Fuji Electric

*Innovating Energy Technology*

Compact inverter

# *FRENIC-Mini* Series

COMPACT
INVERTER
FRENIC
**Mini**

**FUJI ELECTRIC INVERTERS**

High Perfomance
Compact Body
Welcome to the
NEXT Generation
of Compact Inverters

**New**

**NEXT Generation!**

Compact

And

High Perfomance

24A1-E-0011c

Điện City
Connect & Innovate

# CÔNG TY TNHH THƯƠNG MẠI KỸ THUẬT ĐIỆN CITY

## Nhà phân phối thiết bị điện công nghiệp hàng đầu Việt Nam

TOGI KAKU® INOVANCE IDEC
Think Automation and beyond...

Fuji Electric
Innovating Energy Technology

MITSUBISHI ELECTRIC
Changes for the Better

TAIWAN METERS


## LIÊN HỆ VỚI CHÚNG TÔI

**Địa chỉ:** 125 Phú Châu, KP1, P. Tam Bình, TP. Thủ Đức, TP. HCM
**Hotline:** 0909 808 905 (Zalo)
**Email:** minh.diencity@gmail.com
**Website:** diencity.com

High Performance and Multipurpose

Fully Compatible with Existing Products

Easy Operation and Maintenance

# New Compact Inverter

High Performance Compact Body.
Get Our Most User-Friendly Inverter yet!


## NEXT Generation!

# COMPACT INVERTER

## FRENIC Mini

**FUJI ELECTRIC INVERTERS**
High Perfomance Compact Body.
Welcome to the NEXT Generation of Compact Inverter

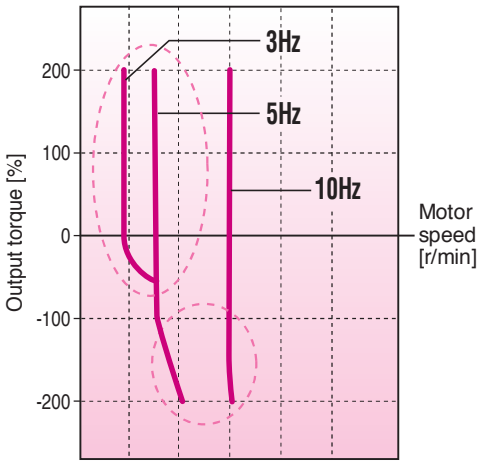
With its functionality, compact design, simple operation, and global compatibility, the new FRENIC-Mini elevates the performance of a wide range of devices and equipment--including conveyors, fans, pumps, centrifugal separators, and food processing machines--to give you the system integration, energy efficiency, reduced labor, and lower overall costs you're looking for.

Energy Efficient

Network Capabilities

Global Compatibility

# High Performance and Multipurpose




## Dynamic Torque Vector Control System

Fuji Electric original dynamic torque vector control system is known for its top-of-the line performance, delivering stabile torque output even at low speeds. This feature has a wide range of applications, including conveyors and high-inertia loads that demand high starting torque.

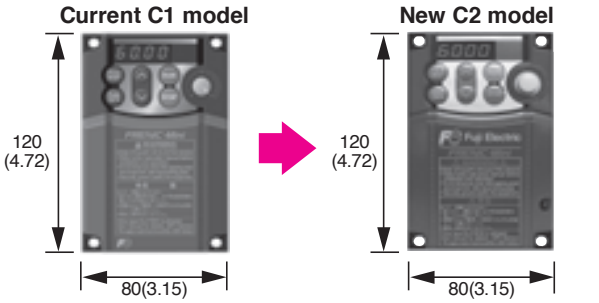
## Slip Compensation shortens setting time

The slip compensation controller works with voltage tuning for even more accurate speed control at low velocity. This reduces speed control variability and stabilizing creep speed for more accurate stopping in conveyors and similar equipment.

## Fastest CPU Processor in its Class

Advanced CPU processes data at twice the speed of our current model

# Full Compatibility and User Friendly Design




Note: Three-phase 200V 0.1–0.75kW dimensions shown (mm(inch))

| | |
|---|---|
| External dimensions | Interchangeable |
| Installed dimensions | Interchangeable |
| Number of terminals | Same for both main circuit and controllers |
| Terminal position | Compatible terminal wire length |
| Function codes | Compatible function codes |
| RS-485 communication | Shared communications protocol |

# Easy Operation and Maintenance

## Usability

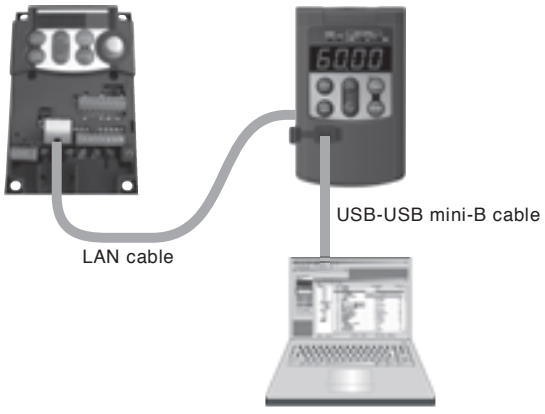
Delivers all the usability of the C1. Provides volume of frequency and the same ease of operation as the current model.

## Improve Maintainability

| Function | Description |
|---|---|
| Mock malfunction | Select a function to set off a mock alarm |
| Number of startups | Count the total number of ON/OFF run cycles |
| Cumulative motor running time | Monitor motor run time |
| Total power | Set to measure total power consumption |
| Trip history | Saves and displays information on up to four past trips |

## USB Keypad

Optional USB keypad available. Enhanced PC loader connectivity.

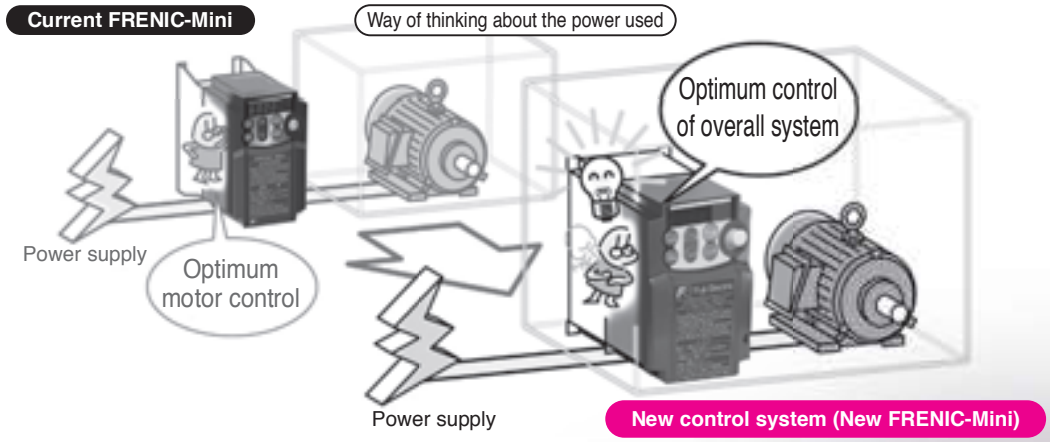



· PC loader software available as a free download

## Energy Optimization

### Optimum Energy Control

Motor tuning minimizes power loss




### PID Control Function

Permits motor operation while controlling temperature, pressure, and flow rate without the use of a temperature controller or other external device

### Cooling Fan ON/OFF Control Function

The cooling fan can be switched off when the fan or pump is not running to reduce both noise and energy consumption

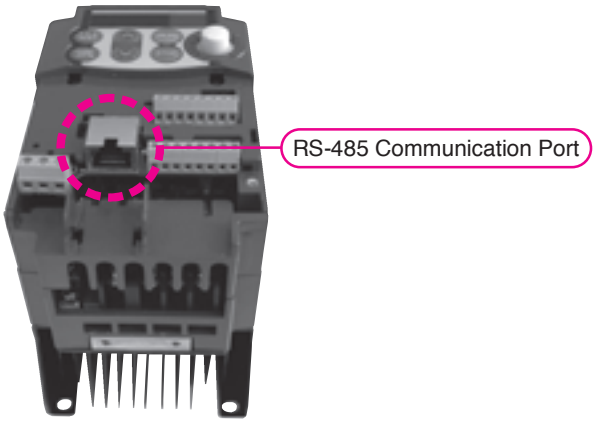
### Synchronous Motor Control

Use of sensorless synchronous motor control together with the motor can reduce energy consumption

## Network Capabilities

### RS-485 Communications Port as Standard

Communications can be controlled through the standard RS-485 communications port using the Modbus-RTU or Fuji Electric inverter protocol




## Other Features

### Functions for User Applications

V/F (non-linear 3 step)
Two motor parameter sets
Brake signal (brake release signal)
Rotational direction control (prevent forward/reverse movement)

### Global Standard

EC Directives (CE making)

