MITSUBISHI ELECTRIC

INVERTER
E860
INVERTER SAFETY GUIDELINE
FR-E860-0017(0.75K) to 0120(7.5K)

Thank you for choosing Mitsubishi Electric inverter. This Inverter Safety Guideline provides handling information and precautions for use of this product. Do not use this product until you have full knowledge of the product mechanism, safety information and instructions.
Please forward this Safety Guideline to the end user.

For more information on the product

IB-0600862ENG-F(2312)MEE
Specifications subject to change without notice.

MITSUBISHI ELECTRIC CORPORATION
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◆ **Related manuals**

Manual name	Manual number	Details
FR-E860 Instruction Manual (Connection)	IB-0600906ENG	Manuals describing installation, wiring, specifications, outline dimensions, standards, and how to connect options.
FR-E800 Instruction Manual (Function)	IB-0600868ENG	Manual describing details of the functions.
FR-E800 Instruction Manual (Communication)	IB-0600871ENG	Manual describing details of the communications.
FR-E800 Instruction Manual (Maintenance)	IB-0600874ENG	Manual describing how to identify causes of faults and warnings.
FR-E800 Instruction Manual (Functional Safety)	BCN-A23488-000	Manual describing the functional safety.
FR Configurator2 Instruction Manual	IB-0600516ENG	Manual describing details of the software used to set inverter parameters using a personal computer.
PLC Function Programming Manual	IB-0600492ENG	Manual describing details of the PLC function.

Safety Information

Do not attempt to install, operate, maintain or inspect this product until you have read through this Safety Guideline and supplementary documents carefully to use the equipment correctly. Do not use the product until you have full knowledge of the product mechanism, safety information and instructions.
Installation, operation, maintenance and inspection must be performed by qualified personnel. Here, qualified personnel means a person who meets all the following conditions:
- **A person who possesses a certification in regard with electric appliance handling, or person took a proper engineering training. Such training may be available at your local Mitsubishi Electric office. Contact your local sales office for schedules and locations.**
- **A person who can access operating manuals for the protective devices (for example, light curtain) connected to the safety control system, or a person who has read these manuals thoroughly and familiarized themselves with the protective devices.**

In this Safety Guideline, 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.**

Note that even the ⚠ CAUTION level may lead to a serious consequence depending on conditions. Be sure to follow the instructions of both levels as they are critical to personnel safety.

◆ **Electric shock prevention**

⚠ WARNING
- Do not remove the front cover or the wiring cover while the power of this product is ON, and do not run this product with the front cover or the wiring cover removed, as the exposed high voltage terminals or the charging part of the circuitry can be touched. Doing so may cause an electric shock.
- Even if power is OFF, do not remove the front cover except for wiring or periodic inspection as the inside of this product is charged. Doing so may cause an electric shock.
- Before wiring or inspection, check that the display of the operation panel is OFF. Any person who is involved in wiring or inspection shall wait for 10 minutes or longer after power OFF and check that there are no residual voltage using a digital multimeter or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.
- This must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical code (NEC section 250, 61140 class 1 and other applicable standards).
- Any person who is involved in wiring or inspection of this product shall be fully competent to do the work.
- Use crimp terminals with insulation sleeves to wire the power supply and the motor.
- This product body must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Do not touch the setting dial or keys with wet hands. Doing so may cause an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Doing so may cause an electric shock.
- Do not change the cooling fan while power is ON as 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. Doing so may cause an electric shock.
- Never touch the motor terminals, etc. right after powering OFF as the DC voltage is applied to the motor for 1 second at powering OFF if the main circuit capacitor capacity is measured. Doing so may cause an electric shock.

◆ **Fire prevention**

⚠ CAUTION
- This product must be installed on a nonflammable wall without holes in it so that its components cannot be touched from behind. Installing it on or near flammable material may cause a fire.
- If this product becomes faulty, the product power must be switched OFF. A continuous flow of large current may cause a fire.
- Do not connect a resistor directly to the DC terminals P/+ and N/-. Doing so could cause a fire.
- Across terminals P/+ and PR, connect only an external brake resistor.
- Be sure to perform daily and periodic inspections as specified in the Instruction Manual (Maintenance). There is a possibility of explosion, damage, or fire if this product is used without inspection.

◆ **Injury prevention**

⚠ CAUTION
- The voltage applied to each terminal must be as specified in the Instruction Manual (Connection). Otherwise an explosion or damage may occur.
- The cables must be connected to the correct terminals. Otherwise an explosion or damage may occur.
- The polarity (+ and -) must be correct. Otherwise an explosion or damage may occur.
- While power is ON or for some time after power OFF, do not touch the inverter as it will be extremely hot. Doing so may cause burns.

◆ **Additional instructions**

The following instructions must be also followed. If the product is handled incorrectly, it may cause unexpected fault, an injury, or an electric shock.

⚠ CAUTION

Transportation and installation
- Use proper lifting techniques or a trolley when carrying products. 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 in a position where it withstands the weight of the product according to the information in the Instruction Manual.
- Do not install or operate this product if it is damaged or has parts missing.
- When carrying this product, do not hold it by the front cover. It may fall or break.
- Do not stand or place heavy objects on the product.
- Ensure the mounting orientation of this product is correct.
- Prevent conductive objects such as screws, metal fragments, and wire offcuts, or flammable substances such as oil from entering the inverter.
- As this product is a precision instrument, do not drop or subject it to impact.
- The surrounding air temperature must be between -10°C and +60°C (non-freezing). The rated current must be reduced at a surrounding air temperature above 50°C. Otherwise this product may be damaged.
- The surrounding humidity must be 90% RH or less (non-condensing) for models without circuit board coating and 95% RH or less (non-condensing) for models with circuit board coating. Otherwise this product may be damaged.
- The temporary storage temperature (applicable to a short time) time such as a transportation time) must be between -40°C and +70°C. Otherwise this product may be damaged.
- This product must be used indoors (without corrosive gas, flammable gas, oil mist, dust and dirt). Otherwise the product may be damaged.
- Do not use this product at an altitude above 2000 m. Vibration should not exceed 5.9 m/s² at 10 to 55 Hz in X, Y, and Z directions. Otherwise the product may be damaged.
- If halogens (including fluorine, chlorine, bromine, and iodine) contained in fumigants for wood packages enter this product, the product may be damaged. Prevent the entry of fumigant residuals or use an alternative method such as heat disinfection. Note that sterilization or disinfection of wood packages should be performed before packing the product.

