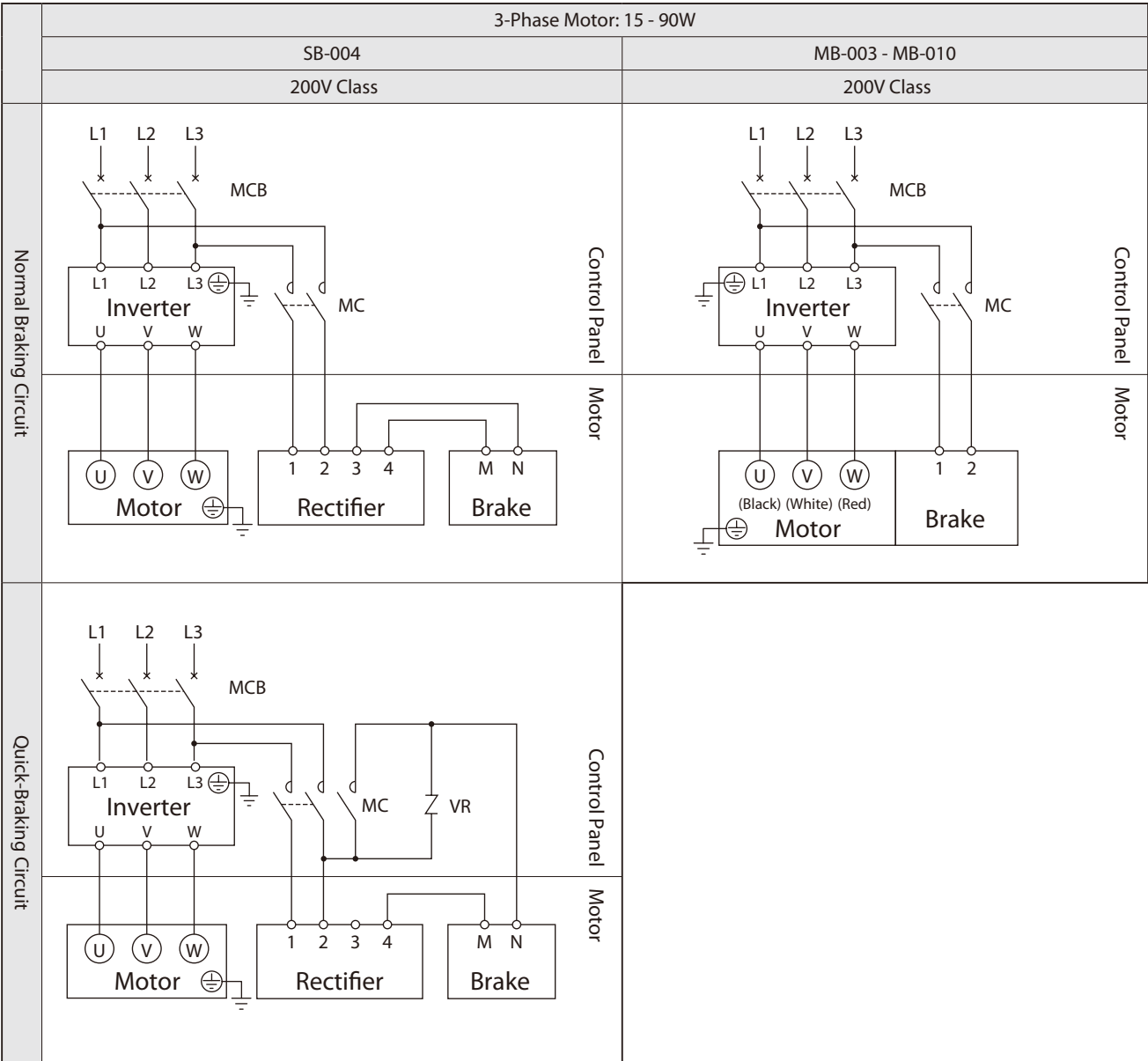
Rectifiers for ESB-250 and ESB-250-2 are external to the main unit. Rectifiers are made for indoor use. Install in an area where they will not come into contact with water, etc.

- ESB-250 and ESB-250-2 are for 200V class. For 400V class power sources, prepare a 400V/200V transformer.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

Customer to prepare.

- For brake types, see Table 1-1 on P6 or Table 7-2 on P46.
- A motor rated at 40 to 90 W for China has black, white and red lead wires.
- Brake action delay time is different between normal and quick-braking circuits.
- Table 7-2 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- A rectifier for MB-003 to MB-010 is built-in the brake unit.

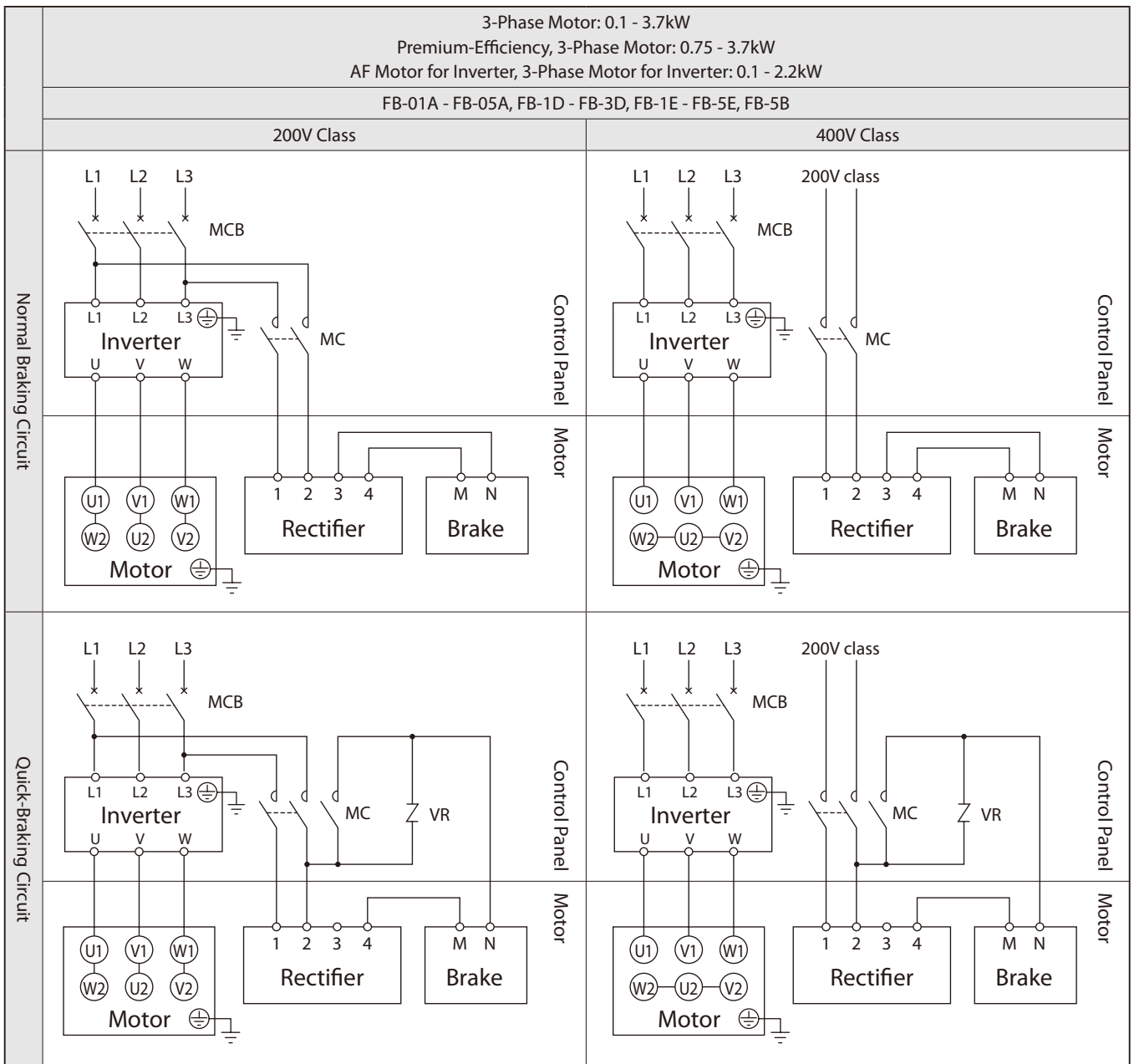
- Always use the inverter's power source side for the brake power source.
- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.



# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

Customer to prepare.

In the case of a motor voltage of 400V class, the brake is 200V class, so when using inverter drive, connect the brake to a 200V class power supply by using a separate turnoff circuit.

Be careful not to connect the brake to a 400V class power supply, because this will result in the brake burning out.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.

- The motor must be insulated to inverter-drive a 400V class 3-phase motor.

- Brake action delay time is different between normal and quick-braking circuits.

Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.

- Use a quick-braking circuit to improve hoisting equipment and stopping precision.

- Use a quick braking circuit when a phase-advancing capacitor is mounted.

- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.

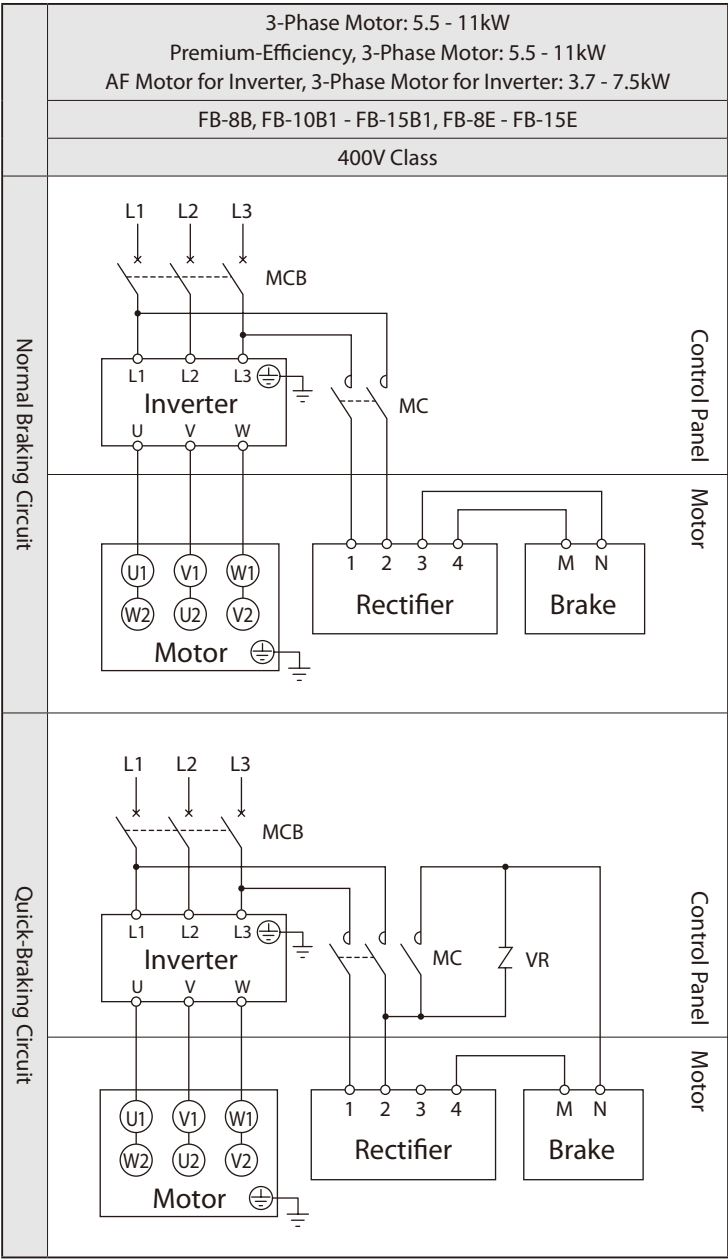
- Always use the inverter's power source side for the brake power source.

- Match the opening and closing of the brake circuit's electromagnetic contactor to the timing of the inverter control.

# 6. Wiring

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, Inverter Drive



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

Customer to prepare.

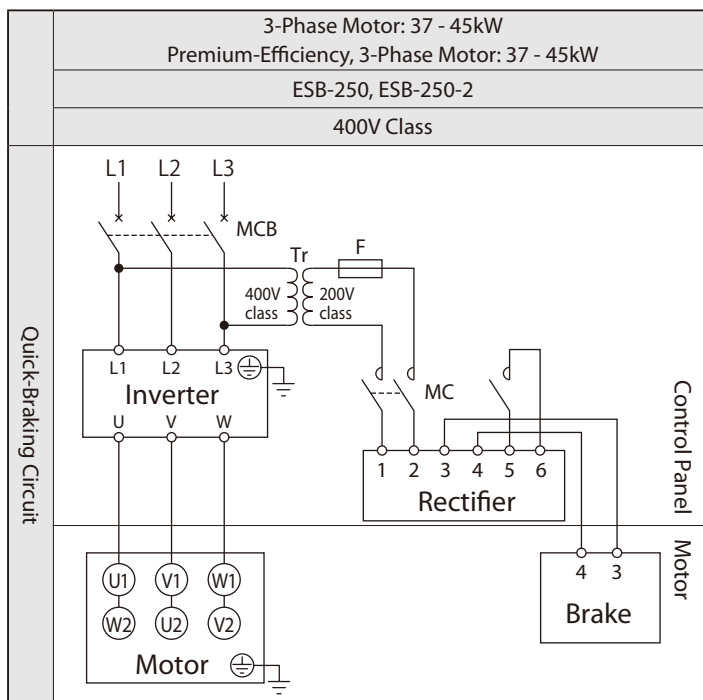
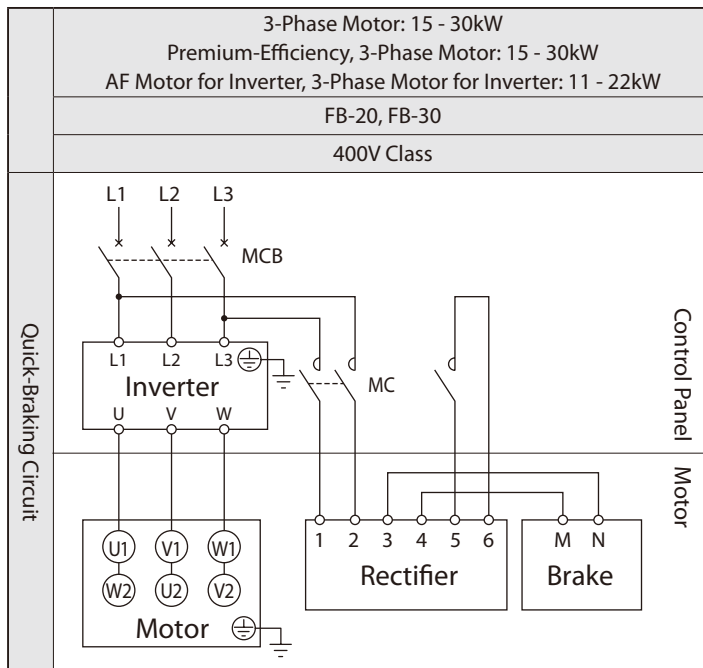
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
  - The motor must be insulated to inverter-drive a 400V class 3-phase motor.
  - brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
  - Use a quick-braking circuit to improve hoisting equipment and stopping precision.
  - Use a quick braking circuit when a phase-advancing capacitor is mounted.
  - For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.

- 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

■ For Europe, Singapore, Southeast Asia/CE Marking; China/CCC, CE Marking; Russia/EAC

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

F: Fuse 3 – 5A

Customer to prepare.

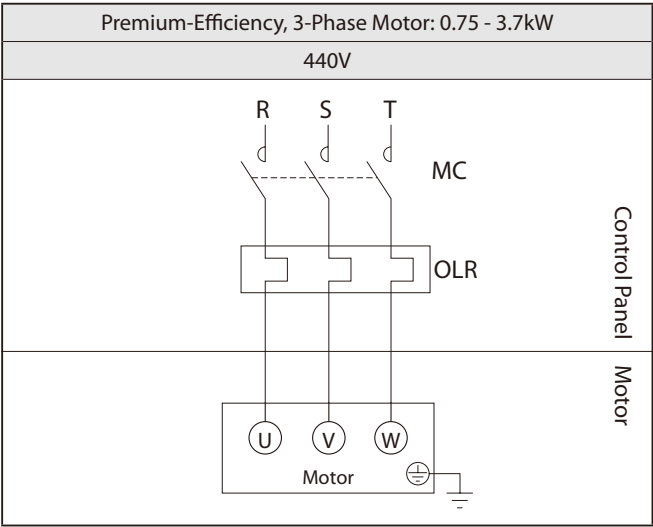
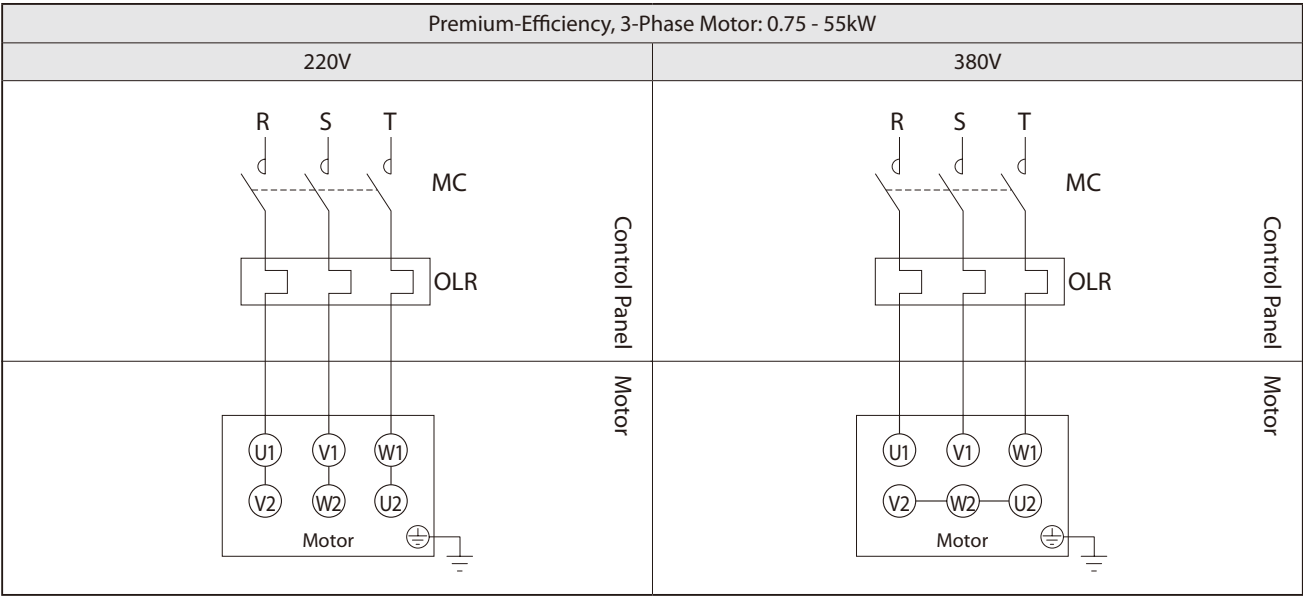
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- The motor must be insulated to inverter-drive a 400V class 3-phase motor.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-4 on P44.
- FB-20, and FB-30 are shipped with a short circuit plate connecting terminals 5 and 6. Remove the short circuit plate when wiring.
- Rectifiers for ESB-250 and ESB-250-2 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.
- ESB-250 and ESB-250-2 are 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.

