

**E860** 

Related manuals

FR-E800 Inst

ER-E800 In

Manual name

FR-E800 Instruction Manual (Funct

FR-E800 Instruction Manual (Mainter

FR Configurator2 Instruction Manual

PLC Function Programming Manual

### Thank you for choosing Mitsubishi Electric inverter. This Inverter Safety Guideline provides handling information and precautions for 800 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

## INVERTER INSTALLATION AND PRECAUTIONS

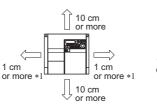
When installing the inverter on the enclosure surface, remove the front cover and wiring cover to fix the inverter.

Install the inverter on a strong surface securely with screws.

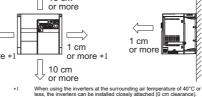
Leave enough clearances and take cooling measures. Avoid places where the inverter is subjected to direct sunlight, high temperature and high

Install the inverter on a nonflammable wall surface.

INSTALLATION AND WIRING



Allow clearance





IB-0600862ENG-G(2405)MEE Specifications subject to change without notice.

**INVERTER SAFETY GUIDELINE** 

FR-E860-0017(0.75K) to 0120(7.5K)

# MITSUBISHI ELECTRIC CORPORATION

For automatic restart after instantaneous power failure

CAUTION

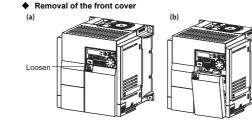
Failure Has Been Selected

time has elapsed) when

Stay away from the motor and machine. They will start suddenly (after reset

instantaneous power failure occurs.

Automatic Restart after Instantaneous Power



(a) Loosen the mounting screws of the cover. (These screws cannot be

With the cover removed, the control circuit terminals can be wired and

(b) Pull out the cover using its lower side as a support

Screwdriver

(a) Insert a tool such as a flathead screwdriver into the half-hole above the

(b) Pull out the cover along the guides in the direction shown by the arrow in

(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.

"PUSH" mark on the wiring cover to push the stopper behind the wiring cover approx. 3 mm.

the plug-in option can be installed.

FR-E860-0040(2.2K) or lower

Removal of the wiring cover

2

2.1

removed.)

the figure above.

(a)

612

6

(b)

2.2

FR-E860-0061(3.7K) or higher

- Screwdriver

Three-phase 575 V class

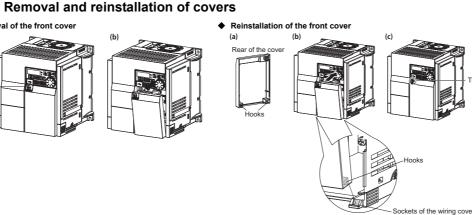
75K) to 0040(2.2k

Jumpe

Power supply

R/L1 S/L2 T/L3

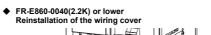
Removal of the wiring of

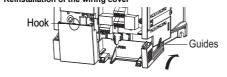


(a) Check the position of the hooks on the rear of the cover.

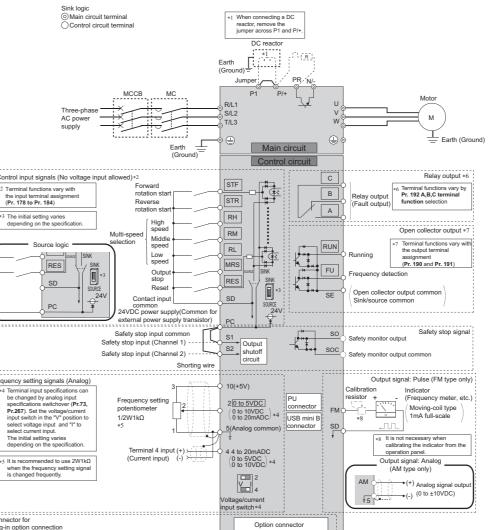
(b) Insert the hooks of the cover into the sockets of the wiring cover, and reinstall the cover to the inverter.

