# Instruction Manual

**FRENIC-Mini series** FRN

#### Thank you for purchasing our FRENIC-Mini series of inverters. The purpose of this instruction manual is to provide handing information in handling, setting up and operating of the FRENIC-Mini series of inverters. Do not use this product until you have full knowledge of the product, safety information and instructions from this Instruction Manual and Related documents.

[Related Documents] Instruction Manual (Detailed Version) INR-SI47-1729 -E User's Manual 24A7-E-0023 RS-485 Communication User's Manual 24A7-E-0099 This manuals can be downloaded in PDF form from QR code in right figure.



# Fuji Electric Co., Ltd.

Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual. In no event will Fuji Electric Co., Ltd. be liable for any direct or indirect damages resulting from the application of the information in this manual.

First Edition, October 2020 INR-SI47-2363-E

https://www.fujielectric.com/products/ac\_drives\_lv/frenic-mini/download/\_pr/

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- Thank you for purchasing our FRENIC-Mini series of inverters.
- This product is designed to drive a three-phase induction motor and three-phase permanent magnet synchronous motor. Read through this instruction manual and be familiar with the handling procedure for correct use.
- Improper handling might result in incorrect operation, a short life, or even a failure of this product as well as the motor.
- Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.
- For instructions on how to use an optional device, refer to the instruction and installation manuals for that optional device.
- Drawings in this manual may be illustrated without covers or safety shields for explanation of detail parts. Restore the covers and shields in the original state and observe the description in the manual before starting operation.

### **≜ WARNING**

Application

- FRENIC-Mini is designed to drive a three-phase induction motor and three-phase per-manent magnet synchronous motor (PMSM). Do not use it for single-phase
- motors or for other purposes. Fire or an accident could occur.
- FRENIC-Mini may not be used for a life-support system or other purposes directly related to the human safety. Though FRENIC-Mini is manufactured under strict quality control, install safety devices for applications where serious accidents or material losses are foreseen in
- relation to the failure of it. An accident could occur.
- nstallation
- Install the inverter on a nonflammable material such as metal.
- Otherwise fire could occur.
- Do not place flammable matter nearby. Doing so could cause fire.

#### Viring

- When wiring the inverter to the power source, insert a recommended molded case circuit breaker (MCCB) or residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) in the path of power lines. Use the devices within the recommended current range. Use wires in the specified size. When wiring the inverter to the power supply of 500 kVA or more, be sure to connect an optional DC reactor (DCR).
- Otherwise, fire could occur.
- Do not use one multicore cable in order to connect several inverters with motors.
- Do not connect a surge killer to the inverter's output (secondary) circuit Doing so could cause fire.
- Be sure to connect the grounding wires without fail. Otherwise, electric shock or fire could occur.
- Qualified electricians should carry out wiring.
- Be sure to perform wiring after turning the power off.
- Ground the inverter in compliance with the national or local electric code. Otherwise, electric shock could occur.
- Be sure to perform wiring after installing the inverter body.
- Otherwise, electric shock or injuries could occur Ensure that the number of input phases and the rated voltage of the product match the number of phases and the voltage of the AC power supply to which the produ-
- s to be connected. Dtherwise fire or an accident could occur.
- Do not connect the power source wires to output terminals (U, V, and W).
- Do not insert a braking resistor between terminals P (+) and N (-), P1 and N (-), P (+) and P1, DB and N (-), or P1 and DB.
- Doing so could cause fire or an accident. Generally, control signal wires are not reinforced insulation. If they accidentally touch any of live parts in the main circuit, their insulation coat may break for any reasons. In such a case, an extremely high voltage may be applied to the signal lines. Make a complete remedy to protect the signal line from contacting any hot high
- voltage lines. Doing so could cause an accident or electric shock.
- Be sure to install the terminal block cover before turning the power on. Do not remove the cover while power is applied. Otherwise electric shock could occur.
- Do not operate switches with wet hands
- Doing so could cause electric shock.
- If the retry function has been selected, the inverter may automatically restart and drive the motor depending on the cause of tripping.
- (Design the machinery or equipment so that human safety is ensured after restarting.)
- toright by the intervention function (current limiter), automatic deceleration, and overload prevention control have been selected, the inverter may operate at an accelera-tion/deceleration time or frequency different from the set ones. Design the machine so that safety is ensured even in such cases. Otherwise an accident could occur.
- The STOP key is only effective when function setting (Function code F02) has been established to enable the STOP key. Prepare an emergency stop switch separately. If you disable the STOP key priority function and enable operation by external commands, you cannot emergency-stop the inverter using the STOP key on the builtkeypad If an alarm reset is made with the operation signal turned on, a sudden start will occur. Ensure that the operation signal is turned off in advance.
- Otherwise an accident could occur
- If you enable the "restart mode after momentary power failure" (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure" (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " (Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " ( Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " ( Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " ( Function code F14 = 4 or 5), then the inverter automatically restarts running the motor when the power failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 or 5), the failure " ( Function code F14 = 4 o
- is recovered. (Design the machinery or equipment so that human safety is ensured after restarting.)
- If you set the function codes wrongly or without completely understanding this instruction manual and the FRENIC-Mini User's Manual, the motor may rotate with a torque or at a speed not permitted for the machine. An accident or injuries could occur.
- Do not touch the inverter terminals while the power is applied to the inverter even if the inverter stops.
- Doing so could cause electric shock.
- Maintenance and inspection, and parts replacement
- Turn the power off and wait for at least five minutes Eurther, check that the LED monitor is unlit, and check the DC link bus voltage the P (+) and N (-) terminals to be lower than 25 VDC. Otherwise, electric shock could occur.
- Be sure to carry out daily and periodic inspections given in the instruction manual. Running the inverter without inspections for a long time could result in an inverte failure, breakage, accident or fire.
- Recommended periodic inspection interval is once to twice a year; however, shorten the inspection interval depending upon the running conditions
- It is recommended that periodical replacement parts be replaced according to the standard replacement intervals given in the instruction manual. Running the inverter without re-placement for a long time could result in an inverter failure, breakage, accident or fire.
- he contact output [30A/B/C] uses a relay which could stick to ON, OFF or ambiguous state if the service life has expired. For safety, provide an external protection
- Fire or an accident could occur.
- Maintenance, inspection, and parts replacement should be made only by qualified persons.
- Take off the watch, rings and other metallic matter before starting work.
- Use insulated tools. Otherwise, electric shock or injuries could occur
- Never attempt to modify the inverter. Doing so could cause electric shock or injuries

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- nstallation
- Do not support the inverter by its terminal block cover during transportation Doing so could cause a drop of the inverter and injuries
- Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from accumulating on the heat sink. Otherwise, a fire or an accident might result.
- Do not install or operate an inverter that is damaged or lacking parts Doing so could cause fire, an accident or injuries.
- Do not get on a shipping box.
- Do not stack shipping boxes higher than the indicated information printed on those boxes. Doing so could cause injuries.
- Storage In case of storing this product for certain period of time, review the environmental conditions and follow the guidance described in Instruction Manual (Detailed Version

 Wire the three-phase motor to terminals U, V, and W of the inverter, aligning phases each other.
 Otherwise injuries could occur. The inverter, motor and wiring generate electric noise. Take care of malfunction of the nearby sensors and devices. To prevent the motor from malfunctioning Otherwise an accident could occur Do not turn the main circuit power on or off in order to start or stop inverter operation Doing so could cause failure Do not touch the heat sink or braking resistor because they become very hot. Doing so could cause burns. Setting the inverter to high speeds is easy. Before changing the frequency (speed) setting, check the specifications of the motor and machinery. The brake function of the inverter does not provide mechanical holding means. EMC filter built-in type • When the wiring length between the inverter and motor exceeds 10 m (33 ft), the filter circuit may be overheated and damaged due to increase of leakage current. To reduce the leakage current, set the motor sound (carrier frequency) to 2 kHz or below with function code F26. Otherwise a failure could occur.

Handle the inverter as an industrial waste when disposing of it. Otherwise injuries could occur.

#### Chapter 1 BEFORE USING THE INVERTER

1.1 Acceptance Inspection Unpack the package and check that:

(1) An inverter and instruction manual (this manual) are contained in the package.