# 6. Wiring

■ For South Korea/KS

Without Brake, 3-Phase Power Source

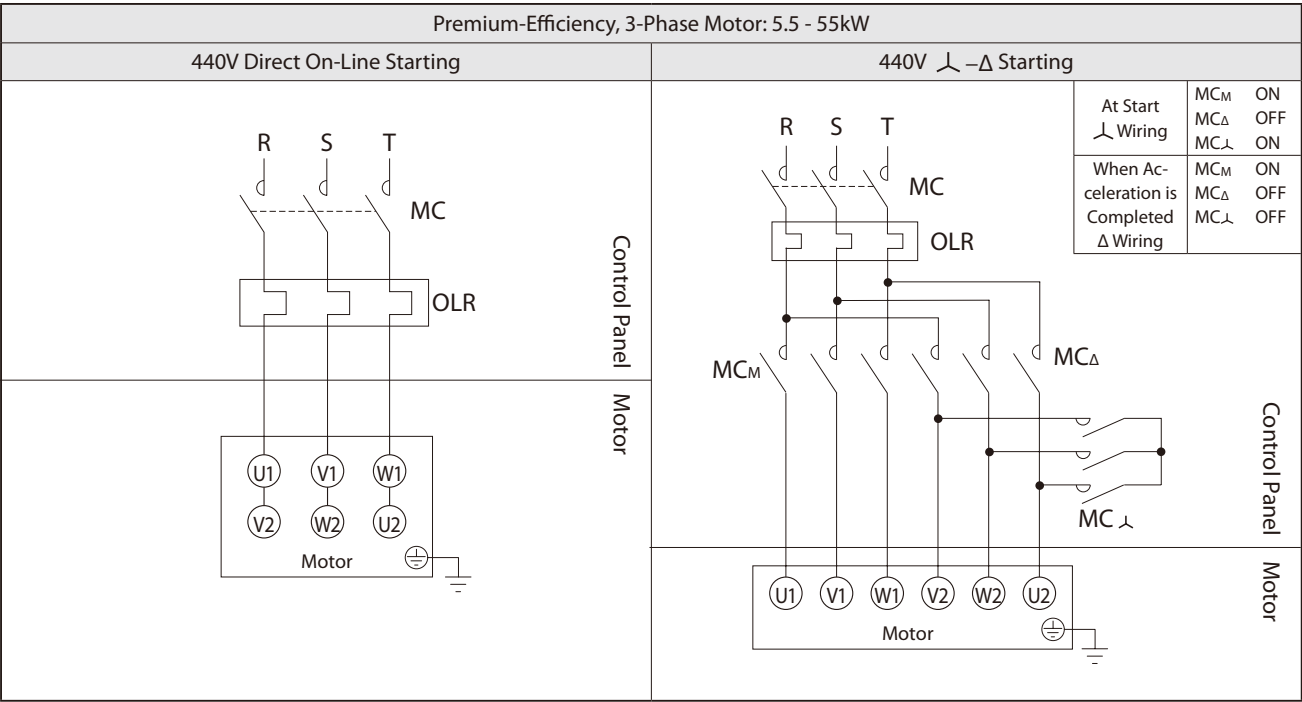


MC: Electromagnetic contactor  
OLR: Overload protection device or electronic thermal relay

Customer to prepare.

■ For South Korea/KS

Without Brake, 3-Phase Power Source



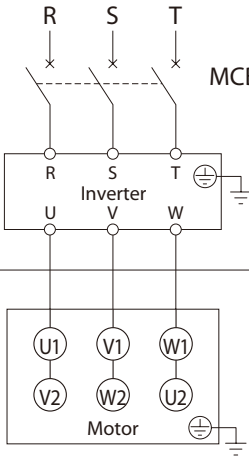
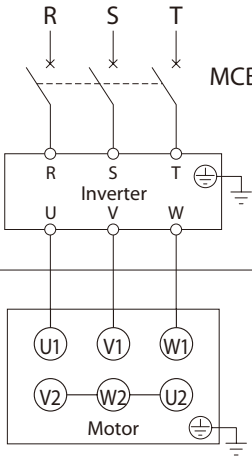
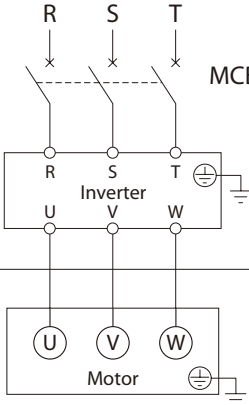
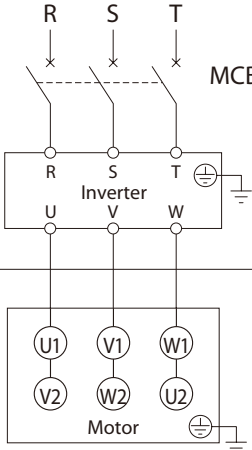
MC: Electromagnetic contactor  
OLR: Overload protection device or electronic thermal relay

} Customer to prepare.

# 6. Wiring

■ For South Korea/KS

Without Brake, Inverter Drive

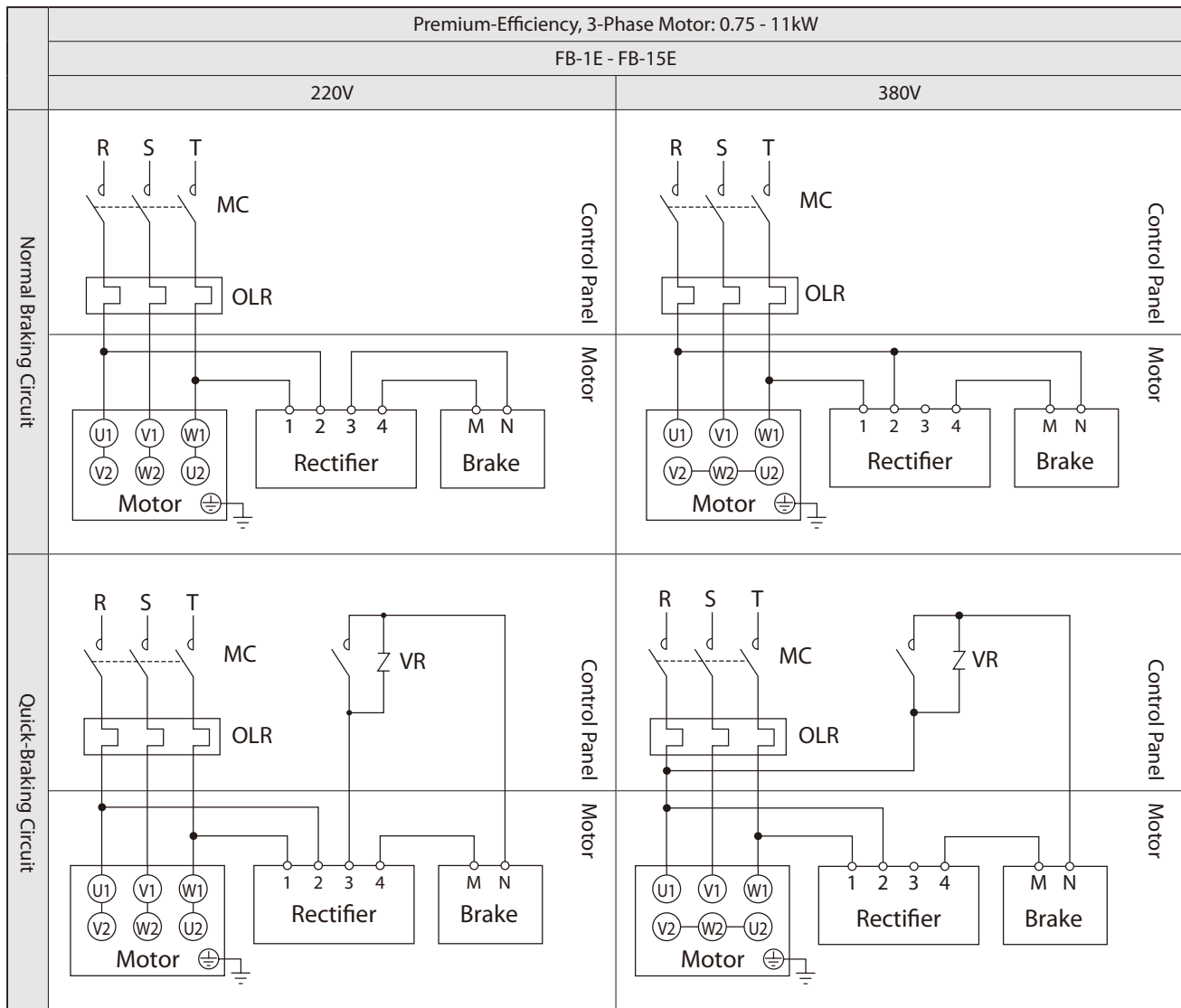
Premium-Efficiency, 3-Phase Motor: 0.75 - 55kW			
220V		380V	
	Control Panel	Motor	
Premium-Efficiency, 3-Phase Motor: 0.75 - 3.7kW		Premium-Efficiency, 3-Phase Motor: 5.5 - 55kW	
440V		440V	
	Control Panel	Motor	

MCB: Breaker for wiring — Customer to prepare.

# 6. Wiring

## ■ For South Korea/KS

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

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

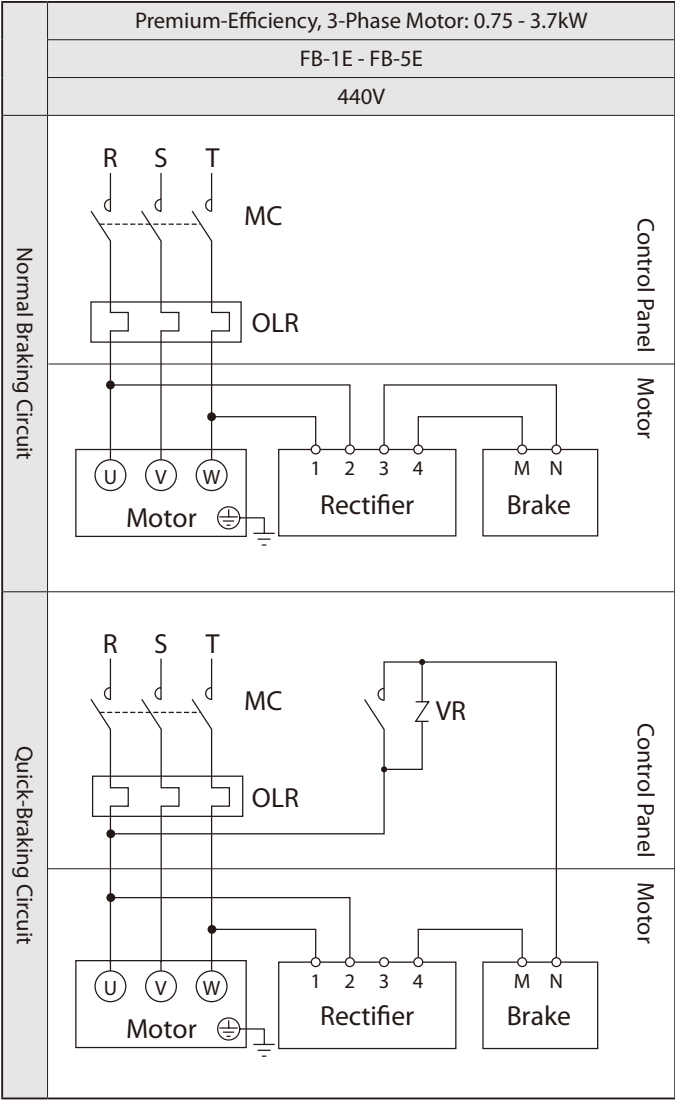
Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

# 6. Wiring

## ■ For South Korea/KS

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



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

Customer to prepare.

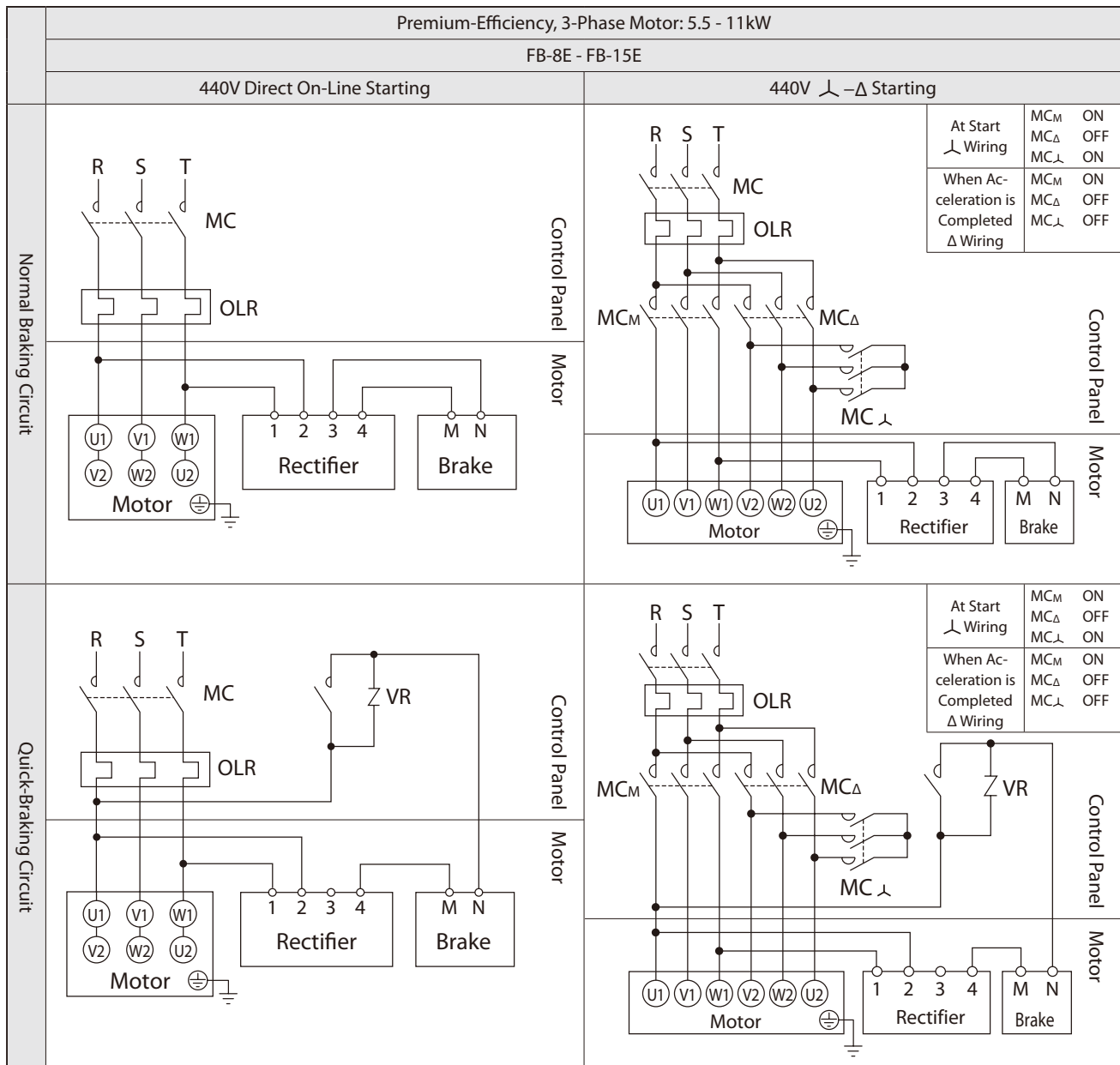
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
  - Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
  - Use a quick-braking circuit to improve hoisting equipment and stopping precision.
  - Use a quick braking circuit when a phase-advancing capacitor is mounted.
  - For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
  - For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.



# 6. Wiring

## ■ For South Korea/KS

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

OLR: Overload protection device or electronic thermal relay

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

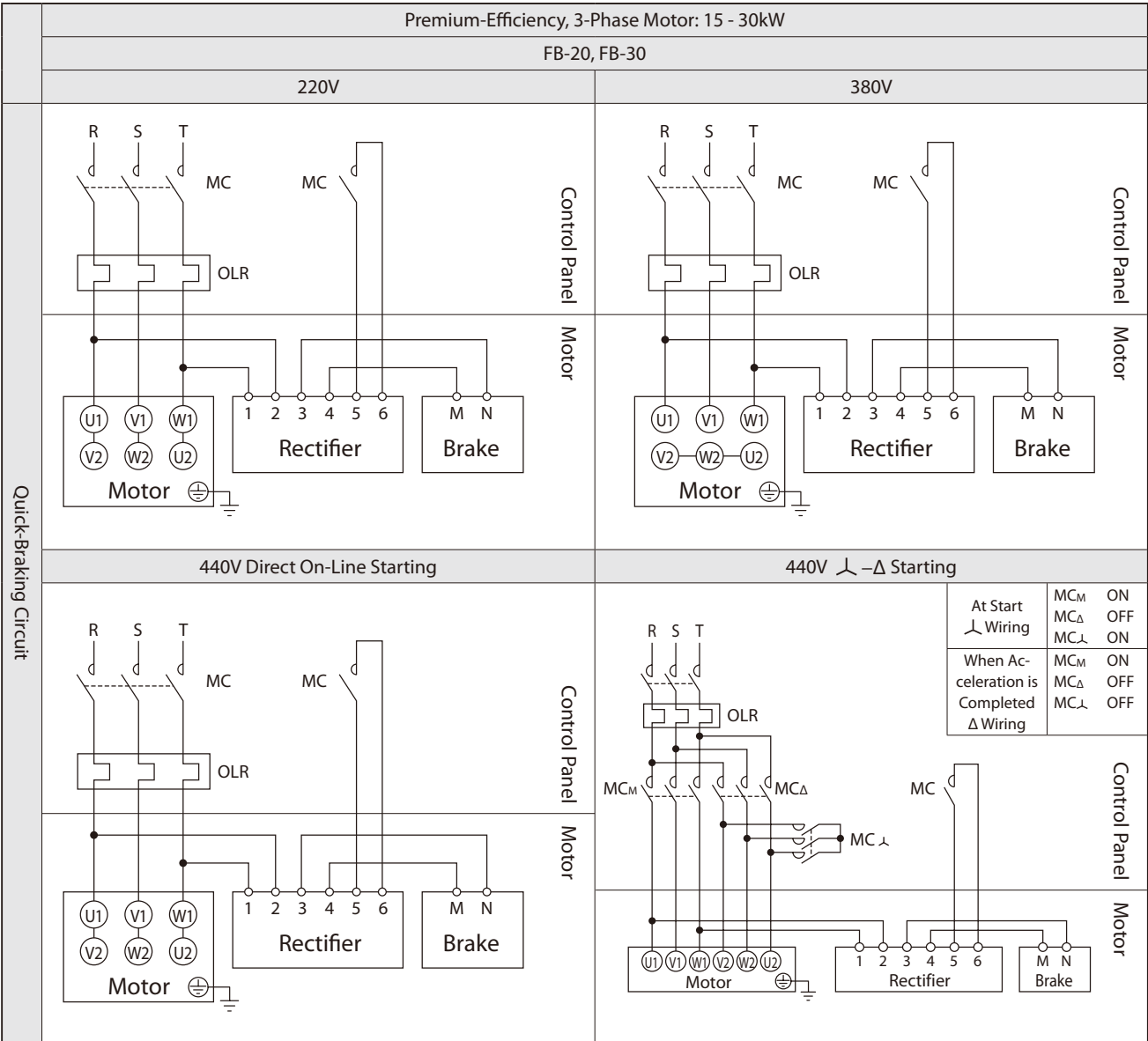
Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- For quick braking-circuits, gang the brake circuit's electromagnetic contactor to the motor's electromagnetic contactor.