(c) Tighten the mounting screws of the front cover. (Tightening torque: 0.6 to 0.8  $N{\cdot}m)$ 

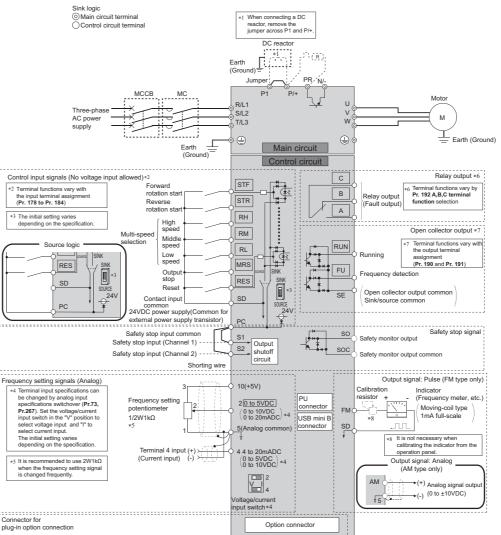


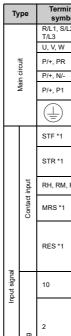


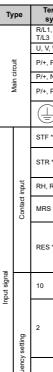
Fit the cover to the inverter along the guides, and push the hook into the socket

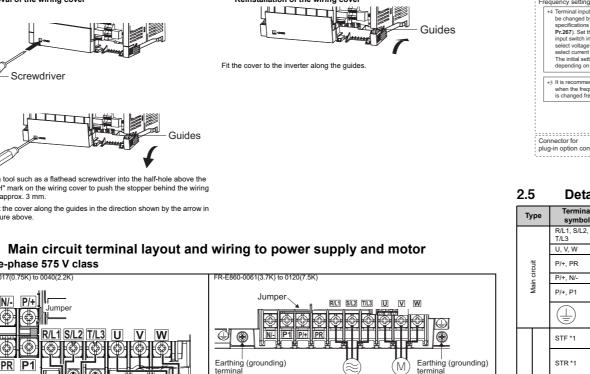












	2.5	5	
	Ту	pe	٦
			R/L T/L
			U,
		rcuit	P/+
	Main circuit		P/+
	2	Ma	P/+
Ð			(-
<b>⊕</b>			ST
 ing (grounding) nal			ST
		input	RH
		Contact input	MF

75 V class	
auper	FR-E860-0061(3.7K) to 0120(7.5K) Jumper REJ BLZ TEL U V M GOOD FROM THE STATE OF THE STATE Earthing (grounding) terminal Power supply Motor

