

Thank you for purchasing Fuji Electric's FRENIC-Ace series. This instruction manual contains the minimum information required for product wiring and operation. Please read the instruction manual (Detailed Edition) carefully, and ensure an understanding of the safety-related content prior to use.

Related documents
User's Manual 2447-E-0173-1
RS-485 Communication User's Manual 2447-E-0082-1
Instruction Manual QR Code
Refer to the Fuji Electric website for details on the above documents.
https://www.fujielectric.com/products/inverter/frn-ace3-download/pdf/

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 information in this manual.

This instruction manual may be subject to change without prior notice.

CAUTION

Thank you for purchasing Fuji Electric's FRENIC-Ace series of high-performance, multi-function inverters. This product is designed to drive three-phase induction motors and synchronous motors under variable speed control. Please read this instruction manual beforehand to gain an understanding of how to handle the product and ensure correct use. Incorrect handling may lead to abnormal operation, or result in a shortening of the product life or failure. Deliver this manual to the end user of this product. Store this instruction manual in a safe location until the inverter is disposed of. This instruction manual should be read before operation. Please refer to the instruction manuals for the respective options. All of the drawings in this instruction manual are used to provide detailed descriptions, and therefore may have been drawn with the covers or safety shields removed. When running the product, do as so described in the instruction manual only after returning the covers or shields to their prescribed original locations.

WARNING

The FRENIC-Ace is a piece of equipment used to run three-phase induction motors and synchronous motors. It cannot be used for single-phase motors or other applications. Failure to observe this could result in fire or an accident. The FRENIC-Ace cannot be used as for applications which may have a direct effect on the human body such as life support machines. Strict safety control has been observed in the manufacture of this product, however, safety devices should be installed when the product is used for equipment which may result in a serious accident or in the event of failure. Failure to observe this could result in an accident.

Installation
Install on noncombustibles such as metal. Do not install near combustibles. Failure to observe this could result in fire. If using an optional DC reactor, there is a possibility of users coming into contact with main circuit terminal block parts (live parts). In such cases, take measures such as installing the product in a location where it will not easily come into contact with people. Failure to observe this could result in electric shock or injury.

Wiring
If no device for detecting zero-phase current (earth leakage current) such as a ground-fault relay is installed in the upstream power supply line in order to avoid the entire power supply system's shutdown undesirable to factory operation, install a residual-current-operated protective device (RCO) earth leakage circuit breaker (ELCB) individually to inverters to break the individual inverter power supply lines only. Connect to the power supply via a molded case circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) with overcurrent protection function for each inverter. Use the recommended molded case circuit breaker or earth leakage circuit breaker, and do not use devices that exceed the recommended capacity. Be sure to use the specified wire size. Tighten terminals with the prescribed tightening torque. If there are multiple inverter and motor combinations, do not use multi-core cables for the purpose of bundling and storing wiring for multiple combinations. Do not install a surge suppressor at the inverter output side (secondary side). Be sure to connect an optional DC reactor (DCR) when the capacity of the power supply transformer exceeds 500 kVA, and is at least 10 times the inverter rated capacity. Failure to observe this could result in fire. Carry out class C or class D grounding work based on the inverter input voltage system. Be sure to ground the inverter ground terminal (G) grounding wire. Failure to observe this could result in electric shock or fire. Wiring work should be carried out by qualified professionals. Carry out wiring work after ensuring that the power has been turned off.

Risk of electric shock
Be sure to carry out wiring after installing the unit. Failure to observe this could result in electric shock or injury. Ensure that the number of phases and rated voltage of the product input power supply matches that for the connected power supply. Do not connect the power lines to the inverter output terminals (U, V, W). When connecting a DC tracing resistor (DTR), never connect it to terminals other than terminals P(+), N(-) and DB. Failure to observe this could result in fire or an accident. Control signal lines generally do not have a reinforced insulation coating, and therefore if control signal lines come into contact with live parts of the main circuit, the insulation coating may be damaged for some reason. In such a case, there is a danger that high voltage from the main circuit will be applied to the control signal lines, and therefore care should be taken to ensure that they do not come into contact with live parts of the main circuit. Failure to observe this could result in an accident or electric shock. Switch off switches after waiting for at least 5 minutes after turning OFF the power, ensuring that the LED monitor and charge lamp are OFF, and using a device such as a tester to ensure that the DC intermediate circuit voltage across main circuit terminals P(+), N(-) and DB has dropped to a safe level (<25 VDC or less).