# 6. Wiring

## ■ For South Korea/KS

With Brake, 3-Phase Power Source, Operates Rotating in One Direction



MC: Electromagnetic contactor

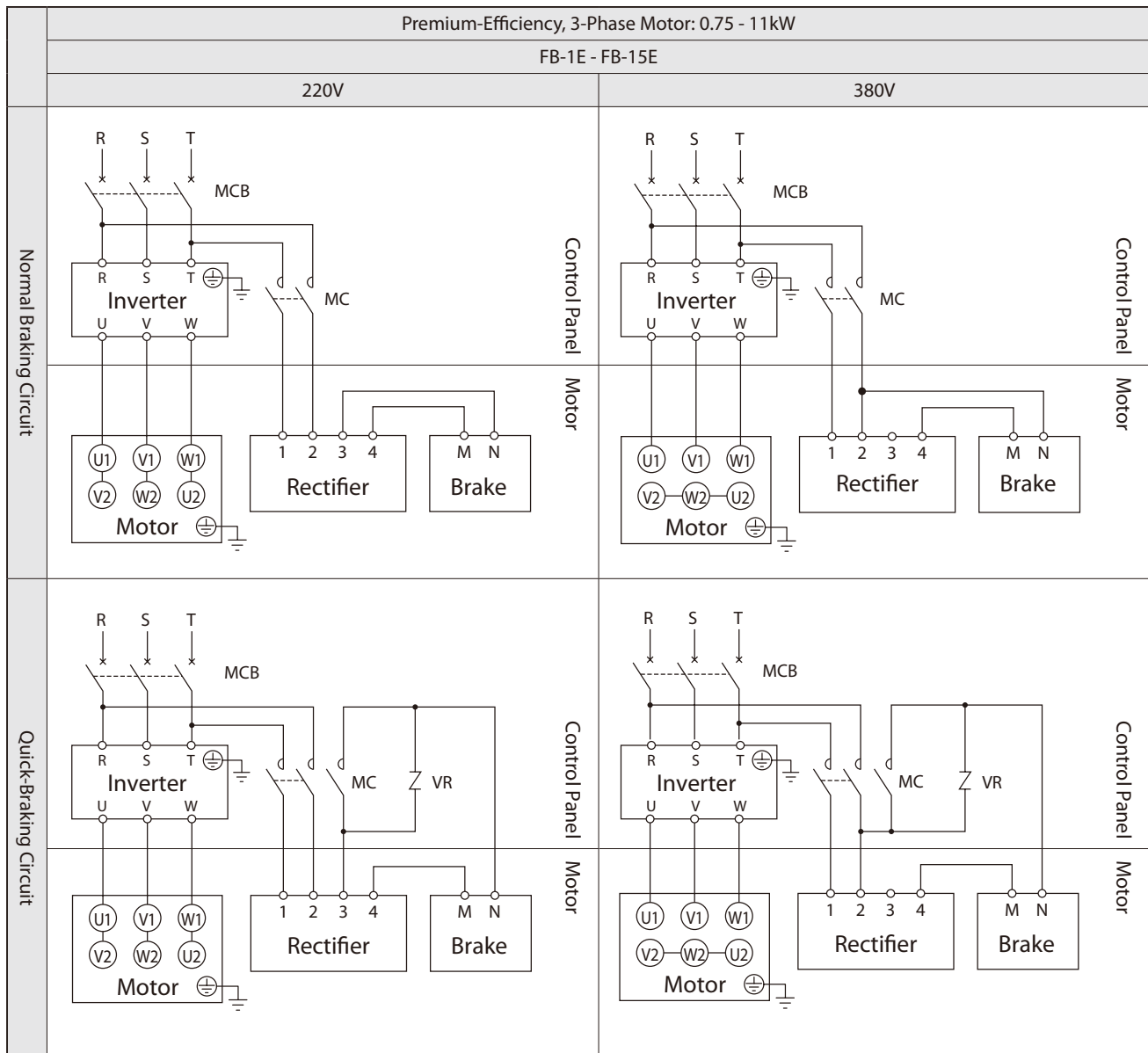
OLR: Overload protection device or electronic thermal relay

Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-4 on P44.
- 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.

## ■ For South Korea/KS

With Brake, Inverter Drive



MC: Electromagnetic contactor

MCB: Breaker for wiring

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

Customer to prepare.

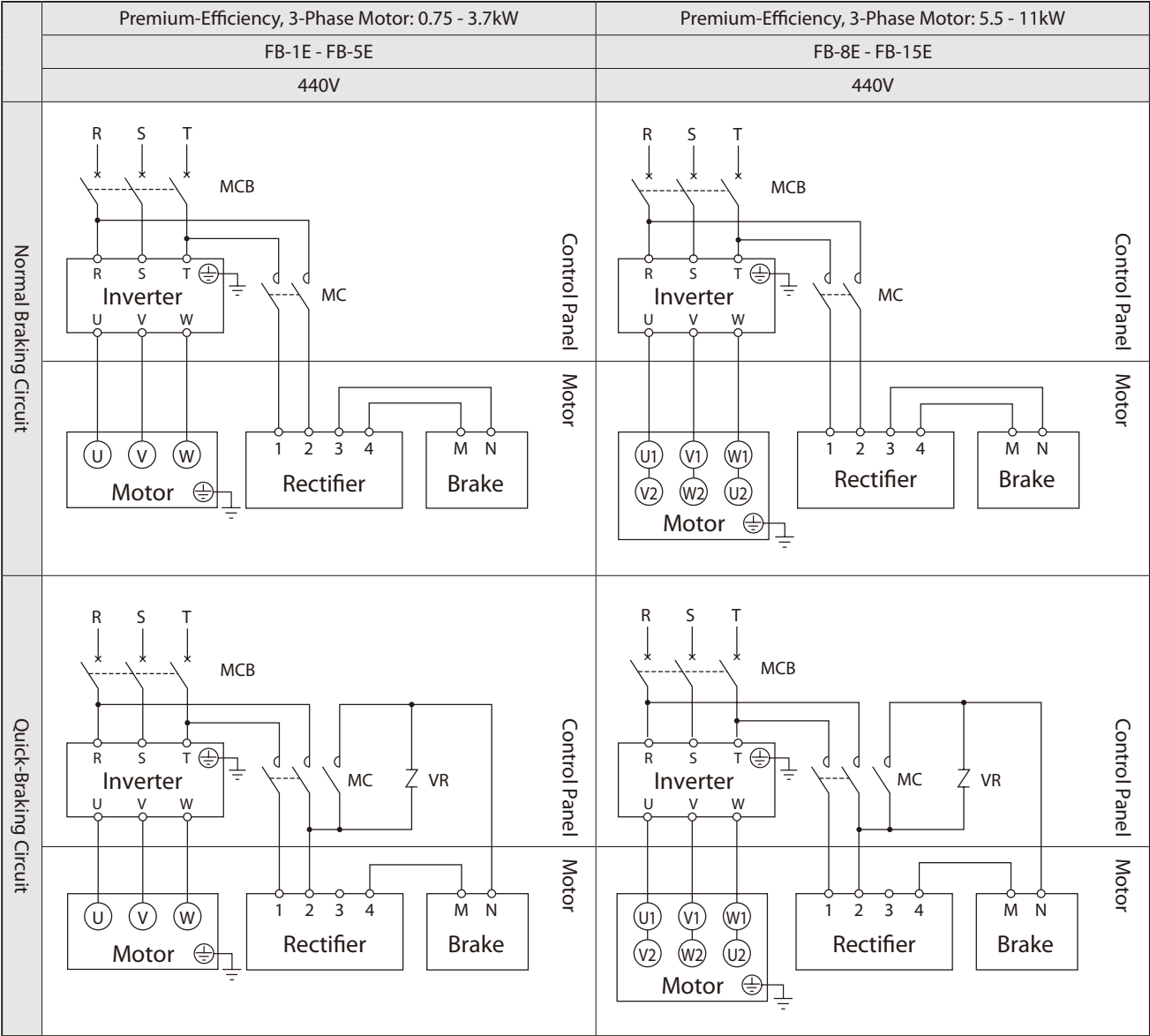
- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
- Brake action delay time is different between normal and quick-braking circuits. Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
- Use a quick-braking circuit to improve hoisting equipment and stopping precision.
- Use a quick braking circuit when a phase-advancing capacitor is mounted.
- For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.

- 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

## ■ For South Korea/KS

With Brake, Inverter Drive



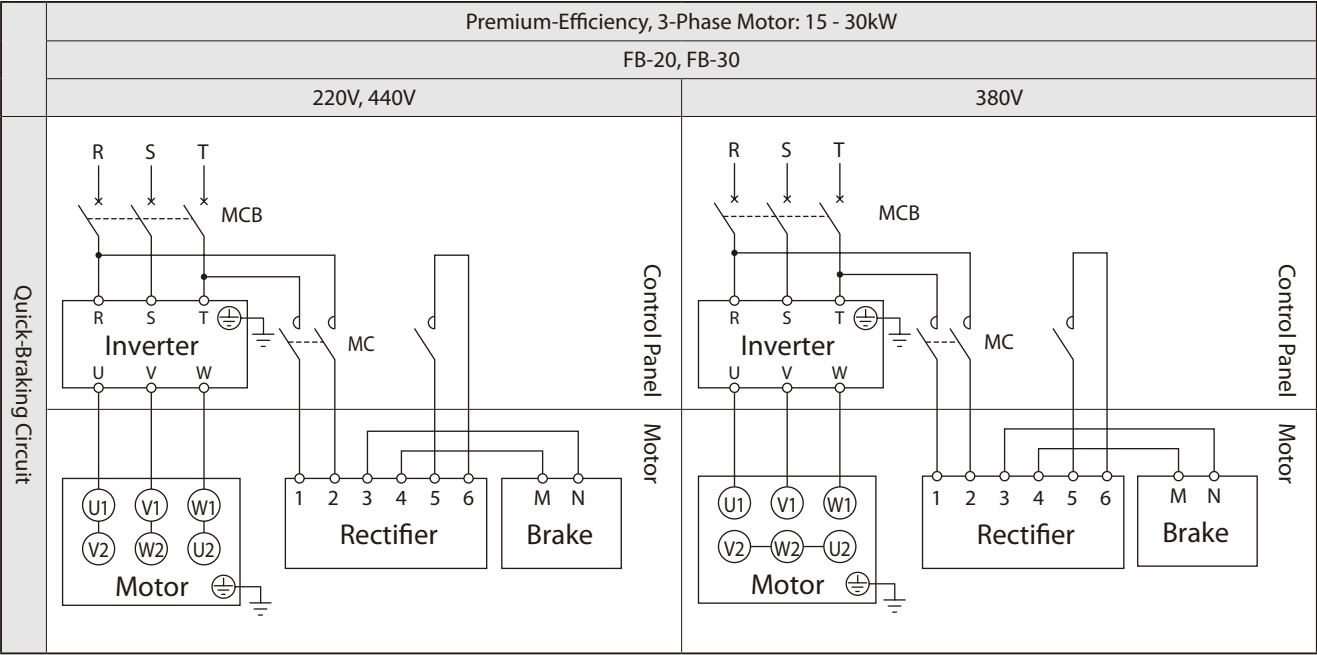
MC: Electromagnetic contactor  
MCB: Breaker for wiring  
VR: Varistor (for protecting contact points, rectifier, etc.)

Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
  - Brake action delay time is different between normal and quick-braking circuits.  
Table 7-3 on P46 shows action delay time. Choose the circuit that matches work requirements.
  - Use a quick-braking circuit to improve hoisting equipment and stopping precision.
  - Use a quick braking circuit when a phase-advancing capacitor is mounted.
  - For information on electromagnetic contactors and varistors for quick-braking circuits, see Table 6-4 on P44.
- 
- 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.

■ For South Korea/KS

With Brake, Inverter Drive



MC: Electromagnetic contactor  
MCB: Breaker for wiring

Customer to prepare.

- For brake types, see Table 1-2 on P6 or Table 7-3 on P46.
  - Use with a quick braking circuit. For information on electromagnetic contactors for quick-braking circuits, see Table 6-3 on P44.
  - Shipped with a short circuit plate connecting rectifier 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

### 6-7 Points to Note when Using a Quick Braking Circuit

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

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

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

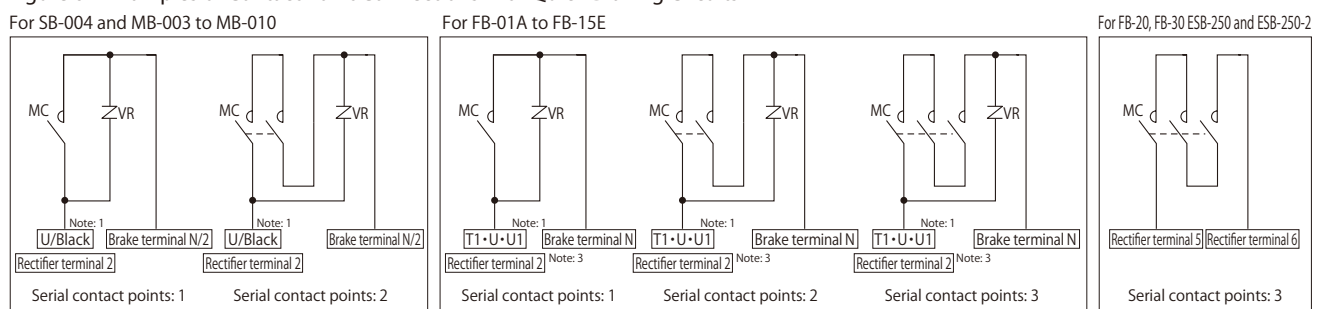
- Connect electromagnetic contactor contact points in serial. (See Figure 6-2)
- Connect the varistor (VR) as close to the unit as possible. (See Figure 6-2)

Table 6-4 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)										
USA Canada	Europe Singapore Southeast Asia China Russia	South Korea		Made by Fuji Electric FA Components & Systems Co., Ltd.		Made by Mitsubishi Electric Corporation		Contact Point Capacity (DC-13 class)		Varistor Nomenclature		Maximum Allowable Circuit Voltage	Varistor Voltage	Power Rating						
-	Maximum 3.7kW 200 - 240V 380 - 415V	-	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-01A																	
			FB-02A																	
			FB-05A																	
			FB-1D, FB-1E																	
			FB-1HE																	
			FB-2D, FB-2E																	
FB-3D, FB-3E																				
FB-4E																				
FB-5B, FB-5E																				
20 - 30HP 230V	-	15 - 22kW 220V	FB-20	SC-S-1	Serial contact points: 3 (10A)	S-N20 or S-N21	Serial contact points: 3 (10.0A)		Minimum 4.5A	-	-	-								
			FB-30																	
-	37 - 45kW 380 - 415V	-	ESB-250 ESB-250-2																	
1 - 15HP 230V 460V	Maximum 3.7kW Inverter drive  380 - 415V	0.75 - 11kW 220V 380V 440V	FB-01A	SC-05	Serial contact points: 1 (0.25A)	S-N11 or S-N12	Serial contact points: 2 (0.5A)	DC220V	Minimum 0.2A	TND10V-821KB00AAA0	ACS10V	820V (738 - 902V)	0.4W							
			FB-02A		Serial contact points: 2 (0.4A)				Minimum 0.3A											
			FB-05A						Minimum 0.5A											
			FB-1D, FB-1E						Minimum 1.0A											
			FB-1HE		Serial contact points: 3 (2.0A)		S-N18		TND14V-821KB00AAA0	TND20V-821KB00AAA0			1.0W							
			FB-2D, FB-2E																	
			FB-3D, FB-3E																	
			FB-4E																	
			FB-5B, FB-5E		S-N20 or S-N21		Serial contact points: 3 (4.0A)		Minimum 1.5A	-			-	-						
			FB-8B, FB-8E						Minimum 3.0A											
			FB-10B1, FB-10E						Minimum 2.5A											
			FB-15B1, FB-15E																	
			20 - 30HP 460V		Minimum 5.5kW 380 - 415V		15 - 22kW 380V 440V		FB-20	-			-	S-N20 or S-N21	Serial contact points: 3 (4.0A)		Minimum 2.5A	-	-	-
									FB-30											

- 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 6-4 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.
- In the FB-20, 30, ESB250 and 250-2, a varistor for protecting the connector contact points is built in to the rectifier.

### Figure 6-2 Examples of Contact Point Connections with Quick-Braking Circuits



Note: 1. For inverter drives, connect to the L1 phase or R phase (power source side).  
2. A motor with the MB brake does not have a rectifier's terminal 2 and a varistor (VR).  
3. The rectifier terminal for a 200V class power supply for a motor for America, Canada or South Korea is terminal 3.

## DANGER

- Do not approach or touch rotating parts (output shaft, etc.) during operation; otherwise loose clothing may be 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 motor 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 motor 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 products 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 products excess of rated load; 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?

Upon completing the above checks, run in the motor under no load, and gradually apply a load to it. At this time, check the items in Table 7-1.

### 7-2 Items to Check During Operation

Table 7-1 Items to Check During Operation

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

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 following tables show 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 (s)		
		3-Phase Motor		Normal Braking Circuit (Simultaneous Turn-Off Circuit)	Normal Braking Circuit for Inverter Circuit (Separate Turnoff Circuit)	Quick-Braking Circuit
		4P				
SB-004	HYPONIC/01 03 05 07	15 25 40 60	0.4	0.1 - 0.2	0.08 - 0.12	0.005 - 0.015
MB-003	HYPONIC/17 1240	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	0.5	0.1 - 0.15	0.05 - 0.08	0.05 - 0.08
	PREST NEO					
	ALTAX NEO					
MB-010	ALTAX NEO	90	1.0			

Table 7-3 FB Brakes and ESB Brakes

Brake Type	Motor Capacity (HP)			Brake Torque (Dynamic Friction Torque) (N·m)	Brake Activation Delay Time (s)		
	3-Phase Motor	Premium Efficiency, 3-Phase Motor	AF Motor for Inverter 3-Phase Motor for Inverter		Normal Braking Circuit (Simultaneous Turn-Off Circuit)	Normal Braking Circuit for Inverter Circuit (Separate Turnoff Circuit)	Quick-Braking Circuit
	4P	4P	4P				
FB-01A	0.1 (1/8)	-	-	1.0	0.15 - 0.2	0.08 - 0.12	0.015 - 0.02
FB-02A	0.2 (1/4) 0.25 (1/3) <sup>1)</sup>	-	0.1 (1/8)	2.0			
FB-05A	0.4 (1/2)	-	0.2 (1/4)	4.0	0.1 - 0.15	0.03 - 0.07	0.01 - 0.015
FB-1D	0.55 (3/4) 0.75	-	0.4 (1/2)	7.5	0.2 - 0.3	0.1 - 0.15	0.01 - 0.02
FB-1E	-	0.75 (1)	-		0.25 - 0.45	0.15 - 0.25	0.01 - 0.03
FB-1HE	-	1.1 (1.5)	-	11	0.45 - 0.65	0.25 - 0.35	
FB-2D	1.1 1.5	-	0.75	15	0.2 - 0.3	0.1 - 0.15	0.01 - 0.02
FB-2E	-	1.5 (2)	-		0.35 - 0.55	0.15 - 0.25	0.01 - 0.03
FB-3D	2.2	-	1.5	22	0.3 - 0.4	0.15 - 0.2	0.01 - 0.02
FB-3E	-	2.2 (3)	-		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-5B	3.0 3.7	-	2.2	37	0.4 - 0.5	0.2 - 0.25	0.01 - 0.02
FB-5E	-	3.7 (5)	-	40	1.1 - 1.3	0.4 - 0.5	0.02 - 0.04
FB-8B	5.5	-	3.7	55	0.3 - 0.4	0.1 - 0.15	0.01 - 0.02
FB-8E	-	5.5 (7.5)	-		1.0 - 1.2	0.3 - 0.4	0.02 - 0.04
FB-10B1	7.5	-	5.5	75	1.0 - 1.1	0.4 - 0.5	0.025 - 0.04
FB-10E	-	7.5 (10)	-	80	1.8 - 2.0	0.6 - 0.7	0.02 - 0.04
FB-15B1	11	-	7.5	110	0.7 - 0.8	0.2 - 0.3	0.025 - 0.04
FB-15E	-	11 (15)	-		1.6 - 1.8	0.5 - 0.6	0.02 - 0.04
FB-20	15	15 (20)	11	150	-	-	0.06 - 0.14
FB-30	18.5	18.5 (25)	-	190	-	-	0.03 - 0.11
	22	22 (30)	15	220			
	30	30 (40)	18.5 22	200			
ESB-250 (Horizontal Type) ESB-250-2 (Vertical Type)	37	37	-	Horizontal	266	-	0.065
				Vertical	244		
	45	45	-	Horizontal	320		
				Vertical	292		

Note: 1. HYPONIC Gearmotor, 3-phase motor 4P 0.25kW is FB-05A.