FR-E860-0061(3.7K) or higher

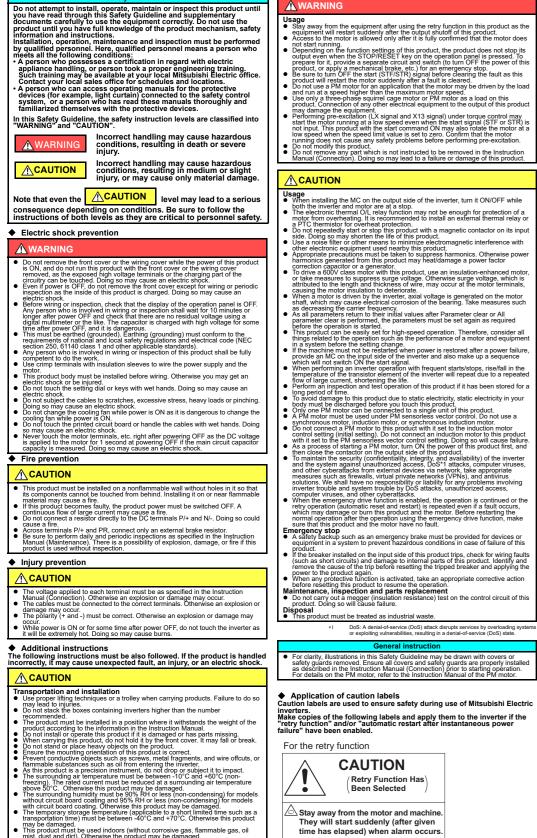
installation of the wiring cove

Fit the cover to the inverter along the guides

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

Guides

Manual number anuals describing installation, wiring, specifications, outline dimensions FR-E860 Instruction Manual (Connection) IB-0600906ENG 1AJ060 tandards, and how to connect option IB-0600868ENG oing details of the fu IB-0600871ENG Manual describing how to identify causes of faults and warnings. 3CN-A23488-000 ibing details of the software used to set inverter parameters using a IB-0600516ENG IB-0600492ENG Manual describing details of the PLC function A WARNING



transportation time) must be between 40 C and 70 C. Oureringe unspiced 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 exce 5.9 m/s<sup>2</sup> at 10 to 55 Hz in X, Y, and Z directions. Otherwise the product may be 5.5 m/s<sup>2</sup> at 10 to 30 nZ m A, n, attu 2 unsubine. Subtrace us pre-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. Viring

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 notate inversely.
 within the PM motor is running. Ensure the PM photor 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.

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.

## 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

	Terminal screw size *3	Tightening torque N∙m	0		Cable gauge					
e Inverter			Crimp t	erminal	HIV cables,	etc. (mm <sup>2</sup> ) *1	AWG (mm <sup>2</sup> ) *2			
del			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		
K)	M4	1	2-4	2-4	2	2	14	14		
()	M4	1	2-4	2-4	2	2	14	14		
()	M4	1	2-4	2-4	2	2	14	14		
()	M4	1	2-4	2-4	2	2	14	14		
()	M4	1	2-4	2-4	2	2	14	14		
()	M4	1	5.5-4	2-4	3.5	2	12	14		

s maximum permissible temperature of 75°C. It is assumed that the cables will be used in a surrounding air temperature o 10°C or lesson of the winning distance of 20 m or shorter. THW cable with a continuous maximum premission of 5°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\*.) The screw size for terminals RU1, SU2, TU3, U, V, W, PR, PI+, Ni, and P1, and the earthing (grounding) terminal is shown. can be calculated by the following formula:

## The line voltage drop

2.3

R-E860-0017(0.75

FR-E860-0027(1.5K)

FR-E860-0040(2.2K

FR-E860-0061(3.7K

FR-E860-0090(5.5K FR-E860-0120(7.5K

 Total wiring let Connect one or mo

Cable type

Jnshielded

2.4

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

length ore motors within the total wiring length (sum of the wiring lengths of the motor and the inverter) shown in the following table.										
Pr.72 setting (carrier frequency)	Voltage class	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K			
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.

## Terminal connection diagram

tails	ont	the	main	circuit	terminals	and the	control	circuit ter	minals
lans		uie	mann	Circuit	terminais	and the	control	Circuit ter	IIIIIais