Wiring
- Do not install a power factor correction capacitor, surge absorber, or radio noise filter on the output side of this product. These devices may overheat or burn out.
- The output terminals (terminals U, V, and W) must be connected to a motor correctly. Otherwise the motor will rotate inversely.
- Even with the power OFF, high voltage is still applied to the terminals U, V and W while the PM motor is running. Ensure the PM motor has stopped before carrying out any wiring. Otherwise you may get an electric shock.
- Never connect a PM motor to a commercial power supply. Connecting a commercial power supply to the input terminals (U, V, W) of a PM motor will burn it out. The PM motor must be connected with the output terminals (U, V, W) of this product.

Test operation
- Before starting the operation, confirm or adjust the parameter settings. Failure to do so may cause some machines to make unexpected motions.

⚠ WARNING

Usage
- Stay away from the equipment after using the retry function in this product as the equipment will restart suddenly after the output shutoff of this product.
- Access to the motor is allowed only after it is fully confirmed that the motor does not start running.
- Depending on the function settings of this product, the product does not stop its output even when the STOP/RESET key on the operation panel is pressed. To prepare for it, provide a separate circuit and switch (to turn OFF the power of this product, or apply a mechanical brake, etc.) for an emergency stop.
- Be sure to turn OFF the start (STF/STR) signal before clearing the fault as this product will restart the motor suddenly after a fault is cleared.
- Do not use a PM motor for an application that the motor may be driven by the load and run at a speed higher than the maximum motor speed.
- Use only a three-phase squirrel cage motor or PM motor as a load on this product. Connection of any other electrical equipment to the output of this product may damage the equipment.
- Performing pre-excitation (LX signal and X13 signal) under torque control may start the motor running at a low speed even when the start signal (STF or STR) is not input. This product with the start command ON may also rotate the motor at a low speed when the speed limit value is set to zero. Confirm that the motor running does not cause any safety problems before performing pre-excitation.
- Do not modify this product.
- Do not remove any part which is not instructed to be removed in the Instruction Manual (Connection). Doing so may lead to a failure or damage of this product.

⚠ CAUTION

Usage
- When installing the MC on the output side of the inverter, turn it ON/OFF while both the inverter and motor are at a stop.
- The electronic thermal O/L relay function may not be enough for protection of a motor from overheating. It is recommended to install an external thermal relay or a PTC thermistor for overheat protection.
- Do not repeatedly start or stop this product with a magnetic contactor on its input side. Doing so may shorten the life of this product.
- Use a noise filter or other means to minimize electromagnetic interference with other electronic equipment used nearby this product.
- Appropriate precautions must be taken to suppress harmonics. Otherwise power harmonics generated from this product may heat/damage a power factor correction capacitor or a generator.
- To drive a 600 V class motor with this product, use an insulation-enhanced motor. Or take measures to suppress surge voltage. Otherwise surge voltage, which is attributed to the length and thickness of wire, may occur at the motor terminals, causing the motor insulation to deteriorate.
- When a motor is driven by the inverter, axial voltage is generated on the motor shaft, which may cause electrical corrosion of the bearing. Take measures such as decreasing the carrier frequency.
- As all parameters return to their initial values after Parameter clear or All parameter clear is performed, the parameters must be set again as required before the operation is started.
- This product can be easily set for high-speed operation. Therefore, consider all things related to the operation such as the performance of a motor and equipment in a system before the setting change.
- If the machine must not be restarted when power is restored after a power failure, provide an MC on the input side of the inverter and also make up a sequence which will not switch ON the start signal.
- When performing an inverter operation with frequent starts/stops, 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.
- Perform an inspection and test operation of this product if it has been stored for a long period of time.
- To avoid damage to this product due to static electricity, static electricity in your body must be discharged before you touch this product.
- Only one PM motor can be connected to a single unit of this product.
- A PM motor must be used under PM sensorless vector control. Do not use a synchronous motor, induction motor, or synchronous induction motor.
- Do not connect a PM motor to this product with it set to the induction motor control setting (initial setting). Do not connect an induction motor to this product with it set to the PM sensorless vector control setting. Doing so will cause failure.
- As a process of starting a PM motor, turn ON the power of this product first, and then close the contactor on the output side of this product.
- To maintain the security (confidentiality, integrity, and availability) of the inverter and the system against unauthorized access, DoS*1 attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.
- When the emergency drive function is enabled, the operation is continued or the retry operation (automatic reset and restart) is repeated even if a fault occurs, which may damage or burn this product and the motor. Before restarting the operation, confirm the operation using the emergency drive function, make sure that this product and the motor have no fault.

Emergency stop
- A safety backup such as an emergency brake must be provided for devices or equipment in a system to prevent hazardous conditions in case of failure of this product.
- If the breaker installed on the input side of this product trips, check for wiring faults (such as short circuits) and damage to internal parts of this product. Identify and remove the cause of the trip before resetting the tripped breaker and applying the power to the product again.
- When any protective function is activated, take an appropriate corrective action before resetting this product to resume the operation.

Maintenance, inspection and parts replacement
- Do not carry out a megger (insulation resistance) test on the control circuit of this product. Doing so will cause failure.

Disposal
- This product must be treated as industrial waste.

*1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

General instruction
- For clarity, illustrations in this Safety Guideline may be drawn with covers or safety guards removed. Ensure all covers and safety guards are properly installed as directed in the Instruction Manual (Connection) prior to the operation. For details on the PM motor, refer to the Instruction Manual of the PM motor.

◆ **Application of caution labels**
Caution labels are used to ensure safety during use of Mitsubishi Electric inverters.
Make copies of the following labels and apply them to the inverter if the "retry function" and/or "automatic restart after instantaneous power failure" have been enabled.

For the retry function

CAUTION
(Retry Function Has Been Selected)
Stay away from the motor and machine. They will start suddenly (after given time has elapsed) when alarm occurs.

