Fuji Electric

e-Front runners

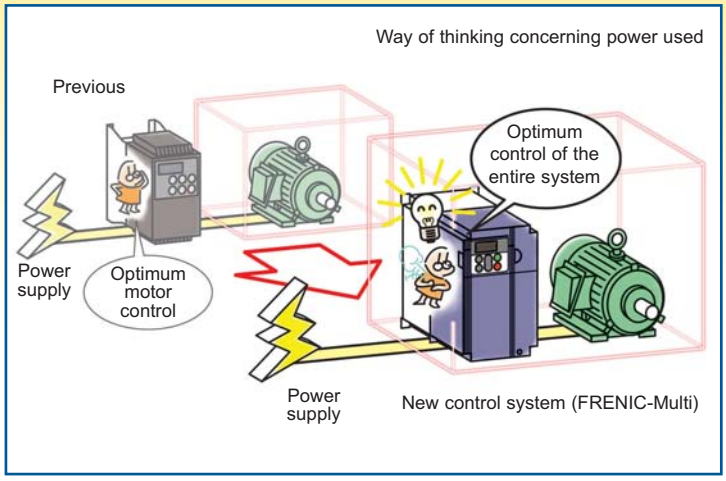
FRENIC-Multi

Fuji Electric High Performance Compact Inverter

Single-phase 200 V 0.1 – 2.2 kW
Three-phase 400 V 0.4 – 15 kW

CE

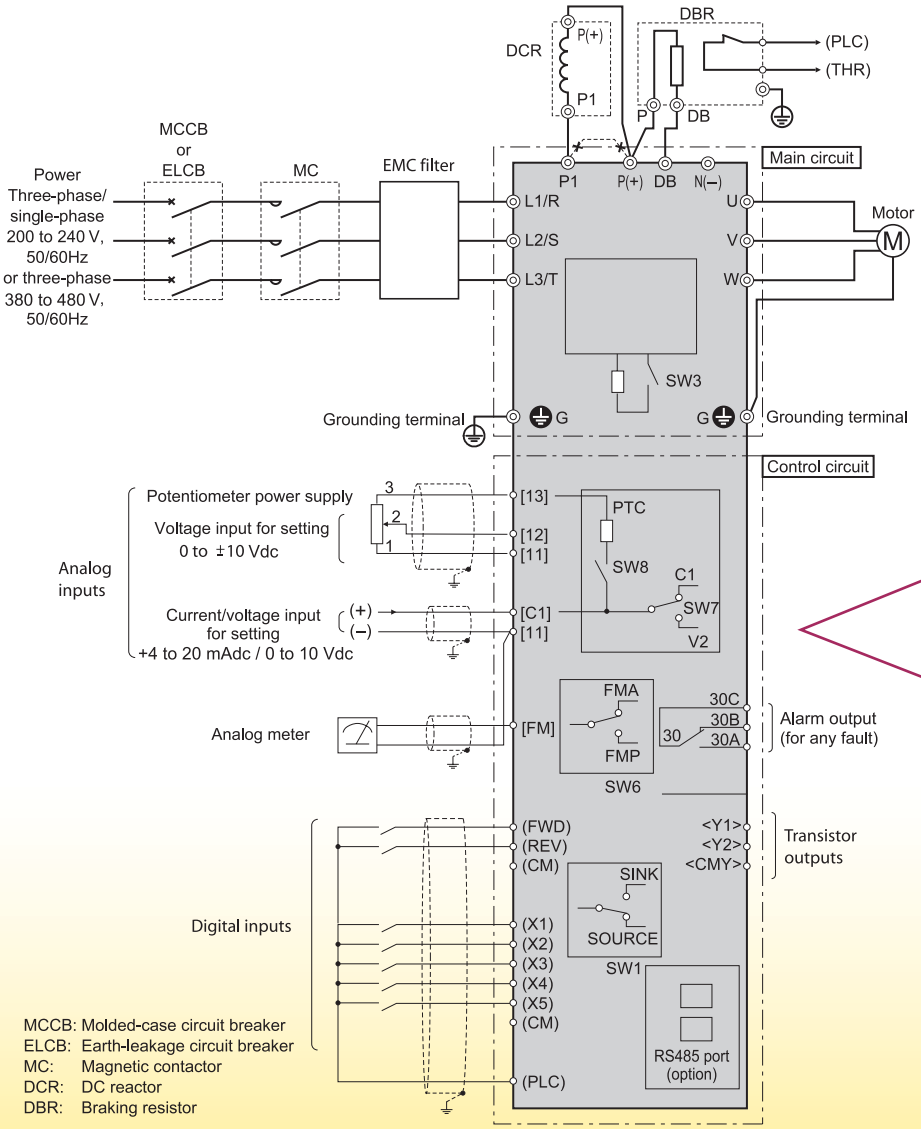
c UL US LISTED



Environment-friendly

- Complies with European regulations that limit the use of specific hazardous substances (RoHS directive 2002/95/EC).
- Long-life design for limited life internal components:
  Main circuit capacitors (87600h)
  Electrolytic capacitors on the printed circuit board (87600h)
  Cooling fan (87600h)
- New system for more energy-efficient operation “First time in the industry”
