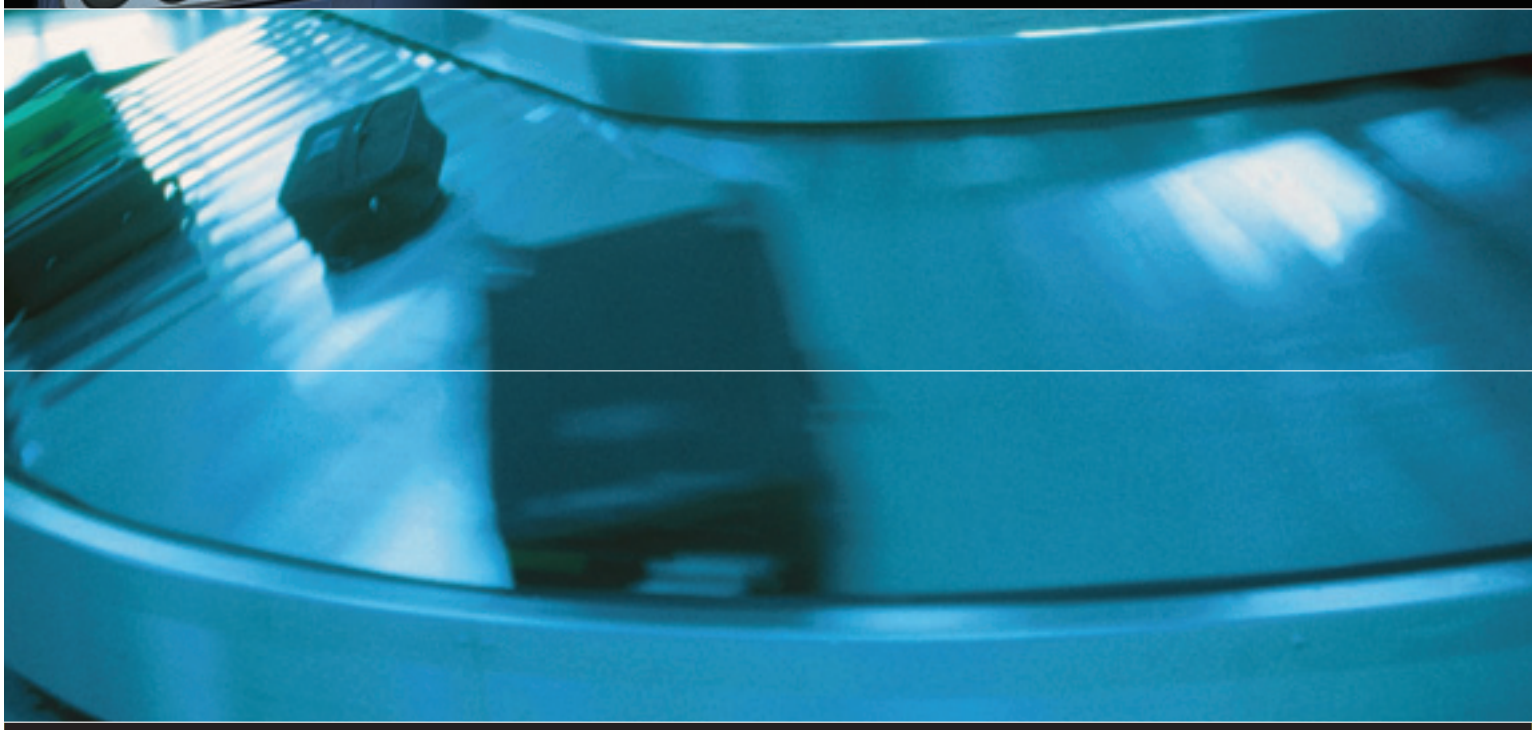
e-Front runners

High Performance Compact Inverters

FRENIC-Multi Series

FRENIC Multi



FUJI INVERTERS

HIGH PERFORMANCE THROUGH COMPACT DEDICATED DESIGNS

WELCOME TO A NEW GENERATION OF MULTI-USE INVERTERS

c UL us LISTED CE

MEH653b

With advanced technology built in, these new

Gentler on the environment!

Complies with European regulations that limit the use of specific hazardous substances (RoHS).

These inverters are gentle on the environment.
Use of 6 hazardous substances is limited. (Products manufactured beginning in the autumn of 2005 will comply with European regulations (except for interior soldering in the power module.))

<Six Hazardous Substances>
Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated biphenyl (PBB), Polybrominated diphenyl ether (PBDE)

<About RoHS>
The Directive 2002/95/EC, promulgated by the European Parliament and European Council, limits the use of specific hazardous substances included in electrical and electronic devices.

Long-life design!

The design life of each internal component with limited life has been extended to 10 years. This helps to extend the maintenance cycle for your equipment.

Limited Life Component	Service Life
Main circuit capacitors	10 years
Electrolytic capacitors on the printed circuit board	10 years
Cooling fan	10 years

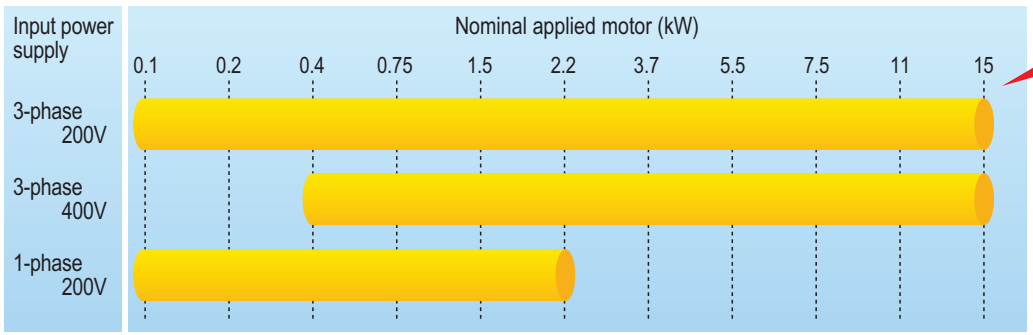
Conditions: Ambient temperature is 40°C and load factor is 80% of the inverter's rated current.

Noise is reduced by the built-in EMC filter.

Use of a built-in EMC filter that reduces noise generated by the inverter makes it possible to reduce the effect on peripheral equipment.

Expanded capacity range and abundant model variation!

●Standard Series



Capacity expanded to 15kW

●Semi-Standard type
- EMC filter built-in type

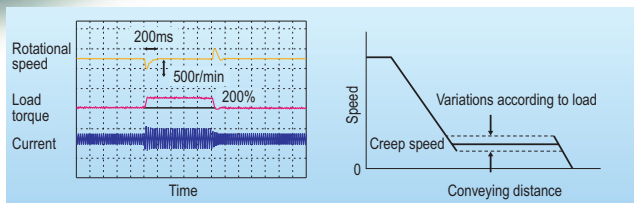
●Option card
- PG interface card (5V type)(12V type)
- RS-485 communication card
- Synchronized operation card

inverters can be used for multiple purposes!

The highest standards of control and performance in its class!

Shortened setting time in slip compensation control

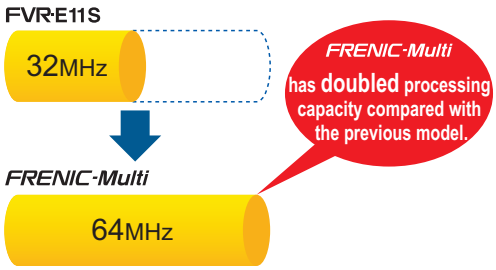
Through "slip compensation control" + "voltage tuning," speed control accuracy at low speeds is improved. This minimizes variations in speed control accuracy at times when the load varies, and since the time at creep speeds is shortened, single cycle tact times can be shortened.



Equipped with the highest level CPU for its class!

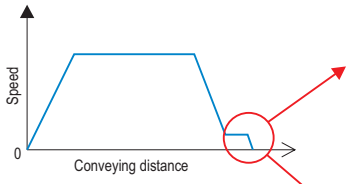
The highest level CPU of any inverter is used. Computation and processing capacity is doubled over the previous inverter, improving speed control accuracy.

●CPU speed comparison

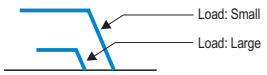


Compatible with PG feedback control

<Example of conveyor operation pattern>



■ Without speed feedback



The speed just before positioning varies, so positioning accuracy drops.

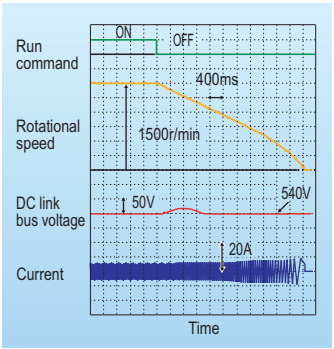
■ With speed feedback

The speed just before positioning is stabilized, and so positioning accuracy is improved.

- Improved speed control accuracy improves conveyor positioning accuracy.
- Positioning time can be shortened.
- Improves measuring accuracy on a scale.

Tripless deceleration by automatic deceleration control

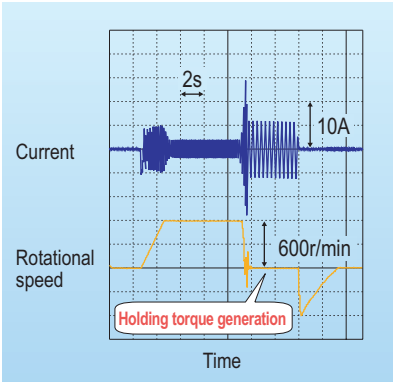
The inverter controls the energy level generated and the deceleration time, and so deceleration stop can be accomplished without tripping due to overvoltage.



Optimum for the operations specific to vertical and horizontal conveyance!

Hit-and-stop control is realized more easily!

Impacts are detected mechanically and not only can the inverter's operation pattern be set on coast-to-stop or deceleration stop, but switching from torque limitation to current limitation and generating a holding torque (hit-and-stop control) can be selected, making it easy to adjust brake application and release timing.



Inclusion of a brake signal makes it even more convenient.

■ **At brake release time**
After the motor operates, torque generation is detected and signals are output.

■ **At brake application time**
Brake application that matches the timing can be done, and so mechanical brake wear is reduced.

Limit operations can be selected to match your equipment!

Inverters are equipped with two limit operations, "torque limitation" and "current limitation," so either can be selected to match the equipment you are using the inverter with.

■ **Torque limitation**
In order to protect mechanical systems, this function accurately limits the torque generated by the motor. (Instantaneous torque cannot be limited.)

■ **Current limitation**
This function limits the current flowing to the motor to protect the motor thermally or to provide rough load limitation. (Instantaneous current cannot be limited. Auto tuning is not required.)

Simple and thorough maintenance!

The life information on each of the inverter's limited life components is displayed.

Simple cooling fan replacement!

Construction is simple, enabling quick removal of the top cover and making it easy to replace the cooling fan. (5.5kW or higher models)

Cooling fan replacement procedure

The cover on top of the inverter can be quickly removed.

Simply disconnect the power connector and replace the cooling fan.

Information that contributes to equipment maintenance is displayed!

In addition to inverter maintenance information, data that also take equipment maintenance into consideration are displayed.

Item	Purpose
Motor cumulative running time (hr)	The actual cumulative running time of the equipment (motor) the inverter is being used with is calculated. <Example of use> If the inverter is used to control a fan, this information is an indication of the timing for replacing the belt that is used on the pulleys.
Number of starts (times)	The number of times the inverter starts and stops can be counted. <Example of use> The number of equipment starts and stops is recorded, and so this information can be used as a guideline for parts replacement timing in equipment in which starting and stopping puts a heavy load on the machinery.

The alarm history records the latest four incidents.

Detailed information can be checked for the four most recent alarms.

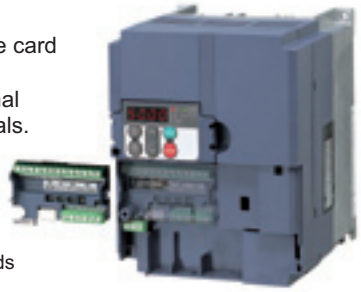
Simple operation, simple wiring!

A removable keypad is standard equipment.

The keypad can be easily removed and reset, making remote operation possible. If the back cover packed with the inverter is installed and a LAN cable is used, the keypad can be easily mounted on the equipment's control panel.

A removable interface card is adapted.

Wiring is quite easy because the interface card can be attached and detached as a terminal base for control signals.



The following option cards are available.

Option card names	Installation method
RS-485 communication card	Built in the inverter (replaced with the standard interface card)
PG interface card (for 5V)	Built in the inverter (replaced with the standard interface card)
PG interface card (for 12V)	Built in the inverter (replaced with the standard interface card)
CC-Link card	Front installation type
DeviceNet card	Front installation type
DIO card	Front installation type
SY (synchronized operation) card	Front installation type
PROFIBUS-DP card	Front installation type

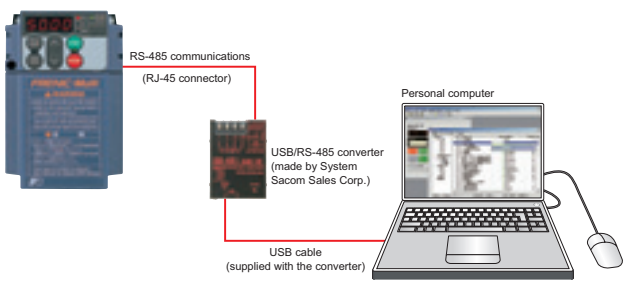
Note) The inverter that can be used with the SY card includes special specifications. When ordering the SY card, please order together with the inverter in a set.

A multi-function keypad which enables a wide variety of operations is available.

A multi-function keypad is available as an option. This keypad features a large 7-segment LED with five digits and large back-lighted liquid crystal panel. Its view-ability is high, and guidance is displayed on the liquid crystal panel, therefore operations can be conducted simply. (A copy function is included.)

Inverter support loader software is available.

Windows compatible loader software is available to simplify the setting and management of function codes.



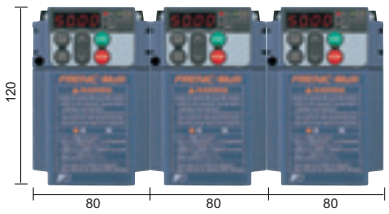
Simulated failure enables peripheral device operation checks.

The inverter has the function for outputting dummy alarm signals, enabling simple checking of sequence operations of peripheral devices from the control panel where the inverter is used.

Consideration of peripheral equipment, and a full range of protective functions!

Side-by-side mounting saves space!

If your control panel is designed to use multiple inverters, these inverters make it possible to save space through their horizontal side-by-side installation. (3.7kW or smaller models)



(The 3-phase 200V, 0.75kW model is shown here.)

Resistors for suppressing inrush current are built in, making it possible to reduce the capacity of peripheral equipment.

When FRENIC-Multi Series (including FRENIC-Mini Series, FRENIC-Eco Series and 11 Series) is used, the built-in resistor suppresses the inrush current generated when the motor starts. Therefore, it is possible to select peripheral equipment with lower capacity when designing your system than the equipment needed for direct connection to the motor.

Outside panel cooling is also made possible using the mounting adapter for external cooling (option).

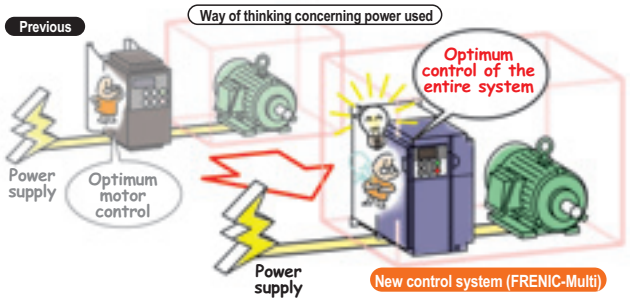
The mounting adapter for external cooling (option) can be installed easily as an outside panel cooling system. This function is standard on 5.5kW or higher models.

You can use an inverter equipped with functions like these!

First time in the industry

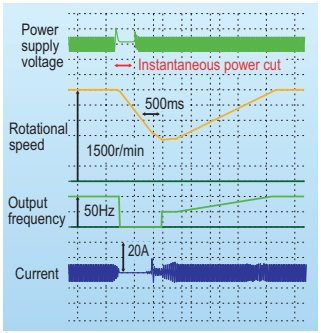
New system for more energy-efficient operation!

Previous energy saving operation functions worked only to control the motor's loss to keep it at a minimum in accordance with the load condition. In the newly developed FRENIC-Multi Series, the focus has been switched away from the motor alone to both the motor and the inverter as electrical products. As a result, we incorporated a new control system (optimum and minimum power control) that minimizes the power consumed by the inverter itself (inverter loss) and the loss of the motor.



Smooth starts through the pick-up function!

In the case where a fan is not being run by the inverter but is turning free, the fan's speed is checked, regardless of its rotational direction, and operation of the fan is picked up to start the fan smoothly. This function is convenient in such cases as when switching instantaneously from commercial power supply to the inverter.

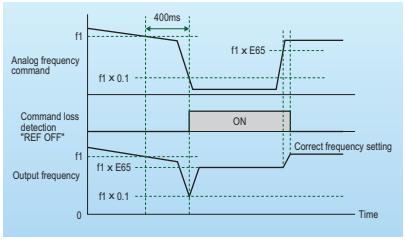


Equipped with a full range of PID control functions!

Differential alarm and absolute value alarm outputs have been added for PID adjusters which carry out process controls such as temperature, pressure and flow volume control. In addition, an anti-reset windup function to prevent PID control overshoot and other PID control functions which can be adjusted easily through PID output limiter, integral hold/reset signals are provided. The PID output limiter and integral hold/reset signals can also be used in cases where the inverter is used for dancer control.

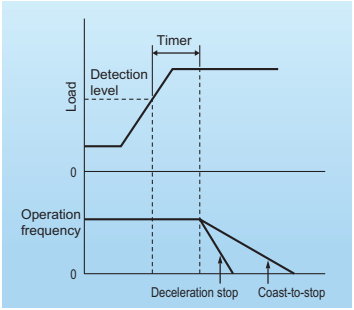
Operating signal trouble is avoided by the command loss detection function!

If frequency signals connected to the inverter (0 to 10V, 4 to 20mA, Multi-speed signals, communications, etc.) are interrupted, the missing frequency commands are detected as a "command loss." Further, the frequency that is output when command loss occurs can be set in advance, so operation can be continued even in cases where the frequency signal lines are cut due to mechanical vibrations of the equipment, etc.



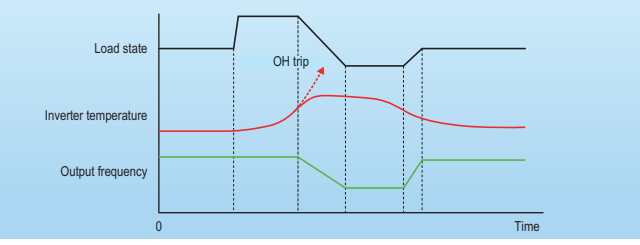
An overload stop function protects equipment from over-operation!

If the load on equipment suddenly becomes great while controlled by the inverter, the inverter can be switched to deceleration stop or to coast-to-stop operation to prevent damage to the equipment.



Continuous equipment operation with overload avoidance control!

If foreign matter gets wrapped around a fan or pulley and the load increases, resulting in a sudden temperature rise in the inverter or an abnormal rise in the ambient temperature, etc. and the inverter becomes overloaded, it reduces the motor's speed, reducing the load and continuing operation.



Fully compatible with network operation!

RS-485 communications (connector) is standard!

A connector (RJ-45) that is compatible with RS-485 communications is standard equipment (1 port, also used for keypad communications), so the inverter can be connected easily using a LAN cable (10BASE).

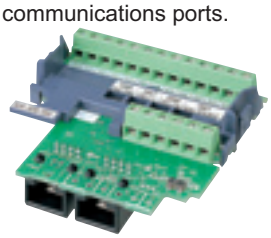
Complies with optional networks using option cards. (Available soon)

Installation of special interface cards (option) makes it possible to connect to the following networks.

•DeviceNet	•CC-Link
•PROFIBUS-DP	

Wiring is easy with the RS-485 communications card (optional)!

The RS-485 communications card is also available as an option. When it is installed, you can add a branch connection that is separate from the communications port provided as standard equipment (RJ-45 connector), and have two communications ports.

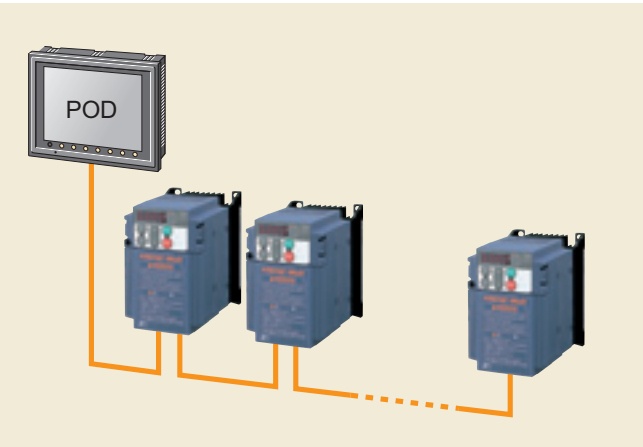


■ **Important Points**

(1) A separate branch adaptor is not required because of two ports.

(2) The built-in terminal ting resistor makes provision of a separate terminal ting resistor unnecessary.

■ **Example of connection configuration with peripheral equipment**



Global compatibility!

Europe	North America/Canada
EC Directives (CE Mark)	UL Standard (cUL Certified)
CE	c UL us LISTED

- ●Complies with standards
- ●Sink/Source switchable
- ●Wide voltage range
- ●The multi-function keypad displays multiple languages (Japanese,
- ●English, German, French, Spanish, Italian, Chinese, Korean).

* This product supports multiple languages such as Japanese, English, German, French, Spanish and Italian. Another multiple language version is also available, which supports Japanese, English, Chinese, Korean and simplified Chinese. (Contact us for the detail separately.)

Safety Precautions	1. Use the contents of this catalog only for selecting product types and models. When using a product, read the Instruction Manual beforehand to use the product correctly. 2. Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives. Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, and traffic control, are requested to consult the Fuji's Sales Division. Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.

Variation

Model List

Applicable motor rating (kW)	Standard type EMC filter built-in type		Semi-standard type	
	Three-phase 400V series	Single-phase 200V series	Three-phase 400V series	Single-phase 200V series
0.1		FRN0.1E1E-7E		FRN0.1E1S-7E
0.2		FRN0.2E1E-7E		FRN0.2E1S-7E
0.4	FRN0.4E1E-4E	FRN0.4E1E-7E	FRN0.4E1S-4E	FRN0.4E1S-7E
0.75	FRN0.75E1E-4E	FRN0.75E1E-7E	FRN0.75E1S-4E	FRN0.75E1S-7E
1.5	FRN1.5E1E-4E	FRN1.5E1E-7E	FRN1.5E1S-4E	FRN1.5E1S-7E
2.2	FRN2.2E1E-4E	FRN2.2E1E-7E	FRN2.2E1S-4E	FRN2.2E1S-7E
4.0	FRN4.0E1E-4E		FRN4.0E1S-4E	
5.5	FRN5.5E1E-4E		FRN5.5E1S-4E	
7.5	FRN7.5E1E-4E		FRN7.5E1S-4E	
11	FRN11E1E-4E		FRN11E1S-4E	
15	FRN15E1E-4E		FRN15E1S-4E	

How to read the inverter model

FRN 0.75 E 1 E - 4 E

Code	Series name
FRN	FRENIC series

Code	Applicable motor rating
0.1	0.1kW
0.2	0.2kW
0.4	0.4kW
0.75	0.75kW
↓	↓
7.5	7.5kW
11	11kW
15	15kW

Code	Application range
E	High performance/Compact

Code	Developed inverter series
1	Series

Code	Destination, Instruction manuals
E	Europe, English

Code	Input power source
4	Three-phase 400V
7	Single-phase 200V

Code	Enclosure
E	EMC filter built-in type
S	Semi-standard type (IP20)

Caution The contents of this catalog are provided to help you select the product model that is best for you. Before actual use, be sure to read the User's Manual thoroughly to assure correct operation.

