



Compact Inverter

FRENIC-Mini

Three-phase 200 V series: FRN0025 to 0060C2S-2□

Three-phase 400 V series: FRN0013 to 0030C2S-4□

⚠ CAUTION

Thank you for purchasing our FRENIC-Mini series of inverters.

- This manual is a supplement to the FRENIC-Mini Instruction Manual (INR-SI47-1729-E, INR-SI47-1745-E). It describes the FRENIC-C2S (Inverter types FRN0025 to 0060C2S-2□ and FRN0013 to 0030C2S-4□). For other descriptions, refer to the original manual.
- Improper handling might result in incorrect operation, a short life, or even a failure of this product as well as the motor.
- Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.

Chapter 2 MOUNTING AND WIRING OF THE INVERTER

2.3.2 Terminal arrangement and screw specifications

(1) Arrangement of the main circuit terminals

Table 2.3 Main Circuit Terminals

| Power supply voltage | Nominal applied motor (kW) | Inverter type | Terminal screw size | Tightening torque (N·m) | Refer to: |
|----------------------|----------------------------|---------------|---------------------|-------------------------|-----------|
| Three-phase 200 V | 5.5 | FRN0025C2S-2□ | M5 | 3.0 | Figure E |
| | 7.5 | FRN0033C2S-2□ | | | |
| | 11 | FRN0047C2S-2□ | M6 | 5.8 | Figure F |
| | 15 | FRN0060C2S-2□ | | | |
| Three-phase 400 V | 5.5 | FRN0013C2S-4□ | M5 | 3.0 | Figure E |
| | 7.5 | FRN0018C2S-4□ | | | |
| | 11 | FRN0024C2S-4□ | M6 | 5.8 | Figure F |
| | 15 | FRN0030C2S-4□ | | | |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

Figure E

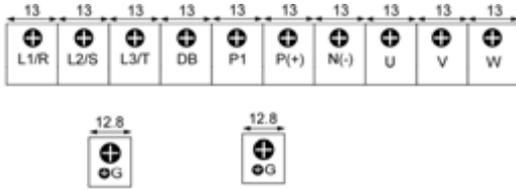
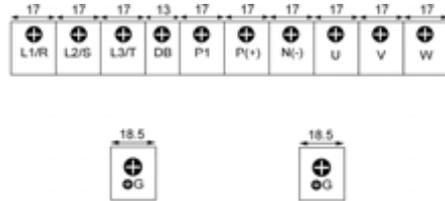


Figure F



2.3.3 Recommended wire sizes

Table 2.6 lists the recommended wire sizes. The recommended wire sizes for the main circuit terminals for an ambient temperature of 50°C are indicated for two types of wire: HIV single wire (for the maximum allowable temperature 75°C) (before a slash (/)) and IV single wire (for 60°C) (after a slash (/)),

Table 2.6 Recommended Wire Sizes

| Power supply voltage | Nominal applied motor (kW) | Inverter type | *1 Recommended wire size (mm ²) | | | | | |
|----------------------|----------------------------|---------------|--|------------------|------------------------------|--------------------|---------------------------------|------------------|
| | | | Main circuit | | | | | Control circuit |
| | | | Main circuit power input [L1/R, L2/S, L3/T] [L1/L, L2/N] Grounding [⊕G] | | Inverter output [U, V, W] | DCR [P1, P (+)] | Braking resistor [P (+), DB] | |
| | | | w/ DCR | w/o DCR *2 | | | | |
| Three-phase 200 V | 5.5 | FRN0025C2S-2□ | 2.0/5.5 | 3.5/8.0 | 3.5/5.5 | 3.5/5.5 | 2.0/2.0 | 0.5 ∩ 1.25 |
| | 7.5 | FRN0033C2S-2□ | 3.5/8.0 | 5.5/14 | 3.5/8.0 | 5.5/14 | | |
| | 11 | FRN0047C2S-2□ | 5.5/14 | 14/22 | 8.0/14 | 8.0/22 | | |
| | 15 | FRN0060C2S-2□ | 14/22 | 22/38 | 14/22 | 14/38 | | |
| Three-phase 400 V | 5.5 | FRN0013C2S-4□ | 2.0/2.0 (2.5) | 2.0/3.5 (2.5) | 2.0/2.0 (2.5) | 2.0/2.0 (2.5) | 2.0/2.0 (2.5) | 0.5 ∩ 1.25 |
| | 7.5 | FRN0018C2S-4□ | | 2.0/5.5 (4.0) | 2.0/3.5 (2.5) | 2.0/3.5 (2.5) | | |
| | 11 | FRN0024C2S-4□ | 2.0/5.5 (4.0) | 3.5/8.0 (6.0) | 2.0/5.5 (4.0) | 3.5/5.5 (4.0) | | |
| | 15 | FRN0030C2S-4□ | 3.5/8.0 (6.0) | 5.5/14 (10) | 3.5/8.0 (6.0) | 5.5/14 (6.0) | | |

DCR: DC reactor

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

*1 Use crimp terminals covered with an insulated sheath or insulating tube. Recommended wire sizes are for HIV/IV (PVC in the EU).

*2 Wire sizes are calculated on the basis of input RMS current under the condition that the power supply capacity and impedance are 500 kVA and 5%, respectively.

