MITSUBISHI ELECTRIC

INVERTER

Model

# FR-A700

Support Vector Control

Changes for the Better

700 series

## Highest level in your hand


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

MELSOFT

# FR-A700

**Mitsubishi real sensorless vector control ensures the highest level of driving performance**

# Highest level in your hand


CE c UL US LISTED

## Vector control with/without encoder — Highest level of driving performance

•Advanced driving performance makes it possible to support a wide range of applications from variable-speed applications such as conveyance and chemical machines to line control applications such as winding machines and printing machines.

## Design life of 10 years — Long life parts and life check function

•Adoption of long life parts ensures more reliable operation.
•The reliable life diagnosis function notifies the maintenance time.

## FA network — Network connection as you desired

•It is compatible with CC-Link communication, SSCNET and other major overseas networks. The inverter can be controlled or monitored via network from the controller.

## Enhanced noise measures — Environmental consciousness

•Noise measures are available without an option.
Harmonic currents technique is available with a new type reactor.

# 1 Highest Level of Driving Performance

Real sensorless vector control

## (1) Exhibit best performance of the general-purpose motor (real sensorless vector control)

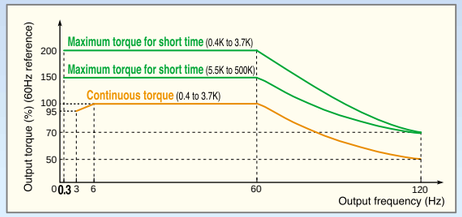
High accuracy/fast response speed operation by the vector control can be performed with a general-purpose motor without encoder.

- Maximum of **200%** high torque can be generated at an ultra low speed of **0.3Hz** (0.4K to 3.7K).
- Torque control operation can be performed also.* (Torque control range 1:20, absolute torque accuracy ±20%, repeated torque accuracy ±10%)

* Since torque control can not be performed in the low speed regeneration region and at a low speed with light load, use the vector control with encoder.

- Response level has been improved.

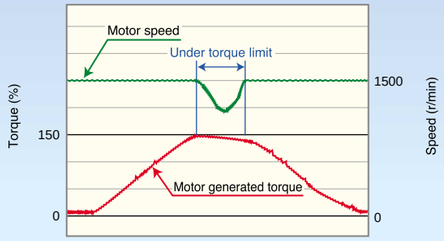
**Speed control range** **1:200** (0.3Hz to 60Hz driving only)
**Speed response** **120rad/s**




**Example of torque characteristic under real sensorless vector control**
When the motor SF-JR 4P is used (at 220V input)

### 1. Torque limit function limits the maximum motor torque during speed control

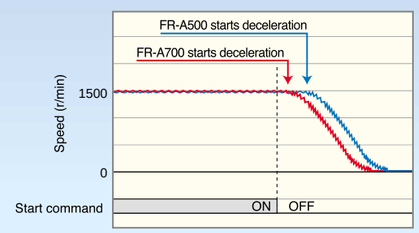
Torque limit function is effective to prevent machine from damage (prevention against damage of grinding machine tools, etc.) against the sudden disturbance torque.




**Example of torque limit characteristic**
When the motor SF-JR 4P 3.7kW is used

### 2. Improvement of input command signal response

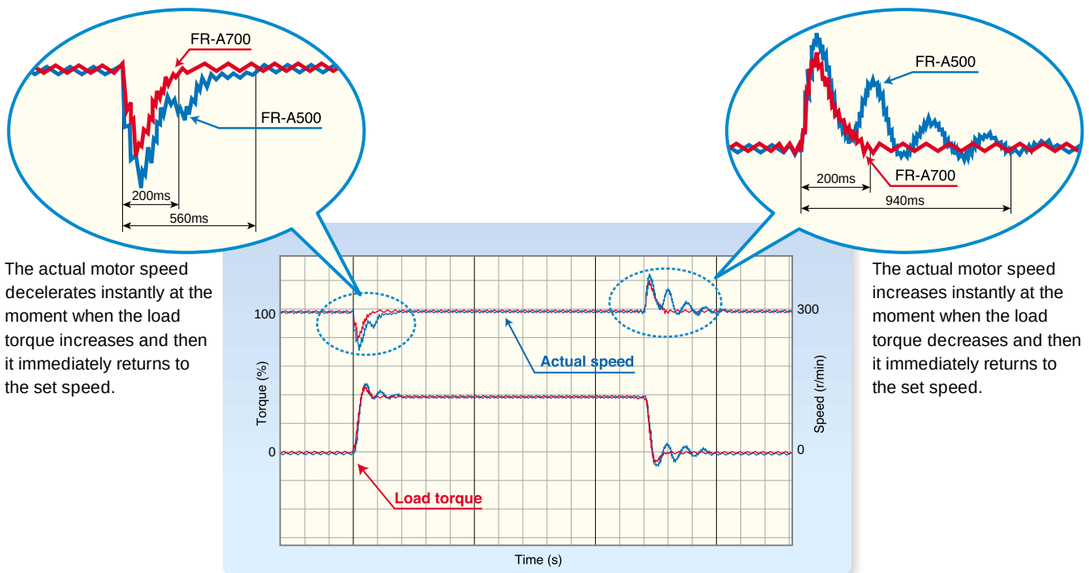
The delay to the input command has been minimized. The response time has been reduced to half as compared to the conventional model (FR-A500). It is suitable for cycle-operation applications.




**Example of input command signal response characteristic**

### 3. Quick response to the sudden load fluctuation

Torque response level to the sudden load fluctuation has been greatly improved as compared to the conventional model (FR-A500). The motor speed variation is minimized to maintain a constant speed. It is suitable for a sawmill machine, etc.




The actual motor speed decelerates instantly at the moment when the load torque increases and then it immediately returns to the set speed.

The actual motor speed increases instantly at the moment when the load torque decreases and then it immediately returns to the set speed.

**Example of actual speed variation when a load is instantaneously applied**
FR-A700 series under real sensorless vector control
FR-A500 series under advanced magnetic flux vector control



## (2) Higher accuracy operation is realized with a motor with encoder (vector control)

Vector control

Vector control operation can be performed using a motor with encoder*1. Torque control/position control*2 as well as fast response/high accuracy speed control (zero speed control, servo lock) can be realized with the inverter.

*1 A plug-in option for encoder feed back control (FR-A7AP) is necessary.
*2 Only a pulse train+code system is employed for pulse command system when performing position control with an inverter and the FR-A7AP. The maximum pulse input is 100kpps.

- **Speed control**

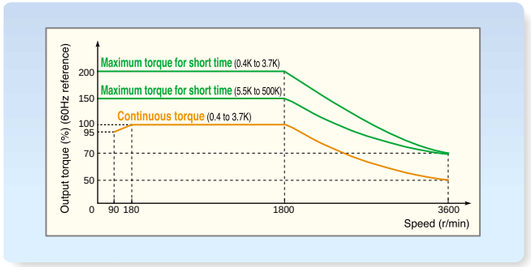
**Speed control range** **1:1500** (both driving/regeneration*3)
**Speed variation rate** **±0.01%** (100% means 3000r/min)
**Speed response** **300rad/s** (with model adaptive speed control)

*3 Regeneration unit (option) is necessary for regeneration

- **Torque control**

**Torque control range** **1:50**
**Absolute torque accuracy** **±10%***4
**Repeated torque accuracy** **±5%***4

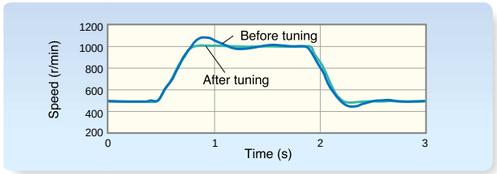
*4 Online auto tuning (with adaptive magnetic flux observer)




**Example of torque characteristic under vector control**
When the motor with encoder, SF-JR4P, is used (at 220V input)

### 1. Easy gain tuning

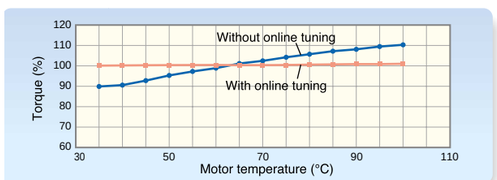
Since the load inertia of the motor is automatically estimated online to calculate the optimum speed control gain and position loop gain, gain adjustment is easily done. By repeating acceleration and deceleration, load inertia is automatically estimated.




**Comparison of the speed accuracy before and after the load inertia estimation**

### 2. High accuracy torque control with online auto tuning

Operation with high torque accuracy less susceptible to the motor second resistance value change due to a temperature change is realized with online tuning (adaptive magnetic flux observer). This operation is appropriate for applications such as a winder/printing machine (tension control) which is controlled by torque.




**Example of motor temperature-torque characteristics**

### 3. Vector control dedicated motor

Use of vector control dedicated motor realizes 100% of the continuous operation torque even at a low speed. It is suitable for winder and unwinder applications. Motors with speed ratio of 1000/2000r/min, 1000/3000r/min and 500/2000r/min specifications are available and they can support applications whose winding diameter greatly changes. Decreasing the rated speed will increase the rated torque, so you can select a motor with a smaller capacity. (The inverter one rank higher than the motor in capacity needs to be selected depending on the motor capacity.)

- **Lineup of vector control dedicated motors**

| Type | Base/Maximum Speed (r/min) | Motor Capacity |
|---|---|---|
| SF-V5RU | 1500/3000 | 1.5kW to 55kW |
| SF-V5RU1 | 1000/2000 | 1.5kW to 37kW |
| SF-V5RU3 | 1000/3000 | 1.5kW to 30kW |
| SF-V5RU4 | 500/2000 | 1.5kW to 15kW |
| SF-THY | 1500/3000 | 75kW to 250kW |

Vector control dedicated motor
SF-V5RU-1.5K

## (3) V/F control and advanced magnetic flux vector control operations are also available

V/F control

Advanced magnetic flux vector control

Since V/F control and advanced magnetic flux vector control operations are also available, you can replace the conventional model (FR-A500 series) without anxiety.

- **Complement: list of functions according to driving control method**

| Control Method | Speed Control | Torque Control | Position Control | Speed Control Range | Speed Response | Applied Motor |
|---|---|---|---|---|---|---|
| **V/F** | ○ | × | × | 1:10 (6 to 60Hz : Driving) | 10 to 20rad/s | General-purpose motor (without encoder) |
| **Advanced magnetic flux vector** | ○ | × | × | 1:120 (0.5~60Hz : Driving) | 20 to 30rad/s | General-purpose motor (without encoder) |
| **Real sensorless vector** | ○ | ○ | × | 1:200 (0.3~60Hz : Driving) | 120rad/s | General-purpose motor (without encoder) |
| **Vector (FR-A7AP is necessary)** | ○ (zero speed control, servo lock) | ○ | ○ *5 | 1:1500 (1~1500r/min: Both driving/regeneration)*6 | 300rad/s | General-purpose motor (with encoder) Dedicated motor |

*5 Only a pulse train+code method is employed for pulse command method when performing position control with an inverter and the FR-A7AP. The maximum pulse input is 100kpps.
*6 Regeneration unit (option) is necessary for regeneration

## 2 Long Life Components and Life Check Function

Design life 10years

### (1) Further extended components life

- The life of a newly developed cooling fan has been extended to 10 years of design life*1. The life of the cooling fan is further extended with ON/OFF control of the cooling fan.
- Longevity of capacitor was achieved with the adoption of a design life of 10 years*1*2.
  (A capacitor with specification of 5000 hours at 105 °C ambient temperature is adapted.)

*1 Ambient temperature : annual 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: equivalent to rating current of the Mitsubishi standard motor (4 poles).

- Life indication of life components

| Components | Life Guideline of the FR-A700 | Guideline of JEMA*3 |
|---|---|---|
| Cooling fan | 10 years | 2 to 3 years |
| Main circuit smoothing capacitor | 10 years | 5 years |
| Printed board smoothing capacitor | 10 years | 5 years |

*3 Excerpts from "Periodic check of the transistorized inverter" of JEMA (Japan Electrical Manufacturer's Association).

### (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 monitored.
- Since a parts life alarm can be output*4 by self-diagnosis, troubles can be avoided.

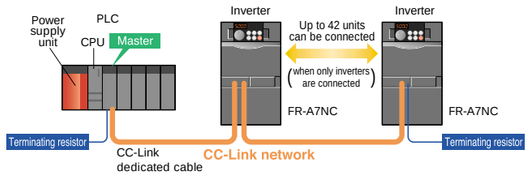
*4 Any one of main circuit capacitor, control circuit capacitor, inrush current limit circuit and cooling fan reaches the output level, an alarm is output.
For the main circuit capacitor, the capacitor capacity needs to be measured during a stop by setting parameter.

## 3 Network Connection as You Desired

FA network

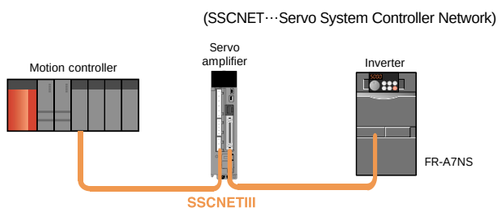
### (1) Compatible with the CC-Link communication (option)

The inverter can be connected to the Mitsubishi PLC (Q, QnA, A series, etc.) through the CC-Link. It is compatible with the CC-Link Ver.1.1 and Ver.2.0. The inverter operation, monitoring and parameter setting change can be done from the PLC.



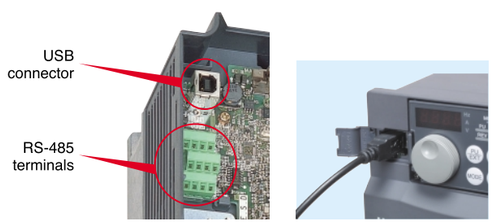

### (2) Compatible with SSCNETIII (option, available soon)

The inverter can be connected to Mitsubishi motion controller through the SSCNETIII. The SSCNETIII employs a high-speed synchronous serial communication system and is appropriate for the synchronous operation.




### (3) RS-485 and USB connection

- The RS-485 terminals are equipped as standard in addition to the PU connector.
  You can make RS-485 communication with the operation panel or parameter unit connected to the PU connector.
- Since the inverter can be connected to the network with terminals, multi-drop connection is also easily done.
- Modbus-RTU (Binary) protocol has been added for communications in addition to the conventional Mitsubishi inverter protocol (computer link).
- As a USB connector (USB1.1B connector) is standard equipped, communication with a personnel computer can be made with a USB cable only.
- Using the RS-485 terminal or USB connector, you can make communication by the FR-Configurator (setup S/W).




### (4) Corresponds to major networks overseas

The inverter can be connected with networks such as DeviceNET™, PROFIBUS-DP, LONWORKS, EtherNet (available soon) and CANopen (available soon) when communication options are used.



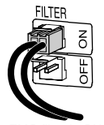


## 4 Free of Environmental Worries

Enhanced noise measures

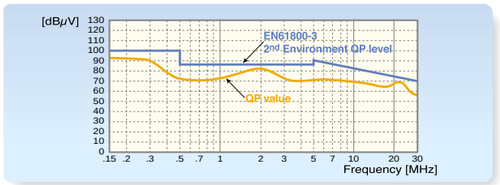
### (1) Reduction of electromagnetic noise (built-in EMC filter)

- Reduction of noise generated from the inverter was achieved with adoption of a new technology (low-noise of switching power, low noise of inverter element).
- Because of the newly developed built-in noise filter (EMC filter), the inverter itself can comply with the EMC Directive (2nd Environment*3).
  (To make the EMC filter of the inverter valid*1, set ON/OFF connector*2 to ON.)



EMC filter is ON

*1 Leakage current will increase when the EMC filter is selected.
*2 Since the leakage current when using the EMC filter for the 200V class 0.4K and 0.75K is small, the filter is always valid (setting connector is not provided).
*3 Refer to the EMC installation manual for compliance conditions.




| | Capacitive Filter (Radio noise filter) | Zero-phase Reactor (Line noise filter) | DC Reactor |
|---|---|---|---|
| 55K or less | Standard (built-in) | Standard (built-in) | Option (sell separately) |
| 75K or more | Standard (built-in) | Option (sell separately) | Standard (provided) |

### (2) Measures against harmonic leakage current

- A compact AC reactor (FR-HAL) and a DC reactor (FR-HEL), which limit harmonics current flowing into the power supply and improve the power factor, are available as options. (For the 75K or more, a DC reactor is supplied as standard.)


AC reactor (FR-HAL)


DC reactor (FR-HEL)

- A high power factor converter (FR-HC, MT-HC) for effective suppressions of power-supply harmonics (conversion coefficient: K5=0) can be connected.

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

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

## 5 Simple Operation and Easy Maintenance

Easy

### (1) Easy maintenance with FR-Configurator (Option)

- Parameter management (parameter setting, file storage, printing) is easy.
- Maintenance and setup of the inverter can be done from a personal computer connected with USB.
- Mechanical resonance is easily avoided with machine analyzer function.
- Parameter setting after replacement of the FR-A500 series can be made with a parameter automatic conversion function.

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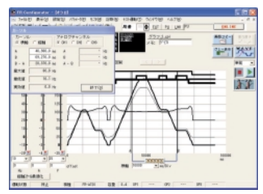
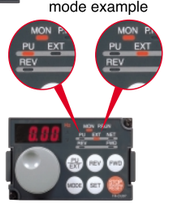


### (2) Operation panel with the popular setting dial

- Possible to copy parameters with operation panel.
  Parameter setting values are stored in the operation panel and optional parameter unit (FR-PU07).
- Operation is easy with the setting dial.


Example of parameter change

PU/EXT operation mode example



- Operation panel is detachable and can be installed on the enclosure surface. (cable connector option is required)
- PU/EXT (operation mode) can be switched with a single touch.
- A dial/key operation lock function prevents operational errors.

### (3) New type parameter unit FR-PU07 (option)

- An operation panel can be removed and a parameter unit can be connected.
- Setting such as direct input method with a numeric keypad, operation status indication, and help function are usable. Eight languages can be displayed.
- Parameter setting values of a maximum of three inverters can be stored.
- Since a battery pack type (available soon) is connectable, parameter setting and parameter copy can be performed without powering on the inverter.

### (4) Easy replacement with the cooling fan cassette

Cooling fans are provided on top of the inverter.
Cooling fans can be replaced without disconnecting main circuit wires.

### (5) Removable terminal block

A removable terminal block was adapted. (The terminal block of the FR-A700 series is compatible with that of the FR-A500 series. Note that some functions of the FR-A700 series are restricted when using the terminal block of the FR-A500 series. Note that the wiring cover is not compatible.)

### (6) Combed shaped wiring cover

Since a wiring cover can be mounted after wiring, wiring work is easily done.

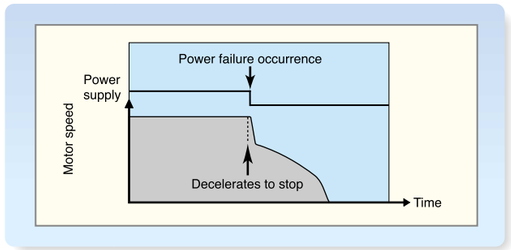
# 6 Improved Usability with Full of Useful Functions

## (1) More advanced auto tuning

Tuning accuracy equivalent to that of the conventional tuning of “with rotation mode” is realized with the auto tuning without motor running. Even for the machine which disallows a motor to run during tuning, the motor performance can be maximized. The sophisticated auto tuning function which measures circuit constants of the motor allows sensorless vector control with any kind of motor.

## (2) Power-failure deceleration stop function/original operation continuation at instantaneous power-failure

- The motor can be decelerated to a stop when a power failure or undervoltage occurred to prevent the motor from coasting. For fail-safe of machine tool, etc., it is effective to stop the motor when a power failure has occurred.




- Since the original operation continuation at instantaneous power failure function has been newly adopted, the motor continues running without coasting even if an instantaneous power failure occurs during operation.

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

## (3) Regeneration avoidance function

For operations of such as a pressing machine, in which an instantaneous regeneration occurs, overvoltage trip can be made less likely to occur by increasing frequency during regeneration.

## (4) Built-in brake transistor (22K or less) (0.4K to 7.5K built-in brake resistor)

In addition to the 0.4K to 7.5K, a brake transistor is built-in to the 11K, 15K, 18.5K and 22K. A brake resistor (option) can be also connected to the 11K to 22K.

## (5) Pulse train I/O function

Speed command by pulse train signal (single pulse) from the controller etc. can be directly input to the inverter.
Since pulse can be output from the inverter at the same time, synchronous speed operation of inverters can be performed.
(maximum pulse input 100kpps, output 50kpps)

## (6) Enhanced I/O function

- For the analog input terminal (two points), you can switch between voltage (0 to 5V, 0 to 10V) and current (0 to 20mA).
- You can display the ON/OFF status of the I/O terminals on the operation panel.
- Two points relay output is available.

# 7 Global Compliance

## (1) Complies with UL, cUL, EN (Low Voltage Directive) as standard

## (2) Sink/source logic can be switched with a single touch

## (3) Wide voltage range

Compliance with both 240V power supply (55K or less) and 480V power supply as standard.

## Wide range of lineup

FR-A7 2 0-0.4K

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

| Symbol | Inverter Capacity |
|---|---|
| 0.4K~500K | Indicate capacity (kW) |


FR-A720-0.4K


FR-A720-3.7K


FR-A720-7.5K


FR-A720-22K


FR-A720-55K

| Applied Motor (kW) | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 250 | 280 | 315 | 355 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Three-phase 200V class FR-A720-□□ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | — | — | — | — | — | — | — | — | — | — | — | — |
| Three-phase 400V class FR-A740-□□ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

●: Available models —: Not available



# Connection with Peripheral Devices

**Three-phase AC power supply**
Use within the permissible power supply specifications of the inverter.

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

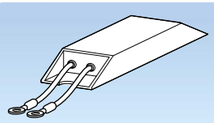
**Magnetic contactor (MC)**
Install the magnetic contactor to ensure safety. Do not use this magnetic contactor to start and stop the inverter. Doing so will cause the inverter life to be shorten.

**Reactor (FR-HAL, FR-HEL option)**
Reactors (option) must 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. Remove the jumpers across terminals P-P1 to connect the DC reactor to the 55K or less.

**USB connector**
A personal computer and an inverter can be connected with a USB (Ver1. 1) cable.

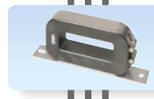

**High-duty brake resistor (FR-ABR*3)**
Braking capability of the inverter built-in brake can be improved. Remove the jumper across terminal PR-PX when connecting the high-duty brake resistor. (7.5K or less)

*3 Compatible with the 22K or less.



**AC reactor (FR-HAL)**

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

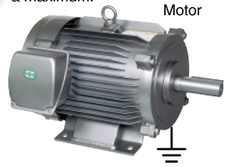


**Noise filter (FR-BLF)**
The 55K or less has a built-in zero-phase reactor.

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

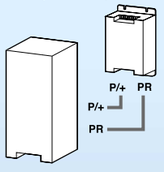
Earth (Ground)

**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. A wire should be wound four turns at a maximum.

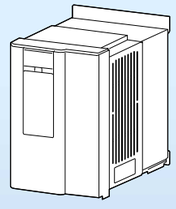

Motor

Earth (Ground)

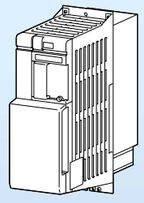
**Brake unit (FR-BU*1, MT-BU5*2)**


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.



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



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

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

**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. For reduction of induction noise from the power line of the inverter, it is recommended to wire the earth (ground) cable by returning it to the earth (ground) terminal of the inverter.

# Standard Specifications

## Rating

### ●200V class

| Type FR-A720-□□K | | | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable motor capacity (kW) *1 | | | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 |
| Output | Rated capacity (kVA) *2 | | 1.1 | 1.9 | 3.1 | 4.2 | 6.7 | 9.2 | 12.6 | 17.6 | 23.3 | 29 | 34 | 44 | 55 | 67 | 82 | 110 | 132 |
| | Rated current (A) *3 | | 3 | 5 | 8 | 11 | 17.5 | 24 | 33 | 46 | 61 | 76 | 90 | 115 | 145 | 175 | 215 | 288 (245) | 346 (294) |
| | Overload current rating *4 | | 150% 60s, 200% 3s (inverse time characteristics) ambient temperature 50°C | | | | | | | | | | | | | | | | |
| | Voltage *5 | | Three-phase 200 to 240V | | | | | | | | | | | | | | | | |
| | Regenerative braking torque | Maximum value/ permissible duty | 150% torque/ 3%ED | | | 100% torque/ 3%ED | | 100% torque/ 2%ED | | 20% torque/ continuous *6 | | | | 20% torque/ continuous | | | | 10% torque/ continuous | |
| 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 capacity (kVA) *7 | | 1.5 | 2.5 | 4.5 | 5.5 | 9 | 12 | 17 | 20 | 28 | 34 | 41 | 52 | 66 | 80 | 100 | 110 | 132 |
| Protective structure (JEM 1030) *9 | | | Enclosed type (IP20) *8 | | | | | | | | | | | Open type (IP00) | | | | | |
| Cooling system | | | Self-cooling | | Forced air cooling | | | | | | | | | | | | | | |
| Approx. mass (kg) | | | 1.9 | 2.3 | 3.8 | 3.8 | 3.8 | 7.1 | 7.1 | 7.5 | 13 | 13 | 14 | 23 | 35 | 35 | 58 | 70 | 70 |

### ●400V class

| Type FR-A740-□□K | | | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable motor capacity (kW) *1 | | | 0.4 | 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 | | 1.1 | 1.9 | 3 | 4.6 | 6.9 | 9.1 | 13 | 17.5 | 23.6 | 29 | 32.8 | 43.4 | 54 | 65 | 84 |
| | Rated current (A) | | 1.5 | 2.5 | 4 | 6 | 9 | 12 | 17 | 23 | 31 | 38 | 44 | 57 | 71 | 86 | 110 |
| | Overload current rating *4 | | 150% 60s, 200% 3s (inverse time characteristics) ambient temperature 50°C | | | | | | | | | | | | | | |
| | Voltage *5 | | Three-phase 380 to 480V | | | | | | | | | | | | | | |
| | Regenerative braking torque | Maximum value/ permissible duty | 100% torque/2%ED | | | | | | | 20% torque/continuous *6 | | | | 20% torque/continuous | | | |
| 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 capacity (kVA) *7 | | 1.5 | 2.5 | 4.5 | 5.5 | 9 | 12 | 17 | 20 | 28 | 34 | 41 | 52 | 66 | 80 | 100 |
| Protective structure (JEM 1030) *9 | | | Enclosed type (IP20) *8 | | | | | | | | | | | 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 | 37 |

| Type FR-A740-□□K | | | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 250 | 280 | 315 | 355 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable motor capacity (kW) *1 | | | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 250 | 280 | 315 | 355 | 400 | 450 | 500 |
| Output | Rated capacity (kVA) *2 | | 110 | 137 | 165 | 198 | 248 | 275 | 329 | 367 | 417 | 465 | 521 | 587 | 660 | 733 |
| | Rated current (A)*3 | | 144 (122) | 180 (153) | 216 (184) | 260 (221) | 325 (276) | 361 (307) | 432 (367) | 481 (409) | 547 (465) | 610 (519) | 683 (581) | 770 (655) | 866 (736) | 962 (818) |
| | Overload current rating *4 | | 150% 60s, 200% 3s (inverse time characteristics) ambient temperature 50°C | | | | | | | | | | | | | |
| | Voltage*5 | | Three-phase 380 to 480V | | | | | | | | | | | | | |
| | Regenerative braking torque | Maximum value/ permissible duty | 10% torque/continuous | | | | | | | | | | | | | |
| Power supply | Rated input AC voltage/frequency | | Three-phase 380 to 480V 50Hz/60Hz | | | | | | | | | | | | | |
| | Permissible AC voltage fluctuation | | 323 to 528V 50Hz/60H | | | | | | | | | | | | | |
| | Permissible frequency fluctuation | | ±5% | | | | | | | | | | | | | |
| | Power supply capacity (kVA) *7 | | 110 | 137 | 165 | 198 | 248 | 275 | 329 | 367 | 417 | 465 | 521 | 587 | 660 | 733 |
| Protective structure (JEM 1030) *9 | | | Open type (IP00) | | | | | | | | | | | | | |
| Cooling system | | | Forced air cooling | | | | | | | | | | | | | |
| Approx. mass (kg) | | | 50 | 57 | 72 | 72 | 110 | 110 | 175 | 175 | 175 | 260 | 260 | 370 | 370 | 370 |

*1. The applicable 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 of 75K or more with a value larger than 2kHz set in *Pr. 72 PWM frequency selection*, the rated output current is the value in parenthesis.
*4. The % value of the overload current rating indicates 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. For the 11K to 22K capacities, using the dedicated external brake resistor (FR-ABR) will achieve the performance of 100% torque/6%ED.
*7. The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
*8. 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).
*9. FR-DU07:IP40 (except for the PU connector)

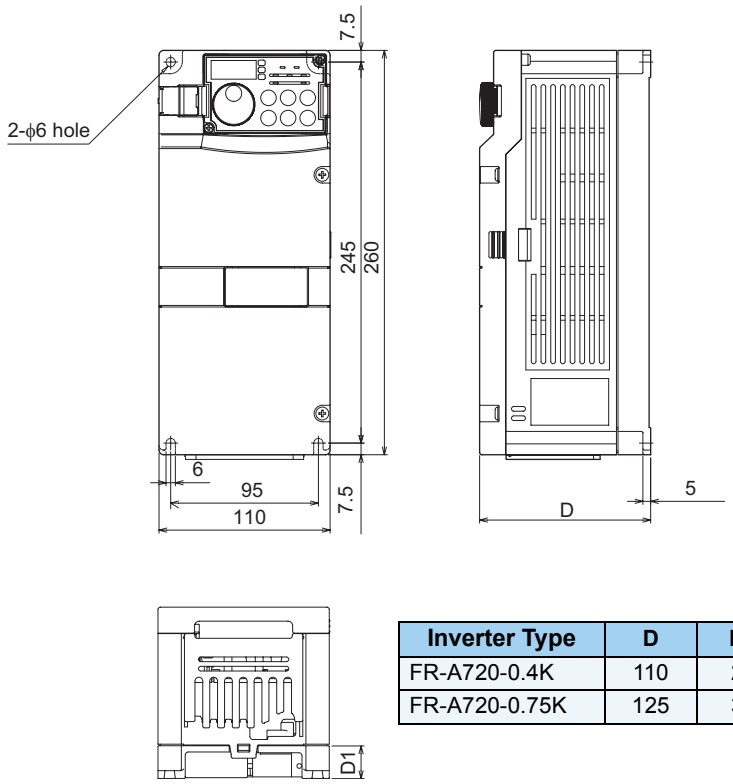
## Common specifications

| | | | |
|---|---|---|---|
| Control specifications | Control method | | Soft-PWM control/high carrier frequency PWM control (selectable from among V/F control, advanced magnetic flux vector control and real sensorless vector control) / vector control (when used with option FR-A7AP)*1 |
| | Output frequency range | | 0.2 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/about 11bit, terminal 1: 0 to ±10V/12bit)<br>0.06Hz/0 to 60Hz (terminal 1: 0 to ±5V/11bit) |
| | | 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 | | 200% 0.3Hz (0.4K to 3.7K), 150% 0.3Hz (5.5K or more) (under real sensorless vector control or vector control) |
| | Torque boost | | Manual torque boost |
| | Acceleration/deceleration time setting | | 0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration 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 220% adjustable), whether to use the function or not can be selected |
| | Torque limit level | | Torque limit value can be set (0 to 400% variable) |
| Operation specifications | Frequency setting signal | Analog input | • Terminal 2, 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected • Terminal 1: -10 to +10V, -5 to +5V can be selected |
| | | Digital input | Input using the setting dial of the operation panel or parameter unit<br>Four-digit BCD or 16 bit binary (when used with option FR-A7AX) |
| | Start signal | | Forward and reverse rotation or 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, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (FR-HC/FR-CV connection), FR-HC connection (instantaneous power failure detection), PU operation/external inter lock signal , external DC injection brake operation start, PID control enable terminal, brake opening completion signal, PU operation/external operation switchover, load pattern selection forward rotation reverse rotation boost, V/F switching, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, pre-excitation, output stop, start self-holding selection, control mode changing, torque limit selection, start-time tuning start external input, torque bias selection 1, 2 *1, P/PI control switchover, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover, and command source switchover. |
| | | Pulse train input | 100kpps |
| | Operational functions | | Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, commercial power supply-inverter switchover operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, third function, multi-speed operation, original operation continuation at instantaneous power failure, stop-on-contact control, load torque high speed frequency control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, online auto tuning function, PID control, computer link operation (RS-485), motor end orientation*1, machine end orientation*1, pre-excitation, notch filter, machine analyzer*1, easy gain tuning, speed feed forward, and torque bias*1 |
| | Output signals | Operating status | You can select any signals using *Pr. 190 to Pr. 196 (output terminal function selection)* from among inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake prealarm, 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, orientation completion*1, brake opening request, fan fault output, heatsink overheat pre-alarm , inverter running/start command on, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, life alarm, alarm output 1, 2, 3 (power-off signal), power savings average value update timing, current average monitor, maintenance timer alarm, remote output, forward rotation output*1, reverse rotation output*1, low speed output, torque detection, regenerative status output *1, start-time tuning completion, in-position completion*1, minor failure output and 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) | In addition to the above, you can select any 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. (only positive logic can be set for extension terminals of the FR-A7AR) |
| | | Pulse train output | 50kpps |
| | | Pulse/analog output | You can select any signals using *Pr. 54 FM terminal function selection (pulse train output)* and *Pr. 158 AM terminal function selection (analog output)* from among output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, power saving effect, regenerative brake duty ,PID set point, PID measured value, motor output, torque command, torque current command, and torque monitor. |
| Indication | PU (FR-DU07/ FR-PU07/ FR-PU04) | Operating status | Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed,motor torque, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, cumlative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*2, output terminal option monitor*2, option fitting status*3, terminal assignment status*3, torque command, torque current command, feed back pulse*1,motor output |
| | | Alarm definition | Alarm definition is displayed during the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and past 8 alarm definitions are stored. |
| | | Interactive guidance | Operation guide/trouble shooting with a help function*3 |
| 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 short circuit, main circuit element overheat, 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 current limit circuit alarm, communication alarm (inverter), USB error, opposite rotation deceleration error, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm, electronic thermal relay function prealarm, PU stop, maintenance timer alarm*2, brake transistor alarm, parameter write error, copy operation error, operation panel lock, parameter copy alarm, speed limit indication, encoder no-signal*1, speed deviation large*1, overspeed*1, position error large*1, encoder phase error*1 |
| Environment | Ambient Temperature | | -10°C to +50°C (non-freezing) |
| | Ambient humidity | | 90%RH maximum (non-condensing) |
| | Storage temperature*4 | | -20°C to +65°C |
| | Atmosphere | | Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.) |
| | Altitude/vibration | | Maximum 1000m above sea level, 5.9m/s$^2$ or less *5 (conforms to JIS C 60068-2-6) |

*1. Only when the option (FR-A7AP) is mounted
*2. Can be displayed only on the operation panel (FR-DU07).
*3. Can be displayed only on the parameter unit (FR-PU07/FR-PU04).
*4. Temperature applicable for a short period in transit, etc.
*5. 2.9m/s$^2$ or less for the 160K or more.

# Outline Dimension Drawings

● FR-A720-0.4K, 0.75K

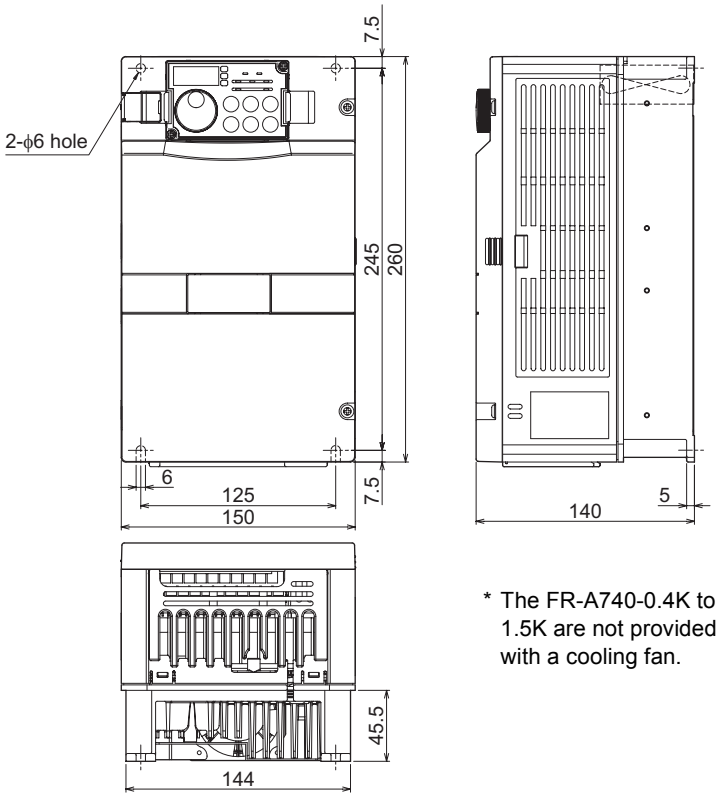



| Inverter Type | D | D1 |
|---|---|---|
| FR-A720-0.4K | 110 | 21 |
| FR-A720-0.75K | 125 | 36 |

(Unit: mm)

●FR-A720-1.5K, 2.2K, 3.7K

●FR-A740-0.4K, 0.75K, 1.5K, 2.2K, 3.7K

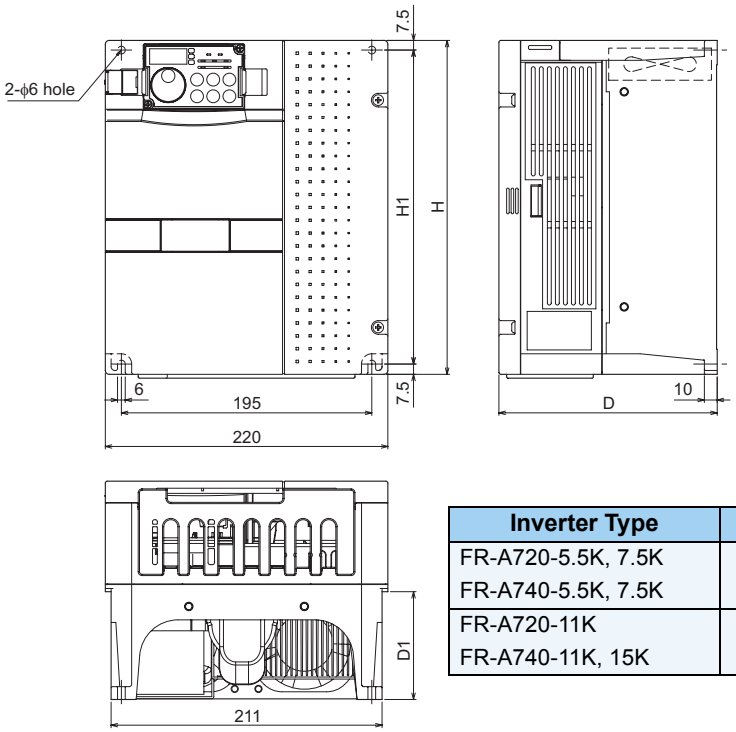



* The FR-A740-0.4K to 1.5K are not provided with a cooling fan.

(Unit: mm)

●FR-A720-5.5K, 7.5K, 11K

●FR-A740-5.5K, 7.5K, 11K, 15K

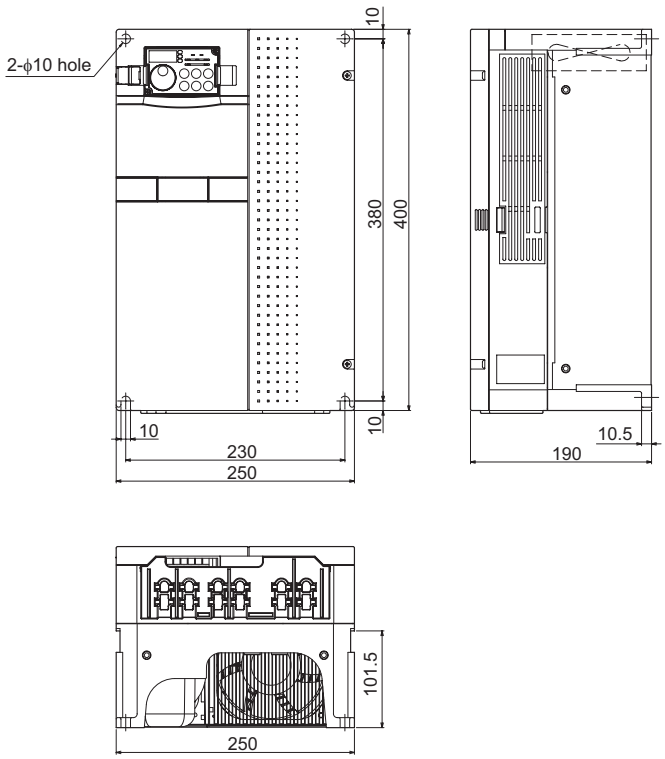



| Inverter Type | H | H1 | D | D1 |
|---|---|---|---|---|
| FR-A720-5.5K, 7.5K<br>FR-A740-5.5K, 7.5K | 260 | 245 | 170 | 84 |
| FR-A720-11K<br>FR-A740-11K, 15K | 300 | 285 | 190 | 101.5 |

(Unit: mm)

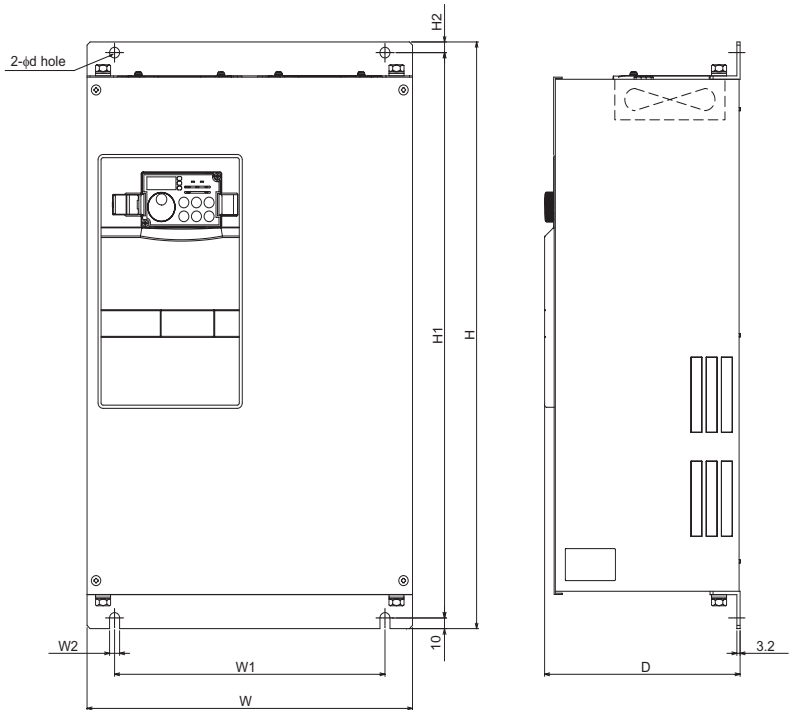
●FR-A720-15K, 18.5K, 22K

●FR-A740-18.5K, 22K




(Unit: mm)

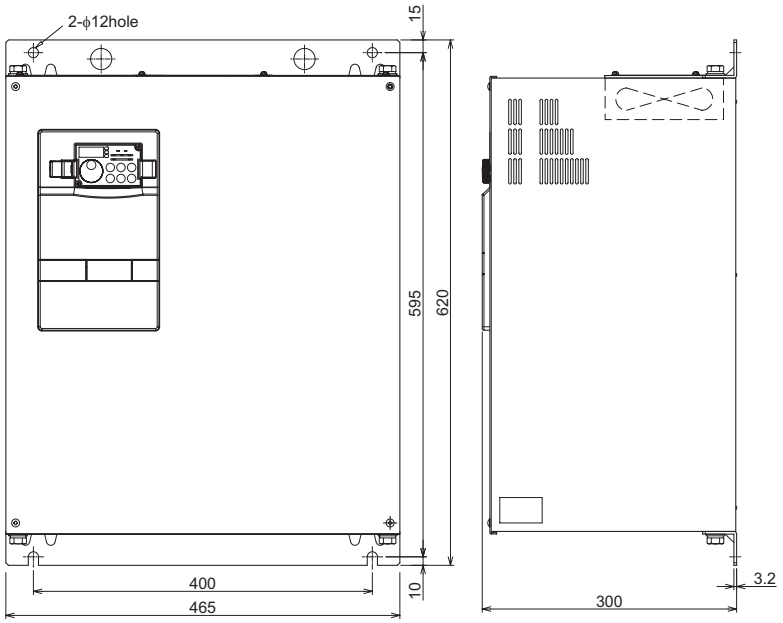
●FR-A720-30K, 37K, 45K, 55K
●FR-A740-30K, 37K, 45K, 55K



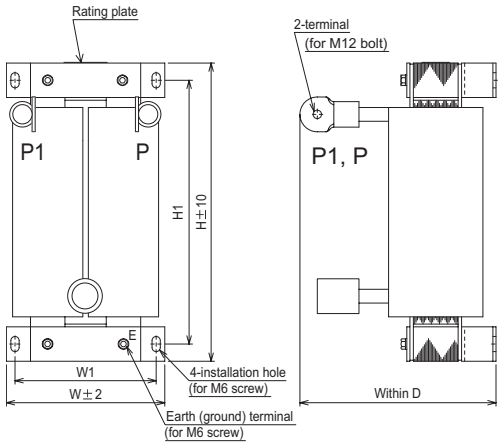

| Inverter Type | W | W1 | W2 | H | H1 | H2 | d | D |
|---|---|---|---|---|---|---|---|---|
| FR-A720-30K<br>FR-A740-30K | 325 | 270 | 10 | 550 | 530 | 10 | 10 | 195 |
| FR-A720-37K, 45K<br>FR-A740-37K, 45K, 55K | 435 | 380 | 12 | 550 | 525 | 15 | 12 | 250 |
| FR-A720-55K | 465 | 410 | 12 | 700 | 675 | 15 | 12 | 250 |

(Unit: mm)

●FR-A740-75K, 90K



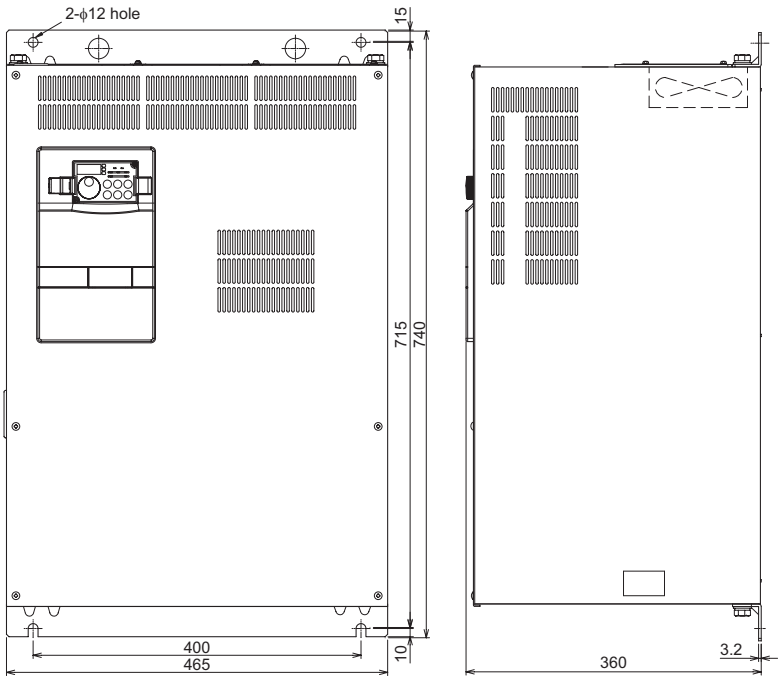

●DC reactor supplied



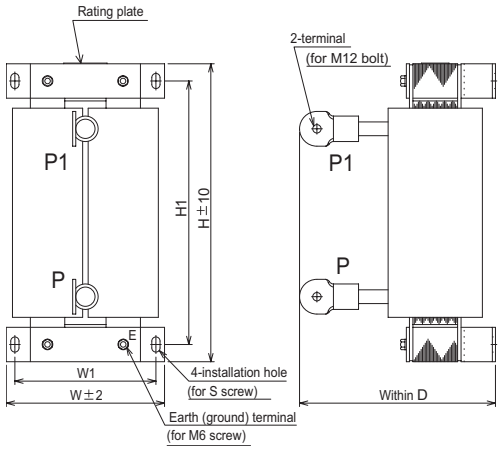

| DC Reactor Type | W | W1 | H | H1 | D | Mass (Kg) |
|---|---|---|---|---|---|---|
| FR-HEL-H75K (FR-A740-75K) | 140 | 120 | 320 | 295 | 185 | 16 |
| FR-HEL-H90K (FR-A740-90K) | 150 | 130 | 340 | 310 | 190 | 20 |

(Unit: mm)

●FR-A720-75K, 90K
●FR-A740-110K, 132K



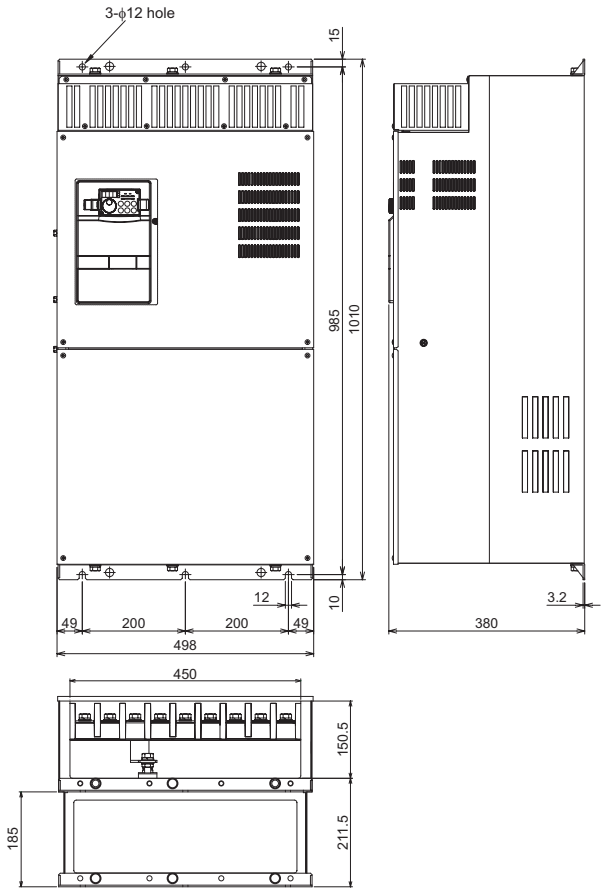

●DC reactor supplied



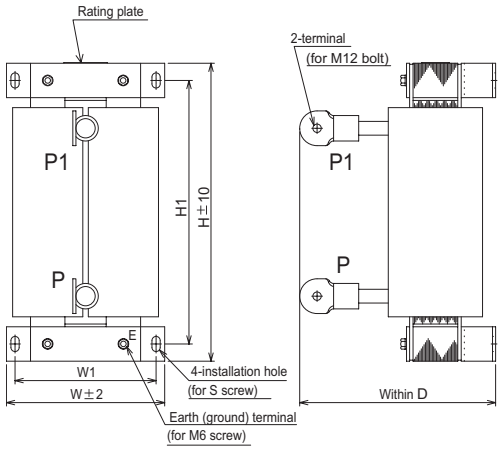

| DC Reactor Type | W | W1 | H | H1 | D | S | Mass (kg) |
|---|---|---|---|---|---|---|---|
| FR-HEL-75K (FR-A720-75K) | 150 | 130 | 340 | 310 | 190 | M6 | 17 |
| FR-HEL-90K (FR-A720-90K) | 150 | 130 | 340 | 310 | 200 | M6 | 19 |
| FR-HEL-H110K (FR-A740-110K) | 150 | 130 | 340 | 310 | 195 | M6 | 22 |
| FR-HEL-H132K (FR-A740-132K) | 175 | 150 | 405 | 370 | 200 | M8 | 26 |

(Unit: mm)

●FR-A740-160K, 185K



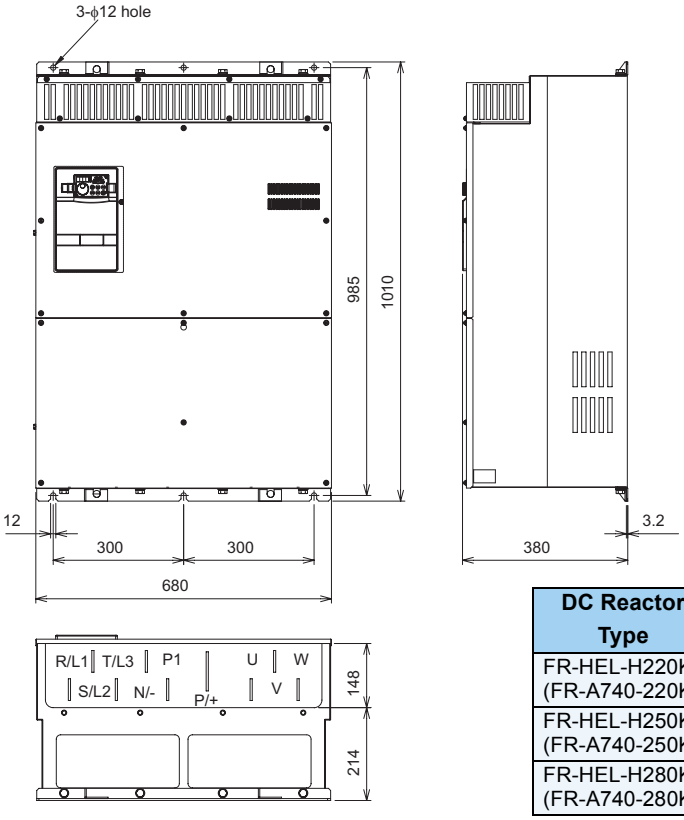

●DC reactor supplied



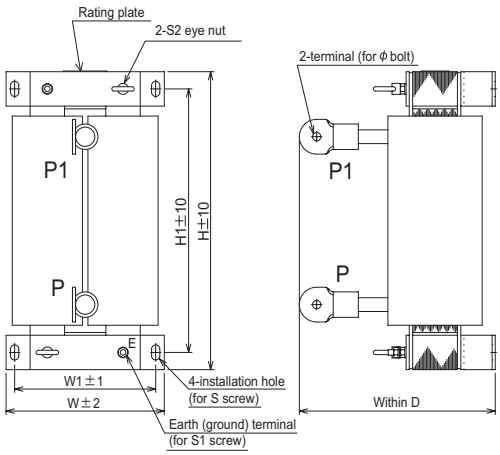

| DC Reactor Type | W | W1 | H | H1 | D | S | Mass (kg) |
|---|---|---|---|---|---|---|---|
| FR-HEL-H160K (FR-A740-160K) | 175 | 150 | 405 | 370 | 205 | M8 | 28 |
| FR-HEL-H185K (FR-A740-185K) | 175 | 150 | 405 | 370 | 240 | M8 | 29 |

(Unit: mm)

●FR-A740-220K, 250K, 280K




●DC reactor supplied

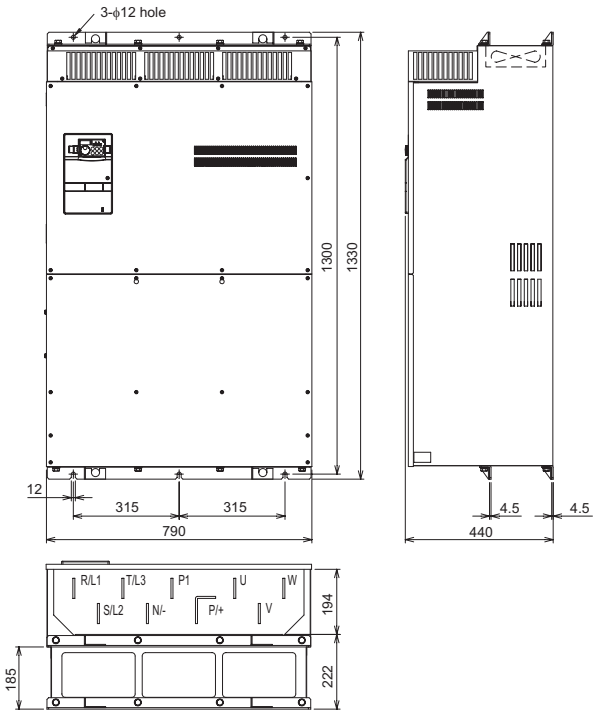



* Remove the eye nut after installation of the product.

