



**MITSUBISHI
ELECTRIC**
INVERTER
FR-F700PJ



INSTRUCTION MANUAL (BASIC)

FR-F720PJ-0.4K to 15K (F)
FR-F740PJ-0.4K to 15K (F)

Thank you for choosing this Mitsubishi Electric Inverter.
This Instruction Manual (Basic) provides handling information and precautions for use of the equipment.
Please forward this Instruction Manual (Basic) to the end user.

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 **For the customers intending to use IPM motors** **23**

This inverter is set for a general-purpose motor in the initial settings.
For use with an IPM motor, refer to page 23.

 **To obtain the Instruction Manual (Applied)**

Contact where you purchased the inverter, your Mitsubishi Electric sales representative, or the nearest Mitsubishi Electric FA Center for the following manual:

- *Instruction Manual (Applied)* [IB(NA)-0600426ENG]

This manual is required if you are going to utilize functions and performance.

The PDF manuals are also available for download at the Mitsubishi Electric FA Global Website (URL: <http://www.MitsubishiElectric.co.jp/fa/>).

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This Instruction Manual (Basic) provides handling information and precautions for use of the equipment. Please forward this Instruction Manual (Basic) to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through the Instruction Manual (Basic) and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.

In this Instruction Manual (Basic), the safety instruction levels are classified into "WARNING" and "CAUTION".

WARNING Incorrect handling may cause hazardous conditions, resulting in death or severe injury.

CAUTION Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.

The **CAUTION** level may even lead to a serious consequence according to conditions. Both instruction levels must be followed because these are important to personal safety.

1. Electric Shock Prevention

WARNING

- While the inverter power is ON, do not remove the front cover or the wiring cover. Do not run the inverter with the front cover or the wiring cover removed. Otherwise you may access the exposed high voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is OFF, do not remove the front cover except for wiring or periodic inspection. You may accidentally touch the charged inverter circuits and get an electric shock.
- Before wiring or inspection, power must be switched OFF. To confirm that, LED indication of the operation panel must be checked. (It must be OFF.) Any person who is involved in wiring or inspection shall wait for at least 10 minutes after the power supply has been switched OFF and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.
- This inverter must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical code (NEC section 250, IEC 61140 class 1 and other applicable standards). A neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard must be used.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The inverter must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Setting dial and key operations must be performed with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
- Do not change the cooling fan while power is ON. It is dangerous to change the cooling fan while power is ON.
- Do not touch the printed circuit board or handle the cables with wet hands. Otherwise you may get an electric shock.
- When measuring the main circuit capacitor capacity, the DC voltage is applied to the motor for 1s at powering OFF. Never touch the motor terminal, etc. right after powering OFF to prevent an electric shock.
- IPM motor is a synchronous motor with high-performance magnets embedded in the motor. Motor terminals hold high voltage while the motor is running even after the inverter power is turned OFF. Before wiring or inspection, the motor must be confirmed to be stopped. When the motor is driven by the load in applications such as fan and blower, a low-voltage manual contactor must be connected at the inverter's output side, and wiring and inspection must be performed while the contactor is open. Otherwise you may get an electric shock.

2. Fire Prevention

CAUTION

- Inverter (Filterpack) must be installed on a nonflammable wall without holes (so that nobody touches the inverter heatsink on the rear side, etc.). Mounting it to or near flammable material can cause a fire.
- If the inverter has become faulty, the inverter power must be switched OFF. A continuous flow of large current could cause a fire.
- When using a brake resistor, a sequence that will turn OFF power when a fault signal is output must be configured. Otherwise the brake resistor may overheat due to damage of the brake transistor and possibly cause a fire.
- Do not connect a resistor directly to the DC terminals P/+ and N/-. Doing so could cause a fire.
- Be sure to perform daily and periodic inspections as specified in the Instruction Manual. If a product is used without any inspection, a burst, breakage, or a fire may occur.

3. Injury Prevention

CAUTION

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise burst, damage, etc. may occur.
- Polarity must be correct. Otherwise burst, damage, etc. may occur.
- While power is ON or for some time after power-OFF, do not touch the inverter (Filterpack) since the inverter (Filterpack) will be extremely hot. Doing so can cause burns.

4. Additional Instructions

Also the following points must be noted to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and Mounting

CAUTION

- The product must be transported in correct method that corresponds to the weight. Failure to do so may lead to injuries.
- Do not stack the boxes containing inverters higher than the number recommended.
- The product must be installed to the position where withstands the weight of the product according to the information in the Instruction Manual.
- Do not install or operate the inverter (Filterpack) if it is damaged or has missing parts.
- When carrying the inverter, do not hold it by the front cover or setting dial; it may fall off or fail.
- Do not stand or rest heavy objects on the product.
- The inverter mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter (Filterpack). That includes screws and metal fragments or other flammable substance such as oil.
- Because the inverter (Filterpack) is a precision instrument, do not drop or subject it to impact.
- The inverter (Filterpack) must be used under the following environment conditions: Otherwise the inverter (Filterpack) may be damaged.

Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90%RH or less (non-condensing)
	Storage temperature	-20°C to +65°C *1
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
Altitude/vibration	Maximum 1000m. 5.9m/s ² or less at 10 to 55Hz *2 (directions of X, Y, Z axes)	

*1 Temperature applicable for a short time, e.g. in transit.
*2 When installing the Filterpack of 11K or 15K on the rear panel of the inverter, do not install on moving objects or places which vibrates (exceeding 1.96m/s²).

CAUTION

- If halogen-based materials (fluorine, chlorine, bromine, iodine, etc.) infiltrate into a Mitsubishi Electric product, the product will be damaged. Halogen-based materials are often included in fumigant, which is used to sterilize or disinfect wooden packages. When packaging, prevent residual fumigant components from being infiltrated into Mitsubishi Electric products, or use an alternative sterilization or disinfection method (heat disinfection, etc.) for packaging. Sterilization or disinfection of wooden package should also be performed before packaging the product.

(2) Wiring

CAUTION

- Do not install a power factor correction capacitor or surge suppressor/capacitor type filter on the inverter output side. These devices on the inverter output side may be overheated or burn out.
- The connection orientation of the output cables U, V, W to the motor affects the rotation direction of the motor.
- IPM motor terminals (U, V, W) hold high-voltage while the IPM motor is running even after the power is turned OFF. Before wiring, the IPM motor must be confirmed to be stopped. Otherwise you may get an electric shock.
- Never connect an IPM motor to the commercial power supply. Applying the commercial power supply to input terminals (U, V, W) of an IPM motor will burn the IPM motor. The IPM motor must be connected with the output terminals (U, V, W) of the inverter.

(3) Trial run

CAUTION

- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

(4) Usage

WARNING

- The IPM motor capacity must be same with the inverter capacity. (The 0.75K inverter can be used with a one-rank lower motor.)
- Do not use multiple IPM motors with one inverter.
- Any person must stay away from the equipment when the retry function is set as it will restart suddenly after trip.
- Since pressing  key may not stop output depending on the function setting status, separate circuit and switch that make an emergency stop (power OFF, mechanical brake operation for emergency stop, etc.) must be provided.
- OFF status of the start signal must be confirmed before resetting the inverter fault. Resetting inverter alarm with the start signal ON restarts the motor suddenly.
- Do not use an IPM motor in an application where a motor is driven by its load and runs at a speed higher than the maximum motor speed.
- A dedicated IPM motor must be used under IPM motor control. Do not use a synchronous motor, induction motor, or synchronous induction motor under IPM motor control.
- The inverter must be used for three-phase induction motors or the dedicated IPM motor. Connection of any other electrical equipment to the inverter output may damage the equipment.
- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the product.

CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter. Otherwise, the life of the inverter decreases.
- The effect of electromagnetic interference must be reduced by using an EMC filter or by other means. Otherwise nearby electronic equipment may be affected.
- Appropriate measures must be taken to suppress harmonics. Otherwise power supply harmonics from the inverter may heat/damage the power factor correction capacitor and generator.
- When driving a 400V class motor by the inverter, the motor must be an insulation-enhanced motor or measures must be taken to suppress surge voltage. Surge voltage attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations because all parameters return to the initial value.
- The inverter can be easily set for high-speed operation. Before changing its setting, the performances of the motor and machine must be fully examined.
- Stop status cannot be held by the inverter's brake function. In addition to the inverter's brake function, a holding device must be installed to ensure safety.
- Before running an inverter which had been stored for a long period, inspection and test operation must be performed.
- Static electricity in your body must be discharged before you touch the product. Otherwise the product may be damaged.
- Do not connect an IPM motor under the general-purpose motor control settings (initial settings). Do not use a general-purpose motor under the IPM motor control setting. Doing so will cause a failure.
- In the system with an IPM motor, the inverter power must be turned ON before closing the contacts of the contactor at the output side.

(5) Emergency stop

CAUTION

- A safety backup such as an emergency brake must be provided for devices or equipment in a system to prevent hazardous conditions in case of failure of the inverter or an external device controlling the inverter.
- When the breaker on the inverter input side trips, the wiring must be checked for fault (short circuit), and internal parts of the inverter for a damage, etc. The cause of the trip must be identified and removed before turning ON the power of the breaker.
- When any protective function is activated, appropriate corrective action must be taken, and the inverter must be reset before resuming operation.

(6) Maintenance, inspection and parts replacement

CAUTION

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.

(7) Disposal

CAUTION

- The inverter must be treated as industrial waste.

General instruction

Many of the diagrams and drawings in this Instruction Manual (Basic) show the inverter without a cover or partially open for explanation. Never operate the inverter in this manner. The cover must be always reinstalled and the instruction in this Instruction Manual (Basic) must be followed when operating the inverter. For more details on a dedicated IPM motor, refer to the Instruction Manual of the dedicated IPM motor.

<Abbreviation>

- PU: Operation panel and parameter unit (FR-PU04/FR-PU07)
- Inverter: Mitsubishi Electric inverter FR-F700PJ series
- FR-F700PJ: Mitsubishi Electric inverter FR-F700PJ series
- Pr.: Parameter number (Number assigned to function)
- PU operation: Operation using the PU (operation panel/FR-PU04/FR-PU07)
- External operation: Operation using the control circuit signals
- Combined operation: Operation using both the PU (operation panel/FR-PU04/FR-PU07) and External operation
- General-purpose motor: Three-phase induction motor
- Standard motor: SF-JR
- Constant-torque motor: SF-HRCA
- Filterpack: FR-BFP2
- IPM motor: Dedicated IPM motor MM-EF(1800r/min specification)

The following marks are used to indicate the controls as below.
(Parameters without any mark are valid for all controls.)

Mark	Control method	Applied motor (control)
	V/F control	Three-phase induction motor (general-purpose motor control)
	General-purpose magnetic flux vector control	
	IPM motor control	Dedicated IPM motor (IPM motor control)

<Trademark>

- Company and product names herein are the trademarks and registered trademarks of their respective owners.

<Mark>



REMARKS: Additional helpful contents and relations with other functions are stated.



NOTE: Contents requiring caution or cases when set functions are not activated are stated.



POINT: Useful contents and points are stated.

<Notes on descriptions in this Instruction Manual>

- Connection diagrams in this Instruction Manual appear with the control logic of the input terminals as sink logic, unless otherwise specified. (For the control logic, refer to *page 1*.)

<Related document>

 Refer to the *Instruction Manual (Applied)* for further information on the following points.

- Removal and reinstallation of the cover
- Connection of stand-alone option unit
- EMC and leakage currents
- Detailed explanation on parameters
- Troubleshooting
- Check first when you have a trouble
- Inspection items (life diagnosis, cooling fan replacement)
- Measurement of main circuit voltages, currents and powers
- For customers who are replacing the conventional model with this inverter

Harmonic suppression guideline (when inverters are used in Japan)

All models of general-purpose inverters used by specific consumers are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". (For further details,  refer to *Chapter 3 of the Instruction Manual (Applied)*.)

1 OUTLINE

1.1 Product checking and parts identification

Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

(1) Inverter

● Inverter model

FR- F740PJ - 1.5 K

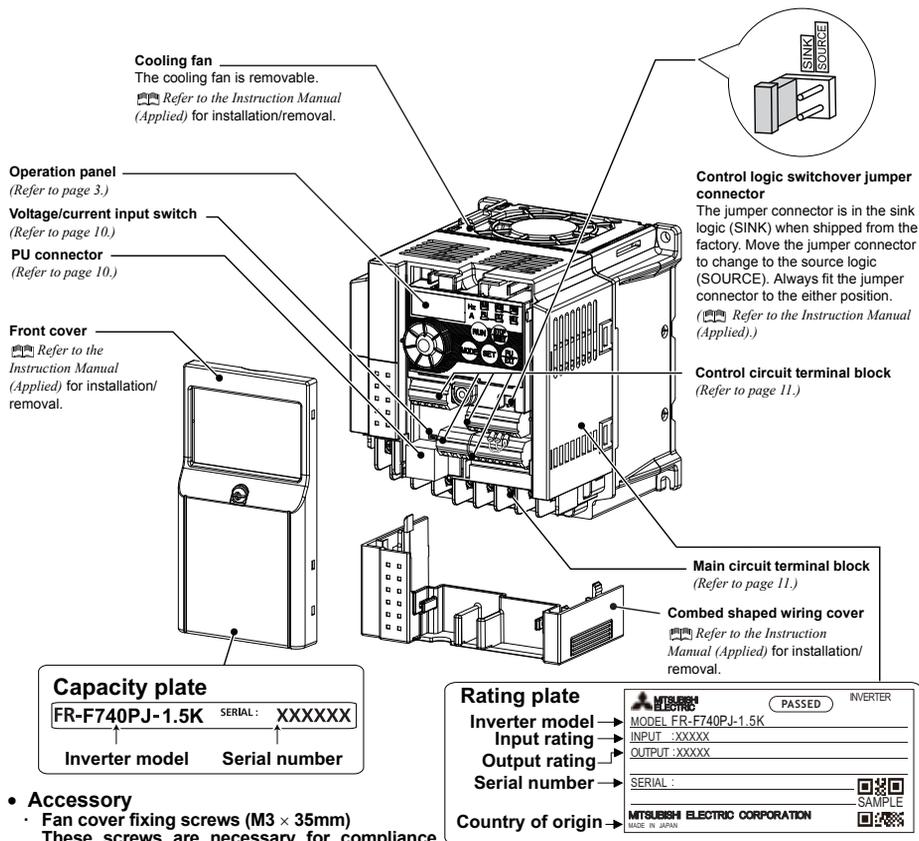
Symbol	Voltage class
F720PJ	Three-phase 200V class
F740PJ	Three-phase 400V class

Represents the inverter capacity [kW]

Symbol	Filterpack
None	Without
F	With

REMARKS

Filterpack (FR-BFP2) is enclosed for the inverter with Filterpack ("F" at the end of its model names marked on the packaging box.)



Capacity	Quantity
1.5K to 3.7K	1
5.5K to 15K	2



REMARKS

- For how to find the SERIAL number, refer to page 55.

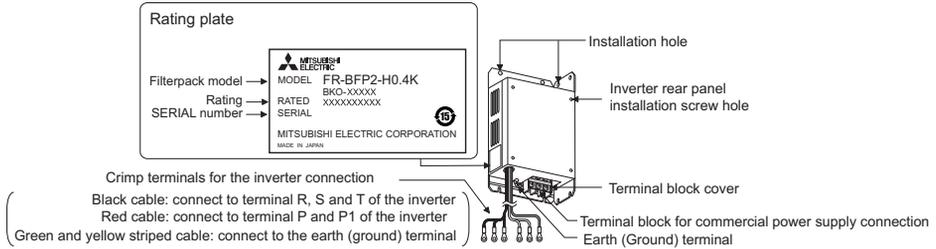
(2) Filterpack

●Filterpack model

FR-BFP2- H K

Symbol	Applicable power voltage		0.4 to 15	Represents the applicable inverter capacity (kW)
None	200V class			
H	400V class			

●Parts name and plate



●Enclosed items

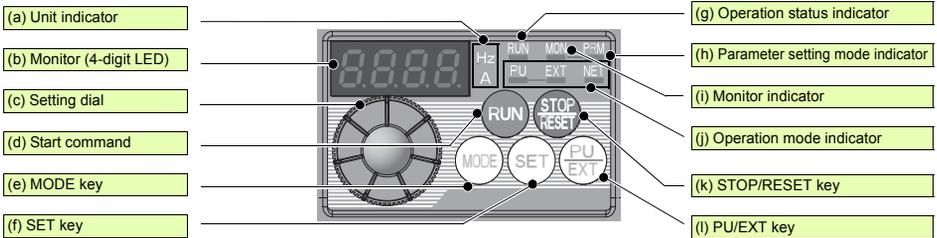
Name	Description	Quantity	Refer to page
Screw for leakage current countermeasure and spacer	When the earth leakage breaker or earth leakage relay operates unnecessarily due to leakage current, use this screw as a countermeasure.	1 for each	Instruction Manual (Applied)
Rear panel installation L-bracket	Enclosed for the 5.5K or higher	1	9
Screw for inverter rear panel installation	Use these screws for installation of Filterpack onto the inverter rear panel.	4*	9

* The screw size differs according to capacities. ((H)7.5K or lower: M4×14, (H)11K and (H)15K: M5×20)

1.2 Operation panel

1.2.1 Names and functions of the operation panel

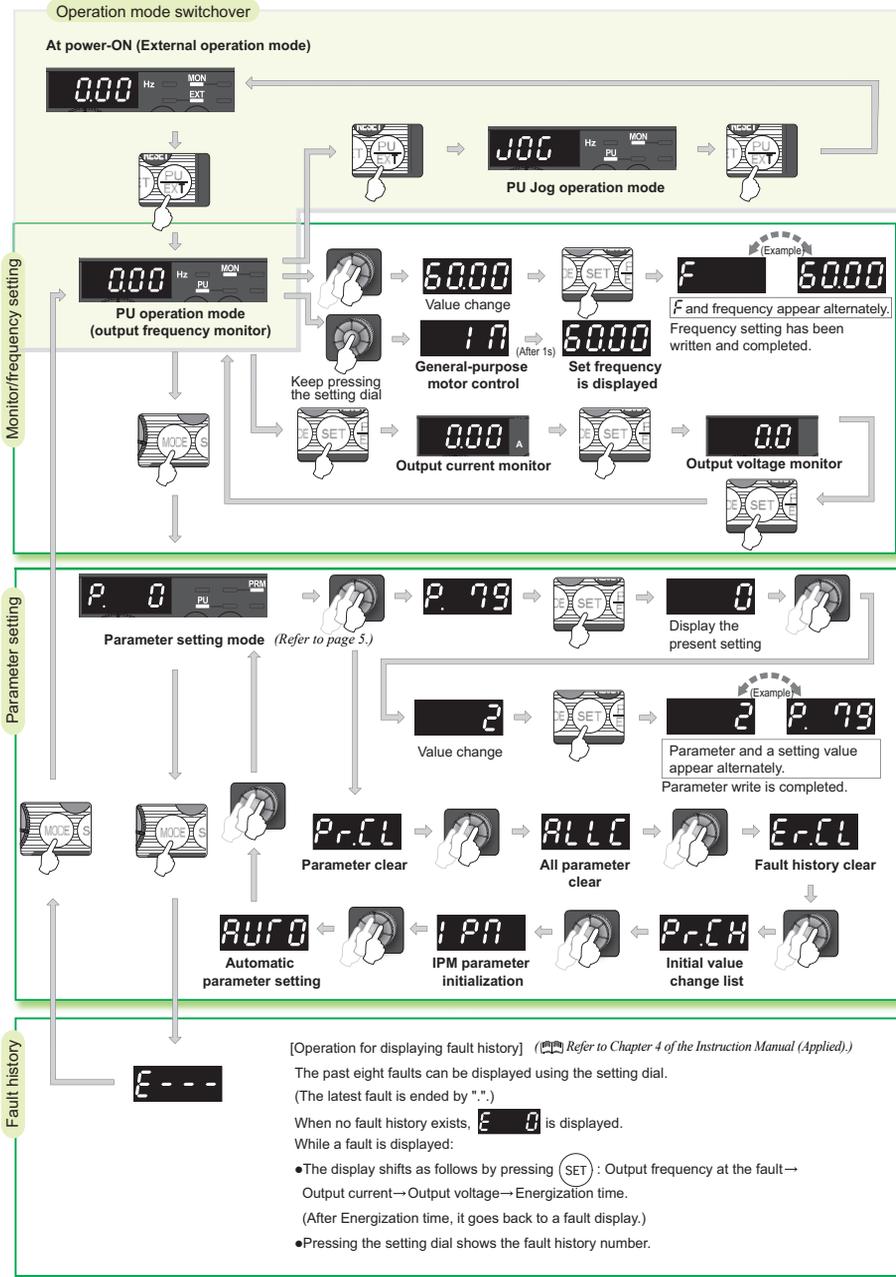
The operation panel cannot be removed from the inverter.



No.	Component	Name	Description
(a)		Unit indicator	Hz: Lit to indicate frequency. (Blinks when the set frequency monitor is displayed.) A: Lit to indicate current. (Both "Hz" and "A" turns OFF to indicate a value other than frequency or current.)
(b)		Monitor (4-digit LED)	Shows the frequency, parameter number, etc. (To monitor the output power, the set frequency and other items, set Pr: 52.)
(c)		Setting dial	The dial of the Mitsubishi Electric inverters. The setting dial is used to change the frequency and parameter settings. Press the setting dial to perform the following operations: <ul style="list-style-type: none"> To display a control method (general-purpose motor control or IPM motor control) during the monitor mode To display the set frequency when pressed for 1s or longer under PU operation mode or External/PU combined operation mode (Pr: 79 = "3") To display the present setting during calibration To display a fault history number in the fault history mode
(d)		Start command	Select the rotation direction in Pr: 40.
(e)		MODE key	Used to switch among different setting modes. Pressing simultaneously changes the operation mode. Holding this key for 2 seconds locks the operation. The key lock is invalid when Pr: 161 = "0 (initial setting)." (Refer to the Instruction Manual (Applied).)
(f)		SET key	Used to enter a setting. If pressed during the operation, monitored item changes as the following: <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 5px;"> Output frequency → Output current → Output voltage* </div> * Energy saving monitor is displayed when the energy saving monitor is set with Pr: 52.
(g)		Operation status indicator	Lit or blinks during inverter operation.* * Lit: When the forward rotation operation is being performed. Slow blinking (1.4s cycle): When the reverse rotation operation is being performed. Fast blinking (0.2s cycle): When has been pressed or the start command has been given, but the operation cannot be made. <ul style="list-style-type: none"> When the frequency command is less than the starting frequency. When the MRS signal is being input.
(h)		Parameter setting mode indicator	Lit to indicate the parameter setting mode.
(i)		Monitor indicator	Lit to indicate the monitor mode.
(j)		Operation mode indicator	PU: Lit to indicate the PU operation mode. EXT: Lit to indicate the External operation mode. (EXT is lit at power-ON in the initial setting.) NET: Lit to indicate the Network operation mode. PU and EXT: Lit to indicate EXT/PU combined operation mode 1 and 2. All of these indicators are OFF when the command source is not at the operation panel.
(k)		STOP/RESET key	Used to stop operation commands. Used to reset a fault when the protective function (fault) is activated.
(l)		PU/EXT key	Used to switch between the PU and External operation modes. To use the External operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indicator. (Press simultaneously (0.5s), or change the Pr:79 setting to change to the combined operation mode. (Refer to the Instruction Manual (Applied).) PU: PU operation mode EXT: External operation mode Used to cancel the PU stop also.

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1.2.2 Basic operation (factory setting)



1.2.3 Changing the parameter setting value

Operation example Change the Pr. 1 Maximum frequency setting.

Operation	
1.	Screen at power-ON The monitor display appears.
2.	Operation mode change Press  to choose the PU operation mode. PU indicator is lit.
3.	Parameter setting mode Press  to choose the parameter setting mode.
4.	Selecting the parameter number Turn  until "P. 1" (Pr. 1) appears.
5.	Reading the setting value Press  to read the present set value. "120.0" (120.0Hz (initial value)) appears.
6.	Changing the setting value Turn  to change the set value to "60.00" (60.00Hz).
7.	Setting the parameter Press  to set. The parameter number and the setting value blink alternately.