  Optimum and minimum power control which minimizes power consumed by the inverter itself (inverter loss) and loss of the motor
- Emissions reduced by built-in EMC filter

Basic wiring diagram (Operation by external inputs)

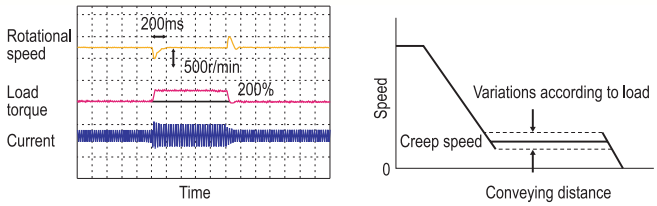


Options:

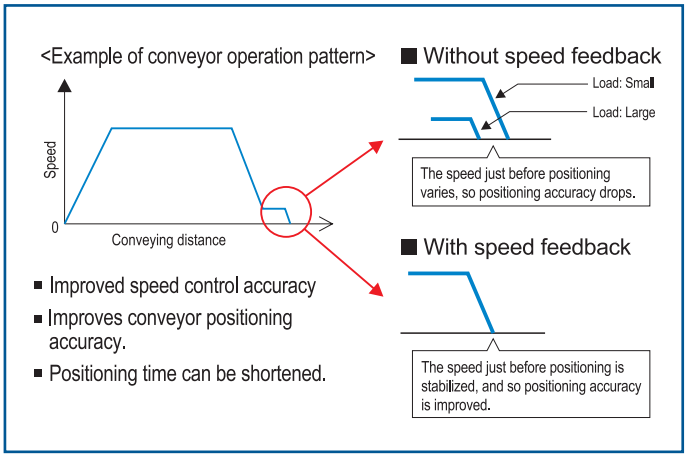
DIO-card, PG interface-card, RS485 communication card

The highest standards of control and performance in its class

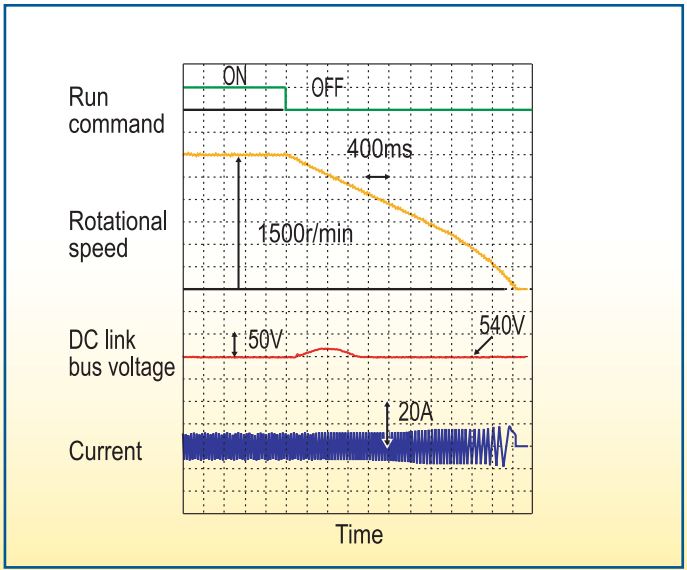
- Shortened setting time
  Speed control accuracy at low speeds is improved by “slip-compensation control” and “voltage tuning”