Risk of electric shock
Be sure to attach the inverter surface cover before turning the power on. Do not remove the surface cover while the power is on. Do not operate the inverter with wet hands. Failure to observe this could result in fire. The product stops after being tripped when the return function is selected, depending on the cause of the trip, the product will restart automatically, and the motor will rotate. Design machines such that way as to ensure the safety of the human body and surrounding area even when operation is resumed. There may be times when the return prevention function (torque limiting) causes the product to run at an acceleration/deceleration time or speed different from the set values. Design machines in such a way that safety is ensured even in such cases. Failure to observe this could result in fire or an accident. The keypad (K) key is enabled only when keypad operation is selected with function code F02. Please prepare a separate EMERGENCY STOP button. When function code H06 has been set to "0" or "2", the (K) key will be disabled if the operation command method is changed from operation command with the keypad by selecting key operation "LIC". After eliminating the cause of the protective function being triggered, ensure that operation command is OFF before canceling the alarm. Canceling the alarm with the operation command ON may result in power being supplied to the motor by the inverter, causing the motor to rotate, and is therefore dangerous. Failure to observe this could result in fire or an accident. By selecting the momentary power failure resume operation (F14 = 3) to 5), operation will resume automatically following recovery. Design machines in such a way as to ensure operator safety even when operation is resumed. Set function codes after ensuring a sufficient understanding of the instruction manual. If operation is performed after recklessly changing function code data, the motor may rotate at a torque and speed at which the machine is unable to tolerate. When auto tuning is started, the motor rotates. Conduct a sufficient check to ensure that there is no danger when the motor rotates. Failure to observe this could result in an accident or injury. Even though the inverter has interrupted power to the motor, if the voltage is applied to the main circuit input terminals L1R, L2S, L3T (three-phase), and L1L, L2N (single-phase), voltage may be output to inverter output terminals U, V, and W. Even if the motor is stopped by DC braking operation or pre-excitation operation, voltage will be output to the inverter output (U, V, and W) terminals. Risk of electric shock Inverter high-speed operation settings can be specified easily. If settings are changed, use the product after sufficiently checking the motor and machine specifications. Failure to observe this could result in injury.

Maintenance and inspection, part replacement
Carry out inspection after turning OFF the power and waiting at least 5 minutes. Furthermore, ensure that the LED monitor and charge lamp are OFF, and use a device such as a tester to ensure that the DC intermediate circuit voltage across main circuit terminals P(+), N(-) and DB has dropped to a safe level (<25 VDC or less). Risk of electric shock Be sure to perform the daily inspection and periodic inspection described in the instruction manual. Lengthy use of the product without inspection could result in inverter failure and damage, or accident or fire. A periodic inspection cycle of 1 to 2 years is recommended, however, the cycle may be shortened depending on the usage conditions. It is recommended that parts for periodic replacement be replaced after the standard number of years indicated in the instruction manual. Lengthy use of the product without replacing parts could result in inverter failure and damage, or accident or fire. Contact outputs (S0A/B/C) use relays, and may remain ON or OFF, or in an indefinite state when the life is reached. In the interests of safety, equip the product with an external protection function. Failure to observe this could result in fire or an accident. Maintenance and inspection, and part replacement should only be carried out by the specified individuals. Remove all metal objects (watches, rings, etc.) before beginning work. Be sure to use insulated tools. Never modify the product. Failure to observe this could result in electric shock or injury.

CAUTION

Installation
Do not hold the surface cover when transporting the product. Failure to observe this could result in injury if the product is dropped. Take measures to prevent foreign material such as lint, wastewater, dust, or metal scraps getting into the inverter, or adhering to the cooling fan. Use the specified screws for changing the mounting base. Failure to observe this could result in fire or an accident. Do not install or run inverters with damaged external or internal parts. Failure to observe this could result in fire, an accident, or injury.

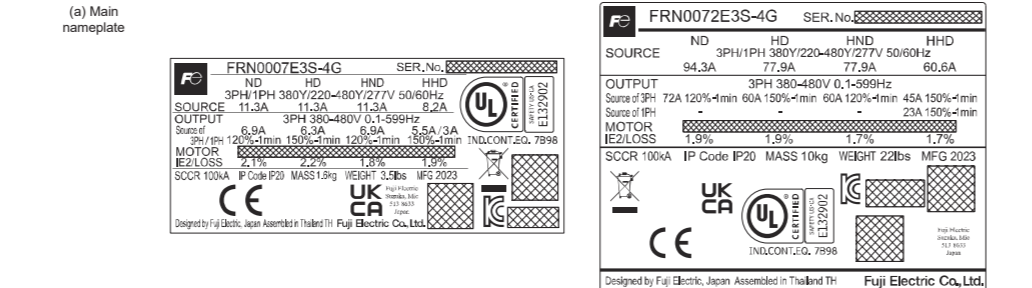
Wiring
The inverter, motor and wiring generate electric noise, which may cause nearby sensors and devices to malfunction. Employ noise countermasures to prevent malfunction. Failure to observe this could result in an accident. Operation
The cooling fans and braking resistors become very hot. Do not touch. Mechanical holding is not possible with the inverter brake function. Failure to observe this could result in injury. The digital input terminals are equipped with a function used to start stop operation or change the speed command with the "FWD" operation command or "BX" free-run command and so on. Depending on the digital input terminal status, operation may start suddenly, or the speed may change significantly simply by changing the function code settings. Make changes to function code settings after sufficiently ensuring safety. With digital input, functions "SS1, SS2, SS4, SS8", "HzPID", "HzPID", "IYS", "LE", etc.) used to change the operation procedure for operation commands or command procedure for speed commands can be specified. Depending on the conditions, changes to these signals may result in operation being started suddenly or the speed changing suddenly. Ensure safety before modifying customizable logic related function code settings (U codes and related function codes) or turning ON the "Cancel customizable logic" terminal command L1C. Depending upon the settings, such modification or cancellation of the customizable logic may change the operation sequence to cause a sudden motor start or an unexpected motor operation. Fully ensure it is safe before performing the operation. Failure to observe this could result in an accident or injury. Disposal
If disposing of the FRENIC-Ace, handle as industrial waste. Failure to observe this could result in injury.

