MITSUBISHI ELECTRIC

INVERTER
E806-SCE
INVERTER SAFETY GUIDELINE
FR-E846-0026(0.75K) to 0095(3.7K)SCE

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-0600984ENG-A(2307)MEE
Specifications subject to change without notice.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

◆ **Related manuals**

Manual name	Manual number	Model code	Details
FR-E800 Instruction Manual (Connection)	IB-0600865ENG	1A2-P89	Manual describing installation, wiring, specifications, outline dimensions, standards, and how to connect options.
FR-E800 Instruction Manual (Function)	IB-0600868ENG	1A2-P91	Manual describing details of the functions.
FR-E800 Instruction Manual (Communication)	IB-0600871ENG	1A2-P93	Manual describing details of the communications.
FR-E800 Instruction Manual (Maintenance)	IB-0600874ENG	1A2-P95	Manual describing how to identify causes of faults and warnings.
FR-E800-SCE Instruction Manual (Functional safety)	BCN-A23488-004	—	Manual describing details of the safety communication parameters.
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.**

Read this Guideline before use. In addition, scan the 2D code below to download the FR-E800 Instruction Manual (Connection) and read "Safety Instructions". The PDF manual can also be downloaded from the Mitsubishi Electric FA Global Website. To order the non-free printed manual, please contact your sales representative.

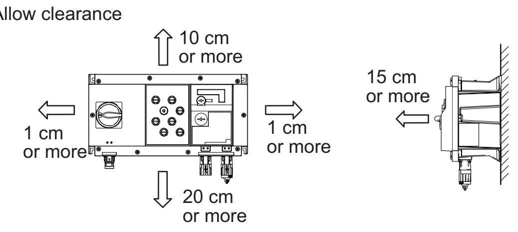
For more information on the product

1 INVERTER INSTALLATION AND PRECAUTIONS

The front cover cannot be removed. If removed, it will not meet IP66/IP67.

- 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.

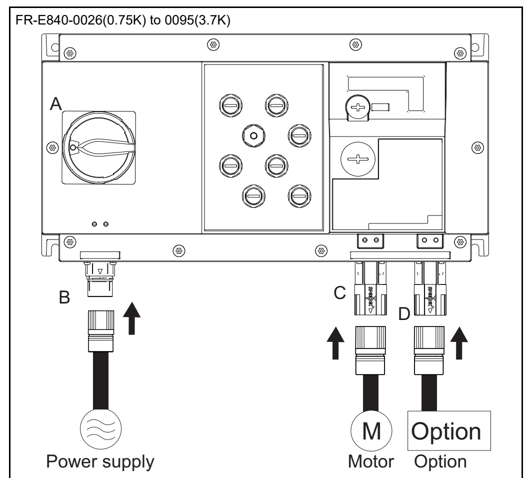
Allow clearance

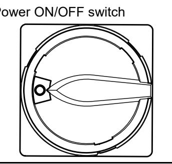


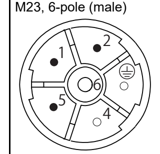
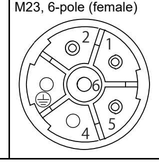
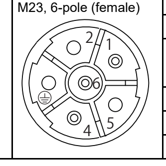
2 INSTALLATION AND WIRING

2.1 Wiring of the power supply and the motor, the option

FR-E840-0026(0.75K) to 0095(3.7K)



Symbol	Name	Description
A	Power ON/OFF switch 	Clockwise: ON (|) Counterclockwise: OFF(○)

Symbol	Connector		Terminal symbol	Symbol	Connector		Terminal symbol
B	M23, 6-pole (male) 	1	R/L1	C	M23, 6-pole (female) 	1	U
		2	S/L1			2	V
		⏚	PE			⏚	PE
		4	-			4	—
		5	T/L1			5	W
		6	-			6	—
D	M23, 6-pole (female) 	1	P				
		2	-				
		⏚	-				
		4	N				
		5	-				
		6	PR				

◆ **Wiring method**
Prepare cables with connectors suitable for applicable connector types shown in the table above for main circuit terminals on the inverter. To meet the UL/cUL standards, purchase cables shown in the following table.
Manufacturer: Tyco Electronics.

