

Chapter 8 SPECIFICATIONS

8.1 Standard Models

8.1.1 Three-phase 230 V class series

Item		Specifications											
Type(FRN...E1S-2U)		F12	F25	F30	001	002	003	005	007	010	015	020	
Applicable motor rating (HP)	*1	1/8	1/4	1/2	1	2	3	5	7.5	10	15	20	
Rated capacity (kVA)	*2	0.3	0.6	1.2	2.0	3.2	4.4	6.8	10	13	18	24	
Rated voltage (V)	*3	Three-phase 200 to 240 V (with AVR function)											
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)	17 (16.5)	25 (23.5)	33 (31)	47 (44)	60 (57)	
Overload capability	*5	150% of rated current for 1 min., 200% for 0.5 s.											
Rated frequency (Hz)		50, 60 Hz											
Phases, voltage, frequency		Three-phase, 200 to 240 V, 50/60 Hz											
Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance: 2% or less) ⁶⁾ , Frequency: +5 to -5%											
Rated current (A)	*7	(with DCR)	0.57	0.93	1.6	3.0	5.7	8.3	14.0	21.1	28.8	42.2	57.8
		(without DCR)	1.1	1.8	3.1	5.5	9.5	13.2	22.2	31.5	42.7	60.7	80.0
Required power supply capacity (kVA)	*8	0.2	0.3	0.6	1.1	2.0	2.9	4.9	7.4	10	15	20	
Torque (%)	*9	150		100		70		40				20	
Torque (%)	*10	150											
DC braking		Starting frequency: 0.1 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100% of rated current											
Braking transistor		Built-in											
Applicable safety standards		UL508C, C22.2 No.14, EN50178:1997											
Enclosure (IEC60529)		IP20, UL open type											
Cooling method		Natural cooling					Fan cooling						
Weight/Mass(ks/kg)		1.3(0.8)	1.3(0.6)	1.5(0.7)	1.8(0.8)	3.7(1.7)	3.7(1.7)	5.1(2.3)	7.5(3.4)	7.9(3.6)	13.4(6.1)	15.7(7.1)	

*1 Standard 4-pole motor

*2 Rated capacity is calculated assuming the output rated voltage as 230 V.

*3 Output voltage cannot exceed the power supply voltage.

*4 Use the inverter at the current enclosed with parentheses () or below when the carrier frequency is set to 4 kHz or above (F26) and the inverter continuously runs at 100% load.

*5 In the case of inverters with a capacity of 20 HP at an ambient temperature of 45°C (104°F) or above, this overload capability is assured, provided that the inverter has run continuously with 85% of the rated current.

*6
$$\text{Voltage unbalance (\%)} = \frac{\text{Max voltage (V)} - \text{Min voltage (V)}}{\text{Three - phase average voltage (V)}} \times 67 \text{ (IEC 61800 - 3)}$$

If this value is 2 to 3%, use an optional AC reactor (ACR).

*7 The value is calculated assuming that the inverter is connected with a power supply with the capacity of 500 kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50 kVA) and %X is 5%.

*8 Obtained when a DC reactor (DCR) is used.

*9 Average braking torque obtained when reducing the speed from 60 Hz with AVR control OFF. (It varies with the efficiency of the motor.)

*10 Average braking torque obtained by use of an external braking resistor (standard type available as option)

8.1.2 Three-phase 460 V class series

Item		Specifications										
Type(FRN...E1S4L)		F50	001	002	003	005	007	010	015	020		
Applicable motor rating (HP)		*1	1/2	1	2	3	5	7.5	10	15	20	
Rated capacity (kVA)		*2	1.2	2.0	2.9	4.4	7.2	10	14	18	24	
Output ratings	Rated voltage (V)	*3	Three-phase 380 to 480 V (with AVR function)									
	Rated current (A)	*4	1.5	2.5	3.7	5.5	9.0	13	18	24	30	
	Overload capability	*5	150% of rated current for 1 min., 200% for 0.5 s.									
	Rated frequency (Hz)		50, 60 Hz									
Input power	Phases, voltage, frequency		Three-phase, 380 to 480 V, 50/60 Hz									
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance: 2% or less) ⁶ ; Frequency: +5 to -5%									
	Rated current (A)	*7	(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)	*8	0.6	1.1	2.0	2.9	4.9	7.4	10	15	20	
Braking	Torque (%)	*9	100		70		40		20			
	Torque (%)	*10	150									
	DC braking		Starting frequency: 0.1 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100% of rated current									
	Braking transistor		Built-in									
Applicable safety standards			UL508C, C22.2 No.14, EN50178:1997									
Enclosure (IEC60529)			IP20, UL open type									
Cooling method			Natural cooling			Fan cooling						
Weight/Mass(2e/kg)			2.4(1.1)	2.6(1.2)	3.7(1.7)	3.7(1.7)	5.1(2.3)	7.5(3.4)	7.9(3.6)	13.4(6.1)	15.7(7.1)	

*1 Standard 4-pole motor

*2 Rated capacity is calculated assuming the output rated voltage as 460 V.

*3 Output voltage cannot exceed the power supply voltage.

*4 Use the inverter at the current enclosed with parentheses () or below when the carrier frequency is set to 4 kHz or above (F26) and the inverter continuously runs at 100% load.