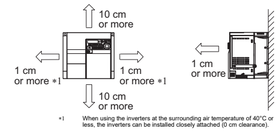
For automatic restart after instantaneous power failure

CAUTION
(Automatic Restart after Instantaneous Power Failure Has Been Selected)
Stay away from the motor and machine. They will start suddenly (after reset time has elapsed) when instantaneous power failure occurs.

1 INVERTER INSTALLATION AND PRECAUTIONS

When installing the inverter on the enclosure surface, remove the front cover and wiring cover to fix the inverter.
- Install the inverter on a strong surface securely with screws.
- Leave enough clearances and take cooling measures.
- Avoid places where the inverter is subjected to direct sunlight, high temperature and high humidity.
- Install the inverter on a nonflammable wall surface.

Allow clearance

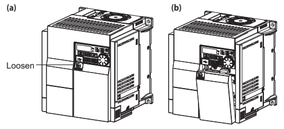


*1 When using the inverters at the surrounding air temperature of 40°C or less, the inverters can be installed closely attached (0 cm clearance).

2 INSTALLATION AND WIRING

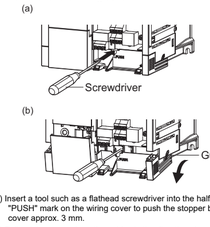
2.1 Removal and reinstallation of covers

◆ **Removal of the front cover**



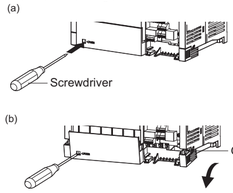
(a) Loosen the mounting screws of the cover. (These screws cannot be removed.)
(b) Pull out the cover using its lower side as a support.
With the cover removed, the control circuit terminals can be wired and the plug-in option can be installed.

◆ **FR-E860-0040(2.2K) or lower**
Removal of the wiring cover



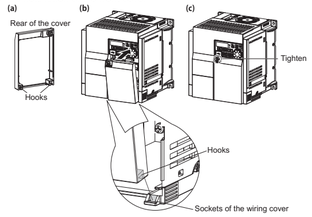
(a) Insert a tool such as a flathead screwdriver into the half-hole above the "PUSH" mark on the wiring cover to push the stopper behind the wiring cover approx. 3 mm.
(b) Pull out the cover along the guides in the direction shown by the arrow in the figure above.

◆ **FR-E860-0061(3.7K) or higher**
Removal of the wiring cover



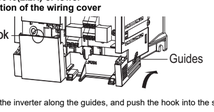
(a) Insert a tool such as a flathead screwdriver into the half-hole above the "PUSH" mark on the wiring cover to push the stopper behind the wiring cover approx. 3 mm.
(b) Pull out the cover along the guides in the direction shown by the arrow in the figure above.

◆ **Reinstallation of the front cover**



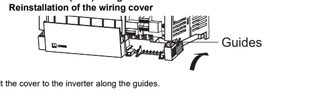
(a) Check the position of the hooks on the rear of the cover.
(b) Insert the hooks of the cover into the sockets of the wiring cover, and reinstall the cover to the inverter.
(c) Tighten the mounting screws of the front cover. (Tightening torque: 0.6 to 0.8 N·m)

◆ **FR-E860-0040(2.2K) or lower**
Reinstallation of the wiring cover



Fit the cover to the inverter along the guides, and push the hook into the socket.

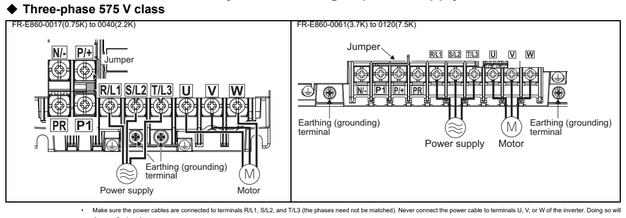
◆ **FR-E860-0061(3.7K) or higher**
Reinstallation of the wiring cover



Fit the cover to the inverter along the guides.

2.2 Main circuit terminal layout and wiring to power supply and motor

◆ **Three-phase 575 V class**



- Make sure the power cables are connected to terminals R/L1, S/L2, and T/L3 (the phases need not be matched). Never connect the power cable to terminals U, V, or W of the inverter. Doing so will damage the inverter.
- Connect the motor to terminals U, V, and W. The motor rotates counterclockwise when viewed from the motor load side when the forward rotation switch (signal) turns ON.

2.3 Applicable cables and wiring length

Select cables of recommended gauge size to ensure that the voltage drop will be 2% or less.
If the wiring distance is long between the inverter and motor, the voltage drop in the main circuit will cause the motor torque to decrease especially at a low speed.
The following table shows a selection example for the wiring length of 20 m at the ND rating. When using the inverter with the LD rating, refer to the FR-E860 Instruction Manual (Connection).

Applicable Inverter model	Terminal screw size *3	Tightening torque N·m	Crimp terminal		Cable gauge			
					HIV cables, etc. (mm²) *1		AWG (mm²) *2	
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W
FR-E860-0017(0.75K)	M4	1	2-4	2-4	2	2	14	14
FR-E860-0027(1.5K)	M4	1	2-4	2-4	2	2	14	14
FR-E860-0040(2.2K)	M4	1	2-4	2-4	2	2	14	14
FR-E860-0061(3.7K)	M4	1	2-4	2-4	2	2	14	14
FR-E860-0090(5.5K)	M4	1	2-4	2-4	2	2	14	14
FR-E860-0120(7.5K)	M4	1	5.5-4	2-4	3.5	2	12	14

*1 HIV cable (600 V grade heat-resistant PVC insulated wire) with a continuous maximum permissible temperature of 75°C. It is assumed that the cables will be used in a surrounding air temperature of 50°C or less and the wiring distance of 20 m or shorter.
*2 THHW cable with a continuous maximum permissible temperature of 75°C. It is assumed that the cables will be used in a surrounding air temperature of 40°C or less and the wiring distance of 20 m or shorter. (For use in the United States or Canada, refer to the section 7.2 "Instructions for UL and cUL".)
*3 The screw size for terminals R/L1, S/L2, T/L3, U, V, W, PR, P/+, N/-, and P1, and the earthing (grounding) terminal is shown.

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

Line voltage drop [V] = $\sqrt{3}$ × wire resistance [mΩ/m] × wiring distance [m] × 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.

