

E860-E

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 800 knowledge of the product mechanism, safety information and instructions Please forward this Safety Guideline to the end user.

MITSUBISHI ELECTRIC CORPORATION

INVERTER INSTALLATION AND PRECAUTIONS - 1

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.





2 INSTALLATION AND WIRING

2.1 Removal and reinstallation of covers





ockets of the wiring cover (a) Check the position of the hooks on the rear of the cove

(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

◆ FR-E860-0040(2.2K) or lower tallation of the wiring cove



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







Relay Ye's Y''

2.3

Manual (Connection

FR-E860-0017(0.75k

FR-E860-0027(1.5K

FR-E860-0040(2.2)

FR-E860-0061(3.7K

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

2.4

Applicabl mo

nput and "I" to s

















cover approx. 3 mm

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

2.2 Main circuit terminal layout and wiring to power supply and motor Three-phase 575 V class

ER-E860-0017(0 75K) to 0040(2 2K R-E860-0061(3.7K) to 0120(7.5K) RLI SLZ TLJ U V W <u>.</u> Earthing (grounding) Earthing (grounding) terminal Power supply Moto THEREFT Ш Earthing (grounding) Power supply Make sure the power cables are connected to terminals RL1, SiL2, and TiL3 (the phases need not be matched). Never connect the power cable to terminals U, V, or W of the inverter. Doing so will

amage the inverter. onnect 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

habels are used to ensure safety during use of Mitsubishi Electric

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.

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

For more information on the product 回煤機回 FR-E860-E GAIYOU SETUMEI EIBUN 1AJ057

INVERTER SAFETY GUIDELINE

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

IB-0600863ENG-G(2405)MEE Specifications subject to change without notice.

Related manuals

Manual name	Manual number	Model code	Details
FR-E860 Instruction Manual (Connection)	IB-0600906ENG	1AJ060	Manuals describing installation, wiring, specifications, outline dimensions, standards, and how to connect options.
FR-E800 Instruction Manual (Function)	IB-0600868ENG	1AJ045	Manual describing details of the functions.
FR-E800 Instruction Manual (Communication)	IB-0600871ENG	1AJ051	Manual describing details of the communications.
FR-E800 Instruction Manual (Maintenance)	IB-0600874ENG	1AJ054	Manual describing how to identify causes of faults and warnings.
FR-E800 Instruction Manual (Functional Safety)	BCN-A23488-000	1AJ030	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.



(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 cov

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





(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 the figure above.

FR-E860-0061(3.7K) or highe Removal of the wiring

(a) Screwdriver





(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















emoved.)

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





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

			Original terminal		Cable gauge *1					
Inverter	Terminal	Tightening torque N∙m	Crimp terminal		HIV cables,	etc. (mm ²) *1	AWG *2			
el	screw size *3		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		
)	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		

de 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 wiring distance of 20 m or shorter. 50° C or less and the wining distance of 20 m or shorter.
 21 THHW cable will a continuous maximum bermissable temperature of 75°. It is assumed that the cables will be used in a surrounding air temperature of 40°C or less and the wining distance of 20 m or shorter.
 3 The screw size for tempinas Rul 1, S12, T13, U, W, MR, Pi+, 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		
Inshielded	1 (1 kHz) or lower	575 V	100m	100m	100m	200m	400m	500m		
onomened	2 (2 kHz) or higher	0/0 1	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