Cable type	Cable length		Model
M23, 6-pole (female) for power supply	5 m	Unshielded	1-2391589-1
	10 m		2-2391589-1
	20 m		3-2391589-1
	5 m	Shielded	1-2391589-2
	10 m		2-2391589-2
	20 m		3-2391589-2
M23, 6-pole (male) for motor	5 m	Unshielded	1-2391590-1
	10 m		2-2391590-1
	20 m		3-2391590-1
	5 m	Shielded	1-2391590-2
	10 m		2-2391590-2
	20 m		3-2391590-2
M23, 6-pole (male) for option	5 m	Unshielded	1-2391600-1
	10 m		2-2391600-1
	20 m		3-2391600-1
	5 m	Shielded	1-2391600-2
	10 m		2-2391600-2
	20 m		3-2391600-2

If you need a cable whose length is not listed in the table, please contact Tyco Electronics.

2.2 Recommended 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 the recommended cable size for cables that are 20 m in length at the ND rating. When using the inverter with the LD rating, refer to the FR-E800 Instruction Manual (Connection).)

Applicable Inverter model	Cable gauge							
	HIV cables, etc. (mm^2) *1			AWG *2		PVC cables, etc. (mm^2) *3		
	R/L1, S/L2, T/L3	U, V, W	Earthing (grounding) cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earthing (grounding) cable
FR-E846-0026(0.75K) to 0095(3.7K)	2	2	2	14	14	2.5	2.5	2.5

*1 The cable size is that of the HIV cable (600 V grade heat-resistant PVC insulated wire) etc. with continuous maximum permissible temperature of 75°C. It assumes a surrounding air temperature of 50°C or lower and the wiring distance of 20 m or shorter.
*2 The cable size is that of the THHW cable with continuous maximum permissible temperature of 75°C. It assumes a surrounding air temperature of 40°C or lower and the wiring distance of 20 m or shorter. (For use in the United States or Canada, refer to the section 6.2 "Instructions for UL and cUL".)
*3 The cable size is that of the PVC cable with continuous maximum permissible temperature of 70°C. It assumes a surrounding air temperature of 40°C or lower and the wiring distance of 20 m or shorter (selection example mainly for use in Europe).

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

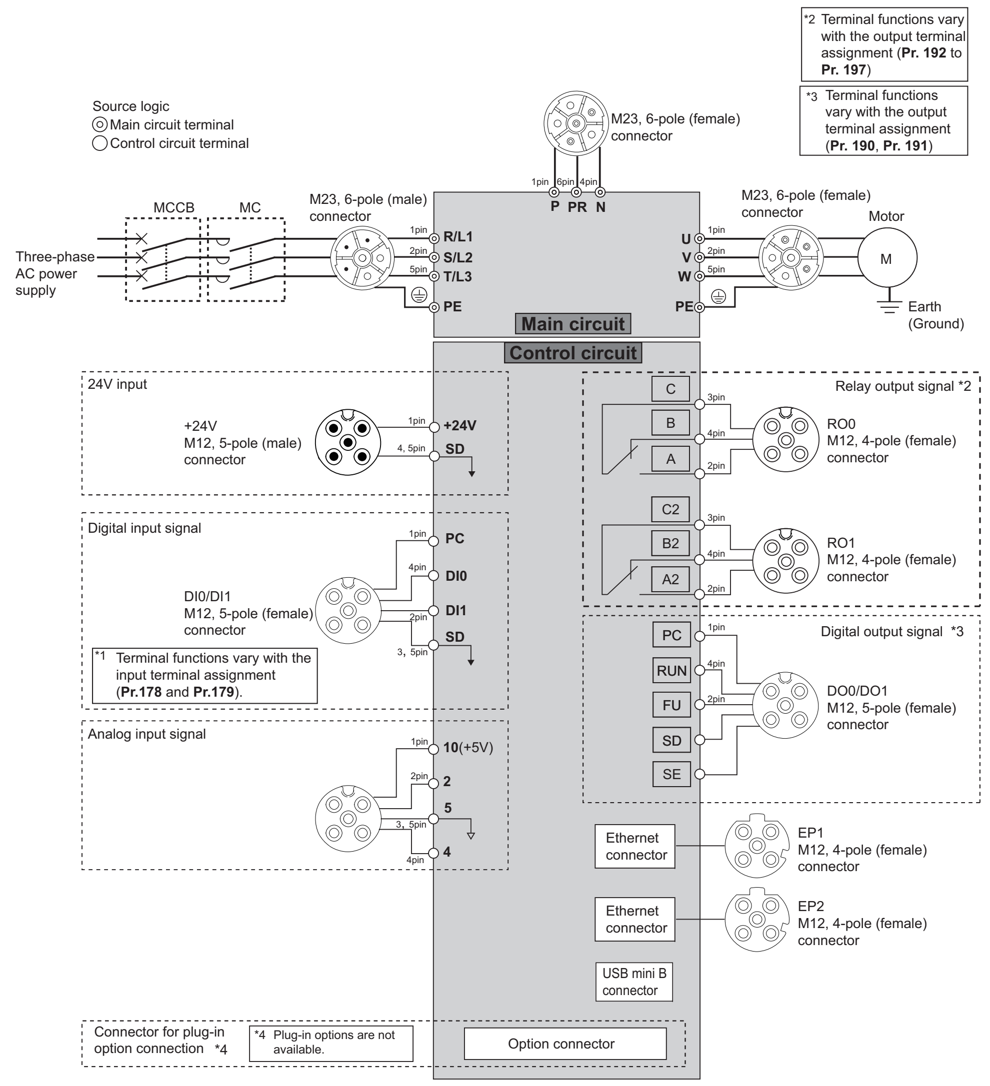
Use a larger diameter cable when the wiring distance is long or when the voltage drop (torque reduction) in the low speed range needs to be reduced.