- 2) The inverter has not been damaged during transportation—there should be no dents or parts missing. (3) The inverter is the type you ordered. You can check the type and specifications on the main nameplate. (The main and sub nameplates are attached to the inverter as shown on Figure 1-1)
- Fill Tarlin Stocks Fill FRN0010C2S-2A FO Fuji Electric SOURCE 9.5A 9.5A 9.5A 9.5A TYPE FRN0010C2S-2A SER.No. T21A123A0001AA 1-400Hz 3.0kVA 8.0A 150% 1min IP Code IP20 SCCR 100kA MASS 1./kg 201 Made in Japan (a) Main Nameplate for -A, -C, -E (b) Sub Nameplate for -A, -C, -E F Fuji Electric TYPE FRN0010C2S-2U SOURCE 3FF 200-24(V 50-00Hz 9.5A JFF 200-240 TYPE FRN0010C2S-2U SER.No. T21A123A0001AA
- 1-400Hz 3.0kVA 8.0A GLIT 3.7bs 20

(a) Main Nameplate for -U

- Figure 1-1 Nameplates TYPE: Type of inverter Code FRN FRN 0010 C2S - 2A FRENIC series Version/Instruction Manual Nominal applied Code Asia/English motor current (A 0001 0002 0004 China/Chinese EU/English USA/English Power supply voltage Three-phase 200 V Three-phase 400 V 0047 0060 47.0 67.0 Single-phase 100V Single-phase 200 V Code C Application range Compact Standard (IP20)
- Code Developed inverter series EMC filter built-in type (IP20) SOURCE: Number of input phases (three-phase: 3PH, single-phase: 1PH), input voltage, input frequency, input current

OUTPUT: Number of output phases, rated output capacity, rated output voltage, output frequency range, rated output current, and overload capacity SER.No.: Product number Manufacturing date

T21A123A0001<u>AA</u>

Production week: This indicates the week number that is numbered from 1st week of January. The 1st week of January is indicated as '01'. — Production year: Last digit of year Product version

(b) Sub Nameplate for -U

If you suspect the product is not working properly or if you have any questions about your product, contact your Fuji Electric representative

The temperature of the heat sink may rise up to approx. 90°C (194°F) during operation of the inverter, so the inverter

Ensure that the minimum clearances indicated in Figure 2-1 are maintained at all times. When installing the inverter in the panel of your system, take extra care with ventilation inside the panel as the temperature around the inverter tends to increase.

When mounting two or more inverters in the same unit or panel, basically lay them out side by side. As long as the ambient temperature is 40°C (104°F) or lower, inverters can be mounted side by side without any clearance between them. When mounting the inverters necessarily, one above the other, be sure to separate them with a partition plate or the like so that any heat radiating from an inverter will not affect the one(s) above.

Secure the inverter to the mounting base with four screws or bolts (M4) so that the FRENIC-Mini logo faces outwards. Tighten those screws or bolts perpendicular to the mounting base.

Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from

Do not mount the inverter upside down or horizontally. Doing so will reduce the heat dissipation efficiency of the inverter

should be mounted on a base made of material that can withstand temperatures of this level. Install the inverter on a base made of metal or other non-flammable material.

and cause the overheat protection function to operate, so the inverter will not run

#### Chapter 2 MOUNTING AND WIRING OF THE INVERTER 2.1 Operating Environment

Please do not the deviant use the use environment. Otherwise a failure could occur.

2.2 Installing the Inverter

A fire may result with other material.

When mounting two or more inverters

accumulating on the heat sink. This may result in a fire or accident.

(3) Mounting direction

(1) Mounting base

(2) Clearances

Install the inverter in an environment that satisfies the requirements listed in Table 2-1.

Table 2.2 Environmental Rea

	Table 2-2 Environmental Re	equirements	Та	able 2-1	Output Current Derating	Factor in Relation to Altitude	
Item	Spe	ecifications		Altitude Output current derating			
Site location	Indoors		1000 n	n (3300 fi	t) or lower	1.00	
Ambient temperature	-10 to +50°C (14 to 122°F) (	IP20) (Note 1)	1000 to	o 1500 m	(3300 to 4900 ft)	0.97	
Relative humidity	5 to 95% (No condensation)		1500 to	o 2000 m	(4900 to 6600 ft)	0.95	
Atmosphere	The inverter must not be	exposed to dust, direct sunlight,	2000 to	o 2500 m	(6600 to 8200 ft)	0.91	
	corrosive gases, flammable	gas, oil mist, vapor or water drops.	2500 to	o 3000 m	(8200 to 9800 ft)	0.88	
(NOTE 2) The atmosphere can contain only a low level of salt. (0.01 mg/c-m <sup>2</sup> or less per year) The inverter must not be subjected to sudden changes in temperature that will cause condensation to form			(Note 1)	When ir them, th +40°C (	nverters are mounted side e ambient temperature sho 14 to 104°F).	-by-side without any gap betweer ould be within the range from -10 to	
Altitude	1,000 m (3300 ft) max. (Not	e 3)	(Note 2)	2) Do not install the inverter in an environment where it may be expo			
Atmospheric pressure	86 to 106 kPa			to cotton waste or moist dust or dirt which will clog the heat si inverter. If the inverter is to be used in such an environment			
Vibration	Vibration         3 mm (0.12 inch) (Max. amplitude)         2 to less than 9 Hz           9.8 m/s²         9 to less than 20 Hz           2 m²²         2 to less than 20 Hz			in the panel of your system or other dustproof containers.			
			(Note 3) If you use the inverter in an altitude above 1000 m (33) apply an output current derating factor as listed in Ta		above 1000 m (3300 ft), you should actor as listed in Table 2.2.		
	2 m/s <sup>-</sup>	55 to less than 200 Hz					

#### 2.3 Wiring

Follow the procedure below. (In the following description, the inverter has already been installed.)

2.3.1 Removing and mounting the terminal block covers (1) For inverters of 3.7 kW (5 HP) or below

1) Loosen the screw securing the control circuit terminal block cover.

Insert your finger in the cutout (near "PULL") in the bottom of the control circuit terminal block cover, then pull the cover towards you 3) Hold both sides of the main circuit terminal block cover between thumb and forefinger and slide it towards you.



Figure 2-2 Removing the Terminal Block Covers

# (2) For inverters of 5.5 kW (7.5 HP) or above

1) Loosen the screw securing the control circuit terminal block cover Insert your finger in the cutout in the bottom of the control circuit terminal block cover, then pull the cover towards you.

3) Hold both sides of the main circuit terminal block cover between thumb and forefinger and slide it towards you. 4) After performing wiring, mount the main circuit terminal block cover and control circuit terminal block cover in the reverse order of removal.



#### 2.3.2 Terminal arrangement and screw specifications

Power supply voltage

phase 200 V

Three-phase 400 V

Single-phase 200 V

Single-phase 100 V

Figure A

Figure D

O O LIA

0 0 0

00 mm

00 mm

2**02**Ç

Bottom

Figure 2-1 Mounting Direction and Required

(0.39 inc

3.9 inches

0.39 inches)

The figures below show the arrangement of the main and control circuit terminals which differs according to inverter type. The two terminals prepared for grounding, which are indicated by the symbol  $\bigoplus$  in Figures A to D, make no distinction between the power supply side (primary circuit) and the motor side (secondary circuit) (except the EMC filter built-in type of 5.5 kW or above).

(1) Arrangement of the main circuit terminal Table 2-3 Main Circuit Terminals (kW rating)