*3 Insert the DC reactor (DCR) in either of the primary power input lines. Refer to Chapter 10 for more details.

Chapter 5 FUNCTION CODES

5.1 Function Code Tables

Table A Fuji Standard Motor Parameters

| Power supply voltage | Applicable motor rating (kW) | Inverter type | Fuji's standard torque boost (%) | Nominal rated current of Fuji standard motor (A) | | Nominal rated capacity of Fuji standard motor (kW) | Restart Mode after Momentary Power Failure (s) |
|----------------------|------------------------------|---------------|----------------------------------|--|--------|--|--|
| | | | Function code F09/A05 | Function codes F11/A07/E34/E37 | | Function code P02/A16 | Function code H13 |
| | | | | Shipping destination (version) | | | |
| | | | | Asia | Europe | | |
| Three-phase 200 V | 5.5 | FRN0025C2S-2□ | 4.9 | 20.50 | 21.25 | 5.50 | 0.5 |
| | 7.5 | FRN0033C2S-2□ | 4.4 | 26.41 | 26.92 | 7.50 | 0.5 |
| | 11 | FRN0047C2S-2□ | 3.5 | 38.24 | 38.87 | 11.00 | 1.0 |
| | 15 | FRN0060C2S-2□ | 2.8 | 50.05 | 50.14 | 15.00 | 1.0 |
| Three-phase 400 V | 5.5 | FRN0013C2S-4□ | 4.9 | 11.49 | 11.50 | 5.50 | 0.5 |
| | 7.5 | FRN0018C2S-4□ | 4.4 | 14.63 | 14.50 | 7.50 | 0.5 |
| | 11 | FRN0024C2S-4□ | 3.5 | 21.23 | 21.00 | 11.00 | 1.0 |
| | 15 | FRN0030C2S-4□ | 2.8 | 28.11 | 27.50 | 15.00 | 1.0 |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

■ The following function code , in the ROM version 0800 or later, the data setting range and the factory default is change.

| Code | Name | Data setting range | Default setting | Refer to page: |
|------|------------------------------|---|--|----------------|
| F44 | Current Limiter (Level) | 20 to 180 : 3.7kW or below 20 to 200 : 5.5kW or above (The data is interpreted as the rated output current of the inverter for 100%.) | 3.7kW or below : 160 5.5kW or above : 180 | 5-42 |
| H27 | Thermistor for Motor (Level) | 0.00 to 5.00 | 1.6 | — |

5.2 Details of Function Codes

F50, F51 Electronic Thermal Overload Protection for Braking Resistor (Discharging capability and Allowable average loss)

■ External Braking Resistors

Standard models

| Power supply voltage | Inverter type | Braking resistor | | Resistance (Ω) | Continuous braking (100% braking torque) | | Intermittent braking (Period: 100 s or less) | |
|----------------------|---------------|------------------|------|----------------|--|------------------|--|------------|
| | | Type | Qty. | | Discharging capability (kW) | Braking time (s) | Allowable average loss (kW) | Duty (%ED) |
| Three-phase 200 V | FRN0025C2S-2□ | DB5.5-2 | 1 | 20 | 55 | 20 | 0.138 | 5 |
| | FRN0033C2S-2□ | DB7.5-2 | | 15 | 37 | 10 | 0.188 | |
| | FRN0047C2S-2□ | DB11-2 | | 10 | 55 | | 0.275 | |
| | FRN0060C2S-2□ | DB15-2 | | 8.6 | 75 | 0.375 | | |
| Three-phase 400 V | FRN0013C2S-4□ | DB5.5-4 | 1 | 80 | 55 | 20 | 0.138 | 5 |
| | FRN0018C2S-4□ | DB7.5-4 | | 60 | 38 | 10 | 0.188 | |
| | FRN0024C2S-4□ | DB11-4 | | 40 | 55 | | 0.275 | |
| | FRN0030C2S-4□ | DB15-4 | | 34.4 | 75 | 0.375 | | |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

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| Power supply voltage | Inverter type | Braking resistor | | Resistance (Ω) | Continuous braking (100% braking torque) | | Intermittent braking (Period: 100 s or less) | |
|----------------------|---------------|------------------|------|----------------|--|------------------|--|------------|
| | | Type | Qty. | | Discharging capability (kW) | Braking time (s) | Allowable average loss (kW) | Duty (%ED) |
| Three-phase 200 V | FRN0025C2S-2□ | DB5.5-2C | 1 | 20 | 55 | 20 | 0.275 | 10 |
| | FRN0033C2S-2□ | DB7.5-2C | | 15 | 37 | 10 | 0.375 | |
| | FRN0047C2S-2□ | DB11-2C | | 10 | 55 | | 0.55 | |
| | FRN0060C2S-2□ | DB15-2C | | 8.6 | 75 | 0.75 | | |
| Three-phase 400 V | FRN0013C2S-4□ | DB5.5-4C | 1 | 80 | 55 | 20 | 0.275 | 10 |
| | FRN0018C2S-4□ | DB7.5-4C | | 60 | 38 | 10 | 0.375 | |
| | FRN0024C2S-4□ | DB11-4C | | 40 | 55 | | 0.55 | |
| | FRN0030C2S-4□ | DB15-4C | | 34.4 | 75 | 0.75 | | |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