◆ **Total wiring length**
Connect one or more motors within the total wiring length (sum of the wiring lengths of the motor and the inverter) shown in the following table.

Cable type	Pr.72 setting (carrier frequency)	Voltage class	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K
Unshielded	1 (1 kHz) or lower	575 V	100m	100m	100m	200m	400m	500m
	2 (2 kHz) or higher		100m	100m	100m	200m	300m	400m

Use a "600 V class inverter-driven insulation-enhanced motor" and set **Pr.72 PWM frequency selection** according to the wiring length: "14.5 kHz or less" when the wiring length is 50 m or shorter, "8 kHz or less" when the wiring length is from 50 m to 100 m, or "2 kHz or less" when the wiring length is longer than 100 m.

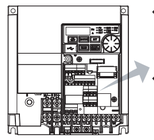
2.4 Terminal connection diagram

2.5 Details on the main circuit terminals and the control circuit terminals

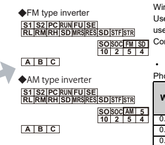
Type	Terminal symbol	Common	Terminal name	Terminal function description		
Main circuit	R/L1, S/L2, T/L3	—	AC power input	Connected to the commercial power supply.		
	U, V, W	—	Inverter output	Connected to a three-phase squirrel cage motor or a PM motor.		
	P/+, PR	—	Brake resistor connection	Connect a brake resistor across terminals P/+ and PR.		
	P/+, N/-	—	Brake unit connection	Connect the brake unit.		
	P/+, P1	—	DC reactor connection	Remove the jumper across terminals P/+ and P1, and connect a DC reactor. When a DC reactor is not connected, the jumper across terminals P/+ and P1 should not be removed.		
	⏚	—	Earth (ground)	For earthing (grounding) the inverter chassis. Be sure to earth (ground) the inverter.		
Input signal — Contact input	STF *1	SD (sink (negative common)) / PC (source (positive common))	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop.	When the STF and STR signals are turned ON simultaneously, the stop command is given.	Input resistance: 4.7 kΩ Voltage when contacts are open: 21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC
	STR *1		Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.		
	RH, RM, RL *1		Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.		
	MRS *1		Output stop	Turn ON the MRS signal (5 ms or more) to stop the inverter output. Use this signal to shut off the inverter output when stopping the motor with an electromagnetic brake.		
	RES *1		Reset	Use this signal to reset a fault output provided when a protective function is activated. Turn ON the RES signal for 0.1 second or longer, then turn it OFF. In the initial setting, reset is always enabled. By setting Pr.75, reset can be enabled only at an inverter fault occurrence. The inverter will restart about 1 second after reset.		
Input signal — Frequency setting	10	5	Power supply for a frequency setting potentiometer	Used as the power supply for an external frequency setting (speed setting) potentiometer.		5 ±0.5 VDC, Permissible load current: 10 mA
	2	5	Frequency setting (voltage)	Inputting 0 to 5 VDC (or 0 to 10 VDC) provides the maximum output frequency at 5 V (or 10 V) and makes input and output proportional. Use Pr.73 to switch among input 0 to 5 VDC (initial setting), 0 to 10 VDC, and 0 to 20 mA. * The initial setting varies depending on the specification. Set the voltage/current input switch to the "I" position to select current input (0 to 20 mA).		For voltage input, Input resistance: 10 to 11 kΩ Maximum permissible voltage: 20 VDC For current input, Input resistance: 245 ±5 Ω Permissible maximum current: 30 mA
	4	5	Frequency setting (current)	Inputting 4 to 20 mADC (or 0 to 5 VDC, 0 to 10 VDC) provides the maximum output frequency at 20 mA and makes input and output proportional. This input signal is valid only when the AU signal is ON (terminal 2 input is invalid). To use the terminal 4 (current input at initial setting), assign "4" to any parameter from Pr.178 to Pr.184 (input terminal function selection) before turning ON the AU signal. * The initial setting varies depending on the specification. Use Pr.267 to switch among input 4 to 20 mA (initial setting), 0 to 5 VDC, and 0 to 10 VDC. Set the voltage/current input switch in the "V" position to select voltage input (0 to 5 V / 0 to 10 V).		
Contact input	SD	—	Contact input common (sink (negative common))	Common terminal for the contact input terminal (sink logic) and terminal FM.		
			External transistor common (source (positive common))	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current.		
	SD	—	24 VDC power supply common	Common output terminal for 24 VDC 0.1 A power supply (terminal PC). Isolated from terminals 5 and SE.		
	PC	—	External transistor common (sink (negative common))	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable current.		Power supply voltage range: 22 to 26.5 VDC Permissible load current: 100 mA
			Safety stop input terminal common	Common terminal for safety stop input terminals		
			Contact input common (source (positive common))	Common terminal for the contact input terminal (source logic).		
	SD		24 VDC power supply common	Can be used as a 24 VDC 0.1 A power supply.		
Frequency setting	5	—	Frequency setting common	Common terminal for the frequency setting signal (terminal 2 or 4). Do not earth (ground).		
Relay	A, B, C	—	Relay output (fault output)	1 changeover contact output indicates that the inverter protective function has activated and the outputs are stopped. Fault: discontinuity across B and C (continuity across A and C), Normal: continuity across B and C (discontinuity across A and C)		Contact capacity: 240 VAC 2 A (power factor = 0.4) or 30 VDC 1 A
Open collector	RUN	SE	Inverter running	The output is in LOW state when the inverter output frequency is equal to or higher than the starting frequency (initial value: 0.5 Hz). The output is in HIGH state during stop or DC injection brake operation. *2		Permissible load: 24 VDC (maximum 27 VDC) 0.1 A (The voltage drop is 3.4 V at maximum while the signal is ON.)
	FU	SE	Frequency detection	The output is in LOW state when the inverter output frequency is equal to or higher than the preset detection frequency, and is in HIGH state when it is less than the preset detection frequency. *2		
Pulse	FM *3	SD	For indication on external meters	Among several monitor items such as output frequency, select one to output it via these terminals. (The signal is not output during an inverter reset.) The size of output signal is proportional to the magnitude of the corresponding monitor item.	Output item: Output frequency (initial setting)	Permissible load current: 1 mA 1440 pulses/s at 60 Hz
Analog	AM *3	5	Analog voltage output			Output signal: 0 ±10 VDC, permissible load current: 1 mA (load impedance 10 kΩ or more), resolution: 12 bits
Safety stop function	S1	PC	Safety stop input (Channel 1)	Use terminals S1 and S2 to receive the safety stop signal input from the safety relay module. Terminals S1 and S2 can be used at a time (dual channel). The Inverter judges the condition of the internal safety circuit from the status (shorted/opened) between terminals S1 and PC, or between S2 and PC. When the status is opened, the inverter output is shut off. In the initial status, terminal S1 and S2 are shorted with terminal PC by shorting wires. Remove the shorting wires and connect the safety relay module when using the safety stop function.		Input resistance: 4.7 kΩ Voltage when contacts are open: 21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC
	S2	PC	Safety stop input (Channel 2)			
	SO	SOC	Safety monitor output (open collector output)	The output status varies depending on the input status of the safety stop signals. The output is in HIGH state during occurrence of the internal safety circuit fault. The output is in LOW state otherwise. (The open collector transistor is ON (conductive) in LOW state. The transistor is OFF (not conductive) in HIGH state.) Refer to the FR-E800 Instruction Manual (Functional Safety) (BCN-A23488-000) when the signal is switched to HIGH while both terminals S1 and S2 are open. (Please contact your sales representative for the manual.)		Permissible load: 24 VDC (27 VDC at maximum), 0.1A (The voltage drop is 3.4 V at maximum while the signal is ON.)
Communication	—	—	PU connector	With the PU connector, communication can be made through RS-485. • Conforming standard: EIA-485 (RS-485) · Transmission format: Multidrop link • Communication speed: 300 to 115200 bps· Overall length: 500 m		
	—	—	USB connector *4	Use the USB connector to communicate with a personal computer. Setting and monitoring of the inverter is enabled using FR Configurator2. • Interface: conforms to USB 1.1· Transmission speed: 12 Mbps • Connector: USB mini B connector (receptacle mini B type)		