UL standard (cUL certification) c UL US LISTED

# Variation

| Nominal Applied Motor (kW)[HP] | Three-phase 200V series | Three-phase 400V series | Single-phase 200V series | Single-phase 100V series |
|---|---|---|---|---|
| **Standard specifications** | | | | |
| **Without EMC filter type** | | | | |
| 0.1 [1/8] | FRN0001C2S-2☐ | | FRN0001C2S-7☐ | FRN0001C2S-6U |
| 0.2 [1/4] | FRN0002C2S-2☐ | | FRN0002C2S-7☐ | FRN0002C2S-6U |
| 0.4 [1/2] | FRN0004C2S-2☐ | FRN0002C2S-4☐ | FRN0004C2S-7☐ | FRN0003C2S-6U |
| 0.75 [1] | FRN0006C2S-2☐ | FRN0004C2S-4☐ | FRN0006C2S-7☐ | FRN0005C2S-6U |
| 1.5 [2] | FRN0010C2S-2☐ | FRN0005C2S-4☐ | FRN0010C2S-7☐ | |
| 2.2 [3] | FRN0012C2S-2☐ | FRN0007C2S-4☐ | FRN0012C2S-7☐ | |
| 3.7 [5] | FRN0020C2S-2☐ | FRN0011C2S-4☐ | | |
| 5.5 [7.5] | FRN0025C2S-2☐ | FRN0013C2S-4☐ | | |
| 7.5 [10] | FRN0033C2S-2☐ | FRN0018C2S-4☐ | | |
| 11 [15] | FRN0047C2S-2☐ | FRN0024C2S-4☐ | | |
| 15 [20] | FRN0060C2S-2☐ | FRN0030C2S-4☐ | | |
| Destination ☐ | A(Asia), U(USA) | A(Asia), C(China), E(Europe), U(USA) | | U(USA) |
| **Semi-standard specifications** | | | | |
| **EMC filter built-in type** | | | | |
| 0.1 [1/8] | | | FRN0001C2E-7☐ | |
| 0.2 [1/4] | | | FRN0002C2E-7☐ | |
| 0.4 [1/2] | | FRN0002C2E-4☐ | FRN0004C2E-7☐ | |
| 0.75 [1] | | FRN0004C2E-4☐ | FRN0006C2E-7☐ | |
| 1.5 [2] | | FRN0005C2E-4☐ | FRN0010C2E-7☐ | |
| 2.2 [3] | | FRN0007C2E-4☐ | FRN0012C2E-7☐ | |
| 3.7 [5] | | FRN0011C2E-4☐ | | |
| 5.5 [7.5] | | FRN0013C2E-4☐ | | |
| 7.5 [10] | | FRN0018C2E-4☐ | | |
| 11 [15] | | FRN0024C2E-4☐ | | |
| 15 [20] | | FRN0030C2E-4☐ | | |
| Destination ☐ | | C(China), E(Europe) | | |

Coming Soon

## How To Read Model Number

**FRN 0010 C 2 S - 4 A**

| Code | Series Name |
|---|---|
| FRN | FRENIC series |

| Applicable Current Rating |
|---|
| This value shows an amperage rating |
| 0001～0060 |

| Code | Application Range |
|---|---|
| C | Compact |

| Code | Developed Inverter Series |
|---|---|
| 2 | 2-series |

| Code | Enclosure |
|---|---|
| S | Standard (IP20) (UL Open Type) |
| E | EMC filter built-in type |

| Code | Destination/Manual |
|---|---|
| A | Asia/English |
| C | China/Chinese |
| E | Europe/English |
| U | USA/English |

| Code | Input Power Source |
|---|---|
| 2 | Three-phase 200V |
| 4 | Three-phase 400V |
| 6 | Single-phase 100V |
| 7 | Single-phase 200V |

**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.

# Standard Model

## Specifications

### Three-phase 200V series

| Item | | | Specifications | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input power source | | | Three-phase 200V | | | | | | | | | |
| Type (FRN □□□□C2S-2△, △=A, U) | | | FRN□□□□C2S-2A, FRN□□□□C2S-2U | | | | | | | | | |
| | | | 0001 | 0002 | 0004 | 0006 | 0010 | 0012 | 0020 | 0025 | 0033 | 0047 | 0060 |
| Nominal applied motor[kW](△=A) | | | 0.1 | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 |
| Nominal applied motor[HP](△=U) | | | 1/8 | 1/4 | 1/2 | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 |
| Output ratings | Rated capacity[kVA] | | 0.30 | 0.57 | 1.3 | 2.0 | 3.5 | 4.5 | 7.2 | 9.5 | 12 | 17 | 22 |
| | Rated voltage[V] | | Three-phase 200 to 240V (With AVR) | | | | | | | | | | |
| | Rated current[A](*1) | | 0.8(0.7) | 1.5(1.4) | 3.5(2.5) | 5.5(4.2) | 9.2(7.0) | 12.0(10.0) | 19.1(16.5) | 25.0(23.5) | 33.0(31.0) | 47.0(44.0) | 60.0(57.0) |
| | Overload capability | | 150% of rated current for 1min<br>150% of rated current for 1min or 200% of rated current for 0.5s (If the rated current is in parenthesis) | | | | | | | 150% of rated current for 1min or<br>200% of rated current for 0.5s | | | |
| | Rated frequency[Hz] | | 50, 60Hz | | | | | | | | | | |
| Input ratings | Phases, Voltage, Frequency | | Three-phase, 200 to 240V, 50/60Hz | | | | | | | | | | |
| | Voltage/Frequency variations | | Voltage: +10 to -15% (Voltage unbalance : 2% or less), Frequency: +5 to -5% | | | | | | | | | | |
| | Rated current[A] | (with DCR) | 0.57 | 0.93 | 1.6 | 3.0 | 5.7 | 8.3 | 14.0 | 21.1 | 28.8 | 42.2 | 57.6 |
| | | (without DCR) | 1.1 | 1.8 | 3.1 | 5.3 | 9.5 | 13.2 | 22.2 | 31.5 | 42.7 | 60.7 | 80.0 |
| | Required power supply capacity[kVA] | | 0.2 | 0.3 | 0.6 | 1.1 | 2.0 | 2.9 | 4.9 | 7.4 | 10 | 15 | 20 |
| Braking | Torque[%] | | 150 | | 100 | | 50 | 30 | | 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, EN 61800-5-1:2007 | | | | | | | | | | |
| Enclosure (IEC 60529) | | | IP20 (IEC 60529:1989) / UL open type (UL50) | | | | | | | | | | |
| Cooling method | | | Natural cooling | | | | Fan cooling | | | | | | |
| Weight / Mass[kg(lbs)] | | | 0.6(1.3) | 0.6(1.3) | 0.7(1.5) | 0.8(1.8) | 1.7(3.7) | 1.7(3.7) | 2.5(5.5) | 3.1(6.8) | 3.1(6.8) | 4.5(9.8) | 4.5(9.8) |

*1 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 3kHz or above or ambient temperature exceeds 40°C (104°F).

### Three-phase 400V series

| Item | | | Specifications | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Input power source | | | Three-phase 400V | | | | | | | | |
| Type (FRN □□□□C2S-4△, △=A, C, E, U) | | | FRN□□□□C2S-4A, FRN□□□□C2S-4C<br>FRN□□□□C2S-4E, FRN□□□□C2S-4U | | | | | | | | |
| | | | 0002 | 0004 | 0005 | 0007 | 0011 | 0013 | 0018 | 0024 | 0030 |
| Nominal applied motor[kW] (△=A, C, E) | | | 0.4 | 0.75 | 1.5 | 2.2 | 3.7(△=A, C)<br>4.0(△=E) | 5.5 | 7.5 | 11 | 15 |
| Nominal applied motor[HP](△=U) | | | 1/2 | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 |
| Output ratings | Rated capacity[kVA] | | 1.3 | 2.3 | 3.2 | 4.8 | 8.0 | 9.9 | 13 | 18 | 22 |
| | Rated voltage[V] | | Three-phase 380 to 480V (With AVR) | | | | | | | | |
| | Rated current[A](*1) | | 1.8(1.5) | 3.1(2.5) | 4.3(3.7) | 6.3(5.5) | 10.5(9.0) | 13.0 | 18.0 | 24.0 | 30.0 |
| | Overload capability | | 150% of rated current for 1min<br>150% of rated current for 1min or 200% of rated current for 0.5s (If the rated current is in parenthesis) | | | | | 150% of rated current for 1min or<br>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), Frequency: +5 to -5% | | | | | | | | |
| | Rated current[A] | (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] | | 0.6 | 1.1 | 2.0 | 2.9 | 4.9 | 7.4 | 10 | 15 | 20 |
| Braking | Torque[%] | | 100 | | 50 | 30 | | 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, EN 61800-5-1:2007 | | | | | | | | |
| Enclosure (IEC 60529) | | | IP20 (IEC 60529:1989) / UL open type (UL50) | | | | | | | | |
| Cooling method | | | Natural cooling | | Fan cooling | | | | | | |
| Weight / Mass[kg(lbs)] | | | 1.2(2.6) | 1.3(2.9) | 1.7(3.7) | 1.7(3.7) | 2.5(5.5) | 3.1(6.8) | 3.1(6.8) | 4.5(9.8) | 4.5(9.8) |

*1 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 3kHz or above or ambient temperature exceeds 40°C (104°F).

