MITSUBISHI ELECTRIC

INVERTER

Model

# FR-F700

*Changes for the Better*

700 series

*The energy saving effect is obvious*


Lineup complete

## Energy saving inverter

# F700 series is now available

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001 (standards for quality assurance management systems).

ISO 14001 JACO EC97J1113 UKAS ENVIRONMENTAL MANAGEMENT 051

Certified ISO 9001 by BVQI UKAS QUALITY MANAGEMENT 008

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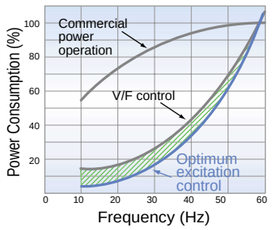
# Evolution of the inverter for fan and pump applications, energy savings for buildings and factories as a whole

## 1. More Energy Savings

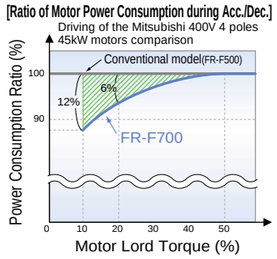
### (1) Upgrade of the renown Optimum Excitation Control!!

•Achieved a higher level of energy savings during acc./dec. to say nothing of during constant speed.

[Ex. of Blower Operation Characteristics]




[Ratio of Motor Power Consumption during Acc./Dec.]




### (2) The effect of energy savings is obvious A

•The effect of energy savings can be confirmed using the operation panel, output terminal (FM, AM terminal) and via networks with the newly developed energy saving monitor.

**Ex. of Power Savings Monitor Display**


**[Energy Saving Monitor List]**

| |
|---|
| Power saving monitor (kW) |
| Power saving rate (%) |
| Power saving amount (kWh) |
| Power saving amount charge ($) |
| Power saving average value (kW) |
| Power saving rate average value (%) |
| Power saving charge average value ($) |
| Annual power saving amount (kWh) |
| Annual power saving amount charge ($) |

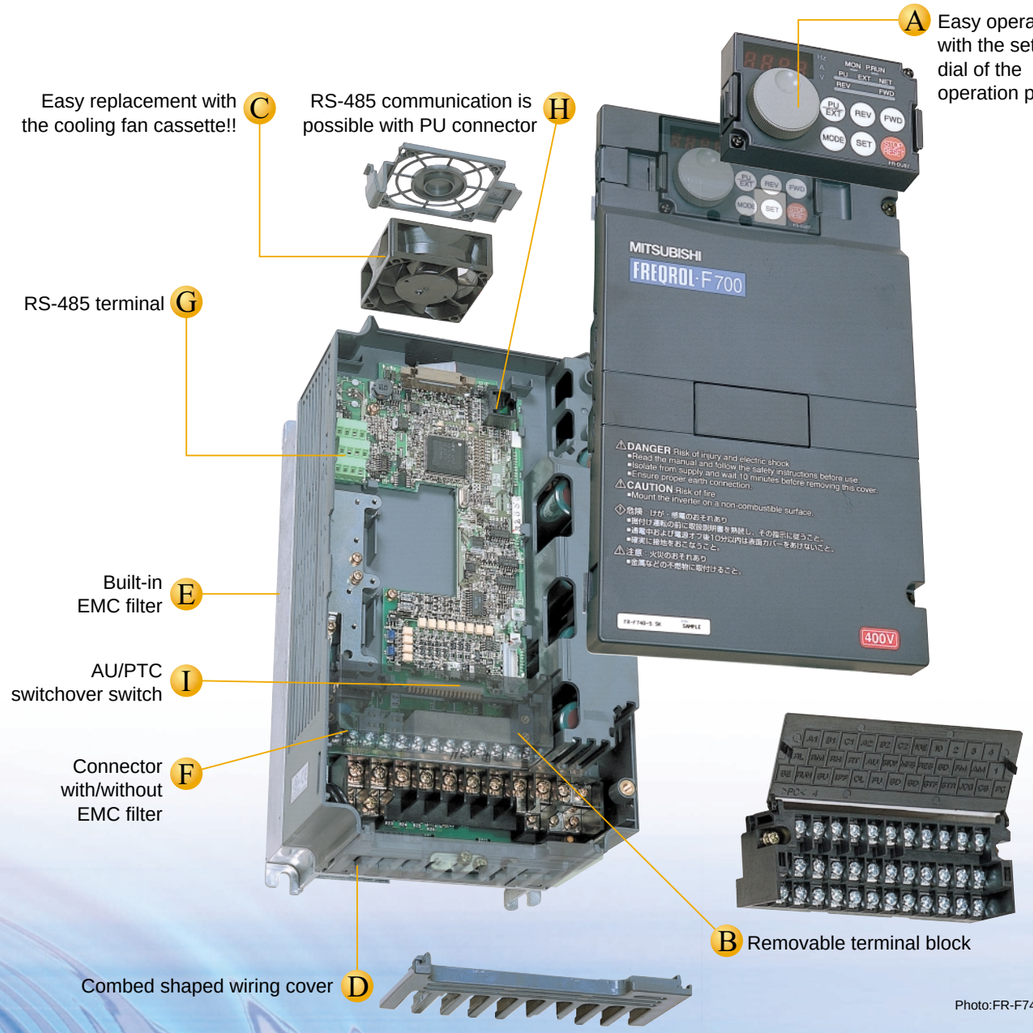
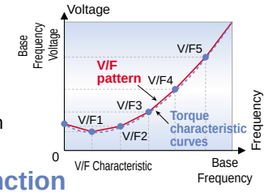



Photo:FR-F740-5.5K

## 2. Ideal for Fans and Pumps

### (1) Adjustable 5 points V/F

•Possible to set the torque pattern that is optimum for the machine's characteristic
•Possible to expect even more energy savings with optimum excitation control and optimum V/F pattern working together



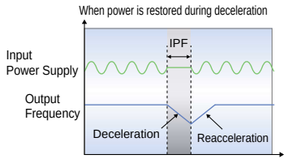

### (2) Enhanced PID function

•Energy savings in low speed region ... PID shutoff (sleep control) function
•Shorter PID startup time ... PID automatic switchover function
•Monitor of set point/measured value/deviation possible ... PID monitor
•Convenient for HVAC usage ... forward/reverse operation switchover is simple with an external signal
•Corresponds to a wide range of detectors ... set point and measured value for PID input can either be voltage (0 to 5V/0 to 10 V) or current (4 to 20mA)

### (3) Adoption of the original operation continuation at instantaneous power failure function

•Operation continues without the motor coasting when an instantaneous power failure occurred in fan and blower applications.

*The inverter may trip and the motor may coast depending on the load condition.




### (4) Restart after instantaneous power failure function

•Restart can be made without stopping the motor when the motor is coasting due to an instantaneous power failure.

### (5) Flying start

•Smoothly restarts a motor that is rotating even in the opposite direction due to the windmill effect.

### (6) Regeneration avoidance function

•Possible to avoid regeneration overvoltage alarm by automatically increasing the frequency and continue operation if the fan happens to rotate faster due to the effect of another fan in the same duct.

### (7) PTC thermistor input I

•Protection of the motor can be certain since the built-in PTC of the motor can be input directly in addition to the electronic thermal relay function.
PTC thermistor input…Positive Temperature Coefficient Thermistor

### (8) Commercial power-supply switchover sequence

•Switchover to commercial power-supply operation is simple using R1 and S1 terminals of the control circuit and commercial power-supply switchover sequence.

## 3. Long Life and Simple Maintenance

### (1) Operating life of parts are further lengthened

•Adoption of newly developed long life cooling fan (design life of 10 years*1)
Longer operating life is further enhanced with the use of ON/OFF control of cooling fan.
•Adoption of long life capacitor (design life of 10 years*1, 2)
A capacitor with specification of 5000 hours at 105°C ambient temperature is adapted.

*1 Ambient temperature: yearly average 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt)
Since the design life is a calculated value, it is not a guaranteed value.
*2 Output current: 80% of the rated current of Mitsubishi standard 4P motor

### (2) State of the art longevity diagnostic method

•Degrees of deterioration of main circuit capacitor, control circuit capacitor or inrush current limit circuit can be diagnosed by monitor.
•Trouble can be avoided with the self-diagnostic alarms* that is output when the life span is near.

*Any of alarm for main circuit capacitor, control circuit capacitor, inrush current limit circuit and cooling fan can be output.

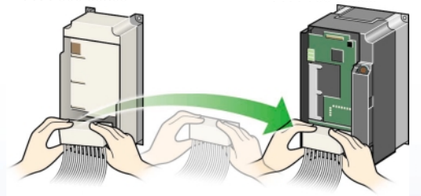
### (3) Maintenance timer

•Maintenance timer output function can also inform of maintenance time for peripheral equipments.
•Average output current value and maintenance timer value are output as pulses.

### (4) Update is also easy

•**Removable terminal block** B
¥When exchanging the inverter, the control circuit terminals can be exchanged.
The removable terminal block of the FR-F500 series can be used.
(The terminal block of the FR-F700 series is compatible with that of the FR-F500 series.
Note that some functions of the FR-F700 series are restricted when using the terminal block of the FR-F500 series.)

FR-F500 series FR-F700 series



### (5) Improved workability

•**Easy replacement of cooling fan** C
¥The installation position of the cooling fan is in the upper portion of the inverter.
Fan replacement is easily done without having to remove the main circuit wires.

•**Wiring is easy with the combed shaped wiring cover** D
¥Wiring cover can be reinstalled after wiring (200V class 22K or less, 400V class 30K or less)

•**Possible to copy parameters with operation panel** A
¥Parameter setting for multiple inverters is simple by copy with the operation panel.

•**Alarm history**
¥Alarm history (alarm details and frequency, current, voltage and cumulative energization time at time of alarm occurrence) can be displayed on the operation panel and the cause of a trouble can be checked.(up to 8 past alarms)

# Full of attractive features!

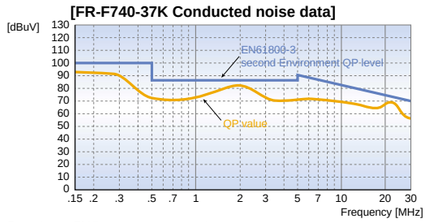
## 4. Free of Environmental Worries

### (1) Reduction of electromagnetic noises E F

•Inverter noises have been reduced with the adoption of new technologies.

•**Newly developed noise filter (EMC filter)**

¥Because of the built-in EMC filter, the inverter itself can comply with the EMC Directive (2nd environment*1) by setting the connector to "with filter"(*2,*3).




*1: Refer to the EMC instruction manual for compliance conditions.
*2: Leakage current will increase when the EMC filter is selected.
*3: Since the leakage current when using the EMC filter for the 200V class 0.75K and 1.5K is small, the filter is always valid (a setting connector is not provided).

¥Because of the built-in capacitive filter and zero-phase reactor (55K or less) connecting the optional DC reactor to the inverter will comply with the electric installation work common specification and machine installation work common specification (2001) written under the general editorship of the Japanese Ministry of land, infrastructure and transportation.

| | Capacitive filter | Zero-phase reactor | DC reactor |
|---|---|---|---|
| 55K or less | Standard (Built-in) | Standard (Built-in) | Option (Sell separately) |
| 75K or more | Standard (Built-in) | Option (Sell separately) | Standard (supplied) |

### (2) Countermeasures for harmonic current output

•**Small AC reactor (FR-HAL)/DC reactor (FR-HEL)**

¥AC reactor and DC reactor options for the control of harmonics current output has been miniaturized.
(DC reactor is supplied with the 75K or more as standard.)

•**Connection with high power factor converter (FR-HC/MT-HC) is possible**

¥Connection is possible to high power-factor converter for effective suppressions of power-supply harmonics (coefficient K5=0).

### (3) Equipped with inrush current limit circuit

•Because of the built-in inrush current limit circuit, the current at power on is restricted.

## 5. Simple Operation

### (1) Equipped with operation panel with the popular setting dial A

•Operation is easy with the popular setting dial.

¥Frequency and parameters can be set without frustrations

¥Settings can be made quickly or slowly depending on fast the dial is being turned.

¥Settings are certain due to the "clicking" sensation and notch on dial

Example of parameter change

•Operation panel is detachable and can be installed on the front cover. (Cable connector option is required.)

•PU/EXT (operation mode) switchover key is available.

•Dial/key operation lock function is available.

PU/EXT
Example of operation mode

### (2) FR Configurator (setup software)

•From start up to maintenance of the inverter is simple.

•Possible to save and print parameter setting file making parameter management simple

(Possible to use communications connecting to any of PU connector and RS-485 terminals)

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## 6. Enhanced Network

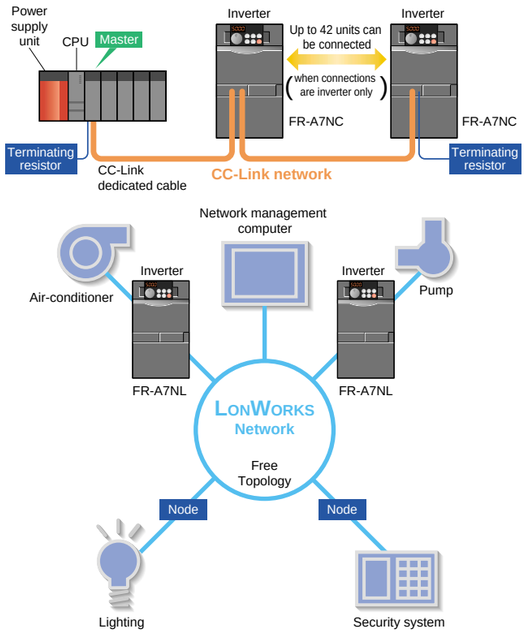
### (1) RS-485 terminal is standard equipped G H

•RS-485 terminals are available in addition to the PU. connector. RS-485 communication can be performed using the operation panel or parameter unit. Since terminals for input and output are provided separately, multi-drop connection is easily done.

•Modbus-RTU (Binary) protocol has been added for communications in addition to computer link.

### (2) Possible to correspond with major networks

•Possible to connect with LonWorks, CC-Link Ver.1.1 and Ver.2.0, DeviceNet™ and Profibus-DP when used with communication options




## 7. Global Compliance

### (1) Complies with UL, cUL, EN (LVD) standards

c UL us LISTED

CE

### (2) Possible to switch sink/source with one-touch

•Possible to switch the logic of I/O terminals. Possible to use in all regions

### (3) Wide voltage range

•Accommodate both 240V power supply (55K or less) and 480V power supply as standard

## 8. Wide Range of Functions

### (1) Remote output function

•You can utilize the on/off of the inverter's output signals instead of the remote output function of the programmable logic controller.

### (2) Enhanced I/O is standard

•12 contact inputs, 3 analog inputs, 5 open collector outputs, 2 relay outputs, analog output and pulse output are all standard.

•Possible to assign variety of functions to contact inputs, open collector outputs and relay outputs

•Possible to switch between voltage and current for the analog input.

•Possible to display the ON/OFF status of the I/O terminals on the operation panel

### (3) Simple magnetic flux vector control is possible

•High torque in low speed region is possible with simple magnetic flux vector control
(120% torque is possible at 3Hz with slip compensation)

| | V/F + Optimum Excitation | Simple Magnetic Flux Vector |
|---|---|---|
| For torque | — | ◎ |
| For energy savings | ◎ | — |

## LINE UP

**FR-F720-0.75K**

| Symbol | Voltage |
|---|---|
| 2 | 200V class |
| 4 | 400V class |

| Symbol | Inverter Capacity |
|---|---|
| 0.75K to 560K | Indicate capacity (kW) |

| Applied Motor (kW) | Three-phase 200V class FR-F720-□□ | Three-phase 400V class FR-F740-□□ |
|---|---|---|
| 0.75 | ● | ● |
| 1.5 | ● | ● |
| 2.2 | ● | ● |
| 3.7 | ● | ● |
| 5.5 | ● | ● |
| 7.5 | ● | ● |
| 11 | ● | ● |
| 15 | ● | ● |
| 18.5 | ● | ● |
| 22 | ● | ● |
| 30 | ● | ● |
| 37 | ● | ● |
| 45 | ● | ● |
| 55 | ● | ● |

| Applied Motor (kW) | Three-phase 200V class FR-F720-□□ | Three-phase 400V class FR-F740-□□ |
|---|---|---|
| 75 | ● | ● |
| 90 | ● | ● |
| 110 | ● | ● |
| 132 | — | ● |
| 160 | — | ● |
| 185 | — | ● |
| 220 | — | ● |
| 250 | — | ● |
| 280 | — | ● |
| 315 | — | ● |
| 355 | — | ● |
| 400 | — | ● |
| 450 | — | ● |
| 500 | — | ● |
| 560 | — | ● |

●:Available models —:Not available

# Connection with Peripheral Devices

Peripheral devices necessary for driving the FR-F700 series inverter are indicated below.

### Three-phase AC power supply
Use within the permissible power supply specifications of the inverter.
*(Refer to page 7.)*

### Moulded case circuit breaker (MCCB) or earth leakage circuit breaker (ELB), fuse
The breaker must be selected carefully since an in-rush current flows in the inverter at power on.
*(Refer to page 57.)*

### Magnetic contactor(MC)
Install the magnetic contactor to ensure safety. Do not use this magnetic contactor to start and stop the inverter.
Doing so will cause the inverter life to be shorten.
*(Refer to page 57.).*

### Reactor (FR-HAL, FR-HEL)
Reactors (option) should be used when power harmonics measures are taken, the power factor is to be improved or the inverter is installed near a large power supply system (1000kVA or more).
The inverter may be damaged if you do not use reactors.
Select the reactor according to the model.
For the 55K or less, remove the jumpers across terminals P/+-P1 to connect to the DC reactor.
*(Refer to page 51.).*

### PLC

### Inverter (FR-F700)
The life of the inverter is influenced by ambient temperature. The ambient temperature should be as low as possible within the permissible range. (*Refer to page 8.*) This must be noted especially when the inverter is installed in an enclosure.
Wrong wiring might lead to damage of the inverter. The control signal lines must be kept fully away from the main circuit to protect them from noise.

### RS-485 terminal block
The inverter can be connected with computers such as PLC.
It supports Mitsubishi inverter protocol and Modbus-RTU (binary) protocol.


### AC reactor (FR-HAL)
*(Refer to page 51.)*

### DC reactor (FR-HEL)
For the 75K or more, a DC reactor is supplied.
Always install the reactor.
*(Refer to page 51.)*

### Noise filter (FR-BLF)
It is not necessary for the 55K or less.

P/+ P1 R/L1 S/L2 T/L3 P/+ N/-

Earth (Ground)

U V W

### Noise filter (FR-BSF01, FR-BLF)
Install a noise filter to reduce the electromagnetic noise generated from the inverter. Effective in the range from about 1MHz to 10MHz.
When more wires are passed through, a more effective result can be obtained.

### Motor

Earth (Ground)

### Devices connected to the output
Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the output side of the inverter.
When installing a moulded case circuit breaker on the output side of the inverter, contact each manufacturer for selection of the moulded case circuit breaker.

### Earth (Ground)
To prevent an electric shock, always earth (ground) the motor and inverter.

### Brake unit (FR-BU*1, MT-BU5*2)

P/+ PR
P/+
PR

### Resistor unit (FR-BR*1, MT-BR5*2)
The regenerative braking capability of the inverter can be exhibited fully.
Install this as required.

### Power regeneration common converter (FR-CV*1)
### Power regeneration converter (MT-RC*2)
Greater braking capability is obtained.
Install this as required.

### High power factor converter (FR-HC*1, MT-HC*2)
Power supply harmonics can be greatly suppressed.
Install this as required.

*1 Compatible with the 55K or less.
*2 Compatible with the 75K or more.

Refer to *page 49* for the option list and details.

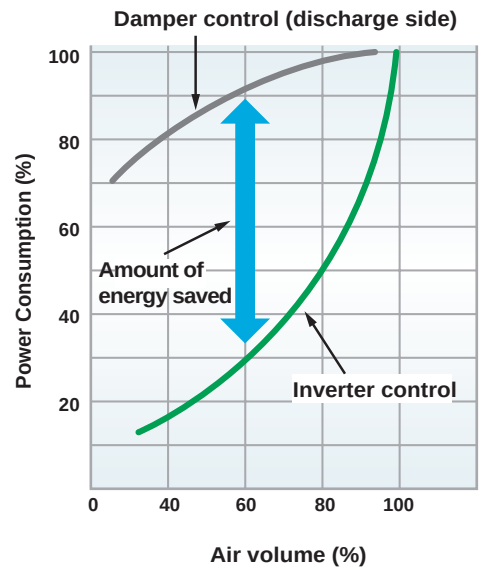
# Why Can the Inverter Save Energy?

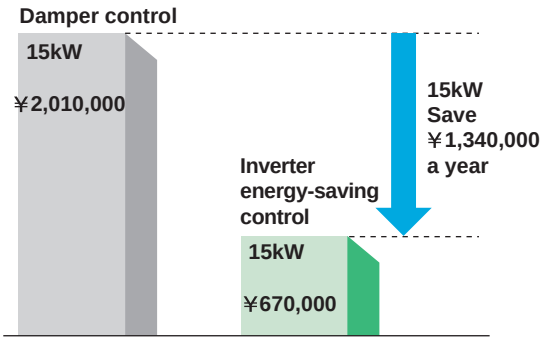
The load torque of a motor-driven machine generally changes depending on speed. On the other hand, motor output is proportional to the product of load torque and speed as indicated in the following formula, and therefore, necessary motor output varies with speed.

Motor output P = T × N/(9550 × $\eta$) [kW]
T : Motor shaft-equivalent load torque [N·m]
N : Motor speed [r/min]
$\eta$ : Machine efficiency

When this motor is operated by the inverter, the inverter output provides the frequency f appropriate to the motor speed, and the then output voltage V is determined by a "V/f = constant" pattern in the case of a constant-torque load.
For example, when the motor is operated at middle speed, f, i.e. output voltage V, decreases, and therefore, the inverter output power V × I reduces if the output current I is constant.
Proportionately, the inverter input current decreases and the power consumption reduces. Namely, when the motor output reduces, the input power of the inverter also decreases as a matter of course.
The fundamental principle of energy saving by the inverter is to eliminate wasted power consumption by minimizing loss caused by the other devices and minimizing the motor output as compared to the other system (for example, commercial power supply operation or secondary resistance control of wound-rotor motor). A maximum energy saving effect is produced on a fan, pump or like by the variable-torque load characteristic that reduces load torque as speed decreases.

Motor speed control enables substantial energy-saving operation as compared to commercial power supply operation.




For example, when a 15kW motor is operated at 60% air volume and the power charge is 17 yen/kW·h, the power charge as much as below can be saved in a year.

(1)Damper control
15kW×0.9×17 yen×24h×365days ≒ 2.01 million yen
(2)Inverter control
15kW×0.3×17 yen×24h×365days ≒ 0.67 million yen

**(1) - (2) = energy-saving effect**
**Approx. 1.34 million yen**

# Standard Specifications

## Rating

### ●200V class

| Type FR-F720-□□K | | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied motor capacity (kW)*1 | | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 |
| Output | Rated capacity (kVA)*2 | 1.6 | 2.7 | 3.7 | 5.8 | 8.8 | 11.8 | 17.1 | 22.1 | 27 | 32 | 43 | 53 | 65 | 81 | 110 | 132 | 165 |
| | Rated current (A)*3 | 4.2 (3.6) | 7.0 (6.0) | 9.6 (8.2) | 15.2 (13) | 23 (20) | 31 (26) | 45 (38) | 58 (49) | 70 (60) | 85 (72) | 114 (97) | 140 (119) | 170 (145) | 212 (180) | 288 (244) | 346 (294) | 432 (367) |
| | Overload current rating*4 | 120% 60s, 150% 3s (inverse time characteristics) | | | | | | | | | | | | | | | | |
| | Voltage*5 | Three-phase 200 to 240V | | | | | | | | | | | | | | | | |
| Power supply | Rated input AC voltage/frequency | Three-phase 200 to 220V 50Hz, 200 to 240V 60Hz | | | | | | | | | | | | | | | | |
| | Permissible AC voltage fluctuation | 170 to 242V 50Hz, 170 to 264V 60Hz | | | | | | | | | | | | | | | | |
| | Permissible frequency fluctuation | ±5% | | | | | | | | | | | | | | | | |
| | Power supply system capacity (kVA)*6 | 2.5 | 4.5 | 5.5 | 9 | 12 | 17 | 20 | 28 | 34 | 41 | 52 | 65 | 79 | 99 | 110 | 132 | 165 |
| Protective structure (JEM 1030)*8 | | Enclosed type (IP20)*7 | | | | | | | | | | Open type (IP00) | | | | | | |
| Cooling system | | Self-cooling | Forced air cooling | | | | | | | | | | | | | | | |
| Approx. mass (kg) | | 1.8 | 2.2 | 3.5 | 3.5 | 3.5 | 6.5 | 6.5 | 7.5 | 13 | 13 | 14 | 23 | 35 | 35 | 67 | 70 | 70 |

### ●400V class

| Type FR-F740-□□K | | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied motor capacity (kW)*1 | | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
| Output | Rated capacity (kVA)*2 | 1.6 | 2.7 | 3.7 | 5.8 | 8.8 | 12.2 | 17.5 | 22.1 | 26.7 | 32.8 | 43.4 | 53.3 | 64.8 | 80.8 |
| | Rated current (A)*3 | 2.1 (1.8) | 3.5 (3.0) | 4.8 (4.1) | 7.6 (6.4) | 11.5 (9.8) | 16 (13) | 23 (19) | 29 (24) | 35 (30) | 43 (36) | 57 (48) | 70 (60) | 85 (72) | 106 (90) |
| | Overload current rating*4 | 120% 60s, 150% 3s (inverse time characteristics) | | | | | | | | | | | | | |
| | Voltage*5 | Three-phase 380 to 480V | | | | | | | | | | | | | |
| Power supply | Rated input AC voltage/frequency | Three-phase 380 to 480V 50Hz/60Hz | | | | | | | | | | | | | |
| | Permissible AC voltage fluctuation | 323 to 528V 50Hz/60Hz | | | | | | | | | | | | | |
| | Permissible frequency fluctuation | ±5% | | | | | | | | | | | | | |
| | Power supply system capacity (kVA)*6 | 2.5 | 4.5 | 5.5 | 9 | 12 | 17 | 20 | 28 | 34 | 41 | 52 | 66 | 80 | 100 |
| Protective structure (JEM 1030)*8 | | Enclosed type (IP20)*7 | | | | | | | | | | | Open type (IP00) | | |
| Cooling system | | Self-cooling | | | Forced air cooling | | | | | | | | | | |
| Approx. mass (kg) | | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 6.5 | 6.5 | 7.5 | 7.5 | 13 | 13 | 23 | 35 | 35 |

| Type FR-F740-□□K | | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 250 | 280 | 315 | 355 | 400 | 450 | 500 | 560 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied motor capacity (kW)*1 | | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 250 | 280 | 315 | 355 | 400 | 450 | 500 | 560 |
| Output | Rated capacity (kVA)*2 | 110 | 137 | 165 | 198 | 247 | 275 | 329 | 366 | 416 | 464 | 520 | 586 | 659 | 733 | 833 |
| | Rated current (A)*3 | 144 (122) | 180 (153) | 216 (183) | 260 (221) | 325 (276) | 361 (306) | 432 (367) | 481 (408) | 547 (464) | 610 (518) | 683 (580) | 770 (654) | 866 (736) | 962 (817) | 1094 (929) |
| | Overload current rating*4 | 120% 60s, 150% 3s (inverse time characteristics) | | | | | | | | | | | | | | |
| | Voltage*5 | Three-phase 380 to 480V | | | | | | | | | | | | | | |
| Power supply | Rated input AC voltage/frequency | Three-phase 380 to 480V 50Hz/60Hz | | | | | | | | | | | | | | |
| | Permissible AC voltage fluctuation | 323 to 528V 50Hz/60Hz | | | | | | | | | | | | | | |
| | Permissible frequency fluctuation | ±5% | | | | | | | | | | | | | | |
| | Power supply system capacity (kVA)*6 | 110 | 137 | 165 | 198 | 247 | 275 | 329 | 366 | 416 | 464 | 520 | 586 | 659 | 733 | 833 |
| Protective structure (JEM 1030)*8 | | Open type (IP00) | | | | | | | | | | | | | | |
| Cooling system | | Forced air cooling | | | | | | | | | | | | | | |
| Approx. mass (kg) | | 37 | 50 | 57 | 72 | 72 | 110 | 110 | 220 | 220 | 220 | 260 | 260 | 370 | 370 | 370 |

*1. The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
*2. The rated output capacity indicated assumes that the output voltage is 220V for 200V class and 440V for 400V class.
*3. When operating the inverter with the carrier frequency set to 3kHz or more, the carrier frequency automatically decreases if the inverter output current exceeds the value in parenthesis of the rated current. This may cause the motor noise to increase.
*4. The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
*5. The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
*6. The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
*7. When the hook of the inverter front cover is cut off for installation of the plug-in option, the inverter changes to an open type (IP00).
*8. FR-DU07 : IP40 (Except for the PU connector).

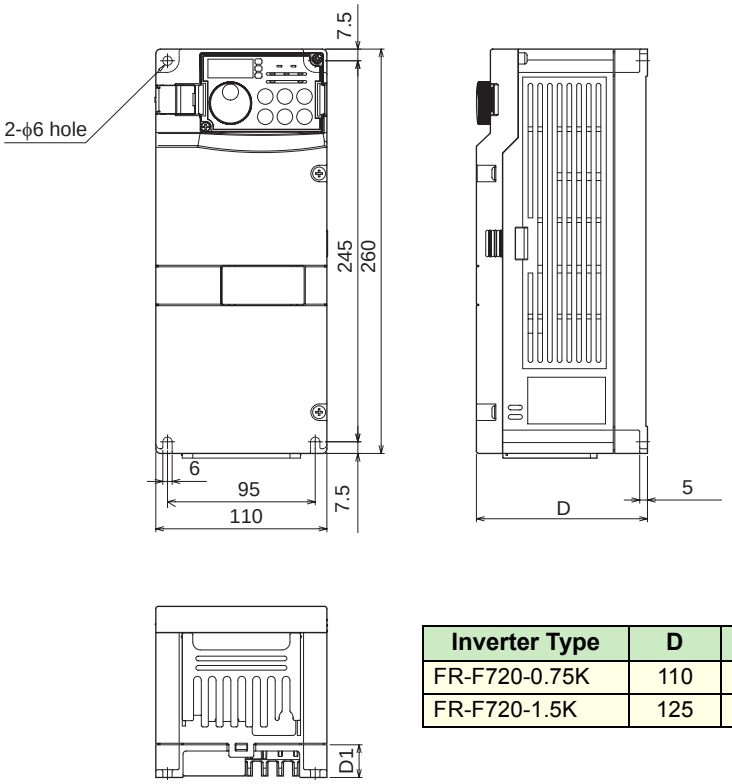
## Common specifications

| | | | |
|---|---|---|---|
| Control specifications | Control system | | High carrier frequency PWM control (V/F control)/optimum excitation control/simple magnetic flux vector control |
| | Output frequency range | | 0.5 to 400Hz |
| | Frequency setting resolution | Analog input | 0.015Hz/0 to 60Hz (terminal 2, 4: 0 to 10V/12bit)<br>0.03Hz/0 to 60Hz (terminal 2, 4: 0 to 5V/11bit, 0 to 20mA/11bit, terminal 1: -10V to +10V/11bit)<br>0.06Hz/0 to 60Hz (terminal 1: 0 to ±5V/10bit) |
| | | Digital input | 0.01Hz |
| | Frequency accuracy | Analog input | Within ±0.2% of the max. output frequency (25°C ± 10°C) |
| | | Digital input | Within 0.01% of the set output frequency |
| | Voltage/frequency characteristics | | Base frequency can be set from 0 to 400Hz Constant torque/variable torque pattern or adjustable 5 points V/F can be selected |
| | Starting torque | | 120% (3Hz) when set to simple magnetic flux vector control and slip compensation |
| | Acceleration/deceleration time setting | | 0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode can be selected. |
| | DC injection brake | | Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) variable |
| | Stall prevention operation level | | Operation current level can be set (0 to 150% adjustable), whether to use the function or not can be selected |
| Operation specifications | Frequency setting signal | Analog input | Terminal 2, 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected<br>Terminal 1: -10 to +10V, -5 to 5V can be selected |
| | | Digital input | Four-digit BCD or16-bit binary using the setting dial of the operation panel (when used with the option FR-A7AX) |
| | Start signal | | Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected. |
| | Input signals | | You can select any twelve signals using Pr.178 to Pr.189 (input terminal function selection) from among multi speed selection, second function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, external thermal relay input, HC connection (inverter operation enable signal), HC connection (instantaneous power failure detection), PU operation/external inter lock signal , PID control enable terminal, PU operation, external operation switchover, output stop, start self-holding selection, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover, command source switchover. |
| | Operational functions | | Maximum and minimum frequency settings, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, original operation continuation at instantaneous power failure, commercial power supply-inverter switchover operation, forward/reverse rotation prevention, operation mode selection, PID control, computer link operation (RS-485). |
| | Output signals | Operating status | You can select any seven signals using Pr.190 to Pr.196 (output terminal function selection) from among inverter running, up-to-speed, instantaneous power failure /undervoltage, overload warning, output frequency detection, second output frequency detection, regenerative brake prealarm*4, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, commercial power supply-inverter switchover MC1, commercial power supply-inverter switchover MC2, commercial power supply-inverter switchover MC3, fan fault output, heatsink overheat pre-alarm, inverter running start command on, deceleration at an instantaneous power failure, PID control activated, during retry, during PID output suspension, life alarm, alarm output 3 (power-off signal), power savings average value update timing, current average monitor, alarm output 2, maintenance timer alarm, remote output, minor failure output, alarm output. Open collector output (5 points), relay output (2 points) and alarm code of the inverter can be output (4 bit) from the open collector. |
| | | When used with the FR-A7AY, FR-A7AR (option) | You can select any seven signals using Pr.313 to Pr. 319 (extension output terminal function selection) from among control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life and the above stated signals. (Only positive logic can be set for terminals of the FR-A7AR.) |
| | | Pulse/analog output | Selection can be made from output frequency, motor current (steady or peak value), output voltage, frequency setting value, running speed, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, reference voltage output, motor load factor, power saving effect, regenerative brake duty*4, PID set value, PID measured value using Pr.54 "FM terminal function selection (pulse train output)" and Pr.158 "AM terminal function selection (analog output)". |
| Display | PU (FR-DU07/ FR-PU04) | Operating status | Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, cumulative energization time, actual operation time, motor load factor, cumulative energization power, power saving effect, cumulative saving power, regenerative brake duty*4, PID set point, PID measured value, PID deviation value, inverter I/O terminal monitor, input terminal option monitor*1, output terminal option monitor*1, option fitting status monitor*2, terminal assignment status*2 |
| | | Alarm definition | Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored |
| | | Interactive guidance | Operation guide/trouble shooting with a help function*2 |
| Protective/warning function | | | Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase failure, motor overload, output side earth (ground) fault overcurrent, output phase failure, external thermal relay operation, PTC thermistor operation, option alarm, parameter error, PU disconnection, retry count excess, CPU alarm, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess, inrush resistance overheat, communication alarm (inverter), analog input alarm, internal circuit alarm (15V power supply), fan fault, overcurrent stall prevention, overvoltage stall prevention, electronic thermal relay function prealarm, PU stop, maintenance timer alarm*1, brake transistor alarm*4, parameter write error, copy operation error, operation panel lock, parameter copy alarm |
| Environment | Ambient temperature | | -10°C to +50°C (non-freezing) |
| | Ambient humidity | | 90%RH or less (non-condensing) |
| | Storage temperature*3 | | -20°C to +65°C |
| | Atmosphere | | Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.) |
| | Altitude, vibration | | Maximum 1000m above seal level, 5.9m/s$^2$ or less *5 (conforms to JIS C 60068-2-6) |

*1. Can be displayed only on the operation panel (FR-DU07).
*2. Can be displayed only on the parameter unit (FR-PU04).
*3. Temperature applicable for a short period in transit, etc.
*4. Only the 75K or more functions.
*5. 2.9m/s$^2$ or less for the 185K or more.

# Outline Dimension Drawings

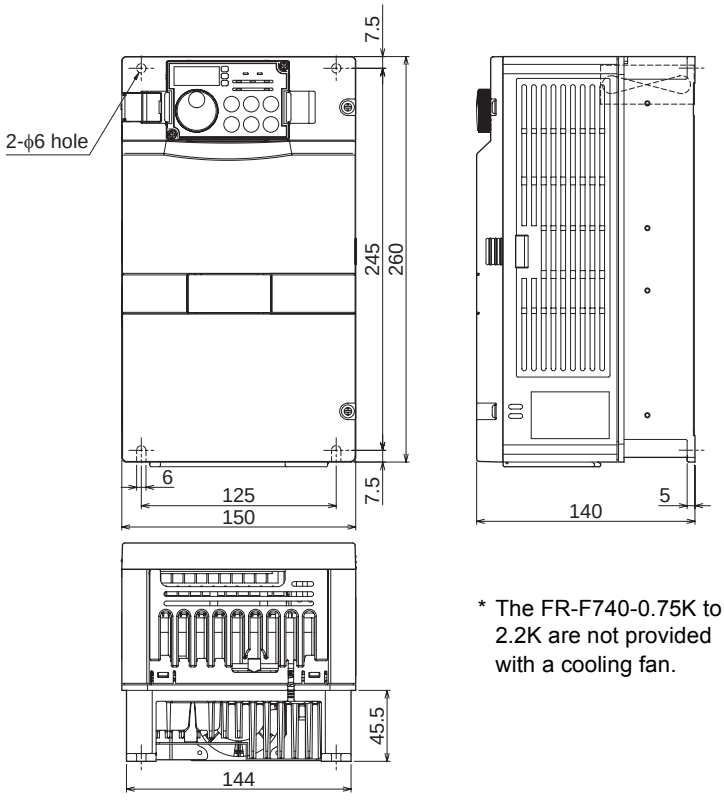
● FR-F720-0.75K, 1.5K




| Inverter Type | D | D1 |
|---|---|---|
| FR-F720-0.75K | 110 | 21 |
| FR-F720-1.5K | 125 | 36 |

(Unit: mm)

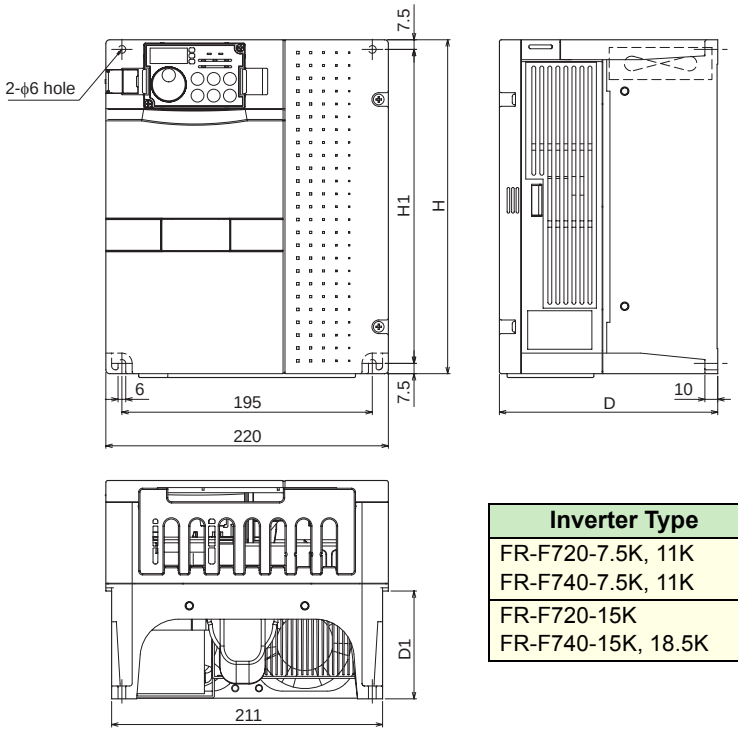
● FR-F720-2.2K, 3.7K, 5.5K
● FR-F740-0.75K, 1.5K, 2.2K, 3.7K, 5.5K




* The FR-F740-0.75K to 2.2K are not provided with a cooling fan.