*1 Terminal functions can be selected using **Pr.178 to Pr.184 (input terminal function selection)**. (Refer to the FR-E800 Instruction Manual (Function).)
*2 The open collector transistor is ON (conductive) in LOW state. The transistor is OFF (not conductive) in HIGH state.
*3 Terminal FM is available for the FM type inverter. Terminal AM is available for the AM type inverter.
*4 USB bus power connection is available. The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.

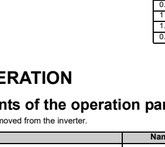
2.6 Control circuit terminal layout



◆FM type inverter



◆AM type inverter



Wiring method
Use crimp terminals and stripped wire for the control circuit wiring. If only a single wire is used, the wire can be stripped and used without a ferrule.
Connect the end of wires (crimp terminal or stranded wire) to the terminal block.

- Crimp terminals commercially available (as of April 2023.)

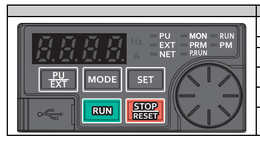
Phoenix Contact Co., Ltd.

Wire gauge (mm²)	Ferrule part No.		Crimping tool model No.
	With insulation sleeve	Without insulation sleeve	
0.3	AI 0.34-10TQ	—	CRIMPFOX 6
0.5	AI 0.5-10WH	—	
0.75	AI 0.75-10GY	A 0.75-10	
1	AI 1-10RD	A 1-10	
1.25, 1.5	AI 1.5-10BK	A 1.5-10	
0.75 (for 2 wires)	AI-TWIN 2×0.75-10GY	—	

3 BASIC OPERATION

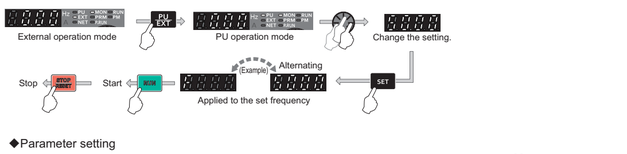
3.1 Components of the operation panel

The operation panel cannot be removed from the inverter.

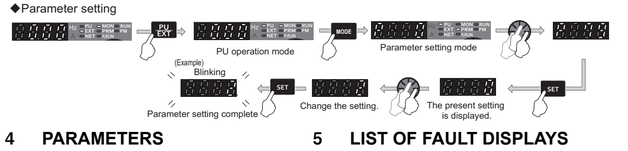


Name	Description
PU/EXT key	Switches between the PU operation mode, the PU/JOG operation mode, and the External operation mode.
MODE key	Switches the operation panel to a different mode.
SET key	Used to confirm each selection. Switches the monitor screen in the monitor mode.
RUN key	Start command The direction of motor rotation depends on the **Pr.40** setting.
STOP/RESET key	Used to stop operation commands. Used to reset the inverter when the protective function is activated.
Setting dial	The setting dial of the Mitsubishi Electric inverters. Turn the setting dial to change the setting of frequency or parameter.

◆Starting/stopping the inverter on the operation panel



◆Parameter setting



4 PARAMETERS

For details, refer to the FR-E800 Instruction Manual (Function).
The PDF manual can also be downloaded from the Mitsubishi Electric FA Global Website.

For more information on the product

5 LIST OF FAULT DISPLAYS

For details, refer to the FR-E800 Instruction Manual (Maintenance).
The PDF manual can also be downloaded from the Mitsubishi Electric FA Global Website.