nal pol	Common	Terminal name	Terminal fu	nction description			
.2,	-	AC power input	Connected to the commercial power supply.				
	-	Inverter output	Connected to a three-phase squirrel cage moto	r or a PM motor.			
	-	Brake resistor connection	Connect a brake resistor across terminals P/+ a				
	-	Brake unit connection	Connect the brake unit.				
	-	DC reactor connection	Remove the jumper across terminals P/+ and P connected, the jumper across terminals P/+ and				
	-	Earth (ground)	For earthing (grounding) the inverter chassis. B	e sure to earth (ground) th	the inverter.		
		Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop. turned ON				
	SD (sink	Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.	simultaneously, the stop command is given.	Input resistance: 4.7 kΩ		
RL *1	(negative common))	Multi-speed selection	Multi-speed can be selected according to the ca and RL signals.	ombination of RH, RM	Voltage when contacts are open: 21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC		
	PC (source (positive	Output stop	Turn ON the MRS signal (5 ms or more) to stop Use this signal to shut off the inverter output wh with an electromagnetic brake.				
	common))	Reset	Use this signal to reset a fault output provided function is activated. Turn ON the RES signal for then turn it OFF. In the initial setting, reset is always enabled. By be enabled only at an inverter fault occurrence. about 1 second after reset.	4 to 6 mADC			
	5	Power supply for a frequency setting potentiometer	Used as the power supply for an external freque setting) potentiometer.	ency setting (speed	5 ±0.5 VDC, Permissible load current: 10 mA		
	5	potentiometer         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).					
	5	Frequency setting (current)	Inputting 4 to 20 mADC (or 0 to 5 VDC, 0 to 10 maximum output frequency at 20 mA and make proportional. This input signal is valid only when (terminal 2 input is invalid). To use the terminal 4 (current input at initial set parameter from <b>Pr.178 to Pr.184 (Input termin</b> before turning ON the AU signal. * The initial set on the specification. Use <b>Pr.267</b> to switch among input 4 to 20 mA ( VDC, and 0 to 10 VDC. Set the voltage/current position to select voltage input (0 to 5 V / 0 to 1	<ul> <li>kΩ</li> <li>Maximum permissible voltage: 20 VDC</li> <li>For current input, Input resistance: 245 ±5 Ω</li> <li>Permissible maximum current: 30 mA</li> </ul>			

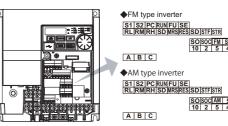
Ту	pe	Terminal symbol	Common	Terminal name	Terminal fu	nction description				
	Relay	A, B, C	-	Relay output (fault output)	1 changeover contact output indicates that the i function has activated and the outputs are stop Fault: discontinuity across B and C (continuity across continuity across B and C (discontinuity across	bed. cross A and C), Normal:	Contact capacity: 240 VAC 2 A (power factor = 0.4) or 30 VDC 1 A			
signal	Open collector	RUN	SE	Inverter running	The output is in LOW state when the inverter or to or higher than the starting frequency (initial v output is in HIGH state during stop or DC inject	alue: 0.5 Hz). The	Permissible load: 24 VDC (maximum 27 VDC) 0.1 A (The voltage drop is 3.4 V at maximum while the			
Output signal		FU	SE	Frequency detection	The output is in LOW state when the inverter ou to or higher than the preset detection frequency when it is less than the preset detection frequen	, and is in HIGH state	signal is ON.)			
	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.	Output item: Output	Permissible load current: 1 mA 1440 pulses/s at 60 Hz			
	Analog	AM *3	5	Analog voltage output	(The signal is not output during an inverter reset.) The size of output signal is proportional to the magnitude of the corresponding monitor item.	frequency (initial setting)	Output signal: $0 \pm 10$ VDC, permissible load current: 1 mA (load impedance 10 k $\Omega$ or more), resolution: 12 bits			
		S1	PC	Safety stop input (Channel 1)	Use terminals S1 and S2 to receive the safety st safety relay module. Terminals S1 and S2 can be	oe used at a time (dual	Input resistance: 4.7 kΩ Voltage when contacts are			
	Tunction	S2	PC	Safety stop input (Channel 2)	shut off. In the initial status, terminal S1 and S2 are shore	ted/opened) between terminals S1 and PC, or When the status is opened, the inverter output is erminal S1 and S2 are shorted with terminal PC by we the shorting wires and connect the safety relay he safety stop function.				
	sarety stop runction	SO	SOC	Safety monitor output (open collector output)	The output status varies depending on the inpu stop signals. The output is in HIGH state during occurrence ( circuit fault. The output is in LOW state otherwis (The open collector transistor is ON (conductive transistor is OFF (not conductive) in HIGH state Refer to the FR-E800 Instruction Manual (Func A23488-000) when the signal is switched to HIG S1 and S2 are open. (Please contact your sale: 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.)				
				Contact input common (sink (negative common))	Common terminal for the contact input terminal	(sink logic) and terminal I	FM.			
		SD	-	External transistor common (source (positive common))	Connect this terminal to the power supply comr output) device, such as a programmable contro undesirable current.					
				24 VDC power supply common	Common output terminal for 24 VDC 0.1 A pow SE.	solated from terminals 5 and				
	Common terminal			External transistor common (sink (negative common))	transistor output (open collector output) device,	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				
	nomn	PC	-	Safety stop input terminal common	Common terminal for safety stop input terminals	5	Power supply voltage range: 22 to 26.5 VDC			
Ċ	5			Contact input common (source (positive common))	Common terminal for the contact input terminal	(source logic).	Permissible load current: 100 mA			
			SD	24 VDC power supply common	Can be used as a 24 VDC 0.1 A power supply.					
		5	_	Frequency setting common	Common terminal for the frequency setting sign	al (terminal 2 or 4). Do no	t earth (ground).			
		SE	_	Open collector output common	Common terminal for terminals RUN and FU.					
		SOC	-	Safety monitor output terminal common	Common terminal for terminal SO.		_			
	cation	_		PU connector	With the PU connector, communication can be • Conforming standard: EIA-485 (RS-485)· Trar • Communication speed: 300 to 115200 bps· O	smission format: Multidro	p link			
	Communication	_		USB connector *4	Use the USB connector to communicate with a inverter is enabled using FR Configurator2. Interface: conforms to USB 1.1- Transmission Connector: USB mini B connector (receptacle	speed: 12 Mbps	g and monitoring of the			