Chapter 1 BEFORE USE

1.1 Acceptance Inspection (Rating Plate and Inverter Type)

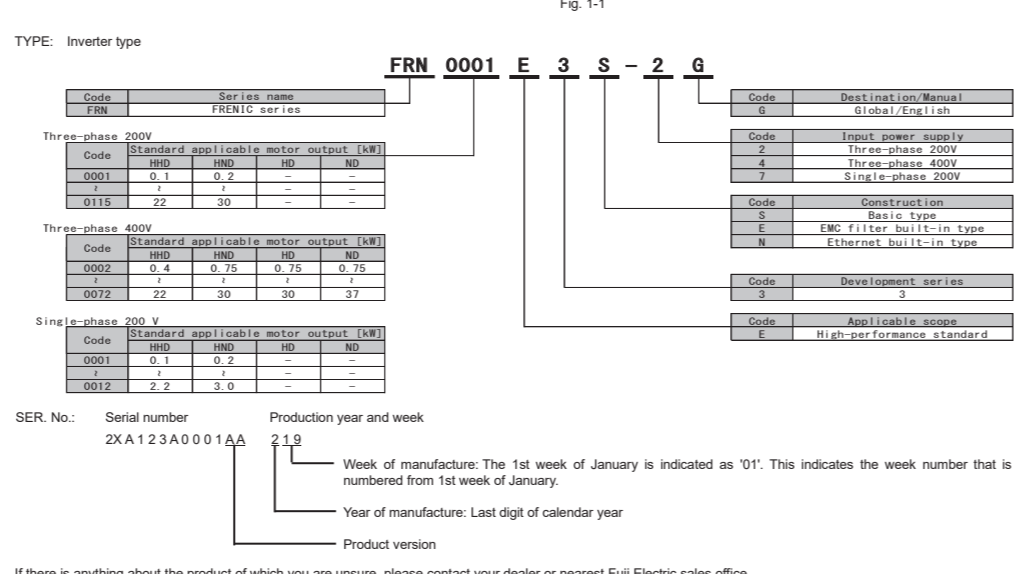
Unpack the product and check the following items.

- Ensure that the package contents both the inverter unit and instruction manual (this manual), and that the product has suffered no damage (breakage, dents, parts that have fallen off) during transport.
- The (a) Main nameplate and (b) Sub nameplate shown in Figure 1-1 are affixed to the inverter. Ensure that the product is the same as the one ordered.



(a) Main nameplate

FRN0072E3S-4G	SER. No.	0209E3-3-G
ND	HD	HND
3PH1PH	3PH1PH	3PH1PH
94.3A	77.9A	60.6A
3PH1PH 380V/220-480V/27V 50/60Hz	3PH 380V/220-480V/27V 50/60Hz	3PH 380V/220-480V/27V 50/60Hz
Output	Input	Output
7.5kW	11.25kW	7.5kW
Surge P1: 7.5kW/120min	Surge P1: 11.25kW/120min	Surge P1: 7.5kW/120min
Surge P2: 11.25kW/120min	Surge P2: 11.25kW/120min	Surge P2: 11.25kW/120min
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Surge P100: 11.25kW/120min	Surge P100: 11.25kW/120min	Surge P100: 11.25kW/120min



Production year and week
Week of manufacture: The first week of January is indicated as '01'. This indicates the week number that is numbered from 1st week of January.
Year of manufacture: Last digit of calendar year.
Product version

If there is anything about the product of which you are unsure, please contact your dealer or nearest Fuji Electric sales office.

Chapter 2 INSTALLATION AND WIRING

2.1 Operating Environment

Install FRENIC-Ace in an operating environment that satisfies the conditions listed in Table 2-1 Operating environment.

Table 2-1 Operating environment

Item	Specifications
Location	Indoor

2.2.2 Control Circuit Terminals

A description of control terminal functions is shown in Table 2-3. The control circuit terminal connection method differs based on function code settings to suit the purpose for which the inverter is used.

Wire appropriately to minimize the effect of noise from main circuit wiring.