For more information on the product

6 SPECIFICATIONS

6.1 Inverter rating

◆ Three-phase 575 V power supply

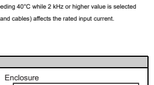
Model FR-E860-[]				0017	0027	0040	0061	0090	0120
				0.75K	1.5K	2.2K	3.7K	5.5K	7.5K
Applicable motor capacity (kW) *1			LD	1.5	2.2	3.7	5.5	7.5	11.0
			ND	0.75	1.5	2.2	3.7	5.5	7.5
Output	Rated capacity (kVA) *2		LD	2.5	3.6	5.6	8.2	11.0	15.9
			ND	1.7	2.7	4.0	6.1	9.0	12.0
	Rated current (A) *7		LD	2.5 (2.1)	3.6 (3.0)	5.6 (4.8)	8.2 (7.0)	11.0 (9.0)	16.0 (13.6)
			ND	1.7	2.7	4.0	6.1	9.0	12.0
	Overload current rating *3		LD	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature of 50°C					
			ND	150% 60 s, 200% 3 s (inverse-time characteristics) at surrounding air temperature of 50°C					
	Voltage *4			Three-phase 525 to 600 V					
	Regenerative braking	Brake transistor		Built-in					
		Maximum brake torque (ND reference) *5		100%	50%	20%			
Power supply	Rated input AC voltage/frequency			Three-phase 575 V 60 Hz					
	Permissible AC voltage fluctuation			490 to 632 V, 60 Hz					
	Permissible frequency fluctuation			±5%					
	Rated input current (A) *8	Without DC reactor	LD	4.3	5.9	8.9	12.4	15.9	22.4
			ND	3.0	4.6	6.6	9.5	13.3	17.4
		With DC reactor	LD	2.5	3.6	5.6	8.2	11.0	16.0
			ND	1.7	2.7	4.0	6.1	9.0	12.0
	Power supply capacity (kVA) *6	Without DC reactor	LD	4.3	5.9	8.9	12.3	16.0	23.0
			ND	3.0	4.6	6.6	9.5	14.0	18.0
		With DC reactor	LD	2.5	3.6	5.6	8.2	11.0	16.0
			ND	1.7	2.7	4.0	6.1	9.0	12.0
Protective structure (IEC 60529)				Open type (IP20)					
Cooling system				Natural	Forced air				
Approx. mass (kg)				1.9	1.9	1.9	2.4	2.4	2.4

*1 The motor capacity indicates the maximum capacity of a 4-pole standard motor driven by all of the inverters in parallel connection.
*2 The rated inverter capacity assumes that the output voltage is 575 V.
*3 The percentage of the overload current rating 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. The maximum point of the voltage waveform at the output side of the inverter is approximately the power supply voltage multiplied by $\sqrt{2}$.
*5 The amount of braking torque is the average deceleration torque (which varies depending on motor loss) that is generated when a motor decelerates in the shortest time by itself from 60 Hz. It is not continuous regenerative torque. The average deceleration torque becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a built-in brake resistor. Use a brake resistor for an operation with large regenerative power. A brake unit can be also used.
*6 The power supply capacity varies with the value of the power supply side impedance (including those of the input reactor and cables).
*7 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 40°C while 2 kHz or higher value is selected in **Pr.72 PWM frequency selection**.
*8 The rated input current is the value when at the rated output current. The impedance at the power supply side (including those of the input reactor and cables) affects the rated input current.

6.2 Inverter installation environment

Item	Description
Surrounding air temperature *1	-10°C to +60°C (The rated current must be reduced at a temperature above 50°C. For details, refer to the FR-E860 Instruction Manual (Connection). To meet the UL/EN standards, use the product at temperatures from -10°C to 50°C.)
Ambient humidity	95% RH or less (non-condensing) (With circuit board coating (IEC 60721-3-3:1994 3C2 compatible)) 90% RH or less (non-condensing) (Without circuit board coating)
Storage temperature	-40°C to +70°C
Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
Altitude/vibration	Maximum 2000 m, 5.9 m/s² or less (For installation at an altitude above 1000 m, consider a 3% reduction in the rated current per 500 m increase in altitude.)

Enclosure



*1 Surrounding air temperature is a temperature measured at a measurement position in an enclosure. Ambient temperature is a temperature outside an enclosure.

7 APPENDIX

7.1 Instructions for compliance with the EU Directives

- The authorized representative in the EU
  The authorized representative in the EU is shown below.
  Name: Mitsubishi Electric Europe B.V.
  Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

◆ EMC Directive

We declare that this inverter conforms with the EMC Directive and affix the CE marking on the inverter.

- EMC Directive: 2014/30/EU
- Standard: IEC 61800-3 (Category "C3" / Second environment)
- This inverter is not intended to be used on a low-voltage public network which supplies domestic premises. When using the inverter in a residential area, take appropriate measures and ensure the conformity of the inverter used in the residential area.
- Radio frequency interference is expected if used on such a network.

◆ Notes

- 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 the motor and controller cable found in the EMC Installation Guidelines (BCN-A21041-204) and Technical News (MF-S-177) according to the instructions. (Contact your sales representative for the manual.)
- To make full use of the EMC Directive compliant noise filter, motor cable lengths should not exceed 20 m.
- Ensure that the finalized system which includes an inverter complies with the EMC Directive.

◆ Low Voltage Directive

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

- Low Voltage Directive: 2014/35/EU
- Standard: EN 61800-5-1

◆ 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 (ground) securely.
- Wire the earth terminal independently. (Do not connect two or more cables to one terminal.)
- Select appropriate wire according to EN 60204-1 or IEC 60364-5-52. (Refer to the selection examples of cable sizes in 2.3 Applicable cables and wiring length.)
- Use a tinned (plating should not include zinc) crimping terminal to connect the earth (ground) 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 cables.
- Use PVC cables for I/O wiring.
- Use the molded case circuit breaker and magnetic contactor which conform to the EN or IEC Standard.
- If an earth leakage circuit breaker is required, use a type-B earth leakage circuit breaker (AC/DC detection compatible).
- Use the inverter under the conditions of overvoltage category III specified in IEC 60664.
- To use the inverter under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher for protection against electric shock and fire.
- Attach the fan cover to the fan with the fan cover fixing screw enclosed with the inverter.

FR-E860-0017(0.75K) or higher

If the cover is not fixed, the inverter protective structure is regarded as IP00.

◆ Fuse selection for branch circuit protection

Use the following semiconductor fuses for branch circuit protection.

Inverter model	Cat. No	Manufacturer	Rating
FR-E860-0017(0.75K)	170M1409, 170M1309 or 170M1359	Bussmann	700 V, 16 A
FR-E860-0027(1.5K)	170M1410, 170M1310 or 170M1360	Bussmann	700 V, 20 A
FR-E860-0040(2.2K)	170M1312, 170M1362 or 170M1412	Bussmann	700 V, 32 A

Inverter model	Cat. No	Manufacturer	Rating
FR-E860-0061(3.7K)	170M1413, 170M1313 or 170M1363	Bussmann	700 V, 40 A
FR-E860-0090(5.5K)	170M1414, 170M1314 or 170M1364	Bussmann	700 V, 50 A
FR-E860-0120(7.5K)	170M1415, 170M1315 or 170M1365	Bussmann	700 V, 63 A

◆ Motor overload protection

For details, refer to 7.2 Instructions for UL and cUL: Motor overload protection.