- Brake type may differ depending on specification. Check the nameplate.
- 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.
- 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 power is turned on. Be sure to turn off the power when operating the motor; 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.
- 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 products; otherwise, electric shock, injury, fire, or damage to the equipment may result.
  - The products 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 products without a safety cover (removed during inspection) in place to shield rotating parts; otherwise loose clothing may be caught in these rotating parts and cause serious injury or death may result.
  - 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 products; 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.
  - 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 and Maintenance

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? Is it extremely rising?
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 for 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 P86 and 87) 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

- With the exception of a motor for a CYCLO Drive and some models of stand-alone motor products, a sealed type bearing (not constructed for filling or draining grease) is used.
- In the case of motor for CYCLO Drive, bearing type and maintenance technique will vary according to motor frame size. When maintaining, confirm the bearing type by referring to the nameplate or Table 8-2.
- In the case of stand-alone motor products, bearing type and maintenance technique vary according to motor frame size. When maintaining, confirm the bearing type by referring to the nameplate.

Table 8-2 Bearing Types (CYCLO Drive)

Bearing Type	Specified Motor (Frame Size)		Remarks
	Load Side	Anti-Load Side	
Sealed Bearing	Frame size 160 and lower	All types of motors	Not constructed for filling or draining grease
	Frame size 180 and higher, CYCLO frame size 6225 and lower		
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, maintenance with disassembly after approximately 20,000 hours or 3 to 5 years will further increase lifetime.

Contact the nearest authorized service station regarding maintenance with disassembly.

#### (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
6316	50	8000	6500	5500	4500	3000	2500
NU314	40	4000	3500	3000	2500	1500	1000
NU315	45	4000	3000	3000	2000	1500	1000
NU317	55	3500	3000	2500	2000	1500	1000
NU318	60	3500	2500	2500	2000	1000	1000

- Replenishment quantity is the quantity to refill at each interval.
- Even in the case of intermittent operation, replenish grease at least 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
-10~40	UNIREX N2	Stamina 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.

[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.

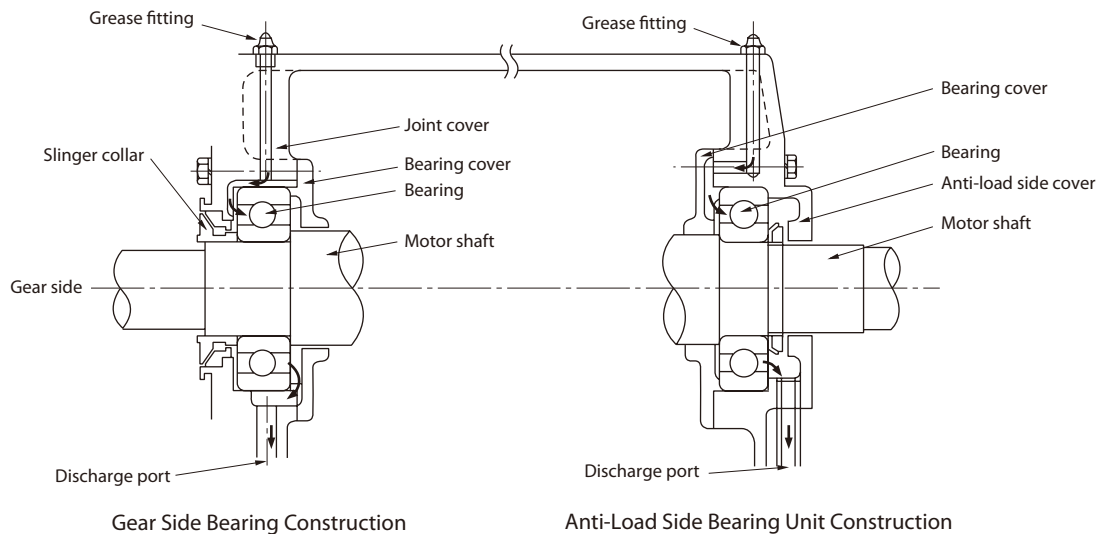



Figure 8-1 Open Bearing Unit Construction

## 8-3 Oil Seal Maintenance


- An oil seal has a finite life. If it is used for a long period, the performance of the seal will be degraded due to natural deterioration or wear. The life of a seal differs greatly according to the conditions under which it is used and also the surrounding environment. When the product is used under normal conditions (operation for 10 hours a day under a uniform load, at normal temperature), we recommend that you replace the seals every one to three years. If an oil seal or the sliding surface of the V-ring becomes worn or rusty, replace it. The sliding surface of an oil seal is made of carbon steel, so in order to prevent rust forming on it, if there are parts of the oil seal that are exposed to the outside, periodically take steps to prevent rusting by coating the oil seal with rust preventive oil.

# 8. Daily Inspection and Maintenance

## 8-4 Brake Maintenance and Inspection

 **DANGER**

- Do not handle the unit when power is turned on. 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 be 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 and ESB-250-2). 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 and ESB-250-2), wear and damage to mechanical parts may cause dropping or overdrive problems.

## 8-5 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 the gap is close to the limit on inspection, 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-01A1–05A, FB-1D–3D (for PREST NEO and ALTAX NEO only)

FB-1E–4E (for all types)

FB-5E (for ALTAX NEO only)

# 8. Daily Inspection and Maintenance

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

## ■ For USA

Brake Type	Specifi- cations	Page	Brake Release Device
FB-01A, FB-02A, FB-05A	Out- door type	P61	Not equipped
FB-1D		P77	One-touch release lever method
FB-1E		P78	
FB-1HE, FB-2E		P79	
FB-3E		P80	
FB-5E, FB-8E		P81	
FB-10E, FB-15E		P82	
FB-20		P72	Release bolt method
FB-30		P73	

## ■ For Canada

Brake Type	Specifi- cations	Page	Brake Release Device
FB-01A, FB-02A	Out- door type	P61	Not equipped
FB-05A		P76	One-touch release lever method
FB-1D		P77	
FB-1E		P78	
FB-1HE, FB-2E		P79	
FB-3E		P80	
FB-5E, FB-8E		P81	
FB-10E, FB-15E		P82	
FB-20		P72	Release bolt method
FB-30		P73	

## ■ For Europe

Brake Type	Specifi- cations	Page	Brake Release Device
SB-004	Indoor type	P52	Not equipped
MB-003, MB-005, MB-010		P53	
FB-01A, FB-02A, FB-05A	Out- door type	P61	
FB-1D		P62	
FB-1E		P63	
FB-1HE, FB-2E		P64	
FB-2D		P65	
FB-3D		P66	
FB-3E, FB-4E		P67	
FB-5B, FB-8B		P68	
FB-5E, FB-8E		P69	
FB-10B1, FB-15B1		P70	
FB-10E, FB-15E		P71	
FB-20		P72	
FB-30		P73	
ESB-250, ESB-250-2		P74, P75	

## ■ For Singapore, Southeast Asia

Brake Type	Specifi- cations	Page	Brake Release Device
SB-004	Indoor type	P52	Not equipped
MB-003, MB-005, MB-010		P53	
FB-01A, FB-02A, FB-05A	Out- door type	P61	
FB-1D		P62	Release bolt method
FB-1E		P63	
FB-1HE, FB-2E		P64	
FB-2D		P65	
FB-3D		P66	
FB-3E, FB-4E		P67	
FB-5B, FB-8B		P68	
FB-5E, FB-8E		P69	
FB-10B1, FB-15B1		P70	
FB-10E, FB-15E		P71	
FB-20		P72	
FB-30		P73	
ESB-250, ESB-250-2		P74, P75	Not equipped

## ■ For China

Brake Type	Specifi- cations	Page	Brake Release Device
FB-01A, FB-02A, FB-05A	Out- door type	P61	Not equipped
FB-1D		P62	Release bolt method
FB-1E		P63	
FB-1HE, FB-2E		P64	
FB-3E, FB-4E		P67	
FB-5E, FB-8E		P69	
FB-10E, FB-15E		P71	
FB-20		P72	
FB-30		P73	

## ■ For Russia

Brake Type	Specifi- cations	Page	Brake Release Device
FB-01A, FB-02A, FB-05A	Out- door type	P61	Not equipped
FB-1D		P62	Release bolt method
FB-1E		P63	
FB-1HE, FB-2E		P64	
FB-3E, FB-4E		P67	
FB-5E, FB-8E		P69	
FB-10E, FB-15E		P71	
FB-20		P72	
FB-30		P73	
ESB-250, ESB-250-2		P74, P75	Not equipped

## ■ For South Korea

Brake Type	Specifi- cations	Page		Brake Release Device
		Indoor Type	Outdoor Type	
FB-1E	Indoor type	P54	P63	Release bolt method
FB-1HE, FB-2E		P55	P64	
FB-3E, FB-4E		P56	P67	
FB-5E, FB-8E	Out- door type	P57	P69	
FB-10E, FB-15E		P58	P71	
FB-20		P59	P72	
FB-30		P60	P73	

- Note: 1. In the case where an option is used, the details will differ from those set out in Table 8-5. Check the manufacturing specifications.  
 2. For Europe specifications, see the construction diagrams of release bolt method.  
 3. An ESB brake does not have a release device. However, you can perform a manual release operation by pushing the bolt into the manual release hole.

# 8. Daily Inspection and Maintenance

## ■ SB-004 (Indoor Type)

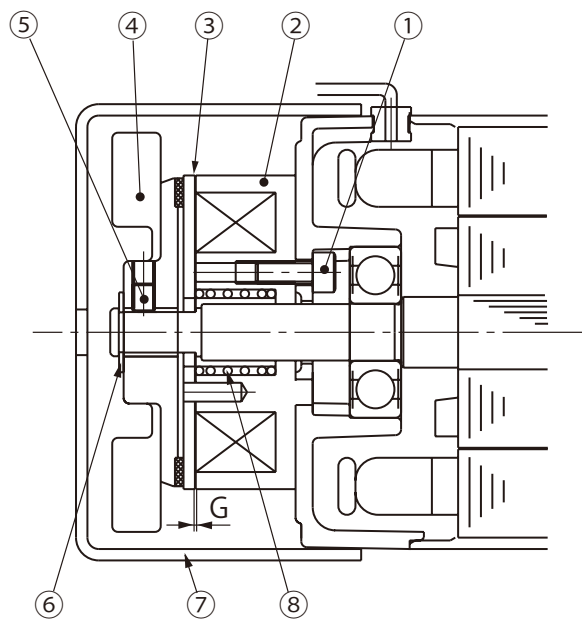


Figure 8-2

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.

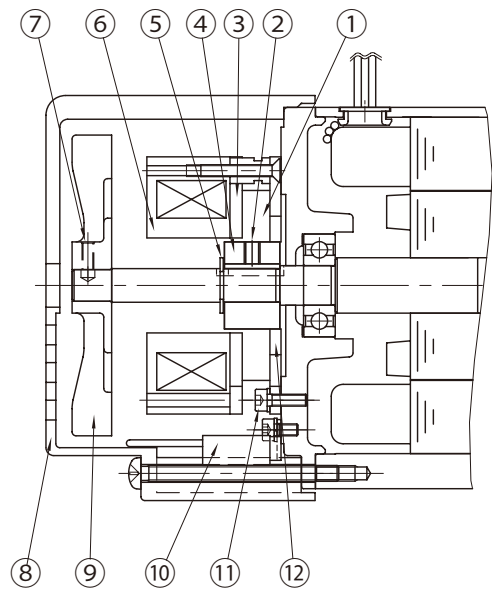
Gap Value G (mm)	
Required Value (Original Value)	Limit Value
0.15 - 0.25	0.4

### - 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, MB-005, MB-010 (Indoor Type)



Code	Part Name
1	Brake lining
2	Boss set screw
3	Armature plate
4	Boss
5	Shaft-retaining E-ring
6	Stationary core
7	Fan set screw
8	Cover
9	Fan (mounted for single phase 60 and 90W only)
10	Rectifier
11	Brake mounting bolt
12	Fixed plate

Figure 8-3

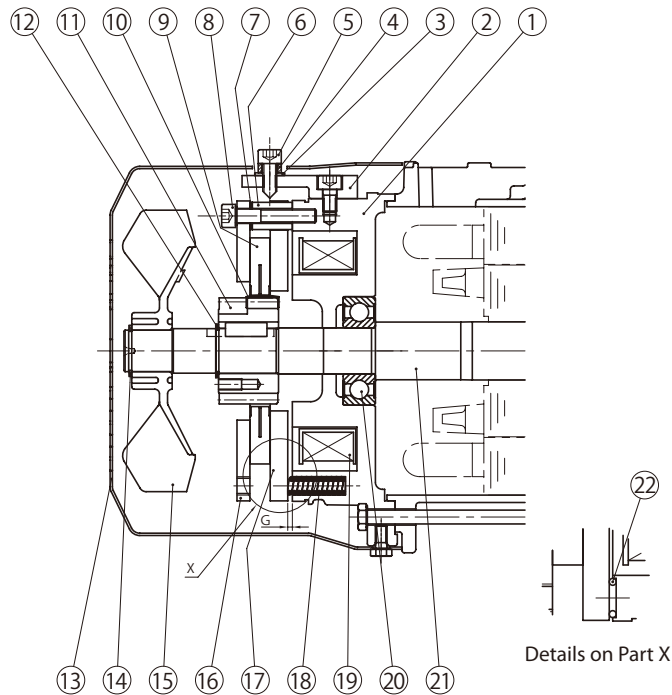
## - Gap Inspection

- (1) Remove the cover [8].
- (2) Insert a gap gauge between the stationary core [6] and the armature plate [3] 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-1E (Indoor Type, Release Bolt Method)



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

Figure 8-4

### - 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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

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] only, make sure not to fall the gap adjustment shims [7] and 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-1E, FB-2E (Indoor Type, Release Bolt Method)

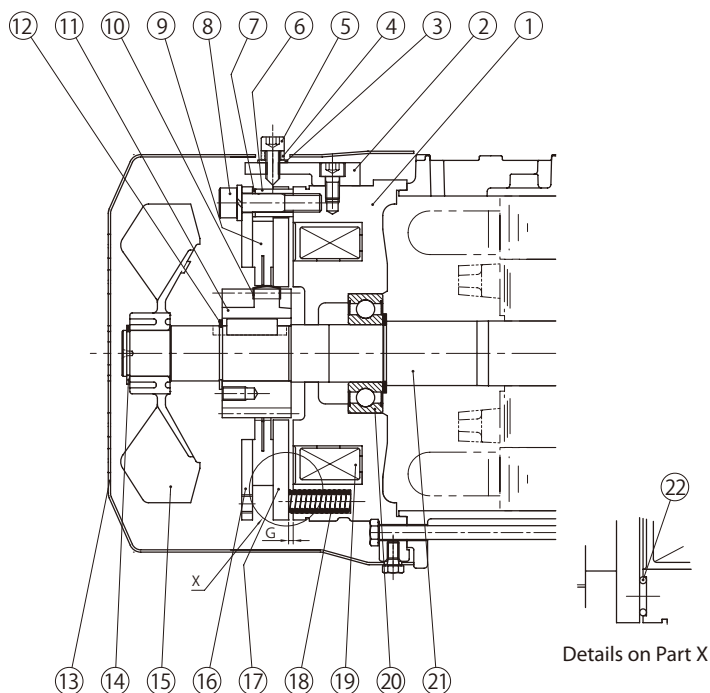


Figure 8-5

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

### - Gap Inspection

- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- (4) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.35 to 0.45 or less.)

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] only, make sure not to fall the gap adjustment shims [7] and the shock absorber [22].
- (5) The gap adjustment shims [7] have a thickness of 0.35 – 0.45 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-3E, FB-4E (Indoor Type, Release Bolt Method)

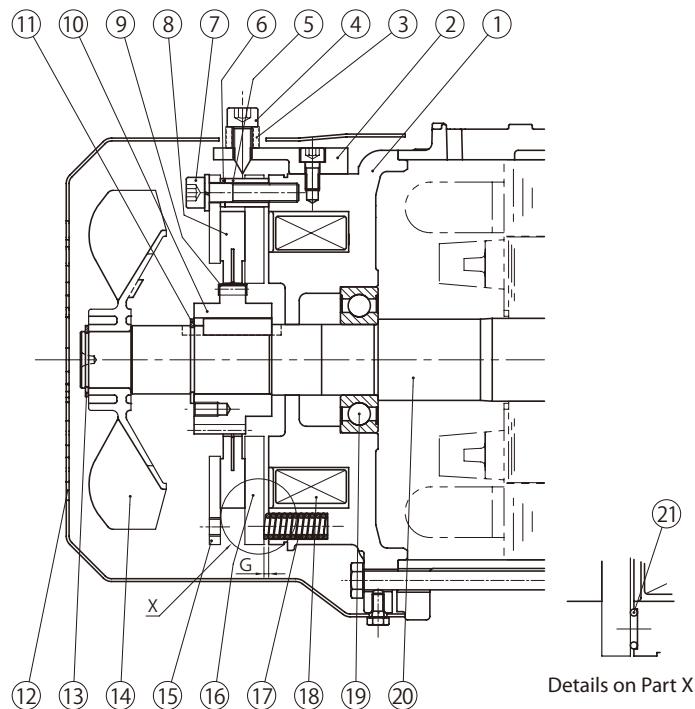


Figure 8-6

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	Cover
13	Shaft-retaining C-ring
14	Fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearings
20	Motor shaft
21	Shock absorber

#### - Gap Inspection

- (1) Remove the brake release bolt [4] and the manual release prevention spacer [3].
- (2) Remove the cover [12].
- (3) Insert a gap gauge between the stationary core [1] and the armature plate [16] and measure the gap. Measure in 3 locations around the circumference.
- (4) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.45 to 0.55 or less.)