	Nominal			Main circui	it terminals			Grounding	terminals		
Power	applied	laurates trans	Input	Output	Input	Output	Power su	pply side	Moto	r side	Defector
voltage	motor (kW)	inverter type	Terr	minal w size	Tighteni (N	Tightening torque (N·m)		Tightening torque (N·m)	Terminal screw size	Tightening torque (N·m)	Relef to:
	0.1	FRN0001C2S-2A									
	0.2	FRN0002C2S-2A		2.5	10		140.5	10	140.5	10	<b>E</b> in A
	0.4	FRN0004C2S-2A	M	3.5	1	1.2		1.2	M3.5	1.2	Fig. A
	0.75	FRN0006C2S-2A									
Three-	1.5	FRN0010C2S-2A									
phase	2.2	FRN0012C2S-2A	N	<i>M</i> 4	1	.8	M4	1.8	M4	1.8	Fig. B
200 V	3.7	FRN0020C2S-2A									
	5.5	FRN0025C2S-2A		45		0	145	2.0	145	2.0	Ein E
	7.5	FRN0033C2S-2A	N	ch	3	.0	МЭ	3.0	CIM	3.0	FIG. E
	11	FRN0047C2S-2A		140		5.0		E 9	MG	E 0	Fig. F
	15	FRN0060C2S-2A	IVIO		5.6		IVIO	5.6	IVIO	5.6	Fig. F
	0.4	FRN0002C2=-4									
	0.75	FRN0004C2=-4									
	1.5	FRN0005C2=-4	M4		1.8		M4	1.8	M4	1.8	Fig. B
	2.2	FRN0007C2=-4								i I	
	3.7 (4.0)*	FRN0011C2=-40									
Three-		FRN0013C2S-40	N	И5	3.0		M5	3.0			Fig. E
phase	5.5	FRN0013C2E-4E	M4	M5	1.8	3.0	M6	3.5	ME	2.0	Fig. G
400 V	7.5	FRN0018C2S-4□	Ν	И5	3	.0	M5	3.0	MD	3.0	Fig. E
	7.5	FRN0018C2E-4E	M4	M5	1.8	3.0	M6	3.5			Fig. G
	44	FRN0024C2S-4□	Ň	<i>M</i> 6	5	.8	M6	5.8			Fig. F
		FRN0024C2E-4E	M4	M6	1.8	5.8	M6	3.5	MG	5.0	Fig. H
	15	FRN0030C2S-4□	Ν	<i>M</i> 6	5	.8	M6	5.8	INIO	5.6	Fig. F
	15	FRN0030C2E-4E	M4	M6	1.8	5.8	M6	3.5			Fig. H
	0.1	FRN0001C2=-7									
	0.2	FRN0002C2=-7		2.5		2	M2 5	10	M2 5	10	Fig. C
Single-	0.4	FRN0004C2=-7	M	3.5	1	.2	M3.5	1.2	M3.5	1.2	Fig. C
200 V	0.75	FRN0006C2=-7□									
	1.5	FRN0010C2=-70			4	0		1.0		1.0	Fig. D
	2.2	FRN0012C2=-7□	N	//**	1	.0	1/14	1.0	M4	1.8	Fig. D

# Note 1) A box (■) in the above table replaces S or E depending on the enclosure 2) A box (□) in the above table replaces A, C, or E depending on the shipping destination. \*: 4.0 kW for the EU. The inverter type is FRN0011C2S-4E.

Table 2-4 Main Circuit Terminals (HP rating)											
	Nominal			Main circui	it terminals		Grounding terminals				
	applied	Inverter type	Input	Output	Input	Output	Power su	Power supply side		r side	Defector
	motor (HP)	inverter type	Ter scre	minal w size	Tightenir (Ib	ng torque -in)	Terminal screw size	Tightening torque (lb-in)	Terminal screw size	Tightening torque (Ib-in)	TREFET TO.
	1/8	FRN0001C2S-2U									
	1/4	FRN0002C2S-2U		12 5	10	26	M2 5	10.6	M2 5	10.6	
	1/2	FRN0004C2S-2U		13.5		0.0	WI3.5	10.6	WI3.5	10.6	FIG. A
	1	FRN0006C2S-2U									
	2	FRN0010C2S-2U									
	3	FRN0012C2S-2U	, I	M4	15	5.9	M4	15.9	M4	15.9	Fig. B
	5	FRN0020C2S-2U									
	7.5	FRN0025C2S-2U		46	24		ME	26.6	ME	26.6	Fig. F
	10	FRN0033C2S-2U	'	GIVI		20.0 M5		20.0	NID	20.0	Fig. E
	15	FRN0047C2S-2U	,	MG		13	M6	51.3	M6	51.3	Fig. F
	20	FRN0060C2S-2U	MIO		5	01.0		51.5	NIO	51.5	i ig. i
	1/2	FRN0002C2S-4U									
	1	FRN0004C2S-4U		M4		15.9 M4					
	2	FRN0005C2S-4U	, I		15		M4	15.9	M4	15.9	Fig. B
	3	FRN0007C2S-4U									
	5	FRN0011C2S-4U									
	7.5	FRN0013C2S-4U	,	45	26	3.6	M5	26.6	M5	26.6	Fig. F
	10	FRN0018C2S-4U	'	VIJ	20	5.0	IVI5	20.0	UID	20.0	FIG. E
	15	FRN0024C2S-4U	J ,	46	51	13	M6	51.3	MG	51.3	Fig. F
	20	FRN0030C2S-4U		vio	5	1.5	WIO	51.5	IVIO	51.5	i ig. i
	1/8	FRN0001C2S-7U									
	1/4	FRN0002C2S-7U		3.5	10	16	M3.5	10.6	M3 5	10.6	Fig. C
	1/2	FRN0004C2S-7U		10.0			10.5	10.0	1013.5	10.0	rig. C
	1	FRN0006C2S-7U									
	2	FRN0010C2S-7U	<u> </u>	44	16	5.0	ма	15.0	MA	15.0	Fig. D
	3	FRN0012C2S-7U	'		16		101-4	10.0	1114	10.0	rig. D
	1/8	FRN0001C2S-6U									
	1/4	FRN0002C2S-6U		2.5	10	16	M2 5	10.6	M2 5	10.6	Fig. C
	1/2	FRN0003C2S-6U	M3.5	10	0.0	1013.5	10.0	1/13.5	10.0	Fig. C	

1 FRN0005C2S-6U	
0         0	Figure B
Ø         Ø	Figure E
(Note 1) (Power supply (Power supply side)	Figure H (Note 1) (Power suppl t) t 2 (3) (Power suppl side) (Power suppl (Power suppl)
•     • <th>Φ         Φ</th>	Φ         Φ

		e L1/L	٠	0 12N	<b>C</b> P1	0 P(-)	0 N(-)
	⊕G 6 ⊕3 6		9 2		<b>e</b> U	0 V	<b>0</b> W
Figure F							

Figure C

**9**6 **9 O** 6 **O** 

(Note 1) The screw type of the filter inp	out terminal is listed
below.	
Inverter type	Screw type
FRN0013C2E-40	Flat
FRN0018C2E-40	FidL
FRN0024C2E-4	Cross
FRN0030C2E-4	CIUSS

A box (□) in the above table replaces A, C, or E depending on the shipping desti

(2) Arrangement of the control circuit terminals (common to all FRENIC-Mini models)



Screw size: M 2.5 Tightening torque: 0.4 N•m 2.3.3 Recommended wire sizes

Table 2-5 lists the recommended wire sizes. The recommended wire sizes for the main circuit terminals for an ambient temperature of 50°C (122°F) are indicated for two types of wire: HIV single wire (for the maximum allowable temperature 75°C (167°F)) (before a slash (/)) and IV single wire (for 60°C (140°F)) (after a slash (/)). Table 2-5 Recommended Wire Sizes (kW, rating)

					Recommended wire	size (mm <sup>2</sup> ) *1			
ply	Nominal				Main circuit				
Power sup voltage	applied motor (kW)	Inverter type	Main circuit power input [L1/R, L2/S, L3/T] [L1/L, L2/N] Grounding [🍽G]		Inverter output [U, V, W]	DCR [P1, P (+)]	Braking resistor [P (+), DB]	Control circuit	
			w/ DCR	w/o DCR *2					
	0.1	FRN0001C2S-2A							
	0.2	FRN0002C2S-2A					-		
	0.4	FRN0004C2S-2A		2.0 / 2.0	2.0 / 2.0	2.0 / 2.0			
	0.75	FRN0006C2S-2A	2.0 / 2.0	(2.5)	(2.5)	(2.5)			
	1.5	FRN0010C2S-2A	(2.5)						
20	2.2	FRN0012C2S-2A							
nase 2(	3.7	FRN0020C2S-2A		2.0 / 5.5 (2.5 / 6.0)	2.0 / 3.5 (2.5 / 4.0)	2.0 / 3.5 (2.5 / 4.0)		0.5	
hree-pl	5.5	FRN0025C2S-2A	2.0 / 5.5 (2.5 / 6.0)	3.5 / 8.0 (4.0 / 10)	3.5 / 5.5 (4.0 / 6.0)	3.5 / 5.5 (4.0 / 6.0)	2.0 / 2.0 (2.5)		
-	7.5	FRN0033C2S-2A	3.5 / 8.0 (4.0 / 10)	5.5 / 14 (6.0 / 16)	3.5 / 8.0 (4.0 / 10)	5.5 / 14 (6.0 / 16)			
	11	FRN0047C2S-2A	5.5 / 14 (6.0 / 16)	14 / 22 (16 / 25)	8.0 / 14 (10 / 16)	8.0 / 22 (10 / 25)			
	15	FRN0060C2S-2A	14 / 22 (16 / 25)	22 / 38 (25 / 50)	14 / 22 (16 / 25)	14 / 38 (16 / 50)			
	0.4	FRN0002C2=-4□							
	0.75	FRN0004C2=-4□	2.0 / 2.0 (2.5)			20/20			
	1.5	FRN0005C2∎-4□		2.0 / 2.0	20/20				
>	2.2	FRN0007C2∎-4□		(2.0)	(2.5)	(2.5)			
400	3.7 (4.0)*	FRN0011C2∎-4□		(2.5)	(2.5)				
phase	5.5	FRN0013C2∎-4□		2.0 / 3.5 (2.5 / 4.0)			2.0 / 2.0 (2.5)	0.5	
Three-	7.5	FRN0018C2∎-4□		2.0 / 5.5 (2.5 / 6.0)	2.0 / 3.5 (2.5 / 4.0)	2.0 / 3.5 (2.5 / 4.0)			
	11	FRN0024C2∎-4□	2.0 / 5.5 (2.5 / 6.0)	3.5 / 8.0 (4.0 / 10)	2.0 / 5.5 (2.5 / 6.0)	3.5 / 5.5 (4.0 / 6.0)			
	15	FRN0030C2=-4□	3.5 / 8.0 (4.0 / 10)	5.5 / 14 (6.0 / 16)	3.5 / 8.0 (4.0 / 10)	5.5 / 14 (6.0 / 16)			
	0.1	FRN0001C2=-70							
2	0.2	FRN0002C2 -7		2.0 / 2.0			-		
200	0.4	FRN0004C2=-7□	2.0 / 2.0	(2.5)		2.0 / 2.0			
lase	0.75	FRN0006C2■-7□	(2.5)		2.0 / 2.0	(2.5)		0.5	
ngle-pt	1.5	FRN0010C2=-7		2.0 / 3.5 (2.5 / 4.0)	(2.5)		2.0 / 2.0 (2.5)		
Si	2.2	FRN0012C2■-7□	2.0 / 3.5 (2.5 / 4.0)	3.5 / 5.5 (4.0 / 6.0)		2.0 / 3.5 (2.5 / 4.0)			
							D	CR. DC reactor	