(Unit: mm)

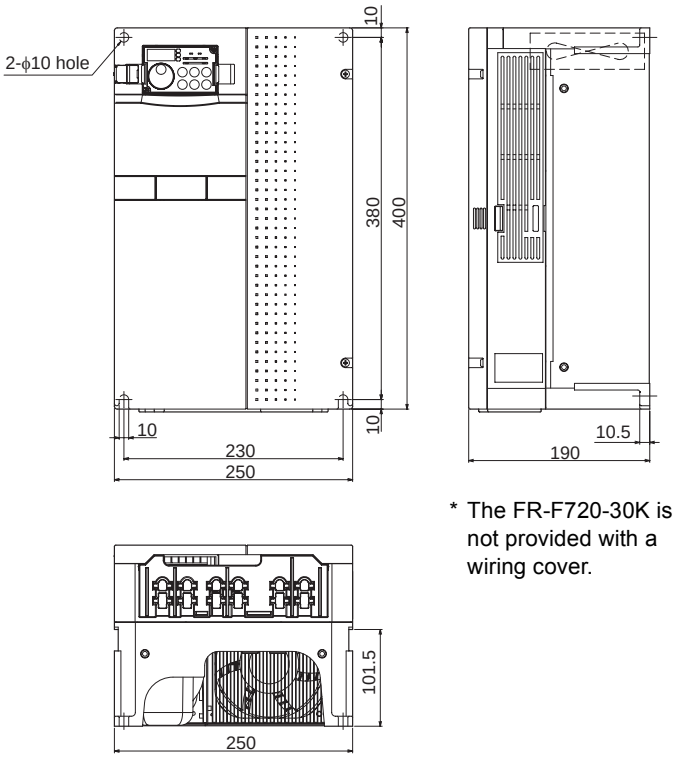
- FR-F720-7.5K, 11K, 15K
- FR-F740-7.5K, 11K, 15K, 18.5K




| Inverter Type | H | H1 | D | D1 |
|---|---|---|---|---|
| FR-F720-7.5K, 11K<br>FR-F740-7.5K, 11K | 260 | 245 | 170 | 84 |
| FR-F720-15K<br>FR-F740-15K, 18.5K | 300 | 285 | 190 | 101.5 |

(Unit: mm)

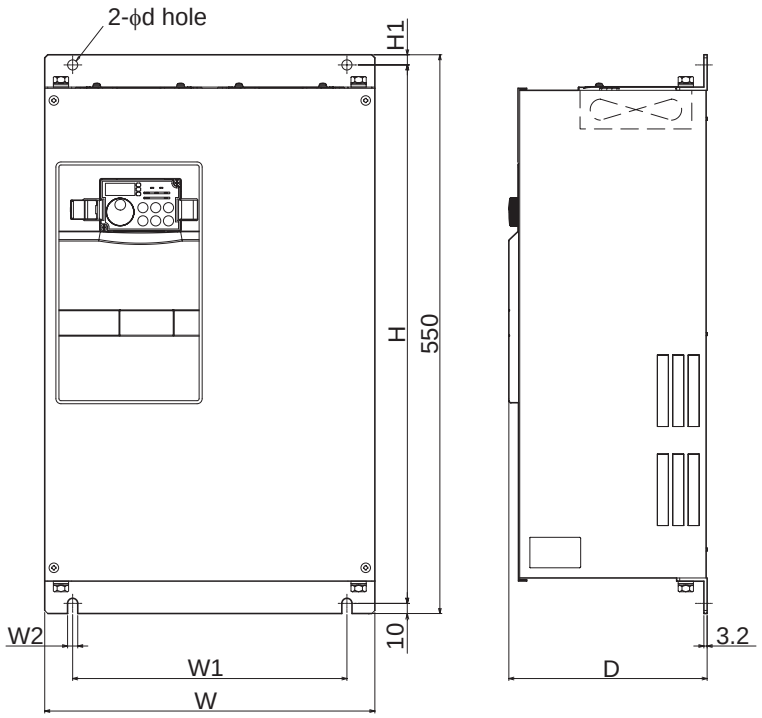
- FR-F720-18.5K, 22K, 30K
- FR-F740-22K, 30K




* The FR-F720-30K is not provided with a wiring cover.

(Unit: mm)

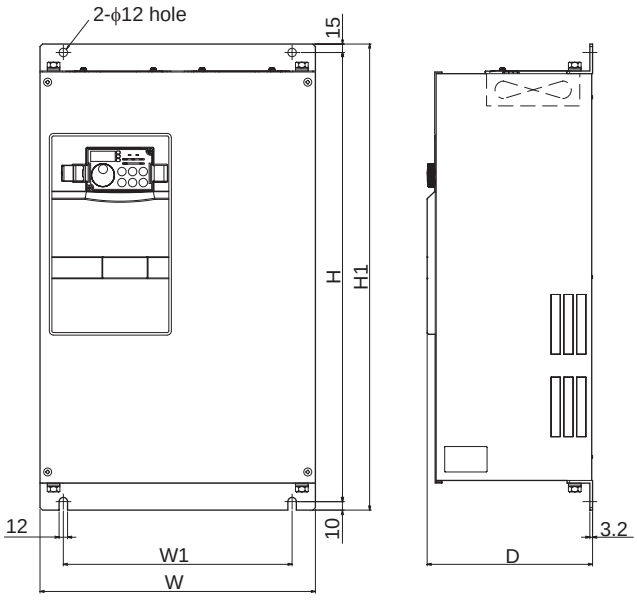
● FR-F720-37K, 45K, 55K
● FR-F740-37K, 45K, 55K




| Inverter Type | W | W1 | W2 | H | H1 | d | D |
|---|---|---|---|---|---|---|---|
| FR-F720-37K<br>FR-F740-37K | 325 | 270 | 10 | 530 | 10 | 10 | 195 |
| FR-F720-45K, 55K<br>FR-F740-45K, 55K | 435 | 380 | 12 | 525 | 15 | 12 | 250 |

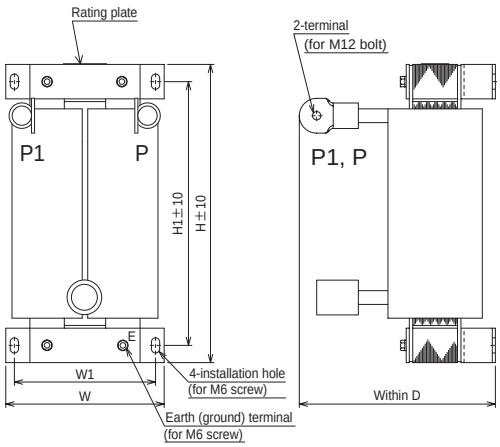
(Unit: mm)

● FR-F740-75K, 90K




| Inverter Type | W | W1 | H | H1 | D |
|---|---|---|---|---|---|
| FR-F740-75K | 435 | 380 | 525 | 550 | 250 |
| FR-F740-90K | 465 | 400 | 595 | 620 | 300 |

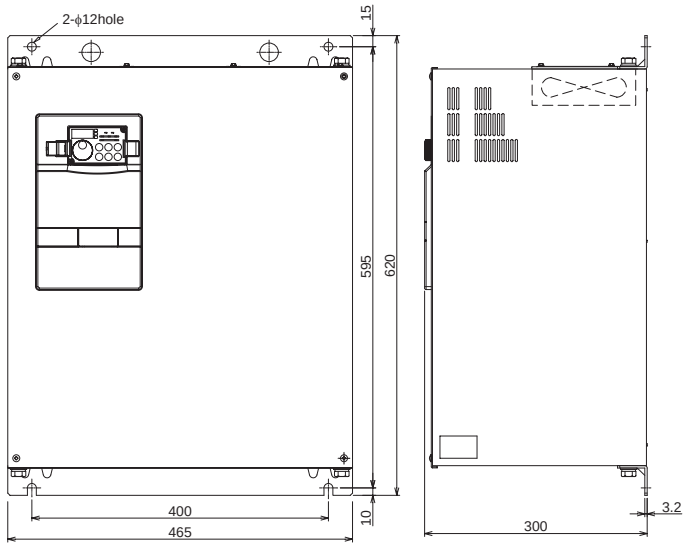
• DC reactor supplied



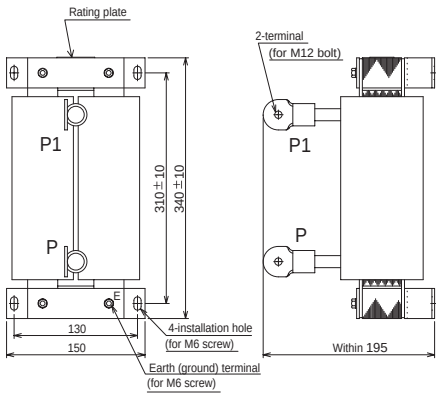

| Inverter Type | W | W1 | H | H1 | D | Mass (kg) |
|---|---|---|---|---|---|---|
| FR-F740-75K<br>(FR-HEL-H75K) | 140 | 120 | 320 | 295 | 185 | 16 |
| FR-F740-90K<br>(FR-HEL-H90K) | 150 | 130 | 340 | 310 | 190 | 20 |

(Unit: mm)

●FR-F740-110K



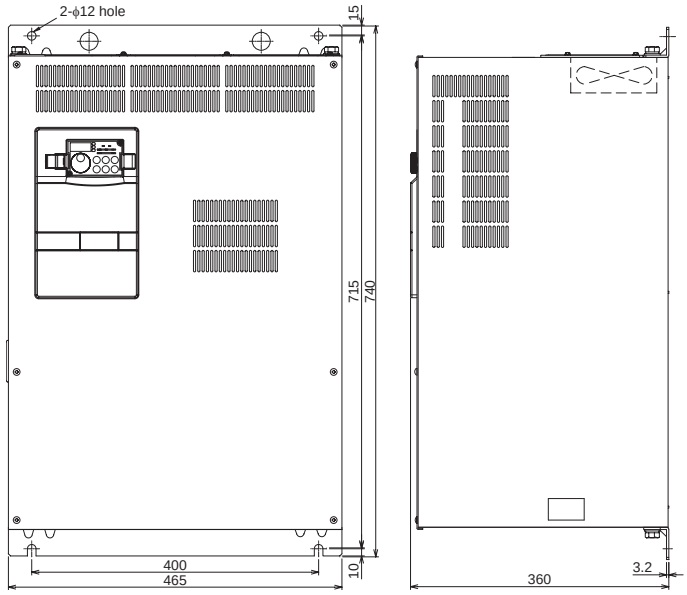

● DC reactor supplied



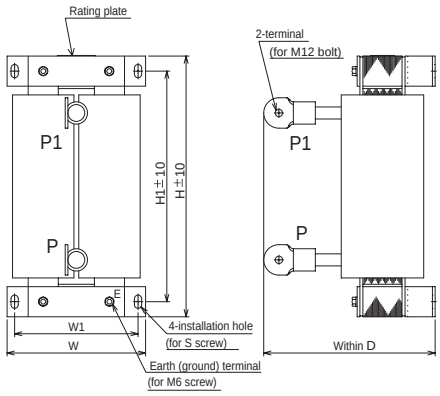

| Inverter Type | Mass (kg) |
|---|---|
| FR-F740-110K(FR-HEL-H110K) | 22 |

(Unit: mm)

●FR-F720-75K, 90K, 110K
●FR-F740-132K, 160K



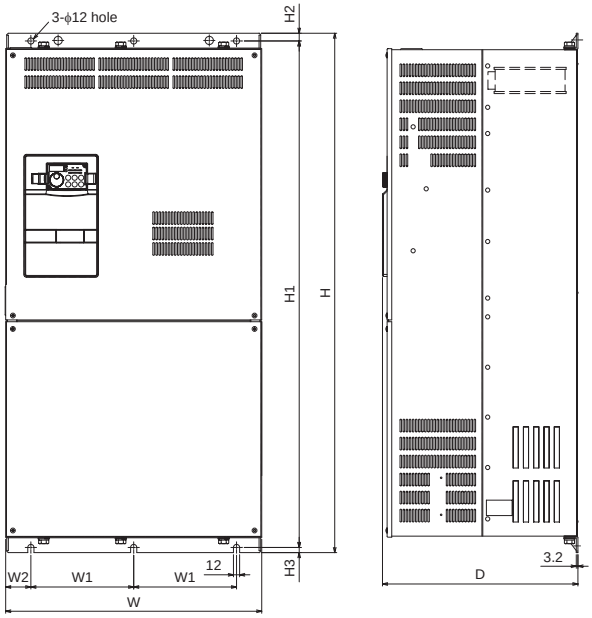

● DC reactor supplied




| Inverter Type | W | W1 | H | H1 | D | S | Mass (kg) |
|---|---|---|---|---|---|---|---|
| FR-F720-75K(FR-HEL-75K) | 150 | 130 | 340 | 310 | 190 | M6 | 17 |
| FR-F720-90K(FR-HEL-90K) | 150 | 130 | 340 | 310 | 200 | M6 | 19 |
| FR-F720-110K(FR-HEL-110K) | 175 | 150 | 400 | 365 | 200 | M8 | 20 |
| FR-F740-132K(FR-HEL-H132K) | 175 | 150 | 405 | 370 | 200 | M8 | 26 |
| FR-F740-160K(FR-HEL-H160K) | 175 | 150 | 405 | 370 | 205 | M8 | 28 |

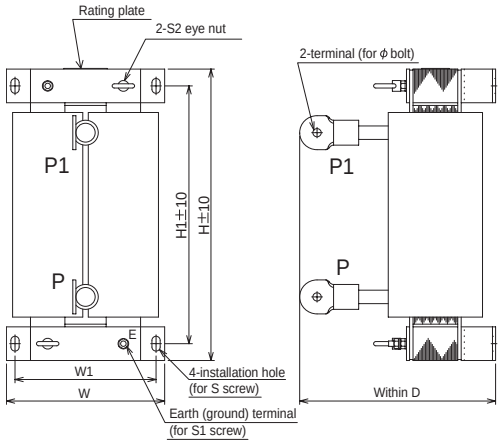
(Unit: mm)

● FR-F740-185K, 220K, 250K, 280K, 315K, 355K




| Inverter Type | W | W1 | W2 | H | H1 | H2 | H3 | D |
|---|---|---|---|---|---|---|---|---|
| FR-F740-185K, 220K | 498 | 200 | 49 | 1010 | 985 | 15 | 10 | 380 |
| FR-F740-250K, 280K, 315K | 680 | 300 | 40 | 1010 | 985 | 15 | 10 | 380 |
| FR-F740-355K | 790 | 315 | 80 | 1330 | 1300 | 15 | 15 | 440 |

● **DC reactor supplied**

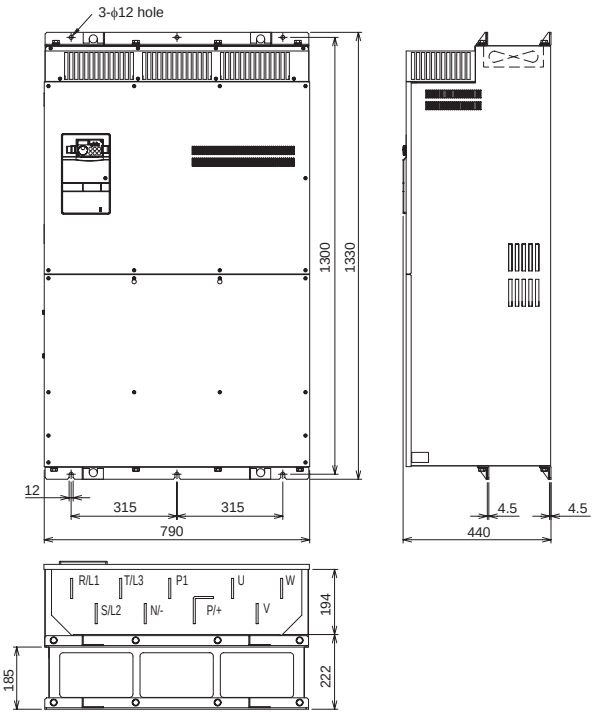



* Remove the eye nut after installation of the product.

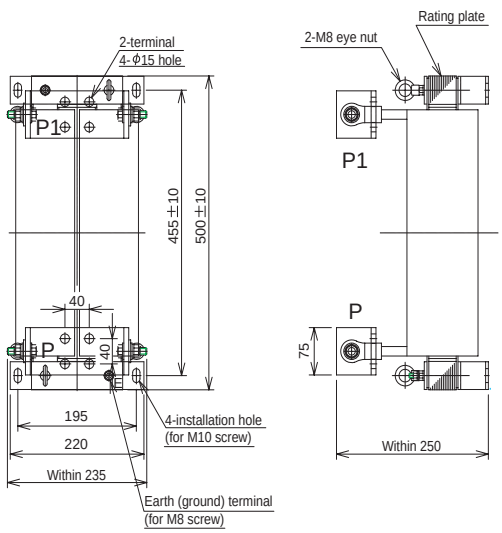
| Inverter Type | W | W1 | H | H1 | D | S | S1 | S2 | φ | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| FR-F740-185K(FR-HEL-H185K) | 175 | 150 | 405 | 370 | 240 | M8 | M6 | — | M12 | 29 |
| FR-F740-220K(FR-HEL-H220K) | 175 | 150 | 405 | 370 | 240 | M8 | M6 | M6 | M12 | 30 |
| FR-F740-250K(FR-HEL-H250K) | 190 | 165 | 440 | 400 | 250 | M8 | M8 | M8 | M12 | 35 |
| FR-F740-280K(FR-HEL-H280K) | 190 | 165 | 440 | 400 | 255 | M8 | M8 | M8 | M16 | 38 |
| FR-F740-315K(FR-HEL-H315K) | 210 | 185 | 495 | 450 | 250 | M10 | M8 | M8 | M16 | 42 |
| FR-F740-355K(FR-HEL-H355K) | 210 | 185 | 495 | 450 | 250 | M10 | M8 | M8 | M16 | 46 |

(Unit: mm)

● FR-F740-400K




● DC reactor supplied

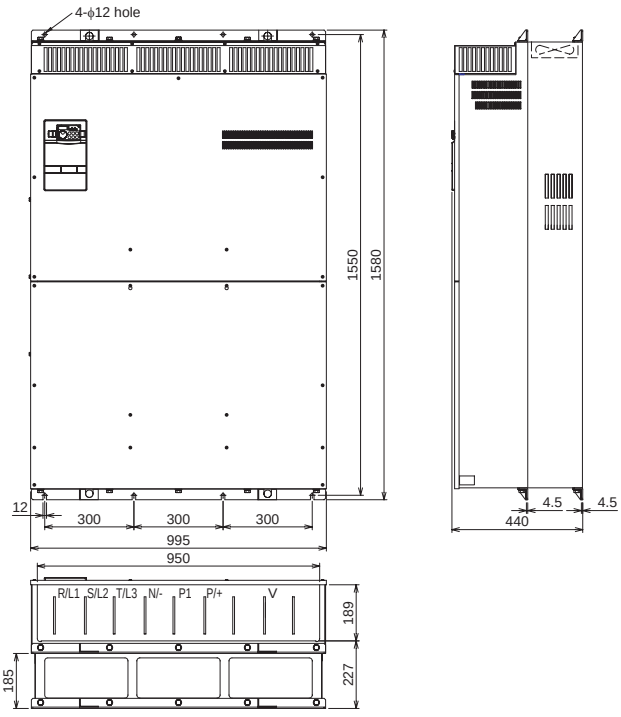



* Remove the eye nut after installation of the product.

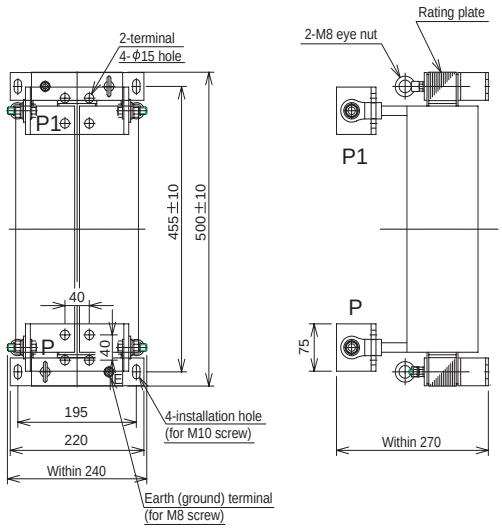
| Inverter Type | Mass (kg) |
|---|---|
| FR-F740-400K(FR-HEL-H400K) | 50 |

(Unit: mm)

● FR-F740-450K




● DC reactor supplied

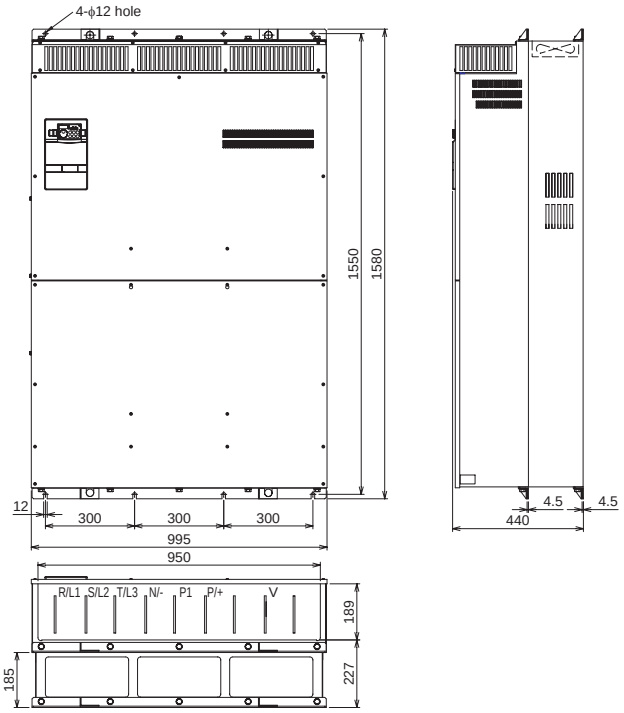



* Remove the eye nut after installation of the product.

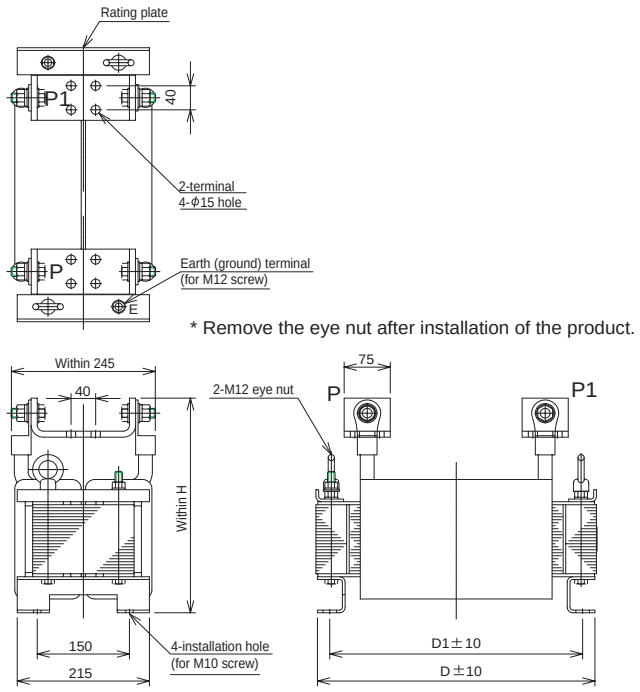
| Inverter Type | Mass (kg) |
|---|---|
| FR-F740-450K(FR-HEL-H450K) | 57 |

(Unit: mm)

● FR-F740-500K, 560K




● DC reactor supplied

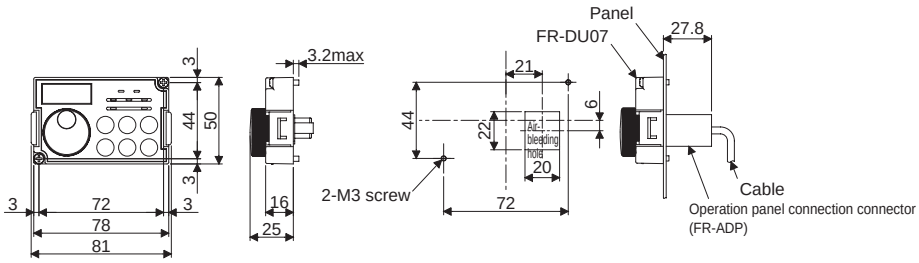



| Inverter Type | H | D | D1 | Mass (kg) |
|---|---|---|---|---|
| FR-F740-500K(FR-HEL-H500K) | 345 | 455 | 405 | 67 |
| FR-F740-560K(FR-HEL-H560K) | 360 | 460 | 410 | 85 |

(Unit: mm)

● Operation panel (FR-DU07)

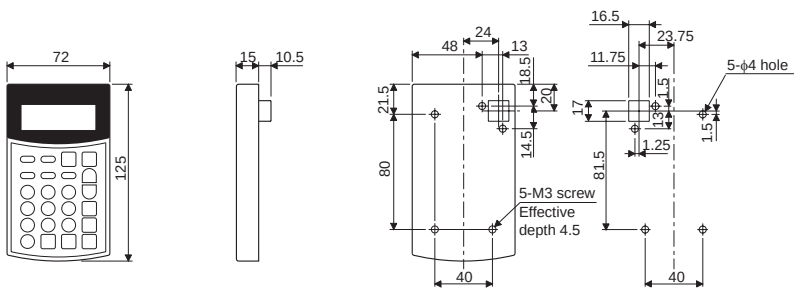
<Outline drawing> <Panel cutting dimension drawing>




(Unit: mm)

● Parameter unit (option) (FR-PU04)

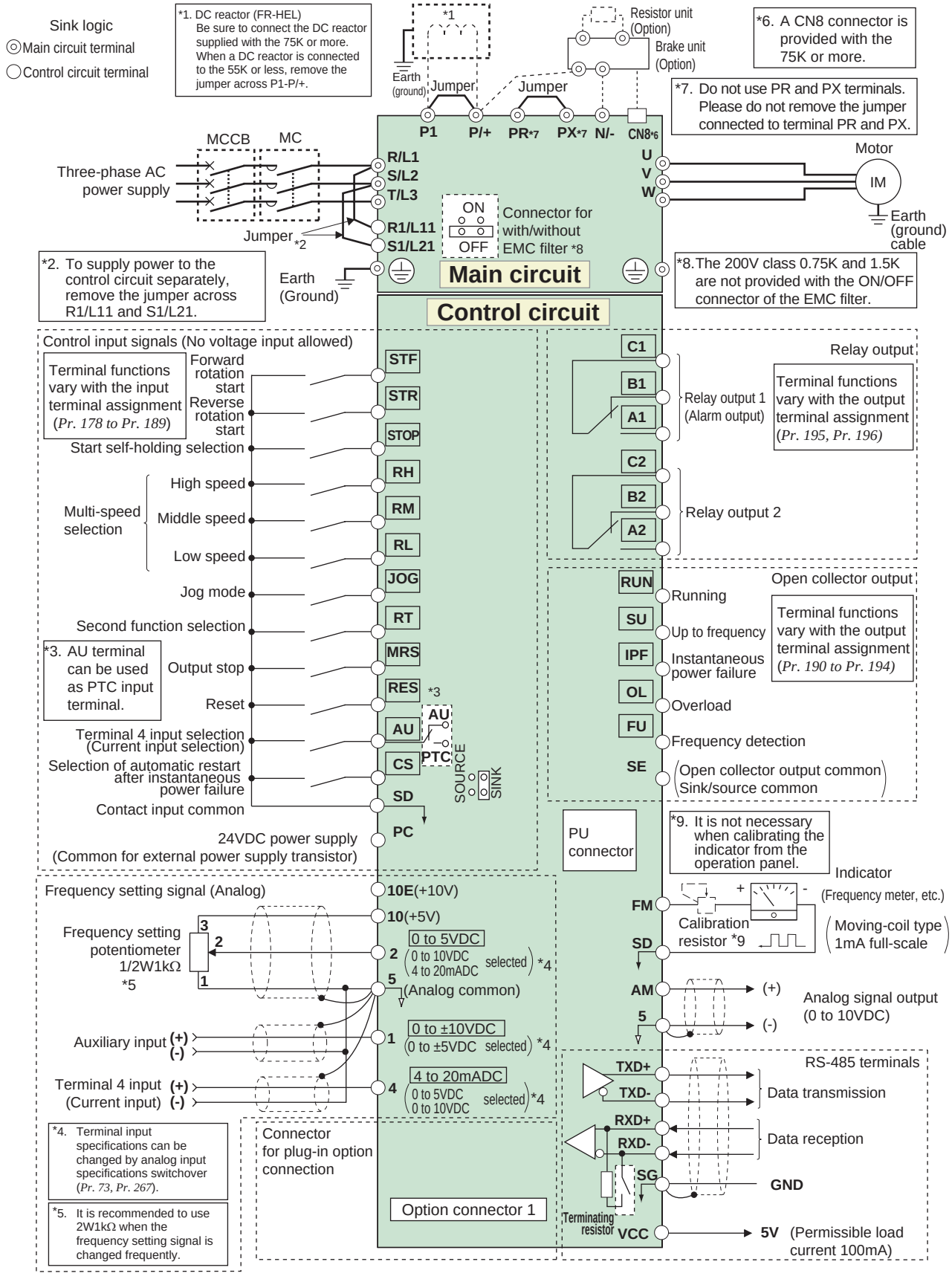
<Outline drawing> <Panel cutting dimension drawing>




Select the installation screws whose length will not exceed the effective depth of the installation screws threads.

(Unit: mm)

# Terminal Connection Diagram




## CAUTION

- To prevent a malfunction due to noise, keep the signal cables more than 10cm away from the power cables.
- Be sure to use the inverter and motor after grounding (earthing) them.
- This connection diagram assumes that the control circuit is sink logic (initial setting). Refer to the instruction manual for the connection in the case of source logic.

# Terminal Specification Explanation

| Type | | Terminal Symbol | Terminal Name | Description | |
|---|---|---|---|---|---|
| Main circuit | | R/L1, S/L2, T/L3 | AC power input | Connect to the commercial power supply. | |
| | | U, V, W | Inverter output | Connect a three-phase squirrel-cage motor. | |
| | | R1/L11, S1/L21 | Power supply for control circuit | Connected to the AC power supply terminals R/L1 and S/L2. To retain the alarm display and alarm output, apply external power to this terminal. | |
| | | P/+, N/- | Brake unit connection | Connect the brake unit (FR-BU, BU, MT-BU5), power regeneration common converter (FR-CV), power regeneration converter (MT-RC) or high power factor converter (FR-HC, MT-HC). | |
| | | P/+, P1 | DC reactor connection | For the 55K or less, remove the jumper across terminals P/+ - P1 and connect the DC reactor. (For the 75K or more, a DC reactor is supplied as standard.) | |
| | | PR, PX | Please do not remove or use terminals PR and PX or the jumper connected. | | |
| | | ⏚ | Earth (Ground) | For earthing (grounding) the inverter chassis. Must be earthed (grounded). | |
| Control circuit input signal | Contact input | STF | Forward rotation start | Turn on the STF signal to start forward rotation and turn it off to stop. | When the STF and STR signals are turned on simultaneously, the stop command is given. |
| | | STR | Reverse rotation start | Turn on the STR signal to start reverse rotation and turn it off to stop. | |
| | | STOP | Start self-holding selection | Turn on the STOP signal to self-hold the start signal. | |
| | | RH, RM, RL | Multi-speed selection | Multi-speed can be selected according to the combination of RH, RM and RL signals. | |
| | | JOG | Jog mode selection | Turn on the JOG signal to select Jog operation (initial setting) and turn on the start signal (STF or STR) to start Jog operation. | |
| | | RT | Second acceleration/ deceleration time selection | Turn on the RT signal to select second acceleration/deceleration time.<br>When the second function such as "second torque boost" and "second V/F (base frequency)" are set, turning on the RT signal selects these functions. | |
| | | MRS | Output stop | Turn on the MRS signal (20ms or more) to stop the inverter output.<br>Use to shut off the inverter output when stopping the motor by electromagnetic brake. | |
| | | RES | Reset | Used to reset alarm output provided when protective function is activated. Turn on the RES signal for more than 0.1s, then turn it off.<br>Recover about 1s after reset is cancelled. | |
| | | AU | Terminal 4 input selection | Terminal 4 is made valid only when the AU signal is turned on. (The frequency setting signal can be set between 4 and 20mADC.)<br>Turning the AU signal on makes terminal 2 (voltage input) invalid. | |
| | | | PTC input | AU terminal is used as PTC input terminal (thermal protection of the motor). When using it as PTC input terminal, set the AU/PTC switch to PTC. | |
| | | CS | Selection of automatic restart after instantaneous power failure | When the CS signal is left on, the inverter restarts automatically at power restoration. Note that restart setting is necessary for this operation. In the initial setting, a restart is disabled. | |
| | | SD | Contact input common (sink) | Common terminal for contact input terminal (sink logic) and terminal FM. Common output terminal for 24VDC 0.1A power supply (PC terminal). Isolated from terminals 5 and SE. | |
| | | PC | External transistor common, 24VDC power supply, contact input common (source) | When connecting the transistor output (open collector output), such as a programmable controller (PLC), when sink logic is selected, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents. Can be used as 24VDC 0.1A power supply. When source logic has been selected, this terminal serves as a contact input common. | |
| | Frequency setting | 10E | Frequency setting power supply | When connecting the frequency setting potentiometer at an initial status, connect it to terminal 10.<br>Change the input specifications when connecting it to terminal 10E. | 10VDC, permissible load current 10mA. |
| | | 10 | | | 5VDC, Permissible load current 10mA. |
| | | 2 | Frequency setting (voltage) | Inputting 0 to 5VDC (or 0 to 10V, 4 to 20mA) provides the maximum output frequency at 5V (10V, 20mA) and makes input and output proportional. Use *Pr.73* to switch from among input 0 to 5VDC (initial setting), 0 to 10VDC, and 4 to 20mA.<br>Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC<br>Current input: Input resistance 250Ω ± 2% Maximum permissible current 30mA | |
| | | 4 | Frequency setting (current) | Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA (5V, 10V) makes input and output proportional. This input signal is valid only when the AU signal is on (terminal 2 input is invalid). Use *Pr.267* to switch between the input 4 to 20mA and 0 to 5VDC, 0 to 10VDC (initial setting).<br>Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC<br>Current input: Input resistance 250Ω ± 2% Maximum permissible current 30mA | |
| | | 1 | Frequency setting auxiliary | Inputting 0 to ±5 VDC or 0 to ±10VDC adds this signal to terminal 2 or 4 frequency setting signal. Use *Pr.73* to switch between the input 0 to ±5VDC and 0 to ±10VDC (initial setting).<br>Input resistance 10kΩ ± 1kΩ, Maximum permissible voltage ± 20VDC | |
| | | 5 | Frequency setting common | Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground). | |

| Type | | Terminal Symbol | | Terminal Name | Description | |
|---|---|---|---|---|---|---|
| Control circuitoutput signal | Relay | A1, B1, C1 | | Relay output 1 (alarm output) | Changeover contact output indicates that the inverter protective function has activated and the output stopped. Abnormal: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C) Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A | |
| | | A2, B2, C2 | | Relay output 2 | 1 changeover contact output Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A | |
| | Open collector | RUN | | Inverter running | Switched low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched high during stop or DC injection brake operation.*1 | Permissible load 24VDC 0.1A (a voltage drop is 3.4V maximum when the signal is on)<br><br>Alarm code (4bit) output (Refer to *page 36*) |
| | | SU | | Up to frequency | Switched low when the output frequency reaches within the range of ±10% (initial value) of the set frequency. Switched high during acceleration/deceleration and at a stop.*1 | |
| | | OL | | Overload alarm | Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled. *1 | |
| | | IPF | | Instantaneous power failure | Switched low when an instantaneous power failure and under voltage protections are activated. *1 | |
| | | FU | | Frequency detection | Switched low when the inverter output frequency is equal to or higher than the preset detected frequency and high when less than the preset detected frequency. *1 | |
| | | SE | | Open collector output common | Common terminal for terminals RUN, SU, OL, IPF, FU | |
| | Pulse | FM | | For meter | Select one e.g. output frequency from monitor items. *2<br>The output signal is proportional to the magnitude of the corresponding monitoring item. | Output item:<br>Output frequency (initial setting)<br>Permissible load current 2mA<br>1440 pulses/s at 60Hz |
| | Analog | AM | | Analog signal output | | Output item:<br>Output frequency (initial setting)<br>Output signal 0 to 10VDC<br>Permissible load current 1mA (load impedance 10kΩ or more) Resolution 8 bit |
| Communication | | PU connector | | PU connector | With the PU connector, communication can be made through RS-485.<br>(for connection on a 1:1 basis only)<br>. Conforming standard : EIA-485(RS-485)<br>. Transmission format : Multidrop<br>. Communication speed : 4800 to 38400bps<br>. Overall length : 500m | |
| | | RS-485 terminal | TXD+ | Inverter transmission terminal | With the RS-485 terminal, communication can be made through RS-485.<br>Conforming standard : EIA-485 (RS-485)<br>Transmission format : Multidrop link<br>Communication speed : 300 to 38400bps<br>Overall length : 500m | |
| | | | TXD- | | | |
| | | | RXD+ | Inverter reception terminal | | |
| | | | RXD- | | | |
| | | | SG | Earth (Ground) | | |

**CAUTION**

- The inverter will be damaged if power is applied to the inverter output terminals (U, V, W). Never perform such wiring.
- ▭ indicates that terminal functions can be selected from *Pr. 178 to Pr. 196* (I/O terminal function selection)

*1. Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).
*2. Not output during inverter reset.

