



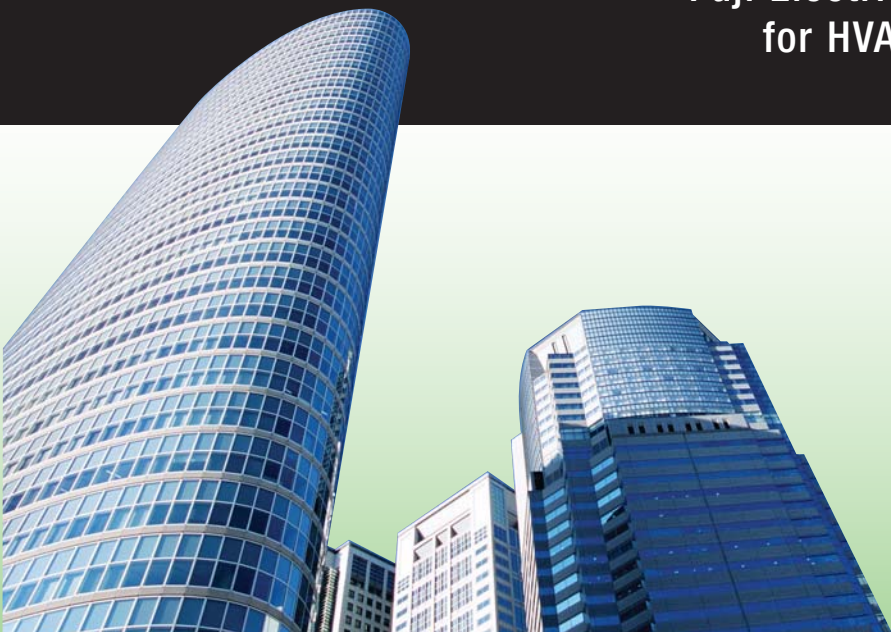
# FRENIC-ECO



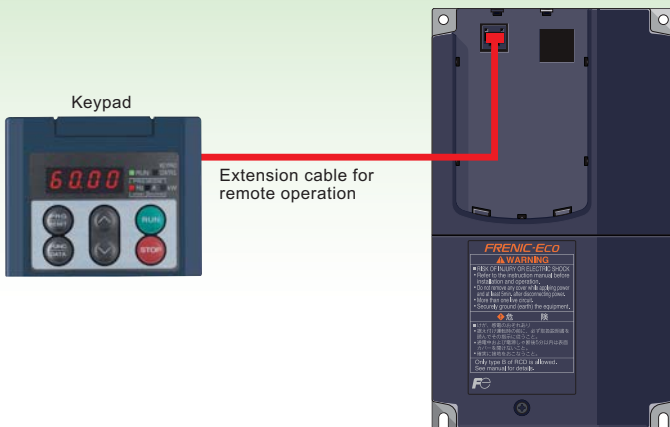
Fuji Electric frequency inverter  
for HVAC and pump control



0,75 – 560kW  
3-phase 400V  
IP20/00 & IP54



## Flexible through options



## Remote operation is possible by using extension cable

The keypad can be remotely connected to the inverter through an extension cable.

## Network/Fieldbus connectivity

Compatible with various open buses such as DeviceNet, PROFIBUS-DP, LonWorks network, Modbus Plus, CC-Link, Metasys, etc. A standard RS485 communication port (Modbus RTU) is provided. With an additional RS485 communication card (optional), up to two ports can be installed.

## Inverter loader software (option free of charge)

This option is available on Windows-basis which simplifies setting of function codes and data management.