Chapter 8 SPECIFICATIONS

8.1 Standard Models

8.1.1 Three-phase 200 V class series (□ = A only)

| Item | | Specifications | | | | |
|---|----------------------------------|---|--------------------|--------------------|--------------------|------|
| Type (FRN_ _ _ C2S-2□) | | 0025 | 0033 | 0047 | 0060 | |
| Applicable motor rating (kW) *1 (when □ = A) | | 5.5 | 7.5 | 11 | 15 | |
| Output Ratings | Rated capacity (kVA) *2 | 9.5 | 12 | 17 | 22 | |
| | Rated voltage (V) *3 | Three-phase 200 to 240 V (with AVR function) | | | | |
| | Rated current (A) | 25 (23.5) *10 | 33.0 (31.0) *10 | 47.0 (44.0) *10 | 60.0 (57.0) *10 | |
| | Overload capability | 150% of rated output current for 1 min or 200% of rated output current for 0.5 min | | | | |
| | Rated frequency (Hz) | 50, 60 Hz | | | | |
| Input Ratings | Phases, voltage, frequency | Three-phase 200 to 240 V, 50/60 Hz | | | | |
| | Voltage and frequency variations | Voltage: +10 to -15% (Interphase voltage unbalance: 2% or less) *5, Frequency: +5 to -5% | | | | |
| | Rated current (A) *6 | (w/ DCR) | 21.1 | 28.8 | 42.2 | 57.6 |
| | | (w/o DCR) | 31.5 | 42.7 | 60.7 | 80.0 |
| Required power supply capacity (kVA) *7 | 7.4 | 10 | 15 | 20 | | |
| Braking | Torque (%) *8 | 20 | | | | |
| | DC braking | Braking starting frequency*9: 0.0 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100% | | | | |
| | Braking transistor | Built-in | | | | |
| Applicable safety standards | | UL508C, IEC 61800-5-1: 2007 (under application) | | | | |
| Enclosure | | IP20 (IEC 60529:1989), UL open type (UL50) | | | | |
| Cooling method | | Fan cooling | | | | |
| Mass (kg) | | 3.1 | 3.1 | 4.5 | 4.5 | |

*1 Fuji 4-pole standard motors

*2 Refers to the rated capacity assuming the rated output voltage as 220 V for three-phase 200V series.

*3 Output voltages cannot exceed the power supply voltage.

$$*5 \text{ Interphase voltage unbalance}(\%) = \frac{\text{Max. voltage (V)} - \text{Min. voltage (V)}}{3\text{-phase average voltage (V)}} \times 67 \text{ (Refer to IEC 61800-3:2004)}$$

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

*6 Refers to the estimated value to apply when the power supply capacity is 500 kVA (inverter capacity x 10 when the inverter capacity exceeds 50 kVA) and the inverter is connected to the %X = 5% power supply.

*7 Refers to the value to apply when a DC reactor (DCR) is used.

*8 Refers to the average braking torque to apply when the motor running alone decelerates from 60 Hz with the AVR control being OFF. (It varies with the efficiency of the motor.)

*9 Available only for induction motor drive.

*10 The load shall be reduced so that the continuous operating current is the rated current in parentheses or less if the carrier frequency is set to 4 kHz or above or the ambient temperature exceeds 40°C (104°F) .

Note: A box (□) in the above table replaces A depending on the shipping destination.

8.1.2 Three-phase 400 V class series (□ = A, E)

| Item | | Specifications | | | | |
|--|----------------------------------|---|------|------|------|------|
| Type (FRN_ _ _ _ C2S-4□) | | 0013 | 0018 | 0024 | 0030 | |
| Applicable motor rating (kW) *1 (when □ = A or E) | | 5.5 | 7.5 | 11 | 15 | |
| Output Ratings | Rated capacity (kVA) *2 | 9.9 | 13 | 18 | 22 | |
| | Rated voltage (V) *3 | Three-phase 380 to 480 V (with AVR function) | | | | |
| | Rated current (A) | 13.0 | 18.0 | 24.0 | 30.0 | |
| | Overload capability | 150% of rated output current for 1 min or 200% of rated output current for 0.5 min | | | | |
| | Rated frequency (Hz) | 50, 60 Hz | | | | |
| Input Ratings | Phases, voltage, frequency | Three-phase 380 to 480 V, 50/60 Hz | | | | |
| | Voltage and frequency variations | Voltage: +10 to -15% (Interphase voltage unbalance: 2% or less) *5, Frequency: +5 to -5% | | | | |
| | Rated current (A) *6 | (w/ DCR) | 10.6 | 14.4 | 21.1 | 28.8 |
| | | (w/o DCR) | 17.3 | 23.2 | 33.0 | 43.8 |
| Required power supply capacity (kVA) *7 | 7.4 | 10 | 15 | 20 | | |
| Braking | Torque (%) *8 | 20 | | | | |
| | DC braking | Braking starting frequency*9: 0.0 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 100% | | | | |
| | Braking transistor | Built-in | | | | |
| Applicable safety standards | | UL508C, IEC 61800-5-1: 2007 (under application) | | | | |
| Enclosure | | IP20 (IEC 60529:1989), UL open type (UL50) | | | | |
| Cooling method | | Fan cooling | | | | |
| Mass (kg) | | 3.1 | 3.1 | 4.5 | 4.5 | |

*1 Fuji 4-pole standard motors

*2 Refers to the rated capacity assuming the rated output voltage as 440 V for three-phase 400V series.