# Explanation of the Operation Panel (FR-DU07)

**Operation mode indication**
PU: Lit to indicate PU operation mode.
EXT: Lit to indicate external operation mode.
NET: Lit to indicate network operation mode.

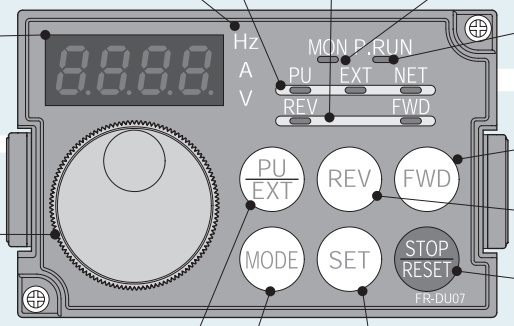
**Rotation direction indication**
FWD: Lit during forward rotation
REV: Lit during reverse rotation
On: Forward/reverse operation
Flickering: When the frequency command is not given even if the forward/reverse command is given.

**Unit indication**
· Hz: Lit to indicate frequency.
· A: Lit to indicate current.
· V: Lit to indicate voltage.
(Flicker when the set frequency monitor is displayed.)

**Monitor indication**
Lit to indicate monitoring mode.

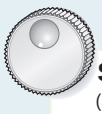
**No function**

**Monitor(4-digit LED)**
Shows the frequency, parameter number, etc.




FWD **Operation command forward rotation**

REV **Operation command reverse rotation**



**Setting dial**
(Setting dial: Mitsubishi inverter dial)
Used to change the frequency setting and parameter values.

STOP/RESET **Stop operation**
Alarms can be reset


SET
Used to set each setting.
If pressed during operation, monitor changes as below;

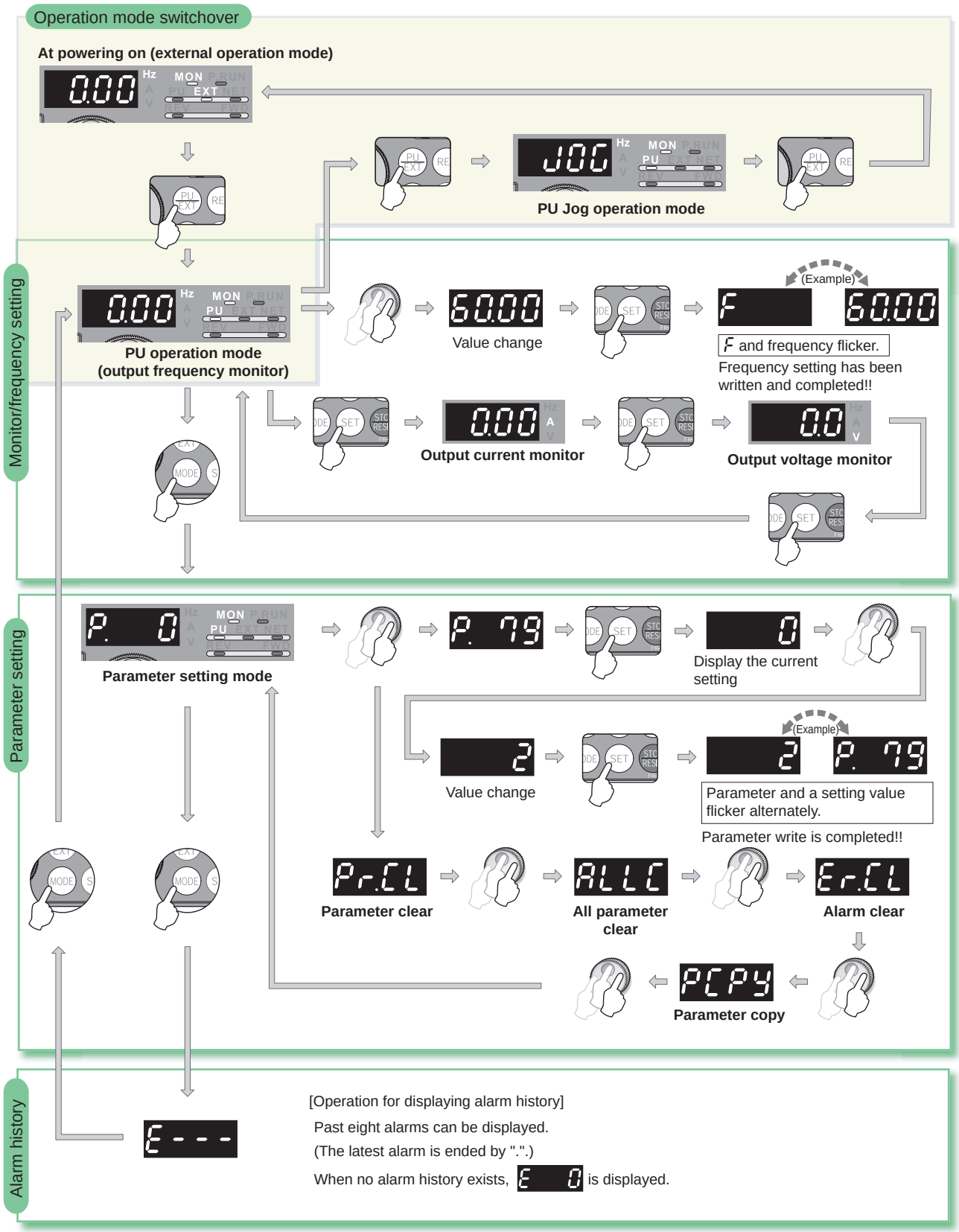
Running frequency → Output current → Output voltage *

* Energy saving monitor is displayed when the energy saving monitor of *Pr. 52* is set.

MODE **Mode switchover**
Used to change each setting mode.

PU/EXT **Operation mode switchover**
Used to switch between the PU and external operation mode.
When using the external operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indication. (Change the *Pr.79* value to use the combined mode.)
PU: PU operation mode
EXT: External operation mode

## Basic operation



# Parameter List

For simple variable-speed operation of the inverter, the initial setting of the parameters may be used as they are. Set the necessary parameters to meet the load and operational specifications. Parameter setting, change and check can be made from the operation panel (FR-DU07). For details of parameters, refer to the instruction manual.

**POINT**

Only simple mode parameters are displayed by the initial setting of *Pr.160 User group read selection.* Set *Pr.160 User group read selection* as required.

## ●Simple mode parameter

| Parameter Number | Name | Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|
| 0 | Torque boost | 0 to 30% | 0.1% | 6/4/3/2/1.5/1%*2 | 28 |
| 1 | Maximum frequency | 0 to 120Hz | 0.01Hz | 120/60Hz*1 | 28 |
| 2 | Minimum frequency | 0 to 120Hz | 0.01Hz | 0Hz | 28 |
| 3 | Base frequency | 0 to 400Hz | 0.01Hz | 60Hz | 28 |
| 4 | Multi-speed setting (high speed) | 0 to 400Hz | 0.01Hz | 60Hz | 28 |
| 5 | Multi-speed setting (middle speed) | 0 to 400Hz | 0.01Hz | 30Hz | 28 |
| 6 | Multi-speed setting (low speed) | 0 to 400Hz | 0.01Hz | 10Hz | 28 |
| 7 | Acceleration time | 0 to 3600/ 360s | 0.1/0.01s | 5s/15s*3 | 28 |
| 8 | Deceleration time | 0 to 3600/ 360s | 0.1/0.01s | 10s/30s*3 | 28 |
| 9 | Electronic thermal O/L relay | 0 to 500/ 0 to 3600A*1 | 0.01/0.1A*1 | Rated inverter output current | 29 |
| 60 | Energy saving control selection | 0, 4, 9 | 1 | 0 | 34 |
| 79 | Operation mode selection | 0, 1, 2, 3, 4, 6, 7 | 1 | 0 | 37 |
| 125 | Terminal 2 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| 126 | Terminal 4 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| 160 | User group read selection | 0, 1, 9999 | 1 | 9999 | 40 |

## ●Extended mode parameter

**Remarks**

- The parameters marked with ◎ indicate simple mode parameters.
- The shaded parameters in the table allow its setting to be changed during operation even if "0" (initial value) is set in *Pr. 77 Parameter write selection*.

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| Basic functions | ◎ 0 | Torque boost | 0 to 30% | 0.1% | 6/4/3/2/1.5/1%*2 | 28 |
| | ◎ 1 | Maximum frequency | 0 to 120Hz | 0.01Hz | 120/60Hz*1 | 28 |
| | ◎ 2 | Minimum frequency | 0 to 120Hz | 0.01Hz | 0Hz | 28 |
| | ◎ 3 | Base frequency | 0 to 400Hz | 0.01Hz | 60Hz | 28 |
| | ◎ 4 | Multi-speed setting (high speed) | 0 to 400Hz | 0.01Hz | 60Hz | 28 |
| | ◎ 5 | Multi-speed setting (middle speed) | 0 to 400Hz | 0.01Hz | 30Hz | 28 |
| | ◎ 6 | Multi-speed setting (low speed) | 0 to 400Hz | 0.01Hz | 10Hz | 28 |
| | ◎ 7 | Acceleration time | 0 to 3600/ 360s | 0.1/0.01s | 5s/15s*3 | 28 |
| | ◎ 8 | Deceleration time | 0 to 3600/ 360s | 0.1/0.01s | 10s/30s*3 | 28 |
| | ◎ 9 | Electronic thermal O/L relay | 0 to 500/ 0 to 3600A*1 | 0.01/0.1A*1 | Rated inverter output current | 29 |
| DC Injection Brake | 10 | DC injection brake operation frequency | 0 to 120Hz, 9999 | 0.01Hz | 3Hz | 29 |
| | 11 | DC injection brake operation time | 0 to 10s | 0.1s | 0.5s | 29 |
| | 12 | DC injection brake operation voltage | 0 to 30% | 0.1% | 4/2/1%*4 | 29 |
| — | 13 | Starting frequency | 0 to 60Hz | 0.01Hz | 0.5Hz | 29 |
| — | 14 | Load pattern selection | 0, 1 | 1 | 1 | 29 |
| Jog operation | 15 | Jog frequency | 0 to 400Hz | 0.01Hz | 5Hz | 29 |
| | 16 | Jog acceleration/deceleration time | 0 to 3600/360s | 0.1/0.01s | 0.5s | 29 |

*1 Differ according to capacities. (55K or less/75K or more)
*2 Differ according to capacities. (0.75K/1.5K to 3.7K/5.5K, 7.5K/11K to 37K/45K, 55K/75K or more)
*3 Differ according to capacities. (7.5K or less/11K or more)
*4 Differ according to capacities. (7.5K or less/11K to 55K/75K or more)

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| — | 17 | MRS input selection | 0, 2 | 1 | 0 | 29 |
| — | 18 | High speed maximum frequency | 120 to 400Hz | 0.01Hz | 120/60Hz*1 | 28 |
| — | 19 | Base frequency voltage | 0 to 1000V, 8888, 9999 | 0.1V | 9999 | 28 |
| Acceleration and deceleration times | 20 | Acceleration/deceleration reference frequency | 1 to 400Hz | 0.01Hz | 60Hz | 28 |
| | 21 | Acceleration/deceleration time increments | 0, 1 | 1 | 0 | 28 |
| Stall prevention | 22 | Stall prevention operation level | 0 to 150%, 9999 | 0.1% | 120% | 30 |
| | 23 | Stall prevention operation level compensation factor at double speed | 0 to 200%, 9999 | 0.1% | 9999 | 30 |
| Multi-speed setting | 24 to 27 | Multi-speed setting 4 speed to 7 speed | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 28 |
| — | 28 | Multi-speed input compensation selection | 0, 1 | 1 | 0 | 30 |
| — | 29 | Acceleration/deceleration pattern selection | 0, 1, 2, 3 | 1 | 0 | 30 |
| — | 30 | Regenerative function selection | 0, 2/0, 1, 2*1 | 1 | 0 | 31 |
| Frequency jump | 31 | Frequency jump 1A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| | 32 | Frequency jump 1B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| | 33 | Frequency jump 2A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| | 34 | Frequency jump 2B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| | 35 | Frequency jump 3A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| | 36 | Frequency jump 3B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| — | 37 | Speed display | 0, 1 to 9998 | 1 | 0 | 31 |
| Frequency detection | 41 | Up-to-frequency sensitivity | 0 to 100% | 0.1% | 10% | 31 |
| | 42 | Output frequency detection | 0 to 400Hz | 0.01Hz | 6Hz | 31 |
| | 43 | Output frequency detection for reverse rotation | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 31 |
| Second functions | 44 | Second acceleration/deceleration time | 0 to 3600/360s | 0.1/0.01s | 5s | 28 |
| | 45 | Second deceleration time | 0 to 3600/360s, 9999 | 0.1/0.01s | 9999 | 28 |
| | 46 | Second torque boost | 0 to 30%, 9999 | 0.1% | 9999 | 28 |
| | 47 | Second V/F (base frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 28 |
| | 48 | Second stall prevention operation current | 0 to 150% | 0.1% | 120% | 30 |
| | 49 | Second stall prevention operation frequency | 0 to 400Hz, 9999 | 0.01Hz | 0Hz | 30 |
| | 50 | Second output frequency detection | 0 to 400Hz | 0.01Hz | 30Hz | 31 |
| | 51 | Second electronic thermal O/L relay | 0 to 500A, 9999 / 0 to 3600A, 9999*1 | 0.01/0.1A*1 | 9999 | 29 |
| Monitor functions | 52 | DU/PU main display data selection | 0, 5, 6, 8 to 14, 17, 20, 23 to 25, 50 to 57, 100 | 1 | 0 | 32 |
| | 54 | FM terminal function selection | 1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53 | 1 | 1 | 32 |
| | 55 | Frequency monitoring reference | 0 to 400Hz | 0.01Hz | 60Hz | 32 |
| | 56 | Current monitoring reference | 0 to 500/0 to 3600A*1 | 0.01/0.1A*1 | Rated inverter output current | 32 |
| Automatic restart functions | 57 | Restart coasting time | 0, 0.1 to 5s, 9999/ 0, 0.1 to 30s, 9999*1 | 0.1s | 9999 | 33 |
| | 58 | Restart cushion time | 0 to 60s | 0.1s | 1s | 33 |
| — | 59 | Remote function selection | 0, 1, 2, 3 | 1 | 0 | 33 |
| — | ◎ 60 | Energy saving control selection | 0, 4, 9 | 1 | 0 | 34 |
| — | 65 | Retry selection | 0 to 5 | 1 | 0 | 34 |

*1 Differ according to capacities. (55K or less/75K or more)

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| — | 66 | Stall prevention operation reduction starting frequency | 0 to 400Hz | 0.01Hz | 60Hz | 30 |
| Retry | 67 | Number of retries at alarm occurrence | 0 to 10, 101 to 110 | 1 | 0 | 34 |
| | 68 | Retry waiting time | 0 to 10s | 0.1s | 1s | 34 |
| | 69 | Retry count display erase | 0 | 1 | 0 | 34 |
| — | 70 | Special regenerative brake duty *2 | 0 to 10% | 0.1% | 0% | 31 |
| — | 71 | Applied motor | 0, 1, 2, 20 | 1 | 0 | 34 |
| — | 72 | PWM frequency selection | 0 to 15/0 to 6, 25*1 | 1 | 2 | 35 |
| — | 73 | Analog input selection | 0 to 7, 10 to 17 | 1 | 1 | 35 |
| — | 74 | Input filter time constant | 0 to 8 | 1 | 1 | 36 |
| — | 75 | Reset selection/disconnected PU detection/PU stop selection | 0 to 3, 14 to 17 | 1 | 14 | 36 |
| — | 76 | Alarm code output selection | 0, 1, 2 | 1 | 0 | 36 |
| — | 77 | Parameter write selection | 0, 1, 2 | 1 | 0 | 36 |
| — | 78 | Reverse rotation prevention selection | 0, 1, 2 | 1 | 0 | 36 |
| — | ◎ 79 | Operation mode selection | 0, 1, 2, 3, 4, 6, 7 | 1 | 0 | 37 |
| Simple magnetic flux vector control | 80 | Motor capacity (simple magnetic flux vector control) | 0.4 to 55kW, 9999 /0 to 3600kW, 9999*1 | 0.01/0.1kW*1 | 9999 | 37 |
| | 90 | Motor constant (R1) | 0 to 50Ω, 9999 /0 to 400mΩ, 9999*1 | 0.001Ω/ 0.01mΩ*1 | 9999 | 37 |
| Adjustable 5 points V/F | 100 | V/F1 (first frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 38 |
| | 101 | V/F1 (first frequency voltage) | 0 to 1000V | 0.1V | 0V | 38 |
| | 102 | V/F2 (second frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 38 |
| | 103 | V/F2 (second frequency voltage) | 0 to 1000V | 0.1V | 0V | 38 |
| | 104 | V/F3 (third frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 38 |
| | 105 | V/F3 (third frequency voltage) | 0 to 1000V | 0.1V | 0V | 38 |
| | 106 | V/F4 (fourth frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 38 |
| | 107 | V/F4 (fourth frequency voltage) | 0 to 1000V | 0.1V | 0V | 38 |
| | 108 | V/F5 (fifth frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 38 |
| | 109 | V/F5 (fifth frequency voltage) | 0 to 1000V | 0.1V | 0V | 38 |
| PU connector communication | 117 | PU communication station | 0 to 31 | 1 | 0 | 38 |
| | 118 | PU communication speed | 48, 96, 192, 384 | 1 | 192 | 38 |
| | 119 | PU communication stop bit length. | 0, 1, 10, 11 | 1 | 1 | 38 |
| | 120 | PU communication parity check | 0, 1, 2 | 1 | 2 | 38 |
| | 121 | Number of PU communication retries | 0 to 10, 9999 | 1 | 1 | 38 |
| | 122 | PU communication check time interval | 0, 0.1 to 999.8s, 9999 | 0.1s | 9999 | 38 |
| | 123 | PU communication waiting time setting | 0 to 150ms, 9999 | 1 | 9999 | 38 |
| | 124 | PU communication CR/LF presence/ absence selection | 0, 1, 2 | 1 | 1 | 38 |
| — | ◎ 125 | Terminal 2 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| — | ◎ 126 | Terminal 4 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| PID operation | 127 | PID control automatic switchover freqeuncy | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 39 |
| | 128 | PID action selection | 10, 11, 20, 21, 50, 51, 60, 61 | 1 | 10 | 39 |
| | 129 | PID proportional band | 0.1 to 1000%, 9999 | 0.1% | 100% | 39 |
| | 130 | PID integral time | 0.1 to 3600s, 9999 | 0.1s | 1s | 39 |
| | 131 | PID upper limit | 0 to 100%, 9999 | 0.1% | 9999 | 39 |
| | 132 | PID lower limit | 0 to 100%, , 9999 | 0.1% | 9999 | 39 |
| | 133 | PID action set point | 0 to 100%, 9999 | 0.01% | 9999 | 39 |
| | 134 | PID differential time | 0.01 to 10.00s, 9999 | 0.01s | 9999 | 39 |

*1 Differ according to capacities. (55K or less/75K or more)
*2 Setting can be made for the 75K or more.

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| Commercial power supply-inverter switch-over | 135 | Commercial power-supply switchover sequence output terminal selection | 0, 1 | 1 | 0 | 39 |
| | 136 | MC switchover interlock time | 0 to 100s | 0.1s | 1s | 39 |
| | 137 | Waiting time at a start | 0 to 100s | 0.1s | 0.5s | 39 |
| | 138 | Commercial power-supply operation switchover selection at an alarm | 0, 1 | 1 | 0 | 39 |
| | 139 | Automatic switchover frequency between inverter and commercial power-supply operation | 0 to 60Hz, 9999 | 0.01Hz | 9999 | 39 |
| Backlash measures | 140 | Backlash acceleration stopping frequency | 0 to 400Hz | 0.01Hz | 1Hz | 30 |
| | 141 | Backlash acceleration stopping time | 0 to 360s | 0.1s | 0.5s | 30 |
| | 142 | Backlash deceleration stopping frequency | 0 to 400Hz | 0.01Hz | 1Hz | 30 |
| | 143 | Backlash deceleration stopping time | 0 to 360s | 0.1s | 0.5s | 30 |
| — | 144 | Speed setting switchover | 0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110 | 1 | 4 | 31 |
| PU | 145 | PU display language selection | 0 to 7 | 1 | 0 | 40 |
| Current detection | 148 | Stall prevention level at 0V input. | 0 to 150% | 0.1% | 120% | 30 |
| | 149 | Stall prevention level at 10V input. | 0 to 150% | 0.1% | 150% | 30 |
| | 150 | Output current detection level | 0 to 150% | 0.1% | 120% | 40 |
| | 151 | Output current detection signal delay time | 0 to 10s | 0.1s | 0s | 40 |
| | 152 | Zero current detection level | 0 to 150% | 0.1% | 5% | 40 |
| | 153 | Zero current detection time | 0 to 1s | 0.01s | 0.5s | 40 |
| — | 154 | Voltage reduction selection during stall prevention operation | 0, 1 | 1 | 1 | 30 |
| — | 155 | RT signal reflection time selection | 0, 10 | 1 | 0 | 40 |
| — | 156 | Stall prevention operation selection | 0 to 31, 100, 101 | 1 | 0 | 30 |
| — | 157 | OL signal output timer | 0 to 25s, 9999 | 0.1s | 0s | 30 |
| — | 158 | AM terminal function selection | 1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53 | 1 | 1 | 32 |
| — | 159 | Automatic switchover ON range between commercial power-supply and inverter operation | 0 to 10Hz, 9999 | 0.01Hz | 9999 | 39 |
| — | ◎160 | User group read selection | 0, 1, 9999 | 1 | 9999 | 40 |
| — | 161 | Frequency setting/key lock operation selection | 0, 1, 10, 11 | 1 | 0 | 41 |
| Automatic restart functions | 162 | Automatic restart after instantaneous power failure selection | 0, 1, 10, 11 | 1 | 0 | 33 |
| | 163 | First cushion time for restart | 0 to 20s | 0.1s | 0s | 33 |
| | 164 | First cushion voltage for restart | 0 to 100% | 0.1% | 0% | 33 |
| | 165 | Stall prevention operation level for restart | 0 to 150% | 0.1% | 120% | 33 |
| Current detection | 166 | Output current detection signal retention time | 0 to 10s, 9999 | 0.1s | 0.1s | 40 |
| | 167 | Output current detection operation selection | 0, 1 | 1 | 0 | 40 |
| — | 168 | Parameter for manufacturer setting. Do not set. | | | | |
| — | 169 | | | | | |
| Cumulative monitor clear | 170 | Cumulative power meter clear | 0, 10, 9999 | 1 | 9999 | 32 |
| | 171 | Operation hour meter clear | 0, 9999 | 1 | 9999 | 32 |
| User group | 172 | User group registered display/batch clear | 9999, (0 to 16) | 1 | 0 | 40 |
| | 173 | User group registration | 0 to 999, 9999 | 1 | 9999 | 40 |
| | 174 | User group clear | 0 to 999, 9999 | 1 | 9999 | 40 |

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| Input terminal function assignment | 178 | STF terminal function selection | 0 to 8, 10 to 12, 14, 16, 24, 25, 60, 62, 64 to 67, 9999 | 1 | 60 | 41 |
| | 179 | STR terminal function selection | 0 to 8, 10 to 12, 14, 16, 24, 25, 61, 62, 64 to 67, 9999 | 1 | 61 | 41 |
| | 180 | RL terminal function selection | 0 to 8, 10 to 12, 14, 16, 24, 25, 62, 64 to 67, 9999 | 1 | 0 | 41 |
| | 181 | RM terminal function selection | | 1 | 1 | 41 |
| | 182 | RH terminal function selection | | 1 | 2 | 41 |
| | 183 | RT terminal function selection | | 1 | 3 | 41 |
| | 184 | AU terminal function selection | 0 to 8, 10 to 12, 14, 16, 24, 25, 62 to 67, 9999 | 1 | 4 | 41 |
| | 185 | JOG terminal function selection | 0 to 8, 10 to 12, 14, 16, 24, 25, 62, 64 to 67, 9999 | 1 | 5 | 41 |
| | 186 | CS terminal function selection | | 1 | 6 | 41 |
| | 187 | MRS terminal function selection | | 1 | 24 | 41 |
| | 188 | STOP terminal function selection | | 1 | 25 | 41 |
| | 189 | RES terminal function selection | | 1 | 62 | 41 |
| Output terminal function assignment | 190 | RUN terminal function selection | 0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 47, 64, 70, 90 to 96, 98, 99, 100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 147, 164, 170, 190 to 196, 198, 199, 9999 | 1 | 0 | 41 |
| | 191 | SU terminal function selection | | 1 | 1 | 41 |
| | 192 | IPF terminal function selection | | 1 | 2 | 41 |
| | 193 | OL terminal function selection | | 1 | 3 | 41 |
| | 194 | FU terminal function selection | | 1 | 4 | 41 |
| | 195 | ABC1 terminal function selection | 0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 47, 64, 70, 90, 91, 94 to 96, 98, 99, 100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 147, 164, 170, 190, 191, 194 to 196, 198, 199, 9999 | 1 | 99 | 41 |
| | 196 | ABC2 terminal function selection | | 1 | 9999 | 41 |
| Multi-speed setting | 232 to 239 | Multi-speed setting 8 speed to 15 speed | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 28 |
| — | 240 | Soft-PWM operation selection | 0, 1 | 1 | 1 | 35 |
| — | 241 | Analog input display unit switchover | 0, 1 | 1 | 0 | 39 |
| — | 242 | Terminal 1 added compensation amount (terminal 2) | 0 to 100% | 0.1% | 100% | 35 |
| — | 243 | Terminal 1 added compensation amount (terminal 4) | 0 to 100% | 0.1% | 75% | 35 |
| — | 244 | Cooling fan operation selection | 0, 1 | 1 | 1 | 42 |
| Slip compensation | 245 | Rated slip | 0 to 50%, 9999 | 0.01% | 9999 | 42 |
| | 246 | Slip compensation time constant | 0.01 to 10s | 0.01s | 0.5s | 42 |
| | 247 | Constant-output region slip compensation selection | 0, 9999 | 1 | 9999 | 42 |
| — | 250 | Stop selection | 0 to 100s, 1000 to 1100s, 8888, 9999 | 0.1s | 9999 | 42 |
| — | 251 | Output phase failure protection selection | 0, 1 | 1 | 1 | 42 |
| Frequency compensation function | 252 | Override bias | 0 to 200% | 0.1% | 50% | 35 |
| | 253 | Override gain | 0 to 200% | 0.1% | 150% | 35 |
| Life check | 255 | Life alarm status display | (0 to 15) | 1 | 0 | 42 |
| | 256 | Inrush current limit circuit life display | (0 to 100%) | 1% | 100% | 42 |
| | 257 | Control circuit capacitor life display | (0 to 100%) | 1% | 100% | 42 |
| | 258 | Main circuit capacitor life display | (0 to 100%) | 1% | 100% | 42 |
| | 259 | Main circuit capacitor life measuring | 0, 1 | 1 | 0 | 42 |
| — | 260 | PWM frequency automatic switchover | 0, 1 | 1 | 1 | 35 |

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| Power failure stop | 261 | Power failure stop selection | 0, 1, 2 | 1 | 0 | 43 |
| | 262 | Subtracted frequency at deceleration start | 0 to 20Hz | 0.01Hz | 3Hz | 43 |
| | 263 | Subtraction starting frequency | 0 to 120Hz, 9999 | 0.01Hz | 60Hz | 43 |
| | 264 | Power-failure deceleration time 1 | 0 to 3600/ 360s | 0.1/0.01s | 5s | 43 |
| | 265 | Power-failure deceleration time 2 | 0 to 3600/ 360s, 9999 | 0.1/0.01s | 9999 | 43 |
| | 266 | Power failure deceleration time switchover frequency | 0 to 400Hz | 0.01Hz | 60Hz | 43 |
| — | 267 | Terminal 4 input selection | 0, 1, 2 | 1 | 0 | 35 |
| — | 268 | Monitor decimal digits selection | 0, 1, 9999 | 1 | 9999 | 32 |
| — | 269 | Parameter for manufacturer setting. Do not set. | | | | |
| — | 299 | Rotation direction detection selection at restarting | 0, 1, 9999 | 1 | 9999 | 33 |
| RS-485 communication | 331 | RS-485 communication station | 0 to 31(0 to 247) | 1 | 0 | 38 |
| | 332 | RS-485 communication speed | 3, 6, 12, 24, 48, 96, 192, 384 | 1 | 96 | 38 |
| | 333 | RS-485 communication stop bit length | 0, 1, 10, 11 | 1 | 1 | 38 |
| | 334 | RS-485 communication parity check selection | 0, 1, 2 | 1 | 2 | 38 |
| | 335 | RS-485 communication number of retries | 0 to 10, 9999 | 1 | 1 | 38 |
| | 336 | RS-485 communication check time interval | 0, 0.1 to 999.8s, 9999 | 0.1s | 0s | 38 |
| | 337 | RS-485 communication waiting time setting | 0 to 150ms, 9999 | 1 | 9999 | 38 |
| | 338 | Communication operation command source | 0, 1 | 1 | 0 | 44 |
| | 339 | Communication speed command source | 0, 1, 2 | 1 | 0 | 44 |
| | 340 | Communication startup mode selection | 0, 1, 2, 10, 12 | 1 | 0 | 37 |
| | 341 | RS-485 communication CR/LF selection | 0, 1, 2 | 1 | 1 | 38 |
| | 342 | Communication EEPROM write selection | 0, 1 | 1 | 0 | 38 |
| | 343 | Communication error count | — | 1 | 0 | 38 |
| Remote output | 495 | Remote output selection | 0, 1 | 1 | 0 | 44 |
| | 496 | Remote output data 1 | 0 to 4095 | 1 | 0 | 44 |
| | 497 | Remote output data 2 | 0 to 4095 | 1 | 0 | 44 |
| Maintenance | 503 | Maintenance timer | 0 (1 to 9998) | 1 | 0 | 44 |
| | 504 | Maintenance timer alarm output set time | 0 to 9998, 9999 | 1 | 9999 | 44 |
| Communication | 549 | Protocol selection | 0, 1 | 1 | 0 | 38 |
| | 550 | NET mode operation command source selection | 0, 1, 9999 | 1 | 9999 | 44 |
| | 551 | PU mode operation command source selection | 1, 2 | 1 | 2 | 44 |
| Current average monitor | 555 | Current average time | 0.1 to 1.0s | 0.1s | 1s | 44 |
| | 556 | Data output mask time | 0.0 to 20.0s | 0.1s | 0s | 44 |
| | 557 | Current average value monitor signal output reference current | 0 to 500/0 to 3600A*1 | 0.01/0.1A*1 | Rated inverter current | 44 |
| — | 563 | Energization time carrying-over times | 0 to 65535 | 1 | 0 | 32 |
| — | 564 | Operating time carrying-over times | 0 to 65535 | 1 | 0 | 32 |
| — | 571 | Holding time at a start | 0.0 to 10.0s, 9999 | 0.1s | 9999 | 29 |
| PID control | 575 | Output interruption detection time | 0 to 3600s, 9999 | 0.1s | 1s | 39 |
| | 576 | Output interruption detection level | 0 to 400Hz | 0.01Hz | 0Hz | 39 |
| | 577 | Output interruption release level | 900 to 1100% | 0.1% | 1000% | 39 |
| — | 611 | Acceleration time at a restart | 0 to 3600s, 9999 | 0.1s | 5/15s*1 | 33 |

*1 Differ according to capacities. (55K or less/75K or more)

| Function | Parameters | Name | Setting Range | Increments | Initial Value | Refer to page |
|---|---|---|---|---|---|---|
| — | 867 | AM output filter | 0 to 5s | 0.01s | 0.01s | 32 |
| — | 872 | Input phase failure protection selection | 0, 1 | 1 | 0 | 42 |
| Regeneration avoidance function | 882 | Regeneration avoidance operation selection | 0, 1 | 1 | 0 | 45 |
| | 883 | Regeneration avoidance operation level | 300 to 800V | 0.1V | 380V/760V*1 | 45 |
| | 884 | Regeneration avoidance at deceleration detection sensitivity | 0 to 5 | 1 | 0 | 45 |
| | 885 | Regeneration avoidance compensation frequency limit value | 0 to 10Hz, 9999 | 0.01Hz | 6Hz | 45 |
| | 886 | Regeneration avoidance voltage gain | 0 to 200% | 0.1% | 100% | 45 |
| Free parameter | 888 | Free parameter 1 | 0 to 9999 | 1 | 9999 | 45 |
| | 889 | Free parameter 2 | 0 to 9999 | 1 | 9999 | 45 |
| Energy saving monitor | 891 | Cumulative power monitor digit shifted times | 0 to 4, 9999 | 1 | 9999 | 32 |
| | 892 | Load factor | 30 to 150% | 0.1% | 100% | 45 |
| | 893 | Energy saving monitor reference (motor capacity) | 0.1 to 55/0 to 3600kW*2 | 0.01/0.1kW*2 | Inverter rated capacity | 45 |
| | 894 | Control selection during commercial power-supply operation | 0, 1, 2, 3 | 1 | 0 | 45 |
| | 895 | Power saving rate reference value | 0, 1, 9999 | 1 | 9999 | 45 |
| | 896 | Power unit cost | 0 to 500, 9999 | 0.01 | 9999 | 45 |
| | 897 | Power saving monitor average time | 0, 1 to 1000h, 9999 | 1 | 9999 | 45 |
| | 898 | Power saving cumulative monitor clear | 0, 1, 10, 9999 | 1 | 9999 | 45 |
| | 899 | Operation time rate (estimated value) | 0 to 100%, 9999 | 0.1% | 9999 | 45 |
| Calibration parameters | C0 (900) | FM terminal calibration | — | — | — | 46 |
| | C1 (901) | AM terminal calibration | — | — | — | 46 |
| | C2 (902) | Terminal 2 frequency setting bias frequency | 0 to 400Hz | 0.01Hz | 0Hz | 39 |
| | C3 (902) | Terminal 2 frequency setting bias | 0 to 300% | 0.1% | 0% | 39 |
| | 125 (903) | Terminal 2 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| | C4 (903) | Terminal 2 frequency setting gain | 0 to 300% | 0.1% | 100% | 39 |
| | C5 (904) | Terminal 4 frequency setting bias frequency | 0 to 400Hz | 0.01Hz | 0Hz | 39 |
| | C6 (904) | Terminal 4 frequency setting bias | 0 to 300% | 0.1% | 20% | 39 |
| | 126 (905) | Terminal 4 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 39 |
| | C7 (905) | Terminal 4 frequency setting gain | 0 to 300% | 0.1% | 100% | 39 |
| — | 989 | Parameter copy alarm release | 10/100 | 1 | 10/100*2 | - |
| PU | 990 | PU buzzer control | 0, 1 | 1 | 1 | 46 |
| | ◎ 991 | PU contrast adjustment | 0 to 63 | 1 | 58 | 46 |
| Clear parameters | Pr.CL | Parameter clear | 0, 1 | 1 | 0 | 46 |
| | ALLC | All parameter clear | 0, 1 | 1 | 0 | 46 |
| | Er.CL | Alarm history clear | 0, 1 | 1 | 0 | 46 |
| | PCPY | Parameter copy | 0, 1, 2, 3 | 1 | 0 | 46 |

*1 The initial value differs according to the voltage class. (200V class / 400V class)

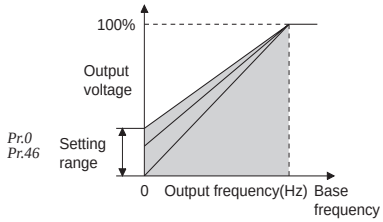
*2 Differ according to capacities. (55K or less/75K or more)

## Pr.0 Pr.46 Manual torque boost

*Pr.0 Torque boost* *Pr.46 Second torque boost*

You can compensate for a voltage drop in the low-frequency region to improve motor torque reduction in the low-speed region.

- Motor torque in the low-frequency range can be adjusted to the load to increase the starting motor torque.
- The starting torque boost can be changed by switching terminal RT.
- When simple magnetic flux vector control is selected in *Pr. 80*, the settings of *Pr. 0 and Pr. 46* are invalid.




| *Pr.0* Initial Value | | When using the constant torque motor |
|---|---|---|
| 0.75K | 6% | ← |
| 1.5K to 3.7K | 4% | ← |
| 5.5K, 7.5K | 3% | 2%* |
| 11K to 37K | 2% | ← |
| 45K, 55K | 1.5% | ← |
| 75K or more | 1% | ← |

* If the initial set *Pr. 71* value is changed to the setting for use with a constant-torque motor, the *Pr. 0* setting changes to the corresponding value in above.

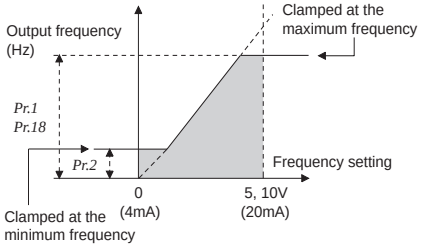
## Pr.1, 2 Pr.18 Maximum/minimum frequency

*Pr.1 Maximum frequency* *Pr.2 Minimum frequency*

*Pr.18 High speed maximum frequency*

You can limit the motor speed.

- Clamp the upper and lower limits of the output frequency.
- When you want to perform operation above 120Hz, set the upper limit of the output frequency to *Pr. 18* .
  (When *Pr. 18* is set, *Pr. 1* automatically switches to the frequency of *Pr. 18*. When *Pr. 1* is set, *Pr. 18* is automatically changed to the frequency set in *Pr. 1*.)

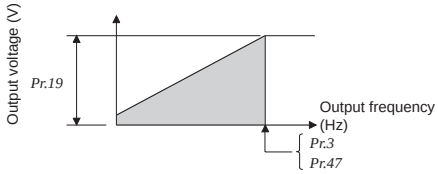



## Pr.3 Pr.19, 47 Base frequency, voltage

*Pr.3 Base frequency*

*Pr.19 Base frequency voltage* *Pr.47 Second V/F (base frequency)*

- Used to adjust the inverter outputs (voltage, frequency) to the motor rating.
- When operating a standard motor, generally set the rated frequency of the motor to *Pr. 3* Base frequency. When running the motor using commercial power supply-inverter switch-over operation, set *Pr. 3* to the same value as the power supply frequency.
- When you want to change the base frequency when switching multiple motors with one inverter, use the *Pr. 47* Second base frequency.
- Use *Pr. 19 Base frequency voltage* to set the base voltage (e.g. rated motor voltage).