Note 1) A box (
) in the above table replaces S or E depending on the enclosure 2) A box ( $\square$ ) in the above table replaces A, C, or E depending on the shipping destination.

\*: 4.0 kW for the EU. The inverter type is FRN0011C2S-4E.

1: Use crimp terminals covered with an insulated sheath or insulating tube. Recommended wire sizes are for HIV/IV (PVC in the EU). \*2: Wire sizes are calculated on the basis of input RMS current under the condition that the power supply capacity and impedance are 500 kVA and 5%, respectively.

Table 2-6 Recommended Wire Sizes (HP rating)

					Recommended wire	size(AWG) *1		
ply	Nominal				Main circuit			
Power support Power support (HP)	applied motor (HP)	Inverter type	Main circuit [L1/R, L2/S, L3 Groundi	Main circuit power input [L1/R, L2/S, L3/T] [L1/L, L2/N] Grounding [CG]		DCR [P1, P (+)]	Braking resistor [P (+), DB]	Control circuit
	1/8	ERN0001C2S-2U	W/ DOIX	W/O DOIX 2				
	1/4	EBN0002C2S 2U					-	
	1/2	ERN0004C2S-2U						
>	1/2	ERN0006C2S-2U	14 / 14	14 / 14	14 / 14	14 / 14		
200	2	ERN0010C2S-2U	147 14					
ase	3	ERN0012C2S-2U						20
ĥd-	5	FRN0020C2S-2U		14 / 10	14 / 12	14 / 12	14 / 14	20
hree	7.5	FRN0025C2S-2U	14 / 10	12/8	12/10	12/10	147.14	
F	10	FRN0033C2S-2U	12/8	10/6	12/18	10/6		
	15	FRN0047C2S-2U	10/6	6/4	8/6	8/4		
	20	FRN0060C2S-2U	6/4	4/1	6/4	6/1		
	1/2	FRN0002C2S-4U	14 /14	14 / 14				
	1	FRN0004C2S-4U						
>	2	FRN0005C2S-4U			14 / 14			
40	3	FRN0007C2S-4U				14 / 14	14 / 14	
lase	5	FRN0011C2S-4U						20
e-pl	7.5	FRN0013C2S-4U		14 / 12				
Thre	10	FRN0018C2S-4U		14 / 10	14 / 12	14 / 12		
	15	FRN0024C2S-4U	14 / 10	12 / 8	14 / 10	12 / 10		
	20	FRN0030C2S-4U	12 / 8	10 / 6	12 / 8	10 / 6		
V	1/8	FRN0001C2S-7U						
200	1/4	FRN0002C2S-7U		14 /14			-	
ase	1/2	FRN0004C2S-7U	14 /14	14 / 14	14 /14	14 /14		20
-pha	1	FRN0006C2S-7U			14/14		14 /14	20
ngle	2	FRN0010C2S-7U		14 / 12			14/14	
Si	3	FRN0012C2S-7U	14 / 12	12 / 10		14 / 12		
Ise	1/8	FRN0001C2S-6U					_	
-pha	1/4	FRN0002C2S-6U	14 /14	14 /14	14/14	*3	_	20
101	1/2	FRN0003C2S-6U	144 / 144		144 / 144	3	14 /14	20
Sin	1	FRN0005C2S-6U		14 / 12			14/14	

DCR: DC reactor \*1: Use crimp terminals covered with an insulated sheath or insulating tube. Recommended wire sizes are for HIV/IV. \*2: Wire sizes are calculated on the basis of input RMS current under the condition that the power supply capacity and impedance are 500 kVA (50 kVA for single-phase 100 V class series) and 5%, respectively.

\*3: For single-phase 100 V class series of inverters, use the same size of wires as used for the main circuit power input. Insert the DC reactor (DCR) in either of the primary power input lines.

#### 2.3.4 Connection diagram in operation by external signal inputs



(Note 1) Install a recommended molded case circuit breaker (MCCB) or a residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) in the primary circuit of the inverter to protect wiring. Do not use an MCCB or RCD/ELCB whose capacity exceeds the recommended rated current.

(Note 2) A magnetic contactor (MC) should, if necessary, be mounted independent of the MCCB or ELCB to cut off the power fed to the inverter. MCs or solenoids that will be installed close to the inverter require surge absorbers to be connected in parallel to their coils.

(Note 3) When connecting a DC reactor (option), remove the jumper bar from terminals [P1] and [P+].

(Note 4) The THR function can be used by assigning "9" (External alarm) to any of terminals [X1] to [X3], [FWD] or [REV] (function code E01 to E03, E98, or E99). (Note 5) Frequency can be set by connecting a frequency setting device (external potentiometer) between terminals [11], [12], and [13] instead of inputting voltage signal (0 to +10 VDC or 0 to +5 VDC) between terminals [12] and [11].

(Note 6) For the wiring of the control circuit, use shielded or twisted wires. When using shielded wires, connect the shields to earth. To prevent malfunction due to noise, keep the control circuit wiring away from the main circuit wiring as far as possible (recommended: 10 cm or longer), and never set them in the same wire duct. When crossing the control circuit wiring with the main circuit wiring, set them at right angles.

(Note 7) It is recommended for noise control that 3-phase, 4-wire cable be used for the motor wiring. Connect grounding wires of the motor to the grounding terminal zG on the inverter.

Classifi cation	Symbol	Name	Functions
	₿G	Grounding terminal	Be sure to ground either of the two grounding terminals for safety and noise reduction. It is stipulated by the Electric Facility Technical Standard that all metal frames of electrical equipment must be grounded to avoid electric shock, fire and other disasters.
	U, V, W	Inverter output	1) Connect the three wires of the three-phase motor to terminals U, V, and W, aligning phases each other.
		terminals	<ol> <li>Connect the grounding wire of terminals U, V, and W to the grounding terminal (G).</li> </ol>
	P1, P(+)	DC reactor	<ol> <li>Remove the jumper bar from terminals P1 and P(+).</li> </ol>
		terminals	<ol><li>Connect a DC reactor (option) to terminals P1 and P(+).</li></ol>
			The wiring length should be 10 m (33 ft) or below.
			<ul> <li>If both a DC reactor and a braking resistor are to be connected to the inverter, secure both wires of the DC reactor and braking resistor together to terminal P(+).</li> </ul>
cnit			<ul> <li>Do not remove the jumper bar if a DC reactor is not going to be used.</li> </ul>
, cir	P(+), DB	Braking resistor	1) Connect terminals P and DB of a braking resistor (option) to terminals P(+) and DB on the main circuit terminal block.
Mair		terminals	<ol> <li>Arrange the inverter and braking resistor to keep the wiring length to 5 m (16 ft) or less and twist the two wires or route them together in parallel.</li> </ol>
	P(+), N(-)	DC link bus terminals	These are provided for the DC link bus powered system. Connect these terminals with terminals P(+) and N (-) of other inverters.
			Note Consult your Fuji Electric representative if these terminals are to be used.
	L1/R, L2/S, and L3/T	Main circuit power input terminals	<ol> <li>For safety, make sure that the molded case circuit breaker (MCCB) or magnetic contactor (MC) is turned off before wiring the main circuit power input terminals.</li> </ol>
	(for three- phase voltage		<ol> <li>Connect the main circuit power supply wires (L1/R, L2/S and L3/T) to the input terminals of the inverter via an MCCB or residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB)*, and MC if necessary.</li> </ol>
	input)		It is not necessary to align phases of the power supply wires and the input terminals of the inverter with each other.
			* With overcurrent protection
	•	•	