Table 2-3 Description of control circuit terminal functions

Classification	Terminal symbol	Terminal name	Function description
Power supply	[13]	Power supply for potentiometer	The terminal is used for the power supply (+10 VDC) for the external frequency setter (variable resistor: 1 to 5 kΩ). Contact resistors larger than 1 Ω are not allowed.
	[12]	Analog setting voltage input	(1) Frequency is set up according to the external analog voltage input command value. • 0 to ±10 VDC to ±100% (normal operation) • 10 to 50 VDC to ±100% (inverse operation) (2) Other than frequency settings, this terminal can be assigned to PID commands, PID control feedback signals, frequency auxiliary settings, ratio settings, torque limit value settings, torque command values/torque current command values, speed limit values, and analog input monitors with analog input. (3) Hardware specifications • Input impedance: 22 kΩ • Up to +15 VDC can be input. However, input exceeding +10 VDC will be recognized as +10 VDC. • To input bipolar (0 to ±10 VDC) analog setting voltage at terminal [12], set function code C35 to 7. • Up to DC 30 mA can be input.
Analog input	[C1]	Analog setting Current input (I ₁ function)	(1) Frequency is set up according to the external analog current input command value. It is necessary to switch SW3 and SW4 (See User's Manual (2A47-E-0173)) on the PCB. • 4 to 20 mA DC to 100%, 0 to 20 mA DC to 100% (normal operation) • 20 to 4 mA DC to 100%, 0 to 20 mA DC to 100% (inverse operation) (2) Other than frequency settings, this terminal can be assigned to PID commands, PID control feedback signals, frequency auxiliary settings, ratio settings, torque limit value settings, torque command values/torque current command values, speed limit values, and analog input monitors with analog input. (3) Hardware specifications • Input impedance: 250 Ω • Up to +15 VDC can be input. However, input exceeding DC 20 mA will be recognized as DC 20 mA.
		Analog setting Voltage input (V2 function)	(1) Frequency is set up according to the external analog voltage input command value. It is necessary to switch SW3 and SW4 (See User's Manual (2A47-E-0173)) on the PCB. • 0 to ±10 VDC to ±100% (normal operation) • 10 to 50 VDC to ±100% (inverse operation) (2) Other than frequency settings, this terminal can be assigned to PID commands, PID control feedback signals, frequency auxiliary settings, ratio settings, torque limit value settings, torque command values/torque current command values, speed limit values, and analog input monitors with analog input. (3) Hardware specifications • Input impedance: 22 kΩ • Up to +15 VDC can be input. However, input exceeding +10 VDC will be recognized as +10 VDC.
PTC thermistor input (PTC function)	[11]	Analog common	This is a common terminal for the analog input/output signal terminals ([13], [12], [C1], [F1], and [F2]). This terminal is insulated from terminals [CM1] and [CM2].
	[X1] [X2] [X3] [X4] [X5]	Digital input 1 to 5	(1) Various signals (coast to stop command, external alarm, multi-speed selection, etc.) can be set with function codes E01 to E05, E08, E99. Refer to the User's Manual (2A47-E-0173) for details. (2) The input mode can be switched with SW1. (3) The operating mode between each digital input terminal and terminal [CM] can be changed to "ON when shorted (active ON)" or "OFF when shorted (active OFF)". (4) Digital input terminal [X3] can be set up as a pulse train input terminal by switching the function code F04. Maximum wire length: 20 m Maximum input pulse: 30 kHz. When connected to open collector output pulse generator (pull-up and pull-down resistor) 100 kHz. When connected to complementary output pulse generator. Refer to the User's Manual (2A47-E-0173) for details on function code settings.
Forward rotation/runstop command input	[REV]	Reverse rotation/runstop command input	Refer to the User's Manual (2A47-E-0173) for digital input circuit specifications.
	[EN1] [EN2]	Enable input	(1) When terminals [EN1] and [EN2] are OFF, the inverter output transistors stop switching (safe torque off: STO). Be sure to operate terminals [EN1] and [EN2] simultaneously; otherwise an \overline{L} alarm is issued and inverter operation is disabled. (2) The input mode for terminals [EN1] and [EN2] is fixed to SOURCE. The mode cannot be switched to SINK. (3) This function can be enabled and disabled with SW9. If using this function, set the respective SW9 switches to the OFF side. Refer to the User's Manual (2A47-E-0173) for the terminal [EN1] and [EN2] circuit specifications.
Programmable logic controller signal power supply	[PLC]	Programmable logic controller signal power supply	(1) Connect the output signal power supply for the programmable controller. (Rated voltage +24 VDC (power supply voltage fluctuation range: +20 to +27 VDC), maximum 100 mA). (2) The terminal can also be used as the power supply for loads connected to transistor outputs. Refer to the "Transistor output" section for details.
	[CM]	Analog common	This is a common terminal for digital input signals. The terminal is insulated from terminals [CM1] and [CM2].
Analog monitor (FMV function) (FMI function)	[F1]	Analog monitor (FMV function) (FMI function)	This terminal outputs analog DC voltage of 0 to +10 VDC, or analog DC current of 4 to 20 mA to 20 mA monitor signals. The [FMI] output form (FMV) can be switched using SW5 on the PCB and function code F29. The signal content is selected by setting function code F31 data. Allowable impedance for connection: Min. 5 kΩ (at 0 to +10 VDC output) (up to 2 analog voltmeters (0 to 10 VDC, input impedance 10 kΩ) can be connected). • Allowable impedance for connection: Max. 500 Ω (with output of 4 to 20 mA DC) • Gain adjustment range: 0 to 300%.
	[F2]	Analog monitor (FMV2 function) (FMI2 function)	This terminal outputs analog DC voltage of 0 to +10 VDC, or analog DC current of 4 to 20 mA to 20 mA monitor signals. The [FMI2] output form (FMV2) can be switched using SW7 on the PCB and function code F32. The signal content is selected by setting function code F32 data. Allowable impedance for connection: Min. 5 kΩ (at 0 to +10 VDC output) (up to 2 analog voltmeters (0 to 10 VDC, input impedance 10 kΩ) can be connected). • Allowable impedance for connection: Max. 500 Ω (with output of 4 to 20 mA DC) • Gain adjustment range: 0 to 300%.
Pulse monitor (FMP function)	[Y1] [Y2]	Transistor output 1 to 2	(1) Various signals (running signal, frequency reached signal, overload feedback signal, etc.) set with function codes E20 and E21 can be output. Refer to the User's Manual (2A47-E-0173) for details. (2) The operating mode between each transistor output terminal and terminal [CM] can be changed to "ON when signal output (active ON)" or "OFF when signal output (active OFF)". • Maximum voltage for pull-up power supply: 48 V, maximum load current when ON: 50 mA
	[CMY]	Transistor output common	This is a common terminal for transistor output signals. The terminal is insulated from terminals [CM1] and [CM2].
Integrated alarm output	[DOA] [DOB] [DOC]	Integrated alarm output	(1) When the inverter stops with an alarm, an integrated alarm is output at the relay contact (IC). Contact capacity: 250 VAC 0.3A cos φ = 0.3, 48 VDC 0.5 A (2) The same signals as those of terminals [Y1] [Y2] can be selected and output. (3) It is possible to switch between a "short circuit between terminals [DOA] and [DOC] when an ON signal is output (exclusion: active OFF)" or an "open circuit between terminals [DOA] and [DOC] when an ON signal is output (non-exclusion: active OFF)".
	[DX+][DX-][SC]	RS-485 communication port 2	This is an input/output terminal used to connect a computer or programmable controller, etc. by RS-485 communication. (Refer to the User's Manual (2A47-E-0173)) for details on terminating resistance.) (Refer to the User's Manual (2A47-E-0173)) for details on recommended terminal types.
For keypad connector	[RS-485 connector 1]	RS-485 communication port 1	(1) This is used as a connector for connecting the keypad. The keypad power is supplied from the inverter via an extension cable for remote operation. If using an extension cable, turn ON the SW2 terminating resistor. (2) This is used to connect a computer or programmable controller, etc. by RS-485 communication after disconnecting the keypad. (Refer to the User's Manual (2A47-E-0173)) for details on terminating resistance. (3) If connecting an extension cable to remote operation, a keypad relay adaptor (option) is necessary. (4) Pins 1, 2, 7, and 8 are assigned as the power supply source for the keypad. When connecting this RJ-45 connector to other devices, do not use these pins. Do not connect the PC LAN ports, Ethernet hubs, or telephone lines to the RJ-45 connector. The inverter and the connected device may be damaged. Failure to observe this could result in fire.
	USB connector	USB port	This is a USB connector (miniB specification) for connecting to a computer. Function codes can be edited, transferred, and verified, and an inverter test run can be performed, and all states can be monitored using the inverter support loader (FRENIC Loader). * Refer to the User's Manual (2A47-E-0173) for details.