Specifications

●Standard type

EMC filter built-in type

■Three-phase 400V series (0.4 to 15kW)

Item			Specifications								
Type (FRN□□□E1E-4E)			0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Nominal applied motor [kW] (*1)			0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Output ratings	Rated capacity [kVA] (*2)		1.1	1.9	2.8	4.1	6.8	9.9	13	18	22
	Rated voltage [V] (*3)		Three-phase 380 to 480V (with AVR)								
	Rated current [A] (*4)		1.5	2.5	3.7	5.5	9.0	13	18	24	30
	Overload capability		150% of rated current for 1min or 200% of rated current for 0.5s								
	Rated frequency		50, 60Hz								
Input ratings	Phases, voltage, frequency		Three-phase, 380 to 480V, 50/60Hz								
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance: 2% or less(*7)), Frequency: +5 to -5%								
	Rated current [A] (*8)	(with DCR)	0.85	1.6	3.0	4.4	7.3	10.6	14.4	21.1	28.8
		(without DCR)	1.7	3.1	5.9	8.2	13.0	17.3	23.2	33.0	43.8
	Required power supply capacity [kVA] (*5)		0.6	1.1	2.0	2.9	4.9	7.4	10	15	20
Braking	Torque [%] (*6)		100		70	40		20			
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100%								
	Braking transistor		Built-in								
Applicable safety standards			UL508C,C22.2No.14 (pending), EN50178:1997								
Enclosure			IP20 (IEC60529)/UL open type (UL50)								
Cooling method			Natural cooling		Fan cooling						
EMC standard compliance	Emission		Class 1A (EN55011:1998/A1:1999)					2nd Env. (EN61800-3:1996+A11:2000)			
	Immunity		2nd Env. (EN61800-3:1996/A11:2000)								
Weight / Mass [kg]			1.5	1.6	2.5	2.5	3.0	TBD	TBD	TBD	TBD

■Single-phase 200V series (0.1 to 2.2kW)

Item			Specifications					
Type (FRN□□□E1E-7E)			0.1	0.2	0.4	0.75	1.5	2.2
Nominal applied motor [kW] (*1)			0.1	0.2	0.4	0.75	1.5	2.2
Output ratings	Rated capacity [kVA] (*2)		0.30	0.57	1.1	1.9	3.0	4.1
	Rated voltage [V] (*3)		Three-phase 200V to 240V (with AVR)					
	Rated current [A] (*4)		0.8 (0.7)	1.5 (1.4)	3.0 (2.5)	5.0 (4.2)	8.0 (7.0)	11 (10)
	Overload capability		150% of rated current for 1min or 200% of rated current for 0.5s					
	Rated frequency [Hz]		50, 60Hz					
Input ratings	Phases, voltage, frequency		Single-phase, 200 to 240V, 50/60Hz					
	Voltage/frequency variations		Voltage: +10 to -10%, Frequency: +5 to -5%					
	Rated current [A] (*8)	(with DCR)	1.1	2.0	3.5	6.4	11.6	17.5
		(without DCR)	1.8	3.3	5.4	9.7	16.4	24.8
	Required power supply capacity [kVA] (*5)		0.3	0.4	0.7	1.3	2.4	3.5
Braking	Torque [%] (*6)		150		100		70	40
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100%					
	Braking transistor		Built-in					
Applicable safety standards			UL508C, C22.2No.14 (pending), EN50178:1997					
Enclosure			IP20 (IEC60529)/UL open type (UL50)					
Cooling method			Natural cooling				Fan cooling	
EMC standard compliance	Emission		Class 1A (EN55011:1998/A1:1999)					
	Immunity		2nd Env. (EN61800-3:1996/A11:2000)					
Weight / Mass [kg]			0.7	0.7	0.8	1.3	2.5	3.0

*1) Fuji's 4-pole standard motor
*2) Rated capacity is calculated by regarding the output rated voltage as 220V for three-phase 200V series.
*3) Output voltage cannot exceed the power supply voltage.
*4) The load shall be reduced so that the continuous operating current is the rated current in parenthesis or less if the carrier frequency is set to 4kHz or above.
*5) Obtained when a DC REACTOR is used.
*6) Average braking torque when a motor of no load decelerates. (Varies with the efficiency of the motor.)
*7) Voltage unbalance [%] = $\frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}}$ x 67 (IEC61800-3(5.2.3))
If this value is 2 to 3%, use an AC REACTOR.
*8) The currents are calculated on the condition that the inverters are connected to power supply of 500kVA, %x=5%.

●Semi-standard type

■Three-phase 400V series (0.4 to 15kW)

Item			Specifications								
Type (FRN□□□E1S-4E)			0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Nominal applied motor [kW] (*1)			0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Output ratings	Rated capacity [kVA] (*2)		1.1	1.9	2.8	4.1	6.8	9.9	13	18	22
	Rated voltage [V] (*3)		Three-phase 380V to 480V (with AVR)								
	Rated current [A] (*4)		1.5	2.5	3.7	5.5	9.0	13	18	24	30
	Overload capability		150% of rated current for 1min or 200% of rated current for 0.5s								
	Rated frequency [Hz]		50, 60Hz								
Input ratings	Phases, voltage, frequency		Three-phase, 380 to 480V, 50/60Hz								
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance : 2% or less(*7)) Frequency: +5 to -5%								
	Rated current [A] (*8)	(with DCR)	0.85	1.6	3.0	4.4	7.3	10.6	14.4	21.1	28.8
		(without DCR)	1.7	3.1	5.9	8.2	13.0	17.3	23.2	33.0	43.8
	Required power supply capacity [kVA] (*5)		0.6	1.1	2.0	2.9	4.9	7.4	10	15	20
Braking	Torque [%] (*6)		100		70	40		20			
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100%								
	Braking transistor		Built-in								
Applicable safety standards			UL508C, C22.2No.14 (pending), EN50178:1997								
Enclosure			IP20 (IEC60529)/UL open type (UL50)								
Cooling method			Natural cooling		Fan cooling						
Weight / Mass [kg]			1.1	1.2	1.7	1.7	2.3	3.4	3.6	6.1	7.1

■Single-phase 200V series (0.1 to 2.2kW)

Item			Specifications					
Type (FRN□□□E1S-7E)			0.1	0.2	0.4	0.75	1.5	2.2
Nominal applied motor [kW] (*1)			0.1	0.2	0.4	0.75	1.5	2.2
Output ratings	Rated capacity [kVA] (*2)		0.3	0.57	1.1	1.9	3.0	4.1
	Rated voltage [V] (*3)		Three-phase 200V to 240V (with AVR)					
	Rated current [A] (*4)		0.8 (0.7)	1.5 (1.4)	3.0 (2.5)	5.0 (4.2)	8.0 (7.0)	11 (10)
	Overload capability		150% of rated current for 1min or 200% of rated current for 0.5s					
	Rated frequency [Hz]		50, 60Hz					
Input ratings	Phases, voltage, frequency		Single-phase, 200 to 240V, 50/60Hz					
	Voltage/frequency variations		Voltage: +10 to -10%, Frequency: +5 to -5%					
	Rated current [A] (*8)	(with DCR)	1.1	2.0	3.5	6.4	11.6	17.5
		(without DCR)	1.8	3.3	5.4	9.7	16.4	24.8
	Required power supply capacity [kVA] (*5)		0.3	0.4	0.7	1.3	2.4	3.5
Braking	Torque [%] (*6)		150		100		70	40
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100%					
	Braking transistor		Built-in					
Applicable safety standards			UL508C, C22.2No.14 (pending), EN50178:1997					
Enclosure			IP20 (IEC60529)/UL open type (UL50)					
Cooling method			Natural cooling				Fan cooling	
Weight / Mass [kg]			0.6	0.6	0.7	0.9	1.8	2.4

(*1) Fuji's 4-pole standard motor
(*2) Rated capacity is calculated by regarding the output rated voltage as 220V for three-phase 200V series.
(*3) Output voltage cannot exceed the power supply voltage.
(*4) The load shall be reduced so that the continuous operating current is the rated current in parenthesis or less if the carrier frequency is set to 4kHz or above.
(*5) Obtained when a DC REACTOR is used.
(*6) Average braking torque when a motor of no load decelerates. (Varies with the efficiency of the motor.)
(*7) Voltage unbalance [%] = $\frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}}$ x 67 (IEC61800-3(5.2.3))
If this value is 2 to 3%, use an AC REACTOR.
(*8) The currents are calculated on the condition that the inverters are connected to power supply of 500kVA, %x=5%.

Specifications

●Common specifications

Item			Explanation	Remarks	Related function code
Output frequency	Setting range	Maximum frequency	25 to 400Hz variable setting		F03
		Base frequency	25 to 400Hz variable setting		F04
		Starting frequency	0.1 to 60.0Hz variable setting, Duration: 0.0 to 10.0s		F23,F24
		Carrier frequency	0.75 to 15kHz variable setting	Frequency may drop automatically to protect the inverter depending on environmental temperature and output current.This protective operation can be canceled by function code H98.	F26 F27 H98
	Accuracy (Stability)		• Analog setting: ±0.2% of maximum frequency (at 25±10˚C) • Keypad setting: ±0.01% of maximum frequency (at -10 to +50˚C)		
	Setting resolution		• Analog setting: 1/3000 of maximum frequency (ex. 0.02Hz at 60Hz, 0.4Hz at 120Hz) • Keypad setting: 0.01Hz (99.99Hz or less), 0.1Hz (100.0Hz or more) • Link setting: Selectable from 2 types • 1/2000 of maximum frequency (ex. 0.003Hz at 60Hz, 0.006Hz at 120Hz) • 0.01Hz (fixed)	Setting with ∧ and ∨ keys	
Control	Control method		• V/f control • Dynamic torque-vector control (magnetic flux estimator) • V/f control (with sensor, when the PG interface card (option) is installed)		
	Voltage/freq. characteristic		Possible to set output voltage at base frequency and at maximum output frequency (common spec). AVR control can be turned ON or OFF (Factory setting: OFF).	Three-phase 200V, single-phase 200V: 80 to 240V Three-phase 400V: 160 to 500V	F03 to F06
	(Non-linear V/f setting)		2 points (Desired voltage and frequency can be set.)	Three-phase and single-phase 200V: 0 to 240V/0 to 400Hz Three-phase 400V: 0 to 500V/0 to 400Hz	H50 to H53
	Torque boost		Torque boost can be set with the function code F09.	Set when 0, 1, 3, or 4 is selected at F37.	F09, F37
	(Load selection)		Select application load type with the function code F37. 0: Squared variable torque load 1: Constant torque load 2: Auto torque boost 3: Auto energy-save operation (variable torque load in deceleration) 4: Auto energy-save operation (constant torque load) 5: Auto energy-save operation (auto torque boost)		F09, F37
	Starting torque		200% or over (Auto torque boost in 0.5Hz operation, slip compensation and auto torque boost)		H68, F37
	Start/stop	Keypad operation	Start and stop with RUN and STOP keys	Keypad (standard)	F02
			Start and stop with FWD / REV and STOP keys	Multi-function keypad	F02
			External signals (7digital inputs): FWD (REV), RUN, STOP commands (3 wire operation possible), coast-to-stop, external alarm, alarm reset, etc.		E01 to E05 E98, E99
			Linked operation: Operation through RS485 or field buss (option) communications		H30, y98
			Switching operation command: Link switching, switching between communication and inverter (keypad or external signals)		
	Frequency setting		Key operation: Can be set with ∧ and ∨ keys	With data protection	F01, C30
			External volume: Can be set with external potentiometer (1 to 5kΩ1/2W)	Connected to analog input terminals 13, 12, and 11. Potentiometer must be provided.	
		Analog input	Analog input can be set with external voltage/current input • 0 to ±10V DC (0 to ±5V DC)/0 to ±100% (terminal 12, C1 (V2)) • +4 to +20mA DC/0 to 100% (terminal C1)	• 0 to +5V DC can be used depending on the analog input gain (200%). +1 to +5V DC can be adjusted with bias and analog input gain. • Voltage can be input (terminal V2) to the terminal 1.	F18, C50, C32 to C34, C37 to C39, C42 to C44
			Multistep frequency: Selectable from 16 steps (step 0 to 15)		C05 to C19
			UP/DOWN operation: Frequency can be increased or decreased while the digital input signal is ON.		F01, C30
			Linked operation: Frequency can be set through RS-485 or field buss (optional) communications.		H30, y98
			Switching frequency setting: Frequency setting can be switched (2 settings) with external signal (digital input). Switching to frequency setting via communication and multi-frequency setting are available.		F01, C30
			Auxiliary frequency setting: Terminal 12 input and terminal C1 input (terminal V2 input) can be added to main setting as auxiliary frequency.		E61 to E63
			Inverse operation: Normal/inverse operation can be set or switched with digital input signal and function code setting. • +10 to 0V DC /0 to 100% (terminal 12, C1 (V2)) • +20 to +4mA DC/0 to 100% (terminal C1)		C53
			Pulse train input: 30kHz (max.)/ Maximum output frequency	When the PG interface card (optional) is installed.	
	Acceleration/deceleration time		0.00 to 3600s *If 0.00s is set, the time setting is cancelled and acceleration and deceleration is made according to the pattern given with an external signal.		F07, F08
			Acceleration and deceleration time can be independently set with 2 types and selected with digital input signal (1 point).		E10,E11
	(Curve)		Acceleration and deceleration pattern can be selected from 4 types: Linear, S-curve (weak), S-curve (strong), Non-linear		H07
			Deceleration with coasting can be stopped with operation stop command.		H11
	Frequency limiter (Upper limit and lower limit frequencies)		High and Low limiters can be set. (Setting range: 0 to 400Hz)	If the set frequency is lower than lower limit, continuous motor running or stop running motor can be selected.	F15, F16 H63
	Bias		Bias of set frequency and PID command can be independently set (setting range: 0 to ±100%).		F18, C50 to C52
	Gain		Analog input gain can be set between 0 and 200%.	Voltage signal from terminal 12, C1 (V2) and current signal (from terminal C1) can be set independently.	C32, C34, C37 C39, C42, C44
	Jump frequency		Three operation points and their common jump width (0 to 30.0Hz) can be set.		C01 to C04
	Timer operation		The inverter operates and stops for the time set with the keypad (1-cycle operation).		C21
	Jogging operation		• Can be operated using digital input signal or keypad. • Acceleration and deceleration time (same duration used only for jogging) can be set. • Jogging frequency: 0.00 to 400.0Hz		H54 C20
	Auto-restart after momentary power failure		• Restarts the inverter without stopping the motor after instantaneous power failure. • Select "Continuous motor mode" to wait for the power recovering with low output frequency. • Restart at 0Hz, restart from the frequency used before momentary power failure, restart at the set frequency can be selected. • Motor speed at restart can be searched and restarted.		F14 H13 to H16 H92, H93
	Torque limit		• Controls the output torque lower than the set limit value. • Can be switched to the second torque limit with digital input signal. • Soft start (filter function) is available when switching the torque control to 1/2.		F40, F41 E16, E17 H76
	Current limit		Keeps the current under the preset value during operation.		F43, F44
	Slip compensation		• Compensates for decrease in speed according to the load, enabling stable operation. • Time constant can be changed. Possible to enable or disable slip compensation during acceleration/deceleration or in constant output range.		H68 P09 to P12
	Droop control		Decrease the speed according to the load torque.		H28

Item			Explanation	Remarks	Related function code
Control	PID control		Control with PID regulator or dancer controller. ■ Process command • Key operation (and keys) : 0 to 100% • Analog input (terminal 12, C1 (V2)) : 0 to ±10V DC/0 to ±100% • Analog input (terminal C1) : 4 to 20mA DC/0 to 100% • UP/DOWN (digital input) : 0 to 100% • Communication (RS-485, bus option) : 0 to 20000/0 to 100% ■ Feedback value • Analog input from terminal 12, C1 (V2) : 0 to ±10V DC/0 to ±100% • Analog input (terminal C1) : 4 to 20mA DC/0 to 100% ■ Accessory functions • Alarm output (absolute value alarm, deviation alarm) • Normal operation/inverse operation • PID output limiter • Anti-reset wind-up function • Integration reset/hold		E61 to E63 J01 to J06 J10 to J19
	Pick-up		Operation begins at a preset pick-up frequency to search for the motor speed to start an idling motor without stopping it.		H09, H13, H17
	Automatic deceleration		When the torque calculation value exceeds the limit level set for the inverter during deceleration, the output frequency is automatically controlled and the deceleration time automatically extends to avoid an OU trip.	Trip may occur due to load conditions.	H69, F08
	Deceleration characteristic		The motor loss increases during deceleration to reduce the load energy regenerating at the inverter to avoid an OU trip upon mode selection.		H71
	Automatic energy-saving operation		The output voltage is controlled to minimize the total sum of the motor loss and inverter loss at a constant speed.		F37, F09
	Overload Prevention Control		The output frequency is automatically reduced to suppress the overload protection trip o inverter caused by an increase in the ambient temperature, operation frequency, motor load or the like.		H70
	Auto-tuning		The motor parameters are automatically tuned.	Mode that the motor rotates and mode that the motor does not rotate can be selected.	P04
	Cooling fan ON/OFF control		Detects inverter internal temperature and stops cooling fan when the temperature is low.	An external output is issued in a transistor output signal.	H06
	Secondary motor setting		• One inverter can be used to control two motors by switching (switching is not available while a motor is running). Base frequency, rated current, torque boost, electronic thermal, slip compensation can be set as data for the secondary motor. • The second motor constants can be set in the inverter. (Auto-tuning possible)		
	Universal DI		The presence of digital signal in a device externally connected to the set terminal can be sent to the master controller.		
	Universal AO		The output from the master controller can be output from the terminal FM.		
	Speed control		The motor speed can be detected with the pulse encoder and speed can be controlled.	When the PG interface card (optional) Is installed.	
	Positioning control		Only one program can be executed by setting the number of pulses to the stop position and deceleration point.	When the PG interface card (optional) Is installed.	
	Rotation direction control		Select either of reverse prevention or forward rotation prevention.		
Indication	Running/stopping		• Speed monitor, output current [A], output voltage [V], torque calculation value, input power [kW], PID reference value, PID feedback value, PID output, load factor, motor output, period for timer operation [s] ◆Select the speed monitor to be displayed from the following: Output frequency [Hz], Output frequency 1 [Hz] (before slip compensation), Output frequency 2 (after slip compensation) [Hz], Motor speed (set value) [r/min], Motor speed [r/min], Load shaft speed (set value) [r/min], Load shaft speed (r/min), Line speed (set value), Line speed (r/min)		E43 E48
	Life early warning		The life early warning of the main circuit capacitors, capacitors on the PC boards and the cooling fan can be displayed.	An external output is issued in a transistor output signal.	
	Cumulative run hours		The cumulative motor running hours, cumulative inverter running hours and cumulative watt-hours can be displayed.		
	I/O check		Displays the input signal status of the inverter.		
	Power monitor		Displays input power (momentary), accumulated power, electricity cost (accumulated power x displayed coefficient).		
	Trip mode		Displays the cause of trip by codes. • OC 1 (Overcurrent during acceleration) • OC 2 (Overcurrent during deceleration) • OC 3 (Overcurrent at constant speed) • L in (Input phase loss) • LU (Undervoltage) • OPL (Output phase loss) • OU 1 (Overvoltage during acceleration) • OU 2 (Overvoltage during deceleration) • OU 3 (Overvoltage at constant speed) • OH 1 (Overheating of the heat sink) • OH 2 (External alarm) • OH 3 (Inverter overheat) • OH 4 (Motor protection (PTC thermistor)) • OL 1 (Motor 1 overload) • OL 2 (Motor 2 overload) • OL U (Inverter overload) • dbH (Overheating of braking resistor) • PG (PG disconnection) • Er 1 (Memory error) • Er 2 (Keypad communication error) • Er 3 (CPU error) • Er 4 (Optional communication error) • Er 5 (Option error) • Er 6 (Operation error) • Er 7 (Tuning error) • Er 8 (RS-485 communication error) • Er F (Data save error due to undervoltage) • Er P (RS485 communication error (option)) • Er H (Power LSI error) • Err (Simulation error)		
	Running or trip mode		Trip history: Saves and displays the last 4 trip codes and their detailed description.		E52
Protection	Overcurrent protection		The inverter is stopped upon an overcurrent caused by an overload.		
	Short circuit protection		The inverter is stopped upon an overcurrent caused by a short circuit in the output circuit.		
	Grounding fault protection		The inverter is stopped upon an overcurrent caused by a grounding fault in the output circuit.		
	Overvoltage protection		An excessive DC link circuit voltage is detected to stop the inverter.	3-phase 200V / 400V DC, Single-phase 200V/400V DC 3-phase 400V / 800V D	
	Undervoltage		Stops the inverter by detecting voltage drop in DC link circuit.	3-phase 200V / 200V DC, Single-phase 200V/400V DC 3-phase 400V / 400V DC	F14
	Input phase loss		Stops or protects the inverter against input phase loss.	The protective function can be canceled with function code 99.	H98
	Output phase loss		Detects breaks in inverter output wiring at the start of running and during running, stopping the inverter output.	The protective function can be canceled with function code 99.	H98
	Overheating		The temperature of the heat sink of the inverter or that inside the inverter unit is detected to stop the inverter, upon a failure or overload of the cooling fan.		H43
	Overload		The inverter is stopped upon the temperature of the heat sink of the inverter or the temperature of the switching element calculated from the output current.		
	Motor protection	Electronic thermal	The inverter is stopped upon an electronic thermal function setting to protect the motor.	Thermal time constant can be adjusted (0.5 to 75.0min.)	F10 to F12, P99
		PTC thermistor	A PTC thermistor input stops the inverter to protect the motor.		H26, H27
		Overload early warning	Warning signal can be output based on the set level before the inverter trips.		F10, F12, E34, E35, P99
	Stall prevention		The output frequency decreases upon an output current exceeding the limit during acceleration or constant speed operation, to avoid overcurrent trip.		H12
	Momentary power failure protection		• A protective function (inverter stoppage) is activated upon a momentary power failure for 15msec or longer. • If restart upon momentary power failure is selected, the inverter restarts upon recovery of the voltage within the set time.		H13 to H16 F14
	Retry function		When the motor is tripped and stopped, this function automatically resets the tripping state and restarts operation.	Waiting time before resetting and the number of retry times can be set.	H04, H05
	Command loss detection		A loss (broken wire, etc.) of the frequency command is detected to output an alarm and continue operation at the preset frequency (set at a ratio to the frequency before detection).		E65
Environment	Installation location		Shall be free from corrosive gases, flammable gases, oil mist, dusts, and direct sunlight. (Pollution degree 2 (IEC60664-1)). Indoor use only.		
	Ambient temperature		-10 to +50˚C	-10 to 40˚C when inverters are installed side by side without clearance.	
	Ambient humidity		5 to 95% RH (without condensation)		
	Altitude		Altitude [m] / Output decrease Lower than 1,000 / None 1,001 to 2,000 / Decreases 2,001 to 3,000 / Decreases*	* If the altitude exceeds 2,000m, insulate the interface circuit from the main power supply to conform to the Low Voltage Directives.	
	Vibration		3mm (vibration width): 2 to less than 9Hz, 9.8m/s^2: 9 to less than 20Hz, 2m/s^2: 20 to less than 55Hz, 1m/s^2: 55 to less than 200Hz		
	Storage	Ambient temp.	-25 to +65˚C		
		Ambient humidity	5 to 95%RH (without condensation)		

External Dimensions

●Inverter main body (EMC filter built-in type)