REMARKS

? **Er 1** to **Er 4** is displayed...Why?

 **Er 1** appears Write disable error

Er 2 appears Write error during operation

Er 3 appears Calibration error

Er 4 appears Mode designation error

For details,  refer to the *Instruction Manual (Applied)*.

- The number of digits displayed on the operation panel is four. Only the upper four digits of values can be displayed and set. If the values to be displayed have five digits or more including decimal places, the fifth or later numerals cannot be displayed nor set. (Example) For Pr. 1

When 60Hz is set, 60.00 is displayed.

When 120Hz is set, 120.0 is displayed and second decimal place is not displayed nor set.

1.2.4 Parameter clear/all parameter clear



POINT

- Set "1" in Pr.CL Parameter clear or ALLC all parameter clear to initialize parameters. (Parameters are not cleared when "1" is set in Pr. 77 Parameter write selection.)
- Refer to the extended parameter list of  the *Instruction Manual (Applied)* for parameters cleared with this operation.

Operation	
1.	Screen at power-ON The monitor display appears.
2.	Operation mode change Press  to choose the PU operation mode. PU indicator is lit.
3.	Parameter setting mode Press  to choose the parameter setting mode.
4.	Selecting Parameter Clear (All Parameter Clear) Turn  until "Pr.CL" ("ALLC") appears
5.	Selecting the setting value Press  to read the present set value. "0"(initial value) appears. Turn  to change it to the set value "1".
6.	Press to set. Press  to set. "1" and Pr. CL (ALLC) indications blink alternately.



REMARKS

? **1** and **Er 4** are displayed alternately ... Why?

 The inverter is not in the PU operation mode.

 PU connector or USB connector is used.

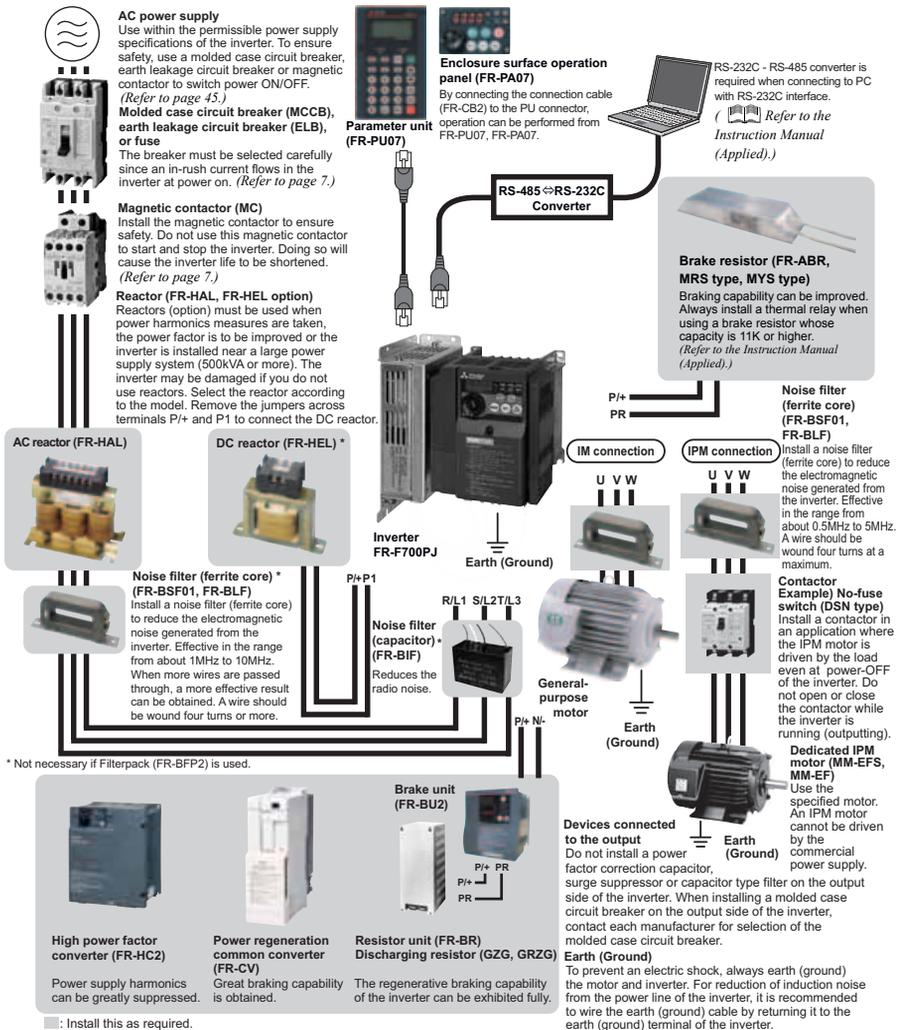
1. Press . [PU] is lit and the monitor (4-digit LED) displays "1". (When Pr. 79 = "0" (initial value))

2. Carry out operation from step 5 again.

- Stop the inverter. Parameter clear is unavailable when the inverter is running, and will cause the write disable error.

Setting	Description
0	Clear is not executed.
1	Sets parameters back to the initial values. (Parameter clear sets back all parameters except calibration parameters, terminal function selection parameters to the initial values.) Refer to the parameter list of  the <i>Instruction Manual (Applied)</i> for availability of parameter clear and all parameter clear.

2 INSTALLATION AND WIRING



NOTE

- The life of the inverter is influenced by surrounding air temperature. Use the product within the permissible surrounding air temperature. This must be noted especially when the inverter is installed in an enclosure. (Refer to Chapter 3 of the Instruction Manual (Applied).)
- Wrong wiring might lead to damage of the inverter. The control signal lines must be kept fully away from the main circuit to protect them from noise. (Refer to page 10.)
- Do not install a power factor correction capacitor, surge suppressor or capacitor type filter on the inverter output side. This will cause the inverter to trip or the capacitor and surge suppressor to be damaged. If any of the above devices are connected, immediately remove them.
- Electromagnetic wave interference
The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, install the FR-BIF optional EMC filter (capacitor) (for use in the input side only) or FR-BSF01 or FR-BLF EMC filter (ferrite core) to minimize interference. (Refer to Chapter 3 of the Instruction Manual (Applied).)
- Refer to the Instruction Manual of each option and peripheral devices for details of peripheral devices.
- An IPM motor cannot be driven by the commercial power supply.
- An IPM motor is a motor with permanent magnets embedded inside. High voltage is generated at the motor terminals while the motor is running. Before closing the contactor at the output side, make sure that the inverter power is ON and the motor is stopped.

2.1 Peripheral devices

Check the inverter model of the inverter you purchased. Appropriate peripheral devices must be selected according to the capacity. Refer to the following list and prepare appropriate peripheral devices.

Voltage	Inverter Model	Motor Output (kW) *1	Molded Case Circuit Breaker (MCCB) *2 or Earth Leakage Circuit Breaker (ELB) (NF or NV type)		Magnetic Contactor (MC) *3	
			Reactor or Filterpack Connection		Reactor or Filterpack Connection	
			Without	With	Without	With
200V class	FR-F720PJ-0.4K	0.4	5A	5A	S-T10	S-T10
	FR-F720PJ-0.75K	0.75	10A	5A	S-T10	S-T10
	FR-F720PJ-1.5K	1.5	15A	10A	S-T10	S-T10
	FR-F720PJ-2.2K	2.2	20A	15A	S-T10	S-T10
	FR-F720PJ-3.7K	3.7	30A	30A	S-T21	S-T10
	FR-F720PJ-5.5K	5.5	50A	40A	S-T35	S-T21
	FR-F720PJ-7.5K	7.5	60A	50A	S-T35	S-T35
	FR-F720PJ-11K	11	75A	75A	S-T35	S-T35
400V class	FR-F720PJ-15K	15	125A	100A	S-T50	S-T50
	FR-F740PJ-0.4K	0.4	5A	5A	S-T10	S-T10
	FR-F740PJ-0.75K	0.75	5A	5A	S-T10	S-T10
	FR-F740PJ-1.5K	1.5	10A	10A	S-T10	S-T10
	FR-F740PJ-2.2K	2.2	15A	10A	S-T10	S-T10
	FR-F740PJ-3.7K	3.7	20A	15A	S-T10	S-T10
	FR-F740PJ-5.5K	5.5	30A	20A	S-T21	S-T12
	FR-F740PJ-7.5K	7.5	30A	30A	S-T21	S-T21
	FR-F740PJ-11K	11	50A	40A	S-T21	S-T21
	FR-F740PJ-15K	15	60A	50A	S-T35	S-T21

*1 Assumes the power supply voltage is for a dedicated IPM motor or of a Mitsubishi Electric 50Hz 4-pole standard motor.

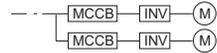
*2 Select an MCCB according to the power supply capacity.

Install one MCCB per inverter.

For the use in the United States or Canada, refer to *page 54*, and select an appropriate fuse or molded case circuit breaker (MCCB).

*3 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.

If using an MC for emergency stop during motor driving, select an MC regarding the inverter input side current as JEM1038-AC-3 class rated current. When using an MC on the inverter output side for commercial-power supply operation switching using a general-purpose motor, select an MC regarding the motor rated current as JEM1038-AC-3 class rated current.



NOTE

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model, and cable and reactor according to the motor output.
- When the breaker on the inverter input side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power ON the breaker.

2.2 Installation of the inverters and precautions

2.2.1 Installation of the inverter (without Filterpack)

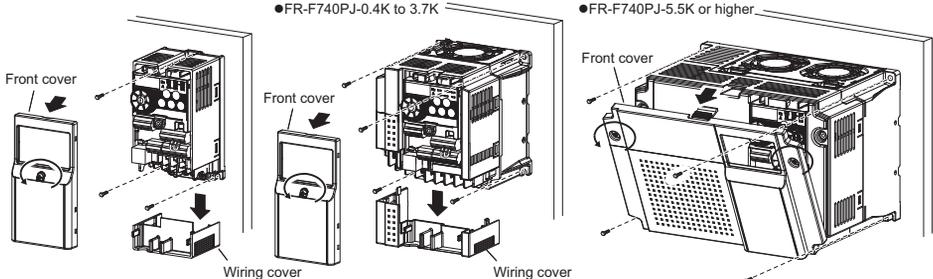
Enclosure surface mounting

Remove the front cover and wiring cover to mount the inverter to the surface. (Remove the covers in the directions of the arrows.)

●FR-F720PJ-0.4K, 0.75K

●FR-F720PJ-1.5K to 3.7K
●FR-F740PJ-0.4K to 3.7K

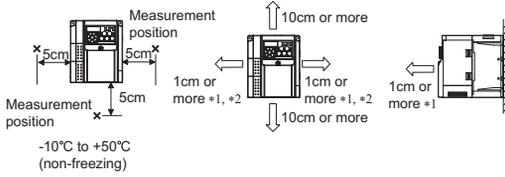
●FR-F720PJ-5.5K or higher
●FR-F740PJ-5.5K or higher





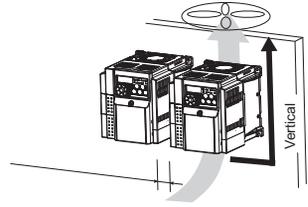
NOTE

- When encasing multiple inverters, install them in parallel as a cooling measure.
- Install the inverter vertically.
- For heat dissipation and maintenance, allow minimum clearance shown in the figures below from the inverter to the other devices and to the inner surface of the enclosure.



*1 Allow 5cm or more clearance for 5.5K or higher.

*2 When using the inverters at the surrounding air temperature of 40°C or less, the inverters can be installed without any clearance between them (0cm clearance).



2.2.2 Installation of the inverter and Filterpack (for rear panel installation)

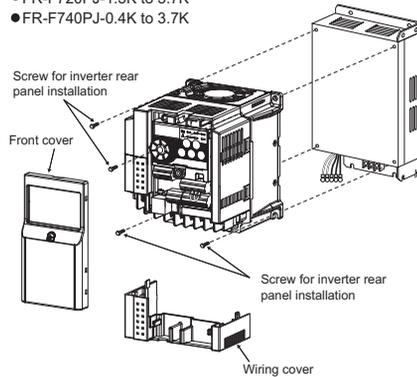
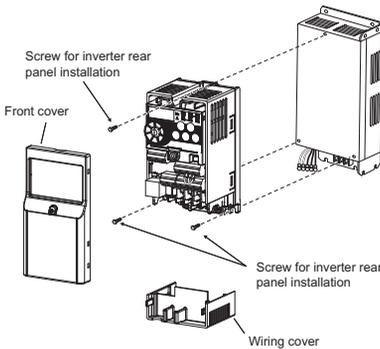
<0.4K to 3.7K>

Remove the front cover and wiring cover to attach the inverter.

● FR-F720PJ-0.4K to 0.75K

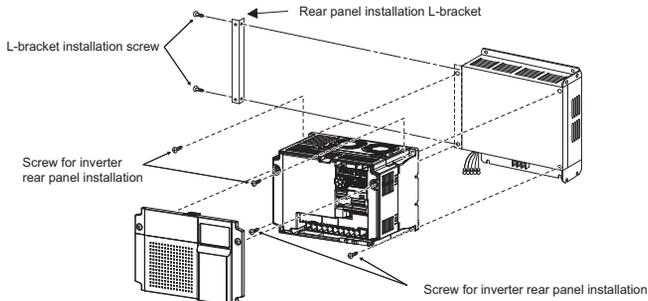
● FR-F720PJ-1.5K to 3.7K

● FR-F740PJ-0.4K to 3.7K



<5.5K to 15K>

Remove the L-bracket installation screws from Filterpack (two for the 7.5K or lower, three for the 11K or higher), and attach the included L-bracket to Filterpack with these screws. Remove the front cover to attach the inverter.



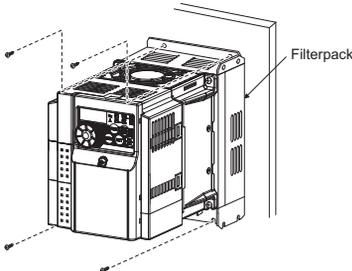
NOTE

- When encasing multiple inverters, install them in parallel as a cooling measure.
- Install the inverter (Filterpack) vertically.
- When installing the Filterpack to the inverter, use the included installation screws for the inverter rear panel. Using a longer screw may damage the Filterpack.
- Side-by-side installation is not available for Filterpacks.

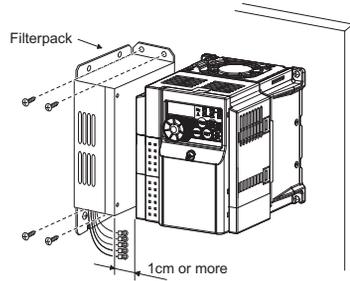
2.2.3 Installation of Filterpack

The following installations are recommended for Filterpack and the inverter. For wiring of Filterpack and the inverter, refer to *page 13*.

●Rear panel installation



●Side panel installation



NOTE

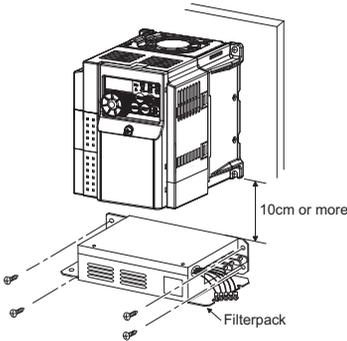
- When installing Filterpack of 11K or 15K on the rear panel of the inverter, do not install on moving objects or places which vibrates (exceeding 1.96m/s²).



NOTE

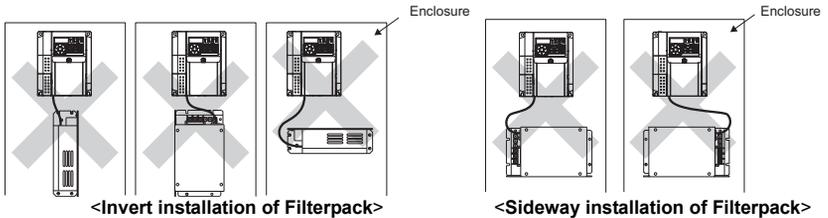
- To release heat of the inverter and Filterpack, leave clearance of 1 cm or more when installing the inverter and Filterpack.

●Underneath installation



NOTE

- Install Filterpack with the wiring portion facing right.
- Underneath installation is not available for 11K and 15K.
- To release heat, leave clearance of 10cm or more between the inverter and Filterpack.
- To prevent malfunctions and damages, never perform installations in the following manners. Only install according to the recommended mounting methods.



2.2.4 Environment

Before installation, check that the environment meets the specifications on *page 46*.



NOTE

- Install the inverter on a strong surface securely and vertically with bolts.
- Leave enough clearances and take cooling measures.
- Avoid places where the inverter is subjected to direct sunlight, high temperature and high humidity.
- Install the inverter on a nonflammable wall surface.

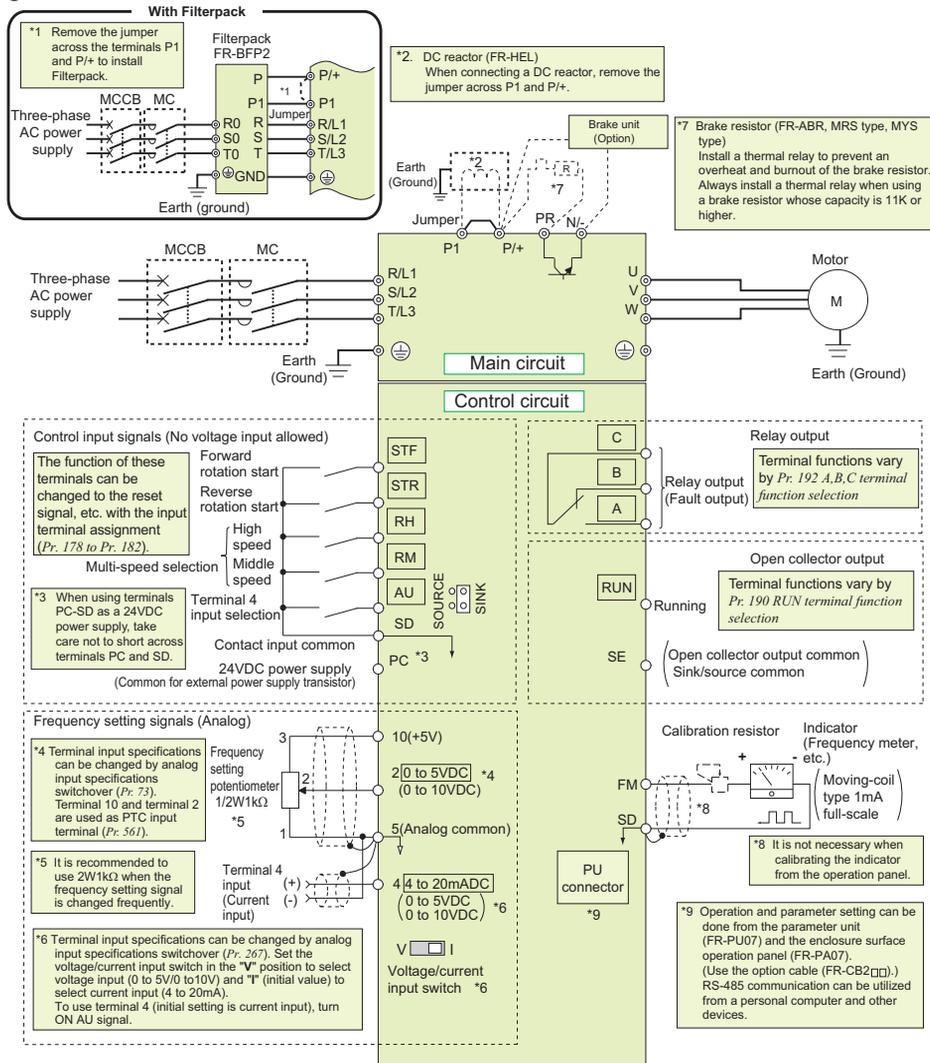
2.3 Wiring

2.3.1 Terminal connection diagram

Sink logic

⊙ Main circuit terminal

○ Control circuit terminal



NOTE

- To prevent a malfunction caused by noise, separate the signal cables more than 10cm from the power cables. Also separate the main circuit wire of the input side and the output side.
- After wiring, wire offsets must not be left in the inverter.
- Wire offsets can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.
- Terminals S1, S2, SC, and SO are for manufacturer setting. DO NOT remove the shortening wires across terminals S1 and SC and terminals S2 and SC.

2.3.2 Terminal specifications

Type	Terminal Symbol	Terminal Name	Terminal Specification			
Main circuit	Inverter	R/L1, S/L2, T/L3	AC power input	Connect to the commercial power supply. Do not connect anything to these terminals when using the high power factor converter (FR-HC2) or power regeneration common converter (FR-CV). To use Filterpack, connect the R, S, and T cables of Filterpack.		
		U, V, W	Inverter output	Connect a three-phase squirrel-cage motor or a dedicated IPM motor.		
		P/+, PR	Brake resistor connection	Connect a brake resistor (FR-ABR, MRS type, MYS type) across terminals P/+ and PR.		
		P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2), power regeneration common converter (FR-CV) or high power factor converter (FR-HC2).		
		P/+, P1	DC reactor (Filterpack) connection	Remove the jumper across terminals P/+ and P1 and connect a DC reactor. To use Filterpack, remove the jumper across the terminals P/+ and P1, then connect the P and P1 cables of Filterpack.		
			Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded). To use Filterpack, connect the GND cable of Filterpack.		
	Filterpack	R0, S0, T0	Commercial power supply input	Connect to the commercial power supply.		
			Earth (Ground)	For earthing (grounding) the Filterpack. Must be earthed (grounded).		
		R, S, T	Inverter power supply	Connect to R/L1, S/L2, and T/L3 of the inverter.		
		P, P1	DC reactor terminal	Remove the jumper across terminals P/+ and P1, and connect to the terminals P/+ and P1 of the inverter.		
		GND	Inverter earth (ground) connection	Connect to the earth (ground) terminal of the inverter.		
	Control circuit/Input signal	Contact input	STF	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop.	When the STF and STR signals are turned ON simultaneously, the stop command is given.
			STR	Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.	
			RH, RM	Multi-speed selection	Multi-speed can be selected according to the combination of RH and RM signals.	
AU			Terminal 4 input selection	The terminal 4 function is available only when the AU signal is ON. (the operation with the frequency setting signal of 4 to 20mA DC is available) Turning ON the AU signal disables the terminal 2 (voltage input) function.		
PC		SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.		
			External transistor common (source)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current.		
			24VDC power supply common	Common output terminal for 24VDC 0.1A power supply (PC terminal). Isolated from terminals 5 and SE.		
		PC	External transistor common (sink) (initial setting)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable current.		
			Contact input common (source)	Common terminal for contact input terminal (source logic).		
			24VDC power supply	Can be used as 24VDC 0.1A power supply.		
Frequency setting		10	Frequency setting power supply	Used as power supply when connecting potentiometer for frequency setting (speed setting) from outside of the inverter.	5VDC permissible load current 10mA	
		2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V) provides the maximum output frequency at 5V (10V) and makes input and output proportional. Use Pr: 73 to switch between input 0 to 5VDC input (initial setting) and 0 to 10VDC.	Input resistance 10kΩ ± 1kΩ Permissible maximum voltage 20VDC	
		4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA and makes input and output proportional. The input signal to terminal 4 is valid only when the AU signal is ON (terminal 2 input is invalid). Use Pr: 267 to switch from among input 4 to 20mA (initial setting), 0 to 5VDC and 0 to 10VDC. Set the voltage/current input switch in the "V" position to select voltage input (0 to 5V/0 to 10V).	Current input: Input resistance 249Ω ± 5Ω Maximum permissible current 30mA Voltage input: Input resistance 10kΩ ± 1kΩ Permissible maximum voltage 20VDC	
		5	Frequency setting common	Frequency setting signal (terminal 2 or 4) common terminal.	Do not earth (ground).	
Thermistor	10	PTC thermistor input	For connecting PTC thermistor output. When PTC thermistor protection is valid (Pr: 561 ≠ "9999"), terminal 2 is not available for frequency setting.	Adaptive PTC thermistor specification Heat detection resistance : 500Ω to 30kΩ (Set by Pr: 561)		
	2					