*5 In the case of inverters with a capacity of 20 HP at an ambient temperature of 45°C (104°F) or above, this overload capability is assured, provided that the inverter has run continuously with 85% of the rated current.

*6
$$\text{Voltage unbalance (\%)} = \frac{\text{Max voltage (V)} - \text{Min voltage (V)}}{\text{Three - phase average voltage (V)}} \times 67 \text{ (IEC 61800 - 3)}$$

If this value is 2 to 3%, use an optional AC reactor (ACR).

*7 The value is calculated assuming that the inverter is connected with a power supply with the capacity of 500 kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50 kVA) and %X is 5%.

*8 Obtained when a DC reactor (DCR) is used.

*9 Average braking torque obtained when reducing the speed from 60 Hz with AVR control OFF. (It varies with the efficiency of the motor.)

*10 Average braking torque obtained by use of an external braking resistor (standard type available as option)

8.1.3 Single-phase 230 V class series

Item		Specifications							
Type(FRN... E1S-7U)		F12	F25	F50	001	002	003		
Applicable motor rating (HP)	*1	1/8	1/4	1/2	1	2	3		
Output ratings	Rated capacity (kVA)	*2	0.3	0.8	1.2	3.2	4.4		
	Rated voltage (V)	*3	Three-phase 200 to 240 V (with AVR function)						
	Rated current (A)	*4	0.8 (0.7)	1.5 (1.4)	3.0 (2.5)	5.0 (4.2)	9.0 (7.0)	11 (10)	
	Overload capability		150% of rated current for 1 min., 200% for 0.5 s.						
	Rated frequency (Hz)		50, 60 Hz						
Input power	Phases, voltage, frequency		Single-phase, 200 to 240 V, 50/60 Hz						
	Voltage/frequency variations		Voltage: +10 to -10%, Frequency: +5 to -5%						
	Rated current (A)	*5	(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	24.0
	Required power supply capacity (kVA)	*6	0.3	0.4	0.7	1.3	2.4	3.5	
Braking	Torque (%)	*7	100		100		70	40	
	Torque (%)	*8	150						
	DC braking		Starting frequency: 0.1 to 60.0 Hz, Braking level: 0 to 100% of rated current, Braking time: 0.0 to 30.0 s						
	Braking transistor		Built in						
	Applicable safety standards		UL508C, C22.2 No. 14, EN50178:1997						
	Enclosure (IEC60529)		IP20, UL open type						
	Cooling method		Natural cooling				Fan cooling		
	Weight/Mass(lbs/kg)		1.3(0.6)	1.3(0.6)	1.5(0.7)	2.0(0.9)	4.0(1.8)	5.3(2.4)	

*1 Standard 4-pole motor

*2 Rated capacity is calculated by assuming the output rated voltage as 230 V.

*3 Output voltage cannot exceed the power supply voltage.

*4 Use the inverter at the current enclosed with parentheses () or below when the carrier frequency is set to 4 kHz or above (F26) and the inverter continuously runs at 100% load.

*5 The value is calculated assuming that the inverter is connected with a power supply with the capacity of 500 kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50 kVA) and %X is 5%.

*6 Obtained when a DC reactor (DCR) is used.

*7 Average braking torque obtained when reducing the speed from 60 Hz with AVR control OFF. (It varies with the efficiency of the motor.)

*8 Average braking torque obtained by use of an external braking resistor (standard type available as option)

8.2 Models Available on Order (EMC filter built-in type)

8.2.1 Three-phase 230 V class series

Item		Specifications										
Type(FRN___E1E-2U)		F12	F25	F50	001	002	003	005	007	010	015	020
Applicable motor rating (HP) *1		1/8	1/4	1/2	1	2	3	5	7.5	10	15	20
Weight(lbs(kg))		1.5 (0.7)	1.5 (0.7)	1.8 (0.8)	2.0 (0.9)	5.3 (2.4)	5.3 (2.4)	6.4 (2.9)	11.2 (5.1)	11.7 (5.3)	22.7 (10.3)	24.9 (11.3)
EMC Directives (EN61800-3:2004)	Emission	Category C2						Category C3				
	Immunity	Category C3						Category C3				

*1 Standard 4-pole motors

Other than those items in the above table are the same as those in Section 8.1 " Standard Models."

8.2.2 Three-phase 460 V class series

Item		Specifications										
Type(FRN___E1E-4U)		F50	001	002	003	005	007	010	015	020		
Applicable motor rating (HP) *1		1/2	1	2	3	5	7.5	10	15	20		
Weight(lbs(kg))		3.3 (1.5)	3.5 (1.6)	5.5 (2.5)	5.5 (2.5)	6.6 (3.0)	10.6 (4.8)	11.0 (5.0)	17.9 (8.1)	20.0 (9.1)		
EMC Directives (EN61800-3:2004)	Emission	Category C2						Category C3				
	Immunity	Category C3						Category C3				

*1 Standard 4-pole motors

Other than those items in the above table are the same as those in Section 8.1 " Standard Models."