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] only, make sure not to fall the gap adjustment shims [6] and 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 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], 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-5E, FB-8E (Indoor Type, Release Bolt Method)

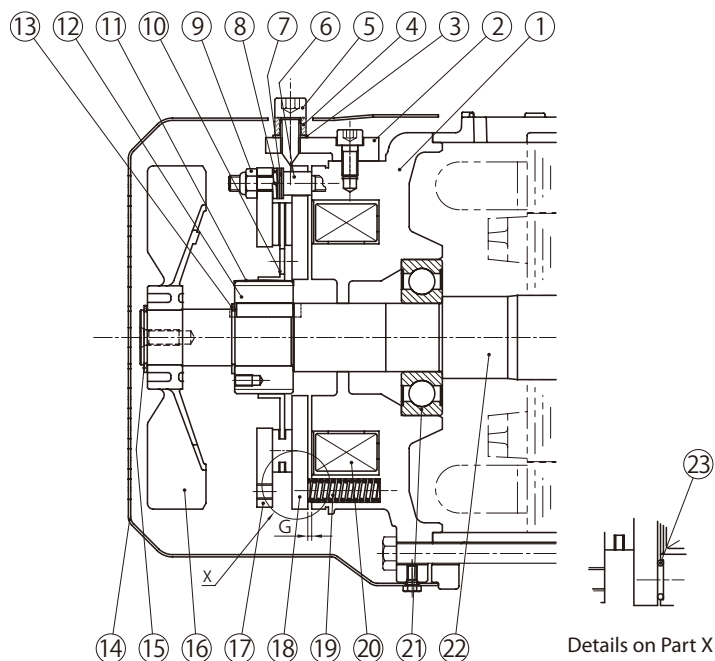


Figure 8-7

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

Note: [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 the gap is too large to adjust, 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-10E, FB-15E (Indoor Type, Release Bolt Method)

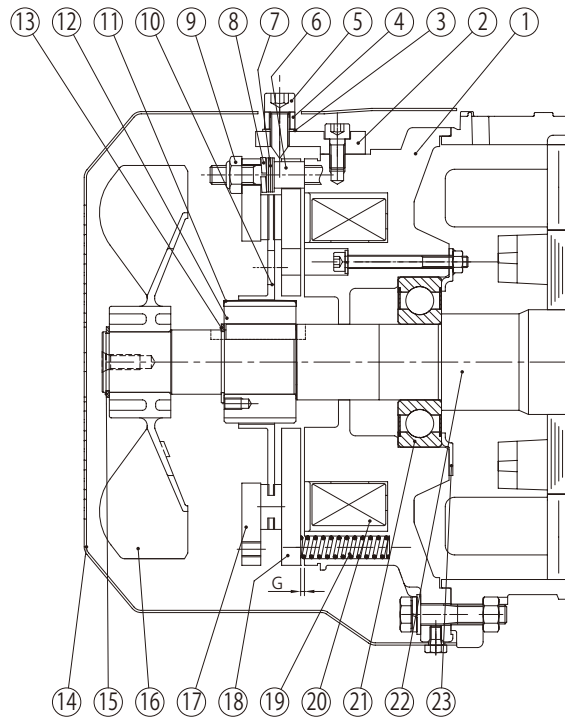


Figure 8-8

Code	Part Name
1	Stationary core
2	Brake release
3	Seal washer
4	Manual release protection spacer
5	Brake release bolt
6	Stud bolt
7	Adjusting washer
8	Spring washer
9	Gap adjusting nut
10	Brake lining
11	Leaf spring
12	Boss
13	Shaft-retaining C-ring
14	Cover
15	Shaft-retaining C-ring
16	Fan
17	Fixed plate
18	Armature plate
19	Spring
20	Electromagnetic coil
21	Ball bearings
22	Motor shaft
23	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 the gap is too large to adjust, 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-20 (Indoor Type, Release Bolt Method)

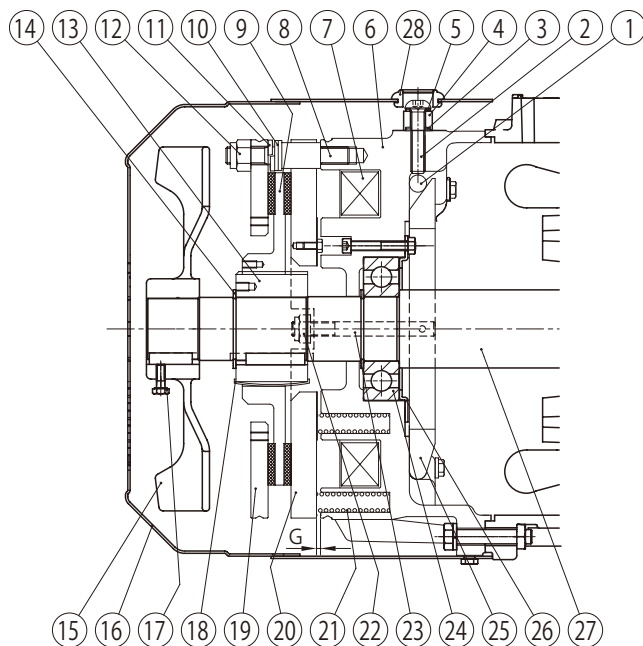


Figure 8-9

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release protection 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	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 the gap is too large to adjust, 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, Release Bolt Method)

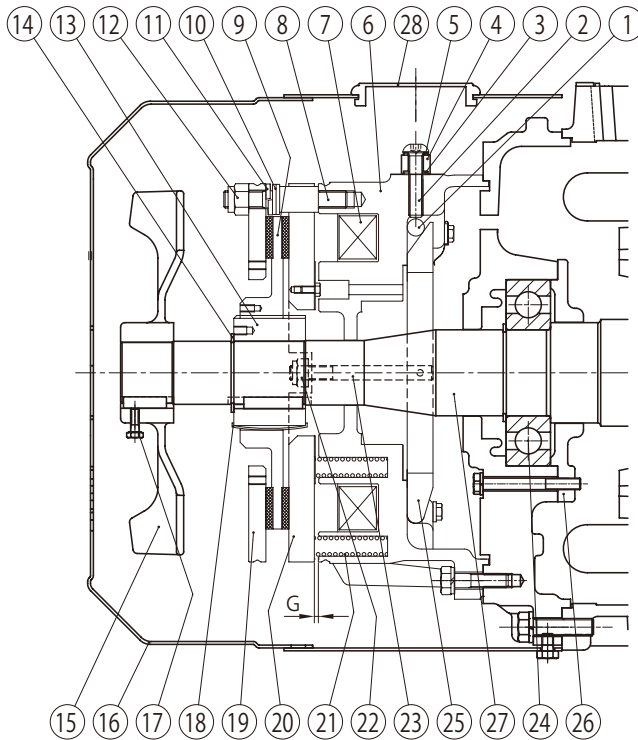


Figure 8-10

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release protection 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	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 the gap is too large to adjust, 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-01A, FB-02A, FB-05A (Outdoor Type)

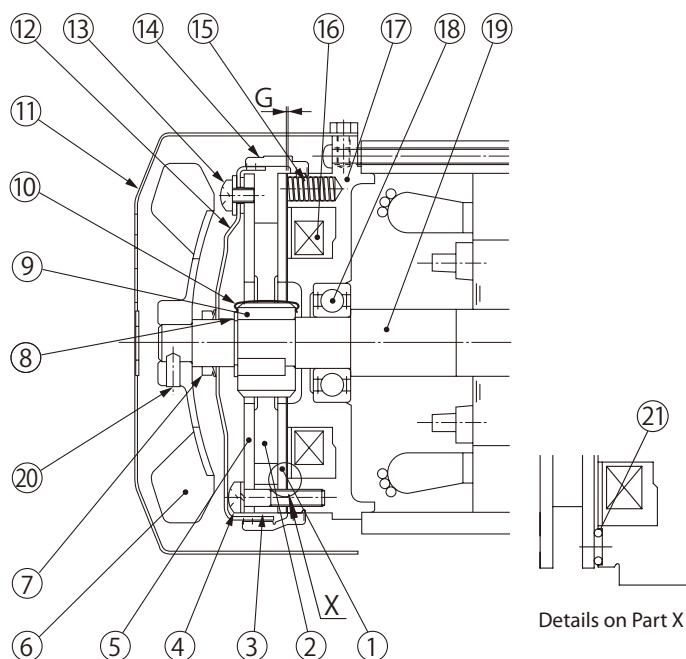


Figure 8-11

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

Note: 1. FB-01A of a 3-phase motor 0.1kW (1/8HP) does not have [6], [7], and [20].

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

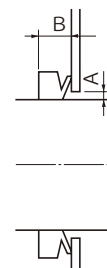
### - Gap Inspection

- (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. 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.



# 8. Daily Inspection and Maintenance

## ■ FB-1D (Indoor Type, Release Bolt Method)

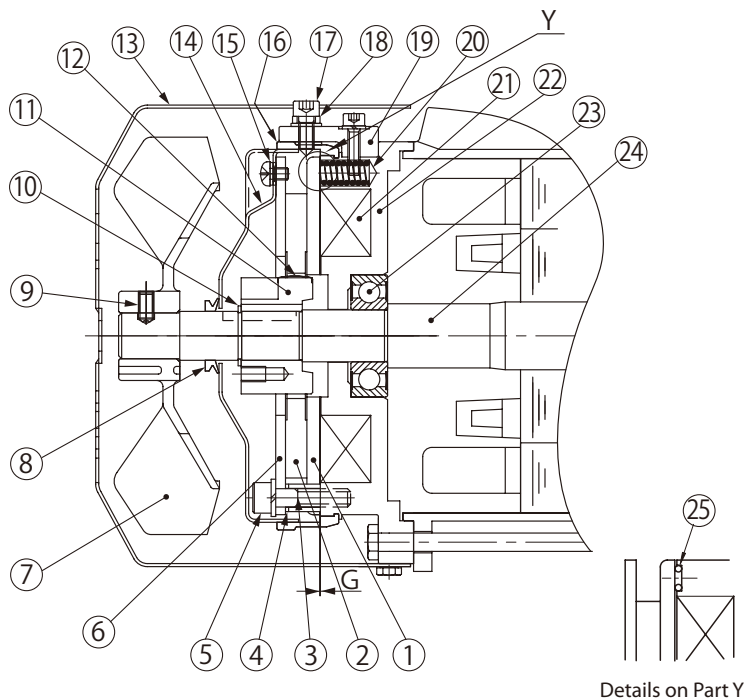


Figure 8-12

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

### - Gap 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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

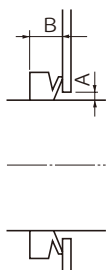
Note: 1. [25] is provided only to PREST NEO and ALTAX NEO.

2. Products for Europe does not have a release device, so [17] to [19] are not installed.

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 adjustment shims [4], attachment bolts [5] and 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 adjustment 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 the gap and the required value.
- (11) Attach the waterproof cover [14] using the attachment bolts [15]. Attach the waterproof cover [14] so that the gap (A) between its hole and the motor shaft [24] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction 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 – 1.05N•m. (9) Finally, attach the brake release bolt [17] and the manual release prevention spacer [18].





# 8. Daily Inspection and Maintenance

## ■ FB-1E (Outdoor Type, Release Bolt Method)

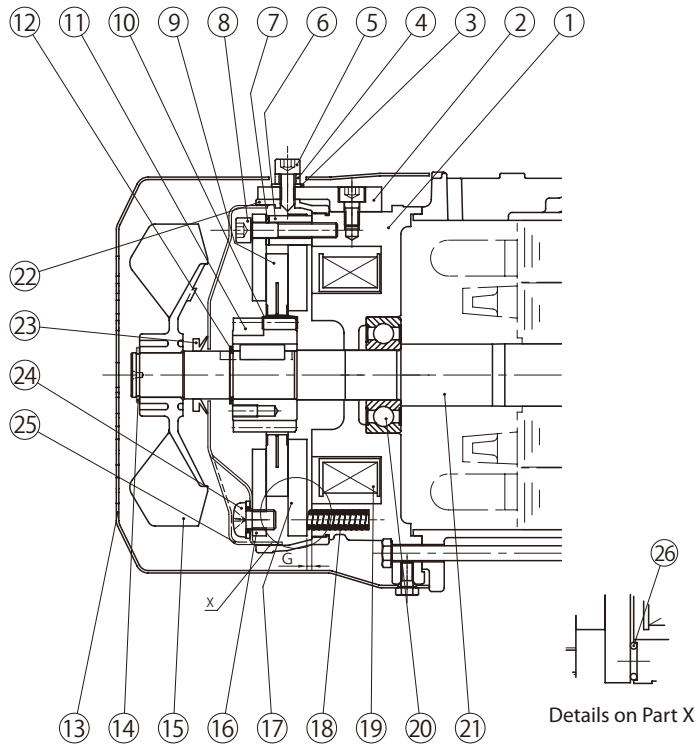


Figure 8-13

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

Note: Products for Europe does not have a release device, so [2] to [5] are not installed.

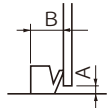
### - Gap Inspection

- (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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

### - 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] only, make sure not to fall the gap adjustment shims [7] and 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 the gap and the required value.
- (10) Attach the waterproof cover [25] using the 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 release bolt with the position of 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].

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



# 8. Daily Inspection and Maintenance

## ■ FB-1HE, FB-2E (Outdoor Type, Release Bolt Method)

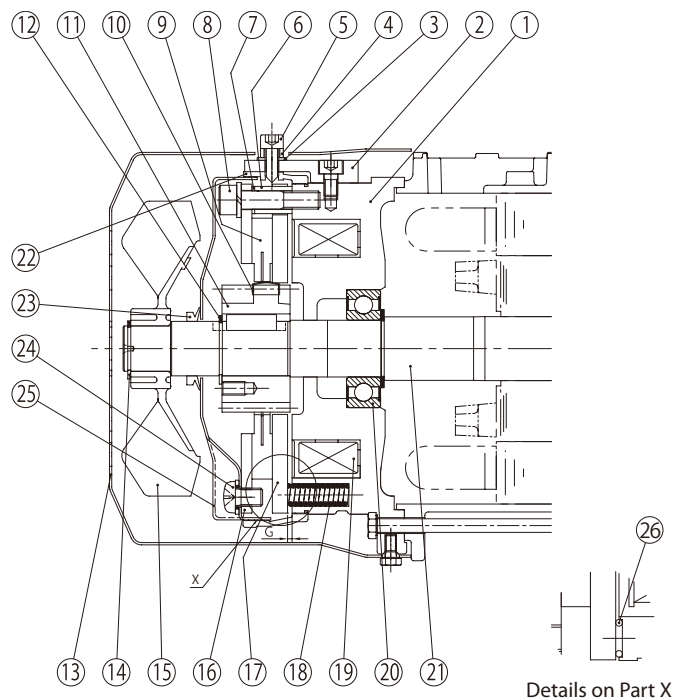


Figure 8-14

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

### - Gap Inspection

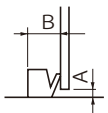
- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [22].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [17] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.35 to 0.45 or less.)

Note: Products for Europe does not have a release device, so [2] to [5] are not installed.

### - 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] only, make sure not to fall the gap adjustment shims [7] and the shock absorber [26].
- (8) The gap adjustment shims [7] have a thickness of 0.35 – 0.45mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [6], gap adjustment shims [7], attachment bolts [8] and the fixed plate [16] as a set.
- (9) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (10) Attach the waterproof cover [25] using the 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 release bolt with the position of 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].

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



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# 8. Daily Inspection and Maintenance

## ■ FB-2D (Outdoor Type, Release Bolt Method)

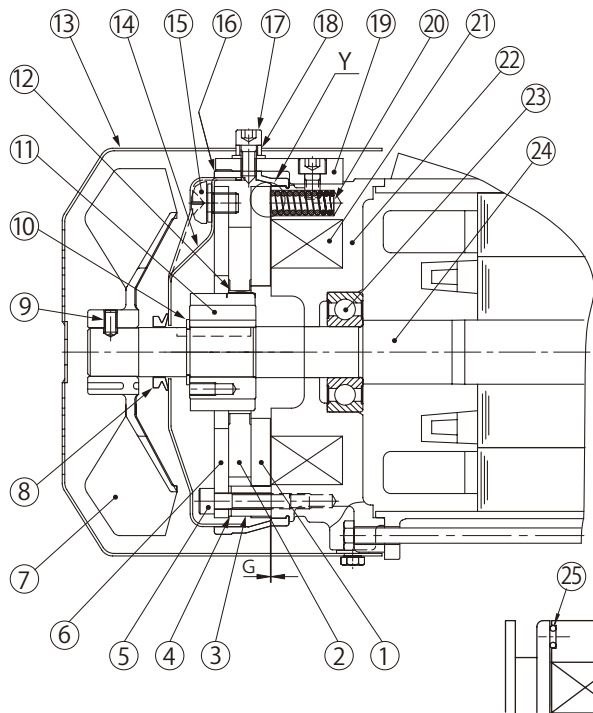


Figure 8-15

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	fan
8	V-ring
9	Fan set screw
10	Shaft-retaining C-ring
11	Boss
12	Leaf spring
13	Cover
14	Waterproof cover
15	Waterproof cover attachment bolts
16	Waterproof seal
17	Brake release bolt
18	Manual release protection spacer
19	Brake release
20	Spring
21	Electromagnetic coil
22	Stationary core
23	Bearing
24	Motor shaft
25	Shock absorber

### - Gap 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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

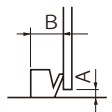
Note: 1. [25] is provided only to PREST NEO and ALTAX NEO.

2. Products for Europe does not have a release device, so [17] to [19] are not installed.

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

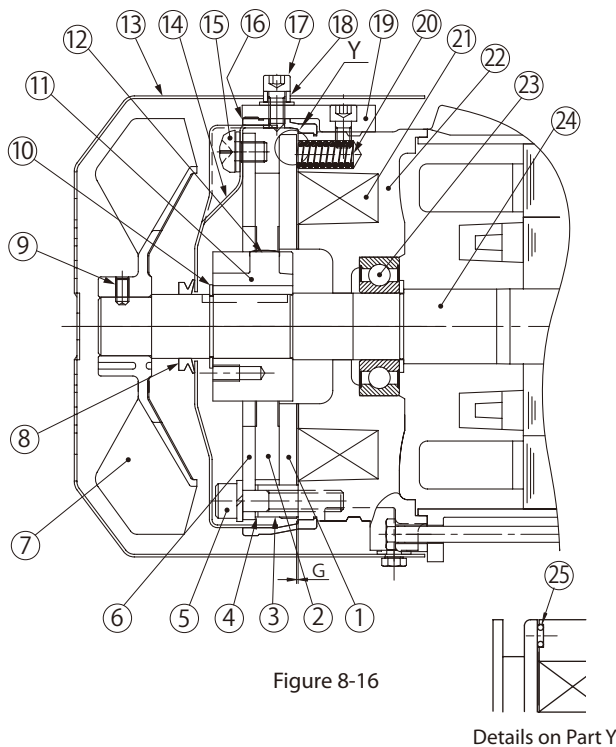
### - Gap Adjustment

- (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 adjustment shims [4], attachment bolts [5] and 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 adjustment 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 the gap and the required value.
- (11) Attach the waterproof cover [14] using the attachment bolts [15]. Attach the waterproof cover [14] so that the gap (A) between its hole and the motor shaft [24] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction diagram, install the waterproof seal [16] between the stationary core [22] and the waterproof cover [14]. Then attach the brake release [2]. 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 – 1.05N•m. (9) Finally, attach the brake release bolt [17] and the manual release prevention spacer [18].



# 8. Daily Inspection and Maintenance

## ■ FB-3D (Outdoor Type, Release Bolt Method)



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

### - Gap 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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

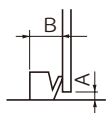
Note: 1. [25] is provided only to PREST NEO and ALTAX NEO.

2. Products for Europe does not have a release device, so [17] to [19] are not installed.

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 adjustment shims [4], attachment bolts [5] and 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 adjustment 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 the gap and the required value.
- (11) Attach the waterproof cover [14] using the attachment bolts [15]. Attach the waterproof cover [14] so that the gap (A) between its hole and the motor shaft [24] is nearly uniform.
- (12) Clean the surface of the waterproof seal [16] to remove impurities.
- (13) As shown in the construction 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 – 1.05N·m. (9) Finally, attach the brake release bolt [17] and the manual release prevention spacer [18].



# 8. Daily Inspection and Maintenance

## ■ FB-3E, FB-4E (Outdoor Type, Release Bolt Method)

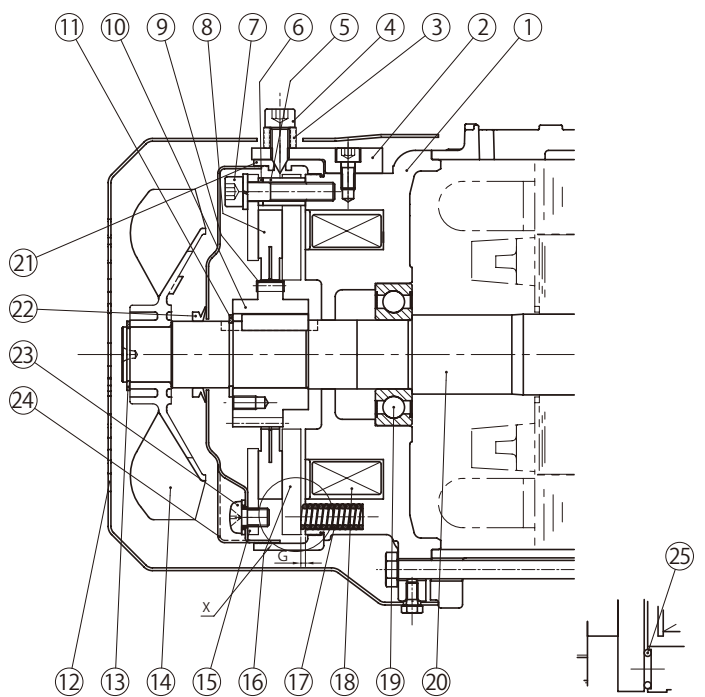


Figure 8-17

Details on Part X

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	Cover
13	Shaft-retaining C-ring
14	fan
15	Fixed plate
16	Armature plate
17	Spring
18	Electromagnetic coil
19	Ball bearings
20	Motor shaft
21	Waterproof seal
22	V-ring
23	Waterproof cover attachment bolts
24	Waterproof cover
25	Shock absorber

### - Gap Inspection

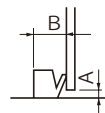
- (1) Remove the brake release bolt [4] and the manual release prevention spacer [5].
- (2) Remove the cover [12].
- (3) Remove the shaft-retaining C-ring [13], and remove the fan [14].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [21].
- (5) Insert a gap gauge between 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.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.45 to 0.55 or less.)