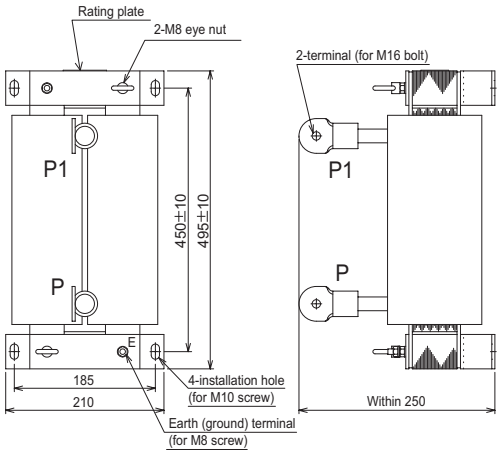
| DC Reactor Type | W | W1 | H | H1 | D | S | S1 | S2 | φ | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| FR-HEL-H220K (FR-A740-220K) | 175 | 150 | 405 | 370 | 240 | M8 | M6 | M6 | M12 | 30 |
| FR-HEL-H250K (FR-A740-250K) | 190 | 165 | 440 | 400 | 250 | M8 | M8 | M8 | M12 | 35 |
| FR-HEL-H280K (FR-A740-280K) | 190 | 165 | 440 | 400 | 255 | M8 | M8 | M8 | M16 | 38 |

(Unit: mm)

●FR-A740-315K, 355K




●DC reactor supplied

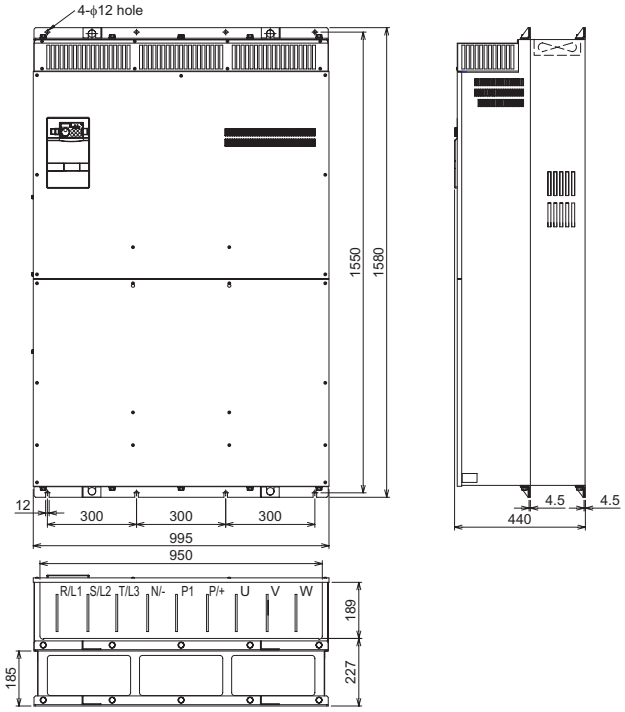



* Remove the eye nut after installation of the product.

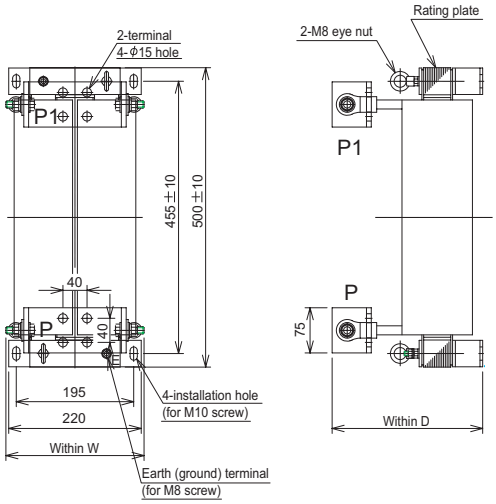
| DC Reactor Type | Mass (kg) |
|---|---|
| FR-HEL-H315K (FR-A740-315K) | 42 |
| FR-HEL-H355K (FR-A740-355K) | 46 |

(Unit: mm)

●FR-A740-400K, 450K, 500K



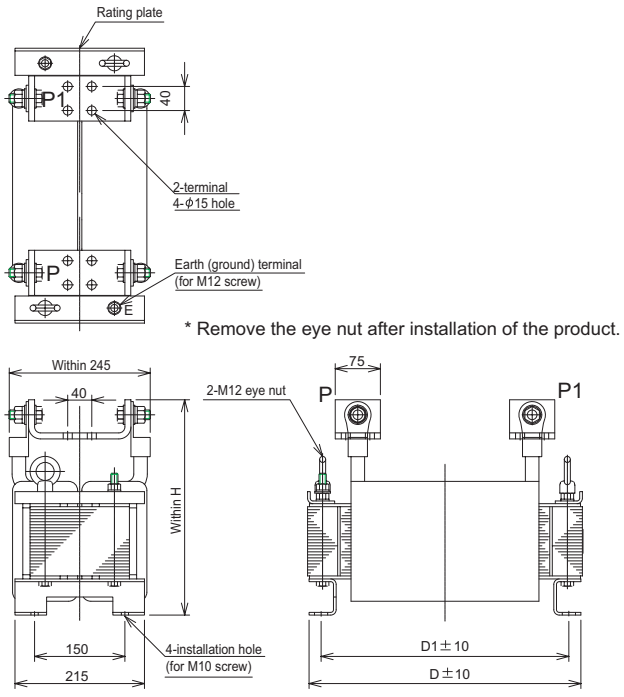

●DC reactor supplied




* Remove the eye nut after installation of the product.

| DC Reactor Type | W | D | Mass (kg) |
|---|---|---|---|
| FR-HEL-H400K (FR-A740-400K) | 235 | 250 | 50 |
| FR-HEL-H450K (FR-A740-450K) | 240 | 270 | 57 |

●DC reactor supplied



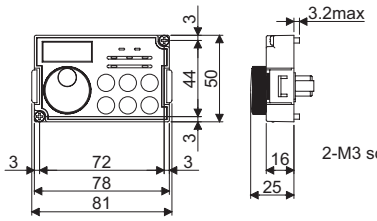

* Remove the eye nut after installation of the product.

| DC Reactor Type | H | D | D1 | Mass (kg) |
|---|---|---|---|---|
| FR-HEL-H500K (FR-A740-500K) | 345 | 455 | 405 | 67 |

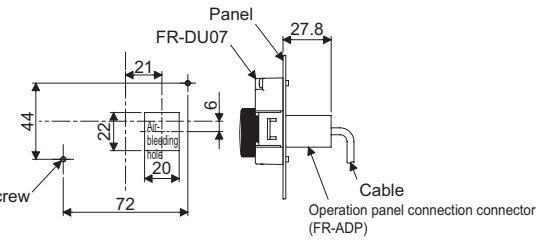
(Unit: mm)

● Operation panel (FR-DU07)

<Outline drawing>



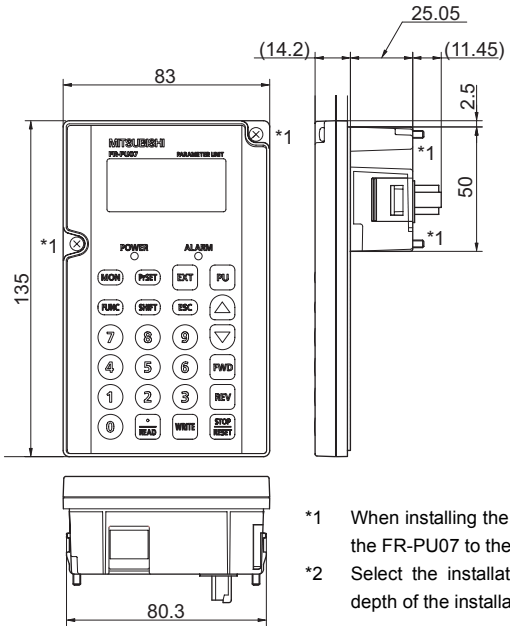

<Panel cutting dimension drawing>



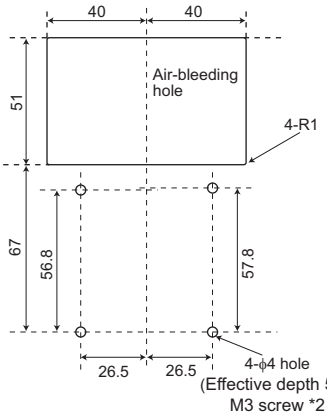

(Unit: mm)

● Parameter unit (option) (FR-PU07)

<Outline drawing>




<Panel cutting dimension drawing>



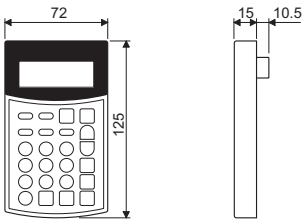

*1 When installing the FR-PU7 on the enclosure, etc., remove screws for fixing the FR-PU07 to the inverter or fix the screws to the FR-PU07 with M3 nuts.

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

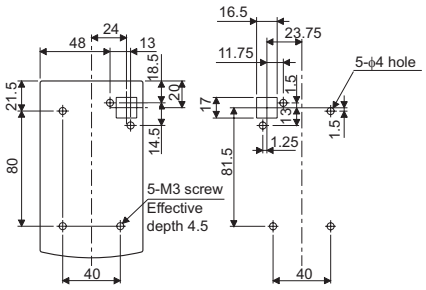
(Unit: mm)

● 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)

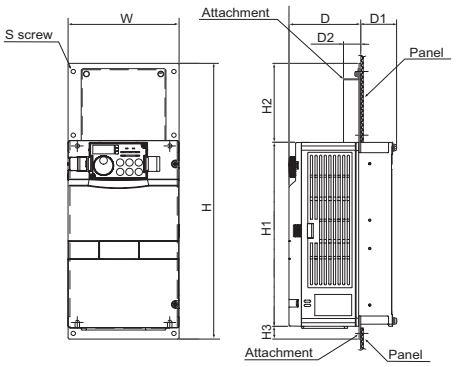
## Heatsink protrusion procedure

When encasing the inverter in an enclosure, the generated heat amount in an enclosure can be greatly reduced by installing the heatsink portion of the inverter outside the enclosure.
When installing the inverter in a compact enclosure, etc., this installation method is recommended. For the 160K or more, a heatsink can be protruded outside the enclosure without using an attachment.

### ●When using a heatsink protrusion attachment (FR-A7CN)

For the FR-A720-1.5K to 90K and FR-A740-0.4K to 132K, a heatsink can be protruded outside the enclosure using a heatsink protrusion attachment (FR-A7CN).
Refer to the instruction manual of the heatsink protrusion attachment (FR-A7CN) for details.

●Drawing after attachment installation (when used with the FR-A7CN)

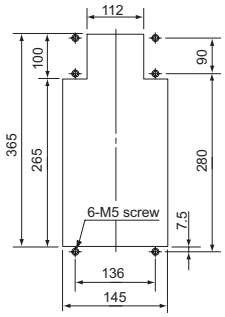



| Type | W | H | H1 | H2 | H3 | D | D1 | D2 | S |
|---|---|---|---|---|---|---|---|---|---|
| FR-A7CN01 | 150 | 389.5 | 260 | 111.5 | 18 | 97 | 48.4 | 23.3 | M5 |
| FR-A7CN02 | 245 | 408.5 | 260 | 116.5 | 32 | 86 | 89.4 | 12.3 | M5 |
| FR-A7CN03 | 245 | 448.5 | 300 | 116.5 | 32 | 89 | 106.4 | 20 | M5 |
| FR-A7CN04 | 280 | 554 | 400 | 122 | 32 | 88.5 | 110.6 | 45.3 | M8 |
| FR-A7CN05 | 338 | 645 | 480 | 130 | 35 | 123.5 | 71.5 | 105 | M8 |
| FR-A7CN06 | 338 | 645 | 480 | 130 | 35 | 123.5 | 71.5 | 83.5 | M8 |
| FR-A7CN07 | 451 | 650 | 465 | 145 | 40 | 96 | 154 | 55 | M10 |
| FR-A7CN08 | 510 | 725 | 535 | 150 | 40 | 116.5 | 183.5 | 45 | M10 |
| FR-A7CN09 | 510 | 725 | 535 | 150 | 40 | 116.5 | 183.5 | 45 | M10 |
| FR-A7CN10 | 510 | 845 | 655 | 150 | 40 | 176.5 | 183.5 | 45 | M10 |
| FR-A7CN11 | 510 | 805 | 615 | 150 | 40 | 97 | 153 | 45 | M10 |

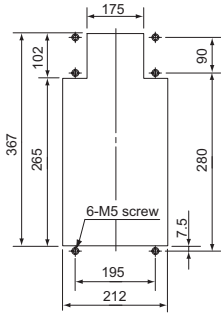
(Unit: mm)

●Panel cut dimension drawing (when used with the FR-A7CN)

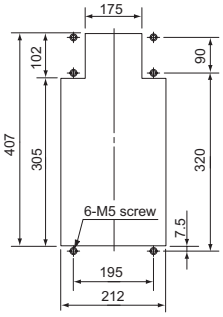
FR-A7CN01



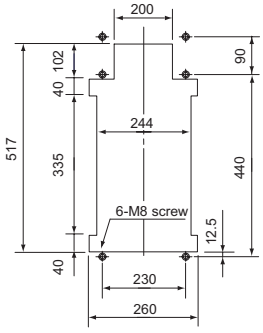

FR-A7CN02



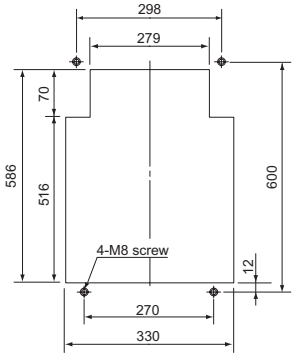

FR-A7CN03



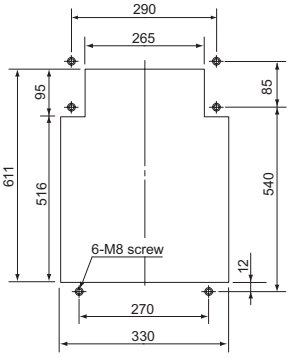

FR-A7CN04



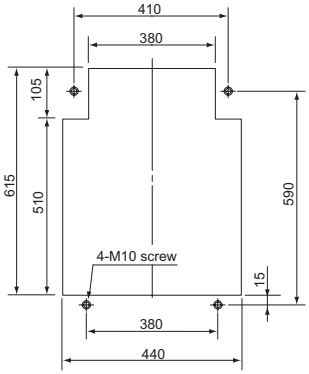

FR-A7CN05



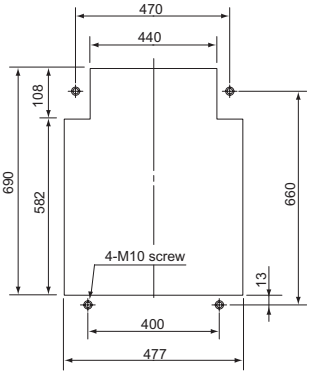

FR-A7CN06




FR-A7CN07



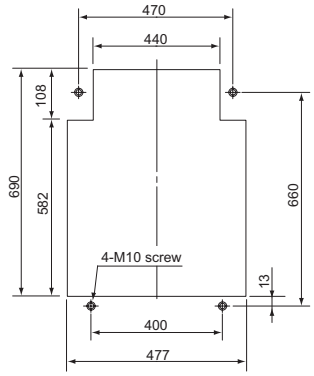

FR-A7CN08



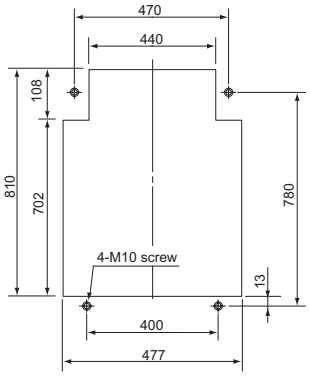

(Unit: mm)

### ●When using a heatsink protrusion attachment (FR-A7CN)

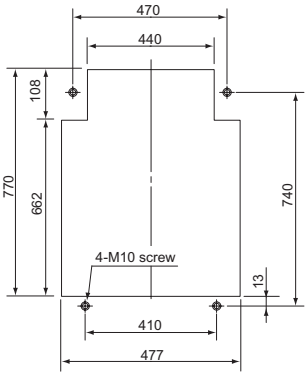
FR-A7CN09




FR-A7CN10




FR-A7CN11

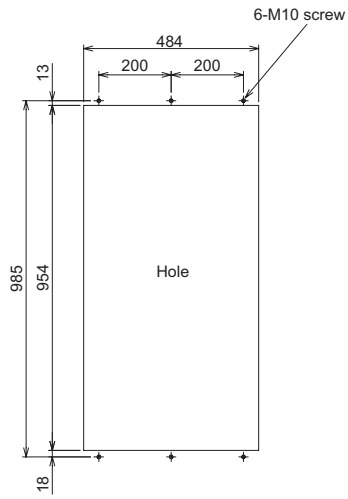



Refer to *page 79* for the correspondence table of the attachment and inverter. (Unit: mm)

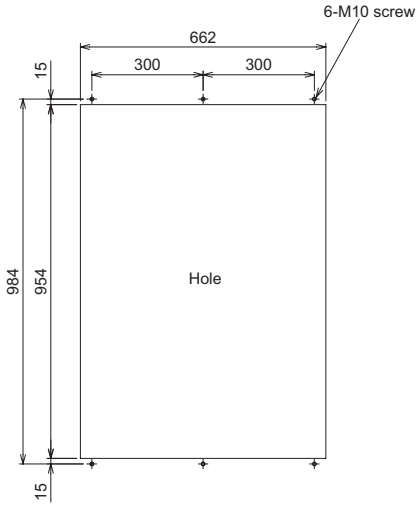
### ●Protrusion of heatsink of the FR-A740-160K or more

- Panel cutting
  Cut the panel of the enclosure according to the inverter capacity.

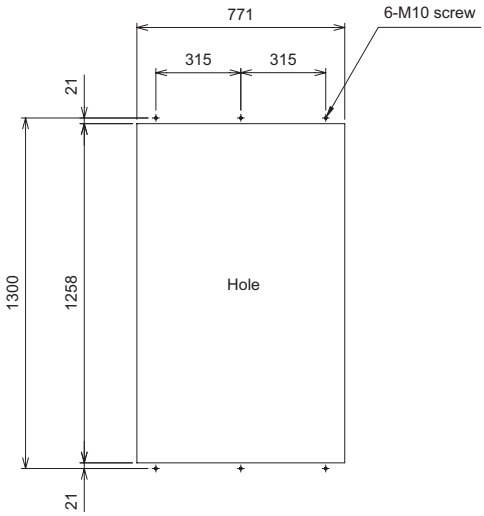
●FR-A740-160K, 185K



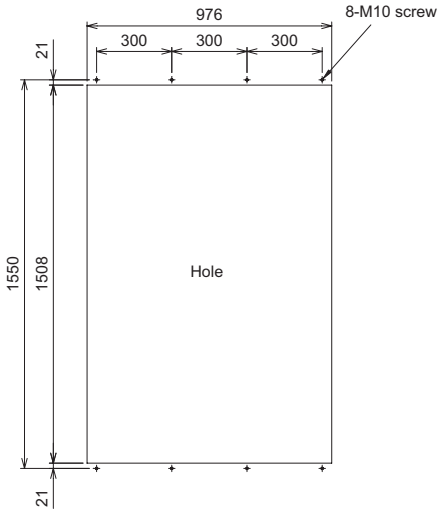

●FR-A740-220K, 250K, 280K




●FR-A740-315K, 355K



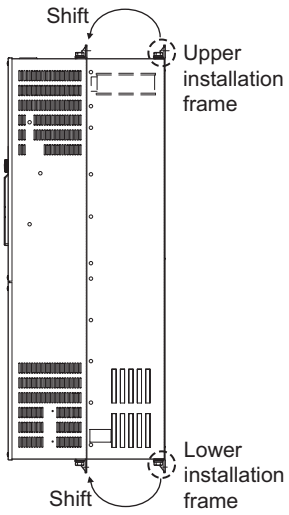

●FR-A740-400K, 450K, 500K



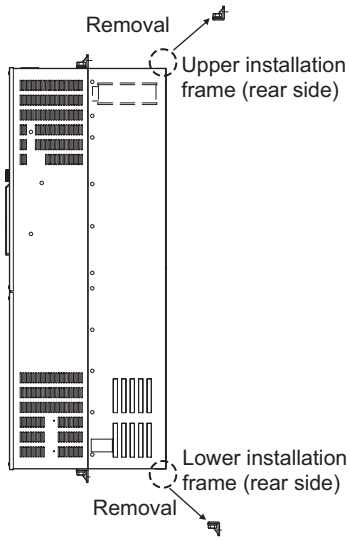

(Unit: mm)

●Shift and removal of a rear side installation frame

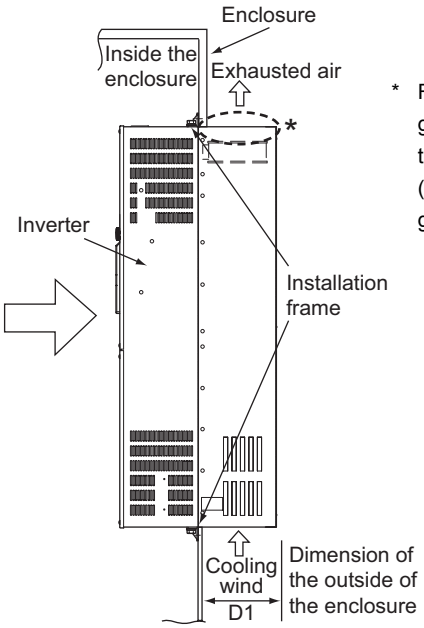
- FR-A740-160K to 280K
  One installation frame is attached to each of the upper and lower part of the inverter. Change the position of the rear side installation frame on the upper and lower side of the inverter to the front side as shown on the right. When changing the installation frames, make sure that the installation orientation is correct.



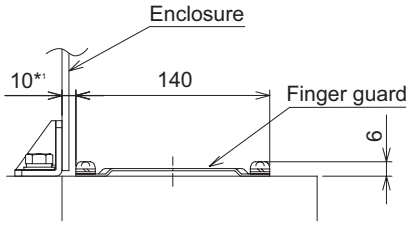

- FR-A740-315K or more
  Two installation frames each are attached to the upper and lower part of the inverter. Remove the rear side installation frame on the upper and lower side of the inverter as shown below.




- Installation of the inverter
  Push the inverter heatsink portion outside the enclosure and fix the enclosure and inverter with upper and lower installation frame.




* For the FR-F740-220K or more, there are finger guards behind the enclosure. Therefore, the thickness of the panel should be less than 10mm (*1) and also do not place anything around finger guards to avoid contact with the finger guards.



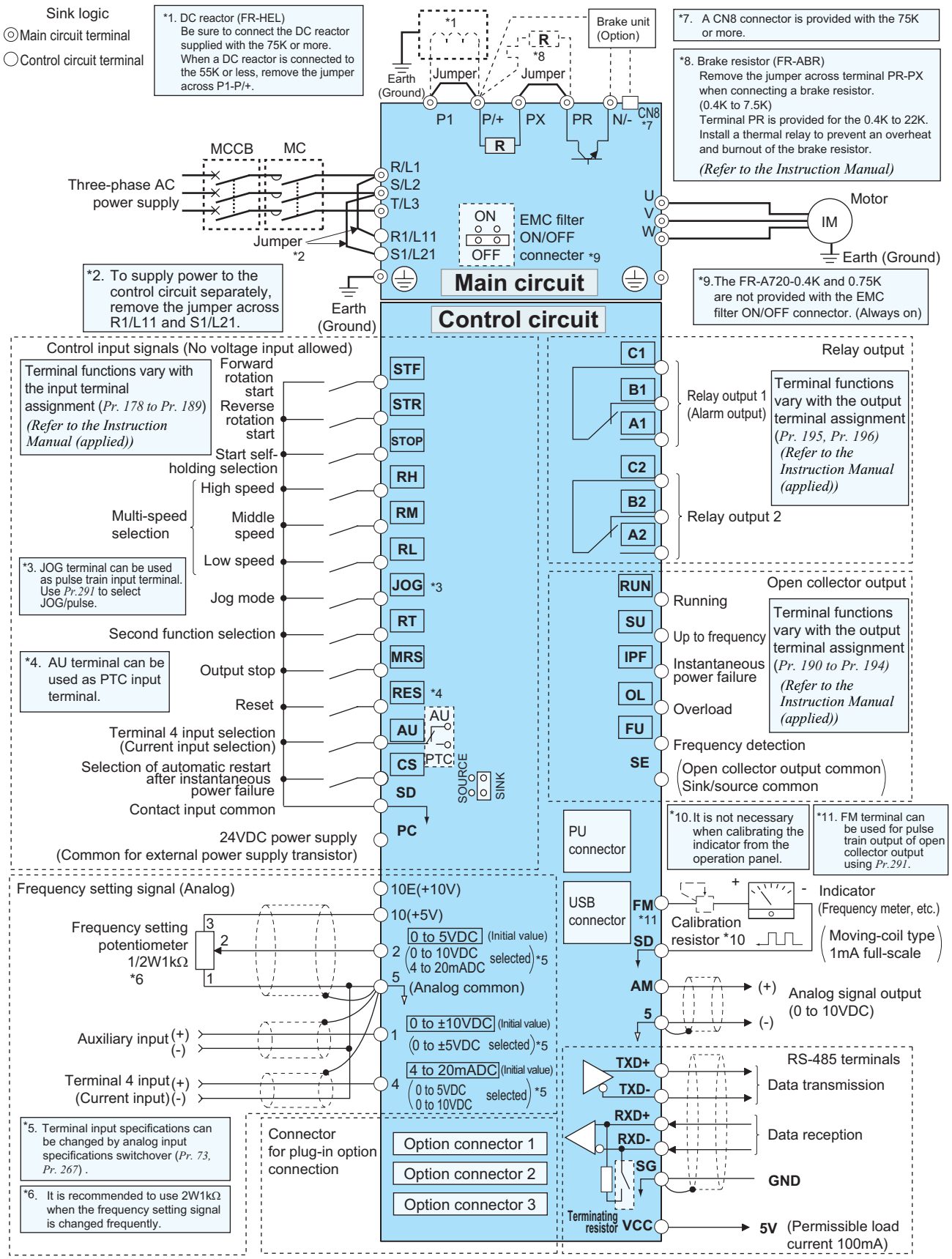

| Inverter Type | D1 |
|---|---|
| FR-A740-160K, 185K | 185 |
| FR-A740-220K to 500K | 184 |

(Unit: mm)

**CAUTION**

- Having a cooling fan, the cooling section which comes out of the enclosure can not be used in the environment of water drops, oil, mist, dust, etc.
- Be careful not to drop screws, dust etc. into the inverter and cooling fan section.

# Terminal Connection Diagram




**CAUTION**

- To prevent a malfunction caused by noise, separate the signal cables more than 10cm from the power cables.
- Be sure to earth (ground) the inverter and motor before use.
- 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 alarm display and alarm output, apply external power to this terminal. | |
| | | P/+, PR | Brake resistor connection | Remove the jumper from terminals PR-PX (7.5K or less) and connect an optional brake resistor (FR-ABR) across terminals P/+-PR. The PR terminal is provided for the 22K or less. | |
| | | P/+, N/- | Brake unit connection | Connect the brake unit (FR-BU and BU, MT-BU5), power regeneration common converter (FR-CV) or regeneration common converter (MT-RC) and 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 a DC reactor. (For the 75K or more, a DC reactor is supplied as standard.) | |
| | | PR, PX | Built-in brake circuit connection | When the jumper is connected across terminals PX-PR (initial status), the built-in brake circuit is valid. The PX terminal is provided for the 7.5K or less. | |
| | | ⏚ | 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. | |
| | | | Pulse train input | JOG terminal can be used as pulse train input terminal. To use as pulse train input terminal, the *Pr.291* setting needs to be changed. (maximum input pulse: 100kpulses/s) | |
| | | RT | Second function selection | Turn on the RT signal to select second function selection<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. 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.<br>Turning the AU signal on makes terminal 2 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 a frequency setting potentiometer at an initial status, connect it to terminal 10.<br>Change the input specifications of terminal 2 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 ±5Ω (When power is ON)<br>Maximum permissible current 30mA<br>Input resistance 10kΩ ±1kΩ (When power is OFF) | |
| | | 4 | Frequency setting (current) | Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA and 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 from among input 4 to 20mA (initial setting), 0 to 5VDC, and 0 to 10VDC.<br>Voltage input: Input resistance 10kΩ ±1kΩ Maximum permissible voltage 20VDC<br>Current input: Input resistance 250Ω ±5Ω (When power is ON)<br>Maximum permissible current 30mA<br>Input resistance 10kΩ ±1kΩ (When power is OFF) | |
| | | 1 | Frequency setting auxiliary | Inputting 0 to ±5VDC or 0 to ±10VDC adds this signal to terminal 2 or 4 frequency setting signal. Use *Pr.73* to switch between input 0 to ±5VDC and 0 to ±10VDC (initial setting) input.<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 circuit/input signal | Relay | A1, B1, C1 | Relay output 1 (alarm output) | 1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Alarm: discontinuity across B-C (continuity across A-C), Normal: continuity across B-C (discontinuity 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 2.8V maximum when the signal is on) |
| | | 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 | Alarm code (4bit) output (Refer to page 53.) | |
| | | 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 The output signal is proportional to the magnitude of the corresponding monitoring item. | Output item: output frequency (initial setting), permissible load current 2mA, 1440 pulses/s at 60Hz | |
| | | | Open collector output | | Signals can be output from the open collector terminals by setting *Pr.291*. (maximum output pulse: 50kpulses/s) | |
| | Analog | AM | Analog signal output | | Output item: output frequency (initial setting), output signal 0 to 10VDC, permissible load current 1mA(load impedance 10kΩ or more), resolution 8 bit | |
| Communication | | — | PU connector | With the PU connector, communication can be made through RS-485. (1:1 connection only)<br>· Conforming standard: EIA-485(RS-485) · Communication speed: 4800 to 38400bps<br>· Transmission format: Multi-drop link · Overall extension: 500m | | |
| | | RS-485 terminals TXD+, TXD- | Inverter transmission terminal | With the RS-485 terminals, communication can be made through RS-485.<br>· Conforming standard: EIA-485(RS-485) · Communication speed: 300 to 38400bps<br>· Transmission format: Multi-drop link · Overall extension: 500m | | |
| | | RXD+, RXD- | Inverter reception terminal | | | |
| | | SG | Earth (Ground) | | | |
| | | — | USB connector | The FR-Configurator can be operated by connecting the inverter to the personnel computer through USB.<br>· Interface: conforms to USB1.1 · Connector: USB series B connector<br>· Transfer rate: FS transfer (12Mbps) | | |

**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)*.

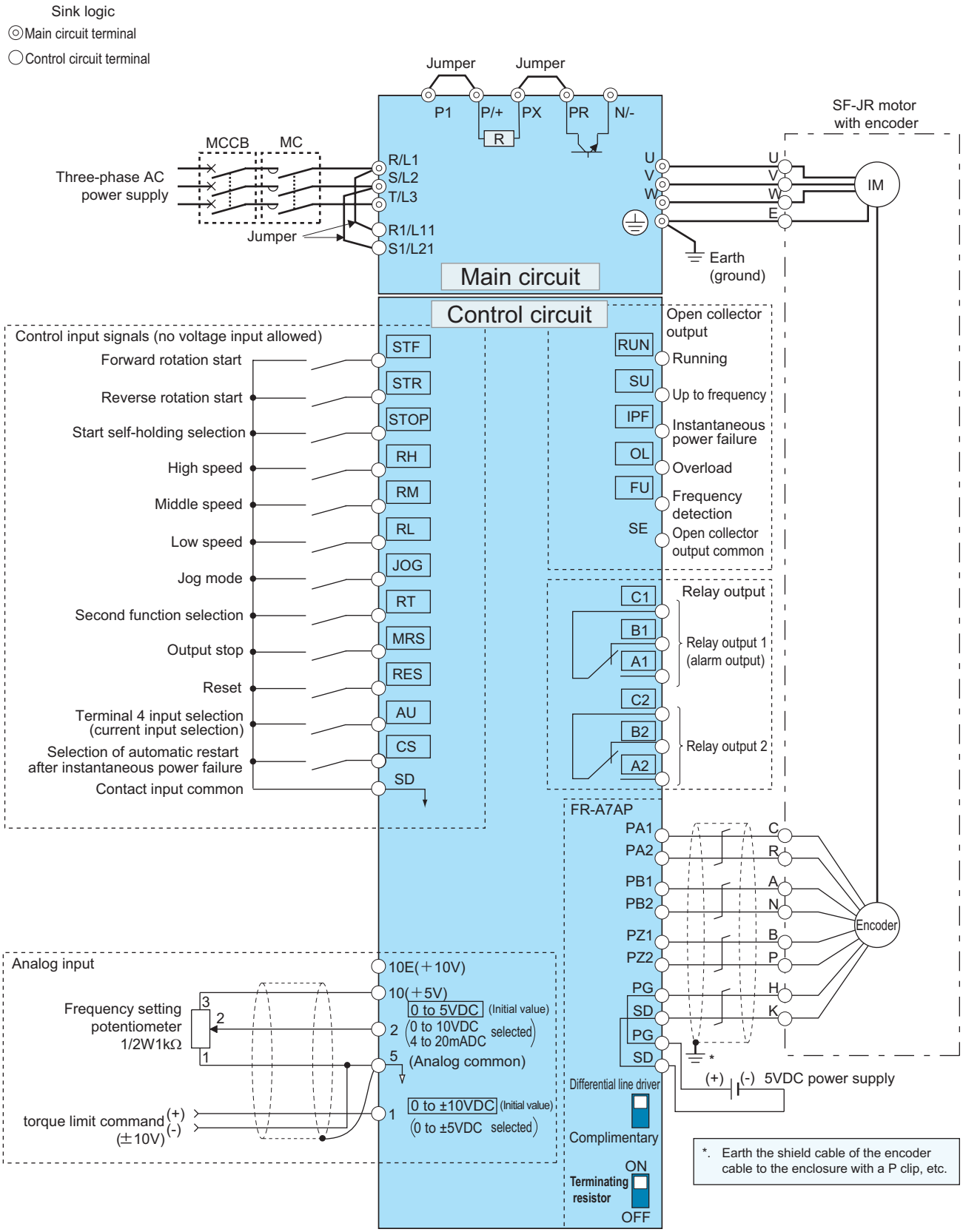
· Terminal names and terminal functions are those of the factory set.

*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.

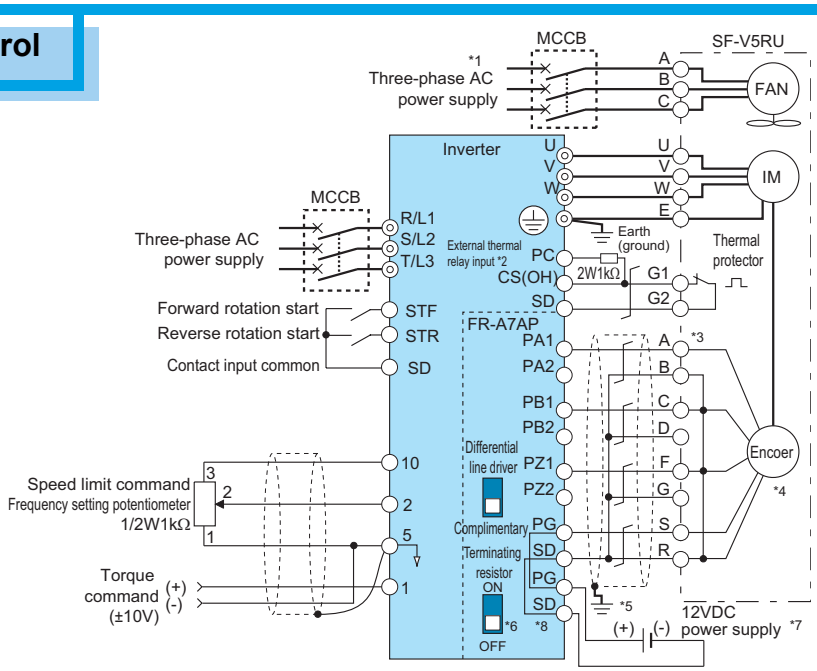
## Wiring example

### Standard motor with encoder (SF-JR), 5V differential line driver (speed control)

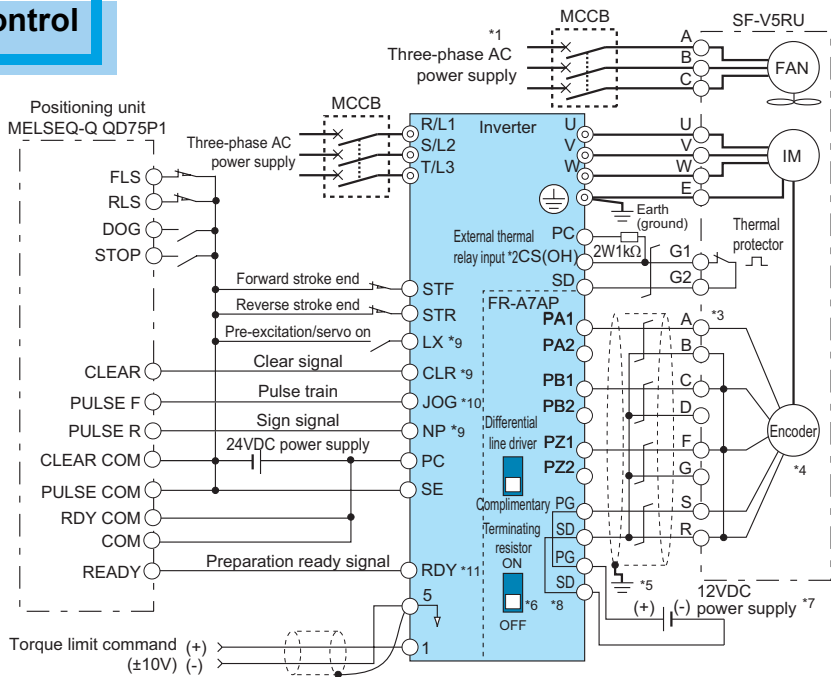


# Vector control dedicated motor (SF-V5RU), 12V complimentary

## Torque control

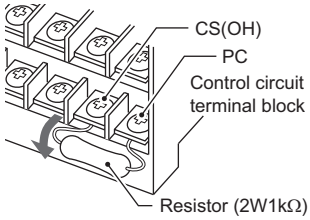



## Position control




*1 For the fan of the 7.5kW or less dedicated motor, the power supply is single phase (200V/50Hz, 200 to 230V/60Hz).

*2 Assign OH (external thermal input) signal to the terminal CS. (Set "7" in *Pr. 186*.)
Connect a 2Wlkω resistor between the terminal PC and CS (CH). Install the resistor pushing it against the bottom part of the terminal block so as to avoid a contact with other cables.
Refer to the inverter manual for details of *Pr. 186 CS terminal function selection*.




*3 The pin number differs according to the encoder used.

*4 Connect the encoder so that there is no looseness between the motor and motor shaft. Speed ratio should be 1:1.

*5 Earth the shield cable of the encoder cable to the enclosure with a P clip, etc.

*6 For the complementary, set the switch to off position.

*7 A separate power supply of 5V/12V/15V/24V is necessary according to the encoder power specification.

*8 For terminal compatibility of the FR-JCBL, FR-V5CBL and FR-A7AP, refer to the inverter manual or the instruction manual of the FR-A7AP.

*9 Assign the function using *Pr.178 to Pr.184, Pr.187 to Pr.189 (input terminal function selection)*.

*10 When position control is selected, terminal JOG function is made invalid and conditional position pulse train input terminal becomes valid.

*11 Assign the function using *Pr.190 to Pr.194 (output terminal function selection)*.

# 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.

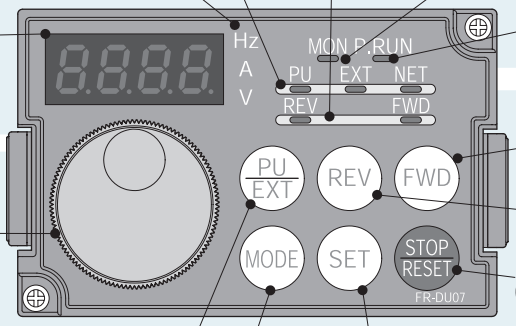
**Rotation direction indication**
FWD: Lit during forward rotation
REV: Lit during reverse rotation
On: Forward/reverse operation
Flickering: When the frequency command is not given even if the forward/reverse command is given.

**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**

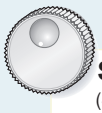
**Monitor(4-digit LED)**
Shows the frequency, parameter number, etc.




FWD **Start command forward rotation**

REV **Start command reverse rotation**

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



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


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

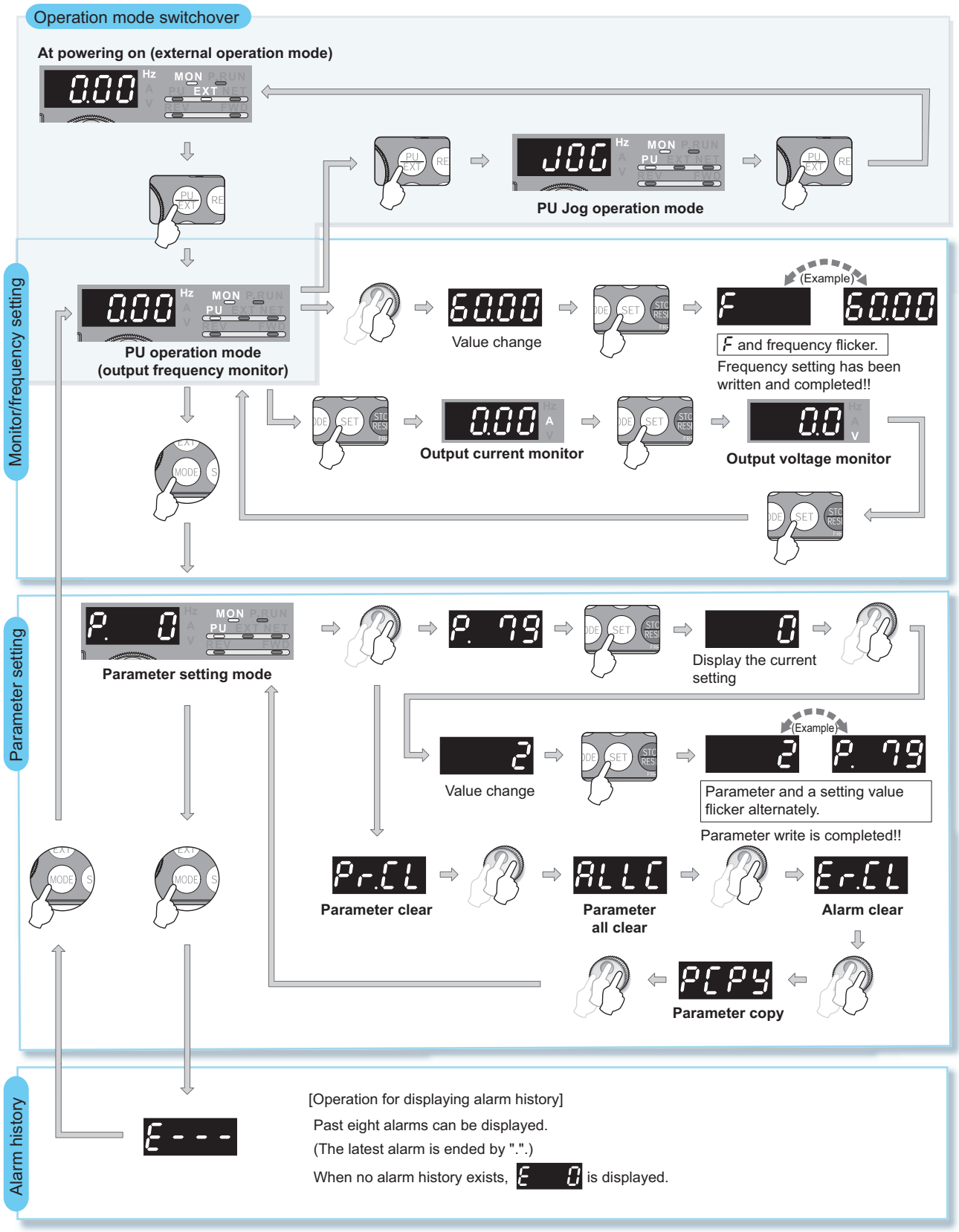
Running frequency → Output current → Output voltage *

* 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.