# Specifications

## Single-phase 200V/100V series

| Item | | | Specifications | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input power source | | | Single-phase 200V | | | | | | Single-phase 100V | | | |
| Type (FRN □□□□C2S-□△, △=A, C, E, U) | | | FRN □□□□C2S-7A, FRN□□□□C2S-7C<br>FRN □□□□C2S-7E, FRN□□□□C2S-7U | | | | | | FRN □□□□C2S-6U | | | |
| | | | 0001 | 0002 | 0004 | 0006 | 0010 | 0012 | 0001 | 0002 | 0003 | 0005 |
| Nominal applied motor[kW] (△=A, C, E) | | | 0.1 | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 | 0.1 | 0.2 | 0.4 | 0.75 |
| Nominal applied motor[HP](△=U) | | | 1/8 | 1/4 | 1/2 | 1 | 2 | 3 | 1/8 | 1/4 | 1/2 | 1 |
| Output ratings | Rated capacity[kVA] | | 0.30 | 0.57 | 1.3 | 2.0 | 3.5 | 4.5 | 0.26 | 0.53 | 0.95 | 1.6 |
| | Rated voltage[V] | | Three-phase 200 to 240V (With AVR) | | | | | | | | | |
| | Rated current[A](*1) | | 0.8(0.7) | 1.5(1.4) | 3.5(2.5) | 5.5(4.2) | 9.2(7.0) | 12.0(10.0) | 0.7 | 1.4 | 2.5 | 4.2 |
| | Overload capability | | 150% of rated current for 1min<br>150% of rated current for 1min or 200% of rated current for 0.5s (If the rated current is in parenthesis) | | | | | | 150% of rated current for 1min<br>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 | | | | | | Single-phase 100 to 120V, 50/60Hz | | | |
| | Voltage/Frequency variations | | Voltage: +10 to -10%, Frequency: +5 to -5% | | | | | | | | | |
| | Rated current[A] | (with DCR) | 1.1 | 2.0 | 3.5 | 6.4 | 11.6 | 17.5 | 2.2 | 3.8 | 6.4 | 12.0 |
| | | (without DCR) | 1.8 | 3.3 | 5.4 | 9.7 | 16.4 | 24.0 | 3.6 | 5.9 | 9.5 | 16.0 |
| | Required power supply capacity[kVA] | | 0.3 | 0.4 | 0.7 | 1.3 | 2.4 | 3.5 | 0.3 | 0.5 | 0.7 | 1.3 |
| Braking | Torque[%] | | 150 | | 100 | | 50 | 30 | 150 | | 100 | |
| | 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 | | | | – | | Built-in | |
| Applicable safety standards | | | UL508C, EN 61800-5-1:2007 | | | | | | UL508C | | | |
| Enclosure (IEC 60529) | | | IP20 (IEC 60529:1989) / UL open type (UL50) | | | | | | | | | |
| Cooling method | | | Natural cooling | | | | Fan cooling | | Natural cooling | | | |
| Weight / Mass[kg(lbs)] | | | 0.6(1.3) | 0.6(1.3) | 0.7(1.5) | 0.9(2) | 1.8(4) | 2.5(5.5) | 0.7(1.5) | 0.7(1.5) | 0.8(1.8) | 1.3(2.9) |

*1 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 3kHz or above or ambient temperature exceeds 40°C (104°F).

# EMC Filter Built-in Model

## Specifications

### Three-phase 400V series

| Item | | | Specifications | | | | |
|---|---|---|---|---|---|---|---|
| Input power source | | | Three-phase 400V | | | | |
| Type | | | FRN□□□□C2E-4C, FRN□□□□C2E-4E | | | | |
| (FRN □□□□C2E-4△, △=C, E) | | | 0002 | 0004 | 0005 | 0007 | 0011 |
| Nominal applied motor[kW](△=C, E) | | | 0.4 | 0.75 | 1.5 | 2.2 | 3.7(△=A, C)/4.0(△=E) |
| Nominal applied motor[HP] | | | 1/2 | 1 | 2 | 3 | 5 |
| Output ratings | Rated capacity[kVA] | | 1.3 | 2.3 | 3.2 | 4.8 | 8.0 |
| | Rated voltage[V] | | Three-phase 380 to 480V (With AVR) | | | | |
| | Rated current[A](*1) | | 1.8(1.5) | 3.1(2.5) | 4.3(3.7) | 6.3(5.5) | 10.5(9.0) |
| | Overload capability | | 150% of rated current for 1min<br>150% of rated current for 1min or 200% of rated current for 0.5s (If the rated current is in parenthesis) | | | | |
| | 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), Frequency: +5 to -5% | | | | |
| | Rated current[A] | (with DCR) | 0.85 | 1.6 | 3.0 | 4.4 | 7.3 |
| | | (without DCR) | 1.7 | 3.1 | 5.9 | 8.2 | 13.0 |
| | Required power supply capacity[kVA] | | 0.6 | 1.1 | 2.0 | 2.9 | 4.9 |
| Braking | Torque[%] | | 100 | | 50 | 30 | |
| | 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, EN 61800-5-1:2007 | | | | |
| Applicable EMC standards (EN61800-3:2004 +A1:2012) (in progress) | | | Immunity : Second Environment (Industrial)<br>Emission : Category C2 | | | | |
| Enclosure (IEC 60529) | | | IP20 (IEC 60529:1989) / UL open type (UL50) | | | | |
| Cooling method | | | Natural cooling | | Fan cooling | | |
| Weight / Mass[kg(lbs)] | | | 1.5(3.3) | 1.6(3.5) | 2.5(5.5) | 2.5(5.5) | 3.0(6.6) |

*1 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 3kHz or above or ambient temperature exceeds 40°C (104°F).

### Single-phase 200V series

| Item | | | Specifications | | | | | |
|---|---|---|---|---|---|---|---|---|
| Input power source | | | Single-phase 200V | | | | | |
| Type | | | FRN□□□□C2E-7C, FRN□□□□C2E-7E | | | | | |
| (FRN □□□□C2E-7△, △=C, E) | | | 0001 | 0002 | 0004 | 0006 | 0010 | 0012 |
| Nominal applied motor[kW](△=C, E) | | | 0.1 | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 |
| Nominal applied motor[HP] | | | 1/8 | 1/4 | 1/2 | 1 | 2 | 3 |
| Output ratings | Rated capacity[kVA] | | 0.30 | 0.57 | 1.3 | 2.0 | 3.5 | 4.5 |
| | Rated voltage[V] | | Single-phase, 200 to 240V, 50/60Hz | | | | | |
| | Rated current[A](*1) | | 0.8(0.7) | 1.5(1.4) | 3.5(2.5) | 5.5(4.2) | 9.2(7.0) | 12.0(10.0) |
| | Overload capability | | 150% of rated current for 1min<br>150% of rated current for 1min or 200% of rated current for 0.5s (If the rated current is in parenthesis) | | | | | |
| | 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] | (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] | | 0.3 | 0.4 | 0.7 | 1.3 | 2.4 | 3.5 |
| Braking | Torque[%] | | 150 | | 100 | | 50 | 30 |
| | 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, EN 61800-5-1:2007 | | | | | |
| Applicable EMC standards (EN61800-3:2004 +A1:2012) (in progress) | | | Immunity : Second Environment (Industrial)<br>Emission : Category C2 | | | | | |
| Enclosure (IEC 60529) | | | IP20 (IEC 60529:1989) / UL open type (UL50) | | | | | |
| Cooling method | | | Natural cooling | | | | Fan cooling | |
| Weight / Mass[kg(lbs)] | | | 0.7(1.5) | 0.7(1.5) | 0.7(1.5) | 1.2(2.6) | 2.4(5.3) | 2.9(6.4) |

*1 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 3kHz or above or ambient temperature exceeds 40°C (104°F).