Note: Products for Europe does not have a release device, so [2] to [4] are not installed.

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 remove 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] only, make sure not to fall the gap adjustment shims [6] and 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 the fixed plate [15] as a set.
- (9) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (10) Attach the waterproof cover [24] using the 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]. At this time align the hole in the waterproof seal [21] for the release bolt with the position of 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, FB-8B (OutdoorType, Release Bolt Method)

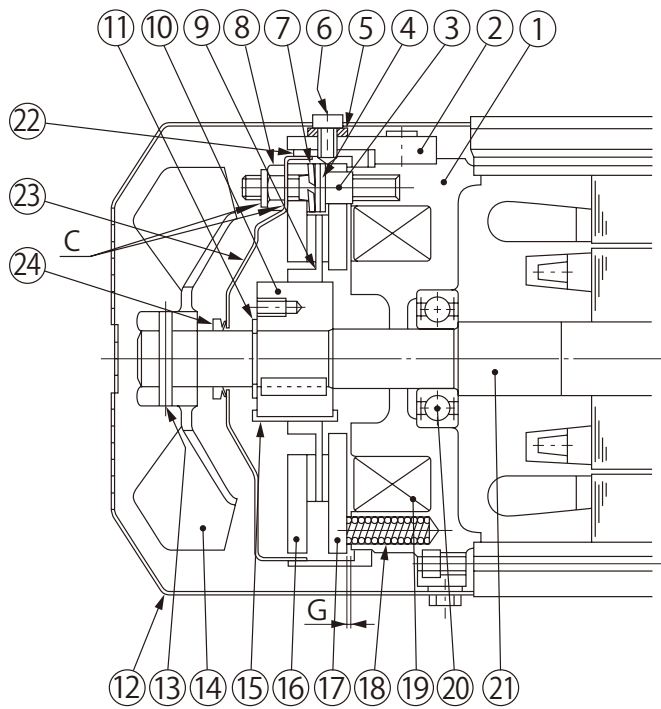


Figure 8-18

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	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

Note: Products for Europe does not have a release device, so [2], [5] and [6] are not installed.

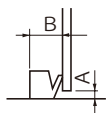
### - Gap Inspection

- (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 near 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 is too large to adjust, decrease the number of adjusting 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 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 cover [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].



# 8. Daily Inspection and Maintenance

## ■ FB-5E, FB-8E (Outdoor Type, Release Bolt Method)

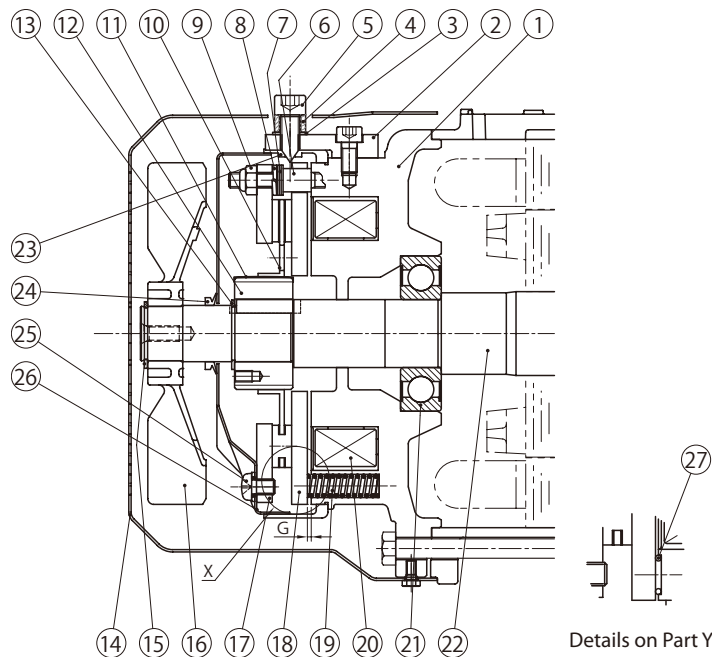


Figure 8-19

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

### - Gap 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 remove 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.

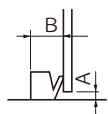
### - Gap Adjustment

- (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 remove 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 too large to adjust, 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.
- (8) Attach the waterproof cover [26] using the 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]. At this time align the hole in the waterproof seal [23] for the release bolt with the position of release bolt [5]. Then 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].

Note: 1. [27] is provided only to FB-5E of ALTAX NEO.

2. Products for Europe does not have a release device, so [2] to [5] are not installed.

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



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# 8. Daily Inspection and Maintenance

## ■ FB-10B1, FB-15B1 (Outdoor Type, Release Bolt Method)

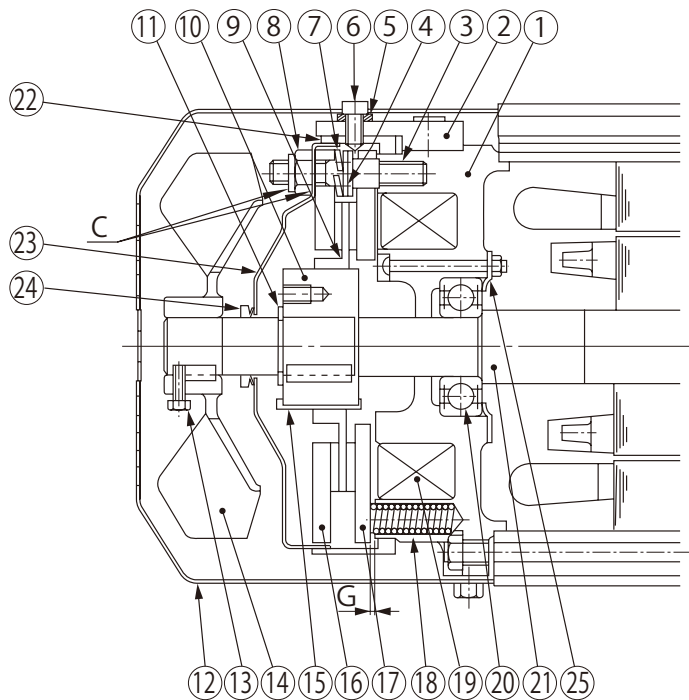


Figure 8-20

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	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

Note: Products for Europe does not have a release device, so [2], [5] and [6] are not installed.

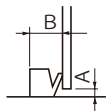
### - Gap Inspection

- (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 near 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 is too large to adjust, decrease the number of adjusting 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 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 cover [12]. Finally, attach the brake release bolt [6] and the manual release prevention spacer [5].





# 8. Daily Inspection and Maintenance

## ■ FB-10E, FB-15E (Outdoor Type, Release Bolt Method)

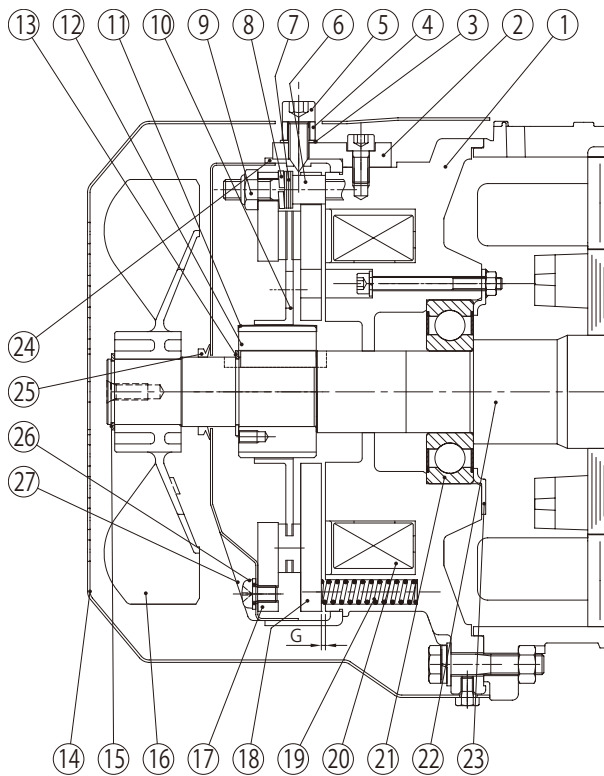


Figure 8-21

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

### - Gap Inspection

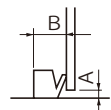
- (1) Remove the brake release bolt [5] and the manual release prevention spacer [4].
- (2) Remove the cover [14].
- (3) Remove the shaft-retaining C-ring [15], and remove the fan [16].
- (4) Remove the brake release [2] (2 locations) and remove the waterproof seal [24].
- (5) Insert a gap gauge between 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.

Note: Products for Europe does not have a release device, so [2] to [5] are not installed.

### - 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 remove 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 too large to adjust, 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.
- (8) Attach the waterproof cover [27] using the attachment bolts [26]. At this time align the cutout area on the side of the waterproof cover [27] with 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]. At this time align the hole in the waterproof seal [24] for the release bolt with the position of release bolt [5]. Then 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].

Gap Value G (mm)	
Required Value (Original Value)	Limit Value
0.35 - 0.45	1.2



# 8. Daily Inspection and Maintenance

## ■ FB-20 (Outdoor Type, Release Bolt Method)

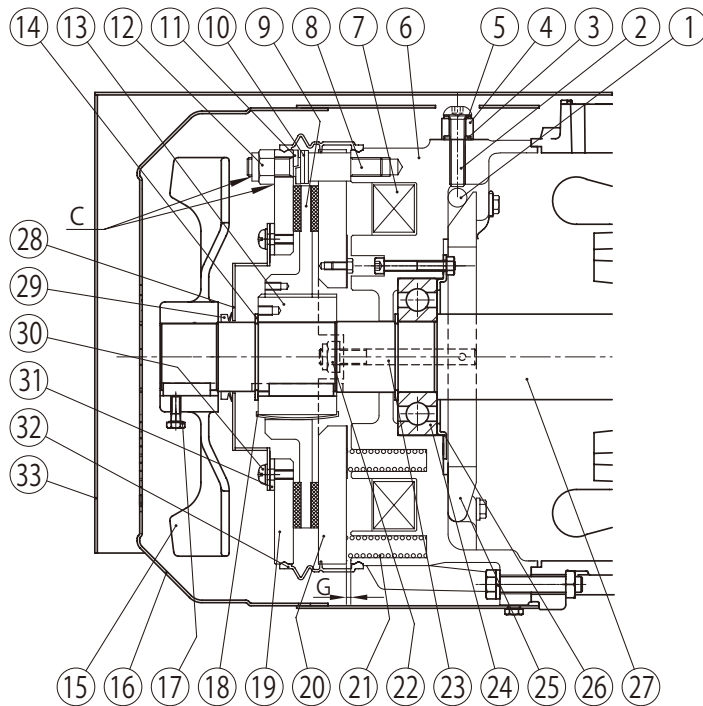


Figure 8-22

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release protection 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	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.

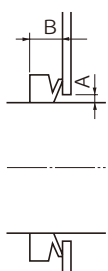
### - Gap Adjustment

- (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 the gap is too large to adjust, 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 the 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] and cover [16] and outdoor cover [33].

Note: 1. The outdoor cover [33] for the vertical types has a different shape.

2. Products for Europe does not have a release device, so [1] to [5] and [25] are not installed.

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, Release Bolt Method)

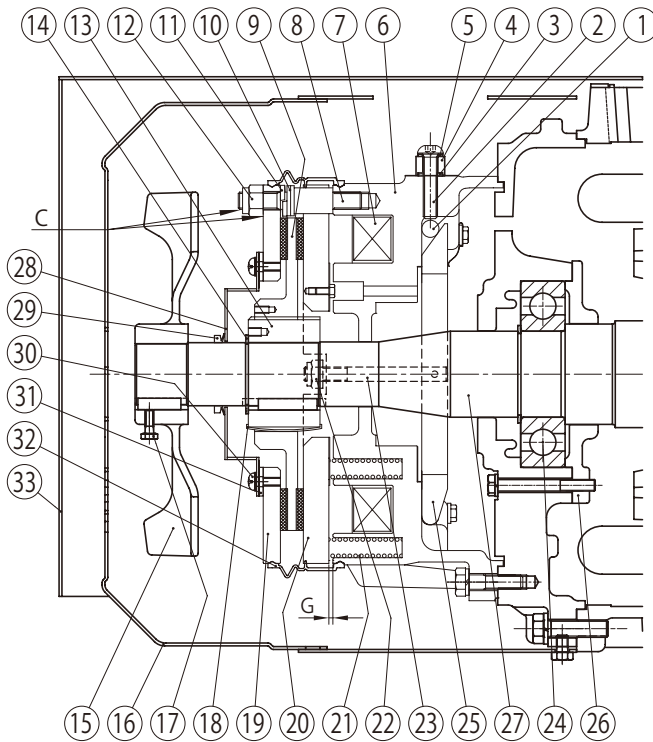


Figure 8-23

Code	Part Name
1	Roller
2	Brake release bolt
3	Rubber packing
4	Manual release protection 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	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

Note: 1. The outdoor cover [33] for the vertical types has a different shape.

2. Products for Europe does not have a release device, so [1] to [5] and [25] are not installed.

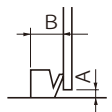
### - Gap Inspection

- (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 the gap is too large to adjust, 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 the 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] and 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, ESB-250-2 (Outdoor Type)

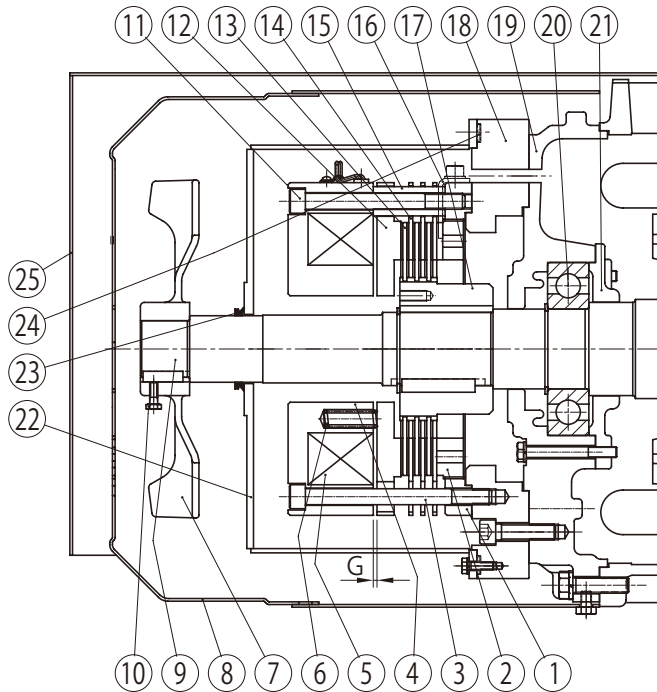


Figure 8-24

Code	Part Name
1	Center ring
2	Gap adjusting screw
3	Attachment bolt
4	Field
5	Brake coil
6	Actuating spring
7	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

Note: 1. There are 3 of [13][14] for ESB-250 (horizontal type), and 2 for ESB-250-2 (vertical type).

2. The outdoor cover [25] for ESB-250-2 (vertical type) 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
	Steady Voltage
	DC180V (for AC200V input)
	DC90V (for AC200V input)
Maximum Output Current	DC1.8A (Steady output)
Over Excitation Time	0.4 - 1.2s
Insulation Resistance	100MΩ or larger (When measured with 1000V megohmmeter)
Insulation Withstand Voltage	AC2000V for one time or more
Maximum Frequency	Inching
	Steady
	(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

## ■ Accessory Rectifier (DC Power Supply Unit) Model HD-110M3

Outline Drawing

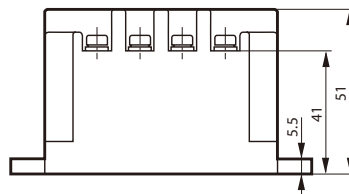
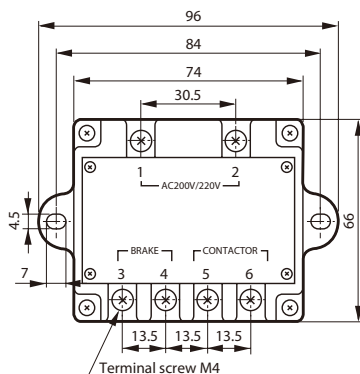
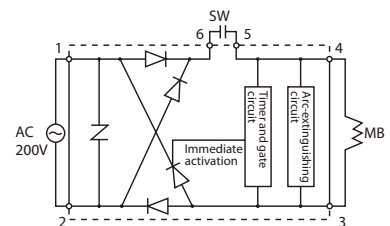


Figure 8-25

Internal Circuit (Diagram)



Note: 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 P85.
- (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 8-26)
- (3) Insert the gap adjusting bar (customer to prepare an angle plate. See Figure 8-28) 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 8-27)
- (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.

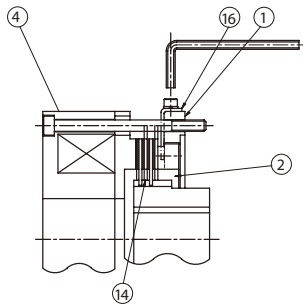


Figure 8-26

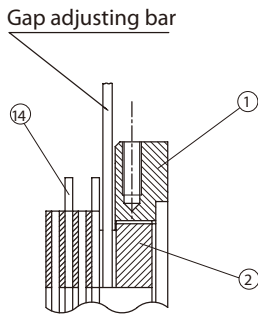


Figure 8-27

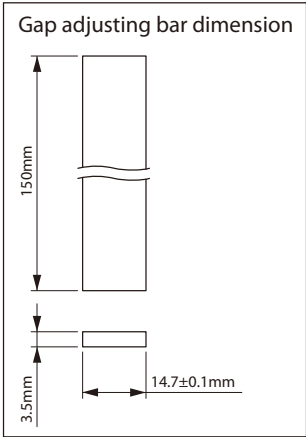


Figure 8-28

# 8. Daily Inspection and Maintenance

## ■ FB-05A (Outdoor Type, One-Touch Release Lever Method)

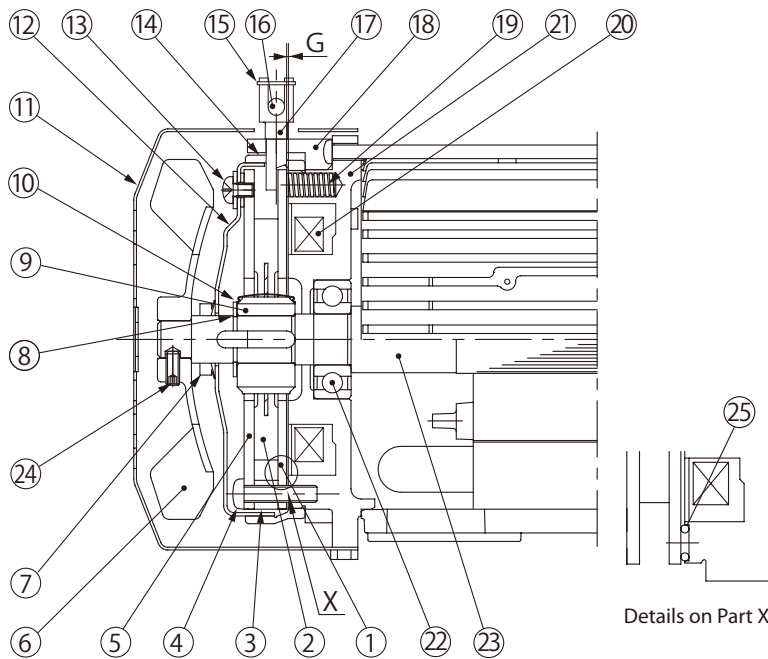


Figure 8-29

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

### - Gap Inspection

- (1) Remove the retaining E-ring [15], the release lever [16] and the release pin [17].
- (2) Remove the cover [11].
- (3) Loosen the fan set screw [24] and remove the fan [6].
- (4) Remove the brake release [18]. (2 Places)
- (5) Remove the waterproof seal [14].
- (6) Insert a gap gauge between the stationary core [21] 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.

