MITSUBISHI ELECTRIC

700 series

INVERTER
FR-E700
INSTRUCTION MANUAL (BASIC)

FL remote communication function

FR-E720-0.1KNF to 15KNF
FR-E740-0.4KNF to 15KNF

Thank you for choosing this Mitsubishi 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.

CONTENTS

To obtain the Instruction Manual (Applied) and the Safety stop function instruction manual

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

- *Instruction Manual (Applied) [IB(NA)-0600398ENG]*
- *Safety stop function instruction manual [BCN-A211508-004]*

These manuals are required if you are going to utilize functions and performance.

The PDF version of this manual is also available for download at "MELFANS Web," the Mitsubishi Electric FA network service on the world wide web (URL: http://www.MitsubishiElectric.co.jp/melfansweb)

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 power is ON or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.**
- **Do not run the inverter with the front cover or 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 536 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.**
- **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.**

2. Fire Prevention

⚠CAUTION

- **Inverter 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.**

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 as they 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 if it is damaged or has parts missing.**
- **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. That includes screws and metal fragments or other flammable substance such as oil.**
- **As the inverter is a precision instrument, do not drop or subject it to impact.**
- **The inverter must be used under the following environment. Otherwise the inverter 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 1,000m above sea level. 5.9m/s^2 or less at 10 to 55Hz (directions of X, Y, Z axes)

∗1 Temperature applicable for a short time, e.g. in transit.

(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.

(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

- Any person must stay away from the equipment when the retry function is set as it will restart suddenly after trip.
- Since pressing STOP RESET 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.
- The inverter must be used for three-phase induction motors. 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 a noise 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 hold 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.
- For prevention of damage due to static electricity, nearby metal must be touched before touching this product to eliminate static electricity from your body.

(5) Emergency stop

⚠CAUTION

- A safety backup such as an emergency brake must be provided to prevent hazardous condition to the machine and equipment in case of inverter failure.
- 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.

1 PRODUCT CHECKING AND PARTS IDENTIFICATION

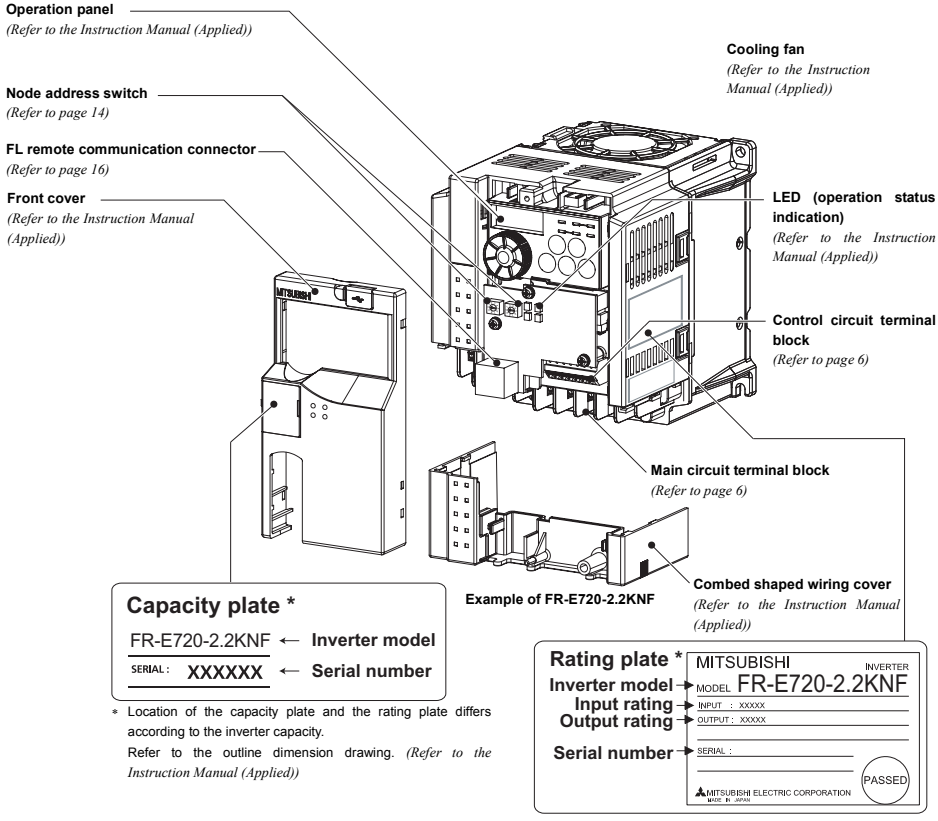
Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

●Inverter model

FR - E720 - 2.2 KNF

No.	Voltage class
E720	Three-phase 200V class
E740	Three-phase 400V class

Represents the inverter capacity [kW]



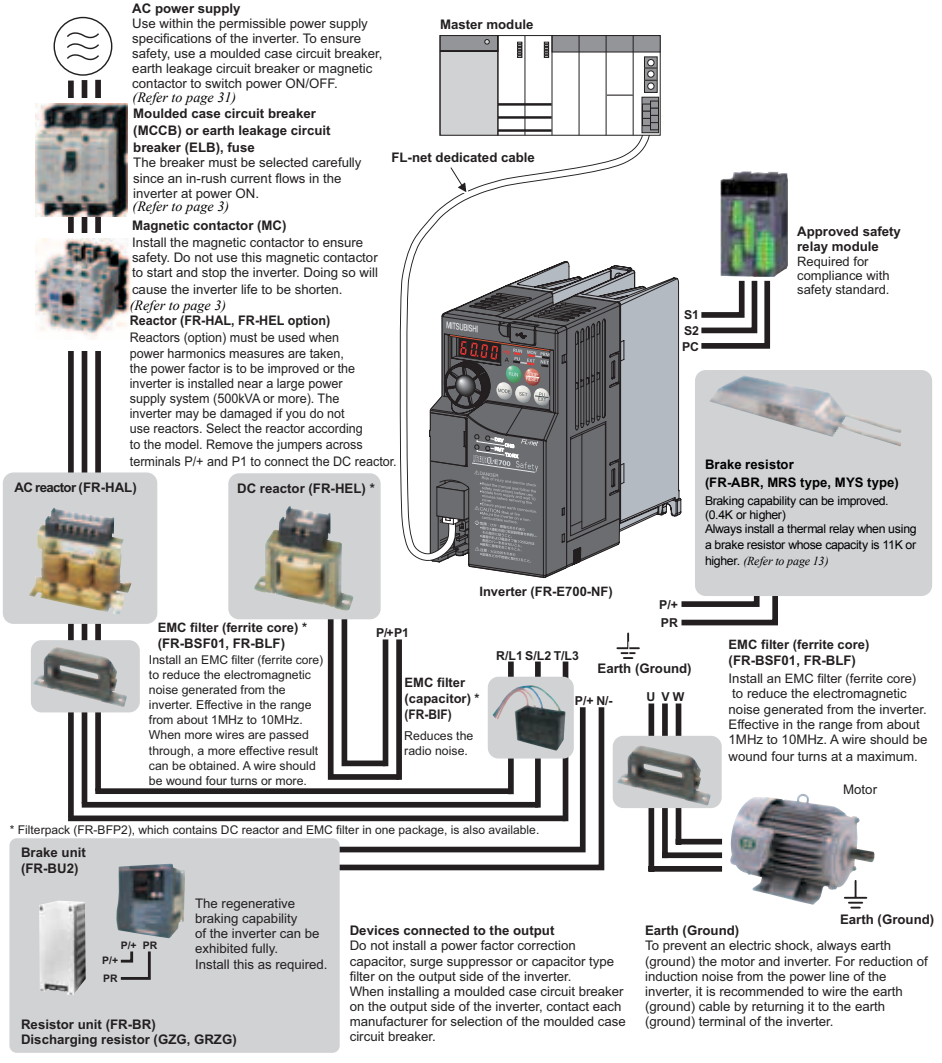
∗ Location of the capacity plate and the rating plate differs according to the inverter capacity.
Refer to the outline dimension drawing. *(Refer to the Instruction Manual (Applied))*

- **Accessory**
  - **Fan cover fixing screws (M3 × 35mm)**
    These screws are necessary for compliance with the EU Directive (*Refer to page 35*)

Capacity	Quantity
FR-E720-1.5KNF to 3.7KNF, FR-E740-1.5KNF to 3.7KNF	1
FR-E720-5.5KNF to 15KNF, FR-E740-5.5KNF to 15KNF	2

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 the Instruction Manual (Applied).*)

2 INSTALLATION AND WIRING



NOTE

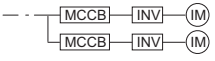
- **Up to 64 inverters can be connected when using FL remote communication.**
- **The life of the inverter is influenced by surrounding air temperature. The surrounding air temperature should be as low as possible within the permissible range. This must be noted especially when the inverter is installed in an enclosure.** *(Refer to page 4)*
- **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 5***)**
- **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 options among the capacitor type EMC filter FR-BIF (for use in the input side only), the ferrite core type EMC filter FR-BSF01/FR-BLF, Filterpack, and EMC filter to minimize the interference. (*Refer to the Instruction Manual (Applied)***).**
- **Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.**

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:

	Applicable Inverter Model	Motor Output (kW)	Moulded Case Circuit Breaker (MCCB) ∗1 or Earth Leakage Circuit Breaker (ELB) ∗2 (NF, NV type)		Magnetic Contactor (MC) ∗3		Reactor	
			Reactor connection		Reactor connection		FR-HAL	FR-HEL
			without	with	without	with		
Three-Phase 200V	FR-E720-0.1KNF	0.1	5A	5A	S-N10	S-N10	0.4K ∗4	0.4K ∗4
	FR-E720-0.2KNF	0.2	5A	5A	S-N10	S-N10	0.4K ∗4	0.4K ∗4
	FR-E720-0.4KNF	0.4	5A	5A	S-N10	S-N10	0.4K	0.4K
	FR-E720-0.75KNF	0.75	10A	10A	S-N10	S-N10	0.75K	0.75K
	FR-E720-1.5KNF	1.5	15A	15A	S-N10	S-N10	1.5K	1.5K
	FR-E720-2.2KNF	2.2	20A	15A	S-N10	S-N10	2.2K	2.2K
	FR-E720-3.7KNF	3.7	30A	30A	S-N20, S-N21	S-N10	3.7K	3.7K
	FR-E720-5.5KNF	5.5	50A	40A	S-N25	S-N20, S-N21	5.5K	5.5K
	FR-E720-7.5KNF	7.5	60A	50A	S-N25	S-N25	7.5K	7.5K
	FR-E720-11KNF	11	75A	75A	S-N35	S-N35	11K	11K
	FR-E720-15KNF	15	125A	100A	S-N50	S-N50	15K	15K
Three-Phase 400V	FR-E740-0.4KNF	0.4	5A	5A	S-N10	S-N10	H0.4K	H0.4K
	FR-E740-0.75KNF	0.75	5A	5A	S-N10	S-N10	H0.75K	H0.75K
	FR-E740-1.5KNF	1.5	10A	10A	S-N10	S-N10	H1.5K	H1.5K
	FR-E740-2.2KNF	2.2	15A	10A	S-N10	S-N10	H2.2K	H2.2K
	FR-E740-3.7KNF	3.7	20A	15A	S-N10	S-N10	H3.7K	H3.7K
	FR-E740-5.5KNF	5.5	30A	20A	S-N20, S-N21	S-N11, S-N12	H5.5K	H5.5K
	FR-E740-7.5KNF	7.5	30A	30A	S-N20, S-N21	S-N20, S-N21	H7.5K	H7.5K
	FR-E740-11KNF	11	50A	40A	S-N20, S-N21	S-N20, S-N21	H11K	H11K
	FR-E740-15KNF	15	60A	50A	S-N25	S-N20, S-N21	H15K	H15K

∗1 •Select an MCCB according to the power supply capacity.
•Install one MCCB per inverter.