**REMARKS**

- ◎ indicates simple mode parameters. (initially set to extended mode)
- 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 | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Basic functions | ◎ 0 | Torque boost | 0 to 30% | 0.1% | 6/4/3/2/1% *1 | 42 | |
| | ◎ 1 | Maximum frequency | 0 to 120Hz | 0.01Hz | 120/60Hz *2 | 42 | |
| | ◎ 2 | Minimum frequency | 0 to 120Hz | 0.01Hz | 0Hz | 42 | |
| | ◎ 3 | Base frequency | 0 to 400Hz | 0.01Hz | 60Hz | 42 | |
| | ◎ 4 | Multi-speed setting (high speed) | 0 to 400Hz | 0.01Hz | 60Hz | 42 | |
| | ◎ 5 | Multi-speed setting (middle speed) | 0 to 400Hz | 0.01Hz | 30Hz | 42 | |
| | ◎ 6 | Multi-speed setting (low speed) | 0 to 400Hz | 0.01Hz | 10Hz | 42 | |
| | ◎ 7 | Acceleration time | 0 to 3600/360s | 0.1/0.01s | 5/15s *3 | 43 | |
| | ◎ 8 | Deceleration time | 0 to 3600/360s | 0.1/0.01s | 5/15s *3 | 43 | |
| | ◎ 9 | Electronic thermal O/L relay | 0 to 500/0 to 3600A *2 | 0.01/0.1A *2 | Inverter rated output current | 43 | |
| DC injection brake | 10 | DC injection brake operation frequency | 0 to 120Hz, 9999 | 0.01Hz | 3Hz | 43 | |
| | 11 | DC injection brake operation time | 0 to 10s, 8888 | 0.1s | 0.5s | 43 | |
| | 12 | DC injection brake operation voltage | 0 to 30% | 0.1% | 4/2/1%*3 | 43 | |
| — | 13 | Starting frequency | 0 to 60Hz | 0.01Hz | 0.5Hz | 43 | |
| — | 14 | Load pattern selection | 0 to 5 | 1 | 0 | 44 | |
| Jog operation | 15 | Jog frequency | 0 to 400Hz | 0.01Hz | 5Hz | 44 | |
| | 16 | Jog acceleration/deceleration time | 0 to 3600/360s | 0.1/0.01s | 0.5s | 44 | |
| — | 17 | MRS input selection | 0, 2 | 1 | 0 | 44 | |
| — | 18 | High speed maximum frequency | 120 to 400Hz | 0.01Hz | 120/60Hz *2 | 42 | |
| — | 19 | Base frequency voltage | 0 to 1000V, 8888, 9999 | 0.1V | 9999 | 42 | |
| Acceleration/deceleration times | 20 | Acceleration/deceleration reference frequency | 1 to 400Hz | 0.01Hz | 60Hz | 43 | |
| | 21 | Acceleration/deceleration time increments | 0, 1 | 1 | 0 | 43 | |
| Stall prevention | 22 | Stall prevention operation level (torque limit level ) | 0 to 400% | 0.1% | 150% | 44, 45 | |
| | 23 | Stall prevention operation level compensation factor at double speed | 0 to 200%, 9999 | 0.1% | 9999 | 44 | |
| Multi-speed setting | 24 to 27 | Multi-speed setting(4 speed to 7 speed) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 42 | |
| — | 28 | Multi-speed input compensation selection | 0, 1 | 1 | 0 | 45 | |
| — | 29 | Acceleration/deceleration pattern selection | 0 to 5 | 1 | 0 | 46 | |
| — | 30 | Regenerative function selection | 0, 1, 2, 10, 11, 12, 20, 21 | 1 | 0 | 46 | |
| Frequency jump | 31 | Frequency jump 1A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| | 32 | Frequency jump 1B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| | 33 | Frequency jump 2A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| | 34 | Frequency jump 2B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| | 35 | Frequency jump 3A | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| | 36 | Frequency jump 3B | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |
| — | 37 | Speed display | 0, 1 to 9998 | 1 | 0 | 47 | |
| Frequency detection | 41 | Up-to-frequency sensitivity | 0 to 100% | 0.1% | 10% | 47 | |
| | 42 | Output frequency detection | 0 to 400Hz | 0.01Hz | 6Hz | 47 | |
| | 43 | Output frequency detection for reverse rotation | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 47 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Second functions | 44 | Second acceleration/deceleration time | 0 to 3600/360s | 0.1/0.01s | 5s | 43 | |
| | 45 | Second deceleration time | 0 to 3600/360s, 9999 | 0.1/0.01s | 9999 | 43 | |
| | 46 | Second torque boost | 0 to 30%, 9999 | 0.1% | 9999 | 42 | |
| | 47 | Second V/F (base frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 42 | |
| | 48 | Second stall prevention operation current | 0 to 220% | 0.1% | 150% | 44 | |
| | 49 | Second stall prevention operation frequency | 0 to 400Hz, 9999 | 0.01Hz | 0Hz | 44 | |
| | 50 | Second output frequency detection | 0 to 400Hz | 0.01Hz | 30Hz | 47 | |
| | 51 | Second electronic thermal O/L relay | 0 to 500A, 9999/ 0 to 3600A, 9999 *2 | 0.01/0.1A *2 | 9999 | 43 | |
| Monitor functions | 52 | DU/PU main display data selection | 0, 5 to 14, 17 to 20, 22 to 25, 32 to 35, 50 to 57, 100 | 1 | 0 | 48 | |
| | 54 | FM terminal function selection | 1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53 | 1 | 1 | 48 | |
| | 55 | Frequency monitoring reference | 0 to 400Hz | 0.01Hz | 60Hz | 48 | |
| | 56 | Current monitoring reference | 0 to 500/0 to 3600A *2 | 0.01/0.1A *2 | Inverter rated output current | 48 | |
| Automatic restart | 57 | Restart coasting time | 0, 0.1 to 5s, 9999/ 0, 0.1 to 30s, 9999 *2 | 0.1s | 9999 | 49 | |
| | 58 | Restart cushion time | 0 to 60s | 0.1s | 1s | 49 | |
| — | 59 | Remote function selection | 0, 1, 2, 3 | 1 | 0 | 50 | |
| — | 60 | Energy saving control selection | 0, 4 | 1 | 0 | 50 | |
| Automatic acceleration/ deceleration | 61 | Reference current | 0 to 500A, 9999/ 0 to 3600A, 9999 *2 | 0.01A/0.1A *2 | 9999 | 50 | |
| | 62 | Reference value at acceleration | 0 to 220%, 9999 | 0.1% | 9999 | 50 | |
| | 63 | Reference value at dcceleration | 0 to 220%, 9999 | 0.1% | 9999 | 50 | |
| | 64 | Starting frequency for elevator mode | 0 to 10Hz, 9999 | 0.01Hz | 9999 | 50 | |
| — | 65 | Retry selection | 0 to 5 | 1 | 0 | 51 | |
| — | 66 | Stall prevention operation reduction starting frequency | 0 to 400Hz | 0.01Hz | 60Hz | 44 | |
| Retry | 67 | Number of retries at alarm occurrence | 0 to 10, 101 to 110 | 1 | 0 | 51 | |
| | 68 | Retry waiting time | 0 to 10s | 0.1s | 1s | 51 | |
| | 69 | Retry count display erase | 0 | 1 | 0 | 51 | |
| — | 70 | Special regenerative brake duty | 0 to 30%/0 to 10% *2 | 0.1% | 0% | 46 | |
| — | 71 | Applied motor | 0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54 | 1 | 0 | 51 | |
| — | 72 | PWM frequency selection | 0 to 15/0 to 6, 25 *2 | 1 | 2 | 52 | |
| — | 73 | Analog input selection | 0 to 7, 10 to 17 | 1 | 1 | 52 | |
| — | 74 | Input filter time constant | 0 to 8 | 1 | 1 | 52 | |
| — | 75 | Reset selection/disconnected PU detection/PU stop selection | 0 to 3, 14 to 17 | 1 | 14 | 53 | |
| — | 76 | Alarm code output selection | 0, 1, 2 | 1 | 0 | 53 | |
| — | 77 | Parameter write selection | 0, 1, 2 | 1 | 0 | 53 | |
| — | 78 | Reverse rotation prevention selection | 0, 1, 2 | 1 | 0 | 53 | |
| — | ◎ 79 | Operation mode selection | 0, 1, 2, 3, 4, 6, 7 | 1 | 0 | 54 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Motor constants | 80 | Motor capacity | 0.4 to 55kW, 9999/ 0 to 3600kW, 9999 *2 | 0.01/0.1kW *2 | 9999 | 55 | |
| | 81 | Number of motor poles | 2, 4, 6, 12, 14, 16, 9999 | 1 | 9999 | 55 | |
| | 82 | Motor excitation current | 0 to 500A, 9999/ 0 to 3600A, 9999 *2 | 0.01/0.1A *2 | 9999 | 55 | |
| | 83 | Motor rated voltage | 0 to 1000V | 0.1V | 200/400V | 55 | |
| | 84 | Rated motor frequency | 10 to 120Hz | 0.01Hz | 60Hz | 55 | |
| | 89 | Speed control gain (magnetic flux vector) | 0 to 200% | 0.1% | 9999 | 55 | |
| | 90 | Motor constant (R1) | 0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *2 | 0.001Ω/ 0.01mΩ *2 | 9999 | 55 | |
| | 91 | Motor constant (R2) | 0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *2 | 0.001Ω/ 0.01mΩ *2 | 9999 | 55 | |
| | 92 | Motor constant (L1) | 0 to 50Ω (0 to 1000mH), 9999/ 0 to 3600mΩ (0 to 400mH), 9999 *2 | 0.001Ω (0.1mH)/ 0.01mΩ(0.01mH) *2 | 9999 | 55 | |
| | 93 | Motor constant (L2) | 0 to 50Ω (0 to 1000mH), 9999/ 0 to 3600mΩ (0 to 400mH), 9999 *2 | 0.001Ω (0.1mH)/ 0.01mΩ(0.01mH) *2 | 9999 | 55 | |
| | 94 | Motor constant (X) | 0 to 500Ω (0 to 100%), 9999/ 0 to 100Ω (0 to 100%), 9999 *2 | 0.01Ω (0.1%)/ 0.01Ω (0.01%) *2 | 9999 | 55 | |
| | 95 | Online auto tuning selection | 0 to 2 | 1 | 0 | 56 | |
| | 96 | Auto tuning setting/status | 0, 1, 101 | 1 | 0 | 55 | |
| Adjustable 5 points V/F | 100 | V/F1(first frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 56 | |
| | 101 | V/F1(first frequency voltage) | 0 to 1,000V | 0.1V | 0V | 56 | |
| | 102 | V/F2(second frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 56 | |
| | 103 | V/F2(second frequency voltage) | 0 to 1,000V | 0.1V | 0V | 56 | |
| | 104 | V/F3(third frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 56 | |
| | 105 | V/F3(third frequency voltage) | 0 to 1,000V | 0.1V | 0V | 56 | |
| | 106 | V/F4(fourth frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 56 | |
| | 107 | V/F4(fourth frequency voltage) | 0 to 1,000V | 0.1V | 0V | 56 | |
| | 108 | V/F5(fifth frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 56 | |
| | 109 | V/F5(fifth frequency voltage) | 0 to 1,000V | 0.1V | 0V | 56 | |
| Third functions | 110 | Third acceleration/deceleration time | 0 to 3600/360s, 9999 | 0.1/0.01s | 9999 | 43 | |
| | 111 | Third deceleration time | 0 to 3600/360s, 9999 | 0.1/0.01s | 9999 | 43 | |
| | 112 | Third torque boost | 0 to 30%, 9999 | 0.1% | 9999 | 42 | |
| | 113 | Third V/F (base frequency) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 42 | |
| | 114 | Third stall prevention operation current | 0 to 220% | 0.1% | 150% | 44 | |
| | 115 | Thrid stall prevention operation frequency | 0 to 400Hz | 0.01Hz | 0 | 44 | |
| | 116 | Third output frequency detection | 0 to 400Hz | 0.01Hz | 60Hz | 47 | |
| PU connector communication | 117 | PU communication station | 0 to 31 | 1 | 0 | 56 | |
| | 118 | PU communication speed | 48, 96, 192, 384 | 1 | 192 | 56 | |
| | 119 | PU communication stop bit length | 0, 1, 10, 11 | 1 | 1 | 56 | |
| | 120 | PU communication parity check | 0, 1, 2 | 1 | 2 | 56 | |
| | 121 | Number of PU communication retries | 0 to10, 9999 | 1 | 1 | 56 | |
| | 122 | PU communication check time interval | 0, 0.1 to 999.8s, 9999 | 0.1s | 9999 | 56 | |
| | 123 | PU communication waiting time setting | 0 to 150ms, 9999 | 1 | 9999 | 56 | |
| | 124 | PU communication CR/LF presence/ absence selection | 0, 1, 2 | 1 | 1 | 56 | |
| — | ◎ 125 | Terminal 2 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 57 | |
| — | ◎ 126 | Terminal 4 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 57 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| PID operation | 127 | PID control automatic switchover freqeuncy | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 58 | |
| | 128 | PID action selection | 10, 11, 20, 21, 50, 51, 60, 61 | 1 | 10 | 58 | |
| | 129 | PID proportional band | 0.1 to 1000%, 9999 | 0.1% | 100% | 58 | |
| | 130 | PID integral time | 0.1 to 3600s, 9999 | 0.1s | 1s | 58 | |
| | 131 | PID upper limit | 0 to 100%, 9999 | 0.1% | 9999 | 58 | |
| | 132 | PID lower limit | 0 to 100%, 9999 | 0.1% | 9999 | 58 | |
| | 133 | PID action set point | 0 to 100%, 9999 | 0.01% | 9999 | 58 | |
| | 134 | PID differential time | 0.01 to 10.00s, 9999 | 0.01s | 9999 | 58 | |
| Commercial power supply-inverter switch-over | 135 | Commercial power-supply switchover sequence output terminal selection | 0, 1 | 1 | 0 | 58 | |
| | 136 | MC switchover interlock time | 0 to 100s | 0.1s | 1s | 58 | |
| | 137 | Start waiting time | 0 to 100s | 0.1s | 0.5s | 58 | |
| | 138 | Commercial power-supply operation switchover selection at an alarm | 0, 1 | 1 | 0 | 58 | |
| | 139 | Automatic switchover frequency between inverter and commercial power-supply operation | 0 to 60Hz, 9999 | 0.01Hz | 9999 | 58 | |
| Backlash measures | 140 | Backlash acceleration stopping frequency | 0 to 400Hz | 0.01Hz | 1Hz | 46 | |
| | 141 | Backlash acceleration stopping time | 0 to 360s | 0.1s | 0.5s | 46 | |
| | 142 | Backlash deceleration stopping frequency | 0 to 400Hz | 0.01Hz | 1Hz | 46 | |
| | 143 | Backlash deceleration stopping time | 0 to 360s | 0.1s | 0.5s | 46 | |
| — | 144 | Speed setting switchover | 0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110 | 1 | 4 | 47 | |
| PU | 145 | PU display language selection | 0 to 7 | 1 | 0 | 58 | |
| Current detection | 148 | Stall prevention level at 0V input | 0 to 220% | 0.1% | 150% | 44 | |
| | 149 | Stall prevention level at 10V input | 0 to 220% | 0.1% | 200% | 44 | |
| | 150 | Output current detection level | 0 to 220% | 0.1% | 150% | 58 | |
| | 151 | Output current detection signal delay time | 0 to 10s | 0.1s | 0s | 58 | |
| | 152 | Zero current detection level | 0 to 220% | 0.1% | 5% | 58 | |
| | 153 | Zero current detection time | 0 to 1s | 0.01s | 0.5s | 58 | |
| — | 154 | Voltage reduction selection during stall prevention operation | 0, 1 | 1 | 1 | 44 | |
| — | 155 | RT signal reflection time selection | 0, 10 | 1 | 0 | 59 | |
| — | 156 | Stall prevention operation selection | 0 to 31, 100, 101 | 1 | 0 | 44 | |
| — | 157 | OL signal output timer | 0 to 25s, 9999 | 0.1s | 0s | 44 | |
| — | 158 | AM terminal function selection | 1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53 | 1 | 1 | 48 | |
| — | 159 | Automatic switchover ON range between commercial power-supply and inverter operation | 0 to 10Hz, 9999 | 0.01Hz | 9999 | 58 | |
| — | ◎ 160 | User group read selection | 0, 1, 9999 | 1 | 0 | 59 | |
| — | 161 | Frequency setting/key lock operation selection | 0, 1, 10, 11 | 1 | 0 | 59 | |
| Automatic restart functions | 162 | Automatic restart after instantaneous power failure selection | 0, 1, 2, 10, 11, 12 | 1 | 0 | 49 | |
| | 163 | First cushion time for restart | 0 to 20s | 0.1s | 0s | 49 | |
| | 164 | First cushion voltage for restart | 0 to 100% | 0.1% | 0% | 49 | |
| | 165 | Stall prevention operation level for restart | 0 to 220% | 0.1% | 150% | 49 | |
| Current detection | 166 | Output current detection signal retention time | 0 to 10s, 9999 | 0.1s | 0.1s | 58 | |
| | 167 | Output current detection operation selection | 0, 1 | 1 | 0 | 58 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| — | 168 | Parameter for manufacturer setting. Do not set. | | | | | |
| — | 169 | | | | | | |
| Cumulative monitor clear | 170 | Watt-hour meter clear | 0, 10, 9999 | 1 | 9999 | 48 | |
| | 171 | Operation hour meter clear | 0, 9999 | 1 | 9999 | 48 | |
| User group | 172 | User group registered display/batch clear | 9999, (0 to 16) | 1 | 0 | 59 | |
| | 173 | User group registration | 0 to 999, 9999 | 1 | 9999 | 59 | |
| | 174 | User group clear | 0 to 999, 9999 | 1 | 9999 | 59 | |
| input terminal function assignment | 178 | STF terminal function selection | 0 to 20, 22 to 28, 42 to 44, 60, 62, 64 to 71, 9999 | 1 | 60 | 60 | |
| | 179 | STR terminal function selection | 0 to 20, 22 to 28, 42 to 44, 61, 62, 64 to 71, 9999 | 1 | 61 | 60 | |
| | 180 | RL terminal function selection | 0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 9999 | 1 | 0 | 60 | |
| | 181 | RM terminal function selection | | 1 | 1 | 60 | |
| | 182 | RH terminal function selection | | 1 | 2 | 60 | |
| | 183 | RT terminal function selection | | 1 | 3 | 60 | |
| | 184 | AU terminal function selection | 0 to 20, 22 to 28, 42 to 44, 62 to 71, 9999 | 1 | 4 | 60 | |
| | 185 | JOG terminal function selection | 0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 9999 | 1 | 5 | 60 | |
| | 186 | CS terminal function selection | | 1 | 6 | 60 | |
| | 187 | MRS terminal function selection | | 1 | 24 | 60 | |
| | 188 | STOP terminal function selection | | 1 | 25 | 60 | |
| | 189 | RES terminal function selection | | 1 | 62 | 60 | |
| Output terminal function assignment | 190 | RUN terminal function selection | 0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70, 84, 85, 90 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184, 185, 190 to 199, 9999 | 1 | 0 | 60 | |
| | 191 | SU terminal function selection | | 1 | 1 | 60 | |
| | 192 | IPF terminal function selection | | 1 | 2 | 60 | |
| | 193 | OL terminal function selection | | 1 | 3 | 60 | |
| | 194 | FU terminal function selection | | 1 | 4 | 60 | |
| | 195 | ABC1 terminal function selection | 0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70, 84, 85, 90, 91, 94 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184, 185, 190, 191, 194 to 199, 9999 | 1 | 99 | 60 | |
| | 196 | ABC2 terminal function selection | | 1 | 9999 | 60 | |
| Multi-speed setting | 232 to 239 | Multi-speed setting(8 speed to 15 speed) | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 42 | |
| — | 240 | Soft-PWM operation selection | 0, 1 | 1 | 1 | 52 | |
| — | 241 | Analog input display unit switchover | 0, 1 | 1 | 0 | 57 | |
| — | 242 | Terminal 1 added compensation amount (terminal 2) | 0 to 100% | 0.1% | 100% | 52 | |
| — | 243 | Terminal 1 added compensation amount (terminal 4) | 0 to 100% | 0.1% | 75% | 52 | |
| — | 244 | Cooling fan operation selection | 0, 1 | 1 | 1 | 61 | |

| Func-tion | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Slip compensation | 245 | Rated slip | 0 to 50%, 9999 | 0.01% | 9999 | 61 | |
| | 246 | Slip compensation time constant | 0.01 to 10s | 0.01s | 0.5s | 61 | |
| | 247 | Constant-power region slip compensation selection | 0, 9999 | 1 | 9999 | 61 | |
| — | 250 | Stop selection | 0 to 100s,1000 to 1100s 8888, 9999 | 0.1s | 9999 | 61 | |
| — | 251 | Output phase failure protection selection | 0, 1 | 1 | 1 | 61 | |
| Frequency compensation function | 252 | Override bias | 0 to 200% | 0.1% | 50% | 52 | |
| | 253 | Override gain | 0 to 200% | 0.1% | 150% | 52 | |
| Life check | 255 | Life alarm status display | (0 to 15) | 1 | 0 | 61 | |
| | 256 | Inrush current limit circuit life display | (0 to 100%) | 1% | 100% | 61 | |
| | 257 | Control circuit capacitor life display | (0 to 100%) | 1% | 100% | 61 | |
| | 258 | Main circuit capacitor life display | (0 to 100%) | 1% | 100% | 61 | |
| | 259 | Main circuit capacitor life measuring | 0, 1 | 1 | 0 | 61 | |
| Power failure stop | 261 | Power failure stop selection | 0, 1, 2, 11, 12 | 1 | 0 | 62 | |
| | 262 | Subtracted frequency at deceleration start | 0 to 20Hz | 0.01Hz | 3Hz | 62 | |
| | 263 | Subtraction starting frequency | 0 to 120Hz, 9999 | 0.01Hz | 60Hz | 62 | |
| | 264 | Power-failure deceleration time 1 | 0 to 3600/360s | 0.1/0.01s | 5s | 62 | |
| | 265 | Power-failure deceleration time 2 | 0 to 3600s/360s, 9999 | 0.1/0.01s | 9999 | 62 | |
| | 266 | Power failure deceleration time switchover frequency | 0 to 400Hz | 0.01Hz | 60Hz | 62 | |
| — | 267 | Terminal 4 input selection | 0, 1, 2 | 1 | 0 | 52 | |
| — | 268 | Monitor decimal digits selection | 0,1, 9999 | 1 | 9999 | 48 | |
| — | 269 | Parameter for manufacturer setting. Do not set. | | | | | |
| — | 270 | Stop-on contact/load torque high-speed frequency control selection | 0, 1, 2, 3 | 1 | 0 | 63 | |
| Load torque high speed frequency control | 271 | High-speed setting maximum current | 0 to 220% | 0.1% | 50% | 63 | |
| | 272 | Middle-speed setting minimum current | 0 to 220% | 0.1% | 100% | 63 | |
| | 273 | Current averaging range | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 63 | |
| | 274 | Current averaging filter time constant | 1 to 4000 | 1 | 16 | 63 | |
| Stop-on contact control | 275 | Stop-on contact excitation current low-speed multiplying factor | 0 to 1000%, 9999 | 0.1% | 9999 | 63 | |
| | 276 | PWM carrier frequency at stop-on contact | 0 to 9, 9999/ 0 to 4, 9999 *2 | 1 | 9999 | 63 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Brake sequence function | 278 | Brake opening frequency | 0 to 30Hz | 0.01Hz | 3Hz | 64 | |
| | 279 | Brake opening current | 0 to 220% | 0.1% | 130% | 64 | |
| | 280 | Brake opening current detection time | 0 to 2s | 0.1s | 0.3s | 64 | |
| | 281 | Brake operation time at start | 0 to 5s | 0.1s | 0.3s | 64 | |
| | 282 | Brake operation frequency | 0 to 30Hz | 0.01Hz | 6Hz | 64 | |
| | 283 | Brake operation time at stop | 0 to 5s | 0.1s | 0.3s | 64 | |
| | 284 | Deceleration detection function selection | 0, 1 | 1 | 0 | 64 | |
| | 285 | Overspeed detection frequency (Speed deviation excess detection frequency) | 0 to 30Hz, 9999 | 0.01Hz | 9999 | 64 | |
| Droop control | 286 | Droop gain | 0 to 100% | 0.1% | 0% | 65 | |
| | 287 | Droop filter time constant | 0 to 1s | 0.01s | 0.3s | 65 | |
| | 288 | Droop function activation selection | 0, 1, 2, 10, 11 | 1 | 0 | 65 | |
| — | 291 | Pulse train I/O selection | 0, 1, 10, 11, 20, 21, 100 | 1 | 0 | 65 | |
| — | 292 | Automatic acceleration/deceleration | 0, 1, 3, 5 to 8, 11 | 1 | 0 | 50 | |
| — | 293 | Acceleration/deceleration individual operation selection | 0 to 2 | 1 | 0 | 50 | |
| — | 294 | UV avoidance voltage gain | 0 to 200% | 0.1% | 100% | 62 | |
| — | 299 | Rotation direction detection selection at restarting | 0, 1, 9999 | 1 | 0 | 49 | |
| RS-485 communication | 331 | RS-485 communication station | 0 to 31(0 to 247) | 1 | 0 | 56 | |
| | 332 | RS-485 communication speed | 3, 6, 12, 24, 48, 96, 192, 384 | 1 | 96 | 56 | |
| | 333 | RS-485 communication stop bit length | 0, 1, 10, 11 | 1 | 1 | 56 | |
| | 334 | RS-485 communication parity check selection | 0, 1, 2 | 1 | 2 | 56 | |
| | 335 | RS-485 communication retry count | 0 to 10, 9999 | 1 | 1 | 56 | |
| | 336 | RS-485 communication check time interval | 0 to 999.8s, 9999 | 0.1s | 0s | 56 | |
| | 337 | RS-485 communication waiting time setting | 0 to 150ms, 9999 | 1 | 9999 | 56 | |
| | 338 | Communication operation command source | 0, 1 | 1 | 0 | 65 | |
| | 339 | Communication speed command source | 0, 1, 2 | 1 | 0 | 65 | |
| | 340 | Communication startup mode selection | 0, 1, 2, 10, 12 | 1 | 0 | 54 | |
| | 341 | RS-485 communication CR/LF selection | 0, 1, 2 | 1 | 1 | 56 | |
| | 342 | Communication EEPROM write selection | 0, 1 | 1 | 0 | 56 | |
| | 343 | Communication error count | — | 1 | 0 | 56 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Orientation control | 350 *6 | Stop position command selection | 0, 1, 9999 | 1 | 9999 | 66 | |
| | 351 *6 | Orientation speed | 0 to 30Hz | 0.01Hz | 2Hz | 66 | |
| | 352 *6 | Creep speed | 0 to 10Hz | 0.01Hz | 0.5Hz | 66 | |
| | 353 *6 | Creep switchover position | 0 to 16383 | 1 | 511 | 66 | |
| | 354 *6 | Position loop switchover position | 0 to 8191 | 1 | 96 | 66 | |
| | 355 *6 | DC injection brake start position | 0 to 255 | 1 | 5 | 66 | |
| | 356 *6 | Internal stop position command | 0 to 16383 | 1 | 0 | 66 | |
| | 357 *6 | In-position zone | 0 to 255 | 1 | 5 | 66 | |
| | 358 *6 | Servo torque selection | 0 to 13 | 1 | 1 | 66 | |
| | 359 *6 | Encoder rotation direction | 0, 1 | 1 | 1 | 66 | |
| | 360 *6 | 16 bit data selection | 0 to 127 | 1 | 0 | 66 | |
| | 361 *6 | Position shift | 0 to 16383 | 1 | 0 | 66 | |
| | 362 *6 | Orientation position loop gain | 0.1 to 100 | 0.1 | 1 | 66 | |
| | 363 *6 | Completion signal output delay time | 0 to 5s | 0.1s | 0.5s | 66 | |
| | 364 *6 | Encoder stop check time | 0 to 5s | 0.1s | 0.5s | 66 | |
| | 365 *6 | Orientation limit | 0 to 60s, 9999 | 1s | 9999 | 66 | |
| | 366 *6 | Recheck time | 0 to 5s, 9999 | 0.1s | 9999 | 66 | |
| | 367 *6 | Speed feedback range | 0 to 400Hz, 9999 | 0.01Hz | 9999 | 66 | |
| | 368 *6 | Feedback gain | 0 to 100 | 0.1 | 1 | 66 | |
| | 369 *6 | Number of encoder pulses | 0 to 4096 | 1 | 1024 | 66 | |
| | 374 | Overspeed detection level | 0 to 400Hz | 0.01Hz | 140Hz | 66 | |
| | 376 *6 | Open cable detection enable/disable selection | 0, 1 | 1 | 0 | 66 | |
| S-pattern acceleration/ deceleration C | 380 | Acceleration S-pattern 1 | 0 to 50% | 1% | 0 | 46 | |
| | 381 | Deceleration S-pattern 1 | 0 to 50% | 1% | 0 | 46 | |
| | 382 | Acceleration S-pattern 2 | 0 to 50% | 1% | 0 | 46 | |
| | 383 | Deceleration S-pattern 2 | 0 to 50% | 1% | 0 | 46 | |
| Pulse train input | 384 | Input pulse division scaling factor | 0 to 250 | 1 | 0 | 65 | |
| | 385 | Frequency for 0 input pulse | 0 to 400Hz | 0.01Hz | 0 | 65 | |
| | 386 | Frequency for maximum input pulse | 0 to 400Hz | 0.01Hz | 60Hz | 65 | |
| Orientation control | 393 *6 | Orientation selection | 0, 1, 2 | 1 | 0 | 66 | |
| | 396 *6 | Orientation speed gain (P term) | 0 to 1000 | 1 | 60 | 66 | |
| | 397 *6 | Orientation speed integral time | 0 to 20s | 0.001s | 0.333s | 66 | |
| | 398 *6 | Orientation speed gain (D term) | 0 to 100 | 0.1 | 1 | 66 | |
| | 399 *6 | Orientation deceleration ratio | 0 to 1000 | 1 | 20 | 66 | |
| Position control | 419 *6 | Position command source selection | 0, 2 | 1 | 0 | 67 | |
| | 420 *6 | Command pulse scaling factor numerator | 0 to 32767 | 1 | 1 | 67 | |
| | 421 *6 | Command pulse scaling factor denominator | 0 to 32767 | 1 | 1 | 67 | |
| | 422 *6 | Position loop gain | 0 to 150sec$^{-1}$ | 1sec$^{-1}$ | 25sec$^{-1}$ | 68 | |
| | 423 *6 | Position feed forward gain | 0 to 100% | 1% | 0 | 68 | |
| | 424 *6 | Position command acceleration/ deceleration time constant | 0 to 50s | 0.001s | 0s | 67 | |
| | 425 *6 | Position feed forward command filter | 0 to 5s | 0.001s | 0s | 68 | |
| | 426 *6 | In-position width | 0 to 32767pulse | 1 | 100 | 68 | |
| | 427 *6 | Excessive level error | 0 to 400, 9999 | 1 | 40 | 68 | |
| | 428 *6 | Command pulse selection | 0 to 5 | 1 | 0 | 67 | |
| | 429 *6 | Clear signal selection | 0, 1 | 1 | 1 | 67 | |
| | 430 *6 | Pulse monitor selection | 0 to 5, 9999 | 1 | 9999 | 67 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Second motor constants | 450 | Second applied motor | 0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54, 9999 | 1 | 9999 | 51 | |
| | 451 | Second motor control method selection | 10, 11, 12, 20, 9999 | 1 | 9999 | 55 | |
| | 453 | Second motor capacity | 0.4 to 55kW, 9999/ 0 to 3600kW, 9999 *2 | 0.01kW/0.1kW *2 | 9999 | 55 | |
| | 454 | Number of second motor poles | 2, 4, 6, 8, 10, 9999 | 1 | 9999 | 55 | |
| | 455 | Second motor excitation current | 0 to 500A,9999/ 0 to 3600A, 9999 *2 | 0.01/0.1A *2 | 9999 | 55 | |
| | 456 | Rated second motor voltage | 0 to 1000V | 0.1V | 200/400V | 55 | |
| | 457 | Rated second motor frequency | 10 to 120Hz | 0.01Hz | 60Hz | 55 | |
| | 458 | Second motor constant (R1) | 0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *2 | 0.001Ω/ 0.01mΩ *2 | 9999 | 55 | |
| | 459 | Second motor constant (R2) | 0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *2 | 0.001Ω/ 0.01mΩ *2 | 9999 | 55 | |
| | 460 | Second motor constant (L1) | 0 to 50Ω (0 to 1000mH), 9999/ 0 to 3600mΩ (0 to 400mH), 9999 *2 | 0.001Ω (0.1mH)/ 0.01mΩ(0.01mH) *2 | 9999 | 55 | |
| | 461 | Second motor constant (L2) | 0 to 50Ω (0 to 1000mH), 9999/ 0 to 3600mΩ (0 to 400mH), 9999 *2 | 0.001Ω (0.1mH)/ 0.01mΩ(0.01mH) *2 | 9999 | 55 | |
| | 462 | Second motor constant (X) | 0 to 500Ω (0 to 100%), 9999/ 0 to 100Ω (0 to 100%), 9999 *2 | 0.01Ω (0.1%)/ 0.01Ω (0.01%) *2 | 9999 | 55 | |
| | 463 | Second motor auto tuning setting/ status | 0, 1, 101 | 1 | 0 | 55 | |
| Conditional position feed function | 464 *6 | Digital position control sudden stop deceleration time | 0 to 360.0s | 0.1s | 0 | 67 | |
| | 465 *6 | First position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 466 *6 | First position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 467 *6 | Second position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 468 *6 | Second position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 469 *6 | Third position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 470 *6 | Third position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 471 *6 | Fourth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 472 *6 | Fourth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 473 *6 | Fifth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 474 *6 | Fifth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 475 *6 | Sixth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 476 *6 | Sixth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 477 *6 | Seventh position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 478 *6 | Seventh position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 479 *6 | Eighth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 480 *6 | Eighth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 481 *6 | Ninth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 482 *6 | Ninth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 483 *6 | Tenth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 484 *6 | Tenth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 485 *6 | Eleventh position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 486 *6 | Eleventh position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 487 *6 | Twelfth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 488 *6 | Twelfth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 489 *6 | Thirteenth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 490 *6 | Thirteenth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 491 *6 | Fourteenth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 492 *6 | Fourteenth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 493 *6 | Fifteenth position feed amount lower 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| | 494 *6 | Fifteenth position feed amount upper 4 digits | 0 to 9999 | 1 | 0 | 67 | |
| Remote output | 495 | Remote output selection | 0, 1 | 1 | 0 | 68 | |
| | 496 | Remote output data 1 | 0 to 4095 | 1 | 0 | 68 | |
| | 497 | Remote output data 2 | 0 to 4095 | 1 | 0 | 68 | |

| Function | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Maintenance | 503 | Maintenance timer | 0 (1 to 9998) | 1 | 0 | 68 | |
| | 504 | Maintenance timer alarm output set time | 0 to 9998, 9999 | 1 | 9999 | 68 | |
| — | 505 | Speed setting reference | 1 to 120Hz | 0.01Hz | 60Hz | 46 | |
| S-pattern acceleration/ deceleration D | 516 | S-pattern time at a start of acceleration | 0.1 to 2.5s | 0.1s | 0.1s | 46 | |
| | 517 | S-pattern time at a completion of acceleration | 0.1 to 2.5s | 0.1s | 0.1s | 46 | |
| | 518 | S-pattern time at a start of deceleraiton | 0.1 to 2.5s | 0.1s | 0.1s | 46 | |
| | 519 | S-pattern time at a completion of deceleraiton | 0.1 to 2.5s | 0.1s | 0.1s | 46 | |
| USB | 547 | USB communication station number | 0 to 31 | 1 | 0 | 68 | |
| | 548 | USB communication check time interval | 0 to 999.8s, 9999 | 0.1s | 9999 | 68 | |
| Communication | 549 | Protocol selection | 0, 1 | 1 | 0 | 56 | |
| | 550 | NET mode operation command source selection | 0, 1, 9999 | 1 | 9999 | 65 | |
| | 551 | PU mode operation command source selection | 1, 2, 3 | 1 | 2 | 65 | |
| Current average value monitor | 555 | Current average time | 0.1 to 1.0s | 0.1s | 1s | 68 | |
| | 556 | Data output mask time | 0.0 to 20.0s | 0.1s | 0s | 68 | |
| | 557 | Current average value monitor signal output reference current | 0 to 500/0 to 3600A *2 | 0.01/0.1A *2 | Rated inverter current | 68 | |
| — | 563 | Energization time carrying-over times | (0 to 65535) | 1 | 0 | 48 | |
| — | 564 | Operating time carrying-over times | (0 to 65535) | 1 | 0 | 48 | |
| Second motor constants | 569 | Second motor speed control gain | 0 to 200% | 0.1% | 100% | 55 | |
| — | 571 | Holding time at a start | 0.0 to 10.0s, 9999 | 0.1s | 9999 | 43 | |
| — | 574 | Second motor online auto tuning | 0, 1 | 1 | 0 | 56 | |
| PID control | 575 | Output interruption detection time | 0 to 3600s, 9999 | 0.1s | 1s | 58 | |
| | 576 | Output interruption detection level | 0 to 400Hz | 0.01Hz | 0Hz | 58 | |
| | 577 | Output interruption cancel level | 900 to 1100% | 0.1% | 1000% | 58 | |
| — | 611 | Acceleration time at a restart | 0 to 3600s,9999 | 0.1s | 5/15s *2 | 49 | |
| — | 665 | Regeneration avoidance frequency gain | 0 to 200% | 0.1% | 100 | 49 | |
| — | 684 | Tuning data unit switchover | 0, 1 | 1 | 0 | 55 | |
| — | 800 | Control method selection | 0 to 5, 9 to 12, 20 | 1 | 20 | 55 | |
| — | 802 *6 | Pre-excitation selection | 0, 1 | 1 | 0 | 43 | |
| Torque command | 803 | Constant power range torque characteristic selection | 0, 1 | 1 | 0 | 45 | |
| | 804 | Torque command source selection | 0, 1, 3 to 6 | 1 | 0 | 69 | |
| | 805 | Torque command value (RAM) | 600 to 1400% | 1% | 1000% | 69 | |
| | 806 | Torque command value (RAM,EEPROM) | 600 to 1400% | 1% | 1000% | 69 | |
| Speed limit | 807 | Speed limit selection | 0, 1, 2 | 1 | 0 | 69 | |
| | 808 | Forward rotation speed limit | 0 to 120Hz | 0.01Hz | 60Hz | 69 | |
| | 809 | Reverse rotation speed limit | 0 to 120Hz, 9999 | 0.01Hz | 9999 | 69 | |

| Func-tion | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Torque limit | 810 | Torque limit input method selection | 0, 1 | 1 | 0 | 45 | |
| | 811 | Set resolution switchover | 0, 1, 10, 11 | 1 | 0 | 45 | |
| | 812 | Torque limit level (regeneration) | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| | 813 | Torque limit level (3rd quadrant) | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| | 814 | Torque limit level (4th quadrant) | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| | 815 | Torque limit level 2 | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| | 816 | Torque limit level during acceleration | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| | 817 | Torque limit level during deceleration | 0 to 400%, 9999 | 0.1% | 9999 | 45 | |
| Easy gain tuning | 818 | Easy gain tuning response level setting | 1 to 15 | 1 | 2 | 69 | |
| | 819 | Easy gain tuning selection | 0 to 2 | 1 | 0 | 69 | |
| Adjustment function | 820 | Speed control P gain 1 | 0 to 1000% | 1% | 60% | 70 | |
| | 821 | Speed control integral time 1 | 0 to 20s | 0.001s | 0.333s | 70 | |
| | 822 | Speed setting filter 1 | 0 to 5s, 9999 | 0.001s | 9999 | 52 | |
| | 823 *6 | Speed detection filter 1 | 0 to 0.1s | 0.001s | 0.001s | 70 | |
| | 824 | Torque control P gain 1 | 0 to 200% | 1% | 100% | 70 | |
| | 825 | Torque control integral time 1 | 0 to 500ms | 0.1ms | 5ms | 70 | |
| | 826 | Torque setting filter 1 | 0 to 5s, 9999 | 0.001s | 9999 | 52 | |
| | 827 | Torque detection filter 1 | 0 to 0.1s | 0.001s | 0s | 70 | |
| | 828 | Model speed control gain | 0 to 1000% | 1% | 60% | 70 | |
| | 830 | Speed control P gain 2 | 0 to 1000%, 9999 | 1% | 9999 | 70 | |
| | 831 | Speed control integral time 2 | 0 to 20s, 9999 | 0.001s | 9999 | 70 | |
| | 832 | Speed setting filter2 | 0 to 5s, 9999 | 0.001s | 9999 | 52 | |
| | 833 *6 | Speed detection filter 2 | 0 to 0.1s | 0.001s | 0.001s | 70 | |
| | 834 | Torque control P gain 2 | 0 to 200%, 9999 | 1% | 9999 | 70 | |
| | 835 | Torque control integral time 2 | 0 to 500ms, 9999 | 0.1ms | 9999 | 70 | |
| | 836 | Torque setting filter2 | 0 to 5s, 9999 | 0.001s | 9999 | 52 | |
| | 837 | Torque detection filter 2 | 0 to 0.1s, 9999 | 0.001s | 9999 | 70 | |
| Torque bias | 840 *6 | Torque bias selection | 0 to 3, 9999 | 1 | 9999 | 71 | |
| | 841 *6 | Torque bias 1 | 600 to 1400%, 9999 | 1% | 9999 | 71 | |
| | 842 *6 | Torque bias 2 | 600 to 1400%, 9999 | 1% | 9999 | 71 | |
| | 843 *6 | Torque bias 3 | 600 to 1400%, 9999 | 1% | 9999 | 71 | |
| | 844 *6 | Torque bias filter | 0 to 5s, 9999 | 0.001s | 9999 | 71 | |
| | 845 *6 | Torque bias operation time | 0 to 5s, 9999 | 0.01s | 9999 | 71 | |
| | 846 *6 | Torque bias balance compensation | 0 to 10V, 9999 | 0.1V | 9999 | 71 | |
| | 847 *6 | Fall-time torque bias terminal 1 bias | 0 to 400%, 9999 | 1% | 9999 | 71 | |
| | 848 *6 | Fall-time torque bias terminal 1 gain | 0 to 400%, 9999 | 1% | 9999 | 71 | |
| Additional function | 849 | Analog input off set adjustment | 0 to 200% | 0.1% | 100% | 52 | |
| | 850 | Control operation selection | 0, 1 | 1 | 0 | 43 | |
| | 853 | Speed deviation time | 0 to 100s | 0.1s | 1s | 64 | |
| | 854 | Excitation ratio | 0 to 100% | 1% | 100% | 71 | |
| | 858 | Terminal 4 function assignment | 0, 1, 4, 9999 | 1 | 0 | 71 | |
| | 859 | Torque current | 0 to 500A, 9999/ 0 to 3600A, 9999 *2 | 0.01A/0.1A *2 | 9999 | 55 | |
| | 860 | Second motor torque current | 0 to 500A, 9999/ 0 to 3600A, 9999 *2 | 0.01A/0.1A *2 | 9999 | 55 | |
| | 862 | Notch filter time constant | 0 to 60 | 1 | 0 | 72 | |
| | 863 | Notch filter depth | 0, 1, 2, 3 | 1 | 0 | 72 | |
| | 864 | Torque detection | 0 to 400% | 0.1% | 150% | 72 | |
| | 865 | Low speed detection | 0 to 400Hz | 0.01Hz | 1.5Hz | 47 | |
| Indication function | 866 | Torque monitoring reference | 0 to 400% | 0.1% | 150% | 48 | |

| Func-tion | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| — | 867 | AM output filter | 0 to 5s | 0.01s | 0.01s | 48 | |
| — | 868 | Terminal 1 function assignment | 0 to 6, 9999 | 1 | 0 | 71 | |
| Protective Functions | 872 | Input phase failure protection selection | 0§1 | 1 | 0 | 61 | |
| | 873 | Speed limit | 0 to 120Hz | 0.01Hz | 20Hz | 72 | |
| | 874 | OLT level setting | 0 to 200% | 0.1% | 150% | 45 | |
| | 875 | Fault definition | 0, 1 | 1 | 0 | 72 | |
| Control system functions | 877 | Speed feed forward control/model adaptive speed control selection | 0, 1, 2 | 1 | 0 | 70 | |
| | 878 | Speed feed forward filter | 0 to 1s | 0.01s | 0s | 70 | |
| | 879 | Speed feed forward torque limit | 0 to 400% | 0.1% | 150% | 70 | |
| | 880 | Load inertia ratio | 0 to 200 times | 0.1 | 7 | 70 | |
| | 881 | Speed feed forward gain | 0 to 1000% | 1% | 0% | 70 | |
| Regeneration avoidance function | 882 | Regeneration avoidance operation selection | 0, 1, 2 | 1 | 0 | 72 | |
| | 883 | Regeneration avoidance operation level | 300 to 800V | 0.1V | 380/760VDC *5 | 72 | |
| | 884 | Regeneration avoidance at deceleration detection sensitivity | 0 to 5 | 1 | 0 | 72 | |
| | 886 | Regeneration avoidance voltage gain | 0 to 200% | 0.1% | 100% | 72 | |
| Free parameters | 888 | Free parameter 1 | 0 to 9999 | 1 | 9999 | 73 | |
| | 889 | Free parameter 2 | 0 to 9999 | 1 | 9999 | 73 | |
| Energy saving monitor | 891 | Cumulative power monitor digit shifted times | 0 to 4, 9999 | 1 | 9999 | 48 | |
| | 892 | Load factor | 30 to 150% | 0.1% | 100% | 73 | |
| | 893 | Energy saving monitor reference (motor capacity) | 0.1 to 55/0 to 3600kW *2 | 0.01/ 0.1kW *2 | Inverter rated capacity | 73 | |
| | 894 | Control selection during commercial power-supply operation | 0, 1, 2, 3 | 1 | 0 | 73 | |
| | 895 | Power saving rate reference value | 0, 1, 9999 | 1 | 9999 | 73 | |
| | 896 | Power unit cost | 0 to 500, 9999 | 0.01 | 9999 | 73 | |
| | 897 | Power saving monitor average time | 0,1 to 1000h, 9999 | 1 | 9999 | 73 | |
| | 898 | Power saving cumulative monitor clear | 0, 1, 10, 9999 | 1 | 9999 | 73 | |
| | 899 | Operation time rate (estimated value) | 0 to 100%, 9999 | 0.1% | 9999 | 73 | |

| Func-tion | Parameter | Name | Setting Range | Minimum Setting Increments | Initial Value | Refer to Page | Customer Setting |
|---|---|---|---|---|---|---|---|
| Calibration parameters | C0 (900) | FM terminal calibration | — | — | — | 73 | |
| | C1 (901) | AM terminal calibration | — | — | — | 73 | |
| | C2 (902) | Terminal 2 frequency setting bias frequency | 0 to 400Hz | 0.01Hz | 0Hz | 57 | |
| | C3 (902) | Terminal 2 frequency setting bias | 0 to 300% | 0.1% | 0% | 57 | |
| | 125 (903) | Terminal 2 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 57 | |
| | C4 (903) | Terminal 2 frequency setting gain | 0 to 300% | 0.1% | 100% | 57 | |
| | C5 (904) | Terminal 4 frequency setting bias frequency | 0 to 400Hz | 0.01Hz | 0Hz | 57 | |
| | C6 (904) | Terminal 4 frequency setting bias | 0 to 300% | 0.1% | 20% | 57 | |
| | 126 (905) | Terminal 4 frequency setting gain frequency | 0 to 400Hz | 0.01Hz | 60Hz | 57 | |
| | C7 (905) | Terminal 4 frequency setting gain | 0 to 300% | 0.1% | 100% | 57 | |
| Calibration parameters | C12 (917) | Terminal 1 bias frequency (speed) | 0 to 400Hz | 0.01Hz | 0Hz | 57 | |
| | C13 (917) | Terminal 1 bias frequency (speed) | 0 to 300% | 0.1% | 0% | 57 | |
| | C14 (918) | Terminal 1 gain frequency (speed) | 0 to 400Hz | 0.01Hz | 60Hz | 57 | |
| | C15 (918) | Terminal 1 gain (speed) | 0 to 300% | 0.1% | 100% | 57 | |
| | C16 (919) | Terminal 1 bias command (torque/ magnetic flux) | 0 to 400% | 0.1% | 0% | 57 | |
| | C17 (919) | Terminal 1 bias (torque/magnetic flux) | 0 to 300% | 0.1% | 0% | 57 | |
| | C18 (920) | Terminal 1 gain command (torque/ magnetic flux) | 0 to 400% | 0.1% | 100% | 57 | |
| | C19 (920) | Terminal 1 gain (torque/magnetic flux) | 0 to 300% | 0.1% | 100% | 57 | |
| | C38 (932) | Terminal 4 bias command (torque/ magnetic flux) | 0 to 400% | 0.1% | 0% | 57 | |
| | C39 (932) | Terminal 4 bias (torque/magnetic flux) | 0 to 300% | 0.1% | 20% | 57 | |
| | C40 (933) | Terminal 4 gain command (torque/ magnetic flux) | 0 to 400% | 0.1% | 100% | 57 | |
| | C41 (933) | Terminal 4 gain (torque/magnetic flux) | 0 to 300% | 0.1% | 100% | 57 | |
| — | 989 | Parameter copy alarm release | 10/100 | 1 | 10/100 *2 | | |
| PU | 990 | PU buzzer control | 0, 1 | 1 | 1 | 74 | |
| | 991 | PU contrast adjustment | 0 to 63 | 1 | 58 | 74 | |
| Clear parameters | Pr. CL | Parameter clear | 0, 1 | 1 | 0 | 74 | |
| | ALLC | All parameter clear | 0, 1 | 1 | 0 | 74 | |
| | Er.CL | Alarm history clear | 0, 1 | 1 | 0 | 74 | |
| | PCPY | Parameter copy | 0, 1, 2, 3 | 1 | 0 | 74 | |

*1 Differ according to capacities. (0.4K, 0.75K/1.5K to 3.7K/5.5K, 7.5K/11K to 55K/75K or more)
*2 Differ according to capacities. (55K or less/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)
*5 Differs according to the voltage class. (200V class/400V class)
*6 Setting can be made only when the FR-A7AP is mounted.

The abbreviations in the explanations below are as follows: V/F ...V/F control, Magnetic flux ...advanced magnetic flux vector control, Sensorless ...real sensorless vector control, Vector ...vector control

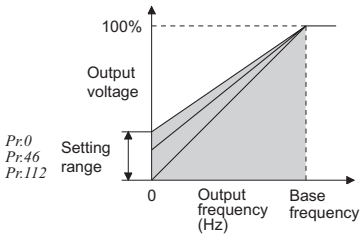
(Parameters without any indication are valid for all control)

## Pr. 0, 46, 112
## Manual torque boost V/F

*Pr.0 Torque boost*
*Pr.112 Third torque boost*
*Pr.46 Second torque boost*

A voltage drop in the low-frequency region can be compensated to improve the motor torque reduction in the low speed range.