◆ **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.The value in the parentheses is the total wiring length when unshielded cables are used.

Pr.72 setting (carrier frequency)	Voltage class	0.75K	1.5K	2.2K	3.7K
1 (1 kHz) or lower	400 V	50 m(200 m)	75 m(300 m)	100 m(500 m)	100 m(500 m)
2 (2 kHz) or higher	400 V	25 m(100 m)	50 m(200 m)	75 m(300 m)	100 m(500 m)

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

2.3 Terminal connection diagram



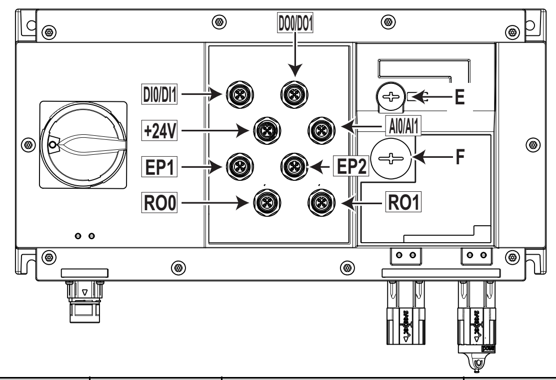
2.4 Details on the main circuit terminals and the control circuit terminals

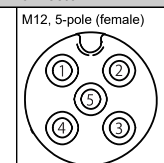
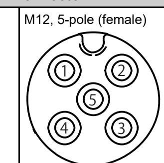
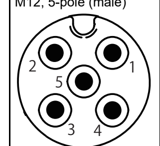
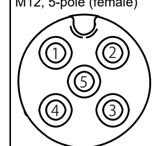
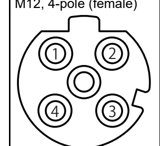
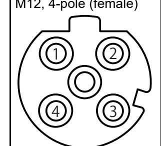
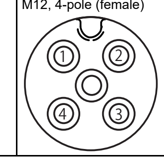
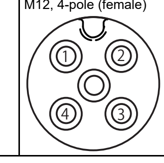
Type		Terminal symbol	Common	Terminal name	Terminal function description	
Main circuit	Power supply	R/L1, S/L2, T/L3	—	AC power input	Connected to the commercial power supply.	
		PE	—	Earth (ground)	For earthing (grounding) the inverter chassis. Be sure to earth (ground) the inverter.	
	Motor	U, V, W	—	Inverter output	Connected to a three-phase squirrel cage motor or a PM motor.	
		PE	—	Earth (ground)	For earthing (grounding) the inverter chassis. Be sure to earth (ground) the inverter.	
	Option	P, PR	—	Brake resistor connection	Connect an optional brake transistor (MRS, MYS, FR-ABR) between terminal P and PR. The option is not compatible with IP67. Install the option in the appropriate enclosure.	
		P, N	—	Brake unit connection	Connect the brake unit (FR-BU2, FR-BU, or BU). The protective structure of the option is not compatible with IP67. Install the option in the appropriate enclosure.	
24 V power supply input	Power input	+24	SD	24 V external power supply input	Use the 24 V external power supply to turn ON/ OFF I/O terminals, keep the operation panel ON, and carry out communication during communication operation even at power-OFF state of inverter's main circuit power supply. Turning ON the main circuit power during the 24 V external power supply operation switches the operation to the normal operation. Before the operation is switched, a reset is performed in the inverter	Input voltage: 23.5 to 26.5 VDC Input current: 0.7 A or less
	Common	SD	—	24 VDC power supply common	Common output terminal for 24 VDC 0.1 A power supply (terminal +24). Isolated from terminal 5.	