*3 Output voltages cannot exceed the power supply voltage.

$$*5 \text{ Interphase voltage unbalance (\%)} = \frac{\text{Max. voltage (V)} - \text{Min. voltage (V)}}{3 - \text{phase average voltage (V)}} \times 67 \text{ (Refer to IEC 61800-3 : 2004)}$$

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

*6 Refers to the estimated value to apply when the power supply capacity is 500 kVA (inverter capacity x 10 when the inverter capacity exceeds 50 kVA) and the inverter is connected to the %X = 5% power supply.

*7 Refers to the value to apply when a DC reactor (DCR) is used.

*8 Refers to the average braking torque to apply when the motor running alone decelerates from 60 Hz with the AVR control being OFF. (It varies with the efficiency of the motor.)

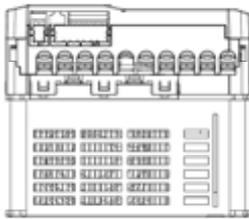
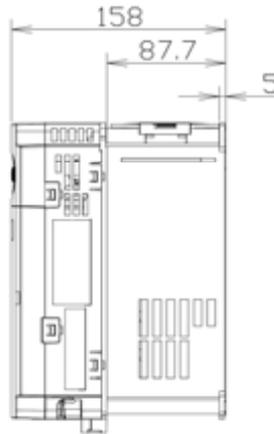
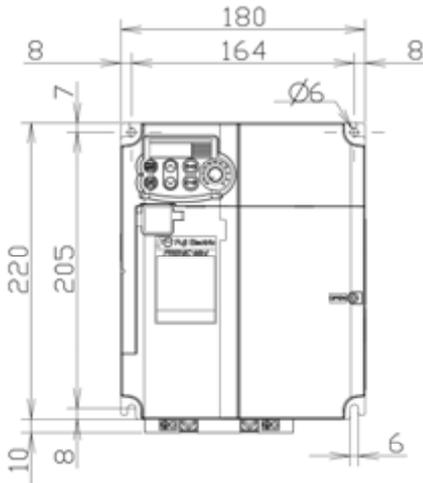
*9 Available only for induction motor drive.

Note: A box (□) in the above table replaces A or E depending on the shipping destination.

8.4 External Dimensions

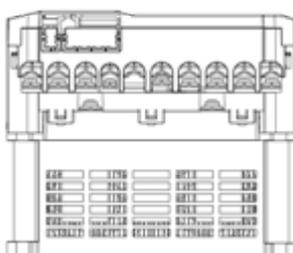
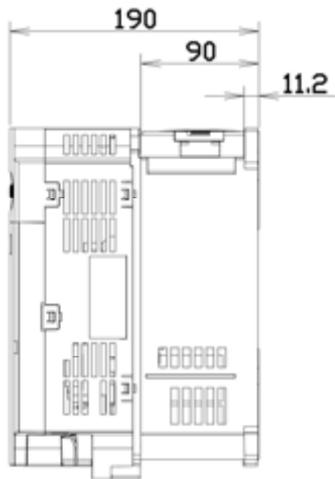
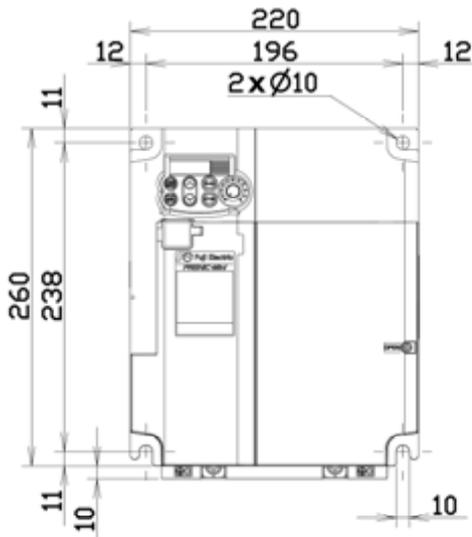
8.4.1 Standard models

Unit : mm



| Power supply voltage | Inverter type |
|----------------------|---------------|
| Three-phase 200 V | FRN0025C2S-2□ |
| | FRN0033C2S-2□ |
| Three-phase 400 V | FRN0013C2S-4□ |
| | FRN0018C2S-4□ |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.



| Power supply voltage | Inverter type |
|----------------------|---------------|
| Three-phase 200 V | FRN0047C2S-2□ |
| | FRN0060C2S-2□ |
| Three-phase 400 V | FRN0024C2S-4□ |
| | FRN0030C2S-4□ |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