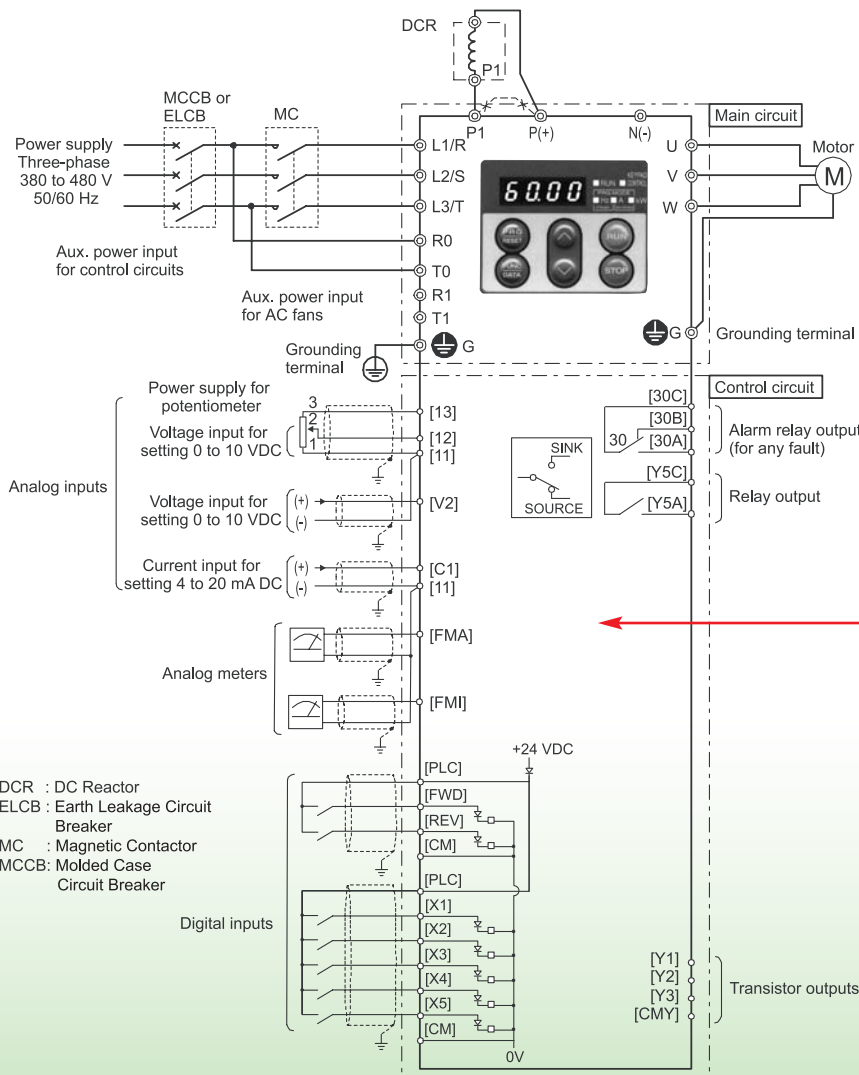
## External cooling attachment

An external cooling attachment (option for 30kW or smaller, standard for 37kW or larger) allows you to mount the inverter in such away that the heat sink assembly may be exposed to the outside of the cabinet. This greatly reduces heat radiated inside your enclosure.

## Relay output card

This card is used to expand the number of outputs (3 additional relay outputs).

## Basic Wiring Diagram



## Notes

Sink/Source digital input connections selectable by a switch.  
 PID-Control: Terminal 12 (0 to 10V) for pressure command  
 PID-Control: Terminal C1 (Sensor Output: 4 to 20mA) for feedback Sensor

Relay output card, fieldbus card, RS485 communication card

## Contribution to energy saving

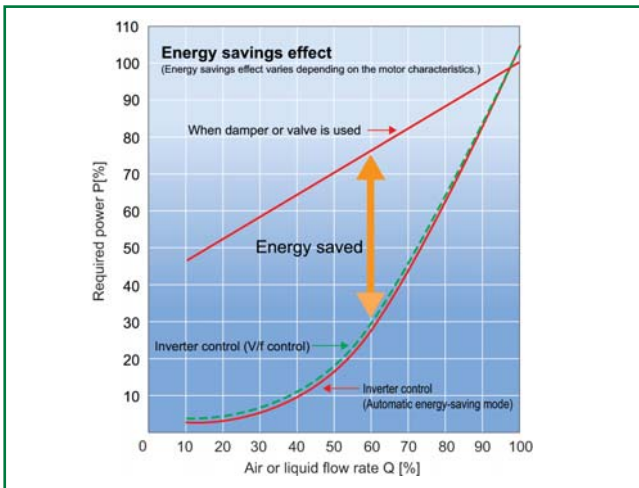
### Automatic energy saving operation function

In addition to the motor losses, the inverter losses are also kept to a minimum with the FRENIC Eco when applied to fans or pumps.

### Cooling fan ON/OFF control function

The inverter's cooling fan can be stopped for noise reduction and energy saving whenever the motor is stopped.

## Example for energy saving



## Simple operation

### Analog input monitor

Analog signals can be sent to the inverter to allow status monitoring of peripheral equipment and issuance of commands to peripheral equipment.

### Quick setup menu

Up to 19 frequently used or important function codes can be defined for quick setup in order to shortcut operation and management.

### Standard keypad capable of remote operation with optional extension cable

Data can be easily copied to the second or more inverters with the code copying function.

### Multi-function keypad (option)

A backlit LCD is installed to allow simple set up through interactive data entry. Function codes can be added or deleted to or from the 19 function codes within the quick setup function.

### Multi-function keypad with built-in copy-function

Seeing that the optional multi-function keypad is provided with a built-in copy function, data can be easily copied to the second inverter without requiring individual setups.

## Easy maintenance and many protective functions

### The lifetime of the main circuit capacitor can be estimated

Because the capacitor's life compared with its initial value can be checked, the replacement timing of the main circuit capacitor can be determined.

### A long-life cooling fan is provided

Use of a long-life cooling fan (design life: 87600 hours for models up to 30kW; 61300 hours for models above 30kW; at an ambient temperature of 40°C and a load factor of 80%) reduces replacement work.

### Cumulative running time is recorded and displayed

The inverter records and displays the cumulative "motor running time" and "inverter running time" (PC board capacitor running time, cooling fan running time), so that they can be used to determine machine and inverter maintenance.

### It is possible to output lifetime forecast signal to the transistor output

This signal is output when the main circuit capacitors in the DC bus circuit, the electrolytic capacitors on the PC boards or the cooling fans are near the end of their service life.

### The alarm history for the 4 latest alarms is recorded

Detailed information from back as far as the latest 4 alarms can also be checked.

### Protective function against phase loss in input/output

It is possible upon start-up and operation.

### Protective function for grounding fault

Protection is provided for an overcurrent caused by a grounding fault.