Details on the main circuit terminals and the control circuit terminals

nal ol	Common	Terminal name	Term	inal function description		
2,	-	AC power input	Connected to the commercial power su	pply.		
	_	Inverter output	Connected to a three-phase squirrel cag	ge motor or a PM motor.		
	-	Brake resistor connection	Connect an optional brake resistor acro	ss terminals P/+ and PR.		
	-	Brake unit connection	Connect the brake unit.			
	-	DC reactor connection	Remove the jumper across terminals P/ connected, the jumper across terminals	+ and P1, and connect a DC reac P/+ and P1 should not be remove	tor. When a DC reactor is not ed.	
	-	Earth (ground)	For earthing (grounding) the inverter ch	ne inverter.		
	SD (sink (negative common))	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop. When the STF and STR		Input resistance: 4.7 kΩ Voltage when contacts are open:	
	PC (source (positive common))	Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.	signals are turned ON simultaneously, the stop command is given	21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC	
	5	Power supply for a frequency setting potentiometer	Used as the power supply for an externa setting) potentiometer.	5 ±0.5 VDC, Permissible load current: 10 mA		
	5	Frequency setting (voltage)	Inputting 0 to 5 VDC (or 0 to 10 VDC) pr frequency at 5 V (or 10 V) and makes in Use Pr.73 to switch among input 0 to 5 VDC, and 0 to 20 mA. * The initial settin specification. Set the voltage/current input switch to tr input (0 to 20 mA).	For voltage input, Input resistance: 10 to 11		
	5	Frequency setting (current)	Inputting 4 to 20 mADC (or 0 to 5 VDC, maximum output frequency at 20 mA ar proportional. This input signal is valid or (terminal 2 input is invalid). To use the terminal 4 (current linput at in Pr.178 or Pr.179 (Input terminal functi ON the AU signal. "The initial setting vs specification. Use Pr.267 to switch among input 4 to 2 VDC, and 0 to 10 VDC. Set the voltage iposition to select voltage input (0 to 5 V	0 to 10 VDC) provides the d makes input and output high when the AU signal is ON ititial setting), assign "4" to ion selection) before turning arises depending on the 20 mA (initial setting), 0 to 5 (current input switch in the "V" / 0 to 10 V).	Maximum permissible voltage: 20 VDC For current input, Input resistance: 245 ±5 Ω Permissible maximum current: 30 mA	
	_	Relay output (fault output)	1 changeover contact output indicates the function has activated and the outputs a Fault: discontinuity across B and C (continuity across B and C (discontinuity across B across B and C (discontinuity across B across	Contact capacity: 240 VAC 2 A (power factor = 0.4) or 30 VDC 1 A		

Туре	Terminal symbol	Common	Terminal name	Terminal function description					
	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 the safety relay induced the safety stop of the safety set of the	Input resistance: 4.7 kΩ				
function	S2	PC	Safety stop input (Channel 2)	channel). The inverter judges the condition or the internal safety circuit from the status (shorted/opened) between terminals 31 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.	open: 21 to 26 VDC Current when contacts are short-circuited: 4 to 6 mADC				
Safety stop	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 transitor 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.)				
	SD	D —	Contact input common (sink (negative common))	Common terminal for the contact input terminal (sink logic).					
			External transistor common (source (positive common))	Connect this terminal to the power supply common terminal of a transisto output) device, such as a programmable controller, in the source logic to undesirable current.	r output (open collector avoid malfunction by				
			24 VDC power supply common	Common terminal for the 24 VDC power supply (terminal PC). Isolated from	om terminal 5.				
on terminal	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				
Comm			Safety stop input terminal common	Common terminal for safety stop input terminals	range 22 to 26.5 VDC				
0			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 signal (terminal 2 or 4). Do not	t earth (ground).				
	SOC	-	Safety monitor output terminal common	Common terminal for terminal SO.	_				
munication	_	_	Ethernet connector (2 ports) *2	Communication can be made via Ethernet. - Category: 100BASE-TX/10BASE-T Transmission method: Baseband - Data transmission speed: 100 Mbps (100BASE-TX) / 10 Mbps (10BASE - Maximum segment length: 100 m between the hub and the inverter: Inte - Number of cascade connection stages: Up to 2 (100BASE-TX) / up to 4 - Number of interfaces available: 1- IP version: IPv4	-T) trface: RJ-45 (10BASE-T)				
Com	-	-	USB connector *3	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)					

Do not connect the parameter unit. The inverter may be damaged.
 USB bus power connection is available. The maximum SCCR is 500 mA

2.6 Control circuit terminal layout

ABC

se crimp terminals and stripped wire for the control circuit wiring. If only a single wire is used, the wire an 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.)
 S1
 S2
 PC
 DI0
 DI1
 SD
 • Crimp terminals comr

 10
 2
 5
 4
 SO
 SOC
 Phoenix Contact Co., Ltd.

	Ferrule pa	rt No.	Crimping tool model No.	
Wire gauge (mm ²)	With insulation sleeve	Without insulation sleeve		
0.3	AI 0,34-10TQ	-		
0.5	AI 0,5-10WH	-		
0.75	AI 0,75-10GY	A 0,75-10		
1	AI 1-10RD	A 1-10	CIVINIF I OX 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 inverter.



Starting/stopping the inverter on the operation panel



Website.

4 PARAMETERS

For details, refer to the FR-E800 Instruction Manual (Function).