2

Type	Terminal Symbol	Terminal Name	Terminal Specification
Control circuit terminal/Output signal	Relay A, B, C	Relay output (fault output)	1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Fault: discontinuity across B-C (continuity across A-C). Normal: continuity across B-C (discontinuity across A-C) Contact capacity: 230VAC 0.3A (power factor =0.4) 30VDC 0.3A
	Open collector RUN	Inverter running	Switched Low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched High during stop or DC injection brake operation. (Low is when the open collector output transistor is ON (conducts). High is when the transistor is OFF (does not conduct).)
		SE	Open collector output common
	Pulse FM	For meter	Selected one e.g. output frequency from monitored items. (Not output during inverter reset.) The output signal is proportional to the magnitude of the corresponding monitored item.
Communication	—	PU connector	With the PU connector, communication can be established through RS-485. •Conforming standard: EIA-485 (RS-485) •Transmission format: Multidrop link •Communication speed: 4800 to 38400bps •Overall length: 500m

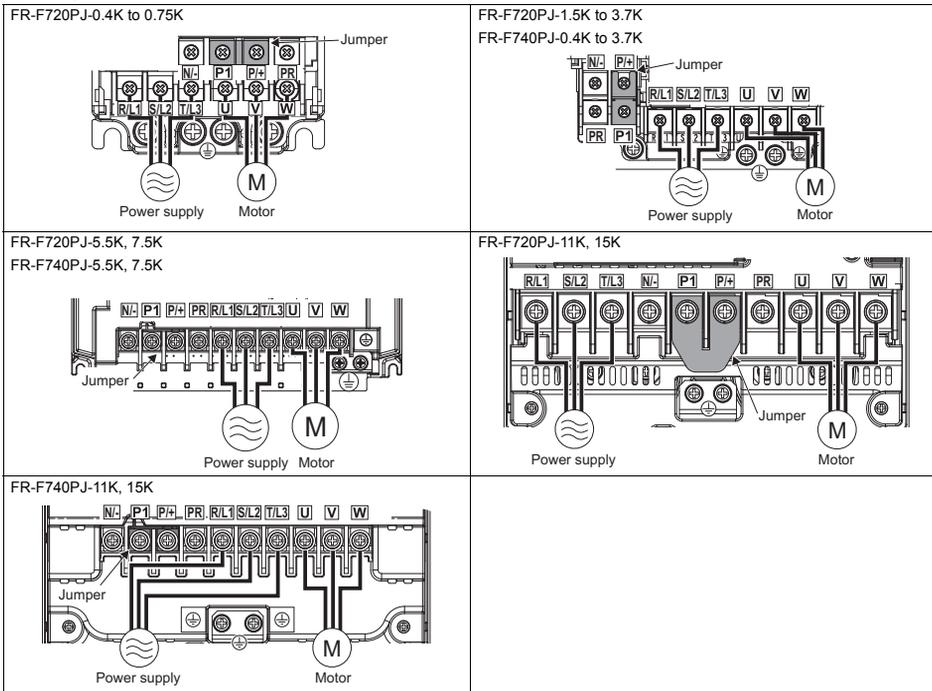


NOTE

- To change the input specification for terminal 4, set *Pr. 267* and the voltage/current input switch correctly, then input the analog signal relevant to the setting. Applying a voltage with voltage/current input switch in "I" position (current input is selected) or a current with switch in "V" position (voltage input is selected) could cause component damage of the inverter or analog circuit of output devices.
- Connecting the power supply to the inverter output terminals (U, V, W) will damage the inverter. Do not perform such wiring.
- indicates that terminal functions can be selected using *Pr. 178 to Pr. 182*, *Pr. 190* and *Pr. 192* (I/O terminal function selection).
- The terminal names and functions shown here are the initial settings.
- Terminals S1, S2, SC, and SO are for manufacturer setting. Do not connect anything to these. Doing so may cause an inverter failure. Do not remove the shortening wires across terminals S1 and SC and terminals S2 and SC. Removing either shortening wire disables the inverter operation.

2.3.3 Terminal arrangement of the main circuit terminal, power supply and the motor wiring

●Three-phase 200V/400V class



2



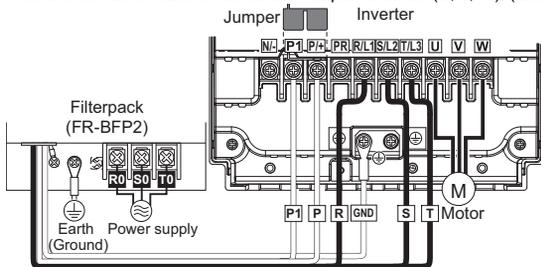
NOTE

- For the inverters without Filterpacks, make sure the power cables are connected to R/L1, S/L2, and T/L3. (Phase does not need to be matched.) Never connect the power cable to the U, V, and W of the inverter. Doing so will damage the inverter.
- Connect the motor to U, V, and W. Turning ON the forward rotation switch (signal) at this time rotates the motor counterclockwise when viewed from the load shaft.

2.3.4 Wiring of the inverter and Filterpack

Perform wiring of the inverter and Filterpack in the following procedure.

- (1) Connect the commercial power supply to terminals R0, S0 and T0 of the Filterpack.
- (2) Connect the earthing cable (green and yellow striped cable) of the Filterpack to the inverter earth (ground) terminal.
- (3) Connect the power supply cable (black cable) of the Filterpack to terminals R, S and T. (Phase sequence need not be matched.)
- (4) Remove the jumper across terminals P and P1 of the inverter, and connect the P and P1 cables (red cable) of the Filterpack.
- (5) Connect the motor cable to the inverter output terminals (U, V, W). (Match the phase sequence)



Connection example with FR-F740PJ-11K



NOTE

- For the inverters with Filterpacks, make sure the power cables are connected to terminals R0, S0, and T0 of the Filterpack (FR-BFP2). (Phase sequence does not need to be matched)
Never connect the power cable to the U, V, W of the inverter. Doing so will damage the inverter.
- When connecting Filterpack, make sure that the jumper across terminals P and P1 of the inverter is removed.
- Connect the GND cable of Filterpack to the earth (ground) terminal of the inverter.
Use the earth (ground) terminal of Filterpack for earthing (grounding). The inverter is earthed (grounded) through Filterpack.
- Connect the Filterpack terminals P and P1 to the inverter terminals of P/+ and P1, respectively. Improper connections may damage the inverter.

2.3.5 Cables and wiring length

(1) Applicable cable size

Select the recommended cable size to ensure that a voltage drop will be 2% at maximum.

If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.

The following table indicates a selection example for the wiring length of 20m.

Three-phase 200V class (when input power supply is 220V)

Applicable Inverter Model	Terminal Screw Size ^{*4}	Tightening Torque N·m	Crimp Terminal		Cable Size							
			HIV Cables, etc. (mm ²) ^{*1}		AWG ^{*2}		PVC Cables, etc. (mm ²) ^{*3}					
			R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earthing cable ^{*7}	R/L1 S/L2 T/L3	U, V, W	Earthing cable ^{*7}		
FR-F720PJ-0.4K to 0.75K	M3.5	1.2	2-3.5	2-3.5	2	2	2	14	14	2.5	2.5	2.5
FR-F720PJ-1.5K, 2.2K	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-F720PJ-3.7K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-F720PJ-5.5K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	10	10	6	6	6
FR-F720PJ-7.5K	M5	2.5	14-5	8-5	14	8	5.5	6	8	16	10	6
FR-F720PJ-11K	M5	2.5	14-5	14-5	14	14	8	6	6	16	16	16
FR-F720PJ-15K ^{*5}	M6 (M5)	4.4 (2.5)	22-6 (14-5)	22-6 (14-5)	22	22	14	4	4	25	25	16

Three-phase 400V class (when input power supply is 440V)

Applicable Inverter Model	Terminal Screw Size ^{*4}	Tightening Torque N·m	Crimp Terminal		Cable Size							
			HIV Cables, etc. (mm ²) ^{*1}		AWG ^{*2}		PVC Cables, etc. (mm ²) ^{*3}					
			R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earthing cable ^{*7}	R/L1 S/L2 T/L3	U, V, W	Earthing cable ^{*7}		
FR-F740PJ-0.4K to 3.7K	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-F740PJ-5.5K	M4	1.5	5.5-4	2-4	3.5	2	3.5	12	14	4	2.5	4
FR-F740PJ-7.5K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-F740PJ-11K	M4	1.5	5.5-4	5.5-4	5.5	5.5	5.5	10	10	6	6	10
FR-F740PJ-15K ^{*6}	M5 (M6)	2.5 (4.4)	8-5 (14-6)	8-5 (14-6)	8	8	5.5	8	8	10	10	10

^{*1} The cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 50°C or less and the wiring distance is 20m or less.

^{*2} The recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.

(For the use in the United States or Canada, refer to page 54.)

^{*3} The recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.

(Selection example for use mainly in Europe.)

^{*4} The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, PR, P/+, N/-, P1 and a screw for earthing (grounding). Terminal screw size for Filterpack (FR-BFP2) is same as the terminal screw size for the inverter.

^{*5} Screw size for earthing (grounding) the FR-F720PJ-15K is indicated in parenthesis.

^{*6} Screw sizes of the terminals R0, S0, and T0 and the earthing terminal of FR-BFP2-H15K are indicated in parenthesis.

^{*7} For the earthing cable size for Filterpack, use the same size as for the inverter.



NOTE

- Tighten the terminal screw to the specified torque. A screw that has been tightened too loosely can cause a short circuit or malfunction. A screw that has been tightened too tightly can cause a short circuit or malfunction due to the unit breakage.
- Use crimp terminals with insulation sleeve to wire the power supply and motor.

The line voltage drop can be calculated by the following formula:

$$\text{Line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance [m}\Omega/\text{m}] \times \text{wiring distance [m]} \times \text{current [A]}}{1000}$$

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

(2) Total wiring length

● Under general-purpose motor control

Connect one or more general-purpose motors within the total wiring length shown in the following table.

Voltage Class	Cable Type	Pr. 72 PWM frequency selection Setting (carrier frequency)	Wiring Length				
			0.4K	0.75K	1.5K	2.2K	3.7K or Higher
200V	Unshielded cable	1 (1kHz) or lower	300m	500m	500m	500m	500m
		2 (2kHz) or higher	200m	300m	500m	500m	500m
	Shielded cable	1 (1kHz) or lower	75m	100m	100m	100m	100m
		2 (2kHz) or higher	50m	75m	100m	100m	100m
400V	Unshielded cable	1 (1kHz) or lower	200m	200m	300m	500m	500m
		2 (2kHz) or higher	30m	100m	200m	300m	500m
	Shielded cable	1 (1kHz) or lower	50m	50m	75m	100m	100m
		2 (2kHz) or higher	10m	25m	50m	75m	100m

When driving a 400V class motor by the inverter, surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.

If that is the case, use a "400V class inverter-driven insulation-enhanced motor" and set frequency in Pr. 72 PWM frequency selection according to wiring length. (Refer to Chapter 3 in the Instruction Manual (Applied) to drive a 400V class motor with an inverter.)

Pr. 72 PWM frequency selection Setting (carrier frequency)	Wiring Length		
	50m or less	50m to 100m	Exceeding 100m
15 (14.5kHz) or less	8 (8kHz) or less	2 (2kHz) or less	

● Under IPM motor control

Use the following length of wiring or shorter when connecting an IPM motor.

Voltage Class	Cable Type	Pr. 72 PWM frequency selection Setting (carrier frequency)	Wiring Length			
			0.4K	0.75K	1.5K	2.2K or Higher
200V	Unshielded cable	4 (2.5kHz) or lower	100m	100m	100m	100m
		5 (5kHz) or higher	30m	30m	30m	30m
	Shielded cable	4 (2.5kHz) or lower	75m	100m	100m	100m
		5 (5kHz) or higher	30m	30m	30m	30m
400V	Unshielded cable	4 (2.5kHz) or lower	50m	100m	100m	100m
		5 (5kHz) or higher	30m	30m	30m	30m
	Shielded cable	4 (2.5kHz) or lower	50m	50m	75m	100m
		5 (5kHz) or higher	10m	25m	30m	30m

Use one dedicated IPM motor for one inverter. Multiple IPM motors cannot be connected to an inverter.



NOTE

- Especially for long-distance wiring, the inverter may be affected by a charging current caused by the stray capacitances of the wiring, leading to a malfunction of the overcurrent protective function, fast-response current limit function, or stall prevention function or a malfunction or fault of the equipment connected on the inverter output side. If malfunction of fast-response current limit function occurs, disable this function. If malfunction of stall prevention function occurs, increase the stall level.

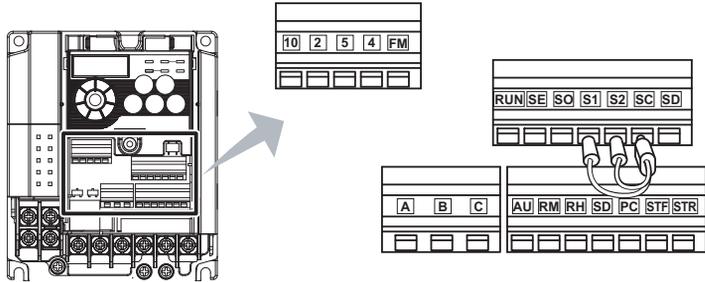
(Refer to Pr. 22 Stall prevention operation level and Pr. 156 Stall prevention operation selection in Chapter 4 of the Instruction Manual (Applied).)

- When using the automatic restart after instantaneous power failure function for a general-purpose motor with the wiring length longer than 100m, select "without frequency search" by setting Pr.162 = "1 or 11." (Refer to Chapter 4 of the Instruction Manual (Applied).)

2.3.6 Wiring of control circuit

(1) Control circuit terminal layout

Recommend wire size:
0.3mm² to 0.75mm²



NOTE

- Do not remove the shortening wires across the terminals S1 and SC and the terminals S2 and SC. Removing either shortening wire disables the inverter operation.

(2) Wiring method

●Wiring

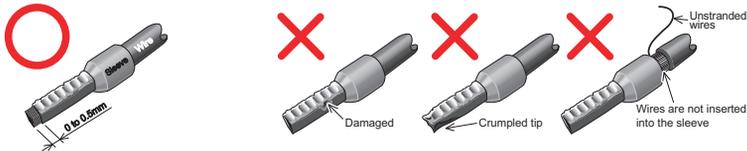
Use a blade terminal and a wire with a sheath stripped off for the control circuit wiring. For a single wire, strip off the sheath of the wire and apply directly. Insert the blade terminal or the single wire into a socket of the terminal.

- Strip off the sheath about the length below. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off. Wire the stripped wire after twisting it to prevent it from becoming loose. In addition, do not solder it.

Wire stripping length



- Crimp the blade terminal. Insert wires to a blade terminal, and check that the wires come out for about 0 to 0.5 mm from a sleeve. Check the condition of the blade terminal after crimping. Do not use a blade terminal of which the crimping is inappropriate, or the face is damaged.



Blade terminals available on the market: (as of January 2017)

●Phoenix Contact Co., Ltd.

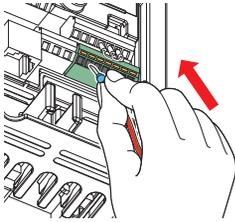
Wire Size (mm ²)	Ferrule Terminal Model			Crimping Tool Name
	With Insulation Sleeve	Without Insulation Sleeve	For UL Wire *1	
0.3	AI 0,34-10TQ	—	—	CRIMPFOX 6
0.5	AI 0,5-10WH	—	AI 0,5-10WH-GB	
0.75	AI 0,75-10GY	A 0,75-10	AI 0,75-10GY-GB	
1	AI 1-10RD	A1-10	AI 1-10RD/1000GB	
1.25, 1.5	AI 1,5-10BK	A1,5-10	AI 1,5-10BK/1000GB *2	
0.75 (for two wires)	AI-TWIN 2 x 0,75-10GY	—	—	

*1 A ferrule terminal with an insulation sleeve compatible with MTW wire which has a thick wire insulation
*2 Applicable for terminal ABC.

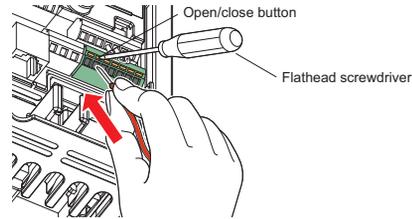
●NICHIFU Co., Ltd.

Wire Size (mm ²)	Blade Terminal Product Number	Insulation Cap Product Number	Crimping Tool Product Number
0.3 to 0.75	BT 0.75-11	VC 0.75	NH 69

3) Insert the wire into a socket.



When using a single wire or a stranded wire without a blade terminal, push an open/close button all the way down with a flathead screwdriver, and insert the wire.

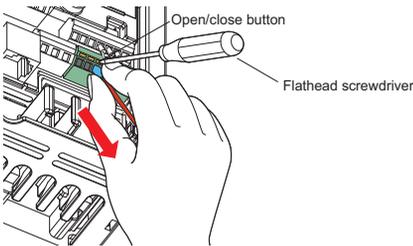


NOTE

- When using a stranded wire without a blade terminal, twist enough to avoid short circuit with a nearby terminals or wires.
- Place the flathead screwdriver vertical to the open/close button. In case the blade tip slips, it may cause to damage of inverter or injury.

●Wire removal

Pull the wire with pushing the open/close button all the way down firmly with a flathead screwdriver.



NOTE

- Pulling out the terminal block forcefully without pushing the open/close button all the way down may damage the terminal block.
- Use a small flathead screwdriver (Tip thickness: 0.4mm/ tip width: 2.5mm).
If a flathead screwdriver with a narrow tip is used, terminal block may be damaged.

Products available on the market: (as of February 2016)

Product	Type	Manufacturer
Flathead screwdriver	SZF 0- 0,4 x 2,5	Phoenix Contact Co., Ltd.

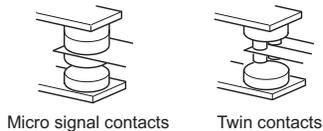
- Place the flathead screwdriver vertical to the open/close button. In case the blade tip slips, it may cause to damage of inverter or injury.

(3) Control circuit common terminals (SD, 5, SE)

- Terminals SD, SE and 5 are common terminals for I/O signals. (All common terminals are isolated from each other.) Do not earth them. Avoid connecting the terminals SD and 5 and the terminals SE and 5.
- Terminal SD is a common terminal for the contact input terminals (STF, STR, RH, RM, AU) and the pulse train output terminal (FM). The open collector circuit is isolated from the internal control circuit by photocoupler.
- Terminal 5 is a common terminal for the frequency setting signals (terminals 2 or 4). It should be protected from external noise using a shielded or twisted cable.
- Terminal SE is a common terminal for the open collector output terminal (RUN). The contact input circuit is isolated from the internal control circuit by photocoupler.

(4) Wiring instructions

- It is recommended to use the cables of 0.3mm² to 0.75mm² gauge for connection to the control circuit terminals.
- The maximum wiring length should be 30m (200m for terminal FM).
- Do not short across terminals PC and SD. Inverter may be damaged.
- When using contact inputs, use two or more parallel micro-signal contacts or twin contacts to prevent contact faults since the control circuit input signals are micro-currents.
- To suppress EMI, use shielded or twisted cables for the control circuit terminals and run them away from the main and power circuits (including the 200V relay sequence circuit). For the cables connected to the control circuit terminals, connect their shields to the common terminal of the connected control circuit terminal. When connecting an external power supply to the terminal PC, however, connect the shield of the power supply cable to the negative side of the external power supply. Do not directly earth (ground) the shield to the enclosure, etc.
- Always apply a voltage to the fault output terminals (A, B, C) via a relay coil, lamp, etc.
- When using an external power supply for transistor output, note the following points to prevent a malfunction caused by undesirable current.



Do not connect any terminal SD on the inverter and the 0V terminal of the external power supply (when the sink logic is selected).

Do not connect terminal PC on the inverter and the +24V terminal of the external power supply (when the source logic is selected).

Do not install an external power source in parallel with the internal 24VDC power source (connected to terminals PC and SD) to use them together.

Refer to Chapter 2 of the Instruction Manual (Applied) for the detail.

2.3.7 Assigning signals (output stop signal (MRS), reset signal (RES), etc.) to contact input terminals



POINT

- Use Pr.178 to Pr.182 (input terminal function selection) to select and change the functions assigned to input terminals.
To assign the output stop signal (MRS) to the terminal RH, for example, assign "24" to Pr.182 RH terminal function selection. (Refer to page 5 to change a parameter setting value.)

Pr.	Name	Initial Value	Range
178	STF terminal function selection	60	0: Low-speed operation command (RL) 1: Middle-speed operation command (RM) 2: High-speed operation command (RH) 25: Start self-holding selection (STOP) 60: Forward rotation (STF) *1
179	STR terminal function selection	61	3: Second function selection (RT) 4: Terminal 4 input selection (AU) 61: Reverse rotation (STR) *2 5: JOG operation selection (JOG) 62: Inverter reset (RES) 64: PID forward/reverse action switchover (X64) 65: PU-NET operation switchover (X65)
180	AU terminal function selection	4	66: External-NET operation switchover (X66) 7: External thermal relay input (OH) 8: Fifteen speed selection (REX) 67: Command source switchover (X67)
181	RM terminal function selection	1	10: Inverter operation enable signal (X10) (FR-HC2/FR-CV connection) 12: PU operation external interlock (X12) 72: PID integral value reset (X72) 14: PID control valid terminal (X14) 9999: No function
182	RH terminal function selection	2	16: PU-External operation switchover (X16) 24: Output stop (MRS) *1 Assigned to STF terminal (Pr. 178) only *2 Assigned to STR terminal (Pr. 179) only



NOTE

- Changing the terminal assignment using Pr.178 to Pr.182 (input terminal function selection) may affect the other functions. Set parameters after confirming the function of each terminal.

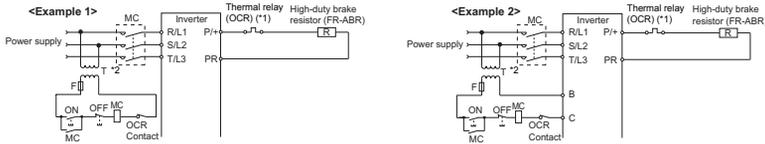
2.4 Connection of a dedicated external brake resistor (MRS type, MYS type, FR-ABR)

Install a dedicated brake resistor (MRS type, MYS type, FR-ABR) outside when the motor driven by the inverter is made to run by the load, quick deceleration is required, etc. Connect a dedicated brake resistor (MRS type, MYS type, FR-ABR) to terminals P/+ and PR. (For the locations of terminals P/+ and PR, refer to the terminal block layout (page 13).)

Set the parameters below. (Refer to the Instruction Manual (Applied) for the parameter details.)

Connected Brake Resistor	Pr. 30 Regenerative function selection Setting	Pr. 70 Special regenerative brake duty Setting	
MRS type, MYS type	0 (initial value)	—	
MYS type (used at 100% torque/6%ED)	1	6%	
FR-ABR	1	7.5K or lower	10%
		11K or higher	6%

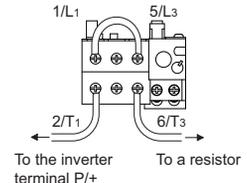
It is recommended to configure a sequence, which shuts off power in the input side of the inverter by the external thermal relay as shown below, to prevent overheat and burnout of the brake resistor (MRS type, MYS type) and high duty brake resistor (FR-ABR) in case the regenerative brake transistor is damaged.



- *1 Refer to the table below for the type number of each capacity of thermal relay and the diagram below for the connection. (Always install a thermal relay when using a brake resistor whose capacity is 11K or higher.)
- *2 When the power supply is 400V class, install a step-down transformer.