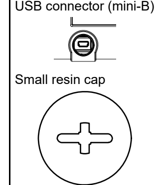
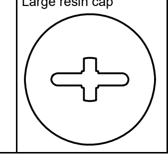
Type		Terminal symbol	Common	Terminal name	Terminal function description		
Digital input signal	Contact input	DI0	PC (source (positive common))	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop.	When the STF and STR signals are turned ON simultaneously, the stop command is given.	Input resistance: 4.7 kΩ, voltage when contacts are open: 21 to 27 VDC, current when contacts are short-circuited: 4 to 6 mADC
		DI1		Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.		
	Common	SD	—	24 VDC power supply common	Common output terminal for 24 VDC 0.1A power supply (terminal PC). Isolated from terminal 5.		
				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, to avoid malfunction by undesirable current.		
		PC	SD	Contact input common (source (positive common))	Common terminal for contact input terminal (source logic).		
			—	24 VDC power supply	Can be used as a 24 VDC 0.1 A power supply.		Power supply voltage range: 22 to 26.5 VDC Permissible load current: 100 mA
Analog 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.		Input resistance: 10 to 11 kΩ Maximum permissible voltage: 20 VDC
		4	5	Frequency setting (current)	Inputting 4 to 20 mADC 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 terminal 4, assign "4" to **Pr.178 or Pr.179 (Input terminal function selection)** before turning ON the AU signal.		Input resistance: 245 ±5 Ω Permissible maximum current: 30 mA
	Common	5	—	Frequency setting common	Common terminal for the frequency setting signal (terminal 2 or 4). Do not earth (ground).		
Relay output signal	Relay	A, B, C	—	Relay output 1 (fault output)	1 changeover contact output that indicates that an inverter's protective function has been 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 2A (power factor = 0.4) or 30 VDC 1 A
		A2, B2, C2	—	Relay output 2	The function of these terminals can be changed using the **Pr.197 ABC2 terminal funtion selection**. Fault: discontinuity across B2 and C2 (continuity across A2 and C2), Normal: continuity across B2 and C2 (discontinuity across A2 and C2)		
Digital output signal	Open collector	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.		Permissible load: 24 VDC (27 VDC at maximum) 0.1 A (The voltage drop is 3.4 V at maximum while the signal is ON.)
		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.		
		SE	—	Open collector output common	Common terminal for terminals RUN and FU.		
Communication		—	—	Ethernet connector (2 ports)	Communication can be made via Ethernet. · Category: 100BASE-TX/10BASE-T· Transmission method: Baseband · Data transmission speed: 100 Mbps (100BASE-TX) / 10 Mbps (10BASE-T) · Maximum segment length: 100 m between the hub and the inverter· Interface: Interface: M12 round D coding connector conforming to IEC 61076-2-101 Commercially available connectors (as of November 2022):T4111501041-000 manufactured by TE Connectivity To meet the UL standard, refer to the FR-E800 Instruction Manual (Connection). · Number of cascade connection stages: Up to 2 (100BASE-TX) / up to 4 (10BASE-T) · Number of interfaces available: 2· IP version: IPv4		
		—	—	USB connector*1	By connecting an inverter to the personal computer through USB, FR Configurator2 can be used for setting the inverter and monitoring the operation. · Interface: conforms to USB 1.1· Transmission speed: 12 Mbps · Connector: USB mini B connector (receptacle mini B type)		

*1 USB bus power connection is available. The maximum SCCR is 500 mA.