8.2.3 Single-phase 230 V class series

Item		Specifications					
Type(FRN___E1E-7U)		F12	F25	F50	001	002	003
Applicable motor rating (HP) *1		1/8	1/4	1/2	1	2	3
Weight(lbs(kg))		1.5 (0.7)	1.5 (0.7)	1.8 (0.8)	2.9 (1.3)	5.5 (2.5)	6.6 (3.0)
EMC Directives (EN61800-3:2004)	Emission	Category C2					
	Immunity	Category C3					

*1 Standard 4-pole motors

8.3 Specifications of Keypad Related

8.3.1 General specifications of keypad

Table 8.1 General Specifications

Items	Specification	Remarks
Protective structure	Front side: IP40, Back (mounting) side: IP20	
Site to be installed	In door	
Ambient temperature	-10°C (14°F) to 50°C (122°F)	
Ambient humidity	5 to 95% RH, no condensation allowed	
Ambient air	No corrosive gas, no inflammable gas, no dust, and no direct sunlight allowed	
Altitude	3281ft (1000 m) or less	(Note)
Air pressure	86 to 106 kPa	
Vibration	3 mm (maximum amplitude): Within 2 to 9 Hz 9.8 m/s ² : Within 9 to 20 Hz 2 m/s ² : Within 20 to 55 Hz 1 m/s ² : Within 55 to 200 Hz	
Storage ambient temperature	-25 (-13°F) to 70°C(158°F)	
Storage ambient humidity	5 to 95% RH (no condensation allowed)	
External dimension	Refer to Section 8.4.2 "Standard keypad"	
Mass	0.081 lbs(35 grams)	With a keypad rear cover

(Note) When using an inverter in a place of an altitude within 3281ft (1000 m) to 9843ft (3000 m), you need to lower the output current of the inverter. For details, refer to Chapter 2, Section 2.1 "Operating Environment."

8.3.2 Communications specifications of keypad

Table 8.2 Hardware specifications

Items	Specification	Remarks
No. of linkable unit	One-to-one connection with an inverter	For a remote site operation.
Link cable	US ANSI TIA/EIA-568A category 5 compliant straight type cable (10BASE-T/100BASE-TX straight type)	Extension cable for the remote site operation (CB-5S, CB-3S, CB-1S and etc.)
Maximum cable length	66ft (20 m)	
Connector	Standard RJ-45 connector/jack	Refer to Table 8.3

Table 8.3 Pin Assignment of RJ-45 Connector

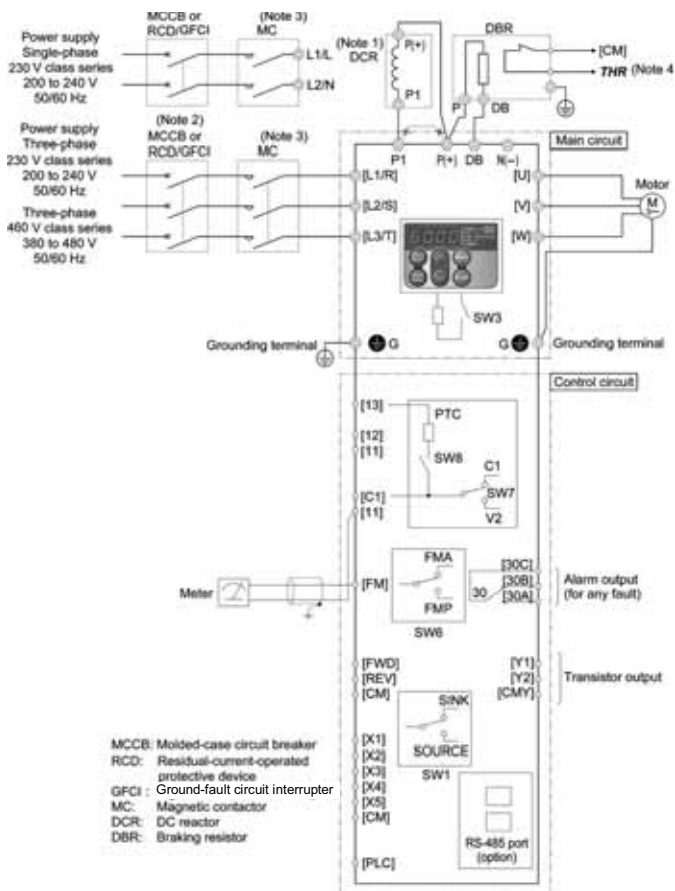
Pin number	Signal	Description	Remarks
1 and 8	Vcc	Power supply lines for keypad	5 VDC
2 and 7	GND	Reference potential	0 V
3 and 6	NC	Reserved	
4	DX-	RS-485 communications data line (-)	
5	DX+	RS-485 communications data line (+)	

8.4 Terminal Specifications

8.4.1 Terminal functions

For details about the main and control circuit terminals, refer to Chapter 2, Section 2.3.5 and Section 2.3.6 (Table 2.9), respectively.

8.4.2 Running the inverter with keypad



(Note 1) When connecting an optional DCR, remove the jumper bar from the terminals [P1] and [P +].