Power Supply Voltage	Brake Resistor	Thermal Relay Type (Mitsubishi Electric product)	Rated Operating Current
200V	MRS120W200	TH-T25-0.7A	120VAC: 2A (NO contact) / 3A (NC contact), 240VAC: 1A (NO contact) / 2A (NC contact) (AC15 class) 110VDC: 0.2A, 220VDC: 0.1A (DC13 class)
	MRS120W100	TH-T25-1.3A	
	MRS120W60	TH-T25-2.1A	
	MRS120W40	TH-T25-3.6A	
	MYS220W50 (two units in parallel)	TH-T25-5A	

Power Supply Voltage	High-duty Brake Resistor	Thermal Relay Type (Mitsubishi Electric product)	Rated Operating Current
200V	FR-ABR-0.4K	TH-T25-0.7A	120VAC: 2A (NO contact) / 3A (NC contact), 240VAC: 1A (NO contact) / 2A (NC contact) (AC15 class) 110VDC: 0.2A, 220VDC: 0.1A (DC13 class)
	FR-ABR-0.75K	TH-T25-1.3A	
	FR-ABR-2.2K	TH-T25-2.1A	
	FR-ABR-3.7K	TH-T25-3.6A	
	FR-ABR-5.5K	TH-T25-5A	
	FR-ABR-7.5K	TH-T25-6.6A	
	FR-ABR-11K	TH-T25-11A	
	FR-ABR-15K	TH-T25-11A	
400V	FR-ABR-H0.4K	TH-T25-0.24A	120VAC: 2A (NO contact) / 3A (NC contact), 240VAC: 1A (NO contact) / 2A (NC contact) (AC15 class) 110VDC: 0.2A, 220VDC: 0.1A (DC13 class)
	FR-ABR-H0.75K	TH-T25-0.35A	
	FR-ABR-H1.5K	TH-T25-0.9A	
	FR-ABR-H2.2K	TH-T25-1.3A	
	FR-ABR-H3.7K	TH-T25-2.1A	
	FR-ABR-H5.5K	TH-T25-2.5A	
	FR-ABR-H7.5K	TH-T25-3.6A	
	FR-ABR-H11K	TH-T25-6.6A	
FR-ABR-H15K	TH-T25-6.6A		



NOTE

- The brake resistor connected should only be the dedicated brake resistor.
- Perform wiring and operation according to the Instruction Manual of each option unit.
- Brake resistor cannot be used with the brake unit, high power factor converter, power supply regeneration converter, etc.
- Do not use the brake resistor (MRS type or MYS type) with a lead wire extended.
- Do not connect a resistor directly to terminals P/+ and N/-. This could cause a fire.

3 PRECAUTIONS FOR USE OF THE INVERTER

The FR-F700PJ series is a highly reliable product, but using incorrect peripheral circuits or incorrect operation/handling methods may shorten the product life or damage the product.

Before starting operation, always recheck the following items.

- (1) **Use crimp terminals with insulation sleeve to wire the power supply and motor.**
- (2) **Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Never perform such wiring.**
- (3) **After wiring, wire offcuts must not be left in the inverter (Filterpack).**

Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter (Filterpack) clean.
When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter (Filterpack).
- (4) **Use cables of the appropriate size to make a voltage drop of 2% or less.**

If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency. Refer to *page 22* for the recommended wire sizes.
- (5) **The total wiring length should be within the prescribed length.**

Especially for long distance wiring, the fast-response current limit function may decrease, or the equipment connected to the output side may malfunction. This is caused by a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. (*Refer to page 24.*)
- (6) **Electromagnetic wave interference**

The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. For an inverter without Filterpack, install the FR-BIF optional capacitor type filter (for use in the input side only), FR-BSF01 or FR-BLF line noise filter to minimize interference.
- (7) **Electrical corrosion of the bearing**

When a motor is driven by the inverter, axial voltage is generated on the motor shaft, which may cause electrical corrosion of the bearing in rare cases depending on the wiring, load, operating conditions of the motor or specific inverter settings (high carrier frequency, use of a capacitive filter*1).
The following shows examples of countermeasures for the inverter.

 - Decrease the carrier frequency.
 - Remove the capacitive filter.
 - Provide a common mode choke*2 on the output side of the inverter. (This is effective regardless of the use of the capacitive filter.)

*1 Mitsubishi Electric capacitive filter: FR-BIF, SF[], FR-E5NF-[], FR-S5NFS[A], FR-BFP2-[]
*2 Recommended common mode choke: FT-3KM F series FINEMETR® common mode choke cores manufactured by Hitachi Metals, Ltd.
FINEMETR is a registered trademark of Hitachi Metals, Ltd.
- (8) **Do not install a power factor correction capacitor, surge suppressor or capacitor type filter on the inverter output side.**

This will cause the inverter to trip or the capacitor and surge suppressor to be damaged. If any of the above devices are connected, immediately remove them.
- (9) **For some short time after the power is switched OFF, a high voltage remains in the smoothing capacitor.**

When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched OFF, and then make sure that the voltage across the main circuit terminals P/+ and N/- of the inverter is no more than 30VDC using a tester, etc.
- (10) **A short circuit or earth (ground) fault on the inverter output side may damage the inverter modules.**
 - Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits may damage the inverter modules. These short circuits may be caused by peripheral circuit inadequacy, an earth (ground) fault caused by wiring inadequacy, or reduced motor insulation resistance.
 - Fully check the to-earth (ground) insulation and phase to phase insulation of the inverter output side before power-on. Especially for an old motor or use in a hostile atmosphere, securely check the motor insulation resistance etc.

(11) Do not use the inverter input side magnetic contactor to start/stop the inverter.

Since repeated inrush currents at power ON will shorten the life of the converter circuit (switching life is about 1,000,000 times,) frequent starts and stops of the MC must be avoided. Turn ON/OFF the inverter start controlling terminals (STF, STR) to run/stop the inverter.

(12) Across terminals P/+ and PR, connect only an external brake resistor.

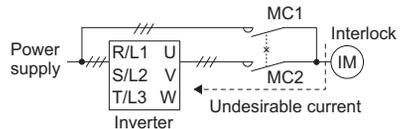
Do not connect a mechanical brake.

(13) Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.

Application of a voltage higher than the permissible voltage to the inverter I/O signal circuits or opposite polarity may damage the I/O devices. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short terminals 10 and 5.

(14) To use the commercial power supply, be sure to provide electrical and mechanical interlocks between the electronic bypass contactors MC1 and MC2.

When using a switching circuit as shown right, chattering due to misconfigured sequence or arc generated at switching may allow undesirable current to flow in and damage the inverter. Miswiring may also damage the inverter.



(15) If the machine must not be restarted when power is restored after a power failure, provide a magnetic contactor in the inverter's input side and also make up a sequence which will not switch ON the start signal.

If the start signal (start switch) remains ON after a power failure, the inverter will automatically restart as soon as the power is restored.

(16) Inverter input side magnetic contactor (MC)

On the inverter input side, connect a MC for the following purposes. (Refer to *page 7* for selection.)

- 1) To release the inverter from the power supply when a fault occurs or when the drive is not functioning (e.g. emergency stop operation). For example, MC avoids overheat or burnout of the brake resistor when heat capacity of the resistor is insufficient or brake regenerative transistor is damaged with short while connecting an optional brake resistor.
- 2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
- 3) To separate the inverter from the power supply to ensure safe maintenance and inspection work.

If using an MC for emergency stop during operation, select an MC regarding the inverter input side current as JEM1038-AC-3 class rated current.

(17) Handling of inverter output side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned ON while the inverter is operating, overcurrent protection of the inverter and such will activate. If an MC is provided to switch to the commercial power supply or for similar purposes under general-purpose motor control, switch the MC after the inverter and motor have stopped.

(18) Countermeasures against inverter-generated EMI

If electromagnetic noise generated from the inverter causes frequency setting signal to fluctuate and motor rotation speed to be unstable when changing motor speed with analog signal, the following countermeasures are effective.

- Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
- Run signal cables as far away as possible from power cables (inverter I/O cables).
- Use shield cables as signal cables.
- Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).

(19) Instructions for overload operation

When performing operation of frequent start/stop of the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a repeated flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current at locked condition, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. A counter action for this is to raise the permissible current level by increasing the inverter capacity (up to 2 ranks) when using a general-purpose motor, and by increasing the inverter and IPM motor capacities when using an IPM motor.

(20) Make sure that the specifications and rating match the system requirements.

4 FAILSAFE OF THE SYSTEM WHICH USES THE INVERTER

When a fault occurs, the inverter trips to output a fault signal. However, a fault output signal may not be output at an inverter fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi Electric assures best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to machine when the inverter fails for some reason and at the same time consider the system configuration where failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

(1) Interlock method which uses the inverter status output signals

By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

No.	Interlock Method	Check Method	Used Signals	Refer to Page
1)	Inverter protective function operation	Operation check of an alarm contact Circuit error detection by negative logic	Fault (ALM) signal	Refer to Chapter 4 of the Instruction Manual (Applied).
2)	Inverter operating status	Operation ready signal check	Operation ready (RY) signal	Refer to Chapter 4 of the Instruction Manual (Applied).
3)	Inverter running status	Logic check of the start signal and running signal	Start (STF/STR) signal Inverter running (RUN) signal	Refer to Chapter 4 of the Instruction Manual (Applied).
4)	Inverter running status	Logic check of the start signal and output current	Start (STF/STR) signal Output current detection (Y12) signal	Refer to Chapter 4 of the Instruction Manual (Applied).

(2) Backup method outside the inverter

Even if the interlock is provided by the inverter status signal, enough failsafe is not ensured depending on the failure status of the inverter itself. For example, when the inverter CPU fails, even if the interlock is provided using the inverter fault signal, start signal and RUN signal, there is a case where a fault signal is not output and RUN signal is kept output even if an inverter fault occurs.

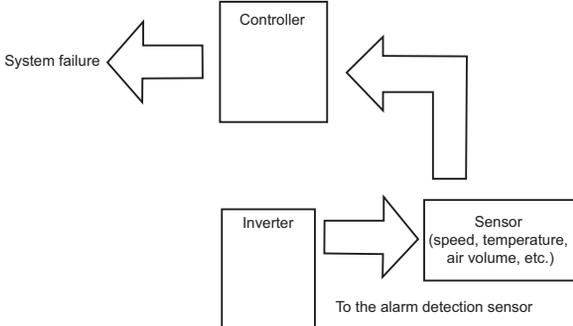
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as checking up as below according to the level of importance of the system.

1) Start signal and actual operation check

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the motor current runs as the motor is running for the period until the motor stops since the inverter starts decelerating even if the start signal turns OFF. For the logic check, configure a sequence considering the inverter deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.

2) Command speed and actual operation check

Check if there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.



5 DRIVING THE IPM MOTOR

Highly efficient motor control and highly accurate motor speed control can be performed by using the inverter with an IPM motor. The motor speed is detected by the output voltage and current of the inverter. It does not require a speed detector such as an encoder. The inverter drives the IPM motor with the least required current when a load is applied in order to achieve the highest motor efficiency.

 Refer to Chapter 4 of the Instruction Manual (Applied) for the details of the IPM motor control.



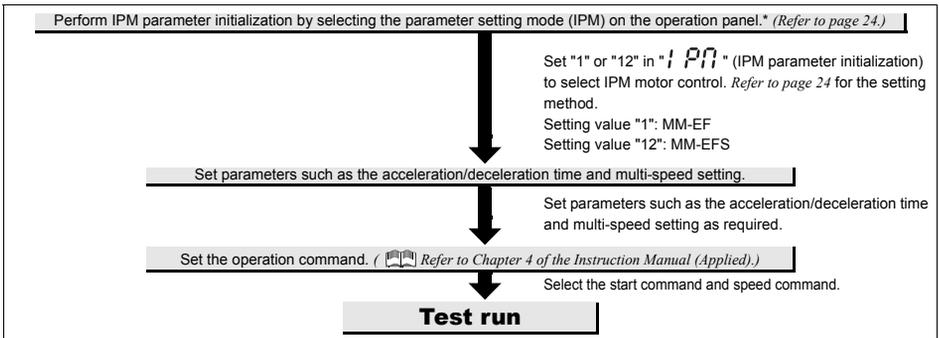
POINT

The following conditions must be met to perform IPM motor control.

- For the motor model, dedicated IPM motor (MM-EF (1800r/min specification)) must be used.
- The motor capacity must be equivalent to the inverter capacity.
- Single-motor operation (one motor run by one inverter) must be performed.
- The overall wiring length with the motor must be 100m or less (50m or less for the 400V class 0.4K).

5.1 Setting procedure of IPM motor control

This inverter is set for a general-purpose motor in the initial setting. Follow the following procedure to change the setting for the IPM motor control.



* Initialization is performed by setting Pr.998 IPM parameter initialization or by choosing the mode on the operation panel. To change to the IPM motor control, perform IPM parameter initialization at first. If parameter initialization is performed after setting other parameters, some of those parameters will be initialized too. ( Refer to Chapter 4 of the Instruction Manual (Applied) for the parameters that are initialized.)



REMARKS

- IPM motor control can also be selected with Pr. 80 Motor capacity and Pr. 998 IPM parameter initialization. ( Refer to Chapter 4 of the Instruction Manual (Applied).)
- To check the control method (general-purpose motor control/IPM motor control), simply press the setting dial while the monitor screen is displayed. ( Refer to Chapter 4 of the Instruction Manual (Applied).)



NOTE

- The selectable carrier frequencies under IPM motor control are 2.5kHz, 5kHz, 7.5kHz, 10kHz and 12.5kHz.
- Constant-speed operation cannot be performed in the low-speed range of less than 150r/min (for the 1500r/min specification MM-EFS) or 180r/min (for the 1800r/min specification MM-EFS). Generally, speed control can be performed in the range that satisfies the ratio, 1:10.
- During IPM motor control, the RUN signal is output about 100ms after turning ON the start command (STF, STR). The delay is due to the magnetic pole detection.
- The following operations and controls are disabled during IPM motor control: stop by power failure, Optimum excitation control, and speed smoothing control.
- The option surge voltage suppression filter (FR-ASF-H/FR-BMF-H) cannot be used under IPM motor control, so do not connect them.
- When parameter copy is performed from a FR-F700PJ series inverter, which is set to use MM-EFS under IPM motor control, check that IPM motor control is selected on the operation panel after the copy. When parameters are copied to a FR-F700PJ series inverter, which is not compatible with MM-EFS, General-purpose magnetic flux vector control is selected instead of IPM motor control.

(1) IPM motor control setting by selecting the parameter setting mode on the operation panel ("1 Pn")



POINT

The parameters required to drive an IPM motor are automatically changed as a batch. (Refer to the Instruction Manual (Applied).)

Operation example Initialize the setting of some parameters for the premium high-efficiency IPM motor (MM-EFS) control by changing the setting of Pr. IPM.

Operation	Display
<p>1. Screen at power-ON The monitor display appears.</p>	
<p>2. Parameter setting mode</p> <p>Press MODE to choose the parameter setting mode.</p>	<p style="font-size: small;">(The parameter number read previously appears.)</p>
<p>3. Selecting the parameter</p> <p>Turn ▲ until "1 Pn" (IPM parameter initialization) appears.</p>	
<p>4. Displaying the setting</p> <p>Press SET to read the currently set value.</p> <p>"0" (initial value) appears.</p>	
<p>5. Selecting the setting</p> <p>Turn ▲ to change it to the set value "12".</p>	
<p>6. Parameter setting</p> <p>Press SET to set.</p>	

Alternate display.....Parameter setting complete.

- Turn **▲** to read another parameter.
- Press **SET** to show the setting again.
- Press **SET** twice to show the automatic parameter setting (AUTO).

Setting	Description
0	Parameter settings for a general-purpose motor
1	Parameter settings for a high-efficiency IPM motor MM-EF (rotations per minute)
12	Parameter settings for a premium high-efficiency IPM motor MM-EFS (rotations per minute)

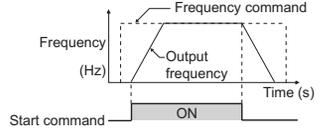


REMARKS

- Performing IPM parameter initialization in the parameter setting mode on the operation panel automatically changes the Pr.998 IPM parameter initialization setting.
- To check the control method (general-purpose motor control/IPM motor control), simply press the setting dial while the monitor screen is displayed. (Refer to Chapter 4 of the Instruction Manual (Applied).)
- The IPM parameter setting is displayed as "1, 12" in the parameter setting mode even if Pr.998 IPM parameter initialization = "101, 112".

6 DRIVING THE MOTOR

The inverter needs frequency command and start command.
 Frequency command (set frequency) determines the rotation speed of the motor.
 Turning ON the start command starts the motor to rotate.



REMARKS

- Set the required parameters according to the load and operating conditions. (Refer to page 34.)

6.1 Start/stop from the operation panel (PU operation)



POINT

From where is the frequency command given?

- Operation at the frequency set in the frequency setting mode of the operation panel (Refer to 6.1.1 (Refer to page 25).)
- Operation using the setting dial as the potentiometer (Refer to 6.1.2 (Refer to page 26).)
- Change of frequency with ON/OFF switches connected to terminals (Refer to 6.1.3 (Refer to page 27).)
- Perform frequency setting using voltage input signal (Refer to 6.1.4 (Refer to page 28).)
- Perform frequency setting using current input signal (Refer to 6.1.4 (Refer to page 28).)

6.1.1 Setting the frequency by the operation panel



Operation example Operate at 30Hz.

Operation

- Screen at power-ON
The monitor display appears.
- Operation mode change
Press **PU EXT** to choose the PU operation mode. PU indicator is lit.
- Frequency setting
Turn to show the frequency "30.00" (30.00Hz) you want to set. The frequency blinks for about 5s. While the value is blinking, press **SET** to set the frequency. "F" and "30.00" appear alternately. After about 3s, the indication of the value goes back to "0.00" (0.00Hz) (monitor display). (If **SET** is not pressed, the indication of the value goes back to "0.00" (0.00Hz) after about 5s of blinking. In that case, turn again, and set the frequency.)
- Start → acceleration → constant speed
Press **RUN** to start operation.
The frequency value on the display increases in Pr. 7 Acceleration time, and "30.00" (30.00Hz) appears.
(To change the set frequency, perform the operation in above step 3. The previously set frequency is displayed at first.)
- Deceleration → stop
Press **STOP RESET** to stop. The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with "0.00" displayed.



REMARKS

- can also be used like a potentiometer to perform operation. (Refer to Chapter 4 of the Instruction Manual (Applied).)
- When you always operate in the PU operation mode at power-ON, set Pr.79 Operation mode selection = "1" to choose the PU operation mode always.

6.1.2 Using the setting dial like a potentiometer to perform operation



POINT

- Set "0" (extended parameter valid) in *Pr. 160 User group read selection*.
- Set "1" (setting dial potentiometer mode) in *Pr. 161 Frequency setting/key lock operation selection*.

Operation example Change the frequency from 0Hz to 60Hz during operation

Operation

- 1.** Screen at power-ON
The monitor display appears.
- 2.** Operation mode change
Press  to choose the PU operation mode. PU indicator is lit.
- 3.** Selecting the setting dial mode
Change the *Pr. 160* setting to "0" and the *Pr. 161* setting to "1".
(Refer to *page 5* for change of the setting.)
- 4.** Start
Press  to start the inverter.
- 5.** Frequency setting
Turn  until "60.00" (60.00Hz) appears. The blinking frequency is the set frequency.
You need not press .



REMARKS

- If blinking "60.00" turns to "0.00", the *Pr. 161 Frequency setting/key lock operation selection* setting may not be "1".
- Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning the .
- (Use *Pr. 295 Magnitude of frequency change setting* to change the frequency setting increments of .)



NOTE

- When setting frequency by turning setting dial, the frequency goes up to the set value of *Pr. 1 Maximum frequency* (initial value: 120Hz). Adjust *Pr. 1 Maximum frequency setting* according to the application.

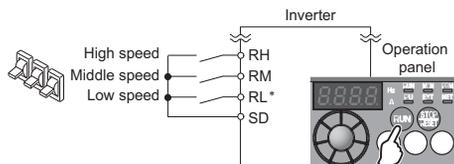
6.1.3 Setting the frequency by switches (three-speed setting) (Pr. 4 to Pr. 6)



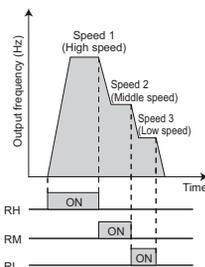
POINT

- Use the operation panel () to give a start command.
- Switch ON the RH, RM, or RL signal to give a frequency command.
- Set "4" (External/PU combined operation mode 2) in Pr. 79 Operation mode selection.

[Connection diagram]



* To input the RL signal, set "0" in any of Pr.178 to Pr.182 (Input terminal function selection) to assign the function to the terminal.



Operation example Operation at low speed (10Hz)

Operation

1. Screen at power-ON
The monitor display appears.
2. Easy operation mode setting
Press and for 0.5s. " - - " appears, and the [PRM] indicator blinks.
3. Operation mode selection
Turn until " - 4 " appears. [PU] and [PRM] indicators blink.
4. Operation mode setting
Press to enter the setting. (Set "4" in Pr.79.)
" - 4 " and " - - " appear alternately. [PU] and [EXT] indicators are lit.
5. Start
Turn ON the low-speed switch (RL).
Acceleration → constant speed
6. Press to start running.
The frequency value on the display increases in Pr. 7 Acceleration time, and " " (10.00Hz) appears.
[RUN] indicator is lit during forward rotation operation and blinks slowly during reverse rotation operation.
7. Deceleration
Press to stop.
The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with " " (0.00Hz) displayed.
8. Stop
Turn OFF the low-speed switch (RL).



REMARKS

- The initial settings of the RH, RM, and RL signals are 60Hz, 30Hz, and 10Hz. (Use Pr. 4, Pr. 5 and Pr. 6 to change.)
- In the initial setting, when two or three of multi-speed settings are simultaneously selected, priority is given to the set frequency of the lower signal.
For example, when the RH and RM signals turn ON, the RM signal (Pr. 5) has a higher priority.
- Maximum of 15-speed operation can be performed. (Refer to Chapter 4 of the Instruction Manual (Applied).)

6.1.4 Setting the frequency by analog input (voltage input/current input)

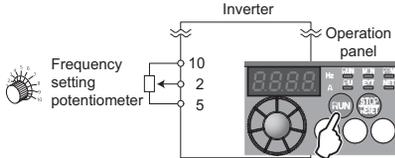


POINT

- Use the operation panel (RUN) to give a start command.
- Use the potentiometer (frequency setting potentiometer) (voltage input) or 4-to-20mA input (current input) to give a frequency command.
- Set "4" (External/PU combined operation mode 2) in Pr. 79 Operation mode selection.

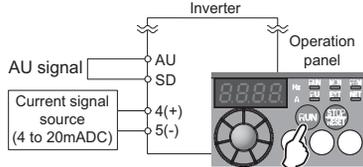
[Connection example for voltage input]

(The inverter supplies 5V power to the frequency setting potentiometer. (terminal 10))



[Connection example for current input]

Assign the AU signal in one of Pr. 178 to Pr. 182.



Operation example Operate at 60Hz.

Operation

- 1. Screen at power-ON**
 The monitor display appears.
- Assignment of the AU signal (current input) (Refer to the step 3 for voltage input.)**
 Set Pr. 160 to "0" to activate extended parameters.
 To assign the AU signal, set "4" in one of Pr. 178 to Pr. 182. (Refer to page 5 to change the setting.)
 Turn ON the AU signal.
- Easy operation mode setting**
 Press **PU/EXT** and **MODE** for 0.5s. "79 - -" appears, and the [PRM] indicator blinks.
- Operation mode selection**
 Turn **▲** until "79 - 4" appears. [PU] and [PRM] indicators blink.
- Operation mode setting**
 Press **SET** to enter the setting. (Set "4" in Pr.79.)
 "79 - 4" and "79 - -" appear alternately. [PU] and [EXT] indicators are lit.
- Start**
 Press **RUN**. [RUN] blinks fast as no frequency command is given.
- Acceleration → constant speed**
 For voltage input, turn the potentiometer (frequency setting potentiometer) clockwise slowly to full.
 For current input, input 20mA.
 The frequency value on the display increases in Pr. 7 Acceleration time, and "6000" (60.00Hz) appears.
 [RUN] indicator is lit during forward rotation operation and blinks slowly during reverse rotation operation.
- Deceleration**
 For voltage input, turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full.
 For current input, input 4mA.
 The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with "000" (0.00Hz) displayed.
 [RUN] blinks fast.
- Stop**
 Press **STOP/RESET**. [RUN] indicator turns OFF.