∗2 For the use in the United States or Canada, 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. Alternatively, select a UL489 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.
When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

∗4 The power factor may be slightly lower.

NOTE

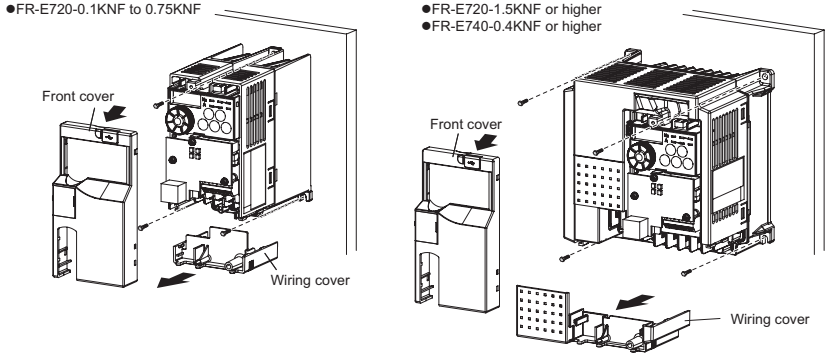
- **When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model and cable and reactor according to the motor output.**
- **When the breaker on the inverter input side trips, check for the wiring fault (short circuit), damage to 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 inverter and instructions

(1) Installation of the inverter

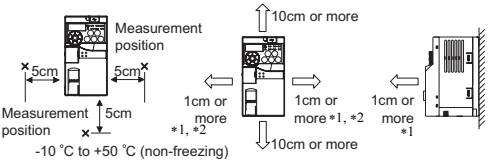
Enclosure surface mounting

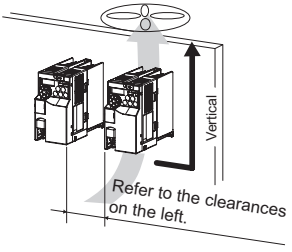
Remove the front cover and wiring cover to fix the inverter to the surface. (Remove the covers in the directions of the arrows.)



Note

- **When encasing multiple inverters, install them in parallel as a cooling measure.**
- **Install the inverter vertically.**
- **For heat dissipation and maintenance, take at least the clearances shown in the table below from the inverter to the other devices and to the enclosure surface.**





∗1 Take 5cm or more clearances 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) Environment

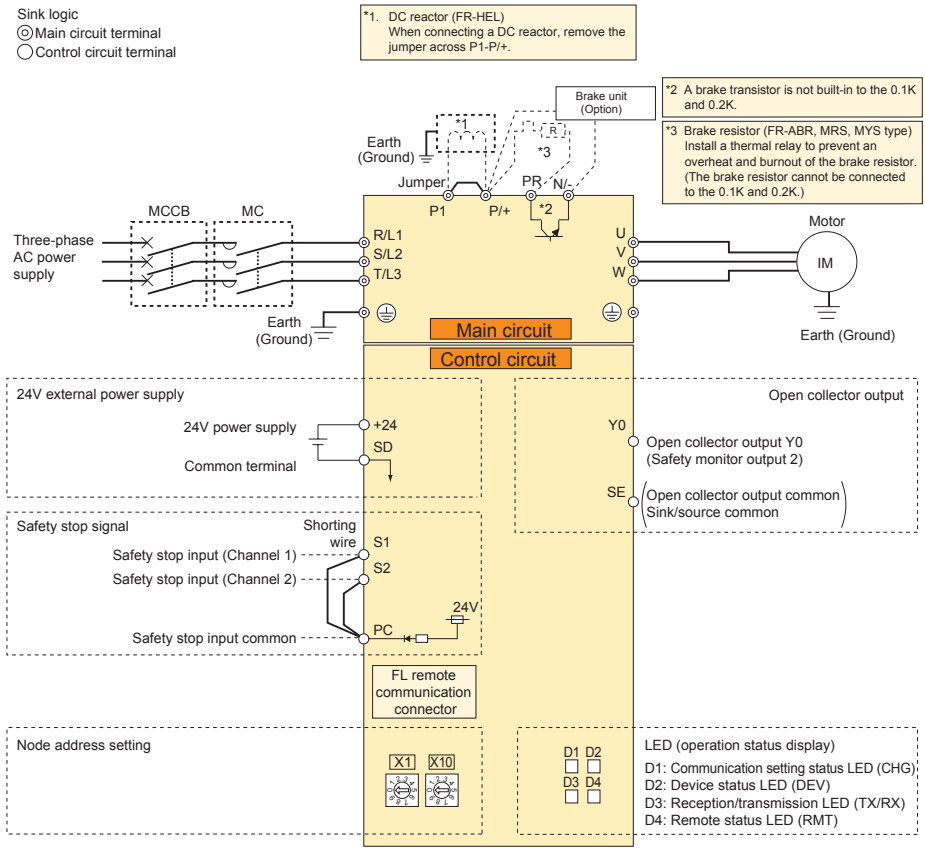
Before installation, check that the environment meets the specifications on *page 32*.

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 non-flammable wall surface.**

2.3 Wiring

2.3.1 Terminal connection diagram



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 offcuts must not be left in the inverter.**
  Wire offcuts 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.

2.3.2 Terminal specifications

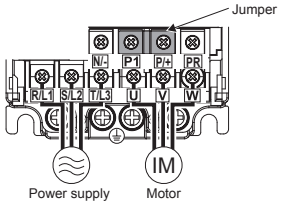
Type		Terminal Symbol	Terminal Name	Description	
Main circuit		R/L1, S/L2, T/L3	AC power input	Connect to the commercial power supply.	
		U, V, W	Inverter output	Connect a three-phase squirrel-cage motor.	
		P/+, PR	Brake resistor connection	Connect a brake resistor (FR-ABR, MRS type, MYS type) across terminals P/+ and PR. (The brake resistor cannot be connected to the 0.1K or 0.2K.)	
		P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2).	
		P/+, P1	DC reactor connection	Remove the jumper across terminals P/+ and P1 and connect a DC reactor.	
		⏚	Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded).	
Control circuit	24V external power supply	+24	24V external power supply	Even when the main circuit power supply is OFF, FL-net communication continues with the input from the 24V external power supply.	Input voltage 23.5 to 26.5VDC Input current 0.7A or less
		SD	24V external power supply common terminal	Common terminal for the terminal +24	
	Safety stop function *	S1	Safety stop input (Channel 1)	Terminal S1/S2 are safety stop signals for use with in conjunction with an approved external safety unit. Both terminal S1/S2 must be used in dual channel form. Inverter output is shutoff depending on shorting/opening between S1 and PC, S2 and PC. In the initial status, terminal S1 and S2 are shorted with terminal PC by shorting wire. Remove the shorting wire and connect the safety relay module when using the safety stop function.	Input resistance 4.7kΩ Voltage when contacts are open 21 to 26VDC When contacts are short-circuited 4 to 6mADC
		S2	Safety stop input (Channel 2)		
		PC	Safety stop input terminal common	Common terminal for safety stop input terminals S1 and S2.	
		Y0	Open collector output Y0 (safety monitor output 2)	This terminal is switched to Low during the operation with no internal safety circuit fault (E.SAF, E.6, E.7, E.CPU). It is switched to High in operation statuses other than above. (Low indicates that the open collector output transistor is ON (conducts). High indicates that the transistor is OFF (does not conduct).)	Permissible load 24VDC (maximum 27VDC) 0.1A (a voltage drop is 3.4V maximum when the signal is ON)
		SE	Open collector output common	Common terminal of terminal Y0.	
	FL remote communication connector			With the FL remote communication connector, FL remote communication can be performed.	

* For more details, *refer to the Safety stop function instruction manual (BCN-A211508-004)*. (Refer to the front cover for how to obtain the manual.)