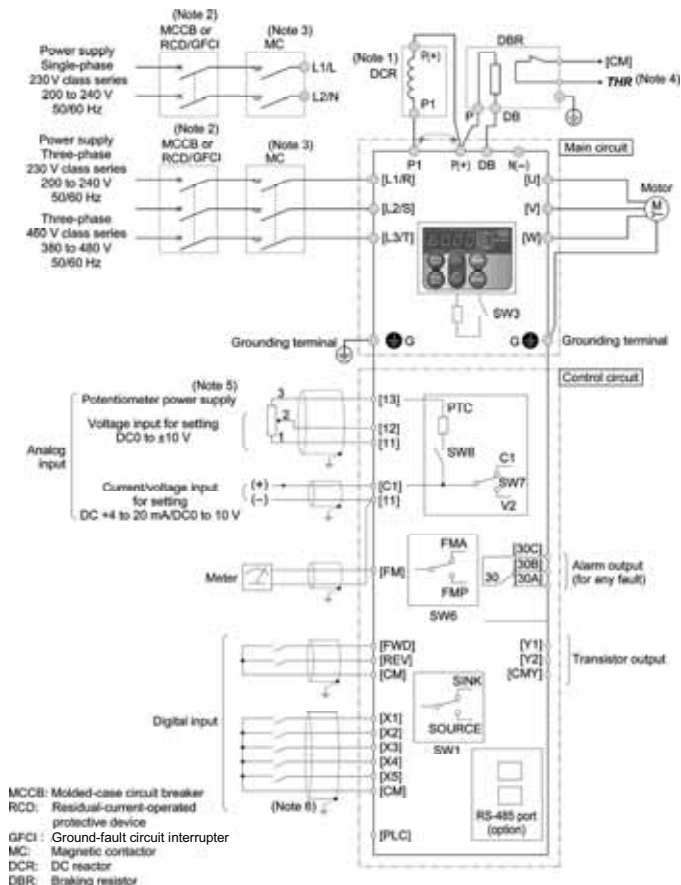
(Note 2) Install a recommended MCCB or RCD/GFCI (with overcurrent protection) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

(Note 3) Install an MC for each inverter to separate the inverter from the power supply, apart from the MCCB or RCD/GFCI, when necessary.

Connect a surge killer in parallel when installing a coil such as the MC or solenoid near the inverter.

(Note 4) **THR** function can be used by assigning code "9" (external alarm) to any of the terminals [X1] to [X5], [FWD] and [REV] (function code; E01 to E05, E98, or E99).

8.4.3 Running the inverter by terminal commands

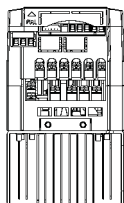
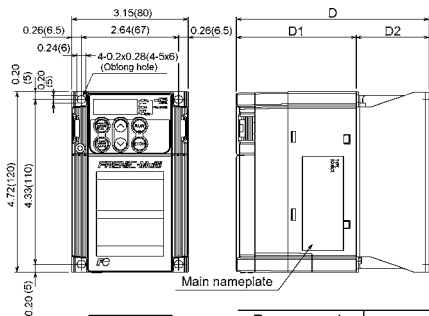


- (Note 1) When connecting an optional DCR, remove the jumper bar from the terminals [P1] and [P (+)].
- (Note 2) Install a recommended MCCB or RCD/GFCI (with overcurrent protection) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.
- (Note 3) Install an MC for each inverter to separate the inverter from the power supply, apart from the MCCB or RCD/GFCI, when necessary. Connect a surge killer in parallel when installing a coil such as the MC or solenoid near the inverter.
- (Note 4) **THR** function can be used by assigning code "9" (external alarm) to any of the terminals [X1] to [X5], [FWD] and [REV] (function code: E01 to E05, E98, or E99).
- (Note 5) 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 +10 VDC, 0 to +5 VDC or +1 to +5 VDC) between the terminals [12] and [11].
- (Note 6) For the control signal wires, use shielded or twisted pair 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: 10 cm 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.

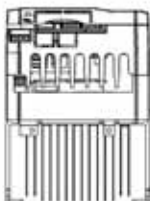
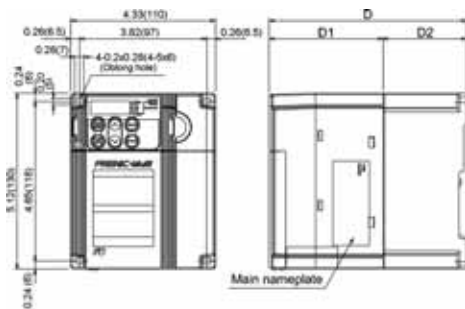
8.5 External Dimensions

8.5.1 Standard models

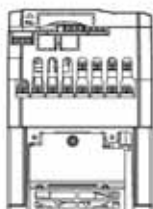
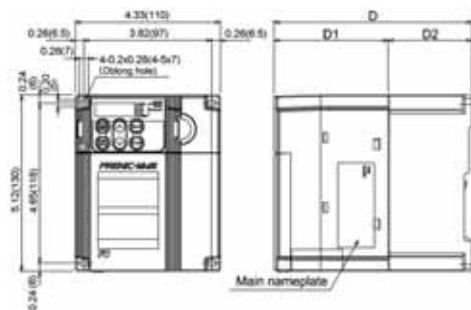
Unit: inch(mm)