REMARKS

- For voltage input, the frequency (maximum potentiometer setting) at the full right turn of the (frequency setting) potentiometer is 60Hz in the initial setting. (To change the setting, use Pr.125.) (Refer to page 32.)
- To input 10VDC to terminal 2, set Pr. 73 Analog input selection = "0". The initial value is "1 (0 to 5V input)". (Refer to Chapter 4 of the Instruction Manual (Applied).)
- For current input, the frequency at 20mA input is 60Hz in the initial setting. (To change the setting, use Pr. 126.) (Refer to Chapter 4 of the Instruction Manual (Applied).)

6.2 Start and stop using terminals (External operation)



POINT

From where is the frequency command given?

- Operation at the frequency set in the frequency setting mode of the operation panel  refer to 6.2.1 (Refer to page 29.)
- Give a frequency command by switch (multi-speed setting)  refer to 6.2.2 (Refer to page 30.)
- Perform frequency setting by a voltage input signal  refer to 6.2.3 (Refer to page 31.)
- Perform frequency setting by a current input signal  refer to 6.2.3 (Refer to page 31.)

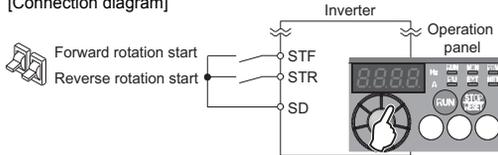
6.2.1 Setting the frequency by the operation panel (Pr. 79 = 3)



POINT

- Switch ON the STF (STR) signal to give a start command.
- Use the operation panel  to give a frequency command.
- Set "3" (External/PU combined operation mode 1) in Pr. 79.

[Connection diagram]



Operation example Operate at 30Hz.

Operation

- Screen at power-ON
The monitor display appears.
- Easy operation mode setting
Press  and  for 0.5s. "79 - -" appears, and the [PRM] indicator blinks.
- Operation mode selection
Turn  until "79 - 3" appears. [EXT] and [PRM] indicators blink.
- Operation mode setting
Press  to enter the setting. (Set "3" in Pr.79.)
"79 - 3" and "79 - -" appear alternately. [PU] and [EXT] indicators are lit.
- Frequency setting
Turn  to show the frequency "3000" you want to set. The frequency blinks for about 5s. While the value is blinking, press  to set the frequency. "F" and "3000" appear alternately. After about 3s of blinking, the indication of the value goes back to "000" (monitor display). (If  is not pressed, the indication of the value goes back to "000" (0.00Hz) after about 5s of blinking. In that case, turn  again, and set the frequency.)
- Start → acceleration → constant speed
Turn the start switch (STF or STR) ON.
The frequency value on the display increases in Pr. 7 Acceleration time, and "3000" (30.00Hz) appears. [RUN] indicator is lit during forward rotation operation and blinks during reverse rotation operation. (To change the set frequency, perform the operation in above step 5. The previously set frequency is displayed at first.)
- Deceleration → stop
Turn OFF the start switch (STF or STR). The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with "000" (0.00Hz) displayed. [RUN] turns OFF.

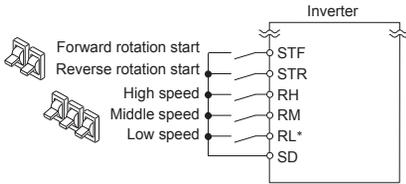
6.2.2 Setting the frequency by switches (three-speed setting) (Pr. 4 to Pr. 6)



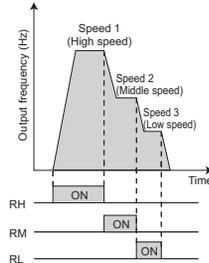
POINT

- Switch ON the STF (STR) signal to give a start command.
- Switch ON the RH, RM, or RL signal to give a frequency command.

[Connection diagram]



* To input the RL signal, set "0" in any of Pr.178 to Pr.182 (Input terminal function selection) to assign the function to the terminal.



Operation example Operation at high speed (60Hz)

Operation

1. Screen at power-ON
The monitor display appears.
2. Start
Turn ON the high-speed switch (RH).
Acceleration → constant speed
Turn ON the start switch (STF or STR). The frequency value on the display increases in Pr. 7 Acceleration time, and "60.00" (60.00Hz) appears.
[RUN] indicator is lit during forward rotation operation and blinks during reverse rotation operation.
 - When RM is turned ON, 30Hz is displayed. When RL is turned ON, 10Hz is displayed.
3. Deceleration
Turn OFF the start switch (STF or STR). The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with "0.00" (0.00Hz) displayed.
[RUN] turns OFF.
4. Stop
Turn OFF the high-speed switch (RH)



REMARKS

- To always select the External operation mode, set Pr.79 Operation mode selection = "2 (External operation mode)".
- Initial settings of RH, RM and RL signals are 60Hz, 30Hz, and 10Hz. (To change, set Pr. 4, Pr. 5 and Pr. 6.)
- In the initial setting, when two or three of multi-speed settings are simultaneously selected, priority is given to the set frequency of the lower signal.
For example, when the RH and RM signals turn ON, the RM signal (Pr. 5) has a higher priority.
- Maximum of 15-speed operation can be performed. (Refer to Chapter 4 of the Instruction Manual (Applied).)

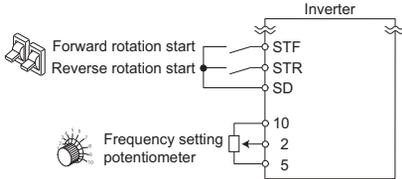
6.2.3 Setting the frequency by analog input (voltage input/current input)



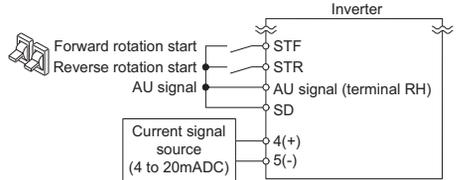
POINT

- Switch ON the STF (STR) signal to give a start command.
- Use the potentiometer (frequency setting potentiometer) (voltage input) or 4-to-20mA input (current input) to give a frequency command.

[Connection example for voltage input]
 (The inverter supplies 5V power to the frequency setting potentiometer. (terminal 10))



[Connection example for current input]
 Assign the AU signal in one of Pr. 178 to Pr. 182.



Operation example Operate at 60Hz.

Operation

1. Screen at power-ON
 The monitor display appears.
2. Assignment of the AU signal (current input) (Refer to the step 3 for voltage input.)
 Set Pr. 160 to "0" to activate extended parameters.
 To assign the AU signal, set "4" in one of Pr. 178 to Pr. 182. (Refer to page 5 to change the setting.)
 Turn ON the AU signal.
- Start
3. Turn the start switch (STF or STR) ON.
 [RUN] blinks fast because the frequency command is not given.
- Acceleration → constant speed
 For voltage input, turn the potentiometer (frequency setting potentiometer) clockwise slowly to full.
 For current input, input 20mA.
 The frequency value on the display increases in Pr. 7 Acceleration time, and "50.00" (60.00Hz) appears.
 [RUN] indicator is lit during forward rotation operation and blinks slowly during reverse rotation operation.
- Deceleration
 For voltage input, turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full.
 For current input, input 4mA.
 The frequency value on the display decreases in Pr. 8 Deceleration time, and the motor stops rotating with "0.00" (0.00Hz) displayed.
 [RUN] blinks fast.
- Stop
6. Turn the start switch (STF or STR) OFF.
 [RUN] turns OFF.



REMARKS

- For voltage input, the frequency (maximum potentiometer setting) at the full right turn of the (frequency setting) potentiometer is 60Hz in the initial setting. (To change the setting, use Pr.125.) (Refer to page 32.)
- To input 10VDC to the terminal 2, set Pr. 73 Analog input selection = "0". The initial value is "1 (0 to 5V input)". (Refer to Chapter 4 of the Instruction Manual (Applied).)
- For current input, the frequency at 20mA input is 60Hz in the initial setting. (To change the setting, use Pr. 126.) (Refer to Chapter 4 of the Instruction Manual (Applied).)
- To always select the External operation mode, set Pr. 79 Operation mode selection = "2 (External operation mode)".

6.2.4 Operating at 60Hz or higher using the external potentiometer

< How to change the maximum frequency >

Changing example

When you want to use 0 to 5VDC input frequency setting potentiometer to change the frequency at 5V from 60Hz (initial value) to 70Hz, make adjustment to output "70Hz" at 5V voltage input. Set "70Hz" in Pr: 125.

Operation

Parameter selection	
1.	Turn  until "P. 125" (Pr: 125) appears. Press  to show the present set value "60.00" (60.00Hz).
Changing the maximum frequency	
2.	Turn  to change the set value to "70.00" (70.00Hz). Press  to enter. "70.00" and "P. 125" appear alternately.
Mode/monitor check	
3.	Press  twice to choose the monitor/frequency monitor.
Start	
4.	Turn the start switch (STF or STR) ON. [RUN] blinks fast because the frequency command is not given.
Acceleration → constant speed	
5.	Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full. The frequency value on the display increases in Pr: 7 Acceleration time, and "70.00" (70.00Hz) appears. [RUN] indicator is lit during forward rotation operation and blinks slowly during reverse rotation operation.
Deceleration	
6.	Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full. The frequency value on the display decreases in Pr: 8 Deceleration time, and the motor stops rotating with "0.00" (0.00Hz) displayed. [RUN] blinks fast.
Stop	
7.	Turn the start switch (STF or STR) OFF. [RUN] turns OFF.



REMARKS

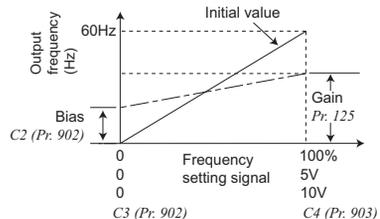
To change the value to 120Hz or more, the maximum frequency must be set to 120Hz or more.

? Use calibration parameter C2 to set frequency at 0V and calibration parameter C0 to adjust the meter.

() Refer to Chapter 4 of the Instruction Manual (Applied).

• To input 10VDC to the terminal 2, set Pr:73 Analog input selection = "0". The initial value is "1 (0 to 5V input)".

() Refer to Chapter 4 of the Instruction Manual (Applied).



As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied across terminals 2 and 5 or a method to adjust at any point without a voltage applied. () Refer to Chapter 4 of the Instruction Manual (Applied) for the setting method of calibration parameter C4.)

? Change the frequency (60Hz) at the maximum current input (20mA in the initial setting)

 Adjust it with Pr:126 Terminal 4 frequency setting gain frequency. () Refer to Chapter 4 of the Instruction Manual (Applied).

? Change the frequency (0Hz) at the minimum current input (4mA in the initial setting)

 Adjust with the calibration parameter C5 Terminal 4 frequency setting bias frequency. () Refer to Chapter 4 of the Instruction Manual (Applied).

7 ENERGY SAVING OPERATION FOR FANS AND PUMPS

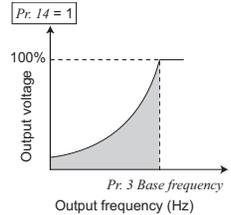
Set the following functions to perform energy saving operation for fans and pumps.

(1) Load pattern selection (Pr. 14)

Select the optimum output characteristic (V/F characteristic) that is suitable for the application and load characteristics.

- Set Pr.14 Load pattern selection = "1 (for variable-torque load)."
- When the output frequency is equal to or less than the base frequency, the output voltage changes by its square in proportion to the output frequency.

Use this setting to drive a load whose load torque changes in proportion to the square of the speed, such as a fan and a pump.



NOTE

- Load pattern selection is available only under V/F control. Load pattern selection is not available under IPM motor control and General-purpose magnetic flux vector control. (Refer to Chapter 4 of the Instruction Manual (Applied).)

(2) Optimum excitation control (Pr. 60)

Without a detailed parameter setting, the inverter automatically performs energy saving operation.

This operation is optimum for fan and pump applications.

- Set Pr.60 Energy saving control selection = "9 (optimum excitation control mode)."
- The Optimum excitation control mode is a control system which controls excitation current to improve the motor efficiency to the maximum and determines output voltage as an energy saving method.



REMARKS

- When the motor capacity is too small as compared to the inverter capacity or two or more motors are connected to one inverter, the energy saving effect is not expected.



NOTE

- When the Optimum excitation control mode is selected, deceleration time may be longer than the setting value. Since overvoltage alarm tends to occur as compared to the constant-torque load characteristics, set a longer deceleration time.
- Optimum excitation control is available only under V/F control. Optimum excitation control is not available under IPM motor control and General-purpose magnetic flux vector control. (Refer to Chapter 4 of the Instruction Manual (Applied).)
- Optimum excitation control will not be performed during an automatic restart after instantaneous power failure.
- Since output voltage is controlled by Optimum excitation control, output current may slightly increase.

8 PARAMETERS

Simple variable-speed operation can be performed with the inverter in the initial settings. Set the required parameters according to the load and operating conditions. Use the operation panel to set or change a parameter. (Refer to  Chapter 4 of the Instruction Manual (Applied) for the detailed description of parameters.)

8.1 Simple mode parameters



POINT

In the initial setting, only the simple mode parameters are displayed by the Pr. 160 Extended function display selection setting. Change the Pr. 160 Extended function display selection setting as required. (Refer to page 5 to change the parameter.)

Parameter Number	Name	Unit	Initial Value	Range	Application
0 	Torque boost	0.1%	6%/4%/3%/2%*	0 to 30%	Use this parameter to increase starting torque under V/F control. Use this when a loaded motor cannot be driven and the warning [OL] occurs, then the inverter trips with [OC1] under V/F control. * Initial value depends on the inverter capacity. (0.75K or lower/1.5K to 3.7K/5.5K, 7.5K/11K, 15K)
1	Maximum frequency	0.01Hz	120Hz	0 to 120Hz	Use this parameter to set the upper limit for the output frequency.
2	Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Use this parameter to set the lower limit for the output frequency.
3  	Base frequency	0.01Hz	60Hz	0 to 400Hz	Use this parameter when the rated motor frequency is 50Hz. Check the rating plate of the motor.
4	Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Use these parameters to change among pre-set operation speeds with the terminals. The speeds are pre-set with parameters.
5	Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz	
6	Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz	
7	Acceleration time	0.1s	5s/15s*	0 to 3600s	
8	Deceleration time	0.1s	10s/30s*	0 to 3600s	Use these parameters to set the acceleration/deceleration time. * Initial value depends on the inverter capacity. (7.5K or lower/11K, 15K)
9	Electronic thermal O/L relay	0.01A	Inverter rated current	0 to 500A	With this parameter, the inverter protects the motor from heat. Set the rated motor current.
79	Operation mode selection	1	0	0	External/PU switchover mode
				1	Fixed to PU operation mode
				2	Fixed to External operation mode
				3	External/PU combined operation mode 1 (Start command from External, frequency command from PU)
				4	External/PU combined operation mode 2 (Frequency command from External, start command from PU)
				6	Switchover mode
				7	External operation mode (PU operation interlock)
125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Use this parameter to change the frequency at the maximum potentiometer setting (SV in the initial setting)
126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Use this parameter to change the frequency at the maximum current input (20mA in the initial setting)
160	Extended function display selection	1	9999	0 9999	Simple mode + extended mode parameters are displayed. Only the simple mode parameters are displayed.
998	IPM parameter initialization	1	0	0, 1, 12, 101, 112	By performing IPM parameter initialization, IPM motor control is selected and the parameters, which are required to drive an IPM motor, are changed.

Parameter Number	Name	Unit	Initial Value	Range	Application
999	Automatic parameter setting	1	9999	10, 20, 21, 9999	Parameter settings are changed as a batch. Those include communication parameter settings for the Mitsubishi's human machine interface (GOT) connection and the parameter setting for the rated frequency settings of 50Hz/60Hz.
Pr.CL	Parameter clear	1	0	0, 1	Setting "1" returns all parameters except calibration parameters to the initial values.
ALLC	All parameter clear	1	0	0, 1	Setting "1" returns all parameters to the initial values.
Er.CL	Fault history clear	1	0	0, 1	Setting "1" clears eight past faults.
Pr.CH	Initial value change list	—	—	—	Displays and sets the parameters changed from the initial value.
IPM	IPM parameter initialization	1	0	0, 1, 12	Use this parameter to select the IPM motor control and to change parameter settings to the settings required to drive an IPM motor.
AUTO	Automatic parameter setting	—	—	—	Parameter settings are changed as a batch. Those include communication parameter settings for the Mitsubishi's human machine interface (GOT) connection and the parameter setting for the rated frequency settings of 50Hz.

8.2 Parameter list



REMARKS

- indicates simple mode parameters.
- The parameters surrounded by a black border in the table allow its setting to be changed during operation even if "0" (initial value) is set in *Pr. 77 Parameter write selection*.

Parameter	Name	Setting Range	Initial Value
● 0	Torque boost	0 to 30%	6/4/3/2% ⁺¹
● 1	Maximum frequency	0 to 120Hz	120Hz
● 2	Minimum frequency	0 to 120Hz	0Hz
● 3	Base frequency	0 to 400Hz	60Hz
● 4	Multi-speed setting (high speed)	0 to 400Hz	60Hz
● 5	Multi-speed setting (middle speed)	0 to 400Hz	30Hz
● 6	Multi-speed setting (low speed)	0 to 400Hz	10Hz
● 7	Acceleration time	0 to 3600s	5/15s ⁺²
● 8	Deceleration time	0 to 3600s	10/30s ⁺²
● 9	Electronic thermal O/L relay	0 to 500A	Inverter rated current
10	DC injection brake operation frequency	0 to 120Hz	3Hz
11	DC injection brake operation time	0 to 10s	0.5s
12	DC injection brake operation voltage	0 to 30%	4/2% ⁺⁴
13	Starting frequency	0 to 60Hz	0.5Hz
14	Load pattern selection	0, 1	1
15	Jog frequency	0 to 400Hz	5Hz
16	Jog acceleration/deceleration time	0 to 3600s	0.5s
17	MRS input selection	0, 2, 4	0
18	High speed maximum frequency	120 to 400Hz	120Hz
19	Base frequency voltage	0 to 1000V, 8888, 9999	9999
20	Acceleration/deceleration reference frequency	1 to 400Hz	60Hz
22	Stall prevention operation level	0 to 150%	120%

Parameter	Name	Setting Range	Initial Value
23	Stall prevention operation level compensation factor at double speed	0 to 200%, 9999	9999
24	Multi-speed setting (speed 4)	0 to 400Hz, 9999	9999
25	Multi-speed setting (speed 5)	0 to 400Hz, 9999	9999
26	Multi-speed setting (speed 6)	0 to 400Hz, 9999	9999
27	Multi-speed setting (speed 7)	0 to 400Hz, 9999	9999
29	Acceleration/deceleration pattern selection	0 to 2	0
30	Regenerative function selection	0 to 2	0
31	Frequency jump 1A	0 to 400Hz, 9999	9999
32	Frequency jump 1B	0 to 400Hz, 9999	9999
33	Frequency jump 2A	0 to 400Hz, 9999	9999
34	Frequency jump 2B	0 to 400Hz, 9999	9999
35	Frequency jump 3A	0 to 400Hz, 9999	9999
36	Frequency jump 3B	0 to 400Hz, 9999	9999
37	Speed display	0, 0.01 to 9998	0
40	RUN key rotation direction selection	0, 1	0
41	Up-to-frequency sensitivity	0 to 100%	10%
42	Output frequency detection	0 to 400Hz	6Hz
43	Output frequency detection for reverse rotation	0 to 400Hz, 9999	9999
44	Second acceleration/deceleration time	0 to 3600s	5/15s ⁺²

Parameter list

Parameter	Name	Setting Range	Initial Value
45	Second deceleration time	0 to 3600s, 9999	9999
46	Second torque boost	0 to 30%, 9999	9999
47	Second V/F (base frequency)	0 to 400Hz, 9999	9999
48	Second stall prevention operation current	0 to 150%, 9999	9999
51	Second electronic thermal O/L relay	0 to 500A, 9999	9999
52	DU/PU main display data selection	0, 5, 8 to 12, 14, 20, 23 to 25, 50 to 55, 61, 62, 64, 100	0
54	FM terminal function selection	1 to 3, 5, 8 to 12, 14, 21, 24, 50, 52, 53, 61, 62	1
55	Frequency monitoring reference	0 to 400Hz	60Hz
56	Current monitoring reference	0 to 500A	Inverter rated current
57	Restart coasting time	0, 0.1 to 5s, 9999	9999
58	Restart cushion time	0 to 60s	1s
59	Remote function selection	0 to 3	0
60	Energy saving control selection	0, 9	0
65	Retry selection	0 to 5	0
66	Stall prevention operation reduction starting frequency	0 to 400Hz	60Hz
67	Number of retries at fault occurrence	0 to 10, 101 to 110	0
68	Retry waiting time	0.1 to 600s	1s
69	Retry count display erase	0	0
70	Special regenerative brake duty	0 to 30%	0%
71	Applied motor	0, 1, 3, 13, 23, 40, 43, 50, 53, 120, 210	0
72	PWM frequency selection	0 to 15	1
73	Analog input selection	0, 1, 10, 11	1
74	Input filter time constant	0 to 8	1
75	Reset selection/disconnected PU detection/PU stop selection	0 to 3, 14 to 17	14
77	Parameter write selection	0 to 2	0
78	Reverse rotation prevention selection	0 to 2	0
79	Operation mode selection	0 to 4, 6, 7	0
80	Motor capacity	0.4 to 15kW, 9999	9999
82	Motor excitation current	0 to 500A, 9999	9999
83	Rated motor voltage	0 to 1000V	200/400V ^{±5}
84	Rated motor frequency	10 to 120Hz	60Hz
90	Motor constant (R1)	0 to 50Ω, 9999	9999
96	Auto tuning setting/status	0, 11, 21	0
117	PU communication station number	0 to 31 (0 to 247)	0
118	PU communication speed	48, 96, 192, 384	192
119	PU communication stop bit length	0, 1, 10, 11	1

Parameter	Name	Setting Range	Initial Value
120	PU communication parity check	0 to 2	2
121	Number of PU communication retries	0 to 10, 9999	1
122	PU communication check time interval	0, 0.1 to 999.8s, 9999	0
123	PU communication waiting time setting	0 to 150ms, 9999	9999
124	PU communication CR/LF selection	0 to 2	1
125	Terminal 2 frequency setting gain frequency	0 to 400Hz	60Hz
126	Terminal 4 frequency setting gain frequency	0 to 400Hz	60Hz
127	PID control automatic switchover frequency	0 to 400Hz, 9999	9999
128	PID action selection	0, 20, 21	0
129	PID proportional band	0.1 to 1000%, 9999	100%
130	PID integral time	0.1 to 3600s, 9999	1s
131	PID upper limit	0 to 100%, 9999	9999
132	PID lower limit	0 to 100%, 9999	9999
133	PID action set point	0 to 100%, 9999	9999
134	PID differential time	0.01 to 10s, 9999	9999
144	Speed setting switchover	2, 4, 6, 8, 10, 102, 104, 106, 108, 110	4
145	PU display language selection	0 to 7	0
146	Built-in potentiometer switching	0, 1	1
150	Output current detection level	0 to 150%	120%
151	Output current detection signal delay time	0 to 10s	0s
152	Zero current detection level	0 to 150%	5%
153	Zero current detection time	0 to 1s	0.5s
154	Voltage reduction selection during stall prevention operation	1, 11	1
156	Stall prevention operation selection	0 to 31, 100, 101	0
157	OL signal output timer	0 to 25s, 9999	0s
160	Extended function display selection	0, 9999	9999
161	Frequency setting/key lock operation selection	0, 1, 10, 11	0
162	Automatic restart after instantaneous power failure selection	0, 1, 10, 11	1
165	Stall prevention operation level for restart	0 to 150%	120%
166	Output current detection signal retention time	0 to 10s, 9999	0.1s
167	Output current detection operation selection	0, 1	0
168	Parameter for manufacturer setting. Do not set.		
169			
170	Watt-hour meter clear	0, 10, 9999	9999
171	Operation hour meter clear	0, 9999	9999