2.3.6 Wiring for control circuit terminal

2.3.5 Wiring for main circuit terminals and grounding terminals

Table 2-7 lists the symbols, names and functions of the control circuit terminals. The wiring to the control circuit terminals differs depending upon the setting of the function codes, which reflects the use of the inverter Put back the main circuit reminal block cover and then connect wires to the control circuit terminals. Route these wires correctly to reduce the influence of noise.

			Table 2-7 Symbols, Names and Functions of the Control Circuit Terminals
Classification	Symbol	Name	Functions
	[13]	Power supply for potentiometer	Power supply (+10 VDC) for an external frequency command potentiometer (Potentiometer: 1 to 5 k $\Omega$ ) A potentiometer of 1/2 W rating or more should be connected.
	[12]	Analog setting voltage input	<ol> <li>The frequency is commanded according to the external analog input voltage.</li> <li>to +10 (VDC)/0 to 100 (%) (Normal operation)</li> <li>+10 to 0 (VDC)/0 to 100 (%) (Inverse operation)</li> <li>Used for reference signal (PID process command) or PID feedback signal.</li> <li>Used as additional auxiliary setting for various main frequency commands.</li> <li>* Input impedance: 22 kΩ</li> <li>* The allowable maximum linput is +15 VDC; however, the voltage higher than +10 VDC is treated as +10 VDC.</li> </ol>
Analog input	[C1]	Current input	<ol> <li>(1) The frequency is commanded according to the external analog input current.         <ul> <li>+4 to +20 mA DC/0 to 100% (Normal operation)</li> <li>+20 to +4 mA DC/0 to 100% (Inverse operation)</li> <li>+0 to +20 mA DC/0 to 100% (Inverse operation)</li> <li>+0 to +20 mA DC/0 to 100% (Inverse operation)</li> <li>+20 to 0 mA DC/0 to 100% (Inverse operation)</li> <li>(2) Used for reference signal (PID process command) or PID feedback signal.</li> <li>(3) Connects PTC (Positive Temperature Coefficient) thermistor for motor protection.</li> <li>(4) Used as additional auxiliary setting for various main frequency commands.</li> <li>* Input impedance: 250Ω</li> <li>* The allowable maximum input is +30 mA DC; however, the current larger than +20 mA DC is treated as +20 mA DC.</li> </ul> </li> </ol>
	[11]	Analog common	Common terminal for analog input and output signals This terminal is electrically isolated from terminals ICMI and IY1EI
	Note	<ul> <li>These low level analog use shielded wires. In p [11] may be effective.</li> </ul>	signals are especially susceptible to the external noise effects. Route the wiring as short as possible (within 20 m (66 ft)) and principle, ground the shielded sheath of wires; if effects of external inductive noises are considerable, connection to terminal
ıt	[X1] [X2] [X3] [FWD] [REV]	Digital input 1 Digital input 2 Digital input 3 Run forward command Run reverse command	<ol> <li>The various signals such as "Coast to a stop," "Enable external alarm tip," and "Select multistep frequency" can be assigned to terminals [X1] to [X3], [FWD] and [REV] by setting function codes E01 to E03, E98, and E99.</li> <li>Input mode, i.e. SinK/Source, is changeable by using the internal jumper switch.</li> <li>Switches the logic value (1/0) for ON/OFF of the terminals between [X1] to [X3], [FWD] or [REV], and [CM]. If the logic value for ON between [X1] and [CM] is 1 in the normal logic system, for example, OFF is 1 in the negative logic system and vice versa.</li> </ol>
udui le	121 01		(4) The negative logic signaling cannot be applicable to [FWD] and [REV].
Digita	[PLC]	PLC signal power	Connects to PLC output signal power supply. Rated voltage: +24 VDC (Allowable range: +22 to +27 VDC), Max. 50 mA
	[CM]	Digital common	Common terminal for digital input signals This terminal is electrically isolated from terminals [11] and [Y1E].
	Tip	<ul> <li>Using a relay contact to t Figure 2.8 shows two ex (a) has a connecting jur Note: To configure this</li> </ul>	urn [X1], [X2], [X3], [FWD] or [REV] ON or OFF xamples of a circuit that uses a relay contact to turn control signal input [X1], [X2], [X3], [FWD] or [REV] ON or OFF. Circuit mper applied to SINK, whereas circuit (b) has one that is applied to SOURCE. kind of circuit, use a highly reliable relay. (Recommended product: Fuji control relay Model HH54PW)
Analog output	[FMA]	Analog monitor	The monitor signal for analog DC voltage (0 to +10 VDC) is output. The signal functions can be selected from the following with function code F31.         Output frequency (before slip compensation)         Output frequency (after slip compensation)         Output frequency (after slip compensation)         Output current       - Output voltage         Input power       - PID feedback amount         DC link bus voltage       - Calibration         - PID command (SV)       - PID output (MV)         * Input power       - PID output (MV)
	[11]	Analog common	Common terminal for analog input and output signals This terminal is electrically isolated from terminals (CM) and [Y1E]
output	[Y1]	Transistor output	<ol> <li>Various signals such as "Inverter running," "Frequency arrival signal" and "Motor overload early warning" can be assigned to terminal [Y1] by setting function code E20.</li> <li>Switches the logic value (10) for ON/OFF of the terminals between [Y1] and [Y1E]. If the logic value for ON between [Y1] and [Y1E] is 11 the normal locic system. for example. OFF is 1 in the neative locic system and vice versa.</li> </ol>
Fransistor (	[PLC]	Transistor output power	Power source of +24 VDC to be fed to the transistor output circuit load (50 mA at maximum). To enable the source, it is necessary to short-circuit between terminals [Y1E] and [CM]. Can also be used as a 24 VDC power source.
	[Y1E]	Transistor output common	Common terminal for transistor output signal This terminal is electrically Isolated from terminals [CM] and [11].
Relay contact output	[30A], [30B], [30C]	Alarm relay output (for any fault)	<ol> <li>Outputs a contact signal (SPDT) when a protective function has been activated to stop the motor. Contact rating: 250 VAC 0.3A cos φ = 0.3 +48 VDC, 0.5A</li> <li>A command similar to terminal [Y1] can be selected for the transistor output signal and use it for signal output.</li> <li>Switching of the normal/negative logic output is applicable to the following two contact outputs: "Terminals [30A] and [30C] are short-circuited for ON signal output" or "Terminals [30B] and [30C] are short-circuited (non-excite) for ON signal output."</li> </ol>
Communi- cation	RJ-45 conn	ector (RS-485)	<ol> <li>Used to connect an optional keypad to the inverter.</li> <li>Used to connect the inverter to a computer running FRENIC Loader via the RS-485 communications link.</li> </ol>

# Chapter 3 OPERATION USING THE KEYPAD

3.1 Names and Functions of Keypad Components As shown in the figure at right, the keypad consists of a four-digit 7-segment LED monitor, a potentiometer (POT), and six keys. The keypad allows you to start and stop the motor, monitor running status, configure the function code data, check I/O signal states, and display maintenance information and alarm information.