# Common Specifications

## Common Specifications

| Item | | | Explanation | | Remarks |
|---|---|---|---|---|---|
| Output frequency | Setting range | Maximum frequency | 25 to 400Hz | | |
| | | Base frequency | 25 to 400Hz | | |
| | | Starting frequency | 0.1 to 60.0Hz | | |
| | | Carrier frequency | 0.75 to 16kHz<br>Note: The unit is equipped with an automatic reduction/stop function that may automatically drop the carrier frequency to protect the inverter when it is running at frequencies above 6 kHz, depending on ambient temperature, output current, and other conditions. (*1)<br>· Under modulated carrier conditions, the system scatters carrier frequency to reduce noise | | |
| | Accuracy (stability) | | · Analog setting: : Absolute accuracy within ± 2% (at 25°C(77°F)), temperature drift within ± 0.2% (25°C(77°F) ± 10°C(50°F))<br>· Keypad setting: : Absolute accuracy within ± 0.01% (at 25°C(77°F)), temperature drift within ± 0.01% (25°C(77°F) ± 10°C(50°F)) | | |
| | Setting resolution | | · Analog setting : 1/1000 of maximum frequency<br>· Keypad setting : 0.01Hz (99.99Hz or less), 0.1Hz (100.0Hz to 400.0Hz)<br>· Link operation : 1/20000 of maximum frequency or 0.01Hz (fixed) | | |
| Control | Control method | | Induction motor drive<br>· V/f control · Slip compensation · Automatic torque boost<br>· Dynamic torque vector control · Automatic energy-saving function | | |
| | | | Synchronous motor drive<br>· Sensorless magnetic positioning (speed control range: 10% of base frequency and up) | | |
| | Voltage/freq. characteristic | 200V series | Base frequency and maximum output frequency can each be set between :80 to 240<br>AVR control (*1) can be turned ON or OFF<br>Allowable non-linear V/f (*1) settings (2): optional voltage (0–240V) and frequency (0–400Hz) | | |
| | | 400V series | Base frequency and maximum output frequency can each be set between :160 to 500<br>AVR control (*1) can be turned ON or OFF<br>Allowable non-linear V/f (*1) settings (2): optional voltage (0–500V) and frequency (0–400Hz) | | |
| | Torque boost (*1) | | · Automatic torque boost (for constant torque loads) | | |
| | | | · Manual torque boost: Optional torque boost value can be set between 0.0 and 20.0% | | |
| | | | · Application load can be selected (for constant and variable torque loads) | | |
| | Starting torque (*1) | | 150% or more/frequency set to 3Hz Slip compensation /automatic torque boost active | | |
| | Start/stop | | Keypad operation : Start and stop with RUN, STOP keys (standard keypad)<br>: Start and stop with RUN, STOP keys (remote keypad: optional) | | |
| | | | External signals (digital input) : FWD (REV) operation/stop command [3-wire operation enabled]<br>Coast-to-stop command, trip command (external fault), fault reset, etc. | | |
| | | | Link operation : Communication via RS-485 | | |
| | | | Changing run command : Communications used to change run command | | |
| | Frequency setting | | Keypad operation : Can be set with ∧ or ∨ key (with save data function)<br>Also can be set with function code (only via communication) and be copied.(*2) | | |
| | | | Set based on built-in volume | | |
| | | | Analog input : 0 to +10V DC/0 to 100% (terminal 12)<br>: 4 to +20mA DC/0 to 100%, 0 to +20mA DC/0 to 100% (terminal C1) | | |
| | | | Multistep frequency : Selectable from 16 steps (step 0 to 15) | | |
| | | | UP/DOWN operation : Raises or lowers frequency while digital input signal is ON | | |
| | | | Link operation: : Frequency set through RS-485 communication | | |
| | | | Changing frequency settings : Two types of frequency settings can be changed using external signals (digital input) : frequency settings and multistep frequency settings | | |
| | | | Auxiliary frequency setting : Built-in potentiometer, Inputs at terminal 12, C1 can be added to the main setting as auxiliary frequency settings. | | |
| | | | Inverse operation : Can be switched from (DC 0 to +10V/0 to 100%) to (DC +10 to 0V/0 to 100%) externally<br>: Can be switched from (DC 4 to 20mA (DC 0–20mA)/0 to 100%) to (DC 20 to 4mA (DC 20–0mA)/0 to 100%) externally | | |
| | Acceleration/deceleration time | | · Can be set between 0.00 and 3600s<br>· There are two independent settings that can be selected for acceleration/deceleration time (can be switched while running)<br>· Pattern : The following four acceleration/deceleration types can be selected<br>Linear, S-curve (weak/strong), non-linear (constant output maximum capacity acceleration/deceleration)<br>· Coast-to-stop acceleration/deceleration is enabled when run commands are OFF<br>· Acceleration/deceleration time can be set during jogging operation (between 0.00 and 3600s) | | |

*1 Only valid when induction motor drive is in operation

# Common Specifications

## Common Specifications

| | Item | Explanation | Remarks |
|---|---|---|---|
| Control | Frequency limiter (Peak/bottom frequency limit) | High and low limiters can be set in addition to Hz values (0–400Hz) | |
| | Bias frequency | Bias of set frequency and PID command can be set separately between 0 and ±100% | |
| | Gain for frequency setting | Analog input gain can be set between 0 and 200% | |
| | Jump frequency control | Three operation points and their common jump hysteresis width can be set (0–30Hz)<br>Six operation points and their common jump hysteresis width can be set (0–30Hz) (*2) | |
| | Timer operation | Operation starts and stops at the time set from keypad (1 cycle) | |
| | Jogging operation (*1) | Operated using the RUN key (on the standard or remote keypad) or digital contact point input<br>(acceleration and deceleration time--same duration used only for jogging) | |
| | Auto-restart after momentary power failure (*1) | ・Trip at power failure: The inverter trips immediately after power failure.<br>・Trip at power recovery: Coast-to-stop at power failure and trip at power recovery<br>・Deceleration stop: Deceleration stop at power failure, and trip after stoppage (*2)<br>・Start at the frequency selected before momentary stop: Coast-to-stop at power failure and start after power recovery at the frequency selected before momentary stop.<br>・Start at starting frequency: Coast-to-stop at power failure and start at the starting frequency after power recovery. | |
| | Current limit by hardware (*1) | Uses hardware to limit current and prevent overcurrent trips resulting from sudden load changes, momentary power failures, and similar events that cannot be handled by software current limiters (can be canceled) | |
| | Slip compensation (*1) | Compensates for decrease in speed according to the load, enabling stable operation | |
| | Current limit | Keeps the current under the preset value during operation | |
| | PID control | Process PID regulator<br>· PID command, keyboard, analog input (terminal 12, C1), RS-485 communication<br>· Feedback value: Analog input (terminal 12, C1)<br>· Low liquid level stop function · Switch forward/reverse operation · Integration reset/hold function | |
| | Automatic deceleration | · Automatically limits output frequency, limits energy generated by the inverter, and avoids overcurrent trips when torque relay value is exceeded (*1)<br>· Makes deceleration time three times longer to avoid 0U trip when DC link circuit voltage exceeds overage limit | |
| | Deceleration characteristics (improved braking capacity) | Increases motor loss and reduces energy generated by the inverter during deceleration to avoid overcurrent trips | |
| | Energy saving operation (*1) | Restricts output voltage to minimize total motor and inverter loss during constant speed operation | |
| | Overload prevention control | Lowers frequency when IGBT junction temperature and ambient temperature rise due to overloading to avoid further overload | |
| | Offline tuning (*1) | Performs r1, Xσ, and excitation current tuning<br>Performs r1, Xσ, slip frequency and excitation current tuning (*2) | |
| | Fan stop operation | Detects inverter internal temperature and stops cooling fan when the temperature is low | |
| | Secondary motor settings | · Switching between two motors in the same inverter is enabled (switching cannot be performed while the inverter is running)<br>Induction motor settings can only be applied to the second motor<br>Data settings (base frequency, rated current, torque boost, electronic thermal, and slip compensation, etc.) can be entered for the second motor<br>· Constants can be set within the second motor. Auto-tuning is also enabled. | |
| | Rotational direction limits | Select either prevent reverse or prevent forward operation | |
| Indication | Running/stopping | Speed monitor, output current [A], output voltage [V], input power [kW], PID reference, PID feedback value, PID output, timer value (for timer operation) [s], total power amount<br>Select the speed monitor to be displayed from the following:<br>Output frequency (before slip compensation) [Hz], output frequency (after slip compensation) [Hz], set frequency [Hz], load shaft speed [min$^{-1}$], line speed [m/min], constant rate of feeding time [min] | |
| | Lifetime alarm | Displays the lifetime alarm for the main circuit condenser, PCB condenser, and cooling fan. External output is enabled for lifetime alarm information. | |
| | Total running time | Can display total motor running time, total inverter running time, and total power use | |
| | I/O check | Displays control circuit terminal output status | |
| | Energy saving monitor | Power consumption, power consumption x coefficient | |
| | Trip mode | Displays cause of trip:<br>· 0C 1 : Overcurrent during acceleration · 0C2 : Overcurrent during deceleration · 0C3 : Overcurrent at constant speed<br>· L in : Input phase loss · LU : Undervoltage · 0PL : Output phase loss<br>· 0U 1 : Overvoltage during acceleration · 0U2 : Overvoltage during deceleration · 0U3 : Overvoltage during constant speed<br>· 0H 1 : Overheating of the heat sink · 0H2 : External thermal relay tripped · 0H4 : Motor protection (PTC thermistor)<br>· dbH : Overheating of the DB circuit · CoF : PID feedback break detected · 0L 1 : Overload in motor 1<br>· 0L2 : Overload in motor 2 · 0LU : Inverter unit overload · Er 1 : Memory error<br>· Er2 : Keypad communication error · Er3 : CPU error · Er6 : Operation procedure error<br>· Er7 : Tuning error · Er8 : RS485 error · ErF : Data save error due to undervoltage<br>· Erd : Step out detected (for synchronous motor drive) (*2) · Err : Mock error | |
| | Running or Trip mode | Trip history: Saves and displays the last 4 trip codes and their detailed description<br>Saves and displays detailed data for each section on up to four past trips | |