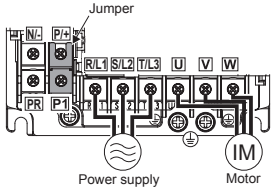
2.3.3 Terminal arrangement of the main circuit terminal, power supply and the motor wiring

Three-phase 200V class

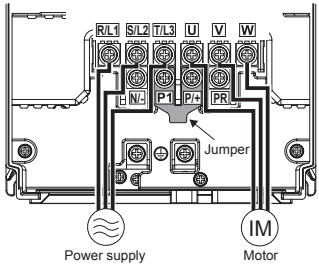
FR-E720-0.1KNF to 0.75KNF



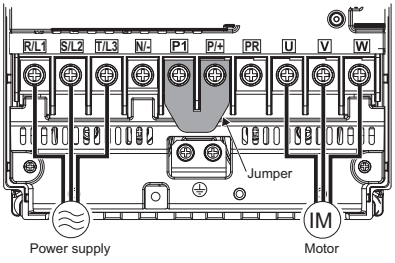
FR-E720-1.5KNF to 3.7KNF



FR-E720-5.5KNF, 7.5KNF

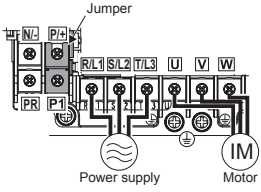


FR-E720-11KNF, 15KNF

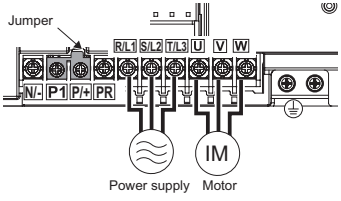


Three-phase 400V class

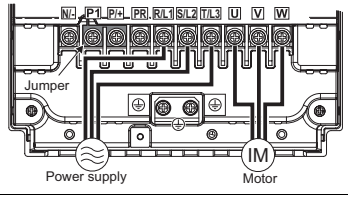
FR-E740-0.4KNF to 3.7KNF



FR-E740-5.5KNF, 7.5KNF



FR-E740-11KNF, 15KNF



NOTE

- **Make sure the power cables are connected to the R/L1, S/L2, T/L3. (Phase need not be matched.) Never connect the power cable to the U, V, W of the inverter. Doing so will damage the inverter.**
- **Connect the motor to U, V, W. Turning ON the forward rotation switch (signal) at this time rotates the motor counterclockwise when viewed from the load shaft.**

2.3.4 Cables and wiring length

(1) Cable size and other specifications of the main circuit terminals and the earthing terminal

Select the recommended cable size to ensure that a voltage drop will be 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.
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	Crimping 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	Earth (ground) cable	R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable
FR-E720-0.1KNF to 0.75KNF	M3.5	1.2	2-3.5	2-3.5	2	2	2	14	14	2.5	2.5	2.5
FR-E720-1.5KNF, 2.2KNF	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-E720-3.7KNF	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-E720-5.5KNF	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	10	10	6	6	6
FR-E720-7.5KNF	M5	2.5	14-5	8-5	14	8	5.5	6	8	16	10	6
FR-E720-11KNF	M5	2.5	14-5	14-5	14	14	14	6	6	16	16	16
FR-E720-15KNF	M6(M5)	4.4	22-6	22-6	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	Crimping 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	Earth (ground) cable	R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable
FR-E740-0.4KNF to 3.7KNF	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-E740-5.5KNF	M4	1.5	5.5-4	2-4	3.5	2	3.5	12	14	4	2.5	4
FR-E740-7.5KNF	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-E740-11KNF	M4	1.5	5.5-4	5.5-4	5.5	5.5	8	10	10	6	6	10
FR-E740-15KNF	M5	2.5	8-5	8-5	8	8	8	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. (Selection example for use mainly in the United States.)

*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).
A screw for earthing (grounding) of the FR-E720-15KNF is indicated in ( ).

NOTE

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

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

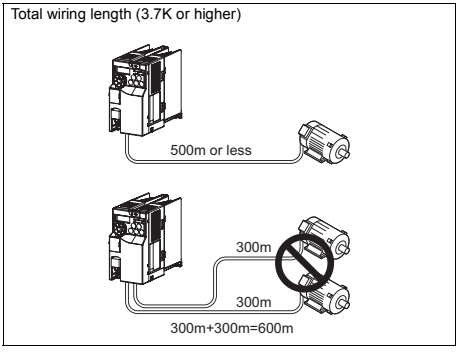
$$\text{Line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance[m}\Omega\text{/m]} \times \text{wiring distance[m]} \times \text{current[A]}}{1000}$$

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

The overall wiring length for connection of a single motor or multiple motors should be within the value in the table below.

Pr. 72 PWM frequency selection Setting (carrier frequency)		0.1K	0.2K	0.4K	0.75K	1.5K	2.2K	3.7K or Higher
1 (1kHz) or less	200V class	200m	200m	300m	500m	500m	500m	500m
	400V class	—	—	200m	200m	300m	500m	500m
2 to15 (2kHz to 14.5kHz)	200V class	30m	100m	200m	300m	500m	500m	500m
	400V class	—	—	30m	100m	200m	300m	500m



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. Take the following measures (1) or (2) in this case.

(1) Use a "400V class inverter-driven insulation-enhanced motor" and set frequency in *Pr. 72 PWM frequency selection* according to wiring length.

	Wiring Length		
	50m or less	**50m to 100m**	**Exceeding 100m**
Carrier frequency	14.5kHz or less	8kHz or less	2kHz or less

(2) Connect the surge voltage suppression filter (FR-ASF-H/FR-BMF-H) on the inverter output side.

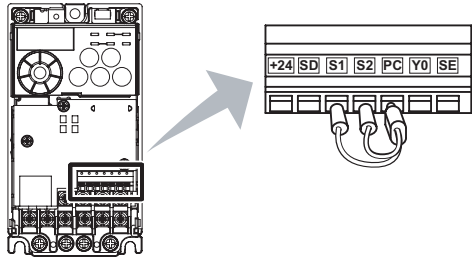
NOTE

- **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 5 of the Instruction Manual (Applied))*
- *Refer to Chapter 5 of the Instruction Manual (Applied)* **for details of** *Pr. 72 PWM frequency selection* **. Refer to the manual of the option for details of surge voltage suppression filter (FR-ASF-H/FR-BMF-H).**
- **When using the automatic restart after instantaneous power failure function with wiring length exceeding than 100m, select without frequency search (***Pr. 162* **= "1 (initial setting), 11"). (** *Refer to Chapter 5 of the Instruction Manual (Applied))*

2.3.5 Wiring of control circuit

(1) Terminal layout of control circuit terminal

Recommended wire size:
0.3mm² to 0.75mm²

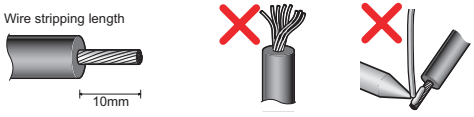


(2) Wiring method

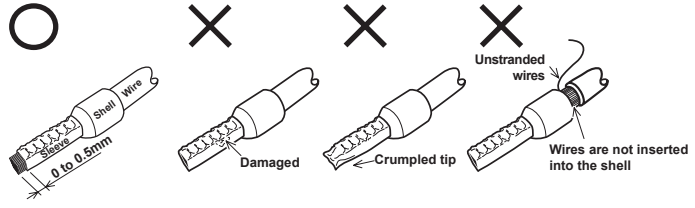
●Wiring

For the control circuit wiring, strip off the sheath of wires, and use them with a blade terminal. 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.

1) 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.



2) 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 Jan. 2010)

●Phoenix Contact Co.,Ltd.

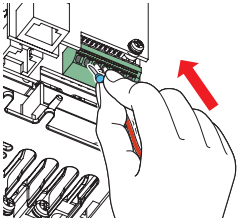
Wire Size (mm²)	Blade Terminal Model			Blade terminal crimping tool
	with insulation sleeve	without insulation sleeve	for UL wire*	
0.3	AI 0,5-10WH	—	—	CRIMPFOX 6
0.5	AI 0,5-10WH	—	AI 0,5-10WH-GB	
0.75	AI 0,75-10GY	A 0,75-10	AI 0,75-10GY-GB	
1	AI 1-10RD	A1-10	AI 1-10RD/1000GB	
1.25, 1.5	AI 1,5-10BK	A1,5-10	—	
0.75 (for two wires)	AI-TWIN 2 x 0,75-10GY	—	—	

* A blade terminal with an insulation sleeve compatible with MTW wire which has a thick wire insulation

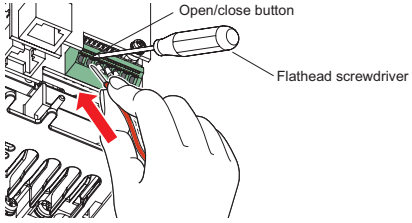
●NICHIFU Co.,Ltd.

Wire Size (mm²)	Blade terminal product number	Insulation product number	Blade terminal crimping tool
0.3 to 0.75	BT 0.75-11	VC 0.75	NH 67

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.

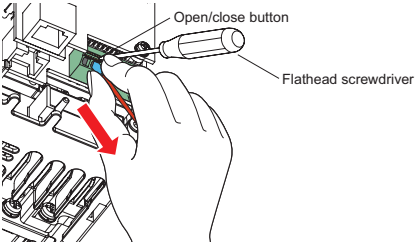


NOTE

- **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.
  Introduced products :(as of Oct. 2008)

Product	Type	Maker
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, SE)

Terminals SD and SE are common terminals for I/O signals. (Both common terminals are isolated from each other.) Do not earth them.

Terminal SD is a common terminal for the 24V external power supply terminal (+24). The open collector circuit is isolated from the internal control circuit by photocoupler.

Terminal SE is a common terminal for the open collector output terminal (Y0). The contact input circuit is isolated from the internal control circuit by photocoupler.

(4) Wiring instructions

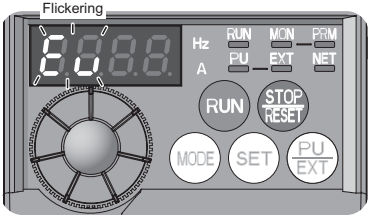
1) It is recommended to use the cables of 0.3mm^2 to 0.75mm^2 gauge for connection to the control circuit terminals.
2) The maximum wiring length should be 30m.
3) Do not short across terminals +24 and SD. It may cause a failure to the external power supply.
4) Use shielded or twisted cables for connection to the control circuit terminals and run them away from the main and power circuits (including the 200V relay sequence circuit).

2.3.6 Connecting the 24V external power supply

FL remote communication between the master module and the inverter can be continued while the main power circuit is OFF if the 24V external power supply is connected across terminals +24 and SD. When the main circuit power supply is turned ON, the power supply changes from the 24V external power supply to the main circuit power supply.

(1) Specification of the applied 24V external power supply
- Input voltage 23.5 to 26.5VDC
- Input current 0.7A or less

(2) Operation panel display during the 24V external power supply operation
- "EV" flickers.