Chapter 3 OPERATION USING THE KEYPAD

Refer to the User's Manual for details.

3.1 Name and Function of Each Keypad Part

The keypad allows you to run and stop the motor, display various data, configure function code data, and monitor IO signal states, maintenance information and alarm information.

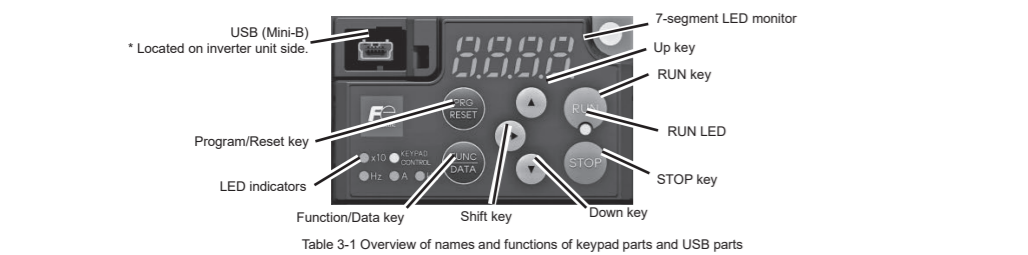
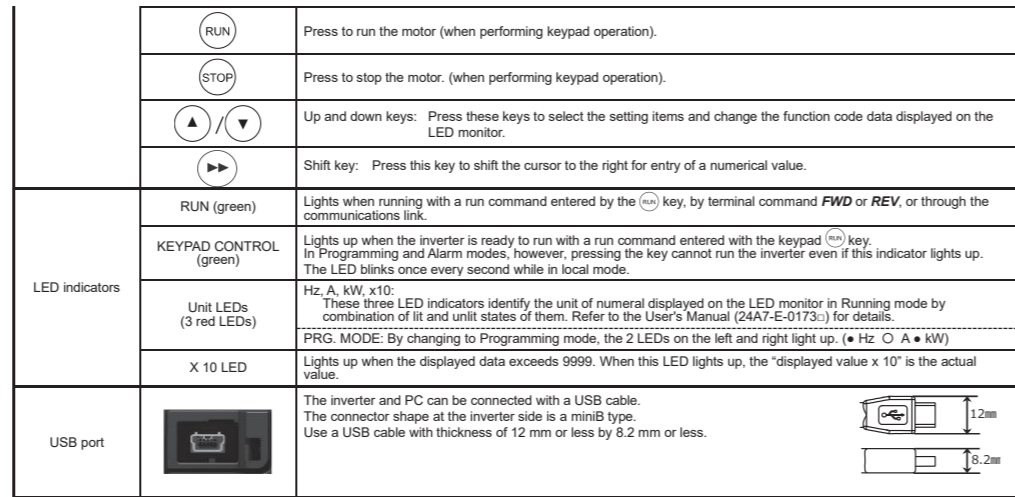