Fig. a

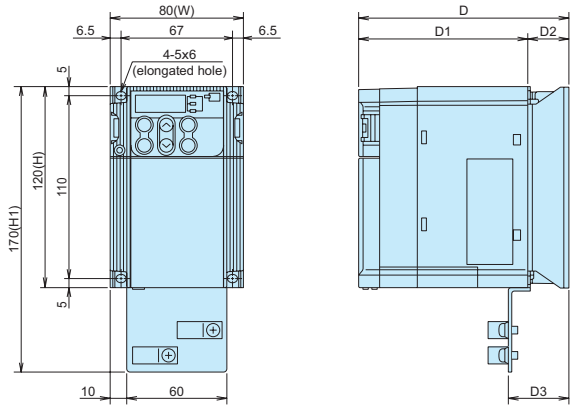


Fig. b

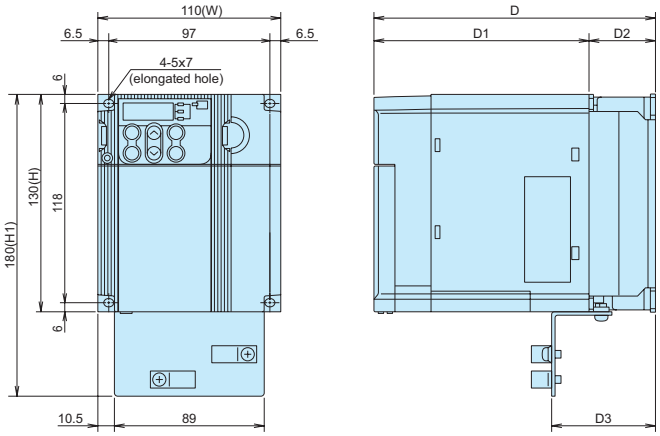


Fig.c

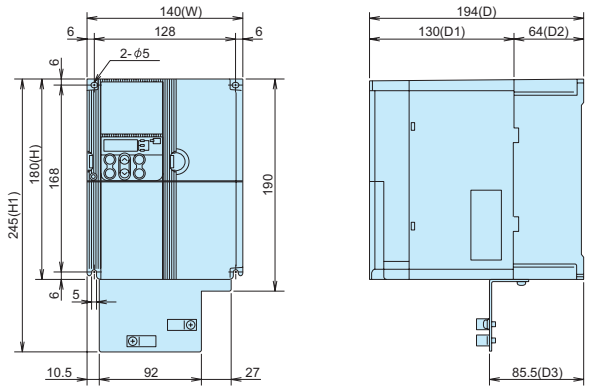


Fig. d

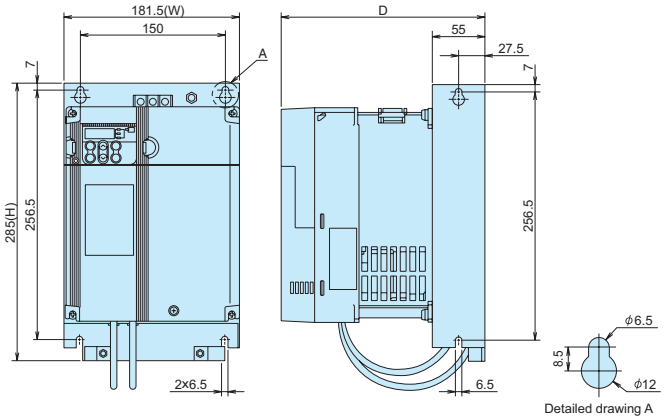
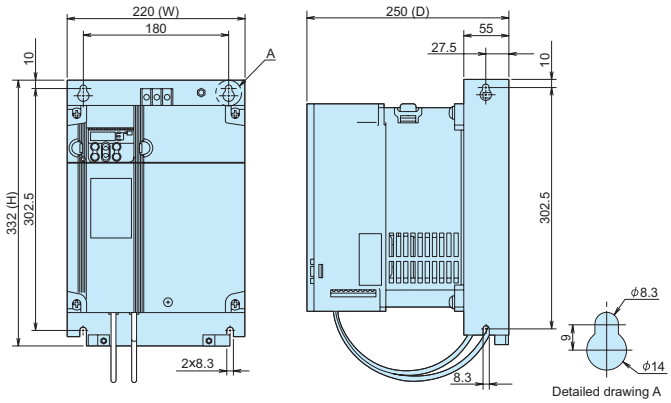
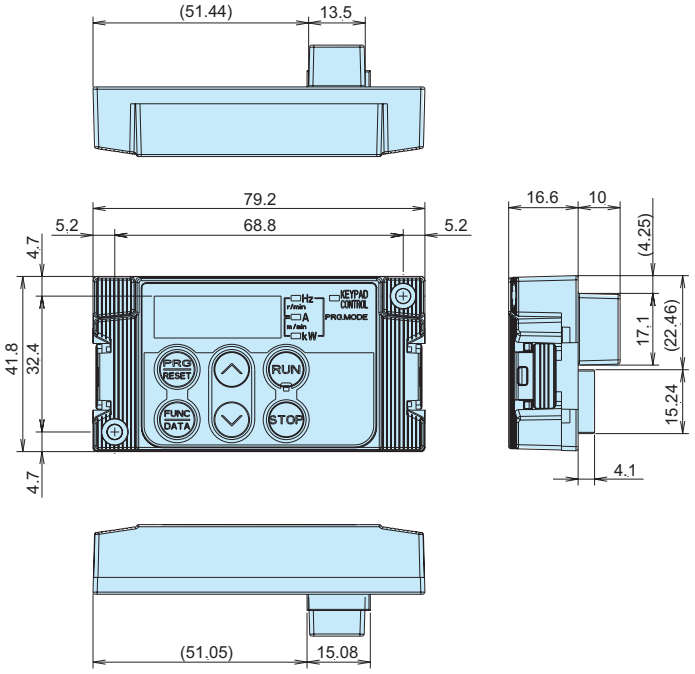


Fig. e

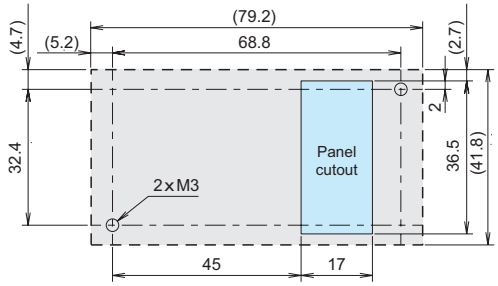


Power supply voltage	Inverter type	Fig.	Dimension (mm)						
			W	H	H1	D	D1	D2	D3
Three-phase 400V	FRN0.4E1E-4E	b	110	130	180	169	129	40	61.5
	FRN0.75E1E-4E					193		64	85.5
	FRN1.5E1E-4E	c	140	180	245	194	130	64	85.5
	FRN2.2E1E-4E								
	FRN3.7E1E-4E								
	FRN5.5E1E-4E	d	181.5	285	–	208	–	–	–
	FRN7.5E1E-4E								
	FRN11E1E-4E	e	220	332	–	250	–	–	–
	FRN15E1E-4E								
Single-phase 200V	FRN0.1E1E-7E	a	80	120	170	112	102	10	21.2
	FRN0.2E1E-7E								
	FRN0.4E1E-7E					127		25	36.2
	FRN0.75E1E-7E	b	110	130	180	150	110	40	55.2
	FRN1.5E1E-7E	c	140	180	245	194	130	64	85.5
	FRN2.2E1E-7E								

●Keypad



* Dimensions when installing the supplied rear cover



Dimensions of panel cutting (viewed from "A")

External Dimensions

●Inverter main body (Semi-standard type)

Fig. f

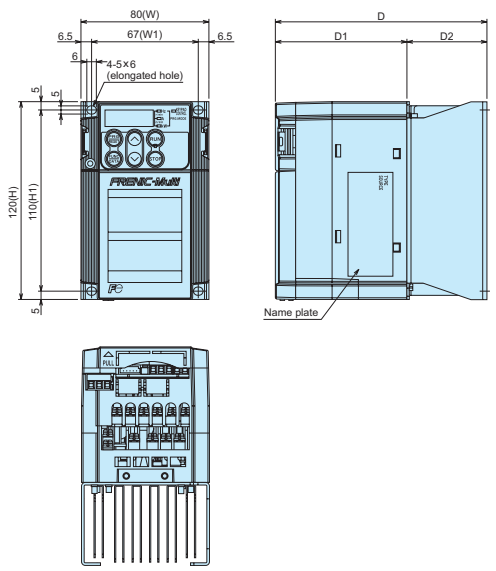


Fig.g

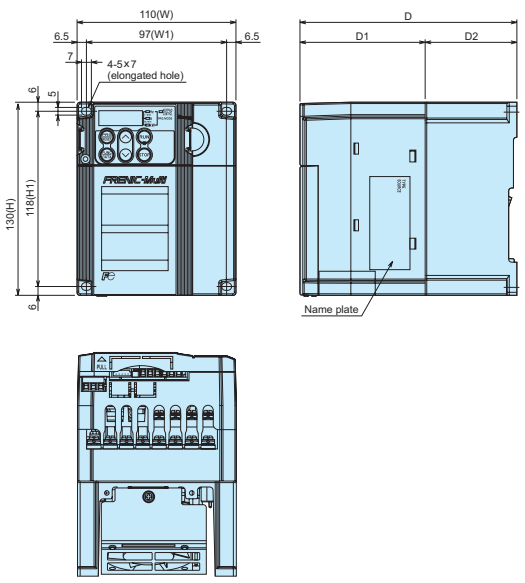


Fig. h

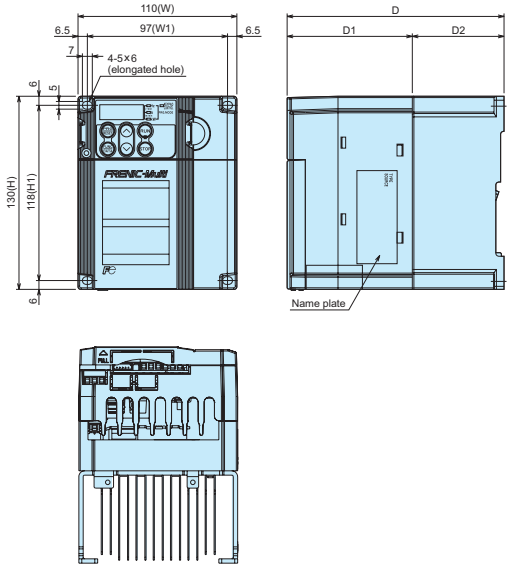


Fig. i

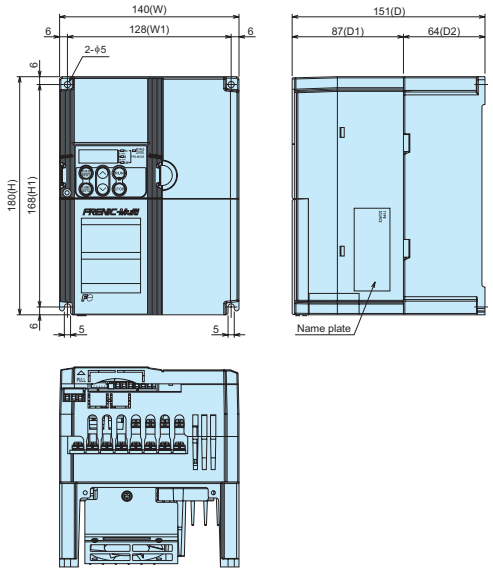


Fig. j

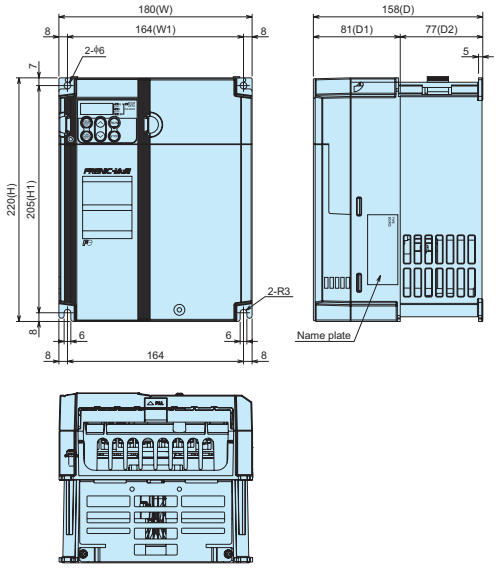
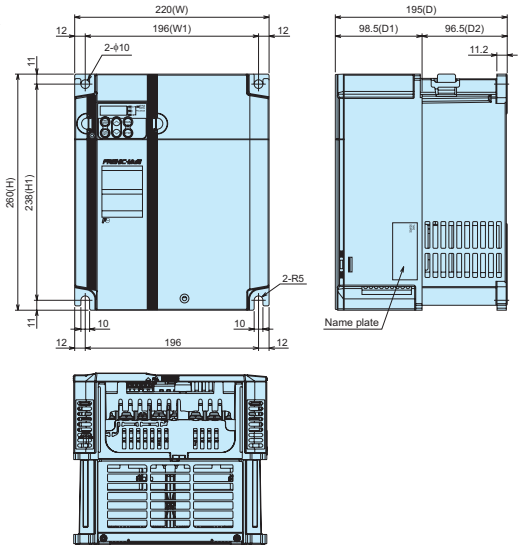


Fig. k



Power supply voltage	Inverter type	Fig.	Dimension (mm)						
			W	W1	H	H1	D	D1	D2
Three-phase 400V	FRN0.4E1S-4E	h	110	97	130	118	126	86	40
	FRN0.75E1S-4E						150		64
	FRN1.5E1S-4E	g	110	97	130	118	150	86	64
	FRN2.2E1S-4E								
	FRN3.7E1S-4E	i	140	128	180	168	151	87	64
	FRN5.5E1S-4E	j	180	164	220	205	158	81	77
	FRN7.5E1S-4E								
	FRN11E1S-4E	k	220	196	260	238	195	98.5	96.5
	FRN15E1S-4E								
Single-phase 200V	FRN0.1E1S-7E	f	80	67	120	110	92	102	10
	FRN0.2E1S-7E								
	FRN0.4E1S-7E						107		25
	FRN0.75E1S-7E						152		50
	FRN1.5E1S-7E	g	110	97	130	118	150	86	64
	FRN2.2E1S-7E	i	140	128	180	168	151	87	64

Keypad Operations

Keypad switches and functions

LED monitor

When the motor is running or stopped:

The monitor displays speeds, such as output frequency, set frequency, motor speed and load shaft speed, output voltage, output current, and power consumption.

Alarm mode:

The monitor shows the alarm description with a fault code.

Unit display

The unit of the data displayed at the LED monitor is indicated.
Use the FUNC/DATA key to switch the displayed data.

Operation mode display

During keypad operation:

When function code F02 is, 0, 2 or 3 (keypad operation), the green KEYPAD CONTROL LED lights up.

Program/Reset key

Used to change the mode.

Programming mode:

Used to shift the digit (cursor movement) to set data.

Alarm mode:

Resets trip prevention mode.

Run key

While the motor is stopped:

Used to start the operation.

This key is invalid if the function code F02 (operation by external signals) is set to 1.

During operation:

The green RUN LED lights up.

Function/Data select key

Used to change the LED monitor and to store the function code and data.

Stop key

Used to stop the operation.

During operation:

This key is invalid if the function code F02 (operation by external signals) is set to 1.

The inverter stops when the function code H96 is set to 1 or 3.

Up/Down keys

During operation: Used to increase or decrease the frequency or motor speed.

In data setting: Used to indicate the function code number or to change data set value.

Monitor display and key operation

The keypad modes are classified into the following 3 modes.

Monitor, keys \ Operation mode			Programming mode		Running mode		Alarm mode
			STOP	RUN	STOP	RUN	
Monitor	8.8.8.8.	Function	Displays the function code and data.		Displays the output frequency, set frequency, loaded motor speed, power consumption, output current, and output voltage.		Displays the alarm description and alarm history.
		Display	Lighting		Blinking	Lighting	Blinking/Lighting
	Hz r/min A m/min kW PRG.MODE	Function	Indicates that the program mode is selected.		Displays the units of frequency, output current, power consumption, and rotation speed.		None
		Display	Hz r/min A m/min kW PRG.MODE ON		Frequency display: Hz r/min A m/min kW PRG.MODE ON; Speed display: Hz r/min A m/min kW PRG.MODE ON; Current display: Hz r/min A m/min kW PRG.MODE ON; Capacity or Current indication: Hz r/min A m/min kW PRG.MODE blinks or lit		OFF
	☐ KEYPAD CONTROL	Function	Operation selection (keypad operation/terminal operation) is displayed.				
		Display	Lit in keypad operation mode				
	☐ RUN	Function	Indicates absence of operation commands.	Indicates presence of operation commands.	Indicates absence of operation commands.	Indicates presence of operation commands.	Indicates that the operation is trip-stopped.
		Display	☐ RUN unlit	■ RUN lit	☐ RUN unlit	■ RUN lit	If an alarm occurs during operation, the lamp is unlit during keypad operation and lit during terminal block operation.
Keys	PRG RESET	Function	Switches to running mode Digit shift (cursor movement) in data setting		Switches to programming mode		Releases the trip and switches to stop mode or running mode.
	FUNC DATA	Function	Determines the function code, stores and updates data.		Switches the LED monitor display.		Displays the operation information.
	▲ ▼	Function	Increases/decreases the function code and data.		Increases/decreases the frequency, motor speed and other settings.		Displays the alarm history.
	RUN	Function	Invalid		Starts running (switches to running mode (RUN)).	Invalid	Invalid
	STOP	Function	Invalid	Deceleration stop (switches to programming mode (STOP)).	Invalid	Deceleration stop (switches to running mode (STOP)).	Invalid

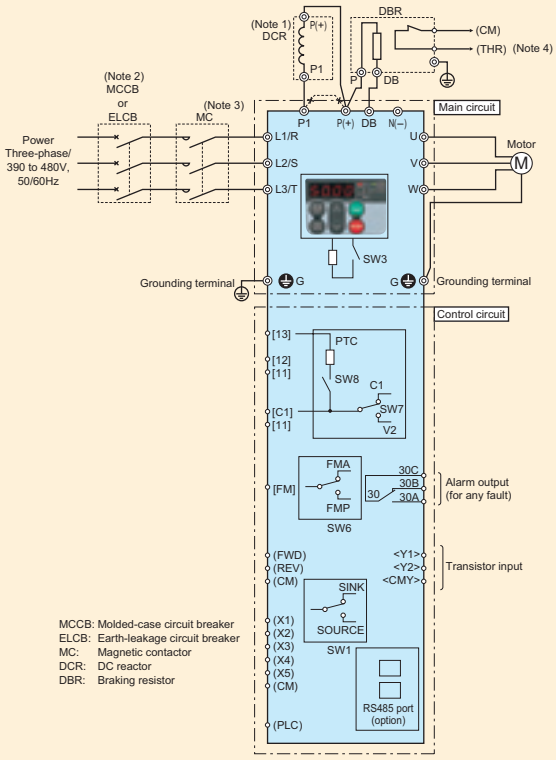
This keypad supports the full menu mode that allows you to set or display the following information. Indication and setting change of changed function code, drive monitor, I/O check, maintenance information, and alarm information. For the actual operation methods, refer to the FRENIC-Multi Instruction Manual or User's Manual.

Basic Wiring Diagram

●Wiring diagram

The following diagram is for reference only. For detailed wiring diagrams, refer to the instruction manual.

■Keypad operation



■Run/Stop operation and frequency setting on the keypad

[Wiring procedure]

(1) Wire the inverter main power circuit.

[Operation method]

(1) Run/Stop: Press RUN or STOP key.

(2) Setting frequency: Set the frequency with ∧ and ∨ keys.

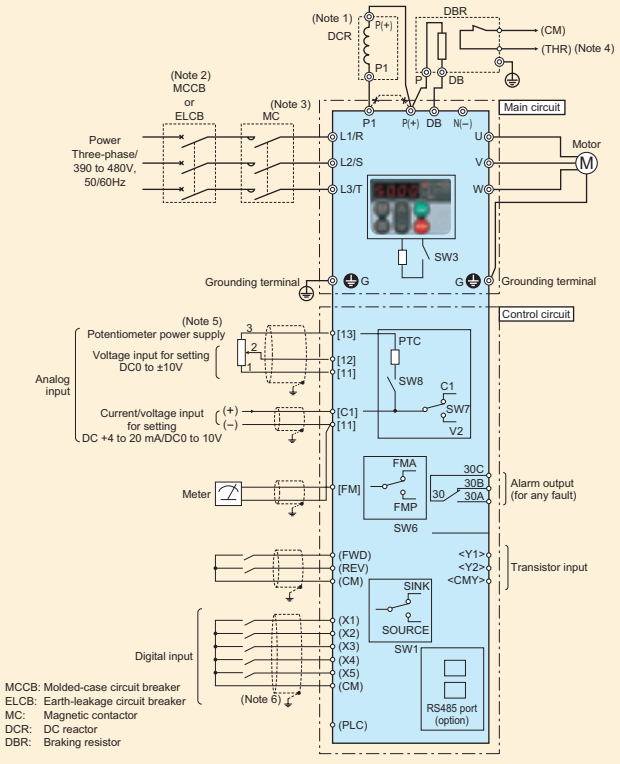
Note1: When connecting a DC REACTOR (DCR option), remove the jumper bar from across the terminals [P1] and [P (+)].

Note2: Install a recommended molded-case circuit breaker (MCCB) or an earth-leakage circuit-breaker (ELCB) (with an overcurrent protection function) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

Note3: Install a magnetic contactor (MC) for each inverter to separate the inverter from the power supply, apart from the MCCB or ELCB, when necessary.
Connect a surge killer in parallel when installing a coil such as the MC or solenoid near the inverter.

Note4: (THR) function can be used by assigning code "9" (external alarm) to any of the terminals X1 to X5, FWD or REV (function code; E01 to E05, E98, or E99).

■Operation by external signal inputs



■Run/Stop operation and frequency setting through external signals

[Wiring procedure]

(1) Wire both the inverter main power circuit and control circuit.

(2) Set 1 (external signal) at function code F02. Next, set 1 (voltage input (terminal 12) (0 to +10V DC)), 2 (current input (terminal C1) (+4 to 20mA DC)), or other value at function code F01.

[Operation method]

(1) Run/Stop: Operate the inverter across terminals FDW and CM short-circuited, and stop with open terminals.

(2) Frequency setting: Voltage input (0 to +10V DC), current input (+4 to 20mA DC)

Note1: When connecting a DC REACTOR (DCR option), remove the jumper bar from across the terminals [P1] and [P (+)].

Note2: Install a recommended molded-case circuit breaker (MCCB) or an earth-leakage circuit-breaker (ELCB) (with an overcurrent protection function) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

Note3: Install a magnetic contactor (MC) for each inverter to separate the inverter from the power supply, apart from the MCCB or ELCB, when necessary.
Connect a surge killer in parallel when installing a coil such as the MC or solenoid near the inverter.

Note4: (THR) function can be used by assigning code "9" (external alarm) to any of the terminals X1 to X5, FWD or REV (function code; E01 to E05, E98, or E99).

Note5: Frequency can be set by connecting a frequency-setting device (external potentiometer) between the terminals 11, 12 and 13 instead of inputting a voltage signal (0 to +10V DC, 0 to +5V DC or +1 to +5V DC) between the terminals 12 and 11.

Note 6: For the control signal wires, use shielded or twisted wires. Ground the shielded wires. To prevent malfunction due to noise, keep the control circuit wiring away from the main circuit wiring as far as possible (recommended: 10cm or more). Never install them in the same wire duct.
When crossing the control circuit wiring with the main circuit wiring, set them at right angles.