Function/Data key Down key Up key STOP key

	Table 3-1 Names and Functions of Keypad Components					
Monitor, Potentiometer and Keys	Functions					
6000	Four-digit, 7-segment LED monitor which displays the following according to the operation modes *.         In Running mode:       Running status information (e.g., output frequency, current, and voltage)         In Programming mode:       Menus, function codes and their data         In Alarm mode:       Alarm code which identifies the error factor if the protective function is activated.					
O	Potentiometer (POT) which is used to manually set a reference frequency, auxiliary frequencies 1 and 2 or PID process command.					
RUN	RUN key. Press this key to run the motor.					
STOP	STOP key. Press this key to stop the motor.					
$\otimes/\otimes$	UP/DOWN keys. Press these keys to select the setting items and change the function code data displayed on the LED monitor.					
PRG	Program/Reset key which switches the operation modes* of the inverter.           In Running mode:         Pressing this key switches the inverter to Programming mode.           In Programming mode:         Pressing this key switches the inverter to Running mode.           In Alam mode:         Pressing this key switches the inverter to Running mode.					
FUNC DATA	Function/Data key which switches the operation you want to do in each mode as follows:         In Running mode:       Pressing this key switches the information to be displayed concerning the status of the inverter (output frequency, output current, output voltage, etc.).         In Programming mode:       Pressing this key displays the function codes and sets their data entered with the 🔗 and 🔗 keys or the POT Pressing this key displays detailed alarm information.					

Chapter 4 FUNCTION CODES



nini/download/\_pr1

Chapter 5 ALARM CODES

The PDF manual can be downloaded from below QR code. For more information of Alarm codes list

> os://www.fujielectric.com/products/ac\_drives\_lv/ mini/download/\_pr2/

Function Codes Table (Quick Set Up Function Code Table)

Code	Name	Data setting range
F01	Frequency setting 1	0: Keypad key operation (⊘l⊘key) 1: Analog voltage input (Terminal [12]) (from 0 to ±10 VDC) 2: Analog voltage input (Terminal [12]) (C1 function)) (4 to 20mA DC, 0 to 20mA DC) 3: Analog voltage input (Terminal [12]) + Analog current input (Terminal [C1] (C1 function)) 4: Built-in potentiometer (POT) 7: UP/DOWN control
F02	Operation method	0: Keypad operation (rotation direction input: terminal block) 1: External signal (digital input) 2: Keypad operation (forward rotation) 3: Keypad operation (Reverse rotation)
F03	Maximum output frequency 1	25.0 to 400.0 Hz
F04	Base frequency 1	25.0 to 400.0Hz
F05	Rated voltage at base frequency 1	0         :AVR disable (output voltage proportional to power voltage)           80 to 240 V         :AVR operation (200V class)           160 to 500V         :AVR operation (400V class)
F06	Maximum output voltage 1	80 to 240V : AVR operation (200V class) 160 to 500V : AVR operation (400V class)
F07	Acceleration time1	0.00 to 3600 s
F08	Deceleration time1	* 0.00 is for acceleration and deceleration time cancel (when performing soft-start and stop externally)
F09	Torque boost 1	0.0 to 20.0% (% value against base frequency voltage 1)
F10	Electronic thermal overload protection for motor 1 (Select motor characteristics)	Enable (For a general-purpose motor with self-cooling fan)     Enable (For an inverter-driven motor (FV) with separately powered cooling fan)
F11	(Overload detection level)	0.00 (disable), current value of 1 to 135% of inverter rated current
F14	Restart mode after momentary power failure (Mode selection)	0: Trip immediately 1: Trip after a recovery from power failure 2: Trip after momentary deceleration is stopped 4: Restart from frequency at power failure (for general load) 5: Restart from starting frequency
F16	(Lower limit)	0.0 to 400.0Hz
F26	Motor sound (Carrier frequency)	0.75 to 16 kHz
E52	Keypad (Menu display mode)	0: Function code data setting mode (Menu 1) 1: Function code data check mode (Menu 2) 2: Full-menu mode
P02	(Rated capacity)	0.01 to 30.00 kW (At P99 = 0,3,4,5,20 or 21) 0.01 to 30.00 HP (At P99 = 1)
P03	(Rated current)	0.00 to 100.0A
P04	(Auto-tuning)	0: Disable 1: Stop tuning 2: Rotation tuning
P99	Motor 1 selection	0: Motor characteristics 0 (Fuji standard IM, 8-series) 1: Motor characteristics 1 (HP rating IM) 3: Motor characteristics 3 (Fuji standard IM, 6-series) 4: Other motors(IM) 20: Other motors(PMSM) 21: Fuji standard PMSM without sensor

products/ac\_drives\_lv/

Chapter 6 MAINTENANCE AND INSPECTION

#### 6.1 Inquiries about Product and Guarantee

6.1.1 When making an inquiry Upon breakage of the product, uncertainties, failure or inquiries, inform your Fuji Electric representative of the following information

1) Inverter type (Refer to Chapter 1, Section 1.1.)

2) SER No. (serial number of equipment) (Refer to Chapter 1, Section 1.1.) Function codes and their data that you changed from the factory defaults

ROM version

5) Date of purchase

Inquiries (for example, point and extent of breakage, uncertainties, failure phenomena, and other circumstances) Production year & week (Refer to Chapter 1, Section 1.1.)

6.1.2 Product warranty

6.1.2 Product warranty To all our customers who purchase Fuji Electric products included in this documentation: Please take the following items into consideration when placing your order. When requesting an estimate and placing your orders for the products included in these materials, please be aware that any items such as specifications which are not specifically mentioned in the contract, catalog, specifications or other materials will be as mentioned below. In addition, the products included in these materials are limited in the use they are put to and the place where they can be used, etc., and may require periodic inspection. Please confirm these points with your sales representative or directly with this company. Furthermore, regarding purchased products and delivered products, we request that you take adequate consideration of the necessity of rapid receiving inspections and of product management and maintenance even before receiving your products.

#### 6.1.2.1 Free of charge warranty period and warranty range

(1) Free of charge warranty period

1) The product warranty period is "1 year from the date of purchase" or 24 months from the manufacturing date imprinted on the name place, whichever date is earlier. 2) However, in cases where the use environment, conditions of use, use frequency and times used, etc., have an effect on product life, this warranty period may not apply. 3) Furthermore, the warranty period for parts restored by Fuji Electric's Service Department is "6 months from the date that repairs are completed."

### (2) Warranty range

- In the event that breakdown occurs during the product's warranty period which is the responsibility of Fuji Electric, Fuji Electric will replace or repair the part of the product that has broken down free of charge at the place where the product was purchased or where it was delivered. However, if the following cases are applicable, the terms of this warranty may not apply.
  - The breakdown was caused by inappropriate conditions, environment, handling or use methods, etc. which are not specified in the catalog, operation manual, specifications or other relevant documents.
- 2 The breakdown was caused by the product other than the purchased or delivered Fuji's product.
- ③ The breakdown was caused by the product other than Fuji's product, such as the customer's equipment or software design, etc. ④ Concerning the Fuji's programmable products, the breakdown was caused by a program other than a program supplied by this company, or the results from using such a program.
- 5 The breakdown was caused by modifications or repairs affected by a party other than Fuji Electric.
- 6 The breakdown was caused by improper maintenance or replacement using consumables, etc. specified in the operation manual or catalog, etc. The breakdown was caused by a science or technical problem that was not foreseen when making practical application of the product at the time it was purchased or delivered.
- 8 The product was not used in the manner the product was originally intended to be used. 9 The breakdown was caused by a reason which is not this company's responsibility, such as lightning or other disaster
- 2) Furthermore, the warranty specified herein shall be limited to the purchased or delivered product alone.
- 3) The upper limit for the warranty range shall be as specified in item (1) above and any damages (damage to or loss of machinery or equipment, or lost profits from the same, etc.) consequent to or resulting from breakdown of the purchased or delivered product shall be excluded from coverage by this warranty.
- (3) Trouble diagnosis As a rule, the customer is requested to carry out a preliminary trouble diagnosis. However, at the customer's request, this company or its service network can perform the trouble diagnosis on a chargeable basis. In this case, the customer is asked to assume the burden for charges levied in accordance with this company's fee schedule.

#### 6.1.2.2 Exclusion of liability for loss of opportunity, etc.

Regardless of whether a breakdown occurs during or after the free of charge warranty period, this company shall not be liable for any loss of opportunity, loss of profits, or damages arising from special circumstances, secondary damages, accident compensation to another company, or damages to products other than this company's products, whether foreseen or not by this company, which this company is not be responsible for causing.

### 6.1.2.3 Repair period after production stop, spare parts supply period (holding period)

Concerning models (products) which have gone out of production, this company will perform repairs for a period of 7 years after production stop, counting from the month and year when the production stop occurs. In addition, we will continue to supply the spare parts required for repairs for a period of 7 years, counting from the month and year when the production stop occurs. In addition, we will continue to supply the spare parts required for repairs for a period of 7 years, counting from the month and year when the production stop occurs. In setting the site interval that the life cycle of certain electronic and other parts is short and it will be difficult to provide repairs or supply spare parts even within this 7-year period. For details, please confirm at our company's business office or our service office.