Table 3-1 Overview of names and functions of keypad parts and USB ports

Item	Display and keys	Function Overview
LED monitor	Four-digit, 7-segment LED monitor which displays the following according to the operation mode. • In Running mode: Running status information (output frequency, output current, output voltage, etc.) Changes to the light alarm display when a light alarm occurs. • In Programming mode: Menu, function codes, function code data, etc. • In Alarm mode: Alarm codes showing why protective function was triggered	• In Running mode: Pressing this key changes the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.) • In Programming mode: Pressing this key changes the inverter mode to Programming mode. • In Alarm mode: Pressing this key changes the inverter mode to Running mode. • In Alarm mode: Pressing this key after clearing the cause of the alarm resets the alarm and changes the mode back to Running mode.
Operation keys	Function/Data key Shift key	Function/Data key which performs the following operations. • In Running mode: Pressing this key changes the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.) • In Programming mode: Pressing this key displays the function code or finalizes the data setting. • In Alarm mode: Pressing this key displays details of the problem indicated by the alarm code displayed on the LED monitor.



3.2 Destination setting

For inverter type FRN-1E3-32G4/G7G (FRENIC-AE Global Model), the destination must be set first after the initial power supply. Without setting the destination, the function code cannot be changed. The inverter cannot be operated. By setting the destination, basic function codes such as rated voltage, rated frequency, etc. are initialized to general values in each region (Table 3-2). If the destination value setting is changed after the initial destination setting, it can be changed with \overline{L} in the program mode menu or function code H10. If the destination is initialized to the factory defaults, if the destination is set by H10, only the function codes in Table 3-2 are initialized to the values in the table. The destination can be selected by the regions of Japan, Asia, China, Europe, Americas and Korea.
If the function code set including the destination setting function code (H10) is copied with the data copy function or the FRENIC loader, manual destination setting is not required.
The destination setting is shown below. Refer to Table 3-2.
(1) With \overline{L} displayed, press \overline{R} key first.
(2) \overline{R} / \overline{L} (Asian region) is displayed first. For other regions, press \overline{A} key or \overline{C} key to select the destination.
(3) After selecting the destination, \overline{S} / \overline{R} is displayed by pressing \overline{S} key and the destination setting is completed. Then, \overline{D} / \overline{D} is displayed.

	Destination	Asia	China	Europe	Americas	Korea	Japan
H10	Destination	2	3	4	5	7	1
F03/A01	Maximum output frequency 1, 2	60.0Hz	60.0Hz	60.0Hz	60.0Hz	60.0Hz	60.0Hz
E13/E36/E54	Frequency detection 1 to 3 (Level)	200V	50.0Hz	50.0Hz	60.0Hz	60.0Hz	50.0Hz
F04/A02	Rated voltage at base frequency 1, 2	400V	200/380V	230/400V	230/460V	200/400V	200/400V
F05/A04	Maximum output voltage 1, 2	240V15V	200/380V	230/400V	230/460V	200/400V	200/400V
F14	Restart mode after momentary power failure (Mode selection)	1	1	0	0	1	1
F44	Current limiter (Level)	130%	130%	130%	130%	130%	130%
F80	NH/HH/HND/HH/HD mode selection	NH/HH/HHND/HH/HD	NH/HH/HHND/HH/HD	NH/HH/HHND/HH/HD	NH/HH/HHND/HH/HD	NH/HH/HHND/HH/HD	NH/HH/HHND/HH/HD
P02/A16	Motor 1, 2 (Rated capacity)	Set in kW	Set in HP	Set in kW	Set in kW	Set in kW	Set in kW
P09/A39	Motor 1, 2 selection	5	1	5	5	5	5
H98	STOP key priority / Start check function	0	0	0	3	0	0
K01	Multifunction keypad TP-A2SW (Language selection)	1	6	1	1	1	0
F09/A05	Torque boost 1, 2				0.00%		
F11/A07	Electronic thermal 1, 2 (Overload detection level)						
E34/E37/E55	Overload early warning/Current detection 1 to 3						
P03/A17	Motor 1, 2 (Rated current)						
P06/A20	Motor 1, 2 (No-load current)						
P07/A21	Motor 1, 2 (RFL)						
P08/A22	Motor 1, 2 (%)						
P12/A26	Motor 1, 2 (Rated slip frequency)						
P13/A27	Motor 1, 2 (from less factor)						
P16/A30	Motor 1, 2 (Magnetic saturation factor 1 to 5)						
P65/A45	Motor 1, 2 (Torque current under vector control)						
P66/A46	Motor 1, 2 (Induced voltage factor)						
P57/A57	Motor 1, 2 (For adjustment by manufacturer)						

Chapter 4 FUNCTION CODES

Function codes can be viewed and downloaded by accessing the QR Code below.

Function code list QR Code



Chapter 5 ALARM DISPLAY

The alarm display can be viewed and downloaded by accessing the QR Code below.