### Protection of motor with PTC thermistor

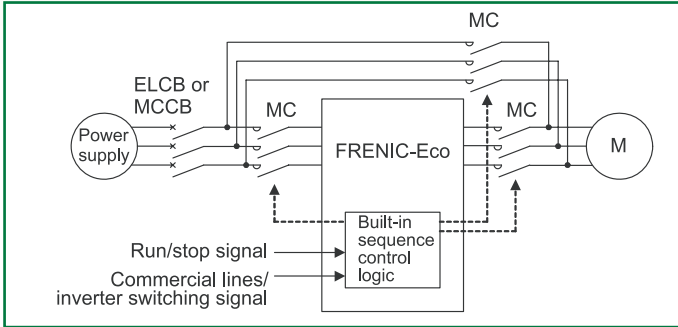
In addition to the protection of the motor with an electronic thermal relay, a PTC thermistor can be used for motor protection.



# Full capabilities for HVAC and pump control

## Line/inverter switching

FRENIC Eco inverter is provided with additional control supply inputs. This allows to switch the power source of the controlled motor between commercial power and inverter output. Two types of sequences are available: integrated standard and the auto-switching upon occurring an inverter alarm.

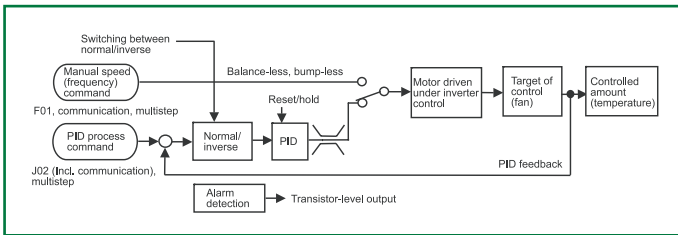


## Basic speed control

The speed setpoint is commanded from a PLC or a process controller to the inverter.

## Full PID control functions

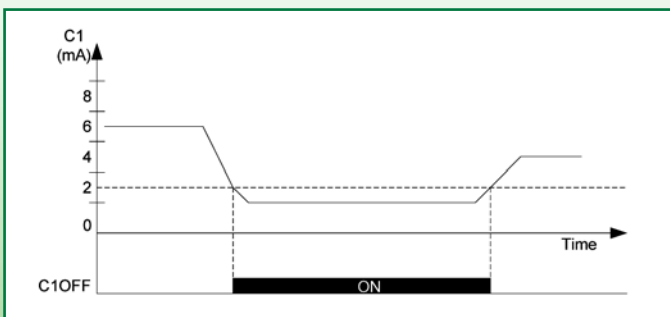
FRENIC Eco has a powerful PID control provided with features that ease the adjustments:



- deviation alarm/absolute value alarm output
- balance-less and bump-less switching that automatically adjusts the actual frequency against the frequency command
- anti-reset wind-up function for the prevention of overshooting in the PID control
- PID output limiter
- integration hold/reset signals

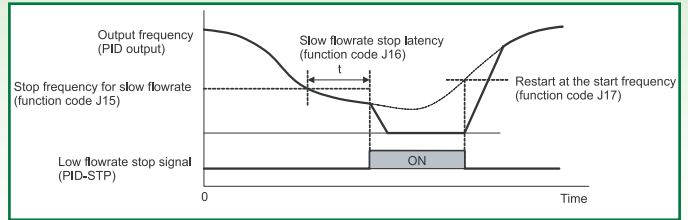
## C1 (current input) loss detection under PID control

If the current value in the input (C1: from 4 to 20mA) is less than 2mA an output can be activated if it is set with function C1OFF. This function is a safety supervision of the sensor that is connected to C1 as PID feedback and prevents damages due to sensor loss.



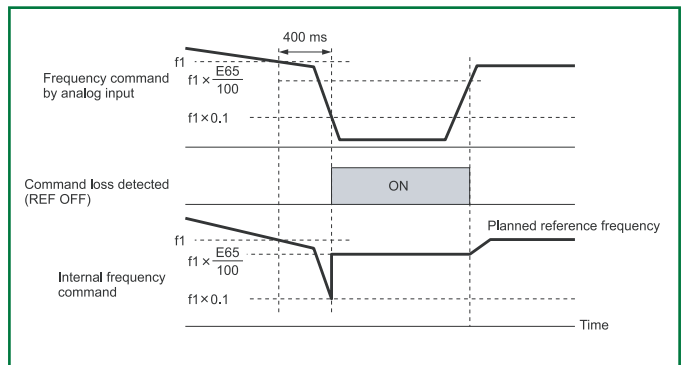
## Stop for slow flow rate function

A function for stopping the fan or pump at speeds lower than the lower limit is provided to assure the minimum speed. The function can be used also to stop at a low water flow.



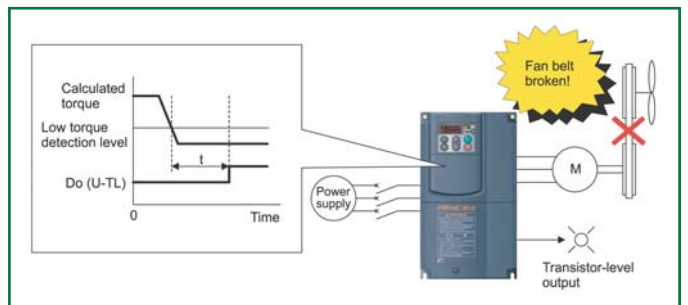
## Command loss detection

The analog frequency command is monitored and when an abnormal condition is detected, an alarm signal is output. If this happens in a critical system such as an air conditioner for an important facility the system will be stopped or will continue its operation at the specified speed.