## Pr.4 to Pr.6 Pr.24 to 27, 232 to 239 Multi-speed setting operation

*Pr.4 Multi-speed setting (high speed)* *Pr.5 Multi-speed setting (middle speed)*

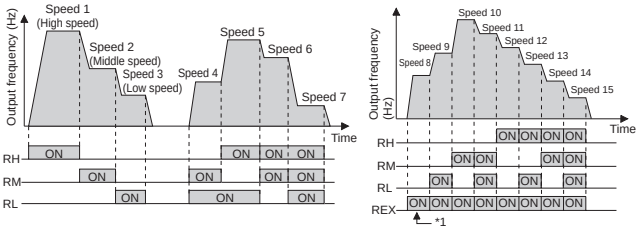
*Pr.6 Multi-speed setting (low speed)*

*Pr.24 Multi-speed setting (speed4)* *Pr.25 Multi-speed setting (speed 5)*
*Pr.26 Multi-speed setting (speed 6)* *Pr.27 Multi-speed setting (speed 7)*
*Pr.232 Multi-speed setting (speed 8)* *Pr.233 Multi-speed setting (speed 9)*
*Pr.234 Multi-speed setting (speed 10)* *Pr.235 Multi-speed setting (speed 11)*
*Pr.236 Multi-speed setting (speed 12)* *Pr.237 Multi-speed setting (speed 13)*
*Pr.238 Multi-speed setting (speed 14)* *Pr.239 Multi-speed setting (speed 15)*

Can be used to change the preset speed in the parameter with the contact signals.

Any speed can be selected by merely turning on-off the contact signals (RH, RM, RL, REX signals).

- The inverter operates at frequencies set in *Pr. 4* when RH signal is on, *Pr. 5* when RM signal is on and *Pr. 6* when RL signal is on.
- Frequency from speed 4 to speed 15 can be set according to the combination of the RH, RM, RL and REX signals. Set the running frequencies to *Pr. 24 to Pr. 27, Pr. 232 to Pr. 239.* (In the initial value setting, speed 4 to 15 are unavailable.)



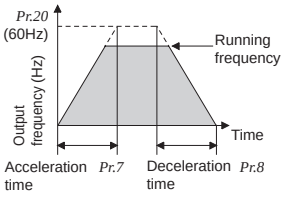

*1 When turning RH, RM and RL off and REX on with "9999" set in *Pr. 232* "multi speed setting (8 speed), the inverter operates at frequency set in *Pr. 6*.

## Pr.7, 8 Pr.20, 21, 44, 45 Acceleration/deceleration time setting

*Pr.7 Acceleration time* *Pr.8 Deceleration time*

*Pr.20 Acceleration/deceleration reference frequency*
*Pr.21 Acceleration/deceleration time increments* *Pr.44 Second acceleration/deceleration time*
*Pr.45 Second deceleration time*

- Used to set motor acceleration/deceleration time.
- Set a larger value for a slower speed increase/decrease or a smaller value for a faster speed increase/decrease.
- Use *Pr. 7 Acceleration time* to set the acceleration time required to reach *Pr. 20 Acceleration/deceleration reference frequency* from 0Hz.
- Use *Pr. 8 Deceleration time* to set the deceleration time required to stop from the *Pr. 20 Acceleration/deceleration reference frequency*.




| *Pr.21* Setting | Description | |
|---|---|---|
| 0 (initial value) | Increments: 0.1s Range: 0 to 3600s | Increments and setting range of acceleration/ deceleration time setting can be changed. |
| 1 | Increments: 0.01s Range: 0 to 360s | |

## Pr. 9 Pr. 51 Motor protection from overheat (electronic thermal relay function)

*Pr.9 Electronic thermal O/L relay* *Pr.51 Second electronic thermal O/L relay*

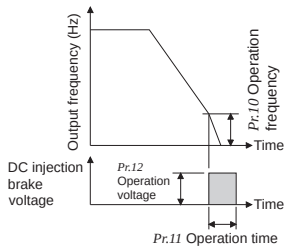
Set the current of the electronic overcurrent protection to protect the motor from overheat.This feature provides the optimum protective characteristics, including reduced motor cooling capability, at low speed.

- This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.
- Set the rated current [A] of the motor in *Pr.9*.
- When using a motor with an external thermal relay, etc., set "0" in *Pr. 9* to make the electronic thermal relay function invalid. (Note that the output transistor protection of the inverter (E.THT) functions.)
- When using the Mitsubishi constant-torque motor
  1) Set "1" in *Pr.71* .
     (This provides a 100% continuous torque characteristic in the low-speed range.)
  2) Set the rated motor current in *Pr. 9*.
- When the RT signal is on, thermal protection is provided based on the *Pr. 51* setting.
  Use this function when rotating two motors of different rated currents individually by a single inverter. (When rotating two motors together, use external thermal relays.)

## Pr. 10 to 12 DC injection brake

*Pr.10 DC injection brake operation frequency* *Pr.11 DC injection brake operation time*
*Pr.12 DC injection brake operation voltage*

The DC injection brake can be operated at a motor stop to adjust the stop timing and braking torque.



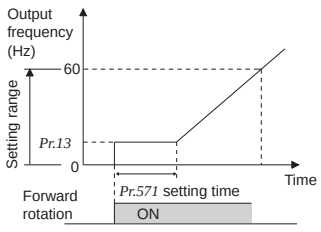

| Pr.12 Initial Value | | When Using the Mitsubish Constant Torque Motor | When Using the Energy Saving Motor |
|---|---|---|---|
| 3.7K or less | 4% | ← | ← |
| 5.5K to 7.5K | 4% | 2% * | 3% |
| 11K or more | 2% | ← | ← |
| 75K or more | 1% | ← | ← |

* If the *Pr. 71* initial value is changed to the setting for use with a constant-torque motor, the *Pr. 12* setting changes to the corresponding value in the above table.

## Pr. 13, 571 Starting frequency

*Pr.13 Starting frequency* *Pr.571 Holding time at a start*

You can set the starting frequency and hold the set starting frequency for a certain period of time.
Set these functions when you need the starting torque or want smooth motor drive at a start.

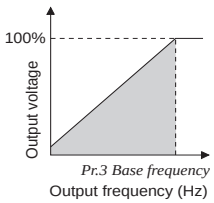



## Pr. 14 V/F pattern matching applications

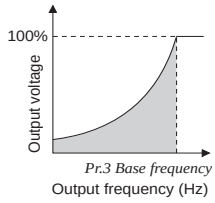
*Pr. 14 Load pattern selection*

You can select the optimum output characteristic (V/F characteristic) for the application and load characteristics.

**Setting "0"**
**For constant-torque load**



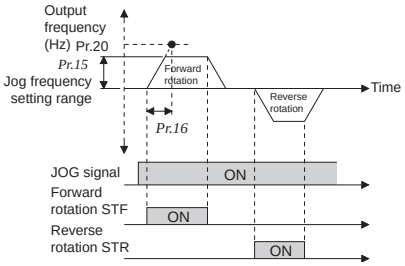

**Setting "1" (initial value)**
**For variable-torque load**




## Pr. 15, 16 Jog operation

*Pr.15 Jog frequency* *Pr.16 Jog acceleration/deceleration time*

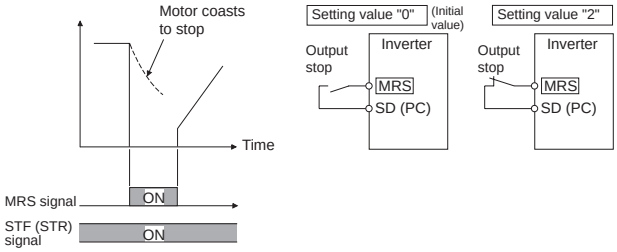
You can set the frequency and acceleration/decelertion time for jog operation. Jog operation can be performed from either the outside or PU.
Can be used for conveyor positioning, test operation, etc.




## Pr. 17 Logic selection of output stop signal (MRS)

*Pr.17 MRS input selection*

The inverter output can be shut off by the MRS signal. The logic of the MRS signal can also be selected.




Pr. 18 → **Refer to the section about** *Pr.1*, *Pr.2*

Pr. 19 → **Refer to the section about** *Pr. 3*.

Pr. 20, 21 → **Refer to the section about** *Pr.7*, *Pr.8*



Pr indicates simple mode parameters and (Pr) indicates extended parameters. When setting parameters, refer to the instruction manual (applied) and understand instructions.

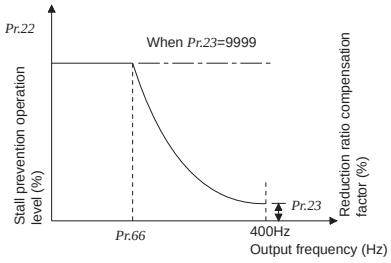
## Pr. 22, 23, 48, 49, 66, 148, 149, 154, 156, 157

# Stall prevention operation

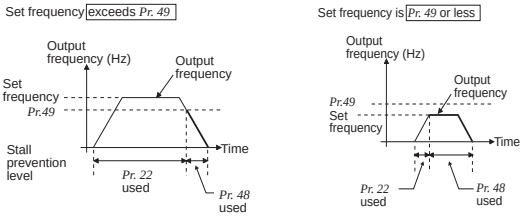
*Pr.22 Stall prevention operation level*
*Pr.23 Stall prevention operation level compensation factor at double speed*
*Pr.48 Second stall prevention operation current* *Pr.49 Second stall prevention operation frequency*
*Pr.66 Stall prevention operation reduction starting frequency*
*Pr.148 Stall prevention level at 0V input.* *Pr.149 Stall prevention level at 10V input.*
*Pr.154 Voltage reduction selection during stall prevention operation*
*Pr.156 Stall prevention operation selection* *Pr.157 OL signal output timer*

This function monitors the output current and automatically changes the output frequency to prevent the inverter from coming to an alarm stop due to overcurrent, overvoltage, etc. It can also limit stall prevention and fast-response current limit operation during acceleration/deceleration, driving or regeneration.

- Stall prevention
  If the output current exceeds the limit value, the output frequency of the inverter is automatically varied to reduce the output current. Also the second stall prevention function can restrict the output frequency range in which the stall prevention function is valid. *(Pr.49)*
- Fast-response current limit
  If the current exceeds the limit value, the output of the inverter is shut off to prevent an overcurrent.
- Set in *Pr. 22* the ratio of the output current to the rated inverter current at which stall prevention operation will be performed. Normally set this parameter to120% (initial value).
- When “9999” is set in *Pr. 22*, stall prevention operation level can be changed by the signal to the auxiliary input terminal (terminal 1). For the adjustment of bias/gain of analog signal, use *Pr. 148* and *Pr. 149*.
- During high-speed operation above the rated motor frequency, acceleration may not be made because the motor current does not increase. If operation is performed in a high frequency range, the current at motor lockup becomes smaller than the rated output current of the inverter, and the protective function (OL) is not executed if the motor is at a stop.
  To improve the operating characteristics of the motor in this case, the stall prevention level can be reduced in the high frequency region. This function is effective for performing operation up to the high speed region on a centrifugal separator etc. Normally, set 60Hz in *Pr. 66* and 100% in *Pr. 23*.
- By setting "9999" (initial value) in *Pr. 23 Stall prevention operation level compensation factor at double speed*, the stall prevention operation level is constant at the *Pr. 22* setting up to 400Hz.




- Setting "9999" in *Pr. 49* Second stall prevention operation frequency and turning the RT signal on make *Pr. 48 Second stall prevention operation current* valid.
- The stall prevention operation level from 0Hz to the output frequency set in *Pr. 49* can be set in *Pr. 48*.




| *Pr. 49* Setting | Operation |
|---|---|
| 0 (initial value) | Second stall prevention function is not activated |
| 0.01Hz to 400Hz | If the output frequency is less than the frequency set in Pr. 49, the second stall prevention operation function is activated. (during constant speed or deceleration) |
| 9999 | The second stall prevention function is performed according to the RT signal.<br>RT signal on ..... Stall level *Pr. 48*<br>RT signal off ..... Stall level *Pr. 22* |

- Stall prevention operation and fast response current restriction function can be restricted according to the operation condition using *Pr. 156*.

Pr. 24 to 27 → **Refer to the section about** *Pr.4 to Pr.6*

## Pr. 28 Input compensation of multi-speed and remote setting

*Pr.28 Multi-speed input compensation selection*

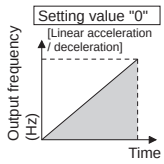
By inputting the frequency setting compensation signal (terminal 1, 2), the speed (frequency) can be compensated for relative to the multi-speed setting or the speed setting by remote setting function.

| *Pr. 28* Setting | Definition |
|---|---|
| 0 (initial value) | Without compensation |
| 1 | With compensation |

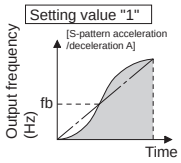
## Pr. 29, 140 to 143 Acceleration/ deceleration pattern and back lash measures

*Pr.29 Acceleration/deceleration pattern selection* *Pr.140 Backlash acceleration stopping frequency*
*Pr.141 Backlash acceleration stopping time* *Pr.142 Backlash deceleration stopping frequency*
*Pr.143 Backlash deceleration stopping time*

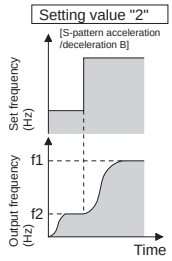
You can set the acceleration/deceleration pattern suitable for application.
You can also set the backlash measures that stop acceleration/deceleration once at the parameter-set frequency and time during acceleration/deceleration.



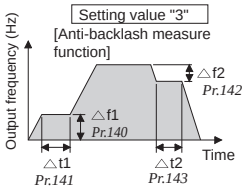

- Linear acceleration/deceleration (setting "0", initial value)
  · When the frequency is changed for acceleration, deceleration, etc. in inverter operation, the output frequency is changed linearly (linear acceleration/deceleration) to reach the set frequency without straining the motor and inverter.




- S-pattern acceleration/deceleration A (setting "1")
  · For machine tool spindle applications, etc.
  Use when acceleration/deceleration must be made in a short time to a high-speed region of not lower than base frequency.




- S-pattern acceleration/deceleration B (setting "2")
  · For prevention of load shifting in conveyor and other applications
  Since acceleration/deceleration is always made in an S shape from current frequency (f2) to target frequency (f1), this function eases shock produced at acceleration/deceleration and is effective for load collapse prevention, etc.




- Backlash measures (setting "3", *Pr.140 to Pr.143* )
  · To avoid backlash, acceleration/deceleration is temporarily stopped. Set the acceleration/deceleration stopping frequency and time in *Pr. 140 to Pr. 143*.

## Pr. 30, 70 Selection of regeneration unit

*Pr.30 Regenerative function selection* *Pr.70 Special regenerative brake duty **

- Use the high power factor converter (FR-HC) to reduce harmonics, improve the power factor, or continuously use the regenerative mode.
- For the 75K or more, use the brake unit MT-BU5 or BR5 when the regenerative brake duty is need to be increased due to frequent starts and stops. Use the high power factor converter MT-HC to reduce harmonics, improve the power factor, or continuously use the regenerative mode.

<55K or less>

| *Pr.30* Setting | Regeneration Unit |
|---|---|
| 0 (initial value) | Brake unit (FR-BU, BU) |
| 2 | High power factor converter (FR-HC), power regeneration common converter (FR-CV) |

<75K or more>

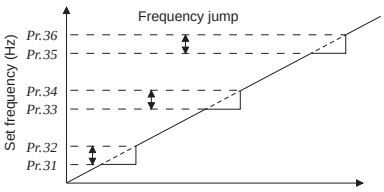
| *Pr.30* Setting | *Pr.70* Setting * | Regeneration Unit |
|---|---|---|
| 0 (initial value) | — | Not used |
| 1 | 0% | Power regeneration converter (MT-RC) |
| | 10% | Brake unit (MT-BU5) |
| 2 | — | High power factor converter (MT-HC) |

* *Pr.70 Special regenerative brake duty* can be set for the 75K or more inverter.

## Pr. 31 to 36 Avoid mechanical resonance points (frequency jump)

*Pr.31 Frequency jump 1A* *Pr.32 Frequency jump 1B*
*Pr.33 Frequency jump 2A* *Pr.34 Frequency jump 2B*
*Pr.35 Frequency jump 3A* *Pr.36 Frequency jump 3B*

When it is desired to avoid resonance attributable to the natural frequency of a mechanical system, these parameters allow resonant frequencies to be jumped.




- Up to three areas may be set, with the jump frequencies set to either the top or bottom point of each area.
- The value set to 1A, 2A or 3A is a jump point and operation in the jump zone is performed at these frequencies.
- Frequency jump is not performed if the initial value is set to "9999".
- During acceleration/deceleration, the running frequency within the set area is valid.

## Pr. 37, 144 Speed display and speed setting

*Pr.37 Speed display* *Pr.144 Speed setting switchover*

You can change the PU (FR-DU07) monitor display or frequency setting to motor speed or machine speed.

- When the running speed monitor is selected, each monitor and setting are determined according to the combination of *Pr. 37* and *Pr. 144*. (The units within the thick frame are the initial values.)

| *Pr. 37* Setting | *Pr. 144* Setting | Output Frequency Monitor | Set Frequency Monitor | Running Speed Monitor | Frequency Setting Parameter Setting |
|---|---|---|---|---|---|
| 0 | 0 | Hz | Hz | r/min *1 | Hz |
| | 2 to 10 | Hz | Hz | r/min *1 | Hz |
| | 102 to 110 | r/min *1 | r/min *1 | r/min *1 | r/min *1 |
| 1 to 9998 | 0 | Hz | Hz | Machine speed *1 | Hz |
| | 2 to 10 | Machine speed *1 | Machine speed *1 | Machine speed *1 | Machine speed *1 |
| | 102 to 110 | Hz | Hz | r/min *1 | Hz |

*1 Motor speed r/min conversion formula
..... Frequency × 120/number of motor poles *(Pr. 144)*
Machine speed conversion formula
..... *Pr. 37* × frequency/60Hz
For *Pr. 144* in the above formula, the value is "*Pr. 144*-100" when "102 to 110" is set in *Pr. 144* and the value is "4" when *Pr. 37*=0 and *Pr.144*=0.

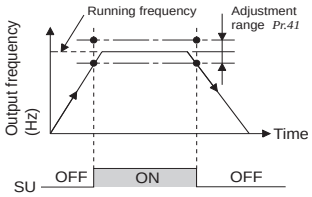
*2 The increments for Hz are 0.01Hz, machine speed are 1m/min and r/min are 1r/min

## Pr. 41 to 43, 50 Detection of output frequency (SU, FU, FU2 signal)

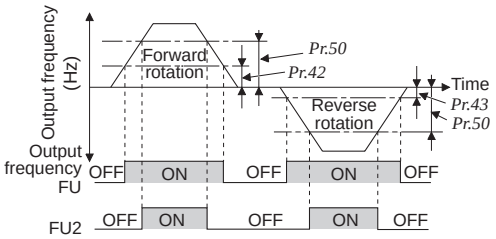
*Pr.41 Up-to-frequency sensitivity* *Pr.42 Output frequency detection*
*Pr.43 Output frequency detection for reverse rotation*
*Pr.50 Second output frequency detection*

The inverter output frequency is detected and output at the output signals.

- If the set frequency is considered as 100%, output frequency can be adjusted between ±1% and ±100% with *Pr. 41*.
- This parameter can be used to ensure that the running frequency has been reached to provide the operation start signal etc. for related equipment.




- When the output frequency reaches or exceeds the setting of *Pr. 42*, the output frequency detection signal (FU) is output.
  This function can be used for electromagnetic brake operation, open signal, etc.
- When the detection frequency is set in *Pr. 43*, frequency detection for reverse rotation use only can also be set. This function is effective for switching the timing of electromagnetic brake operation between forward rotation (rise) and reverse rotation (fall) during vertical lift operation, etc.
- When outputting a frequency detection signal besides the FU signal, set the detection frequency to *Pr. 50* . The FU2 signal is output when the output frequency reaches or exceeds the *Pr. 50* setting.




Pr. 44, 45 → **Refer to the section about *Pr.7*, *Pr.8***

Pr. 46 → **Refer to the section about *Pr. 0*.**

Pr. 47 → **Refer to the section about *Pr. 3*.**

Pr. 48, 49 → **Refer to the section about *Pr. 22* and other relevant parameters.**

Pr. 50 → **Refer to the section about *Pr. 41* and other relevant parameters.**

Pr. 51 → **Refer to the section about *Pr. 9*.**

## Pr. 52, 54, 158, 170, 171, 268, 563, 564, 867, 891

### Change of DU/PU monitor descriptions Cumulative monitor clear

*Pr.52 DU/PU main display data selection* *Pr.54 FM terminal function selection*
*Pr.158 AM terminal function selection* *Pr.170 Cumulative power meter clear*
*Pr.171 Operation hour meter clear* *Pr.268 Monitor decimal digits selection*
*Pr.563 Energization time carrying-over times* *Pr.564 Operating time carrying-over times*
*Pr.867 AM output filter*
*Pr.891 Cumulative power monitor digit shifted times*

The monitor to be displayed on the main screen of the operation panel (FR-DU07) / parameter unit (FR-PU04) can be selected.

| Types of Monitor | Increments | *Pr.52* Parameter Setting Value | | *Pr.54* (FM) *Pr.158* (AM) Setting | Full Scale Value |
|---|---|---|---|---|---|
| | | DU LED | PU main monitor | | |
| Output frequency | 0.01Hz | 0/100 | | 1 | *Pr.55* |
| Output current | 0.01A/ 0.1A*6 | 0/100 | | 2 | *Pr.56* |
| Output voltage | 0.1V | 0/100 | | 3 | 200V class : 400V 400V class : 800V |
| Alarm display | — | 0/100 | | — | — |
| Frequency setting | 0.01Hz | 5 | *1 | 5 | *Pr.55* |
| Running speed | 1(r/min) | 6 | *1 | 6 | Value of *Pr. 55* represented in terms of *Pr. 37* value |
| Converter output voltage | 0.1V | 8 | *1 | 8 | 200V class : 400V 400V class : 800V |
| Regenerative brake duty *5 | 0.1% | 9 | *1 | 9 | Brake duty set in *Pr. 30* and *Pr. 70* |
| Electronic thermal relay function load factor | 0.1% | 10 | *1 | 10 | Electronic thermal relay function operation level |
| Output current peak value | 0.01A/ 0.1A*6 | 11 | *1 | 11 | *Pr.56* |
| Converter output voltage peak value | 0.1V | 12 | *1 | 12 | 200V class : 400V 400V class : 800V |
| Input power | 0.01kW/ 0.1kW*6 | 13 | *1 | 13 | Rated inverter power × 2 |
| Output power | 0.01kW/ 0.1kW*6 | 14 | *1 | 14 | Rated inverter power × 2 |
| Input terminal status | — | 55 | *1 | — | — |
| Output terminal status | — | | *1 | — | — |
| Option input terminal status | — | 56 | × | — | — |
| Option output terminal status | — | 57 | × | — | — |
| Load meter | 0.1% | 17 | | 17 | *Pr.56* |
| Reference voltage output | — | — | — | 21 | — |
| Cumulative energization time *2 | 1h | 20 | | — | — |
| Actual operation time *2, 3 | 1h | 23 | | — | — |
| Motor load factor | 0.1% | 24 | | 24 | 200% |
| Cumulative power | 0.01kWh/ 0.1kWh *4, *6 | 25 | | — | — |
| Power saving effect | Variable according to parameters | 50 | | 50 | Inverter capacity |
| Cumulative saving power | | 51 | | — | — |
| PID set point | 0.1% | 52 | | 52 | 100% |
| PID measured value | 0.1% | 53 | | 53 | 100% |
| PID deviation value | 0.1% | 54 | | — | — |

*1 Selected by the parameter unit(FR-PU04)
*2 The cumulative energization time and actual operation time are accumulated from 0 to 65535 hours, then cleared, and accumulated again from 0.
When the operation panel (FR-DU07) is used, up to 65.53 (65530h) is displayed as 1h=0.001 and then accumulated from 0.
*3 The actual operation time is not added up if the cumulative operation time before power supply-off is less than 1h.
*4 When using the parameter unit (FR-PU04), "kW" is displayed.
*5 Setting can be made for the 75K or more.
*6 The setting depends on the inverter capacity.(55K or less/75K or more)

- The cumulative power monitor value digit can be shifted to the right by the number set in *Pr. 891*.
- By setting "0" in *Pr. 170*, the cumulative power monitor can be cleared.
- You can check the numbers of cumulative energization time monitor exceeded 65535h with *Pr. 563* and the numbers of actual operation time monitor exceeded 65535h with *Pr. 564*.
- Writing "0" in *Pr. 171* clears the actual operation time monitor.

| *Pr. 268* Setting | Description |
|---|---|
| 9999 (initial value) | No function |
| 0 | When 1 or 2 decimal places (0.1 increments or 0.01 increments) are monitored, the decimal places are dropped and the monitor displays an integer value (1 increments).<br>The monitor value of 0.99 or less is displayed as 0. |
| 1 | When 2 decimal places (0.01 increments) are monitored, the 0.01 decimal place is dropped and the monitor displays the first decimal place (0.1 increments).<br>When the monitor display digit is originally in 1 increments, it is displayed unchanged in 1 increments. |

- When *Pr. 52* is set to "100", the set frequency monitor is displayed during a stop and the output frequency monitor is displayed during operation. (LED of Hz flickers during stop and is lit during operation.)

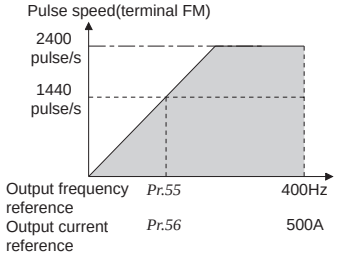
| | *Pr.52* | | |
|---|---|---|---|
| | 0 | 100 | |
| | During operation/stop | During stop | During running |
| Output frequency | Output frequency | Set frequency | Output frequency |
| Output current | Output current | | |
| Output voltage | Output voltage | | |
| Alarm display | Alarm display | | |

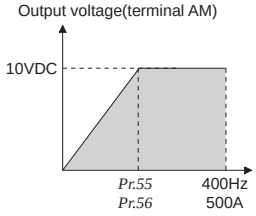
- Using *Pr. 867* , the output voltage response of the terminal AM can be adjusted within the range 0 to 5s.

## Pr. 55, 56 Change of the monitor output from terminal FM and AM

*Pr.55 Frequency monitoring reference* *Pr.56 Current monitoring reference*

Set the full-scale value to output the output frequency monitor value to terminal FM and AM.
Set the full-scale value to output the output current monitor value to terminal FM and AM in *Pr. 56*.



## Pr. 57, 58, 162 to 165, 299, 611

### Restart operation after instantaneous power failure / Flying start

*Pr.57 Restart coasting time* *Pr.58 Restart cushion time*
*Pr.162 Automatic restart after instantaneous power failure selection*
*Pr.163 First cushion time for restart*
*Pr.164 First cushion voltage for restart* *Pr.165 Stall prevention operation level for restart*
*Pr.299 Rotation direction detection selection at restarting*
*Pr.611 Acceleration time at a restart*

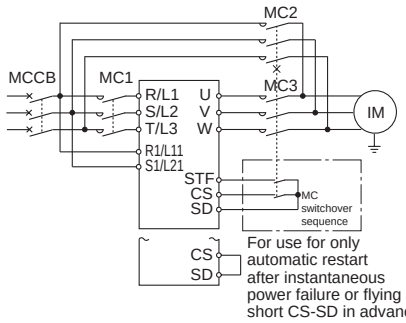
You can restart the inverter without stopping the motor in the following cases.

- when commercial power supply operation is switched to inverter operation
- when power comes back on after an instantaneous power failure
- when motor is coasting at start

| Pr. Number | Setting Range | Description |
|---|---|---|
| 57 | 0 | 1.5K or less.....0.5s,<br>2.2K to 7.5K.....1s,<br>11K or more .....3.0s<br>75K or more .....5.0s<br>The above times are coasting time. |
| | 0.1 to 5s/<br>0.1 to 30s* | Set the waiting time for inverter-triggered restart after an instantaneous power failure. |
| | 9999 (initial value) | No restart |
| 58 | 0 to 60s | Set a voltage starting time at restart. |
| 162 | 0 (initial value) | With frequency search |
| | 1 | Without frequency search (reduced voltage system) |
| | 10 | Frequency search at every start |
| | 11 | Reduced voltage system at every start |
| 163 | 0 to 20s | Set a voltage starting time at restart. Consider using these parameters according to the load (inertia moment, torque) magnitude. |
| 164 | 0 to 100% | |
| 165 | 0 to 150% | Consider the rated inverter current as 100% and set the stall prevention operation level during restart operation. |
| 299 | 0 | Without rotation direction detection |
| | 1 | With rotation direction detection |
| | 9999 | When *Pr. 78* =0, the rotation direction is detected.<br>When *Pr. 78* =1,2, the rotation direction is not detected. |
| 611 | 0 to 3600s | Set the acceleration time to reach the set frequency at restart. |
| | 9999 | Acceleration time for restart is the normal acceleration time (e.g. *Pr. 7*). |

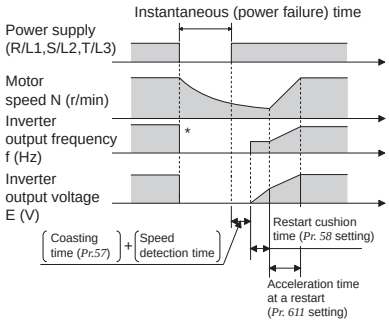
* The setting range varies according to the inverter capacity. (55K or less/ 75K or more)

<Connection diagram>




- When "0 (initial value) or 10" is set in *Pr. 162*, the inverter smoothly starts after detecting the motor speed upon power restoration.
- Even when the motor is rotating in the opposite direction, the inverter can be restarted smoothly as the direction of rotation is detected. (You can select whether to make rotation direction detection or not with *Pr. 299 Rotation direction detection selection at restarting*. )

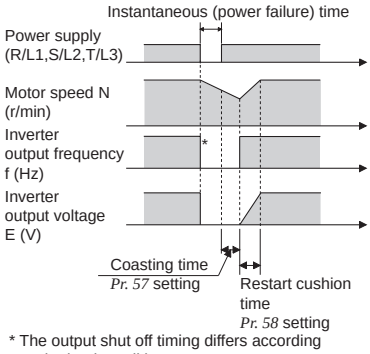
**When *Pr. 162* = 0, 10 (with frequency search)**




* The output shut off timing differs according to the load condition.

- When *Pr. 162* = "1" or "11", automatic restart operation is performed in a reduced voltage system, where the voltage is gradually risen with the output frequency unchanged from prior to an instantaneous power failure independently of the coasting speed of the motor.

**When *Pr. 162* = 1, 11 (without frequency search)**



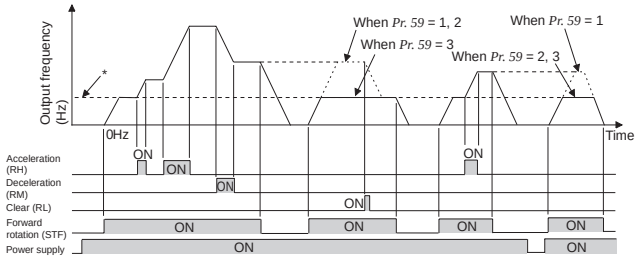

* The output shut off timing differs according to the load condition.

## Pr. 59 Remote setting function

*Pr.59 Remote function selection*

- Even if the operation panel is located away from the enclosure, you can use contact signals to perform continuous variable-speed operation, without using analog signals.
- By merely setting this parameter, you can use the acceleration, deceleration and setting clear functions of the motorized speed setter (FR-FK).

| *Pr.59* Setting | Description | |
|---|---|---|
| | RH, RM, RL signal function | Frequency setting storage function |
| 0 (initial value) | Multi-speed setting | — |
| 1 | Remote setting | Yes |
| 2 | Remote setting | No |
| 3 | Remote setting | No (Turning STF/STR off clears remotely-set frequency.) |




* External runnning frequency (other than multi-speed operation) or PU running frequency

## Pr. 60 Energy saving control selection

*Pr.60 Energy saving control*

Without a fine parameter setting, the inverter automatically performs energy saving operation.
This inverter is optimum for fan and pump applications.

| *Pr. 60* Setting | Description |
|---|---|
| 0 (initial value) | Normal operation mode |
| 4 | Energy saving operation mode<br>In the energy saving operation mode, the inverter automatically controls the output voltage to minimize the inverter output voltage during a constant operation. |
| 9 | Optimum excitation control mode<br>The optimum excitation control mode is a control system which controls excitation current to improve the motor efficiency to maximum and determines output voltage as an energy saving system. |

## Pr. 65, 67 to 69 Retry function at alarm occurrence

*Pr.65 Retry selection*
*Pr.67 Number of retries at alarm occurrence*
*Pr.68 Retry waiting time*
*Pr.69 Retry count display erase*

If an alarm occurs, the inverter resets itself automatically to restart. You can also select the alarm description for a retry.
When selection of automatic restart after instantaneous power failure is selected (*Pr. 57 Restart coasting time*, restart operation is performed at retry operation as at an instantaneous power failure.)

- Use *Pr. 65* to select the alarm to be activated for retries.
  "●" indicates the alarms selected for retry.

| Alarm Indication for Retry | *Pr.65* Setting | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| E.OC1 | ● | ● | | ● | ● | ● |
| E.OC2 | ● | ● | | ● | ● | |
| E.OC3 | ● | ● | | ● | ● | ● |
| E.OV1 | ● | | ● | ● | ● | |
| E.OV2 | ● | | ● | ● | ● | |
| E.OV3 | ● | | ● | ● | ● | |
| E.THM | ● | | | | | |
| E.THT | ● | | | | | |
| E.IPF | ● | | | | ● | |
| E.UVT | ● | | | | ● | |
| E.BE | ● | | | | ● | |
| E. GF | ● | | | | ● | |
| E.OHT | ● | | | | | |
| E.OLT | ● | | | | ● | |
| E.OPT | ● | | | | ● | |
| E.OP1 | ● | | | | ● | |
| E. PE | ● | | | | ● | |
| E.PTC | ● | | | | | |
| E.CDO | ● | | | | ● | |
| E.SER | ● | | | | ● | |
| E.ILF | ● | | | | ● | |

- Set the number of retries at alarm occurrence in *Pr. 67*.

| *Pr. 67* Setting | Description |
|---|---|
| 0 (initial value) | No retry function |
| 1 to 10 | Set the number of retries at alarm occurrence.<br>An alarm output is not provided during retry operation. |
| 101 to 110 | Set the number of retries at alarm occurrence.<br>(The setting value of minus 100 is the number of retries.)<br>An alarm output is provided during retry operation. |

- Use *Pr. 68* to set the waiting time from when an inverter alarm occurs until a retry is made in the range 0 to 10s.
- Reading the *Pr. 69* value provides the cumulative number of successful restart times made by retry.

Pr. 66 → **Refer to the section about *Pr. 22* and other relevant parameters.**

Pr. 67 to 69 → **Refer to the section about *Pr. 65* and other relevant parameters.**

Pr. 70 → **Refer to the section about *Pr. 30* and other relevant parameters.**

## Pr. 71 Use the constant torque motor (applied motor)

*Pr.71 Applied motor*

Setting of the used motor selects the thermal characteristic appropriate for the motor.
Setting is necessary when using a constant-torque motor. Thermal characteristic of the electronic thermal relay function suitable for the motor is set.

| *Pr.71* Setting | Thermal Characteristic of the Electronic Thermal Relay Function | Motor (○: Motor used) | |
|---|---|---|---|
| | | Standard (SF-JR, etc.) | Constant torque (SF-HRCA, etc.) |
| 0 (initial value) | Thermal characteristics of a standard motor | ○ | |
| 1 | Thermal characteristics of the Mitsubishi constant-torque motor | | ○ |
| 2 | Thermal characteristics of a standard motor<br>Adjustable 5 points V/F | ○ | |
| 20 | Mitsubishi standard motor SF-JR4P (1.5kW or less) | ○ | |

- For the 5.5K and 7.5K, the *Pr. 0 Torque boost* and *Pr. 12 DC injection brake operation voltage* settings are automatically changed according to the *Pr. 71* setting as follows.

| *Pr.71* | Standard Motor Setting 0, 2, 20 | Constant Torque Motor Setting 1 |
|---|---|---|
| *Pr. 0* | 3% | 2% |
| *Pr. 12* | 4% | 2% |

## Pr. 72, 240, 260

# Carrier frequency and SoftPWM selection

*Pr.72 PWM frequency selection* *Pr.240 Soft-PWM operation selection*
*Pr.260 PWM frequency automatic switchover*

You can change the motor sound.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 72 | 0 to 15/ 0 to 6, 25 * | You can change the PWM carrier frequency. The setting displayed is in [kHz]. Note that 0 indicates 0.7kHz, 15 indicates 14.5kHz and 25 indicates 2.5kHz. |
| 240 | 0 | Soft-PWM is invalid |
| | 1 | When "0 to 5" ("0 to 4" for the 75K or more) is set in *Pr. 72*, Soft-PWM is valid |
| 260 | 0 | PWM carrier frequency is constant independently of load. When the carrier frequency is set to 3kHz or more (*Pr. 72* ≥ 3), perform continuous operation at less than 85% of the rated inverter current. |
| | 1 | Decreases PWM carrier frequency automatically when load increases. |

* The setting range varies according to the inverter capacity. (55K or less/75K or more).

(Note)When *Pr. 260*="1 (initial value)", if continuous operation is performed at 85% or more of the rated inverter current with *Pr. 72* value set to "3" (3kHz) or more, the carrier frequency is automatically reduced. This may cause the motor noise to increase.