◆ EU RoHS Directive

We have declared that our inverters are compliant to the EU RoHS Directive and affix the CE marking on the inverters.

For other information, refer to the FR-E860 Instruction Manual (Connection).

7.2 Instructions for UL and cUL

(Standard to comply with: UL 61800-5-1, CSA C22.2 No. 274)

◆ Product handling information / Informations sur la manipulation du produit

-WARNING- Operation of this product requires detailed installation and operation instructions provided in this Safety Guideline and the Instruction Manual (Connection) intended for use with this product. Please forward relevant manuals to the end user. The manuals can also be downloaded in PDF form from the Mitsubishi Electric FA Global Website. To order manuals, please contact your sales representative.

-AVERTISSEMENT-
L'utilisation de ce produit nécessite des instructions détaillées d'installation et d'utilisation fournies dans le présent document de la Directive de sécurité et le Manuel d'instructions (Connexion) destiné à être utilisé avec ce produit. Veuillez transmettre les manuels correspondants à l'utilisateur final. Les manuels peuvent également être téléchargés au format PDF sur Mitsubishi Electric FA Global Website. Pour commander des manuels, veuillez contacter votre représentant commercial.

◆ Branch circuit protection

For installation in the United States, use the branch circuit protection equipment specified in Technical News MF-S-187, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, use the branch circuit protection equipment specified in Technical News MF-S-187, in accordance with the Canadian Electrical Code and any applicable local codes.
Short circuit protection of the inverter cannot be used as branch circuit protection. Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.
The installation/operation manual is available via the internet at https://www.mitsubishielectric.com/fa/products/drv/inv/support/e800/e800.html.
A hard copy of this information may be ordered at +1 (847) 478-2100 (Mitsubishi Electric Automation, Inc. in USA).

◆ Precautions for opening the branch-circuit protective device / Précautions pour ouvrir le dispositif de protection du circuit de dérivation

-WARNING- If the fuse melts down or the breaker trips on the input side of this product, check for wiring faults (such as short circuits). Identify and remove the cause of melting down or the trip before replacing the fuse or resetting the tripped breaker (or before applying the power to the inverter again).

-AVERTISSEMENT-
Si le fusible fond ou si le disjoncteur se déclenche du côté entrée de ce produit, vérifier les défauts de câblage (tels que les courts-circuits). Identifier et éliminer la cause de la fonte ou du déclenchement avant de remplacer le fusible ou de réinitialiser le disjoncteur déclenché (ou avant de remettre sous tension l'onduleur).

◆ Capacitor discharge time / Temps de décharge du condensateur

CAUTION - Risk of Electric Shock -
Before wiring or inspection, check that the LED display of the operation panel is OFF. Any person who is involved in wiring or inspection shall wait for 10 minutes or longer after power OFF, and check that there are no residual voltage using a digital multimeter or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.

ATTENTION - Risque de choc électrique -
Avant le câblage ou l'inspection, vérifier que le témoin LED s'éteint. Toute personne impliquée dans le câblage ou l'inspection doit attendre 10 minutes ou plus après la mise hors tension et vérifier l'absence de tension résiduelle à l'aide d'un multimètre numérique ou similaire. Le condensateur est chargé avec une haute tension pendant un certain temps après la mise hors tension, ce qui est dangereux. Précautions pour ouvrir le dispositif de protection du circuit de dérivation

◆ Wiring to the power supply and the motor

- Refer to the National Electrical Code (Article 310) regarding the allowable current of the cable. Select the cable size for 125% of the rated current according to the National Electrical Code (Article 430). For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL listed copper, stranded wires (rated at 75°C) and round crimp terminals. Crimp the terminals with the crimping tool recommended by the terminal manufacturer.

The following table shows examples when the inverter rating is the LD rating, when the cable is the THHW cable with continuous maximum permissible temperature of 75°C, when the surrounding air temperature is 30°C or less, and the wiring length is 20 m or shorter.

Applicable inverter model	Terminal screw size *1	Tightening torque (N-m)	Crimp terminal		Cable gauge AWG	
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W
FR-E860-0017(0.75K) to 0040(2.2K)	M4	1.5	2-4	2-4	14	14
FR-E860-0061(3.7K), 0090(5.5K)	M4	1.5	3.5-4	2-4	12	14
FR-E860-0120(7.5K)	M4	1.5	5.5-4	3.5-4	10	12

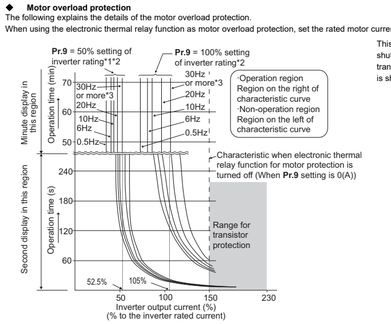
*1 The screw size for terminals R/L1, S/L2, T/L3, U, V, W, PR, P/+, N/-, and P1, and the earthing (grounding) terminal is shown.

◆ Short circuit ratings

- 600 V class: Suitable for use in a circuit capable of delivering not more than 100 kA rms symmetrical amperes, 575 V maximum.

◆ Motor overload protection

The following explains the details of the 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**.



This function detects the overload (overheat) of the motor and shut off the inverter output by stopping the operation of the transistor at the inverter output side. (The operation characteristic is shown on the left.)

- When using the constant-torque motor
  1) Set one of "10, 13, 15, 16" in **Pr.71**. (This setting enables the 100% constant-torque characteristic in the low-speed range.)
  2) Set the rated motor current in **Pr.9**.

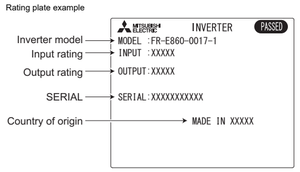
*1 When setting **Pr.9** to a value (current value) of 50% of the inverter rated output current.
*2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the rated motor current.
*3 When the electronic thermal relay function dedicated to the constant-torque motor is set, this characteristic curve applies to operation at 6 Hz or higher.