## Low motor torque detection

A low motor torque detection output signal is asserted in the event of sudden decrease in torque as a result of an abnormal condition such as the belt being broken between the motor and the load (e.g., a belt-driven fan).



## Continued operation upon momentary power failure

The inverter automatically restarts upon recovery from momentary power failure without stopping the motor. You can choose under three possibilities:

- Starting at the frequency at momentary power failure occurrence
- Starting at 0Hz
- Operation continues at a lower frequency while using the kinetic energy obtained from the inertia of the load at momentary power failure

### Switching among remote/panel/independent inverter operation modes

Through frequency setting 1 and frequency setting 2, run/stop command 1 and run/stop command 2, and local operation (keypad operation), the remote/panel/independent inverter operation modes can be selected for both operation commands and frequency commands.

### Various frequency setting methods

The best method can be selected for the frequency setting according to the frequency signal to be used. Keypad operation (and keys), analog input (4-20 mA, 0-5 V, 0-10 V), 15 step multi-step frequencies setting, UP/DOWN operation, communication, etc.

### Motor pick-up during idling

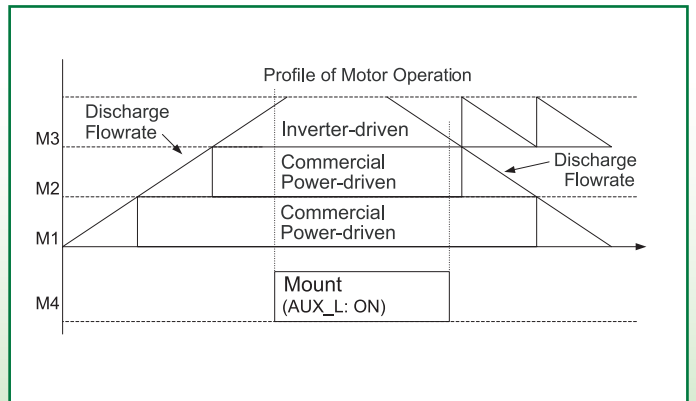
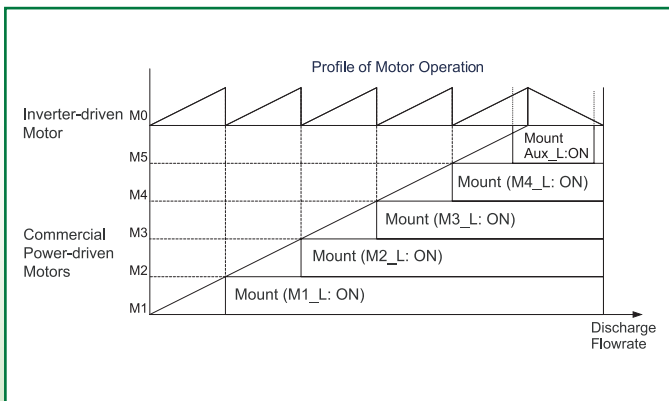
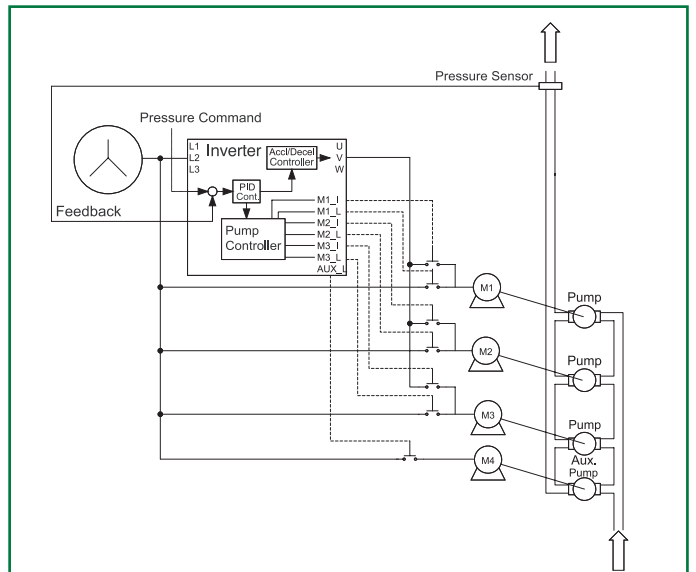
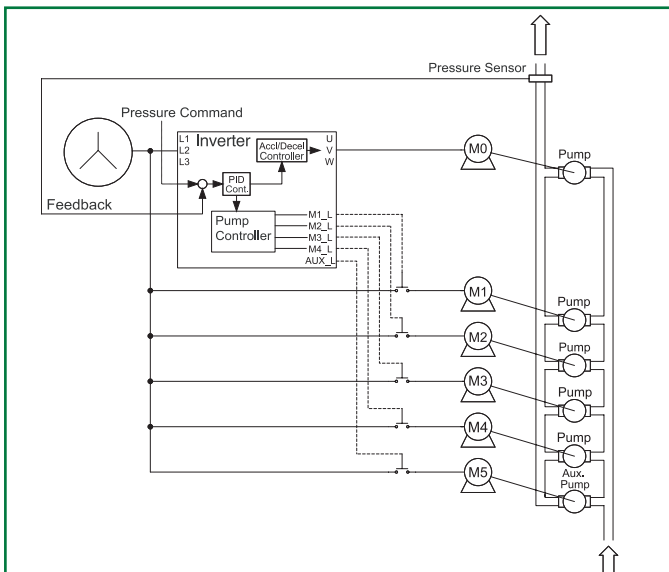
If the motor runs due to natural convection or other similar situations, you can use the pick-up function to start smoothly.