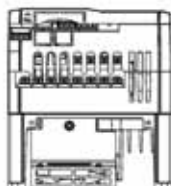
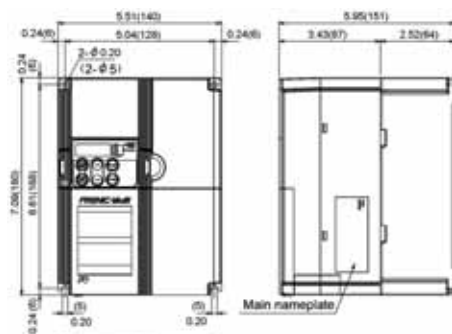
Power supply voltage	Inverter type	Dimensions [inch(mm)]		
		D	D1	D2
Three-phase 230 V	FRNF12E1S-2U	3.62(92)	3.23(82)	0.39(10)
	FRNF25E1S-2U			0.98(25)
	FRNF50E1S-2U	4.21(107)		1.97(50)
Single-phase 230 V	FRN001E1S-2U	5.20(132)	4.02(102)	1.97(50)
	FRNF12E1S-7U	3.62(92)		0.39(10)
	FRNF25E1S-7U	4.21(107)		0.98(25)
	FRNF50E1S-7U	5.00(152)		1.97(50)



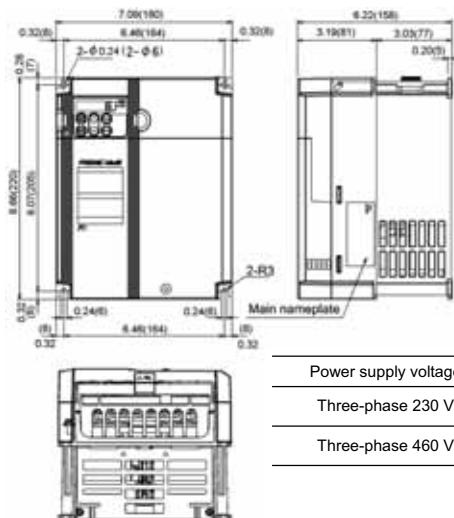
Power supply voltage	Inverter type	Dimensions [inch(mm)]		
		D	D1	D2
Three-phase 460 V	FRNF50E1S-4U	4.96(126)	3.39(86)	1.57(40)
	FRN001E1S-4U	5.90(150)		2.52(64)



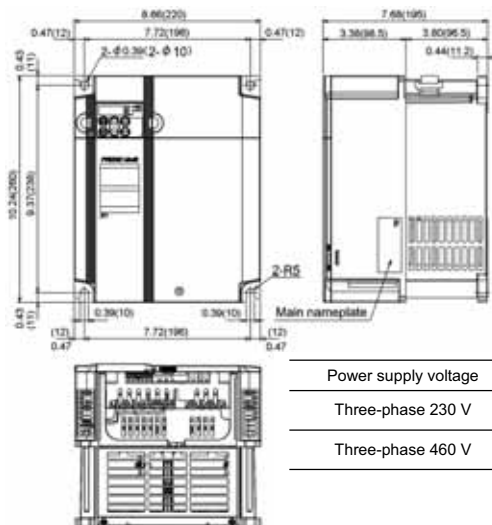
Power supply voltage	Inverter type	Dimensions [inch(mm)]		
		D	D1	D2
Three-phase 230 V	FRN002E1S-2U	5.90 (150)	3.39 (86)	2.52 (64)
	FRN003E1S-2U			
Three-phase 460 V	FRN002E1S-4U	6.30 (160)	3.78 (96)	
	FRN003E1S-4U			
Single-phase 230 V	FRN002E1S-7U			



Power supply voltage	Inverter type
Three-phase 230 V	FRN005E1S-2U
Three-phase 460 V	FRN005E1S-4U
Single-phase 230 V	FRN003E1S-7U



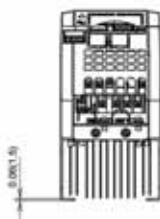
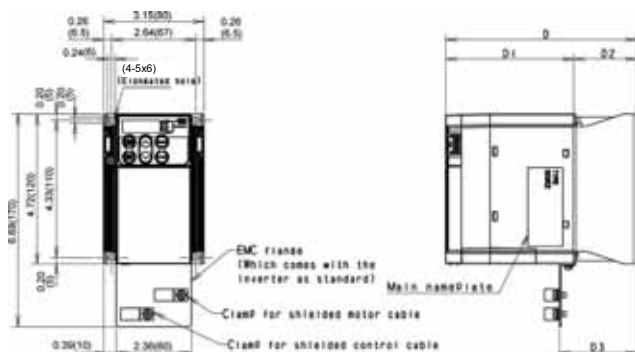
Power supply voltage	Inverter type
Three-phase 230 V	FRN007E1S-2U
	FRN010E1S-2U
Three-phase 460 V	FRN007E1S-4U
	FRN010E1S-4U



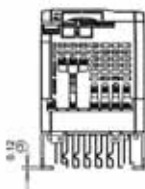
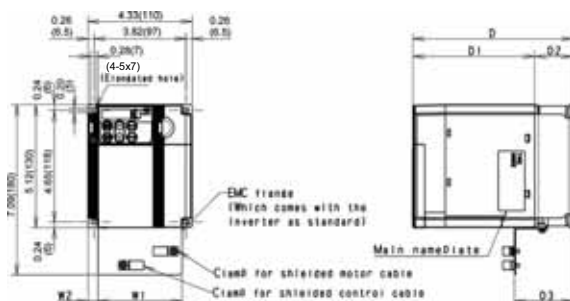
Power supply voltage	Inverter type
Three-phase 230 V	FRN015E1S-2U
	FRN020E1S-2U
Three-phase 460 V	FRN015E1S-4U
	FRN020E1S-4U