Terminal Functions

Terminal Functions

Division	Symbol	Terminal name	Functions	Remark	Related function code
Main circuit	L1/R,L2/S,L3/T	Power input	Connect a three-phase power supply.		
	U,V,W	Inverter output	Connect a three-phase motor.		
	P1,P (+)	For DC REACTOR	Connect the DC reactor (DCR).		
	P (+),DB	For braking resistor	Connect the braking resistor (option).		
	P (+),N (–)	For DC bus connection	Used for DC bus connection.		
	⏚ G	Grounding	Terminal for inverter chassis (case) and motor grounding	Two terminals are provided.	
Frequency setting	13	Potentiometer power supply	Used for frequency setting device power supply (variable resistance: 1 to 5kΩ) (10V DC 10mA DC max.)	Connect the potentiometer with higher than 1/2W.	
	12	Analog setting voltage input	Used as a frequency setting voltage input.0 to ±10V DC/0 to 100% (0 to ±5V DC/0 to 100%)	Input impedance: 22kΩ Maximum input: +15V DC However, the current larger than ±20mA DC is handled as ±20mA DC.	F18 C32 to C35 E61
		(Inverse operation)	±10 to 0V DC/0 to ±100%		
		(PID control)	Used for setting signal (PID process command value) or feedback signal.		
		(Frequency aux. setting)	Used as additional auxiliary setting to various frequency settings.		
	C1	Analog setting current input	Used as a frequency setting current input.4 to 20mA DC/0 to 100%	Input impedance: 250Ω Maximum input: 30mA DC However, the voltage higher than ±10V DC is handled as ±0V DC.	F18 C37 to C39 E62
		(Inverse operation)	20 to 4mA DC/0 to 100%		
		(PID control)	Used for setting signal (PID process command value) or feedback signal.		
		(Frequency aux. setting)	Used as additional auxiliary setting to various frequency settings.		
	(V2)	Analog setting voltage input	Used as a frequency setting voltage input.0 to +10V DC/0 to 100% (0 to +5V DC/0 to 100%)	Input impedance: 22kΩ Maximum input:+15V DC However, the voltage higher than ±10V DC is handled as ±10V DC.	F18 C42 to C44 E63
		(Inverse operation)	+10 to 0V DC/0 to 100%		
		(PID control)	Used for setting signal (PID process command value) or feedback signal.		
		(Frequency aux. setting)	Used as additional auxiliary setting to various frequency settings.		
	(PTC)	(PTC thermistor)	Connect the thermistor used to protect the motor.		H26, H27
	11	Analog common	Common terminal for frequency setting signals (13, 12, C1, FM)	Two terminals are provided. Isolated from terminals CM and CMY.	
Digital input	X1	Digital input 1	The following functions can be set at terminals X1 to X5, FWD and REV for signal input. <Common function> • Sink and source are changeable using the built-in sliding switch. • ON timing can be changed between short-circuit of terminals X1 and CM and open circuits of them. The same setting is possible between CM and any of the terminals among X2, X3, X4, X5, FWD, and REV.	ON state Source current: 2.5 to 5mA Voltage level: 2V Allowable leakage current: Smaller than 0.5mA Voltage: 22 to 27V	E01
	X2	Digital input 2			E02
	X3	Digital input 3			E03
	X4	Digital input 4			E04
	X5	Digital input 5			E05
	FWD	Forward operation command			E98
	REV	Reverse operation command			E99
	(FWD)	Forward operation command	The motor runs in the forward direction upon ON across (FWD) and CM. The motor decelerates and stops upon OFF.	This function can be set only for the terminals FWD and REV.	
	(REV)	Reverse operation command	The motor runs in the reverse direction upon ON across (REV) and CM. The motor decelerates and stops upon OFF.		
	(SS1) (SS2) (SS4) (SS8)	Multistep freq. selection	16-step operation can be conducted with ON/OFF signals at (SS1) to (SS8).		C05 to C19
	(RT1)	Acceleration time selection command	ON across (RT1) and CM: The acceleration time 2 setting is available. OFF across (RT1) and CM: The acceleration time 1 setting is available.		E10, E11 F07, F08
	(HLD)	3-wire operation stop command	Used for 3-wire operation. ON across (HLD) and CM: The inverter self-holds FWD or REV signal. OFF across (HLD) and CM: The inverter releases self-holding.		
	(BX)	Coast-to-stop command	ON across (BX) and CM: The inverter output is shut off immediately and the motor coasts to a stop.	No alarm signal will be output.	
	(RST)	Alarm (error) reset	ON across (RST) and CM: Faults are reset.	Alarm reset signal width: 0.1(s) or more	
	(THR)	Trip command (External fault)	OFF across (THR) and CM: The inverter output is shut off immediately and the motor coasts-to-stop.	Alarm signal 0H2 will be output.	
	(Hz2/Hz1)	Freq. set 2/Freq. set 1	ON across (Hz2/Hz1) and CM: Freq. set 2 is effective.		F01, F30
	(M2/M1)	Motor2/Motor1	ON across (M2/M1) and CM: The motor 2 setting is available. OFF across (M2/M1) and CM: The motor 1 setting is available.		A01 to A46 P01 to P99
	(DCBRK)	DC braking command	ON across (DCBRK) and CM: Starts DC braking action.		F20 to F22
	(TL2/TL1)	Torque limit 2/Torque limit 1	ON across (TL2/TL1) and CM: The torque limit 2 setting is available.		E16, E17
			OFF across (TL2/TL1) and CM: The torque limit 1 setting is available.		F40, F41
	(UP)	UP command	The output frequency rises while the circuit across (UP) and CM is connected.		F01, C30
	(DOWN)	DOWN command	The output frequency drops while the circuit across (DOWN) and CM is connected.		J02
	(WE-KP)	Write enable for KEYPAD (Changing data is available.)	The function code data can be changed from the keypad only when (WE-KP) is ON.		F00
	(Hz/PID)	PID cancel	PID control can be canceled when the circuit across (Hz/PID) and CM is connected. (Operation proceeds according to the selected frequency setting method such as the multi-step frequency, keypad and analog input.)		J01 to J06 J10 to J19
	(IVS)	Inverse mode changeover	The frequency setting or PID control output signal (frequency setting) action mode switches between normal and inverse actions when the circuit across (IVS) and CM is connected.		C50, J01
	(LE)	Link enable	Operation proceeds according to commands sent via RS485 communication or field bus (option) when the circuit across (LE) and CM are connected.		H30, y98
	(U-DI)	Universal DI	An arbitrary digital input signal is transmitted to the host controller.		
	(STM)	Starting characteristic selection	ON across (STM) and CM: Starting at the pick-up frequency becomes valid.		H17, H09
	(STOP)	Forcible stop	OFF across (STOP) and CM: The inverter is forcibly stopped in the special deceleration time.		H56
	(PID-RST)	PID differentiation / integration reset	ON across (PID-RST) and CM: Resets differentiation and integration values of PID.		J01 to J06
	(PID-HLD)	PID integral hold	ON across (PID-HLD) and CM: Holds integration values of PID.		J10 to J19
	(JOG)	Jogging operation	ON across (JOG) and CM: The operation node enters jogging mode and frequency setting switches to jogging frequency and acceleration and deceleration time for jogging operation.		C20 H54
	PLC	PLC terminal	Connect to PLC output signal power supply. Common for 24V power.	+24V (22 to 27V) 50mA max.	
	CM	Digital common	Common terminal for digital input signal	Isolated from terminals 11 and CMY. Two terminals are provided.	

Multistep frequency

Digital input	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(SS1)	–	ON	–	ON	–	ON	–	ON	–	ON	–	ON	–	ON	–	ON
(SS2)	–	–	ON	ON	–	–	ON	ON	–	–	ON	ON	–	–	ON	ON
(SS4)	–	–	–	–	ON	ON	ON	ON	–	–	–	–	ON	ON	ON	ON
(SS8)	–	–	–	–	–	–	–	–	ON	ON	ON	ON	ON	ON	ON	ON

Terminal Functions

Division	Symbol	Terminal name	Functions	Remark	Related function code
Analog output	FM (FMA)	Analog monitor	A monitor signal of analog DC voltage between 0 to +10V DC) can be output for the item selected from the following: • Output frequency 1 (before slip compensation) • Output frequency 2 (after slip compensation) • Output current • Output voltage • Output torque • Load factor. • Power consumption • PID feedback value (PV) • DC link circuit voltage • Universal AO. • Motor output • Analog output test. • PID command (SV) • PID output (MV)	Connectable impedance (Minimum impedance: 5kW In the (0 to +10V DC) In case of voltage output, up to two analog voltmeters (0 to 10V DC, input impedance: 10kW) can be connected.Gain adjustment range: 0 to 300%	F29 to F31
Pulse output	(FMP)	Pulse monitor	One of the following items can be output in a pulse frequency. • Output frequency 1 (before slip compensation) • Output frequency 2 (after slip compensation) • Output current • Output voltage • Output torque • Load factor.o Power consumption • PID feedback value (PV) • DC link circuit voltage • Universal AO • Motor output • Analog output test • PID command (SV) • PID output (MV)	Up to two analog voltmeters (0 to10V DC, input impedance: 10kΩ) can be connected. (Driven at average voltage)	F29, F31, F33
Transistor output	(PLC)	Transistor output power	Power supply for a transistor output load. (24V DC 50mA DC Max)	• Short circuit across terminals CM and CMY to use • Same terminal as digital input PLC terminal	E20
	Y1	Transistor output 1	The following functions can be set at terminals Y1 or Y2 for signal output. • The setting of "short circuit upon active signal output" or "open upon active signal output" is possible. • Sink/source support (switching unnecessary)	Max. voltage: 27V DC Max. current: 50mA Leak current: 0.1mA max. ON voltage: within 2V (at 50mA)	E21
	Y2	Transistor output 2			E22
	(RUN)	Inverter running	An ON signal is output when the inverter runs at higher than the starting frequency.		
	(RUN2)	Inverter output on	A signal is issued when the inverter runs at smaller than the starting frequency or when DC braking is in action.		
	(FAR)	Speed/freq. arrival	An active signal is issued when the output frequency reaches the set frequency.	Detection width: 0 to 10.0 [Hz]	E30
	(FDT)	Speed/freq. detection	An ON signal is output at output frequencies above a preset detection level. The signal is deactivated if the output frequency falls below the detection level.	Operation level: 0.0 to 400.0 [Hz] Hysteresis width: 0.0 to 400.0 [Hz]	E31 E32
	(LV)	Undervoltage detection	The signal is output when the inverter stops because of undervoltage.		
	(B/D)	Torque polarity detection	The OFF signal is output when the inverter is running in drive mode and the ON signal is output in the braking mode or stopped state.		
	(IOL)	Inverter output limit (limit on current)	The signal is output when the inverter is limiting the current.		F43, F44
	(IPF)	Auto-restarting	The signal is output during auto restart operation (after momentary power failure and until completion of restart).		F14
	(OL)	Overload early warning (motor)	The signal is output when the electronic thermal relay value is higher than the preset alarm level.		F10 to F12
	(RDY)	Operation ready output	A signal is issued if preparation for inverter operation is completed.		
	(SWM2)	Motor 2 switching	The motor switching signal (M2/M1) is input and the ON signal is output when the motor 2 is selected.		
	(TRY)	Retry in action	The signal is output during an active retry.		H04, H05
	(OH)	Heat sink overheat early warning	An early warning signal is issued before the heat sink trips due to overheat.		
	(FAR2)	Frequency arrival 2	The signal is output when the time set in E29 elapses after the frequency arrival signal (FAR) is output.		E29
	(IOL2)	Inverter output limit	If more than 20ms elapse while one of the following operations is operating: current limiter for the inverter, automatic deceleration operation or torque limiter.		F41 to F44 H69
	(LIFE)	Lifetime alarm	Outputs alarm signal according to the preset lifetime level.		H42, H43, H98
	(REF OFF)	Command loss detection	A loss of the frequency command is detected.		E65
	(OLP)	Overload preventive control	The signal is output when the overload control is activated.		H70
	(ID)	Current detection	The signal is output when a current larger than the set value has been detected for the timer-set time.		E34, E35
	(ID2)	Current detection 2	The signal is output when a current larger than the set value 2 has been detected for the timer-set time.		E37, E38
	(PID-ALM)	PID alarm output	An absolute value alarm or deviation alarm under PID control is issued as a signal.		J11 to J13
	(BRKS)	Brake signal	The signal for enabling or releasing the brake is output.		J68 to J72
	(ALM)	Alarm relay output (for any fault)	An alarm relay output (for any fault) signal is issued as a transistor output signal.		
	CMY	Transistor output common	Common terminal for transistor output	The terminal is isolated from terminals 11 and CM.	
Contact output	30A,30B,30C	Alarm relay output (for any fault)	• A no-voltage contact signal (1c) is issued when the inverter is stopped due to an alarm. • Multi-purpose relay output; signals similar to above-mentioned signals Y1 to Y2 can be selected. • An alarm output is issued upon either excitation or no excitation according to selection.	Contact capacity: 250V AC,0.3A, cosϕ=0.3, +48V DC, 0.5A	E27
Communication	—	RJ-45 connector for connection of keypad	One of the following protocols can be selected. • Protocol exclusively for keypad (default selection) • Modbus RTU • Fuji's special inverter protocol • SX protocol for PC loader	Power (+5V) is supplied to the keypad.	H30 y01 to y20 y98,y99

Terminal Functions

■ Terminal Arrangement

●Main circuit terminals

Power source	Applied motor [kW]	Inverter type	Fig.
Three-phase 400V	0.4	FRN0.4E1□-4E	Fig. A
	0.75	FRN0.75E1□-4E	
	1.5	FRN1.5E1□-4E	
	2.2	FRN2.2E1□-4E	
	3.7	FRN3.7E1□-4E	
	5.5	FRN5.5E1□-4E	Fig. B
	7.5	FRN7.5E1□-4E	
	11	FRN11E1□-4E	
	15	FRN15E1□-4E	
Single-phase 200V	0.1	FRN0.1E1□-7E	Fig. C
	0.2	FRN0.2E1□-7E	
	0.4	FRN0.4E1□-7E	
	0.75	FRN0.75E1□-7E	
	1.5	FRN1.5E1□-7E	Fig. D
	2.2	FRN2.2E1□-7E	

Note: For the inverter type FRN 0.4E1□-4E, the symbol is replaced with either of the following alphabets.
□ S(standard type), E(EMC filter built-in type)

Fig. A

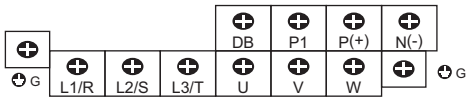


Fig. B

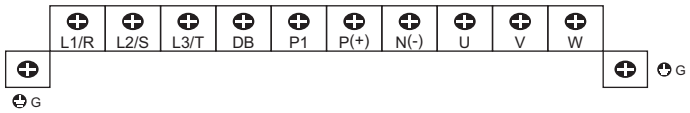


Fig. C

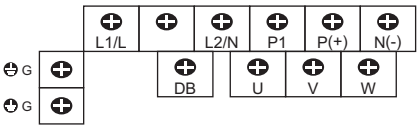
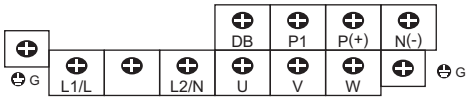


Fig. D



●Control circuit terminals (common to all the inverter models)

CMY	Y1	Y2	C1	11	FM	CM	X1	X2	X3	X4	X5	PLC

11	12	13	CM	FWD	REV

30A	30B	30C

Terminal size: M3

Protective Functions

Protective Functions	Description		LED indication	Alarm output (30A, B, C) Note)	Related function code
Overcurrent protection	The inverter is stopped for protection against overcurrent.	During acceleration	OC1	○	
Short circuit protection	The inverter is stopped for protection against overcurrent caused by a short circuit in the output circuit.	During deceleration	OC2		
Grounding fault protection	The inverter is stopped upon start-up for protection against overcurrent caused by a grounding fault in the output circuit. If the power supply is turned on with the grounding fault, the inverter and the controlled equipment may not be protected.	During constant speed operation	OC3		
Overvoltage protection	An excessive voltage (3-phase and Single-phase 200V series: 400V DC, 3-phase 400V series: 800V DC) in the DC link circuit is detected and the inverter is stopped. If an excessive voltage is applied by mistake, the protection cannot be guaranteed.	During acceleration	OU1	○	
		During deceleration	OU2		
		During constant speed operation	OU3		
Undervoltage protection	The voltage drop (3-phase 200V series: 200V DC, 3-phase 400V series: 400V DC) in the DC link circuit is detected to stop the inverter. However, when "F14: 3, 4 or 5" is selected, an alarm is not issued even upon a voltage drop in the DC link circuit.		LU	△	F14
Input phase loss protection	The input phase loss is detected to shut off the inverter output. This function protects the inverter from being damaged by adding extreme stress caused by a power phase loss or imbalance between phases. When the load to be connected is small or DC REACTOR is connected a phase loss is not detected.		Lin	○	H98
Output phase loss protection	Detects breaks in inverter output wiring at the start of operation and during running, to shut off the inverter output.		OPL	○	H98
Overheating protection	Stops the inverter output upon detecting excess heat sink temperature in case of cooling fan failure or overload.		OH1	○	H43, H98
	Discharging and inverter operation are stopped due to overheating of an external braking resistor. * Function codes must be set corresponding to the braking resistor.		dbH	○	
Overload protection	The temperature inside the IGBT is calculated from the detection of output current and internal temperature, to shut off the inverter output.		OLU	○	
External alarm input	With the digital input signal (THR) opened, the inverter is stopped with an alarm.		OH2	○	E01 to E05 E98, E99
Motor protection: Electronic thermal	The inverter is stopped with an electronic thermal function set to protect the motor.		OL1 OL2	○	F10,A06 F11,F12,A07,A08
	• The standard motor is protected at all the frequencies. • The inverter motor is protected at all the frequencies. *The operation level and thermal time constant can be set.				
Motor protection: PTC thermistor	A PTC thermistor input stops the inverter to protect the motor.		OH4	○	H26,H27
	• The PTC thermistor is connected between terminals C1 and 11 to set switches and function codes on the control PC board.				
Motor protection: Overload early warning	Warning signal is output at the predetermined level before stopping the inverter with the electronic thermal function to protect the motor.		—	—	E34,E35
Stall prevention	This is protected when the instantaneous overcurrent limit works.		—	—	H12
	• Instantaneous overcurrent limit: Operates when the inverter output current goes beyond the instantaneous overcurrent limiting level, and avoids tripping (during acceleration and constant speed operation).				
Alarm relay output (for any fault)	The relay signal is output when the inverter stops upon an alarm. <Alarm reset> The RESET key or digital input signal (RST) is used to reset the alarm stop state. <Storage of alarm history and detailed data> Up to the last 4 alarms can be stored and displayed.		—	○	E20,E21,E27 E01 to E05 E98,E99
Memory error	Data is checked upon power-on and data writing to detect any fault in the memory and to stop the inverter if any.		Er1	○	
Keypad communication error	The keypad (standard) or multi-function keypad (optional) is used to detect a communication fault between the keypad and inverter main body during operation and to stop the inverter.		Er2	○	F02
CPU error	Detects a CPU error or LSI error caused by noise.		Er3	○	
Option communication error	When each option card is used, a fault of communication with the inverter main body is detected to stop the inverter.		Er4	—	
Option error	When each option card is used, the option card detects a fault to stop the inverter.		Er5	—	
Operation error	STOP key priority:	Pressing the STOP key on the keypad or entering the digital input signal will forcibly decelerate and stop the motor even if the operation command through signal input or communication is selected.	Er6	○	H96
	Start check:	Start check: If the operation command is entered in the following cases, Er6 will be displayed on the LED monitor to prohibit operation. • Power-on • Alarm reset (RESET key ON or alarm (error) reset [RST] is reset.) • The link operation selection "LE" is used to switch operation.			
Tuning error	When tuning failure, interruption, or any fault as a result of turning is detected while tuning for motor constant.		Er7	○	P04
RS-485 communication error	When the connection port of the keypad connected via RS485 communication port to detect a communication error, the inverter is stopped and displays an error.		Er8	○	
Data save error upon Undervoltage	When the undervoltage protection works, an error is displayed if data cannot be stored.		ErF	○	
RS-485 communication error (optional)	When an optional RS-485 communication card is used to configure the network, a fault of communication with the inverter main body is detected to stop the inverter.		ErP	○	
Retry	When the inverter is tripped and stopped, this function automatically resets the tripping state and restarts operation. (The number of retries and the length of wait before resetting can be set.)		—	—	H04,H05
Surge protection	The inverter is protected against surge voltage intruding between the main circuit power line and ground.		—	—	
Command loss detection	A loss (broken wire, etc.) of the frequency command is detected to output an alarm and continue operation at the preset frequency (set at a ratio to the frequency before detection).		—	—	E65
PG disconnection	An error displays when the signal line for PG is disconnected while the PG feedback card is installed.		PG	○	
Momentary power failure protection	• A protective function (inverter stoppage) is activated upon a momentary power failure for 15msec or longer. • If restart upon momentary power failure is selected, the inverter restarts upon recovery of the voltage within the set time.		—	—	F14 H13 to H16
Overload avoidance control	The inverter output frequency is reduced to avoid tripping before heat sink overheating or tripping due to an overload (alarm indication: OH1 or OLU.		—	—	H70
Hardware error	The inverter is stopped when poor connection between the control board and power source board or interface board, or short-circuit between terminals between 13 and 11 is detected.		ErH	○	
Simulation error	Simulated alarm is output to check the fault sequence.		Err	○	H45

Note: The item indicated with △ in the alarm output (30A, B, C) column may not be issued according to some function code settings.