## Pr. 73, 242, 243, 252, 253, 267

# Analog input selection

*Pr.73 Analog input selection*
*Pr.242 Terminal 1 added compensation amount (terminal 2)*
*Pr.243 Terminal 1 added compensation amount (terminal 4)*
*Pr.252 Override bias* *Pr.253 Override gain*
*Pr.267 Terminal 4 input selection*

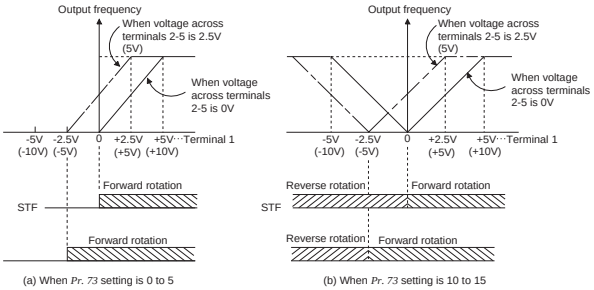
- You can select the function that switches between forward rotation and reverse rotation according to the analog input polarity, the override function and the input signal specifications.
- For the terminals 1, 2, 4 used for analog input, voltage input (0 to 5V, 0 to 10V) or current input (4 to 20mA) can be selected.
- The additional compensation and fixed ratio of analog compensation (override) using terminal 2 as an auxiliary input can be made to multi-speed operation or the speed setting signal (main speed) of the terminal 2 or terminal 4.
  ( indicates the main speed setting)

| *Pr. 73* Setting | Terminal 2 Input | Terminal 1 Input | Terminal 4 Input | Compensation Input Terminal and Compensation Method | Polarity Reversible |
|---|---|---|---|---|---|
| 0 | 0 to 10V | 0 to ±10V | When the AU signal is off × | Terminal 1 added compensation | Not function (Indicates that a frequency command signal of negative polarity is not accepted. ) |
| 1 (Initial value) | 0 to 5V | 0 to ±10V | | | |
| 2 | 0 to 10V | 0 to ±5V | | | |
| 3 | 0 to 5V | 0 to ±5V | | | |
| 4 | 0 to 10V | 0 to ±10V | | Terminal 2 override | |
| 5 | 0 to 5V | 0 to ±5V | | | |
| 6 | 4 to 20mA | 0 to ±10V | | Terminal 1 added compensation | |
| 7 | 4 to 20mA | 0 to ±5V | | | |
| 10 | 0 to 10V | 0 to ±10V | | | Function |
| 11 | 0 to 5V | 0 to ±10V | | | |
| 12 | 0 to 10V | 0 to ±5V | | | |
| 13 | 0 to 5V | 0 to ±5V | | | |
| 14 | 0 to 10V | 0 to ±10V | | Terminal 2 override | |
| 15 | 0 to 5V | 0 to ±5V | | | |
| 16 | 4 to 20mA | 0 to ±10V | | Terminal 1 added compensation | |
| 17 | 4 to 20mA | 0 to ±5V | | | |

| *Pr. 73* Setting | Terminal 2 Input | Terminal 1 Input | Terminal 4 Input | Compensation Input Terminal and Compensation Method | Polarity Reversible |
|---|---|---|---|---|---|
| 0 | 0 to 10V | 0 to ±10V | When the AU signal is on According to the *Pr. 267* setting (Initial value) 1:0 to 5V 2:0 to 10V | Terminal 1 added compensation | Not function (Indicates that a frequency command signal of negative polarity is not accepted. ) |
| 1 (Initial value) | × | 0 to ±10V | | | |
| 2 | | 0 to ±5V | | | |
| 3 | | 0 to ±5V | | | |
| 4 | 0 to 10V | × | | Terminal 2 override | |
| 5 | 0 to 5V | | | | |
| 6 | × | 0 to ±10V | | Terminal 1 added compensation | |
| 7 | | 0 to ±5V | | | |
| 10 | × | 0 to ±10V | | | Function |
| 11 | | 0 to ±10V | | | |
| 12 | | 0 to ±5V | | | |
| 13 | | 0 to ±5V | | | |
| 14 | 0 to 10V | × | | Terminal 2 override | |
| 15 | 0 to 5V | | | | |
| 16 | × | 0 to ±10V | | Terminal 1 added compensation | |
| 17 | | 0 to ±5V | | | |

### (1) Added compensation *(Pr.242, Pr.243)*

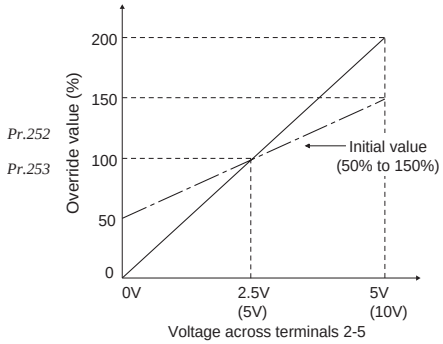
· A compensation signal can be added to the main speed setting for synchronous operation, etc.




· The terminal 1 (frequency setting auxiliary input) signal is added to the main speed setting signal of the terminal 2 or 4.

### (2) Override function *(Pr.252, Pr.253)*

· When an override is selected, the terminal 1 or 4 is used for the main speed setting and the terminal 2 for the override signal. (When the main speed of the terminal 1 or terminal 4 is not input, compensation by the terminal 2 is invalid.)




· When an override is selected, the terminal 1 or 4 is used for the main speed setting and the terminal 2 for the override signal (50% to 150% at 0 to 5V or 0 to 10V). (When the main speed of the terminal 1 or 4 is not input, compensation by the terminal 2 is invalid.)

· When *Pr. 22 Stall prevention operation level* = "9999", the value of the terminal 1 is as set to the stall prevention operation level.

## Pr. 74 Noise elimination at the analog input

*Pr. 74 Input filter time constant*

The time constant of the primary delay filter relative to external frequency command (analog input (terminal 1, 2, 4) signal) can be set.

- Valid for eliminating noise of the frequency setting circuit.
- Increase the filter time constant if steady operation cannot be performed due to noise.
  A larger setting results in slower response. (The time constant can be set between approximately 10ms to 1s with the setting of 0 to 8.)

## Pr. 75 Reset selection, disconnected PU detection

*Pr. 75 Reset selection/disconnected PU detection/PU stop selection*

You can select the reset input acceptance, disconnected PU (FR-DU07) connector detection function and PU stop function.

| *Pr. 75* Setting | Reset Selection | Disconnected PU Detection | PU Stop Selection |
|---|---|---|---|
| 0 | Reset input normally enabled. | If the PU is disconnected, operation will be continued as-is. | Pressing STOP RESET decelerates the motor to a stop only in the PU operation mode. |
| 1 | Reset input enabled only when the protective function is activated. | | |
| 2 | Reset input normally enabled. | When the PU is disconnected, the inverter output is shut off. | |
| 3 | Reset input enabled only when the protective function is activated. | | |
| 14 (initial value) | Reset input normally enabled. | If the PU is disconnected, operation will be continued as-is. | Pressing STOP RESET decelerates the motor to a stop in any of the PU, external and communication operation modes. |
| 15 | Reset input enabled only when the protective function is activated. | | |
| 16 | Reset input normally enabled. | When the PU is disconnected, the inverter output is shut off. | |
| 17 | Reset input enabled only when the protective function is activated. | | |

- Reset selection
  - You can select the operation timing of reset function (RES signal, reset command through communication) input
- Disconnected PU detection
  - This function detects that the PU (FR-DU07/FR-PU04) has been disconnected from the inverter for longer than 1s and causes the inverter to provide an alarm output (E.PUE) and come to an alarm stop.
- PU stop selection
  - In any of the PU operation, external operation and network operation modes, the motor can be stopped by pressing STOP RESET of the PU.

## Pr. 76 Output function of alarm code

*Pr. 76 Alarm code output selection*

At alarm occurrence, its description can be output as a 4-bit digital signal from the open collector output terminals.
The alarm code can be read by a programmable controller, etc., and its corrective action can be shown on a display, etc.

| *Pr. 76* Setting | Description |
|---|---|
| 0 (initial value) | Without alarm code output |
| 1 | With alarm code output *(Refer to the following table)* |
| 2 | Alarm code output at alarm occurrence only *(Refer to the following table)* |

- The following table indicates alarm codes to be output. (0: output transistor off, 1: output transistor on)

| Operation Panel Indication (FR-DU07) | Output of Output Terminals | | | | Alarm Code |
|---|---|---|---|---|---|
| | SU | IPF | OL | FU | |
| Normal * | 0 | 0 | 0 | 0 | 0 |
| E.OC1 | 0 | 0 | 0 | 1 | 1 |
| E.OC2 | 0 | 0 | 1 | 0 | 2 |
| E.OC3 | 0 | 0 | 1 | 1 | 3 |
| E.OV1 to E.OV3 | 0 | 1 | 0 | 0 | 4 |
| E.THM | 0 | 1 | 0 | 1 | 5 |
| E.THT | 0 | 1 | 1 | 0 | 6 |
| E.IPF | 0 | 1 | 1 | 1 | 7 |
| E.UVT | 1 | 0 | 0 | 0 | 8 |
| E.FIN | 1 | 0 | 0 | 1 | 9 |
| E.BE | 1 | 0 | 1 | 0 | A |
| E. GF | 1 | 0 | 1 | 1 | B |
| E.OHT | 1 | 1 | 0 | 0 | C |
| E.OLT | 1 | 1 | 0 | 1 | D |
| E.OPT | 1 | 1 | 1 | 0 | E |
| E.OP1 | 1 | 1 | 1 | 0 | E |
| Other than the above | 1 | 1 | 1 | 1 | F |

* When *Pr. 76* = "2", the output terminals output the signals assigned to *Pr. 190 to Pr. 196*.

## Pr. 77 Prevention of parameter rewrite

*Pr. 77 Parameter write selection*

You can select whether write to various parameters can be performed or not. Use this function to prevent parameter values from being rewritten by misoperation.

| *Pr. 77* Setting | Description |
|---|---|
| 0 (initial value) | Write is enabled only during a stop |
| 1 | Parameter write is not enabled. |
| 2 | Parameter write is enabled in any operation mode regardless of operation status. |

## Pr. 78 Prevention of reverse rotation of the motor

*Pr. 78 Reverse rotation prevention selection*

This function can prevent reverse rotation fault resulting from the incorrect input of the start signal.

| *Pr. 78* Setting | Description |
|---|---|
| 0 (initial value) | Both forward and reverse rotations allowed |
| 1 | Reverse rotation disabled |
| 2 | Forward rotation disallowed |

## Pr.79 Pr.340 Operation mode selection

*Pr.79 Operation mode selection* *Pr.340 Communication startup mode selection*

●Used to select the operation mode of the inverter.
You can freely change between operation by external signal (external operation), operation by PU (FR-DU07) (PU operation), operation by combination of PU operation and external operation (external/PU combined operation) and network operation (when RS-485 terminals or a communication option is used).

| *Pr.79* Setting | Description | LED Indication :Off :On |
|---|---|---|
| 0 (initial value) | External/PU switchover mode ( Press PU/EXT to switch between the PU and external operation mode.) External operation mode at power-on | External operation mode PU EXT NET<br>PU operation mode PU EXT NET |
| 1 | Fixed to PU operation mode | PU EXT NET |
| 2 | Fixed to external operation mode Operation can be performed by switching between the external and Net operation mode. | External operation mode PU EXT NET<br>NET operation mode PU EXT NET |
| 3 | External/PU combined operation mode 1<br>Running frequency: PU (FR-DU07 / FR-PU04) setting or external signal input (multi-speed setting, across terminals 4-5 (valid when AU signal turns on))<br>Start signal: External signal input (terminal STF, STR) | PU EXT NET |
| 4 | External/PU combined operation mode 2<br>Running frequency: External signal input (terminal 2, 4, 1, Jog, multi-speed setting, etc)<br>Start signal: Input from the PU (FR-DU07 / FR-PU04) (FWD, REV) | |
| 6 | Switch-over mode Switch among PU operation, external operation, and NET operation while keeping the same operation status. | PU operation mode PU EXT NET<br>External operation mode PU EXT NET<br>NET operation mode PU EXT NET |
| 7 | External operation mode (PU operation interlock)<br>X12 signal ON<br>Operation mode can be switched to the PU operation mode.<br>(output stop during external operation)<br>X12 signal OFF<br>Operation mode can not be switched to the PU operation mode. | PU operation mode PU EXT NET<br>External operation mode PU EXT NET |

● Specify operation mode at power on *(Pr.340)*
- When power is switched on or when power comes back on after instantaneous power failure, the inverter can be started up in the network operation mode.
  After the inverter has started up in the network operation mode, parameter write and operation can be performed from a program.
  Set this mode for communication operation using the inverter RS-485 terminals or communication option.
- You can set the operation mode at power on (reset) according to the *Pr. 79* and *Pr. 340* settings.

| *Pr. 340* Setting | *Pr.79* Setting | Operation mode at Power On, Power Restoration, Reset | Operation Mode Switchover |
|---|---|---|---|
| 0 (initial value) | As set in Pr. 79. | | |
| 1, 2 *1 | 0 | NET operation mode | Can be switched to external, PU or NET operation mode *2 |
| | 1 | PU operation mode | Fixed to PU operation mode |
| | 2 | NET operation mode | Can be switched to external or NET operation mode Switching to PU operation mode disabled |
| | 3, 4 | External/PU combined operation mode | Operation mode switching disabled |
| | 6 | NET operation mode | Can be switched to external, PU or NET operation mode with operation continued |
| | 7 | X12 (MRS) signal ON .. NET operation mode | Can be switched to external, PU or NET operation mode *2 |
| | | X12(MRS)signal OFF .. External operation mode | Fixed to external operation mode (Forcibly switched to external operation mode.) |
| 10, 12 *1 | 0 | NET operation mode | Can be switched to PU or NET operation mode *3 |
| | 1 | PU operation mode | Fixed to PU operation mode |
| | 2 | NEToperation mode | Fixed to NET operation mode |
| | 3, 4 | External/PU combined operation mode | Operation mode switching is disallowed |
| | 6 | NET operation mode | Can be switched to PU or NET operation mode with operation continued *3 |
| | 7 | External operation mode | Fixed to external operation mode (Forcibly switched to external operation mode.) |

*1 The *Pr. 340* setting "2" or "12" is mainly used for communication operation using the inverter RS-485 terminals.
When a value other than "9999" (selection of automatic restart after instantaneous power failure) is set in *Pr. 57 Restart coasting time,* the inverter will resume the same operation state which was in before after power has been restored from an instantaneous power failure.

*2 The operation mode cannot be switched directly between the PU operation mode and network operation mode.

*3 Operation mode can be changed between the PU operation mode and network operation mode with PU/EXT key of the operation panel (FR-DU07) and X65 signal.

## Pr.80, 90 Simple magnetic flux vector control

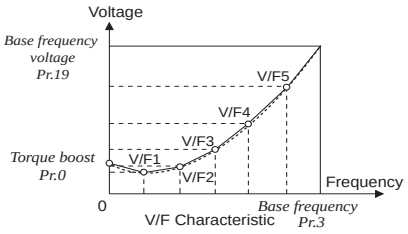
*Pr.80 Motor capacity (simple magnetic flux vector control)*
*Pr.90 Motor constant (R1)*

Providing optimum excitation to the motor can also produce high torque in a low-speed region. (simple magnetic flux vector control)
- Set the used motor capacity (equal to or one rank higher than the inveter capacity) in *Pr. 80*.
  - The number of motor poles should be any of 2, 4 and 6 poles.
  - Single-motor operation (one motor for one inverter)
  - Wiring length from inverter to motor should be within 30m.
- When simple magnetic flux vector control is not used, set "9999" (initial value) in *Pr. 80*.
- For *Pr. 90 Motor constant (R1)*, normally setting is not necessary. When you need more torque under simple magnetic flux vector control for other manufacturer's motor, set the motor primary resistance value (R1) for ⅄ connection in *Pr. 90*

## Pr. 100 to 109
## Adjustable 5 points V/F

*Pr.100 V/F1 (first frequency)* *Pr.101 V/F1 (first frequency voltage)*
*Pr.102 V/F2 (second frequency)* *Pr.103 V/F2 (second frequency voltage)*
*Pr.104 V/F3 (third frequency)* *Pr.105 V/F3 (third frequency voltage)*
*Pr.106 V/F4 (fourth frequency)* *Pr.107 V/F4 (fourth frequency voltage)*
*Pr.108 V/F5 (fifth frequency)* *Pr.109 V/F5 (fifth frequency voltage)*

A dedicated V/F pattern can be made by freely setting the V/F characteristic between a startup and the base frequency and base voltage under V/F control (frequency voltage/frequency).
Possible to set the torque pattern that is optimum for the machine's characteristic




- Adjustable 5 points V/F will not function under simple magnetic flux vector control.
- When *Pr. 19 Base frequency voltage* = "8888" or "9999", *Pr. 71* cannot be set to "2". To set *Pr. 71* to "2", set the rated voltage value to *Pr. 19*
- When the frequency values of the points are the same, a write inhibit error ( Er1 ) occurs.
- Set the points (frequencies, voltages) of *Pr. 100 to Pr. 109* within the ranges of *Pr. 3 Base frequency* and *Pr. 19 Base frequency voltage* .
- When "2" is set in *Pr. 71*, *Pr. 47 Second V/F (base frequency)* will not function.
- When "2" is set in *Pr. 71*, thermal characteristic of the electronic thermal relay function changes to thermal characteristics of a standard motor.

## Pr. 117 to 124, 331 to 337, 341 to 343, 549
## Communication initial setting

*Pr.117 PU communication station* *Pr.118 PU communication speed*
*Pr.119 PU communication stop bit length.* *Pr.120 PU communication parity check*
*Pr.121 Number of PU communication retries* *Pr.122 PU communication check time interval*
*Pr.123 PU communication waiting time setting*
*Pr.124 PU communication CR/LF presence/absence selection*
*Pr.331 RS-485 communication station* *Pr.332 RS-485 communication speed*
*Pr.333 RS-485 communication stop bit length*
*Pr.334 RS-485 communication parity check selection*
*Pr.335 RS-485 communication number of retries* *Pr.336 RS-485 communication check time interval*
*Pr.337 RS-485 communication waiting time setting*
*Pr.341 RS-485 communication CR/LF selection* *Pr.342 Communication EEPROM write selection*
*Pr.343 Communication error count* *Pr.549 Protocol selection*

### (1) Initial settings and specifications of RS-485 communication (*Pr.117 to Pr.124, Pr.331 to Pr.337, Pr.341*)

Used to perform required settings for RS-485 communication between the inverter and personal computer.

- There are two different communications: communication using the PU connector of the inverter and communication using the RS-485 terminals.
- You can perform parameter setting, monitor, etc. using the Mitsubishi inverter protocol or Modbus-RTU protocol.
- To make communication between the personal computer and inverter, initialization of the communication specifications must be made to the inverter.
  Data communication cannot be made if the initial settings are not made or there is any setting error.

| Pr. Number | Setting Range | Description | |
|---|---|---|---|
| 117<br>331 | 0 to 31<br>(0 to 247) *1 | Specify the inverter station number.<br>Set the inverter station numbers when two or more inverters are connected to one personal computer. | |
| 118<br>332 | 48, 96, 192, 384<br>(3, 6, 12, 24) *2 | Set the communication speed.<br>The setting value × 100 equals the communication speed.<br>For example, the communication speed is 19200bps when the setting value is "192". | |
| 119<br>333 | | Stop bit length | Data length |
| | 0 | 1bit | 8bit |
| | 1 (initial value) | 2bit | |
| | 10 | 1bit | 7bit |
| | 11 | 2bit | |
| 120<br>334 | 0 | Without parity check | |
| | 1 | With odd parity check | |
| | 2 (initial value) | With even parity check | |
| 121<br>335 | 0 to 10 | Set the permissible number of retries at occurrence of a data receive error. If the number of consecutive errors exceeds the permissible value, the inverter will come to an alarm stop. | |
| | 9999 | If a communication error occurs, the inverter will not come to an alarm stop. | |
| 122<br>336 | 0 | No PU connector communication<br>Communication with RS-485 terminal can be made, but the inverter will come to an alarm stop in the NET operation mode. | |
| | 0.1 to 999.8s | Set the interval of communication check time.<br>If a no-communication state persists for longer than the permissible time, the inverter will come to an alarm stop. | |
| | 9999 (initial value) | No communication check | |
| 123<br>337 | 0 to 150ms | Set the waiting time between data transmission to the inverter and response. | |
| | 9999 (initial value) | Set with communication data. | |
| 124<br>341 | 0 | Without CR/LF | |
| | 1 (initial value) | With CR | |
| | 2 | With CR/LF | |

*1 When making communication through Modbus-RTU protocol with the RS-485 terminals, the setting range of *Pr. 331* within parenthesis is applied.
*2 The values in parenthesis are added to the setting range of *Pr. 332*.

### (2) Communication EEPROM write selection (*Pr.342*)

Parameters written via the inverter's PU connector or RS-485 terminals or from the communication option can be written to the RAM. When performing parameter change frequently, set "1" in *Pr. 342*.

### (3) Modbus-RTU communication specifications (*Pr.343, Pr.549*)

* The Modbus-RTU protocol is valid for only communication from the RS-485 terminals.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 343 | — | Display the number of communication errors during Modbus-RTU communication. Reading only |
| 549 | 0<br>(initial value) | Mitsubishi inverter (computer link) protocol |
| | 1 | Modbus-RTU protocol |

## Pr. 125 Pr. 126 Pr. 241, C2(902) to C7(905)

### Analog input frequency change and voltage, current input and frequency adjustment (calibration)

*Pr.125 Terminal 2 frequency setting gain frequency*

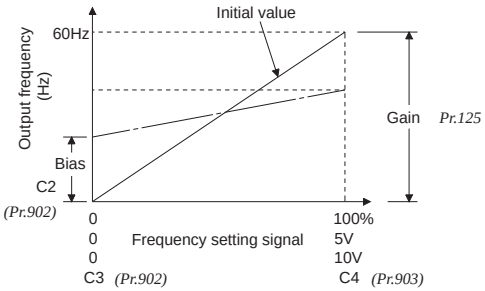
*Pr.126 Terminal 4 frequency setting gain frequency*

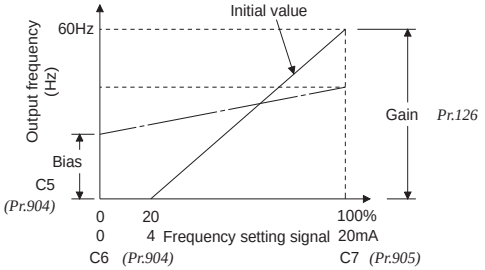
*Pr. 241 Analog input display unit switchover*
*C2(Pr.902) Terminal 2 frequency setting bias frequency*
*C3(Pr.902) Terminal 2 frequency setting bias* *C4(Pr.903) Terminal 2 frequency setting gain*
*C5(Pr.904) Terminal 4 frequency setting bias frequency*
*C6(Pr.904) Terminal 4 frequency setting bias* *C7(Pr.905) Terminal 4 frequency setting gain*

- You can set the magnitude (slope) of the output frequency as desired in relation to the frequency setting signal (0 to 5VDC, 0 to 10V or 4 to 20mA).

**(1) Change the frequency at maximum analog input. (*Pr.125, Pr.126*)**

Set a value in *Pr. 125 (Pr. 126)* when changing only the frequency setting (gain) of the maximum analog input power (current). (*C2 (Pr. 902) to C7 (Pr. 905)* setting need not be changed)




**(2) Analog input bias/gain calibration (*C2(Pr.902) to C7(Pr.905)*)**

- The "bias" and "gain" functions are used to adjust the relationship between the input signal entered from outside the inverter to set the output frequency, e.g. 0 to 5V, 0 to 10V or 4 to 20mADC, and the output frequency.
- Set the bias frequency of terminal 2 input using *C2(Pr. 902)*. (Factory-set to the frequency at 0V)
- Using *Pr. 125* , set the output frequency relative to the frequency command voltage (current) set in *Pr. 73 Analog input selection*.
- Set the bias frequency of the terminal 4 input using *C5(Pr. 904)*. (Factory-set to the frequency at 4mA)
- Using *Pr. 126* , set the output frequency relative to 20mA of the frequency command current (4 to 20mA).

**(3) Analog input display unit changing (Pr. 241)**

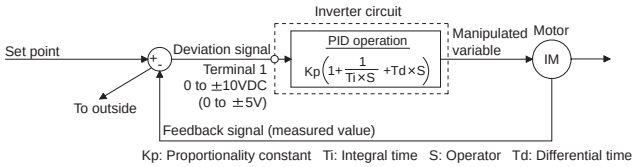
- You can change the analog input display unit (%/V/mA) for analog input bias/gain calibration.

## Pr. 127 to 134, 575 to 577 PID control

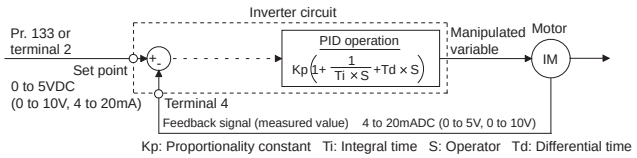
*Pr.127 PID control automatic switchover freqeuncy*
*Pr.128 PID action selection* *Pr.129 PID proportional band*
*Pr.130 PID integral time* *Pr.131 PID upper limit*
*Pr.132 PID lower limit* *Pr.133 PID action set point*
*Pr.134 PID differential time* *Pr.575 Output interruption detection time*
*Pr.576 Output interruption detection level* *Pr.577 Output interruption release level*

The inverter can be used to exercise process control, e.g. flow rate, air volume or pressure.
The terminal 2 input signal or parameter setting is used as a set point and the terminal 4 input signal used as a feedback value to constitute a feedback system for PID control.

- *Pr.128* ="10, 11" (Deviation value signal input)




- *Pr.128* ="20, 21" (Measured value input)



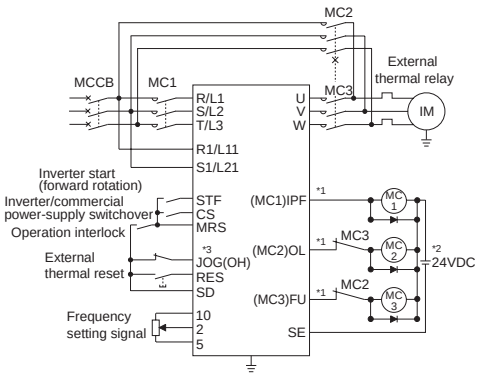

## Pr. 135 to 139, 159 Switch between the inverter operation and commercial power-supply operation to use

*Pr.135 Commercial power-supply switchover sequence output terminal selection*
*Pr.136 MC switchover interlock time* *Pr.137 Waiting time at a start*
*Pr.138 Commercial power-supply operation switchover selection at an alarm*
*Pr.139 Automatic switchover frequency between inverter and commercial power-supply operation*
*Pr.159 Automatic switchover ON range between commercial power-supply and inverter operation*

The complicated sequence circuit for commercial power supply-inverter switchover is built in the inverter. Hence, merely inputting the start, stop or automatic switchover selection signal facilitates the interlock operation of the switchover magnetic contactor.

| *Pr135* Setting | Description |
|---|---|
| 0 (initial value) | Without commercial power-supply switchover sequence |
| 1 | With commercial power-supply switchover sequence |

Sink logic type, *Pr.185* = "7", *Pr.192* = "17", *Pr.193* = "18", *Pr.194* = "19"




Commercial power-supply switchover sequence connection diagram

*1 Take caution for the capacity of the sequence output terminal.
*2 When connecting a DC power supply, insert a protective diode.
*3 The used terminal changes depending on the setting of *Pr. 180 to Pr. 189 (input terminal function selection)*.

Pr. 140 to 143 → **Refer to the section about *Pr. 29* and other relevant parameters.**

Pr. 144 → **Refer to the section about *Pr. 37* and other relevant parameters.**

## Pr. 145 Parameter unit display language selection

*Pr.145 PU display language selection*

You can switch the display language of the parameter unit (FR-PU04) to another.

| *Pr.145* Setting | Description |
|---|---|
| 0 (initial value) | Japanese |
| 1 | English |
| 2 | German |
| 3 | French |
| 4 | Spanish |
| 5 | Italian |
| 6 | Swedish |
| 7 | Finnish |

Pr. 148, 149 → Refer to the section about *Pr. 22* and other relevant parameters.

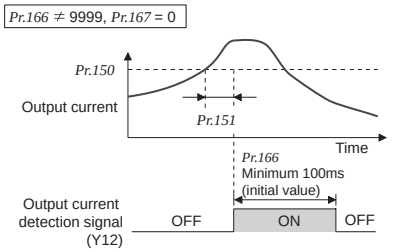
## Pr. 150 to 153, 166, 167 Detection of output current (Y12 signal) detection of zero current (Y13 signal)

*Pr.150 Output current detection level* *Pr.151 Output current detection signal delay time*
*Pr.152 Zero current detection level* *Pr.153 Zero current detection time*
*Pr.166 Output current detection signal retention time*
*Pr.167 Output current detection operation selection*

The output current during inverter running can be detected and output to the output terminal.

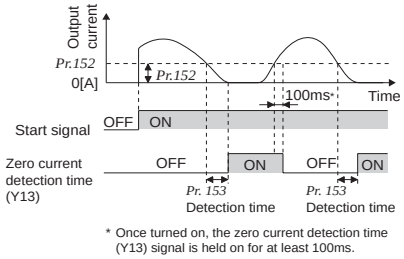
### (1) Output current detection (Y12 signal, *Pr. 150, Pr. 151, Pr. 166, Pr. 167*)

- The output current detection function can be used for excessive torque detection, etc.
- If the output current remains higher than the *Pr. 150* setting during inverter operation for longer than the time set in *Pr. 151*, the output current detection signal (Y12) is output from the inverter's open collector or relay output terminal.




### (2) Zero current detection (Y13 signal, *Pr. 152, Pr. 153*)

- If the output current remains lower than the *Pr. 152* setting during inverter operation for longer than the time set in *Pr. 153*, the zero current detection (Y13) signal is output from the inverter's open collector or relay output terminal.




* Once turned on, the zero current detection time (Y13) signal is held on for at least 100ms.

Pr. 154 → Refer to the section about *Pr. 22* and other relevant parameters.

## Pr. 155 Selection of action conditions of the second function signal (RT)

*Pr.155 RT signal reflection time selection*

You can select the second function using the external terminal (RT signal).
You can also set the RT signal operation condition (reflection time).

| *Pr.155* Setting | Description |
|---|---|
| 0 (initial value) | This function is immediately made valid with on of the RT signal. |
| 10 | This function is valid only during the RT signal is on and constant speed operation. (invalid during acceleration/deceleration) |

- Functions that can be set as second functions

| Function | First Function Parameter Number | Second Function Parameter Number |
|---|---|---|
| Torque boost | Pr.0 | Pr.46 |
| Base frequency | Pr.3 | Pr.47 |
| Acceleration time | Pr.7 | Pr.44 |
| Deceleration time | Pr.8 | Pr.44, Pr.45 |
| Electronic thermal O/L relay | Pr.9 | Pr.51 |
| Stall prevention | Pr.22 | Pr.48, Pr.49 |

Pr. 156, 157 → Refer to the section about *Pr. 22* and other relevant parameters.

Pr. 158 → Refer to the section about *Pr. 54* and other relevant parameters.

Pr. 159 → Refer to the section about *Pr. 135* and other relevant parameters.

## Pr. 160 Pr. 172 to 174 Display of applied parameters and user group function

*Pr.160 User group read selection*

*Pr.172 User group registered display/batch clear*
*Pr.173 User group registration* *Pr.174 User group clear*

- Parameter which can be read from the operation panel and parameter unit can be restricted.
  In the initial setting, only the simple mode parameters are displayed.

| *Pr. 160* Setting | Description |
|---|---|
| 9999 (initial value) | Only the simple mode parameters can be displayed. |
| 0 | Simple mode+extended parameters can be displayed. |
| 1 | Only parameters registered to the user group can be displayed. |

### (1) Display of simple mode parameters and extended parameters (*Pr.160*)

- When *Pr. 160* = "9999" (initial value), only the simple mode parameters can be displayed on the operation panel (FR-DU07) and parameter unit (FR-PU04).
- When "0" is set in *Pr. 160*, simple mode parameters and extended parameters can be displayed.

### (2) User group function (*Pr.160, Pr.172 to Pr.174*)

- The user group function is designed to display only the parameters necessary for setting.
- From among all parameters, a maximum of 16 parameters can be registered to a user group. When *Pr. 160* is set in "1", only the parameters registered to the user group can be accessed. (The parameters not registered to the user group cannot be read.)
- To register a parameter to the user group, set its parameter number to *Pr. 173*.
- To delete a parameter from the user group, set its parameter number to *Pr. 174*. To batch-delete the registered parameters, set *Pr. 172* in "9999".

## Pr. 161 Operation selection of the operation panel

*Pr.161 Frequency setting/key lock operation selection*

You can use the setting dial of the operation panel (FR-DU07) like a potentiometer to perform operation.
The key operation of the operation panel can be disabled.

| *Pr.161* Setting | Description | |
|---|---|---|
| 0 (initial value) | Setting dial frequency setting mode | Key lock mode invalid |
| 1 | Setting dial potentiometer mode | |
| 10 | Setting dial frequency setting mode | Key lock mode valid |
| 11 | Setting dial potentiometer mode | |

Pr. 162 to 165 → **Refer to the section about** *Pr. 57* **and other relevant parameters.**

Pr. 166, 167 → **Refer to the section about** *Pr. 150* **and other relevant parameters.**

Pr. 168, 169 Parameter for manufacturer setting. Do not set.

Pr. 170, 171 → **Refer to the section about** *Pr. 52* **and other relevant parameters.**

Pr. 172 to 174 → **Refer to the section about** *Pr. 160* **and other relevant parameters.**

## Pr. 178 to 189 Function assignment of input terminal

*Pr.178 STF terminal function selection* *Pr.179 STR terminal function selection*
*Pr.180 RL terminal function selection* *Pr.181 RM terminal function selection*
*Pr.182 RH terminal function selection* *Pr.183 RT terminal function selection*
*Pr.184 AU terminal function selection* *Pr.185 JOG terminal function selection*
*Pr.186 CS terminal function selection* *Pr.187 MRS terminal function selection*
*Pr.188 STOP terminal function selection* *Pr.189 RES terminal function selection*

Use these parameters to select/change the input terminal functions.

| *Pr.178* to *Pr.189* Setting | Signal Name | Function | |
|---|---|---|---|
| 0 | RL | *Pr.59* =0 (initial value) | Low speed operation command |
| | | *Pr.59* =1, 2 *1 | Remote setting (setting clear) |
| 1 | RM | *Pr.59* =0 (initial value) | Middle speed operation command |
| | | *Pr.59* =1, 2 *1 | Remote setting (deceleration) |
| 2 | RH | *Pr.59* =0 (initial value) | High speed operation command |
| | | *Pr.59* =1, 2 *1 | Remote setting (acceleration) |
| 3 | RT | Second function selection | |
| 4 | AU | Terminal 4 input selection | |
| 5 | JOG | Jog operation selection | |
| 6 | CS | Selection of automatic restart after instantaneous power failure, flying start | |
| 7 | OH | External thermal relay input *2 | |
| 8 | REX | 15 speed selection (combination with three speeds RL, RM, RH) | |
| 10 | X10 | Inverter operation enable signal (FR-HC, FR-CV connection) | |
| 11 | X11 | FR-HC connection, instantaneous power failure detection | |
| 12 | X12 | PU operation external interlock | |
| 14 | X14 | PID control valid terminal | |
| 16 | X16 | PU-external operation switchover | |
| 24 | MRS | Output stop | |
| 25 | STOP | Start self-holding selection | |
| 60 | STF | Forward rotation command (assigned to STF terminal *(Pr. 178)* only) | |
| 61 | STR | Reverse rotation command (assigned to STR terminal *(Pr. 179)* only) | |
| 62 | RES | Inverter reset | |
| 63 | PTC | PTC thermistor input (assigned to AU terminal *(Pr. 184)* only) | |
| 64 | X64 | PID forward/reverse action switchover | |
| 65 | X65 | NET/PU operation switchover | |
| 66 | X66 | External/NET operation switchover | |
| 67 | X67 | Command source switchover | |
| 9999 | — | No function | |

*1 When *Pr. 59 Remote function selection* = "1" or "2", the functions of the RL, RM and RH signals are changed as given in the table.
*2 The OH signal turns on when the relay contact "opens".

## Pr. 190 to 196 Terminal assignment of output terminal

*Pr.190 RUN terminal function selection* *Pr.191 SU terminal function selection*
*Pr.192 IPF terminal function selection* *Pr.193 OL terminal function selection*
*Pr.194 FU terminal function selection* *Pr.195 ABC1 terminal function selection*
*Pr.196 ABC2 terminal function selection*

You can change the functions of the open collector output terminal and relay output terminal.

| *Pr.190 to Pr.196* Setting | | Signal Name | Function |
|---|---|---|---|
| Positive logic | Negative logic | | |
| 0 | 100 | RUN | Inverter running |
| 1 | 101 | SU | Up to frequency |
| 2 | 102 | IPF | Instantaneous power failure/ undervoltage |
| 3 | 103 | OL | Overload alarm |
| 4 | 104 | FU | Output frequency detection |
| 5 | 105 | FU2 | Second output frequency detection |
| 5 | 105 | FU2 | Second output frequency detection |
| 7 | 107 | RBP | Regenerative brake prealarm * |
| 10 | 110 | PU | PU operation mode |
| 11 | 111 | RY | Inverter operation ready |
| 12 | 112 | Y12 | Output current detection |
| 13 | 113 | Y13 | Zero current detection |
| 14 | 114 | FDN | PID lower limit |
| 15 | 115 | FUP | PID upper limit |
| 16 | 116 | RL | PID forward/reverse rotation output |
| 17 | — | MC1 | Commercial power-supply switchover MC1 |
| 18 | — | MC2 | Commercial power-supply switchover MC2 |
| 19 | — | MC3 | Commercial power-supply switchover MC3 |
| 25 | 125 | FAN | Fan fault output |
| 26 | 126 | FIN | Heatsink overheat pre-alarm |
| 45 | 145 | RUN3 | During inverter running and start command is on |
| 46 | 146 | Y46 | During deceleration at occurrence of power failure (retained until release) |
| 47 | 147 | PID | During PID control activated |
| 64 | 164 | Y64 | During retry |
| 70 | 170 | SLEEP | During PID output suspension |
| 90 | 190 | Y90 | Life alarm |
| 91 | 191 | Y91 | Alarm output 3 (power-off signal) |
| 92 | 192 | Y92 | Energy saving average value updated timing |
| 93 | 193 | Y93 | Current average monitor signal |
| 94 | 194 | ALM2 | Alarm output 2 |
| 95 | 195 | Y95 | Maintenance timer signal |
| 96 | 196 | REM | Remote output |
| 98 | 198 | LF | Minor fault output |
| 99 | 199 | ALM | Alarm output |
| 9999 | | — | No function |

* Setting can be made for the 75K or more.

Pr. 232 to 239 → **Refer to the section about** *Pr.4 to Pr.6*

Pr. 240 → **Refer to the section about** *Pr. 72* **and other relevant parameters.**

Pr. 241 → **Refer to the section about** *Pr. 125, Pr.126*

Pr. 242, 243 → **Refer to the section about** *Pr. 73* **and other relevant parameters.**

## Pr. 244 Increase cooling fan life

*Pr.244 Cooling fan operation selection*

You can control the operation of the cooling fan (200V class 2.2K or more, 400V class 3.7K or more) built in the inverter.

| *Pr. 244* Setting | Description |
|---|---|
| 0 | The cooling fan operates at power on.<br>Cooling fan on/off control invalid (The cooling fan is always on at power on) |
| 1 (initial value) | Cooling fan on/off control valid<br>The fan is normally on during inverter operation. The fan switches on/off according to the temperature during a stop of the inverter whose status is monitored. |

## Pr. 245 to 247 Slip compensation

*Pr.245 Rated slip* *Pr.246 Slip compensation time constant*
*Pr.247 Constant-output region slip compensation selection*

The inverter output current may be used to assume motor slip to keep the motor speed constant.