The open collector transition is On (conducting in Long state, the transition is of 1 (to state), intervention, and the state of the transition is of 1 (to state), and the state of the transition is a state of the transition of the state of the stat

SO SOC AI 10 2 5

### 2.6 Control circuit terminal layout

Terminal Contraction



Wiring method Use crimp terminals and stripped wire for the control circuit wiring. If only a single wire is SOBOCTM SD 10 2 5 4

•	Crimp	terminals	commercially	available	(as	of April	2023.
Dha	aniv C	antast Ca	1 + 4				

		Ferrule pa	rt No.	Crimping tool model No.	
5	Wire gauge (mm <sup>2</sup> )	With insulation sleeve	Without insulation sleeve		
4	0.3	AI 0,34-10TQ	—		
	0.5	AI 0,5-10WH	-		
	0.75	AI 0,75-10GY	A 0,75-10	CRIMPFOX 6	
	1	AI 1-10RD	A 1-10	CRIMPFOX 0	
	1.25, 1.5	AI 1,5-10BK	A 1,5-10		
	0.75 (for 2 wires)	AI-TWIN 2×0,75-10GY	—		

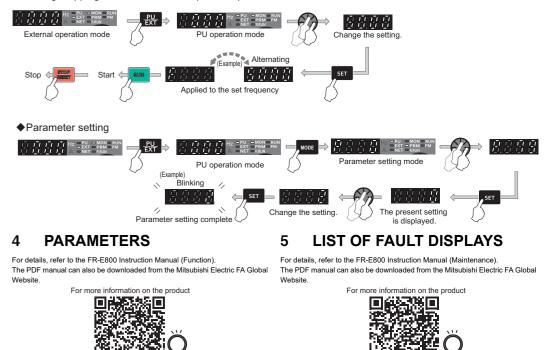
### **BASIC OPERATION** 3

### 3.1 Components of the operation panel

The operation panel cannot be removed from the inverte

	Name	Description
PU MON RUN	PU/EXT key	Switches between the PU operation mode, the PUJOG operation mode, and the External operation mode.
	MODE key	Switches the operation panel to a different mode.
A NET PRUN	SET key	Used to confirm each selection. Switches the monitor screen in the monitor mode.
PU EXT MODE SET	RUN key	Start command The direction of motor rotation depends on the <b>Pr.40</b> 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