Function Settings

■Function Settings

●F codes: Fundamental Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
F00	Data Protection	0: Disable both data protection and digital reference protection 1: Enable data protection and disable digital reference protection 2: Disable data protection and enable digital reference protection 3: Enable both data protection and digital reference protection	—	—	Y	0
F01	Frequency Command 1	0 : ▲ / ▼ keys on keypad 1: Voltage input to terminal [12] (-10 to +10 VDC) 2: Current input to terminal [C1] (C1 function) (4 to 20 mA DC) 3: Sum of voltage and current inputs to terminals [12] and [C1] (C1 function) 5: Voltage input to terminal [C1] (V2 function) (0 to 10 VDC) 7: Terminal command UP /DOWN control 11: Digital input (option) 12: Pulse input (option)	—	—	Y	0
F02	Operation Method	0: RUN/STOP keys on keypad (Motor rotational direction specified by terminal command FWD/REV) 1: Terminal command FWD or REV 2: RUN/STOP keys on keypad (forward) 3: RUN/STOP keys on keypad (reverse)	—	—	Y	2
F03	Maximum Frequency 1	25.0 to 400.0	0.1	Hz	Y	50.0
F04	Base Frequency 1	25.0 to 400.0	0.1	Hz	Y	50.0
F05	Rated Voltage at Base Frequency 1	0: Output a voltage in proportion to input voltage 80 to 240: Output an AVR-controlled voltage (for 200 V class series) 160 to 500: Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	230
F06	Maximum Output Voltage 1	80 to 240: Output an AVR-controlled voltage (for 200 V class series) 160 to 500: Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	400
F07	Acceleration Time 1	0.00 to 3600 Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	0.01	s	Y	6.00
F08	Deceleration Time 1	0.00 to 3600 Note: Entering 0.00 cancels the deceleration time, requiring external soft-start.	0.01	s	Y	6.00
F09	Torque Boost 1	0.0 to 20.0 (percentage with respect to "F05: Rated Voltage at Base Frequency 1") Note: This setting takes effect when F37 = 0, 1, 3, or 4.	0.1	%	Y	Depending on the inverter capacity
F10	Electronic Thermal Overload Protection for Motor 1 (Select motor characteristics)	1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor, non-ventilated motor, or motor with separately powered cooling fan	—	—	Y	1
F11	(Overload detection level)	0.00: Disable1 to 135% of the rated current (allowable continuous drive current) of the motor	0.01	A	Y1Y2	100% of the motor rated current
F12	(Thermal time constant)	0.5 to 75.0	0.1	min	Y	5.0
F14	Restart Mode after Momentary Power Failure (Mode selection)	0: Disable restart (Trip immediately) 1: Disable restart (Trip after a recovery from power failure) 4: Enable restart (Restart at the frequency at which the power failure occurred, for general loads) 5: Enable restart (Restart at the starting frequency, for low-inertia load)	—	—	Y	0
F15	Frequency Limiter (High)	0.0 to 400.0	0.1	Hz	Y	70.0
F16	(Low)	0.0 to 400.0	0.1	Hz	Y	0.0
F18	Bias (Frequency command 1)	-100.00 to 100.00 *1	0.01	%	Y	0.00
F20	DC (Braking starting frequency)	0.0 to 60.0	0.1	Hz	Y	0.0
F21	Braking 1 (Braking level)	0 to 100	1	%	Y	0
F22	(Braking time)	0.00 : Disable 0.01 to 30.00	0.01	s	Y	0.00
F23	Starting Frequency 1	0.1 to 60.0	0.1	Hz	Y	0.5
F24	(Holding time)	0.01 to 10.00	0.01	s	Y	0.00
F25	Stop Frequency	0.1 to 60.0	0.1	Hz	Y	0.2
F26	Motor Sound (Carrier frequency)	0.75 to 15	1	kHz	Y	15
F27	(Tone)	0 : Level 0 (Inactive) 1 : Level 1 2 : Level 2 3 : Level 3	—	—	Y	0
F29	Analog Output [FM] (Mode selection)	0 : Output in voltage (0 to 10 VDC) [FMA] 2 : Output in pulse (0 to 6000p/s) [FMP]	—	—	Y	0
F30	(Voltage adjustment)	0 to 300 [FMA]	1	%	Y	100
F31	(Function)	Select a function to be monitored from the followings. 0: Output frequency 1 (before slip compensation) 1: Output frequency 2 (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Load factor 6: Input power 7: PID feedback amount (PV) 8: PG feedback value 9: DC link bus voltage 10: Universal AO 13: Motor output 14: Calibration 15: PID command (SV) 16: PID output (MV)	—	—	Y	0
F33	(Pulse rate)	25 to 6000 (FMP, Pulse rate at 100% output)	1	p/s	Y	1440
F37	Load Selection/ Auto Torque Boost / Auto Energy Saving Operation 1	0: Variable torque load 1: Constant torque load 2: Auto-torque boost 3: Auto-energy saving operation (Variable torque load during ACC/DEC) 4: Auto-energy saving operation (Constant torque load during ACC/DEC) 5: Auto-energy saving operation (Auto-torque boost during ACC/DEC)	—	—	Y	1
F39	Stop Frequency (Holding Time)	0.00 to 10.00	0.01	s	Y	0.00
F40	Torque (Limiting Level for driving)	20 to 200 999 : Disable	1	%	Y	999
F41	Limiter 1 (Limiting Level for braking)	20 to 200 999 : Disable	1	%	Y	999
F42	Control Mode Selection 1	0: V/f control with slip compensation inactive 1: Dynamic torque vector control 2: V/f control with slip compensation active 3: V/f control with PG 4: Dynamic torque vector control with PG	—	—	Y	0

●F codes: Fundamental Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
F43	Current Limiter (Mode selection)	0: Disable (No current limiter works.) 1: Enable at constant speed (Disable during ACC/DEC) 2: Enable during ACC/constant speed operation	—	—	Y	2
F44	(Level)	20 to 200 (The data is interpreted as the rated output current of the inverter for 100%.)	1	%	Y	180
F50	Electronic Thermal (Discharging capability) Overload Protection	1 to 900 999: Disable 0: Reserved	1	kWs	Y	999
F51	for braking resistor (Allowable average loss)	0.001 to 50.000 0.000: Reserved	0.001	kW	Y	0.000

●E codes: Extension Terminal Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
E01	Terminal X1 function	Selecting function code data assigns the corresponding function to terminals [X1] to [X5] as listed below.	—	—	Y	0
E02	Terminal X2 function	0 (1000) : Select multi-frequency [SS1]	—	—	Y	1
E03	Terminal X3 function	1 (1001) : Select multi-frequency [SS2]	—	—	Y	2
E04	Terminal X4 function	2 (1002) : Select multi-frequency [SS4]	—	—	Y	7
E05	Terminal X5 function	3 (1003) : Select multi-frequency [SS8]	—	—	Y	8
		4 (1004) : Select ACC/DEC time [RT1]				
		6 (1006) : Enable 3-wire operation [HLD]				
		7 (1007) : Coast to a stop [BX]				
		8 (1008) : Reset alarm [RST]				
		9 (1009) : Enable external alarm trip [THR]				
		10 (1010) : Ready for jogging [JOG]				
		11 (1011) : Select frequency command 2/1 [Hz2/Hz1]				
		12 (1012) : Select motor 2/motor 1 [M2/M1]				
		13 : Enable DC braking [DCBRK]				
		14 (1014) : Select torque limiter level [TL2/TL1]				
		17 (1017) : UP (Increase output frequency) [UP]				
		18 (1018) : DOWN (Decrease output frequency) [DOWN]				
		19 (1019) : Enable data change with keypad [WE-KP]				
		20 (1020) : Cancel PID control [Hz/PID]				
		21 (1021) : Switch normal/inverse operation [IVS]				
		24 (1024) : Enable communications link via RS-485 or field bus [LE]				
		25 (1025) : Universal DI [U-DI]				
		26 (1026) : Enable auto search for idling motor speed at starting [STM]				
		27 (1027) : Speed feedback control switch [PG/Hz]				
		30 (1030) : Force to stop [STOP]				
		33 (1033) : Reset PID integral and differential components [PID-RST]				
		34 (1034) : Hold PID integral component [PID-HLD]				
		42 (1042) : Position control limit switch [LS]				
		43 (1043) : Position control start/reset command [S/R]				
		44 (1044) : Serial pulse Receive mode [SPRM]				
		45 (1045) : Position Control return mode [RTN]				
		46 (1046) : Overload stopping effective command [OLS]				
		Setting the value of 1000s in parentheses ( ) shown above assigns a negative logic input to a terminal. Note: In the case of THR and STOP , data (1009) and (1030) are for normal logic, and "9" and "30" are for negative logic, respectively.				
E10	Acceleration Time 2	0.00 to 3600 Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	0.01	s	Y	10.0
E11	Deceleration Time 2	0.00 to 3600 Note: Entering 0.00 cancels the acceleration time, requiring external soft-start.	0.01	s	Y	10.0
E16	Torque (Limiting Level for driving)	20 to 200 999 : Disable	1	%	Y	999
E17	Limiter 2 (Limiting Level for braking)	20 to 200 999 : Disable	1	%	Y	999
E20	Terminal [Y1] Function	Selecting function code data assigns the corresponding function to terminals [Y1], [Y2], and [30A/B/C] as listed below.	—	—	Y	0
E21	Terminal [Y2] Function	0 (1000) : Inverter running [RUN]	—	—	Y	7
E27	Terminal [30A/B/C] Function	1 (1001) : Frequency arrival signal [FAR]	—	—	Y	99
		2 (1002) : Frequency detected [FDT]				
		3 (1003) : Undervoltage detected (Inverter stopped) [LU]				
		4 (1004) : Torque polarity detected [B/D]				
		5 (1005) : Inverter output limiting [IOL]				
		6 (1006) : Auto-restarting after momentary power failure [IPF]				
		7 (1007) : Motor overload early warning [OL]				
		10 (1010) : Inverter ready to run [RDY]				
		21 (1021) : Frequency arrival signal 2 [FAR2]				
		22 (1022) : Inverter output limiting with delay [IOL2]				
		26 (1026) : Auto-resetting [TRY]				
		28 (1028) : Heat sink overheat early warning [OH]				
		30 (1030) : Service lifetime alarm [LIFE]				
		33 (1033) : Reference loss detected [REF OFF]				
		35 (1035) : Inverter output on [RUN2]				
		36 (1036) : Overload prevention control [OLP]				
		37 (1037) : Current detected [ID]				
		38 (1038) : Current detected 2 [ID2]				
		42 (1042) : PID alarm [PID-ALM]				
		49 (1049) : Switched to motor 2 [SWM2]				
		57 (1057) : Brake signal [BRKS]				
		76 (1076) : PG error signal [PG-ERR]				
		80 (1080) : Over traveling [OT]				
		81 (1081) : Time up of the start timer or the end timer [TO]				
		82 (1082) : Completion of positioning [PSET]				
		83 (1083) : Current position pulse overflow [POF]				
		99 (1099) : Alarm output (for any alarm) [ALM]				
		Setting the value of 1000s in parentheses ( ) shown above assigns a negative logic input to a terminal.				

*1 When you make settings from the keypad, the incremental unit is restricted by the number of digits that the LED monitor can display.
(Example) If the setting range is from -200.00 to 200.00, the incremental unit is as follows:
"1" for -200 to -100, "0.1" for -99.9 to -10.0, "0.01" for -9.99 to -0.01, "0.01" for 0.00 to 99.99, and "0.1" for 100.0 to 200.0

*2 Symbols in the "Data copy" column
Y: Will be copied unconditionally.
Y1: Will not be copied if the rated capacity differs from the source inverter.
Y2: Will not be copied if the rated input voltage differs from the source inverter.
N: Will not be copied.

*3 Reserved for the maker. Do not set any data.

<Changing, validating, and saving function code data when the motor is running>
: Impossible, : Possible (Change data with keys and then save/validate it with key), : Possible (Change and validate data with keys and then save it with key)

■Functions Settings

●E codes: Extension Terminal Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
E29	Frequency Arrival Delay Time	0.01 to 10.00	0.01	s	Y	0.10
E30	Frequency Arrival (hysteresis width)	0.0 to 10.0	0.1	Hz	Y	2.5
E31	Frequency Detection (FDT) (Detection level)	0.0 to 400.0	0.1	Hz	Y	50
E32	(hysteresis width)	0.0 to 400.0	0.1	Hz	Y	1.0
E34	Overload Early Warning /Current Detection (Level)	0.00 : Disable Current value of 1 to 200% of the inverter rated current	0.01	A	Y1Y2	100% of the motor rated current
E35	(Timer)	0.01 to 600.00 *1	0.01	s	Y	10.00
E37	Current detection 2 (Level)	0.00 : Disable Current value of 1 to 200% of the inverter rated current	0.01	A	Y1Y2	100% of the motor rated current
E38	(Timer)	0.01 to 600.00 *1	0.01	s	Y	10.00
E39	Coefficient for Constant Feeding Rate Time	0.000 to 9.999	0.001	—	Y	0.000
E40	PID Display Coefficient A	-999 to 0.00 to 9990 *1	0.01	—	Y	100
E41	B	-999 to 0.00 to 9990 *1	0.01	—	Y	0.00
E42	LED Display filter	0.0 to 5.0	0.1	s	Y	0.5
E43	LED Monitor (Item selection)	0: Speed monitor (select by E48) 3: Output current 4: Output voltage 8: Calculated torque 9: Input power 10: PID command 12: PID feedback amount 13: Timer 14: PID output 15: Load factor 16: Motor output 21: Present pulse position 22: Deviation of pulse position	—	—	Y	0
E45	LCD Monitor *3 (Item selection)	0: Running status, rotational direction and operation guide 1: Bar charts for output frequency, current and calculated torque	—	—	Y	0
E46	(Language selection)	0 : Japanese 1 : English 2 : German 3 : French 4 : Spanish 5 : Italian	—	—	Y	1
E47	(Contrast control)	0 (Low) to 10 (High)	1	—	Y	5
E48	LED Monitor (Speed monitor item)	0: Output frequency (Before slip compensation) 1: Output frequency (After slip compensation) 2: Reference frequency 3: Motor speed in r/min 4: Load shaft speed in r/min 5: Line speed in m/min 6: Constant feeding rate time	—	—	Y	0
E50	Coefficient for Speed Indication	0.01 to 200.00 *1	0.01	—	Y	30.00
E51	Display Coefficient for Input Watt-hour Data	0.000 (Cancel/reset) 0.001 to 9999	0.001	—	Y	0.010
E52	Keypad (Menu display mode)	0: Function code data editing mode (Menus #0 and #1) 1: Function code data check mode (Menu #2) 2: Full-menu mode (Menus #0 through #6)	—	—	Y	0
E59	Terminal [C1] Signal Definition (C1/V2 Function)	0: Current input (C1 function), 4 to 20 mADC 1: Voltage input (V2 function), 0 to +10 VDC	—	—	Y	0
E61	Terminal [12] Extended Function	Selecting function code data assigns the corresponding function to terminals [12] and [C1] (C1/V2 function) as listed below.	—	—	Y	0
E62	Terminal [C1] Extended Function (C1 function)	0: None	—	—	Y	0
E63	Terminal [C1] Extended Function (V2 function)	1: Auxiliary frequency command 1 2: Auxiliary frequency command 2 3: PID command 1 5: PID feedback amount	—	—	Y	0
E65	Reference Loss Detection (Continuous running frequency)	0: Decelerate to stop 20 to 120 999: Disable	1	%	Y	999
E98	Terminal [FWD] Function	Selecting function code data assigns the corresponding function to terminals [FWD] and [REV] as listed below.	—	—	Y	98
E99	Terminal [REV] Function	0 (1000) : Select multi-frequency [SS1] 1 (1001) : Select multi-frequency [SS2] 2 (1002) : Select multi-frequency [SS4] 3 (1003) : Select multi-frequency [SS8] 4 (1004) : Select ACC/DEC time [RT1] 6 (1006) : Enable 3-wire operation [HLD] 7 (1007) : Coast to a stop [BX] 8 (1008) : Reset alarm [RST] 9 (1009) : Enable external alarm trip [THR] 10 (1010) : Ready for jogging [JOG] 11 (1011) : Select frequency command 2/1 [Hz2/Hz1] 12 (1012) : Select motor 2/motor 1 [M2/M1] 13 : Enable DC braking [DCBRK] 14 (1014) : Select torque limiter level [TL2/TL1] 17 (1017) : UP (Increase output frequency) [UP] 18 (1018) : DOWN (Decrease output frequency) [DOWN] 19 (1019) : Enable data change with keypad [WE-KP] 20 (1020) : Cancel PID control [Hz/PID] 21 (1021) : Switch normal/inverse operation [IVS] 24 (1024) : Enable communications link via RS-485 or field bus [LE] 25 (1025) : Universal DI [U-DI] 26 (1026) : Enable auto search for idling motor speed at starting [STM] 27 (1027) : Speed feedback control switch [PG/Hz] 30 (1030) : Force to stop [STOP] 33 (1033) : Reset PID integral and differential components [PID-RST] 34 (1034) : Hold PID integral component [PID-HLD]	—	—	Y	99

●E codes: Extension Terminal Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
		42 (1042) : Position control limit switch [LS] 43 (1043) : Position control start/reset command [S/R] 44 (1044) : Serial pulse Receive mode [SPRM] 45 (1045) : Position Control return mode [RTN] 46 (1046) : Overload stopping effective command [OLS] 98 : Run forward [FWD] 99 : Run reverse [REV] Setting the value of 1000s in parentheses ( ) shown above assigns a negative logic input to a terminal. Note: In the case of THR and STOP , data (1009) and (1030) are for normal logic, and "9" and "30" are for negative logic, respectively.				

●C codes: Control Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
C01	Jump Frequency 1	0.0 to 400.0	0.1	Hz	Y	0.00
C02	2				Y	0.00
C03	3				Y	0.00
C04	(Hysteresis width)	0.0 to 30.0	0.1	Hz	Y	3.0
C05	Multi-Frequency 1	0.00 to 400.00	0.01	Hz	Y	0.00
C06	2				Y	0.00
C07	3				Y	0.00
C08	4				Y	0.00
C09	5				Y	0.00
C10	6				Y	0.00
C11	7				Y	0.00
C12	8				Y	0.00
C13	9				Y	0.00
C14	10				Y	0.00
C15	11				Y	0.00
C16	12				Y	0.00
C17	13				Y	0.00
C18	14				Y	0.00
C19	15				Y	0.00
C20	Jogging Frequency	0.00 to 400.00	0.01	Hz	Y	0.00
C21	Timer Operation	0 : Disable 1 : Enable	-	-	Y	0
C30	Frequency Command 2	0 : ▲ / ▼ keys on keypad 1: Voltage input to terminal [12] (-10 to +10 VDC) 2: Current input to terminal [C1] (C1 function) (4 to 20 mA DC) 3: Sum of voltage and current inputs to terminals [12] and [C1] (C1 function) 5: Voltage input to terminal [C1] (V2 function) (0 to 10 VDC) 7: Terminal command UP / DOWN control 11: Digital input (option) 12: Pulse input (option)	-	-	Y	2
C31	Analog Input Adjustment (offset)	-5.0 to 5.0	0.1	%	Y	0.0
C32	for [12] (Gain)	0.00 to 200.00 *1	0.01	%	Y	100.0
C33	(Filter time constant)	0.00 to 5.00	0.01	s	Y	0.05
C34	(Gain base point)	0.00 to 100.00 *1	0.01	%	Y	100.0
C35	(Polarity)	0 : Bipolar 1 : Unipolar	-	-	Y	1
C36	Analog Input Adjustment (offset)	-5.0 to 5.0	0.1	%	Y	0.0
C37	for [C1] (C1 function) (Gain)	0.00 to 200.00 *1	0.01	%	Y	100.0
C38	(Filter time constant)	0.00 to 5.00	0.01	s	Y	0.05
C39	(Gain base point)	0.00 to 100.00 *1	0.01	%	Y	100.0
C41	Analog Input Adjustment (offset)	-5.0 to 5.0	0.1	%	Y	0.0
C42	for [C1] (V2 function) (Gain)	0.00 to 200.00 *1	0.01	%	Y	100.0
C43	(Filter time constant)	0.00 to 5.00	0.01	s	Y	0.05
C44	(Gain base point)	0.00 to 100.00 *1	0.01	%	Y	100.0
C50	Bias (Frequency command 1) (Bias base point)	0.00 to 100.00 *1	0.01	%	Y	0.00
C51	Bias (PID command 1) (Bias value)	-100.00 to 100.00	0.01	%	Y	0.00
C52	(Bias base point)	0.00 to 100.00 *1	0.01	%	Y	0.00
C53	Selection of Normal/Inverse Operation (Frequency command 1)	0 : Normal operation 1 : Inverse operation	-	-	Y	0

*1 When you make settings from the keypad, the incremental unit is restricted by the number of digits that the LED monitor can display.
(Example) If the setting range is from -200.00 to 200.00, the incremental unit is as follows: "1" for -200 to -100, "0.1" for -99.9 to -10.0, "0.01" for -9.99 to -0.01, "0.01" for 0.00 to 99.99, and "0.1" for 100.0 to 200.0

*2 Symbols in the "Data copy" column
Y: Will be copied unconditionally.
Y1: Will not be copied if the rated capacity differs from the source inverter.
Y2: Will not be copied if the rated input voltage differs from the source inverter.
N: Will not be copied.

*3 Reserved for the maker. Do not set any data.

*4 Use these functions by connection with the multi-tasking keypad (optional).
<Changing, validating, and saving function code data when the motor is running>
▭: Impossible, ▭: Possible (Change data with ▲▼ keys and then save/validate it with PRG key), ▭: Possible (Change and validate data with ▲▼ keys and then save it with PRG key)

Functions Settings

■Functions Settings

●P codes: Motor Parameters

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
P01	Motor 1 (No. of poles)	2 to 22	2	Pole	Y1Y2	4
P02	(Rated capacity)	0.01 to 30.00 (where, P99 data is 0, 3, or 4.)	0.01	kW	Y1Y2	Rated capacity of motor
		0.01 to 30.00 (where, P99 data is 1.)	0.01	HP		
P03	(Rated current)	0.00 to 100.0	0.01	A	Y1Y2	Rated value of Fuji standard motor
P04	(Auto-tuning)	0: Disable 1: Enable (Tune %R1 and %X while the motor is stopped.) 2: Enable (Tune %R1, %X and rated slip while the motor is stopped, and no-load current while running.)	—	—	N	0
P05	(Online tuning)	0 : Disable 1 : Enable	—	—	Y	0
P06	(No-load current)	0.00 to 50.00	0.01	A	Y1Y2	Rated value of Fuji standard motor
P07	(%R1)	0.00 to 50.00	0.01	%	Y1Y2	Rated value of Fuji standard motor
P08	(%X)	0.00 to 50.00	0.01	%	Y1Y2	Rated value of Fuji standard motor
P09	(Slip compensation gain for driving)	0.0 to 200.0	0.01	%	Y	100.0
P10	(Slip compensation response time)	0.00 to 10.00	0.01	s	Y1Y2	0.50
P11	(Slip compensation gain for braking)	0.0 to 200.0	0.01	%	Y	100.0
P12	(Rated slip frequency)	0.00 to 15.00	0.01	Hz	Y1Y2	Rated value of Fuji standard motor
P99	Motor 1 Selection	0: Motor characteristics 0 (Fuji standard motors, 8-series) 1: Motor characteristics 1 (HP rating motors) 3: Motor characteristics 3 (Fuji standard motors, 6-series) 4: Other motors	—	—	Y1Y2	0

●H codes: High Performance Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
H03	Data Initialization	0: Disable initialization 1: Initialize all function code data to the factory defaults 2: Initialize motor 1 parameters 3: Initialize motor 2 parameters	—	—	N	0
H04	Auto-reset (Times)	0: Disable 1 to 10	1	Times	Y	0
H05	(Reset interval)	0.5 to 20.0	0.1	s	Y	5.0
H06	Cooling Fan ON/OFF Control	0: Disable (Always in operation) 1: Enable (ON/OFF controllable)	—	—	Y	0
H07	Acceleration/Deceleration Pattern	0: Linear 1: S-curve (Weak) 2: S-curve (Strong) 3: Curvilinear	—	—	Y	0
H08	Limiting the direction of the motor rotation	0: Disable 1: Enable (Reverse rotation inhibited) 2: Enable (Forward rotation inhibited)	—	—	Y	0
H09	Starting Mode (Auto search)	0: Disable 1: Enable (At restart after momentary power failure) 2: Enable (At restart after momentary power failure and at normal start)	—	—	Y	0
H11	Deceleration Mode	0: Normal deceleration 1: Coast-to-stop	—	—	Y	0
H12	Instantaneous Overcurrent Limiting (Mode selection)	0 : Disable 1 : Enable	—	—	Y	1
H13	Restart Mode after Momentary Power Failure (Restart time)	0.1 to 10.0	0.1	s	Y1Y2	Depending on the inverter capacity
H14	(Frequency fall rate)	0.00 : FSelected deceleration time 0.01 to 100.00 999: Follow the current limit command	0.01	Hz/s	Y	999
H16	(Allowable momentary power failure time)	0.0 to 30.0 999 : Automatically determined by inverter	0.1	s	Y	999
H26	Thermistor (Mode selection)	0: Disable 1: Enable (With PTC, the inverter immediately trips with 0H4 displayed.)0.00 to 5.00V	—	—	Y	0
H27	(Level)	0.00 to 5.00	0.01	V	Y	1.60
H28	Droop control	-60.0 to 0.0	0.1	Hz	Y	0.0
H30	Communications Link Function (Mode selection)	Frequency command / Run command 0: F01/C30 / F02 1: RS-485 / F02 2: F01/C30 / RS-485 3: RS-485 / RS-485 4: RS-485 (option) / F02 5: RS-485 (option) / RS-485 6: F01/C30 / RS-485 (option) 7: RS-485 / RS-485 (option) 8: RS-485 (option) / RS-485 (option)	—	—	Y	0
H42	Capacitance of DC Link Bus Capacitor	Indication for replacing DC link bus capacitor (0000 to FFFF: Hexadecimal)	1	—	N	—
H43	Cumulative Run Time of Cooling Fan	Indication of cumulative run time of cooling fan for replacement	—	—	N	—
H44	Startup Times of Motor 1	Indication of cumulative startup times	—	—	N	—
H45	Mock Alarm	0: Disable 1: Enable (Once a mock alarm occurs, the data automatically returns to 0.)	—	—	N	0
H47	Initial Capacitance of DC Link Bus Capacitor	Indication for replacing DC link bus capacitor (0000 to FFFF: Hexadecimal)	—	—	N	Set at factory shipping
H48	Cumulative Run Time of Capacitors on Printed Circuit Boards	Indication for replacing capacitors on printed circuit boards (0000 to FFFF: Hexadecimal). Resettable.	—	—	N	—
H49	Starting Mode (Delay time)	0.0 to 10.0	0.1	s	Y	0.0
H50	Non-linear V/f Pattern 1 (Frequency)	0.0 : Cancel 0.1 to 400.0	0.1	Hz	Y	0.0
H51	(Voltage)	0 to 240 : Output an AVR-controlled voltage (for 200 V class series) 0 to 500 : Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	0
H52	Non-linear V/f Pattern 2 (Frequency)	0.0 : Cancel 0.1 to 400.0	0.1	Hz	Y	0.0
H53	(Voltage)	0 to 240: Output an AVR-controlled voltage (for 200 V class series) 0 to 500: Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	0
H54	ACC/DEC time (Jogging operation)	0.00 to 3600 *ACC time and DEC time are common.	0.01	s	Y	6.00
H56	Deceleration Time for Forced Stop	0.00 to 3600	0.01	s	Y	6.00