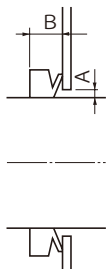
Note: 1. FB-01A of a 3-phase motor 0.1kW (1/8HP) does not have [6], [7], and [24].

2. [25] is provided only to PREST NEO and ALTAX NEO.

### - Gap Adjustment

- (1) Remove the retaining E-ring [15], the release lever [16] and the release pin [17].
- (2) Remove the cover [11].
- (3) Loosen the fan set screw [24] and remove the fan [6].
- (4) Remove the waterproof seal [14].
- (5) Pull off the V-ring [7].
- (6) Remove the brake release [18]. (2 Places)
- (7) Remove the waterproof cover attachment bolts [13], and remove the waterproof cover [12].
- (8) 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.)
- (9) 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 [23] is nearly uniform around the circumference.
- (10) Clean the surface of the waterproof seal [14] to remove impurities.
- (11) As shown in the construction diagram install the waterproof seal [14] between the stationary core [21] and the waterproof cover [12]. Then attach the brake release [18]. 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 pin with the position of the release pin [17]. Attach the waterproof seal [14] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [21]. Otherwise water could leak in.
- (12) Turn the power on and off to check brake action.
- (13) 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).
- (14) Attach the fan [6] and cover [11]. Use a fan set screw [24] coated with Three Bond TB2365 (Sumitomo part number EW444WW-01), and tighten to a torque of 0.3 – 0.5 N·m. (1) Finally, attach the retaining E-ring [15], the release lever [16] and the release pin [17].

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





# 8. Daily Inspection and Maintenance

## ■ FB-1D (Outdoor Type, One-Touch Release Lever Method)

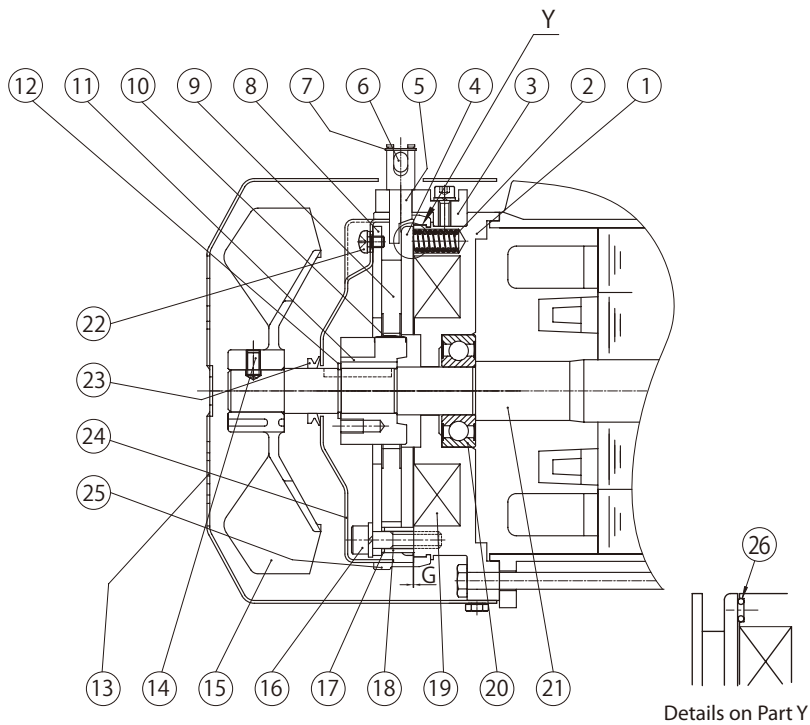


Figure 8-30

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

Note: [26] is provided only to PREST NEO and ALTAX NEO.

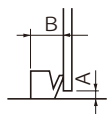
Gap Value G (mm)	
Required Value (Original Value)	Limit Value
0.3 - 0.4	0.6

### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Loosen the fan set screw [14] and remove the fan [15].
- (4) Remove the brake release [3]. (2 Places)
- (5) Remove the waterproof seal [25].
- (6) Insert a gap gauge between the stationary core [1] and the armature plate [4] and measure the gap. Measure in 3 locations around the circumference.
- (7) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

### - Gap Adjustment

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Loosen the fan set screw [14] and remove the fan [15].
- (4) Pull off the V-ring [23].
- (5) Remove the brake release [3]. (2 Places)
- (6) Remove the waterproof seal [25].
- (7) Remove the waterproof cover attachment bolts [22], and remove the waterproof cover [24].
- (8) Loosen the attachment bolts [16] and remove the spacers [18], gap adjustment shims [17], attachment bolts [16] and fixed plate [8] as a set. When removing the attachment bolts only, make sure not to fall the gap adjustment shims [17] and the shock absorber [26].
- (9) The gap adjustment shims [17] have a thickness of 0.2 – 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [18], gap adjustment shims [17], attachment bolts [16] and the fixed plate [8] as a set.
- (10) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (11) Attach the waterproof cover [24] using the attachment bolts [22]. Attach the waterproof cover [24] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (12) Clean the surface of the waterproof seal [25] to remove impurities.
- (13) As shown in the construction diagram, install the waterproof seal [25] between the stationary core [1] and the waterproof cover [24]. Then attach the brake release [3]. Insert the waterproof seal [25] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [25] for the release pin with the position of release pin [5]. Attach the waterproof seal [25] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. Otherwise water could leak in.
- (14) Turn the power on and off to check brake action.
- (15) Attach the V-ring [23]. Wipe off the lip and surface near the lip of V-ring [23], lightly coat the lip surface with grease, and attach. Observe the attaching dimension (B=4.5mm).
- (16) Attach the fan [15] and cover [13]. Use a fan set screw [14] coated with Three Bond TB2365 (Sumitomo part number EW445WW-01), and tighten to a torque of 0.85 – 1.05N·m. Finally, attach the retaining E-ring [7], the release lever [6] and the release pin [5].



# 8. Daily Inspection and Maintenance

## ■ FB-1E (Outdoor Type, One-Touch Release Lever Method)

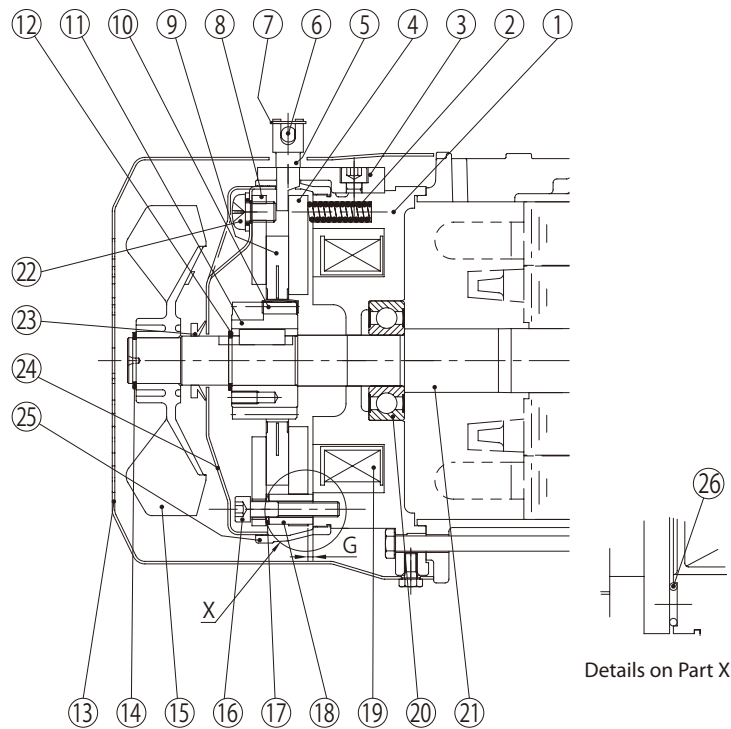


Figure 8-31

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

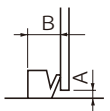
### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [3] (2 locations) and remove the waterproof seal [25].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [4] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.2 to 0.25 or less.)

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

### - Gap Adjustment

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (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 [3] (2 locations) and remove the waterproof seal [25].
- (6) Remove the waterproof cover attachment bolts [22], and remove the waterproof cover [24].
- (7) Loosen the attachment bolts [16] and remove the spacers [18], gap adjustment shims [17], attachment bolts [16] and fixed plate [8] as a set. When removing the attachment bolts [16] only, make sure not to fall the gap adjustment shims [17] and the shock absorber [26].
- (8) The gap adjustment shims [17] have a thickness of 0.2 – 0.25 mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [18], gap adjustment shims [17], attachment bolts [16] and the fixed plate [8].
- (9) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (10) Attach the waterproof cover [24] using the attachment bolts [22]. At this time align the cutout area on the side of the waterproof cover [24] with the brake release pin[5]. Attach the waterproof cover [24] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (11) Clean the surface of the waterproof seal [25] to remove impurities.
- (12) As shown in the construction diagram, install the waterproof seal [25] between the stationary core [1] and the waterproof cover [24]. Then attach the brake release [3]. Insert the waterproof seal [25] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [25] for the release pin with the position of release pin [5]. Attach the waterproof seal [25] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. (Be careful that the waterproof seal [25] 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 retaining E-ring [7], the release lever [6] and the release pin [5].





# 8. Daily Inspection and Maintenance

## ■ FB-1HE, FB-2E (Outdoor Type, One-Touch Release Lever Method)

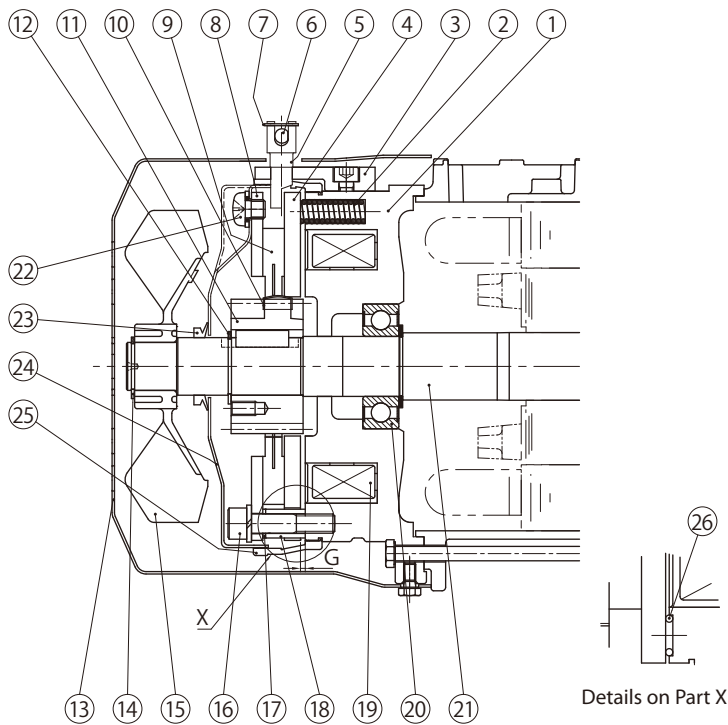


Figure 8-32

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

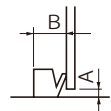
### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [3] (2 locations) and remove the waterproof seal [25].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [4] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.35 to 0.45 or less.)

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

### - Gap Adjustment

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (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 [3] (2 locations) and remove the waterproof seal [25].
- (6) Remove the waterproof cover attachment bolts [22], and remove the waterproof cover [24].
- (7) Loosen the attachment bolts [16] and remove the spacers [18], gap adjustment shims [17], attachment bolts [16] and fixed plate [8] as a set. When removing the attachment bolts [16] only, make sure not to fall the gap adjustment shims [17] and the shock absorber [26].
- (8) The gap adjustment shims [17] have a thickness of 0.35 – 0.45mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [18], gap adjustment shims [17], attachment bolts [16] and the fixed plate [8].
- (9) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (10) Attach the waterproof cover [24] using the attachment bolts [22]. At this time align the cutout area on the side of the waterproof cover [24] with the brake release pin[5]. Attach the waterproof cover [24] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (11) Clean the surface of the waterproof seal [25] to remove impurities.
- (12) As shown in the construction diagram, install the waterproof seal [25] between the stationary core [1] and the waterproof cover [24]. Then attach the brake release [3]. Insert the waterproof seal [25] with its arrow mark pointing toward the load side. Align the hole in the waterproof seal [25] for the release pin with the position of release pin [5]. Attach the waterproof seal [25] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. (Be careful that the waterproof seal [25] 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 retaining E-ring [7], the release lever [6] and the release pin [5].



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# 8. Daily Inspection and Maintenance

## ■ FB-3E (Outdoor Type, One-Touch Release Lever Method)

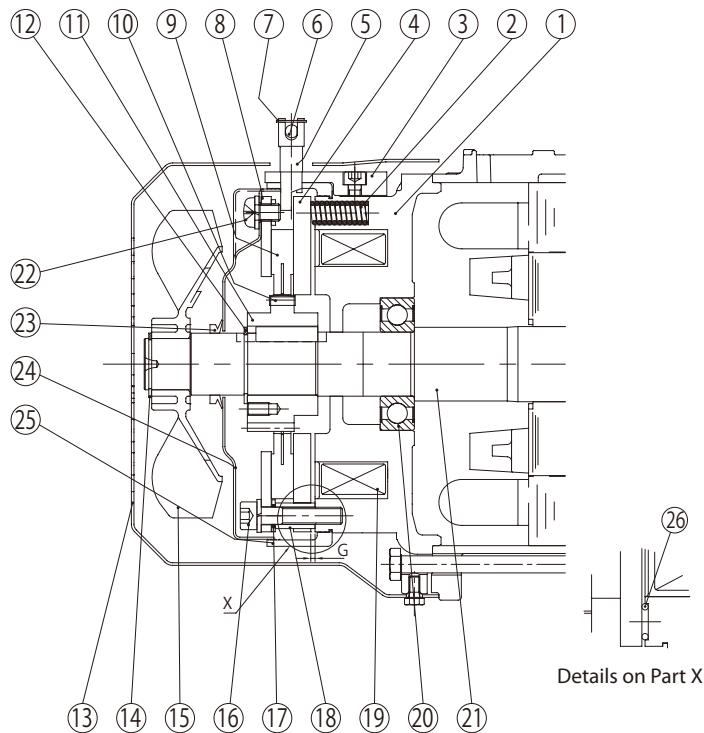


Figure 8-33

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

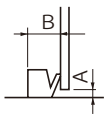
### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [3] (2 locations) and remove the waterproof seal [25].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [4] and measure the gap. Measure in 3 locations around the circumference.
- (6) Adjustment is required if the gap value is near the limit.  
(You cannot adjust the thickness of the gap adjustment shims to about 0.45 to 0.55 or less.)

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

### - Gap Adjustment

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (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 [3] (2 locations) and remove the waterproof seal [25].
- (6) Remove the waterproof cover attachment bolts [22], and remove the waterproof cover [24].
- (7) Loosen the attachment bolts [16] and remove the spacers [18], gap adjustment shims [17], attachment bolts [16] and fixed plate [8] as a set. When removing the attachment bolts [16] only, make sure not to fall the gap adjustment shims [17] and the shock absorber [26].
- (8) The gap adjustment shims [17] have a thickness of 0.45 – 0.55mm. Reduce the number of shims according to the wear conditions, then reassemble the spacers [18], gap adjustment shims [17], attachment bolts [16] and the fixed plate [8].
- (9) Check the gap G, and readjust the shims if there is a large difference between the gap and the required value.
- (10) Attach the waterproof cover [24] using the attachment bolts [22]. At this time align the cutout area on the side of the waterproof cover [24] with the brake release pin[5]. Attach the waterproof cover [24] so that the gap (A) between its hole and the motor shaft [21] is nearly uniform.
- (11) Clean the surface of the waterproof seal [25] to remove impurities.
- (12) As shown in the construction diagram, install the waterproof seal [25] between the stationary core [1] and the waterproof cover [24]. Then attach the brake release [3]. At this time align the hole in the waterproof seal [25] for the release pin with the position of release pin [5]. Attach the waterproof seal [25] so that its protrusion fits snugly around the entire circumference of the groove for the stationary core [1]. (Be careful that the waterproof seal [25] 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 retaining E-ring [7], the release lever [6] and the release pin [5].



# 8. Daily Inspection and Maintenance

## ■ FB-5E, FB-8E (Outdoor Type, One-Touch Release Lever Method)

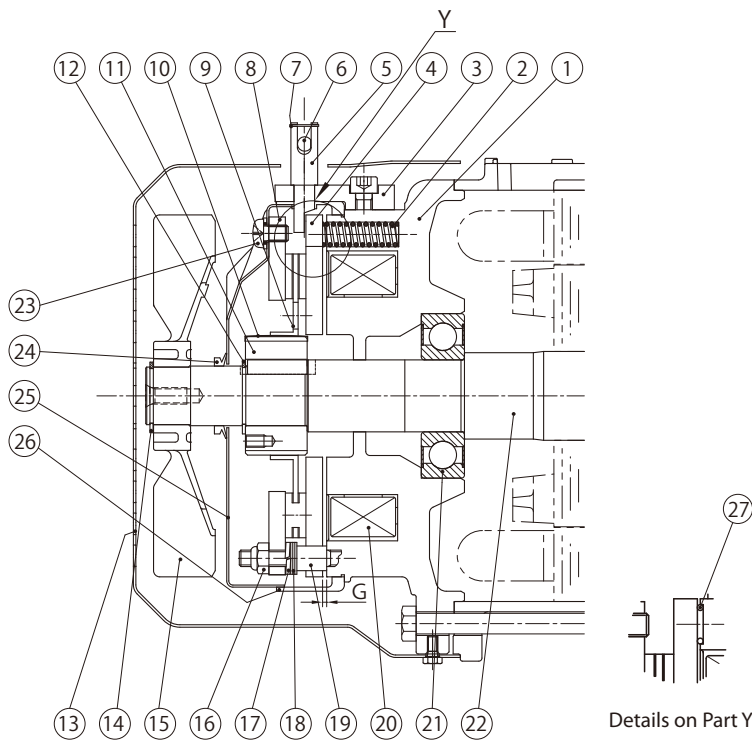


Figure 8-34

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

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

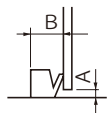
Gap Value G (mm)	
Required Value (Original Value)	Limit Value
0.35 - 0.45	1.0

### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [3] (2 locations) and remove the waterproof seal [26].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [4] 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 retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Pull off the V-ring [24].
- (5) Remove the brake release [3] (2 locations) and remove the waterproof seal [26].
- (6) Remove the waterproof cover attachment bolts [23], and remove the waterproof cover [25].
- (7) Insert a gap gauge between the stationary core [1] and the armature plate [4] and rotate to the right the gap adjusting nuts [16] that are attached to ends of the stud bolts [19]. If the gap is too large to adjust, decrease the number of adjusting washers [18]. There are 3 gap adjusting nuts [16]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (8) Attach the waterproof cover [25] using the attachment bolts [23]. At this time align the cutout area on the side of the waterproof cover [25] with the brake release pin [5]. Attach the waterproof cover [25] so that the gap (A) between its hole and the motor shaft [22] is nearly uniform.
- (9) Clean the surface of the waterproof seal [26] to remove impurities.
- (10) As shown in the construction diagram install the waterproof seal [26] between the stationary core [1] and the waterproof cover [25]. Then attach the brake release [3]. At this time align the hole in the waterproof seal [26] for the release pin with the position of release pin [5]. Then attach along the machined surfaces around the stationary core [1]. (Be careful that the waterproof seal [26] 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 [15], shaft-retaining C-ring [14] and cover [13].
- (14) Finally, attach the retaining E-ring [7], the release lever [6] and the release pin [5].