*1 Only valid when induction motor drive is in operation

*2 These functions can be supported by the inverters having a ROM version 0500 or later

# Common Specifications

| | Item | | Explanation | | Remarks |
|---|---|---|---|---|---|
| Protection | Overcurrent | | Stops the inverter to protect against overcurrent due to overload | | LED display<br>OC1<br>OC2<br>OC3 |
| | Short-circuit | | Stops the inverter to protect against overcurrent due to a short circuit in the output circuit | | |
| | Ground fault | | Stops the inverter to protect against overcurrent due to a ground fault (initial ground circuit only) in the output circuit | | |
| | Overvoltage | | Detects excess voltage in DC link circuit (200V: DC 400V,400V: DC 800V) and stops the inverter<br>Cannot protect against significantly large voltage input mistakenly applied | | OU1<br>OU2<br>OU3 |
| | Undervoltage | | Detects drops in DC link circuit voltage (200V: DC 200V,400V: DC400V) and stops the inverter<br>Note that no alarm will sound if auto-restart after momentary power failure is selected | | LU |
| | Input phase loss | | Stops or protects the inverter against input phase loss<br>Even when there is input phase loss, the loss may not be detected if the connected load is light or a DC reactor is connected to the inverter | | Lin |
| | Output phase loss detected | | Detects loss from breaks in output wiring while running or during startup and stops the inverter | | OPL |
| | Overheating | | Stops the inverter by detecting the temperature of the inverter cooling system (e.g. when the cooling fan is malfunctioning or there is an overload) | | OH1 |
| | | | Protects against overheating during braking resistance based on braking resistor electronic thermal function settings | | dbH |
| | Overload | | Stops the inverter based on the temperature of the cooling system and the switching element calculated from output current flow | | OLU |
| | External alarm input | | Stops the inverter alarm through digital input (THR) | | OH2 |
| | Motor protection | Electronic thermal | Stops running the inverter to protect the motor according to electronic thermal function settings<br>Protects the standard motor and inverter motor over the full frequency range. The second motor can also be protected. (Operation level and thermal time constant can be set between 0.5 and 75.0 minutes) | | OL1<br>OL2 |
| | | PTC thermistor | · Stops running the inverter to protect the motor when the PTC thermistor detects motor temperature<br>A PTC thermistor is connected between terminals C1 and 11, and a resistor is connected between terminals 13 and C1. Set function code. | | OH4 |
| | | Overload early warning | Outputs a preliminary alarm at a preset level before the electronic thermal stops the inverter | | — |
| | Memory error | | Checks data when the power is turned on and data is being written, and stops the inverter if a memory malfunction is detected. | | Er1 |
| | Keypad communication error | | Stops the inverter if a communication malfunction is detected between the keypad and inverter unit while an operation command is in progress from the remote keypad | | Er2 |
| | CPU error | | Stops the inverter if a CPU malfunction caused by noise or similar factors is detected | | Er3 |
| | Operation error | STOP key priority | Pressing the STOP key on the keypad forces the inverter to stop, even if run commands are being delivered via terminals or communications. Er6 is displayed once stop is complete. | | Er6 |
| | | Start check | Prohibits run operations and displays Er6 if a run command is given while any of the following status changes are occurring:<br>· Powering up · Canceling an alarm<br>· Switching run command methods via link operation | | |
| | Tuning error (*1) | | Stops the inverter when there is a tuning failure, interruption, or abnormality in tuning results during motor constant tuning | | Er7 |
| | RS-485 communication error | | Stops the inverter if a communications malfunction is detected in RS-485 communication with the inverter unit | | Er8 |
| | Data save error during undervoltage | | Displays an error if data save cannot proceed normally because an undervoltage protection function is activated | | ErF |
| | Step out detected (*2) | | Stops the inverter when a synchronous motor step out is detected | | Erd |
| | PID feedback break detected | | Stops the inverter when a break is detected during current input (C1 terminal) distribution to PID feedback (can be enabled/disabled) | | CoF |
| | Stall prevention | | Output frequency is reduced to avoid an overcurrent trip when output current exceeds the limit during acceleration/deceleration or constant speed operation | | |
| | Alarm output (for any fault) | | · Outputs a relay signal when the inverter is stopped due to an alarm<br>· Alarm stop status can be canceled by pressing the PRG/RESET key or by inputting a digital signal (RST) | | |
| | Retry | | Inverter can be automatically reset and restarted after stopping due to a trip (the number of retries and wait time until reset can also be set) | | |
| | Incoming surge | | Protects the inverter from surge voltage between the main circuit and ground terminal | | |
| | Momentary power failure | | · Launches a protective function (stops the inverter) when there is a momentary power failure of 15ms or more<br>· Restarts and restores voltage within the set time when momentary power failure restart is selected | | |
| | Mock malfunction | | Can output a mock alarm to check malfunction sequences | | Err |
| Environment | Installation location | | · Must be indoors and free of corrosive gases, flammable gases, dust, and oil mist (contamination level 2 (IEC 60664-1: 2007)<br>· Keep out of direct sunlight | | |
| | Ambient temperature | | Open: –10°C (14°F) to + 50°C (122°F) (IP20) | | |
| | Ambient humidity | | 5 to 95%RH (no condensation) | | |
| | Altitude | | 1000m (3300ft) or less (Output derating is not necessary.)<br>Above 1000m (3300ft) to 3000m (9800ft) or less (Output derating is necessary.)<br>Above 1000m (3300ft) to 1500m (4900ft) or lower : 0.97, Above 1500m (4900ft) to 2000m (6600ft) or lower : 0.95,<br>Above 1000m (3300ft) to 2500m (8200ft) or lower : 0.91, Above 2500m (8200ft) to 3000m (9800ft) lower : 0.88 | | |
| | Vibration | | 3mm (0.12inch) (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 | | |
| | Saved temperature | | -25°C (77°F) ± 70°C (158°F) | | |
| | Saved humidity | | 5 to 95%RH (no condensation) | | |

*1 Only valid when induction motor drive is in operation

*2 These functions can be supported by the inverters having a ROM version 0500 or later

# Terminal Functions

## Terminal Functions

| Category | Symbol | Terminal Name | Functions | Remarks |
|---|---|---|---|---|
| Main circuit | L1/R,L2/S,L3/T | Power input | Connect a three-phase power supply (three-phase 200V,400V) | |
| | U,V,W | Inverter output | Connect a three-phase induction motor | |
| | P(+) ,P1 | For DC REACTOR | Connect the DC REACTOR | |
| | P(+) ,N(-) | For DC bus connection | Used for DC bus connection system | |
| | P(+) ,DB | For EXTERNAL BRAKING RESISTOR | Connect external braking resistor | Only for 0.4kW and above. Connections are enabled for 0.2kW and below, but operation will not work. |
| | ⏚G(2-terminal) | Grounding | Ground terminal for inverter chassis | |
| Frequency setting | 13 | Potentiometer power supply | Power supply for frequency setting potentiometer (1 to 5kΩ) | DC10V |
| | 12 | Voltage input | · Used as voltage input for frequency setting<br>0 to +10V DC/0 to 100% | |
| | | (Inverse operation)<br>(PID control)<br>(Frequency aux. setting) | · +10 to +0V DC/0 to 100%<br>· Used for reference signal (PID process command) or feedback signal<br>· Used as additional auxiliary setting to various main settings of frequency | |
| | C1 | Current input | · Used as current input for frequency setting<br>+4 to +20mA DC (0 to +20mA DC)/0 to 100% | |
| | | (Inverse operation)<br>(PID control)<br>(Frequency aux. setting) | · +4 to +20mA DC (0 to +20mA DC)/0 to 100%<br>· Used for reference signal (PID process command) or feedback signal<br>· Used as additional auxiliary setting to various main settings of frequency | |
| | | (For PTC thermistor) | · Connects PTC thermistor for motor protection | |
| | 11(2-terminal) | Common | Common terminal for frequency setting signal (12, 13, C1, FMA) | Isolated from terminal CM and Y1E |
| Digital input | X1 | Digital input 1 | The following functions can be set at terminals X1 to X3, FWD, and REV for signal input.<br>- Common function<br>· Switch between synch/source using the built-in switches on the unit<br>· Short-circuit ON or open circuit ON settings are enabled between the terminal X1 and CM<br>The same setting is possible between CM and any of the terminals among X2, X3, FWD, and REV. | |
| | X2 | Digital input 2 | | |
| | X3 | Digital input 3 | | |
| | FWD | Forward operation command | | |
| | REV | Reverse operation command | | |
| | (FWD) | Forward operation command | The motor runs in the forward direction when (FWD) is ON, stops after deceleration when FWD is OFF | Only terminal FWD/REV settings are allowed, only short circuit ON |
| | (REV) | Reverse operation command | The motor runs in the reverse direction when (REV) is ON, stops after deceleration when REV is OFF | do. |
| | (SS1)<br>(SS2)<br>(SS4)<br>(SS8) | Multistep freq. selection | 16-speed operation is enabled using the ON/OFF signal from (SS1) through (SS8) | |
| | (RT1) | ACC/DEC selection | Acceleration/deceleration time setting 1 is active when RT1 is OFF<br>Acceleration/deceleration time setting 2 is active when RT1 is ON | |
| | (HLD) | 3-wire operation stop command | · Used as an automatic hold signal during 3-wire operation<br>· The FWD or REV signal is automatically stopped when HLD is ON, and the hold is removed when HLD is OFF | |
| | (BX) | Coast-to-stop command | When BX is ON, inverter output is shut off immediately and the motor coasts-to-stop (no alarm output) | |
| | (RST) | Alarm reset | Alarm hold status is removed when RST is ON | Signal at 0.1s or higher |
| | (THR) | Trip command (External fault) | When THR is OFF, inverter output is shut off immediately and the motor coasts-to-stop (alarm output enabled: OH2) | |
| | (JOG) | Jogging operation | Turn JOG ON to enable jogging operation: switches the running mode to jogging mode, the frequency setting to jogging frequency, and acceleration/deceleration time to jogging running use | (*1) |
| | (Hz2/Hz1) | Freq. set 2/ Freq. set 1 | Frequency setting 2 is selected when Hz2/Hz1 is ON | |
| | (M2/M1) | Motor 2/Motor 1 | Motor 1 settings take effect when M2/M1 is OFF. Motor 2 settings take effect when M2/M1 is ON. | |