- Motor torque in the low-frequency range can be adjusted to the load to increase the starting motor torque.
- Three kinds of starting torque boost can be switched by using terminal RT and X9 signal.
- This function is valid for V/F control only.




| *Pr.0* Initial Value | | When Using the Constant Torque Motor |
|---|---|---|
| 0.4K, 0.75K | 6% | ← |
| 1.5K to 3.7K | 4% | ← |
| 5.5K, 7.5K | 3% | 2%* |
| 11K to 55K | 2% | ← |
| 75K or more | 1% | ← |

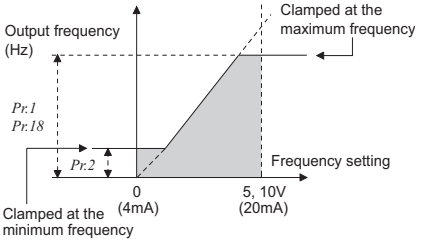
* If the *Pr.71* initial value is changed to the setting for use with a constant-torque motor, the *Pr.0* setting changes to the corresponding value in the above table.

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

*Pr.1 Maximum frequency*
*Pr.18 High speed maximum frequency*
*Pr.2 Minimum frequency*

Motor speed can be limitted.

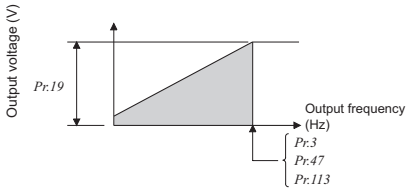
- Clamp the upper and lower limits of the output frequency.
- To perform operation above 120Hz (60Hz for the75K or more), set the maximum output frequency in *Pr.18*.
  (When *Pr.18* is set, *Pr.1* is automatically changed to the frequency set in *Pr.18*. Also, when *Pr.1* is set, *Pr.18* is automatically changed to the frequency set in *Pr.1*.
- *Pr.18* is valid only under V/F control and advanced magnetic flux vector control.
- The maximum frequency is valid for the speed command obtained from the droop pulses during position control under vector control. The minimum frequency is invalid.




## Pr. 3, 19, 47, 113
## Base frequency, voltage V/F

*Pr.3 Base frequency*
*Pr.47 Second V/F (base frequency)*
*Pr.19 Base frequency voltage*
*Pr.113 Third V/F (base frequency)*

- Used to adjust the inverter outputs (voltage, frequency) to the motor rating.
- When running a standard motor, generally set the rated frequency of the motor in *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, etc., use the *Pr.47 Second V/F (base frequency)* and *Pr.113 Third V/F (base frequency)* .
- Use *Pr.19 Base frequency voltage* to set the base voltage (e.g. rated motor voltage).
- This function is valid for V/F control only.

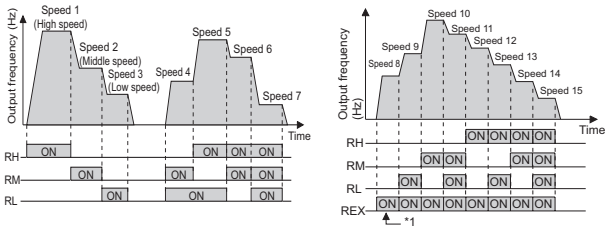



## Pr. 4 to 6, 24 to 27, 232 to 239
## Multi-speed setting operation

*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 input compensation selection*
*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 4 speed to 15 speed can be set according to the combination of the RH, RM, RL and REX signals. Set the running frequencies in *Pr.24 to Pr.27, Pr.232 to Pr.239* (In the initial value setting, speed 4 to speed 15 are unavailable)



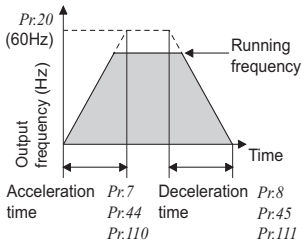

*1 When "9999" is set in *Pr.232 Multi-speed setting (speed 8)*, operation is performed at frequency set in *Pr.6* when RH, RM and RL are turned off and REX is turned on.

## Pr. 7, 8, 20, 21, 44, 45, 110, 111
## 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* |
| *Pr.110 Third acceleration/deceleration time* | *Pr.111 Third 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 taken to reach *Pr. 20 Acceleration/deceleration reference frequency* from 0Hz.
- Use *Pr.8 Deceleration time* to set the deceleration time taken to reach 0Hz from *Pr.20 Acceleration/deceleration reference frequency*.




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

## Pr. 9, 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 thermal relay function to protect the motor from overheat. This feature provides the optimum protective characteristics, including reduced motor cooling capability, at low speed.

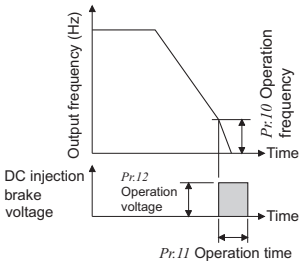
- Used to detect the motor overload (overheat) and stop the inverter output transistor operation to stop the output.
- Set the rated current [A] of the motor in *Pr.9*.
  (When the power supply specification is 200V/220V(400V/440V) 60Hz, set the 1.1 times the rated motor current.)
- Set "0" in *Pr.9* to make the electronic thermal relay function invalid when using a motor with an external thermal relay, etc. (Note that the output transistor protection of the inverter functions (E.THT).)
- When using a Mitsubishi constant-torque motor
  1) Set any of "1, 13 to 18, 50, 53, 54" in *Pr.71*. (This provides a 100% continuous torque characteristic in the low-speed range.)
  2) Set the rated current of the motor in *Pr.9*.
- When the RT signal is on, thermal protection is provided based on the *Pr.51* setting.
  Use this function when running two motors of different rated currents individually by a single inverter. (When running two motors together, use external thermal relays.)

## Pr. 10 to 12, 802, 850
## DC injection brake, zero speed control, servo lock

| | |
|---|---|
| *Pr.10 DC injection brake operation frequency* | *Pr.11 DC injection brake operation time* |
| *Pr.12 DC injection brake operation voltage* | *Pr.802 Pre-excitation selection* |
| *Pr.850 Brake operation selection* | |

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

- When "8888" is set in *Pr. 11*, DC brake is applied while X13 signal is on.
- *Pr.12* is valid only under V/F control and advanced magnetic flux vector control.




| *Pr.12* Initial Value | | When Using the Mitsubishi Constant Torque Motor | When Using the Energy Saving Motor |
|---|---|---|---|
| 3.7K or less | 4% | ← | ← |
| 5.5K, 7.5K | 4% | 2%* | 3% |
| 11K to 55K | 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.

- DC brake (setting "0", initial value) and zero speed control (setting "1") can be selected using *Pr.850* under real sensorless vector control.
- This function selects either zero speed control or servo lock for braking operation when pre-excitation is performed with the LX signal during speed control operation under vector control. Turning on the LX signal enables the pre-excitation function.

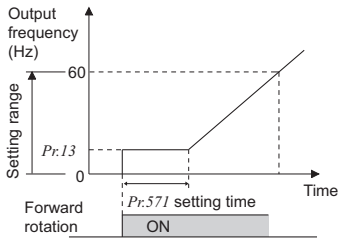
| *Pr.802* Setting | Braking Operation | Description |
|---|---|---|
| 0 (initial value) | Zero speed control | Even under load, an attempt is made to maintain 0r/min to keep the motor shaft stopped.<br>Note that if the shaft is overcome and turned by external force, it does not return to the original position. |
| 1 | Servo lock | Even under load, an attempt is made to maintain the motor shaft position.<br>Note that if the shaft is turned by external force, it returns to the original position after the external force has gone away. |

- Set the frequency at which control changes to zero speed control or servo lock control (select using *Pr.802* ) in *Pr.10* and operation time in *Pr.11* during vector control.
  The initial value of *Pr.10* automatically changes to 0.5Hz during vector control.

## 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.





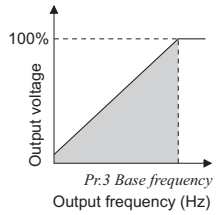

When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 14
## V/F pattern matching applications V/F

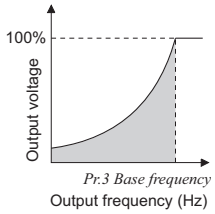
*Pr.14 Load pattern selection*

You can select the optimum output characteristic (V/F characteristic) for the application and load characteristics.
This function is valid for V/F control only.

**Setting "0" (initial value) setting "4, 5", RT signal is on For rated torque load**

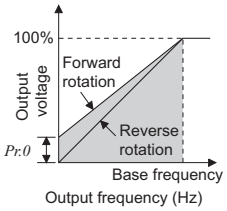



**Setting "1" For variable-torque load**



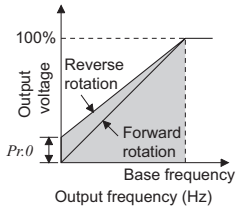

**Setting "2" setting "4", RT signal is off For elevator loads**

At forward rotation boost...*Pr.0* setting
At reverse rotation boost...0%




**Setting "3" setting "5", RT signal is off For elevator loads**

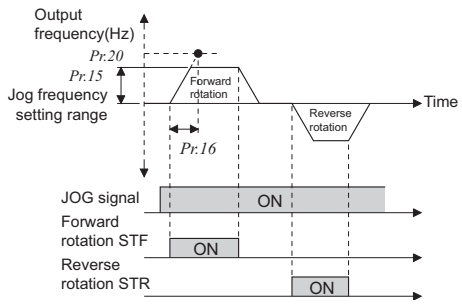
At forward rotation boost...0%
At reverse rotation boost...*Pr.0* setting




## Pr. 15, 16
## Jog operation

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

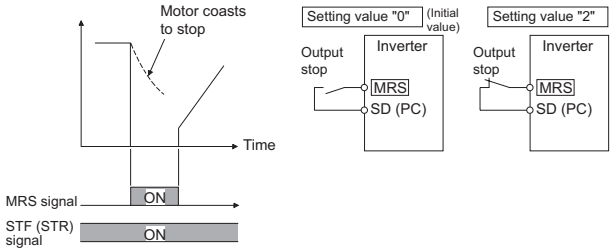
You can set the frequency and acceleration/deceleration time for jog operation. Jog operation can be performed from either the outside or PU.
Can be used for conveyor positioning, test operation, etc.




## 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. Also, logic for the MRS signal can be selected.




**Pr. 18** Refer to the section about *Pr. 1*.

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

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

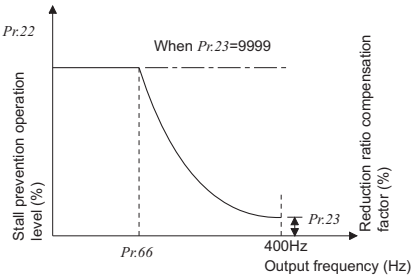
## Pr. 22, 23, 48, 49, 66, 114, 115, 148, 149, 154, 156, 157, 858, 868
## Stall prevention operation V/F Magnetic flux

| | |
|---|---|
| *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.114 Third stall prevention operation current* | *Pr.115 Thrid stall prevention operation 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* |
| *Pr.858 Terminal 4 function assignment* | *Pr.868 Terminal 1 function assignment* |

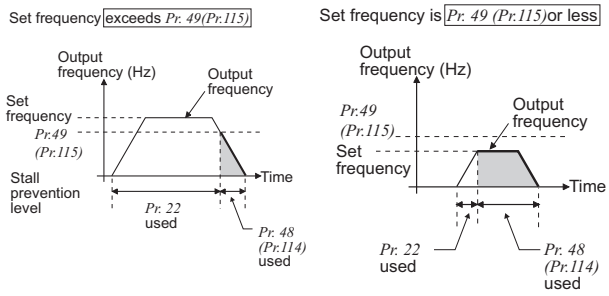
This function monitors the output current and automatically changes the output frequency to prevent the inverter from coming to an alarm stop due to overcurrent, overvoltage, etc. It can also limit stall prevention and fast-response current limit operation during acceleration/deceleration, driving or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

- Stall prevention
  If the output current exceeds the stall prevention operation level, the output frequency of the inverter is automatically varied to reduce the output current. Also the second and third stall prevention function can restrict the output frequency range in which the stall prevention function is valid.
- 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 percentage of the output current to the rated inverter current at which stall prevention operation will be performed. Normally set this parameter to 150% (initial value).
  For the 3.7kW or less, the *Pr.22* setting changes from 150% (initial value) to 200% when operation is changed from V/F control or advanced magnetic flux vector control to real sensorless vector control or vector control.
- To set stall prevention operation level using an analog signal from terminal 1 (terminal 4) , set "4" in *Pr.868 (Pr. 858)*. 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 executed even 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 range. This function is effective for performing operation up to the high-speed range 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.
- Setting a value other than "0" in *Pr.115 Thrid stall prevention operation frequency* and turning the X9 signal on make *Pr.114 Third stall prevention operation current* valid.
- The stall prevention operation level from 0Hz to the output frequency set in *Pr.49 (Pr.115)* can be set in *Pr. 48 (Pr.114)*.




| *Pr.49* Setting | *Pr.115* Setting | Operation |
|---|---|---|
| 0 (initial value) | | The second (third) stall prevention function is not activated. |
| 0.01Hz to 400Hz | | The second (third) stall prevention function is activated according to the frequency. |
| 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 limit function can be limitted according to the operation condition using *Pr.156*.
- When real sensorless vector control is selected using *Pr.800*, *Pr.22* serves as a torque limit level.

## Pr. 22, 803, 810 to 817, 858, 868, 874

## Torque limit level Sensorless Vector

*Pr.22 Torque limit level*
*Pr.803 Constant power range torque characteristic selection*
*Pr.810 Torque limit input method selection*
*Pr.811 Set resolution switchover*
*Pr.812 Torque limit level (regeneration)*
*Pr. 813 Torque limit level (3rd quadrant)*
*Pr.814 Torque limit level (4th quadrant)*
*Pr.815 Torque limit level 2*
*Pr.816 Torque limit level during acceleration*
*Pr.817 Torque limit level during deceleration*
*Pr.858 Terminal 4 function assignment*
*Pr.868 Terminal 1 function assignment*
*Pr.874 OLT level setting*

This function limits the output torque to the predetermined value during speed control under real sensorless vector control or vector control.

- Set the torque limit level within the range 0 to 400% in *Pr.22* .
  If the TL signal is turned on, torque limit level 2 *(Pr.815)* functions.
- You can select whether the torque limit level is set using parameters or analog input teminals (terminal 1, 4).
  In addition, you can set torque limit level for forward (power driving/regeneration) and reverse (power driving/regeneration) operation individually.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 810 | 0 (initial value) | Torque limit by parameter |
| | 1 | Torque limit based on the analog input from terminal 1 and 4. |
| 812 | 0 to 400% | Set the torque limit level for forward rotation regeneration. |
| | 9999 (initial value) | *Pr.22* value is used for limit. |
| 813 | 0 to 400% | Set the torque limit level for reverse rotation driving. |
| | 9999 (initial value) | *Pr.22* value is used for limit. |
| 814 | 0 to 400% | Set the torque limit level for reverse rotation regeneration. |
| | 9999 (initial value) | *Pr.22* value is used for limit. |

- To set torque limit level using an analog signal from terminal 1 (terminal 4) , set "1" in *Pr.810* and "4" in *Pr.868 (Pr.858)*.
- Torque limit value during acceleration/deceleration can be set using *Pr.816* and *Pr.817*.
- You can select whether the torque limit in the constant output range be constant torque limit or constant output limit using *Pr.803*.
- This function can make an alarm stop if the torque limit is activated to stall the motor. Set the output torque at which an alarm stop is made in *Pr.874* .
- Using *Pr.811*, the setting increments of the parameter-set torque limit can be changed from 0.1% to 0.01% increments. (valid during vector control)
- When V/F control and advanced magnetic flux vector control are selected using *Pr.800* , *Pr.22* serves as a stall prevention operation level.

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

## 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), speed (frequency) compensation can be applied for the speed setting such as the multi-speed setting and remote setting function.

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



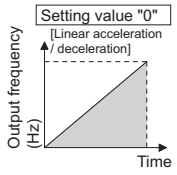
When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 29, 140 to 143, 380 to 383, 516 to 519

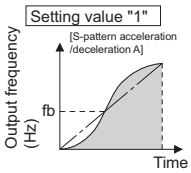
### Acceleration/deceleration pattern and backlash measures

*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*
*Pr.380 Acceleration S-pattern 1*
*Pr.381 Deceleration S-pattern 1*
*Pr.382 Acceleration S-pattern 2*
*Pr.383 Deceleration S-pattern 2*
*Pr.516 S-pattern time at a start of acceleration*
*Pr.517 S-pattern time at a completion of acceleration*
*Pr.518 S-pattern time at a start of deceleraiton*
*Pr.519 S-pattern time at a completion of deceleraiton*

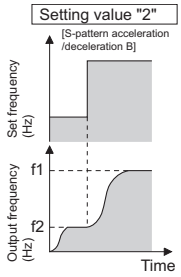
Acceleration/deceleration patterns suitable for applications can be selected.
The backlash measures to stop acceleration/deceleration at the frequency and time set in parameter during acceleration/deceleration can be set.



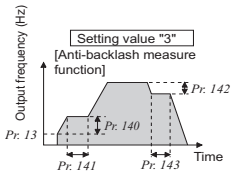

- Linear acceleration/deceleration (setting "0", initial value)
  - For the inverter operation, the output frequency is made to change linearly (linear acceleration/deceleration) to prevent the motor and inverter from excessive stress to reach the set frequency during acceleration, deceleration, etc. when frequency changes.




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

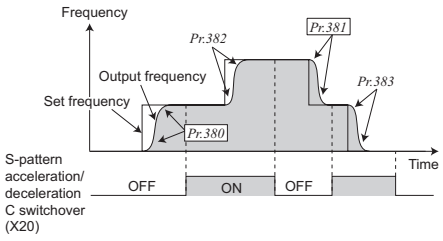



- S-pattern acceleration/deceleration B (setting "2")
  - For prevention of load shifting in conveyor and other applications.
    Since acceleration/deceleration is always made in an S shape from current frequency (f2) to target frequency (f1), this function eases shock produced at acceleration/deceleration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

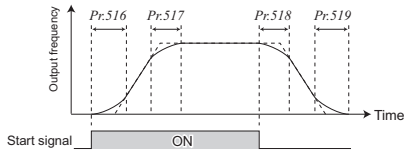



- Backlash measures (setting "3", *Pr.140 to Pr.143* )
  - To avoid backlash, acceleration/deceleration is temporarily stopped. Set the acceleration/deceleration stopping frequency and time in *Pr.140 to Pr.143*.

- S-pattern acceleration/deceleration C (setting "4", *Pr.380 to Pr.383*)
  - The S-pattern acceleration/deceleration C switch signal (X20) changes an acceleration/deceleration curve.
  - Set % of time taken for forming an S-pattern in Pr.380 to Pr.383 as acceleration time is 100%..




- S-pattern acceleration/deceleration D (setting "5", *Pr.516 to Pr.519*)
  - Set the time taken for operations for S-pattern of S-pattern acceleration/deceleration in *Pr.516 to Pr. 519* .




## Pr. 30, 70

### Selection of regeneration unit

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

- When making frequent starts/stops, use the optional "high-duty brake resistor (FR-ABR)" to increase the regenerative brake duty. (22K or less)
- Use the power regeneration common converter (FR-CV for the 55K or less) or power regeneration converter (MT-RC 75K or more) for continuous operation in regeneration status.
  Use a high efficiency converter (FR-HC for the 55K or less, MT-HC for the 75K or more) for harmonic suppression and power factor improvement.
- 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.
- You can select either DC feeding mode 1 in which operation is performed with DC power (terminal P, N) or DC feeding mode 2 in which operation is performed normally with the AC power (R, S, T) and performed with DC power such as battery at occurrence of power failure.

<55K or less>

| *Pr.30* Setting | *Pr.70* Setting | Regeneration Unit | Power Supply |
|---|---|---|---|
| 0 (initial value) | *1 | Built-in brake, brake unit (FR-BU, BU) | R, S, T |
| 1 | 10/6% *2 | High-duty brake resistor (FR-ABR) | R, S, T |
| 2 | 0% (initial value) | High power factor converter (FR-HC), power regeneration common converter (FR-CV) | P, N |
| 10 | *1 | Built-in brake, brake unit (FR-BU, BU) | P, N |
| 11 | 10/6% *2 | High-duty brake resistor (FR-ABR) | P, N |
| 20 | *1 | Built-in brake, brake unit (FR-BU, BU) | R, S, T/P, N |
| 21 | 10/6% *2 | High-duty brake resistor (FR-ABR) | R, S, T/P, N |

*1 The brake duty varies according to the inverter capacity.
*2 7.5K or less/11K or more

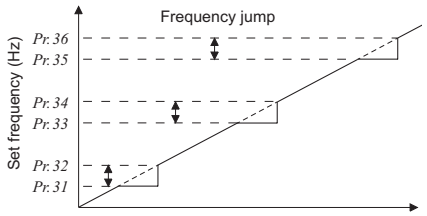
<75K or more>

| *Pr.30* Setting | *Pr.70* Setting | Regeneration Unit | Power Supply |
|---|---|---|---|
| 0 (initial value) | — | Not used | R, S, T |
| 1 | 0% | Power regeneration converter (MT-RC) | R, S, T |
| | 10% | Brake unit (MT-BU5) | |
| 2 | — | High power factor converter (MT-HC) | P, N |
| 10 | — | Not used | P, N |
| 11 | 10% | Brake unit (MT-BU5) | P, N |
| 20 | — | Not used | R, S, T/P, N |
| 21 | 10% | Brake unit (MT-BU5) | R, S, T/P, N |

## 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, 505, 811
## Speed display and speed setting

| | |
|---|---|
| *Pr.37 Speed display* | *Pr.144 Speed setting switchover* |
| *Pr. 505 Speed setting reference* | *Pr. 811 Set resolution switchover* |

The monitor display and frequency setting of the PU (FR-DU07/FR-PU04/FR-PU07) can be changed to the motor speed and 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.)
- Using *Pr.811*, the setting increments of running speed monitor and speed setting (r/min) can be changed from 1r/min to 0.1 r/min.

| *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/*Pr. 505*
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.

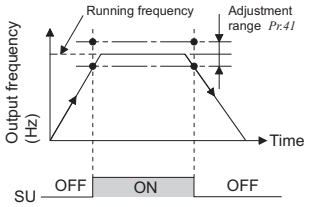
*3 Running speed monitor displays actual motor speed (encoder) during encoder feedback control and vector control.

## Pr. 41 to 43, 50, 116, 865
## Detection of output frequency and motor speed (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)

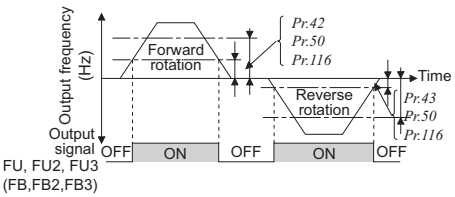
| | |
|---|---|
| *Pr.41 Up-to-frequency sensitivity* | *Pr.42 Output frequency detection* |
| *Pr.43 Output frequency detection for reverse rotation* | *Pr.50 Second output frequency detection* |
| *Pr.116 Third output frequency detection* | *Pr.865 Low speed detection* |

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

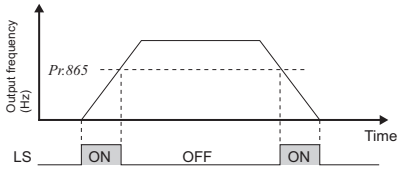
- The *Pr.41* value can be adjusted within the range ±1% and ±100% on the assumption that the set frequency is 100%.
- This parameter can be used to ensure that the running frequency has been reached to provide the operation start signal etc. for related equipment.




- When the output frequency reaches or exceeds the *Pr.42* setting, the output frequency detection signals (FU, FB) are 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 (FB) signal, set the detection frequency in *Pr.50* or *Pr.116*. The FU2 (FB2) signal is output when the output frequency reaches or exceeds the *Pr.50* setting (FU3 (FB3) signal is output if reaches or exceeds the *Pr.116* setting).




- The FU (FU2 and FU3) signal is output when the output frequency reaches the speed command value and output the FB (FB2, FB3) signal when the output frequency reaches the actual motor speed (estimated actual speed value) under real sensoreless vector control and vector control.
  (The output timing of the FU and FB signals is the same under V/F control and advanced magnetic flux vector control.)
- The LS signal is output when the output frequency reduces below the Pr.865 setting under real sensorless vector control and vector control. The signal is output during inverter operation under the following conditions.




**Pr. 44, 45** Refer to the section about *Pr. 7*.
**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*.
**Pr. 50** Refer to the section about *Pr. 41*.
**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 Watt-hour 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.867AM 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/FR-PU07) can be selected.

| Types of Monitor | Unit | *Pr.52* Parameter Setting Value: DU LED | *Pr.52* Parameter Setting Value: PU main monitor | *Pr.54* (FM) *Pr.158* (AM) Setting | Full-Scale Value |
|---|---|---|---|---|---|
| Output frequency | 0.01Hz | 0/100 | | 1 | *Pr.55* |
| Output current | 0.01A/ 0.1A*7 | 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 | The value converted with the *Pr.37* value from *Pr.55*. |
| Motor torque *2 | 0.1% | 7 | *1 | 7 | *Pr.866* |
| Converter output voltage | 0.1V | 8 | *1 | 8 | 200V class: 400V 400V class: 800V |
| Regenerative brake duty | 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*7 | 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*7 | 13 | *1 | 13 | Rated inverter power x 2 |
| Output power | 0.01kW/ 0.1kW*7 | 14 | *1 | 14 | Rated inverter power x 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.866* |
| Motor excitation current | 0.01A/ 0.1A*7 | 18 | | 18 | *Pr.56* |
| Position pulse*3 | — | 19 | | — | — |
| Cumulative energization time*4 | 1h | 20 | | — | — |
| Reference voltage output | — | — | | 21 | — |
| Orientation status *3 | 1 | 22 | | — | — |
| Actual operation time*4, 5 | 1h | 23 | | — | — |
| Motor load factor | 0.1% | 24 | | 24 | 200% |
| Cumulative power | 0.01kWh/ 0.1kWh*6*7 | 25 | | — | — |
| Torque command | 0.1% | 32 | | 32 | *Pr.866* |
| Torque current command | 0.1% | 33 | | 33 | *Pr.866* |
| Motor output | 0.01kW/ 0.1kW*7 | 34 | | 34 | Rated motor capacity |
| Feedback pulse | — | 35 | | — | — |
| 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 | 0.1% | 54 | | — | — |

*1 Selected by the parameter unit (FR-PU04/FR-PU07)
*2 The motor torque display remains "0 " under V/F control.
*3 Position pulse and orientation status function when used with an option (FR-A7AP) and orientation control is made valid. When orientation control is invalid, "0" remains displayed and these functions are invalid.
*4 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, the time is displayed up to 65.53 (65530h) on the assumption that 1h=0.001, and thereafter, it is added up from 0.
*5 The actual operation time is not added up if the cumulative operation time before power supply-off is less than 1h.
*6 When using the parameter unit (FR-PU04/FR-PU07), "kW " is displayed.
*7 The setting depends on the inverter capacity. (55K or less/75K or more)
*8 Available only when the FR-A7AP is mounted.

- The digits of the cumulative power monitor value can be shifted to the right for the number of *Pr.891* settings.
- Writing "0" in *Pr.170* clears the cumulative power monitor.
- 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). 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). 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 running/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, 866

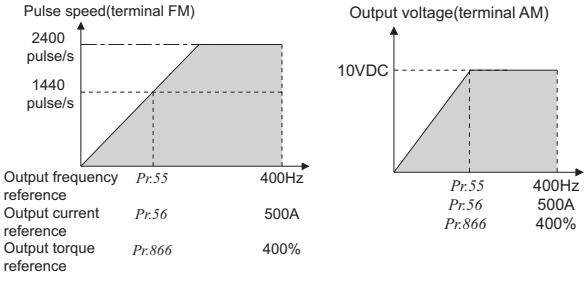
### Reference of the monitor output from terminal FM and AM

*Pr.55 Frequency monitoring reference*
*Pr.56 Current monitoring reference*
*Pr.866 Torque monitoring reference*

Set the full-scale value of the monitor value output from terminal FM and AM.

| Monitor* | Reference Parameter | Initial Value |
|---|---|---|
| Frequency | *Pr.55* | 60Hz |
| Current | *Pr.56* | Rated inverter current |
| Torque | *Pr.866* | 150% |

* Refer to the section about *Pr.52* for monitor names.



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

# Automatic 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*

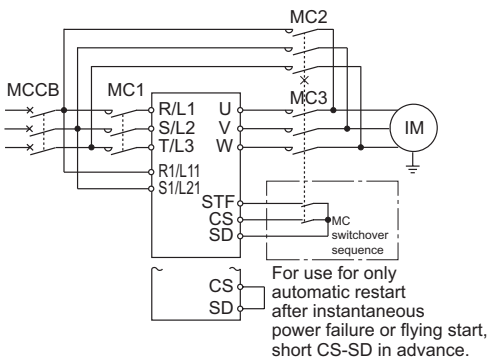
You can restart the inverter without stopping the motor in the following cases:

- 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 to 55K.....3s<br>75K or more.....5s<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<br>(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) |
| | 2 | Encoder detection frequency |
| | 10 | Frequency search at every start |
| | 11 | Reduced voltage system at every start |
| | 12 | Encoder detection frequency at every start |
| 163 | 0 to 20s | Set a voltage starting time at restart. Consider using these parameters according to the load (moment of inertia/ torque) magnitude. |
| 164 | 0 to 100% | |
| 165 | 0 to 220% | 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 a restart. |
| | 9999 | Acceleration time for restart is the normal acceleration time (e.g. *Pr.7*). |

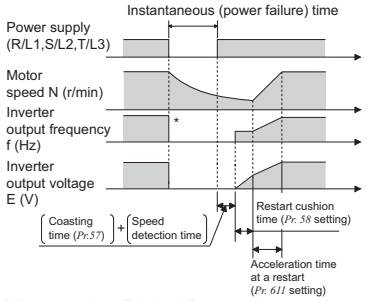
* The setting range depends on the inverter capacity. (55K or less/75K or more)

<Connection diagram>



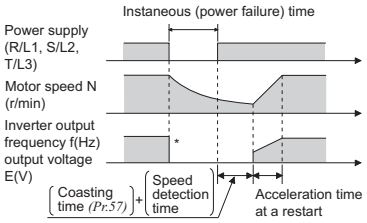

- When " 0 (initial value) or 10 " is set in *Pr.162*, the inverter smoothly starts after detecting the motor speed upon power restoration.
- The motor starts at the motor speed and in the rotation direction detected from the encoder at power restoration when "2 or 12" is set in *Pr.162* under encoder feedback control or vector control. (Valid when the FR-A7AP is fitted)
- 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*.)

V/F control, advanced magnetic flux vector control




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

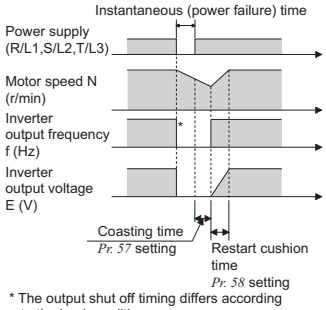
Realsensorless vector control, vector control




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

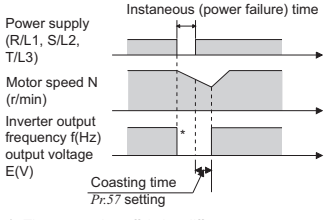
- When *Pr.162*="1" or "11", automatic restart operation is performed in a reduced voltage system, where the voltage is gradually risen with the output frequency unchanged from prior to an instantaneous power failure independently of the coasting speed of the motor.
  For real sensorless vector control, output frequency and voltage before instantaneous power failure are output. (*Pr. 58* is made invalid)

V/F control, advanced magnetic flux vector control




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

Realsensorless vector control




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



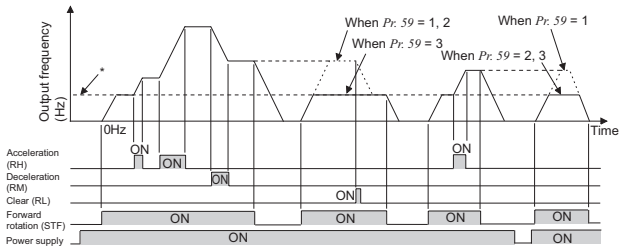
When setting parameters, refer to the instruction manual (applied) and understand instructions.

## 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 | With |
| 2 | Remote setting | Not used |
| 3 | Remote setting | Not used (Turning off STF/STR clears remotely set frequency used) |




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

## Pr. 60
# Energy saving control selection

V/F Magnetic flux

*Pr.60 Energy saving control selection*

Without a fine parameter setting, the inverter automatically performs energy saving operation.
This inverter is optimum for fan and pump applications
Valid only under V/F control and advanced magnetic flux vector control.

| *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. |

## Pr. 61 to 64, 292, 293
# Automatic acceleration/deceleration

*Pr.61 Reference current*
*Pr.62 Reference value at acceleration*
*Pr.63 Reference value at deceleration*
*Pr.64 Starting frequency for elevator mode*
*Pr.292 Automatic acceleration/deceleration*
*Pr.293 Acceleration/deceleration individual operation selection*

The inverter automatically sets appropriate parameters for operation.

- The inverter operates in the same conditions as when appropriate values are set in each parameter even if acceleration/deceleration time and V/F pattern are not set. This operation mode is useful when you just want to operate, etc. without fine parameter setting.
- Even if automatic acceleration/deceleration has been selected, inputting the jog, RT (second function selection) or X9 (third function selection) signal during an inverter stop will switch to the normal operation and give priority to jog operation, second function selection or third function selection.
  After automatic acceleration/deceleration operation has been started, none of jog signal, RT signal and RT signal are accepted.

| *Pr.292* Setting | Operation | | Automatic Setting Parameter |
|---|---|---|---|
| 0 (initial value normal mode) | — | | — |
| 1 (shortest acceleration/ deceleration mode) | Without brake resistor and brake unit | Set when you want to accelerate/decelerate the motor for the shortest time. (stall prevention operation level 150%) | *Pr.7, Pr.8* |
| 11 (shortest acceleration/ deceleration mode) | With brake resistor and brake unit | | |
| 3 (optimum acceleration/ deceleration mode) | The inverter performs optimum operation fully utilizes its' capability within the continuous rating range. | | *Pr.0, Pr.7, Pr.8* |
| 5 (elevator mode 1) | Stall prevention operation level 150% | Inverter output voltage is controlled so that enough torque can be generated even under power driving and regeneration. | *Pr.0, Pr.13, Pr.19* |
| 6 (elevator mode 2) | Stall prevention operation level 180% | | |
| 7 (brake sequence mode 1) | With mechanical brake opening completion signal input | Operation mode in which a machine brake operation timing signal for vertical lift applications is output. | — |
| 8 (brake sequence mode 2) | Without mechanical brake opening completion signal input | | |

- Use *Pr.61 to Pr.63* to change the reference current for the shortest acceleraiton/deceleration mode and optimum acceleraiton/ deceleration mode.
- Use *Pr.64* to set the starting frequency for the elevator mode.
- Calculation of acceleration/deceleration can be performed individually.
  This function is made valid in the shortest acceleration/deceleraion mode and optimum acceleration/deceleration mode.

| *Pr.293* Setting | Description |
|---|---|
| 0 (initial value) | Both acceleraion/deceleration time is calculated. |
| 1 | Only acceleration time is calcurated. |
| 2 | Only deceleration time is calcurated. |

## 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 automatic restart after instantaneous power failure is selected (*Pr.57 Restart coasting time* ≠9999), 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.OP2 | ● | | | | ● | |
| E.OP3 | ● | | | | ● | |
| E. PE | ● | | | | ● | |
| E.MB1 | ● | | | | ● | |
| E.MB2 | ● | | | | ● | |
| E.MB3 | ● | | | | ● | |
| E.MB4 | ● | | | | ● | |
| E.MB5 | ● | | | | ● | |
| E.MB6 | ● | | | | ● | |
| E.MB7 | ● | | | | ● | |
| E.OS | ● | | | | ● | |
| E.OSD | ● | | | | ● | |
| E.OD | ● | | | | ● | |
| 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. An alarm output is not provided during retry operation. |
| 101 to 110 | Set the number of retries at alarm occurrence. (The setting value of minus 100 is the number of retries.) 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*.**
**Pr. 67 to 69 Refer to the section about *Pr. 65*.**
**Pr. 70 Refer to the section about *Pr. 30*.**

## Pr. 71, 450
# Motor selection (applied motor)

*Pr.71 Applied motor*
*Pr.450 Second 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, Pr.450* Setting | Thermal Characteristic of the Electronic Thermal Relay Function | | Motor (○: Motor used) | | |
|---|---|---|---|---|---|
| | | | Standard (SF-JR, etc.) | Constant torque (SF-JRCA, etc.) | Vector (SF-V5RU, etc.) |
| 0 | Thermal characteristics of a standard motor (*Pr. 71* initial value) | | ○ | | |
| 1 | Thermal characteristics of the Mitsubishi constant-torque motor | | | ○ | |
| 2 | Thermal characteristics of a standard motor Adjustable 5 points V/F | | ○ | | |
| 20 | Mitsubishi standard motor SF-JR4P (1.5kW or less) thermal characteristic for the constant-torque motor | | ○ | | |
| 30 | Thermal characteristics of the Mitsubishi vector motor SF-V5RU | | | | ○ |
| 40 | Thermal characteristic of Mitsubishi standard motor SF-HR | | ○*1 | | |
| 50 | Thermal characteristic of Mitsubishi constant-torque motor SF-HRCA | | | ○*2 | |
| 3 | Standard | Select "offline auto tuning setting" | ○ | | |
| 13 | Constant-torque | | | ○ | |
| 23 | Mitsubishi standard SF-JR4P (1.5kW or less) | | ○ | | |
| 33 | Mitsubishi vector SF-V5RU/SF-THY | | | | ○ |
| 43 | Mitsubishi high efficiency SF-HR | | ○*1 | | |
| 53 | Mitsubishi constant-torque SF-HRCA | | | ○*2 | |
| 4 | Standard | Auto tuning data can be read, changed, and set | ○ | | |
| 14 | Constant-torque | | | ○ | |
| 24 | Mitsubishi standard SF-JR4P (1.5kW or less) | | ○ | | |
| 34 | Mitsubishi vector SF-V5RU/SF-THY | | | | ○ |
| 44 | Mitsubishi high efficiency SF-HR | | ○*1 | | |
| 54 | Mitsubishi constant-torque SF-HRCA | | | ○*2 | |
| 5 | Standard *3 | Direct input of motor constants is enabled | ○ | | |
| 15 | Constant-torque *3 | | | ○ | |
| 6 | Standard *4 | | ○ | | |
| 16 | Constant-torque *4 | | | ○ | |
| 7 | Standard *3 | Motor constants direct input + offline auto tuning | ○ | | |
| 17 | Constant-torque *3 | | | ○ | |
| 8 | Standard *4 | | ○ | | |
| 18 | Constant-torque *4 | | | ○ | |
| 9999 | Function invalid (only *Pr.450* can be set, initial value) | | | | |

*1 Motor constants of Mitsubishi high efficiency motor SF-HR
*2 Motor constants of Mitsubishi constant-torque motor SF-HRCA.
*3 Star connection
*4 Delta connection

- 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* and *Pr.450* settings as follows.

| *Pr.71 Pr.450* | Standard Motor Setting 0, 2, 3 to 8, 20, 23, 24, 40, 43, 44 | Constant-Torque Motor Setting 1, 13 to 18, 50, 53, 54 |
|---|---|---|
| *Pr.0* | 3% | 2% |
| *Pr.12* | 4% | 2% |

## Pr. 72, 240
## Carrier frequency and SoftPWM selection

*Pr.72 PWM frequency selection* | *Pr.240 Soft-PWM operation selection*

You can change the motor sound.

| Pr.Number | Setting Range | Description |
|---|---|---|
| 72 | 0 to 15/ 0 to 6, 25* | Note that 0 indicates 0.7kHz, 15 indicates 14.5kHz and 25 indicates 2.5kHz. (Set 25 when using an optional sine wave filter.) The following settings are for real sensorless vector control or vector control. 0 to 5: 2kHz, 6 to 9: 6kHz, 10 to 13: 10kHz, 14 and 15: 14kHz |
| 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 |

* The setting range depends on the inverter capacity. (55K or less/75K or more)

## Pr. 73, 242, 243, 252, 253, 267
## Analog input selection

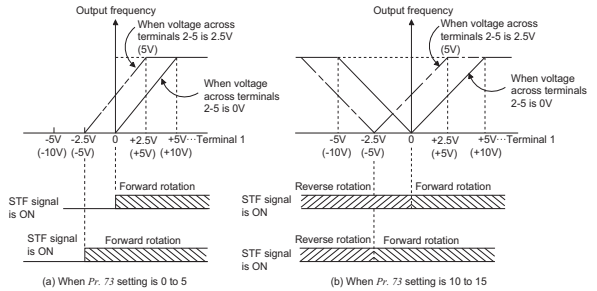
*Pr.73 Analog input selection*
*Pr.242 Terminal 1 added compensation amount (terminal 2)*
*Pr.243 Terminal 1 added compensation amount (terminal 4)*
*Pr.252 Override bias* | *Pr.253 Override gain*
*Pr.267 Terminal 4 input selection*

- You can select the function that switches between forward rotation and reverse rotation according to the analog input terminal specifications, override function and input signal polarity.
- 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 | | | |
| 0 | × | 0 to ±10V | When the AU signal is on According to the *Pr.267* setting 0:4 to 20mA (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)*

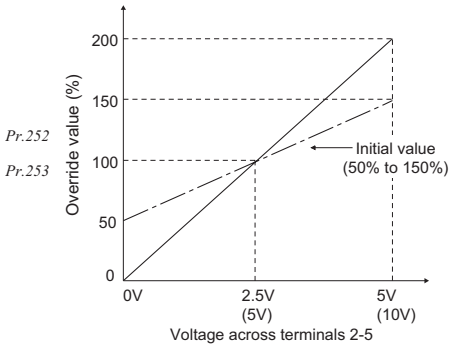
- The compensation signal can be added to the main speed setting for synchronous/continuous speed control operation, etc.




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

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

- When an override is selected, the terminal 1 or terminal 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 made invalid.)




- When "4" is set in *Pr.868 (Pr.865)* , the setting of terminal 1 (terminal 4) is used for stall prevention operation level setting.

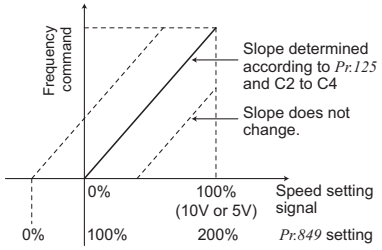
## Pr. 74, 822, 826, 832, 836, 849
## Response level of analog input

*Pr.74 Input filter time constant*
*Pr.822 Speed setting filter 1*
*Pr.826 Torque setting filter 1*
*Pr.832 Speed setting filter 2*
*Pr.836 Torque setting filter 2*
*Pr.849 Analog input offset adjustment*

- The time constant of the primary delay filter relative to external frequency command (analog input (terminal 1, 2, 4) signal) can be set.
  - Effective for filtering noise in 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.)
  - Set the time constant of the primary delay filter relative to the external speed command (analog input command) using *Pr.822* and *Pr.832* .
    Set a large time constant when you want to delay the tracking of the speed command, when the analog input voltage fluctuates, etc.
  - Set the time constant of the primary delay filter relative to the external torque command (analog input command) using *Pr.826 and Pr.836* .
    Set a large time constant value when you want to delay the tracking of the torque command, when the analog input voltage fluctuates, etc.
  - *Pr.832 Speed setting filter 2* and *Pr.836 Torque setting filter 2* are valid when a value other than "9999" is set and the RT signal is on.
- Setting *Pr.849* provides frequency command by analog input (terminal 2) with offset and avoids frequency command to be given due to noise under 0 speed command.

· On the assumption that the *Pr.849* setting 100% as 0, the offset voltage is offset as follows:
100%<*Pr.849*...positive side
100%>*Pr.849*...negative side
The offset voltage is found by the following formula.

$$\text{Offset voltage} = \frac{\text{Voltage at 100\%}}{\text{(according to the } Pr.73 \text{ setting)}} \times \frac{Pr.849 - 100}{100} \text{ [V]}$$




## 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/FR-PU04/FR-PU07) 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/FR-PU07) 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 table below)* |
| 2 | Alarm code output at alarm occurrence only *(refer to the table below)* |

- 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.OP3 | 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 |



When setting parameters, refer to the instruction manual (applied) and understand instructions.

# Pr. 79, 340
# Operation mode selection

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

- Used to select the operation mode of the inverter.
  Mode can be changed as desired between operation using external signals (external operation), operation from the PU (FR-DU07/FR-PU07/FR-PU04), combined operation 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.)<br>External operation mode at power-on. | External operation mode<br>PU EXT NET<br>PU operation mode<br>PU EXT NET |
| 1 | Fixed to PU operation mode | PU EXT NET |
| 2 | Fixed to external operation mode<br>Operation can be performed by switching between the external and Net operation mode. | External operation mode<br>PU EXT NET<br>NET operation mode<br>PU EXT NET |
| 3 | External/PU combined operation mode 1<br>Running frequency: Start signal<br>PU (FR-DU07/FR-PU04/**FR-PU07**) setting or external signal input (multi-speed setting, across terminals 4-5 (valid when AU signal turns on)).: External signal input (terminal STF, STR) | PU EXT NET |
| 4 | External/PU combined operation mode 2<br>Running frequency: Start signal<br>External signal input (terminal 2, 4, 1, JOG, multi-speed selection, etc.): Input from the PU (FR-DU07/FR-PU04/FR-PU07) (FWD, REV) | |
| 6 | Switchover mode<br>Switch among PU operation, external operation, and NET operation while keeping the same operation status. | PU operation mode<br>PU EXT NET<br>External operation mode<br>PU EXT NET<br>NET operation mode<br>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<br>PU EXT NET<br>External operation mode<br>PU EXT NET |

- Specify the 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 | Switching among the external, PU, and NET operation mode is enabled *2 |
| | 1 | PU operation mode | Fixed to PU operation mode |
| | 2 | NET operation mode | Switching between the PU and Net operation mode is enabled<br>Switching to PU operation mode is disabled |
| | 3, 4 | External/PU combined operation mode | Operation mode switching is disabled |
| | 6 | NET operation mode | Switching among the external, PU, and NET operation mode is enabled while running. |
| | 7 | X12 (MRS)signal ON .....NET operation mode | Switching among the external, PU, and NET operation mode is enabled *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 | Switching between the PU and NET operation mode is enabled *3 |
| | 1 | PU operation mode | Fixed to PU operation mode |
| | 2 | NET operation mode | Fixed to NET operation mode |
| | 3, 4 | External/PU combined operation mode | Operation mode switching is disabled |
| | 6 | NET operation mode | Switching between the PU and NET operation mode is enabled while running *3 |
| | 7 | External operation mode | Fixed to external operation mode (Forcibly switched to external operation mode.) |

*1 The *Pr.340* settings "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, 81, 89, 451, 453, 454, 569, 800

# Selection of control method and control mode

Magnetic flux | Sensorless | Vector

| | |
|---|---|
| *Pr.80 Motor capacity* | *Pr.81 Number of motor poles* |
| *Pr.89 Speed control gain (magnetic flux vector)* | *Pr.451 Second motor control method selection* |
| *Pr.453 Second motor capacity* | *Pr.454 Number of second motor poles* |
| *Pr.569 Second motor speed control gain* | *Pr.800 Control method selection* |

Advanced magnetic flux vector control can be selected by setting the capacity and the number of motors to be used in *Pr.80* and *Pr.81*. When low speed torque and high accuracy and fast response control are necessary, select real sensorless vector control or vector control using *Pr.800*.

- What is real sensorless vector control?
  This function enables vector control with a general-purpose motor without encoder.
- What is vector control?
  Speed control, torque control and position control can be performed using a motor with encoder. (Plug-in option FR-A7AP is necessary.)

| Parameter Number | Setting Range | Description | |
|---|---|---|---|
| 80<br>453 | 0.4 to 55kW/0 to 3600kW*1 | Set the applied motor capacity. | |
| | 9999 (initial value) | V/F control | |
| 81<br>454 | 2, 4, 6, 8, 10 | Set the number of motor poles. | |
| | 12, 14, 16, 18, 20 | X18 signal*2-ON: V/F control | Set 10 + number of motor poles. |
| | 9999 (initial value) | V/F control | |
| 800<br>451*3 | 0 | Speed control | Vector control (FR-A7AP) |
| | 1 | Torque control | |
| | 2 | MC signal*2-ON:torque<br>MC signal*2-OFF:speed | |
| | 3 | Position control | |
| | 4 | MC signal*2-ON:position<br>MC signal*2-OFF:speed | |
| | 5 | MC signal*2-ON:torque<br>MC signal*2-OFF:position | |
| | 9 | Vector control test operation<br>Test operation of vector control can be performed without connecting a motor. | |
| | 10 | Speed control | Real sensorless vector control |
| | 11 | Torque control | |
| | 12 | MC signal*2-ON:torque<br>MC signal*2-OFF:speed | |
| | 20 (initial value) | V/F control<br>(advanced magnetic flux vector control) | |

*1 The setting depends on the inverter capacity. (55K or less/75K or more)
*2 Use *Pr.178 to Pr.189* to assign the terminals used for the X18 and MC signal.
*3 Only "10 to 12, 20, 9999" can be set in Pr.451.

- The motor speed fluctuation at load fluctuation can be adjusted using *Pr.89 (Pr.569)* .
- Control method of the second motor can be selected using the RT signal.
- The *Pr.22* function is changed according to the *Pr.800* setting (stall prevention operation level/torque limit level).

## Pr. 82 to 84, 90 to 94, 96, 455 to 463, 684, 859, 860

# Offline auto tuning

Magnetic flux | Sensorless | Vector

| | |
|---|---|
| *Pr.82 Motor excitation current* | *Pr.83 Motor rated voltage* |
| *Pr.84 Rated motor frequency* | *Pr.90 Motor constant (R1)* |
| *Pr.91 Motor constant (R2)* | *Pr.92 Motor constant (L1)* |
| *Pr.93 Motor constant (L2)* | *Pr.94 Motor constant (X)* |
| *Pr.96 Auto tuning setting/status* | *Pr.455 Second motor excitation current* |
| *Pr.456 Rated second motor voltage* | *Pr.457 Rated second motor frequency* |
| *Pr.458 Second motor constant (R1)* | *Pr.459 Second motor constant (R2)* |
| *Pr.460 Second motor constant (L1)* | *Pr.461 Second motor constant (L2)* |
| *Pr.462 Second motor constant (X)* | *Pr.463 Second motor auto tuning setting/status* |
| *Pr.684 Tuning data unit switchover* | *Pr.859 Torque current* |
| *Pr.860 Second motor torque current* | |

Offline auto tuning operation for automatic calculation of motor constants can be executed when using advanced magnetic flux vector control, real sensorless vector control and vector control.
Both offline and online tuning are necessary when using real sensorless vector control.