# 8. Daily Inspection and Maintenance

## ■ FB-10E, FB-15E (Outdoor Type, One-Touch Release Lever Method)

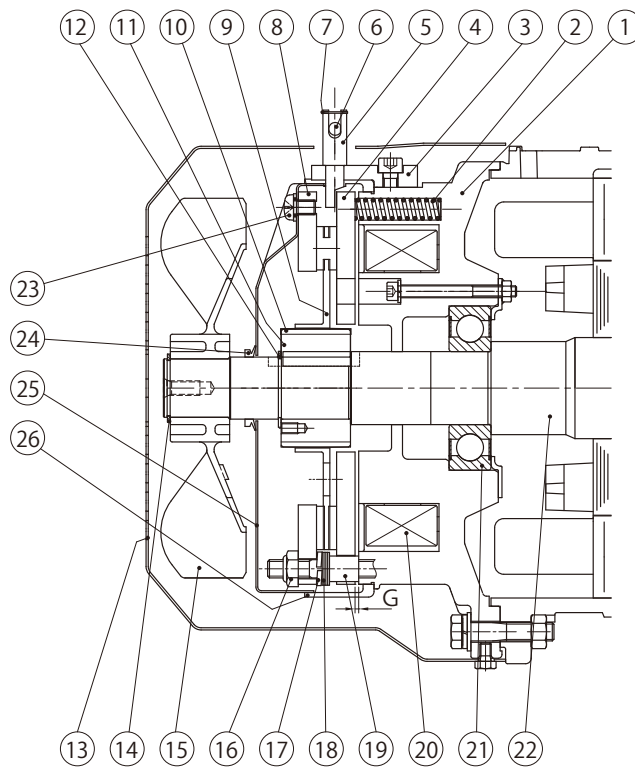


Figure 8-35

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

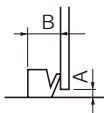
### - Gap Inspection

- (1) Remove the retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Remove the brake release [3] (2 locations) and remove the waterproof seal [26].
- (5) Insert a gap gauge between the stationary core [1] and the armature plate [4] 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 retaining E-ring [7], the release lever [6] and the release pin [5].
- (2) Remove the cover [13].
- (3) Remove the shaft-retaining C-ring [14], and remove the fan [15].
- (4) Pull off the V-ring [24].
- (5) Remove the brake release [3] (2 locations) and remove the waterproof seal [26].
- (6) Remove the waterproof cover attachment bolts [23], and remove the waterproof cover [25].
- (7) Insert a gap gauge between the stationary core [1] and the armature plate [4] and rotate to the right the gap adjusting nuts [16] that are attached to ends of the stud bolts [19]. If the gap is too large to adjust, decrease the number of adjusting washers [18]. There are 3 gap adjusting nuts [16]. Adjust these in turn so that 3 positions on the circumference are uniformly at the required gap.
- (8) Attach the waterproof cover [25] using the attachment bolts [23]. At this time align the cutout area on the side of the waterproof cover [25] with the brake release pin [5]. Attach the waterproof cover [25] so that the gap (A) between its hole and the motor shaft [22] is nearly uniform.
- (9) Clean the surface of the waterproof seal [26] to remove impurities.
- (10) As shown in the construction diagram install the waterproof seal [26] between the stationary core [1] and the waterproof cover [25]. Then attach the brake release [3]. At this time align the hole in the waterproof seal [26] for the release pin with the position of release pin [5]. Then attach along the machined surfaces around the stationary core [1]. (Be careful that the waterproof seal [26] 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 [15], shaft-retaining C-ring [14] and cover [13].
- (14) Finally, attach the retaining E-ring [7], the release lever [6] and the release pin [5].



## 8. Daily Inspection and Maintenance

### 8-6 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-01A - FB-05A), ESB-250, ESB-250-2**

When the thickness of brake lining (SB-004, FB brake) or inner disc (ESB-250, ESB-250-2) reaches the use limit thickness in Table 8-6




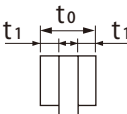
**(2) MB-003 - MB-010**

When the gap reaches the limit (see P53)

**(3) FB-01A- FB-05A**

When the brake gap still reaches the limit after the gap adjustment (see P61 and P76)

Table 8-6 Brake Lining, Inner Disc Dimensions

Brake Type	Brake Lining Inner Disc Dimension Drawing	Original Thickness		Usable Thickness Limit		
		T <sub>0</sub> (mm)	T <sub>1</sub> (mm)	T <sub>0</sub> (mm)	T <sub>1</sub> (mm)	
SB-004		5.0	—	4.6	—	
MB-003 MB-005 MB-010		7.0		—		
FB-01A FB-02A FB-05A		6.0				
FB-1D				7.8		
FB-1E FB-2D				8.0		
FB-1HE, FB-2E FB-3D				8.4		
FB-3E, FB-4E		10		6.0		
FB-5B, FB-8B FB-5E, FB-8E		11		7.0		
FB-10B1, FB-15B1 FB-10E, FB-15E		16		12		
FB-20, FB-30						
ESB-250  ESB-250-2			6.0	1.5	3.6	0.3

- Brake torque may not be at the prescribed level during initial operation. In such a case, turn the brake on and off under as light load as possible to contact the brake's friction surfaces.
- When changing the brake lining, replace the boss and leaf springs (for FB-5B, FB-8B, FB-10B1, FB-15B1, FB-5E – 15E, 20, 30, the gap adjusting nuts are included) as a set.
- After 2 million or more cycles of operation, (for FB-30, ESB-250 and ESB-250-2, 1 million or more cycles of operation), or after 10 years or more have passed since shipment from the factory, inspect to check whether continued operation is possible, even if the lining is not at the usable thickness limit.
- Check the following items concerning the condition of each mechanical part.
  - Are the linings split or chipped?
  - Is there any peeling or gap between the lining and the disc?
  - Does the brake lining or the spline of the inner disc exhibit 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, in case that the brake is used outdoors or in a high-humidity environment or that 10 or more years has passed because of long period storage or rest.

### 8-7 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

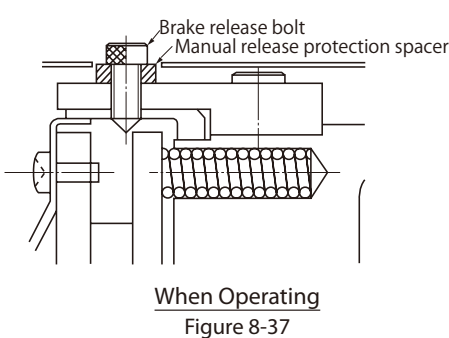
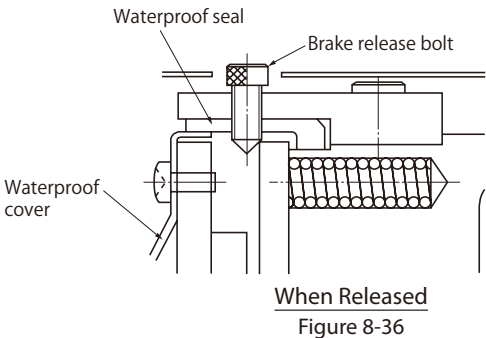
## 8-8 Manually Releasing the Brake

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

### ■ FB Brakes (excluding FB-20, FB-30), Release Bolt Method

- (1) First remove the brake release bolts on the diagonal position remove the release prevention spacers. Reinsert the bolts and tighten 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 -36, 8-37)
- (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 8-37)
- (3) This table show brake release bolt sizes.

Brake Type	Bolt Size
FB-1D	M5
FB-1E - FB-2E FB-2D, FB-3D	M6
FB-3E, FB-4E, FB-5B, FB-8B, FB-10B1, FB-15B1	M8
FB-5E - FB-15E	M10

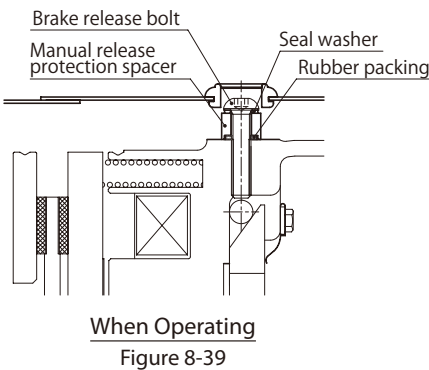
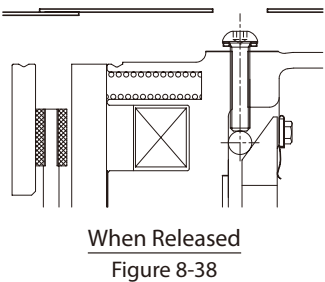


Note: Indoor types do not come with waterproof seals or waterproof covers.

### ■ FB-20, FB-30

- (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 8-38)
- (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 8-39) 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.





# 8. Daily Inspection and Maintenance

## ■ FB-250, ESB-250-2

- (1) Remove outdoor cover [25]. Remove the cover [8], fan [7] and brake cover [22].
- (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 diagonal positions. 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.

Attach the outdoor cover as it was before.

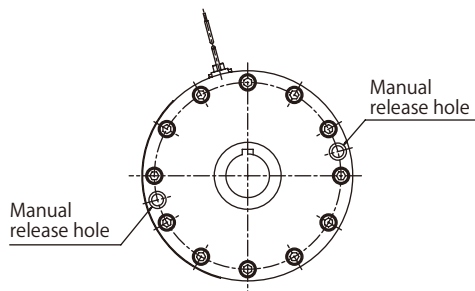


Figure 8-40

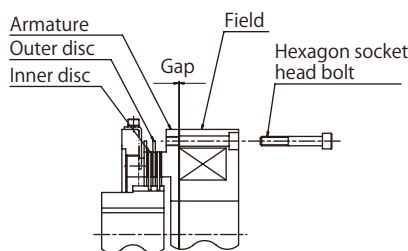


Figure 8-41

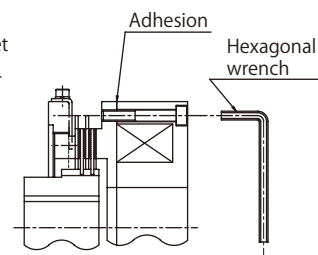


Figure 8-42

## ■ FB Brakes, One-Touch Release Lever Method

All you need to do to release the brake is push the release lever over. (See Figure 8-43)

- (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.)

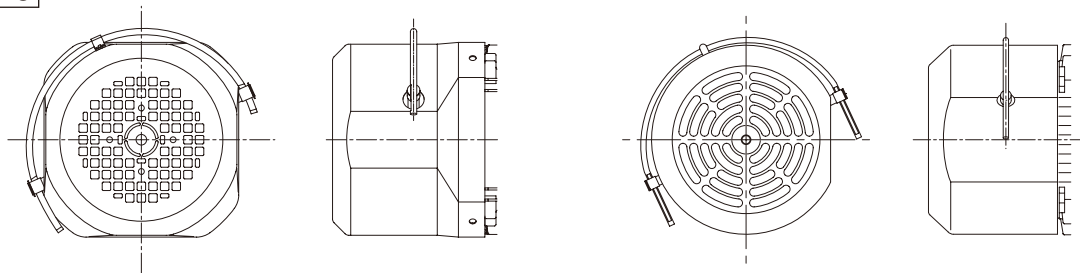
Be careful not to push the lever too far. Pushing the lever too far could damage the brake.

(Push the release lever while checking to see if the brake is released.)

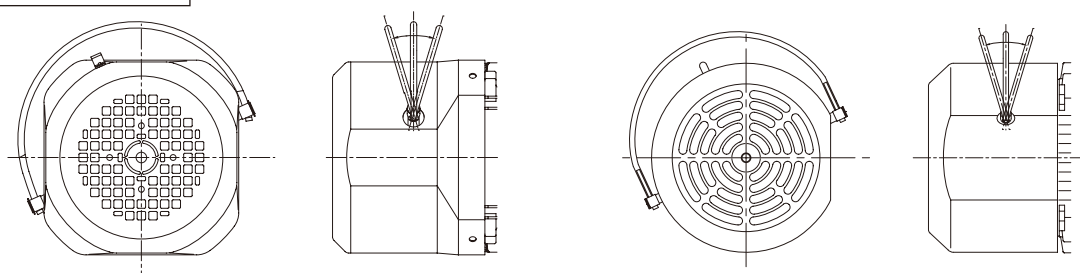
- (2) When operating the motor, make certain to return the lever to its original position and set it inside the holder. Start operation after confirming that the brake operates properly.

Note: While the lever is held down, the brake remains released. When the lever is released, the brake is applied.

When Operating



When Brake is Manually Released



Premium Efficiency Motor

Other than Premium Efficiency Motor

Figure 8-43

# 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 a specified switch.
		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.
Excessive temperature rise	Fuse tripping	The lead wire is short circuited.	Confer with authorized service station.
		Poor contact between motor and starter	Make good connection.
		Overload	Decrease the load to the specified value.
		Voltage drop or rise	Contact the electric power company.
Abnormal sound Excessive vibration		The ambient temperature is high	Improve the ventilation method.
		Damaged bearing	Confer with authorized service station.
		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.
Abnormal motor sounds		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.
		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 P52 - 82.)
		Wear of the brake lining or inner disc	Request brake lining and inner disc 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.



# 9. Troubleshooting

Table 9-2 Troubleshooting

Problem		Cause	Correction
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 and inner disc	Request cleaning from authorized service station.
		Wear of the brake lining or inner disc	Adjust the brake gap. Request brake lining and inner disc 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 Construction Drawing (Example: Direct-Coupled Motor for CYCLO Drive )

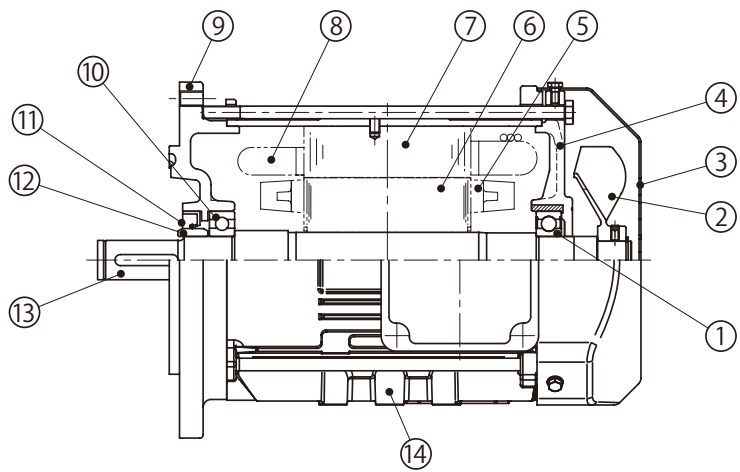


Table10-1 Principal Parts of Motor

Code	Parts Name
1	Anti-load side motor shaft bearing
2	Fan
3	Fan cover
4	Anti-load side cover
5	Rotor conductor
6	Rotor core
7	Stator core
8	Stator windings
9	Motor flange bracket
10	Load side motor shaft bearing
11	Oil seal
12	Oil seal collar
13	Motor shaft
14	Frame

Figure 10-1 Direct-Coupled Motor for CYCLO Drive (Sealed Bearing, Oil Seal Structure)  
(Example: N-100L 2.2kW 4P)

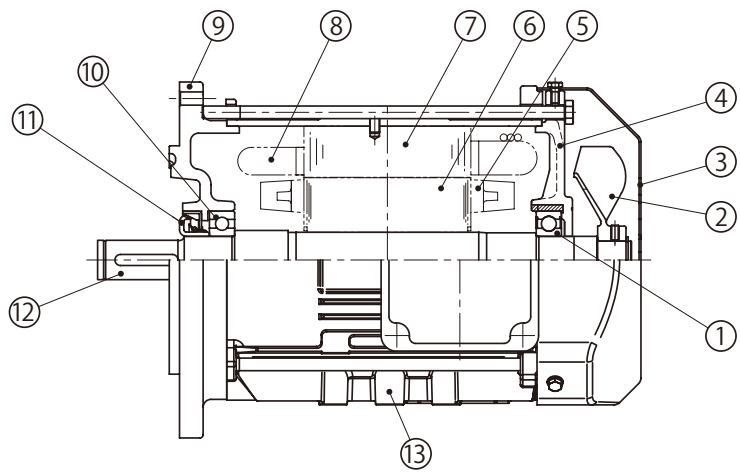


Table10-2 Principal Parts of Motor

Code	Parts Name
1	Anti-load side motor shaft bearing
2	Fan
3	Fan cover
4	Anti-load side cover
5	Rotor conductor
6	Rotor core
7	Stator core
8	Stator windings
9	Motor flange bracket
10	Load side motor shaft bearing
11	Slinger collar
12	Motor shaft
13	Frame

Figure 10-2 Direct-Coupled Motor for CYCLO Drive (Sealed Bearing, Slinger Collar Structure)  
(Example: N-100L 2.2kW 4P)

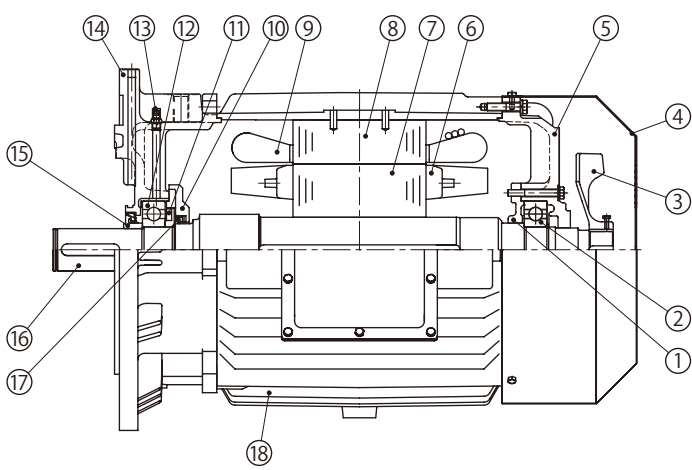


Table10-3 Principal Parts of Motor

Code	Parts Name
1	Bearing cover
2	Anti-load side motor shaft bearing
3	Fan
4	Fan cover
5	Anti-load side cover
6	Rotor conductor
7	Rotor core
8	Stator core
9	Stator windings
10	Bearing cover
11	Oil drain collar
12	Load side motor shaft bearing
13	Grease fitting
14	Motor flange bracket
15	Slinger collar
16	Motor shaft
17	Oil seal
18	Frame

Figure 10-3 Direct-Coupled Motor for CYCLO Drive (Open Bearing Structure)  
(Example: N-200LL 45kW 4P)

# 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 &amp; 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"><li>1. A breakdown resulting from defects in the mounting of the product and connection with other devices, etc.</li><li>2. A breakdown resulting from insufficient maintenance &amp; administration and improper handling of the product, including a case that the product is not stored according to our defined storage manual.</li><li>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.</li><li>4. A breakdown resulting from defects in or special specification of devices, etc. connected by customers.</li><li>5. A breakdown resulting from modification or reconstruction of the product.</li><li>6. A breakdown resulting from defects in parts supplied or specified by customers.</li><li>7. A breakdown caused by inevitable force including earthquake, fire, flood disaster, salt damage, gas damage, and lightning strike, etc.</li><li>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.</li><li>9. A breakdown caused for reasons not attributable to each of the above item.</li></ol>





# Worldwide Locations

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## Power Transmission & Controls Group

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