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 |

*1 Only valid when induction motor drive is in operation

# Terminal Functions

| Category | Symbol | Terminal Name | Functions | Remarks |
|---|---|---|---|---|
| Digital input | (DCBRK) | DC brake command | Turn DCBRK ON to start direct current braking | |
| | (WE-KP) | Write enable for KEYPAD | Function code data changes can only be made when the keypad is turned ON with WE-KP | |
| | (UP) | UP command | Output frequency increases while UP is ON | |
| | (DOWN) | DOWN command | Output frequency decreases while DOWN is ON | |
| | (Hz/PID) | PID control cancel | PID control is canceled when Hz/PID is ON (runs based on multistep frequency/keypad/analog input etc.) | |
| | (IVS) | Inverse mode changeover | Switch from analog frequency setting or PID control output signal (frequency setting) operation mode to forward/reverse operation. Reverse operation enabled when IVS is ON. | |
| | (LE) | Link enable (RS485, Bus) | Operates according to commands from RS-485 when LE is ON | |
| | (PID-RST) | PID integral/differential reset | Turn PID-RST ON to reset PID integration and differential values | |
| | (PID-HLD) | PID integral hold | Turn PID-HLD ON to hold PID differentiation | |
| | PLC | PLC terminal | Connect to PLC output signal power supply Common for 24V power | +24V (22–27V) Max 50mA |
| | CM(2-terminal) | Common | Common for digital input signal | Isolated from terminal 11 and Y1E |
| Transistor output | (PLC) | Transistor output power | Power supply for transistor output load (Max: DC 24V DC 50mA) (Caution: Same terminal as digital input PLC terminal) | Short circuit between terminal CM and Y1E is used |
| | Y1 | Transistor output | Select one of the following signals for output: Short circuit when ON signal is output or open circuit when ON signal is output | Max. voltage: 27Vdc, max. current: 50mA, leak current: 0.1mA max, ON voltage: within 2V(at 50mA) |
| | (RUN) | Inverter running (speed exists) | Comes ON when the output frequency is higher than starting frequency | |
| | (FAR) | Speed/freq. arrival | Comes ON when the difference between output frequency and set frequency rises above the frequency arrival detection range (function code E30) | |
| | (FDT) | Speed/freq. detection | Comes ON when output frequency falls below operational level (function code E31). Turns OFF when it falls below operational level (function code E31) or hysteresis width (function code E32). | |
| | (LU) | Undervoltage detection | Comes ON when there is a run command and running has stopped due to insufficient voltage | |
| | (IOL) | Inverter output limit | Comes ON when the inverter is experiencing limited current, automatic deceleration, or limited torque operation | |
| | (IPF) | Auto-restarting | Comes ON during auto restart operation (after momentary power failure and until completion of restart). | |
| | (OL) | Overload early warning | Comes ON when the electronic thermal relay value is higher than the preset alarm level | |
| | (SWM2) | Switch to Motor 2 | Comes ON when Motor 2 is selected by inputting a motor switch signal (M2/M1) | |
| | (TRY) | Auto-resetting mode | Comes ON during auto reset mode | |
| | (LIFE) | Lifetime alarm | Alarm signal is output according to lifetime assessment standards inside the inverter | |
| | (PID-CTL) | PID control in progress | Comes ON when PID control is in effect | |
| | (PID-STP) | PID low water volume stop in progress | Comes ON when low liquid level stop is in effect in PID control (also stops based on the status of input run command) | |
| | (RUN2) | Inverter output in progress | Comes ON when the inverter is running above startup frequency and DC braking is also in operation (Comes ON when the inverter main circuit (gate) is ON) | |
| | (OLP) | Overload preventive control | Comes ON when overload prevention control is operating | |
| | (ID2) | Current detection 2 | Comes ON when a current larger than the set value (for ID2) is continuously detected for longer than the time set on the timer | |
| | (THM) | Thermistor detected | Comes ON when motor overheating is detected by the PTC/NTC thermistor | (*1) |
| | (BRKS) | Brake signal | Outputs a brake engage/release signal | (*1) |
| | (MNT) | Maintenance timer | Alarm signal is generated when time passes or start-up exceeds over the preset value | (*2) |
| | (FARFDT) | Frequency arrival/frequency detected | Comes ON when both (FAR) and (FDT) are ON | |
| | (C1OFF) | C1 terminal break detected | Comes ON when the system determines that a break will occur if terminal C1 input falls below 2mA | |
| | (ID) | Current detection | Comes ON when a current larger than the set value has been detected for the timer-set time | |

*1 Only valid when induction motor drive is in operation

*2 These functions can be supported by the inverters having a ROM version 0500 or later

# Terminal Functions

## Terminal Functions

| Category | Symbol | Terminal Name | Functions | Remarks |
|---|---|---|---|---|
| Transistor output | (IDL) | Small current detection | Comes ON when a current smaller than the set value has been detected for the timer-set time | |
| | (ALM) | Alarm relay (for any fault) | Alarm signal is output as the transistor output signal | |
| | Y1E | Transistor output common | Common terminal for transistor output | Isolated from terminal 11 and CM |
| Relay output | 30A, 30B, 30C | Alarm relay output (for any fault) | Outputs a no-voltage contact signal (1c) when the inverter stops the alarm<br>Can select the same signal as the Y1 signal for multipurpose relay output<br>· Can switch between alarm output through excitation operation and alarm output through non-excitation operation | Contact rating : AC250V, 0.3A, cosφ=0.3<br>DC48V, 0.5A |
| Analog output | FMA | Analog monitor | Output format: DC voltage (0–10V)<br>Output can be performed in one of the following selected analog formats<br>· Output frequency 1 (Before slip compensation)<br>· Output frequency 2 (After slip compensation)<br>· Output current · Output voltage<br>· Input power · PID feedback value<br>· DC link circuit voltage · Analog output test<br>· PID command · PID output | Gain setting between 0 and 300% |
| LINK | | Built-in RJ-45 connector (RS-485 communication) | Any of the following protocols can be selected:<br>· Dedicated keypad protocol (automatically selected)<br>· Modbus RTU<br>· Fuji dedicated inverter protocol<br>· SX protocol (for PC loader) | Provides power to the keypad<br>Includes terminator ON/OFF switch<br>Communication data storage can be selected.(*2) |

*2 These functions can be supported by the inverters having a ROM version 0500 or later