- You can copy the online tuning data (motor constants) to another inverter using the PU (FR-DU07/FR-PU07).
- Even when motors (other manufacturer's motor, SF-JRC, etc.) other than Mitsubishi standard motor (SF-JR SF-HR 0.4kW or more), Mitsubishi constant-torque motor (SF-JRCA SF-HRCA 200V class four-pole 0.4kW to 55kW) and Mitsubishi vector control dedicated motor (SF-V5RU) are used or the wiring length is long, using the offline auto tuning function runs the motor with the optimum operating characteristics.
- Offline auto tuning conditions
  - A motor should be connected.
  - The motor capacity is equall to or one rank lower than the inverter capacity. (note that the capacity is 0.4kW or more)
  - The maximum frequency is 120Hz.
  - A high-slip motor, high-speed motor and special motor cannot be tuned.
- Note the following when "101" (offline auto tuning performed with motor running) is set in *Pr.96 (Pr.463)* .
  1) Torque is not enough during tuning.
  2) The motor may be run at nearly its rated frequency (*Pr. 84* setting) without any problem.
  3) The brake should be open.
  4) No external force is applied to rotate the motor.
- Even if "1" (tuning performed without motor running) is set in *Pr.96 (Pr.463)*, the motor may run slightly. Therefore, fix the motor securely with a mechanical brake, or before tuning, make sure that there will be no problem in safety if the motor runs.
  * This instruction must be followed especially in elevator.
    Note that if the motor runs slightly, tuning performance is unaffected.

**Pr. 89 ≫ Refer to the section about *Pr. 80*.**

## Pr. 95, 574

## Online auto tuning Magnetic flux Sensorless Vector

*Pr.95 Online auto tuning selection* | *Pr.574 Second motor online auto tuning*

When online auto tuning is selected, excellent torque accuracy is provided by temperature compensation even if the secondary resistance value of the motor varies with the rise of the motor temperature.

Select magnetic flux observer when performing vector control.

| *Pr.95, Pr.574* Setting | Description |
|---|---|
| 0 (initial value) | Online auto tuning is not performed |
| 1 | Start-time tuning (at start-up) |
| 2* | Magnetic flux observer (normal) |

* Only *Pr.95* can be set.

- Perform offline auto tuning before performing start-time tuning of the online auto tuning. Data needs to be calculated.
- For using start-time tuning in elevator, examine the utilization of a brake sequence for the brake opening timing at a start. Though the tuning ends in about a maximum of 500ms after a start, torque is not provided fully during that period. Therefore, note that there may be a possibility of drop due to gravity.
- For the SF-V5RU, SF-JR (with encoder) or SF-HRCA (with encoder), it is not necessary to perform offline auto tuning to select adaptive magnetic flux observer. (However, perform offline auto tuning when the wiring length is long.)

**Pr. 96 Refer to the section about *Pr. 82*.**

## Pr. 100 to 109

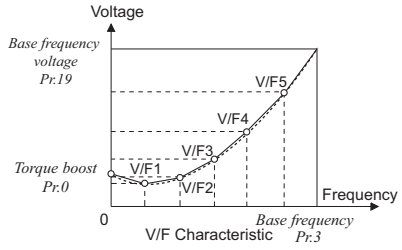
## Adjustable 5 points V/F V/F

*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).

The torque pattern that is optimum for the machine's characteristic can be set.

- Set "2" in *Pr.71* and voltage and frequency in *Pr.100 to Pr.109* .
- When frequency values at each point are the same, write disable error (Er 1) appears. Set frequency and voltage within the range of *Pr.3 Base frequency* and *Pr.19 Base frequency voltage* .




- When *Pr.19 Base frequency voltage* ="8888" or "9999", *Pr.71* cannot be set to "2". When setting "2" in *Pr.71*, set the rated voltage value in *Pr.19*.

**Pr. 110, 111 Refer to the section about *Pr.7*.**

**Pr. 112 Refer to the section about *Pr.0*.**

**Pr. 113 Refer to the section about *Pr.3*.**

**Pr. 114, 115 Refer to the section about *Pr.22*.**

**Pr. 116 Refer to the section about *Pr.41*.**

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

## Communication initial setting

*Pr.117 PU communication station number* | *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 number* | *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 retry count* | *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, monitoring, 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 to10 | 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 terminals 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. 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, 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)*

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

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

## Pr. 125, 126, 241, C2 (902) to C7 (905), C12 (917) to C19 (920), C38 (932) to C41 (933)

## Analog input frequency (speed) and torque/ magnetic flux change and 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*
*C12(Pr.917) Terminal 1 bias frequency (speed)* | *C13(Pr.917) Terminal 1 bias (speed)*
*C14(Pr.918) Terminal 1 gain frequency (speed)* | *C15(Pr.918) Terminal 1 gain (speed)*
*C16(Pr.919) Terminal 1 bias command (torque/magnetic flux)*
*C17(Pr.919) Terminal 1 bias (torque/magnetic flux)*
*C18(Pr.920) Terminal 1 gain command (torque/magnetic flux)*
*C19(Pr.920) Terminal 1 gain (torque/magnetic flux)*
*C38(Pr.932) Terminal 4 bias command (torque/magnetic flux)*
*C39(Pr.932) Terminal 4 bias (torque/magnetic flux)*
*C40(Pr.933) Terminal 4 gain command (torque/magnetic flux)*
*C41(Pr.933) Terminal 4 gain (torque/magnetic flux)*

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

### (1) Change the frequency (speed) at maximum analog input. *(Pr.125, Pr.126, C14(Pr.918))*

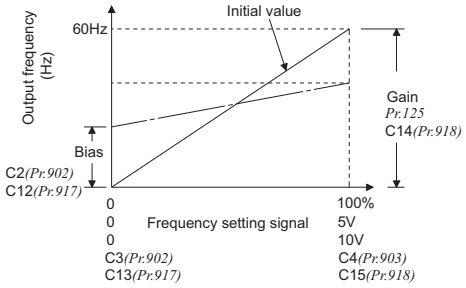
Set a value in *Pr.125(Pr.126, C14(Pr.918))* when changing only the frequency setting (gain) of the maximum analog input voltage (current). (Other calibration parameter settings need not be changed.)

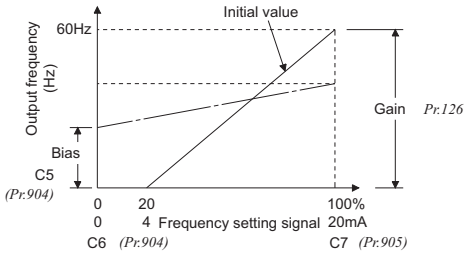
### (2) Change the torque/magnetic flux at maximum analog input. *(C18 (Pr.920), C40 (Pr.933))*

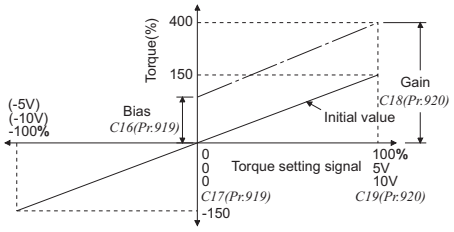
Set *C18(Pr.920), C40(Pr.933)* when changing only torque/ magnetic flux command of the maximum analog input voltage (current). (Other calibration parameter settings need not be changed.)

### (3) Analog input bias/gain calibration *(C2 (Pr.902) to C7 (Pr.905), C16 (Pr. 919) to C19 (Pr. 920), C38 (Pr. 932) to C41 (Pr. 933))*

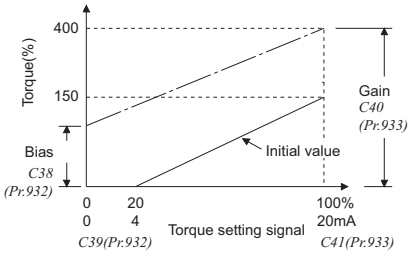
- The "bias" and "gain" functions are used to adjust the relationship between the input signal entered from outside the inverter to set the output frequency (torque/magnetic flux), e.g. 0 to 5V, 0 to 10V or 4 to 20mADC, and the output frequency (torque/magnetic flux).




Calibration example of terminal 1




Calibration example of terminal 4

### (4) Analog input display unit changing *(Pr.241)*

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



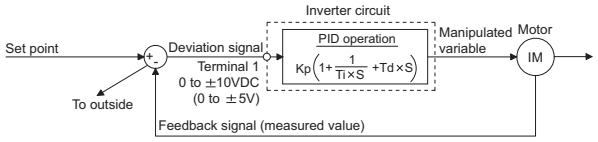
When setting parameters, refer to the instruction manual (applied) and understand instructions.

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

| | |
|---|---|
| *Pr.127 PID control automatic switchover frequency* | *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 cancel level* | |

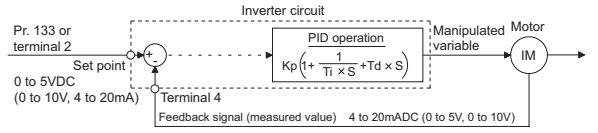
The inverter can be used to exercise process control, e.g. flow rate, air volume or pressure.
The terminal 2 input signal or parameter setting is used as a set point and the terminal 4 input signal used as a feedback value to constitute a feedback system for PID control.

· *Pr.128* = "10, 11"(deviation value signal input)




Kp: Proportionality constant Ti: Integral time S: Operator Td: Differential time

· *Pr.128* ="20, 21"(measured value input)




Kp: Proportionality constant Ti: Integral time S: Operator Td: Differential time

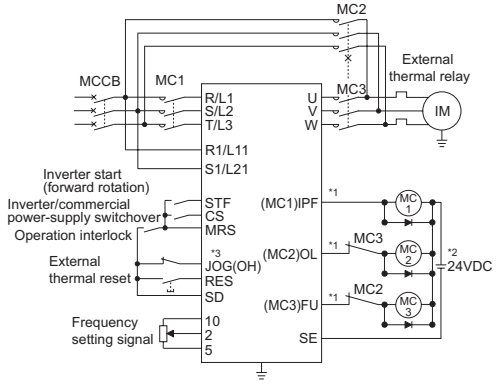
## Pr. 135 to 139, 159
## Switch between the inverter operation and commercial power-supply operation to use

| | |
|---|---|
| *Pr.135 Commercial power-supply switchover sequence output terminal selection* | |
| *Pr.136 MC switchover interlock time* | *Pr.137 Start waiting time* |
| *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.
Commercial operation can not be performed with the Mitsubishi vector motor (SF-V5RU).

| *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, insert a protective diode .
*3 The used terminal changes according to the *Pr.180* to *Pr.189 (input terminal function selection)* settings.

Pr. 140 to 143 Refer to the section about *Pr.29*.

Pr. 144 Refer to the section about *Pr. 37*.

## 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/FR-PU07) 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*.

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

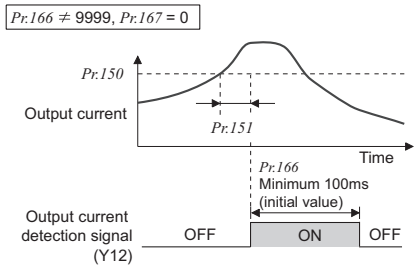
| | |
|---|---|
| *Pr.150 Output current detection level* | *Pr.151 Output current detection signal delay time* |
| *Pr.152 Zero current detection level* | *Pr.153 Zero current detection time* |
| *Pr.166 Output current detection signal retention time* | *Pr.167 Output current detection operation selection*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

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

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

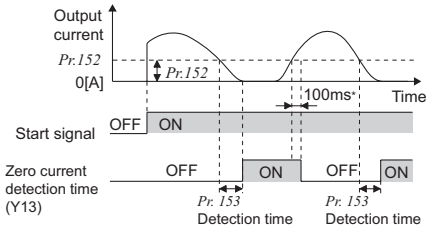
· The output current detection function can be used for excessive torque detection, etc.

· 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 signal (Y13) is held on for at least 100ms.

Pr. 154 Refer to the section about *Pr.22*.

## Pr. 155
## Selection of action conditions of the second function signal (RT) and third function signal (X9)

*Pr.155 RT signal reflection condition selection*

You can select the second (third) function using RT (X9) signal.
You can also set the RT (X9) signal operation condition (reflection time).

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

· Funtions which can be set as second and third function

| Function | First Function Parameter | Second Function Parameter | Third Function Parameter |
|---|---|---|---|
| Torque boost | *Pr.0* | *Pr.46* | *Pr.112* |
| Base frequency | *Pr.3* | *Pr.47* | *Pr.113* |
| Acceleration time | *Pr.7* | *Pr.44* | *Pr.110* |
| Deceleration time | *Pr.8* | *Pr.44, Pr.45* | *Pr.110, Pr.111* |
| Electronic thermal O/L relay | *Pr. 9* | *Pr.51* | — |
| Stall prevention | *Pr.22* | *Pr.48, Pr.49* | *Pr.114, Pr.115* |
| Applied motor | *Pr. 71* | *Pr. 450* | — |
| Motor constants | *Pr.80 to Pr.84, Pr.89 Pr.90 to Pr.94, Pr.96* | *Pr.453 to Pr.457 Pr.569, Pr.458 to Pr.462, Pr.463* | — |
| Motor control method | *Pr.800* | *Pr.451* | — |
| Analog input filter | *Pr.822, Pr.826* | *Pr.832, Pr.836* | — |
| Gain adjustment | *Pr.820, Pr.821, Pr.824, Pr.825* | *Pr.830, Pr.831, Pr.834, Pr.835* | — |
| Speed detection filter | *Pr.823* | *Pr.833* | — |

**Pr. 156, 157** **Refer to the section about** *Pr.22*.

**Pr. 158** **Refer to the section about** *Pr.52*.

**Pr. 159** **Refer to the section about** *Pr.135*.

## Pr. 160, 172 to 174
## User group function

*Pr.160 User group read selection*
*Pr.173 User group registration*
*Pr.172 User group registered display/batch clear*
*Pr.174 User group clear*

- Parameter which can be read from the operation panel and parameter unit can be restricted.
  The inverter is set to display all parameters with initial setting.

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

- 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 in the user group. When "1" is set in *Pr.160* , only parameters registered in the user group can be accessed for reading and writing. (The parameters not registered in the user group can not be read.)
  · To set a parameter in the user group, set its parameter number in *Pr.173*.
  · To delete a parameter from the user group, set its parameter number in *Pr.174* . To batch-delete the registered parameters, set *Pr.172* to "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*.

**Pr. 166, 167** **Refer to the section about** *Pr.150*.

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

**Pr. 170, 171** **Refer to the section about** *Pr.52*.

**Pr. 172 to 174** **Refer to the section about** *Pr.160*.

## 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) |
| | | *Pr.270* =1, 3 *2 | Stop-on contact selection 0 |
| 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 | |
| | | *Pr.270* =1, 3 *2 | Stop-on contact selection 1 |
| 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*3 | |
| 8 | REX | 15-speed selection (combination with three speeds RL, RM, RH) | |
| 9 | X9 | Third function | |
| 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 | |
| 13 | X13 | External DC injection brake operation start | |
| 14 | X14 | PID control valid terminal | |
| 15 | BRI | Brake opening completion signal | |
| 16 | X16 | PU-external operation switchover | |
| 17 | X17 | Load pattern selection forward rotation reverse rotation boost | |
| 18 | X18 | V/F swichover (V/F cntrol is exercised when X18 is on) | |
| 19 | X19 | Load torque high speed frequency | |
| 20 | X20 | S-pattern acceleration/deceleration C switching terminal | |
| 22 | X22 | Orientation command | |
| 23 | LX | Pre-excitation (zero speed control/servo lock) | |
| 24 | MRS | Output stop | |
| 25 | STOP | Start self-holding selection | |
| 26 | MC | Control mode swichover | |
| 27 | TL | Torque limit selection | |
| 28 | X28 | Start time tuning | |
| 42 | X42 | Torque bias selection 1 *4 | |
| 43 | X43 | Torque bias selection 2 *4 | |
| 44 | X44 | P/PI control switchover | |
| 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 thermister input (assigned to AU terminal *(Pr.184)* only) | |
| 64 | X64 | PID forward/reverse action switchover | |
| 65 | X65 | External/NET operation switchover | |
| 66 | X66 | NET/PU operation switchover | |
| 67 | X67 | Command source switchover | |
| 68 | NP | Conditional position pulse train sign*4 | |
| 69 | CLR | Conditional position droop pulse clear*4 | |
| 70 | X70 | DC feeding operation permission | |
| 71 | X71 | DC feeding cancel | |
| 9999 | - - - | No function | |

*1 When *Pr.59 Remote function selection*= "1 or 2", the functions of the RL, RM and RH signals change as listed above.
*2 When *Pr.270* = "1 or 3", the functions of the RL and RT signals change as listed above.
*3 The OH signal turns on when the relay contact "opens".
*4 Available only when used with the FR-A7AP.

## 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 |
| 6 | 106 | FU3 | Third output frequency detection |
| 7 | 107 | RBP | Regenerative brake prealarm |
| 8 | 108 | THP | Electronic thermal relay function 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 |
| 20 | 120 | BOF | Brake opening request |
| 25 | 125 | FAN | Fan fault output |
| 26 | 126 | FIN | Heatsink overheat pre-alarm |
| 27 | 127 | ORA | Orientation in-position * |
| 28 | 128 | ORM | Orientation error * |
| 30 | 130 | Y30 | Forward rotation output * |
| 31 | 131 | Y31 | Reverse rotation output * |
| 32 | 132 | Y32 | Regenerative status output * |
| 33 | 133 | RY2 | Operation ready 2 |
| 34 | 134 | LS | Low speed output |
| 35 | 135 | TU | Torque detection |
| 36 | 136 | Y36 | In-position * |
| 41 | 141 | FB | Speed detection |
| 42 | 142 | FB2 | Second speed detection |
| 43 | 143 | FB3 | Third speed detection |
| 44 | 144 | RUN2 | Inverter running 2 |
| 45 | 145 | RUN3 | During inverter running and start command is on |
| 46 | 146 | Y46 | During deceleration due to instantaneous power failure (retained until release) |
| 47 | 147 | PID | During PID control activated |
| 64 | 164 | Y64 | During retry |
| 70 | 170 | SLEEP | During PID output suspension |
| 84 | 184 | RDY | Preparation ready signal * |
| 85 | 185 | Y85 | DC current feeding |
| 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 |
| 97 | 197 | ER | Minor fault output 2 |
| 98 | 198 | LF | Minor fault output |
| 99 | 199 | ALM | Alarm output |
| 9999 | | — | No function |

* Available only when used with the FR-A7AP.

**Pr. 232 to 239** Refer to the section about *Pr. 4*.
**Pr. 240** Refer to the section about *Pr.72*.
**Pr. 241** Refer to the section about *Pr. 125*.
**Pr. 242, 243** Refer to the section about *Pr.73*.

## Pr. 244
## Increase cooling fan life

*Pr.244 Cooling fan operation selection*

You can control the operation of the cooling fan (200V class 1.5K or more, 400V class 2.2K or more) built in the inverter.

| *Pr.244* Setting | Description |
|---|---|
| 0 | Operates at power on<br>Cooling fan on/off control invalid (the cooling fan is always on in power-on status) |
| 1<br>(initial value) | Cooling fan on/off control valid<br>The fan is always on while the inverter is running.<br>During a stop, the inverter status is monitored and the fan switches on-off according to the temperature. |

## Pr. 245 to 247
## Slip compensation V/F

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

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

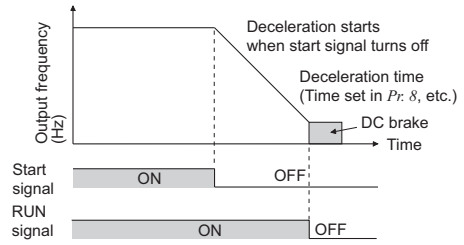
## Pr. 250
## Selection of motor stopping method and start signal

*Pr.250 Stop selection*

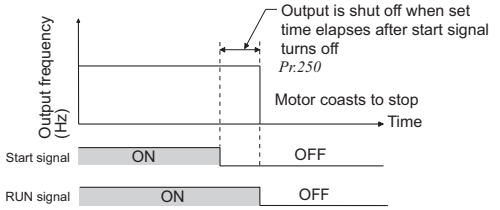
Used to select the stopping method (deceleration to a stop or coasting) when the start signal turns off.
Used to stop the motor with a mechanical brake, etc. together with switching off of the start signal.
You can also select the operations of the start signals (STF/STR).

| *Pr.250* Setting | Description | |
|---|---|---|
| | Start signal (STF/STR) | Stop operation |
| 0 to 100s | STF signal: Forward 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.<br>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 signal | |
| 9999 | STF signal: Forward 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 signal | |

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




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




## 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, S, T) 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*.**

## 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 | Setting "1" and turning the power supply off starts the measurement of the main circuit capacitor life.<br>When the *Pr.259* value is "3" after powering on again, the measuring is completed.Read the deterioration degree in *Pr.258* . |

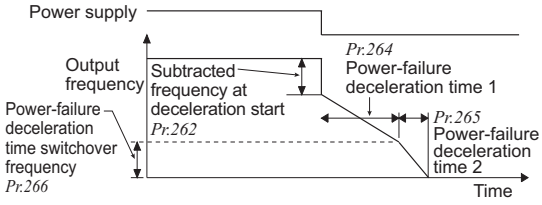
## Pr. 261 to 266, 294
# Operation at instantaneous power failure

*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*
*Pr.294 UV avoidance voltage gain*

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.

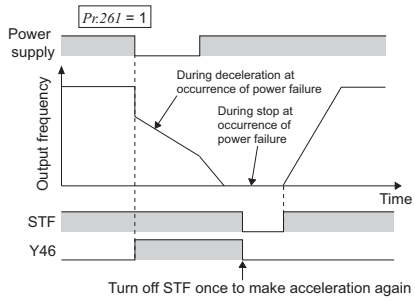
| Pr. Number | Setting Range | Description | |
|---|---|---|---|
| 261 | 0(initial value) | Coasting to stop<br>When undervoltage or power failure occurs, the inverter output is shut off. | |
| | 1 | Without UV avoidance | When undervoltage or a power failure occurs, the inverter can be decelerated to a stop. |
| | 11 | With UV avoidance | |
| | 2 | Without UV avoidance | When undervoltage or a power failure occurs, the inverter can be decelerated to a stop. If power is restored during a power failure, the inverter accelerates again. |
| | 12 | With UV avoidance | |
| 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 3600s/360s * | Set a deceleration slope down to the frequency set in *Pr.266*. | |
| 265 | 0 to 3600s/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. | |
| 294 | 0 to 200% | Adjust response level at UV avoidance operation. A larger setting will improve responsiveness to the bus voltage change. Since the regeneration amount is large when the inertia is large, decrease the setting value. | |

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



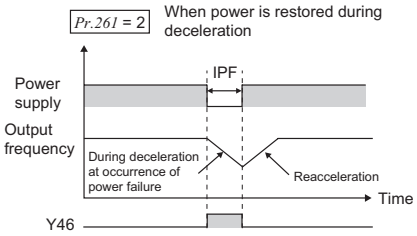

### (1) Power failure stop mode (*Pr.261*="1" "11")

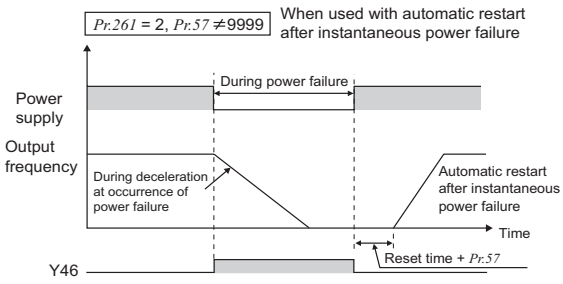
- If power is restored during power failure deceleration, deceleration to a stop is continued and the inverter remaines stopped. To restart, turn off the start signal once, then turn it on again.




### (2) Original operation continuation at instantaneous power failure function (*Pr.261*="2" "12")

- When power is restored during deceleration after a 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*.

**Pr. 268** Refer to the section about *Pr.52*.

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

## Pr. 270 to 274, 4, 5

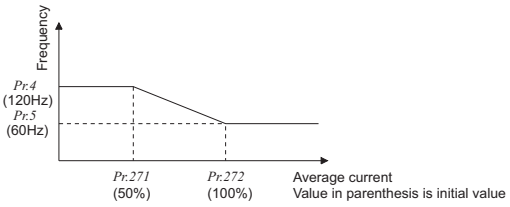
# Load torque high speed frequency control

*Pr.270 Stop-on contact/load torque high-speed frequency control selection*
*Pr.271 High-speed setting maximum current*
*Pr.272 Middle-speed setting minimum current*
*Pr.273 Current averaging range*
*Pr.274 Current averaging filter time constant*
*Pr.4 Multi-speed setting (high speed)*
*Pr.5 Multi-speed setting (middle speed)*

This function is designed to increase speed automatically under light load, for example to minimize the incoming/outgoing time in a multi-story parking lot.
More specifically, the magnitude of the load is judged according to the average current at a certain time after starting to perform operation at higher than the preset frequency under light load.

| *Pr.270* Setting | Description |
|---|---|
| 0 (initial value) | Without stop-on contact control and load torque high-speed frequency control |
| 1 | Stop-on contact control |
| 2 | Load torque high speed frequency control |
| 3 | Stop-on contact + load torque high speed frequency control |

- Set "2 or 3" in *Pr.270* to set the current value, averaging range, etc when the load torque high speed frequency control is selected.
- When the X19 signal (load detection high-speed frequency function selection) is turned on to start operation, the inverter automatically varies the maximum frequency between *Pr.4 Multi-speed setting (high speed)* and *Pr.5* settings according to the average current flowing during acceleration from half of the frequency of the *Pr.5 Multi-speed setting (middle speed)* setting to the frequency set in *Pr.5*.




Frequency relative to the average current

| Pr. Number | Setting Range | Description |
|---|---|---|
| 4 | 0 to 400Hz | Set the higher-speed frequency. |
| 5 | 0 to 400Hz | Set the lower-speed frequency. |
| 271 | 0 to 220% | Set the upper and lower limits of the current at high and middle speeds. |
| 272 | 0 to 220% | |
| 273 | 0 to 400Hz | Average current during acceleration from (*Pr.273* × 1/2)Hz to (*Pr.273* )Hz can be achieved. |
| | 9999 | Average current during acceleration from (*Pr.5* × 1/2)Hz to (*Pr.5*)Hz is achieved. |
| 274 | 1 to 4000 | Set the time constant of the primary delay filter relative to the output current. (The time constant[ms] is 0.75 × *Pr.274* and the factory setting is 12ms.) A larger setting provides higher stability but poorer response. |

## Pr. 270, 275, 276, 6

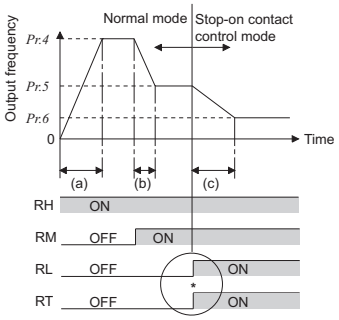
# Stop-on contact control Magnetic flux Sensorless

*Pr.270 Stop-on contact/load torque high-speed frequency control selection*
*Pr.275 Stop-on contact excitation current low-speed multiplying factor*
*Pr.276 PWM carrier frequency at stop-on contact*
*Pr.6 Multi-speed setting (low speed)*

To ensure accurate positioning at the upper limit etc. of an elevator, stop-on-contact control causes a mechanical brake to be closed while the motor is developing a holding torque to keep the load in contact with a mechanical stopper etc.
This function suppresses vibration which is liable to occur when the load is stopped upon contact in vertical motion applications, ensuring steady precise positioning.

| *Pr.270* Setting | Description |
|---|---|
| 0 (initial value) | Without stop-on contact control and load torque high-speed frequency control |
| 1 | Stop-on contact control |
| 2 | Load torque high speed frequency control |
| 3 | Stop-on contact + load torque high speed frequency control |

- Select either real sensorless vector control or advanced magnetic flux vector control. When both the RT and RL signals are switched on, the inverter enters the stop-on contact mode, in which operation is performed at the frequency set in *Pr.6 Multi-speed setting (low speed)* independently of the preceding speed.




Goes into stop-on-contact control mode when both RL and RT switch on.
*RL and RT may be switched on in any order with any time difference
(a):Acceleration time (*Pr.7*)
(b):Deceleration time (*Pr.8*)
(c):Second deceleration time (*Pr.44*)

| Pr. Number | Setting Range | Description |
|---|---|---|
| 6 | 0 to 400Hz | Set the output frequency for stop-on-contact control. The frequency should be as low as possible (about 2Hz). If it is set to more than 30Hz, the operating frequency will be 30Hz. When performing stop-on-contact control during encoder feedback control, encoder feedback control is made invalid due to a mode shift to the stop-on-contact control mode. |
| 48 | 0 to 200% | Set the stall prevention operation level for stop-on-contact when using under advanced magnetic flux vector control. (Use the *Pr.22* setting value under real sensorless vector control.) |
| 275 | 0 to 1000% | Usually set a value between 130% and 180%. Set the force (holding torque) for stop-on-contact control. |
| | 9999 | No compensation. |
| 276 | 0 to9/0 to 4 * | Set a PWM carrier frequency for stop-on-contact control. For real sensorless vector control, carrier frequency is always 2kHz when a setting value is 0 to 5 and always 6kHz when a setting value is 6 to 9. (Valid at the output frequency of 3Hz or less.) |
| | 9999 | As set in *Pr.72 PWM frequency selection*. |

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


When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 278 to 285, 292

# Brake sequence function

Magnetic flux | Sensorless | Vector

*Pr.278 Brake opening frequency*
*Pr.279 Brake opening current*
*Pr.280 Brake opening current detection time*
*Pr.281 Brake operation time at start*
*Pr.282 Brake operation frequency*
*Pr.283 Brake operation time at stop*
*Pr.284 Deceleration detection function selection*
*Pr.285 Overspeed detection frequency*
*Pr.292 Automatic acceleration/deceleration*

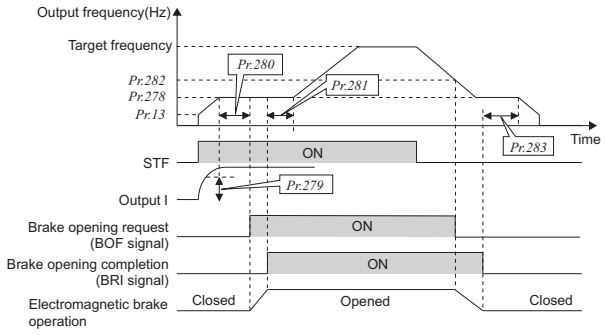
This function is used to output from the inverter the mechanical brake opening completion signal timing signal in vertical lift and other applications.

This function prevents the load from dropping with gravity at a start due to the operation timing error of the mechanical brake or an overcurrent alarm from occurring at a stop, ensuring secure operation.

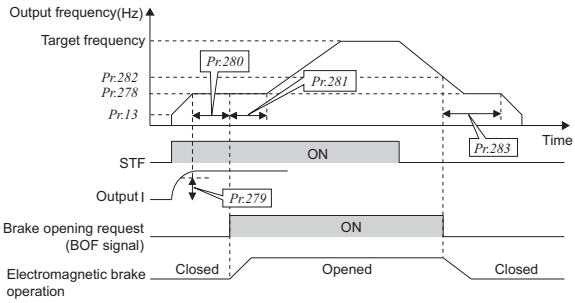
<Operation example>

- At start: When the start signal is input to the inverter, the inverter starts running. When the internal speed command reaches the value set in *Pr.278* and the output current is not less than the value set in *Pr.279*, the inverter outputs the brake opening request signal (BOF) after the time set in *Pr.280* has elapsed.
  When the time set in *Pr.281* elapses after the brake opening completion signal (BRI) was activated, the inverter increases the output frequency to the set speed.
- At stop: When the speed has decreased to the frequency set in *Pr.282* , the brake opening request signal (BOF) is turned off. When the time set in *Pr.283* elapses after the brake operation confirmation signal (BRI) was activated, the inverter output is switched off.
  * If *Pr.292* = "8" (mechanical brake opening completion signal not input), this time is the time after the brake opening request signal is output.

1)*Pr.292* = "7" (brake opening completion signal input)




2)*Pr.292* = "8" (brake opening completion signal not input)




| Pr. Number | Setting Range | Description |
|---|---|---|
| 278 | 0 to 30Hz | Set to the rated slip frequency of the motor + about 1.0Hz.<br>This parameter may be only set if *Pr.278* ≤ *Pr.282*. |
| 279 | 0 to 220% | Generally, set this parameter to about 50 to 90%. If the setting is too low, the load is liable to drop due to gravity at start.<br>Suppose that the rated inverter current is 100%. |
| 280 | 0 to 2s | Generally, set this parameter to about 0.1 to 0.3s. |
| 281 | 0 to 5s | *Pr.292* = 7: Set the mechanical delay time until the brake is loosened.<br>*Pr.292* = 8: Set the mechanical delay time until the brake is loosened+about 0.1 to 0.2s. |
| 282 | 0 to 30Hz | At this frequency, the brake opening request signal (BOF) is switched off.Generally, set this parameter to the *Pr.278* setting + 3 to 4Hz.<br>This parameter may only be set if *Pr.282* ≥ *Pr.278*. |
| 283 | 0 to 5s | *Pr.292* =7: Set the mechanical delay time until the brake is closed + 0.1s.<br>*Pr.292* =8: Set the mechanical delay time until the brake is closed + 0.2 to 0.3s. |
| 284 | 0 (initial value) | Deceleration is not detected. |
| | 1 | If deceleration is not normal during deceleration operation, the inverter alarm (E.MB2) is provided to shut off the output and turn off the brake opening request signal (BOF). |
| 285 | 0 to 30Hz | When brake sequence function is made valid under encoder feedback control<br>If (detected frequency) - (output frequency) > *Pr.285* the inverter alarm (E.MB1) is provided to shut off the output and turn off the brake opening request signal (BOF). |
| | 9999 (initial value) | Overspeed is not detected. |
| 292 | 0, 1, 3, 5 to 8, 11 | Brake sequence function is made valid when a setting is "7 or 8". |

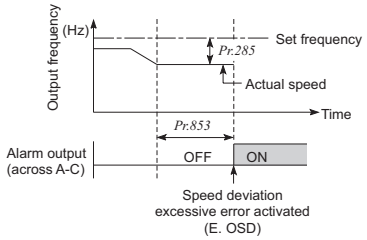
## Pr. 285, 853

# Speed deviation excess detection

Vector

*Pr.285 Speed deviation excess detection frequency*
*Pr.853 Speed deviation time*

- If the difference (absolute value) between the speed command value and actual speed exceeds the *Pr. 285 Speed deviation excess detection frequency* setting for longer than the time set in *Pr. 853 Speed deviation time* during speed control under vector control, speed deviation excessive occurs and error "E. OSD" appears, resulting in a stop.



## Pr. 286 to 288

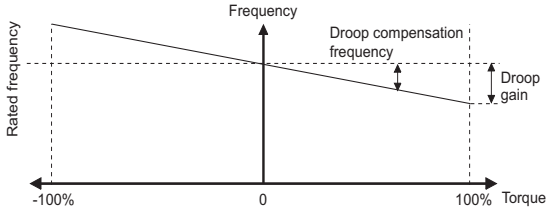
## Droop control Magnetic flux Sensorless Vector

*Pr.286 Droop gain*
*Pr.287 Droop filter time constant*
*Pr.288 Droop function activation selection*

This function is designed to balance the load in proportion to the load torque to provide the speed drooping characteristic.
This function is effective for balancing the load when using multiple inverters

| Pr. Number | Setting Range | Description | |
|---|---|---|---|
| 286 | 0 (initial value) | Droop control is invalid | |
| | 0.1 to 100% | Set the drooping amount at the rated torque as a percentage with respect to the rated motor frequency. | |
| 287 | 0.00 to 1.00s | Set the time constant of the filter applied on the torque amount current. | |
| 288 | | Advanced magnetic flux vector control | Real sensor less vector / vector control |
| | 0 (initial value), 10 | Droop control is not exercised during acceleration/ deceleration. Droop compensation amount is determined using the rated motor frequency as reference. | Droop control is not exercised during acceleration/deceleration. (When *Pr.288* = 10, droop compensation amount is determined using the motor speed as reference.) |
| | 1, 11 | | Droop control is always exercised during operation. (with 0 limit) (When *Pr.288* = 11, droop compensation amount is determined using the motor speed as reference.) |
| | 2 | | Droop control is always exercised during operation. (without 0 limit) |

- Droop control
  This control is valid when a value other than "0" is set in *Pr.286* under advanced magnetic flux vector control, real sensorless vector control and vector control.
  The maximum droop compensation frequency is 120Hz.




## Pr. 291, 384 to 386

## Pulse train I/O

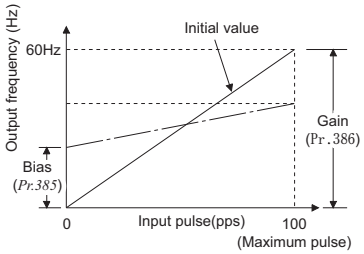
*Pr.291 Pulse train I/O selection*
*Pr.384 Input pulse division scaling factor*
*Pr.385 Frequency for zero input pulse*
*Pr.386 Frequency for maximum input pulse*

The inverter speed can be set by inputting pulse train from terminal JOG.
In addition, pulse train can be output as open collector from terminal FM.
Synchronous speed operation of inverters can be performed by combining pulse train I/O.

| *Pr.291* Setting | Input | Output |
|---|---|---|
| 0 (initial value) | JOG terminal | FM output |
| 1 | Pulse train input | FM output |
| 10 | JOG terminal | Pulse train output (50%Duty) |
| 11 | Pulse train input | |
| 20 | JOG terminal | Pulse train output (ON width is always same) |
| 21 | Pulse train input | |
| 100 | | Pulse train output (ON width is always same)* |

* The inverter outputs the signal input as pulse train as it is regardless of the *Pr.54* setting.

- Change the frequency at pulse train input.*(Pr.385, Pr.386)*




- Calculation method of input pulse division scaling factor *(Pr.384)*
  Maximum number of input pulses (PPS)=*Pr.384* × 400
  (maximum permissible pulses=100kpps)
- When *Pr.419 Position command source selection* ="2" (conditional pulse train position command), JOG terminal serves as conditional position pulse train input terminal regardless of the *Pr.291 Pulse train I/O selection* setting.

**Pr. 292, 293** Refer to the section about *Pr.61*.

**Pr. 294** Refer to the section about *Pr.261*.

**Pr. 299** Refer to the section about *Pr.57*.

**Pr. 331 to 337** Refer to the section about *Pr.117*.

## 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.551PU 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. Operation 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 is valid |
| | 1 | RS-485 terminals are valid |
| | 9999 (initial value) | Automatic recognition of the communication option Normally, the RS-485 terminals are valid. When a communication option is mounted, 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 |
| | 3 | Select the USB 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*.



When setting parameters, refer to the instruction manual (applied) and understand instructions.

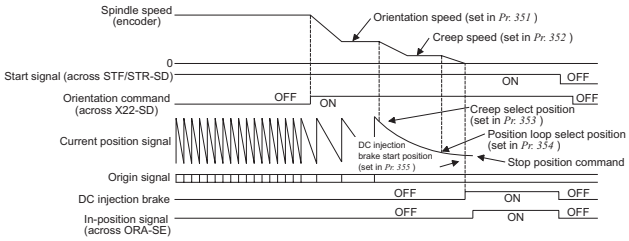
## Pr. 350 to 366, 369, 393, 396 to 399
# Orientation control

V/F | Magnetic flux | Vector

| | |
|---|---|
| *Pr.350 Stop position command selection* | *Pr.351 Orientation speed* |
| *Pr.352 Creep speed* | *Pr.353 Creep switchover position* |
| *Pr.354 Position loop switchover position* | *Pr.355 DC injection brake start position* |
| *Pr.356 Internal stop position command* | *Pr.357 In-position zone* |
| *Pr.358 Servo torque selection* | *Pr.359 Encoder rotation direction* |
| *Pr.360 16 bit data selection* | *Pr.361 Position shift* |
| *Pr.362 Orientation position loop gain* | *Pr.363 Completion signal output delay time* |
| *Pr.364 Encoder stop check time* | *Pr.365 Orientation limit* |
| *Pr.366 Recheck time* | *Pr.369 Number of encoder pulses* |
| *Pr.393 Orientation selection* | *Pr.396 Orientation speed gain (P term)* |
| *Pr.397 Orientation speed integral time* | *Pr.398 Orientation speed gain (D term)* |
| *Pr.399 Orientation deceleration ratio* | |

This function is used with a position detector (encoder) installed to the spindle of a machine tool, etc. to allow a rotation shaft to be stopped at the specified position (oriented).
Plug-in option FR-A7AP is necessary.

- Internal stop position command
  When "0" is set in *Pr.350 Stop position command selection*, the inverter operates in the internal stop position command mode.
  In the internal stop position command mode, the setting value of *Pr. 356 Internal stop position command* becomes a stop position.
- External stop position command
  When 1 is set in *Pr.350 Stop position command selection* and the option FR-A7AX is mounted, set a stop position using 16-bit data.
- Action time chart



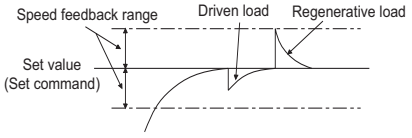

## Pr. 359, 367 to 369
# Encoder feedback control

V/F | Magnetic flux

| | |
|---|---|
| *Pr.359 Encoder rotation direction* | *Pr.367 Speed feedback range* |
| *Pr.368 Feedback gain* | *Pr.369 Number of encoder pulses* |

This controls the inverter output frequency so that the motor speed is constant to the load variation by detecting the motor speed with the speed detector (encoder) to feed it back to the inverter.
Option FR-A7AP is necessary.

- Set the rotation direction of the encoder using *Pr.359 Encoder rotation direction* and *Pr.369 Number of encoder pulses*.
- When a value other than "9999" is set in *Pr.367 Speed feedback range*, encoder feedback control is valid.
  Using the set point (frequency at which stable speed operation is performed) as reference, set the higher and lower setting range. Normally, set the frequency converted from the slip amount (r/min) of the rated motor speed (rated load). If the setting is too large, response becomes slow.




- Set *Pr.368 Feedback gain* when the rotation is unstable or response is slow.

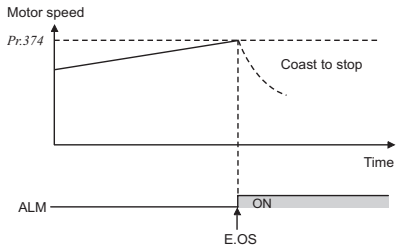
| *Pr.368* Setting | Description |
|---|---|
| *Pr.368* > 1 | Although the response becomes faster, overcurrent or unstable rotation is liable to occur. |
| 1 < *Pr.368* | Although the response becomes slower, the motor rotation becomes stable. |

## Pr. 374
# Overspeed detection

V/F | Magnetic flux | Vector

*Pr.374 Overspeed detection level*

When the motor speed reaches or exceeds the speed set in *Pr.374* during encoder feedback control or vector control, overspeed (E.OS) occurs and stops the inverter output.




## Pr. 376
# Encoder signal cable breakage detection

V/F | Magnetic flux | Vector

*Pr.376 Open cable detection enable/disable selection*

When the cable of the encoder signal is broken during encoder feedback control, orientation control, or vector control, open cable detection (E.ECT) is activated to stop the inverter output.

**Pr. 380 to 383** Refer to the section about *Pr.29*.
**Pr. 384 to 386** Refer to the section about *Pr.291*.

## Pr. 419, 464 to 494

# Conditional position feed by contact input

Vector

| | |
|---|---|
| *Pr.419 Position command source selection* | *Pr.464 Digital position control sudden stop deceleration time* |
| *Pr.465 First position feed amount lower 4 digits* | *Pr.466 First position feed amount upper 4 digits* |
| *Pr.467 Second position feed amount lower 4 digits* | *Pr.468 Second position feed amount upper 4 digits* |
| *Pr.469 Third position feed amount lower 4 digits* | *Pr.470 Third position feed amount upper 4 digits* |
| *Pr.471 Fourth position feed amount lower 4 digits* | *Pr.472 Fourth position feed amount upper 4 digits* |
| *Pr.473 Fifth position feed amount lower 4 digits* | *Pr.474 Fifth position feed amount upper 4 digits* |
| *Pr.475 Sixth position feed amount lower 4 digits* | *Pr.476 Sixth position feed amount upper 4 digits* |
| *Pr.477 Seventh position feed amount lower 4 digits* | *Pr.478 Seventh position feed amount upper 4 digits* |
| *Pr.479 Eighth position feed amount lower 4 digits* | *Pr.480 Eighth position feed amount upper 4 digits* |
| *Pr.481 Ninth position feed amount lower 4 digits* | *Pr.482 Ninth position feed amount upper 4 digits* |
| *Pr. 483 Tenth position feed amount lower 4 digits* | *Pr.484 Tenth position feed amount upper 4 digits* |
| *Pr.485 Eleventh position feed amount lower 4 digits* | *Pr.486 Eleventh position feed amount upper 4 digits* |
| *Pr.487 Twelfth position feed amount lower 4 digits* | *Pr.488 Twelfth position feed amount upper 4 digits* |
| *Pr.489 Thirteenth position feed amount lower 4 digits* | *Pr.490 Thirteenth position feed amount upper 4 digits* |
| *Pr.491 Fourteenth position feed amount lower 4 digits* | *Pr.492 Fourteenth position feed amount upper 4 digits* |
| *Pr.493 Fifteenth position feed amount lower 4 digits* | *Pr. 494 Fifteenth position feed amount upper 4 digits* |

Inputting the number of pulses (positions) in the parameters and setting multi-speed and forward (reverse) commands enable position control during servo operation.This position feed function does not return to the home position.

- Set position command using any two of *Pr. 465 to Pr. 494 (position feed amount)*.

Resolution of encoder × speed × 4

↓

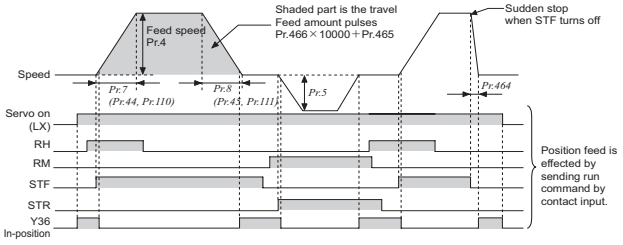
(When stopping the motor after 100 rotations using the FR-V5RU)
2048 (pulse/rev) × 100 (speed) × 4 = 819200 (feed amount)

**Setting of the first feed amount 819200**

*Pr.466* (upper) = "0081" *Pr.465* (lower) = "9200" (decimal)

**<Position feed data setting parameters>**

| Parameter | Name | | Selection Method RE X | RH | RM | RL | Position Feed Speed |
|---|---|---|---|---|---|---|---|
| 465 | First position feed amount | (lower digits) | OFF | ON | OFF | OFF | High speed *(Pr.4)* |
| 466 | | (upper digits) | | | | | |
| 467 | Second position feed amount | (lower digits) | OFF | OFF | ON | OFF | Middle speed *(Pr.5)* |
| 468 | | (upper digits) | | | | | |
| 469 | Third position feed amount | (lower digits) | OFF | OFF | OFF | ON | Low speed *(Pr.6)* |
| 470 | | (upper digits) | | | | | |
| 471 | Fourth position feed amount | (lower digits) | OFF | OFF | ON | ON | Speed 4 *(Pr.24)* |
| 472 | | (upper digits) | | | | | |
| 473 | Fifth position feed amount | (lower digits) | OFF | ON | OFF | ON | Speed 5 *(Pr.25)* |
| 474 | | (upper digits) | | | | | |
| 475 | Sixth position feed amount | (lower digits) | OFF | ON | ON | OFF | Speed 6 *(Pr.26)* |
| 476 | | (upper digits) | | | | | |
| 477 | Seventh position feed amount | (lower digits) | OFF | ON | ON | ON | Speed 7 *(Pr.27)* |
| 478 | | (upper digits) | | | | | |
| 479 | Eigth position feed amount | (lower digits) | ON | OFF | OFF | OFF | Speed 8 *(Pr.232)* |
| 480 | | (upper digits) | | | | | |
| 481 | Ninth position feed amount | (lower digits) | ON | OFF | OFF | ON | Speed 9 *(Pr.233)* |
| 482 | | (upper digits) | | | | | |
| 483 | Tenth position feed amount | (lower digits) | ON | OFF | ON | OFF | Speed 10 *(Pr.234)* |
| 484 | | (upper digits) | | | | | |
| 485 | Eleventh position feed amount | (lower digits) | ON | OFF | ON | ON | Speed 11 *(Pr.235)* |
| 486 | | (upper digits) | | | | | |
| 487 | Twelfth position feed amount | (lower digits) | ON | ON | OFF | OFF | Speed 12 *(Pr.236)* |
| 488 | | (upper digits) | | | | | |
| 489 | Thirteenth position feed amount | (lower digits) | ON | ON | OFF | ON | Speed 13 *(Pr.237)* |
| 490 | | (upper digits) | | | | | |
| 491 | Fourteenth position feed amount | (lower digits) | ON | ON | ON | OFF | Speed 14 *(Pr.238)* |
| 492 | | (upper digits) | | | | | |
| 493 | Fifteenth position feed amount | (lower digits) | ON | ON | ON | ON | Speed 15 *(Pr.239)* |
| 494 | | (upper digits) | | | | | |




## Pr. 419, 428 to 430

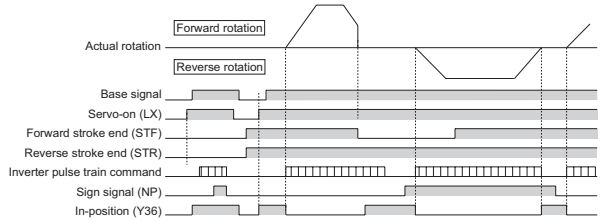
# Position control by pulse train input of the inverter

Vector

| | |
|---|---|
| *Pr.419 Position command source selection* | *Pr.428 Command pulse selection* |
| *Pr.429 Clear signal selection* | *Pr.430 Pulse monitor selection* |

Conditional position pulse train command can be input by pulse train input and sign signal (NP) from the JOG terminal.

- When 2 is set in *Pr.419*, conditional pulse train position command is selected.
- Select command pulse train using *Pr.428*.
- Turning on (short the terminal LX-SD) the servo on signal cancels the base circuit shut-off. When the terminal STF (forward rotation stroke end signal) or terminal STR (reverse rotation stroke end signal) and terminal SD are shorted at this time, the motor starts rotating in accordance with the command pulses. When the forward (reverse) rotation stroke end signal is opened, the motor does not run in the corresponding direction.