## Multi pump cascade control

**Dynamic rotation of pump motors. There are two alternatives to control more than one pump.**

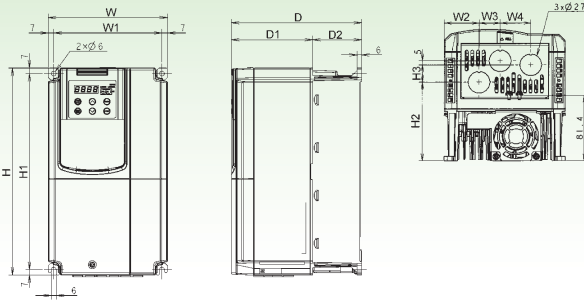
- With a fixed inverter-driven motor: Allows you to control up to 6 pumps (1 inverter-driven + 4 auxiliary + 1 additional). Any flow rate between 0 and 600 % is possible.

- With a floating inverter-driven motor: Allows you to control up to 4 pumps (3 inverter-driven + 1 additional). Any flow rate between 0 and 400 % is possible.



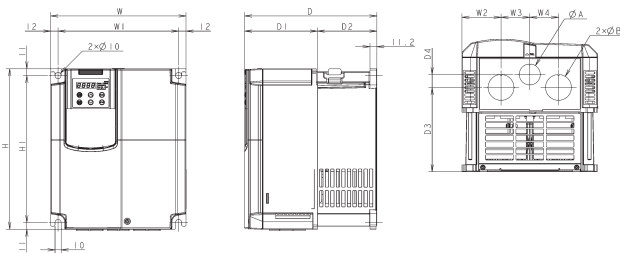
## External dimensions

Main body of inverter 0.75 to 5.5 kW, three-phase 400 V



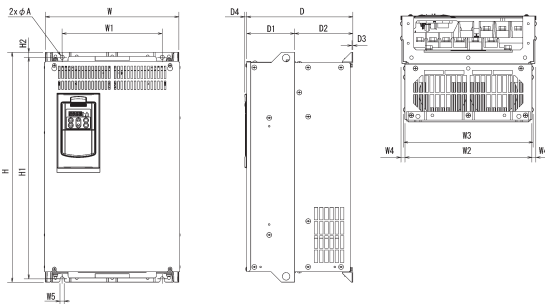
| Type          | Dimensions (mm) |     |    |    |    |     |     |      |      |     |       |      |
|---------------|-----------------|-----|----|----|----|-----|-----|------|------|-----|-------|------|
|               | W               | W1  | W2 | W3 | W4 | H   | H1  | H2   | H3   | D   | D1    | D2   |
| FRN0.75F1S-4E | 150             | 136 | 45 | 30 | 30 | 260 | 245 | 98.9 | 23.5 | 163 | 101.5 | 61.5 |
| FRN1.5F1S-4E  | 150             | 136 | 45 | 30 | 30 | 260 | 245 | 98.9 | 23.5 | 163 | 101.5 | 61.5 |
| FRN2.2F1S-4E  | 150             | 136 | 45 | 30 | 30 | 260 | 245 | 98.9 | 23.5 | 163 | 101.5 | 61.5 |
| FRN4.0F1S-4E  | 150             | 136 | 45 | 30 | 30 | 260 | 245 | 98.9 | 23.5 | 163 | 101.5 | 61.5 |
| FRN5.5F1S-4E  | 150             | 136 | 45 | 30 | 30 | 260 | 245 | 98.9 | 23.5 | 163 | 101.5 | 61.5 |

Main body of inverter 7.5 to 30 kW, three-phase 400 V



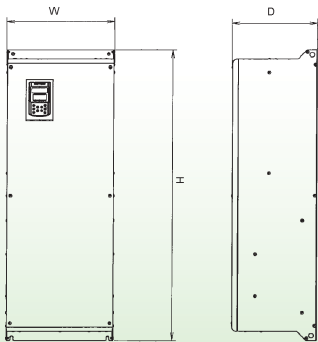
| Type          | Dimensions (mm) |     |      |      |      |     |     |     |       |      |       |    |    |    |
|---------------|-----------------|-----|------|------|------|-----|-----|-----|-------|------|-------|----|----|----|
|               | W               | W1  | W2   | W3   | W4   | H   | H1  | D   | D1    | D2   | D3    | D4 | ∅A | ∅A |
| FRN7.5F1S-4E  | 220             | 196 | 63,5 | 46,5 | 46,5 | 260 | 238 | 215 | 118,5 | 96,5 | 141,7 | 16 | 27 | 34 |
| FRN11F1S-4E   | 220             | 196 | 63,5 | 46,5 | 46,5 | 260 | 238 | 215 | 118,5 | 96,5 | 141,7 | 16 | 27 | 34 |
| FRN15F1S-4E   | 220             | 196 | 63,5 | 46,5 | 46,5 | 260 | 238 | 215 | 118,5 | 96,5 | 136,7 | 21 | 34 | 42 |
| FRN18.5F1S-4E | 250             | 226 | 67   | 58   | 58   | 400 | 378 | 215 | 85    | 130  | 166,2 | 2  | 34 | 42 |
| FRN22F1S-4E   | 250             | 226 | 67   | 58   | 58   | 400 | 378 | 215 | 85    | 130  | 166,2 | 2  | 34 | 42 |
| FRN30F1S-4E   | 250             | 226 |      |      |      | 400 | 378 | 215 | 85    | 130  |       |    |    |    |