2.5 Control circuit terminals (connector) layout



Connector		Pin number	Terminal symbol	Connector		Pin number	Terminal symbol
DI0/DI1	M12, 5-pole (female) 	1	PC	DO0/DO1	M12, 5-pole (female) 	1	PC
		2	DI1			2	FU
		3	SD			3	SE
		4	DI0			4	RUN
		5	SD			5	SD
+24 V	M12, 5-pole (male) 	1	+24 V	AI0/AI1	M12, 5-pole (female) 	1	10
		2	NC			2	2
		3	NC			3	5
		4	SD			4	4
		5	SD			5	5
EP1	M12, 4-pole (female) 	1	SDA	EP2	M12, 4-pole (female) 	1	SDA
		2	RDA			2	RDA
		3	SDB			3	SDB
		4	RDB			4	RDB
RO0	M12, 4-pole (female) 	1	NC	RO1	M12, 4-pole (female) 	1	NC
		2	A			2	A2
		3	C			3	C2
		4	B			4	B2

Symbol	Connector	Description
E	USB connector (mini-B) Small resin cap 	Used to connect the inverter to a personal computer (FR Configurator2). The protective structure is IP00 when the cap is removed. After using the USB connector, always install the cap. (Tightening torque: 1 N·m)
F	Large resin cap 	Not used. Do not remove the large resin cap. If the cap is removed, reinstall the cap. (Tightening torque: 1.5 N·m)

◆ **Wiring method**
Prepare cables with connectors suitable for applicable connector types shown in the table above for control circuit terminals on the inverter. To meet the UL/cUL standards, purchase cables shown in the following table.
Manufacturer: Tyco Electronics.

Cable type	Cable length		Model
M12, 4-pole (male) for terminals RO0 and RO1	5 m	Unshielded	1-2421478-1
	10 m		2-2421478-1
	20 m		3-2421478-1
	5 m	Shielded	1-2421478-2
	10 m		2-2421478-2
	20 m		3-2421478-2
M12, 5-pole (male) for terminals DI0 and DI1	5 m	Unshielded	1-2421479-1
	10 m		2-2421479-1
	20 m		3-2421479-1
	5 m	Shielded	1-2421479-4
	10 m		2-2421479-4
	20 m		3-2421479-4
M12, 5-pole (male) for terminals DO0 and DO1	5 m	Unshielded	4-2421479-1
	10 m		5-2421479-1
	20 m		6-2421479-1
	5 m	Shielded	4-2421479-4
	10 m		5-2421479-4
	20 m		6-2421479-4
M12, 5-pole (male) for terminals AI0 and AI1	5 m	Unshielded	7-2421479-1
	10 m		8-2421479-1
	20 m		9-2421479-1
	5 m	Shielded	7-2421479-4
	10 m		8-2421479-4
	20 m		9-2421479-4
M12, 4-pole (male) for terminals EP1 and EP2	5 m	Unshielded	1-2421480-1
	10 m		2-2421480-1
	20 m		3-2421480-1
	5 m	Shielded	1-2421480-2
	10 m		2-2421480-2
	20 m		3-2421480-2
M12, 5-pole (female) for terminal +24V	5 m	Unshielded	1-2421481-1
	10 m		2-2421481-1
	20 m		3-2421481-1
	5 m	Shielded	1-2421481-2
	10 m		2-2421481-2
	20 m		3-2421481-2

If you need a cable whose length is not listed in the table, please contact Tyco Electronics.

3 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

4 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

5 SPECIFICATIONS

5.1 Inverter installation environment

Item	Description
Surrounding air temperature*1	-20°C to +50°C (The rated current must be reduced at a temperature above 40°C.)
Ambient humidity	95% RH or less (non-condensing) (With circuit board coating (IEC 60721-3-3:1994 C2 compatible))
Storage temperature	-40°C to +70°C
Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
Altitude/vibration	Maximum 3000 m, 5.9 m/s^2 or less (For installation at an altitude above 1000 m, consider a 3% reduction in the rated current per 500 m increase in altitude.)