# 6.1.2.4 Transfer rights

In the case of standard products which do not include settings or adjustments in an application program, the products shall be transported to and transferred to the customer and this company shall not be responsible for local adjustments or trial operatio

### 6.1.2.5 Service contents

The cost of purchased and delivered products does not include the cost of dispatching engineers or service costs. Depending on the request, these can be discussed

#### 6.1.2.6 Applicable scope of service

Above contents shall be assumed to apply to transactions and use of the country where you purchased the products. Consult the local supplier or Fuji for the detail separately.

# Chapter 7 COMPLIANCE WITH STANDARDS

7.1 Compliance with European Standards The CE marking on Fuji products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive issued by the Council of

the European Communities and Low Voltage Directive

	Table 7-1 Conformity with Standards
EMC Directives	IEC/EN61800-3 Immunity : Second environment (Industrial) Emission : 3.7 kW or below Category C2 (Applicable only to the EMC filter built-in type of inverters) Category C2 (Applicable only when an optional EMC-compliant filter is attached) 5.5 kW or above Category C3 (Applicable only to the EMC filter built-in type of inverters) Category C3 (Applicable only when an optional EMC-compliant filter is attached) IEC/EN61326-3-1
Low Voltage Directive	IEC/EN61800-5-1
The FRENIC-Mini series of	inverters are categorized as a "restricted sales distribution class" of the EN61800-3. When you use these products with any home appliances

7.1.1 Compatibility with Revised EMC Directive and Low Voltage Directive

In the revised EMC Directive (2014/30/EU) and Low Voltage Directive (2014/35/EU), it is necessary to clearly state the name and the address of manufacturers and importers to enhance traceability. Importers shall be indicated as follows when exporting products from Fuji Electric to Europe.

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Ľ	Manufacturer	Importer in Europe
Γ	Fuji Electric Co., Ltd 5520, Minami Tamagaki-cho, Suzuka-city, Mie 513-8633, Japan	Fuji Electric Europe GmbH Goethering 58 , 63067 Offenbach / Main, Germany

<Precaution when exporting to Europe>

Not all Fuji Electric products in Europe are necessarily imported by the above importer. If any Fuji Electric products are exported to Europe via another importer, please
ensure that the importer is clearly stated by the customer.

#### 7.2 Conformity with UL standards and cUL-listed for Canada

UL/cUL-listed inverters are subject to the regulations set forth by the UL standards and CSA standards (cUL-listed for Canada) by installation within precautions listed below.

office equipment, you may need to take appropriate countermeasures to reduce or eliminate any noise emitted from these products.

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. 1. Solid state motor overhoad protection (motor protection by electronic thermal overload relay) is provided in each model. Adjust function codes F10 to F12 and H89 to set the protection level.

2. Connect the power supply satisfying the characteristics shown in the table below as an input power supply of the inverter. (Short circuit rating)

3. Use 75 C Cu wire only. 4. Use Class 1 wire only for control circuits.

Short circuit rating

When protected by class J fuses or a circuit breaker, suitable for use on a circuit capable of delivering not more than B rms symmetrical amperes, A volts maximum kW rating

Power supply voltage	Inverter type	Power supply max. voltage	Power supply current		
	FRN0001C2S-2A				
	FRN0002C2S-2A				
	FRN0004C2S-2A				
	FRN0006C2S-2A				
	FRN0010C2S-2A				
Three-phase 200V	FRN0012C2S-2A	240VAC	100,000 A or less		
	FRN0020C2S-2A				
	FRN0025C2S-2A				
	FRN0033C2S-2A				
	FRN0047C2S-2A				
	FRN0060C2S-2A				
	FRN0002C2■-4□				
	FRN0004C2■-4□	480VAC			
	FRN0005C2=-4				
	FRN0007C2■-4				
Three-phase 400V	FRN0011C2■-4□		100,000 A or less		
	FRN0013C2=-4				
	FRN0018C2=-4				
	FRN0024C2■-4				
	FRN0030C2■-4□				
	FRN0001C2=-7				
	FRN0002C2=-7	240VAC			
Single-phase 2001/	FRN0004C2=-7		100 000 A or less		
Single-pridse 200V	FRN0006C2=-7		100,000 A of less		
	FRN0010C2=-7				
	ERN0012C2=-7				

Notes: 1) A box (⊕) in the above table replaces S or E depending on the en-closure. 2) A box (□) in the above table replaces A, C, or E depending on the shipping desti-nation. \* 40 kW for the EU. The inverter type is FRN0011C2S-4E.

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ower supply voltage	Inverter type	Power supply max. voltage "A" (Volts)	Power supply current "B" (Amperes)		
	FRN0001C2S-2U				
ower supply voltage         Inverter type           FRN0001C2S-2U         FRN0001C2S-2U           FRN0004C2S-2U         FRN0004C2S-2U           FRN0006C2S-2U         FRN00102C2S-2U           FRN00102C2S-2U         FRN00102C2S-2U           FRN0012C2S-2U         FRN00102C2S-2U           FRN0012C2S-2U         FRN00302C2S-2U           FRN002C2S-2U         FRN00302C2S-2U           FRN0047C2S-2U         FRN0047C2S-2U           FRN0047C2S-2U         FRN0047C2S-2U           FRN0047C2S-2U         FRN0047C2S-2U           FRN0047C2S-2U         FRN0047C2S-2U           FRN0047C2S-2U         FRN0047C2S-4U           FRN005C2S-4U         FRN005C2S-4U           FRN00112C2S-4U         FRN00112C2S-4U           FRN00112C2S-4U         FRN00112C2S-4U           FRN0005C2S-4U         FRN0006C2S-7U           FRN00012C2S-7U         FRN0006C2S-7U           FRN00012C2S-7U         FRN00102C2S-7U           FRN00102C2S-7U         FRN00102C2S-7U           FRN00102C2S-7U         FRN00102C2S-7U           FRN00012C2S-7U         FRN00012C2S-7U           FRN00012C2S-7U         FRN00102C2S-6U           FRN00012C2S-6U         FRN0003C2S-6U           FRN0003C2S-6U         FRN0003C2S-6U					
	FRN0004C2S-2U				
	FRN0006C2S-2U				
	FRN0010C2S-2U				
Three-phase 200V	FRN0012C2S-2U	240VAC	100,000 A or less		
	FRN0020C2S-2U				
	FRN0025C2S-2U				
	FRN0033C2S-2U				
	FRN0047C2S-2U				
	FRN0060C2S-2U				
	FRN0002C2S-4U				
Three-phase 200V Three-phase 400V Single-phase 200V	FRN0004C2S-4U		100,000 A or less		
	FRN0005C2S-4U				
	FRN0007C2S-4U				
Three-phase 400V	FRN0011C2S-4U	480VAC			
	FRN0013C2S-4U				
	FRN0018C2S-4U				
	FRN0024C2S-4U	7			
	FRN0125C2S-2U           FRN0325C2S-2U           FRN0047C2S-2U           FRN0060C2S-2U           FRN0005C2S-4U           FRN0005C2S-4U           FRN0005C2S-4U           FRN0005C2S-4U           FRN0005C2S-4U           FRN0005C2S-4U           FRN001C2S-4U           FRN001C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN011C2S-4U           FRN0011C2S-4U           FRN0011C2S-4U           FRN0011C2S-4U           FRN0011C2S-4U           FRN0011C2S-4U           FRN0011C2S-7U           FRN0010C2S-7U           FRN0010C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-7U           FRN0011C2S-6U				
	FRN0001C2S-7U				
	FRN0002C2S-7U				
Single phase 2001/	FRN0004C2S-7U	2401/40	100,000 Å et lete		
Single-phase 200V	FRN0006C2S-7U	240VAC	100,000 A or less		
	FRN0010C2S-7U				
	FRN0012C2S-7U				
	FRN0001C2S-6U				
Single phase 100 V	FRN0002C2S-6U	120.1/4.0	65,000 A or less		
single-phase 100 V	FRN0003C2S-6U	120 VAC			
	FRN0005C2S-6U				