Chapter 9 LIST OF PERIPHERAL EQUIPMENT AND OPTIONS

| | Name of peripheral equipment | Function and application | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---|---|----------------------|------------------------------|---------------|--|--|---------------|----------------|-------------------|-----|---------------|----|----|-----|---------------|----|----|----|---------------|----|-----|----|---------------|----|-----|-------------------|-----|---------------|----|----|-----|---------------|----|----|----|---------------|----|----|----|---------------|----|----|
| Main peripheral equipment | Molded case circuit breaker (MCCB) Residual-current-operated protective device (RCD) /Earth leakage circuit breaker (ELCB)* * with overcurrent protection | <p>MCCBs are designed to protect the power circuits between the power control board and inverter's main terminals (L1/R, L2/S and L3/T for three-phase power, L1/L and L2/N for single-phase power) from overload or short-circuit which in turn prevents secondary disasters caused by the inverter malfunctioning.</p> <p>RCDs/ELCBs function in the same way as MCCBs. Use the MCCBs and RCDs/ELCBs that satisfy the recommended rated current listed below.</p> <table border="1" data-bbox="412 600 1372 1093"> <thead> <tr> <th rowspan="2">Power supply voltage</th> <th rowspan="2">Applicable motor rating (kW)</th> <th rowspan="2">Inverter type</th> <th colspan="2">Recommended rated current (A) of MCCB and RCD/ELCB</th> </tr> <tr> <th>w/ DC reactor</th> <th>w/o DC reactor</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Three-phase 200 V</td> <td>5.5</td> <td>FRN0025C2S-2□</td> <td>30</td> <td>50</td> </tr> <tr> <td>7.5</td> <td>FRN0033C2S-2□</td> <td>40</td> <td>75</td> </tr> <tr> <td>11</td> <td>FRN0047C2S-2□</td> <td>50</td> <td>100</td> </tr> <tr> <td>15</td> <td>FRN0060C2S-2□</td> <td>75</td> <td>125</td> </tr> <tr> <td rowspan="4">Three-phase 400 V</td> <td>5.5</td> <td>FRN0013C2S-4□</td> <td>15</td> <td>30</td> </tr> <tr> <td>7.5</td> <td>FRN0018C2S-4□</td> <td>20</td> <td>40</td> </tr> <tr> <td>11</td> <td>FRN0024C2S-4□</td> <td>30</td> <td>50</td> </tr> <tr> <td>15</td> <td>FRN0030C2S-4□</td> <td>40</td> <td>60</td> </tr> </tbody> </table> <p>Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.</p> <div data-bbox="412 1169 1372 1433" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"> WARNING</p> <p>When connecting the inverter to the power supply, add a recommended molded case circuit breaker (MCCB) or a residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB)* in the path of power supply. Do not use the devices with the rated current out of the recommended range. *With overcurrent protection</p> <p>Fire could occur.</p> </div> <p>Select the MCCB or RCD/ELCB with appropriate rated current and breaking capacity according to the power supply capacity.</p> | Power supply voltage | Applicable motor rating (kW) | Inverter type | Recommended rated current (A) of MCCB and RCD/ELCB | | w/ DC reactor | w/o DC reactor | Three-phase 200 V | 5.5 | FRN0025C2S-2□ | 30 | 50 | 7.5 | FRN0033C2S-2□ | 40 | 75 | 11 | FRN0047C2S-2□ | 50 | 100 | 15 | FRN0060C2S-2□ | 75 | 125 | Three-phase 400 V | 5.5 | FRN0013C2S-4□ | 15 | 30 | 7.5 | FRN0018C2S-4□ | 20 | 40 | 11 | FRN0024C2S-4□ | 30 | 50 | 15 | FRN0030C2S-4□ | 40 | 60 |
| | Power supply voltage | Applicable motor rating (kW) | | | | Inverter type | Recommended rated current (A) of MCCB and RCD/ELCB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | w/ DC reactor | w/o DC reactor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Three-phase 200 V | 5.5 | FRN0025C2S-2□ | 30 | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 7.5 | FRN0033C2S-2□ | 40 | 75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 11 | FRN0047C2S-2□ | 50 | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15 | FRN0060C2S-2□ | 75 | 125 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Three-phase 400 V | 5.5 | FRN0013C2S-4□ | 15 | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 7.5 | FRN0018C2S-4□ | 20 | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 11 | FRN0024C2S-4□ | 30 | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | FRN0030C2S-4□ | 40 | 60 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Chapter 10 APPLICATION OF DC REACTORS (DCRs)

Since the "Japanese Guideline for Suppressing Harmonics in Home and General-purpose Appliances" issued by the Ministry of International Trade and Industry (Currently the Ministry of Economy, Trade and Industry) was revised in January 2004, the general-purpose inverters have no longer been subject to the guideline. Individual inverter manufacturers have voluntarily employed harmonics suppression measures. It is recommended that DC reactors (DCRs) specified in Table 10.1 be connected to the FRENIC-Mini series of inverters.

Table 10.1 List of DC Reactors (DCRs)

| Power supply voltage | Nominal applied motor (kW) | Applicable inverter type | DCR type |
|----------------------|----------------------------|--------------------------|----------|
| Three-phase 200 V | 5.5 | FRN0025C2S-2□ | DCR2-5.5 |
| | 7.5 | FRN0033C2S-2□ | DCR2-7.5 |
| | 11 | FRN0047C2S-2□ | DCR2-11 |
| | 15 | FRN0060C2S-2□ | DCR2-15 |
| Three-phase 400 V | 5.5 | FRN0013C2S-4□ | DCR4-5.5 |
| | 7.5 | FRN0018C2S-4□ | DCR4-7.5 |
| | 11 | FRN0024C2S-4□ | DCR4-11 |
| | 15 | FRN0030C2S-4□ | DCR4-15 |

Note: A box (□) in the above table replaces A or E depending on the shipping destination.