(3) Function of the 24V external power supply operation
- When the main power supply is turned ON during the 24V external power supply operation, a reset is performed in the inverter, then the power supply changes to the main circuit power supply. During the reset operation in the inverter, the inverter cannot be controlled through the FL remote communication.
- The operation stops when the power supply changes to the 24V external power supply from the main circuit power supply regardless of the operating status (in a stop, in running, in automatic restart after instantaneous power failure, in offline tuning, in main circuit capacitor life measurement).
- All start signals (STF signal, STR signal, and RUN on the operation panel) are invalid during the 24V external power supply operation.
- Faults history and parameters can be read and parameters can be written (when the parameter write from the operation panel is enabled) using the operation panel keys.
- The safety stop function is also valid during the 24V external power supply operation. When the safety stop function is active, however, "SA" is not displayed because "EV" is displayed. The "EV" display has priority over the "SA" display.
- The following items can be monitored during the 24V external power supply operation:
  Frequency setting, output current peak value*, converter output voltage peak value*, cumulative energization time, actual operation time*, cumulative power*, and cumulative power 2* (monitor dedicated to the FL remote communication)
  * The monitored data is not updated after the power supply is changed from the main circuit power supply.
  (Refer to *Chapter 5 of the Instruction Manual (Applied)* for the details of each monitor.)
- The valid signals when the 24V external power supply is ON are ALM, Safety alarm, Edit, NET, READY and Y95. (Other signals are OFF.)
  (Refer to *Chapter 5 of the Instruction Manual (Applied)* for the detail of each signal.)
- The alarms, which have occurred when the main circuit power supply is ON, continue to be output after the power supply is changed to the 24V external power supply. Perform the inverter reset to reset the alarms.
- The retry function is invalid for all alarms when the 24V external power supply is ON.
- If the power supply changes from the main circuit power supply to the 24V external power supply while measuring the main circuit capacitor's life in the PU operation mode, the measurement completes after the power supply changes back to the main circuit power supply (*Pr.259* = "3").

NOTE

- **When the 24V external power supply is input while the main circuit power supply is OFF, the FL remote communication is enabled, but the inverter operation is disabled.**
- **Inrush current higher than the value described in (1) may flow at a power-ON. Confirm that the power supply and other devices are not affected by the inrush current and the voltage drop caused by it.**
- **When the wiring length between the external power supply and the inverter is long, the voltage often drops. Select the appropriate wiring size and length to keep the voltage in the rated input voltage range.**
- **In a serial connection of several inverters, the current increases when it flows through the inverter wiring near the power supply. The increase of the current causes voltage to drop further. When connecting different inverters to different power supplies, use the inverters after confirming that the input voltage of each inverter is within the rated input voltage range.**
- **"E.SAF" may appear when the start-up time of the 24V power supply is too long in the 24V external power supply operation.**

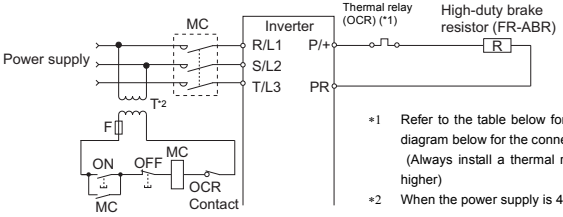
2.4 Connection of a dedicated external brake resistor (MRS type, MYS type, FR-ABR)

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 terminal P/+ and PR. (For the locations of terminal P/+ and PR, refer to the terminal block layout *(page 7)*.)

Set 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, MYS) and high duty brake resistor (FR-ABR) in case the regenerative brake transistor is damaged. (The brake resistor can not be connected to the 0.1K or 0.2K.)

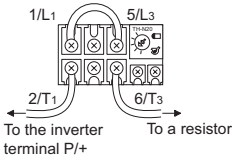


*1 Refer to the table below for the type number of each capacity of thermal relay and the diagram below for the connection.
(Always install a thermal relay when using a brake resistor whose capacity is 11K or higher)

*2 When the power supply is 400V class, install a step-down transformer.

Power Supply Voltage	Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	MRS120W200	TH-N20CXHZ-0.7A	110VAC 5A, 220VAC 2A (AC11 class) 110VDC 0.5A, 220VDC 0.25A (DC11 class)
	MRS120W100	TH-N20CXHZ-1.3A	
	MRS120W60	TH-N20CXHZ-2.1A	
	MRS120W40	TH-N20CXHZ-3.6A	
	MYS220W50 (two units in parallel)	TH-N20CXHZ-5A	

Power Supply Voltage	Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	FR-ABR-0.4K	TH-N20CXHZ-0.7A	110VAC 5A 220VAC 2A (AC11 class) 110VDC 0.5A, 220VDC 0.25A (DC11 class)
	FR-ABR-0.75K	TH-N20CXHZ-1.3A	
	FR-ABR-2.2K	TH-N20CXHZ-2.1A	
	FR-ABR-3.7K	TH-N20CXHZ-3.6A	
	FR-ABR-5.5K	TH-N20CXHZ-5A	
	FR-ABR-7.5K	TH-N20CXHZ-6.6A	
	FR-ABR-11K	TH-N20CXHZ-11A	
	FR-ABR-15K	TH-N20CXHZ-11A	
400V	FR-ABR-H0.4K	TH-N20CXHZ-0.24A	
	FR-ABR-H0.75K	TH-N20CXHZ-0.35A	
	FR-ABR-H1.5K	TH-N20CXHZ-0.9A	
	FR-ABR-H2.2K	TH-N20CXHZ-1.3A	
	FR-ABR-H3.7K	TH-N20CXHZ-2.1A	
	FR-ABR-H5.5K	TH-N20CXHZ-2.5A	
	FR-ABR-H7.5K	TH-N20CXHZ-3.6A	
	FR-ABR-H11K	TH-N20CXHZ-6.6A	
	FR-ABR-H15K	TH-N20CXHZ-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 can not be used with the brake unit, high power factor converter, power supply regeneration converter, etc.**
- **Do not use the brake resistor (MRS type, MYS type) with a lead wire extended.**
- **Do not connect the resistor directly to the terminals P/+ and N/-. This could cause a fire.**

2.5 FL remote communication specification

Type	Built-in to an inverter, RJ-45 connector connection method
Power supply	Supplied from the inverter or the 24VDC external power supply
Connection cable	FL-net dedicated cable *(Refer to page 15)*
Maximum number of connectable inverters	64 units maximum
Communication speed	Auto negotiation (auto detection) (10Mbps/100Mbps)
Topology	• Star (connection with a hub in the center) • Star bus (connection with multiple hubs)
Communication distance	• Between node ⇔ hub: 100m maximum (Node indicate master and inverters.) • Between hubs: 100m maximum • Overall length: 2000m maximum
Electrical interface	Conforms to IEEE802.3u (conforms to CSMA/CD)
Transmission protocol	FL remote
Node address setting	Can be set with node address switch. Reflected to IP address as well. (192.168.250. node address)
I/O points	Input 64 points, output 64 points

2.6 Node address setting

Set a node address between "1 to 64" using node address switches. *(Refer to page 1.)*

The setting is applied when the power turns OFF once, then ON again.

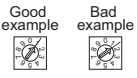
Set the arrow (⇧) of the corresponding switches to the number to set a desired address.

●Setting example

Node address 1: Set the "⇧" of X10(SW2) to "0" and the "⇧" of X1(SW1) to "1." 	Node address 26: Set the "⇧" of X10(SW2) to "2" and the "⇧" of X1(SW1) to "6." 

NOTE

- **Always remove the front cover before setting a node address with node address switches.** *(Refer to Chapter 1 of the Instruction Manual (Applied))*
- **Set the node address switch to the switch number position correctly. If the switch is set between numbers, normal data communication can not be established.**



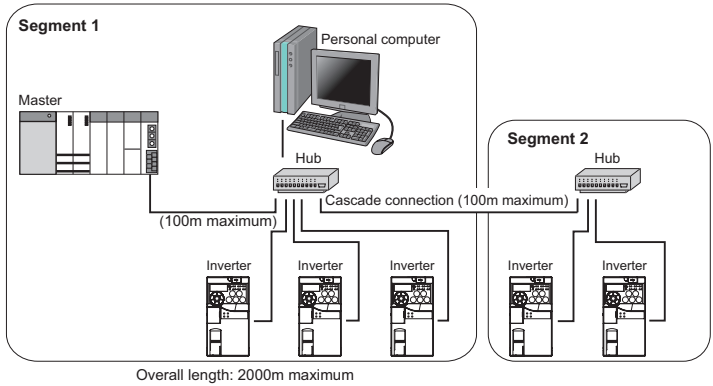
- **If the node address switch is set to a value other than "1 to 64", it is invalid due to outside of setting range. In this case, DEV LED is lit red and E.OPT appears on the operation panel.** *(Refer to Chapter 6 of the Instruction Manual (Applied)*
- **You cannot set the same node address to other devices on the network. (Doing so disables proper communication.)**
- **Set the inverter node address before switching ON the inverter and do not change the setting while power is ON. Otherwise you may get an electric shock.**

2.7 Wiring the FL-net dedicated cable

2.7.1 Connecting to the network

(1) Be sure to check the following points before connecting the inverter to the network.
- Check that the correct node address is set. *(Refer to page 14)*
- Check that the FL-net dedicated cable is correctly connected to the FL remote communication connector. *(Refer to page 16)*

(2) System configuration



Overall length: 2000m maximum

2.7.2 Precautions for system configuration

Enough safety measures are necessary when installing the FL-net dedicated cable and connecting to the FL remote network.
Consult the network provider and network administrator (person in charge of network planning and IP address management) including terminal treatment of connection cable, construction of trunk cable, etc.
We are not responsible for system troubles from connecting to the FL remote network.

2.7.3 Cable specifications

Use the following FL-net dedicated cables.

Cables	:TPCC5 or more (Twisted Pair Communication Cable for LAN Category 5) For the shape, use STP (Shielded Twisted Pair) (according to the 100BASE-TX(IEEE802.3u) standard)
Maximum wiring length	:100m maximum between the hub and the inverter (according to the 100BASE-TX(IEEE802.3u) standard)

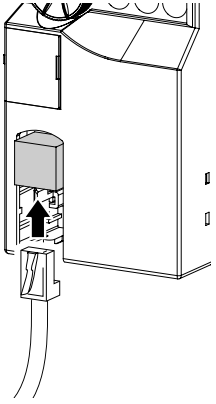
REMARKS

- FL-net dedicated cable...recommended product (as of October 2009)

Model name	Cable length	Manufacturer
FLG-S-○○○	1m to 100m	Shinwa Co., Ltd.
(Example: when the cable length is 1m) FLG-S-010		

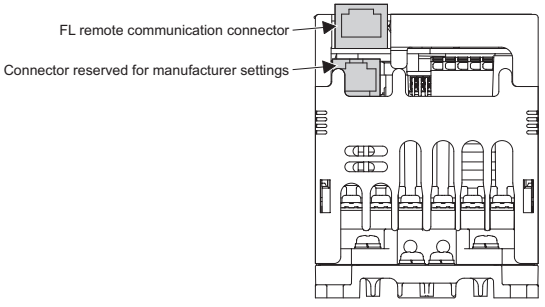
2.7.4 Connecting the FL-net dedicated cable

Connect the FL-net dedicated cable to the FL remote communication connector.