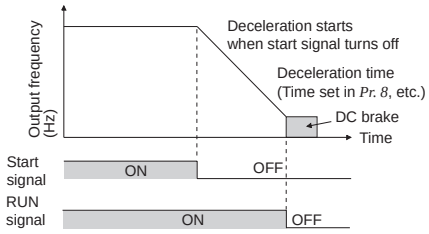
## Pr. 250 Selection of motor stopping method and start signal

*Pr.250 Stop selection*

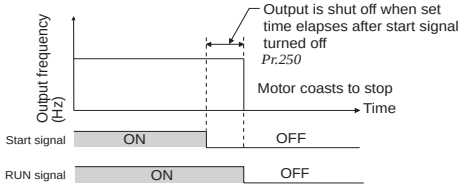
Used to select the stopping method (deceleration to a stop or coasting) when the start signal turns off.
Used to stop the motor with a mechanical brake, etc. together with switching off of the start signal.
You can also select the operations of the start signals (STF/STR).

| *Pr.250* Setting | Description | |
|---|---|---|
| | Start signal (STF/STR) | Stop operation |
| 0 to 100s | STF signal: Foward rotation start<br>STR signal: Reverse rotation start | The motor is coasted to a stop when the preset time elapses after the start signal is turned off. The motor is coasted to a stop (*Pr. 250* - 1000)s after the start signal is turned off. |
| 1000s to 1100s | STF signal: Start signal<br>STR signal: Forward/ reverse rotation signal | |
| 9999 | STF signal: Foward rotation start<br>STR signal: Reverse rotation start | When the start signal is turned off, the motor decelerates to stop. |
| 8888 | STF signal: Start signal<br>STR signal: Forward/ reverse rotation signal | |

When *Pr. 250* is set to "9999" (initial value) or "8888".




When *Pr. 250* is set to values other than "9999" (initial value) or "8888".




## Pr. 251, 872 Input/output phase failure protection selection

*Pr.251 Output phase failure protection selection* *Pr.872 Input phase failure protection selection*

You can disable the output phase failure protection function that stops the inverter output if one of the inverter output side (load side) three phases (U, V, W) opens.
The input phase failure protection selection of the inverter input side (R/L1, S/L2, T/L3) can be made valid.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 251 | 0 | Without output phase failure protection |
| | 1 (initial value) | With output phase failure protection |
| 872 | 0 (initial value) | Without input phase failure protection |
| | 1 | With input phase failure protection |

Pr. 252, 253 → **Refer to the section about *Pr. 73* and other relevant parameters.**

## Pr. 255 to 259 Display of the life of the inverter parts

*Pr.255 Life alarm status display* *Pr.256 Inrush current limit circuit life display*
*Pr.257 Control circuit capacitor life display* *Pr.258 Main circuit capacitor life display*
*Pr.259 Main circuit capacitor life measuring*

Degrees of deterioration of main circuit capacitor, control circuit capacitor or inrush current limit circuit and cooling fan can be diagnosed by monitor.
When any part has approached the end of its life, an alarm can be output by self diagnosis to prevent a fault.
(Use the life check of this function as a guideline since the life except the main circuit capacitor is calculated theoretically.)

| Pr. Number | Setting Range | Description |
|---|---|---|
| 255 | (0 to 15) | Display whether the control circuit capacitor, main circuit capacitor, cooling fan, and each parts of the inrush current limit circuit has reached the life alarm output level or not. Reading only |
| 256 | (0 to 100%) | Display the deterioration degree of the inrush current limit circuit. Reading only |
| 257 | (0 to 100%) | Display the deterioration degree of the control circuit capacitor. Reading only |
| 258 | (0 to 100%) | Display the deterioration degree of the main circuit capacitor. Reading only<br>The value measured by *Pr. 259* is displayed. |
| 259 | 0, 1<br>(2, 3, 8, 9) | Setting "1" and turning off the power starts the measurement of the main circuit capacitor life. When the *Pr. 259* value is "3" after powering on again, the measuring is completed. Read the deterioration degree in *Pr. 258*. |

Pr. 260 → **Refer to the section about *Pr. 72*.**

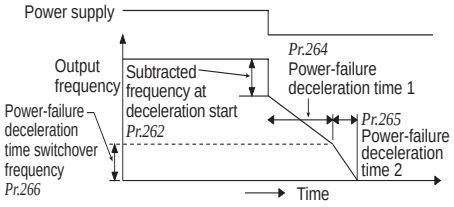
## Pr. 261 to 266 Operation at instantaneous power failure

*Pr.261 Power failure stop selection*
*Pr.262 Subtracted frequency at deceleration start*
*Pr.263 Subtraction starting frequency* *Pr.264 Power-failure deceleration time 1*
*Pr.265 Power-failure deceleration time 2*
*Pr.266 Power failure deceleration time switchover frequency*

When a power failure or undervoltage occurs, the inverter can be decelerated to a stop or can be decelerated and re-accelerated to the set frequency.

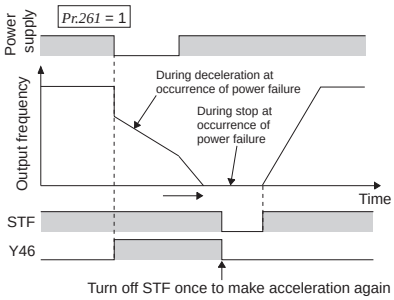
| Pr. Number | Setting Range | Description |
|---|---|---|
| 261 | 0 (initial value) | Coasting to stop<br>When undervoltage or power failure occurs, the inverter output is shut off. |
| | 1 | When undervoltage or a power failure occurs, the inverter can be decelerated to a stop. |
| | 2 | When undervoltage or a power failure occurs, the inverter can be decelerated to a stop.<br>If power is restored during a power failure, the inverter accelerates again. |
| 262 | 0 to 20Hz | Normally operation can be performed with the initial value unchanged. But adjust the frequency according to the magnitude of the load specifications (moment of inertia, torque). |
| 263 | 0 to 120Hz | When output frequency ≥ *Pr. 263*<br>Decelerate from the speed obtained from output frequency minus *Pr. 262*.<br>When output frequency < *Pr. 263*<br>Decelerate from output frequency |
| | 9999 | Decelerate from the speed obtained from output frequency minus *Pr. 262*. |
| 264 | 0 to 3600/ 360s * | Set a deceleration slope down to the frequency set in *Pr. 266*. |
| 265 | 0 to 3600/ 360s * | Set a deceleration slope below the frequency set in *Pr. 266*. |
| | 9999 | Same slope as in *Pr. 264* |
| 266 | 0 to 400Hz | Set the frequency at which the deceleration slope is switched from the *Pr. 264* setting to the *Pr. 265* setting. |

* When the setting of *Pr. 21 Acceleration/deceleration time increments* is "0" (initial value), the setting range is "0 to 3600s" and the setting increments are "0.1s", and when the setting is "1", the setting range is "0 to 360s" and the setting increments are "0.01s"



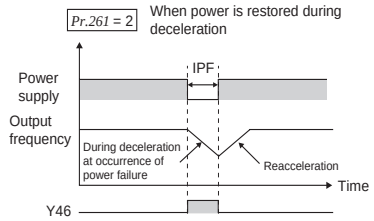

### (1) Power failure stop mode (*Pr.261* = "1")

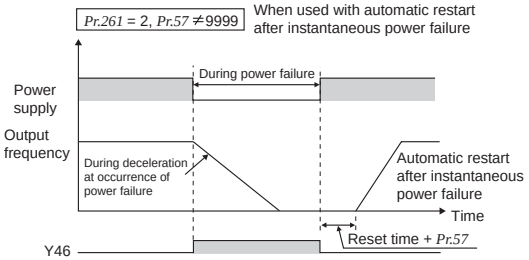
- If power is restored during power failure deceleration, deceleration to a stop is continued and the inverter remains stopped.To restart, turn off the start signal once, then turn it on again.




### (2) Instantaneous power failure-time operation continuation function (*Pr.261* = "2")

- When power is restored during deceleration after an instantaneous power failure, acceleration is made again up to the set frequency.
- When this function is used in combination with the automatic restart after instantaneous power failure operation, deceleration can be made at a power failure and acceleration can be made again after power restoration.
  When power is restored after a stop by deceleration at an instantaneous power failure, automatic restart operation is performed if automatic restart after instantaneous power failure has been selected (*Pr. 57* ≠ "9999")




**Pr. 267** → **Refer to the section about *Pr. 73* and other relevant parameters.**

**Pr. 268** → **Refer to the section about *Pr. 52* and other relevant parameters.**

**Pr. 269** Parameter for manufacturer setting. Do not set.

**Pr. 299** → **Refer to the section about *Pr. 57* and other relevant parameters.**

**Pr. 331 to 337** → **Refer to the section about *Pr. 117* and other relevant parameters.**

## Pr. 338, 339, 550, 551

### Operation command source and speed command source during communication operation

*Pr.338 Communication operation command source*
*Pr.339 Communication speed command source*
*Pr.550 NET mode operation command source selection*
*Pr.551 PU mode operation command source selection*

When the RS-485 terminals or communication option is used, the external operation command and speed command can be made valid. Also, the control command source in the PU operation mode can be selected.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 338 | 0 (initial value) | Operation command source communication |
| | 1 | Operation command source external |
| 339 | 0 (initial value) | Speed command source communication |
| | 1 | Speed command source external (Frequency setting from communication is invalid, terminal 2 and 1 setting from external is valid) |
| | 2 | Speed command source external (Frequency setting from communication is valid, terminal 2 and 1 setting from external is invalid) |
| 550 * | 0 | Communication option valid |
| | 1 | Inverter RS-485 terminal valid |
| | 9999 (initial value) | Automatic communication option recognition Normally, the RS-485 terminals are valid. When the communication option is fitted, the communication option is valid. |
| 551 * | 1 | Select the RS-485 terminals as the PU operation mode control source. |
| | 2 (initial value) | Select the PU connector as the PU operation mode control source. |

* *Pr. 550 and Pr. 551* are always write-enabled.

Pr. 340 → **Refer to the section about** *Pr. 79*.

Pr. 341 to 343 → **Refer to the section about** *Pr. 117* **and other relevant parameters.**

## Pr. 495 to 497 Remote output function (REM signal)

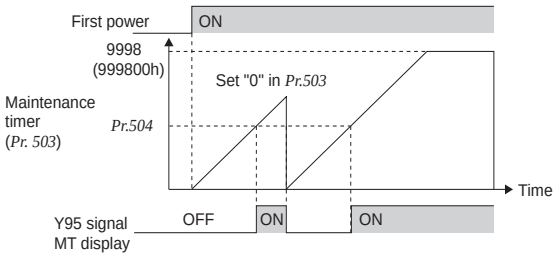
*Pr.495 Remote output selection* *Pr.496 Remote output data 1*
*Pr.497 Remote output data 2*

You can utilize the on/off of the inverter's output signals instead of the remote output terminal of the programmable logic controller.

## Pr. 503 to 504 To determine the maintenance time of parts.

*Pr.503 Maintenance timer* *Pr.504 Maintenance timer alarm output set time*

When the cumulative energization time of the inverter reaches the parameter set time, the maintenance timer output signal (Y95) is output. "MT" (MT) is displayed on the operation panel (FR-DU07)
This can be used as a guideline for the maintenance time of peripheral devices.




- The cumulative energization time of the inverter is stored into the EEPROM every hour and indicated in *Pr. 503 Maintenance timer* in 100h increments. *Pr. 503* is clamped at 9998 (999800h).

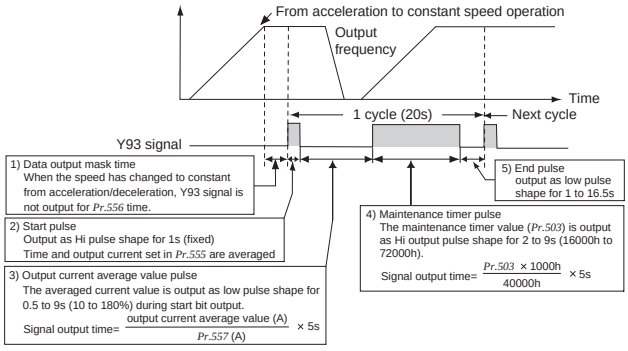
Pr. 549 → **Refer to the section about** *Pr.117 to Pr. 124*.

Pr. 550 to 551 → **Refer to the section about** *Pr. 338, Pr.339*.

## Pr. 555 to 557 Current average value monitor signal

*Pr.555 Current average time* *Pr.556 Data output mask time*
*Pr.557 Current average value monitor signal output reference current*

The average value of the output current during constant speed operation and the maintenance timer value are output as a pulse to the current average value monitor signal (Y93).
The pulse width output to the I/O module of the PLC or the like can be used as a guideline due to abrasion of machines and elongation of belt and for aged deterioration of devices to know the maintenance time.
The current average value monitor signal (Y93) is output as pulse for 20s as 1 cycle and repeatedly output during constant speed operation.




Pr. 571 → **Refer to the section about** *Pr. 13* **and other relevant parameters.**

Pr. 575 to 577 → **Refer to the section about** *Pr. 127* **and other relevant parameters.**

Pr. 611 → **Refer to the section about** *Pr. 57* **and other relevant parameters.**

Pr. 872 → **Refer to the section about** *Pr. 251* **and other relevant parameters.**

## Pr. 882 to 886 Regeneration avoidance function

*Pr.882 Regeneration avoidance operation selection*
*Pr.883 Regeneration avoidance operation level*
*Pr.884 Regeneration avoidance at deceleration detection sensitivity*
*Pr.885 Regeneration avoidance compensation frequency limit value*
*Pr.886 Regeneration avoidance voltage gain*

This function detects a regeneration status and increases the frequency to avoid the regeneration status.

●Possible to avoid regeneration by automatically increasing the frequency and continue operation if the fan happens to rotate faster than the set speed due to the effect of another fan in the same duct.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 882 | 0 (initial value) | Regeneration avoidance function invalid |
| | 1 | Regeneration avoidance function valid |
| 883 | 300 to 800V | Set the bus voltage level at which regeneration avoidance operates. When the bus voltage level is set to low, overvoltage error will be less apt to occur. However, the actual deceleration time increases. The set value must be higher than the power supply valtage × $\sqrt{2}$. |
| 884 | 0 (initial value) | Regeneration avoidance by bus voltage change ratio is invalid |
| | 1 to 5 | Set sensitivity to detect the bus voltage change<br>Setting 1 → 5<br>Detection sensitivity low → high |
| 885 | 0 to 10Hz | Set the limit value of frequency which rises at activation of regeneration avoidance function. |
| | 9999 | Frequency limit invalid |
| 886 | 0 to 200% | Adjust responsiveness at activation of regeneration avoidance. A larger setting will improve responsiveness to the bus voltage change. However, the output frequency could become unstable. |

## Pr. 888, 889 Free parameter

*Pr.888 Free parameter 1* *Pr.889 Free parameter 2*

Parameters you can use for your own purposes.
You can input any number within the setting range 0 to 9999.
For example, the number can be used:

- As a unit number when multiple units are used.
- As a pattern number for each operation application when multiple units are used.
- As the year and month of introduction or inspection.

Pr. 891 → **Refer to the section about *Pr. 52* and other relevant parameters.**

## Pr. 892 to 899 Energy saving monitor

*Pr.892 Load factor*
*Pr.893 Energy saving monitor reference (motor capacity)*
*Pr.894 Control selection during commercial power-supply operation*
*Pr.895 Power saving rate reference value*
*Pr.896 Power unit cost*
*Pr.897 Power saving monitor average time*
*Pr.898 Power saving cumulative monitor clear*
*Pr.899 Operation time rate (estimated value)*

From the power consumption estimated value during commercial power supply operation, the energy saving effect by use of the inverter can be monitored/output.

- The following provides the items that can be monitored by the power saving monitor (*Pr. 52, Pr. 54, Pr. 158* = "50").
  (Only power saving and power saving average value can be output to *Pr. 54* (terminal FM) *and Pr. 158* (terminal AM))

| Energy Saving Monitor Item | Description and Formula | Increments |
|---|---|---|
| Power saving | Difference between the estimated value of power necessary for commercial power supply operation and the input power calculated by the inverter<br>**Power during commercial power supply operation - input power monitor** | 0.01kW/ 0.1kW* |
| Power saving rate | Ratio of power saving on the assumption that power during commercial power supply operation is 100%<br>$\frac{\text{Power saving}}{\text{Power during commercial power supply operation}} \times 100$ | 0.1% |
| | Ratio of power saving on the assumption that *Pr. 893* is 100%<br>$\frac{\text{Power saving}}{Pr.893} \times 100$ | |
| Power saving average value | Average value of power saving amount per hour during predetermined time *(Pr. 897)*<br>$\frac{\Sigma\ (\text{Power saving} \times \Delta t)}{Pr.897}$ | 0.01kWh/ 0.1kWh* |
| Power saving rate reference value | Ratio of power saving average value on the assumption that the value during commercial power supply operation is 100%<br>$\frac{\Sigma\ (\text{Power saving} \times \Delta t)}{Pr.897} \times 100$ | 0.1% |
| | Ratio of power saving average value on the assumption that *Pr. 893* is 100%<br>$\frac{\text{Power saving average value}}{Pr.893} \times 100$ | |
| Power saving charge average value | Power saving average value represented in terms of charge<br>**Power saving average value** × ***Pr. 896*** | 0.01/0.1* |

· The following gives the items which can be monitored by the cumulative saving power monitor (*Pr. 52* = "51").
(The cumulative power monitor data digit can be shifted to the right by the number set in *Pr. 891 Cumulative power monitor digit shifted times*.)

| Energy Saving Monitor Item | Description and Formula | Increments |
|---|---|---|
| Power saving amount | Power saving is added up per hour.<br>**Σ (Power saving × Δt)** | 0.01kWh/<br>0.1kWh* |
| Power saving amount charge | Power saving amount represented in terms of charge<br>**Power saving amount × *Pr. 896*** | 0.01/0.1* |
| Annual power saving amount | Estimated value of annual power saving amount<br>$\frac{\text{Power saving amount}}{\text{Operation time during power saving totalization}} \times 24 \times 365 \times \frac{Pr.899}{100}$ | 0.01kWh/<br>0.1kWh* |
| Annual power saving amount charge | Annual power saving amount represented in terms of charge<br>**Annual power saving amount × *Pr. 896*** | 0.01/0.1* |

* The increments vary according to the inverter capacity. (55K or less/75K or more)

## Pr. C0(900), C1(901) Adjustment of terminal FM and AM (calibration)

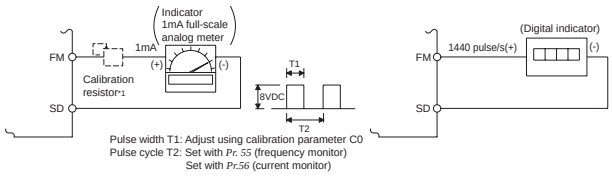
*C0(Pr.900) FM terminal calibration* *C1(Pr.901) AM terminal calibration*

The operation panel and parameter unit can be used to calibrate the full scales of the terminals FM and AM.

### (1) FM terminal calibration (*C0(Pr.900)*)

· The terminal FM is preset to output pulses. By setting the *Calibraton parameter C0 (Pr. 900)*, the meter connected to the inverter can be calibrated by parameter setting without use of a calibration resistor.

· Using the pulse train output of the terminal FM, a digital display can be provided by a digital counter. The monitor value is 1440 pulses/s output at the full-scale value of *Pr. 54 FM terminal function selection*.




*1 Not needed when the operation panel (FR-DU07) or parameter unit (FR-PU04) is used for calibration.
Used when calibration must be made near the frequency meter for such a reason as a remote frequency meter.
However, the frequency meter needle may not deflect to full-scale if the calibration resistor is connected. In this case, use this resistor and operation panel or parameter unit together.

### (2) AM terminal calibration (*C1(Pr.901)*)

· The AM terminal is factory-set to output 10VDC in the full-scale state of each monitor item. By setting the *calibration parameter C1 (Pr. 901)*, the ratio (gain) of the output voltage can be adjusted to the meter scale. Note that the maximum output voltage is 10VDC.

Pr. **C2(902) to C7(905)** → **Refer to the section about** *Pr. 125, Pr. 126*

Pr. **989** Parameter for manufacturer setting. Do not set.

## Pr. 990 Buzzer control of the operation panel

*Pr.990 PU buzzer control*

You can make the buzzer "beep" when you press key of the operation panel (FR-DU07) and parameter unit (FR-PU04).

| *Pr.990* Setting | Description |
|---|---|
| 0 | Without buzzer |
| 1(initial value) | With buzzer |

## Pr. 991 PU contrast adjustment

*Pr.991 PU contrast adjustment*

Contrast adjustment of the LCD of the parameter unit (FR-PU04) can be performed.
Decreasing the setting value makes contrast light.

| *Pr.991* Setting | Description |
|---|---|
| 0 to 63 | 0 : Light<br>↓<br>63 : Dark |

## Pr. 989, CL, ALLC, Er.CL, PCPY Parameter clear, parameter copy

*Pr.989 Parameter copy alarm release*
*Pr.CL Parameter clear* *ALLC All parameter clear*
*Er.CL Alarm history clear* *PCPY Parameter copy*

- Set "1" in *Pr.CL Parameter clear* to initialize all parameters. (Calibration parameters are not cleared.)*
- Set "1" in *ALLC All parameter clear* to initialize all parameters. *
- Set "1" in *Er.CL Alarm history clear* to clear alarm history. *
- Parameter settings can be copied to multiple inverters by using *PCPY*.

When parameters are copied to the 75K or more inverter from the 55K or less inverter or vice versa, an CP alarm appears on the operation panel.
For the parameters whose setting range differ, set *Pr.989* as below after reset.

| | 55K or less | 75K or more |
|---|---|---|
| *Pr.989* setting | 10 | 100 |

| *PCPY* Setting | Description |
|---|---|
| 0 | Cancel |
| 1 | Copy the source parameters in the operation panel. |
| 2 | Write the parameters copied to the operation panel to the destination inverter. |
| 3 | Verify parameters in the inverter and operation panel. |

* Parameters are not cleared when "1" is set in *Pr.77 Parameter write selection*.

# Protective Functions

When an alarm occurs in the inverter, the protective function is activated bringing the inverter to an alarm stop and the PU display automatically changes to any of the following error (alarm) indications.

| Function Name | | Description | Indication |
|---|---|---|---|
| Error message *2 | Operation panel lock | Appears when operation is tried during operation panel lock. | HOLd |
| | Parameter write error | Appears when an error occurs at parameter writing. | Er1 to Er4 |
| | Copy operation error | Appears when an error occurs at parameter copying. | rE1 to rE4 |
| | Error | Appears when the RES signal is on or the PU and inverter can not make normal communication. | Err. |
| Warnings *3 | Stall Prevention (overcurrent) | Appears during overcurrent stall prevention. | OL |
| | Stall prevention (overvoltage) | Appears during overvoltage stall prevention<br>Appears while the regeneration avoidance function is activated. | oL |
| | Regenerative brake prealarm | Appears if the regenerative brake duty reaches or exceeds 85% of the *Pr. 70* "special regenerative brake duty" value. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs.<br>(displayed only for the 75K or more) | rb |
| | Electronic thermal relay function prealarm | Appears when the electronic thermal O/L relay has reached 85% of the specified value. | rH |
| | PU Stop | Appears when STOP RESET on the operation panel was pressed during external operation. | PS |
| | Maintenance signal output | Appears when the cumulative energization time has exceeded the maintenance output timer set value. | mr |
| | Parameter copy | Appears when parameters are copied between models with capacities of 55K or less and 75K or more. | CP |
| Minor fault *4 | Fan fault | Appears when the cooling fan remains stopped when operation is required or when the speed has decreased. | Fn |
| Major failures *5 | Overcurrent shut-off during acceleration | Appears when an overcurrent occurred during acceleration. | E.OC1 |
| | Overcurrent shut-off during constant speed | Appears when an overcurrent occurred during constant speed operation. | E.OC2 |
| | Overcurrent shut-off during deceleration or stop | Appears when an overcurrent occurred during deceleration and at a stop. | E.OC3 |
| | Regenerative overvoltage shutoff during acceleration | Appears when an overvoltage occurred during acceleration. | E.Ov1 |
| | Regenerative overvoltage shut-off during constant speed | Appears when an overvoltage occurred during constant speed operation. | E.Ov2 |
| | Regenerative overvoltage shut-off during deceleration or stop | Appears when an overvoltage occurred during deceleration and at a stop. | E.Ov3 |
| | Inverter overload shut-off (electronic thermal relay function)*1 | Appears when the electronic thermal relay function for inverter element protection was activated. | E.THI |
| | Motor overload shut-off (electronic thermal relay function)*1 | Appears when the electronic thermal relay function for motor protection was activated. | E.THM |
| | Fin overheat | Appears when the heatsink overheated. | E.FIn |
| | Instantaneous power failure protection | Appears when an instantaneous power failure occurred at an input power supply. | E.IPF |
| | Undervoltage protection | Appears when the main circuit DC voltage became low. | E.UVt |
| | Input phase failure | Appears if one of the three phases on the inverter input side opened. | E.ILF |
| | Stall prevention | Appears when the output frequency drops to 0.5Hz as a result of deceleration due to the excess motor load. | E.OLt |
| | Output side earth (ground) fault overcurrent protection | Appears when an earth (ground) fault occurred on the inverter's output side. | E. GF |
| | Output phase failure protection | Appears if one of the three phases on the inverter output side opened. | E. LF |
| | External thermal relay operation *6 | Appears when the external thermal relay connected to the terminal OH operated. | E.OHt |
| | PTC thermistor operation | Appears when the motor overheat status is detected for 10s or more by the external PTC thermistor input connected to the terminal AU. | E.PTC |
| | Option alarm | Appears when an alarm occurred in the option card or an AC power supply is connected to the R/L1, S/L2, T/L3 when the high power factor converter connection is set. | E.OPt |
| | Option slot alarm | Appears when a communication error occurred in the communication option. | E.OP1 |
| | Option alarm | Appears when a functional error occurred in the plug-in option. | E. 1 |
| | Parameter storage devide alarm | Appears when operation of the element where parameters are stored became abnormal. (control circuit board) | E. PE |

| Function Name | | Description | Indication |
|---|---|---|---|
| Major failures *5 | PU disconnection | Appears when a communication error between the PU and inverter occurred, the communication interval exceeded the permissible time during the RS-485 communication with the PU connecter, or communication errors exceeded the number of retries during the RS-485 communication. | E.PUE |
| | Retry count excess | Appears when the operation was not restarted within the set number of retries. | E.rET |
| | Parameter storage devide alarm | Appears when operation of the element where parameters stored became abnormal. (main circuit board) | E.PE2 |
| | CPU error | Appears during the CPU and peripheral circuit errors. | E. 6/<br>E. 7/<br>E.CPU |
| | Operation panel power supply short circuit<br>RS-485 terminals power supply short circuit | Appears when the RS-485 terminal power supply or operation panel power supply was shorted. | E.CTE |
| | 24VDC power output short circuit | Appears when terminals PC-SD were shorted. | E.P24 |
| | Output current detection value exceeded | Appears when output current exceeded the output current detection level set by the parameter. | E.CdO |
| | Inrush resistor overheat | Appears when the resistor of the inrush current limit circuit overheated. | E.IOH |
| | Communication error (inverter) | Appears when a communication error occurred during the RS-485 communication with the RS-485 terminals. | E.SEr |
| | Analog input error | Appears when 30mA or more is input or a voltage (7.5V or more) is input with the terminal 2/4 set to current input. | E.AIE |
| | Internal circuit error | Appears when an internal circuit error occurred. | E. 13 |
| | Brake transistor alarm detection | This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. In this case, the inverter must be powered off immediately. (Internal circuit error for the model 55K or less) | E. 6E |

*1 Resetting the inverter initializes the internal thermal integrated data of the electronic thermal relay function.
*2 The error message shows an operational error. The inverter output is not shut off.
*3 Warnings are messages given before major failures occur. The inverter output is not shut off.
*4 Minor faults warn the operator of failures with output signals. The inverter output is not shut off.
*5 When major failures occur, the protective functions are activated to shut off the inverter output and output the alarms.
*6 The external thermal operates only when the OH signal is set in *Pr. 178 to Pr. 189* (input terminal function selection).

## Options

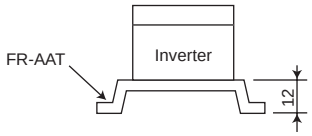
By fitting the following options to the inverter, the inverter is provided with more functions.
One plug-in option can be fitted.

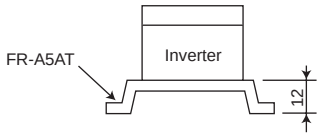
| | Name | | Type | Applications, Specifications, etc. | Applicable Inverter |
|---|---|---|---|---|---|
| Plug-in Type | 16-bit digital input | | FR-A7AX | · This input interface sets the high frequency accuracy of the inverter using an external BCD or binary digital signal.<br>BCD code 3 digits (maximum 999)<br>BCD code 4 digits (maximum 9999)<br>Binary 12 bits (maximum FFFH)<br>Binary 16 bits (maximum FFFFH) | Shared among all models |
| | Digital output extension analog output | | FR-A7AY | · This option provides the inverter with open collector outputs selected from among the standard output signals. | |
| | | | | · This option adds two different signals that can be monitored at the terminals FM and AM, such as the output frequency, output voltage and output current.<br>· 20mADC or 5VDC (10V) meter can be connected. | |
| | Relay output | | FR-A7AR | · Output any three output signals available with the inverter as standard from the relay contact terminals | |
| | Communication | CC-LINK | FR-A7NC | · This option allows the inverter to be operated or monitored or the parameter setting to be changed from a computer or PLC.<br>* For the FR-A7NC (CC-Link), the above operations can be done from the PLC only. | |
| | | LONWORKS | FR-A7NL | | |
| Stand-alone Shared | Parameter unit (Eightlanguages) | | FR-PU04 | Interactive parameter unit with LCD display | Shared among all models |
| | Parameter unit connection cable | | FR-CB20☐ | Cable for connection of operation panel or parameter unit<br>☐ indicates a cable length. (1m, 3m, 5m) | |
| | Operation panel connection connector | | FR-ADP | Connector to connect the operation panel (FR-DU07) and connection cable | |
| | Intercompatibility attachment | | FR-AAT | Attachment for replacing with the F700 series using the installation holes of the FR-F500. | According to capacities |
| | | | FR-A5AT | Attachment for replacing with the F700 series using the installation holes of the FR-A100<Excellent> and FR-A200<Excellent> | |
| | AC reactor | | FR-HAL | For harmonic current reduction and inverter input power factor improvement (total power factor approx. 88%) | For 200V class 55K or less, 400V class 75K or less |
| | DC reactor | | FR-HEL | For harmonic current reduction and inverter input power factor improvement (total power factor approx. 93%) | For the 55K or less |
| | Line noise filter | | FR- BSF01<br>FR- BLF | For line noise reduction | Shared among all models |
| | BU type brake unit | | BU | For increasing the braking capability of the inverter (for high-inertia load or negative load) | For the 55K or less |
| | Brake unit | | FR-BU<br>MT-BU5 | For increasing the braking capability of the inverter (for high-inertia load or negative load)<br>Brake unit and resistor unit are used in combination | According to capacities |
| | Resistor unit | | FR-BR<br>MT-BR5 | | |
| | Power regeneration common converter | | FR-CV | Unit which can return motor-generated braking energy back to the power supply in common converter system | For the 55K or less |
| | Dedicated stand-alone reactor for the FR-CV | | FR-CVL | | |
| | Power regeneration converter | | MT-RC | Energy saving type high performance brake unit which can regenerate the braking energy generated by the motor to the power supply. | For the 75K or more |
| | High power factor converter | | FR-HC<br>MT-HC | The high power factor converter switches the converter section on/off to reshape an input current waveform into a sine wave, greatly suppressing harmonics. (Used in combination with the standard accessory.) | According to capacities |
| | Surge voltage suppression filter | | FR-ASF | Filter for suppressing surge voltage on motor | For 400V class 55K or less |
| | Sine wave filter | Reactor | MT-BSL | Reduce the motor noise during inverter driving<br>Use in combination with a reactor and a capacitor | For the 75K or more |
| | | Capacitor | MT-BSC | | |

| | Name | Type | Applications, Specifications, etc. | Applicable Inverter |
|---|---|---|---|---|
| FR Series Manual Controller/Speed Controller | Manual controller | FR-AX | For independent operation. With frequency meter, frequency setting potentiometer and start switch. | Shared among all models |
| | DC tach. follower | FR-AL | For synchronous operation (1.5VA) by external signal (0 to 5V, 0 to 10V DC) * | |
| | Three speed selector | FR-AT | For three speed switching, among high, middle and low speed operation (1.5VA) * | |
| | Motorized speed setter | FR-FK | For remote operation. Allows operation to be controlled from several places (5VA) * | |
| | Ratio setter | FR-FH | For ratio operation. Allows ratios to be set to five inverters. (3VA) * | |
| | PG follower | FR-FP | For tracking operation by a pilot generator (PG) signal (3VA) * | |
| | Master controller | FR-FG | Master controller (5VA) for parallel operation of multiple (maximum 35) inverters. * | |
| | Soft starter | FR-FC | For soft start and stop. Enables acceleration/deceleration in parallel operation (3VA) * | |
| | Deviation detector | FR-FD | For continuous speed control operation. Used in combination with a deviation sensor or synchro (5VA) * | |
| | Preamplifier | FR-FA | Used as an A/V converter or arithmetic amplifier (3VA) * | |
| Others | Pilot generator | QVAH-10 | For tracking operation. 70V/35VAC 500Hz (at 2500r/min) | |
| | Deviation sensor | YVGC-500W-NS | For continuous speed control operation (mechanical deviation detection). Output 90VAC/90° | |
| | Frequency setting potentiometer | WA2W 1kΩ | For frequency setting. Wirewound 2W 1kΩ B characteristic | |
| | Frequency meter | YM206NRI 1mA | Dedicated frequency meter (graduated to 120Hz). Moving-coil type DC ammeter | |
| | Calibration resistor | RV24YN 10kΩ | For frequency meter calibration. Carbon film type B characteristic | |
| | Inverter setup software (FR Configrator) | FR-SW1-SETUP-WE | Supports an inverter startup to maintenance. | Shared among all models |

* Rated power consumption. The power supply specifications of the FR series manual controllers and speed controllers are 200VAC 50Hz, 220V/220VAC 60Hz, and 115VAC 60Hz.