8.5.2 Models Available on Order (EMC filter built-in type)

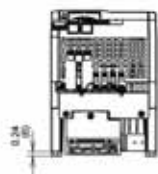
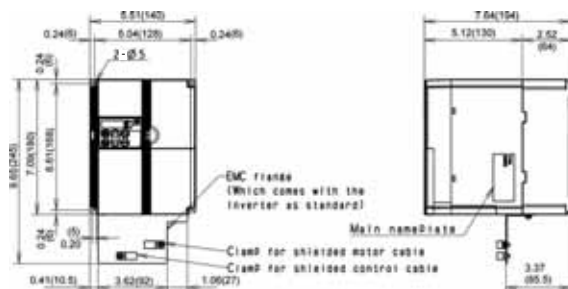
Unit: inch(mm)



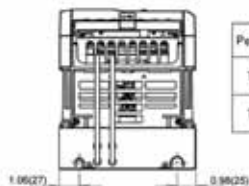
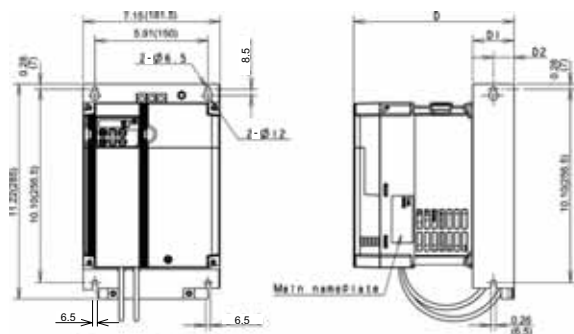
Power supply voltage	Inverter type	Dimensions(inch/mm)			
		D	D1	D2	D3
Three-phase 230V	FRNF12E1E-2U	4.41 (112)	4.02 (102)	0.39 (10)	0.83 (21.2)
	FRNF25E1E-2U	5.99 (152)		0.98 (25)	1.43 (36.3)
	FRNF50E1E-2U	5.99 (152)		1.97 (50)	2.43 (61.3)
	FRN001E1E-2U	5.99 (152)		1.97 (50)	2.43 (61.3)
Single-phase 230V	FRNF12E1E-7U	4.41 (112)	4.02 (102)	0.39 (10)	0.83 (21.2)
	FRNF25E1E-7U	5.99 (152)	4.02 (102)	0.98 (25)	1.43 (36.3)
	FRNF50E1E-7U	5.99 (152)	4.02 (102)	1.97 (50)	2.43 (61.3)



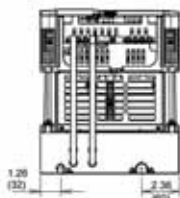
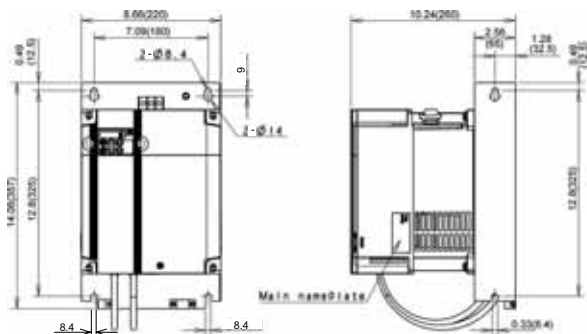
Power supply voltage	Inverter type	Dimensions(inch/mm)					
		W1	W2	D	D1	D2	D3
Three-phase 460V	FRNF50E1E-4U	3.50 (89)	0.41 (10.5)	6.05 (155)	5.08 (129)	1.58 (40)	2.42 (61.5)
	FRN001E1E-4U	3.50 (89)	0.41 (10.5)	7.60 (193)	5.08 (129)	2.52 (64)	3.37 (85.5)
Single-phase 230V	FRN001E1E-7U	2.36 (60)	0.51 (13)	5.90 (150)	4.33 (110)	1.58 (40)	2.17 (55.2)



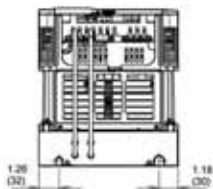
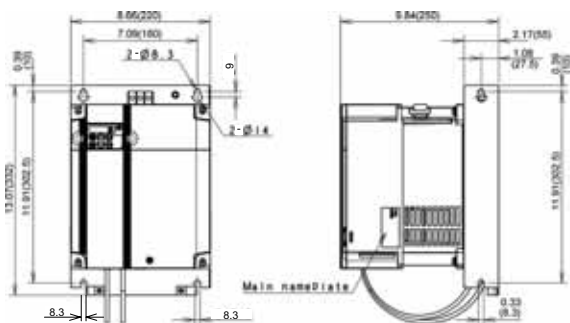
Power supply voltage	Inverter type
Three-phase 230V	FRN002E1E-2U
	FRN003E1E-2U
	FRN005E1E-2U
Three-phase 460V	FRN002E1E-4U
	FRN003E1E-4U
	FRN005E1E-4U
Single-phase 230V	FRN002E1E-7U
	FRN003E1E-7U