## Pr. 420, 421, 424

# Set the electronic gear for position control

Vector

| | |
|---|---|
| *Pr.420 Command pulse scaling factor numerator* | *Pr.421 Command pulse scaling factor denominator* |
| *Pr.424 Position command acceleration/deceleration time constant* | |

Set the ratio of the machine side gear and the motor side gear.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 420 | 0 to 32767 | Set the electronic gear. *Pr. 420* is a numerator and *Pr. 421* is a denominator. |
| 421 | | |
| 424 | 0 to 50s | Used when rotation has become unsmooth at a large electronic gear ratio (about 10 times or more) and low speed. |



When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 422, 423, 425
## Gain adjustment of position control

Vector

*Pr.422 Position loop gain* | *Pr.423 Position feed forward gain*
*Pr.425 Position feed forward command filter*

- Make adjustment of *Pr.422* when any of such phenomena as unusual vibration, noise and overcurrent of the motor/machine occurs.
  Increasing the setting improves trackability for the position command and also improves servo rigidity at a stop, but oppositely makes an overshoot and vibration more liable to occur.
- Function of *Pr.423* is designed to cancel a delay caused by the droop pulses of the deviation counter. Primary delay filter relative to the feed forward command can be input in *Pr.425*.

## Pr. 426, 427
## Positioning adjustment parameter

Vector

*Pr.426 In-position width* | *Pr.427 Excessive level error*

- When the number of droop pulses has fallen below the value set in *Pr.426,* the in-position signal (Y36) turns on.
- When droop pulses exceed the value set in *Pr.427*, position error large occurs and displays an error (E.OD) to stop the inverter.

**Pr. 450** Refer to the section about *Pr.71*.

**Pr. 451** Refer to the section about *Pr.80*.

**Pr. 453, 454** Refer to the section about *Pr.80*.

**Pr. 455 to 463** Refer to the section about *Pr.82*.

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

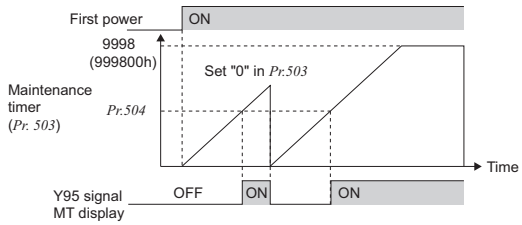
*Pr.495 Remote output selection* | *Pr.496 Remote output data 1*
*Pr.497 Remote output data 2*

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, 504
## Maintenance 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. nr (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. 516 to 519** Refer to the section about *Pr.29*.

## Pr. 547, 548, 551
## Inverter setup using USB communication

*Pr.547 USB communication station number* | *Pr.548 USB communication check time interval*
*Pr.551 PU mode operation command source selection*

Inverter setup with setup software (FR-Configurator) can be easily performed by USB communication.
When performing parameter setting with setup software, set "3" in *Pr.551PU mode operation command source selection*.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 547 | 0 (initial value) | Set the station number of USB device (inverter) within the range "0 to 31". |
| | 1 to 31 | |
| 548 | 0 to 999.8 | Set the communication check time interval of USB communication. If data is not received within the time set in *Pr.548*, E.USB (E.USB) is displayed. |
| | 9999 (initial value) | Communication time interval is not checked. |

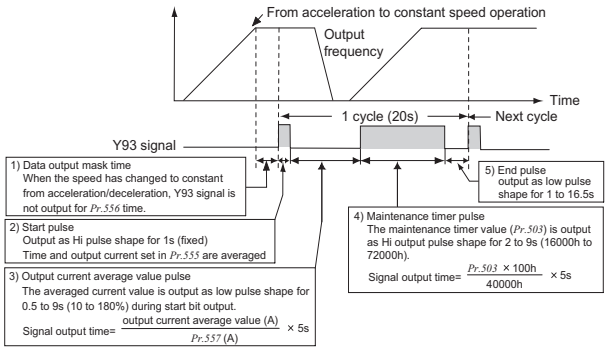
**Pr. 549** Refer to the section about *Pr.117*.

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

## 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. 563, 564** Refer to the section about *Pr.52*.

**Pr. 569** Refer to the section about *Pr.80*.

**Pr. 571** Refer to the section about *Pr.13*.

**Pr. 575 to 577** Refer to the section about *Pr.127*.

**Pr. 611** Refer to the section about *Pr.57*.

**Pr. 665** Refer to the section about *Pr.882*.

**Pr. 684** Refer to the section about *Pr.82*.

**Pr. 800** Refer to the section about *Pr.80*.

**Pr. 802** Refer to the section about *Pr.10*.

**Pr. 803** Refer to the section about *Pr.22*.

## Pr. 804 to 806
# Torque command source selection

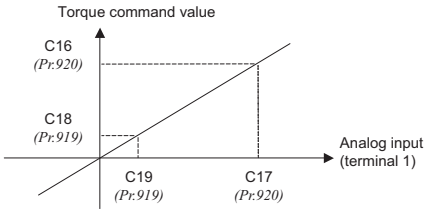
Sensorless Vector

*Pr.804 Torque command source selection* | *Pr.805 Torque command value (RAM)* | *Pr.806 Torque command value (RAM,EEPROM)*

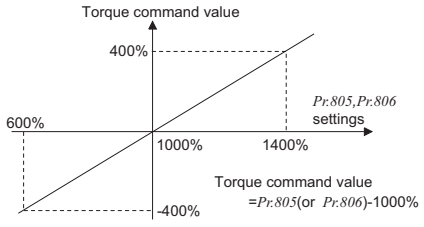
When you selected torque control, you can choose the torque command.

| Pr. Number | Setting Range | Description |
|---|---|---|
| 804 | 0 (initial value) | Torque command by terminal 1 analog input |
| | 1 | Torque command by parameter *Pr.805* or *Pr.806* setting (-400% to 400%) |
| | 3 | Torque command by CC-Link communication (FR-A7NC) Refer to the instruction manual of the option "FR-A7NC (option)" for details. |
| | 4 | Digital input from the option (FR-A7AX) Refer to the instruction manual of "FR-A7AX (option)" for details. |
| | 5 | Torque command by CC-Link communication (FR-A7NC) Refer to the instruction manual of the option "FR-A7NC (option)" for details. |
| | 6 | |
| 805 | 600 to 1400% | Digital setting of the torque command can be made by setting *Pr.805* (RAM) or *Pr.806* (RAM, EEPROM). (Setting from communication option, etc. can be made.) In this case, set the speed limit value to an appropriate value to prevent overspeed. |
| 806 | 600 to 1400% | |

- Torque command by terminal1 analog input
  The torque command value for the analog input of the terminal 1 varies with *C16, C17(Pr.919), C18, C19 (Pr.920)* as shown below.




- Torque command by parameter
  The relationship between the *Pr.805 or Pr.806* setting and actual torque command value at this time is shown below. On the assumption that 1000% is 0%, the torque command is indicated by an offset from 1000%.




## Pr. 807 to 809
# Speed limit during torque control

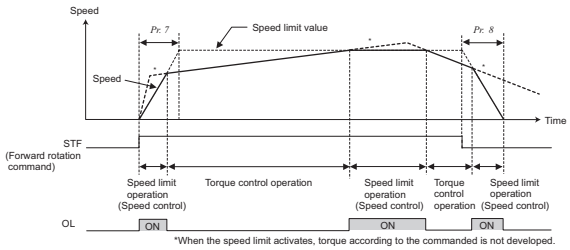
Sensorless Vector

*Pr.807 Speed limit selection* | *Pr.808 Forward rotation speed limit* | *Pr.809 Reverse rotation speed limit*

When you selected torque control, set the speed limit value to prevent the load torque from becoming less than the torque command value, resulting in motor overspeed.

- Select the speed limit input method using *Pr.807* .

| *Pr.807* Setting | Description |
|---|---|
| 0 (initial value) | Use the speed command value during speed control as speed limit. |
| 1 | According to *Pr.808 and Pr.809*, set the speed limit in forward and reverse rotation directions individually. When the reverse rotation speed limit is 9999, the setting is the same as that of the torque limit in forward rotation direction. |
| 2 | The analog voltage of the terminal 1 input is used to make speed limit. For 0 to 10V input, set the forward rotation speed limit. (The reverse rotation speed limit is *Pr.1 Maximum frequency* ) For -10 to 0V input, set the reverse rotation speed limit. (The forward rotation speed limit is *Pr.1 Maximum frequency* .) The maximum frequency of both the forward and reverse rotations is *Pr.1 Maximum frequency*. |




**Pr. 810, 812 to 817** ≫ **Refer to the section about *Pr.22*.**

## Pr. 818, 819
# Easy gain tuning selection

Sensorless Vector

*Pr.818 Easy gain tuning response level setting* | *Pr.819 Easy gain tuning selection*

The ratio of the load inertia to the motor inertia (load inertia moment ratio) is estimated in real time from the torque command and speed during motor operation to automatically set gain *(Pr.422, Pr.820, Pr.821, Pr.828)* for each control from that ratio and response level setting *(Pr.818)*.
Manually input the load inertia ratio during real sensorless vector control.
Time and effort of making gain adjustment can be reduced.

- Set the response level for finding each control gain from the load inertia ratio.

| *Pr.818* Setting Range | Description |
|---|---|
| 1 to 15 | 1: Slow response<br>↓<br>15: Fast response |

- Valid/invalid of easy gain tuning can be selected.

| *Pr.819* Setting Range | Description |
|---|---|
| 0 | No tuning |
| 1 | With load estimation (only under vector control) |
| 2 | With tuning (manual load input) |



When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 820, 830
## Speed loop proportional gain setting

Sensorless Vector

*Pr.820 Speed control P gain 1* | *Pr.830 Speed control P gain 2*

- Set the proportional gain of the speed loop.
  Increasing the gain enhances the speed response level and decreases the speed fluctuation relative to disturbance, but a too large gain will produce vibration and/or sound.
- The setting range of *Pr.820 Speed control P gain 1* and *Pr.830 Speed control P gain 2* is 0 to 1000% and the initial value is 60%.
  For general adjustment, set them within the range 20 to 200%.

## Pr. 821, 831
## Speed control integral time setting

Sensorless Vector

*Pr.821 Speed control integral time 1* | *Pr.831 Speed control integral time 2*

- Set the integral compensation time of the speed loop.
  If speed fluctuation occurs relative to disturbance, decreasing the value shortens the recovery time, but a too small value will cause a speed overshoot.
  A large value improves stability but increases the recovery time (response time) and may cause an undershoot.

**Pr. 822** **Refer to the section about *Pr.74*.**

## Pr. 823, 833
## Speed detection filter function

Vector

*Pr.823 Speed detection filter 1* | *Pr.833 Speed detection filter 2*

- Set the time constant of the primary delay filter relative to the speed feedback signal.
  Since this function reduces the speed loop response, use it with the initial value.
  Set the time constant when speed ripples occur due to harmonic disturbance.
  Note that a too large value will run the motor unstably.

## Pr. 824, 834
## Current loop proportional gain setting

Sensorless Vector

*Pr.824 Torque control P gain 1* | *Pr.834 Torque control P gain 2*

- Set the current loop integral compensation time for real sensorless vector control or vector control.
- A small value enhances the torque response level, but a too small value will cause current fluctuation.

## Pr. 825, 835
## Current control integral time setting

Sensorless Vector

*Pr.825 Torque control integral time 1* | *Pr.835 Torque control integral time 2*

- Set the proportional gain of the speed loop.
  Increasing the gain enhances the speed response level and decreases the speed fluctuation relative to disturbance, but a too large gain will produce vibration and/or sound.
- The setting range of *Pr.820 Speed control P gain 1* and *Pr.830 Speed control P gain 2* is 0 to 1000% and the initial value is 60%.
  For general adjustment, set them within the range of 20 to 200%.

**Pr. 826** **Refer to the section about *Pr.74*.**

## Pr. 827, 837
## Torque detection filter function

Sensorless Vector

*Pr.827 Torque detection filter 1* | *Pr.837 Torque detection filter 2*

- Set the time constant of the primary delay filter relative to the torque feedback signal.
- Since the current loop response reduces, use it with the initial value.

## Pr. 828, 877 to 881
## Speed feed forward control, model adaptive speed control

Sensorless Vector

*Pr.828 Model speed control gain*
*Pr.877 Speed feed forward control/model adaptive speed control selection*
*Pr.878 Speed feed forward filter* | *Pr.879 Speed feed forward torque limit*
*Pr.880 Load inertia ratio* | *Pr.881 Speed feed forward gain*

- By making parameter setting, select the speed feed forward control or model adaptive speed control.
  The speed feed forward control enhances the trackability of the motor in response to a speed command change.
  The model adaptive speed control enables individual adjustment of speed trackability and motor disturbance torque response.

| *Pr.877* Setting | Description |
|---|---|
| 0 (initial value) | Normal speed control is exercised. |
| 1 | Speed feed forward control is exercised. |
| 2 | Model adaptive speed control is enabled. |

### (1) Speed feed forward control

- Calculate required torque in responce to the acceleration/deceleration command for the inertia ratio set in *Pr.880* and generate torque immediately.
- When inertia ratio estimation has been made by easy gain tuning, the inertia ratio estimation result becomes the *Pr.880* setting value from which speed feed forward is computed.
- When the speed feed forward gain is 100%, the calculation result of the speed feed forward is reflected as-is.
- If the speed command changes suddenly, large torque is generated due to the speed feed forward calculation. The maximum value of the speed feed forward is limitted using *Pr.879*.
- Using *Pr.878*, the speed feed forward result can be dulled by the primary delay filter.

### (2) Model adaptive speed control

- The motor's model speed is calculated to feed back the model side speed controller. This model speed is also used as the actual speed controller command.
- The inertia ratio in *Pr. 880* is used for calculation of the torque current command value given by the model side speed controller.
  When inertia ratio estimation has been made by easy gain tuning, *Pr. 880* is overwritten by the inertia ratio estimation result, and that value is used to calculate the torque current command value.
- The torque current command value of the model side speed controller is added to the output of the actual speed controller, and the result is used as the iq current control input.
- *Pr.828* is used for model side speed control (P control), and the first gain in *Pr. 820* is used for the actual speed controller. The model adaptive speed control is valid for the first motor only.
- When *Pr.877* = 2, switching to the second motor handles the second motor as *Pr.877* = 0.

**Pr. 830** ➤ **Refer to the section about** *Pr.820*.

**Pr. 831** ➤ **Refer to the section about** *Pr.821*.

**Pr. 832** ➤ **Refer to the section about** *Pr.74*.

**Pr. 833** ➤ **Refer to the section about** *Pr.823*.

**Pr. 834** ➤ **Refer to the section about** *Pr.824*.

**Pr. 835** ➤ **Refer to the section about** *Pr.825*.

**Pr. 836** ➤ **Refer to the section about** *Pr.74*.

**Pr. 837** ➤ **Refer to the section about** *Pr.827*.

## Pr. 840 to 848
## Torque bias function Vector

*Pr.840 Torque bias selection*
*Pr.841 Torque bias 1*
*Pr.842 Torque bias 2*
*Pr.843 Torque bias 3*
*Pr.844 Torque bias filter*
*Pr.845 Torque bias operation time*
*Pr.846 Torque bias balance compensation*
*Pr.847 Fall-time torque bias terminal 1 bias*
*Pr.848 Fall-time torque bias terminal 1 gain*

- This function accelerates the rise of the torque at a start. Adjust the torque at a motor start using the contact signals or analog signals.

| *Pr.840* Setting | Description |
|---|---|
| 0 | Set the contact signal (X42, X43) based-torque bias amount using *Pr.841 to Pr.843*. |
| 1 | Set the terminal 1-based torque bias amount as desired in *C16 to C19*. (forward rotation) |
| 2 | Set the terminal 1-based torque bias amount as desired in *C16 to C19*. (reverse rotation) |
| 3 | The terminal 1-based torque bias amount can be set automatically in *C16 to C19, Pr.846* according to the load. |
| 9999 (initial value) | Without torque bias, rated torque 100% |

- *Pr.841 Torque bias 1, Pr.842 Torque bias 2, Pr.843 Torque bias 3*
  On the assumption that the rated torque is 100%, the torque bias setting of 1000% is the center value of torque and the bias value is "0".
- *Pr.844 Torque bias filter*
  You can make a torque rise gentler. At this time, the torque rises according to the time constant of the primary delay filter.
- *Pr.845 Torque bias operation time*
  Set the time for output torque be maintained with the torque bias command value alone.
- *Pr.846 Torque bias balance compensation*
  Set the voltage of the torque bias analog input value input to the terminal 1 to compensate for the balance of the torque bias amount.
- *Pr.847 Fall-time torque bias terminal 1 bias*
  Set the torque bias amount at a fall time (when the motor runs in the reverse rotation direction).
- *Pr.848 Fall-time torque bias terminal 1 gain*
  Set the torque bias amount at a fall time.

**Pr. 849** ➤ **Refer to the section about** *Pr.74*.

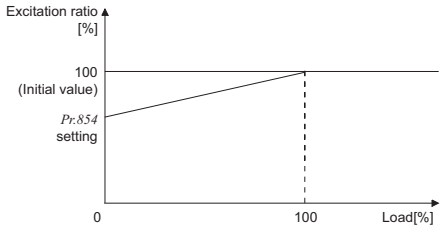
**Pr. 850** ➤ **Refer to the section about** *Pr.10*.

**Pr. 853** ➤ **Refer to the section about** *Pr.285*.

## Pr. 854
## Excitation ratio Sensorless Vector

*Pr.854 Excitation ratio*

- Decrease the excitation ratio when you want to improve efficiency under light load. (motor magnetic noise decreases)
- Note that the rise of output torque becomes slow if excitation ratio is decreased.
  This function is appropriate for applications as machine tools which repeat rapid acceleration/deceleration up to high speed.




## Pr. 858, 868
## Function assignment of analog input terminal

*Pr.858 Terminal 4 function assignment*
*Pr.868 Terminal 1 function assignment*

Function assignment of terminal 1 and terminal 4 of analog input can be selected and changed by parameter.

- Terminal 1 function according to control

| *Pr.868* Setting | V/F Control Magnetic Flux Vector Control | Real Sensorless Vector Control /Vector Control | | |
|---|---|---|---|---|
| | | Speed control | Torque control | Position control* |
| 0 (initial value) | Frequency setting auxiliary | Speed setting auxiliary | Speed limit auxiliary | — |
| 1 | — | Magnetic flux command | Magnetic flux command | Magnetic flux command |
| 2 | — | Regenerative torque limit (*Pr.810* = 1) | — | Regenerative torque limit (*Pr.810* = 1) |
| 3 | — | — | Torque command (*Pr.804* = 0) | — |
| 4 | Stall prevention operation level input (*Pr.810* = 1) | Torque limit (*Pr.810* = 1) | Torque command (*Pr.804* = 0) | Torque limit (*Pr.810* = 1) |
| 5 | — | — | Forward/ reverse rotation speed limit | — |
| 6 | — | Torque bias input (*Pr.840* =1,2,3) | — | — |
| 9999 | — | — | — | — |

* Position control is valid only during vector control

- Terminal 4 function according to control

| *Pr.858* Setting | V/F Control Magnetic Flux Vector Control | Real Sensorless Vector Control /vector Control | | |
|---|---|---|---|---|
| | | Speed control | Torque control | Position control* |
| 0 (initial value) | Frequency command (AU signal-ON) | Speed command (AU signal-ON) | Speed limit (AU signal-ON) | — |
| 1 | — | Magnetic flux command | Magnetic flux command | Magnetic flux command |
| 4 | Stall prevention operation level input (*Pr.810* = 1) | Torque limit (*Pr.810* = 1) | — | Torque limit (*Pr.810* = 1) |
| 9999 | — | — | — | — |

* Position control is valid only during vector control
—:No function

**Pr. 859, 860** ➤ **Refer to the section about** *Pr.82*.



When setting parameters, refer to the instruction manual (applied) and understand instructions.

## Pr. 862, 863
## Notch filter Sensorless Vector

*Pr.862 Notch filter time constant* | *Pr.863 Notch filter depth*

- You can reduce the response level of speed control in the resonance frequency band of the mechanical system to avoid mechanical resonance.
- *Pr.862 Notch filter time constant*

| Setting | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Invalid | 1000 | 500 | 333.3 | 250 | 200 | 166.7 | 142.9 | 125 | 111.1 |

| Setting | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 100 | 90.9 | 83.3 | 76.9 | 71.4 | 66.7 | 62.5 | 58.8 | 55.6 | 52.6 |

| Setting | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 50 | 47.6 | 45.5 | 43.5 | 41.7 | 40 | 38.5 | 37 | 35.7 | 34.5 |

| Setting | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 33.3 | 32.3 | 31.3 | 30.3 | 29.4 | 28.6 | 27.8 | 27.0 | 26.3 | 25.6 |

| Setting | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 25.0 | 24.4 | 23.8 | 23.3 | 22.7 | 22.2 | 21.7 | 21.3 | 20.8 | 20.4 |

| Setting | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 20.0 | 19.6 | 19.2 | 18.9 | 18.5 | 18.2 | 17.9 | 17.5 | 17.2 | 16.9 |

| Setting | 60 |
|---|---|
| Frequency | 16.7 |

- *Pr.863 Notch filter depth*

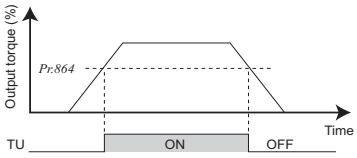
| Setting | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Depth | Deep | ← | → | Sharrow |
| Gain | -40dB | -14dB | -8dB | -4dB |

## Pr. 864
## Torque detection Magnetic flux Sensorless Vector

*Pr.864 Torque detection*

- This function outputs a signal if the motor torque rises to or above the *Pr.864* setting.
- The signal is used as operation and open signal for an electromagnetic brake.

The signal turns on when the output torque rises to or above the detection torque value set in *Pr.864*. It turns off when the torque falls below the detection torque value.




**Pr. 865** Refer to the section about *Pr.41*.

**Pr. 866** Refer to the section about *Pr.55*.

**Pr. 867** Refer to the section about *Pr.52*.

**Pr. 868** Refer to the section about *Pr.858*.

**Pr. 872** Refer to the section about *Pr.251*.

## Pr. 873
## Speed limit during speed control Vector

*Pr.873 Speed limit*

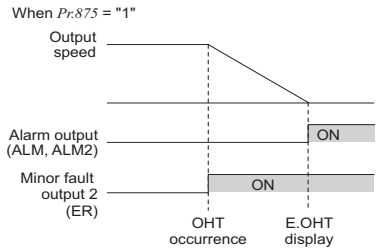
- Frequency is limited at the set frequency + *Pr.873* during vector control.

**Pr. 874** Refer to the section about *Pr.22*.

## Pr. 875
## Fault definition

*Pr.875 Fault definition*

When the electronic thermal function is activated, the motor decelerates to a stop and the base circuit is shut off.




| Pr.875 Setting | Operation | Description |
|---|---|---|
| 0 (initial value) | Normal operation | At occurrence of any alarm, the base circuit is shut off immediately. At this time, the alarm output also turns on. |
| 1 | Fault definition | At occurrence of external thermal operation (OHT), electronic thermal relay function (THM) or PTC thermister function (PTC) alarm, the motor is decelerated to a stop and the base circuit is shut off. At occurrence of an alarm other than OHT, THM and PTC, the base circuit is shut off immediately. Same operation as when "0" is set is performed under position control. |

**Pr. 877 to 881** Refer to the section about *Pr.828*.

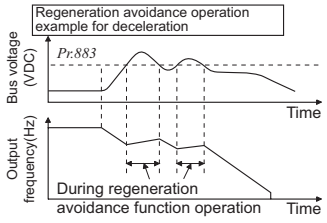
## Pr. 882 to 886, 665
## Regeneration avoidance function

*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* | *Pr.665 Regeneration avoidance frequency 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 is always valid |
| | 2 | Regeneraiton avoidance funcion is valid only during a constant speed operation |
| 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 voltage × √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 ratio.<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. When the load inertia of the motor is large, decrease the *Pr. 886* setting.When vibration is not suppressed by decreasing the *Pr.886* setting, set a smaller value in *Pr.665*. |
| 665 | 0 to 200% | |



## 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*.**

## 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 savings | 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>$\frac{\text{Power savings}}{\text{Power during commercial power supply}} \times 100$<br>Ratio of power saving on the assumption that *Pr.893* is 100%<br>$\frac{\text{Power savings}}{Pr.893} \times 100$ | 0.1% |
| Power savings 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 average value | Ratio of power saving average value on the assumption that the value during commercial power supply operation is 100%<br>$\frac{\Sigma(\text{Power saving rate} \times \Delta t)}{Pr.897} \times 100$<br>Ratio of power saving average value on the assumption that *Pr.893* is 100%<br>$\frac{\text{Energy saving average}}{Pr.893} \times 100$ | 0.1% |
| 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 shows 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/ 0.1kWh* |
| Power saving amount charge | Power saving average value 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>$\frac{\text{Power saving amount}}{\text{Operation time during}} \times 24 \times 365 \times \frac{Pr.899}{100}$ | 0.01kWh/ 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 differ according to the inverter capacity. (55K or less/75K or more)

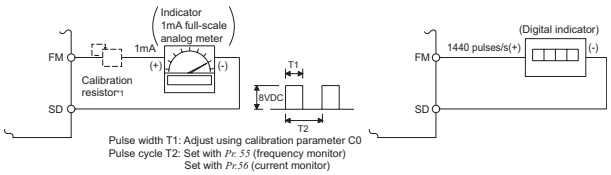
## Pr. C0(900), C1(901)
## Adjustment of terminal FM and AM output (calibration)

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

By using the operation panel or parameter unit, you can calibrate terminal FM and terminal AM to full scale deflection.

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

- The terminal FM is preset to output pulses. By setting the *calibration 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/FR-PU07) 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.

- When the FM terminal is set to the open collector output using *Pr.291 Pulse train I/O selection* , pulse train output can not be calibrated using *Pr.900* .

**(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 *AM terminal calibration 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), C12(917) to C19(920), C38(932) to C41(933) Refer to the section about *Pr.125*.**



When setting parameters, refer to the instruction manual (applied) and understand instructions.

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

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

## 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/FR-PU07)

| *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/FR-PU07) can be performed.
Decreasing the setting value makes contrast light.

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

# 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 | Display |
|---|---|---|---|
| Error Message *2 | Operation panel lock | Appears when operation was tried during operation panel lock. | HOLd |
| | Parameter write error | Appears when an error occurred during parameter writing. | Er1 to Er4 |
| | Copy operation error | Appears when an error occurred during 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. 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. | rb |
| | Electronic thermal relay function prealarm | Appears when the electronic thermal O/L relay has reached 85% of the specified value. | TH |
| | 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. | MT |
| | Parameter copy | Appears when parameters are copied between models with capacities of 55K or less and 75K or more. | CP |
| | Speed limit display (output during speed limit) | Display if the speed limit level is exceeded during torque control. | SL |
| Minor failure *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 shutoff during acceleration | Appears when an overcurrent occurred during acceleration. | E.OC1 |
| | Overcurrent shutoff 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 shut-off 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.THT |
| | 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 |
| | 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. | E. bE |
| | 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 is activated. | 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 |

| Function Name | | Description | Display |
|---|---|---|---|
| Major failures *5 | Option alarm | Appears when torque command by the plug-in option is selected using *Pr. 804* when no plug-in option is mounted or an AC power supply is connected to the R/L1, S/L2, T/L3 when the high power factor converter and power regeneration common converter connection setting (*Pr.30* =2) is selected. | E.OPT |
| | Communication option alarm | Appears when a communication line error occurs in the communication option. | E.OP3 |
| | Option alarm | Appears if a contact fault or the like of the connector between the inverter and communication option occurs or if a communication option is fitted to the connector 1 or 2. (1 to 3 indicate connector numbers for connection of the plug-in option . | E. 1 to E. 3 |
| | Parameter storage device alarm | Appears when operation of the element where parameters stored became abnormal. (control board) | E. PE |
| | 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 device 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 occurred. | E. 6/ E. 7/ E.CPU |
| | Operation panel power supply short circuit 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 excess | 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 alarm (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 |
| | Overspeed occurrence *7 | Indicates that the motor speed has exceeded the overspeed setting level *(Pr.374)*. | E.OS |
| | Speed deviation excess detection *7 | Stops the inverter output if the motor speed is increased or decreased under the influence of the load etc. during vector control and cannot be controlled in accordance with the speed command value. | E.OSd |
| | Open cable detection *7 | Stops the inverter output if the encoder signal is shut off. | E.ECT |
| | Position error large *7 | Indicates that the difference between the position command and position feedback exceeded the reference. | E. Od |
| | Brake sequence error | The inverter output is stopped when a sequence error occurs during use of the brake sequence function *(Pr.278 to Pr.285)*. | E.nb1 to E.nb7 |
| | Encoder phase error *7 | When the rotation command of the inverter differs from the actual motor rotation direction detected from the encoder, the inverter output is stopped. (detected only during tuning is performed in the "rotation mode" of offline auto tuning) | E.EP |
| | Internal circuit error | Appears when an internal circuit error occurred. | E. 13 |
| | USB error | Appears when USB communication error occurred. | E.USB |
| | Opposite rotation deceleration alarm | The speed may not decelerate during low speed operation if the rotation direction of the speed command and the estimated speed differ when the rotation is changing from forward to reverse or from reverse to forward under real sensorless vector control. At this time, the inverter output is stopped if the rotation direction will not change, causing overload. | E. 11 |

*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 failure warns 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).
*7. Appears when the FR-A7AP (option) is fitted.

## Option List

By fitting the following options to the inverter, the inverter is provided with more functions.
Three plug-in options can be fitted at a time. (more than two same options and communication options can not be fitted)

| | Name | | Type | Applications, Specifications, etc. | Applicable Inverter |
|---|---|---|---|---|---|
| Plug-in Type | Vector control | | FR-A7AP | Vector control with encoder can be performed. | Shared among all models |
| | Orientation/encoder | | | The main spindle can be stopped at a fixed position (orientation) in combination with a pulse encoder.The motor speed is sent back and the speed is maintained constant. | |
| | 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) | |
| | Digital output<br>Extension analog output | | FR-A7AY | · Output signals provided with the inverter as standard are selected to output from the open collector. | |
| | | | | · This option adds 2 different signals that can be monitored at the terminals AM0 and AM1, such as the output frequency, output voltage and output current.<br>· 20mADC or 10VDC 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 communication | 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 communication | FR-A7NL | | |
| | | DeviceNet communication | FR-A7ND | | |
| | | PROFIBUS-DP communication | FR-A7NP | | |
| Stand-alone Shared | Parameter unit (8 languages) | | FR-PU07<br>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 | |
| | Cable for encoder<br>Mitsubishi vector control dedicated motor (SF-V5RU) | | FR-V7CBL☐☐ | Connection cable for the inverter and encoder for Mitsubishi vector control dedicated motor (SF-V5RU).<br>☐ indicates a cable length. (1m, 3m, 5m) | |
| | Heatsink protrusion attachment | | FR-A7CN01 to 11 | The inverter heatsink section can be protruded outside of the rear of the enclosure.<br>For a panel cut dimension drawing, refer to *page 19*. | FR-A720-1.5K to 90K<br>FR-A740-0.4K to 132K<br>According to capacities |
| | Intercompatibility attachment | | FR-AAT24 | Attachment for replacing with the A700 series using the installation holes of the FR-A500 series. | FR-A740-11K, 15K |
| | | | FR-A5AT | Attachment for replacing with the FR-A700 series using the installation holes of the FR-A100<Excellent> and FR-A200<Excellent> | According to capacities |
| | AC reactor | | FR-HAL | For harmonic suppression measures and improvement of inverter input power factor<br>(total power factor approx. 88%) | According to capacities |
| | DC reactor | | FR-HEL | For harmonic suppression measures and improvement of inverter input power factor<br>(total power factor approx. 93%) | Compatible with the 55K or less |
| | Line noise filter | | FR-BSF01<br>FR- BLF | For line noise reduction | Shared among all models |
| | High-duty brake resistor | | FR-ABR | For improvement of braking capability of the built-in brake of the inverter | Compatible with the 22K or less |
| | BU type brake unit | | BU | For increasing the braking capability of the inverter (for high-inertia load or negative load) | Compatible with the 55K or less |
| | Brake unit<br>Resistor unit | | FR-BU<br>FR-BR | 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 | Compatible with the 55K or less |
| | | | MT-BU5<br>MT-BR5 | | Compatible with the 75K or more |

| | Name | | Type | Applications, Specifications, etc. | Applicable Inverter |
|---|---|---|---|---|---|
| Stand-alone Shared | Power regeneration common converter<br>Stand-alone reactor dedicated for the FR-CV | | FR-CV<br>FR-CVL | Unit which can return motor-generated braking energy back to the power supply in common converter system | Compatible with the 55K or less |
| | 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. | Compatible with the 75K or more |
| | High power factor converter | | FR-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.) | Compatible with the 55K or less |
| | | | MT-HC | | Compatible with the 75K or more |
| | Surge voltage suppression filter | | FR-ASF | Filter for suppressing surge voltage on motor | Compatible with the 400V class 55K or less |
| | Sine wave filter | Reactor | MT- BSL (-HC) | Reduce the motor noise during inverter driving<br>Use in combination with a reactor and a capacitor | Compatible with the 75K or more |
| | | Capacitor | MT- BSC | | |
| FR Series Manual Controller/Speed Controller | Manual controller | | FR-AX | For independent operation. With frequency meter, frequency 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)* | |
| | Speed detector | | 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. Wire-wound 2W 1kΩ type 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.<br>Carbon film type B characteristic | |
| | Inverter setup software (FR Configurator) | | FR-SW2-SETUP-WE | Supports an inverter startup to maintenance. | |

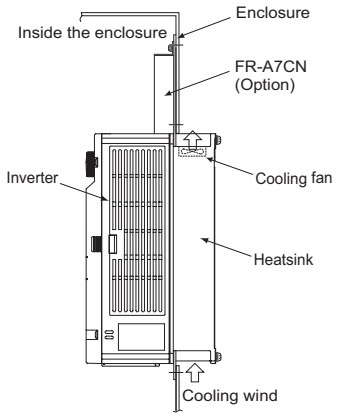
* Rated power consumption. The power supply specifications of the FR series manual controllers and speed controllers are 200VAC 50Hz, 220V/220VAC 60Hz, and 115VAC 60Hz.

## Stand-alone Option

### Heatsink protrusion attachment FR-A7CN□□

- With this attachment the heatsink which is the exothermic section of the inverter can be placed on the rear of the enclosure. Since the heat generated in the inverter can be radiated to the rear of the enclosure, the enclosure can be downsized.
- The use of this attachment requires more installation area. For installation, refer to the drawing after attachment installation *(page 19)*.
- For a panel cutting drawing, refer to *page 19*.

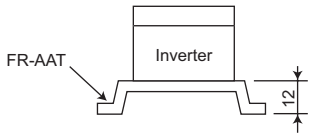
| Type | Applied Inverter | |
|---|---|---|
| | 200V Class | 400V Class |
| **FR-A7CN01** | FR-A720-1.5K to 3.7K | FR-A740-0.4K to 3.7K |
| **FR-A7CN02** | FR-A720-5.5K, 7.5K | FR-A740-5.5K, 7.5K |
| **FR-A7CN03** | FR-A720-11K | FR-A740-11K, 15K |
| **FR-A7CN04** | FR-A720-15K to 22K | FR-A740-18.5K, 22K |
| **FR-A7CN05** | FR-A720-30K | — |
| **FR-A7CN06** | — | FR-A740-30K |
| **FR-A7CN07** | FR-A720-37K, 45K | FR-A740-37K to 55K |
| **FR-A7CN08** | — | FR-A740-75K |
| **FR-A7CN09** | — | FR-A740-90K |
| **FR-A7CN10** | FR-A720-75K, 90K | FR-A740-110K, 132K |
| **FR-A7CN11** | FR-A720-55K | — |



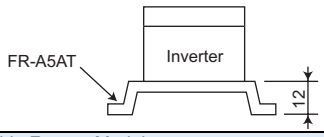

### Intercompatibility attachment FR-AAT24 FR-A5AT□□

- FR-A500 series intercompatibility attachment
  The FR-A700 series inverter can be installed using installation holes of the conventional FR-A500 series with this attachment. This attachment is useful for replacing the conventional model with the FR-A700 series.
  *The depth increases after installation of the inverter when the attachment is used.

| Type | Applicable Inverter |
|---|---|
| FR-AAT24 | FR-A740-11K, 15K |




- FR-A200E/A100E series intercompatibility attachment
  The FR-A700 series inverter can be installed using installation holes of the conventional FR-A200E/A100E series with this attachment. This attachment is useful for replacing the conventional model with the FR-A700 series.
  *The depth increases after installation of the inverter when the attachment is used.



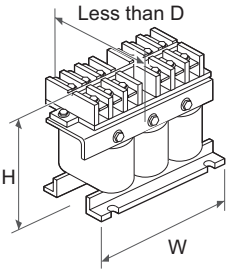

| Type | Mountable Models | | Compatible Former Models | | | |
|---|---|---|---|---|---|---|
| | A720 | A740 | A220E | A240E | A120E | A140E |
| A5AT01 | 0.4K, 0.75K | — | 0.4K, 0.75K | — | 0.75K | — |
| A5AT02 | 0.4K, 0.75K, 1.5K, 2.2K, 3.7K | 0.4K, 0.75K, 1.5K, 2.2K, 3.7K | 1.5K, 2.2K, 3.7K | 0.4K, 0.75K, 1.5K, 2.2K, 3.7K | 1.5K, 2.2K, 3.7K | 0.75K, 1.5K, 2.2K, 3.7K |
| A5AT03 | 1.5K, 2.2K, 3.7K, 5.5K, 7.5K | 0.4K, 0.75K, 1.5K, 2.2K, 3.7K, 5.5K, 7.5K | 5.5K, 7.5K, 11K | 5.5K, 7.5K | 5.5K, 7.5K, 11K | 5.5K, 7.5K, 11K |
| A5AT04 | 11K, 15K, 18.5K, 22K | 11K, 15K, 18.5K, 22K | 18.5K, 22K | 18.5K, 22K | 22K | 22K |
| A5AT05 | 37K, 45K | 37K, 45K, 55K | — | 55K | — | 55K |

### AC reactor (for power coordination) FR-HAL-(H)□□K

●Outline dimension

(Unit: mm)

| | Model | W | D | H | Mass (kg) | | Model | W | D | H | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V | 0.4K | 104 | 72 | 99 | 0.6 | 400V | H0.4K | 135 | 59.6 | 115 | 1.5 |
| | 0.75K | 104 | 74 | 99 | 0.8 | | H0.75K | 135 | 59.6 | 115 | 1.5 |
| | 1.5K | 104 | 77 | 99 | 1.1 | | H1.5K | 135 | 59.6 | 115 | 1.5 |
| | 2.2K | 115 | 77 | 115 | 1.5 | | H2.2K | 135 | 59.6 | 115 | 1.5 |
| | 3.7K | 115 | 83 | 115 | 2.2 | | H3.7K | 135 | 70.6 | 115 | 2.5 |
| | 5.5K | 115 | 83 | 115 | 2.3 | | H5.5K | 160 | 72 | 142 | 3.5 |
| | 7.5K | 130 | 100 | 135 | 4.2 | | H7.5K | 160 | 91 | 142 | 5.0 |
| | 11K | 160 | 111 | 164 | 5.2 | | H11K | 160 | 91 | 146 | 6.0 |
| | 15K | 160 | 126 | 167 | 7.0 | | H15K | 220 | 105 | 195 | 9.0 |
| | 18.5K | 160 | 175 | 128 | 7.1 | | H18.5K | 220 | 170 | 215 | 9.0 |
| | 22K | 185 | 158 | 150 | 9.0 | | H22K | 220 | 170 | 215 | 9.5 |
| | 30K | 185 | 168 | 150 | 9.7 | | H30K | 220 | 170 | 215 | 11 |
| | 37K | 210 | 174 | 175 | 12.9 | | H37K | 220 | 170 | 214 | 12.5 |
| | 45K | 210 | 191 | 175 | 16.4 | | H45K | 280 | 165 | 245 | 15 |
| | 55K | 210 | 201 | 175 | 17.4 | | H55K | 280 | 170 | 245 | 18 |
| | 75K | 240 | 213 | 210 | 23 | | H75K | 205 | 208 | 170 | 20 |
| | 110K | 330 | 258 | 325 | 40 | | H110K | 240 | 220 | 225 | 28 |
| | | | | | | | H185K | 330 | 270 | 325 | 55 |
| | | | | | | | H280K | 330 | 320 | 325 | 80 |
| | | | | | | | H355K | 330 | 340 | 325 | 80 |
| | | | | | | | H560K | 450 | 635 | 540 | 190 |




(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)
2. Power factor improving reactor (FR-BAL) can be used.
Power factor improving effect
FR-BAL approx.90%
FR-HAL approx.88%

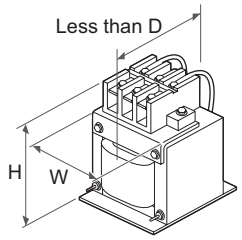
| Name (type) | Specifications, Structure, etc. |
|---|---|

## DC reactor (for power coordination) FR-HEL-(H)□□K

●Outline dimension

(Unit: mm)

| | Model | W | D | H | Mass (kg) | | Model | W | D | H | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V | 0.4K | 70 | 61 | 71 | 0.4 | 400V | H0.4K | 90 | 60 | 78 | 0.6 |
| | 0.75K | 85 | 61 | 81 | 0.5 | | H0.75K | 66 | 70 | 100 | 0.8 |
| | 1.5K | 85 | 70 | 81 | 0.8 | | H1.5K | 66 | 80 | 100 | 1 |
| | 2.2K | 85 | 70 | 81 | 0.9 | | H2.2K | 76 | 80 | 110 | 1.3 |
| | 3.7K | 77 | 82 | 92 | 1.5 | | H3.7K | 86 | 95 | 120 | 2.3 |
| | 5.5K | 77 | 92 | 92 | 1.9 | | H5.5K | 96 | 100 | 128 | 3 |
| | 7.5K | 86 | 98 | 113 | 2.5 | | H7.5K | 96 | 105 | 128 | 3.5 |
| | 11K | 105 | 112 | 133 | 3.3 | | H11K | 105 | 110 | 137 | 4.5 |
| | 15K | 105 | 115 | 133 | 4.1 | | H15K | 105 | 125 | 152 | 5 |
| | 18.5K | 105 | 165 | 93 | 4.7 | | H18.5K | 114 | 120 | 162 | 5 |
| | 22K | 105 | 175 | 93 | 5.6 | | H22K | 133 | 120 | 178 | 6 |
| | 30K | 114 | 200 | 100 | 7.8 | | H30K | 133 | 120 | 178 | 6.5 |
| | 37K | 133 | 195 | 117 | 10 | | H37K | 133 | 155 | 187 | 8.5 |
| | 45K | 133 | 205 | 117 | 11 | | H45K | 133 | 170 | 187 | 10 |
| | 55K | 153 | 209 | 132 | 12.6 | | H55K | 152 | 170 | 206 | 11.5 |

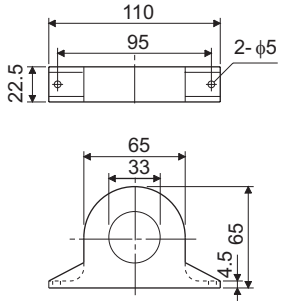



(Note)
1. Be sure to remove the jumper across the inverter terminals P/+-P1. (A failure to do so will produce no power factor improving effect))
2. The wiring length between the reactor and inverter should be within 5m.
3. The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3).
4. Make selection according to the motor capacity.
   (When the inverter capacity is larger than the motor capacity, make selection according to the motor capacity)
5. Power factor improving reactor (FR-BEL) can be used.
   Power factor improving effect
   FR-BEL approx.95%
   FR-HEL approx.93%
6. A DC reactor for the 75K or more is supplied with the inverter.

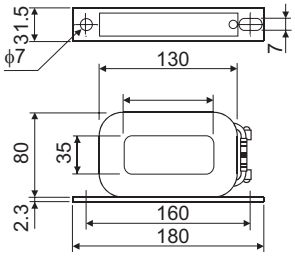
## Line noise filter FR-BSF01...for small capacities FR- BLF

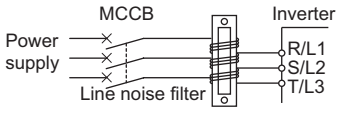
●Outline dimension

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 unmber of turns, the more effective result is obtained.)
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.

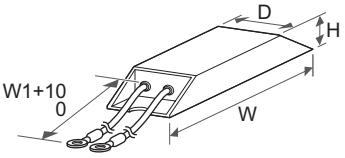
## High-duty brake resistor FR-ABR-(H)□□

●Outline dimension

(Unit: mm)

| | Brake Resistor Type | Permissible Brake Duty | Outline Dimension W | W1 | D | H | Resistance Value (Ω) | Approx Mass (kg) | | Brake Resistor Type | Permissible Brake Duty | Outline Dimension W | W1 | D | H | Resistance Value (Ω) | Approx Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V | FR-ABR-0.4K | 10% | 140 | 500 | 40 | 21 | 200 | 0.2 | 400V | FR-ABR-H0.4K | 10% | 115 | 500 | 40 | 21 | 1200 | 0.2 |
| | FR-ABR-0.75K | 10% | 215 | 500 | 40 | 21 | 100 | 0.4 | | FR-ABR-H0.75K | 10% | 140 | 500 | 40 | 21 | 700 | 0.2 |
| | FR-ABR-2.2K*1 | 10% | 240 | 500 | 50 | 26 | 60 | 0.5 | | FR-ABR-H1.5K | 10% | 215 | 500 | 40 | 21 | 350 | 0.4 |
| | | | | | | | | | | FR-ABR-H2.2K | 10% | 240 | 500 | 50 | 26 | 250 | 0.5 |
| | FR-ABR-3.7K | 10% | 215 | 500 | 61 | 33 | 40 | 0.8 | | FR-ABR-H3.7K | 10% | 215 | 500 | 61 | 33 | 150 | 0.8 |
| | FR-ABR-5.5K | 10% | 335 | 500 | 61 | 33 | 25 | 1.3 | | FR-ABR-H5.5K | 10% | 335 | 500 | 61 | 33 | 110 | 1.3 |
| | FR-ABR-7.5K | 10% | 400 | 500 | 80 | 40 | 20 | 2.2 | | FR-ABR-H7.5K | 10% | 400 | 500 | 80 | 40 | 75 | 2.2 |
| | FR-ABR-11K | 6% | 400 | 700 | 100 | 50 | 13 | 3.5 | | FR-ABR-H11K | 6% | 400 | 700 | 100 | 50 | 52 | 3.2 |
| | FR-ABR-15K*2 | 6% | 300 | 700 | 100 | 50 | 18 (×1/2) | 2.4 (×2) | | FR-ABR-H15K*4 | 6% | 300 | 700 | 100 | 50 | 18 (×2) | 2.4 (×2) |
| | FR-ABR-22K*3 | 6% | 400 | 700 | 100 | 50 | 13 (×1/2) | 3.3 (×2) | | FR-ABR-H22K*5 | 6% | 400 | 700 | 100 | 50 | 52 (×1/2) | 3.3 (×2) |

*1. For the 1.5K and 2.2K inverter.
*2. For the 15K brake resistor, configure so that two 18Ω resistors are connected in parallel.
*3. For the 22K brake resistor, configure so that two 13Ω resistors are connected in parallel.
*4. For the H15K brake resistor, configure so that two 18Ω resistors are connected in series. FR-ABR-15K is indicated on the resistor. (same resistor as the 200V class 15K)
*5. For the H22K brake resistor, configure so that two 52Ω resistors are connected in parallel.




(Note)
1. When using the FR-ABR type brake resistor, remove the jumper across terminal PR-PX. Failure to remove will cause the brake resistor to overheat.
2. The regenerative brake duty setting should be less than permissible brake duty in the table above.
3. The temperature of the brake resistor becomes 300°C or more depending on the operation frequency, care must be taken for installation and heat dissipation.
4. MYS type resistor can be also used. Note the permissible brake duty.

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

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

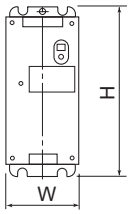
| Voltage | Motor(kW) / Braking torque | 0.4 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V output | 50% 30s | BU-1500 | | BU-3700 | | BU-7.5K | | BU-15K | | 2×BU-15K | | | 3× BU-15K | | 4× BU-15K |
| | 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 | Used Cable (P, N) | Voltage | Brake Unit | Resistor Type | Used 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 | GRZG400-10Ω (twelve in series) | 3.5mm$^2$ |
| | BU-15K | GRZG400-2Ω (six in series) | 3.5mm$^2$ | | | | |

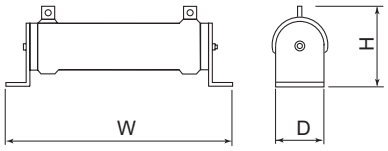
●Brake unit




(Unit: mm)

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

●Electrical-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 of the inverter and brake unit match with each other. Incorrect connection will damage the inverter.
2.Minimize the cable length between the inverter and brake unit and the electrical-discharge 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 setting.
2. The maximum temperature rise of the electrical-discharge 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

- A 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%

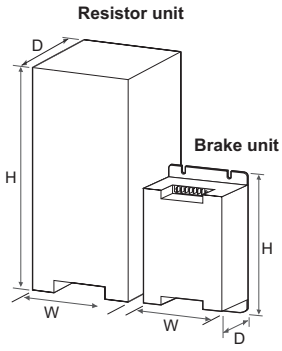
| Motor Capacity | | | | 5.5kW | 7.5kW | 11kW | 15kW | 18.5kW | 22kW | 30kW | 37kW | 45kW | 55kW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | | | 200V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 30K | 37K | 45KK | 55K |
| | | | 400V | 5.5K | 7.5K | 11K | 15K | 18.5K | 22K | 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 |

- Outline dimension

| | Brake Unit | | | | Resistor Unit | | | |
|---|---|---|---|---|---|---|---|---|
| | Type | W | H | D | Type | W | H | D |
| 200V | FR-BU-15K | 100 | 240 | 128 | FR-BR-15K | 170 | 450 | 220 |
| | FR-BU-30K | 160 | 240 | 128 | FR-BR-30K | 340 | 600 | 220 |
| | FR-BU-55K | 265 | 240 | 128 | FR-BR-55K | 480 | 700 | 450 |
| 400V | FR-BU-H15K | 160 | 240 | 128 | FR-BR-H15K | 170 | 450 | 220 |
| | FR-BU-H30K | 160 | 240 | 128 | FR-BR-H30K | 340 | 600 | 220 |
| | FR-BU-H55K | 265 | 240 | 128 | FR-BR-H55K | 480 | 700 | 450 |



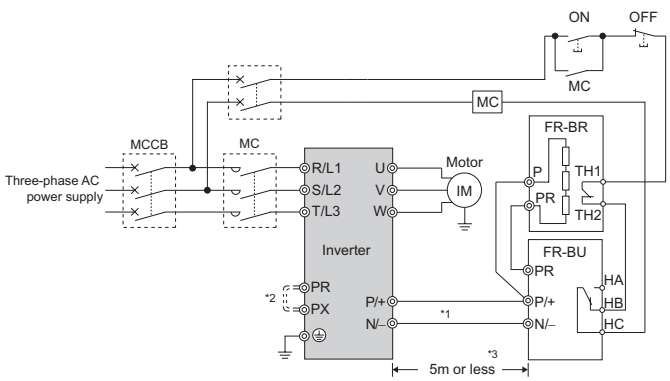

- Brake unit and resistor unit combinations and used wires

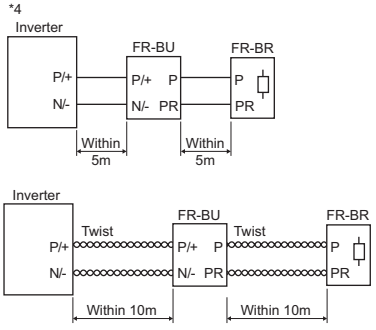
| | Brake Unit Type | Resistor Unit Type | Wire (P/+-P/+, N-N/-, P/+-P, PR-PR) |
|---|---|---|---|
| 200V | FR-BU-15K<br>FR-BU-30K<br>FR-BU-55K | FR-BR-15K<br>FR-BR-30K<br>FR-BR-55K | 3.5mm²<br>5.5mm²<br>14mm² |
| 400V | FR-BU-H15K<br>FR-BU-H30K<br>FR-BU-H55K | FR-BR-H15K<br>FR-BR-H30K<br>FR-BR-H55K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

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

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

- Connection example




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.