- Compatible with PG feedback control

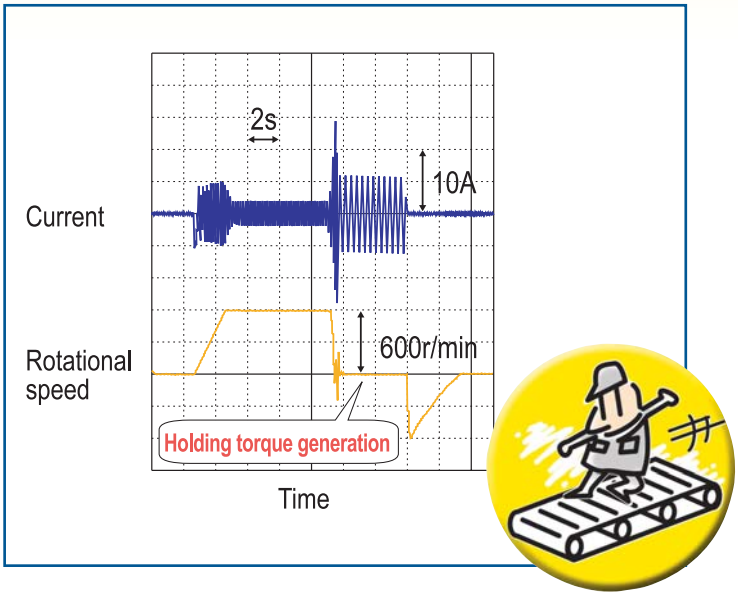


- Tripless deceleration (no overvoltage) by automatic deceleration control

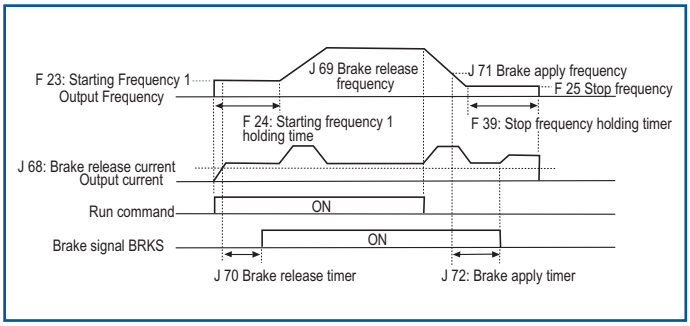


Optimum for the operations specific to vertical and horizontal conveyance

- Hit & Stop control is realized more easily
  Switching from torque limitation to current limitation and generating a holding torque can be selected which make it easy to adjust brake application and release timing.



- Inclusion of a brake control signal makes it even more convenient. The brake is released and applied with the right conditions at the right moment.



- Limit operations can be selected to match your equipment
  Two limit operations like “torque limitation” and “current limitation” can be chosen depending on the equipment you are using the inverter with.

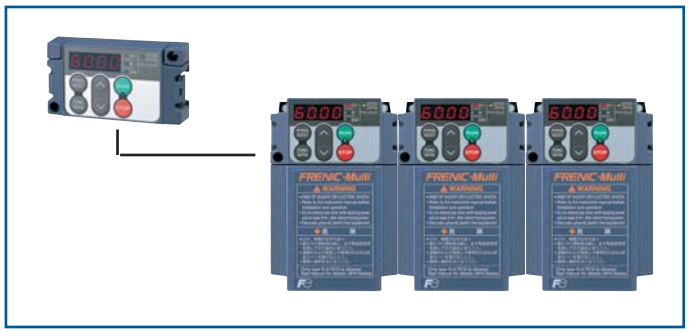
Simple and thorough maintenance

- The life information on each of the inverter’s limited life components is displayed (e.g. main circuit capacitor

capacity, cumulative running time of the electrolytic capacitor on the printed circuit board, cooling fan cumulative running time, inverter cumulative running time)