Main body of inverter 37 to 560 kW, three-phase 400 V



| Type         | Dimensions (mm) |     |     |       |      |    |      |      |      |     |     |     |     |     |    |
|--------------|-----------------|-----|-----|-------|------|----|------|------|------|-----|-----|-----|-----|-----|----|
|              | W               | W1  | W2  | W3    | W4   | W5 | H    | H1   | H2   | D   | D1  | D2  | D3  | D4  | ∅A |
| FRN37F1S-4E  | 320             | 240 | 304 | 310,2 | 8    | 10 | 550  | 530  | 12   | 255 | 115 | 140 | 4   | 4,5 | 10 |
| FRN45F1S-4E  | 320             | 240 | 304 | 310,2 | 8    | 10 | 550  | 530  | 12   | 255 | 115 | 140 | 4   | 4,5 | 10 |
| FRN55F1S-4E  | 355             | 275 | 339 | 345,2 | 8    | 10 | 550  | 530  | 12   | 255 | 115 | 155 | 4   | 4,5 | 10 |
| FRN75F1S-4E  | 355             | 275 | 339 | 345,2 | 8    | 10 | 615  | 595  | 12   | 270 | 115 | 155 | 4   | 4,5 | 10 |
| FRN90F1S-4E  | 355             | 275 | 339 | 345,2 | 8    | 10 | 740  | 720  | 12   | 300 | 145 | 155 | 4   | 6   | 10 |
| FRN110F1S-4E | 355             | 275 | 339 | 345,2 | 8    | 10 | 740  | 720  | 12   | 300 | 145 | 155 | 4   | 6   | 10 |
| FRN132F1S-4E | 530             | 430 | 503 | 509,2 | 13,5 | 15 | 740  | 710  | 15,5 | 315 | 135 | 180 | 4   | 6   | 15 |
| FRN160F1S-4E | 530             | 430 | 503 | 509,2 | 13,5 | 15 | 740  | 710  | 15,5 | 360 | 180 | 180 | 4   | 6   | 15 |
| FRN200F1S-4E | 530             | 430 | 503 | 509,2 | 13,5 | 15 | 1000 | 970  | 15,5 | 360 | 180 | 180 | 4   | 6   | 15 |
| FRN220F1S-4E | 530             | 430 | 503 | 509,2 | 13,5 | 15 | 1000 | 970  | 15,5 | 360 | 180 | 180 | 4   | 6   | 15 |
| FRN280F1S-4E | 680             | 580 | 653 | 659   | 13,5 | 15 | 1000 | 970  | 15,5 | 380 | 200 | 180 | 6,4 | 6   | 15 |
| FRN315F1S-4E | 680             | 580 | 653 | 659   | 13,5 | 15 | 1000 | 970  | 15,5 | 380 | 200 | 180 | 6,4 | 6   | 15 |
| FRN355F1S-4E | 680             | 580 | 653 | 659   | 13,5 | 15 | 1400 | 1370 | 15,5 | 440 | 160 | 180 | 6,4 | 6   | 15 |
| FRN400F1S-4E | 680             | 580 | 653 | 659   | 13,5 | 15 | 1400 | 1370 | 15,5 | 440 | 160 | 180 | 6,4 | 6   | 15 |
| FRN450F1S-4E | 880             | 780 | 853 | 859   | 13,5 | 15 | 1400 | 1370 | 15,5 | 440 | 160 | 180 | 6,4 | 6   | 15 |
| FRN500F1S-4E | 880             | 780 | 853 | 859   | 13,5 | 15 | 1400 | 1370 | 15,5 | 440 | 160 | 180 | 6,4 | 6   | 15 |
| FRN560F1S-4E | 880             | 780 | 853 | 859   | 13,5 | 15 | 1400 | 1370 | 15,5 | 440 | 160 | 180 | 6,4 | 6   | 15 |

IP54, three-phase 400 V



| Type          | W   | H    | D   |
|---------------|-----|------|-----|
| FRN0.75F1L-4E | 210 | 500  | 225 |
| FRN1.5F1L-4E  | 210 | 500  | 225 |
| FRN2.2F1L-4E  | 210 | 500  | 225 |
| FRN4.0F1L-4E  | 210 | 500  | 225 |
| FRN5.5F1L-4E  | 210 | 500  | 225 |
| FRN7.5F1L-4E  | 300 | 600  | 280 |
| FRN11F1L-4E   | 300 | 600  | 280 |
| FRN15F1L-4E   | 300 | 600  | 280 |
| FRN18.5F1L-4E | 350 | 800  | 320 |
| FRN22F1L-4E   | 350 | 800  | 320 |
| FRN30F1L-4E   | 350 | 800  | 320 |
| FRN37F1L-4E   | 400 | 1100 | 320 |
| FRN45F1L-4E   | 400 | 1100 | 320 |
| FRN55F1L-4E   | 450 | 1170 | 350 |
| FRN75F1L-4E   | 450 | 1170 | 350 |
| FRN90F1L-4E   | 450 | 1280 | 360 |