- The internal accumulated heat value of the electronic thermal O/L relay is reset to the initial value by the inverter's power reset or reset signal input. Avoid unnecessary reset and power-OFF.
- Install an external thermal relay (OCR) between the inverter and motors to operate several motors, a multi-pole motor or a dedicated motor with one inverter. When configuring an external thermal relay, note that the current indicated on the motor rating plate is affected by the line-to-line leakage current. (Refer to the Instruction Manual (Function).) The cooling effect of the motor drops during low-speed operation. Use a motor with built-in thermal protector. When the difference between the inverter and motor capacities is large and the set value is small, the protective characteristics of the electronic thermal relay function will be deteriorated. Use an external thermal relay in such cases.
- The cooling effect of the motor drops during low-speed operation. Use a motor with built-in thermal protector.
- A dedicated motor cannot be protected by the electronic thermal relay. Use an external thermal relay.
- Motor over temperature sensing is not provided by the drive.
- The electronic thermal memory retention function is not provided by the drive.
- The electronic thermal relay function is not a speed sensing function.

7.3 SERIAL number check

The SERIAL number can be checked on the inverter rating plate or package.

Rating plate example



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

7.4 Instructions for EAC

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

Note: EAC marking
In 2010, three countries (Russia, Belarus, and Kazakhstan) established a Customs Union for the purposes of revitalizing the economy by forming a large economic bloc by abolishing or reducing tariffs and unifying regulatory procedures for the handling of articles. Products to be distributed over these three countries of the Customs Union must comply with the Customs Union Technical Regulations (CU-TR), and the EAC marking must be affixed to the products.

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

- **Country of origin indication**
  Check the rating plate of the product.
  Example: MADE IN JAPAN
- **Production year and month**
  Check the SERIAL number indicated on the rating plate of the product.
- **Authorized sales representative (importer) in the CU area**
  The authorized sales representative (importer) in the CU area is shown below.
  Name: Mitsubishi Electric Turkey A.S. Head Office
  Address: Serifali Mahallesi Kale Sokak. No:41 34775 Umraniye, Istanbul, Turkey
  Phone: +90-216-969-25-00
  Fax: +90-216-661-44-47

7.5 Compliance with the UK certification scheme

We declare that this product conforms with the related technical requirements under UK legislation, and affix the UKCA (UK Conformity Assessed) marking on the product.
Approval conditions are the same as those for the EU Directives. Refer to the "7.1 Instructions for compliance with the EU Directives" in the Instruction Manual.

UKCA marking:
The UKCA marking is used for products sold in the markets of Great Britain (England, Wales, and Scotland) from January 1, 2021 after the departure of the UK from the EU on January 31, 2020.

7.6 EU ErP Directive (Ecodesign Directive)

The following table shows the power loss data according to Ecodesign Directive.The regulation covers 3-phase variable speed drives from 0.12 kW ≤ Pn ≤ 1 000 kW. (LD rated / ND rated)

Model name	Rated Apparent power	Stand by loss	load point 1 (90;100) (%)	load point 2 (50;100) (%)	load point 3 (0;100) (%)	load point 4 (90;50) (%)	load point 5 (50;50) (%)	load point 6 (0;50) (%)	load point 7 (50;25) (%)	load point 8 (0;25) (%)	IE class
FR-E860-0017(0.75K)	2.5 / 1.7	5.7 / 5.7	1.7 / 1.7	1.7 / 2	1.7 / 2	1.2 / 1.4	1.2 / 1.4	1.2 / 1.4	1.0 / 1.2	1.0 / 1.2	IE2
FR-E860-0027(1.5K)	3.6 / 2.7	9.8 / 9.8	1.4 / 1.5	1.4 / 1.5	1.4 / 1.5	1.1 / 1.2	1.1 / 1.2	1.1 / 1.2	0.9 / 1.1	0.9 / 1.1	IE2
FR-E860-0040(2.2K)	5.6 / 4	9.8 / 9.8	1.3 / 1.4	1.3 / 1.4	1.3 / 1.4	1.0 / 1.0	1.0 / 1.0	1.0 / 1.0	0.8 / 0.9	0.8 / 0.9	IE2
FR-E860-0061(3.7K)	8.2 / 6.1	14.5 / 14.5	1.3 / 1.3	1.3 / 1.3	1.3 / 1.3	0.9 / 1.0	0.9 / 1.0	0.9 / 1.0	0.8 / 0.9	0.8 / 0.9	IE2
FR-E860-0090(5.5K)	11 / 9	14.5 / 14.5	1.2 / 1.2	1.2 / 1.2	1.2 / 1.2	0.7 / 0.8	0.7 / 0.7	0.7 / 0.7	0.6 / 0.6	0.6 / 0.6	IE2
FR-E860-0120(7.5K)	16 / 12	14.5 / 14.5	1.2 / 1.1	1.1 / 1.1	1.1 / 1.1	0.7 / 0.7	0.7 / 0.7	0.7 / 0.7	0.5 / 0.5	0.5 / 0.5	IE2

7.7 Restricted Use of Hazardous Substances in Electronic and Electrical Products

The mark of restricted use of hazardous substances in electronic and electrical products is applied to the product as follows based on the "Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products" of the People's Republic of China.
电器电子产品有害物质限制使用标识要求

本产品中所含有的有害物质的名称、含量、含有部件如下表所示。

- 产品中所含有害物质的名称及含量

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

上表依据 SJ/T11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。
×：表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 规定的限量要求。
*1 即使表中记载为 ×，根据产品型号，也可能会有有害物质的含量为限制值以下的情况。
*2 根据产品型号，一部分部件可能不包含在产品中。

7.8 Referenced Standard (Requirement of Chinese standardized law)

This Product is designed and manufactured accordance with following Chinese standards.
Machinery safety: GB/T 16855.1
GB/T 12668.502
GB 28526
GB/T 12668.3
Electrical safety: GB/T 12668.501
EMC: GB/T 12668.3

8 WARRANTY

Exclusion of loss in opportunity and secondary loss from warranty liability
Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:
(1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.
(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.
(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.