## Stand-alone option

<table>
<tr><th>Name (type)</th><th>Specifications, Structure, etc.</th></tr>
<tr><td>Intercompatibility attachment<br>FR-AAT☐☐<br>FR-A5AT☐☐</td><td>
● FR-F500 series intercompatibility attachment<br>
The FR-F700 series inverter can be installed using installation holes of the conventional FR-F500 series with this attachment.This attachment is useful for replacing the conventional model with the FR-F700 series.<br>
Since the installation size of the 400V class 0.75K to 3.7K, 7.5K, 22K, 37K to 55K are the same, an intercompatibility attachment is not necessary<br>
* The depth increases after installation of the inverter when the attachment is used.<br>


<table>
<tr><th>Type</th><th>Applied Inverter</th></tr>
<tr><td>FR-AAT22</td><td>FR-F740-5.5K</td></tr>
<tr><td>FR-AAT24</td><td>FR-F740-15K, 18.5K</td></tr>
<tr><td>FR-AAT27</td><td>FR-F740-30K</td></tr>
</table>
● FR-A100E and FR-A200E series installation intercompatibility attachment<br>
The FR-F700 series inverter can be installed using installation holes of the conventional FR-A100E and FR-A200E series with this attachment. This attachment is useful for replacing the conventional model with the FR-F700 series.<br>
* The depth increases after installation of the inverter when the attachment is used<br>


<table>
<tr><th>Type</th><th>Applied Inverter</th></tr>
<tr><td>FR-A5AT02</td><td>FR-F740-0.75K to 3.7K</td></tr>
<tr><td>FR-A5AT03</td><td>FR-F740-5.5K to 11K</td></tr>
<tr><td>FR-A5AT04</td><td>FR-F740-15K to 22K</td></tr>
<tr><td>FR-A5AT05</td><td>FR-F740-45K, 55K</td></tr>
</table>
</td></tr>
<tr><td>AC reactor<br>(for power coordination)<br>FR-HAL-(H)☐☐K</td><td>
● Outline dimension<br>
(Unit: mm)<br>
<table>
<tr><th colspan="2">Type</th><th>W</th><th>D</th><th>H</th><th>Mass (kg)</th><th colspan="2">Type</th><th>W</th><th>D</th><th>H</th><th>Mass (kg)</th></tr>
<tr><td rowspan="13">200V</td><td>0.4K</td><td>104</td><td>72</td><td>99</td><td>0.6</td><td rowspan="13">400V</td><td>H0.4K</td><td>135</td><td>59.6</td><td>115</td><td>1.5</td></tr>
<tr><td>0.75K</td><td>104</td><td>74</td><td>99</td><td>0.8</td><td>H0.75K</td><td>135</td><td>59.6</td><td>115</td><td>1.5</td></tr>
<tr><td>1.5K</td><td>104</td><td>77</td><td>99</td><td>1.1</td><td>H1.5K</td><td>135</td><td>59.6</td><td>115</td><td>1.5</td></tr>
<tr><td>2.2K</td><td>115</td><td>77</td><td>115</td><td>1.5</td><td>H2.2K</td><td>135</td><td>59.6</td><td>115</td><td>1.5</td></tr>
<tr><td>3.7K</td><td>115</td><td>83</td><td>115</td><td>2.2</td><td>H3.7K</td><td>135</td><td>70.6</td><td>115</td><td>2.5</td></tr>
<tr><td>5.5K</td><td>115</td><td>83</td><td>115</td><td>2.3</td><td>H5.5K</td><td>160</td><td>72</td><td>142</td><td>3.5</td></tr>
<tr><td>7.5K</td><td>130</td><td>100</td><td>135</td><td>4.2</td><td>H7.5K</td><td>160</td><td>91</td><td>142</td><td>5.0</td></tr>
<tr><td>11K</td><td>160</td><td>111</td><td>164</td><td>5.2</td><td>H11K</td><td>160</td><td>91</td><td>146</td><td>6.0</td></tr>
<tr><td>15K</td><td>160</td><td>126</td><td>167</td><td>7.0</td><td>H15K</td><td>220</td><td>105</td><td>195</td><td>9.0</td></tr>
<tr><td>18.5K</td><td>160</td><td>175</td><td>128</td><td>7.1</td><td>H18.5K</td><td>220</td><td>170</td><td>215</td><td>9.0</td></tr>
<tr><td>22K</td><td>185</td><td>158</td><td>150</td><td>9.0</td><td>H22K</td><td>220</td><td>170</td><td>215</td><td>9.5</td></tr>
<tr><td>30K</td><td>185</td><td>168</td><td>150</td><td>9.7</td><td>H30K</td><td>220</td><td>170</td><td>215</td><td>11</td></tr>
<tr><td>37K</td><td>210</td><td>174</td><td>175</td><td>12.9</td><td>H37K</td><td>220</td><td>170</td><td>214</td><td>12.5</td></tr>
<tr><td>45K</td><td>210</td><td>191</td><td>175</td><td>16.4</td><td>H45K</td><td>280</td><td>165</td><td>245</td><td>15</td></tr>
<tr><td>55K</td><td>210</td><td>201</td><td>175</td><td>17.4</td><td>H55K</td><td>280</td><td>170</td><td>245</td><td>18</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>H75K</td><td>205</td><td>208</td><td>170</td><td>20</td></tr>
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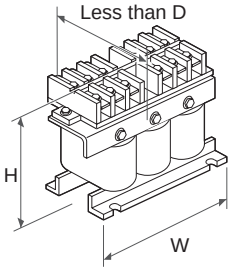
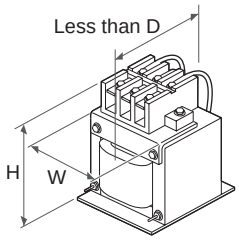
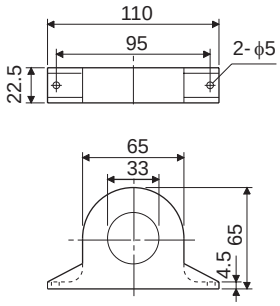


(Note) 1. Make selection according to the applied motor capacity. (When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity)<br>
2. Power factor improving reactor (FR-BAL) can be used.<br>
Power factor improving effect<br>
FR-BAL : approx. 90%<br>
FR-HAL : approx. 88%
</td></tr>
<tr><td>DC reactor<br>(for power coordination)<br>FR-HEL-(H)☐☐K</td><td>
●Outline dimension<br>
(Unit: mm)<br>
<table>
<tr><th colspan="2">Type</th><th>W</th><th>D</th><th>H</th><th>Mass (kg)</th><th colspan="2">Type</th><th>W</th><th>D</th><th>H</th><th>Mass (kg)</th></tr>
<tr><td rowspan="13">200V</td><td>0.4K</td><td>70</td><td>61</td><td>71</td><td>0.4</td><td rowspan="13">400V</td><td>H0.4K</td><td>90</td><td>60</td><td>78</td><td>0.6</td></tr>
<tr><td>0.75K</td><td>85</td><td>61</td><td>81</td><td>0.5</td><td>H0.75K</td><td>66</td><td>70</td><td>100</td><td>0.8</td></tr>
<tr><td>1.5K</td><td>85</td><td>70</td><td>81</td><td>0.8</td><td>H1.5K</td><td>66</td><td>80</td><td>100</td><td>1</td></tr>
<tr><td>2.2K</td><td>85</td><td>70</td><td>81</td><td>0.9</td><td>H2.2K</td><td>76</td><td>80</td><td>110</td><td>1.3</td></tr>
<tr><td>3.7K</td><td>77</td><td>82</td><td>92</td><td>1.5</td><td>H3.7K</td><td>86</td><td>95</td><td>120</td><td>2.3</td></tr>
<tr><td>5.5K</td><td>77</td><td>92</td><td>92</td><td>1.9</td><td>H5.5K</td><td>96</td><td>100</td><td>128</td><td>3</td></tr>
<tr><td>7.5K</td><td>86</td><td>98</td><td>113</td><td>2.5</td><td>H7.5K</td><td>96</td><td>105</td><td>128</td><td>3.5</td></tr>
<tr><td>11K</td><td>105</td><td>112</td><td>133</td><td>3.3</td><td>H11K</td><td>105</td><td>110</td><td>137</td><td>4.5</td></tr>
<tr><td>15K</td><td>105</td><td>115</td><td>133</td><td>4.1</td><td>H15K</td><td>105</td><td>125</td><td>152</td><td>5</td></tr>
<tr><td>18.5K</td><td>105</td><td>165</td><td>93</td><td>4.7</td><td>H18.5K</td><td>114</td><td>120</td><td>162</td><td>5</td></tr>
<tr><td>22K</td><td>105</td><td>175</td><td>93</td><td>5.6</td><td>H22K</td><td>133</td><td>120</td><td>178</td><td>6</td></tr>
<tr><td>30K</td><td>114</td><td>200</td><td>100</td><td>7.8</td><td>H30K</td><td>133</td><td>120</td><td>178</td><td>6.5</td></tr>
<tr><td>37K</td><td>133</td><td>195</td><td>117</td><td>10</td><td>H37K</td><td>133</td><td>155</td><td>187</td><td>8.5</td></tr>
<tr><td>45K</td><td>133</td><td>205</td><td>117</td><td>11</td><td>H45K</td><td>133</td><td>170</td><td>187</td><td>10</td></tr>
<tr><td>55K</td><td>153</td><td>209</td><td>132</td><td>12.6</td><td>H55K</td><td>152</td><td>170</td><td>206</td><td>11.5</td></tr>
</table>


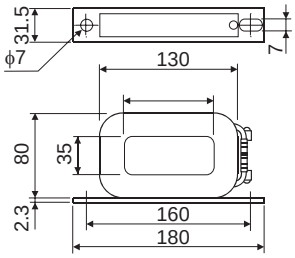
(Note) 1. Be sure to remove the jumper across terminals P/+ - P1 of the inverter. (A failure to do so will produce no power factor improving effect)<br>
2. The wiring length between the reactor and inverter should be within 5m.<br>
3. The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3).<br>
4. Make selection according to the motor capacity.<br>
(When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity)<br>
5. Power factor improving reactor (FR-BEL) can be used.<br>
Power factor improving effect<br>
FR-BEL : approx. 95%<br>
FR-HEL : approx. 93%
</td></tr>
</table>

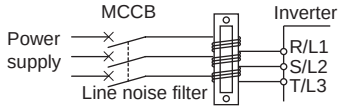
| Name (type) | Specifications, Structure, etc. |
|---|---|
| Line noise filter<br>FR-BSF01...for small capacities<br>FR-BLF | ● Outline dimension |

FR-BSF01




FR-BLF




(Note) 1. Each phase should be wound at least 3 times (4T, 4 turns) in the same direction. (The greater the number of turns, the more efficient.)
2. When the thickness of the wire prevents winding, use at least 4 in series and ensure that the current passes through each phase in the same direction.
3. Can be used on the output side in the same way as the input side.
4. Please use FR-BSF01 for inverters with small capacities of 3.7K or less. Thick wires (38mm$^2$ or more) can not be used. In such cases, use the FR-BLF.

Brake unit
BU-(H)□□
Electrical-discharge resistor GZG type
GRZG type

● A brake unit is an option that fully enhances the regenerative braking capability of the inverter, and should be used with an electrical-discharge resistor.
● Brake units should be selected according to the required braking torque.

● Brake unit selection table

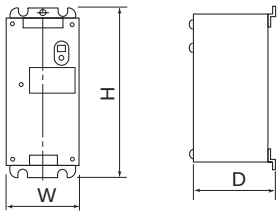
| Voltage | Motor(kW) / Braking torque | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V output | 50%30s | BU-1500 | | BU-3700 | | BU-7.5K | | BU-15K | | 2×BU-15K | | | 3×BU-15K | | 4× BU-15K |
| | 100%30s | BU-1500 | BU-3700 | BU-7.5K | | BU-15K | | 2×BU-15K | | 3×BU-15K | | 4× BU-15K | 5× BU-15K | 6× BU-15K | 7× BU-15K |
| 400V output | 50%30s | * | | BU-H7.5K | | | | BU-H15K | | BU-H30K | | | 2×BU-H30K | | |
| | 100%30s | * | | BU-H7.5K | | BU-H15K | | BU-H30K | | 2×BU-H30K | | | 3×BU-H30K | | 4×BU-H30K |

* The inverter of 1.5K or less with 400V output can not be used in combination with a brake unit.
To use in combination with a brake unit, use the inverter of 2.2K or more.

● Combination of brake unit and electrical discharge resistor

| Voltage | Brake unit | Resistor type | Cable (P, N) | Voltage | Brake unit | Resistor type | Cable (P, N) |
|---|---|---|---|---|---|---|---|
| 200V output | BU-1500 | GZG300W-50Ω(one) | 2mm$^2$ | 400V output | BU-H7.5K | GRZG200-10Ω (six in series) | 2mm$^2$ |
| | BU-3700 | GRZG200-10Ω (three in series) | 2mm$^2$ | | BU-H15K | GRZG300-5Ω (eight in series) | 3.5mm$^2$ |
| | BU-7.5K | GRZG300-5Ω (four in series) | 3.5mm$^2$ | | BU-H30K | GRZG400-2Ω (twelve in series) | 3.5mm$^2$ |
| | BU-15K | GRZG400-2Ω (six in series) | 3.5mm$^2$ | | | | |

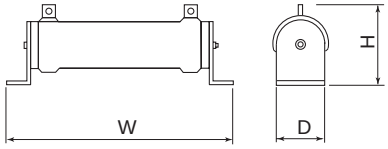
● Brake unit




(Unit: mm)

| Type | W | D | H |
|---|---|---|---|
| BU-1500, 3700, 7.5K, 15K | 100 | 128 | 240 |
| BU-H7.5K, H15K, H30K | 160 | 145 | 240 |

● Discharge resistor




(Unit: mm)

| Type | W | D | H |
|---|---|---|---|
| GZG300W | 335 | 40 | 78 |
| GRZG200 | 306 | 26 | 55 |
| GRZG300 | 334 | 40 | 79 |
| GRZG400 | 411 | 40 | 79 |

(Note) 1. Connect so that the terminal symbols are the same for both inverter and brake unit. Incorrect connection will damage the inverter.
2. Minimize the cable length between the inverter and brake unit and between the discharging resistor and brake unit. Use a twisted cable when the wiring length exceeds 2m.
(If twisted cables are used, the wiring length should be within 5m.)

● Handling precautions
1. The thermal relay in the brake unit will trip if the rated torque is continuously output. After a trip, reset the inverter and increase its deceleration time seting.
2. The maximum temperature rise of the discharging resistor is 100 °C. Use heat-resistant wires and wire to avoid contact with resistors.

| Name (type) | Specifications, Structure, etc. |
|---|---|

Brake unit
FR-BU-(H)☐☐K
Resistor unit
FR-BR-(H)☐☐K

- The brake unit and resistor unit are options that will fully exhibit the regenerative braking capability of the inverter and are always used as a set.
- There are six different brake units as in the following table, from which make selection according to the necessary braking torque and deceleration time.
- The brake unit is equipped with a seven-segment LED that displays the duty (%ED) and alarm.

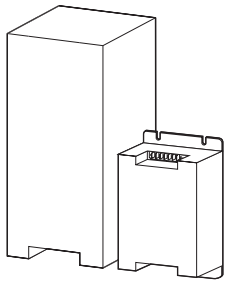
## ● Brake unit selection table

- %ED at short-time rating when braking torque is 100%

| Motor Capacity | | | | 5.5kW | 7.5kW | 11kW | 15kW | 18.5kW | 22kW | 30kW | 37kW | 45kW | 55kW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | | | 200V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 30K | 37K | 45KK | 55K |
| | | | 400V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 30K | 37K | 45KK | 55K |
| Brake unit | 200V | FR-BU-15K | %ED | 80 | 40 | 15 | 10 | — | — | — | — | — | — |
| | | FR-BU-30K | | — | — | 65 | 30 | 25 | 15 | 10 | — | — | — |
| | | FR-BU-55K | | — | — | — | — | 90 | 60 | 30 | 20 | 15 | 10 |
| | 400V | FR-BU-H15K | %ED | 80 | 40 | 15 | 10 | — | — | — | — | — | — |
| | | FR-BU-H30K | | — | — | 65 | 30 | 25 | 15 | 10 | — | — | — |
| | | FR-BU-H55K | | — | — | — | — | 90 | 60 | 30 | 20 | 15 | 10 |

- Braking torque (%) at short-time rating when 10%ED is 15s

| Motor Capacity | | | | 5.5kW | 7.5kW | 11kW | 15kW | 18.5kW | 22kW | 30kW | 37kW | 45kW | 55kW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | | | 200V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 30K | 37K | 45KK | 55K |
| | | | 400V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 30K | 37K | 45KK | 55K |
| Brake unit | 200V | FR-BU-15K | Braking Torque (%) | 280 | 200 | 120 | 100 | 80 | 70 | — | — | — | — |
| | | FR-BU-30K | | — | — | 260 | 180 | 160 | 130 | 100 | 80 | 70 | ------ |
| | | FR-BU-55K | | — | — | — | — | 300 | 250 | 180 | 150 | 120 | 100 |
| | 400V | FR-BU-H15K | Braking Torque (%) | 280 | 200 | 120 | 100 | 80 | 70 | — | — | — | — |
| | | FR-BU-H30K | | — | — | 260 | 180 | 160 | 130 | 100 | 80 | 70 | — |
| | | FR-BU-H55K | | — | — | — | — | 300 | 250 | 180 | 150 | 120 | 100 |



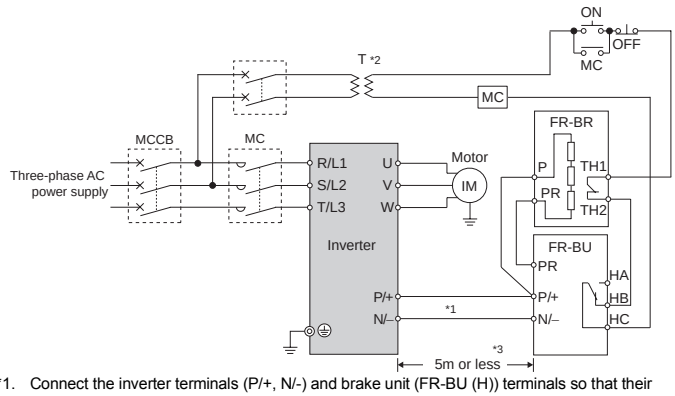

## ● Brake unit and resistor unit combinations and used cables

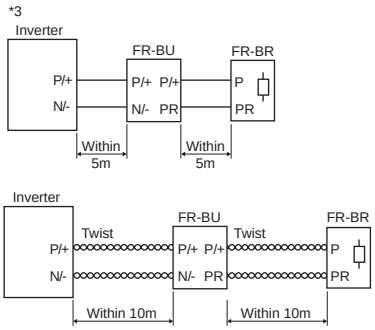
| | Brake Unit Type | Resistor Unit Type | Cable (P/+-P/+, N/--N/-, P/+-P, PR-PR) |
|---|---|---|---|
| 200V | FR-BU-15K<br>FR-BU-30K<br>FR-BU-55K | FR-BR-15K<br>FR-BR-30K<br>FR-BR-55K | 3.5mm²<br>5.5mm²<br>14mm² |
| 400V | FR-BU-H15K<br>FR-BU-H30K<br>FR-BU-H55K | FR-BR-H15K<br>FR-BR-H30K<br>FR-BR-H55K | 3.5mm²<br>3.5mm²<br>5.5mm² |

**Use the wires of the above recommended size or larger.**

(Note) 1. The temperature rise of the resistor unit is about a maximum of 100°C. Therefore, use heat-resistant wires (such as glass wires).

## ● Connection example




*1. Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU (H)) terminals so that their terminal signals match with each other.
(Incorrect connection will damage the inverter.)

*2. When the power supply is 400V class, install a step-down transformer.

*3. Minimize the cable length between the inverter and brake unit and the resistor unit and brake unit. Use a twisted cable when the wiring length exceeds 5m. (If twisted wires are used, the distance should be within 10m.) Use the wires of the above recommended size or larger.

| Name (type) | Specifications, Structure, etc. |
|---|---|

Brake unit
MT-BU5-(H)□□K
Resistor unit
MT-BR5-(H)□□K

- The brake unit and resistor unit are options that will fully exhibit the regenerative braking capability of the inverter. Use them as a set.
- There are six different brake units as in the following table, from which make selection according to the deceleration time.
- When the brake unit duty (%ED) excess and an alarm occur, errors appear in the inverter.

## ● Brake unit selection table

● %ED at short-time rating when braking torque is 100%

| Motor Capacity | | | 75 kW | 90 kW | 110 kW | 132 kW | 160 kW | 185 kW | 220 kW | 280 kW | 375 kW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | | 200V | 75K | 90K | 110K | — | — | — | — | — | — |
| | | 400V | 75K | 90K | 110K | 132K | 160K | 185K | 220K | 280K | 375K |
| Brake unit | 200V | MT-BU5-55K | %ED | 5 | — | — | — | — | — | — | — | — |
| | | MT-BU5-110K | | 20 | 15 | 10 | — | — | — | — | — | — |
| | 400V | MT-BU5-H75K | %ED | 10 | 5 | — | — | — | — | — | — | — |
| | | MT-BU5-H150K | | 40 | 25 | 20 | 10 | 5 | 5 | — | — | — |
| | | MT-BU5-H220K | | 80 | 60 | 40 | 25 | 15 | 10 | 10 | 5 | — |
| | | MT-BU5-H280K | | — | 80 | 65 | 40 | 30 | 20 | 15 | 10 | 5 |
| | | MT-BU5-H375K | | — | — | — | 80 | 50 | 40 | 20 | 15 | 10 |

● Braking torque (%) at short-time rating

| Motor Capacity | | | 75 kW | 90 kW | 110 kW | 132 kW | 160 kW | 185 kW | 220 kW | 280 kW | 375 kW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | | 200V | 75K | 90K | 110K | ----- | ----- | ----- | ----- | ----- | ----- |
| | | 400V | 75K | 90K | 110K | 132K | 160K | 185K | 220K | 280K | 375K |
| Brake unit | 200V | MT-BU5-55K | braking torque (%) | 70 | 60 | 50 | ----- | ----- | ----- | ----- | ----- | ----- |
| | | MT-BU5-110K | | 150 | 120 | 100 | ----- | ----- | ----- | ----- | ----- | ----- |
| | 400V | MT-BU5-H75K | braking torque (%) | 100 | 80 | 70 | 55 | 45 | 40 | 35 | 25 | 20 |
| | | MT-BU5-H150K | | 150 | 150 | 135 | 110 | 90 | 80 | 70 | 50 | 40 |
| | | MT-BU5-H220K | | 150 | 150 | 150 | 150 | 135 | 115 | 100 | 80 | 55 |
| | | MT-BU5-H280K | | 150 | 150 | 150 | 150 | 150 | 150 | 125 | 100 | 70 |
| | | MT-BU5-H375K | | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 130 | 100 |

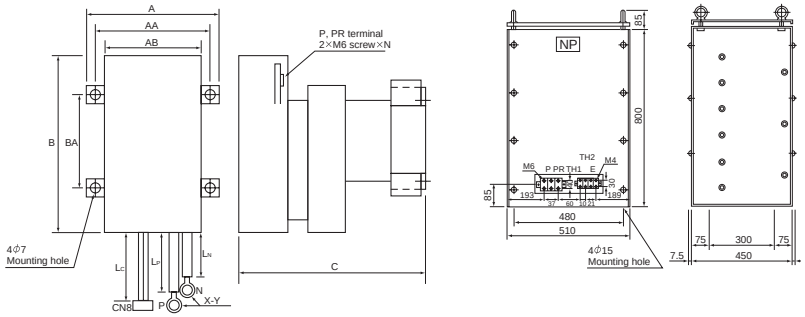
* To obtain a large braking torque, the motor has to have a torque characteristic that meets the braking torque.
Check the torque characteristic of the motor.

## ● Brake unit and resistor unit combinations and cables

| Brake Unit Type | | Resistor unit type | Cable |
|---|---|---|---|
| 200V | MT-BU5-55K | MT-BR5-55K | 14mm$^2$ |
| | MT-BU5-110K | 2×MT-BR5-55K | 2×14mm$^2$ |
| 400V | MT-BU5-H75K | MT-BR5-H75K | 14mm$^2$ |
| | MT-BU5-H150K | 2×MT-BR5-H75K | 2×14mm$^2$ |
| | MT-BU5-H220K | 3×MT-BR5-H75K | 3×14mm$^2$ |
| | MT-BU5-H280K | 4×MT-BR5-H75K | 4×14mm$^2$ |
| | MT-BU5-H375K | 5×MT-BR5-H75K | 5×14mm$^2$ |

(Caution 1) Be sure to select the well-ventilated place for installation of the resistor unit. Ventilation is necessary when installing the resistor in a place, e.g. enclosure, where heat is not well diffused.
(Caution 2) The temperature rise of the discharging resistor is 300deg. Therefore, wire the cable so as not to touch the resistor. In addition, separate the parts with low heat resistance and the resistor by at least 40 to 50cm.
(Caution 3) The temperature of the resistor unit abnormally increases if the brake unit is operated exceeding the specified duty. Since the resistor unit may result in overheat if the temperature of the brake unit is left unchanged, switch off the inverter.
* The resistor unit is provided with a thermostat (a contact) as overheat protection. If this protective device is activated under normal operation, it is assumed that the deceleration time is too short. In such a case, increase the deceleration time setting of the inverter.

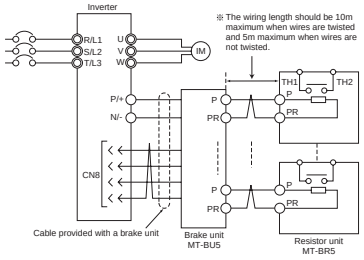
## ● Outline dimension drawings



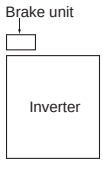

| Brake Unit Type | | A | AA | AB | B | BA | C | Lc | LP | LN | N | Approx. mass | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V class | MT-BU5-55K | 118 | 102 | 90 | 200 | 100 | 256.5 | 550 | 1740 | 1740 | 1 | 1.5 | 14 | 12 | 8 |
| | MT-BU5-110K | 188 | 172 | 160 | 200 | 100 | 256.5 | 550 | 2000 | 2000 | 2 | 3.0 | 22 | 12 | 8 |
| 400V class | MT-BU5-H75K | 118 | 102 | 90 | 200 | 100 | 256.5 | 550 | 1740 | 1740 | 1 | 1.5 | 14 | 12 | 8 |
| | MT-BU5-H150K | 188 | 172 | 160 | 200 | 100 | 256.5 | 550 | 2000 | 2000 | 2 | 3.0 | 22 | 12 | 8 |
| | MT-BU5-H220K | 258 | 242 | 230 | 200 | 100 | 256.5 | 550 | 2000 | 2000 | 3 | 4.5 | 38 | 12 | 8 |
| | MT-BU5-H280K | 328 | 312 | 300 | 200 | 100 | 256.5 | 550 | 2330 | 2330 | 4 | 6.0 | 60 | 12 | 10 |
| | MT-BU5-H375K | 398 | 382 | 370 | 200 | 100 | 256.5 | 550 | 2330 | 2330 | 5 | 7.5 | 60 | 12 | 10 |

| Resistor unit type | | Resistance value | mass |
|---|---|---|---|
| 200V class | MT-BR5-55K | 2.0Ω | 50kg |
| 400V class | MT-BR5-H75K | 6.5Ω | 70kg |

## ● External connection diagram



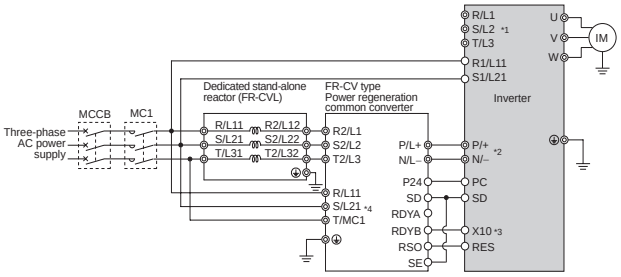

(Caution 1) For wiring of the brake unit and inverter, use an accessory cable supplied with the brake unit. Connect the main circuit cable to the terminals P/+ and N/- and connect the control circuit cable to the connector (CN8) inside by making cuts in the rubber bush at the top of the inverter.
(Caution 2) The brake unit which uses multiple resistor units has terminals equal to the number of resistor units. Connect one resistor unit to one pair of terminals (P, PR).



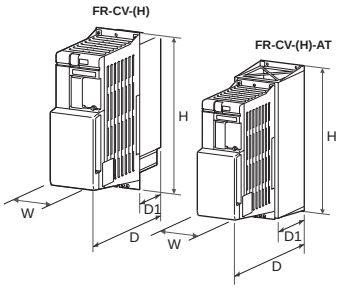
## Power regeneration common converter FR-CV-(H)□□K

- Enables 100%-torque continuous regeneration to support continuous regenerative operation for line control, etc.
- Eliminates the need to use a brake unit with each inverter, reducing total space and total cost.
- Saves energy since regeneration energy is used for the other inverters and excess energy is returned to the power supply.

### Connection example




*1. Remove the jumpers across terminals R/L1-R1/L11 and S/L2-S1/L21 of the inverter, and connect the control circuit power supply across terminals R1/L11-S1/L21. Always keep the power input terminals R/L1, S/L2, T/L3 open. Incorrect connection will damage the inverter. Opposite polarity of terminals N/-, P/+ will damage the inverter.
*2. Do not insert an NFB between the terminals P/+-N/- (between P/L+-P/+, between N/L--N/-).
*3. Assign the terminal for X10 signal using any of Pr. 178 to Pr. 189 (input terminal function selection).
*4. Be sure to connect the power supply and terminals R/L11, S/L21, T/MC1. If the inverter is operated without connection, the power regeneration common converter will be damaged.




FR-CV-(H) (Unit mm)

| Voltage/ Capacity | W | D | D1 | H | Voltage/ Capacity | W | D | D1 | H |
|---|---|---|---|---|---|---|---|---|---|
| 200V 7.5K/11K | 90 | 303 | 103 | 300 | 400V 7.5K/ 11K/15K | 120 | 305 | 105 | 300 |
| 200V 15K | 120 | 305 | 105 | 300 | | | | | |
| 200V 22K/30K | 150 | 322 | 122 | 380 | 400V 22K/30K | 150 | 305 | 105 | 380 |
| 200V 37K/55K | 400 | 250 | 135 | 620 | 400V 37K/55K | 400 | 250 | 135 | 620 |

FR-CV-(H)-AT (Unit mm)

| Voltage/ Capacity | W | D | D1 | H | Voltage/ Capacity | W | D | D1 | H |
|---|---|---|---|---|---|---|---|---|---|
| 200V 7.5K/11K | 110 | 315 | 115 | 330 | 400V 7.5K/ 11K/15K | 130 | 320 | 120 | 330 |
| 200V 15K | 130 | 320 | 120 | 330 | | | | | |
| 200V 22K/30K | 160 | 350 | 150 | 410 | 400V 22K/30K | 160 | 350 | 150 | 410 |

## High power factor converter FR-HC- (H)□□K

- Substantially suppresses power harmonics to realize the equivalent capacity conversion coefficient K5=0 in the "Harmonic suppression guideline for specific consumers".
- Has the power regeneration function as standard.
- Connects multiple inverters to enable common converter system operation.

### Specifications

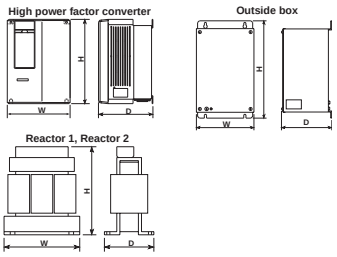
| Inverter Type FR-HC□□ | 200V | | | | 400V | | | |
|---|---|---|---|---|---|---|---|---|
| | 7.5K | 15K | 30K | 55K | H7.5K | H15K | H30K | H55K |
| Applied inverter capacity (*1) | 3.7K to 7.5K | 7.5K to 15K | 15K to 30K | 30K to 55K | 3.7K to 7.5K | 7.5K to 15K | 15K to 30K | 30K to 55K |
| Rated input voltage/ frequency | Three phase 200V to 220V 50Hz 200V to 230V 60Hz | | | | Three phase 380V to 460V 50/60Hz | | | |
| Rated input current (A) | 33 | 61 | 115 | 215 | 17 | 31 | 57 | 110 |
| Rated output voltage (V) (*2) | 293VDC to 335VDC | | | | 558VDC to 670VDC | | | |

*1. The applicable capacity to the high power factor converter is the total capacity of the inverters.
*2. The output voltage varies with the input voltage value.

### Outline dimension

(Unit: mm)

| Voltage | Capacity | High Power Factor Converter FR-HC W | H | D | Reactor 1 FR-HCL01 W | H | D | Reactor 2 FR-HCL02 W | H | D | Outside Box FR-HCB W | H | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V | 7.5K | 220 | 300 | 190 | 160 | 155 | 100 | 240 | 230 | 160 | 190 | 320 | 165 |
| | 15K | 250 | 400 | 190 | 190 | 205 | 130 | 260 | 270 | 170 | | | |
| | 30K | 340 | 550 | 195 | 220 | 230 | 170 | 340 | 320 | 180 | 270 | 450 | 203 |
| | 55K | 480 | 700 | 250 | 210 | 260 | 225 | 430 | 470 | 360 | | | |
| 400V | H7.5K | 220 | 300 | 190 | 160 | 150 | 100 | 240 | 220 | 160 | 190 | 320 | 165 |
| | H15K | 250 | 400 | 190 | 190 | 195 | 130 | 260 | 260 | 170 | | | |
| | H30K | 340 | 550 | 195 | 220 | 215 | 140 | 340 | 310 | 180 | | | |
| | H55K | 480 | 700 | 250 | 280 | 255 | 190 | 400 | 380 | 285 | 270 | 450 | 203 |



| Name (type) | Specifications, Structure, etc. |
|---|---|
| Sine wave filter<br>MT-BSL-(H)□□K<br>MT-BSC-(H)□□K | |

## ● Application of the sine wave filter

For the FR-F700 series (75K or more) inverter, the motor voltage and current can be made to nearly sine wave shaped by providing a sine wave filter on the output side.

1) Low noise

2) Surgeless

3) Motor loss reduction (use of standard motor)

## ● Application condition

The following conditions have to be satisfied to install the sine wave filter.

1) Change the *Pr. 72* setting to "25". (The initial value is "2".)

The carrier frequency changes to 2.5KHz. (The sine wave filter is designed on condition that the carrier frequency is 2.5KHz. Be sure to change the setting properly.) If the inverter is operated with Pr.72 set to other than "25", the inverter and sine wave filter may be damaged.

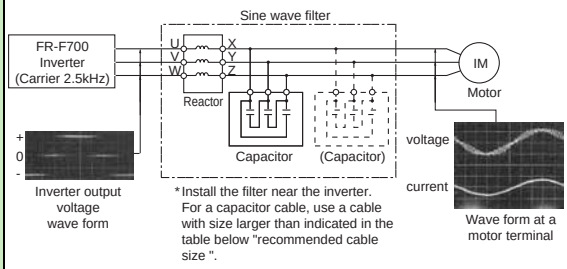
2) The sine wave filter can be used only for 60 Hz or less inverter frequency.

Note that the filter can not be used for the higher frequency operation than this. (Otherwise the filter loss will increase. )

3) Use the inverter with capacity one rank higher. *2

4) Install an external thermal relay of the motor.

## ● Circuit configuration and connection



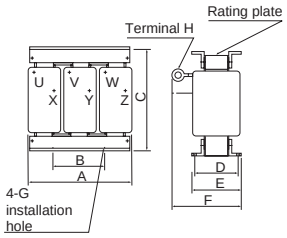

*Install the filter near the inverter. For a capacitor cable, use a cable with size larger than indicated in the table below "recommended cable size ".

| Motor capacity (kW) | | Inverter type: Reactor for filter | Inverter type: Capacitor for filter | Applied Inverter (*2) |
|---|---|---|---|---|
| 200V class | 75 | MT-BSL-75K | 1×MT-BSC-75K | FR-F720-90K |
| | 90 | MT-BSL-90K | 1×MT-BSC-90K | FR-F720-110K |
| 400V class | 75 | MT-BSL-H75K | 1×MT-BSC-H75K | FR-F740-90K |
| | 90 | MT-BSL-H110K | 1×MT-BSC-H110K | FR-F740-110K |
| | 110 | MT-BSL-H110K | 1×MT-BSC-H110K | FR-F740-132K |
| | 132 | MT-BSL-H150K | 2×MT-BSC-H75K | FR-F740-160K |
| | 160 | MT-BSL-H220K | 2×MT-BSC-H110K | FR-F740-185K |
| | 185 | MT-BSL-H220K | 2×MT-BSC-H110K | FR-F740-220K |
| | 220 | MT-BSL-H220K | 2×MT-BSC-H110K | FR-F740-250K |
| | 250 | MT-BSL-H280K | 3×MT-BSC-H110K | FR-F740-280K |
| | 280 | MT-BSL-H280K | 3×MT-BSC-H110K | FR-F740-315K |

*1 For the 2 ×, connect capacitors in parallel as in the connection diagram.

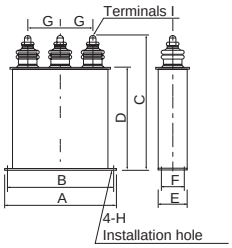
*2 If the rated motor current × (1.05 to 1.1) is less than 80% of the inverter rated current, an inverter with same kW with a motor can be used.

## ● Reactor for sine wave filter




| Inverter type | | A | B | C | D | E | F | G | H | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200V class | MT-BSL-75K | 330 | 150 | 285 | 185 | 216 | 328 | M10 | M12 | 80 |
| | MT-BSL-90K | 390 | 150 | 320 | 180 | 220 | 330 | M12 | M12 | 105 |
| 400V class | MT-BSL-H75K | 330 | 150 | 285 | 185 | 216 | 318 | M10 | M10 | 80 |
| | MT-BSL-H110K | 390 | 150 | 340 | 195 | 235 | 368 | M12 | M12 | 140 |
| | MT-BSL-H150K | 455 | 200 | 397 | 200 | 240 | 380 | M12 | M12 | 190 |
| | MT-BSL-H220K | 495 | 200 | 405 | 250 | 300 | 420 | M12 | M12 | 240 |
| | MT-BSL-H280K | 575 | 200 | 470 | 310 | 370 | 485 | M12 | M12 | 340 |

## ● Capacitor for sine wave filter




| Inverter type | | A | B | C | D | E | F | G | H | I | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V class | MT-BSC-75K | 205 | 190 | 285 | 230 | 70 | 40 | 40 | ϕ7 | M6 | 3.9 |
| | MT-BSC-90K | 280 | 265 | 270 | 180 | 90 | 55 | 80 | ϕ7 | M12 | 5.5 |
| 400V class | MT-BSC-H75K | 205 | 190 | 220 | 170 | 70 | 40 | 50 | ϕ7 | M6 | 3.0 |
| | MT-BSC-H110K | 205 | 190 | 280 | 230 | 70 | 40 | 50 | ϕ7 | M6 | 4.0 |

* Leave more than 25mm space between capacitors.

Recommended cable size

The cable sizes between the Inverter and MT-BSL and between the MT-BSL and IM depend on U, V, W of "Peripheral devices list" (page 57)
The cable size to the MT-BSC is as table below.