NOTE

- **Do not connect the FL-net dedicated cable to the connector reserved for manufacturer settings.**



⚠ CAUTION

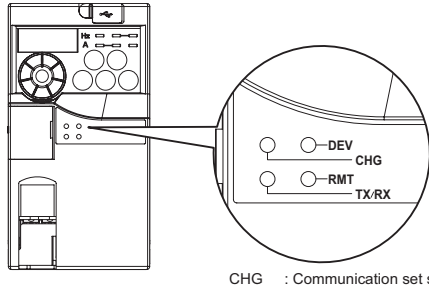
⚠ Do not connect a parameter unit (FR-PU07, etc.) to the FL remote communication connector. Doing so may damage the inverter.

⚠ Take caution not to subject the cables to stress.

⚠ After wiring, wire offcuts must not be left in the inverter. Wire offcuts can cause an alarm, failure or malfunction.

2.8 LED status

Each LED indicates the operating status of the inverter and network according to the indication status.



CHG : Communication set status LED
DEV : Device status LED
TX/RX : Reception/transmission LED
RMT : Remote status LED

2.8.1 Device status LED (DEV), remote status LED (RMT)

LED Status		Node Status	Description
DEV	RMT		
□	□	Power is OFF	The inverter power is OFF.
■	□	Hardware fault	• Node address is out of range (other than 1 to 64). • The option board is faulty. • A contact fault or other failure has occurred in the option connector between the inverter and a communication option.
▣	□	FL remote network is not connected	Although hardware is normal, it is not connected to the FL remote network.
▣	▣↔□	FL remote network at a remote stop	It is correctly set to connect to the FL remote network and waiting for remote I/O control.
		FL remote network during remote connection processing	Although remote I/O control started, initial processing is in progress.
		Master is not present	When the master is disconnected from FL remote network.
▣	▣	FL remote network during remote operation	During remote I/O control
▣	■↔□	Own node is disconnected	When the own node is disconnected from FL remote network.
▣	■↔▣	Setting error	Although it is connected to the FL remote, setting error is found. (When the slave is not the one the master is expected.)
▣	■	Duplicate node	When node address is duplicate with other node address
		Unsupported protocol	Communication is attempted via an unsupported protocol.

□:OFF, ■: red is lit, ▣: green is lit, ■↔□:red is flickering, ▣↔□: green is flickering, ■↔▣: red and green are alternately flickering

2.8.2 Transmitting (TX)/receiving (RX) LED

LED Status	Node Status	Description
□	Not transmitting (TX) /not receiving (RX)	
▣	Transmitting (TX)/receiving (RX)	Flickers at high speed during continuous transmitting/receiving

□ :OFF, ▣: green is lit

2.8.3 Communication set status LED (CHG)

LED Status	Node Status	Description
□	Communication setting is not changed	
■↔□	Communication setting is changed	Red flickers when the setting value actually reflected and of node address switch differ. The setting value of the node address switch is reflected by re-powering ON the inverter in this status, then communication setting status LED turns OFF.

□ :OFF, ■↔□: red is flickering

3 PRECAUTIONS FOR USE OF THE INVERTER

The FR-E700 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.
Before starting operation, always recheck the following items.

(1) Use crimping 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.
Wire offcuts 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.

(4) Use cables of the size to make a voltage drop 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 8* for the recommended wire sizes.

(5) The overall wiring length should be 500m or less.
Especially for long distance wiring, the fast-response current limit function may decrease or the equipment connected to the secondary side may malfunction or become faulty under the influence of a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. (*Refer to page 9*)

(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. In this case, install the FR-BIF optional capacitor type filter (for use in the input side only) or FR-BSF01 common mode filter to minimize interference.

(7) 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.

(8) For some short time after the power is switched OFF, a high voltage remains in the smoothing capacitor.
Before wiring or inspecting inside the inverter, wait 10 minutes or longer after turning OFF the power supply, then confirm that the voltage across the main circuit terminals P/+ and N/- of the inverter is 30VDC or less using a tester, etc. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.

(9) If "EV" is displayed on the operation panel, turn off the 24V external power supply before wiring and inspection.

(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 caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter modules.
- 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 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. *(Refer to the Instruction Manual (Applied))*

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

Do not connect a mechanical brake.

The brake resistor cannot be connected to the 0.1K or 0.2K. Leave terminals P/+ and PR open.

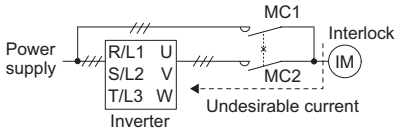
Also, never short between these terminals.

(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.

(14) Provide electrical and mechanical interlocks for MC1 and MC2 which are used for bypass operation.

When the wiring is incorrect and if there is a bypass operation circuit as shown right, the inverter will be damaged when the power supply is connected to the inverter U, V, W terminals, due to arcs generated at the time of switch-over or chattering caused by a sequence error.



(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 3* 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.
   The inverter's input side MC is used for the above purpose, select class JEM1038-AC3 MC for the inverter input side current when making an emergency stop during normal operation.

(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. When MC is provided for switching to the commercial power supply, for example, switch it ON/OFF after the inverter and motor have stopped.

(18) 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. Therefore, choose the inverter which has enough allowance for current (up to 2 rank larger in capacity).

(19) 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 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 providing interlocks, inverter fault can be detected. For the interlocks, use different status output signals of the inverter (virtual terminals of the FL remote communication) in combinations shown below.

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 output signal (ALM signal)	*Refer to Chapter 4 of the Instruction Manual (Applied).*
2)	Inverter running status	Check of the reset release signal	Reset release signal (READY signal)	*Refer to Chapter 4 of the Instruction Manual (Applied).*
3)	Inverter running status	Logic check of the start signal and running signal	Start signal (STF signal, STR signal) Running signal (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 signal (STF signal, STR signal) Output current detection signal (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, even if the interlock is provided using the inverter fault output signal, start signal and RUN signal output, there is a case where a fault output signal is not output and RUN signal is kept output even if an inverter fault occurs.

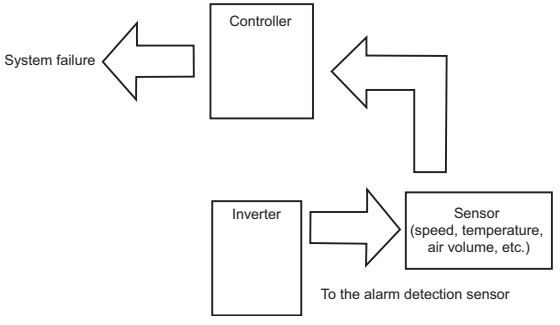
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as checking up as below according to the level of importance of the system.

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 PARAMETER LIST

For simple variable-speed operation of the inverter, the initial setting of the parameters may be used. Set the necessary parameters to meet the load and operational specifications. Parameter setting, change and check can be made from the operation panel.

REMARKS

- ◎ indicates simple mode parameters. (Initially set to extended mode)
- 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*. (Note that the *Pr.77* setting cannot be changed through the FL remote communication.)

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 3600/ 360s	5/10/15s *2
◎ 8	Deceleration time	0 to 3600/ 360s	5/10/15s *2
◎ 9	Electronic thermal O/L relay	0 to 500A	Rated inverter 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%	6/4/2% *3
13	Starting frequency	0 to 60Hz	0.5Hz
14	Load pattern selection	0 to 3	0
15	Jog frequency	0 to 400Hz	5Hz
16	Jog acceleration/deceleration time	0 to 3600/ 360s	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
21	Acceleration/deceleration time increments	0, 1	0
22	Stall prevention operation level	0 to 200%	150%
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, 1, 2	0
30	Regenerative function selection	0, 1, 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 3600/ 360s	5/10/15s *2
45	Second deceleration time	0 to 3600/ 360s, 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 200%, 9999	9999
51	Second electronic thermal O/L relay	0 to 500A, 9999	9999
52	DU/PU main display data selection	0, 5, 7 to 12, 14, 20, 23 to 25, 52 to 57, 61, 62, 100	0
54 to 56	Parameter for manufacturer setting. Do not set.		
57	Restart coasting time	0, 0.1 to 5s, 9999	9999

Parameter	Name	Setting Range	Initial Value
58	Restart cushion time	0 to 60s	1s
59	Remote function selection	0, 1, 2, 3	0
60	Energy saving control selection	0, 9	0
61	Reference current	0 to 500A, 9999	9999
62	Reference value at acceleration	0 to 200%, 9999	9999
63	Reference value at deceleration	0 to 200%, 9999	9999
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 360s	1s
69	Retry count display erase	0	0
70	Special regenerative brake duty	0 to 30%	0%
71	Applied motor	0, 1, 3 to 6, 13 to 16, 23, 24, 40, 43, 44, 50, 53, 54	0
72	PWM frequency selection	0 to 15	1
73, 74	Parameter for manufacturer setting. Do not set.		
75	Reset selection/PU stop selection	0 to 3, 14 to 17	14
77 *6	Parameter write selection	0, 1, 2	0
78	Reverse rotation prevention selection	0, 1, 2	0
79	Parameter for manufacturer setting. Do not set.		
80	Motor capacity	0.1 to 15kW, 9999	9999
81	Number of motor poles	2, 4, 6, 8, 10, 9999	9999
82	Motor excitation current	0 to 500A (0 to ****), 9999 *5	9999
83	Rated motor voltage	0 to 1000V	200V/ 400V *4
84	Rated motor frequency	10 to 120Hz	60Hz
89	Speed control gain (Advanced magnetic flux vector)	0 to 200%, 9999	9999
90	Motor constant (R1)	0 to 50Ω (0 to ****), 9999 *5	9999
91	Motor constant (R2)	0 to 50Ω (0 to ****), 9999 *5	9999
92	Motor constant (L1)	0 to 1000mH (0 to 50Ω, 0 to ****), 9999 *5	9999
93	Motor constant (L2)	0 to 1000mH (0 to 50Ω, 0 to ****), 9999 *5	9999
94	Motor constant (X)	0 to 100% (0 to 500Ω, 0 to ****), 9999 *5	9999
96	Auto tuning setting/status	0, 1, 11, 21	0
117 to 134, 145, 146	Parameter for manufacturer setting. Do not set.		