*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. Be sure to remove a jumper across terminal PR-PX when using the FR-BU with the inverter of 7.5K or less.

| 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 when 100% ED is 15s

| 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.

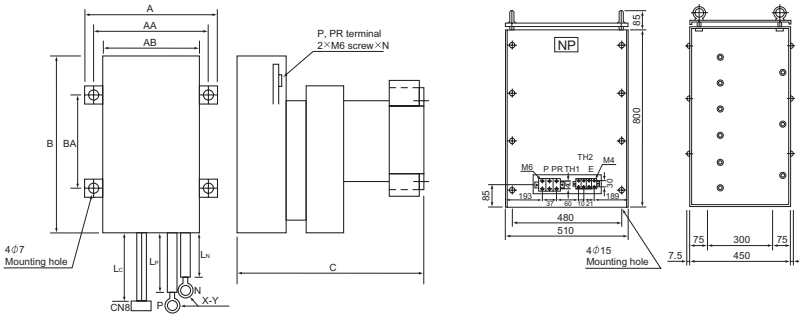
## ● Brake unit and resistor unit combinations and cables

| Brake Unit Type | | Resistor Unit Type | Cable |
|---|---|---|---|
| 200V | MT-BU5-55K | MT-BR5-55K | 14mm² |
| | MT-BU5-110K | 2×MT-BR5-55K | 2×14mm² |
| 400V | MT-BU5-H75K | MT-BR5-H75K | 14mm² |
| | MT-BU5-H150K | 2×MT-BR5-H75K | 2×14mm² |
| | MT-BU5-H220K | 3×MT-BR5-H75K | 3×14mm² |
| | MT-BU5-H280K | 4×MT-BR5-H75K | 4×14mm² |
| | MT-BU5-H375K | 5×MT-BR5-H75K | 5×14mm² |

(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.

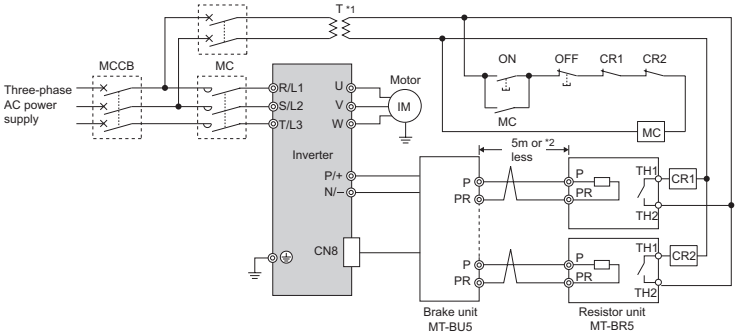
## ● Outline dimension drawings




| 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 |

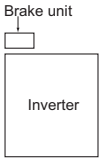
| Resistor Unit Type | | Resistance Value | Mass |
|---|---|---|---|
| 200V class | MT-BR5-55K | 2.0Ω | 50kg |
| 400V class | MT-BR5-H75K | 6.5Ω | 70kg |

## ● External connection diagram




*1 When the power supply is 400V class, install a step-down transformer.
*2 The wiring length between the resistor unit and brake resistor should be 10m maximum when wires are twisted and 5m maximum when wires are not twisted.

(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).



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

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

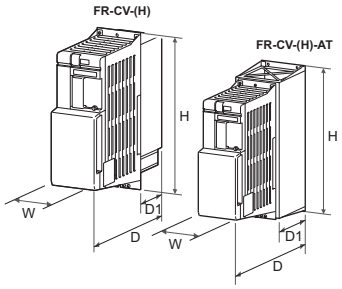
- Enables 100%-torque continuous regeneration to support continuous regenerative operation for line control, etc.
- Eliminates the need to use a brake unit with each inverter, reducing total space and total cost.
- Saves energy since regeneration energy is used for the other inverters and excess energy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

FR-CV-(H) (Unit mm)

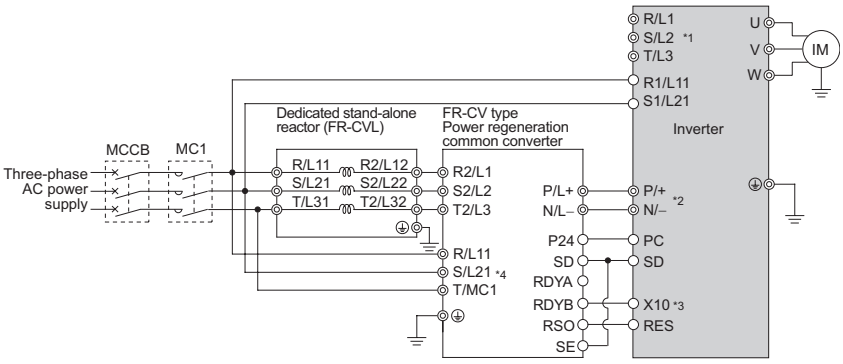
| Voltage/ Capacity | | W | D | D1 | H | Voltage/ Capacity | | W | D | D1 | H |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V | 7.5K/11K | 90 | 303 | 103 | 300 | 400V | 7.5K/11K/ 15K | 120 | 305 | 105 | 300 |
| | 15K | 120 | 305 | 105 | 300 | | | | | | |
| | 22K/30K | 150 | 322 | 122 | 380 | | 22K/30K | 150 | 305 | 105 | 380 |
| | 37K/55K | 400 | 250 | 135 | 620 | | 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 |
| | 15K | 130 | 320 | 120 | 330 | | | | | | |
| | 22K/30K | 160 | 350 | 150 | 410 | | 22K/30K | 160 | 350 | 150 | 410 |




### ●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 MCCB 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. Always 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.

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

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

### ●Specifications

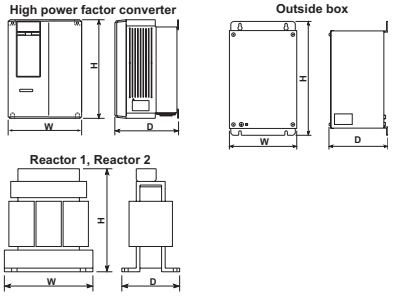
| Type FR-HC□□ | 200V | | | | 400V | | | |
|---|---|---|---|---|---|---|---|---|
| | 7.5K | 15K | 30K | 55K | H7.5K | H15K | H30K | H55K |
| Applicable inverter capacity *1 | 3.7K to 7.5K | 7.5K to 15K | 15K to 30K | 30K to 55K | 3.7K to 7.5K | 7.5K to 15K | 15K to 30K | 30K to 55K |
| Rated input voltage/frequency | 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 | 293V to 335VDC | | | | 558V 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 | | | Reactor 1 FR-HCL01 | | | Reactor 2 FR-HCL02 | | | Outside box FR-HCB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | D | W | H | D | W | H | D | 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
MT-BSL-(H)□□K
MT-BSC-(H)□□K

## ● Application of the sine wave filter

For the FR-A700 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".)

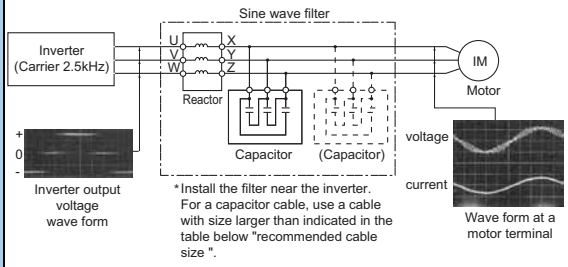
The carrier frequency changes to 2.5KHz. (The sine wave filter is designed on condition that the carrier frequency is 2.5KHz. Be sure to change the setting properly.) If the inverter is operated with Pr.72 set to other than "25", the inverter and sine wave filter may be damaged.

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.
5) This function is valid for V/F control only. (When 25 is set in *Pr.72*, V/F control is automatically selected.
6) Use the MT-BSL-HC when using a sine wave filter with the MT-HC.

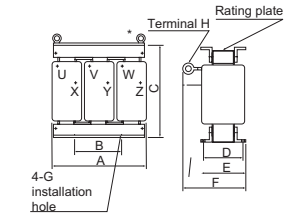
## ● Circuit configuration and connection




| Motor Capacity (kW) | | InverterType: Reactor for filter | InverterType: Capacitor for filter | Applied Inverter (*2) |
|---|---|---|---|---|
| 200V class | 75 | MT-BSL-75K | 1×MT-BSC-75K | FR-A720-90K |
| | 90 | MT-BSL-90K | 1×MT-BSC-90K | — |
| 400V class | 75 | MT-BSL-H75K(-HC) | 1×MT-BSC-H75K | FR-A740-90K |
| | 90 | MT-BSL-H110K(-HC) | 1×MT-BSC-H110K | FR-A740-110K |
| | 110 | MT-BSL-H110K(-HC) | 1×MT-BSC-H110K | FR-A740-132K |
| | 132 | MT-BSL-H150K(-HC) | 2×MT-BSC-H75K | FR-A740-160K |
| | 160 | MT-BSL-H220K(-HC) | 2×MT-BSC-H110K | FR-A740-185K |
| | 185 | MT-BSL-H220K(-HC) | 2×MT-BSC-H110K | FR-A740-220K |
| | 220 | MT-BSL-H220K(-HC) | 2×MT-BSC-H110K | FR-A740-250K |
| | 250 | MT-BSL-H280K(-HC) | 3×MT-BSC-H110K | FR-A740-280K |
| | 280 | MT-BSL-H280K(-HC) | 3×MT-BSC-H110K | FR-A740-315K |

*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 90% of the inverter rated current, an inverter with same kW with a motor can be used.

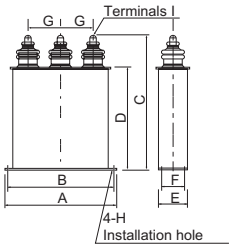
## ● Reactor for sine wave filter




* Remove the eye nut after installation of the product.

| 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 | 120 |
| 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 |
| | MT-BSL-H75K-HC | 385 | 150 | 345 | 185 | 216 | 315 | M10 | M10 | 110 |
| | MT-BSL-H110K-HC | 420 | 170 | 400 | 195 | 235 | 370 | M12 | M12 | 180 |
| | MT-BSL-H150K-HC | 450 | 300 | 455 | 390 | 430 | 500 | M12 | M12 | 250 |
| | MT-BSL-H220K-HC | 510 | 350 | 540 | 430 | 485 | 555 | M12 | M12 | 310 |
| | MT-BSL-H280K-HC | 570 | 400 | 590 | 475 | 535 | 620 | M12 | M12 | 480 |

## ● Capacitor for sine wave filter




| Inverter type | | A | B | C | D | E | F | G | H | I | Mass (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200V class | MT-BSC-75K | 207 | 191 | 285 | 233 | 72 | 41 | 45 | ϕ7 | M8 | 3.9 |
| | MT-BSC-90K | 282 | 266 | 270 | 183 | 92 | 56 | 85 | ϕ7 | M12 | 5.5 |
| 400V class | MT-BSC-H75K | 207 | 191 | 220 | 173 | 72 | 41 | 55 | ϕ7 | M6 | 3.0 |
| | MT-BSC-H110K | 207 | 191 | 280 | 233 | 72 | 41 | 55 | ϕ7 | M6 | 4.0 |

* Leave more than 25mm space between capacitors.

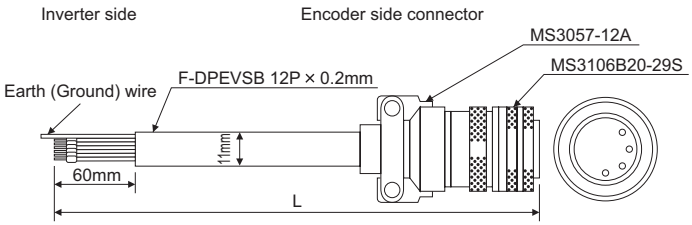
### Recommended cable size

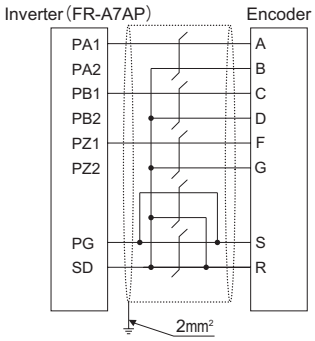
The cable sizes between the Inverter and MT-BSL and between the MT-BSL and IM depend on U, V, W of "Peripheral devices list" *(page 87)*
The cable size to the MT-BSC is as table below.

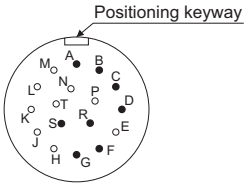
| MT-BSC-75K | MT-BSC-90K | MT-BSC-H75K | MT-BSC-H110K |
|---|---|---|---|
| 38mm$^2$ | 38mm$^2$ | 22mm$^2$ | 22mm$^2$ |

## Dedicated cable option

| Name (type) | Specifications, Structure, etc. |
|---|---|
| Cable for encoder FR-V7CBL☐☐ | ●For dedicated motor |




MS3106B20-29S
(As viewed from wiring side)

| Type | Length L (m) |
|---|---|
| FR-V7CBL5 | 5 |
| FR-V7CBL15 | 15 |
| FR-V7CBL30 | 30 |

(Note) When a cable of 30m length or more is required, consult our sales office.

●Cable selection specifications

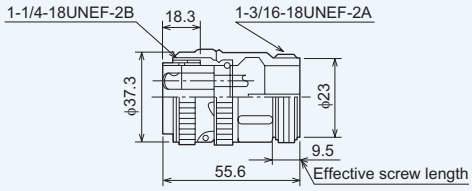
| Wiring Distance | Optional Encoder Dedicated Cable | Cable Specification | |
|---|---|---|---|
| | | Wiring 0.2mm² cables | Using larger gauge cable |
| 5m or less | FR-V7CBL5 | 2 parallels or more | 0.4mm² or more |
| 10m or less | FR-V7CBL15 | 2 parallels or more | |
| 15m or less | | 4 parallels or more | 0.75mm² or more |
| 20m or less | FR-V7CBL30 | 4 parallels or more | |
| 30m or less | | 6 parallels or more | 1.25mm² or more |
| 50m or less | *Available on request, please consult us. | 6 parallels or more | |
| 100m or less | | | |

- If connection cables are not available, make cables according to the left table.
- Cables to terminals PG and SD should be connected in parallel or be larger in size.

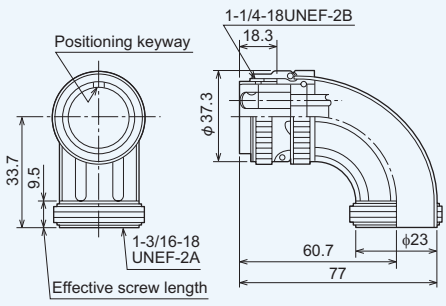
### Encoder connector (Manufactured by Japan Aviation Electronics Industries) for reference

(Unit: mm)

**Straight Plug MS3106B20-29S**

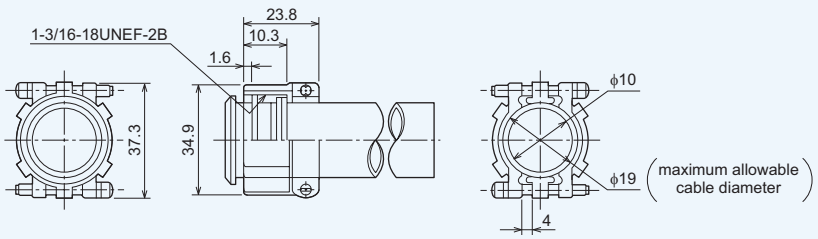



**Angle Plug MS3108B20-29S**




(Note) This angle type connector is not optional. Please obtain it separately.

**Cable Clamp MS3057-12A**

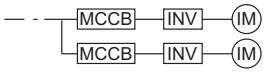


## Peripheral devices/cable size list

| Voltage | Motor Output (kW) *1 | Applicable Inverter Type | Moulded Case Circuit Breaker (MCCB)*2 or Earth Leakage Current Breaker (ELB) | | Input Side Magnetic Contactor*3 | | Recommended Cable Size ($mm^2$)*4 | |
|---|---|---|---|---|---|---|---|---|
| | | | Reactor connection | | Reactor connection | | R, S, T | U, V, W |
| | | | Without | With | Without | With | | |
| 200V class | 0.4 | FR-A720-0.4K | 30AF 5A | 30AF 5A | S-N10 | S-N10 | 2 | 2 |
| | 0.75 | FR-A720-0.75K | 30AF 10A | 30AF 10A | S-N10 | S-N10 | 2 | 2 |
| | 1.5 | FR-A720-1.5K | 30AF 15A | 30AF 15A | S-N10 | S-N10 | 2 | 2 |
| | 2.2 | FR-A720-2.2K | 30AF 20A | 30AF 15A | S-N10 | S-N10 | 2 | 2 |
| | 3.7 | FR-A720-3.7K | 30AF 30A | 30AF 30A | S-N20, N21 | S-N10 | 3.5 | 3.5 |
| | 5.5 | FR-A720-5.5K | 50AF 50A | 50AF 40A | S-N25 | S-N20, N21 | 5.5 | 5.5 |
| | 7.5 | FR-A720-7.5K | 100AF 60A | 50AF 50A | S-N25 | S-N25 | 14 | 8 |
| | 11 | FR-A720-11K | 100AF 75A | 100AF 75A | S-N35 | S-N35 | 14 | 14 |
| | 15 | FR-A720-15K | 225AF 125A | 100AF 100A | S-N50 | S-N50 | 22 | 22 |
| | 18.5 | FR-A720-18.5K | 225AF 150A | 225AF 125A | S-N65 | S-N50 | 38 | 38 |
| | 22 | FR-A720-22K | 225AF 175A | 225AF 150A | S-N80 | S-N65 | 38 | 38 |
| | 30 | FR-A720-30K | 225AF 225A | 225AF 175A | S-N95 | S-N80 | 60 | 60 |
| | 37 | FR-A720-37K | 400AF 250A | 225AF 225A | S-N150 | S-N125 | 80 | 80 |
| | 45 | FR-A720-45K | 400AF 300A | 400AF 300A | S-N180 | S-N150 | 100 | 100 |
| | 55 | FR-A720-55K | 400AF 400A | 400AF 350A | S-N220 | S-N180 | 100 | 100 |
| | 75 | FR-A720-75K | — | NV400AF400A | — | S-N300 | 125 | 125 |
| | 90 | FR-A720-90K | — | NV400AF400A | — | S-N300 | 150 | 150 |
| 400V class | 0.4 | FR-A740-0.4K | 30AF 5A | 30AF 5A | S-N10 | S-N10 | 2 | 2 |
| | 0.75 | FR-A740-0.75K | 30AF 5A | 30AF 5A | S-N10 | S-N10 | 2 | 2 |
| | 1.5 | FR-A740-1.5K | 30AF 10A | 30AF 10A | S-N10 | S-N10 | 2 | 2 |
| | 2.2 | FR-A740-2.2K | 30AF 10A | 30AF 10A | S-N10 | S-N10 | 2 | 2 |
| | 3.7 | FR-A740-3.7K | 30AF 20A | 30AF 15A | S-N10 | S-N10 | 2 | 2 |
| | 5.5 | FR-A740-5.5K | 30AF 30A | 30AF 20A | S-N20 | S-N11, N12 | 2 | 2 |
| | 7.5 | FR-A740-7.5K | 30AF 30A | 30AF 30A | S-N20 | S-N20 | 3.5 | 3.5 |
| | 11 | FR-A740-11K | 50AF 50A | 50AF 40A | S-N20 | S-N20 | 5.5 | 5.5 |
| | 15 | FR-A740-15K | 100AF 60A | 50AF 50A | S-N25 | S-N20 | 8 | 8 |
| | 18.5 | FR-A740-18.5K | 100AF 75A | 100AF 60A | S-N25 | S-N25 | 14 | 8 |
| | 22 | FR-A740-22K | 100AF 100A | 100AF 75A | S-N35 | S-N25 | 14 | 14 |
| | 30 | FR-A740-30K | 225AF 125A | 100AF 100A | S-N50 | S-N50 | 22 | 22 |
| | 37 | FR-A740-37K | 225AF 150A | 225AF 125A | S-N65 | S-N50 | 22 | 22 |
| | 45 | FR-A740-45K | 225AF 175A | 225AF 150A | S-N80 | S-N65 | 38 | 38 |
| | 55 | FR-A740-55K | 225AF 200A | 225AF 175A | S-N80 | S-N80 | 60 | 60 |
| | 75 | FR-A740-75K | — | 225AF 225A | — | S-N95 | 60 | 60 |
| | 90 | FR-A740-90K | — | 225AF 225A | — | S-N150 | 60 | 60 |
| | 110 | FR-A740-110K | — | 225AF 225A | — | S-N180 | 80 | 80 |
| | 132 | FR-A740-132K | — | 400AF 400A | — | S-N220 | 100 | 125 |
| | 150 | FR-A740-160K | — | 400AF 400A | — | S-N300 | 125 | 125 |
| | 160 | FR-A740-160K | — | 400AF 400A | — | S-N300 | 125 | 125 |
| | 185 | FR-A740-185K | — | 400AF 400A | — | S-N300 | 150 | 150 |
| | 220 | FR-A740-220K | — | 600AF 500A | — | S-N400 | 2 × 100 | 2 × 100 |
| | 250 | FR-A740-250K | — | 600AF 600A | — | S-N600 | 2 × 100 | 2 × 100 |
| | 280 | FR-A740-280K | — | 600AF 600A | — | S-N600 | 2 × 125 | 2 × 125 |
| | 315 | FR-A740-315K | — | 800AF 700A | — | S-N600 | 2 × 150 | 2 × 150 |
| | 355 | FR-A740-355K | — | 800AF 800A | — | S-N600 | 2 × 200 | 2 × 200 |
| | 400 | FR-A740-400K | — | 1000AF 900A | — | S-N800 | 2 × 200 | 2 × 200 |
| | 450 | FR-A740-450K | — | 1000AF 1000A | — | 1000A rated product | 2 × 250 | 2 × 250 |
| | 500 | FR-A740-500K | — | 1200AF 1200A | — | 1000A rated product | 2 × 250 | 2 × 250 |

*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.
For details, refer to the Instruction Manual (basic)




*3. Magnetic contactor is selected based on the AC-1 class. 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 class AC-3 rated current for the motor rated current.

*4. Cable
For the 55K or less, the 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 (e.g. LMFC (heat resistant flexible cross-linked polyethylene insulated cable)) with continuous maximum permissible temperature of 90°C. 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 current breaker

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

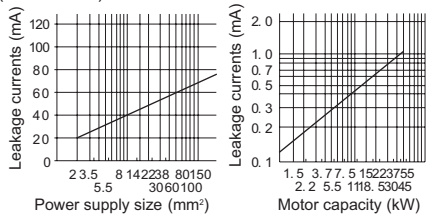
- Breaker designed for harmonic and surge suppression

  Rated sensitivity current$I\Delta n \geq 10 \times (Ig1+Ign+Igi+Ig2+Igm)$
- Standard breaker

  Rated sensitivity current$I\Delta n \geq 10 \times \{(Ig1+Ign+Igi+3 \times (Ig2+Igm)\}$

  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

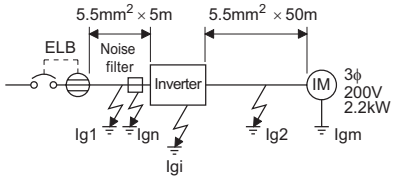
Example of leakage current of cable path per 1km during the commercial power supply operation when the CV cable is routed in metal conduit (200V 60Hz)




Leakage current example of three-phase induction motor during the commercial power supply operation (200V 60Hz)




### Example



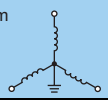

Note:1. Install the earth leakage current breaker (ELB) on the input side of the inverter.
2. In the ⅄ connection earthed-neutral system, the sensitivity current is purified against an earth (ground) fault in the inverter output side. Earthing (Grounding) must conform to the requirements of national 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) | $33 \times \frac{5m}{1,000m} = 0.17$ | |
| 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) | $33 \times \frac{50m}{1,000m} = 1.65$ | |
| Motor leakage current Igm (mA) | 0.18 | |
| Total leakage current (mA) | 3.00 | 6.15 |
| Rated sensitivity current (mA) (≥ Ig × 10) | 30 | 100 |

●Inverter leakage currents (with and without EMC filter)

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

| Earth (Ground) | 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 0.4K and 0.75K, 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

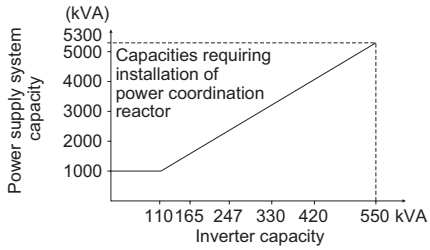
- A magnetic contactor (MC) provided on the input side should not be used to make frequent starts and stops. It could cause the inverter to fail.
- However, at this time, the motor cannot be brought to a sudden stop. Hence, provide a mechanical stopping/holding mechanism for the machine/equipment which 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.

## Power supply

- When the inverter is connected under a large-capacity power transformer (1000kVA or more transformer) or when a power capacitor is to be switched over, an excessive peak current may flow in the power input circuit, damaging the inverter. To prevent this, always install an optional AC reactor (FR-HEL).




- If a surge voltage occurs in the power supply system, this surge energy may flow into the inverter, causing the inverter to display overvoltage protection (E.OV☐) and come to an alarm stop. To prevent this, always install an optional AC reactor (FR-HAL).

## 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" enclosure. When placing the inverter in an enclosure, determine the cooling system and enclosure dimensions so that the ambient temperature of the inverter is within the permissble value. (refer to page 10 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).

## Real sensorless vector control

- Make sure to perform offline auto tuning before performing real sensorless vector control.
- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for real sensorless vector control.
- Torque control can not be performed in the low speed region and at a low speed with light load. Choose vector control.
- Performing pre-excitation (LX signal and X13 signal) under torque control may start the motor running at a low speed even when the start command (STF or STR) is not input. The motor may run also at a low speed when the speed limit value=0 with a start command input. Perform pre-excitation after making sure that there will be no problem in safety if the motor runs.
- Do not switch between the STF (forward rotation command) and STR (reverse rotation command) during operation under torque control. Overcurrent shut-off error (E.OC☐) or opposite rotation deceleration error (E.11) occurs.
- For the 0.4K to 3.7K, the speed deviation may become large at 20Hz or less and torque may become insufficient in the low speed region under 1Hz during continuous operation under real sensorless vector control. In such case, stop operation once and reaccelerate to improve the problems.
- When the inverter is likely to start during motor coasting under real sensorless vector control, set to make frequency search of automatic restart after instantaneous power failure valid (*Pr. 57* ≠ "9999", *Pr. 162* = "10").
- The 22K does not comply with the 2nd environment of the EMC Directive.

# 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, advanced magnetic flux vector, real sensorless vector or vector control cannot provide enough starting torque, select the inverter of one rank higher capacity or increase the capacities of both the motor and inverter.

## Acceleration/deceleration times

- The acceleration/deceleration time of the motor depends on the motor-generated torque, load torque and load inertia moment ($GD^2$).
- When the torque 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, resulting in longer acceleration time), use the advanced magnetic flux vector control or real sensorless 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 (reduction gear, belt, chain, etc.)

- When an oil-lubricated gear box, speed change/reduction gear or similar device is used in the power transfer system, note that continuous operation at low 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 repeated 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 current at locked condition, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. Therefore, choose the inverter which has enough allowance for current.

## 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 input side. For MCCB selection, *refer to page 87* since it depends on the inverter power supply side power factor (which changes depending on the power supply voltage, output frequency and load). Especially for a completely electromagnetic MCCB, one of a slightly large capacity must be selected since its operation characteristic varies with harmonic currents. (Check it in the data of the corresponding breaker.) As an earth leakage current breaker, use the Mitsubishi earth leakage current breaker designed for harmonics and surge sppression. *(Refer to page 88.)*
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.

## Handling of primary side magnetic contactor

For operation via external terminal (terminal STF or STR used), provide an input 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 may be used to make a stop but the regenerative brake specific to the inverter does not operate and the motor is coasted to a stop.

## Handling of the 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 Pr.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 92) 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.

## Measuring instrument on the output side

When the inverter-to-motor wiring length is large, especially in the 400V class, small-capacity models, the meters and CTs may generate heat due to line-to-line leakage current. Therefore, choose the equipment which has enough allowance for the current rating.
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)

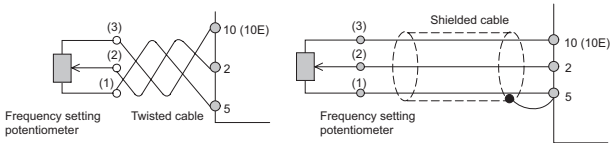
The power factor improving capacitor and surge suppressor on the inverter output side may be overheated or damaged by the harmonic components of the inverter output. Also, since an excessive current flows in the inverter to activate overcurrent protection, do not install a capacitor or surge suppressor. For power factor improvement, use a power factor improving DC reactor *(see page 80)*.

## 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 87)
Especially at a long wiring distance, the maximum wiring length should be within the length in the table below 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) | 0.4K | 0.75K | 1.5K or more |
|---|---|---|---|
| 2 or less | 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)

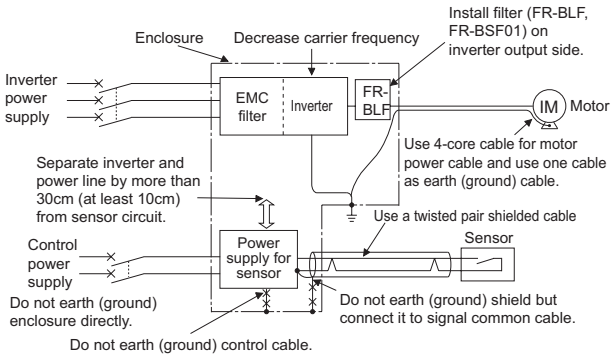
When the inverter is run in the low acoustic noise mode, more leakage currents occur than in the non-low acoustic noise mode due to high-speed switching operation. Be sure to use the inverter and motor after grounding (earthing) them. In addition, always use the earth (ground) terminal of the inverter 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 EMC 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, providing a distance of 30cm (at least 10cm) or more and using a twisted pair shielded cable as a signal cable produces an effect. Do not earth (ground) shield but connect it to signal common cable.

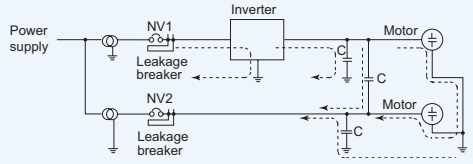
### Example of noise reduction techniques



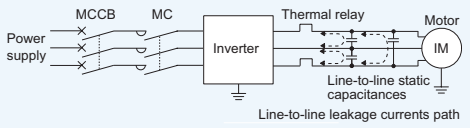
# Leakage currents

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 static 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 current breaker according to its rated sensitivy 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** |  <br>Line-to-line leakage currents path |

## ● Harmonic suppression guideline in Japan

Harmonic currents flow from the inverter to a power receiving point via a power transformer. The harmonic suppression guideline was 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. Later, this guideline was repealed on September 6, 2004. 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 or a DC reactor as before to the users who are not covered by the guideline.

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 | 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>Reference materials<br>· "Harmonic suppression measures of the inverter" Jan. 2004 JEMA :Japan Electrical Manufacturer's Association<br>· "Calculation method of harmonic current of the general-purpose inverter used by specific consumers" JEM-TR201 (revised in Dec. 2003): Japan Electrical Manufacturer's Association |
| Three-phase 400V | | |

For compliance to "Harmonic suppression guideline of the transistorized 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>Reference materials<br>· "Harmonic suppression guideline of the general-purpose inverter (input current of 20A or less)" JEM-TR226 (enacted in Dec. 2003):Japan Electrical Manufacturer's Association |

## ● Calculation of outgoing harmonic current

Outgoing harmonic current = fundamental wave current (value converted 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

| Applicable Motor(kW) | Rated Current [A] | | Fundamental Wave Current Converted from 6.6kV (mA) | Rated Capacity (kVA) | Outgoing Harmonic Current Converted from 6.6kV(mA) (No reactor, 100% operation ratio) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 200V | 400V | | | 5th | 7th | 11th | 13th | 17th | 19th | 23rd | 25th |
| 0.4 | 1.61 | 0.81 | 49 | 0.57 | 31.85 | 20.09 | 4.165 | 3.773 | 2.107 | 1.519 | 1.274 | 0.882 |
| 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 | 257.1 | 161.5 | 33.49 | 30.34 | 16.94 | 12.21 | 10.24 | 7.092 |
| 5.5 | 19.1 | 9.55 | 579 | 6.77 | 376.1 | 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 |
| 75 | 245 | 123 | 7455 | 87.2 | 2237 | 969 | 626 | 373 | 350 | 239 | 224 | 164 |
| 90 | 293 | 147 | 8909 | 104 | 2673 | 1158 | 748 | 445 | 419 | 285 | 267 | 196 |
| 110 | 357 | 179 | 10848 | 127 | 3254 | 1410 | 911 | 542 | 510 | 347 | 325 | 239 |
| 132 | — | 216 | 13091 | 153 | 3927 | 1702 | 1100 | 655 | 615 | 419 | 393 | 288 |
| 160 | — | 258 | 15636 | 183 | 4691 | 2033 | 1313 | 782 | 735 | 500 | 469 | 344 |
| 220 | — | 355 | 21515 | 252 | 6455 | 2797 | 1807 | 1076 | 1011 | 688 | 645 | 473 |
| 250 | — | 403 | 24424 | 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 |

# Application to standard motors

## 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

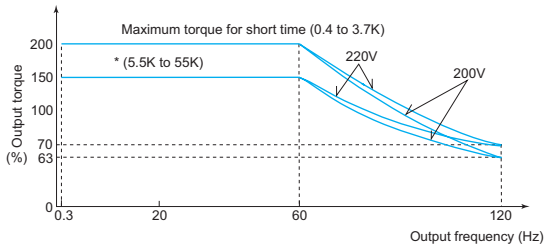
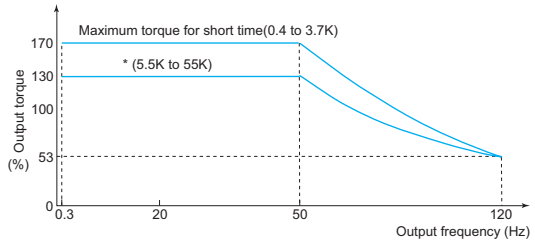
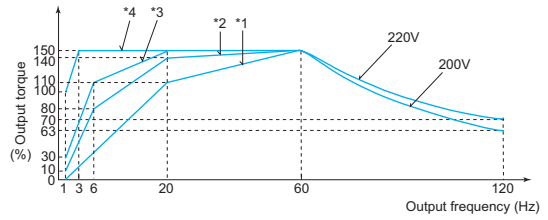
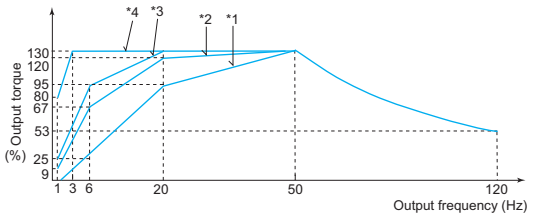
The machine-installed motor operated by the inverter may be slightly greater in vibration than the one driven by the commercial power supply. The possible causes of vibration are as follows.

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 *Pr.72 PWM frequency selection* is changed. When a two-pole motor is operated at higher than 60Hz, caution should be taken since such operation may cause abnormal vibration.

## Motor torque

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.

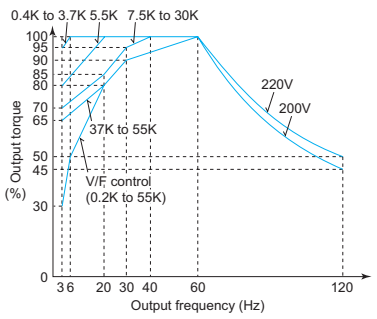
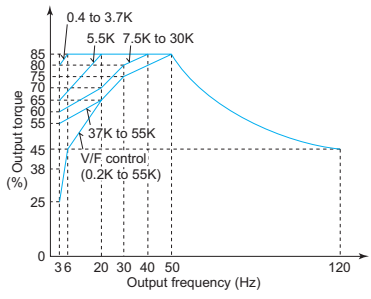
●Maximum torque for short time

| | 60Hz Torque Reference | 50Hz Torque Reference |
|---|---|---|
| Real Sensorless Vector Control |  |  |
| V/F Control |  |  |

- 200% torque (60Hz torque reference) is output at 0.3Hz operation under real sensorless vector control. (0.4 to 3.7K)
  (* 0.3Hz 150% torque for the 5.5K to 55K)
- A 60Hz torque reference indicates that the rated torque of the motor running at 60Hz is 100%, and a 50Hz torque reference indicates that the rated torque of the motor running at 50Hz is 100%

*1. Torque boost minimum (0%)
*2. Torque boost standard (initial value)
*3. Torque boost large (0.4K, 0.75K... 10%, 1.5K to 3.7K... 7%, 5.5K, 7.5K... 6%, 11K or more... 4%)
*4. Torque boost adjustment (3.7kW or less)

●Continuous torque (real sensorless vector control)

| 60Hz Torque Reference | 50Hz Torque Reference |
|---|---|
|  |  |

- 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)
- 200/220V 60Hz or 200V 50Hz in the chart indicates a motor torque reference (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.
- 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.

# Application to constant-torque motors

## SF-HRCA type

- Continuous operation with 100% torque even at low speed of 3Hz is possible. (when using real sensorless vector control)
  For the 37kW or less, load torque is not need to be reduced even at a low speed and constant torque (100% torque) continuous operation is possible within the range of speed ratio 1/20 (3 to 60Hz). (The characteristic of motor running at 60Hz or more is that output torque is constant.)
- Installation size is the same as that of the standard motor

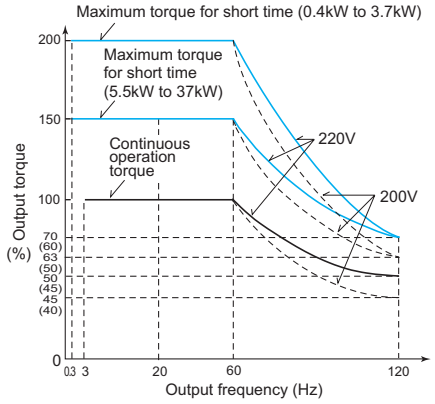
★ Note that operation characteristic in the chart below can not be obtained if V/F control is employed.

## Standard specifications (indoor type)

| Output (kW) | Number of Poles | Frequency Range | Common Specifications |
|---|---|---|---|
| 0.4 | 4 | 3 to 120Hz | Standard frequency 60Hz<br>●Rotation direction (CCW) is counterclockwise when viewed from the motor end<br>●Lead wire<br>3.7kW or less.....3 pcs.<br>5.5kW or more...6 or 12 pcs.<br>●Ambient temperature: 40 °C maximum<br>Protective structure is JP44 |
| 0.75 | | | |
| 1.5 | | | |
| 2.2 | | | |
| 3.7 | | | |
| 5.5 | | | |
| 7.5 | | | |
| 11 | | 3 to 100Hz | |
| 15 | | | |
| 18.5 | | | |
| 22 | | | |
| 30 | | | |
| 37 | | 3 to 65Hz | |
| 45 | | | |
| 55 | | | |

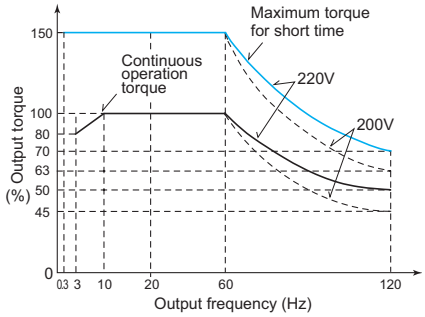
●Continuous rated range of use (real sensorless vector control)

**60Hz Torque Reference (when inverter is 0.4kW to 37kW)**




Values in parenthesis apply to the 0.4kW to 0.75kW

**60Hz Torque Reference (when inverter is 45kW to 55kW)**



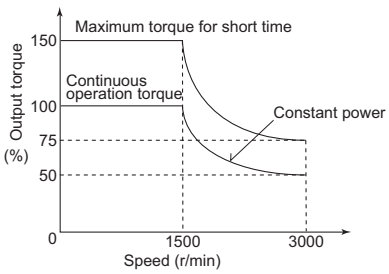

Please contact us separately for the motor constants during real sensorless vector control.

# Application to vector control dedicated motors (SF-V5RU) (55kW or less)

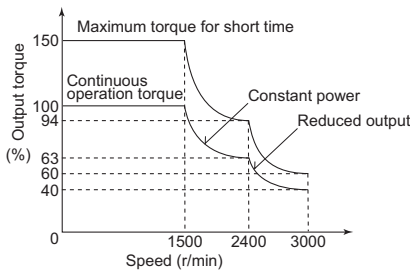
## Motor torque

When the vector control dedicated motor (SF-V5RU) and inverter are used, the torque characteristics are as shown below.

When inverter is 1.5kW to 22kW




When inverter is 30kW to 55kW



## Motor type

SF-V5RU [F] [H] [5K] [B] [1] [T]

| Symbol | Structure |
|---|---|
| None | Horizontal type |
| F | Flange type |

| Symbol | Structure |
|---|---|
| None | 200V class |
| H | 400V class |

| Symbol | Output (kW) | Symbol | Output (kW) |
|---|---|---|---|
| 1K | 1.5 | 18K | 18.5 |
| 2K | 2.2 | 22K | 22 |
| 3K | 3.7 | 30K | 30 |
| 5K | 5.5 | 37K | 37 |
| 7K | 7.5 | 45K | 45 |
| 11K | 11 | 55K | 55 |
| 15K | 15 | | |

| Symbol | Electromagnetic brake |
|---|---|
| None | Without |
| B | With |

| Symbol | Protective device |
|---|---|
| None | With thermal protector |
| T | With thermister |

| Symbol | Rated speed (r/min) | Maximum speed (r/min) |
|---|---|---|
| None | 1500 | 3000 |
| 1 | 1000 | 2000 |
| 3 | 1000 | 3000 |
| 4 | 500 | 2000 |

## Dedicated motor model lineup

Rated speed: 1500r/min (4 pole)

| Model | Standard type | Rated output (kW) | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flame number | 90L | 100L | 112M | 132S | 132M | 160M | 160L | 180M | 180M | 200L | 200L | 200L | 225S |
| Standard horizontal type | SF-V5RU(H)□ | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type | SF-V5RUF(H)□ | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Standard horizontal type with brake | SF-V5RU(H)□B | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type with brake | SF-V5RUF(H)□B | | ● | ● | ● | ● | ● | ● | ● | — | — | — | — | — | — |

Rated speed: 1000r/min (4 pole), Maximum speed: 2000r/min, speed ratio 1:2

| Model | Standard type | Rated output (kW) | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flame number | 100L | 112M | 132S | 132M | 160M | 160L | 180M | 180L | 200L | 200L | 225S |
| Standard horizontal type | SF-V5RU(H)□1 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type | SF-V5RUF(H)□1 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | — |
| Standard horizontal type with brake | SF-V5RU(H)□B1 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type with brake | SF-V5RUF(H)□B1 | | ● | ● | ● | ● | ● | ● | — | — | — | — | — |

Rated speed: 1000r/min (4 pole), Maximum speed: 3000r/min, speed ratio 1:3

| Model | Standard type | Rated output (kW) | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flame number | 112M | 132S | 132M | 160M | 160L | 180M | 180L | 200L | 200L | 225S |
| Standard horizontal type | SF-V5RU(H)□3 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type | SF-V5RUF(H)□3 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Standard horizontal type with brake | SF-V5RU(H)□B3 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Flange type with brake | SF-V5RUF(H)□B3 | | ● | ● | ● | ● | ● | — | — | — | — | — |

Rated speed: 500r/min (4 pole), Maximum speed: 2000r/min, speed ratio 1:4

| Model | Standard type | Rated output (kW) | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 |
|---|---|---|---|---|---|---|---|---|---|
| | | Flame number | 132M | 160M | 160L | 180L | 200L | 225S | 225S |
| Standard horizontal type | SF-V5RU(H)□4 | | ● | ● | ● | ● | ● | ● | ● |
| Flange type | SF-V5RUF(H)□4 | | ● | ● | ● | ● | ● | — | — |
| Standard horizontal type with brake | SF-V5RU(H)□B4 | | ● | ● | ● | ● | ● | ● | ● |
| Flange type with brake | SF-V5RUF(H)□B4 | | ● | ● | ● | — | — | — | — |

●: Available models —: Not available

*: Since motors with frame No. 250 or more, 400V class, speed ratio 1:4 specifications are available as special products, consult our sales office.

## Combination with the SF-V5RU1,3,4 , SF-THY and inverter

| | SF-V5RU□1 (1:2) | | | SF-V5RU□3 (1:3) | | | SF-V5RU□4 (1:4) | | |
|---|---|---|---|---|---|---|---|---|---|
| Voltage | 200V class | | | | | | | | |
| Rated speed | 1000r/min | | | 1000r/min | | | 500r/min | | |
| Base frequency | 33.33Hz | | | 33.33Hz | | | 16.6Hz | | |
| Maximum speed | 2000r/min | | | 3000r/min | | | 2000r/min | | |
| Motor capacity | Motor frame number | Motor type | Inverter type | Motor frame number | Motor type | Inverter type | Motor frame number | Motor type | Inverter type |
| 1.5kW | 100L | SF-V5RU1K1 | FR-A720-2.2K | 112M | SF-V5RU1K3 | FR-A720-2.2K | 132M | SF-V5RU1K4 | FR-A720-2.2K |
| 2.2kW | 112M | SF-V5RU2K1 | FR-A720-3.7K | 132S | SF-V5RU2K3 | FR-A720-3.7K | 160M | SF-V5RU2K4 | FR-A720-3.7K |
| 3.7kW | 132S | SF-V5RU3K1 | FR-A720-5.5K | 132M | SF-V5RU3K3 | FR-A720-5.5K | 160L | SF-V5RU3K4 | FR-A720-7.5K |
| 5.5kW | 132M | SF-V5RU5K1 | FR-A720-7.5K | 160M | SF-V5RU5K3 | FR-A720-7.5K | 180L | SF-V5RU5K4 | FR-A720-7.5K |
| 7.5kW | 160M | SF-V5RU7K1 | FR-A720-11K | 160L | SF-V5RU7K3 | FR-A720-11K | 200L*2 | SF-V5RU7K4 | FR-A720-11K |
| 11kW | 160L | SF-V5RU11K1 | FR-A720-15K | 180M | SF-V5RU11K3 | FR-A720-15K | 225S*2 | SF-V5RU11K4 | FR-A720-15K |
| 15kW | 180M | SF-V5RU15K1 | FR-A720-18.5K | 180L | SF-V5RU15K3 | FR-A720-18.5K | 225S*2 | SF-V5RU15K4 | FR-A720-22K |
| 18.5kW | 180L | SF-V5RU18K1 | FR-A720-22K | 200L*2 | SF-V5RU18K3 | FR-A720-22K | 250MD*2 | SF-THY | FR-A720-22K |
| 22kW | 200L | SF-V5RU22K1 | FR-A720-30K | 200L*2 | SF-V5RU22K3 | FR-A720-30K | 280MD*2 | SF-THY | FR-A720-30K |
| 30kW | 200L | SF-V5RU30K1 | FR-A720-37K | 225S*1 | SF-V5RU30K3 | FR-A720-37K | 280MD*2 | SF-THY | FR-A720-37K |
| 37kW | 225S | SF-V5RU37K1 | FR-A720-45K | 250MD*1 | SF-THY | FR-A720-45K | 280MD*2 | SF-THY | FR-A720-45K |
| 45kW | 250MD | SF-THY | FR-A720-55K | 250MD*1 | SF-THY | FR-A720-55K | 280MD*2 | SF-THY | FR-A720-55K |
| 55kW | 250MD | SF-THY | FR-A720-75K | 280MD*1 | SF-THY | FR-A720-75K | 280L*2 | SF-THY | FR-A720-75K |

Models in the shaded parts and 400V class are developed upon receipt of order.

*1 The maximum speed is 2400r/min.

*2 80% output in the high-speed range. (The output is reduced when the speed is 2400r/min or more. Contact us separately for details.)