●H codes: High Performance Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
H61	UP/DOWN Control (Initial frequency setting)	0 : 0.00 1 : Last UP /DOWN command value on releasing run command	—	—	Y	1
H63	Low Limiter (Mode selection)	0 : Limit by F16 (Frequency limiter: Low) and continue to run 1 : If the output frequency lowers less than the one limited by F16 (Frequency limiter: Low), decelerate to stop the motor.	—	—	Y	0
H64	(Lower limiting frequency)	0.0 (Depends on F16 (Frequency limiter: Low)) 0.1 to 60.0	0.1	Hz	Y	1.6
H68	Slip Compensation 1 (Operating conditions)	0 : Enable during ACC/DEC and enable at base frequency or above 1 : Disable during ACC/DEC and enable at base frequency or above 2 : Enable during ACC/DEC and disable at base frequency or above 3 : Disable during ACC/DEC and disable at base frequency or above	—	—	Y	0
H69	Automatic Deceleration (Mode selection)	0 : Disable 2 : Enable (Canceled if actual deceleration time exceeds three times the one specified by F08/E11.) 4 : Enable (Not canceled if actual deceleration time exceeds three times the one specified by F08/E11.)	—	—	Y	0
H70	Overload Prevention Control	0.00 : Follow deceleration time specified by F08/E11 0.01 to 100.0 999: Disable	0.01	Hz/s	Y	999
H71	Deceleration Characteristics	0 : Disable 1 : Enable	—	—	Y	0
H76	Torque Limiter (Frequency increment limit for braking)	0.0 to 400.0	0.1	Hz	Y	5.0
H80	Output Current Fluctuation Damping Gain for Motor 1	0.00 to 0.40	0.01	—	Y	0.20
H89	Reserved. *3	0, 1	—	—	Y	0
H90	Reserved. *5	0, 1	—	—	Y	0
H91	C1 Disconnection Detection Time (PID control feedback line)*6	0.0 : Disable 0.1 to 60.0: Detection time	0.1	s	Y	0.0
H94	Cumulative Motor Run Time 1	Change or reset the cumulative data	—	—	N	—
H95	DC Braking (Braking response mode)	0 : Slow 1 : Quick	—	—	Y	1
H96	STOP Key Priority/ Start Check Function	Item \ Data: 0 / 1 / 2 / 3 STOP key priority: Disable / Enable / Disable / Enable Start check function: Disable / Disable / Enable / Enable	—	—	Y	0
H97	Clear Alarm Data	Setting H97 data to "1" clears alarm data and then returns to zero.	—	—	N	0
H98	Protection/Maintenance Function (Mode selection)	0 to 31: Display data on the keypad's LED monitor in decimal format (In each bit, "0" for disabled, "1" for enabled.) Bit 0 : Lower the carrier frequency automatically Bit 1 : Detect input phase loss Bit 2 : Detect output phase loss Bit 3 : Select life judgment threshold of DC link bus capacitor Bit 4 : Judge the life of DC link bus capacitor	—	—	Y	19 (bit 4,1,0=1)

●A codes: Motor 2 Parameters

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
A01	Maximum Frequency 2	25.0 to 400.0	0.1	Hz	Y	50.0
A02	Base Frequency 2	25.0 to 400.0	0.1	Hz	Y	50.0
A03	Rated Voltage at Base Frequency 2	0: Output a voltage in proportion to input voltage 80 to 240: Output an AVR-controlled voltage (for 200 V class series) 160 to 500: Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	230
A04	Maximum output Voltage 2	80 to 240V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500V: Output an AVR-controlled voltage (for 400 V class series)	1	V	Y2	400
A05	Torque Boost 2	0.0 to 20.0(percentage with respect to "A03: Rated Voltage at Base Frequency 2") Note: This setting takes effect when A13 = 0, 1, 3, or 4.	0.1	%	Y	Depending on the inverter capacity
A06	Electronic Thermal Overload Protection for Motor 2 (Select motor characteristics)	1 : For a general-purpose motor with shaft-driven cooling fan 2 : For an inverter-driven motor, non-ventilated motor, or motor with separately powered cooling fan	—	—	Y	1
A07	(Overload detection level)	0.00 : Disable 1 to 135% of the rated current (allowable continuous drive current) of the motor	0.01	A	Y1Y2	100% of the motor rated current
A08	(Thermal time constant)	0.5 to 75.0	0.1	min	Y	5.0
A09	DC (Braking starting frequency)	0.0 to 60.0 Hz	0.1	Hz	Y	0.0
A10	Braking 2 (Braking level)	0 to 100	1	%	Y	0
A11	(Braking time)	0.00 : Disable 0.01 to 30.00	0.01	s	Y	0.00
A12	Starting Frequency 2	0.1 to 60.0	0.1	Hz	Y	0.5
A13	Load Selection/ Auto Torque Boost / Auto Energy Saving Operation 2	0 : Variable torque load 1 : Constant torque load 2 : Auto-torque boost 3 : Auto-energy saving operation (Variable torque load during ACC/DEC) 4 : Auto-energy saving operation (Constant torque load during ACC/DEC) 5 : Auto-energy saving operation (Auto-torque boost during ACC/DEC)	—	—	Y	1
A14	Control Mode Selection 2	0 : V/f operation with slip compensation inactive 1 : Dynamic torque vector operation 2 : V/f operation with slip compensation active 3 : V/f operation with PG 4 : Dynamic torque vector operation with PG	—	—	Y	0

*1 When you make settings from the keypad, the incremental unit is restricted by the number of digits that the LED monitor can display.
(Example) If the setting range is from -200.00 to 200.00, the incremental unit is as follows:
"1" for -200 to -100, "0.1" for -99.9 to -10.0, "0.01" for -9.99 to -0.01, "0.01" for 0.00 to 99.99, and "0.1" for 100.0 to 200.0

*2 Symbols in the "Data copy" column
Y: Will be copied unconditionally.
Y1: Will not be copied if the rated capacity differs from the source inverter.
Y2: Will not be copied if the rated input voltage differs from the source inverter.
N: Will not be copied.

*3 Reserved for the maker. Do not set any data.

*5 These function codes and their data are displayed, but they are reserved for particular manufacturers. Unless otherwise specified,do not access these function codes.

*6 These are available on inverters with inverter's ROM version 0800 or lator.

<Changing, validating, and saving function code data when the motor is running>
: Impossible, : Possible (Change data with keys and then save/validate it with key), : Possible (Change and validate data with keys and then save it with key)

Functions Settings

■Functions Settings

●A codes: Motor 2 Parameters

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
A15	Motor 2 (No. of poles)	2 to 22	2	Pole	Y1Y2	4
A16	(Rated capacity)	0.01 to 30.00 (where, P99 data is 0, 3, or 4.)	0.01	kW	Y1Y2	Rated capacity of motor
		0.01 to 30.00 (where, P99 data is 1.)	0.01	HP		
A17	(Rated current)	0.00 to 100.0	0.01	A	Y1Y2	Rated value of Fuji standard motor
A18	(Auto-tuning)	0: Disable 1 : Enable (Tune %R1 and %X while the motor is stopped.) 2 : Enable (Tune %R1, %X and rated slip while the motor is stopped, and no-load current while running.)	—	—	N	0
A19	(ON-Line tuning)	0 : Disable 1 : Enable	—	—	Y	0
A20	(No-load current)	0.00 to 50.00	0.01	A	Y1Y2	Rated value of Fuji standard motor
A21	(%R1)	0.00 to 50.00	0.01	%	Y1Y2	Rated value of Fuji standard motor
A22	(%X)	0.00 to 50.00	0.01	%	Y1Y2	Rated value of Fuji standard motor
A23	(Slip compensation gain for driving)	0.0 to 200.0	0.01	%	Y	100.0
A24	(Slip compensation response time)	0.00 to 10.00	0.01	s	Y1Y2	0.50
A25	(Slip compensation gain for braking)	0.0 to 10.00	0.01	%	Y	100.0
A26	(Rated slip frequency)	0.00 to 15.00	0.01	Hz	Y1Y2	Rated value of Fuji standard motor
A39	Motor 2 Selection	0 : Motor characteristics 0 (Fuji standard motors, 8-series) 1 : Motor characteristics 1 (HP rating motors) 3 : Motor characteristics 3 (Fuji standard motors, 6-series) 4 : Other motors	—	—	Y1Y2	0
A40	Slip compensation 2 (Operating conditions)	0 : Enable during ACC/DEC and enable at base frequency or above 1 : Disable during ACC/DEC and enable at base frequency or above 2 : Enable during ACC/DEC and disable at base frequency or above 3 : Disable during ACC/DEC and disable at base frequency or above	—	—	Y	0
A41	Output Current Fluctuation Damping Gain for Motor 2	0.00 to 0.40	0.01	—	Y	0.20
A45	Cumulative Motor Run Time 2	Change or reset the cumulative data	—	—	N	—
A46	Startup Times of Motor 2	Indication of cumulative startup times	—	—	N	—

●J codes: Application Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
J01	PID Control (Mode selection)	0 : Disable 1 : Enable (Process control, normal operation) 2 : Enable (Process control, inverse operation) 3 : Enable (Dancer control)	—	—	Y	0
J02	(Remote command SV)	0 : UP/DOWN keys on keypad 1 : PID command 1 3 : Terminal command UP /DOWN control 4 : Command via communications link	—	—	Y	0
J03	P (Gain)	0.000 to 30.000 *1	0.001	Times	Y	0.100
J04	I (Integral time)	0.0 to 3600.0 *1	0.1	s	Y	0.0
J05	D (Differential time)	0.0 to 600.00 *1	0.01	s	Y	0.00
J06	(Feedback filter)	0.0 to 900.0	0.1	s	Y	0.5
J10	PID Control (Anti reset windup)	0 to 200	1	%	Y	200
J11	(Select alarm output)	0 : Absolute-value alarm 1 : Absolute-value alarm (with Hold) 2 : Absolute-value alarm (with Latch) 3 : Absolute-value alarm (with Hold and Latch) 4 : Deviation alarm 5 : Deviation alarm (with Hold) 6 : Deviation alarm (with Latch) 7 : Deviation alarm (with Hold and Latch)	—	—	Y	0
J12	(Upper level alarm (AH))	-100 to 100	1	%	Y	100
J13	(Lower level alarm (AL))	-100 to 100	1	%	Y	0
J18	(Upper limit of PID process output)	-150 to 150 999 : F Disable	1	%	Y	999
J19	(Lower limit of PID process output)	-150 to 150 999 : F Disable	1	%	Y	999
J56	(Speed command filter)	0.00 to 5.00	0.01	s	Y	0.10
J57	(Dancer reference position)	-100 to 100	1	%	Y	0
J58	(Detection width of Dancer position deviation)	0 : Disable switching PID constant 1 to 100	1	%	Y	0
J59	P (gain) 2	0.000 to 30.00 *1	0.001	times	Y	0.100
J60	I (Integration time) 2	0.0 to 3600.0 *1	0.1	s	Y	0.0
J61	D (Derivative time) 2	0.00 to 600.00 *1	0.01	s	Y	0.00
J62	(Selection PID control block) (PID control block selection)	Bit 0 : PID output pole 0 = addition, 1 = subtraction Bit 1 : Select compensation of output ratio 0 = speed command, 1 = ratio	1	—	Y	0
J63	Overload stop (Detection value)	0 : Torque 1 : Current	—	—	Y	0
J64	(Detection level)	20 to 200	0.1	%	Y	100
J65	(Mode selection)	0 : Disable 1 : Decelerate to stop 2 : Coast to a stop 3 : Hit mechanical stop	—	—	Y	0
J66	(Operation condition)	0 : Enable at constant speed and during deceleration 1 : Enable at constant speed 2 : Enable anytime	—	—	Y	0
J67	(Timer)	0.00 to 600.00	0.01	s	Y	0
J68	Braking signal (Released current)	0 to 200	1	%	Y	100
J69	(Brake OFF frequency)	0.0 to 25.0	0.1	Hz	Y	1.0
J70	(Brake OFF timer)	0.0 to 5.0	0.1	s	Y	1.0
J71	(Brake ON frequency)	0.0 to 25.0	0.1	Hz	Y	1.0
J72	(Brake ON timer)	0.0 to 5.0	0.1	s	Y	1.0

●J codes: Application Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
J73	Position control (the start timer)	0.0 to 1000.0	0.1	s	Y	0.0
J74	(Start point: MSD)	-999 to 999	1	p	Y	0
J75	(Start point: LSD)	[P], 0 to 9999	1	p	Y	0
J76	(Position preset: MSD)	-999 to 999	1	p	Y	0
J77	(Position preset: LSD)	[P], 0 to 9999	1	p	Y	0
J78	(Creep speed switch point: MSD)	0 to 999	1	p	Y	0
J79	(Creep speed switch point: LSD)	0 to 9999	1	p	Y	0
J80	(Creep speed)	0 to 400	1	Hz	Y	0
J81	(Stopping position: MSD)	-999 to 999	1	p	Y	0
J82	(Stopping position: LSD)	0 to 9999	1	p	Y	0
J83	(Completion width)	0 to 9999	1	p	Y	0
J84	(End timer)	0.0 to 1000.0	0.1	s	Y	0.0
J85	(Coasting compensation)	0 to 9999	1	p	Y	0
J86	(Stopping position specifying method)	0, 1	—	—	Y	0
J87	(Position pre-set condition)	0, 1, 2	—	—	Y	0
J88	(Position detecting direction)	0, 1	—	—	Y	0
J90	Overload stopping, torque limit P (Gain)	0.000 to 2.000, 999	0.001	—	Y	999
J91	Function, torque limit I (Integral time)	0.001 to 9.999, 999	0.001	s	Y	999
J92	Current control level	50.0 to 150.0	0.1	%	Y	100.0

●y codes: Link Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
y01	RS-485 Communication (Standard) (Station address)	1 to 255	1	—	Y	1
y02	(Communications error processing)	0 : Immediately trip with alarm Er8 1 : Trip with alarm Er8 after running for the period specified by timer y03 2 : Retry during the period specified by timer y13.If the retry fails, trip with alarm Er8. If it succeeds, continue to run. 3 : Continue to run	—	—	Y	0
y03	(Timer)	0.0 to 60.0	0.1	s	Y	2.0
y04	(Baud rate)	0 : 2400 bps 1 : 4800 bps 2 : 9600 bps 3 : 19200 bps 4 : 38400 bps	—	—	Y	3
y05	(Data length)	0 : 8 bits 1 : 7 bits	—	—	Y	0
y06	(Parity check)	0 : None (2 stop bits for Modbus RTU) 1 : Even parity (1 stop bit for Modbus RTU) 2 : Odd parity (1 stop bit for Modbus RTU) 3 : None (1 stop bit for Modbus RTU)	—	—	Y	0
y07	(Stop bits)	0 : 2 bits 1 : 1 bit	—	—	Y	0
y08	(No-response error detection time)	0 : No detection 1 to 60	1	s	Y	0
y09	(Response interval)	0.00 to 1.00	0.01	s	Y	0.01
y10	(Protocol selection)	0 : Modbus RTU protocol 1 : FRENIC Loader protocol (SX protocol) 2: Fuji general-purpose inverter protocol	—	—	Y	1
y11	RS-485 Communication (Option) (Station address)	1 to 255	1	—	Y	1
y12	(Communications error processing)	0 : Immediately trip with alarm ErP 1 : Trip with alarm ErP after running for the period specified by timer y13 2 : Retry during the period specified by timer y13. If the retry fails, trip with alarm ErP. If it succeeds, continue to run. 3 Continue to run	—	—	Y	0
y13	(Timer)	0.0 to 60.0	0.1	s	Y	2.0
y14	(Baud rate)	0 : 2400 bps 1 : 4800 bps 2 : 9600 bps 3 : 19200 bps 4 : 38400 bps	—	—	Y	3
y15	(Data length)	0 : 8 bits 1 : 7 bits	—	—	Y	0
y16	(Parity check)	0 : None (2 stop bits for Modbus RTU) 1 : Even parity (1 stop bit for Modbus RTU) 2 : Odd parity (1 stop bit for Modbus RTU) 3 : None (1 stop bit for Modbus RTU)	—	—	Y	0
y17	(Stop bits)	0 : 2 bits 1 : 1 bit	—	—	Y	0
y18	(No-response error detection time)	0 : No detection 1 to 60	1	s	Y	0
y19	(Response interval)	0.00 to 1.00	0.01	s	Y	0.01
y20	(Protocol selection)	0 : Modbus RTU protocol 2 : Fuji general-purpose inverter protocol	—	—	Y	0
y98	Bus Link Function (Mode selection)	Frequency command / Run command 0 : Follow H30 data / Follow H30 data 1 : Via field bus option / Follow H30 data 2 : Follow H30 data / Via field bus option 3 : Via field bus option / Via field bus option	—	—	Y	0
y99	Loader Link Function(Mode selection)	Frequency command / Run command 0 : Follow H30 and y98 data / Follow H30 and y98 data 1 : Via RS-485 link (Loader) / Follow H30 and y98 data 2 : Follow H30 and y98 data / Via RS-485 link (Loader) 3 : Via RS-485 link (Loader) / Via RS-485 link (Loader)	—	—	N	0

*1 When you make settings from the keypad, the incremental unit is restricted by the number of digits that the LED monitor can display.
(Example) If the setting range is from -200.00 to 200.00, the incremental unit is as follows:
"1" for -200 to -100, "0.1" for -99.9 to -10.0, "0.01" for -9.99 to -0.01, "0.01" for 0.00 to 99.99, and "0.1" for 100.0 to 200.0

*2 Symbols in the "Data copy" column
Y: Will be copied unconditionally.
Y1: Will not be copied if the rated capacity differs from the source inverter.
Y2: Will not be copied if the rated input voltage differs from the source inverter.
N: Will not be copied.

*3 Reserved for the maker. Do not set any data.

<Changing, validating, and saving function code data when the motor is running>
: Impossible, : Possible (Change data with keys and then save/validate it with key), : Possible (Change and validate data with keys and then save it with key)

■Functions Settings

●o codes: Option Functions

Func. Code	Name	Data setting range	Min.	Unit	Data copy*2	Default setting
o01	Command/feedback input (Input form selection)	0, 1, 2, 10, 11, 12, 20, 21, 22	1	—	Y	0
o02	Speed control (P item)	0.01 to 200.00	0.01	—	Y	10.00
o03	(I item)	0.000 to 5.000	0.001	s	Y	0.100
o04	(Filter time constant)	0.000 to 5.000	0.001	s	Y	0.020
o05	(Pulse line input) (Encode pulse number)	20 to 3600	1	—	Y	1024
o06	(Filter time constant)	0.000 to 5.000	0.001	s	Y	0.005
o07	(Pulse compensation coefficient 1)	1 to 9999	1	—	Y	1
o08	(Pulse compensation coefficient 2)	1 to 9999	1	—	Y	1
o09	Feedback (Feedback input) (Encoder pulse number)	20 to 3600	1	—	Y	1024
o10	(Filter time constant)	0.000 to 5.000	0.001	s	Y	0.005
o11	(Pulse compensation coefficient 1)	1 to 9999	1	—	Y	1
o12	(Pulse compensation coefficient 2)	1 to 9999	1	—	Y	1
o13	Speed control (Output limiter)	0. 00 to 100.00	0.01	%	Y	100.00
o14	Reserved *3					
o15	Reserved *3					
o16	Reserved *3					
o17	Excessive speed deviation (Level)	0 to 50	1	%	Y	10
o18	(Timer)	0.0 to 10.0	0.1	s	Y	0.5
o19	PG abnormal error selection	0, 1, 2	1	—	Y	2
o20	DIO option (DI mode selection)	0: 8 bit binary setting 1: 12 bit binary setting 4: BCD 3-digit setting 0 to 99.9 5: BCD 3-digit setting 0 to 999	—	—	Y	0
o21	(DO mode selection)	0: Output frequency (befor slip compensation) 1: Out put frequency (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Overload rate 6: Power consumption 7: PID feedback amount 9: DC link circuit voltage 13: Motor output 15: PID command (SV) 16: PID command (MV) 99: Individual signal output	—	—	Y	0
o27	Transmission error (Operation selection)	0 to 15	1	—	Y	0
o28	(Timer selection)	0.0 to 60.0	0.1	s	Y	0.0
o30	Bus setting parameter 1	0 to 255	1	—	Y	0
o31	Bus setting parameter 2	0 to 255	1	—	Y	0
o32	Bus setting parameter 3	0 to 255	1	—	Y	0
o33	Bus setting parameter 4	0 to 255	1	—	Y	0
o34	Bus setting parameter 5	0 to 255	1	—	Y	0
o35	Bus setting parameter 6	0 to 255	1	—	Y	0
o36	Bus setting parameter 7	0 to 255	1	—	Y	0
o37	Bus setting parameter 8	0 to 255	1	—	Y	0
o38	Bus setting parameter 9	0 to 255	1	—	Y	0
o39	Bus setting parameter 10	0 to 255	1	—	Y	0
o40	Writing function code allocation 1	0000H to FFFFH	1	—	Y	0000H
o41	Writing function code allocation 2	0000H to FFFFH	1	—	Y	0000H
o42	Writing function code allocation 3	0000H to FFFFH	1	—	Y	0000H
o43	Writing function code allocation 4	0000H to FFFFH	1	—	Y	0000H
o44	Writing function code allocation 5	0000H to FFFFH	1	—	Y	0000H
o45	Writing function code allocation 6	0000H to FFFFH	1	—	Y	0000H
o46	Writing function code allocation 7	0000H to FFFFH	1	—	Y	0000H
o47	Writing function code allocation 8	0000H to FFFFH	1	—	Y	0000H
o48	Read function code allocation 1	0000H to FFFFH	1	—	Y	0000H
o49	Read function code allocation 2	0000H to FFFFH	1	—	Y	0000H
o50	Read function code allocation 3	0000H to FFFFH	1	—	Y	0000H
o51	Read function code allocation 4	0000H to FFFFH	1	—	Y	0000H
o52	Read function code allocation 5	0000H to FFFFH	1	—	Y	0000H
o53	Read function code allocation 6	0000H to FFFFH	1	—	Y	0000H
o54	Read function code allocation 7	0000H to FFFFH	1	—	Y	0000H
o55	Read function code allocation 8	0000H to FFFFH	1	—	Y	0000H
o56	Read function code allocation 9	0000H to FFFFH	1	—	Y	0000H
o57	Read function code allocation 10	0000H to FFFFH	1	—	Y	0000H
o58	Read function code allocation 11	0000H to FFFFH	1	—	Y	0000H
o59	Read function code allocation 12	0000H to FFFFH	1	—	Y	0000H

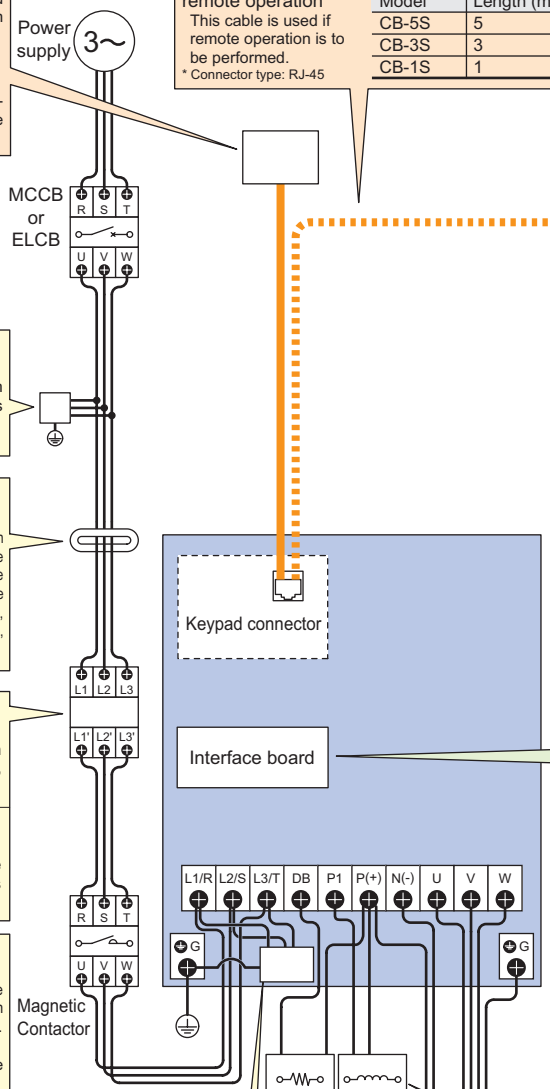
*1 When you make settings from the keypad, the incremental unit is restricted by the number of digits that the LED monitor can display.
(Example) If the setting range is from -200.00 to 200.00, the incremental unit is as follows: "1" for -200 to -100, "0.1" for -99.9 to -10.0, "0.01" for -9.99 to -0.01, "0.01" for 0.00 to 99.99, and "0.1" for 100.0 to 200.0

*2 Symbols in the "Data copy" column
Y: Will be copied unconditionally.
Y1: Will not be copied if the rated capacity differs from the source inverter.
Y2: Will not be copied if the rated input voltage differs from the source inverter.
N: Will not be copied.