## SPECIFICATIONS

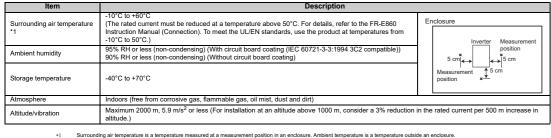
### 6.1 Inverter rating

	Model FR-	E960 []		0017	0027	0040	0061	0090	0120			
	Wouerriv	-2000-[]		0.75K	1.5K	2.2K	3.7K	5.5K	7.5K			
Annlia	able motor capa	oity (k\A/) *1	LD	1.5	2.2	3.7	5.5	7.5	11.0			
Applic	able motor capa		ND	0.75	1.5	2.2	3.7	5.5	7.5			
	Rated capac	ity (k\/A) *2	LD	2.5	3.6 5.6 8.2 11.0 15.9							
	Rateu capac			1.7	2.7	4.0	6.1	9.0	12.0			
	Rated curr	ent (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			
Output	Overload curr	ent rating *3	LD	surround	ing air tem	perature o	-time chara f 50°C -time chara	,				
		ND		surround	ing air tem	perature o		actenstics	aı			
	V	Voltage *4			Three-phase 525 to 600 V							
	Brake tran			Built-in	-							
	Regenerative braking	Regenerative Maximum brake braking torque (ND reference) *5		100%	50%	20%						
	Rated input A	C voltage/free	uency	Three-ph	ase 575 V	60 Hz						
	Permissible A	C voltage fluc	tuation	490 to 63	490 to 632 V, 60 Hz							
	Permissible f	requency fluct	tuation	±5%								
		Without DC	LD	4.3	5.9	8.9	12.4	15.9	22.4			
_	Rated input	reactor	ND	3.0	4.6	6.6	9.5	13.3	17.4			
Power supply	current (A) *8	With DC	LD	2.5	3.6	5.6	8.2	11.0	16.0			
Suppry		reactor	ND	1.7	2.7	4.0	6.1	9.0	12.0			
	<u> </u>	Without DC	LD	4.3	5.9	8.9	12.3	16.0	23.0			
	Power supply capacity	reactor	ND	3.0	4.6	6.6	9.5	14.0	18.0			
	(kVA) *6	With DC	LD	2.5	3.6	5.6	8.2	11.0	16.0			
		reactor	ND	1.7	2.7	4.0	6.1	9.0	12.0			
	Protective s	structure		Open typ	e (IP20 for	IEC 6052	9 only)					
	Cooling s	system		Natural	Forced a	ir						
	Approx. mass (kg)		1.9	1.9	1.9	2.4	2.4	2.4				

num 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 v5. The amount of backing torque is the avarage shorterm forcing (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 avarage 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, b harke unit can be also used. The power supply capacity varies with the value of the power supply side impedance (including those of the input reactor and cables). The **7:22 WWI** frequency selection.

\*6 The value in paren in Pr.72 PWM free incy selection. It 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



## 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 enviro
- 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
- 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.
- Set the EMC Directive compliant EMC litter to the inverter. Insert line holse filters and refruite cores to the power and control caples 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)
- 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 60644. 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



### • Fuse selection for branch circuit protection

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Inverter model	Cat. No	Manufacturer	Rating	Inverter model	Cat. No	Manufacturer	Rating
FR-E860-0017(0.75K)	170M1409, 170M1309 or 170M1359	Bussmann	700 V, 16 A	FR-E860-0061(3.7K)	170M1413, 170M1313 or 170M1363	Bussmann	700 V, 40 A
FR-E860-0027(1.5K)	170M1410, 170M1310 or 170M1360	Bussmann	700 V, 20 A	FR-E860-0090(5.5K)	170M1414, 170M1314 or 170M1364	Bussmann	700 V, 50 A
FR-E860-0040(2.2K)	170M1312, 170M1362	Bussmann	700 V, 32 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)