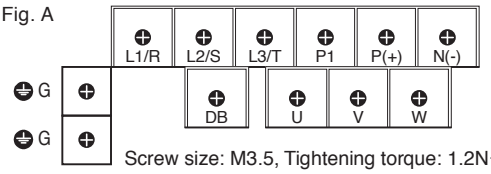
# Terminal Functions

## Terminal Arrangement

### Main circuit terminals

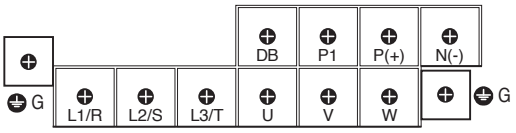
| Power source | Nominal Applied Motor (kW(HP)) | Inverter Type | Reference |
|---|---|---|---|
| Three-phase 200V | 0.1 (1/8) | FRN0001C2S-2□ | Fig. A |
| | 0.2 (1/4) | FRN0002C2S-2□ | |
| | 0.4 (1/2) | FRN0004C2S-2□ | |
| | 0.75 (1) | FRN0006C2S-2□ | |
| | 1.5 (2) | FRN0010C2S-2□ | Fig. B |
| | 2.2 (3) | FRN0012C2S-2□ | |
| | 3.7 (5) | FRN0020C2S-2□ | |
| | 5.5(7.5) | FRN0025C2S-2□ | Fig. E |
| | 7.5(10) | FRN0033C2S-2□ | |
| | 11(15) | FRN0047C2S-2□ | Fig. F |
| | 15(20) | FRN0060C2S-2□ | |
| Three-phase 400V | 0.4 (1/2) | FRN0002C2□-4□ | Fig. B |
| | 0.75 (1) | FRN0004C2□-4□ | |
| | 1.5 (2) | FRN0005C2□-4□ | |
| | 2.2 (3) | FRN0007C2□-4□ | |
| | 3.7 (5) | FRN0011C2□-4□ | |
| | 5.5(7.5) | FRN0013C2S-4□ | Fig. E |
| | 7.5(10) | FRN0018C2S-4□ | |
| | 11(15) | FRN0024C2S-4□ | Fig. F |
| | 15(20) | FRN0030C2S-4□ | |
| Single-phase 200V | 0.1 (1/8) | FRN0001C2□-7□ | Fig. C |
| | 0.2 (1/4) | FRN0002C2□-7□ | |
| | 0.4 (1/2) | FRN0004C2□-7□ | |
| | 0.75 (1) | FRN0006C2□-7□ | |
| | 1.5 (2) | FRN0010C2□-7□ | Fig. D |
| | 2.2 (3) | FRN0012C2□-7□ | |
| Single-phase 100V | 0.1 (1/8) | FRN0001C2S-6U | Fig. C |
| | 0.2 (1/4) | FRN0002C2S-6U | |
| | 0.4 (1/2) | FRN0003C2S-6U | |
| | 0.75 (1) | FRN0005C2S-6U | |

Fig. A



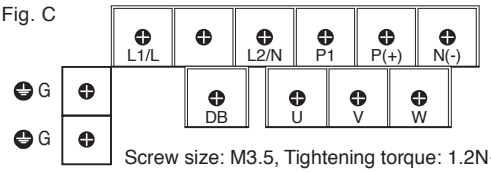

Screw size: M3.5, Tightening torque: 1.2N·m(10.6 lb-in)

Fig. B



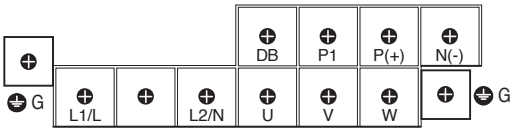

Screw size: M4, Tightening torque: 1.8N·m(15.9 lb-in)

Fig. C



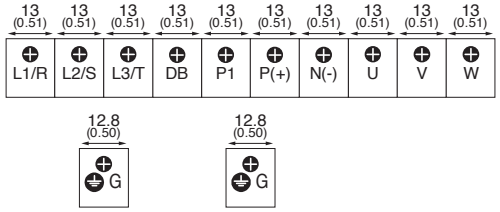

Screw size: M3.5, Tightening torque: 1.2N·m(10.6 lb-in)

Fig. D



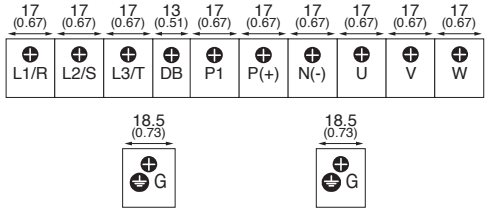

Screw size: M4, Tightening torque: 1.8N·m(15.9 lb-in)

Fig. E




Screw size: M5, Tightening torque: 3.0N·m(26.6 lb-in)

Fig. F




Screw size: M6, Tightening torque: 5.8N·m(51.3 lb-in)

### Control Circuit Terminals

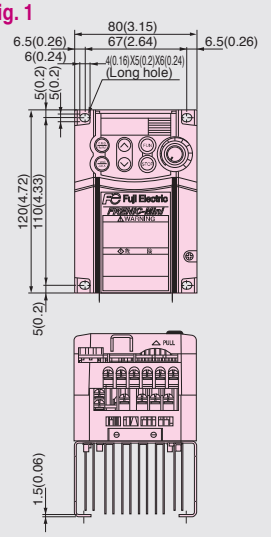

Screw size: M2, Tightening torque: 0.2N·m(1.8 lb-in)

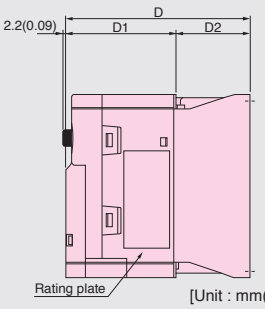

Screw size: M2.5, Tightening torque: 0.4N·m(3.5 lb-in)

# External Dimensions

## Standard Model

### Fig. 1

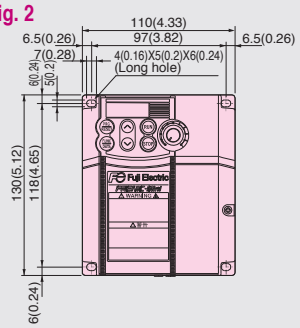


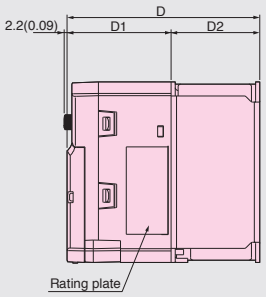




[Unit : mm(inch)]

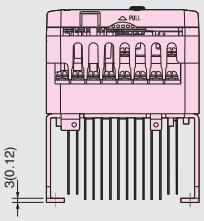
| Power supply voltage | Inverter type | Dimensions (mm(inch)) D | D1 | D2 |
|---|---|---|---|---|
| Three-phase 200V | FRN0001C2S-2□ | 80(3.15) | 70(2.76) | 10(0.39) |
| | FRN0002C2S-2□ | | | 25(0.98) |
| | FRN0004C2S-2□ | 95(3.74) | | 50(1.97) |
| | FRN0006C2S-2□ | 120(4.72) | | |
| Single-phase 200V | FRN0001C2S-7□ | 80(3.15) | 70(2.76) | 10(0.39) |
| | FRN0002C2S-7□ | | | 25(0.98) |
| | FRN0004C2S-7□ | 95(3.74) | | 50(1.97) |
| | FRN0006C2S-7□ | 140(5.51) | 90(3.54) | |
| Single-phase 100V | FRN0001C2S-6U | 100(3.94) | 90(3.54) | 10(0.39) |
| | FRN0002C2S-6U | | | 25(0.98) |
| | FRN0003C2S-6U | 115(4.53) | | |

### Fig. 2



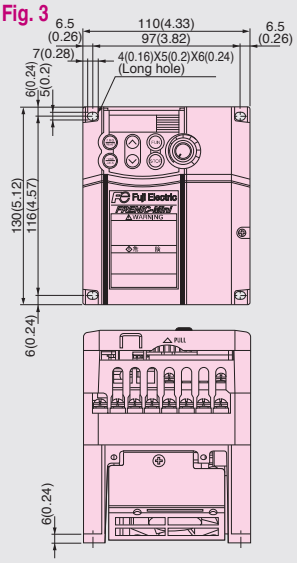



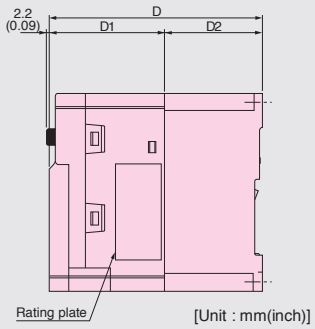

[Unit : mm(inch)]




| Power supply voltage | Inverter type | Dimensions (mm(inch)) D | D1 | D2 |
|---|---|---|---|---|
| Three-phase 400V | FRN0002C2S-4□ | 115(4.53) | 75(2.95) | 40(1.57) |
| | FRN0004C2S-4□ | 139(5.47) | | 64(2.52) |
| Single-phase 100V | FRN0005C2S-6U | 139(5.47) | 99(3.9) | 40(1.57) |

### Fig. 3

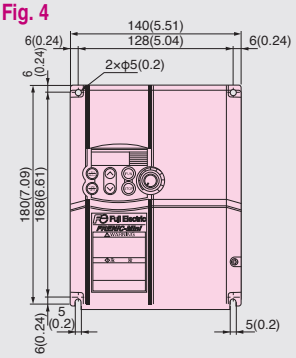


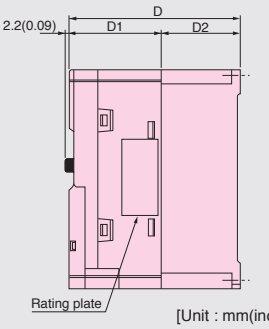




[Unit : mm(inch)]

| Power supply voltage | Inverter type | Dimensions (mm(inch)) D | D1 | D2 |
|---|---|---|---|---|
| Three-phase 200V | FRN0010C2S-2□ | 139(5.47) | 75(2.95) | 64(2.52) |
| | FRN0012C2S-2□ | | | |
| Three-phase 400V | FRN0005C2S-4□ | | | |
| | FRN0007C2S-4□ | | | |
| Single-phase 200V | FRN0010C2S-7□ | 149(5.87) | 85(3.35) | |