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

5.2 Inverter rating

Model FR-E846-[]				0026	0040	0060	0095
				0.75K	1.5K	2.2K	3.7K
Applicable motor capacity (kW)*1			LD	1.5	2.2	3.0	5.5
			ND	0.75	1.5	2.2	3.7
Output	Rated capacity (kVA)*2		LD	2.7	4.2	5.3	8.5
			ND	2.0	3.0	4.6	7.2
	Rated current (A)*7		LD	3.5 (3.0)	5.5 (4.7)	6.9 (5.9)	11.1 (9.4)
			ND	2.6 (2.2)	4.0 (3.8)	6.0 (5.4)	9.5 (8.7)
	Overload current rating*3		LD	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C			
			ND	150% 60 s, 200% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C			
	Voltage*4			Three-phase 380 to 480 V			
	Regenerative braking	Brake transistor		Built-in			
		Maximum brake torque (ND reference)*5		100%	50%	20%	
Power supply	Rated input AC (DC) voltage/ frequency			Three-phase 380 to 480 V, 50/60 Hz			
	Permissible AC (DC) voltage fluctuation			323 to 528 V, 50/60 Hz			
	Permissible frequency fluctuation			±5%			
	Rated input current (A)*8	Without DC reactor	LD	6.0	8.9	10.7	16.2
			ND	4.4	6.7	9.5	14.1
	Power supply capacity (kVA)*6	Without DC reactor	LD	4.5	6.8	8.2	12.4
			ND	3.4	5.1	7.2	10.8
Protective structure (IEC 60529 / UL 50 / UL 50E)				Enclosed type (IP66/IP67, UL Type 4X Indoor Use Only)			
Cooling system				Forced air			
Approx. mass (kg)	Power ON/ OFF switch		With	5.9	5.9	5.9	5.9
			Without	5.7	5.7	5.7	5.7

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard efficiency motor. To drive a Mitsubishi Electric high-performance energy-saving motor, use the 2.2K inverter for a 3 kW motor.
*2 The rated output capacity assumes that the output voltage is 440 V for three-phase 400 V class.
*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 short-term 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 an option brake resistor for an operation with large regenerative power The brake unit (FR-BU2) can be also used.
*6 The power supply capacity varies with the value of the input power 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 APPENDIX

For information on other applicable standards not found in this document, refer to the FR-E800 Instruction Manual (Connection).

6.1 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: IEC61800-3: 2017 (category C2, 2nd 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.
- The installer shall provide a guide for installation and use, including recommended mitigation devices.

◆ Notes

- The EMC Directive compliant noise filter is built in 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, EU Directive compliant EMC filter, and controller cable found in the EMC Installation Guidelines (BCN-A21041-204) 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 61800-5-1:2007

◆ Outline of instructions

- Do not use an earth leakage circuit breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth (ground) securely.
- Use the cable whose size is indicated in Section 2.3 at the surrounding air temperature up to 40°C.
- If conditions are different from above, select appropriate wire according to EN 60204.
- 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.
- When using the relay output terminals A, B, C, A2, B2, and C2 with voltage of 230 VAC, use a power supply classified as overvoltage category II specified in IEC 60664.

◆ Fuse selection for branch circuit protection

To select fuses for branch circuit protection, refer to Fuse selection in 6.2 Instructions for UL and cUL.

◆ Motor overload protection

For details, refer to Motor overload protection in 6.2 Instructions for UL and cUL.

◆ 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-E800 Instruction Manual (Connection).

6.2 Instructions for UL and cUL

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

These devices are intended only for installation on industrial machines in accordance with the "Electrical Standard for Industrial Machinery" (NFPA79).?Due to the nature of these devices they may not be suitable for installation in accordance with the "National Electrical Code" (NFPA70).

◆ 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, branch circuit protection must be provided in accordance with the National Electrical Code and any applicable provincial codes.
For installation in Canada, branch circuit protection must be provided in accordance with the Canadian Electrical Code and any applicable provincial 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 applicable local codes.

◆ 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).

◆ Fuse selection

Fuses are selected based on IEC/EN/UL 61800-5-1 and CSA C22.2 No. 274.
For installation in the United States, the semiconductor fuses shown in the following table must be provided, in accordance with the National Electrical Code and any applicable local codes. For installation in Canada, the semiconductor fuses shown in the following table must be provided, in accordance with the Canadian Electrical Code and any applicable local codes. Always install the following semiconductor fuses for branch circuit protection.