## Standard specifications

### Three-phase 400 V series (0.75 to 55 kW)\*

| Item                                    |                             | Specifications                                                                           |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
|-----------------------------------------|-----------------------------|------------------------------------------------------------------------------------------|--------------------------------------|-----|-------------|------|------|------|------|------|------|------|--------------------|----------------------------------------------------------------------|-----|
| Type (FRN___F1S-4E)                     |                             | 0.75                                                                                     | 1.5                                  | 2.2 | 4.0         | 5.5  | 7.5  | 11   | 15   | 18.5 | 22   | 30   | 37                 | 45                                                                   | 55  |
| Nominal applied motor (kW) *1           |                             | 0.75                                                                                     | 1.5                                  | 2.2 | 4.0         | 5.5  | 7.5  | 11   | 15   | 18.5 | 22   | 30   | 37                 | 45                                                                   | 55  |
| Output ratings                          | Rated capacity (kVA) *2     | 1.9                                                                                      | 2.8                                  | 4.1 | 6.8         | 9.5  | 12   | 17   | 22   | 28   | 33   | 44   | 54                 | 64                                                                   | 80  |
|                                         | Rated voltage (V) *3        | Three-phase, 380, 400 V/50 Hz, 380, 400, 440, 460 V/60 Hz (with AVR function)            |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
|                                         | Rated current (A) *4        | 2.5                                                                                      | 3.7                                  | 5.5 | 9.0         | 12.5 | 16.5 | 23   | 30   | 37   | 44   | 59   | 72                 | 85                                                                   | 105 |
|                                         | Overload capability         | 120% of rated current for 1 min                                                          |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
|                                         | Rated frequency             | 50, 60 Hz                                                                                |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
| Input ratings                           | Phases, voltage, frequency  | Main power supply                                                                        | Three-phase, 380 to 480 V, 50/60 Hz  |     |             |      |      |      |      |      |      |      |                    | Three-phase, 380 to 440 V/50 Hz<br>Three-phase, 380 to 480 V/60 Hz   |     |
|                                         |                             | Auxiliary control power input                                                            | Single-phase, 380 to 480 V, 50/60 Hz |     |             |      |      |      |      |      |      |      |                    | Single-phase, 380 to 440 V/50 Hz<br>Single-phase, 380 to 480 V/60 Hz |     |
|                                         |                             | Auxiliary fan power input *5                                                             | None                                 |     |             |      |      |      |      |      |      |      |                    | *10                                                                  |     |
|                                         | Voltage/frequency allowance | Voltage: +10 to -15% (Voltage unbalance: 2% or less)*9, Frequency: +5 to -5%             |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
| Rated current (A) *6                    | (with DCR)                  | 1.6                                                                                      | 3.0                                  | 4.5 | 7.5         | 10.6 | 14.4 | 21.1 | 28.8 | 35.5 | 42.2 | 57.0 | 68.5               | 83.2                                                                 | 102 |
|                                         | (without DCR)               | 3.1                                                                                      | 5.9                                  | 8.2 | 13.0        | 17.3 | 23.2 | 33.0 | 43.8 | 52.3 | 60.6 | 77.9 | 94.3               | 114                                                                  | 140 |
| Required power supply capacity (kVA) *7 |                             | 1.2                                                                                      | 2.2                                  | 3.1 | 5.3         | 7.4  | 10   | 15   | 20   | 25   | 30   | 40   | 48                 | 58                                                                   | 71  |
| Braking                                 | Torque (%) *8               | 20                                                                                       |                                      |     |             |      |      |      |      |      |      |      | 10 to 15           |                                                                      |     |
|                                         | DC braking                  | Starting frequency: 0.0 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 60% |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
| DC reactor (DCR)                        |                             | Option                                                                                   |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
| Applicable safety standards             |                             | UL508C, C22.2 No.14, EN50178:1997                                                        |                                      |     |             |      |      |      |      |      |      |      |                    |                                                                      |     |
| Enclosure (IEC60529)                    |                             | IP20, UL open type                                                                       |                                      |     |             |      |      |      |      |      |      |      | IP00, UL open type |                                                                      |     |
| Cooling method                          |                             | Natural cooling                                                                          |                                      |     | Fan cooling |      |      |      |      |      |      |      |                    |                                                                      |     |
| Mass (kg)                               |                             | 3.1                                                                                      | 3.2                                  | 3.3 | 3.4         | 3.4  | 5.8  | 6.0  | 6.9  | 9.4  | 9.9  | 11.5 | 23                 | 24                                                                   | 33  |