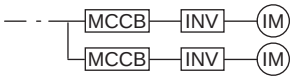
| MT-BSC-75K | MT-BSC-90K | MT-BSC-H75K | MT-BSC-H110K |
|---|---|---|---|
| 38mm$^2$ | 38mm$^2$ | 22mm$^2$ | 22mm$^2$ |

## Peripheral devices list

| Voltage | Motor Output (kW) *1 | Applicable Inverter Type | Moulded Case Circuit Breaker (MCCB) *2 or Earth Leakage Circuit Breaker (ELB) | | | Input Side Magnetic Contactor*3 | | Recommended Cable Size ($mm^2$)*4 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Reactor connection | | Commercial-power supply operation available | Reactor connection | | R, S, T | U, V, W |
| | | | without | with | | without | with | | |
| 200V class | 0.75 | FR-F720-0.75K | 30AF 10A | 30AF 10A | 30AF 10A | S-N10 | S-N10 | 2 | 2 |
| | 1.5 | FR-F720-1.5K | 30AF 15A | 30AF 15A | 30AF 15A | S-N10 | S-N10 | 2 | 2 |
| | 2.2 | FR-F720-2.2K | 30AF 20A | 30AF 15A | 30AF 20A | S-N10 | S-N10 | 2 | 2 |
| | 3.7 | FR-F720-3.7K | 30AF 30A | 30AF 30A | 30AF 30A | S-N20, N21 | S-N10 | 3.5 | 3.5 |
| | 5.5 | FR-F720-5.5K | 50AF 50A | 50AF 40A | 50AF 50A | S-N25 | S-N20, N21 | 5.5 | 5.5 |
| | 7.5 | FR-F720-7.5K | 100AF 60A | 50AF 50A | 100AF 60A | S-N25 | S-N25 | 14 | 8 |
| | 11 | FR-F720-11K | 100AF 75A | 100AF 75A | 100AF 75A | S-N35 | S-N35 | 14 | 14 |
| | 15 | FR-F720-15K | 225AF 125A | 100AF 100A | 225AF 125A | S-N50 | S-N50 | 22 | 22 |
| | 18.5 | FR-F720-18.5K | 225AF 150A | 225AF 125A | 225AF 150A | S-N65 | S-N50 | 38 | 38 |
| | 22 | FR-F720-22K | 225AF 175A | 225AF 150A | 225AF 175A | S-N80 | S-N65 | 38 | 38 |
| | 30 | FR-F720-30K | 225AF 225A | 225AF 175A | 225AF 225A | S-N95 | S-N80 | 60 | 60 |
| | 37 | FR-F720-37K | 400AF 250A | 225AF 225A | 400AF 250A | S-N150 | S-N125 | 80 | 80 |
| | 45 | FR-F720-45K | 400AF 300A | 400AF 300A | 400AF 350A | S-N180 | S-N150 | 100 | 100 |
| | 55 | FR-F720-55K | 400AF 400A | 400AF 350A | 600AF 500A | S-N220 | S-N180 | 100 | 100 |
| | 75 | FR-F720-75K | — | 400AF 400A | 400AF 400A | — | S-N300 | 125 | 125 |
| | 90 | FR-F720-90K | — | 400AF 400A | 600AF 500A | — | S-N300 | 150 | 150 |
| | 110 | FR-F720-110K | — | 600AF 500A | 600AF 600A | — | S-N400 | 2 × 100 | 2 × 100 |
| 400V class | 0.75 | FR-F740-0.75K | 30AF 5A | 30AF 5A | 30AF 5A | S-N10 | S-N10 | 2 | 2 |
| | 1.5 | FR-F740-1.5K | 30AF 10A | 30AF 10A | 30AF 10A | S-N10 | S-N10 | 2 | 2 |
| | 2.2 | FR-F740-2.2K | 30AF 10A | 30AF 10A | 30AF 15A | S-N10 | S-N10 | 2 | 2 |
| | 3.7 | FR-F740-3.7K | 30AF 20A | 30AF 15A | 30AF 20A | S-N10 | S-N10 | 2 | 2 |
| | 5.5 | FR-F740-5.5K | 30AF 30A | 30AF 20A | 30AF 30A | S-N20 | S-N11, N12 | 2 | 2 |
| | 7.5 | FR-F740-7.5K | 30AF 30A | 30AF 30A | 30AF 30A | S-N20 | S-N20 | 3.5 | 3.5 |
| | 11 | FR-F740-11K | 50AF 50A | 50AF 40A | 50AF 50A | S-N20 | S-N20 | 5.5 | 5.5 |
| | 15 | FR-F740-15K | 100AF 60A | 50AF 50A | 100AF 60A | S-N25 | S-N20 | 8 | 8 |
| | 18.5 | FR-F740-18.5K | 100AF 75A | 100AF 60A | 100AF 75A | S-N25 | S-N25 | 14 | 8 |
| | 22 | FR-F740-22K | 100AF 100A | 100AF 75A | 100AF 100A | S-N35 | S-N25 | 14 | 14 |
| | 30 | FR-F740-30K | 225AF 125A | 225AF 100A | 225AF 125A | S-N50 | S-N50 | 22 | 22 |
| | 37 | FR-F740-37K | 225AF 150A | 225AF 125A | 225AF 150A | S-N65 | S-N50 | 22 | 22 |
| | 45 | FR-F740-45K | 225AF 175A | 225AF 150A | 225AF 175A | S-N80 | S-N65 | 38 | 38 |
| | 55 | FR-F740-55K | 225AF 200A | 225AF 175A | 225AF 200A | S-N80 | S-N80 | 60 | 60 |
| | 75 | FR-F740-75K | — | 225AF 225A | 225AF 225A | — | S-N95 | 60 | 60 |
| | 90 | FR-F740-90K | — | 225AF 225A | 400AF 300A | — | S-N150 | 60 | 60 |
| | 110 | FR-F740-110K | — | 225AF 225A | 400AF 350A | — | S-N180 | 80 | 80 |
| | 132 | FR-F740-132K | — | 400AF 400A | 400AF 400A | — | S-N220 | 100 | 125 |
| | 160 | FR-F740-160K | — | 400AF 400A | 600AF 500A | — | S-N300 | 125 | 125 |
| | 185 | FR-F740-185K | — | 400AF 400A | 600AF 500A | — | S-N300 | 150 | 150 |
| | 220 | FR-F740-220K | — | 600AF 500A | 600AF 600A | — | S-N400 | 2 × 100 | 2 × 100 |
| | 250 | FR-F740-250K | — | 600AF 600A | 600AF 600A | — | S-N600 | 2 × 100 | 2 × 100 |
| | 280 | FR-F740-280K | — | 600AF 600A | 800AF 800A | — | S-N600 | 2 × 125 | 2 × 125 |
| | 315 | FR-F740-315K | — | 800AF 700A | 800AF 800A | — | S-N600 | 2 × 150 | 2 × 150 |
| | 355 | FR-F740-355K | — | 800AF 800A | 800AF 800A | — | S-N600 | 2 × 200 | 2 × 200 |
| | 400 | FR-F740-400K | — | 1000AF 900A | 1000AF 1000A | — | S-N800 | 2 × 200 | 2 × 200 |
| | 450 | FR-F740-450K | — | 1000AF 1000A | 1000AF 1000A | — | 1000A rated product | 2 × 250 | 2 × 250 |
| | 500 | FR-F740-500K | — | 1200AF 1200A | 1200AF 1200A | — | 1000A rated product | 2 × 250 | 2 × 250 |
| | 560 | FR-F740-560K | — | 1600AF 1500A | 1600AF 1600A | — | 1200A rated product | 3 × 200 | 3 × 200 |

*1 Selections for use of the Mitsubishi 4-pole standard motor with power supply voltage 200VAC (200V class)/400VAC (400V class) 50Hz.

*2 Install one MCCB per inverter.
For installations in the United States or Canada, use the fuse certified by the UL and cUL.
*(Refer to the Instruction Manual (basics).)*




*3 The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

*4 Cable
For the 55K or less, the recommended cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. Assumes that the ambient temperature is 50°C or less and the wiring distance is 20m or less.
For the 75K or more, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C or more. Assumes that the ambient temperature is 50°C or less and wiring is performed in an enclosure.

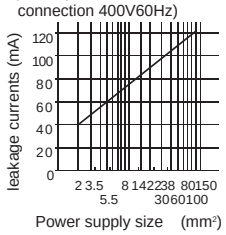
## Selection of rated sensitivity current of earth (ground) leakage breaker

When using the earth leakage circuit breaker with the inverter circuit, select its rated sensitivity current as follows, independently of the PWM carrier frequency:

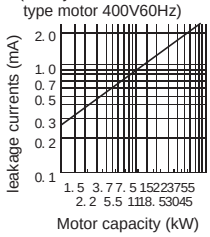
- Breaker designed for harmonic and surge suppression
  Rated sensitivity currentI $\Delta n \geq 10 \times (Ig1 + Ign + Igi + Ig2 + Igm)$
- Standard breaker
  Rated sensitivity currentI $\Delta n \geq 10 \times \{Ig1 + Ign + Igi + 3 \times (Ig2 + Igm)\}$

Ig1, Ig2 : Leakage currents in wire path during commercial power supply operation
Ign : Leakage current of inverter input side noise filter
Igm : Leakage current of motor during commercial power supply operation
Igi : Inverter unit leakage current

Example of leakage current per 1km during the commercial power supply operation when the CV cable is routed in metal conduit
(Three-phase three-wire delta connection 400V60Hz)

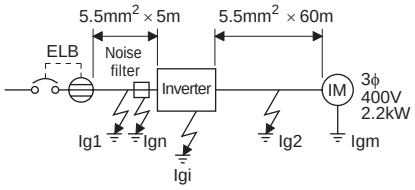



Leakage current example of Three-phase induction motor during the commercial power supply operation
(Totally-enclosed fan-cooled type motor 400V60Hz)




For "人" connection, the amount of leakage current is 1/3

example



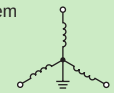

(Note)1. Install the earth leakage breaker (ELB) on the input side of the inverter.
2. In the 人 connection earthed-neutral system, the sensitivity current is purified against an earth (ground) fault in the inverter output side. Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (JIS, NEC section 250, IEC 536 class 1 and other applicable standards)

● Selection example (in the case of the left figure)

| | Breaker Designed for Harmonic and Surge Suppression | Standard Breaker |
|---|---|---|
| Leakage current Ig1 (mA) | $\frac{1}{3} \times 66 \times \frac{5m}{1000m} = 0.11$ | |
| Leakage current Ign (mA) | 0 (without noise filter) | |
| Leakage current Igi (mA) | 1 (Without EMC filter)<br>Refer to the following table for the leakage current of the inverter | |
| Leakage current Ig2(mA) | $\frac{1}{3} \times 66 \times \frac{60m}{1000m} = 1.32$ | |
| Motor leakage current Igm (mA) | 0.36 | |
| Total leakage current (mA) | 2.79 | 6.15 |
| Rated sensitivity current (mA)(≥ Ig × 10) | 30 | 100 |

● Inverter leakage current (with and without EMC filter)

Input power conditions
(200V class : 220V/60Hz, 400V class : 440V/60Hz,
power supply unbalance within 3%)

| | Voltage (V) | EMC Filter | |
|---|---|---|---|
| | | ON (mA) | OFF (mA) |
| Phase grounding  | 200 | 22(1) * | 1 |
| | 400 | 30 | 1 |
| Earthed-neutral system  | 400 | 1 | 1 |

* For the 200V class 0.75K and 1.5K, the EMC filter is always valid. The leakage current is 1mA.

## Precautions for use of the inverter

⚠ Safety Precautions

- To operate the inverter correctly and safely, be sure to read the "instruction manual" before starting operation.
- This product has not been designed or manufactured for use with any equipment or system operated under life-threatening conditions.
- Please contact our sales office when you are considering using this product in special applications such as passenger mobile, medical, aerospace, nuclear, power or undersea relay equipment or system.
- Although this product is manufactured under strict quality control, safety devices should be installed when a serious accident or loss is expected by a failure of this product.
- The load used should be a three-phase induction motor only.

### Operation

- A magnetic contactor (MC) provided on the primary side should not be used to make frequent starts and stops. It could cause the inverter to fail.
- However, at this time, the motor cannot be brought to a sudden stop. Hence, provide a mechanical stopping/holding mechanism for the machine/equipment which requires an emergency stop.
- It will take time for the capacitor to discharge after shutoff of the inverter power supply. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched off, and check to make sure that there are no residual voltage using a tester or the like.

### Wiring

- Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Therefore, fully check the wiring and sequence to ensure that wiring is correct, etc. before powering on.
- The terminals P/+, P1, N/- are provided for connection of a dedicated option. Connect only a dedicated option. Do not short the frequency setting power supply terminal 10 and common terminal 5 or the terminal PC and terminal SD.
- Do not wire the maker-dedicated terminal PR/PX.

### Installation

- Avoid hostile environment where oil mist, fluff, dust particles, etc. are suspended in the air, and install the inverter in a clean place or put it in an ingress-protected "enclosed" panel. When placing the inverter in a panel, determine the cooling system and panel dimensions so that the ambient temperature of the inverter is within the permissble value. (refer to page 8 for the specified value)
- Do not install the inverter on wood or other combustible material as it will be hot locally.
- Install the inverter in the vertical orientation.

### Setting

- The inverter can be operated as fast as a maximum of 400Hz by parameter setting. Therefore, incorrect setting can cause a danger. Set the upper limit using the maximum frequency limit setting function.
- A setting higher than the initial value of DC injection brake operation voltage or operation time can cause motor overheat (electronic thermal relay trip).

## Precautions for selection

### Inverter capacity selection

- When operating a special motor or more than one motor in parallel with a single inverter, select the inverter capacity so that 1.1 times the total rated motor current is less than the rated output current of the inverter.

### Starting torque of the motor

- The start and acceleration characteristics of the motor driven by the inverter are restricted by the overload current rating of that inverter. Generally the torque characteristic is less than when the motor is started by a commercial power supply. When torque boost adjustment or simple magnetic flux vector cannot provide enough starting torque, select the inverter of one rank higher capacity or increase the capacities of both the motor and inverter.

### Acceleration and deceleration times

- The acceleration/deceleration time of the motor depends on the motor-generated torque, load torque and moment of inertia of the load ($GD^2$).
- When the current limit function or stall prevention function is activated during acceleration/deceleration, increase the acceleration/deceleration time as the actual time may become longer.
- To decrease the acceleration/deceleration time, increase the torque boost value (setting of a too large value may activate the stall prevention function at a start, longer the acceleration time), use the simple magnetic flux vector control, or increase the inverter and motor capacities. To decrease the deceleration time, it is necessary to add the brake unit (FR-BU, MT-BU5), power regeneration common converter (FR-CV), power regeneration unit (MT-RC) or a similar device to absorb braking energy.

### Power transfer mechanism

***(gear, belt, chain, etc.)***

- When an oil-lubricated gear box, speed change gear or similar device is used in the power transfer system, note that continuous operation at low decelerated speed only may deteriorate oil lubrication, causing seizure. When performing fast operation at higher than 60Hz, fully note that such operation will cause strength shortage due to the noise, life or centrifugal force of the power transfer mechanism.

### Instructions for overload operation

- When performing operation of frequent start/stop of the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing bound current, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. Therefore, increase the inverter capacity to have enough allowance for current.

# Precautions for Peripheral Device Selection

## Installation and selection of moulded case circuit breaker

Install a moulded case circuit breaker (MCCB) on the power receiving side to protect the wiring of the inverter primary side. For MCCB selection, refer to *page 57* since it depends on the inverter power supply side power factor (which changes depending on the power supply voltage, output frequency and load). Note that the operation characteristics of the completely electromagnetic MCCB changes according to the higher harmonic current, so a larger capacity must be selected. (Check it in the data of the corresponding breaker.) As an earth (ground) leakage breaker, use the Mitsubishi earth (ground) leakage breaker designed for harmonics and surges. *(Refer to page 58.)*

When installing a moulded case circuit breaker on the secondary side of the inverter, contact each manufacturer for selection of the moulded case circuit breaker.

## Handling of primary side magnetic contactor

For operation via external terminal (terminal STF or STR used), provide a primary side MC to prevent an accident caused by a natural restart at power recovery after a power failure, such as an instantaneous power failure, and to ensure safety for maintenance work. Do not use this magnetic contactor to make frequent starts and stops. (The switching life of the inverter input circuit is about 1,000,000 times.) For parameter unit operation, an automatic restart after power failure is not made and the MC cannot be used to make a start. Note that the primary side MC can stop the operation, but the regenerative brake specific to the inverter does not operate and the motor coasts to stop.

## Handling of secondary side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned on while the inverter is operating, overcurrent protection of the inverter and such will activate. When an MC is provided to switch to a commercial power supply, for example, it is recommended to use commercial power supply-inverter switchover operation *Pr. 135 to 139*.

## Thermal relay installation

The inverter has an electronic thermal relay function to protect the motor from overheating. However, when running multiple motors with one inverter or operating a multi-pole motor, provide a thermal relay (OCR) between the inverter and motor. In this case, set the electronic thermal relay function of the inverter to 0A. And for the setting of the thermal relay, add the line-to-line leakage current *(refer to page 61)* to the current value on the motor rating plate.

For low-speed operation where the cooling capability of the motor reduces, it is recommended to use a thermal protector or thermistor-incorporated motor.

## Secondary side measuring instrument

When the wiring length between the inverter and motor is long, select the device that has enough current rating. Otherwise the measuring instrument or CT which is used especially for the 400V class small-capacity inverter may generate heat due to the influence of line leakage current. To measure and display the output voltage and output current of the inverter, it is recommended to use the terminal AM-5 output function of the inverter.

## Disuse of power factor improving capacitor (power capacitor)

The power factor improving capacitor and surge suppressor on the inverter output side may be overheated or damaged by the harmonic components of the inverter output. Also, since an excessive current flows in the inverter to activate overcurrent protection, do not install a capacitor or surge suppressor. For power factor improvement, use the power factor improving DC reactor (see *page 51*).

## Wire thickness and wiring distance

When the wiring length between the inverter and motor is long, use thick wires so that the voltage drop of the main circuit cable is 2% or less especially at low frequency output. (A selection example for the wiring distance of 20m is shown on *page 57*)

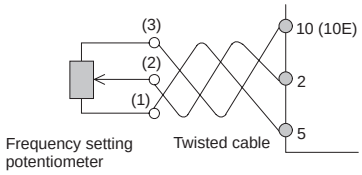
Especially at a long wiring distance, the maximum wiring length should be within 500m since the overcurrent protection function may be misactivated by the influence of a charging current due to the stray capacitances of the wiring. (The overall wiring length for connection of multiple motors should be within the value in the table below.)

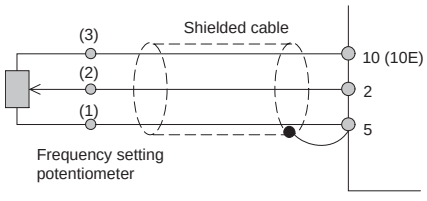
| *Pr. 72 PWM frequency selection* setting (carrier frequency) | 0.75K | 1.5K | 2.2K or more |
|---|---|---|---|
| 2 | 300m | 500m | 500m |
| 3 to 15 | 200m | 300m | 500m |

Use the recommended connection cable when installing the operation panel away from the inverter unit or when connecting the parameter unit.

For remote operation via analog signal, wire the control cable between the operation box or operation signal and inverter within 30m and away from the power circuits (main circuit and relay sequence circuit) to prevent induction from other devices.

When using the external potentiometer instead of the parameter unit to set the frequency, use a shielded or twisted cable, and do not earth (ground) the shield, but connect it to terminal 5 as shown below.




## Earth (Ground)

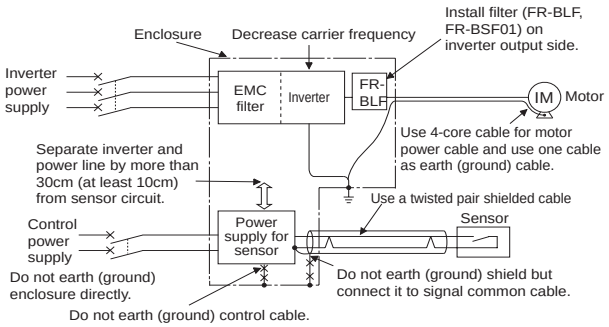
When the inverter is run in the low acoustic noise mode, more leakage currents occur than in the non-low acoustic noise mode due to high-speed switching operation. Be sure to use the inverter and motor after grounding (earthing) them. In addition, always use the earth (ground) terminal of the inverter to earth (ground) the inverter. (Do not use the case and chassis)

## Noise

When performing low-noise operation at higher carrier frequency, electromagnetic noise tends to increase. Therefore, refer to the following measure example and consider taking the measures. Depending on the installation condition, the inverter may be affected by noise in a non-low noise (initial) status.

- The noise level can be reduced by decreasing the carrier frequency (*Pr. 72*).
- As measures against AM radio broadcasting noise and sensor malfunction, turning on the built-in noise reduction filter produces an effect. (For the switching method, refer to the instruction manual.)
- As measures against induction noise from the power cable of the inverter, an effect is produced by putting a distance of 30cm (at least 10cm) or more and using a twisted pair shielded cable as a signal cable. Do not earth (ground) shield but connect it to signal common cable.

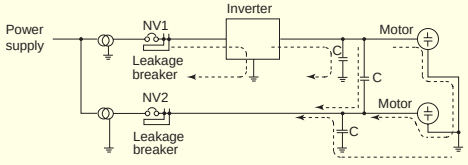
**Noise reduction examples**




## Leakage currents

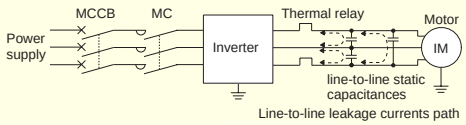
Capacitances exist between the inverter I/O cables, other cables and earth and in the motor, through which a leakage current flows. Since its value depends on the capacitances, carrier frequency, etc., low acoustic noise operation at the increased carrier frequency of the inverter will increase the leakage current. Therefore, take the following measures. Select the earth leakage breaker according to its rated sensitivity current, independently of the carrier frequency setting.

### To-earth (ground) leakage currents

| Type | Influence and Measures |
|---|---|
| **Influence and measures** | · Leakage currents may flow not only into the inverter's own line but also into the other lines through the earth (ground) cable, etc.These leakage currents may operate earth (ground) leakage circuit breakers and earth leakage relays unnecessarily.<br>● Countermeasures<br>· If the carrier frequency setting is high, decrease the *Pr. 72 PWM frequency selection* setting.<br>Note that motor noise increases. Select *Pr. 240 Soft-PWM operation selection* to make the sound inoffensive.<br>· By using earth leakage circuit breakers designed for harmonic and surge suppression in the inverter's own line and other line, operation can be performed with the carrier frequency kept high (with low noise). |
| **Undesirable current path** |  |



### Line leakage current

| Type | Influence and Measures |
|---|---|
| **Influence and measures** | · This leakage current flows via a static capacitance between the inverter output cables.<br>· The external thermal relay may be operated unnecessarily by the harmonics of the leakage current.When the wiring length is long (50m or more) for the 400V class small-capacity model (7.5kW or less), the external thermal relay is likely to operate unnecessarily because the ratio of the leakage current to the rated motor current increases.<br>● Countermeasures<br>· Use *Pr. 9 Electronic thermal O/L relay*.<br>· If the carrier frequency setting is high, decrease the *Pr. 72 PWM frequency selection* setting.<br>Note that motor noise increases. Select *Pr. 240 Soft-PWM operation selection* to make the sound inoffensive.<br>To ensure that the motor is protected against line-to-line leakage currents, it is recommended to use a temperature sensor to directly detect motor temperature. |
| **Undesirable current path** |  |



Line-to-line leakage currents path

● Harmonic suppression guideline

Harmonic currents flow from the inverter to a power receiving point via a power transformer.The harmonic suppression guidelines were established to protect other consumers from these outgoing harmonic currents.

The three-phase 200V input specifications 3.7kW or less are previously covered by "Harmonic suppression guideline for household appliances and general-purpose products" and other models are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". However, the general-purpose inverter has been excluded from the target products covered by "Harmonic suppression guideline for household appliances and general-purpose products" in January 2004 and all capacities of all models are now target products of "Harmonic suppression guideline for consumers who receive high voltage or special high voltage".

· Harmonic suppression guideline for consumers who receive high voltage or special high voltage

This guideline sets forth the maximum values of harmonic currents outgoing from a high-voltage or especially high-voltage consumer who will install, add or renew harmonic generating equipment. If any of the maximum values is exceeded, this guideline requires that consumer to take certain suppression measures.

Users who use models other than the target models are not covered by the guideline. However, we ask to connect an AC reactor and a DC reactor as before.

For compliance to the "Harmonic suppression guideline for consumers who receive high voltage or special high voltage"

| Input Power Supply | Target Capacity | Measures |
|---|---|---|
| Three-phase 200V<br>Three-phase 400V | All capacities | Make a judgment based on "Harmonic suppression guideline for consumers who receive high voltage or special high voltage" issued by the Japanese Ministry of Economy, Trade and Industry (formerly Ministry of International Trade and Industry) in September 1994 and take measures if necessary. For calculation method of power supply harmonics, refer to materials below.<br><br>Reference materials<br>· "Harmonic suppression measures of the general-purpose inverter" Jan., 2004 Japan Electrical Manufacturer's Association<br>· "Calculation method of harmonic current of the general-purpose inverter used by specific consumers" JEM-TR201 (Revised in December 2003) : Japan Electrical Manufacturer's Association |

For compliance to "Harmonic suppression guideline of the general-purpose inverter (input current of 20A or less) for consumers other than specific consumers" published by JEMA

| Input Power Supply | Target Capacity | Measures |
|---|---|---|
| Three-phase 200V | 3.7kW or less | Connect the AC reactor or DC reactor recommended in a catalog or an instruction manual.<br><br>Reference materials<br>· "Harmonic suppression guideline of the general-purpose inverter (input current of 20A or less)" JEM-TR226 (Revised in December 2003) : Japan Electrical Manufacturer's Association |

● Calculation of outgoing harmonic current

Outgoing harmonic current = fundamental wave current (value converterd from received power voltage) × operation ratio × harmonic content

· Operation ratio: Operation ratio = actual load factor × operation time ratio during 30 minutes
· Harmonic content: Found in Table.

Table 1: Harmonic content (Values of the fundamental current is 100%)

| Reactor | 5th | 7th | 11th | 13th | 17th | 19th | 23rd | 25th |
|---|---|---|---|---|---|---|---|---|
| Not used | 65 | 41 | 8.5 | 7.7 | 4.3 | 3.1 | 2.6 | 1.8 |
| Used (AC side) | 38 | 14.5 | 7.4 | 3.4 | 3.2 | 1.9 | 1.7 | 1.3 |
| Used (DC side) | 30 | 13 | 8.4 | 5.0 | 4.7 | 3.2 | 3.0 | 2.2 |
| Used (AC, DC sides) | 28 | 9.1 | 7.2 | 4.1 | 3.2 | 2.4 | 1.6 | 1.4 |

Table 2: Rated capacities and outgoing harmonic currents of inverter-driven motors

| Applied Motor kW | Rated Current [A] | | Fundamental Wave Current Converted from 6.6kV (mA) | Rated Capacity (kVA) | Fundamental Wave Current Converted from 6.6kV (No reactor, 100% operation ratio) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 200V | 400V | | | 5th | 7th | 11th | 13th | 17th | 19th | 23rd | 25th |
| 0.75 | 2.74 | 1.37 | 83 | 0.97 | 53.95 | 34.03 | 7.055 | 6.391 | 3.569 | 2.573 | 2.158 | 1.494 |
| 1.5 | 5.50 | 2.75 | 167 | 1.95 | 108.6 | 68.47 | 14.20 | 12.86 | 7.181 | 5.177 | 4.342 | 3.006 |
| 2.2 | 7.93 | 3.96 | 240 | 2.81 | 156.0 | 98.40 | 20.40 | 18.48 | 10.32 | 7.440 | 6.240 | 4.320 |
| 3.7 | 13.0 | 6.50 | 394 | 4.61 | 256.1 | 161.5 | 33.49 | 30.34 | 16.94 | 12.21 | 10.24 | 7.092 |
| 5.5 | 19.1 | 9.55 | 579 | 6.77 | 376.4 | 237.4 | 49.22 | 44.58 | 24.90 | 17.95 | 15.05 | 10.42 |
| 7.5 | 25.6 | 12.8 | 776 | 9.07 | 504.4 | 318.2 | 65.96 | 59.75 | 33.37 | 24.06 | 20.18 | 13.97 |
| 11 | 36.9 | 18.5 | 1121 | 13.1 | 728.7 | 459.6 | 95.29 | 86.32 | 48.20 | 34.75 | 29.15 | 20.18 |
| 15 | 49.8 | 24.9 | 1509 | 17.6 | 980.9 | 618.7 | 128.3 | 116.2 | 64.89 | 46.78 | 39.24 | 27.16 |
| 18.5 | 61.4 | 30.7 | 1860 | 21.8 | 1209 | 762.6 | 158.1 | 143.2 | 79.98 | 57.66 | 48.36 | 33.48 |
| 22 | 73.1 | 36.6 | 2220 | 25.9 | 1443 | 910.2 | 188.7 | 170.9 | 95.46 | 68.82 | 57.72 | 39.96 |
| 30 | 98.0 | 49.0 | 2970 | 34.7 | 1931 | 1218 | 252.5 | 228.7 | 127.7 | 92.07 | 77.22 | 53.46 |
| 37 | 121 | 60.4 | 3660 | 42.8 | 2379 | 1501 | 311.1 | 281.8 | 157.4 | 113.5 | 95.16 | 65.88 |
| 45 | 147 | 73.5 | 4450 | 52.1 | 2893 | 1825 | 378.3 | 342.7 | 191.4 | 138.0 | 115.7 | 80.10 |
| 55 | 180 | 89.9 | 5450 | 63.7 | 3543 | 2235 | 463.3 | 419.7 | 234.4 | 169.0 | 141.7 | 98.10 |

| Applied Motor kW | Rated Current [A] | | Fundamental Wave Current Converted from 6.6kV (mA) | Rated Capacity (kVA) | Fundamental Wave Current Converted from 6.6kV (With DC reactor , 100% operation ratio) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 200V | 400V | | | 5th | 7th | 11th | 13th | 17th | 19th | 23rd | 25th |
| 75 | 245 | 123 | 8200 | 87.2 | 2237 | 969 | 626 | 373 | 350 | 239 | 224 | 164 |
| 90 | 293 | 147 | 9800 | 104 | 2673 | 1158 | 748 | 445 | 419 | 285 | 267 | 196 |
| 110 | 357 | 179 | 11933 | 127 | 3254 | 1410 | 911 | 542 | 510 | 347 | 325 | 239 |
| 132 | — | 216 | 14400 | 153 | 3927 | 1702 | 1100 | 655 | 615 | 419 | 393 | 288 |
| 160 | — | 258 | 17200 | 183 | 4691 | 2033 | 1313 | 782 | 735 | 500 | 469 | 344 |
| 220 | — | 355 | 23667 | 252 | 6455 | 2797 | 1807 | 1076 | 1011 | 688 | 645 | 473 |
| 250 | — | 403 | 26867 | 286 | 7327 | 3175 | 2052 | 1221 | 1148 | 782 | 733 | 537 |
| 280 | — | 450 | 27273 | 319 | 8182 | 3545 | 2291 | 1364 | 1282 | 873 | 818 | 600 |
| 315 | — | 506 | 30667 | 359 | 9200 | 3987 | 2576 | 1533 | 1441 | 981 | 920 | 675 |
| 355 | — | 571 | 34606 | 405 | 10382 | 4499 | 2907 | 1730 | 1627 | 1107 | 1038 | 761 |
| 400 | — | 643 | 38970 | 456 | 11691 | 5066 | 3274 | 1949 | 1832 | 1247 | 1169 | 857 |
| 450 | — | 723 | 43818 | 512 | 13146 | 5696 | 3681 | 2191 | 2060 | 1402 | 1315 | 964 |
| 500 | — | 804 | 48727 | 570 | 14618 | 6335 | 4093 | 2436 | 2290 | 1559 | 1462 | 1072 |
| 560 | — | 900 | 54545 | 638 | 16364 | 7091 | 4582 | 2727 | 2564 | 1746 | 1636 | 1200 |

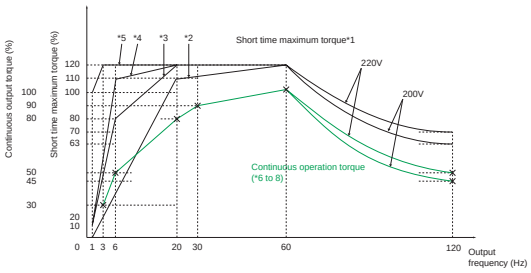
# Application to Motor

## Application to standard motor

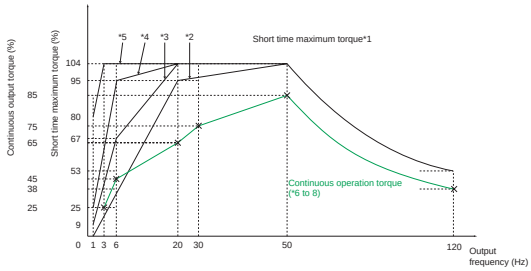
When the Mitsubishi standard squirrel-cage motor (SF-JR, 4-pole) and inverter of the same capacity are used, the torque characteristics are as shown below.

### Output characteristics

**60Hz torque reference**




**50Hz torque reference**




*1 The 60Hz torque reference indicates that the rated torque of the motor running at 60Hz is 100%, and the 50Hz torque reference indicates that the rated torque of the motor running at 50Hz is 100%
*2 Torque boost minimum (0%)
*3 Torque boost standard (initial value)
*4 Torque boost large (0.75K... 10%, 1.5K to 3.7K... 7%, 5.5K, 7.5K... 6%, 11K or more... 4%)
*5 Enabled for torque boost adjustment (3.7kW or less) or simple magnetic flux vector control (slip compensation setting)
*6 A general-purpose, squirrel-cage motor must be used at lower continuous operating torque in rated operation as shown in the chart since the cooling capability of the fan installed on the rotor reduces at a lower speed. (Instantaneous torque occurs)
*7 200/220V 60Hz or 200V 50Hz in the chart indicates a motor torque standard (base frequency set in Pr. 3 of the inverter) and is not the frequency of the power supply. You can also set 60Hz in a 50Hz power supply area.
*8 As shown in the chart, the 60Hz torque reference setting allows you to use the motor more efficiently as it can bring out the 100% torque of the motor continuously.
*9 This chart shows the characteristic available when a constant-torque load is selected for load pattern selection (Pr. 14).

### Motor loss and temperature rise

The motor operated by the inverter has a limit on the continuous operating torque since it is slightly higher in temperature rise than the one operated by a commercial power supply. At a low speed, reduce the output torque of the motor since the cooling effect decreases. When 100% torque is needed continuously at low speed, consider using a constant-torque motor.

### Torque characteristic

The motor operated by the inverter may be less in motor torque (especially starting torque) than the one driven by the commercial power supply. It is necessary to fully check the load torque characteristic of the machine.

### Vibration

The machine-installed motor operated by the inverter may be slightly greater in vibration than the one driven by the commercial power supply. The possible causes of vibration are as follows.

1. Vibration due to imbalance of the rotator itself including the machine
2. Resonance due to the natural oscillation of the mechanical system. Caution is required especially when the machine used at constant speed is operated at variable speed. The frequency jump function allows resonance points to be avoided during operation. (During acceleration/deceleration, the frequency within the setting range is passed through.) An effect is also produced if the PWM carrier frequency in Pr. 72 is changed. When a two-pole motor is operated at higher than 60Hz, caution should be taken since such operation may cause abnormal vibration.

## Inverter-driven 400V class motor

When driving a 400V class motor by the inverter, surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor. In such a case, consider taking the following measures.

(1) Rectifying the motor insulation
1. Use a "400V class inverter driven insulation-enhanced motor".
   Note: The four poles of the Mitsubishi standard motor (SF-JR, SB-JR) have the 400V class inverter driving insulation-enhanced feature.
2. For the dedicated motor such as the constant-torque motor and low-vibration motor, use the "inverter-driven, dedicated motor".

(2) Suppressing the surge voltage on the inverter side
Connect a filter on the secondary side of the inverter to suppress a surge voltage so that the terminal voltage of the motor is 850V or less. When driving by the Mitsubishi inverter, connect an optional surge voltage suppression filter (FR-ASF-H) for the 55K or less and an optional sine wave filter (MT-BSL, BSC) for the 75K or more on the inverter output side.

## Application to constant-torque motor

Since a constant-torque motor is greater in current than the standard motor, the inverter capacity may be one rank higher.
For a constant-torque motor, decrease the torque boost setting.
Recommended value 0.75kW... 6%, 1.5 to 3.7kW... 4%,
5.5 to 7.5kW...3%, 11 to 37kW...2%,
45 to 55kW...1.5%, 75k or more...1%

When two or more motors are operated synchronously, torque imbalance is likely to occur as motor slip is smaller than that of the standard motor.

## Application to special motors

### Pole changing motor

As this motor differs in rated current from the standard motor, confirm the maximum current of the motor and select the inverter. Be sure to change the number of poles after the motor has stopped. If the number of poles is changed during rotation, the regenerative overvoltage protecion circuit may be activated to cause an inverter alarm, coasting the motor to a stop.

### Geared motor

The continuous operating rotation range of this motor changes depending on the lubrication system and maker. Especially in the case of oil lubrication, continuous operation in the low speed range only can cause gear seizure. For fast operation at higher than 60Hz, please consult the maker.

### Synchronous motor

This motor is not suitable for applications of large load variation or impact, where out-of-sync is likely to occur. Please contact us when using this motor because its starting current and rated current are greater than those of the standard motor and will not rotate stably at low speed.

# Main Differences and Compatibilities with the FR-F500(L) Series

| Item | FR-F500 (L) | FR-F700 |
|---|---|---|
| Changed/cleared functions | Simple mode parameters 61 | Simple mode parameters 15 |
| | *Pr. 0 Torque boost* initial value<br>11K to 55K: 2% | *Pr. 0 Torque boost* initial value<br>11K to 37K: 2%, 45K, 55K: 1.5%<br>(When the torque boost value of the FR-F500 series used was the initial value, it is not necessary to change the torque boost value from the initial value when replacing with the FR-F700 series.) |
| | User group 1 (16), user group 2 (16)<br>(Pr. 160, Pr. 173 to Pr. 175) | User group (16) only<br>Setting methods were partially changed<br>(Pr. 160, Pr. 172 to Pr. 173) |
| | User initial value setting (Pr. 199) | "User initial value setting" (Pr. 199) was cleared<br>Substitutable with the copy function of the operation panel (FR-DU07) |
| | DC injection brake function with terminal (X13 signal)<br>(Pr. 11 setting value 8888, Pr. 180 to Pr. 186 setting value 13) | DC injection brake function with terminal was cleared<br>Start in reverse rotation is possible with flying start function (frequency search of automatic restart after instantaneous power failure function) |
| | Long wiring mode<br>(Pr. 240 setting 10, 11) | Setting is not necessary<br>(Pr. 240 settings "10" and "11" were cleared) |
| | Intelligent optimum acceleration/deceleration<br>(Pr. 60 setting "3" and Pr. 61 to Pr. 63) | Function was cleared<br>For deceleration time, overvoltage alarm can be avoided with regeneration avoidance function (Pr. 882 to Pr. 885). |
| | Automatic torque boost<br>(Pr. 38, Pr. 39) | Automatic torque boost was cleared because of addition of "Simple magnetic flux vector" (Pr. 80) |
| Terminal block | Removable terminal block | Removable terminal block<br>Priority compatibility (Terminal block of the F500 can be mounted) |
| PU | FR-PU04, DU04 | FR-DU07<br>FR-DU04 unavailable (Partly restricted when the FR-PU04 is used.) |
| Plug-in option | Dedicated plug-in option (not compatible) | |
| | Computer link, relay output option<br>FR-A5NR | Built into the inverter<br>(RS-485 terminals, relay output 2 points) |
| | Three boards can be mounted | One board can be mounted |
| Installation size | FR-F720-0.75K, 2.2K, 3.7K, 7.5K, 18.5K, 22K, 37K, 45K,<br>FR-F740-0.75K to 3.7K, 7.5K, 22K, 37K to 55K are compatible in mounting dimensions<br>For other capacities, an optional intercompatibility attachment (FR-AAT) is necessary. | |

# Warranty

1. Gratis warranty period and coverage

[Gratis warranty period]

Note that an installation period of less than one year after installation in your company or your customer's premises or a period of less than18 months (counted from the date of production) after shipment from our company, whichever is shorter, is selected.

[Coverage]

(1) Diagnosis of failure

As a general rule, diagnosis of failure is done on site by the customer.

However, Mitsubishi or Mitsubishi service network can perform this service for an agreed upon fee upon the customer's request.

There will be no charges if the cause of the breakdown is found to be the fault of Mitsubishi.

(2) Breakdown repairs

There will be a charge for breakdown repairs, exchange replacements and on site visits for the following four conditions, otherwise there will be a charge.

1) Breakdowns due to improper storage, handling, careless accident, software or hardware design by the customer.
2) Breakdowns due to modifications of the product without the consent of the manufacturer.
3) Breakdowns resulting from using the product outside the specified specifications of the product.
4) Breakdowns that are outside the terms of warranty.

Since the above services are limited to Japan, diagnosis of failures, etc. are not performed abroad.

If you desire the after service abroad, please register with Mitsubishi. For details, consult us in advance.

2. Exclusion of chance loss from warranty liability

Regardless of the gratis warranty term, compensation to chance losses incurred to your company or your customers by failures of Mitsubishi products and compensation for damages to products other than Mitsubishi products and other services are not covered under warranty.

3. Repair period after production is discontinued

Mitsubishi shall accept product repairs for seven years after production of the product is discontinued.

4. Terms of delivery

In regard to the standard product, Mitsubishi shall deliver the standard product without application settings or adjustments to the customer and Mitsubishi is not liable for on site adjustment or test run of the product.

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