*3 Reserved for the maker. Do not set any data.

<Changing, validating, and saving function code data when the motor is running>
: Impossible, : Possible (Change data with keys and then save/validate it with key), : Possible (Change and validate data with keys and then save it with key)

Peripheral Equipment Connection Diagrams



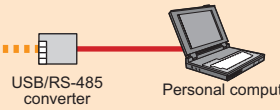
Remote keypad (Standard equipment)
If the back cover packed with the inverter is mounted and the extension cable is used, remote operation can be performed.

Multi-function keypad (to be announced soon)
TP-G1
This multi-function keypad has a large 5-digit 7-segment LED with backlit LCD. (It cannot be mounted on the inverter body.)

Extension cable for remote operation
This cable is used if remote operation is to be performed.
* Connector type: RJ-45

Model	Length (m)
CB-5S	5
CB-3S	3
CB-1S	1

Inverter loader software for Windows
This software is used to set function codes in the inverter from a personal computer, to manage data, etc.
USB/RS-485 converter, USB cable
[Handled by System Sacom Sales Corp.].



Arrestor
CN232□□□□
Used to absorb lightning surges that come in from the power supply to protect all the equipment that is connected to the power supply.
[Handled by Fuji Electric Technica Co., Ltd.]

Radio noise reducing zero phase reactor
ACL-40B, ACL-74B
This is used to reduce noise. For the most part, control effects can be obtained in frequency band of 1MHz or higher. Since the frequency band where effects can be obtained is broad, it is effective as a simple countermeasure against noise. If the wiring distance between a motor and the inverter is short (20m is a good guideline), it is recommended that it be connected to the power supply side, and if the distance exceeds 20m, connect it to the output side.

EMC compliant filter
EFL-□□□
This is an exclusive filter used to comply with European regulations in the EMC Directives (emissions). For details, make connections in accordance with the "Installation Manual."

Power filter
RNF□□□□-□□
This filter can be used for the same purpose as the "EMC compliant filter" described above, but it does not comply with the EMC Directives.

Output circuit filter
OFL-□□□-□
This filter is connected to the output circuits of low noise type inverters (carrier frequency 8kHz to 15kHz, 6kHz or greater in 30kW or higher circuits) and is used for the following purposes.
- Suppresses fluctuation of motor terminal voltages. Prevents damage to motor insulation due to surge voltage in 400V series inverters.
- Suppresses leak current in output side wiring. Reduces leak current when multiple motors are run side by side or when there is long distance wiring.
- Suppresses radiation noise and induction noise from output side wiring. If the wiring length in a plant, etc. is long, it is effective as a countermeasure for noise reduction.

* When this filter is connected, be sure to set the carrier frequency (F26) at 8kHz or higher (6kHz or higher for 30kW or larger model).

OFL-□□□-4A
This filter is connected to the inverter output circuit for the following purposes.
- Suppresses fluctuation of motor terminal voltages. Prevents damage to motor insulation due to surge voltage in 400V serried inverters.
- Suppresses radiation noise and induction noise from output side wiring. If the wiring length in a plant, etc. is long, it is effective as a noise reduction countermeasure.

*This filter is not limited by carrier frequency. Also, motor tuning can be carried out with this option in the installed state.

Surge suppression unit
SSU-□□□-□TA-NS
Prevents the motor insulation from being damaged by the surge current of the inverter.

Surge absorber
S2-A-O: For electromagnetic contactors
S1-B-O: For mini control relays, timers
Absorbs surges and noise generated from other electrical devices to prevent other equipment from malfunctioning.
[Handled by Fuji Electric Technica Co., Ltd.]

Surge killer
FLS-323
Absorbs external surges and noise, preventing malfunction of electronic devices used in control panels, etc.

Braking Resistor
DB□□-□□
Used to improve the braking capacity in cases where there is frequent starting and stopping or when the load is great from the inertial moment, etc.

Filter capacitor for radio noise reduction
NFM□□M315KPD□
Used to reduce noise.
It is effective in the AM radio frequency band.
* Do not use this in the inverter output side.
[Made by NIPPON CHEMI-CON, handled by Fuji Electric Technica Co., Ltd.]

■Interface card (available soon)

PG feedback card
OPC-E1-PG
Carries out frequency setting, speed control and position control through input of pulse strings in accordance with PG feedback.
Applicable PG specifications
- Power supply: 50V, 100mA max
- Output Signal: Open collector or complementary
- Maximum output pulse frequency: 30 kHz or lower

DIO card
OPC-E1-DIO
Used in cases where you desire to add more DI and DO signals to the FRENIC-Multi unit.

RS485 communications card (for branching)
OPC-E1-RS
Connects to a host device (master) such as a personal computer or PLC for controlling FRENIC-Multi as a subordinate device (slave).
(This board is in addition to the RS485 communications function built into the FRENIC-Multi.)
Caution: This optional card cannot be connected to the key pad or assistance loader.
- Connected units: 1 host device, 31 inverters.
- Electrical specifications: EIARS485
- Synchronization method: Start-stop system
- Communications method: Half-duplex
- Communications rates (bps): 2400, 4800, 9600, 19200, 38400
- Maximum communications distance: 500 m
- Terminal resistor: Built-in

DeviceNet Board
OPC-E1-DEV
Used to set, change and check the function codes necessary for operation commands, frequency setting, monitoring and operation from the DeviceNet master.
- Connection Nodes: Max. 64 units (including the master)
- MAC ID: 0 to 63
- Insulation: 500V DC (photo coupler insulation)
- Communications rates (kbps): 500, 250, 125
- Network power consumption: Max 50mA, 24V DC

DC Reactor
DCR□-□□□
(For power supply coordination)
1) Used when the power supply's transformer capacity is 500kVA or higher and is 10 or more times the rated capacity of the inverter.
2) Used in cases where a thyristors transformer is connected as a load on the same transformer.
* If a commutating reactor is not used in the thyristors transformer, it is necessary to connect an AC reactor on the inverter's input side, and so be sure to verify that this is done.
3) Used to prevent tripping in cases where an inverter overvoltage trip is caused by opening and closing of the phase advancing capacitor in the power supply system
4) Used when there is a phase unbalance of 2% or greater in the power supply voltage.

(For improving supplied power factor, reducing harmonics)
- Used to reduce the supplied harmonics current (or improve power factor).

* Concerning reduction effects, please refer to the accompanying guidelines.

Analog frequency meter (45, 60 angle)
TRM-45, FM-60
[Handled by Fuji Electric Technica Co., Ltd.]

Frequency setting volume
RJ-13, WAR3W-1kΩ
[Handled by Fuji Electric Technica Co., Ltd.]

Interchangeability attachment (available soon)
MA-E1-□□
This attachment makes the latest inverters interchangeable with older inverter models manufactured by Fuji Electric.

External cooling fan attachment (available soon)
PB-E1-□□
This is an attachment for relocating the inverter's cooling fan to the outside of the control panel.

Options

■ Options

Braking resistor	Type, specifications and external dimensions	[Unit: mm]

[Standard type] (DB□□□-4)
[10% ED type] (DB□□□-4C)

Fig. A

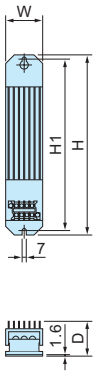


Fig. B

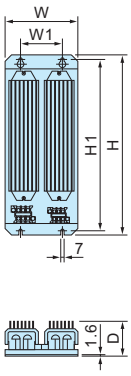


Fig. C

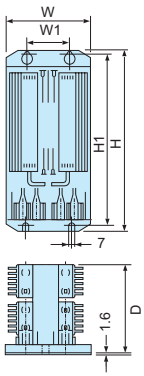


Fig. D

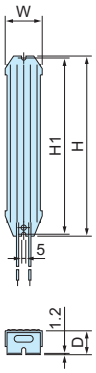


Fig. E

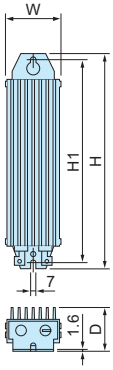
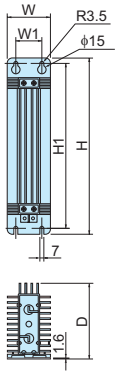


Fig. F

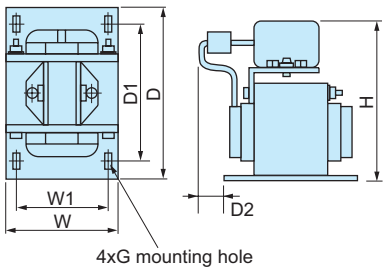


	Voltage 400V series	Fig	Dimensions [mm] W	W1	H	H1	D	Mass [kg]
Standard type	DB0.75-4	A	64	—	310	295	67	1.3
	DB2.2-4	A	64	—	470	455	67	2.0
	DB3.7-4	A	64	—	470	455	67	1.7
	DB5.5-4	B	74	74	470	455	67	4.5
	DB7.5-4	B	74	74	520	495	67	5.0
	DB11-4	C	142	74	430	415	160	6.9
	DB15-4	C	142	74	430	415	160	6.9
10%ED type	DB0.75-4C	D	43	—	221	215	30.5	0.5
	DB2.2-4C	E	67	—	188	172	55	0.8
	DB3.7-4C	E	67	—	328	312	55	1.6
	DB5.5-4C	E	—	—	378	362	78	2.9
	DB7.5-4C	E	—	—	418	402	78	3.3
	DB11-4C	F	80	50	460	440	140	4.3
	DB15-4C	F	80	50	580	440	140	5.6

Braking resistor type	Power supply voltage	Inverter type	Type	Qty.	Resistance [Ω]	Max braking torque [%]	50 [Hz] [N・m]	60 [Hz] [N・m]	Continuous braking (100% torque conversion value) Discharging capacity [kWs]	Braking time [s]	Repetitive braking [Each cycle is less than 100[s].] Average allowable loss [kW]	Duty cycle [%ED]
Standard type	Three-phase 400V	FRN0.4E1□-4E	DB0.75-4	1	200	150	4.02	3.32	9	45	0.044	22
		FRN0.75E1□-4E					7.57	6.25	17		0.068	18
		FRN1.5E1□-4E	DB2.2-4	1	160		15.0	12.4	34		0.075	10
		FRN2.2E1□-4E					22.0	18.2	33	30	0.077	7
		FRN3.7E1□-4E	DB3.7-4	1	130		37.1	30.5	37	20	0.093	5
		FRN5.5E1□-4E	DB5.5-4	1	80	150	54.3	45.0	55	20	1.138	5
		FRN7.5E1□-4E	DB7.5-4	1	60		73.6	61.6	38	10	0.188	5
		FRN11E1□-4E	DB11-4	1	40		108	89.5	55		0.275	5
		FRN15E1□-4E	DB15-4	1	34.4		147	122	75		0.375	5
	Single-phase 200V	FRN0.4E1□-7E	DB0.75-2	1	100	150	4.02	3.32	9	45	0.044	22
		FRN0.75E1□-7E					7.57	6.25	17		0.068	18
		FRN1.5E1□-7E	DB2.2-2	1	40		15.0	12.4	34		0.075	10
		FRN2.2E1□-7E					22.0	18.2	33	30	0.077	7
10%ED type	Three-phase 400V	FRN0.4E1□-4E	DB0.75-4C	1	200	150	4.02	3.32	50	250	5	37
		FRN0.75E1□-4E					7.57	6.25		133		20
		FRN1.5E1□-4E	DB2.2-4C	1	160		15.0	12.4	55	73	0.110	14
		FRN2.2E1□-4E					22.0	18.2		50		10
		FRN3.7E1□-4E	DB3.7-4C	1	130		37.1	30.5	140	75	0.185	10
		FRN5.5E1□-4E	DB5.5-4C	1	80	150	54.3	45.0	55	20	0.275	10
		FRN7.5E1□-4E	DB7.5-4C	1	60		73.5	61.6	38	10	0.375	10
		FRN11E1□-4E	DB11-4C	1	40		108	89.5	55		0.55	10
		FRN15E1□-4E	DB15-4C	1	34.4		147	122	75		0.75	10
	Single-phase 200V	FRN0.4E1□-7E	DB0.75-2C	1	100	150	4.02	3.32	50	250	0.075	37
		FRN0.75E1□-7E					7.57	6.25		133		20
		FRN1.5E1□-7E	DB2.2-2C	1	40		15.0	12.4	55	73	0.110	14
		FRN2.2E1□-7E					22.0	18.2		50		10

Note:For the inverter type FRN 0.4E1□-4E, the symbol □ is replaced with either of the following alphabets.
□ S(standard type), E(EMC filter built-in type)

DC REACTOR



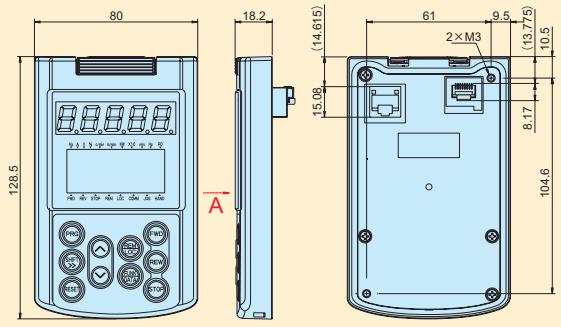
Power supply voltage	Applicable motor rating [kW]	Inverter type	REACTOR type	Dimensions [mm]								Mass [kg]
				W	W1	D	D1	D2	H	Mounting hole	Terminal hole	
Three-phase 400V	0.4	FRN0.4E1□-4E	DCR4-0.4	66	56	90	72	15	94	5.2x8	M4	1.0
	0.75	FRN0.75E1□-4E	DCR4-0.75	66	56	90	72	20	94	5.2x8	M4	1.4
	1.5	FRN1.5E1□-4E	DCR4-1.5	66	56	90	72	20	94	5.2x8	M4	1.6
	2.2	FRN2.2E1□-4E	DCR4-2.2	86	71	100	80	15	110	6x9	M4	2
	3.7	FRN3.7E1□-4E	DCR4-3.7	86	71	100	80	20	110	6x9	M4	2.6
	5.5	FRN5.5E1□-4E	DCR4-5.5	86	71	100	80	20	110	6x9	M4	2.6
	7.5	FRN7.5E1□-4E	DCR4-7.5	111	95	100	80	24	130	7x11	M5	4.2
	11	FRN11E1□-4E	DCR4-11	111	95	100	80	24	130	7x11	M5	4.3
	15	FRN15E1□-4E	DCR4-15	146	124	120	96	15	171	7x11	M5	5.9
Single-phase 200V	0.1	FRN0.1E1□-7E	DCR2-0.2	66	56	90	72	5	94	5.2x8	M4	0.8
	0.2	FRN0.2E1□-7E	DCR2-0.4	66	56	90	72	15	94	5.2x8	M4	1.0
	0.4	FRN0.4E1□-7E	DCR2-0.75	66	56	90	72	20	94	5.2x8	M4	1.4
	0.75	FRN0.75E1□-7E	DCR2-1.5	66	56	90	72	20	94	5.2x8	M4	1.6
	1.5	FRN1.5E1□-7E	DCR2-2.2	86	71	100	80	10	110	6x11	M4	1.8
	2.2	FRN2.2E1□-7E	DCR2-3.7	86	71	100	80	20	110	6x11	M4	2.6

Note:For the inverter type FRN 0.4E1□-4E, the symbol is replaced with either of the following alphabets.
□ S(standard type), E(EMC filter built-in type)

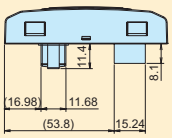
■Multi-function keypad (TP-G1,TP-G1-J1)

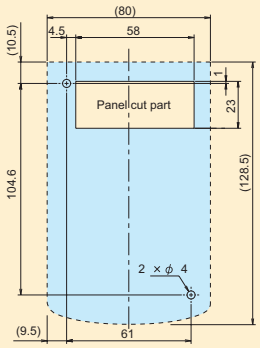
Connection with FRENIC-Multi using an extension cable for remote operation (optional) enables remote operation, function code data setting, monitoring, etc. from the keypad keys and panel.
The keypad is equipped with an LCD panel (with backlight) and the copy function (for three inverter data).

[Unit: mm]



Backside view



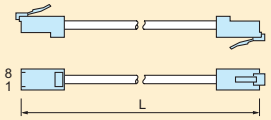


Dimensions of panel cutting (viewed from "A")

Keypad	Applicable model		
TP-G1	Eco	Multi	
TP-G1-J1	Eco	Multi	MEGA

■ Extension cable for remote operation(CB-□s)

This is used to connect the inverter and the remote keypad.



Connector type: RJ-45

Optional type	Length (m)
CB-5S	5
CB-3S	3
CB-1S	1

Options

Options

Interface card

RS-485 communication card (OPC-F1-RS) Built-in type

Connection with a host (master) device such as PC or PLC allows you to control FRENIC-Multi as a subordinate (slave) device. (The card is added to the RS-485 communication devices for FRENIC-Multi.)
NOTE: This option card cannot be connected with the keypad or a support loader.

- Number of connectable devices: 1 host device and 31 inverters
- Number of ports: 2 ports
- Electric specifications: EIA RS-485
- Synchronization method: Start/stop
- Communication method: Half-duplex
- Transmission speed (bps): 2400, 4800, 9600, 19200 and 38400
- Maximum communication distance: 500m
- Terminating resistor: Built-in

PG interface card (OPC-E1-PG) for 5V Built-in type

When this card is built in the inverter, positioning accuracy will improve, resulting in reduced positioning time and improved measuring accuracy by the measuring instrument.

PG interface card (OPC-E1-PG3) for 12V Built-in type

Incorporating the interface card in the inverter permits accurate speed control and position control.The interface card can be used simultaneously with the communication bus for FRENIC-Multi series, optional DeviceNet card (OPC-E1-DEV), CC-Link card (OPC-E1-CCL), and PROFIBUS-DP card (OPC-E1-PDP).

CC-Link card (OPC-E1-CCL) Front installation type

Connection with the CC-Link master unit allows operation commands, freguency settings, function code changes, and centralized data management.

DeviceNet card (OPC-E1=DEV) Front installation type

Connection with the DeviceNet master unit permits application to the system that requires operation commands and frequency settings.

DIO card (OPC-E1-DIO) Front installation type

This card allows frequency setting or status monitoring by exchanging digital signal data with the host controller.

SY card (synchronized operation) NOTE2) Built-in type

Using this card allows synchronized operation of the two motors having a pulse generator (PG).

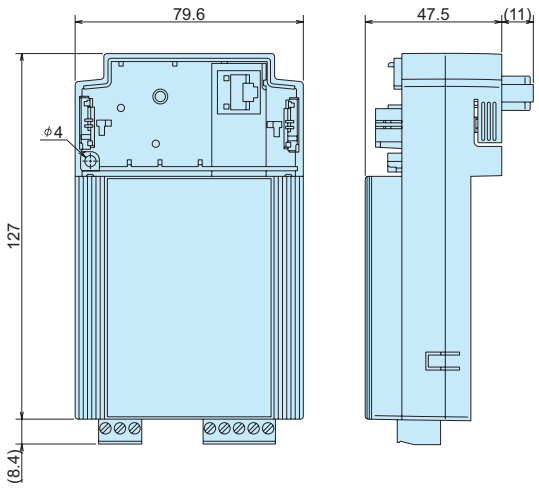
PROFIBUS-DP card (OPC-E1-PDP) Front installation type

Connecting this card to the PROFIBUS master unit allows setting frequency or changing function codes.
Number of connectable devices: Max. 126

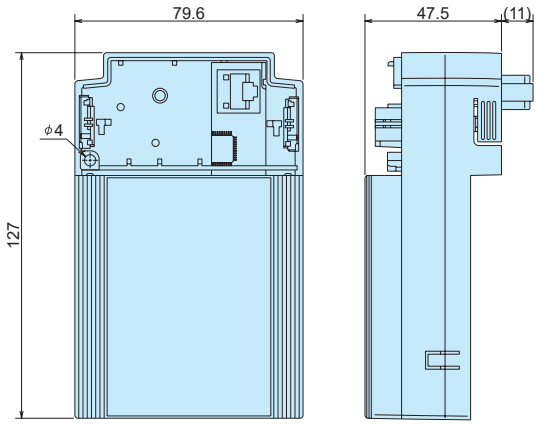
Note1) An external power supply of 24V is needed to use a separately sold option card.
Note2) The inverter that can be used with the SY card includes special specifications. When ordering the SY card, please order together with the inverter in a set.