For three-phase 200 V class series of inverters, it replaces A.

Chapter 11 COMPLIANCE WITH STANDARDS

11.1 Compliance with European Standards

The CE marking on Fuji products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive 2004/108/EC issued by the Council of the European Communities and Low Voltage Directive 2006/95/EC.

Inverters that bear a CE marking are compliant with the Low Voltage Directive.

The products comply with the following standards:

| | |
|-----------------------|--|
| Low Voltage Directive | EN61800-5-1: 2007 |
| EMC Directives | EN61800-3: 2004 +A1: 2012 |
| | Immunity: Second environment (Industrial) |
| | Emission: Category C2 (Applicable only when an optional EMC-compliant filter is attached) |

CAUTION

The FRENIC-Mini series of inverters are categorized as a "restricted sales distribution class" of the EN61800-3. When you use these products with any home appliances or office equipment, you may need to take appropriate countermeasures to reduce or eliminate any noise emitted from these products.

11.2 Compliance with EMC Standard

11.2.2 Recommended installation procedure

■ In case an outboard, EMC-compliant (optional) is used

If noise from the inverter exceeds the permissible level, enclose the inverter and its peripherals within a metal panel.

 For details, refer to the FRENIC-Mini Instruction Manual (INR-SI47-1745-E), Chapter 11 Section 11.2 "Compliance with EMC Standard."

11.2.3 Leakage current of EMC-complaint filter (optional)

Table 11.1 Leakage Current of EMC-compliant Filter (optional)

| Inverter type | | Filter type | Leakage current (mA) *1 to *4 | |
|---------------|---------------------|-----------------|-------------------------------|--------|
| For Japan | For other countries | | Normal | Worst |
| FRN5.5C2S-2J | FRN0025C2S-2□ | FS5956-53-52 | 11 *1 | 11 *1 |
| FRN7.5C2S-2J | FRN0033C2S-2□ | | | |
| FRN11C2S-2J | FRN0047C2S-2□ | EFL-15SP-2 | 20 *1 | 20 *1 |
| FRN15C2S-2J | FRN0060C2S-2□ | | | |
| FRN5.5C2S-4J | FRN0013C2S-4□ | FS21559-24-07-1 | 4 *2 | 59 *2 |
| FRN7.5C2S-4J | FRN0018C2S-4□ | | | |
| FRN11C2S-4J | FRN0024C2S-4□ | FS21312-44-07 | 4 *3 | 167 *3 |
| FRN15C2S-4J | FRN0030C2S-4□ | | | |

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

*1) The values are calculated assuming the power supplies of three-phase 240 V (50 Hz).

*2) The values are calculated assuming the power supplies of three-phase 400 V (50 Hz).

*3) The values are calculated assuming the power supplies of three-phase 480 V (50 Hz).

*4) The worst condition includes a phase loss in the supply line.

11.4 Compliance with the Low Voltage Directive in the EU

11.4.1 General

General-purpose inverters are regulated by the Low Voltage Directive in the EU. Fuji Electric has obtained the proper certification for the Low Voltage Directive from the official inspection agency. Fuji Electric states that all our inverters with CE marking are compliant with the Low Voltage Directive.

11.4.2 Points for consideration when using the FRENIC-Mini series in a system to be certified by the Low Voltage Directive in the EU

If you want to use the FRENIC-Mini series of inverters in systems/equipment in the EU, refer to the guidelines given below.

Conformity to the Low Voltage Directive in the EU

If installed according to the guidelines given below, inverters marked with CE are considered as compliant with the Low Voltage Directive 2006/95/EC.

⚠ CAUTION

12. Use wires listed in IEC60364-5-52.

| Power supply voltage | Applicable motor rating (kW) | Inverter type | Recommended wire size (mm ²) | | | | | | |
|----------------------|------------------------------|---------------|---|---------------|---|---------------|--|--|---|
| | | | *1 Rated current (A) of MCCB or RCD/ELCB | | *2 Main circuit power input [L1/R, L2/S, L3/T] [L1/L, L2/N] Grounding [⊕G] | | *2 Inverter output [U, V, W] | *2 DCR [P1, P (+)] Braking resistor [P (+), DB] | Control circuit (30A, 30B, 30C) |
| | | | w/ DCR | *3 w/o DCR | w/ DCR | *3 w/o DCR | | | |
| 3-phase 200 V | 5.5 | FRN0025C2S-2□ | 30 | 50 | 4.0 | 6.0 | 4.0 | 4.0 | 0.5 |
| | 7.5 | FRN0033C2S-2□ | 40 | 75 | 6.0 | 10 | 6.0 | 6.0 | |
| | 11 | FRN0047C2S-2□ | 50 | 100 | 10 | 16 | 10 | 16 | |
| | 15 | FRN0060C2S-2□ | 75 | 125 | 16 | 25 | 16 | 25 | |
| 3-phase 400 V | 5.5 | FRN0013C2S-4□ | 15 | 30 | 2.5 | 2.5 | 2.5 | 2.5 | 0.5 |
| | 7.5 | FRN0018C2S-4□ | 20 | 40 | | 4.0 | | 4.0 | |
| | 11 | FRN0024C2S-4□ | 30 | 50 | 4.0 | 6.0 | 4.0 | 4.0 | |
| | 15 | FRN0030C2S-4□ | 40 | 60 | 6.0 | 10 | 6.0 | 6.0 | |

MCCB: Molded case circuit breaker

RCD: Residual-current-operated protective device

ELCB: Earth leakage circuit breaker

Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

*1 The frame size and model of the MCCB or RCD/ELCB (with overcurrent protection) will vary, depending on the power transformer capacity. Refer to the related technical documentation for details.