Parameter	Name	Setting Range	Initial Value
178	STF terminal function selection		60
179	STR terminal function selection	0 to 5, 7, 8, 10, 12, 14,	61
180	AU terminal function selection	16, 24, 25, 60 *6, 61 *7,	4
181	RM terminal function selection	62, 64 to 67, 72, 9999	1
182	RH terminal function selection		2
190	RUN terminal function selection	0, 1, 3, 4, 7, 8, 11 to 16, 25, 26, 46 to 48, 57, 64, 70, 79, 90, 91, 92 *8, 93 *8, 95, 96, 98 to 101, 103, 104, 107, 108, 111 to 116, 125, 126, 146 to 148, 157, 164, 170, 179, 190, 191, 192 *8, 193 *8, 195, 196, 198, 199, 9999	0
192	A,B,C terminal function selection		99
232	Multi-speed setting (speed 8)	0 to 400Hz, 9999	9999
233	Multi-speed setting (speed 9)	0 to 400Hz, 9999	9999
234	Multi-speed setting (speed 10)	0 to 400Hz, 9999	9999
235	Multi-speed setting (speed 11)	0 to 400Hz, 9999	9999
236	Multi-speed setting (speed 12)	0 to 400Hz, 9999	9999
237	Multi-speed setting (speed 13)	0 to 400Hz, 9999	9999
238	Multi-speed setting (speed 14)	0 to 400Hz, 9999	9999
239	Multi-speed setting (speed 15)	0 to 400Hz, 9999	9999
240	Soft-PWM operation selection	0, 1	1
241	Analog input display unit switchover	0, 1	0
244	Cooling fan operation selection	0, 1	1
245	Rated slip	0 to 50%, 9999	9999
246	Slip compensation time constant	0.01 to 10s	0.5s
247	Constant-power range slip compensation selection	0, 9999	9999
249	Earth (ground) fault detection at start	0, 1	0
250	Stop selection	0 to 100s, 1000 to 1100s, 8888, 9999	9999
251	Output phase loss protection selection	0, 1	1
255	Life alarm status display	(0 to 15)	0
256	Inrush current limit circuit life display	(0 to 100%)	100%
257	Control circuit capacitor life display	(0 to 100%)	100%
258	Main circuit capacitor life display	(0 to 100%)	100%
259	Main circuit capacitor life measuring	0, 1 (2, 3, 8, 9)	0
260	PWM frequency automatic switchover	0, 1	1
261	Power failure stop selection	0 to 2	0
267	Terminal 4 input selection	0 to 2	0

Parameter	Name	Setting Range	Initial Value
268	Monitor decimal digits selection	0, 1, 9999	9999
269	Parameter for manufacturer setting. Do not set.		
295	Magnitude of frequency change setting	0, 0.01, 0.10, 1.00, 10.00	0
296	Password lock level	1 to 6, 101 to 106, 9999	9999
297	Password lock/unlock	1000 to 9998 (0 to 5, 9999)	9999
298	Frequency search gain	0 to 32767, 9999	9999
299	Rotation direction detection selection at restarting	0, 1, 9999	0
338	Communication operation command source	0, 1	0
339	Communication speed command source	0 to 2	0
340	Communication startup mode selection	0, 1, 10	0
342	Communication EEPROM write selection	0, 1	0
343	Communication error count	—	0
374	Overspeed detection level	0 to 400Hz, 9999	9999
450	Second applied motor	0, 1, 9999	9999
495	Remote output selection	0, 1, 10, 11	0
496	Remote output data 1	0 to 4095	0
502	Stop mode selection at communication error	0 to 3	0
503	Maintenance timer	0 (1 to 9998)	0
504	Maintenance timer alarm output set time	0 to 9998, 9999	9999
505	Speed setting reference	1 to 120Hz	60Hz
549	Protocol selection	0, 1	0
551	PU mode operation command source selection	2, 4, 9999	9999
553	PID deviation limit	0 to 100.0% 9999	9999
554	PID signal operation selection	0 to 3, 10 to 13	0
555	Current average time	0.1 to 1s	1s
556	Data output mask time	0 to 20s	0s
557	Current average value monitor signal output reference current	0 to 500A	Inverter rated current
561	PTC thermistor protection level	0.5 to 30k Ω , 9999	9999
563	Energization time carrying-over times	(0 to 65535)	0
564	Operating time carrying-over times	(0 to 65535)	0
571	Holding time at a start	0 to 10s, 9999	9999
575	Output interruption detection time	0 to 3600s, 9999	1s
576	Output interruption detection level	0 to 400Hz	0Hz
577	Output interruption cancel level	900 to 1100%	1000%
611	Acceleration time at a restart	0 to 3600s, 9999	9999
653	Speed smoothing control	0 to 200%	0%
665	Regeneration avoidance frequency gain	0 to 200%	100%
779	Operation frequency during communication error	0 to 400Hz, 9999	9999
791	Acceleration time in low-speed range	0 to 3600s, 9999	9999

Parameter	Name	Setting Range	Initial Value
792	Deceleration time in low-speed range	0 to 3600s, 9999	9999
799	Pulse increment setting for output power	0.1kWh, 1kWh, 10kWh, 100kWh, 1000kWh	1kWh
800	Control method selection	9, 30	30
820	Speed control P gain 1	0 to 1000%	25%
821	Speed control integral time 1	0 to 20s	0.333s
870	Speed detection hysteresis	0 to 5Hz	0Hz
872	Input phase loss protection selection	0, 1	0
882	Regeneration avoidance operation selection	0 to 2	0
883	Regeneration avoidance operation level	300 to 800V	400/780VDC ⁺⁵
885	Regeneration avoidance compensation frequency limit value	0 to 30Hz, 9999	6Hz
886	Regeneration avoidance voltage gain	0 to 200%	100%
888	Free parameter 1	0 to 9999	9999
889	Free parameter 2	0 to 9999	9999
891	Cumulative power monitor digit shifted times	0 to 4, 9999	9999
892	Load factor	30 to 150%	100%
893	Energy saving monitor reference (motor capacity)	0.4 to 15kW	Inverter rated current
894	Control selection during commercial power-supply operation	0 to 3	0
895	Power saving rate reference value	0, 1, 9999	9999
896	Power unit cost	0 to 500, 9999	9999
897	Power saving monitor average time	0, 1 to 1000h, 9999	9999
898	Power saving cumulative monitor clear	0, 1, 10, 9999	9999
899	Operation time rate (estimated value)	0 to 100%, 9999	9999
C0 (900) ⁺⁹	FM terminal calibration	—	—
C2 (902) ⁺⁹	Terminal 2 frequency setting bias frequency	0 to 400Hz	0Hz
C3 (902) ⁺⁹	Terminal 2 frequency setting bias	0 to 300%	0%
125 (903) ⁺⁹	Terminal 2 frequency setting gain frequency	0 to 400Hz	60Hz
C4 (903) ⁺⁹	Terminal 2 frequency setting gain	0 to 300%	100%
C5 (904) ⁺⁹	Terminal 4 frequency setting bias frequency	0 to 400Hz	0Hz
C6 (904) ⁺⁹	Terminal 4 frequency setting bias	0 to 300%	20%
126 (905) ⁺⁹	Terminal 4 frequency setting gain frequency	0 to 400Hz	60Hz
C7 (905) ⁺⁹	Terminal 4 frequency setting gain	0 to 300%	100%
C22 (922) ⁺⁹⁺¹⁰	Frequency setting voltage bias frequency (built-in potentiometer)	0 to 400Hz	0Hz
C23 (922) ⁺⁹⁺¹⁰	Frequency setting voltage bias (built-in potentiometer)	0 to 300%	0%

Parameter	Name	Setting Range	Initial Value
C24 (923) ⁺⁹⁺¹⁰	Frequency setting voltage gain frequency (built-in potentiometer)	0 to 400Hz	60Hz
C25 (923) ⁺⁹⁺¹⁰	Frequency setting voltage gain (built-in potentiometer)	0 to 300%	100%
C42 (934) ⁺⁹	PID display bias coefficient	0 to 500.00, 9999	9999
C43 (934) ⁺⁹	PID display bias analog value	0 to 300.0%	20%
C44 (935) ⁺⁹	PID display gain coefficient	0 to 500.00, 9999	9999
C45 (935) ⁺⁹	PID display gain analog value	0 to 300.0%	100%
990	PU buzzer control	0, 1	1
991	PU contrast adjustment	0 to 63	58
997	Fault initiation	16 to 18, 32 to 34, 48, 49, 64, 81, 82, 96, 97, 112, 128, 129, 144, 145, 176 to 178, 192, 196, 197, 199, 201, 208, 230, 245, 9999	9999
998	IPM parameter initialization	0, 1, 12, 101, 112	0
999	Automatic parameter setting	10, 20, 21, 9999	9999
Pr.CL	Parameter clear	0, 1	0
ALLC	All parameter clear	0, 1	0
Er.CL	Fault history clear	0, 1	0
Pr.CH	Initial value change list	—	—
IPM	IPM parameter initialization	0, 1	0
AUTO	Automatic parameter setting	—	—

- *1 Differ according to capacities.
6%: 0.75K or lower
4%: 1.5K to 3.7K
3%: 5.5K, 7.5K
2%: 11K, 15K
- *2 Differ according to capacities.
5s: 7.5K or lower
15s: 11K, 15K
- *3 Differ according to capacities
10s: 7.5K or lower
30s: 11K, 15K
- *4 Differ according to capacities.
4%: 0.4K to 7.5K
2%: 11K, 15K
- *5 The initial value differs according to the voltage class. (200V class / 400V class)
- *6 The setting value "60" is only available for Pr. 178.
- *7 The setting value "61" is only available for Pr. 179.
- *8 The setting values "92, 93, 192, and 193" are available only in Pr. 190.
- *9 The parameter number in parentheses is the one for use with the operation panel (PA02) for the FR-E500 series or parameter unit (FR-PU04/FR-PU07).
- *10 Set this parameter when calibrating the operation panel built-in potentiometer for the FR-E500 series operation panel (PA02) connected with cable.

9 TROUBLESHOOTING

When a fault occurs in the inverter, the inverter output is shut off and the PU display automatically changes to one of the following fault or alarm indications.

If the fault does not correspond to any of the following faults or if you have any other problem, please contact your sales representative.

- Retention of fault output signal.. When the magnetic contactor (MC) provided on the input side of the inverter is opened at a fault occurrence, the inverter's control power will be lost and the fault output will not be held.
- Fault or alarm indication.....When a fault or alarm occurs, the operation panel display automatically switches to the fault or alarm indication.
- Resetting method.....When a fault occurs, the inverter output is kept stopped. Unless reset, therefore, the inverter cannot restart. (Refer to page 39.)
- When any fault occurs, take the appropriate corrective action, then reset the inverter, and resume operation. Not doing so may lead to the inverter fault and damage.

Inverter fault or alarm indications are roughly categorized as below.

- (1) Error message
A message regarding operational fault and setting fault by the operation panel and parameter unit (FR-PU04 /FR-PU07) is displayed. The inverter output is not shut off.
- (2) Warning
The inverter output is not shut off even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.
- (3) Alarm
The inverter output is not shut off. You can also output an alarm signal by making parameter setting.
- (4) Fault
When a fault occurs, the inverter output is shut off and a fault signal is output.

REMARKS

- For the details of fault displays and other malfunctions, also refer to the Instruction Manual (Applied).
- Past eight faults can be displayed using the setting dial. (Refer to page 4 for the operation.)

9.1 Reset method of protective function

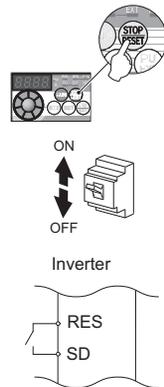
The inverter can be reset by performing any of the following operations. Note that the internal thermal integrated value of the electronic thermal relay function and the number of retries are cleared (erased) by resetting the inverter. Inverter recovers about 1s after the reset is released.

Operation 1 Using the operation panel, press  to reset the inverter.

(This may only be performed when a fault occurs. (Refer to page 40 for fault.))

Operation 2 Switch power OFF once. After the indicator of the operation panel turns OFF, switch it ON again.

Operation 3 Turn ON the reset signal (RES) for more than 0.1s. (If the RES signal is kept ON, "Err." appears (blinks) to indicate that the inverter is in a reset status.)



NOTE

- OFF status of the start signal must be confirmed before resetting the inverter fault. Resetting inverter fault with the start signal ON restarts the motor suddenly.

9.2 List of fault displays

When a fault occurs in the inverter, the inverter trips and the PU display automatically changes to one of the following fault or alarm indications.

The error message shows an operational error. The inverter output is not shut off.

Warnings are messages given before faults occur. The inverter output is not shut off.

Alarms warn the operator of failures with output signals. The inverter output is not shut off.

When faults occur, the protective functions are activated to inverter trip and output the fault signals.

Function Name	Description	Countermeasure	Display	
Error message	Operation panel lock	Operation has been attempted during the operation panel lock. Press  for 2s to release the lock.	HOLD	
	Password locked	Reading/writing of a password-restricted parameter has been attempted. Enter the password in Pr. 297 Password lock/unlock to unlock the password function before operating.	LOCK	
	Write disable error	<ul style="list-style-type: none"> Parameter setting has been attempted although parameter writing is set to be disabled. Overlapping range has been set for the frequency jump. PU and the inverter cannot make normal communication. 	<ul style="list-style-type: none"> Check the setting of Pr. 77 Parameter write selection. Check the setting of Pr. 31 to Pr. 36 (frequency jump). Check the connection of PU and the inverter. 	Er 1
	Write error during operation	Parameter writing has been attempted while a value other than "2" is set in Pr. 77 Parameter write selection and the STF (STR) is ON.	<ul style="list-style-type: none"> Set "2" in Pr. 77 Parameter write selection. After stopping the operation, set parameters. 	Er 2
	Calibration error	Analog input bias and gain calibration values have been set too close.	Check the settings of calibration parameters C3, C4, C6 and C7 (calibration functions).	Er 3
	Mode designation error	<ul style="list-style-type: none"> Parameter setting has been attempted in the External or NET operation mode when Pr. 77 Parameter write selection is not "2". Parameter writing has been attempted when the command source is not at the operation panel. 	<ul style="list-style-type: none"> After setting the operation mode to the "PU operation mode", set parameters. Set "2" in Pr. 77 Parameter write selection. Remove the parameter unit (FR-PU04/FR-PU07), then set the Pr. 551 PU mode operation command source selection = "9999 (initial setting)". Set Pr. 551 PU mode operation command source selection = "4." 	Er 4
	Inverter reset	The reset signal (RES signal) is ON. (Inverter output is shutoff.)	Turn OFF the reset command.	Err.
Warning	Stall prevention (overcurrent)	The overcurrent stall prevention has been activated.	<ul style="list-style-type: none"> Increase or decrease the Pr. 0 Torque boost setting by 1% and check the motor status. (V/F control) Set the acceleration/deceleration time longer. Reduce the load. Try the general-purpose magnetic flux vector control. Check the peripheral devices for faults. Adjust the Pr. 13 Starting frequency setting. Change the Pr. 14 Load pattern selection setting. (V/F control) Set the stall prevention operation current in Pr. 22 Stall prevention operation level. (The acceleration/deceleration time may change.) Increase the stall prevention operation level with Pr. 22 Stall prevention operation level, or disable stall prevention with Pr. 156 Stall prevention operation selection. (Operation at OL occurrence can be selected using Pr. 156 Stall prevention operation selection.) Check the connection of the IPM motor. (IPM motor control) 	OL
	Stall prevention (overvoltage)	The overvoltage stall prevention function or the regeneration avoidance function has been activated. (This warning is also output during the regeneration avoidance operation.)	Set the deceleration time longer.	oL
	Regenerative brake pre-alarm *2	The regenerative brake duty has reached 85% of the Pr. 70 Special regenerative brake duty setting or higher.	<ul style="list-style-type: none"> Set the deceleration time longer. Check the Pr.30 Regenerative function selection and Pr. 70 Special regenerative brake duty settings. 	rb
	Electronic thermal relay function pre-alarm *1	The cumulative value of the electronic thermal O/L relay has reached 85% of the Pr. 9 Electronic thermal O/L relay setting or higher.	<ul style="list-style-type: none"> Reduce the load and frequency of operation. Set an appropriate value in Pr. 9 Electronic thermal O/L relay. 	FH
	PU stop	 on the operation panel has been pressed during the External operation.	Turn the start signal OFF and release with  .	PS
	Maintenance signal output *2	The cumulative energization time has exceeded the maintenance output timer set value.	Setting "0" in Pr. 503 Maintenance timer erases the signal.	MT
	Undervoltage	The voltage at the main circuit power has been lowered.	Investigate the devices on the power supply line such as the power supply itself.	Uu
SA	The shorting wire across the terminals S1 and SC or the terminals S2 and SC is disconnected.	Short across the terminals S1 and SC and the terminals S2 and SC with shortening wires.	SR	
Alarm	Fan alarm	The cooling fan is at a standstill although it is required to be operated. The cooling fan speed has decelerated.	Check for fan failure. Please contact your sales representative.	Fan
Fault	Overcurrent trip during acceleration	Overcurrent has occurred during acceleration.	<ul style="list-style-type: none"> Set the acceleration time longer. (Shorten the downward acceleration time in vertical lift application.) If "E.OCl" always appears at start, disconnect the motor once and restart the inverter. If "E.OCl" still appears, the inverter may be faulty. Contact your sales representative. Check the wiring for output short circuit and ground fault. When the rated motor frequency is 50Hz, set the Pr. 3 Base frequency to 50Hz. (V/F control and General-purpose magnetic flux vector control) Lower the stall prevention operation level. Activate the stall prevention operation and the fast-response current limit operation. (Pr.156) (V/F control and General-purpose magnetic flux vector control) For the operation with frequent regenerative driving, set the base voltage (rated motor voltage, etc.) in Pr. 19 Base frequency voltage. (V/F control and General-purpose magnetic flux vector control) Choose inverter and motor capacities that match. (IPM motor control) If the motor is coasting, stop the motor, then input a start command. Alternatively, use the automatic restart after instantaneous power failure/flying start function. 	EOCl

Function Name	Description	Countermeasure	Display
Overcurrent trip during constant speed	Overcurrent has occurred during constant speed operation.	<ul style="list-style-type: none"> Keep the load stable Check the wiring to avoid output short circuit or ground fault. Lower the stall prevention operation level. Activate the stall prevention operation and the fast-response current limit operation. (Pr.156) (V/F control and General-purpose magnetic flux vector control) Choose inverter and motor capacities that match. (IPM motor control) If the motor is coasting, stop the motor, then input a start command. Alternatively, use the automatic restart after instantaneous power failure/flying start function. 	E0C2
Overcurrent trip during deceleration or stop	Overcurrent has occurred during deceleration or at a stop.	<ul style="list-style-type: none"> Set the deceleration time longer. Check the wiring to avoid output short circuit or ground fault. Check if the mechanical brake is set to be activated too early. Lower the stall prevention operation level. Activate the stall prevention operation and the fast-response current limit operation. (Pr.156) (V/F control and General-purpose magnetic flux vector control) Choose inverter and motor capacities that match. (IPM motor control) If the motor is coasting, stop the motor, then input a start command. Alternatively, use the automatic restart after instantaneous power failure/flying start function. 	E0C3
Regenerative overvoltage trip during acceleration	Overvoltage has occurred during acceleration.	<ul style="list-style-type: none"> Set the acceleration time shorter. Use the regeneration avoidance function (Pr. 882, Pr. 883, Pr. 885, Pr. 886). Set the Pr. 22 Stall prevention operation level correctly. Set Pr. 154 Voltage reduction selection during stall prevention operation = "11". 	E0u1
Regenerative overvoltage trip during constant speed	Overvoltage has occurred during constant speed operation.	<ul style="list-style-type: none"> Keep the load stable Use the regeneration avoidance function (Pr. 882, Pr. 883, Pr. 885, Pr. 886). Use the brake resistor, brake unit or power regeneration common converter (FR-CV) as required. Set the Pr. 22 Stall prevention operation level correctly. Set Pr. 154 Voltage reduction selection during stall prevention operation = "11". 	E0u2
Regenerative overvoltage trip during deceleration or stop	Overvoltage has occurred during deceleration or at a stop.	<ul style="list-style-type: none"> Set the deceleration time longer. (Set the deceleration time which matches the moment of inertia of the load.) Make the brake cycle longer. Use the regeneration avoidance function (Pr. 882, Pr. 883, Pr. 885, Pr. 886). Use the brake resistor, brake unit or power regeneration common converter (FR-CV) as required. Set Pr. 154 Voltage reduction selection during stall prevention operation = "11". 	E0u3
Inverter overload trip (electronic thermal O/L relay function) *1	The electronic thermal relay function for inverter element protection has been activated.	<ul style="list-style-type: none"> Set the acceleration time longer. Adjust the Pr. 0 Torque boost setting. (V/F control) Set the Pr. 14 Load pattern selection setting according to the load pattern of the using machine. (V/F control) Reduce the load. Set the surrounding air temperature to within the specifications. 	E1H1
Motor overload trip (electronic thermal O/L relay function) *1	The electronic thermal relay function for motor protection has been activated.	<ul style="list-style-type: none"> Reduce the load. For a constant-torque motor, set the constant-torque motor in Pr. 71 Applied motor. (V/F control and General-purpose magnetic flux vector control) Set the stall prevention operation level accordingly. 	E1H2
Heatsink overheat	The heatsink has overheated.	<ul style="list-style-type: none"> Set the surrounding air temperature to within the specifications. Clean the heatsink. Replace the cooling fan. 	E1r
Undervoltage 	The restart operation is repeatedly unsuccessful because the power supply voltage of the inverter has dropped.	Investigate the devices on the power supply line such as the power supply itself.	E1u1
Input phase loss *2	One of the three phases on the inverter input side has been lost. It may also appear if phase-to-phase voltage of the three-phase power input has become largely unbalanced.	<ul style="list-style-type: none"> Wire the cables properly. Repair a break portion in the cable. Check the Pr. 872 Input phase loss protection selection setting. Set Pr. 872 Input phase loss protection selection = "0" (without input phase loss protection) when three-phase input voltage is largely unbalanced. 	E1LF
Stall prevention stop	The output frequency has dropped to 1Hz as a result of deceleration due to the excess motor load.	<ul style="list-style-type: none"> Reduce the load. (Check the Pr. 22 Stall prevention operation level setting.) Check the connection of the IPM motor. Check that a start command is not given to the inverter while the motor is coasting. 	E0Lf
Loss of synchronism detection 	<ul style="list-style-type: none"> Operation has gone out of synchronism. Operation was performed without connecting a motor under IPM motor control. 	<ul style="list-style-type: none"> Set the acceleration time longer. Reduce the load. If the motor is coasting, stop the motor, then input a start command. Alternatively, use the automatic restart after instantaneous power failure/flying start function. Drive the dedicated IPM motor (MM-EF series). Set the IPM motor test operation. (IPM motor control) 	E501
Brake transistor alarm detection	A fault has occurred in the brake circuit, such as a brake transistor breakage. (In this case, the inverter must be powered off immediately.)	Replace the inverter.	E. bE
Output side earth (ground) fault overcurrent at start *2	An earth (ground) fault has occurred on the inverter's output side (detected only at a start).	Remedy the ground fault portion.	E. GF

Check first when you have a trouble

Function Name	Description	Countermeasure	Display	
Fault	Output phase loss	<ul style="list-style-type: none"> Wire the cables properly. If the motor capacity is smaller than the inverter capacity, choose the inverter and motor capacities that match. If the motor is coasting, stop the motor, then input a start command. Alternatively, use the automatic restart after instantaneous power failure/flying start function. 	E.LF	
	External thermal relay operation *2	<ul style="list-style-type: none"> Reduce the load and operate less frequently. Even if the relay contacts are reset automatically, the inverter will not restart unless it is reset. 	E.OHT	
	PTC thermistor operation *2	<ul style="list-style-type: none"> Reduce the load. 	E.PTC	
	Parameter storage device fault	<ul style="list-style-type: none"> Please contact your sales representative. When performing parameter writing frequently for communication purposes, set "1" in Pr. 342 Communication EEPROM write selection to enable RAM write. Note that powering OFF returns the inverter to the status before RAM write. 	E.PE	
	PU disconnection	<ul style="list-style-type: none"> A communication error has occurred between the PU and the inverter. The communication interval has exceeded the permissible time period during RS-485 communication via the PU connector. The number of communication errors has exceeded the number of retries. 	<ul style="list-style-type: none"> Connect the parameter unit cable securely. Check the communication data and communication settings. Increase the Pr. 122 PU communication check time interval setting. Or set "9999" (no communication check). 	E.PUE
	Retry count excess *2	<ul style="list-style-type: none"> Operation restart within the set number of retries has failed. 	Eliminate the cause of the error preceding this error indication.	E.rEF
	CPU fault	<ul style="list-style-type: none"> An error has occurred in the CPU and in the peripheral circuits. 	<ul style="list-style-type: none"> Take measures against noises if there are devices producing excess electrical noises around the inverter. If the situation does not improve after taking the above measure, please contact your sales representative. 	E.S / E.CPU
	Output current detection value exceeded *2	<ul style="list-style-type: none"> Output current has exceeded the output current detection level that is set in the parameter. 	Check the settings of Pr. 150 Output current detection level, Pr. 151 Output current detection signal delay time, Pr. 166 Output current detection signal retention time, and Pr. 167 Output current detection operation selection.	E.CdO
	Inrush current limit circuit fault	<ul style="list-style-type: none"> The resistor of the inrush current limit circuit has overheated. 	<ul style="list-style-type: none"> Configure a circuit where frequent power ON/OFF is not repeated. If the situation does not improve after taking the above measure, please contact your sales representative. 	E.IOH
	Analog input fault	<ul style="list-style-type: none"> A voltage (current) has been input to terminal 4 when the setting in Pr. 267 Terminal 4 input selection and the setting of voltage/current input switch are different. 	<ul style="list-style-type: none"> Give a frequency command by a current input or set Pr. 267 Terminal 4 input selection, and set the voltage/current input switch to voltage input. 	E.AI E
	Overspeed occurrence 	<ul style="list-style-type: none"> During the IPM motor control, the motor speed has exceeded the level set in Pr. 374 Overspeed detection level. 	<ul style="list-style-type: none"> Set the Pr. 374 Overspeed detection level value correctly. 	E.OS
	PID signal fault	<ul style="list-style-type: none"> PID upper limit (FUP), PID lower limit (FDN), or PID deviation limit (Y48) has turned ON. 	<ul style="list-style-type: none"> Make correct settings for Pr.131 PID upper limit, Pr.132 PID lower limit, Pr. 553 PID deviation limit. 	E.Pi d
	E.SAF	<ul style="list-style-type: none"> An internal circuit fault has occurred. Either the contact between terminals S1 and SC or terminals S2 and SC has opened. 	<ul style="list-style-type: none"> Short across the terminals S1 and SC and the terminals S2 and SC with shortening wires. 	E.SAF

If faults other than the above appear, contact your sales representative.