Parameter	Name	Setting Range	Initial Value
147	Acceleration/deceleration time switching frequency	0 to 400Hz, 9999	9999
150	Output current detection level	0 to 200%	150%
151	Output current detection signal delay time	0 to 10s	0s
152	Zero current detection level	0 to 200%	5%
153	Zero current detection time	0 to 1s	0.5s
156	Stall prevention operation selection	0 to 31, 100, 101	0
157	OL signal output timer	0 to 25s, 9999	0s
◎ 160	User group read selection	0, 1, 9999	0
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 200%	150%
168, 169	Parameter for manufacturer setting. Do not set.		
170	Watt-hour meter clear	0, 10, 9999	9999
171	Operation hour meter clear	0, 9999	9999
172	User group registered display/ batch clear	9999, (0 to 16)	0
173	User group registration	0 to 999, 9999	9999
174	User group clear	0 to 999, 9999	9999
178 to 184, 190 to 192, 232 to 239	Parameter for manufacturer setting. Do not set.		
240	Soft-PWM operation selection	0, 1	1
241	Parameter for manufacturer setting. Do not set.		
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
261	Power failure stop selection	0, 1, 2	0
267	Parameter for manufacturer setting. Do not set.		
268	Monitor decimal digits selection	0, 1, 9999	9999

Parameter	Name	Setting Range	Initial Value
269	Parameter for manufacturer setting. Do not set.		
270	Stop-on contact control selection	0, 1	0
275	Stop-on contact excitation current low-speed multiplying factor	0 to 300%, 9999	9999
276	PWM carrier frequency at stop-on contact	0 to 9, 9999	9999
277	Stall prevention operation current switchover	0, 1	0
278 to 283	Parameter for manufacturer setting. Do not set.		
286	Droop gain	0 to 100%	0%
287	Droop filter time constant	0 to 1s	0.3s
292	Automatic acceleration/ deceleration	0, 1, 7, 8, 11	0
293	Acceleration/deceleration separate selection	0 to 2	0
295	Magnitude of frequency change setting	0, 0.01, 0.1, 1, 10	0
296	Password lock level	0 to 6, 99, 100 to 106, 199, 9999	9999
297	Password lock/unlock	1000 to 9999 (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 to 340, 342, 343	Parameter for manufacturer setting. Do not set.		
450	Second applied motor	0, 1, 9999	9999
495 to 497, 500	Parameter for manufacturer setting. Do not set.		
501	Communication error occurrence count display	0	0
502	Parameter for manufacturer setting. Do not set.		
503	Maintenance timer	0 (1 to 9998)	0
504	Maintenance timer alarm output set time	0 to 9998, 9999	9999
547 to 551, 555 to 557	Parameter for manufacturer setting. Do not set.		
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
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
800	Control method selection	20, 30	20
859	Torque current	0 to 500A (0 to ****) , 9999 *5	9999
872	Input phase loss protection selection	0, 1	1
882	Regeneration avoidance operation selection	0, 1, 2	0
883	Regeneration avoidance operation level	300 to 800V	400VDC/ 780VDC *4
885	Regeneration avoidance compensation frequency limit value	0 to 10Hz, 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
C0 (900)	Parameter for manufacturer setting. Do not set.		
C2, C3 (902)			
125, C4 (903)			
C5, C6 (904)			
126, C7 (905)			
C22 to C25 (922, 923)			
990, 991			
Pr.CL	Parameter clear	0, 1	0
ALLC	All parameter clear	0, 1	0
Er.CL	Faults history clear	0, 1	0
Pr.CH	Initial value change list	—	—

*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: 3.7K or lower
10s: 5.5K, 7.5K
15s: 11K, 15K

*3 Differ according to capacities.
6%: 0.1K, 0.2K
4%: 0.4K to 7.5K
2%: 11K, 15K

*4 The initial value differs according to the voltage class. (200V class/400V class)

*5 The range differs according to the *Pr. 71* setting.

*6 The setting cannot be changed through the FL remote communication.

6 TROUBLESHOOTING

When a fault occurs in the inverter, the inverter trips and the display on the operation panel 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 when a fault occurs, 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.
- 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 is displayed. The inverter does not trip.

(2) Warning
The inverter does not trip even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.

(3) Alarm
The inverter does not trip.

(4) Fault
When a fault occurs, the inverter trips and a fault signal is output. The ALM signal is also 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.

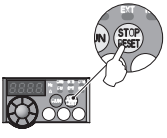
6.1 Reset method of protective function

(1) Resetting the inverter

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.

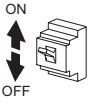
Inverter recovers about 1s after reset is released.

Operation 1: ..... Using the operation panel, press (STOP RESET) to reset the inverter.
(This may only be performed when a fault occurs.)



Operation 2: ..... Change the error reset signal setting of the FL remote communication from "0" to "1."
(This may only be performed when a fault occurs.)

Operation 3: ..... Switch OFF the power once, then switch it ON again after the indicator of the operation panel turns OFF.



REMARKS

- Use the operation 1 or 2 to reset when using the 24V external power supply.

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.**

6.2 List of fault or alarm indications

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

	Function Name	Description	Corrective action	Display
Error message *2	**Operation panel lock**	Appears when operation was tried during operation panel lock.	Press MODE for 2s to release lock.	HOLd
	Password locked	Appears when a password restricted parameter is read/written.	Enter the password in *Pr. 297 Password lock/unlock* to unlock the password function before operating.	LOCd
	Parameter write error	Appears when an error occurred during parameter writing.	• Check the setting of *Pr. 77 Parameter write selection*. • Check the settings of *Pr. 31 to Pr. 36 (frequency jump)*. • After stopping operation, make parameter setting. • After setting the operation mode to the "PU operation mode", make parameter setting.	Er1 Er2 Er4
	Inverter reset	Appears when the RES signal is ON.	• Turn OFF the reset command	Err.
Warning *3	**Stall prevention (overcurrent)**	Appears during overcurrent stall prevention.	• Increase or decrease the *Pr. 0 Torque boost* setting by 1% and check the motor status. • Set a larger value in *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time*. • Reduce the load weight. • Try Advanced magnetic flux vector control and General-purpose magnetic flux vector control. • Change the *Pr. 14 Load pattern selection* setting. • Set stall prevention operation current in *Pr. 22 Stall prevention operation level*. (The initial value is 150%.) 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*.)	OL
	Stall prevention (overvoltage)	Appears during overvoltage stall prevention. Appears while the regeneration avoidance function is activated.	The deceleration time may change. Increase the deceleration time using *Pr. 8 Deceleration time*.	oL
	Regenerative brake prealarm *6	Appears if the regenerative brake duty reaches or exceeds 85% of the *Pr. 70 Special regenerative brake duty* value. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs.	• Increase the deceleration time. • Check that the *Pr. 30 Regenerative function selection* and *Pr. 70 Special regenerative brake duty* settings.	rb
	Electronic thermal relay function prealarm	Appears when the electronic thermal O/L relay has reached 85% of the specified value.	• Reduce the load and frequency of operation. • Set an appropriate value in *Pr. 9 Electronic thermal O/L relay*.	TH
	PU stop	Appears when STOP RESET on the operation panel was pressed during External operation.	Turn the start signal OFF and release with PU EXT.	PS
	Maintenance signal output *6	Appears when the cumulative energization time has exceeded the maintenance output timer set value.	Setting "0" in *Pr. 503 Maintenance timer* erases the signal.	MT
	Undervoltage	Appears when the main circuit power became low voltage.	Check the power supply system equipment such as power supply.	Uu
	Safety stop	Appears when the safety stop function is activated (during output shutoff).	• When not using the safety stop function, short across terminals S1 and PC and across S2 and PC with shorting wire for the inverter to run. • If SA is indicated when across S1 and PC and across S2 and PC are both shorted while using the safety stop function (drive enabled), internal failure might be the cause. Check the wiring of terminals S1, S2 and PC and contact your sales representative if the wiring has no fault.	SA
	24V external power supply operation	Flickers when the main circuit power supply is not supplied and the 24V external power is supplied.	Turn ON the power supply for the inverter (main circuit). • If Eu appears by turning ON the power supply of the inverter (main circuit) while the external 24V power is supplied, check the power supply (for the main circuit). • Check if the jumper is installed securely between terminal P/+ and P1.	Eu
Alarm *4	**Fan alarm**	Appears when the cooling fan remains stopped when operation is required or when the speed has decreased.	Check for fan alarm. Please contact your sales representative.	Fn
Fault *5	**Overcurrent trip during acceleration**	Appears when an overcurrent occurred during acceleration.	• Increase the acceleration time. (Shorten the downward acceleration time for the lift.) • When "E.OC1" is always lit at start, disconnect the motor once and start the inverter. If "E.OC1" is still lit, contact your sales representative. • Check the wiring to make sure that output short circuit/ground fault does not occur. • Set 50Hz in *Pr. 3 Base frequency*. • Lower the setting of stall prevention operation level. • Activate the fast-response current limit operation. • Set base voltage (rated voltage of the motor, etc.) in *Pr. 19 Base frequency voltage*.	E.OC1