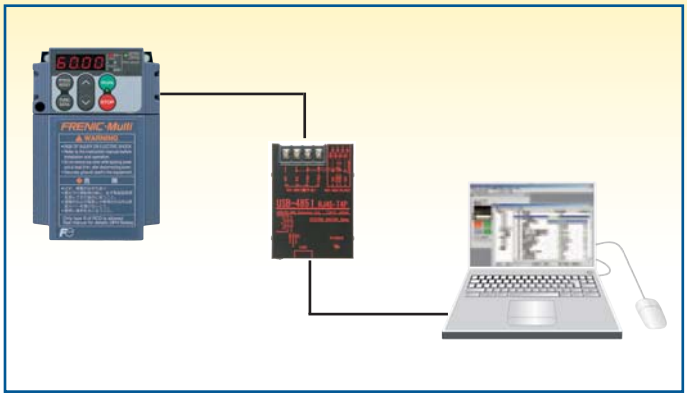
- Information that contributes to equipment maintenance is displayed e.g. 'motor cumulative running time', 'number of starts' etc.
- The alarm history records the latest four failures with complete information (output frequency, I/0 status, output current)
- Simple cooling fan replacement (5.5 kW or bigger)

Simple operation, simple wiring

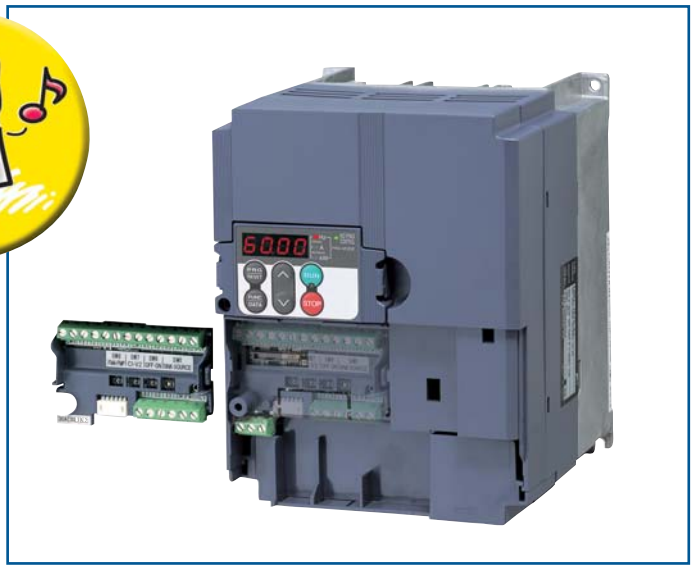


- Side-by-side mounting saves space
- A removable keypad is supplied as standard equipment
- Multi-function keypad with built-in copy function as option
  With a built-in copy function, data can be easily copied to additional inverters without requiring individual setups.

- Inverter loader software is available



- A removable interface board is used
  The standard interface board is used as terminal block. The interface board can be replaced by option boards (like PG-interface-card, additional RS-communication card) and fit in the same installation space.

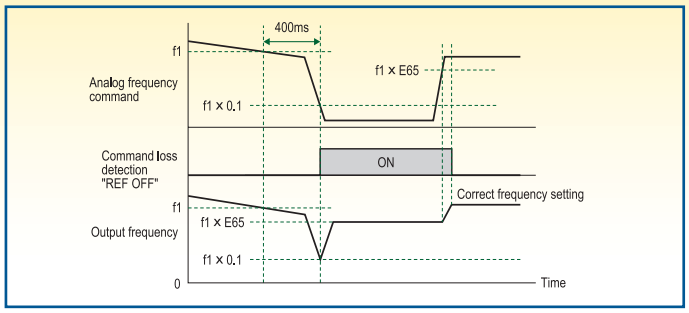


- Outside panel cooling is possible by using the mounting adapter for external cooling