<ol> <li>Install UL c power supp</li> <li>■ Basic type</li> </ol>	ertified fuses rated 600Vac oly and the inverter, referring (kW rating)	or circuit breaker rat g to the table below.	ed 240V or mor	e for 200V input	t, 480V or more for 4	00V input, 12	0V or more fo	r 100V input b	etween the
	Inverter type	Required torque Ib-in (N·m)			Wire size AWG or kcmil (mm <sup>2</sup> )				
Power			Control circuit			Control circuit		Class J	Circuit
voltage		Main terminal	*1 TERM1	*2 TERM2-1 TERM2-2	*3 Main terminal	*1 TERM1	*2 TERM2-1 TERM2-2	current (A)	(A)
	FRN0001C2S-2A							3	5
	FRN0002C2S-2A	10.0(1.0)						6	5
	FRN0004C2S-2A	10.0(1.2)			14(2.0)			10	5
	FRN0006C2S-2A							15	10
	FRN0010C2S-2A							20	15
Three-phase	FRN0012C2S-2A	15.9(1.8)	3.5(0.4)	1.7(0.2)	14(2.0) [12(3.3)]	20(0.5)		30	20
2007	FRN0020C2S-2A				10(5.3)			40	30
	FRN0025C2S-2A	27(2.0)			0(0,4)			60	50
	FRN0033C2S-2A	27(3.0)			0(0.4)			75	75
	FRN0047C2S-2A				6(13.3)			100	100
	FRN0060C2S-2A	51.3(5.8)			4(21.2) [6(13.3)]			150	125
	FRN0002C2S-4		3.5(0.4)	1.7(0.2)	14(2.0)	20(0.5)		3	5
	FRN0004C2S-4	1						6	5
	FRN0005C2S-4	15.9(1.8)						10	10
	FRN0007C2S-4							15	15
Three-phase	FRN0011C2S-4				14(2.0) [12(3.3)]			20	20
4000	FRN0013C2S-4	27(3.0)			12(3.3) [10(5.3)]			30	30
	FRN0018C2S-4				10(5.3)			40	40
	FRN0024C2S-4	F4 0/F 0)			0(0,4)			60	50
	FRN0030C2S-4	51.3(5.8)			8(8.4)			70	60
	FRN0001C2S-7							6	5
	FRN0002C2S-7	10.6(1.2)	3.5(0.4)	1.7(0.2)	14/2.0)			6	5
Single-	FRN0004C2S-7				14(2.0)	20(0.5)		10	10
200V	FRN0006C2S-7							15	15
2301	FRN0010C2S-7	15.9(1.8)			14(2.0) [12(3.3)]			30	20
	FRN0012C2S-7				10(5.3)			40	30

: Denotes the relay contact terminals for [30A], [30B] and [30C].

\*2: Denotes control terminals except for [30A], [30B] and [30C].
\*3: Values in [] mean the size (AWG) of Grounding wire if exist. Notes: A box (D) in the above table replaces A. C, or E depending on the shipping destination.
\* 4.0 kW for the EU. The inverter type is FRN0011C2S-4E.

Basic type (HP rating)

	Inverter type	Required torque Ib-in (N·m)		Wire size AWG or kcmil (mm²)					
Power supply voltage			Control circuit			Control circuit		Class J	Circuit
		Inverter type	Main terminal	*1 TERM1	*2 TERM2-1 TERM2-2	*3 Main terminal	*1 TERM1	*2 TERM2-1 TERM2-2	fuse current(A)
	FRN0001C2S-2U							3	5
	FRN0002C2S-2U	40.0(4.0)		1.7(0.2)	14(2.0)			6	5
	FRN0004C2S-2U	10.0(1.2)						10	5
	FRN0006C2S-2U							15	10
	FRN0010C2S-2U		3.5(0.4)					20	15
Three-phase	FRN0012C2S-2U	15.9(1.8)			14(2.0) [12(3.3)]	20(0.5)	30	20	
2001	FRN0020C2S-2U				10(5.3)			40	30
	FRN0025C2S-2U	27(3.0)			8(8.4)			60	50
	FRN0033C2S-2U	27(0.0)			0(0.4)			75	75
	FRN0047C2S-2U				6(13.3)			100	100
	FRN0060C2S-2U	51.3(5.8)			4(21.2) [6(13.3)]			150	125
	FRN0002C2S-4U	15.9(1.8)	3.5(0.4)	1.7(0.2)	14(2.0)	20(0.5)		3	5
	FRN0004C2S-4U							6	5
	FRN0005C2S-4U							10	10
	FRN0007C2S-4U							15	15
Three-phase	FRN0011C2S-4U				14(2.0) [12(3.3)]			20	20
4000	FRN0013C2S-4U	27(3.0)			12(3.3) [10(5.3)]			30	30
	FRN0018C2S-4U				10(5.3)			40	40
	FRN0024C2S-4U	51.3(5.8)			9(9.4)			60	50
	FRN0030C2S-4U				0(0.4)			70	60
	FRN0001C2S-7U				11(2.0)	20(0.5)		6	5
	FRN0002C2S-7U	10 6(1 2)						6	5
Single-phase	FRN0004C2S-7U	10.6(1.2)	2 5 (0 4)	1 7(0 2)	14(2.0)			10	10
200V	FRN0006C2S-7U		3.5(0.4)	1.7(0.2)		20(1	20(0.5)		15
	FRN0010C2S-7U	15.9(1.8)			14(2.0) [12(3.3)]			30	20
	FRN0012C2S-7U				10(5.3)			40	30
	FRN0001C2S-6U		(1.2) 3.5(0.4)	1.7(0.2)		20(0.5)		6	5
Single-phase	FRN0002C2S-6U	10.0(1.0)						10	10
Single-phase 100V	FRN0003C2S-6U	10.6(1.2)			14			15	15
	ERN0005C2S-6U							30	20

<sup>\*1</sup> Denotes the relay contact terminals for [30A], [30B] and [30C].
 <sup>\*2</sup> Denotes control terminals except for [30A], [30B] and [30C].
 <sup>\*3</sup> Values in brackets [ ] denote the wire sizes (AWG) for grounding terminals (G). For wire sizes not followed by [ ], use that sizes also for grounding terminals (C).

 EMC filter built-in type (kW rating) Required torque Wire size lb-in (N ⋅ m AWG or kcmil(mm Class J fuse Circuit Breaker (A) Main terminal Control circuit Control circuit Inverter type supply voltage \*3 Main \*2 TERM2-1 \*1 TERM1 \*1 TERM1 urrent (A Input Other terminal ERM2 2C2E-4E RN0004C2E-4 14(2.0) 005C2E-4口 10 15.9(1.8) 0007C2E-4口 14(2.0) hree-phas 400V RN0011C2E-4 20 3.5(0.4) 1.7(0.2) [12(3.3)] 20(0.5) 12(3.3) [10(5.3)] N0013C2E-4口 30 27(3.0) 6 2(1 8 RN0018C2E-40 10(5.3) 40 40 024C2E-40 51.3(5.8) 8(8.4) FRN0030C2E-40 60 RN0001C2E -70 FRN0002C2E -70 10.6(1.2) 14(2.0) FRN0004C2E -7□ ingle-phas 200V FRN0006C2E -70 3.5(0.4) 1.7(0.2) 20(0.5) 14(2.0) FRN0010C2E -70 20 15.9(1.8) [12(3.3)] 10(5.3) ERN0012C2E -70 40 30

: Denotes the relay contact terminals for [30A], [30B] and [30C].

\*2: Denotes control terminals except for [30A], [30B] and [30C].
\*3: Values in [] mean the size (AWG) of Grounding wire if exist.
Notes: A box (D) in the above table replaces A, C, or C depending on the shipping desti-nation
\*4.0 kW for the EU. The inverter type is FRN0011C2S-4E.

6. To comply with CSA for 100 VAC input models, transient surge suppression shall be installed on the line side of this equipment and shall be rated 120 V (phase to ground), 120 V (phase to phase), suitable for overvoltage category 3, and shall provide protection for a rated impulse withstand voltage peak of 2.5 KV. To comply with CSA for 200 VAC input models, transient surge suppression shall be installed on the line side of this equipment and shall be rated 240 V (phase to ground), 240 V (phase to phase), suitable for overvoltage category 3, and shall provide protection for a rated impulse withstand voltage peak of 4 kV. (3.7 kW (5 HP) or below)

To comply with CSA for 400 VAC input models, transient surge suppression shall be installed on the line side of this equipment and shall be rated 278 V (phase to ground), 480 V (phase to phase), suitable for overvoltage category 3, and shall provide protection for a rated impulse withstand voltage peak of 4 kV. All models rated 380-480 V input voltage ratings shall be connected to TN-C system power source, i.e. 3-phase, 4-wire, wye (480Y/277V), so that the phase-to-ground rated system voltage is limited to 300 V maximum.

Maximum surrounding air temperature rating of 50 °C (122 °F).

9. For use in pollution degree 2 environments only.

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