- *1 Resetting the inverter initializes the internal cumulative heat value of the electronic thermal relay function.
- *2 This protective function is not available in the initial status.

9.3 Check first when you have a trouble

Description	Countermeasure
Motor does not start.	Check start and frequency command sources and enter a start command (STF, etc.) and a frequency command.
Motor or machine is making abnormal acoustic noise.	Take EMC measures if a steady operation cannot be performed due to EMI. Alternatively, set the Pr.74 Input filter time constant setting higher.
Inverter generates abnormal noise.	Install a fan cover correctly.
Motor generates heat abnormally.	Clean the motor fan. Improve the environment.
Motor rotates in the opposite direction.	Connect phase sequence of the output cables (terminal U, V, W) to the motor correctly. Alternatively, check the connection of the start signal. (STF: forward rotation, STR: reverse rotation)
Speed greatly differs from the setting.	Check the settings of Pr.1 Maximum frequency, Pr.2 Minimum frequency, Pr.18 High speed maximum frequency, and calibration parameters C2 to C7.
Acceleration/deceleration is not smooth.	Reduce the load. Alternatively, increase the acceleration/deceleration time.
Speed varies during operation.	Check the frequency setting signals.
Operation mode is not changed properly.	Turn OFF the start signal (STF or STR). Check if Pr.79 Operation mode selection is set appropriately.
Operation panel display is not operating.	Check the wiring and the installation.
Motor current is large.	<ul style="list-style-type: none"> Increase/decrease the Pr.0 Torque boost setting value by 0.5% increments so that stall prevention does not occur. Set the rated motor frequency to Pr.3 Base frequency. (V/F control and General-purpose magnetic flux vector control)
Speed does not accelerate.	Check the settings of Pr.1 Maximum frequency, Pr.2 Minimum frequency, and calibration parameters C2 to C7. To operate at 120Hz or higher, set Pr.18 High speed maximum frequency.
Unable to write parameter setting.	Check Pr.77 Parameter write selection setting.

* For further information on troubleshooting,  refer to the Instruction Manual (Applied).

10 PRECAUTIONS FOR MAINTENANCE AND INSPECTION

The inverter is a static unit mainly consisting of semiconductor devices. Daily inspection must be performed to prevent any fault from occurring due to the adverse effects of the operating environment, such as temperature, humidity, dust, dirt and vibration, changes in the parts with time, service life, and other factors.



REMARKS

- For maintenance/inspection and parts life, also refer to the Instruction Manual (Applied).

●Precautions for maintenance and inspection

For some short time after the power is switched OFF, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched OFF, and then make sure that the voltage across the main circuit terminals P/+ and N/- of the inverter is not more than 30VDC using a tester, etc.

10.1 Inspection items

Area of Inspection	Inspection Item	Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check	
			Daily	Periodic *3			
General	Surrounding environment	Check the surrounding air temperature, humidity, dirt, corrosive gas, oil mist, etc.	○		Improve environment.		
	Overall unit	Check for unusual vibration and noise.	○		Check alarm location and retighten.		
		Check for dirt, oil, and other foreign material.*1	○		Clean.		
Power supply voltage	Check that the main circuit voltages are normal.*2	○		Inspect the power supply.			
Main circuit	General	(1) Check with megger (across main circuit terminals and earth (ground) terminal).		○	Contact the manufacturer.		
		(2) Check for loose screws and bolts.		○	Retighten.		
		(3) Check for overheat traces on the parts.		○	Contact the manufacturer.		
		(4) Check for stains		○	Clean.		
	Conductors, cables	(1) Check conductors for distortion.		○	Contact the manufacturer.		
		(2) Check cable sheaths for breakage and deterioration (crack, discoloration, etc.)		○	Contact the manufacturer.		
Terminal block	Check for damage.		○	Stop the device and contact the manufacturer.			
Smoothing aluminum electrolytic capacitor	(1) Check for liquid leakage. (2) Check for safety valve projection and bulge. (3) Visual check and judge by the life check of the main circuit capacitor (Refer to Chapter 4 of the Instruction Manual (Applied).)		○	Contact the manufacturer.			
				○	Contact the manufacturer.		
Relay	Check that the operation is normal and no chatter is heard.		○	Contact the manufacturer.			
Control circuit, Protective circuit	Operation check	(1) Check that the output voltages across phases with the inverter operated alone is balanced		○	Contact the manufacturer.		
		(2) Check that no fault is found in protective and display circuits in a sequence protective operation test.		○	Contact the manufacturer.		
	Parts check	Overall	(1) Check for unusual odors and discoloration.		○	Stop the device and contact the manufacturer.	
			(2) Check for serious rust development		○	Contact the manufacturer.	
Aluminum electrolytic capacitor	(1) Check for liquid leakage in a capacitor and deformation trace (2) Visual check and judge by the life check of the main circuit capacitor (Refer to Chapter 4 of the Instruction Manual (Applied).)		○	Contact the manufacturer.			
				○	Contact the manufacturer.		
Cooling system	Cooling fan	(1) Check for unusual vibration and noise.	○		Replace the fan.		
		(2) Check for loose screws and bolts		○	Fix with the fan cover fixing screws.		
		(3) Check for stains		○	Clean.		
Heatsink	(1) Check for clogging (2) Check for stains			○	Clean.		
				○	Clean.		

Area of Inspection	Inspection Item	Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check
			Daily	Periodic *3		
Display	Indication	(1) Check that display is normal. (2) Check for stains	○	○	Contact the manufacturer. Clean.	
	Meter	Check that reading is normal	○		Stop the device and contact the manufacturer.	
Load motor	Operation check	Check for vibration and abnormal increase in operation noise	○		Stop the device and contact the manufacturer.	

- *1 Oil component of the heat dissipation grease used inside the inverter may leak out. The oil component, however, is not flammable, corrosive, nor conductive and is not harmful to humans. Wipe off such oil component.
- *2 It is recommended to install a device to monitor voltage for checking the power supply voltage to the inverter.
- *3 One to two years of periodic inspection cycle is recommended. However, it differs according to the installation environment. Consult us for periodic inspection.



NOTE

- Continuous use of a leaked, deformed, or degraded smoothing aluminum electrolytic capacitor (as shown in the table above) may lead to a burst, breakage or fire. Replace such capacitor without delay.

10.2 Replacement of parts

The inverter consists of many electronic parts such as semiconductor devices.

The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or fault of the inverter. For preventive maintenance, the parts must be replaced periodically.

Use the life check function as a guidance of parts replacement.

Part Name	Estimated lifespan *1	Description
Cooling fan	10 years	Replace (as required)
Main circuit smoothing capacitor	10 years *2	Replace (as required)
On-board smoothing capacitor	10 years *2	Replace the board (as required)
Relays	—	As required

- *1 Estimated lifespan when the yearly average surrounding air temperature is 40°C (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)
- *2 Output current: 80% of the inverter rated current



NOTE

- For parts replacement, contact the nearest Mitsubishi Electric FA Center.

11 SPECIFICATIONS

11.1 Rating

●Three-phase 200V power supply

		Inverter									
Model FR-F720PJ-□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	
Applicable general-purpose motor capacity (kW) ^{*1}		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	
Output	Rated capacity (kVA) ^{*2}	1.0	1.6	2.7	3.8	6.3	9.1	12.1	17.1	22.1	
	Rated current (A)	2.5	4.2	7.0	10.0	16.5	23.8	31.8	45	58	
	Overload current rating ^{*3}	120% 60s, 150% 0.5s (inverse-time characteristics)									
	Rated voltage ^{*4}	Three-phase 200 to 240V									
Power supply	Rated input AC voltage/frequency	Three-phase 200 to 240V 50Hz/60Hz									
	Permissible AC voltage fluctuation	170 to 264V 50Hz/60Hz									
	Permissible frequency fluctuation	±5%									
	Power supply capacity (kVA) ^{*5}	Without Filterpack	1.2	2.1	4.0	5.0	8.8	12.0	17.0	20.0	27.0
		With Filterpack	0.8	1.2	2.6	3.4	5.5	8.4	11.0	16.0	19.0
Protective structure (JEM 1030)		Enclosed type (IP20) ^{*6}									
Cooling system		Natural			Forced air						
Approximate mass(kg)		0.8	1.0	1.4	1.4	1.8	3.6	3.6	6.5	6.5	

		Filterpack								
Model FR-BFP2-□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Approximate mass(kg)		1.3	1.4	2.0	2.2	2.8	3.8	4.5	6.7	7.0
Power factor improving reactor		Install the DC reactor in the DC side. 93% to 95% of power supply power factor under 100% load (94.4% ^{*7})								
Noise filter	Common mode choke	Install a ferrite core on the input side								
	Capacitive filter	About 4mA of capacitor leakage current ^{*8}								
Protective structure (JEM 1030)		Open type (IP00)								

●Three-phase 400V power supply

		Inverter									
Model FR-F740PJ-□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	
Applicable general-purpose motor capacity (kW) ^{*1}		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	
Output	Rated capacity (kVA) ^{*2}	0.9	1.7	2.8	3.8	6.2	9.1	12.4	17.5	22.5	
	Rated current (A)	1.2	2.2	3.7	5.0	8.1	12.0	16.3	23.0	29.5	
	Overload current rating ^{*3}	120%60s, 150% 0.5s (inverse-time characteristics)									
	Rated voltage ^{*4}	Three-phase 380 to 480V									
Power supply	Rated input AC voltage/frequency	Three-phase 380 to 480V 50Hz/60Hz									
	Permissible AC voltage fluctuation	325 to 528V 50Hz/60Hz									
	Permissible frequency fluctuation	±5%									
	Power supply capacity (kVA) ^{*5}	Without Filterpack	1.1	2.2	4.2	4.8	8.6	12.0	17.0	20.0	28.0
		With Filterpack	0.7	1.3	2.7	3.3	5.4	8.5	11.0	16.0	19.0
Protective structure (JEM 1030)		Enclosed type (IP20) ^{*6}									
Cooling system		Natural			Forced air						
Approximate mass (kg)		1.3	1.3	1.4	1.5	1.5	3.3	3.3	6.0	6.0	

		Filterpack								
Model FR-BFP2-H□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Approximate mass (kg)		1.6	1.7	1.9	2.3	2.6	4.5	5.0	7.0	8.2
Power factor improving reactor		Install the DC reactor in the DC side. 93% to 95% of power supply power factor under 100% load (94.4% ^{*7})								
Noise filter	Common mode choke	Install a ferrite core on the input side								
	Capacitive filter	About 8mA of capacitor leakage current ^{*8}								
Protective structure (JEM 1030)		Open type (IP00)								

- ^{*1} The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard motor. To use a dedicated IPM motor, refer to page 47, 48.
- ^{*2} The rated output capacity assumes the following output voltages: 220V for the three-phase 200V and 440V for the three-phase 400V class.
- ^{*3} The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
- ^{*4} The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ^{*5} The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- ^{*6} Open type (IP00) for Filterpack.
- ^{*7} The values in parentheses are calculated with 1 fundamental frequency power factor according to the Architectural Standard Specifications (Electrical Installation) (2010 revision) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan).
- ^{*8} The indicated leakage current is equivalent to one-phase of the three-phase three wire Δ connection cable.

11.2 Common specification

Control specifications	Control method	High carrier frequency PWM control (V/F control)/Optimum excitation control/General-purpose magnetic flux vector control/IPM motor control	
	Output frequency range	0.2 to 400Hz	
	Frequency setting resolution	Analog input	0.06Hz/60Hz (terminals 2 and 4: 0 to 10V/10-bit) 0.12Hz/60Hz (terminals 2 and 4: 0 to 5V/9-bit) 0.06Hz/60Hz (terminal 4: 0 to 20mA/10-bit)
		Digital input	0.01Hz
	Frequency accuracy	Analog input	Within ±1% of the max. output frequency (25°C ± 10°C)
		Digital input	Within 0.01% of the set output frequency
	Speed control range	V/F control 1:10, General-purpose magnetic flux vector control (during power driving) 1:60, IPM motor control 1:10	
	Voltage/frequency characteristics	Base frequency can be set from 0 to 400Hz. Constant-torque/variable-torque pattern can be selected.	
	Starting torque	General-purpose motor control (General-purpose magnetic flux vector control and slip compensation): 150% (at 1Hz) IPM motor control: 50%	
	Torque boost	Manual torque boost	
	Acceleration/deceleration time setting	0.1 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration modes are available.	
	Regenerative braking torque	General-purpose motor control: 15%+1 IPM motor control: 5% (10% for 1.5kW or less)+1	
	DC injection brake	General-purpose motor control: Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) can be changed.	
Stall prevention operation level	Operation current level can be set (0 to 150% variable). Whether to use the function or not can be set.		
Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)	
	Ambient humidity	90% RH or less (non-condensing)	
	Storage temperature ^{*2}	-20°C to +65°C	
	Atmosphere	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt, etc.)	
	Altitude/vibration	Maximum 1000m, 5.9m/s ² or less+3 at 10 to 55Hz (directions of X, Y, Z axes)	

*1 The regenerative braking torque indicates the average short-time torque (which varies by the motor loss) that is generated when a motor decelerates in the shortest time by itself from the rated speed. It is not the continuous regenerative torque. When a motor decelerates from a speed higher than the rated speed, the average deceleration torque decreases. When the regenerative power is large, use an option brake unit.

*2 Temperature applicable for a short time, e.g. in transit. Side-by-side installation is not available for Filterpacks.

*3 When installing Filterpack of 11K or 15K on the rear side of an inverter, do not install to a moving object or place where vibrates (exceeding 1.96m/s²)

11.3 Specification of the premium high-efficiency IPM motor [MM-EFS (1500r/min) series]

Motor model	200V class MM-EFS□1M	7	15	22	37	55	75	11K	15K
	400V class MM-EFS□1M4								
Compatible inverter	200V class FR-F720PJ-□K	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	400V class FR-F740PJ-□K								
Continuous characteristic ⁻¹	Rated output (kW)	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	Rated torque (N•m)	4.77	9.55	14	23.6	35	47.7	70	95.5
Rated speed (r/min)		1500							
Maximum speed (r/min)		2250							
Number of poles		6							
Maximum torque		120% 60s							
Frame number		80M	90L	100L	112M	132S	132M	160M	160L
Moment of inertia J ($\times 10^{-4}$ kg•m ²)		20	40	55	110	275	280	760	770
Rated current (A)	200V class	3.0	6.0	8.2	13.4	20	27	40	54
	400V class	1.5	3.0	4.1	6.7	10	13.5	20	27
Structure		Totally-enclosed fan-cooled motor. With steel framed legs. (protective structure IP44 ⁺²)							
Insulation class		F class							
Vibration class		V-15							
Environment	Surrounding air temperature and humidity	-10°C to +40°C (non-freezing) 90%RH or less (non-condensing)							
	Storage temperature and humidity	-20°C to +70°C (non-freezing) 90%RH or less (non-condensing)							
	Atmosphere	Indoors (not under direct sunlight), and free from corrosive gas, flammable gas, oil mist, dust and dirt.							
	Altitude	Maximum 1000m							
	Vibration	4.9m/s ²							
Mass(kg)		11	15	22	31	50	53	95	100

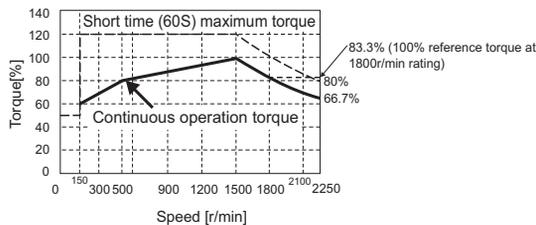
⁺¹ The above characteristics apply when the rated AC voltage is input from the inverter. (Refer to page 43.)

Output and rated motor speed are not guaranteed when the power supply voltage drops.

⁺² This excludes the part where the axis passes through.

● Motor torque characteristic

The following figure shows the torque characteristic of the premium high-efficiency IPM motor [MM-EFS (1500r/min) series] when used with an inverter.



REMARKS

The motor can also be used for applications where the rated speed is 1800r/min.



NOTE

- The torque characteristic is when the armature winding temperature is 20°C, and the input voltage to the inverter is 200VAC or 400VAC.
- Constant-speed operation cannot be performed for the speed less than 150r/min.

11.4 Specification of dedicated IPM motor [MM-EF (1800r/min) series]

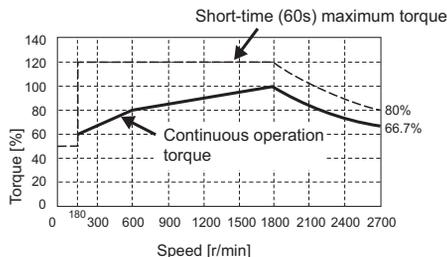
Motor model	200V class MM-EF□2	4	7	15	22	37	55	75	11K	15K
	400V class MM-EF□24									
Compatible inverter	200V class FR-F720PJ-□K	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	400V class FR-F740PJ-□K									
Continuous characteristic ¹⁾	Rated output (kW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	Rated torque (N·m)	2.12	3.98	7.96	11.7	19.6	29.2	39.8	58.4	79.6
Rated speed (r/min)		1800 (90Hz)								
Maximum speed (r/min)		2700 (135Hz)								
Number of poles		6								
Maximum torque		120% 60s								
Moment of inertia ($\times 10^{-4}$ kg·m ²)		10.4	10.4	18.4	36.9	51.2	125	153	274	354
Rated current (A)	200V class	1.6	3.0	5.9	8.7	14.4	22	29	43	55
	400V class	0.8	1.5	3.0	4.4	7.2	11	14.5	21.5	27.5
Structure		Totally-enclosed fan-cooled motor (protective structure IP44 ²⁾)								
Insulation class		B class								
Environment	Surrounding air temperature and humidity	-10°C to +40°C (non-freezing)/90%RH or less (non-condensing)								
	Storage temperature and humidity	-20°C to +70°C (non-freezing)/90%RH or less (non-condensing)								
	Atmosphere	Indoors (avoid direct sun light) and free from corrosive gas, flammable gas, oil mist, dust and dirt								
	Altitude	Maximum 1000m								
Vibration		4.9m/s ² (0.5G)								
Mass (kg)		8.5	9.0	11	15	23	33	38	52	60

*1 The above characteristics apply when the rated AC voltage is input from the inverter. (Refer to page 45.)
Output and rated motor speed are not guaranteed when the power supply voltage drops.

*2 This excludes the part where the axis passes through.

● Motor torque characteristic

The following figure shows the torque characteristic of a dedicated IPM motor [MM-EF (1800r/min) series] when used with an inverter.

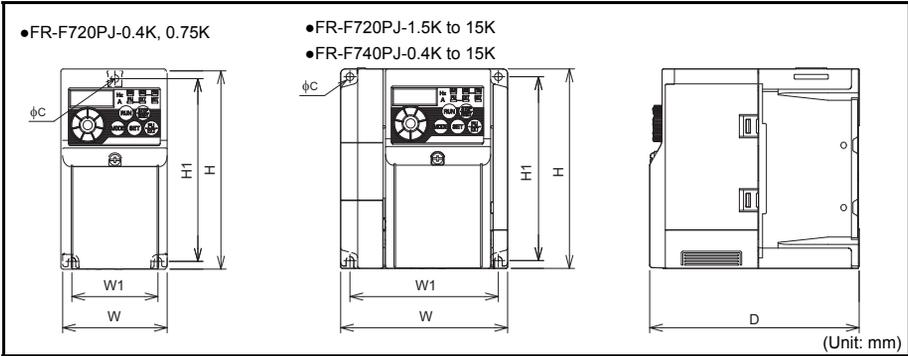


NOTE

- The torque characteristic is when the armature winding temperature is 20°C, and the input voltage to the inverter is 200VAC or 400VAC.
- Constant-speed operation cannot be performed for the speed of 180r/min or less.