	Function Name	Description	Corrective action	Display
Fault *5	**Overcurrent trip during constant speed**	Appears when an overcurrent occurred during constant speed operation.	• Keep load stable. • Check the wiring to make sure that output short circuit/ ground fault does not occur. • Lower the setting of stall prevention operation level. • Activate the fast-response current limit operation.	E.OC2
	Overcurrent trip during deceleration or stop	Appears when an overcurrent occurred during deceleration and at a stop.	• Increase the deceleration time. • Check the wiring to make sure that output short circuit/ ground fault does not occur. • Check the mechanical brake operation. • Lower the setting of stall prevention operation level. • Activate the fast-response current limit operation.	E.OC3
	Regenerative overvoltage trip during acceleration	Appears when an overvoltage occurred during acceleration.	• Decrease the acceleration time. • Use regeneration avoidance function *(Pr. 882, Pr. 883, Pr. 885, Pr. 886)*. • Set the *Pr.22 Stall prevention operation level* correctly.	E.Ov1
	Regenerative overvoltage trip during constant speed	Appears when an overvoltage occurred during constant speed operation.	• Keep load stable. • Use 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.	E.Ov2
	Regenerative overvoltage trip during deceleration or stop	Appears when an overvoltage occurred during deceleration and at a stop.	• Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) • Make the brake cycle longer. • Use 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.	E.Ov3
	Inverter overload trip (electronic thermal relay function)	Appears when the electronic thermal relay function for inverter element protection was activated.	• Increase acceleration/deceleration time. • Adjust the torque boost setting. • Set the load pattern selection setting according to the load pattern of the using machine. • Reduce the load weight. • Set the surrounding air temperature to within the specifications.	E.IHt
	Motor overload trip (electronic thermal relay function) *1	Appears when the electronic thermal relay function for motor protection was activated.	• Reduce the load weight. • For a constant-torque motor, set the constant-torque motor in *Pr. 71 Applied motor*. • Check that stall prevention operation setting is correct.	E.IMt
	Heatsink overheat	Appears when the heatsink was overheated.	• Set the surrounding air temperature to within the specifications. • Clean the heatsink. • Replace the cooling fan.	E.FIn
	Input phase loss *6 *7	Appears if one of the three phases on the inverter input side is lost. It may also appear if phase-to-phase voltage of the three-phase power input becomes largely unbalanced.	• Wire the cables properly. • Repair a break portion in the cable. • Check the *Pr. 872 Input phase loss protection selection* setting. • Set *Pr. 872* = "0" (without input phase loss protection) when three-phase input voltage is largely unbalanced.	E.ILF
	Stall prevention stop	Appears when the output frequency drops to 1Hz as a result of deceleration due to the excess motor load.	Reduce the load weight. (Check the *Pr. 22 Stall prevention operation level* setting.)	E.OLt
	Brake transistor alarm detection	This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. In this case, the inverter must be powered off immediately.	Replace the inverter.	E. bE
	Output side earth (ground) fault overcurrent at start *6	Appears when an earth (ground) fault occurred on the inverter's output side. (detects only at a start)	Remedy the ground fault portion.	E. GF
	Output phase loss	If one of the three phases (U, V, W) on the inverter's output side (load side) is lost during inverter operation (except during DC injection brake operation and when output frequency is under 1Hz), inverter stops the output.	• Wire the cables properly. • Check the *Pr. 251 Output phase loss protection selection* setting.	E. LF

	Function Name	Description	Corrective action	Display
Fault *5	**Communication option fault**	Stops the inverter output at a communication line error of FL remote communication.	• Refer to "Troubleshooting in FL remote communication" in the *Instruction Manual (Applied)*, and take the corrective action for the error. • Check the connection of the FL-net dedicated cable. • Check that each FL-net dedicated cable length between nodes is within the specified range.	E.OP 1
	Option fault	• Appears when a node address is set out of the setting range (other than 1 to 64). Also appears when the node address is set improperly. • Appears when *Pr.296* = "0 or 100."	• Set the node address within the range of 1 to 64. *(Refer to page 14)* • Set the node address switch to the switch number position correctly. *(Refer to page 14)* • Set *Pr.296* ≠ "0 or 100" for the password lock. • If the problem still persists after taking the above measure, contact your sales representative.	E.OPT
	Option fault	• Stops the inverter output if there is excess electrical noise around the inverter. • Appears when the setting of the master is incorrect.	• Take measures against noises if there are devices producing excess electrical noises around the inverter. • Select the FL remote protocol. Set an appropriate number of words for the transmission/receive area. • If the problem still persists after taking the above measure, contact your sales representative.	E. 1
	Parameter storage device fault	Appears when operation of the element where parameters stored became abnormal. (control board)	Please contact your sales representative.	E. PE
	Internal board fault	Inverter output is stopped when the control circuit board and the main circuit board do not match with each other.	Please contact your sales representative. (For parts replacement, consult the nearest Mitsubishi FA Center.)	E.PE2
	Retry count excess *6	Operation restart within the set number of retries has failed.	Eliminate the cause of the error preceding this error indication.	E.rET
	CPU fault	Appears during the CPU and peripheral circuit errors.	• Take measures against noises if there are devices producing excess electrical noises around the inverter. • Check the connection between terminals PC and SD. (E6/ E7) • Please contact your sales representative.	E. 5 1 E. 6 1 E. 7 1 E.CPU
	Inrush current limit circuit fault	Appears when the resistor of the inrush current limit circuit overheated.	Configure a circuit where frequent power ON/OFF is not repeated. If the problem still persists after taking the above measure, please contact your sales representative.	E1 OH
	Internal circuit fault	Appears when an internal circuit fault has occurred.	Please contact your sales representative.	E. 13
	Safety circuit fault	Appears when safety circuit is malfunctioning.	• When not using the safety stop function, short across terminals S1 and PC and across S2 and PC with shorting wire. • When using the safety stop function, check that wiring of terminal S1, S2 and PC is correct and the safety stop input signal source such as safety relay module is operating properly. *Refer to the Safety stop function instruction manual (BCN-211508-004)* for causes and countermeasures. (Please contact your sales representative for the manual.)	E.SAF

*1 Resetting the inverter initializes the internal cumulative heat value of the electronic thermal relay function.
*2 The error message shows an operational error. The inverter output is not shut off.
*3 Warnings are messages given before fault occur. The inverter output is not shut off.
*4 Alarms warn the operator of failures with output signals. The inverter output is not shut off.
*5 When faults occur, the protective functions are activated to inverter trip and output the fault signals.
*6 This protective function does not function in the initial status.
*7 Protective function activates when *Pr.872 Input phase loss protection selection* = "1".

6.3 Check first when you have a trouble

If the following malfunctions occur, refer to the troubleshooting in *the Instruction Manual (Applied).*

- Motor does not start
- Motor or machine is making abnormal acoustic noise
- Inverter generates abnormal noise
- Motor generates heat abnormally
- Motor rotates in the opposite direction
- Speed greatly differs from the setting
- Acceleration/deceleration is not smooth
- Speed varies during operation
- Operation mode is not changed properly
- Operation panel display is not operating
- Motor current is too large
- Speed does not accelerate
- Unable to write parameter setting

7 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 the details of fault displays and other malfunctions, 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.
If "EV" is displayed on the operation panel, turn off the 24V external power supply before inspection.

7.1 Inspection items

Area of Inspection	Inspection Item		Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check
				Daily	Periodic *2		
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	
	Power supply voltage		Check that the main circuit voltages are normal.*1	○		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 stain.		○	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.		○	Contact the manufacturer	
			(2) Check for safety valve projection and bulge.		○	Contact the manufacturer	
			(3) Visual check and judge by the life check of the main circuit capacitor (Refer to Chapter 7 of the Instruction Manual (Applied))		○		
	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 odor 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 trance.		○	Contact the manufacturer	
			(2) Visual check and judge by the life check of the main circuit capacitor (Refer to Chapter 7 of the Instruction Manual (Applied))		○		
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 stain.		○	Clean	
	Heatsink		(1) Check for clogging.		○	Clean	
			(2) Check for stain.		○	Clean	
Display	Indication		(1) Check that display is normal.	○		Contact the manufacturer	
			(2) Check for stain.		○	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 It is recommended to install a device to monitor voltage for checking the power supply voltage to the inverter.
*2 One to two years of periodic inspection cycle is recommended. However, it differs according to the installation environment. Consult us for periodic inspection.

When using the safety stop function, periodic inspection is required to confirm that safety function of the safety system operates correctly.
For more details, *refer to the Safety stop function instruction manual (BCN-A211508-004)*. (Please contact your sales representative for the manual.)

7.2 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 for 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, consult the nearest Mitsubishi FA Center.

8 SPECIFICATIONS

8.1 Rating

● Three-phase 200V power supply

Model FR-E720-☐KNF		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Applicable motor capacity (kW) *1		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Output	Rated capacity (kVA) *2	0.3	0.6	1.2	2.0	3.2	4.4	7.0	9.5	13.1	18.7	23.9
	Rated current (A) *7	0.8 (0.8)	1.5 (1.4)	3 (2.5)	5 (4.1)	8 (7)	11 (10)	17.5 (16.5)	24 (23)	33 (31)	47 (44)	60 (57)
	Overload current rating *3	150% 60s, 200% 3s (inverse-time characteristics)										
	Rated voltage *4	Three-phase 200 to 240V										
	Regenerative braking torque *5	150%		100%		50%	20%					
Power supply	Rated input AC (DC) voltage/frequency	Three-phase 200 to 240V 50Hz/60Hz (283 to 339VDC *8)										
	Permissible AC (DC) voltage fluctuation	170 to 264V 50Hz/60Hz (240 to 373VDC *8)										
	Permissible frequency fluctuation	±5%										
	Power supply capacity (kVA) *6	0.4	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28
Protective structure (JEM1030)		Open type (IP00)										
Cooling system		Self-cooling				Forced air cooling						
Approximate mass (kg)		0.5	0.5	0.7	1.0	1.4	1.4	1.7	4.3	4.3	6.5	6.5

● Three-phase 400V power supply

Model FR-E740-☐KNF		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Applicable 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	1.2	2.0	3.0	4.6	7.2	9.1	13.0	17.5	23.0
	Rated current (A)*7	1.6 (1.4)	2.6 (2.2)	4.0 (3.8)	6.0 (5.4)	9.5 (8.7)	12	17	23	30
	Overload current rating*3	150% 60s, 200% 3s (inverse-time characteristics)								
	Rated voltage*4	Three-phase 380 to 480V								
	Regenerative braking torque *5	100%		50%	20%					
Power supply	Rated input 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)*6	1.5	2.5	4.5	5.5	9.5	12	17	20	28
Protective structure (JEM1030)		Open type (IP00)								
Cooling system		Self-cooling		Forced air cooling						
Approximate mass (kg)		1.4	1.4	1.9	1.9	1.9	3.2	3.2	6.0	6.0

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 230V for three-phase 200V class and 440V for 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 braking torque indicated is a short-duration average torque (which varies with motor loss) when the motor alone is decelerated from 60Hz in the shortest time and is not a continuous regenerative torque. When the motor is decelerated from the frequency higher than the base frequency, the average deceleration torque will reduce. Since the inverter does not contain a brake resistor, use the optional brake resistor when regenerative energy is large. A brake unit (FR-BU2) may also be used. (Option brake resistor cannot be used for 0.1K and 0.2K.)

*6 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

*7 Setting 2kHz or more in *Pr. 72 PWM frequency selection* to perform low acoustic noise operation in the surrounding air temperature exceeding 40°C, the rated output current is the value in parenthesis.