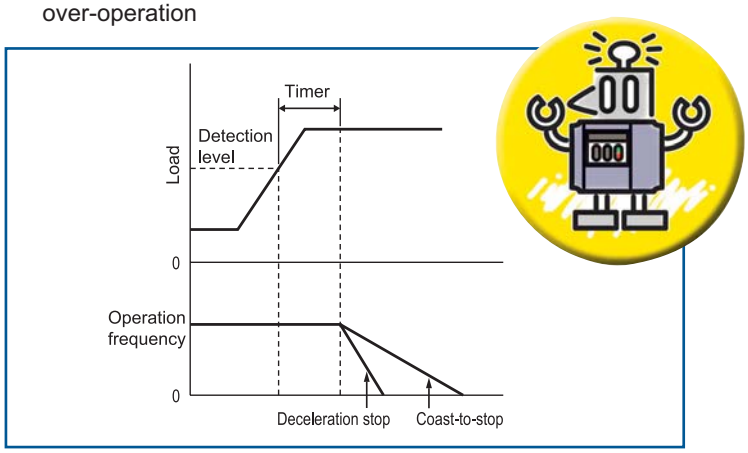
You can use an inverter equipped with functions like these

- Equipped with a full range of PID control functions for applications like pump control (pressure control) or dancer control (winder).
  Several PID functions have been added such as: Deviation alarm, absolute value alarm outputs, anti-reset windup function (for prevention PID control overshoot) etc.

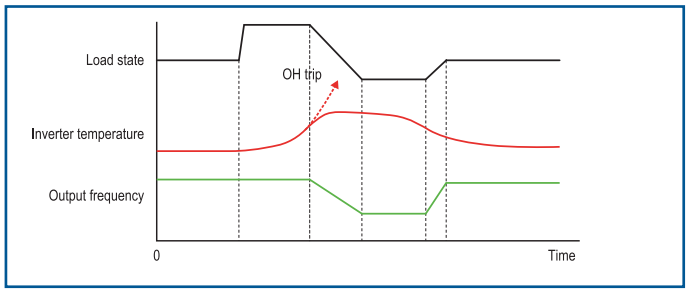
- Operating signal trouble is avoided by the command loss detection function



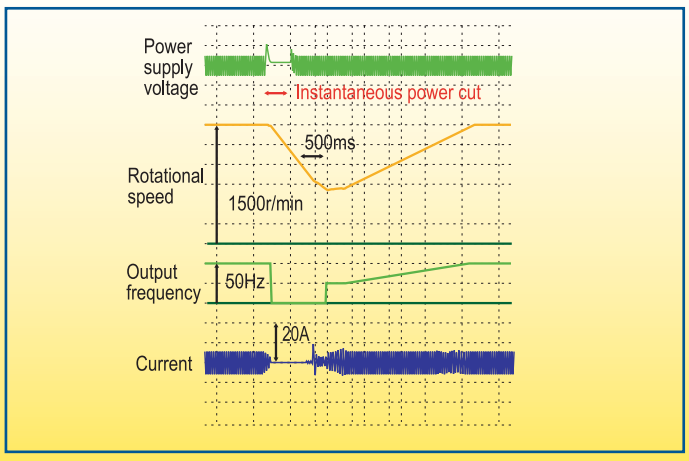
- An overload stop function protects equipment from over-operation



- Continuous equipment operation with overload avoidance control
  If inverter becomes overloaded, it reduces the motor's speed, reducing the load and continuing operation.



- Smooth starts through the pick-up function when switching instantaneously from commercial power supply to inverter or when motor is rotating by external forces.

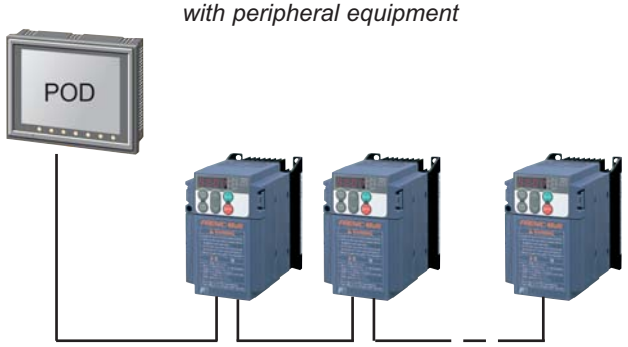


Fully compatible with network operation

- One RS-485 communication port is standard
- Complies with networks using option cards like
- DeviceNet
- PROFIBUS-DP
- CC-Link
- etc.