Power supply voltage	Inverter type	Dimensions (mm)		
		Ø	Ø1	Ø2
Three-phase 230V	FRN007E1E-2U	8.39	2.17	1.08
	FRN010E1E-2U	(213)	(55)	(27.5)
Three-phase 460V	FRN007E1E-4U	8.19	1.97	0.98
	FRN010E1E-4U	(208)	(50)	(25)



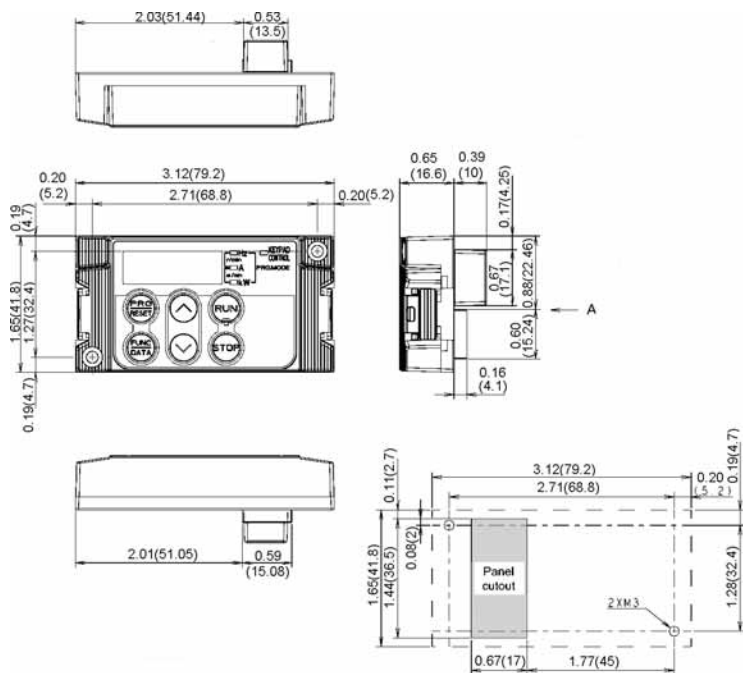
Power supply voltage	Inverter type
Three-Phase 230V	FRN015E1E-2U FRN020E1E-2U



Power supply voltage	Inverter type
Three-Phase 460V	FRN015E1E-4U FRN020E1E-4U

8.5.3 Standard keypad

Unit: inch(mm)



For remote operation or panel wall-mounting


(The keypad rear cover should be mounted.)

Dimensions of holes in panel (viewed from A)



8.6 Protective Functions

Name	Description	LED monitor displays	Alarm output [30A/B/C]
Overcurrent protection	Stops the inverter output to protect the inverter from an overcurrent resulting from overload.	During acceleration <i>OC1</i>	Yes
Short-circuit protection	Stops the inverter output to protect the inverter from overcurrent due to a short-circuiting in the output circuit.	During deceleration <i>OC2</i>	
Ground fault protection	Stops the inverter output to protect the inverter from overcurrent due to a ground fault in the output circuit. This protection is effective only during startup of the inverter. If you turn ON the inverter without removing the ground fault, this protection may not work.	During running at constant speed <i>OC3</i>	
Overvoltage protection	Stops the inverter output upon detection of an overvoltage condition (400 VDC for three-phase 230 V, 800 VDC for three-phase 460 V class series) in the DC link bus. This protection is not assured if extremely large AC line voltage is applied inadvertently.	During acceleration <i>OU1</i>	Yes
		During deceleration <i>OU2</i>	
		During running at constant speed (stopped) <i>OU3</i>	
Undervoltage protection	Stops the inverter output when the DC link bus voltage drops below the undervoltage level (200 VDC for three-phase 230 V, 400 VDC for three-phase 460 V class series). However, if data "4 or 5" is selected for F14, no alarm is output even if the DC link bus voltage drops.	<i>UV</i>	Yes*1
Input phase loss protection	Detects input phase loss, stopping the inverter output. This function prevents the inverter from undergoing heavy stress that may be caused by input phase loss or inter-phase voltage unbalance and may damage the inverter. If connected load is light or a DC reactor is connected to the inverter, this function will not detect input phase loss if any.	<i>LI</i>	Yes
Output phase loss protection	Detects breaks in inverter output wiring at the start of running and during running, stopping the inverter output.	<i>OPL</i>	Yes
Overheat protection	Stops the inverter output upon detecting excess heat sink temperature in case of cooling fan failure or overload.	<i>OH1</i>	Yes
	Discharging and inverter operation are stopped due to overheating of an external braking resistor. * Function codes must be set corresponding to the braking resistor.	<i>OBH</i>	Yes

*1 This alarm on [30A/B/C] should be ignored depending upon the function code setting.