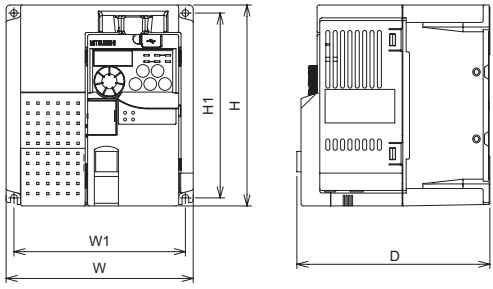
*8
- Connect DC power supply to terminal P/+ and N/-. Connect the plus side of the power supply to terminal P/+ and minus side to terminal N/-.
- Since the voltage between P/+ and N/- may increase due to the regeneration energy from the motor and exceeds 415V temporarily, select the DC power supply which can withstand the voltage/energy during regeneration. If using the power supply which can not withstand voltage/energy during regeneration, insert diodes in series for reverse current prevention.
- Although the FR-E700 series has the built-in inrush current limit circuit, select the DC power supply considering the inrush current at powering ON as the inrush current four times of the rated inverter flows at powering ON.
- Since the power supply capacity depends on the output impedance of the power, select the power supply capacity which has enough allowance according to the AC power supply system capacity.

8.2 Common specifications

Control specifications	**Control method**	Soft-PWM control/high carrier frequency PWM control (V/F control, Advanced magnetic flux vector control, General-purpose magnetic flux vector control, Optimum excitation control are available)
	Output frequency range	0.2 to 400Hz
	Frequency setting resolution (digital input)	0.01Hz
	Frequency accuracy (digital input)	Within 0.01% of the set output frequency
	Voltage/frequency characteristics	Base frequency can be set from 0 to 400Hz, Constant-torque/variable torque pattern can be selected
	Starting torque	200% or more (at 0.5Hz)...when Advanced magnetic flux vector control is set (3.7K or lower)
	Torque boost	Manual torque boost
	Acceleration/deceleration time setting	0.01 to 360s, 0.1 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration modes are available.
	DC injection brake	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 200% adjustable), whether to use the function or not can be selected
Environment	**Surrounding air temperature**	-10°C to +50°C (non-freezing) ∗1
	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 above sea level, 5.9m/s ^{2} or less at 10 to 55Hz (directions of X, Y, Z axes)

∗1 When using the inverters at the surrounding air temperature of 40°C or less, the inverters can be installed closely attached (0cm clearance).
∗2 Temperatures applicable for a short time, e.g. in transit.

8.3 Outline dimension drawings



(Unit:mm)

- Three-phase 200V class

Inverter model	W	W1	H	H1	D
FR-E720-0.1KNF	68	56	128	118	89.5
FR-E720-0.2KNF					
FR-E720-0.4KNF					121.5
FR-E720-0.75KNF					141.5
FR-E720-1.5KNF	108	96			144.5
FR-E720-2.2KNF					
FR-E720-3.7KNF	170	158			151.5
FR-E720-5.5KNF	180	164	260	244	174
FR-E720-7.5KNF					
FR-E720-11KNF	220	195			199
FR-E720-15KNF					

- Three-phase 400V class

Inverter model	W	W1	H	H1	D
FR-E740-0.4KNF	140	128	150	138	123
FR-E740-0.75KNF					
FR-E740-1.5KNF					144
FR-E740-2.2KNF					
FR-E740-3.7KNF					
FR-E740-5.5KNF	220	208			156
FR-E740-7.5KNF					
FR-E740-11KNF		195	260	244	199
FR-E740-15KNF					

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: Gothaer Strasse 8, 40880 Ratingen, Germany

● Note

We declare that this inverter, when equipped with the dedicated EMC filter, conforms with the EMC Directive in industrial environments and affix the CE marking on the inverter. When using the inverter in a residential area, take appropriate measures and ensure the conformity of the inverter used in the residential area.

(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: 2004/108/EC
- Standard(s): EN61800-3:2004 (Second environment / PDS Category "C3")

Note: First environment

Environment including residential buildings. Includes building directly connected without a transformer to the low voltage power supply network which supplies power to residential buildings.

Second environment

Environment including all buildings except buildings directly connected without a transformer to the lower voltage power supply network which supplies power to 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)
* The cable length between the inverter and the motor is 5m maximum.
* Confirm that the final integrated system with the inverter conforms with the EMC Directive.

(2) Low Voltage Directive

We have self-confirmed our inverters as products compliant to the Low Voltage Directive (Conforming standard EN 61800-5-1) and place the CE mark on the inverters.

Outline of instructions

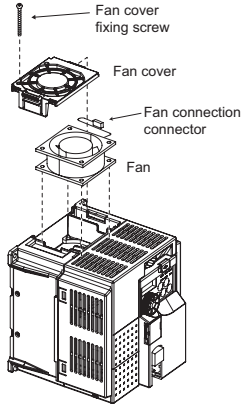
* Do not use an earth leakage circuit breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
* Wire the earth (ground) terminal independently. (Do not connect two or more cables to one terminal.)
* Use the cable sizes on *page 8* under the following conditions.
  •Surrounding air temperature: 40°C maximum

If conditions are different from above, select appropriate wire according to EN60204 ANNEX C TABLE 5.

* Use a tinned (plating should not include zinc) crimping 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 8*.
* Use the moulded 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 IEC664.

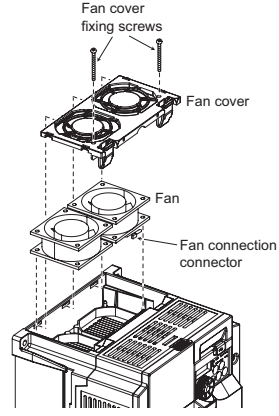
•To use the inverter under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher.
•To use the inverter outside of an enclosure in the environment of pollution degree 2, fix a fan cover with fan cover fixing screws enclosed.

3.7K or lower



Example for FR-E740-3.7KNF

5.5K or higher



Example for FR-E740-5.5KNF

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 Appendix C.
* Control circuit terminals on *page 5* 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

Details are given in the technical information "Low Voltage Directive Conformance Guide" (BCN-A21041-203). Please contact your sales representative.

* 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.

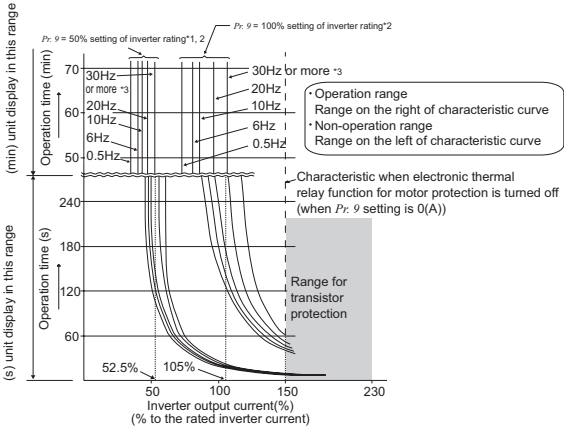
FR-E720-☐☐KNF		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		240V or more										
Fuse Maximum allowable rating (A)*	Without power factor improving reactor	15	15	15	20	30	40	60	70	80	150	175
	With power factor improving reactor	15	15	15	20	20	30	50	60	70	125	150
Molded case circuit breaker (MCCB) Maximum allowable rating (A)*		15	15	15	15	20	25	40	60	80	110	150

FR-E740-☐☐KNF		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		480V or more								
Fuse Maximum 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)*		15	15	15	15	20	30	40	50	70

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

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

Electronic thermal relay function operation characteristic



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 constant-torque motor

1) Set "1" or any of "13" to "16", "50", "53", "54" 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 constant-torque motor, this characteristic curve applies to operation at 6Hz or higher.

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.**
- **Electronic thermal relay may not function when 5% or less of inverter rated current is set to electronic thermal relay setting.**

* Short circuit current ratings

•200V class

Suitable For Use in A Circuit Capable of Delivering Not More Than 5 kA rms Symmetrical Amperes, 264 V Maximum.

•400V class

Suitable For Use in A Circuit Capable of Delivering Not More Than 5 kA rms Symmetrical Amperes, 528 V Maximum.

Appendix 2 Instructions for UL and cUL

(Standard to comply with: UL 508C, CSA C22.2 No. 14)

1. General Precaution

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.

2. 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 specifications *(Refer to page 4)*.

Wiring 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 on *page 36*, UL Class T fuses or any faster acting fuse with the appropriate rating or Listed UL 489 Molded Case Circuit Breaker (MCCB) must be employed.

3. Short circuit ratings

- **200V class**
  Suitable For Use in A Circuit Capable of Delivering Not More Than 100 kA rms Symmetrical Amperes, 264 V Maximum.
- **400V class**
  Suitable For Use in A Circuit Capable of Delivering Not More Than 100 kA rms Symmetrical Amperes, 528 V Maximum.

4. Wiring

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 crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal maker.

5. 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 36)*

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.**
- **Electronic thermal relay may not function when 5% or less of inverter rated current is set to electronic thermal relay setting.**

REMARKS

- **Safety stop function is not certified by the UL.**

REVISIONS

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

Print Date	*Manual Number	Revision
Feb. 2010	IB-0600397ENG-A	First edition
Jan. 2011	IB-0600397ENG-B	Modification • Safety stop function

⚠ For Maximum Safety

- Mitsubishi inverters are not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product are likely to cause a serious accident.
- Please do not use this product for loads other than three-phase induction motors.

Additional notes for Instructions for UL and cUL

Motor overload protection

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

CAUTION

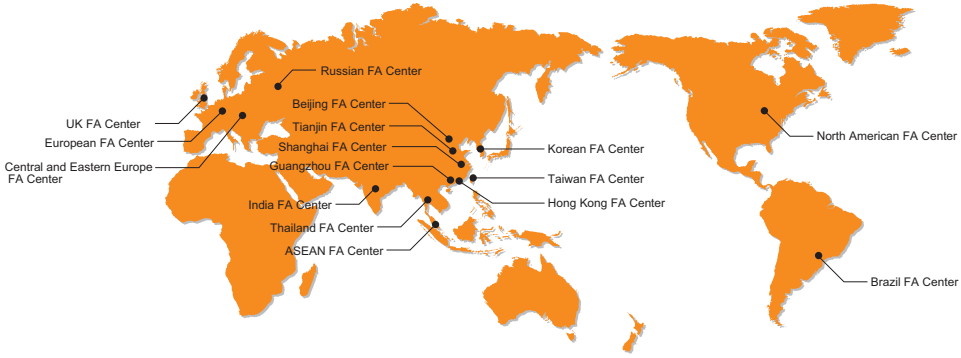
· Motor over temperature sensing is not provided by the drive.

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.

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.

International FA Center



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