Global Website. To order manuals, please contact your sales representative

## -AVERTISSEMENT-

d'instructions (Connexion) destiné à être utilisé avec ce produit. Veuillez transmettre les manuels correspondants à l'utilisateur final. Les manuels peuvent éga être téléchargés au format PDF sur Mitsubishi Electric FA Global Website. Pour commander des manuels, veuillez contacter votre représentant commercial.

and any applicable local codes

- any applicable local codes. Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National
- Precautions for opening the branch-circuit protective device / Précautions pour ouvrir le dispositif de protection du circuit de dérivation -WARNING- If the fuse metts 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).
- -AVEN INSCRIENT-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	<b>_</b>	Tightening torque (N⋅m)	Crimp terminal		Cable gauge		the Instr
	1erminal screw size		Crimp term	inai	AWG		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	UKCA m
FR-E860-0017(0.75K) to 0040(2.2K)	M4	1.5	2-4	2-4	14	14	The UK EU on J
FR-E860-0061(3.7K), 0090(5.5K)	M4	1.5	3.5-4	2-4	12	14	E0 011 J
FR-E860-0120(7.5K)	M4	1.5	5.5-4	3.5-4	10	12	7.6

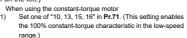
Short circuit ratings
 600 V class: Suitable for use in a circuit capable of delivering not more than 100 kA rms symmetrical amperes, 575 V maximum.

• 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.)



- Set the rated motor current in Pr.9. \*1
- \*2
- When setting **Pr.9** to a value (current value) of 50% of the inverter rated output current. The % value denotes the percentage to the inverter rated output current. It is not the percentage to the rated motor current. 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.
- 环境保护使用期限标识 Æ

7.7

# 电路板组件(包括印 2年10日日 如电阻、电容、集成目 金属壳体、金属部件 树脂壳体、树脂部件

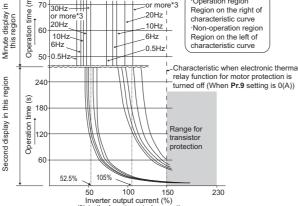
螺丝、电线 上表依据 SJ/T11364 的规定编制。

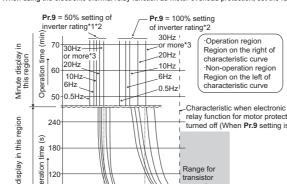
Machinery safety: GB/T 16855.1

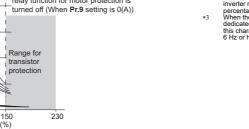
Electrical safety: GB/T 12668.501 EMC: GB/T 12668.3

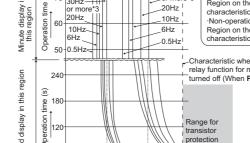
## 8 WARRANTY

Mitsubishi Electric products.









relay function for motor protection is (% to the inverter rated curre

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

• 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

7.4

following:

7.5

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

### 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

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

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).

## 7.3 SERIAL number check

The SERIAL number can be checked on the inverter rating plate or package Rating plate example ANTELECTRIC INVERTER PASSED

Country of origin -→ MADE IN XXXXX



SERIAL 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)

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

· 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

### hone: +90-216-969-25-00 Fax: +90-216-661-44-47

### 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 pproval conditions are the same as those for the EU Directives. Refer to the "7.1 Instructions for compliance with the EU Directives" in Instruction Manual.



## 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

### 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

	有害物质 *1								
部件名称 *2	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)			
印刷电路板及其构成的零部件, 成电路、连接器等)、电子部件	×	0	×	0	0	0			
4	х	0	0	0	0	0			
4	0	0	0	0	0	0			
	0	$\circ$	$\cap$	$\cap$	0	0			

O: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 \*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

GB/T 12668.502 GB 28526

GB/T 12668.3

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

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks

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