Front installation type External dimensions

●OPC-E1-CCL,
OPC-E1-DEV
OPC-E1-PDP



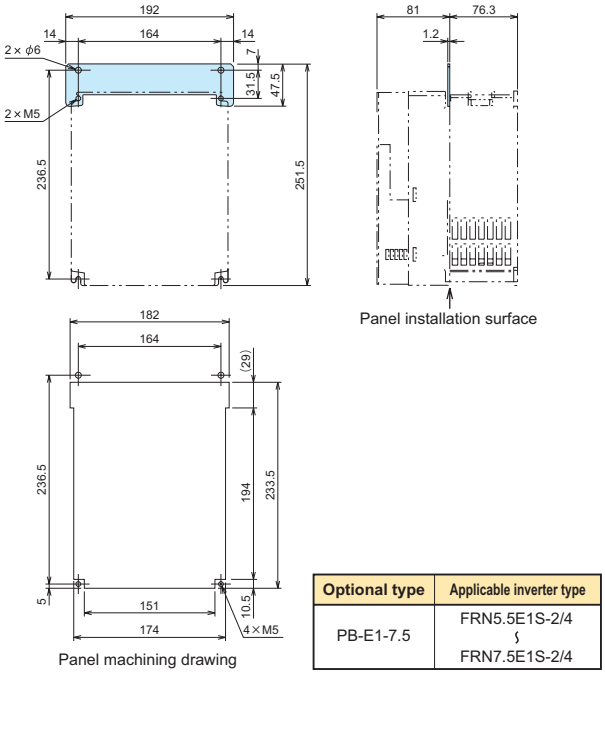
●OPC-E1-DIO



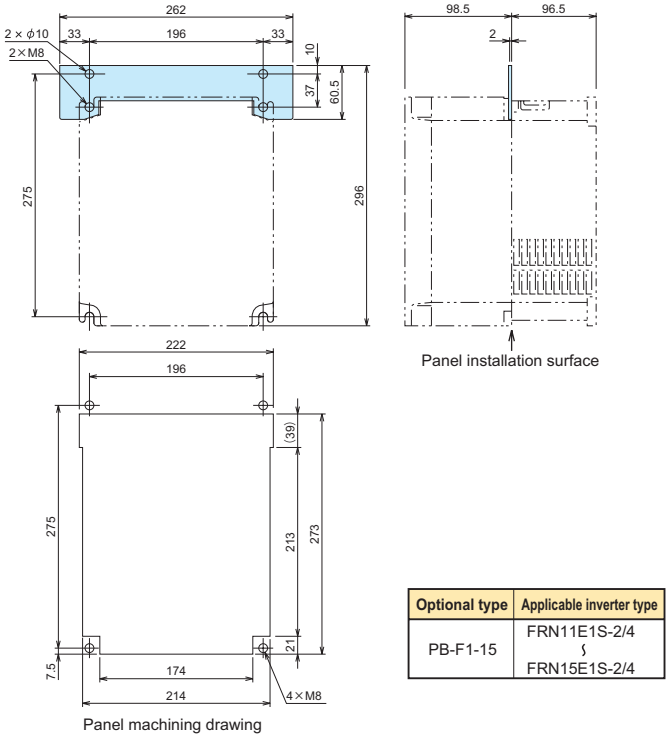
External cooling attachment

External cooling attachment (PB-E1-7.5/PB-F1-15)

This attachment allows installation of the inverter heat sink outside the panel. With this attachment, it is possible to improve the cooling effect and to make the panel more compact.



Optional type	Applicable inverter type
PB-E1-7.5	FRN5.5E1S-2/4 ≀ FRN7.5E1S-2/4



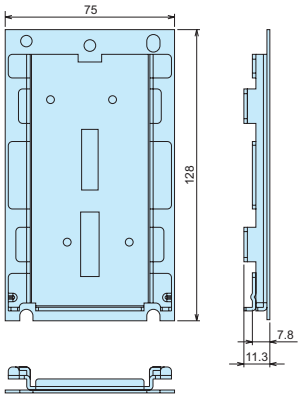
Optional type	Applicable inverter type
PB-F1-15	FRN11E1S-2/4 ≀ FRN15E1S-2/4

Compatible attachment

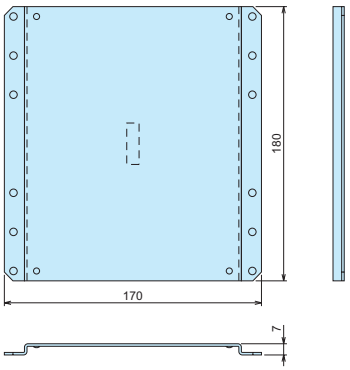
Compatible attachment (MA-E1-□□)

This attachment allows replacing our previous model with the new one without machining.

▪ MA-E1-0.75



▪ MA-E1-3.7



Optional type	Applicable inverter type	Previous inverter type
・MA-E1-0.75	FRN0.1E1S-7J	FVR0.1E11S-7
	FRN0.2E1S-7J	FVR0.2E11S-7
	FRN0.4E1S-7J	FVR0.4E11S-7
・MA-E1-3.7	FRN3.7E1S-4J	FVR3.7E11S-4
	FRN2.2E1S-7J	FVR2.2E11S-7

*The table below shows the previous and new inverters with are compatible and do not need attachment for replacement.

Applicable inverter type	Previous inverter type
FRN0.4E1S-4J	FVR0.4E11S-4
FRN0.75E1S-4J	FVR0.75E11S-4
FRN1.5E1S-4J	FVR1.5E11S-4
FRN2.2E1S-4J	FVR2.2E11S-4
FRN1.5E1S-7J	FVR1.5E11S-7
FRN2.2E1S-7J	FVR2.2E11S-7
FRN5.5E1S-4J	FVR5.5E11S-4
FRN7.5E1S-4J	FVR7.5E11S-4

Options

Devices requiring wiring

Power supply voltage	Applicable motor rating (kW)	Inverter type	MCCB, ELCB rated current (A)		Magnetic contactor (MC)			Recommended cable size (mm²) *1						
					Input circuit		Output circuit	Main power input (L1/R, L2/S, L3/T)		Inverter output [U, V, W]	DC Reactor [P1, P (+)]	DC Reactor [P (+), DB	For control circuit	For connection with Inverter [⏚G]
			With DCR	Without DCR	With DCR	Without DCR		With DCR	Without DCR					
Three-phase 400V	0.4	FRN0.4E1□-4E	5	5	SC-05	SC-05	SC-05	2.0	2.0	2.0	2.0	2.0	0.75 to 1.25	2.0
	0.75	FRN0.75E1□-4E						2.0	2.0	2.0	2.0	2.0		
	1.5	FRN1.5E1□-4E		10				2.0	2.0	2.0	2.0	2.0		
	2.2	FRN2.2E1□-4E		15				2.0	2.0	2.0	2.0	2.0		
	3.7	FRN3.7E1□-4E	10	20				2.0	2.0	2.0	2.0	2.0		
	5.5	FRN5.5E1□-4E	15	30				2.0	2.0	2.0	2.0	2.0		
	7.5	FRN7.5E1□-4E	20	40		SC-4-0		2.0	2.0	2.0	2.0	2.0		3.5
	11	FRN11E1□-4E	30	50	SC-4-0	SC-N1	SC-4-0	2.0	3.5	2.0	3.5	2.0		
	15	FRN15E1□-4E	40	60	SC-5-1		SC-5-1	3.5	5.5	3.5	5.5	2.0		
Single-phase 200V	0.1	FRN0.1E1□-7E	5	5	SC-05	SC-05	SC-05	2.0	2.0	2.0	2.0	2.0	0.75 to 1.25	2.0
	0.2	FRN0.2E1□-7E						2.0	2.0	2.0	2.0	2.0		
	0.4	FRN0.4E1□-7E		10				2.0	2.0	2.0	2.0	2.0		
	0.75	FRN0.75E1□-7E	10	15				2.0	2.0	2.0	2.0	2.0		
	1.5	FRN1.5E1□-7E	15	20				2.0	2.0	2.0	2.0	2.0		
	2.2	FRN2.2E1□-7E	20	30		SC-5-1		2.0	3.5	2.0	2.0	2.0		

- For the inverter type FRN 0.4E1□-4E, the symbol □ is replaced with either of the following alphabets.
  □ S(standard type), E(EMC filter built-in type)
- The frame and series of the MCCB and ELCB models vary according to the transformer capacity and so on of the equipment. Choose the optimum ones according to the catalog and technical data of the circuit breaker and others.
- Choose the optimum rated sensitive current of the ELCB according to technical data, too. The rated currents of the MCCB and ELCB specified in this table indicate those of SA□B/□ and SA□R/□ models.
- Description in the above table may vary for different ambient temperatures, power supply voltages or other conditions.

*1: Use crimp terminals equipped with insulation sheath or those equipped with an insulation tube or the like.
The cable to be used is 600V-insulated cable with an allowable temperature of 75˚C. The ambient temperature is assumed to be 50˚C.

Guideline for Suppressing Harmonics

Application to "Guideline for Suppressing Harmonics by the Users Who Receive High Voltage or Special High Voltage"

Our FRENIC-Multi series are the products specified in the "Guideline for Suppressing Harmonics by Customers Receiving High Voltage or Special High Voltage." When you enter into a new contract with an electric power company or update a contract, you are requested by the electric power company to submit an accounting statement form.

(1) Scope of regulation

In principle, the guideline applies to the customers that meet the following two conditions:

- The customer receives high voltage or special high voltage.
- The "equivalent capacity" of the converter load exceeds the standard value for the receiving voltage (50kVA at a receiving voltage of 6.6kV).

(2) Regulation method

The level (calculated value) of the harmonic current that flows from the customer's receiving point out to the system is subjected to the regulation. The regulation value is proportional to the contract demand. The regulation values specified in the guideline are shown in Table 1.

Table 1 Upper limits of harmonic outflow current per kW of contract demand [mA/kW]

Receiving voltage	5th	7th	11th	13th	17th	19th	23th	Over 25th
6.6kV	3.5	2.5	1.6	1.3	1.0	0.90	0.76	0.70
22kV	1.8	1.3	0.82	0.69	0.53	0.47	0.39	0.36

1. Calculation of Equivalent Capacity (Pi)

Although the equivalent capacity (Pi) is calculated using the equation of (input rated capacity) x (conversion factor), catalog of conventional inverters do not contain input rated capacities. A description of the input rated capacity is shown below:

(1) "Inverter rated capacity" corresponding to "Pi"

- Calculate the input fundamental current I1 from the kW rating and efficiency of the load motor, as well as the efficiency of the inverter. Then, calculate the input rated capacity as shown below:
  Input rated capacity = $\sqrt{3}$ x (power supply voltage) x I_1 x 1.0228/1000[kVA]
  Where 1.0228 is the 6-pulse converter's value obtained by (effective current) / (fundamental current).
- When a general-purpose motor or inverter motor is used, the appropriate value shown in Table 2 can be used. Select a value based on the kW rating of the motor used, irrespective of the inverter type.

Table 2 "Input rated capacities" of general-purpose inverters determined by the nominal applied motors

Nominal applied motor [kW]		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5
Pi [kVA]	200V	0.57	0.97	1.95	2.81	4.61	6.77	9.07	13.1	17.6	21.8
	400V	0.57	0.97	1.95	2.81	4.61	6.77	9.07	13.1	17.6	21.8

(2) Values of "Ki (conversion factor)"

- Depending on whether an optional ACR (AC REACTOR) or DCR (DC REACTOR) is used, apply the appropriate conversion factor specified in the appendix to the guideline. The values of the converter factor are shown in Table 3.

Table 3 "Conversion factors Ki" for general-purpose inverters determined by reactors

Circuit category	Circuit type		Conversion factor Ki	Main applications
3	Three-phase bridge 3 (capacitor smoothing)	Without a reactor	K31=3.4	• General-purpose inverters • Elevators • Refrigerators, air conditioning systems • Other general appliances
		With a reactor (ACR)	K32=1.8	
		With a reactor (DCR)	K33=1.8	
		With reactors (ACR and DCR)	K34=1.4	

2. Calculation of Harmonic Current

(1) Value of "input fundamental current"

- Apply the appropriate value shown in Table 4 based on the kW rating of the motor, irrespective of the inverter type or whether a reactor is used.

* If the input voltage is different, calculate the input fundamental current in inverse proportion to the voltage.

Table 4 "Input fundamental currents" of general-purpose inverters determined by the nominal applied motors

Nominal applied motor [kW]		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5
Input fundamental current [A]	200V	1.62	2.74	5.50	7.92	13.0	19.1	25.6	36.9	49.8	61.4
	400V	0.81	1.37	2.75	3.96	6.50	9.55	12.8	18.5	24.9	30.7
6.6 kV converted value [mA]		49	83	167	240	394	579	776	1121	1509	1860

(2) Calculation of harmonic current

Table 5 Generated harmonic current [%], 3-phase bridge (capacitor smoothing)

Degree	5th	7th	11th	13th	17th	19th	23th	25th
Without a reactor	65	41	8.5	7.7	4.3	3.1	2.6	1.8
With a reactor (ACR)	38	14.5	7.4	3.4	3.2	1.9	1.7	1.3
With a reactor (DCR)	30	13	8.4	5.0	4.7	3.2	3.0	2.2
With reactors (ACR and DCR)	28	9.1	7.2	4.1	3.2	2.4	1.6	1.4

- ACR: 3%
- DCR: Accumulated energy equal to 0.08 to 0.15ms (100% load conversion)
- Smoothing capacitor: Accumulated energy equal to 15 to 30ms (100% load conversion)
- Load: 100%

■ nth harmonic current [A] = Fundamental current [A] x $\frac{\text{Generated nth harmonic current [\%]}}{100}$

Calculate the harmonic current of each degree using the following equation:

(3) Maximum availability factor

- For a load for elevators, which provides intermittent operation, or a load with a sufficient designed motor rating, reduce the current by multiplying the equation by the "maximum availability factor" of the load.
- The "maximum availability factor of an appliance" means the ratio of the capacity of the harmonic generator in operation at which the availability reaches the maximum, to its total capacity, and the capacity of the generator in operation is an average for 30 minutes.
- In general, the maximum availability factor is calculated according to this definition, but the standard values shown in Table 6 are recommended for inverters for building equipment.

Table 6 Availability factors of inverters, etc. for building equipment (standard values)

Equipment type	Inverter capacity category	Single inverter availability factor
Air conditioning system	200kW or less	0.55
	Over 200kW	0.60
Sanitary pump	———	0.30
Elevator	———	0.25
Refrigerator, freezer	50kW or less	0.60
UPS (6-pulse)	200kVA	0.60

[Correction coefficient according to contract demand level]

- Since the total availability factor decreases with increase in the building scale, calculating reduced harmonics with the correction coefficient s defined in Table 7 below is permitted.

Table 7 Correction coefficient according to the building scale

Contract demand [kW]	Correction coefficient β
300	1.00
500	0.90
1000	0.85
2000	0.80

*If the contract demand is between two specified values shown in Table 7, calculate the value by interpolation.

(4) Degree of harmonics to be calculated

Calculate only the "5th and 7th" harmonic currents

Warranty

To all our customers who purchase Fuji Electric FA Components & Systems' products:

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.

1. Free of Charge Warranty Period and Warranty Range

1-1 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."

1-2 Warranty range

(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.
1) 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.
7) The breakdown was caused by a chemical 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.

1-3. 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.

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.

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. However, if it is estimated that the life cycle of certain electronic and other parts is short and 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 at our company's business office or our service office.

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 operation.

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 separately.

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.

Variation

●The rich lineup of the active Fuji inverter family

Applications	Series Name (Catalog No.)	Features
General Industrial equipment	NEW FRENIC-MEGA (MEH642 for JE) (MEH655 for EN)	**High-performance, multi-functional inverter** (Three-phase 400V: 0.4 to 630kW,Three-phase 200V: 0.4 to 90kW) ● Loaded with vector control which is the peak of general purpose inverters. ● Prepared three types; the basic type, EMC filter built-in type. ● Maintainability is further improved with built-in USB port (option). ● The short-time acceleration and deceleration become enabled with achieving better rating of overload ratings at HD spec: 200% for 3 sec and 150% for 1 min and at LD spec: 120% for 1 min.
	FRENIC5000G11S (MEH403 for JE) (MEH413 for EN)	**High-performance, multi-functional inverter multi-functional** Capacity range expanded (Three-phase 200V: 0.2 to 90kW, Three-phase 400V: 0.4 to 630kW) ● Fuji's original dynamic torque vector control system delivers a starting torque of 200% at 0.5Hz. ● These inverters are packed with a full range of convenient functions, beginning with an auto tuning function. ● Compact, fully enclosed (22kW and below).
	FRENIC5000P11S (MEH403)	**Fan, pump inverter** Capacity range expanded (Three-phase 200V: 5.5 to110kW, Three-phase 400V: 5.5 to 710kW) ● Suitable for fans and pumps. ● The built-in automatic energy-saving function makes energy saving operation easy. ● An interactive keypad is standard-equipped for ease of operation.
	FRENIC-Multi (MEH652 for JE) (MEH653 for EN)	**High performance, compact inverter** (Three-phase 200V: 0.1 to 15kW, Single-phase 200V: 0.1 to 2.2kW, Three-phase 400V: 0.4 to 15kW) ● The inverter featuring environment-friendly and long life design (10 years) complies with RoHS Directives (products manufactured beginning in the autumn of 2005). ● With expanded capacity range, abundant model variation, and simple and thorough maintenance, the Multi is usable for a wide range of applications. ● Equipped with the functions optimum for the operations specific to vertical and horizontal conveyance, such as hit-and-stop control, brake signal, torque limit, and current limit.
	FRENIC-Eco (MEH442)	**Fan, pump inverter (for variable torque load)** (Three-phase 200V: 0.75 to 110kW, Three-phase 400V: 0.75 to 560kW) ● Developed exclusively for controlling variable torque load like fans and pumps. ● Full of new functions such as auto energy saving, PID control, life warning, and switching sequence to the commercial power supply. ● Ideal for air conditioners, fans, pumps, etc. which were difficult to use with conventional general-purpose inverters because of cost or functions.
	FRENIC-Mini (MEH441 for JE) (MEH451 for EN)	**Compact inverter** (Three-phase 200V: 0.1 to 3.7kW, Three-phase 400V: 0.4 to 3.7kW, Single-phase 200V: 0.1 to 2.2kW, Single-phase 100V: 0.1 to 0.75kW) ● A frequency setting device is standard-equipped, making operation simple. ● Loaded with auto torque boost, current limiting, and slip compensation functions, all of which are ideal for controlling traverse conveyors. ● Loaded with the functions for auto energy saving operation and PID control, which are ideal for controlling fans and pumps.
	FRENIC5000VG7S (MEH405)	**High performance, vector control inverter** Capacity range expanded (Three-phase 200V: 0.75 to 90kW, Three-phase 400V: 3.7 to 800kW) ● A high precision inverter with rapid control response and stable torque characteristics. ● Abundant functions and a full range of options make this inverter ideal for a broad range of general industrial systems. ● The auto tuning function makes vector control operation possible even for general-purpose motors.
	FRENIC5000MG5	**Inverter with the power supply regeneration function** (Three-phase 200V: 3.7 to 45kW) ● A separate converter is used, and up to 2 drive units can be connected to a single converter unit. ● The power regeneration function is standard-equipped in the converter unit. ● These inverters can be used for general-purpose motors.

Safety Precautions

1. Use the contents of this catalog only for selecting product types and models. When using a product, read the Instruction Manual beforehand to use the product correctly.
2. Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives. Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, and traffic control, are requested to consult the Fuji's Sales Division. Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.

NOTES

When running general-purpose motors

• Driving a 400V general-purpose motor
When driving a 400V general-purpose motor with an inverter using extremely long cables, damage to the insulation of the motor may occur. Use an output circuit filter (OFL) if necessary after checking with the motor manufacturer. Fuji's motors do not require the use of output circuit filters because of their reinforced insulation.

• Torque characteristics and temperature rise
When the inverter is used to run a general-purpose motor, the temperature of the motor becomes higher than when it is operated using a commercial power supply. In the low-speed range, the cooling effect will be weakened, so decrease the output torque of the motor. If constant torque is required in the low-speed range, use a Fuji inverter motor or a motor equipped with an externally powered ventilating fan.

• Vibration
When the motor is mounted to a machine, resonance may be caused by the natural frequencies, including that of the machine. Operation of a 2-pole motor at 60Hz or more may cause abnormal vibration.
* Study use of tier coupling or dampening rubber.
* It is also recommended to use the inverter jump frequency control to avoid resonance points.

• Noise
When an inverter is used with a general-purpose motor, the motor noise level is higher than that with a commercial power supply. To reduce noise, raise carrier frequency of the inverter. High-speed operation at 60Hz or more can also result in more noise.

When running special motors

• High-speed motors
When driving a high-speed motor while setting the frequency higher than 120Hz, test the combination with another motor to confirm the safety of high-speed motors.

• Explosion-proof motors
When driving an explosion-proof motor with an inverter, use a combination of a motor and an inverter that has been approved in advance.

• Submersible motors and pumps
These motors have a larger rated current than general-purpose motors. Select an inverter whose rated output current is greater than that of the motor.
These motors differ from general-purpose motors in thermal characteristics. Set a low value in the thermal time constant of the motor when setting the electronic thermal facility.

• Brake motors
For motors equipped with parallel-connected brakes, their braking power must be supplied from the primary circuit (commercial power supply). If the brake power is connected to the inverter power output circuit (secondary circuit) by mistake, problems may occur.
Do not use inverters for driving motors equipped with series-connected brakes.

• Geared motors
If the power transmission mechanism uses an oil-lubricated gearbox or speed changer/reducer, then continuous motor operation at low speed may cause poor lubrication. Avoid such operation.

• Synchronous motors
It is necessary to use software suitable for this motor type. Contact Fuji for details.

• Single-phase motors
Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.
* Even if a single-phase power supply is available, use a three-phase motor as the inverter provides three-phase output.

Environmental conditions

• Installation location
Use the inverter in a location with an ambient temperature range of -10 to 50˚C.
The inverter and braking resistor surfaces become hot under certain operating conditions. Install the inverter on nonflammable material such as metal.
Ensure that the installation location meets the environmental conditions specified in "Environment" in inverter specifications.

Combination with peripheral devices

• Installing a molded case circuit breaker (MCCB)
Install a recommended molded case circuit breaker (MCCB) or an earth leakage circuit breaker (ELCB) in the primary circuit of each inverter to protect the wiring. Ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

• Installing a magnetic contactor (MC) in the output (secondary) circuit
If a magnetic contactor (MC) is mounted in the inverter's secondary circuit for switching the motor to commercial power or for any other purpose, ensure that both the inverter and the motor are fully stopped before you turn the MC on or off. Remove the surge killer integrated with the MC.

• Installing a magnetic contactor (MC) in the input (primary) circuit
Do not turn the magnetic contactor (MC) in the primary circuit on or off more than once an hour as an inverter fault may result. If frequent starts or stops are required during motor operation, use FWD/REV signals.

• Protecting the motor
The electronic thermal facility of the inverter can protect the motor. The operation level and the motor type (general-purpose motor, inverter motor) should be set. For high-speed motors or water-cooled motors, set a small value for the thermal time constant to protect the motor.
If you connect the motor thermal relay to the motor with a long cable, a high-frequency current may flow into the wiring stray capacitance. This may cause the relay to trip at a current lower than the set value for the thermal relay. If this happens, lower the carrier frequency or use the output circuit filter (OFL).

• Discontinuance of power-factor correcting capacitor
Do not mount power factor correcting capacitors in the inverter (primary) circuit. (Use the DC REACTOR to improve the inverter power factor.) Do not use power factor correcting capacitors in the inverter output circuit (secondary). An overcurrent trip will occur, disabling motor operation.

• Discontinuance of surge killer
Do not mount surge killers in the inverter output (secondary) circuit.

• Reducing noise
Use of a filter and shielded wires are typical measures against noise to ensure that EMC Directives are met. Refer to "Inverter design technical document (MHT221)" for details.

• Measures against surge currents
If an overvoltage trip occurs while the inverter is stopped or operated under a light load, it is assumed that the surge current is generated by open/close of the phase-advancing capacitor in the power system.
We recommend connecting a DC REACTOR to the inverter.

• Megger test
When checking the insulation resistance of the inverter, use a 500V megger and follow the instructions contained in the Instruction Manual.

Wiring

• Wiring distance of control circuit
When performing remote operation, use the twisted shield wire and limit the distance between the inverter and the control box to 20m.

• Wiring length between inverter and motor
If long wiring is used between the inverter and the motor, the inverter will overheat or trip as a result of overcurrent (high-frequency current flowing into the stray capacitance) in the wires connected to the phases. Ensure that the wiring is shorter than 50m. If this length must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL).

• Wiring size
Select cables with a sufficient capacity by referring to the current value or recommended wire size.

• Wiring type
Do not use multicore cables that are normally used for connecting several inverters and motors.

• Grounding
Securely ground the inverter using the grounding terminal.

Selecting inverter capacity

• Driving general-purpose motor
Select an inverter according to the applicable motor ratings listed in the standard specifications table for the inverter. When high starting torque is required or quick acceleration or deceleration is required, select an inverter with a capacity one size greater than the standard.

• Driving special motors
Select an inverter that meets the following condition: Inverter rated current > Motor rated current.

Transportation and storage

When transporting or storing inverters, follow the procedures and select locations that meet the environmental conditions that agree with the inverter specifications.

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