- Wiring is easy with the additional RS-485 communication card (optional)
- A separate branch adaptor is not required because is equipped with two connectors.
- The built-in terminating resistor makes provision of a separate terminating resistor unnecessary

Example of operation configuration with peripheral equipment



Global compatibility

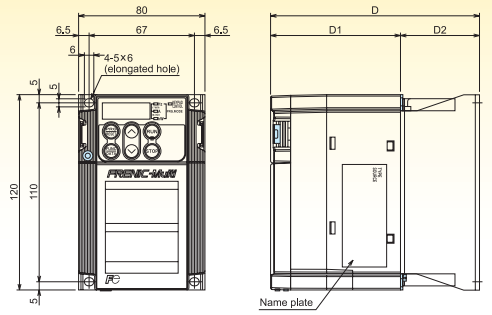
Europe
EC Directives (CE Mark)
CE

North America/Canada
UL Standard (cUL Certified)
c UL us LISTED

- Complies with standards (EC Directives, UL Standard)
- Sink/Source selectable
- Wide voltage range
- The multi-function keypad displays several languages (Japanese, English, German, French, Spanish, Italian).

Dimensions

1



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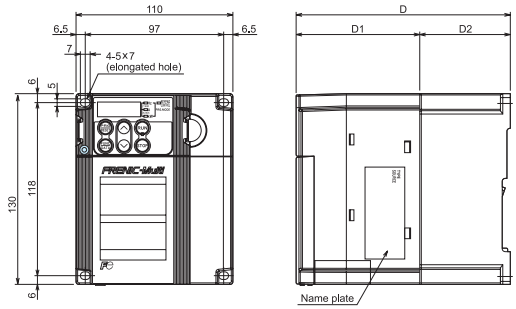

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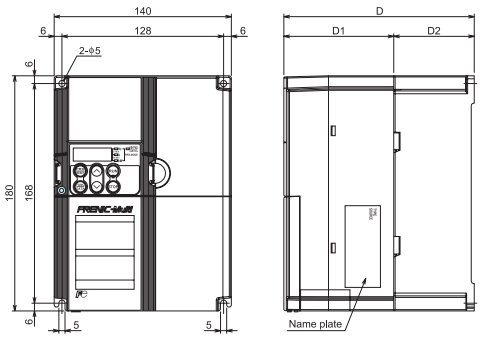
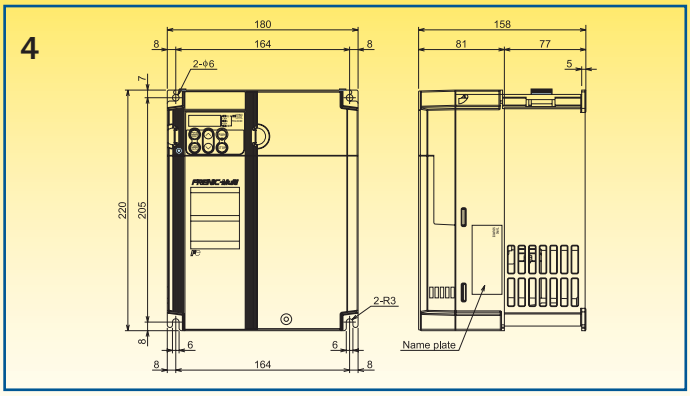