Name	Description	LED monitor displays	Alarm output [30A/B/C]
Overload protection	Stops the inverter output if the Insulated Gate Bipolar Transistor (IGBT) internal temperature calculated from the output current and temperature of inside the inverter is over the preset value.	<i>OL1</i>	Yes
External alarm input	Places the inverter in alarm-stop state upon receiving digital input signal THR .	<i>OL2</i>	Yes
Motor protection	Electronic thermal overload In the following cases, the inverter stops running the motor to protect the motor in accordance with the electronic thermal overload protection setting. - Protects general-purpose motors over the entire frequency range (F10 = 1.) - Protects inverter motors over the entire frequency range (F10 = 2.) The operation level and thermal time constant can be set by F11 and F12. For motor 2, read F10 to F12 as A06 to A08.	<i>OL1</i> <i>OL2</i>	Yes
	PTC thermistor A PTC thermistor input stops the inverter output for motor protection. Connect a PTC thermistor between terminals [C1] and [11] and set the function codes and slide switch on the interface PCB accordingly.	<i>OL4</i>	Yes
	Overload early warning Outputs a preliminary alarm at a preset level before the inverter is stopped by the electronic thermal overload protection for the motor.	—	—
Stall prevention	Operates when instantaneous overcurrent limiting is active.	—	—
	Instantaneous overcurrent limiting: Operates if the inverter's output current exceeds the instantaneous overcurrent limit level, avoiding tripping of the inverter (during constant speed operation or during acceleration).		
Alarm relay output (for any fault)	The inverter outputs a relay contact signal when the inverter issues an alarm and stops the inverter output. < Alarm reset > The alarm stop state is reset by pressing the  key or by the digital input signal RST . < Saving the alarm history and detailed data > The information on the previous 4 alarms can be saved and displayed.	—	Yes
Memory error detection	The inverter checks memory data after power-on and when the data is written. If a memory error is detected, the inverter stops.	<i>Er1</i>	Yes
Keypad communications error detection	The inverter stops by detecting a communications error between the inverter and the keypad during operation using the standard keypad or the multi-function keypad (optional).	<i>Er2</i>	Yes
CPU error detection	If the inverter detects a CPU error or LSI error caused by noise or some other factors, this function stops the inverter.	<i>Er3</i>	Yes

"—": Not applicable.

Name	Description		LED monitor displays	Alarm output [30A/B/C]
Option communications error detection	Upon detection of an error in the communication between the inverter and an optional card, stops the inverter output.		<i>E-4</i>	Yes
Option error detection	When an option card has detected an error, this function stops the inverter output.		<i>E-5</i>	Yes
Operation protection	STOP key priority	Pressing the  key on the keypad forces the inverter to decelerate and stop the motor even if the inverter is running by any run commands given via the terminals or communications (link operation). After the motor stops, the inverter issues alarm <i>E-5</i> .	<i>E-5</i>	Yes
	Start check function	The inverter prohibits any run operations and displays <i>E-5</i> on the 7-segment LED monitor if any run command is present when: <ul style="list-style-type: none"> - Powering up - An alarm is released (the  key is turned ON or an alarm reset RST is input.) - "Enable communications link LE" has been activated and the run command is active in the linked source. 	<i>E-5</i>	Yes
Tuning error detection	During tuning of motor parameters, if the tuning has failed or has aborted, or an abnormal condition has been detected in the tuning result, the inverter stops its output.		<i>E-7</i>	Yes
RS-485 communications error detection	When the inverter is connected to a communications network via the RS-485 port designed for the keypad, detecting a communications error stops the inverter output and displays an error code <i>E-8</i> .		<i>E-8</i>	Yes
Data save error during under-voltage	If the data could not be saved during activation of the undervoltage protection function, the inverter displays the alarm code.		<i>E-F</i>	Yes
RS-485 communications error detection (optional)	When the inverter is connected to a communications network via an optional RS-485 communications card, detecting a communications error stops the inverter output and displays an error code <i>E-P</i> .		<i>E-P</i>	Yes
Retry	When the inverter has stopped because of a trip, this function allows the inverter to automatically reset itself and restart. (You can specify the number of retries and the latency between stop and reset.)		—	—
Surge protection	Protects the inverter against surge voltages which might appear between one of the power lines for the main circuit and the ground.		—	—
Command loss detected	Upon detecting a loss of a frequency command (because of a broken wire, etc.), this function issues an alarm and continues the inverter operation at the preset reference frequency (specified as a ratio to the frequency just before the detection).		—	—

"—": Not applicable.

Name	Description	LED monitor displays	Alarm output [30A/B/C]
Protection against momentary power failure	Upon detecting a momentary power failure lasting more than 15 ms, this function stops the inverter output. If restart after momentary power failure is selected, this function invokes a restart process when power has been restored within a predetermined period.	—	—
Overload prevention control	In the event of overheating of the heat sink or an overload condition (alarm code: \overline{OH} / or \overline{OL}), the output frequency of the inverter is reduced to keep the inverter from tripping.	—	—
Hardware error	The inverter is stopped when poor connection between the control printed circuit board (control PCB) and power printed circuit board (power PCB), interface printed circuit board (interface PCB) or option card, or short-circuit between terminals [13] and [11] is detected.	\overline{EH}	Yes
Mock alarm	Simulated alarm is output to check the fault sequence.	\overline{ERR}	Yes
PID feedback wire break detection	When the inverter is under PID control, detecting a PID feedback wire break stops the inverter output and displays an error code \overline{FOF} .	\overline{FOF}	Yes

—: Not applicable.