11.5 Outline dimension drawings

● Inverter



● Three-phase 200V class

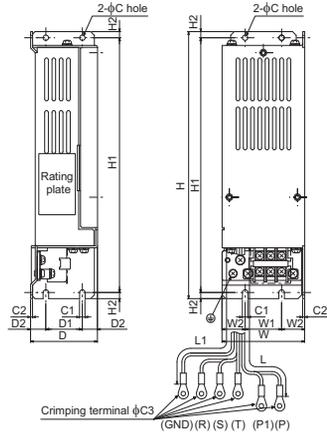
Inverter Model	W	W1	H	H1	D	C
FR-F720PJ-0.4K	68	56	128	118	112.5	5
FR-F720PJ-0.75K					132.5	
FR-F720PJ-1.5K	108	96			135.5	
FR-F720PJ-2.2K					142.5	
FR-F720PJ-3.7K	170	158	150	138	155	6
FR-F720PJ-5.5K	220	208				
FR-F720PJ-7.5K						
FR-F720PJ-11K						
FR-F720PJ-15K		195				

● Three-phase 400V class

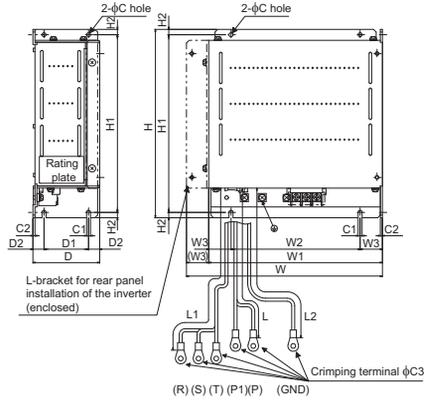
Inverter Model	W	W1	H	H1	D	C
FR-F740PJ-0.4K	108	96	128	118	129.5	5
FR-F740PJ-0.75K					135.5	
FR-F740PJ-1.5K						
FR-F740PJ-2.2K						
FR-F740PJ-3.7K	155	208	150	138	155	6
FR-F740PJ-5.5K						
FR-F740PJ-7.5K	220	195	260	244	190	
FR-F740PJ-11K						
FR-F740PJ-15K						

● Filterpack

FR-BFP2-0.4K to 3.7K
FR-BFP2-H0.4K to H3.7K



FR-BFP2-5.5K to 15K
FR-BFP2-H5.5K to H15K



● 200V class

Filterpack Model	W	W1	W2	W3	H	H1	H2	D	D1	D2	C	C1	C2	C3	L	L1	L2
FR-BFP2-0.4K, 0.75K	68	30	19	—	218	208	5	60	30	15	4.5	4.5	1.6	4.3	240	220	—
FR-BFP2-1.5K, 2.2K	108	55	26.5		188	178		80	55								
FR-BFP2-3.7K	170	120	25		65	40											
FR-BFP2-5.5K, 7.5K	220	195	145	25	210	198	6	75	50	12.5	6	6	2.3	5.3	270	310	400
FR-BFP2-11K					320	305	7.5	85	60						280		280
FR-BFP2-15K					6.4	260	260										

● 400V class

Filterpack Model	W	W1	W2	W3	H	H1	H2	D	D1	D2	C	C1	C2	C3	L	L1	L2
FR-BFP2-H0.4K, H0.75K	108	55	26.5	—	188	178	5	55	30	12.5	4.5	4.5	1.6	4.3	200	220	—
FR-BFP2-H1.5K, H2.2K, H3.7K								80	55								
FR-BFP2-H5.5K, H7.5K								210	198								
FR-BFP2-H11K	220	195	145	25	320	305	7.5	85	60	6	6	2.3	6.4	260	310	280	280
FR-BFP2-H15K																260	260

Appendix 1 Instructions for Compliance with the EU Directives

The EU Directives are issued to standardize different national regulations of the EU Member States and to facilitate free movement of the equipment, whose safety is ensured, in the EU territory.

Since 1996, compliance with the EMC Directive that is one of the EU Directives has been legally required. Since 1997, compliance with the Low Voltage Directive, another EU Directive, has been also legally required. When a manufacturer confirms its equipment to be compliant with the EMC Directive and the Low Voltage Directive, the manufacturer must declare the conformity and affix the CE marking.

● The authorized representative in the EU

The authorized representative in the EU is shown below.

Name: Mitsubishi Electric Europe B.V.

Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

(1) EMC Directive

We declare that this inverter, when equipped with the EMC Directive compliant EMC filter, conforms with the EMC Directive and affix the CE marking on the inverter.

- EMC Directive: 2014/30/EU
- Standard(s): EN61800-3:2004+A1:2012 (Second environment / PDS Category "C3")

Note: First environment

Environment including buildings/facilities which are directly connected to a low voltage main supply which also supplies residential buildings.

Directly connected means that there is no intermediate transformer between these buildings.

Second environment

Environment including all buildings/facilities which are not directly connected to a low voltage main supply which also supplies residential buildings.

● Note

- * Set the EMC Directive compliant EMC filter to the inverter. Insert line noise filters and ferrite cores to the power and control cables as required.
- * Connect the inverter to an earthed power supply.
- * Install a motor, the EMC Directive compliant EMC filter, and a control cable according to the instructions written in the EMC Installation Guidelines (BCN-A21041-204). (Please contact your sales representative for the EMC Installation Guidelines.)
- * The cable length to the motor should be 20m at maximum so that the EMC Directive compliant noise filter functions sufficiently.
- * Confirm that the final integrated system with the inverter conforms with the EMC Directive.
- * This inverter does not conform with the EU Directives when used with an IPM motor or with Filterpack.

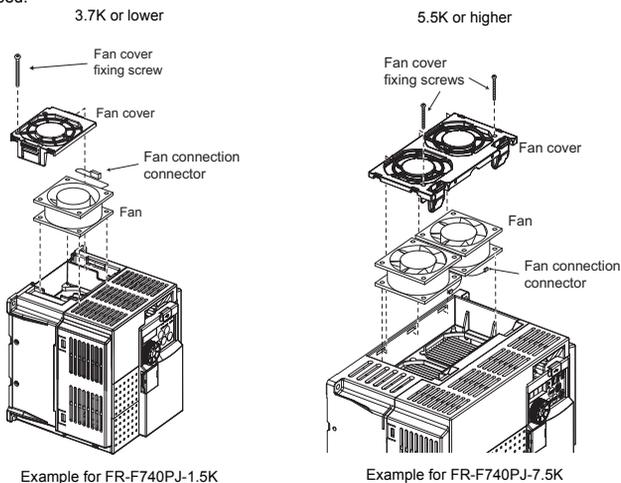
(2) Low Voltage Directive

We have self-confirmed our inverters as products compliant to the Low Voltage Directive and affix the CE marking on the inverters.

- Low Voltage Directive: 2014/35/EU
- Standard: EN61800-5-1:2007

Outline of instructions

- * Do not use an earth leakage circuit breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
 - * Wire the earth (ground) terminal independently. (Do not connect two or more cables to one terminal.)
 - * Use the cable sizes on *page 14* under the following conditions.
 - Surrounding air temperature: 40°C maximum
 - If conditions are different from above, select appropriate wire according to EN60204.
 - * Use a tinned (plating should not include zinc) crimp terminal to connect the earth cable. When tightening the screw, be careful not to damage the threads.
- For use as a product compliant with the Low Voltage Directive, use PVC cable on *page 14*.
- * Use the molded case circuit breaker and magnetic contactor which conform to the EN or IEC Standard.
 - * When using an earth leakage circuit breaker, use a residual current operated protective device (RCD) of type B (breaker which can detect both AC and DC). If not, provide double or reinforced insulation between the inverter and other equipment, or put a transformer between the main power supply and inverter.
 - * Use the inverter under the conditions of overvoltage category II (usable regardless of the earth (ground) condition of the power supply), overvoltage category III (usable with the earthed-neutral system power supply, 400V class only) specified in IEC60664.
 - To use the inverter under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher.
 - To use the inverter outside of an enclosure in the environment of pollution degree 2, fix a fan cover with fan cover fixing screws enclosed.



Note, the protection structure of the Inverter units is considered to be an IP00.

- * On the input and output of the inverter, use cables of the type and size set forth in EN60204.
- * The operating capacity of the relay outputs (terminal symbols A, B, C) should be 30VDC, 0.3A. (Relay output has basic isolation from the inverter internal circuit.)
- * Control circuit terminals on *page 10* are safely isolated from the main circuit.
- * Environment

	Running	In Storage	During Transportation
Surrounding air temperature	-10°C to +50°C	-20°C to +65°C	-20°C to +65°C
Humidity	90% RH or less	90% RH or less	90% RH or less
Maximum Altitude	1000m	1000m	10000m

- * This inverter does not conform with the EU Directives when used with an IPM motor or with Filterpack.

* Select a UL and cUL certified fuse with Class T fuse equivalent cut-off speed or faster with the appropriate rating for branch circuit protection, or a UL489 molded case circuit breaker (MCCB) in accordance with the table below.

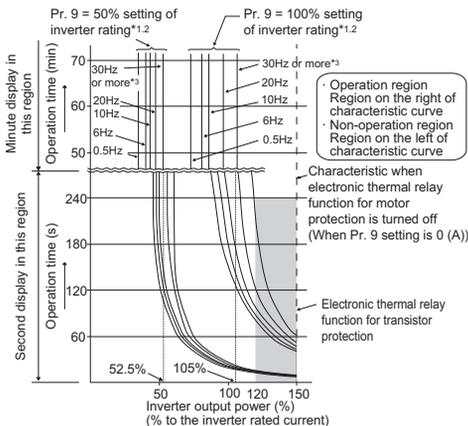
FR-F720PJ-□□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		240V or more								
Fuse allowable rating (A)	Without power factor improving reactor	15	20	30	40	60	70	80	150	175
	With power factor improving reactor	15	20	20	30	50	60	70	125	150
Molded case circuit breaker (MCCB) Maximum allowable rating (A)*1, *2		15	15	20	25	40	60	80	110	150

FR-F740PJ-□□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		480V or more								
Fuse allowable rating (A)	Without power factor improving reactor	6	10	15	20	30	40	70	80	90
	With power factor improving reactor	6	10	10	15	25	35	60	70	90
Molded case circuit breaker (MCCB) Maximum allowable rating (A)*1, *2		15	15	15	15	20	30	40	50	70

*1 Maximum allowable rating by US National Electrical Code. Exact size must be chosen for each installation.

*2 Select an appropriate molded case circuit breaker with a rating that is suitable for the size of the cable.

* When using the electronic thermal relay function as motor overload protection, set the rated motor current in Pr. 9 Electronic thermal O/L relay.



This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.

(The operation characteristic is shown on the left)

- When using the Mitsubishi Electric constant-torque motor
 - 1) Set "1" or any of "13", "50", "53" in Pr. 71. (This provides a 100% continuous torque characteristic in the low-speed range.)
 - 2) Set the rated current of the motor in Pr. 9.

- *1 When 50% of the inverter rated output current (current value) is set in Pr. 9
- *2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the motor rated current.
- *3 When you set the electronic thermal relay function dedicated to the Mitsubishi Electric constant-torque motor, this characteristic curve applies to operation at 6Hz or higher. (For selection of the operation characteristic, refer to Chapter 4 of the Instruction Manual.)



NOTE

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-OFF.
- When multiple motors are operated by a single inverter, protection cannot be provided by the electronic thermal relay function. Install an external thermal relay to each motor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use the external thermal relay.

* Short circuit current ratings

- 200V class
Suitable for use in a circuit capable of delivering not more than 5kA rms symmetrical amperes, 264V maximum.
- 400V class
Suitable for use in a circuit capable of delivering not more than 5kA rms symmetrical amperes, 528V maximum.

Appendix 2 Instructions for UL and cUL

(Standard to comply with: UL 508C, CSA C22.2 No. 274-13)

1. General precaution

CAUTION - Risk of Electric Shock -

The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/- with a meter etc., to avoid a hazard of electrical shock.

ATTENTION - Risque de choc électrique -

La durée de décharge du condensateur de bus est de 10 minutes. Avant de commencer le câblage ou l'inspection, mettez l'appareil hors tension et attendez plus de 10 minutes.

2. Environment

Before installation, check that the environment meets following specifications.

Surrounding air temperature*	-10°C to + 50°C (non-freezing)	
	Ambient humidity	
Storage temperature	-20°C to + 65°C	
Ambience	Indoors (No corrosive and flammable gases, oil mist, dust and dirt.)	
Altitude, vibration	Below 1000m, 5.9m/s ² or less at 10 to 55Hz (directions of X, Y, Z axes)	

* Surrounding Air Temperature is a temperature measured at a measurement position in an enclosure. Ambient Temperature is a temperature outside an enclosure.

3. Installation

The below types of inverter have been approved as products for use in enclosure and approval tests were conducted under the following conditions. Design the enclosure so that the surrounding air temperature, humidity and ambience of the inverter will satisfy the above specifications.

Branch Circuit Protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code for the U.S. or the Canadian Electrical Code for Canada and any additional codes. As specified, UL Class T, Class J, Class CC fuses or any faster acting fuse with the appropriate rating or UL listed 489 molded case circuit breaker (MCCB), or Type E combination motor controller must be employed.

FR-F720PJ-□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		240V or more								
Fuse allowable rating (A)	Without power factor improving reactor	15	20	30	40	60	70	80	150	175
	With power factor improving reactor	15	20	20	30	50	60	70	125	150
Molded case circuit breaker (MCCB)		15	15	20	25	40	60	80	110	150
Maximum allowable rating (A)*1, *2										
	Type E combination motor controller*3	Maximum current rating (A)	6.3	8	13	18	25			
	Maximum SCCR (kA)*4	50	50	50	50	25				

FR-F740PJ-□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		480V or more								
Fuse allowable rating (A)	Without power factor improving reactor	6	10	15	20	30	40	70	80	90
	With power factor improving reactor	6	10	10	15	25	35	60	70	90
Molded case circuit breaker (MCCB)		15	15	15	15	20	30	40	50	70
Maximum allowable rating (A)*1, *2										
	Type E combination motor controller*3	Maximum current rating (A)	2.5	4	6.3	10	18	25	32	
	Maximum SCCR (kA)*4	50	50	50	50	50	25	25		

*1 Maximum allowable rating by US National Electrical Code. Exact size must be chosen for each installation.

*2 Select an appropriate fuse or molded case circuit breaker with a rating that is suitable for the size of the cable.

*3 For UL/cUL certification, use the following product.

Model	Manufacturer	Rated Voltage, Vac
MMP-T32	Mitsubishi Electric Corp.	480Y/277

*4 Suitable for use in a circuit capable of delivering not more than 50 or 25 kA rms symmetrical amperes, 480Y/277 volts maximum when protected by the Type E combination motor controllers indicated in the above table.

4. Short circuit ratings

- 200V class

Suitable for use in a circuit capable of delivering not more than 100kA rms symmetrical amperes, 264V maximum.

- 400V class

Suitable for use in a circuit capable of delivering not more than 100kA rms symmetrical amperes, 528V maximum.

5. Wiring

Refer to the National Electrical Code (Article 310) regarding the allowable current of the cable. Select the cable size for 125% of the rated current according to the National Electrical Code (Article 430).

For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL Listed copper, stranded wires (rated at 75°C) and round crimp terminals. Crimp the terminals with the crimping tool recommended by the terminal maker.

6. Motor overload protection

When using the electronic thermal relay function as motor overload protection, set the rated motor current to Pr. 9 Electronic thermal O/L relay. (Refer to page 53.)



NOTE

- Motor over temperature sensing is not provided by the drive.

- The use of this inverter with an IPM motor or with Filterpack is not certified by the UL nor cUL.

Appendix 3 SERIAL number check

The SERIAL number can be checked on the inverter rating plate or package. (*Refer to page 1.*)

Rating plate example

□ 0 0 000000
Symbol Year Month Control number
SERIAL (Serial No.)

The SERIAL consists of one symbol, two characters indicating the production year and month, and six characters indicating the control number.
Last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), and Z (December).

Appendix 4 Instructions for EAC



The product certified in compliance with the Eurasian Conformity has the EAC marking.

Note: EAC marking

In 2010, three countries (Russia, Belarus, and Kazakhstan) established a Customs Union for the purposes of revitalizing the economy by forming a large economic bloc by abolishing or reducing tariffs and unifying regulatory procedures for the handling of articles.

Products to be distributed over these three countries of the Customs Union must comply with the Customs Union Technical Regulations (CU-TR), and the EAC marking must be affixed to the products.

For information on the country of origin, manufacture year and month, and authorized sales representative (importer) in the CU area of this product, refer to the following:

- Country of origin indication
Check the rating plate of the product. (*Refer to page 1.*)
Example: MADE IN JAPAN
- Manufactured year and month
The SERIAL number (*refer to Appendix 3*) can be checked on the rating plate (*refer to page 1*) of the product.
- Authorized sales representative (importer) in the CU area
The authorized sales representative (importer) in the CU area is shown below.
Name: Mitsubishi Electric (Russia) LLC
Address: 52, bld 1 Kosmodamianskaya Nab 115054, Moscow, Russia
Phone: +7 (495) 721-2070
Fax: +7 (495) 721-2071

Appendix 5 Restricted Use of Hazardous Substances in Electronic and Electrical Products

The mark of restricted use of hazardous substances in electronic and electrical products is applied to the product as follows based on the "Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products" of the People's Republic of China.

电器电子产品有害物质限制使用标识要求



本产品中所含有的有害物质的名称、含量、含有部件如下表所示。

- 产品中所含有害物质的名称及含量

部件名称 *2	有害物质 *1					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
电路板组件 (包括印刷电路板及其构成的零部件, 如电阻、电容、集成电路、连接器等)、电子部件	×	○	×	○	○	○
金属壳体、金属部件	×	○	○	○	○	○
树脂壳体、树脂部件	○	○	○	○	○	○
螺丝、电线	○	○	○	○	○	○

上表依据 SJ/T11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。

×: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 规定的限量要求。

*1 即使表中记载为 ×, 根据产品型号, 也可能会有有害物质的含量为限制值以下的情况。

*2 根据产品型号, 一部分部件可能不包含在产品中。

Appendix 6 Referenced Standard (Requirement of Chinese standardized law)

This Product is designed and manufactured accordance with following Chinese standards.

Electrical safety : GB 12668.501

EMC : GB 12668.3

Warranty

When using this product, make sure to understand the warranty described below.

1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.
 - (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
 - (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
 - 1) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
 - 2) a failure caused by any alteration, etc. to the Product made on your side without our approval
 - 3) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
 - 4) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
 - 5) any replacement of consumable parts (condenser, cooling fan, etc.)
 - 6) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
 - 7) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
 - 8) any other failures which we are not responsible for or which you acknowledge we are not responsible for
2. Term of warranty after the stop of production
- (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
 - (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.
3. Service in overseas
- Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.
4. Exclusion of loss in opportunity and secondary loss from warranty liability
- Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:
- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.
 - (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.
 - (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.
 - (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.
5. Change of Product specifications
- Specifications listed in our catalogs, manuals or technical documents may be changed without notice.
6. Application and use of the Product
- (1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.
 - (2) Our product is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used. In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision Date	*Manual Number	Revision
Sep. 2010	IB(NA)-0600425ENG-A	First edition
Apr. 2018	IB(NA)-0600425ENG-B	<p data-bbox="445 220 527 240"><u>Addition</u></p> <ul data-bbox="445 248 1010 501" style="list-style-type: none"> • Compatibility with the MM-EFS motor • <i>Pr.154 Voltage reduction selection during stall prevention operation</i> • <i>Pr.374 Overspeed detection level</i> • <i>Pr.552 Frequency jump range</i> • Appendix 3 SERIAL number check • Appendix 4 Instructions for EAC • Appendix 5 Restricted Use of Hazardous Substances in Electronic and Electrical Products • Appendix 6 Referenced Standard (Requirement of Chinese standardized law) <p data-bbox="445 509 557 529"><u>Modification</u></p> <ul data-bbox="445 537 1010 639" style="list-style-type: none"> • Total wiring length • Length of the earthing (grounding) cable (GND) of the FR-BFP2-(H)5.5K and 7.5K • Appendix 2 Instructions for UL and cUL

International FA Center

●Shanghai FA Center

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Shanghai FA Center
Mitsubishi Electric Automation Center,
No.1386 Hongqiao Road, Shanghai, China
TEL. 86-21-2322-3030
FAX. 86-21-2322-3000 (9611#)

●Beijing FA Center

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Beijing FA Center
5/F, ONE INDIGO, 20 Jiuxianqiao Road
Chaoyang District, Beijing, China
TEL. 86-10-6518-8830
FAX. 86-10-6518-2938

●Tianjin FA Center

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Tianjin FA Center
Room 2003 City Tower, No.35, Youyi Road,
Hexi District, Tianjin, China
TEL. 86-22-2813-1015
FAX. 86-22-2813-1017

●Guangzhou FA Center

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Guangzhou FA Center
Room 1609, North Tower, The Hub Center,
No.1068, Xingang East Road, Haizhu District,
Guangzhou, China
TEL. 86-20-8923-6730
FAX. 86-20-8923-6715

●Korea FA Center

MITSUBISHI ELECTRIC AUTOMATION
KOREA CO., LTD.
8F, Gangseo Hangang Xi-tower A, 401,
Yangcheon-ro , Gangseo-Gu, Seoul 07528,
Korea
TEL. 82-2-3660-9630
FAX. 82-2-3664-0475

●Taipei FA Center

SETSUYO ENTERPRISE CO., LTD.
3F, No.105, Wugong 3rd Road, Wugu District,
New Taipei City 24889, Taiwan
TEL. 886-2-2299-9917
FAX. 886-2-2299-9963

●Taichung FA Center

MITSUBISHI ELECTRIC TAIWAN CO.,LTD.
No.8-1, Industrial 16th Road, Taichung
Industrial Park, Taichung City 40768 Taiwan
TEL. 886-4-2359-0688
FAX. 886-4-2359-0689

●Thai FA Center

MITSUBISHI ELECTRIC FACTORY
AUTOMATION (THAILAND) CO., LTD.
12th Floor, SV.City Building, Office Tower 1,
No. 896/19 and 20 Rama 3 Road, Kwaeng
Bangpongpan, Khet Yannawa, Bangkok
10120, Thailand
TEL. 66-2682-6522 to 31
FAX. 66-2682-6020

●ASEAN FA Center

MITSUBISHI ELECTRIC ASIA PTE. LTD.
307, Alexandra Road, Mitsubishi Electric
Building, Singapore 159943
TEL. 65-6470-2480
FAX. 65-6476-7439

●Indonesia FA Center

PT. MITSUBISHI ELECTRIC INDONESIA
Cikarang Office
Jl. Kenari Raya Blok G2-07A Delta Silicon 5,
Lippo Cikarang - Bekasi 17550, Indonesia
TEL. 62-21-2961-7797
FAX. 62-21-2961-7794

●Hanoi FA Center

MITSUBISHI ELECTRIC VIETNAM
COMPANY LIMITED Hanoi Branch Office
6th Floor, Detech Tower, 8 Ton That Thuyet
Street, My Dinh 2 Ward, Nam Tu Liem District,
Hanoi, Vietnam
TEL. 84-4-3937-8075
FAX. 84-4-3937-8076

●Ho Chi Minh FA Center

MITSUBISHI ELECTRIC VIETNAM
COMPANY LIMITED
Unit 01-04, 10th Floor, Vincom Center, 72 Le
Thanh Ton Street, District 1, Ho Chi Minh
City, Vietnam
TEL. 84-8-3910-5945
FAX. 84-8-3910-5947

●India Pune FA Center

MITSUBISHI ELECTRIC INDIA PVT. LTD.
Pune Branch
Emerald House, EL -3, J Block, M.I.D.C
Bhosari, Pune - 411026, Maharashtra, India
TEL. 91-20-2710-2000
FAX. 91-20-2710-2100

●India Gurgaon FA Center

MITSUBISHI ELECTRIC INDIA PVT. LTD.
Gurgaon Head Office
2nd Floor, Tower A & B, Cyber Greens, DLF
Cyber City, DLF Phase - III, Gurgaon -
122002 Haryana, India
TEL. 91-124-463-0300
FAX. 91-124-463-0399

●India Bangalore FA Center

MITSUBISHI ELECTRIC INDIA PVT. LTD.
Bangalore Branch
Prestige Emerald, 6th Floor, Municipal No. 2,
Madras Road, Bangalore - 560001,
Karnataka, India
TEL. 91-80-4020-1600
FAX. 91-80-4020-1699

●India Chennai FA Center

MITSUBISHI ELECTRIC INDIA PVT. LTD.
Chennai Branch
Citilights Corporate Centre No.1,
Vivekananda Road, Srinivasa Nagar,
Chetpet, Chennai - 600031, Tamil Nadu,
India
TEL. 91-44-4554-8772
FAX. 91-4445548773

●India Ahmedabad FA Center

MITSUBISHI ELECTRIC INDIA PVT. LTD.
Ahmedabad Branch
B/4, 3rd Floor, SAFAL Profitaire, Corporate
Road, Prahaladnagar, Satellite, Ahmedabad
- 380015, Gujarat, India
TEL. 91-79-6512-0063
FAX. 91-79-6512-0063

●North America FA Center

MITSUBISHI ELECTRIC AUTOMATION,
INC.
500 Corporate Woods Parkway, Vernon
Hills, IL 60061, U.S.A.
TEL. 1-847-478-2334
FAX. 1-847-478-2253

●Mexico Monterrey Center

MITSUBISHI ELECTRIC AUTOMATION,
INC. Monterrey Office
Plaza Mirage, Av. Gonzalitos 460 Sur, Local
28, Col. San Jeronimo,
Monterrey, Nuevo Leon, C.P. 66460, Mexico
TEL. 52-55-3067-7521

●Mexico FA Center

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