No	Power Supply	Inverter Type	Dimensions (mm) D	D1	D2
1	1-phase 200V	FRN0.1E1S-7E	112	102	10
1	1-phase 200V	FRN0.2E1S-7E	112	102	10
1	1-phase 200V	FRN0.4E1S-7E	127	102	25
1	1-phase 200V	FRN0.75E1S-7E	152	102	50
2	3-phase 400V	FRN0.4E1S-4E	126	86	40
2	3-phase 400V	FRN0.75E1S-4E	150	86	64
2	3-phase 400V	FRN1.5E1S-4E	150	86	64
2	3-phase 400V	FRN2.2E1S-4E	150	86	64
2	3-phase 400V	FRN0.4E1E-4E	169	129	40
2	3-phase 400V	FRN0.75E1E-4E	193	129	64
2	1-phase 200V	FRN1.5E1S-7E	160	96	64
3	3-phase 400V	FRN4.0E1S-4E	151	87	64
3	3-phase 400V	FRN1.5E1E-4E	194	130	64
3	3-phase 400V	FRN2.2E1E-4E	194	130	64
3	3-phase 400V	FRN4.0E1E-4E	194	130	64
3	1-phase 200V	FRN2.2E1S-7E	151	87	64
4	3-phase 400V	FRN5.5E1S-4E	158	81	77
4	3-phase 400V	FRN7.5E1S-4E	158	81	77

4



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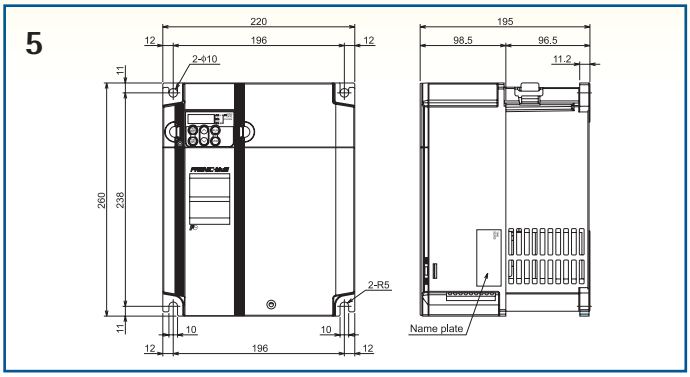

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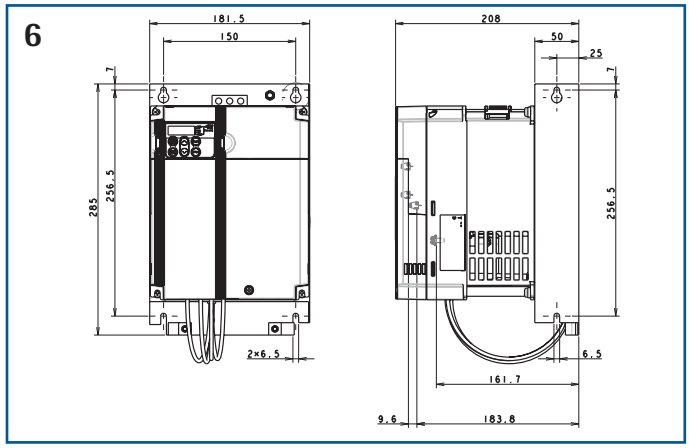

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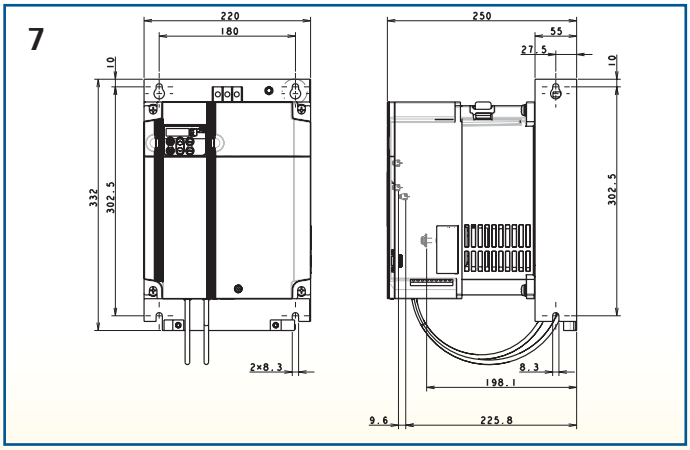