Inverter model	Cat. No	Manufacturer	Rating
FR-E846-0026(0.75K)	170M1410	Bussmann	700 V, 20 A
FR-E846-0040(1.5K)	170M1411	Bussmann	700 V, 25 A

Inverter model	Cat. No	Manufacturer	Rating
FR-E846-0060(2.2K)	170M1412	Bussmann	700 V, 32 A
FR-E846-0095(3.7K)	170M1414	Bussmann	700 V, 50 A

◆ 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 method

To meet the UL/cUL standards, use option cables shown in the following table.
TE Connectivity

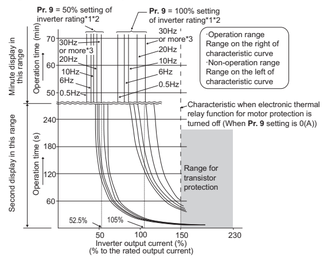
Cable type	Cable length		Model
M23, 6-pole (female) for power supply	5 m	Unshielded	1-2391589-1
	10 m		2-2391589-1
	20 m		3-2391589-1
	5 m	Shielded	1-2391589-2
	10 m		2-2391589-2
	20 m		3-2391589-2
M23, 6-pole (male) for motor	5 m	Unshielded	1-2391590-1
	10 m		2-2391590-1
	20 m		3-2391590-1
	5 m	Shielded	1-2391590-2
	10 m		2-2391590-2
	20 m		3-2391590-2
M23, 6-pole (male) for option	5 m	Unshielded	1-2391600-1
	10 m		2-2391600-1
	20 m		3-2391600-1
	5 m	Shielded	1-2391600-2
	10 m		2-2391600-2
	20 m		3-2391600-2

◆ Short circuit ratings

- 400 V class: Suitable for use in a circuit capable of delivering not more than 50 kA rms symmetrical amperes, 480 Y / 277 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 Mitsubishi Electric constant-torque motor
  1) Set one of "10, 13, 15, 16, 50, 53, 70, or 73" 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**.

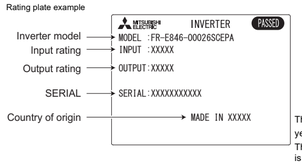
*1 When setting **Pr.9** to a value (current value) of 50% of the inverter rated output current.
*2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the rated motor current.
*3 When the electronic thermal relay function dedicated to the Mitsubishi Electric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

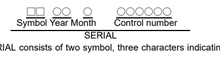
- The internal accumulated heat value of the electronic thermal O/L relay is reset to the initial value by the inverter's power reset or reset signal input. Avoid unnecessary reset and power-OFF.
- Install an external thermal relay (OCR) between the inverter and motors to operate several motors, a multi-pole 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.

6.3 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 is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

6.4 EU ErP Directive (Ecodesign Directive)

Based on the EU ErP Directive (Ecodesign Directive), the efficiency data of the inverters are shown in the following table. The three-phase 0.12kW to 1000kW inverters are subject to the Directive.
(LD rating / ND rating)

Model name	Rated Apparent power (kVA)	Stand by loss (W)	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-E846-0026(0.75K)	2.7 / 2	5.7	2.2 / 2.0	2.1 / 2.0	2.2 / 2.0	1.4 / 1.5	1.4 / 1.4	1.4 / 1.5	1.2 / 1.2	1.2 / 1.2	IE2
FR-E846-0040(1.5K)	4.2 / 3	9.7	2.1 / 2.0	2.1 / 2.0	2.1 / 2.0	1.4 / 1.4	1.4 / 1.4	1.4 / 1.4	1.2 / 1.2	1.2 / 1.2	IE2
FR-E846-0060(2.2K)	5.3 / 4.6	9.8	1.8 / 1.8	1.8 / 1.8	1.8 / 1.8	1.3 / 1.3	1.3 / 1.3	1.3 / 1.3	1.1 / 1.1	1.1 / 1.1	IE2
FR-E846-0095(3.7K)	8.5 / 7.2	9.8	1.7 / 1.7	1.7 / 1.7	1.7 / 1.7	1.2 / 1.2	1.2 / 1.2	1.2 / 1.2	1.0 / 1.1	1.0 / 1.1	IE2

7 Warranty

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