### Fig. 4

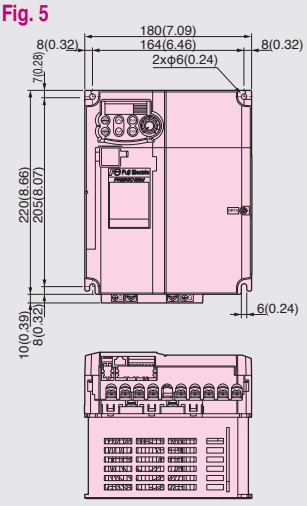


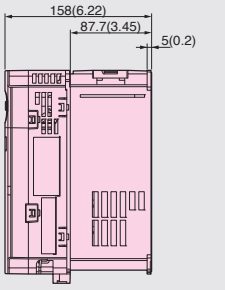




[Unit : mm(inch)]

| Power supply voltage | Inverter type | Dimensions (mm(inch)) D | D1 | D2 |
|---|---|---|---|---|
| Three-phase 200V | FRN0020C2S-2□ | 139(5.47) | 75(2.95) | 64(2.52) |
| Three-phase 400V | FRN0011C2S-4□ | | | |
| Single-phase 200V | FRN0012C2S-7□ | | | |

### Fig. 5

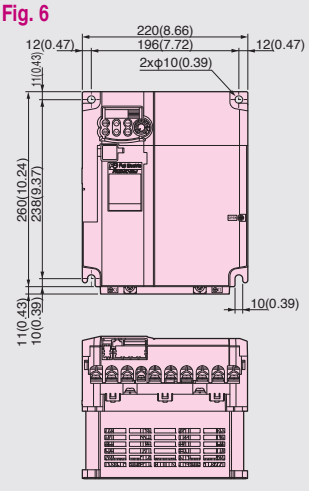


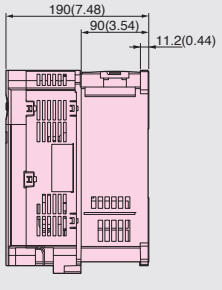




[Unit : mm(inch)]

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

### Fig. 6



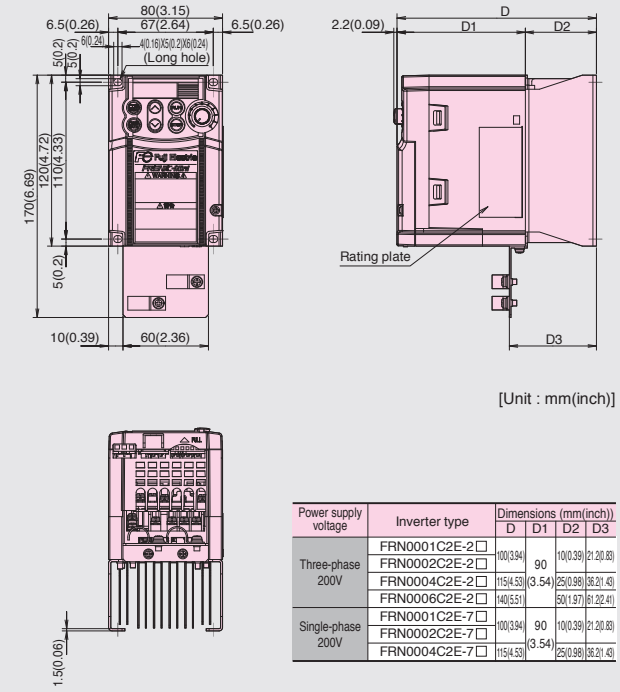




[Unit : mm(inch)]

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

## ■EMC Filter Built-in Model

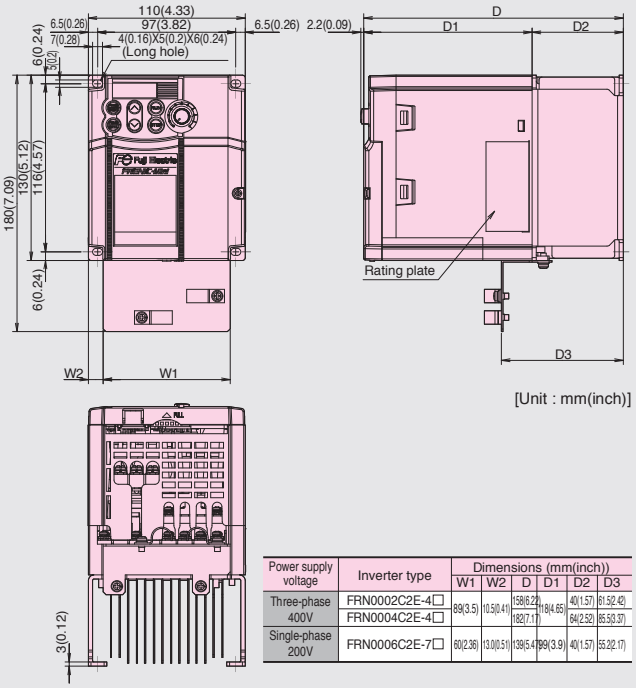
### Fig. 1




[Unit : mm(inch)]

| Power supply voltage | Inverter type | Dimensions (mm(inch)) D | D1 | D2 | D3 |
|---|---|---|---|---|---|
| Three-phase 200V | FRN0001C2E-2□ | 100(3.94) | 90 (3.54) | 10(0.39) | 21.2(0.83) |
| | FRN0002C2E-2□ | 115(4.53) | | 25(0.98) | 36.2(1.43) |
| | FRN0004C2E-2□ | 140(5.51) | | 50(1.97) | 61.2(2.41) |
| | FRN0006C2E-2□ | | | | |
| Single-phase 200V | FRN0001C2E-7□ | 100(3.94) | 90 (3.54) | 10(0.39) | 21.2(0.83) |
| | FRN0002C2E-7□ | 115(4.53) | | 25(0.98) | 36.2(1.43) |
| | FRN0004C2E-7□ | | | | |

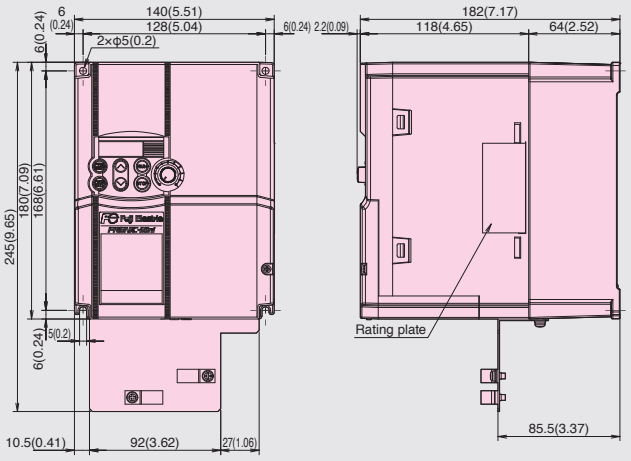
### Fig. 2



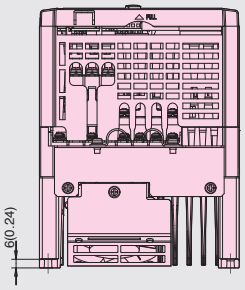

[Unit : mm(inch)]

| Power supply voltage | Inverter type | Dimensions (mm(inch)) W1 | W2 | D | D1 | D2 | D3 |
|---|---|---|---|---|---|---|---|
| Three-phase 400V | FRN0002C2E-4□ | 89(3.5) | 10.5(0.41) | 158(6.22) 182(7.17) | 118(4.65) | 40(1.57) 64(2.52) | 61.5(2.42) 85.5(3.37) |
| | FRN0004C2E-4□ | | | | | | |
| Single-phase 200V | FRN0006C2E-7□ | 60(2.36) | 13.0(0.51) | 139(5.47) | 99(3.9) | 40(1.57) | 55.2(2.17) |

### Fig. 3




[Unit : mm(inch)]




| Power supply voltage | Inverter type |
|---|---|
| Three-phase 200V | FRN0010C2E-2□ |
| | FRN0012C2E-2□ |
| | FRN0020C2E-2□ |
| Three-phase 400V | FRN0005C2E-4□ |
| | FRN0007C2E-4□ |
| | FRN0011C2E-4□ |
| Single-phase 200V | FRN0010C2E-7□ |
| | FRN0012C2E-7□ |

# MEMO

# MEMO

# 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 frequencies 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

- **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.
- **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.
- **Single-phase motors**
  Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.

## Environmental conditions

- **Installation location**
  Use the inverter in a location with an ambient temperature range of -10˚C (14˚F) to 50˚C (122˚F). 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 general-purpose 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.
- **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 twisted shielded wire and limit the distance between the inverter and the control box to 20m (65.6ft).
- **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 (164ft). If this length must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL).
  When wiring is longer than 50m (164ft), and sensorless vector control or vector control with speed sensor is selected, execute off-line tuning.
- **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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URL: http://www.fujielectric.com/

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