Alarm display list QR Code



Function codes (excerpt)

Function code	Name	Data setting range
F01	Frequency setting 1	0: Keypad key operation (\overline{R} / \overline{L} keys) 1: Analog voltage input (terminal [12]) (0 to ±10 VDC) 2: Analog current input (terminal [C1]) (4 to 20 mA DC) 3: Analog voltage input (terminal [12]) + analog current input (terminal [C1]) 4: Analog voltage input (terminal [C1]) (0 to 10 VDC) 7: UP/DOWN control 8: Keypad key operation (\overline{R} / \overline{L} keys) (with balances bumps) 9: Pattern operation 11: Digital input/output interface card (option) 12: Pulse train input
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	5.0 to 599.0 Hz
F04	Base frequency 1	5.0 to 599.0 Hz
F05	Rated voltage at base frequency 1	0: VR disable (output voltage proportional to power supply voltage) 80 to 240 V: AVR enable (200V series) 160 to 520 V: AVR enable (400V series)
F06	Maximum output voltage 1	80 to 240 V: AVR enable (200V series) 160 to 520 V: AVR enable (400V series)
F07	Acceleration time 1	0.00 to 600.0 s 0: 0.0 s for acceleration and deceleration time cancel (when performing soft-start and stop externally)
F08	Deceleration time 1	0.0 to 599.0 Hz
F09	Torque boost 1	0.0 to 20.0% (% value against base frequency voltage 1)
F10	Electronic thermal overload protection for motor 1 (Motor characteristic selection)	1: Enable (for general-purpose motors with self-cooling fan) 2: Enable (for inverter-driven (FV) motors with separately excited fan) (Motor characteristic selection)
F11	(Operation level)	0.00 (disable), current value of 1 to 135% of inverter rated current set with A unit (inverter rated current is dependent on F80)
F14	Restart mode after momentary power failure (mode selection)	0: Tip immediately 1: Tip after a recovery from power failure 2: Tip after momentary deceleration is stopped 3: Continue to run (for heavy inertia load and general load) 4: Stop immediately after power failure (for general load) 5: Restart from starting frequency
F16	Frequency limiter (Low)	0.0 to 599.0 Hz
F26	Motor sound (Carrier frequency)	[FRN-E3E (Basic type)] [FRN-E3E (EMC filter built-in type)] • Inverter type: FRN-E3E-CO • 0.75 to 15 kHz: HND specification 0001 to 011, HND specification 0001 to 0010, 0030 to 0088 • 0.75 to 15 kHz: HND specification 0012 to 010, HND specification 0012 to 0059 • Inverter type: FRN-E3E-4G • 0.75 to 15 kHz: HND specification 0002 to 0072, HND specification 0002 to 0059 • 0.75 to 15 kHz: HND specification 0072, HND specification 0002 to 0059 • 0.75 to 15 kHz: HND specification 0002 • Inverter type: FRN-E3E-7G • 0.75 to 15 kHz: HND specification 0001 to 0012, FRN-E3E, 0001 to 0011, FRN-E3E • 0.75 to 15 kHz: HND specification 0001 to 0012, FRN-E3E
P02	Motor 1 (capacity)	0.01 to 1000 kW (when P99 = 0 or 4, 15) 0.01 to 1000 HP (when P99 = 1)
P03	(Rated current)	0.00 to 2000 A
P04	(Auto-tuning)	0: Disable 1: Stop tuning 2: Stop tuning 3: Stop tuning (SRT) 4: Synchronous motor magnetic pole position offset tuning 5: Stop tuning (SRT) 6: Stop tuning (SRT)
P99	Motor 1 selection	0: Motor characteristics 0 (Fuji standard IM, B-series) 1: Motor characteristics 1 (HP rating motor) 2: Motor characteristics 0 (Refer to replacement material when using FUJI IM, G-series.) 4: Other IMs 5: Motor characteristics 5 (Fuji premium efficiency motors) 20: Other (synchronous motor) 21: Motor characteristics (Fuji synchronous motor (GN2) series) 22: Motor characteristics (Fuji synchronous motor (GNP) series)

Chapter 6 MAINTENANCE AND INSPECTION

6.1 Inquiry Inquiries and Warranty

6.1.1 Product Inquiry

If necessary to make an inquiry relating to such aspects as product failure or damage, or anything that is in doubt, please notify Fuji Electric of the following.
1) Inverter type: Refer to Chapter 1 "1.1 Acceptance Inspection (Nameplates and Inverter Type)".
2) SER No. (serial number of equipment): Refer to Chapter 1 "1.1 Acceptance Inspection (Nameplates and Inverter Type)".
3) Any function code data that has been changed from the factory default values (See User's Manual (2A47-E-0173)).
4) Date of purchase.
5) Inquiries (for example, point and extent of breakage, uncertainties, failure phenomena, and other circumstances).

6.1.2 Product Warranty

To all our customers who purchase Fuji Electric products included in this documentation:
Please take the following 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 the 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 Scope
(1) **The product 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 plate, whichever date is earlier.
2) However, in cases where the use environment, conditions of use, frequency and time 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 scope**
1) 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.
(a) The failure was caused by inappropriate conditions, environment, handling or usage methods, etc., which are not specified in the catalog, instruction manual, specifications, or other related documents.
(b) The failure was caused by some reason other than the purchased or delivered Fuji Electric product.
(c) The failure was unrelated to a Fuji Electric product, such as a problem with the design of the customer's equipment or software.
(d) The failure was caused by running a program other than that supplied by Fuji Electric for a programmable Fuji Electric product, or as a result of using such a program.
(e) The failure was caused by disassembly, modifications, or repairs carried out by a party other than Fuji Electric.
(f) The failure was caused by a failure in maintenance or repair of the inverter, as specified in the Instruction Manual (Detailed Edition).
(g) The failure was caused by a scientific/technical problem that was not foreseen when making practical application of the product at the time it was purchased or delivered.
(h) The product was not used in the manner in which it was originally intended to be used.
(i) The failure was caused by a failure in maintenance, such as natural or other disaster.
2) Furthermore, the warranty specified herein shall be limited solely to the purchased or delivered product.
(3) The upper limit for the warranty scope 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 a failure of the purchased or delivered product shall be excluded from coverage by this warranty.