No	Power Supply	Inverter Type	Dimensions (mm) D	D1	D2
5	3-phase 400V	FRN11E1S-4E	195	98,5	96,5
5	3-phase 400V	FRN15E1S-4E	195	98,5	96,5
6	3-phase 400V	FRN5.5E1E-4E	208	158	50
6	3-phase 400V	FRN7.5E1E-4E	208	158	50
7	3-phase 400V	FRN11E1E-4E	250	195	55
7	3-phase 400V	FRN15E1E-4E	250	195	55

Specification (with and without built-in EMC filter)

Three-phase 400 v series

Item			Specifications								
Type (FRN___E1S/E-4E)			0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Applicable motor rating [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 V to 480 V (With AVR function)								
	Rated current [A]		1.5	2.5	3.7	5.5	9.0	13	18	24	30
	Overload capability		150% of rated current for 1min, 200% - 0.5 s								
	Rated frequency		50, 60Hz								
Input ratings	Phases, voltage, frequency		Three-phase, 380 to 480 V, 50/60 Hz								
	Voltage/frequency variations		Voltage: + 10 to –15% (Voltage unbalance: 2% or less)*9, Frequency: +5% to – 5%								
	Rated current [A] *8)	(with DCRE)	0.85	1.6	3.0	4.4	7.3	10.6	14.4	21.1	28.8
		(without DCRE)	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	Braking torque *6) [%]		100		70	40		20			
	Torque *7) [%]		150								
	DC braking		Starting frequency: 0.1 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100% of rated current								
	Transistor for braking resistor		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
Built-in EMC filter (E1E) *10											
EMC standard compliance	Emission		Category C2 (EN 61800-3: 2004)					Category C3 (EN 61800-3: 2004)			
	Immunity		2nd Env. (EN61800-3: 2004)								
Weight / Mass (kg):			1.5	1.6	2.5	2.5	3.0	4.8	5.0	8.1	9.1

Single-phase 200 V series

Item			Specifications					
Type (FRN___E1S-7E) *10)			0.1	0.2	0.4	0.75	1.5	2.2
Applicable motor rating [kW] *1)			0.1	0.2	0.4	0.75	1.5	2.2
Output ratings	Rated capacity [kVA] *2)		0.3	1.1	1.1	1.9	3.0	4.1
	Rated voltage [V] *3)		Three-phase 200 V 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)
	Overload capability		150% of rated current for 1min, 200% - 0.5 s					
	Rated frequency		50, 60Hz					
Input ratings	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] *8)	(with DCRE)	1.1	2.0	3.5	6.4	11.6	17.5
		(without DCRE)	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	Braking torque *6) [%]		150		100		70	40
	Torque *7) [%]		-	-	150			
	DC braking		Starting frequency: 0.1 to 60.0Hz, Braking level: 0 to 100% of rated current, Braking time: 0.0 to 30.0s					
	Transistor for braking resistor		Built-in					
Applicable safety standards			UL508C, C22.2 No. 14, EN50178: 1997					
Enclosure (IEC60529)			IP20 (IEC60529), UL open type (UL 50)					
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 assuming the output rated voltage as 220V for three-phase 200V series.
*3 Output voltage cannot exceed the power supply voltage.
*4 When setting the carrier frequency (F26) to 3 kHz or less. Use the current ( ) or below when the carrier frequency is higher than 4kHz and continuously operating at 100%.
*5 Obtained when a DC Reactor is used.
*6 Average braking torque when reducing the speed from 60Hz with AVR control OFF (Varies with the efficiency of the motor).
*7 Average braking torque obtained by use of external braking resistor.
*8 The value is calculated on assumption that the inverter is connected with a power supply capacity of 500kVA and %X is 5%.
*9 $\text{Voltage unbalance [\%]} = \frac{\text{Max. voltage [V] - Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$ (IEC 61800-3)
If this value is 2 to 3%, use AC Reactor (option).
*10 For E1S an external EMC-Filter has to be used to fulfil EMC compliance. In this case the EMC compliance levels are different.

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e-Front runners

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