### Three-phase 400 V series (75 to 560 kW)

| Item                                    |                             | Specifications                                                                           |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------------|-----------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Type (FRN___F1S-4E)                     |                             | 75                                                                                       | 90                                                                   | 110 | 132 | 160 | 200 | 220 | 280 | 315 | 355 | 400 | 450 | 500 | 560  |
| Nominal applied motor (kW) *1           |                             | 75                                                                                       | 90                                                                   | 110 | 132 | 160 | 200 | 220 | 280 | 315 | 355 | 400 | 450 | 500 | 560  |
| Output ratings                          | Rated capacity (kVA) *2     | 105                                                                                      | 128                                                                  | 154 | 182 | 221 | 274 | 316 | 396 | 445 | 495 | 563 | 640 | 731 | 792  |
|                                         | Rated voltage (V) *3        | Three-phase, 380, 400 V/50 Hz, 380, 400, 440, 460 V/60 Hz (with AVR function)            |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         | Rated current (A) *4        | 139                                                                                      | 168                                                                  | 203 | 240 | 290 | 360 | 415 | 520 | 585 | 650 | 740 | 840 | 960 | 1040 |
|                                         | Overload capability         | 120% of rated current for 1 min                                                          |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         | Rated frequency             | 50, 60 Hz                                                                                |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Input ratings                           | Phases, voltage, frequency  | Main power supply                                                                        | Three-phase, 380 to 440 V, 50 Hz or Three-phase, 380 to 480 V, 60 Hz |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         |                             | Auxiliary control power input                                                            | Single-phase, 380 to 480 V, 50/60 Hz                                 |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         |                             | Auxiliary fan power input *5                                                             | Single-phase, 380 to 440 V/50 Hz<br>Single-phase, 380 to 480 V/60 Hz |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         | Voltage/frequency allowance | Voltage: +10 to -15% (Voltage unbalance: 2% or less)*9, Frequency: +5 to -5%             |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Rated current (A) *6                    | (with DCR)                  | 138                                                                                      | 164                                                                  | 201 | 238 | 286 | 357 | 390 | 500 | 559 | 628 | 705 | 789 | 881 | 990  |
|                                         | (without DCR)               | —                                                                                        | —                                                                    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —    |
| Required power supply capacity (kVA) *7 |                             | 96                                                                                       | 114                                                                  | 140 | 165 | 199 | 248 | 271 | 347 | 388 | 435 | 489 | 547 | 611 | 686  |
| Braking                                 | Torque (%) *8               | 10 to 15                                                                                 |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
|                                         | DC braking                  | Starting frequency: 0.0 to 60.0 Hz, Braking time: 0.0 to 30.0 s, Braking level: 0 to 60% |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| DC reactor (DCR)                        |                             | Standard                                                                                 |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Applicable safety standards             |                             | UL508C, C22.2 No.14, EN50178:1997                                                        |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Enclosure (IEC60529)                    |                             | IP00, UL open type                                                                       |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Cooling method                          |                             | Fan cooling                                                                              |                                                                      |     |     |     |     |     |     |     |     |     |     |     |      |
| Mass (kg)                               |                             | 34                                                                                       | 42                                                                   | 45  | 63  | 67  | 96  | 98  | 162 | 165 | 282 | 286 | 355 | 360 | 360  |

\*1 Fuji 4-pole standard motor

\*2 Rated capacity is calculated by assuming the output rated voltage as 440 V for three-phase 400 V series.

\*3 Output voltage cannot exceed the power supply voltage.

\*4 An excessively low setting of the carrier frequency may result in the higher motor temperature or tripping of the inverter by its overcurrent limiter setting. Lower the continuous load or maximum load instead. (When setting the carrier frequency (F26) to 1 kHz, reduce the load to 80% of its rating.)

\*5 Use [R1, T1] terminals for driving AC cooling fans of an inverter powered by the DC link bus, such as by a high power factor PWM converter. (In ordinary operation, the terminals are not used.)

\*6 Calculated under Fuji-specified conditions.

\*7 Obtained when a DC reactor (DCR) is used.

\*8 Average braking torque (Varies with the efficiency of the motor.)

\*9 Voltage unbalance (%) =  $\frac{\text{Max. voltage (V)} - \text{Min. voltage (V)}}{\text{Three-phase average voltage (V)}} \times 67$  (IEC61800-3 (5.2.3))  
If this value is 2 to 3%, use an AC reactor (ACR).

\*10 Single-phase, 380 to 440 V/50 Hz or Single-phase, 380 to 480 V/60 Hz



European Headquarters  
**Fuji Electric FA Europe GmbH**  
Goethering 58  
63067 Offenbach/Main  
Germany  
Tel.: +49-69-66 90 29-0  
Fax: +49-69-66 90 29-58  
info\_inverter@fujielectric.de  
www.fujielectric.de

Japanese Headquarters  
**Fuji Electric Systems Co., Ltd.**  
Gate City Ohsaki East Tower,  
11-2 Osaki 1-chome, Shinagawa-ku, Chuo-ku  
Tokio 141-0032  
Japon  
Tel.: +81 3 5435 7280  
Fax: +81 3 5435 7425  
www.fesys.co.jp

Switzerland  
**Fuji Electric FA Europe GmbH**  
Zweigniederlassung Altenrhein  
IG-Park  
9423 Altenrhein  
Tel.: +41-71-8 58 29-49  
Fax: +41-71-8 58 29-40  
info@fujielectric.ch  
www.fujielectric.ch

Spain  
**Fuji Electric FA España**  
Ronda Can Fatjó 5, Edifici D, Local B  
Parc Tecnològic del Vallès  
08290 Cerdanyola (Barcelona)  
Tel.: +34-93-58 24-3 33/5  
Fax: +34-93-58 24-3 44  
www.fujielectric.es  
infospain@fujielectric.de

Distributor:

CEN-F1EN09.03

Subject to change without prior notice