*2 The recommended wire size for main circuits is for the 70°C 600V PVC wires used at an ambient temperature of 40°C.

*3 In the case of no DC reactor, the wire sizes are determined on the basis of the effective input current calculated under the condition that the power supply capacity and impedance are 500 kVA and 5%, respectively.

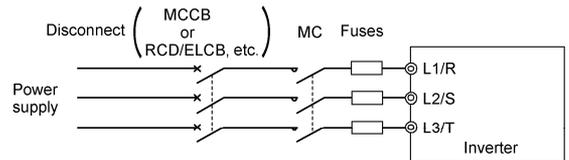
Conformity to the Low Voltage Directive in the EU (Continued)



13. To prevent the risk of hazardous accidents that could be caused by damage of the inverter, install the specified fuses in the supply side (primary side) according to the following tables.

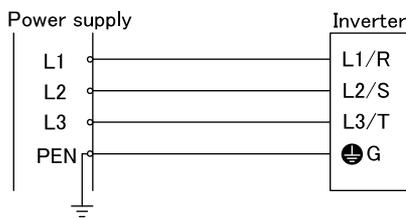
- Breaking capacity: Min. 10 kA
- Rated voltage: Min. 500 V

| Power supply voltage | Nominal applied motor (kW) | Inverter type | Fuse rating (A) |
|----------------------|----------------------------|---------------|-----------------|
| Three-phase 200V | 5.5 | FRN0025C2S-2□ | 125(IEC60269-4) |
| | 7.5 | FRN0033C2S-2□ | 160(IEC60269-4) |
| | 11 | FRN0047C2S-2□ | 160(IEC60269-4) |
| | 15 | FRN0060C2S-2□ | 200(IEC60269-4) |
| Three-phase 400V | 5.5 | FRN0013C2S-4□ | 80(IEC60269-4) |
| | 7.5 | FRN0018C2S-4□ | 80(IEC60269-4) |
| | 11 | FRN0024C2S-4□ | 125(IEC60269-4) |
| | 15 | FRN0030C2S-4□ | 160(IEC60269-4) |

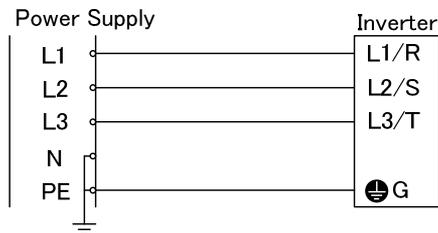


Note: A box (□) in the above table replaces A or E depending on the shipping destination. For three-phase 200 V class series of inverters, it replaces A.

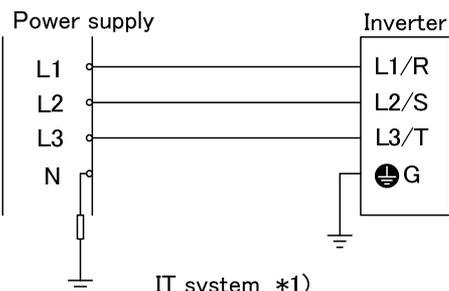
14. Use this inverter at the following power supply system.



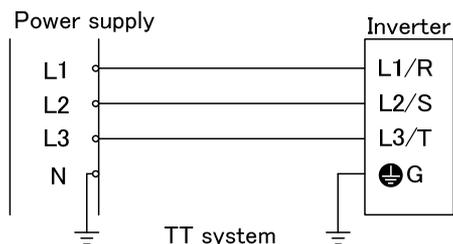
TN-C system



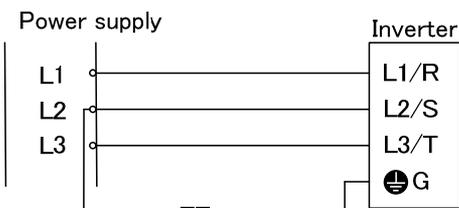
TN-S system



IT system *1)



TT system
(Earthed neutral)



TT system
(corner earthed/phase-earthed)
(Applicable for 200V type only) *2)

Conformity to the Low Voltage Directive in the EU (Continued)

WARNING

*1 Use this inverter at the following IT system.

| | |
|--|--|
| Non-earthed (isolated from earth) IT system | Can be used. In this case the insulation between the control interface and the main circuit of the inverter is basic insulation. Thus do not connect SELV circuit from external controller directly (make connection using a supplementary insulation.). Use an earth fault detector able to disconnect the power within 5s after the earth fault occurs. |
| IT system which earthed neutral by an impedance | |
| Corner earthed / Phase-earthed IT system by an impedance | Can not be used |

*2 Cannot apply to Corner earthed / Phase-earthed TT system of 400V type.