6.1.2.2 Exclusion of Liability for Loss of Opportunity, etc.

Regardless of whether a failure occurs during or after the free of charge warranty period, Fuji Electric 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 Fuji Electric's products, whether or not such products are covered by this warranty. Fuji Electric is not responsible for claims for compensation.

6.1.2.3 Repair period after production stoppage, spare parts supply period (maintenance period)

With regards to models (products) which have gone out of production, Fuji Electric shall carry out repairs for a period of 7 years following production stoppage, from the month and year when the production stoppage occurs. In addition, Fuji Electric shall continue to supply the spare parts required for repairs for a period of 7 years, from the month and year when the production stoppage occurs. However, if it is estimated that the life cycle of certain electronic and other parts is short, it will be difficult to procure or produce those parts, there may be cases where it is difficult to provide repairs or supply spare parts even within this 7-year period. For details, please confirm with the Fuji Electric business office or our service office.

6.1.2.4 Delivery office or service office

The product delivered and handed over to the customer shall be the standard product for which no settings have been specified, or adjustments made with an application, and Fuji Electric accepts no responsibility for any on-site adjustments or test operation.

6.1.2.5 Service responsibility

The price of the purchased or delivered product does not include service costs such as those required for dispatching technicians and so on. Fuji Electric will be more than happy to discuss this further upon request.

6.1.2.6 Applicable scope of service

The above content applies to transactions and use within Japan. Please consult your dealer or Fuji Electric regarding transactions or use outside Japan.

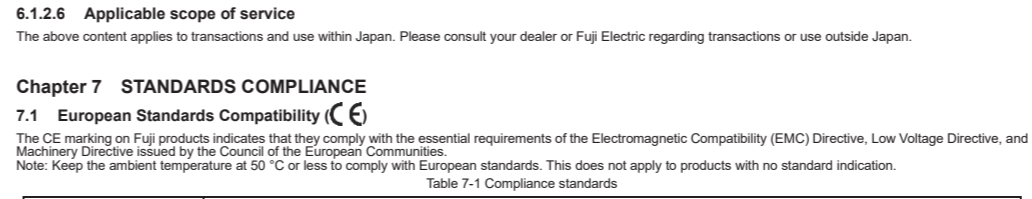
Chapter 7 STANDARDS COMPLIANCE

7.1 European Standards Compatibility (CE)

The CE marking on Fuji products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive, Low Voltage Directive, and Machinery Directive issued by the Council of the European Communities.
Note: Keep the ambient temperature at 50 °C or less to comply with CE standards. This does not apply to products with no standard indication.
EMC Directive: EN 61000-3 Immunity, Second environment (Industrial) Emission: Category C2 (Applicable only when an optional EMC-compliant filter is attached.) Category C2 (FRN01E3E-4G or below, FRN001E3E-7G or below) Category C3 (FRN02E3E-4G or below) (Applicable only to the EMC filter built-in type of inverters)
Low Voltage Directive: Adjustable speed electrical power drive systems. Part 5: EMC (EMC filter built-in type and function code F29)
Machine Directives: EN ISO 13849-1: Cat 3 PL e EN ISO 13849-2: Cat 3 PL e EN 18100-2-1: SIL 3 (Functional Safety, O)

7.2 Compliance with UL Standards and Canadian Standards (cUL Certification)

UL Standards (Underwriters Laboratories Inc. standards) are North American safety standards used to prevent fire and other such accidents, and offer protection to users, service technicians, and the general public. cUL indicates that products which comply with UL standards are certified by UL. cUL certified products are as effective as those certified as complying with UL standards.
7.2.2 UL Standards and Canadian Standards (cUL Certification) Compatibility
Compatibility with UL Standards (UL1800-5-10) and Canadian Standards (cUL certification: C22.2 No.274-17) is ensured by installing inverters with UL / cUL marking in accordance with the following.
UL Standards and Canadian Standards (cUL Certification) Compatibility
WARNING
High available fault current – damage warning:
The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If removal of the current element of an overload relay occurs, the complete overload relay must be replaced.
CAUTION
1. Solid state motor overload protection (motor protection by electronic thermal overload relay) is provided in each model.
Use function codes F10 to F12 to set the protection level, refer to the description below.
F10: Electronic thermal overload protection for motor (Select motor characteristics)
1: Enable (for general-purpose motors with self-cooling fan)
2: Enable (for inverter-driven motors with separately powered cooling fan)
F11: (Overload detection level)
0.00 (disable), current value of 1 to 135% of inverter rated current (dependent on F80)
F12: (Thermal time constant)
0.5 to 75.0 min. Refer to the graph on the right.



Inverter type	UL Standard	Canadian Standard	UL Standard	Canadian Standard
FRN001E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN002E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN003E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN004E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN005E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN006E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN007E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN008E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN009E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN010E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN011E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN012E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN013E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN014E3-2	UL1800-5-10	C22.2 No.274-17	14(2,1)	14(2,1)
FRN015E3-2				