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 The PDF manual can also be downloaded from the Mitsubishi Electric FA Global



SPECIFICATIONS

Inverter rating 6.1

	Model ED	E960 []		0017	0027	0040	0061	0090	0120				
	WOUGH FR-	-⊂990-[]		0.75K	1.5K	2.2K	3.7K	5.5K	7.5K				
Applies	blo motor cana	oity (k)A() *1	LD	1.5	2.2	3.7	5.5	7.5	11.0				
Арриса	ible motor capa	City (KVV) I	ND	0.75	1.5	2.2	3.7	5.5	7.5				
	Batad capac	ity (1/1/A) *2	LD	2.5	3.6	5.6	8.2	11.0	15.9				
	Rateu capac	ity (KVA) 2	ND	1.7	2.7	4.0	6.1	9.0	12.0				
			LD	2.5	3.6	5.6	8.2	11.0	16.0				
	Rated curr	ent (A) *7		(2.1)	(3.0)	(4.8)	(7.0)	(9.0)	(13.6)				
			ND	1.7	2.7	4.0	6.1	9.0	12.0				
	1			120% 60	s, 150% 3	s (inverse	-time char	acteristics)	at				
Output	Overload current rating *3			150% 60	surrounding air temperature of 50°C								
			ND	surroundi	ing air tem	perature o	f 50°C						
	Voltage *4			Three-ph	ase 525 to	600 V							
		sistor	Built-in										
	Regenerative	Maximum	brake										
	braking	torque (ND	100%	50%	20%							
		reference	e) *5										
	Rated input A	Three-ph	ase 575 V	60 Hz									
	Permissible A	490 to 63	2 V, 60 Hz										
	Permissible f	±5%											
		Without DC	LD	4.3	5.9	8.9	12.4	15.9	22.4				
Power	Rated input	reactor	ND	3.0	4.6	6.6	9.5	13.3	17.4				
supply	current (A) *8	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				
	Bower supply	Without DC	LD	4.3	5.9	8.9	12.3	16.0	23.0				
	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 structure						Open type (IP20 for IEC 60529 only)				
	Protective s	structure			Natural Forced air								
	Protective s Cooling s	structure system		Natural	Forced a	ir	-	-					

epeated duty, allow time for the inverter and motor to return to or below the hin the setting range. The maximum point of the voltage waveform at the when a motor decelerates in the shortest time by itself from 60 Hz. It is not ency higher than the base frequency. The inverter is not enuinced with a built

- tive torgue. The average deceleration torgue becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a but a brake resistor for an operation with large regenerative power. A brake unit can be also used. apacity varies with the value of the power supply side impedance (including those of the input reactor and cables). In the second output current when the low accussic noise operation is performed with the surrounding at temperature exceeding 40°C while 2 kHz or higher value is selected every selection. The value in parent
- selection. It he 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

- Environment of the data and the 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 titler to the inverter. Insert line rouse line rouse inter some terms to the power and control courses 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 EC 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.
- For use as a product compliant with the Low Voltage Directive, use PVC cables. Use PVC cables for I/O wring. Use the molded case circuit breaker is required, use a type-B earth leakage circuit breaker (AC/DC detection compatible). 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

Fan cover fixing screw Fan cover



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	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 or 170M1412	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

FU 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. 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/e800e.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
 -VARNING- 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 rimp terminals. Crimp the terminals with the crimping too nded 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.

		Tightening torque	Crimp tormi	nal	Cable gauge		
Applicable inverter model	Terminal screw size *1		Crimp termi	IIdi	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	

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

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



• 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 configurin 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 electronic uternal relay. Use an
 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.

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

Mitsubishi Electric products.

7.5 Assessed) marking on the product.

ne Instruction Manual

Inverter model

Output rating

Country of origin

Note: EAC marking

7.4

U on January 31, 2020

(LD rated / ND rated)















This function detects the overload (overheat) of the motor and shut off

inverter output side. (The operation characteristic is shown on the left.)

When using the constant-torque motor Set one of "10, 13, 15, 16" in **Pr.71**. (This setting enables the

the inverter output by stopping the operation of the transistor at the



螺丝、电线







- Characteristic when electronic therm relay function for motor protection is turned off (When Pr.9 setting is 0(A))



7.3 SERIAL number check

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

		1				
verter model	MODEL :FR-E860-0008EPA					
Input rating	→ INPUT :XXXXX					
Output rating	> OUTPUT : XXXXX	DD 00 0 000000				
SEDIAL		Symbol Year Month Control number				
SERIAL	SERIAL MANAAAAA	SERIAL				
ntry of origin ——	│ → MADE IN XXXXX	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 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.

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 ax: +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 Approval conditions are the same as those for the EU Directives. Refer to the "7.1 Instructions for compliance with the EU Directives" in



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.

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.



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。

	有舌彻烦*1									
8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)				
□刷电路板及其构成的零部件, ∶电路、连接器等)、电子部件	×	0	×	0	0	0				
	Х	0	0	0	0	0				
	0	0	0	0	0	0				
	0	0	0	0	0	0				

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。

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
 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)

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

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



ΕП