11.5 Compliance with UL Standards and Canadian Standards (cUL certification)

11.5.1 General

Originally, the UL standards were established by Underwriters Laboratories, Inc. as private criteria for inspections/investigations pertaining to fire/accident insurance in the USA. Later, these standards were authorized as the official standards to protect operators, service personnel and the general populace from fires and other accidents in the USA.

cUL certification means that UL has given certification for products to clear CSA Standards. cUL certified products are equivalent to those compliant with CSA Standards.

11.5.2 Considerations when using FRENIC-Mini in systems to be certified by UL and cUL

To use the FRENIC-Mini series of inverters as a part of UL Standards or CSA Standards (cUL certified) certified product, refer to the guidelines given below.

Conformity to UL standards and Canadian standards (cUL certification)

If installed according to the guidelines given below, inverters marked with UL/cUL are considered as compliant with the UL and CSA (cUL certified) standards.

CAUTION

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

1. Solid state motor overload protection (motor protection by electronic thermal overload relay) is provided in each model.
Adjust function codes F10 to F12 and H89 to set the protection level.
2. Connect the power supply satisfying the characteristics shown in the table below as an input power supply of the inverter. (Short circuit rating)
3. Use 75°C Cu wire only.
4. Use Class 1 wire only for control circuits.

Conformity to UL standards and Canadian standards (cUL certification)

⚠ CAUTION

Short circuit rating

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

| Power supply voltage | Inverter type | Power supply max. voltage A (Volts) | Power supply current B (Amperes) |
|----------------------|---------------|-------------------------------------|----------------------------------|
| Three-phase 200V | FRN0025C2S-2□ | 240VAC | 100,000 A or less |
| | FRN0033C2S-2□ | | |
| | FRN0047C2S-2□ | | |
| | FRN0060C2S-2□ | | |
| Three-phase 400V | FRN0013C2S-4□ | 480VAC | 100,000 A or less |
| | FRN0018C2S-4□ | | |
| | FRN0024C2S-4□ | | |
| | FRN0030C2S-4□ | | |

Note: A box (□) in the above table replaces A or E depending on the shipping destination.

For three-phase 200 V class series of inverters, it replaces A .

5. Install UL certified fuses rated 600Vac between the power supply and the inverter, referring to the table below.

| Power supply voltage | Inverter type | Required torque lb-in (N·m) | | | Wire size AWG or kcmil(mm ²) | | | Class J fuse current(A) | |
|----------------------|---------------|-----------------------------|---------------------|----------------------------------|--|---------------------|----------------------------------|-------------------------|----------------------------|
| | | Main terminal | Control circuit | | Main terminal ^{*3} | Control circuit | | | |
| | | | ^{*1} TERM1 | ^{*2} TERM2-1 TERM2-2 | | ^{*1} TERM1 | ^{*2} TERM2-1 TERM2-2 | | |
| Three-phase 200V | FRN0025C2S-2□ | 27 (3.0) | 3.5 (0.4) | 1.7 (0.2) | 8 (8.4) | 20 (0.5) | 60 | | |
| | FRN0033C2S-2□ | | | | | | | 51.3 (5.8) | 4 (21.2) 6 (13.3) |
| | FRN0047C2S-2□ | 150 | | | | | | | |
| | FRN0060C2S-2□ | | | | | | | | |
| Three-phase 400V | FRN0013C2S-4□ | 27 (3.0) | 3.5 (0.4) | 1.7 (0.2) | 12 (3.3) 10 (5.3) | 20 (0.5) | 30 | | |
| | FRN0018C2S-4□ | | | | | | | 51.3 (5.8) | 10 (5.3) |
| | FRN0024C2S-4□ | 70 | | | | | | | |
| | FRN0030C2S-4□ | | | | | | | | |

Conformity to UL standards and Canadian standards (cUL certification) (Continued)

CAUTION

Note: A box (□) in the above table replaces A or E depending on the shipping destination.

For three-phase 200 V class series of inverters, it replaces A.

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

*2 Denotes control terminals except for [30A], [30B] and [30C].

*3 Values in [] mean the size(AWG) of Grounding wire if exist.

6. To comply with CSA for 400VAC input models, transient surge suppression shall be installed on the line side of this equipment and shall be rated 278V (phase to ground), 480V (phase to phase), suitable for overvoltage category 3, and shall provide protection for a rated impulse withstand voltage peak of 4kV.

7. All models rated 380-480 V input voltage ratings shall be connected to TN-C system power source, i.e. 3-phase, 4-wire, wye (480Y/277V), so that the phase-to-ground rated system voltage is limited to 300V maximum.

8. Maximum surrounding air temperature rating of 50 °C.

Compact Inverter ***FRENIC-Mini***

Instruction Manual

Supplement for FRN- C2S-2□/4□ (5.5 to 15kW)

First Edition, March 2014

Fuji Electric Co., Ltd.

The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of the FRENIC-Mini series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will Fuji Electric Co., Ltd. be liable for any direct or indirect damages resulting from the application of the information in this manual.