# Motor specification

## ●200V class (Mitsubishi dedicated motor [SF-V5RU (1500r/min series)])

| Motor type SF-V5RU□□K | | 1 | 2 | 3 | 5 | 7 | 11 | 15 | 18 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable inverter type FR-A720-□□K | | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 |
| Rated output (kW) | | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
| Rated torque (N•m) | | 9.55 | 14.1 | 23.6 | 35.0 | 47.7 | 70.0 | 95.5 | 118 | 140 | 191 | 235 | 286 | 350 |
| Maximum torque 150% 60s (N•m) | | 14.3 | 21.1 | 35.4 | 52.4 | 71.6 | 105 | 143 | 176 | 211 | 287 | 353 | 429 | 525 |
| Rated speed (r/min) | | 1500 | | | | | | | | | | | | |
| Maximum speed (r/min) | | 3000 *1 | | | | | | | | | | | | 2400 |
| Frame No. | | 90L | 100L | 112M | 132S | 132M | 160M | 160L | 180M | 180M | 200L | 200L | 200L | 225S |
| Inertia moment J ($\times 10^{-4}$kg•m$^2$) | | 67.5 | 105 | 175 | 275 | 400 | 750 | 875 | 1725 | 1875 | 3250 | 3625 | 3625 | 6850 |
| Noise *4 | | 75dB or less | | | | | | | | | 80dB or less | | | 85dB or less |
| Cooling fan (with thermal protector) | Voltage | Single-phase 200V/50Hz<br>Single-phase 200V to 230V/60Hz | | | | | Three-phase 200V/50Hz<br>Three-phase 200 to 230V/60Hz | | | | | | | |
| | Input *2 | 36/55W (0.26/0.32A) | | | 22/28W (0.11/0.13A) | | 55/71W (0.39/0.39A) | | | | 100/156W (0.47/0.53A) | | | 85/130W (0.46/0.52A) |
| Ambient temperature, humidity | | -10 to +40°C (non-freezing), 90%RH or less (non-condensing) | | | | | | | | | | | | |
| Structure (Protective structure) | | Totally enclosed forced draft system<br>(Motor: IP44, cooling fan: IP23S) *3 | | | | | | | | | | | | |
| Detector | | Encoder 2048P/R, A phase, B phase, Z phase +12VDC power supply | | | | | | | | | | | | |
| Equipment | | Encoder, thermal protector, fan | | | | | | | | | | | | |
| Heat resistance class | | F | | | | | | | | | | | | |
| Vibration rank | | V10 | | | | | | | | | | | | |
| Approx. mass (kg) | | 24 | 33 | 41 | 52 | 62 | 99 | 113 | 138 | 160 | 238 | 255 | 255 | 320 |

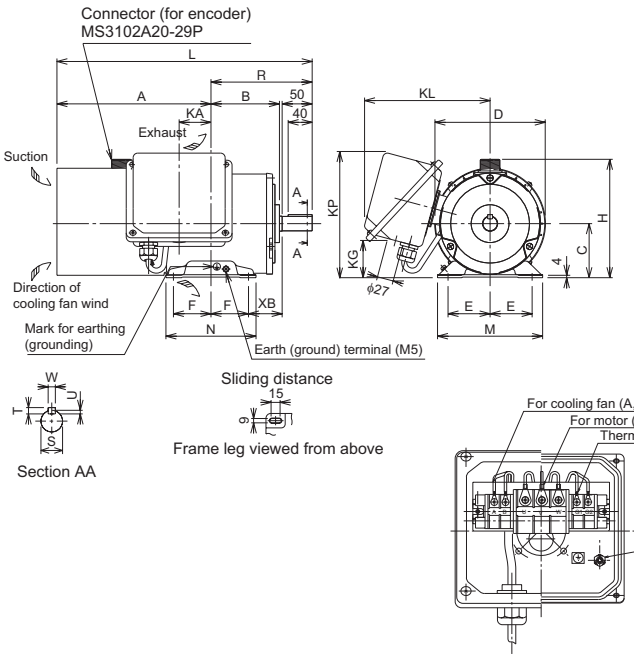
## ●400V class (Mitsubishi dedicated motor [SF-V5RUH (1500r/min series)])

| Motor type SF-V5RUH□□K | | 1 | 2 | 3 | 5 | 7 | 11 | 15 | 18 | 22 | 30 | 37 | 45 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applicable inverter type FR-A720-□□K | | 2.2 | 2.2 | 3.7 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 |
| Rated output (kW) | | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
| Rated torque (N•m) | | 9.55 | 14.1 | 23.6 | 35.0 | 47.7 | 70.0 | 95.5 | 118 | 140 | 191 | 235 | 286 | 350 |
| Maximum torque 150% 60s (N•m) | | 14.3 | 21.1 | 35.4 | 52.4 | 71.6 | 105 | 143 | 176 | 211 | 287 | 353 | 429 | 525 |
| Rated speed (r/min) | | 1500 | | | | | | | | | | | | |
| Maximum speed (r/min) | | 3000 *1 | | | | | | | | | | | | 2400 |
| Frame No. | | 90L | 100L | 112M | 132S | 132M | 160M | 160L | 180M | 180M | 200L | 200L | 200L | 225S |
| Inertia moment J ($\times 10^{-4}$kg•m$^2$) | | 67.5 | 105 | 175 | 275 | 400 | 750 | 875 | 1725 | 1875 | 3250 | 3625 | 3625 | 6850 |
| Noise *4 | | 75dB or less | | | | | | | | | 80dB or less | | | 85dB or less |
| Cooling fan (with thermal protector) | Voltage | Single-phase 200V/50Hz<br>Single-phase 200V to 230V/60Hz | | | | | Three-phase 380 to 400V/50Hz<br>Three-phase 400 to 460V/60Hz | | | | | | | |
| | Input *2 | 36/55W (0.26/0.32A) | | | 22/28W (0.11/0.13A) | | 55/71W (0.19/0.19A) | | | | 100/156W (0.27/0.30A) | | | 85/130W (0.23/0.26A) |
| Ambient temperature, humidity | | -10 to +40°C (non-freezing), 90%RH or less (non-condensing) | | | | | | | | | | | | |
| Structure (Protective structure) | | Totally enclosed forced draft system<br>(Motor: IP44, cooling fan: IP23S) *3 | | | | | | | | | | | | |
| Detector | | Encoder 2048P/R, A phase, B phase, Z phase +12VDC power supply | | | | | | | | | | | | |
| Equipment | | Encoder, thermal protector, fan | | | | | | | | | | | | |
| Heat resistance class | | F | | | | | | | | | | | | |
| Vibration rank | | V10 | | | | | | | | | | | | |
| Approx. mass (kg) | | 24 | 33 | 41 | 52 | 62 | 99 | 113 | 138 | 160 | 238 | 255 | 255 | 320 |

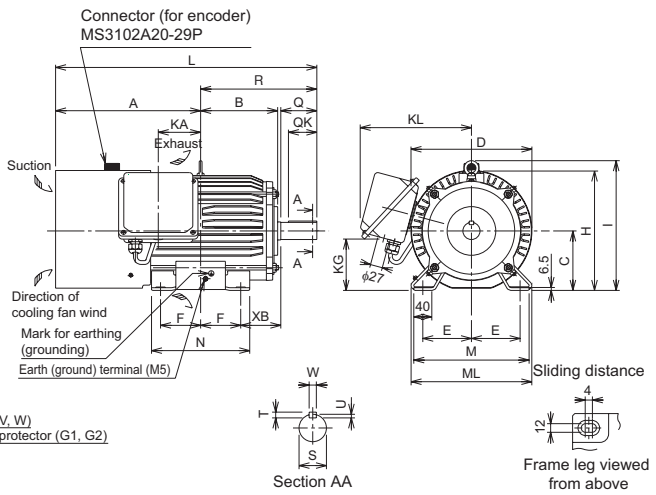
*1 A dedicated motor of 3.7kW or less can be run at the maximum speed of 3600 r/min. Consult our sales office when using the motor at the maximum speed.
*2 Power (current) at 50Hz/60Hz.
*3 Since a motor with brake has a window for gap check, the protective structure of both the cooling fan section and brake section is IP20. S of IP23S is an additional code indicating the condition that a cooling fan is not operated.
*4 The value when high carrier frequency is set (*Pr.72* = 6, *Pr.240* = 0).

# Dedicated motor outline dimension drawings (1500r/min series) (standard horizontal type)

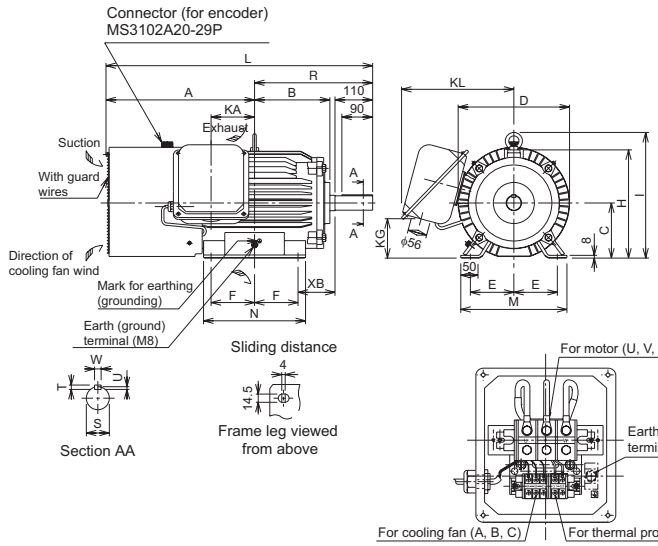
**SF-V5RU(H) 1K**



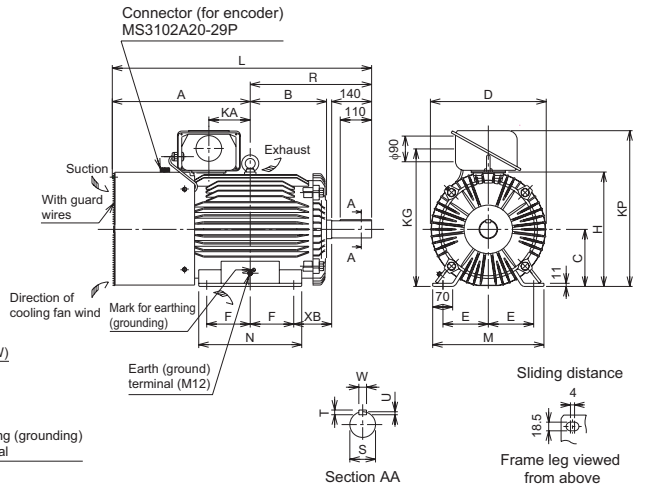

**SF-V5RU(H) 2K, 3K, 5K, 7K**




**SF-V5RU(H) 11K, 15K, 18K, 22K**




**SF-V5RU(H) 30K, 37K, 45K, 55K**




Make sure to earth the earth terminal of the frame installation foot as well as the earth terminal in the terminal box.

## Dimensions table

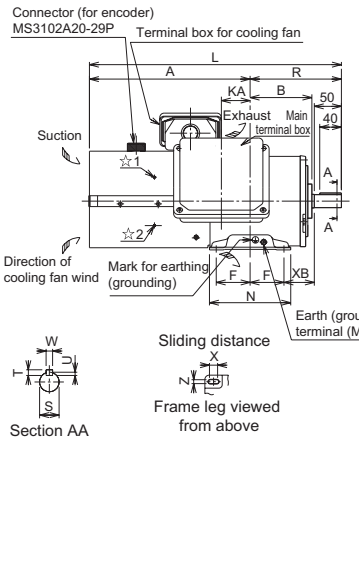
(Unit: mm)

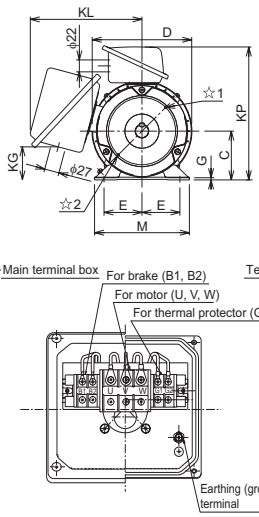
| SF-V5RU Output (kW) | SF-V5RU1 Output (kW) | SF-V5RU3 Output (kW) | SF-V5RU4 Output (kW) | Frame No. | Mass (kg) | Motor | | | | | | | | | | | | | | | | | | | | | | Terminal Screw Size | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | A | B | C | D | E | F | H | I | KA | KG | KL(KP) | L | M | ML | N | XB | Q | QK | R | S | T | U | W | U,V,W | A,B,(C) | G1,G2 |
| 1.5 | — | — | — | 90L | 24 | 256.5 | 114 | 90 | 183.6 | 70 | 62.5 | 198 | — | 53 | 65 | Z20(210) | 425 | 175 | — | 150 | 56 | — | — | 168.5 | 24j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 2.2 | 1.5 | — | — | 100L | 33 | 284 | 128 | 100 | 207 | 80 | 70 | 203.5 | 230 | 65 | 78 | 231 | 477 | 200 | 212 | 180 | 63 | 60 | 45 | 193 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 3.7 | 2.2 | 1.5 | — | 112M | 41 | 278 | 135 | 112 | 228 | 95 | 70 | 226 | 253 | 69 | 93 | 242 | 478 | 230 | 242 | 180 | 70 | 60 | 45 | 200 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 5.5 | 3.7 | 2.2 | — | 132S | 52 | 303 | 152 | 132 | 266 | 108 | 70 | 265 | 288 | 75 | 117 | 256 | 542 | 256 | 268 | 180 | 89 | 80 | 63 | 239 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 |
| 7.5 | 5.5 | 3.7 | 1.5 | 132M | 62 | 322 | 171 | 132 | 266 | 108 | 89 | 265 | 288 | 94 | 117 | 256 | 580 | 256 | 268 | 218 | 89 | 80 | 63 | 258 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 |
| 11 | 7.5 | 5.5 | 2.2 | 160M | 99 | 412 | 198 | 160 | 318 | 127 | 105 | 316 | 367 | 105 | 115 | 330 | 735 | 310 | — | 254 | 108 | — | — | 323 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 |
| 15 | 11 | 7.5 | 3.7 | 160L | 113 | 434 | 220 | 160 | 318 | 127 | 127 | 316 | 367 | 127 | 115 | 330 | 779 | 310 | — | 298 | 108 | — | — | 345 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 |
| 18.5 | — | — | — | 180M | 138 | 438.5 | 225.5 | 180 | 363 | 139.5 | 120.5 | 359 | 410 | 127 | 139 | 352 | 790 | 335 | — | 285 | 121 | — | — | 351.5 | 48k6 | 9 | 5.5 | 14 | M8 | M4 | M4 |
| 22 | 15 | 11 | — | | 160 | | | | | | | | | | | | | | | | | | | | | | | | | |
| — | 18.5 | 15 | 5.5 | 180L | 200 | 457.5 | 242.5 | 180 | 363 | 139.5 | 139.5 | 359 | 410 | 146 | 139 | 352 | 828 | 335 | — | 323 | 121 | — | — | 370.5 | 55m6 | 10 | 6 | 16 | M8 | M4 | M4 |
| 30 | — | — | — | 200L | 238 | 483.5 | 267.5 | 200 | 406 | 159 | 152.5 | 401 | — | 145 | 487 | (546) | 909 | 390 | — | 361 | 133 | — | — | 425.5 | 60m6 | — | — | — | M10 | M4 | M4 |
| 30, 45 | 22, 30 | 18.5 | 7.5 | | 255 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | 37 | 22, 30 | 11, 15 | 225S | 320 | 500 | 277 | 225 | 446 | 178 | 143 | 446 | — | 145 | 533 | (592) | 932 | 428 | — | 342 | 149 | — | — | 432 | 65m6 | — | — | — | M10 | M4 | M4 |

Note) 1. Install the motor on the floor and use it with the shaft horizontal.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$
4 The 400V class motor has -H at the end of its type name.

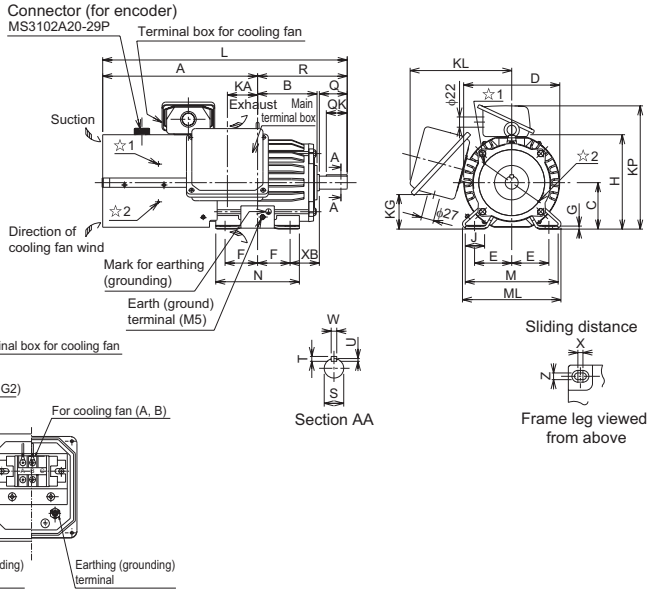
# Dedicated motor outline dimension drawings (1500r/min series) (standard horizontal type with brake)

## SF-V5RU(H) 1KB



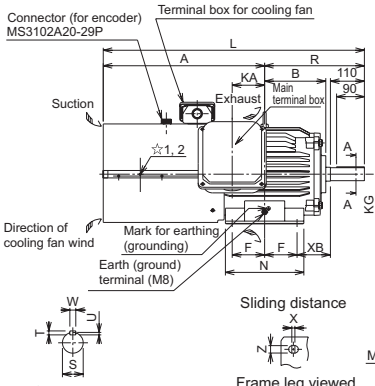

## SF-V5RU(H) 2KB, 3KB, 5KB, 7KB

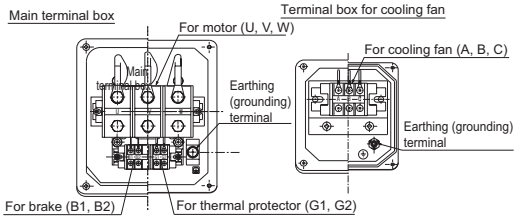




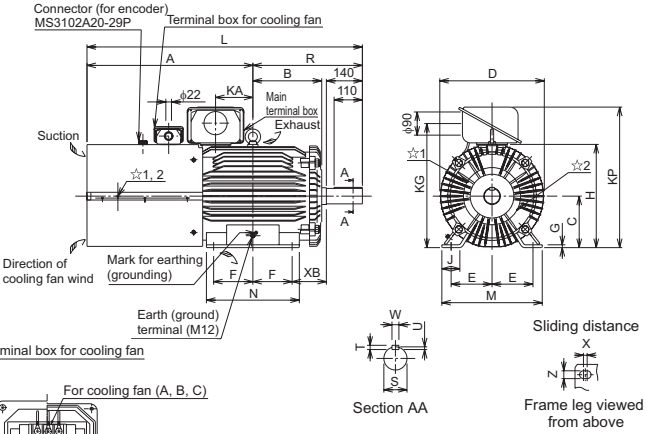


## SF-V5RU(H) 11KB, 15KB, 18KB, 22KB




## SF-V5RU(H) 30KB, 37KB, 45KB, 55KB




☆ indicates an inserting position of a bolt with hex head holes for manual opening.

Make sure to earth the earth terminal of the frame installation foot as well as the earth terminal in the terminal box.

## Dimensions table

(Unit: mm)

| SF-V5RUB Output (kW) | SF-V5RUB1 Output (kW) | SF-V5RUB3 Output (kW) | SF-V5RUB4 Output (kW) | Frame No. | Mass (kg) | Motor A | B | C | D | E | F | G | H | I | J | KA | KD | KG | KL | KP | L | M | ML | N | X | XB | Z | Shaft End Q | QK | R | S | T | U | W | Terminal Screw Size U,V,W | A,B,(C) | G1,G2 | B1,B2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | — | — | — | 90L | 29 | 296.5 | 114 | 90 | 183.6 | 70 | 62.5 | 4 | — | — | — | 53 | 27 | 65 | 220 | 245 | 465 | 175 | — | 150 | 15 | 56 | 9 | 50 | 40 | 168.5 | 24j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 2.2 | 1.5 | — | — | 100L | 46 | 333.5 | 128 | 100 | 207 | 80 | 70 | 6.5 | — | — | 40 | 65 | 27 | 78 | 231 | 265 | 526.5 | 200 | 212 | 180 | 4 | 63 | 12 | 60 | 45 | 193 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 3.7 | 2.2 | 1.5 | — | 112M | 53 | 355 | 135 | 112 | 228 | 95 | 70 | 6.5 | — | — | 40 | 69 | 27 | 93 | 242 | 290 | 555 | 230 | 242 | 180 | 4 | 70 | 12 | 60 | 45 | 200 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 5.5 | 3.7 | 2.2 | — | 132S | 70 | 416 | 152 | 132 | 266 | 108 | 70 | 6.5 | — | — | 40 | 75 | 27 | 117 | 256 | 329 | 655 | 256 | 268 | 180 | 4 | 89 | 12 | 80 | 63 | 239 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 | M4 |
| 7.5 | 5.5 | 3.7 | 1.5 | 132M | 80 | 435 | 171 | 132 | 266 | 108 | 89 | 6.5 | — | — | 40 | 94 | 27 | 117 | 256 | 329 | 693 | 256 | 268 | 218 | 4 | 89 | 12 | 80 | 63 | 258 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 | M4 |
| 11 | 7.5 | 5.5 | 2.2 | 160M | 140 | 522.5 | 198 | 160 | 318 | 127 | 105 | 8 | — | — | 50 | 105 | 56 | 115 | 330 | 391 | 845.5 | 310 | — | 254 | 4 | 108 | 14.5 | 110 | 90 | 323 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 | M4 |
| 15 | 11 | 7.5 | 3.7 | 160L | 155 | 544.5 | 220 | 160 | 318 | 127 | 127 | 8 | — | — | 50 | 127 | 56 | 115 | 330 | 391 | 889.5 | 310 | — | 298 | 4 | 108 | 14.5 | 110 | 90 | 345 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 | M4 |
| 18.5 | — | — | — | 180M | 185 | 568.5 | 225.5 | 180 | 363 | 139.5 | 120.5 | 8 | — | — | 50 | 127 | 56 | 139 | 352 | 428 | 920 | 335 | — | 285 | 4 | 121 | 14.5 | 110 | 90 | 351.5 | 48k6 | 9 | 5.5 | 14 | M8 | M4 | M4 | M4 |
| 22 | 15 | 11 | — | | 215 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| — | 18.5 | 15 | 5.5 | 180L | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 30 | — | — | — | 200L | 305 | 644.5 | 267.5 | 200 | 406 | 159 | 152.5 | 11 | — | — | 70 | 145 | 90 | 487 | — | 546 | 1070 | 390 | — | 361 | 4 | 133 | 18.5 | 140 | 110 | 425.5 | 60m6 | 11 | 7 | 18 | M10 | M4 | M4 | M4 |
| 30, 45 | 22, 30 | 18.5 | 7.5 | | 330 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | 37 | 22, 30 | 11, 15 | 225S | 395 | 659 | 277 | 225 | 446 | 178 | 143 | 11 | — | — | 70 | 145 | 90 | 533 | — | 592 | 1091 | 428 | — | 342 | 4 | 149 | 18.5 | 140 | 110 | 432 | 65m6 | 11 | 7 | 18 | M10 | M4 | M4 | M4 |

Note) 1. Install the motor on the floor and use it with the shaft horizontal.

2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
   Also, check that the ventilation direction of a fan is from the opposite load side to the load side.

3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$

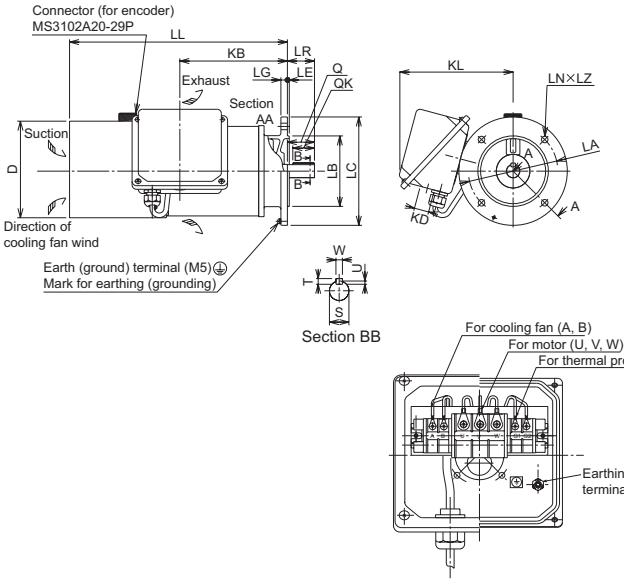
4 The 400V class motor has -H at the end of its type name.

5. Since a brake power device is a stand-alone, install it inside the enclosure. (This device should be arranged at the customer side.)

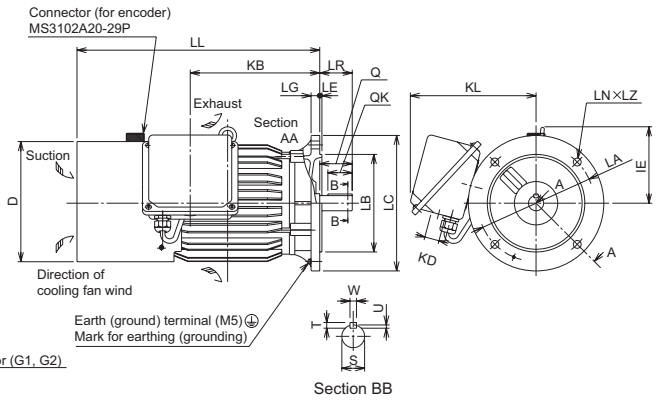
* Consult our sales office.

# Dedicated motor outline dimension drawings (1500r/min series) (flange type)

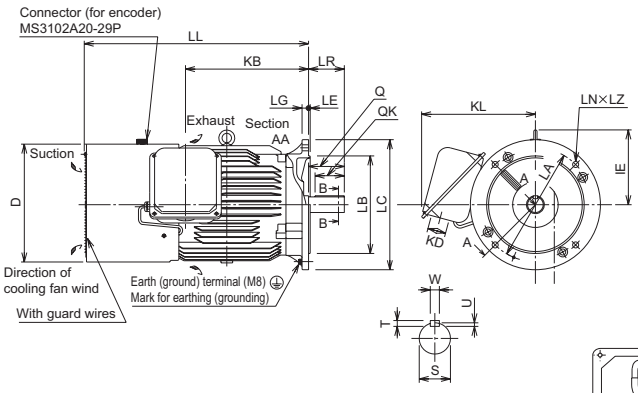
**SF-V5RUF(H) 1K**



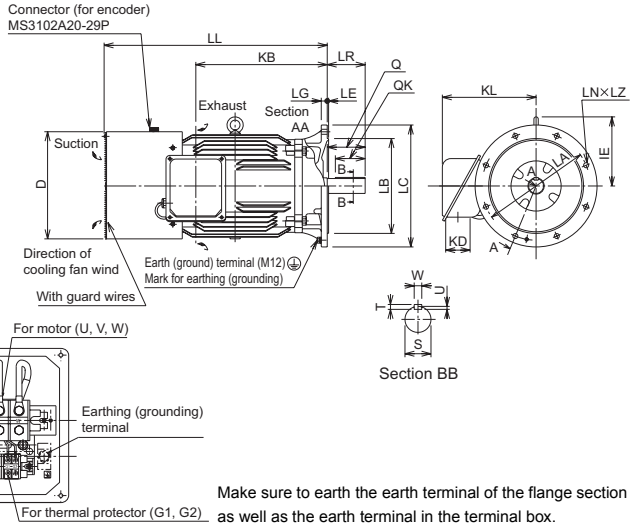

**SF-V5RUF(H) 2K, 3K, 5K, 7K**




**SF-V5RUF(H) 11K, 15K, 18K, 22K**




**SF-V5RUF(H) 30K, 37K, 45K**




Make sure to earth the earth terminal of the flange section as well as the earth terminal in the terminal box.

## Dimensions table

(Unit: mm)

| SF-V5RUF Output (kW) | SF-V5RUF1 Output (kW) | SF-V5RUF3 Output (kW) | SF-V5RUF4 Output (kW) | Flange Number | Frame No. | Mass (kg) | Motor | | | | | | | | | | | | | Shaft End | | | | | | | Terminal Screw Size | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | D | IE | KB | KD | KL | LA | LB | LC | LE | LG | LL | LN | LZ | LR | Q | QK | S | T | U | W | U,V,W | A,B,(C) | G1,G2 |
| 1.5 | — | — | — | FF165 | 90L | 26.5 | 183.6 | — | 198.5 | 27 | 220 | 165 | 130j6 | 200 | 3.5 | 12 | 402 | 4 | 12 | 50 | 50 | 40 | 24j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 2.2 | 1.5 | — | — | FF215 | 100L | 37 | 207 | 130 | 213 | 27 | 231 | 215 | 180j6 | 250 | 4 | 16 | 432 | 4 | 14.5 | 60 | 60 | 45 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 3.7 | 2.2 | 1.5 | — | FF215 | 112M | 46 | 228 | 141 | 239 | 27 | 242 | 215 | 180j6 | 250 | 4 | 16 | 448 | 4 | 14.5 | 60 | 60 | 45 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 |
| 5.5 | 3.7 | 2.2 | — | FF265 | 132S | 65 | 266 | 156 | 256 | 27 | 256 | 265 | 230j6 | 300 | 4 | 20 | 484 | 4 | 14.5 | 80 | 80 | 63 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 |
| 7.5 | 5.5 | 3.7 | 1.5 | FF265 | 132M | 70 | 266 | 156 | 294 | 27 | 256 | 265 | 230j6 | 300 | 4 | 20 | 522 | 4 | 14.5 | 80 | 80 | 63 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 |
| 11 | 7.5 | 5.5 | 2.2 | FF300 | 160M | 110 | 318 | 207 | 318 | 56 | 330 | 300 | 250j6 | 350 | 5 | 20 | 625 | 4 | 18.5 | 110 | 110 | 90 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 |
| 15 | 11 | 7.5 | 3.7 | FF300 | 160L | 125 | 318 | 207 | 362 | 56 | 330 | 300 | 250j6 | 350 | 5 | 20 | 669 | 4 | 18.5 | 110 | 110 | 90 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 |
| 18.5 | — | — | — | FF350 | 180M | 160 | 363 | 230 | 378.5 | 56 | 352 | 350 | 300j6 | 400 | 5 | 20 | 690 | 4 | 18.5 | 110 | 110 | 90 | 48k6 | 9 | 5.5 | 14 | M8 | M4 | M4 |
| 22 | 15 | 11 | — | | | 185 | | | | | | | | | | | | | | | | | | | | | | | |
| — | 18.5 | 15 | 5.5 | FF350 | 180L | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 30 | — | — | — | FF400 | 200L | 270 | 406 | 255 | 485 | 90 | 346 | 400 | 350j6 | 450 | 5 | 22 | 823.5 | 8 | 18.5 | 140 | 140 | 110 | 60m6 | 11 | 7 | 18 | M10 | M4 | M4 |
| 37, 45 | 22, 30 | 18.5 | 7.5 | | | 290 | | | | | | | | | | | | | | | | | | | | | | | |

* Consult our sales office.

Note) 1. Install the motor on the floor and use it with the shaft horizontal.
For use under the shaft, the protection structure of the cooling fan is IP20.

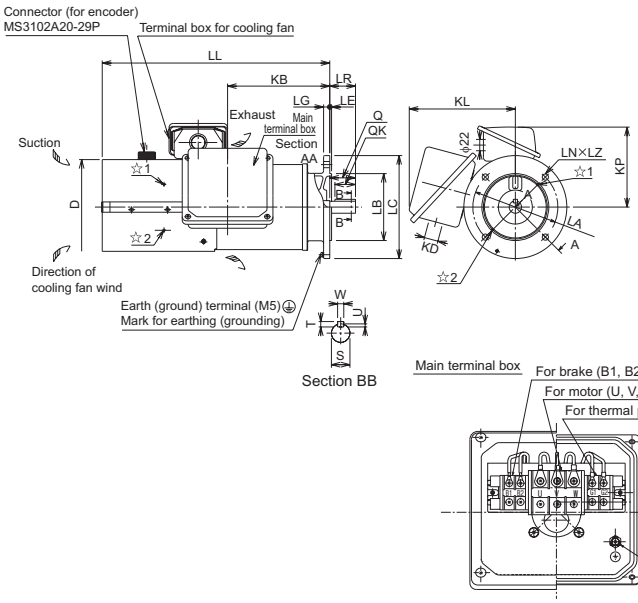
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.

3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$

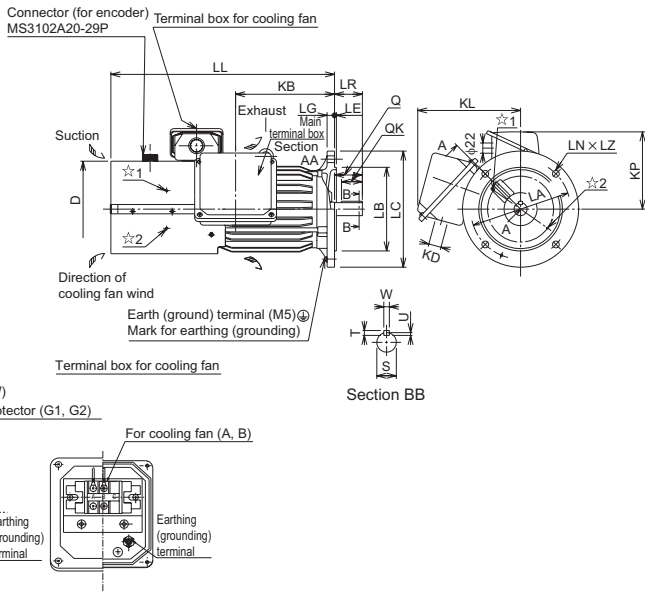
4 The 400V class motor has -H at the end of its type name.

# Dedicated motor outline dimension drawings (1500r/min series) (flange type with brake)

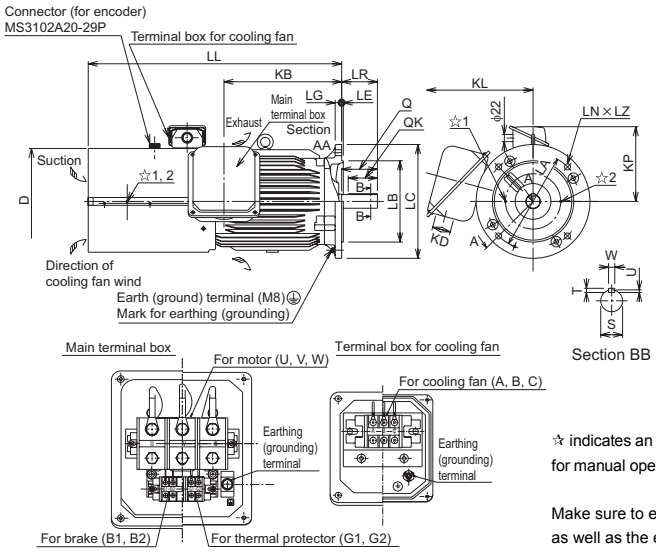
## SF-V5RUF(H) 1KB




## SF-V5RUF(H) 2KB, 3KB, 5KB, 7KB




## SF-V5RUF(H) 11KB, 15KB




☆ indicates an inserting position of a bolt with hex head holes for manual opening.

Make sure to earth the earth terminal of the flange section as well as the earth terminal in the terminal box.

## Dimensions table

(Unit: mm)

| SF-V5RUFB Output (kW) | SF-V5RUFB1 Output (kW) | SF-V5RUFB3 Output (kW) | SF-V5RUFB4 Output (kW) | Flange Number | Frame No. | Mass (kg) | Motor | | | | | | | | | | | | | Shaft End | | | | | | | Terminal Screw Size | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | D | KB | KD | KL | KP | LA | LB | LC | LE | LG | LL | LN | LZ | LR | Q | QK | S | T | U | W | U,V,W | A,B,(C) | B1,B2 | G1,G2 |
| 1.5 | — | — | — | FF165 | 90L | 31.5 | 183.6 | 198.5 | 27 | 220 | 155 | 165 | 130j6 | 200 | 3.5 | 12 | 442 | 4 | 12 | 50 | 50 | 40 | 24j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 2.2 | 1.5 | — | — | FF215 | 100L | 50 | 207 | 213 | 27 | 231 | 165 | 215 | 180j6 | 250 | 4 | 16 | 481.5 | 4 | 14.5 | 60 | 60 | 45 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 3.7 | 2.2 | 1.5 | — | FF215 | 112M | 58 | 228 | 239 | 27 | 242 | 178 | 215 | 180j6 | 250 | 4 | 16 | 525 | 4 | 14.5 | 60 | 60 | 45 | 28j6 | 7 | 4 | 8 | M6 | M4 | M4 | M4 |
| 5.5 | 3.7 | 2.2 | — | FF265 | 132S | 83 | 266 | 256 | 27 | 256 | 197 | 265 | 230j6 | 300 | 4 | 20 | 597 | 4 | 14.5 | 80 | 80 | 63 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 | M4 |
| 7.5 | 5.5 | 3.7 | 1.5 | FF265 | 132M | 88 | 266 | 294 | 27 | 256 | 197 | 265 | 230j6 | 300 | 4 | 20 | 635 | 4 | 14.5 | 80 | 80 | 63 | 38k6 | 8 | 5 | 10 | M6 | M4 | M4 | M4 |
| 11 | 7.5 | 5.5 | 2.2 | FF300 | 160M | 151 | 318 | 318 | 56 | 330 | 231 | 300 | 250j6 | 350 | 5 | 20 | 735.5 | 4 | 18.5 | 110 | 110 | 90 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 | M4 |
| 15 | 11 | 7.5 | 3.7 | FF300 | 160L | 167 | 318 | 362 | 56 | 330 | 231 | 300 | 250j6 | 350 | 5 | 20 | 779.5 | 4 | 18.5 | 110 | 110 | 90 | 42k6 | 8 | 5 | 12 | M8 | M4 | M4 | M4 |

Note) 1. Install the motor on the floor and use it with the shaft horizontal.
For use under the shaft, the protection structure of the cooling fan is IP20.

2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.

3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$

4 The 400V class motor has -H at the end of its type name.

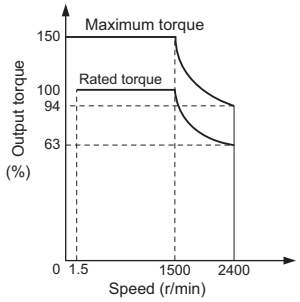
5. Since a brake power device is a stand-alone, install it inside the enclosure.
(This device should be arranged at the customer side.)

# Application to vector dedicated motor (SF-THY) (frame No. 250 or more)

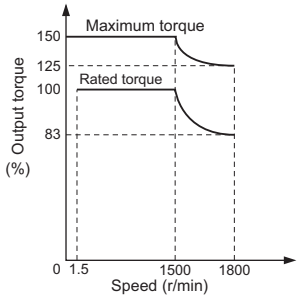
## Motor torque

When the vector dedicated motor (SF-THY) and inverter of the same capacity are used and rated voltage is input, the torque characteristics are as shown below.

**<75[kW]>**




**<90 to 250[kW]>**




## Dedicated motor model lineup

Rated speed: 1500r/min (4 poles)

| Model | Standard Type | Rated Output (kW) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 75 | 90 | 110 | 132 | 160 | 200 | 250 |
| Standard horizontal type | SF-THY□ | 75 | 90 | 110 | 132 | 160 | 200 | 250 |

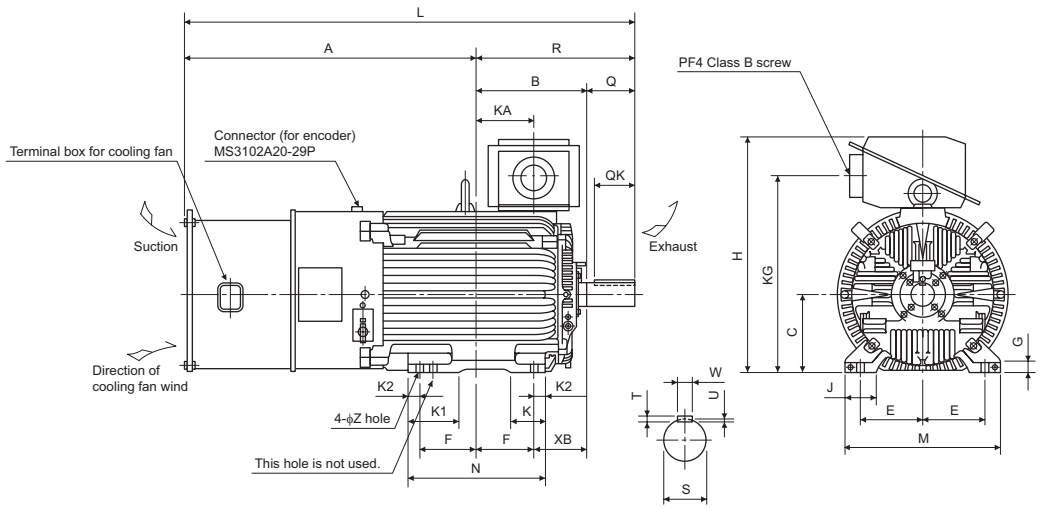
Note) Both 200V and 400V are the same type.
Since motors with the speed ratio of 1:2, 1:3, and 1:4 are available as special products, consult our sales office.

## Motor specifications

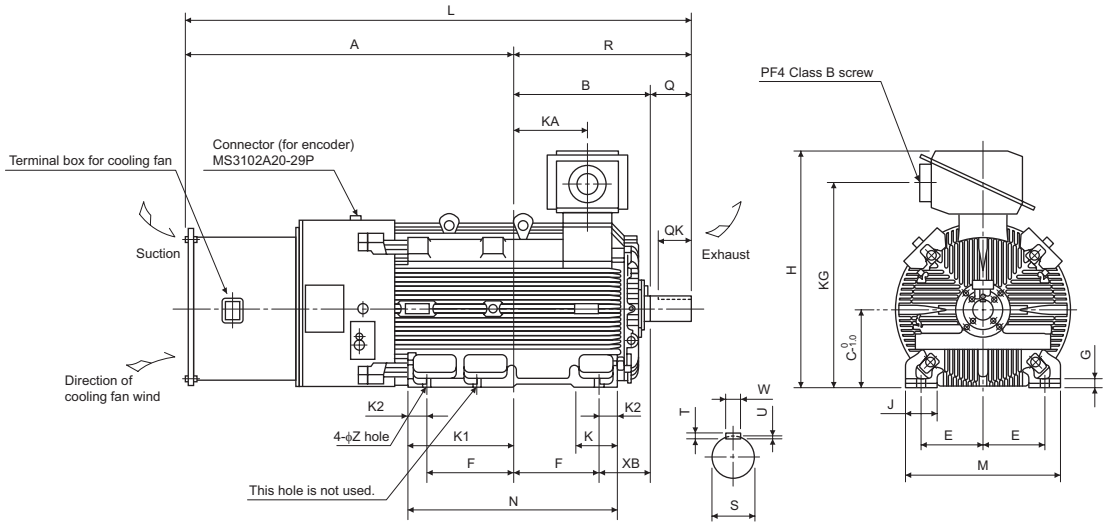
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 200V class | Motor type | | | SF-THY | | | | | |
| | Applicable Inverter FR-A720-□□K | | | 90 | | | | | |
| | Rated output(kW) | | | 75 | | | | | |
| | Rated torque (kgf•m) | | | 48.7 | | | | | |
| | (N•m) | | | 477 | | | | | |
| | Maximum torque (kgf•m) 150%60s | | | 73.0 | | | | | |
| | (N•m) | | | 715 | | | | | |
| | Rated speed (r/min) | | | 1500 | | | | | |
| | Maximum speed (r/min) | | | 2400 | | | | | |
| | Frame No. | | | 250MD | | | | | |
| | Inertia moment J (kg•m$^2$) | | | 1.1 | | | | | |
| | Noise | | | 90dB | | | | | |
| | Cooling fan | Voltage | | Three-phase, 200V/50Hz, 200V/60Hz, 220V/60Hz (400V class cooling fan is available upon order) | | | | | |
| | | Input (W) | | 750 | | | | | |
| 400V class | Motor type | | | SF-THY | | | | | |
| | Applicable Inverter FR-A740-□□K | | | 90 | 110 | 132 | 160 | 185 | 220 | 280 |
| | Rated output (kW) | | | 75 | 90 | 110 | 132 | 160 | 200 | 250 |
| | Rated torque (kgf•m) | | | 48.7 | 58.4 | 71.4 | 85.7 | 103.9 | 129.9 | 162.3 |
| | (N•m) | | | 477 | 572 | 700 | 840 | 1018 | 1273 | 1591 |
| | Maximum torque (kgf•m) 150%60s | | | 73.0 | 87.6 | 107.1 | 128.5 | 155.8 | 194.8 | 243.4 |
| | (N•m) | | | 715 | 858 | 1050 | 1260 | 1527 | 1909 | 2386 |
| | Rated speed (r/min) | | | 1500 | | | | | | |
| | Maximum speed (r/min) | | | 2400 | 1800 | | | | | |
| | Frame No. | | | 250MD | 250MD | 280MD | 280MD | 280MD | 280L | 315H |
| | Inertia moment J (kg•m$^2$) | | | 1.1 | 1.7 | 2.3 | 2.3 | 4.0 | 3.8 | 5.0 |
| | Noise | | | 90dB | | | 95dB | | | |
| | Cooling fan | Voltage | | Three-phase, 200V/50Hz, 200V/60Hz, 220V/60Hz (400V class cooling fan is available upon order) | | | | | | |
| | | Input (W) | 50Hz | 400 | 400 | 400 | 400 | 400 | 750 | 750 |
| | | | 60Hz | 750 | 750 | 750 | 750 | 750 | 1500 | 1500 |

# Dedicated motor outline dimension drawings (1500r/min series)

## 75kW to 160kW




## 200kW, 250kW




## Dimensions table

(Unit: mm)

| Outpur | Frame No. | Mass (kg) | Motor | | | | | | | | | | | | | | | | | | | Shaft End Size | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H | J | K | K1 | K2 | L | M | N | R | Z | XB | KA | KG | Q | QK | S | W | T | U |
| 75 | 250MD | 610 | 988.5 | 340.5 | 250 | 557 | 203 | 174.5 | 30 | 775 | 100 | 130 | 168 | 50 | 1471 | 486 | 449 | 482.5 | 24 | 168 | 157.5 | 635 | 140 | 110 | ϕ75m6 | 20 | 12 | 7.5 |
| 90 | 250MD | 660 | 988.5 | 340.5 | 250 | 557 | 203 | 174.5 | 30 | 775 | 100 | 130 | 168 | 50 | 1471 | 486 | 449 | 482.5 | 24 | 168 | 157.5 | 635 | 140 | 110 | ϕ75m6 | 20 | 12 | 7.5 |
| 110 | 280MD | 870 | 1049.5 | 397.5 | 280 | 607 | 228.5 | 209.5 | 30 | 845 | 110 | 130 | 181 | 40 | 1619 | 560 | 449 | 569.5 | 24 | 190 | 210.5 | 705 | 170 | 140 | ϕ85m6 | 22 | 14 | 9 |
| 132 | 280MD | 890 | 1049.5 | 397.5 | 280 | 607 | 228.5 | 209.5 | 30 | 845 | 110 | 130 | 181 | 40 | 1619 | 560 | 449 | 569.5 | 24 | 190 | 210.5 | 705 | 170 | 140 | ϕ85m6 | 22 | 14 | 9 |
| 160 | 280MD | 920 | 1049.5 | 397.5 | 280 | 607 | 228.5 | 209.5 | 30 | 845 | 110 | 130 | 181 | 40 | 1619 | 560 | 499 | 569.5 | 24 | 190 | 210.5 | 705 | 170 | 140 | ϕ85m6 | 22 | 14 | 9 |
| 200 | 280L | 1170 | 1210.5 | 416.5 | 280 | 652 | 228.5 | 228.5 | 30 | 885 | 110 | 160 | 160 | 75 | 1799 | 560 | 607 | 588.5 | 24 | 190 | 214.5 | 745 | 170 | 140 | ϕ85m6 | 22 | 14 | 9 |
| 250 | 315H | 1630 | 1343 | 565 | 315 | 717 | 254 | 355 | 35 | 965 | 130 | 175 | 428 | 80 | 2084 | 636 | 870 | 741 | 28 | 216 | 306 | 825 | 170 | 140 | ϕ95m6 | 25 | 14 | 9 |

Note) The tolerance of the top and bottom of the center shaft height *C is $^{0}_{-0.5}$ for the 250 frame and $^{0}_{-1.0}$ for the 280 frame or more.

## 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 special motors

### Motor with brake

Use the motor with brake having independent power supply for the brake, connect the brake power supply to the inverter primary side power and make the inverter output off using the output stop terminal (MRS) when the brake is applied (motor stop). Rattle may be heard according to the type of the brake in the low speed region but it is not a fault.

### 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.

### Submersible motor

Since the motor rated current is larger than that of the standard motor, make selection of the inverter capacity carefully. In addition, the wiring distance between the motor and inverter may become longer, refer to page 87 to perform wiring with a cable thick enough. Leakage current may flow more than the land motor, take care when selecting the earth leakage current breaker.

### Explosion-proof motor

To drive an explosion-proof type motor, an explosion-proof test of the motor and inverter together is necessary. The test is also necessary when driving an existing explosion-proof motor.

The inverter is an non-explosion proof structure, install it in a safety location.

### 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 motor 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.

### Single phase motor

The single phase motor is not suitable for variable operation by the inverter.

For the capacitor starting system, the capacitor may be damaged due to harmonic current flowing to the capacitor. For the deviation phase starting system and repulsion starting system, not only output torque is not generated at low speed but it will result in starting coil burnout due to failure of centrifugal force switch inside. Replace with a three-phase motor for use.

# Main Differences and Compatibilities with the FR-A500(L) Series

| Item | FR-A500(L) | FR-A700 |
|---|---|---|
| Control method | V/F control<br>Advanced magnetic flux vector control | V/F control<br>Advanced magnetic flux vector control<br>Real sensorless vector control<br>Vector control (used with a plug-in option FR-A7AP) |
| Changed/cleared functions | 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) |
| | Long wiring mode<br>(*Pr. 240* setting 10, 11) | Setting is not necessary<br>(*Pr. 240* settings "10" and "11" were cleared) |
| | Intelligent mode selection<br>*(Pr. 60)* | Parameter number change<br>*(Pr. 60 Energy saving control selection)*<br>*(Pr. 292 Automatic acceleration/deceleration)* |
| | Program operation<br>*(Pr. 200 to Pr. 231)* | Function was cleared |
| Terminal block | Removable terminal block | Removable terminal block<br>Upward compatibility (A500 terminal block mountable) |
| PU | FR-PU04, DU04 | FR-PU07<br>FR-DU07<br>FR-PU04 (Some functions, such as parameter copy, are unavailable.)<br>FR-DU04 unavailable |
| Plug-in Options | Dedicated plug-in option (incompatible) | |
| | Computer link, relay output option<br>FR-A5NR | Built into the inverter<br>(RS-485 terminals, relay output 2 points) |
| Installation size | · FR-A720-0.4K to 90K, FR-A740-0.4K to 7.5K, 18.5K to 55K, 110K, 160K are compatible in mounting dimensions<br>For the FR-A740-11K, 15K, an optional intercompatibility attachment (FR-AAT) is necessary.<br>· Heatsink protrusion attachment is not compatible.<br>Also, the panel cut dimension of 3.7K or less, 200V class 30K, 55K or more, 400V class 11K, 15K, 75K or more is not compatible. | |

# 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 your company and your customers.
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 opportunity loss from warranty liability

Regardless of the gratis warranty term, compensation to opportunity loss 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.

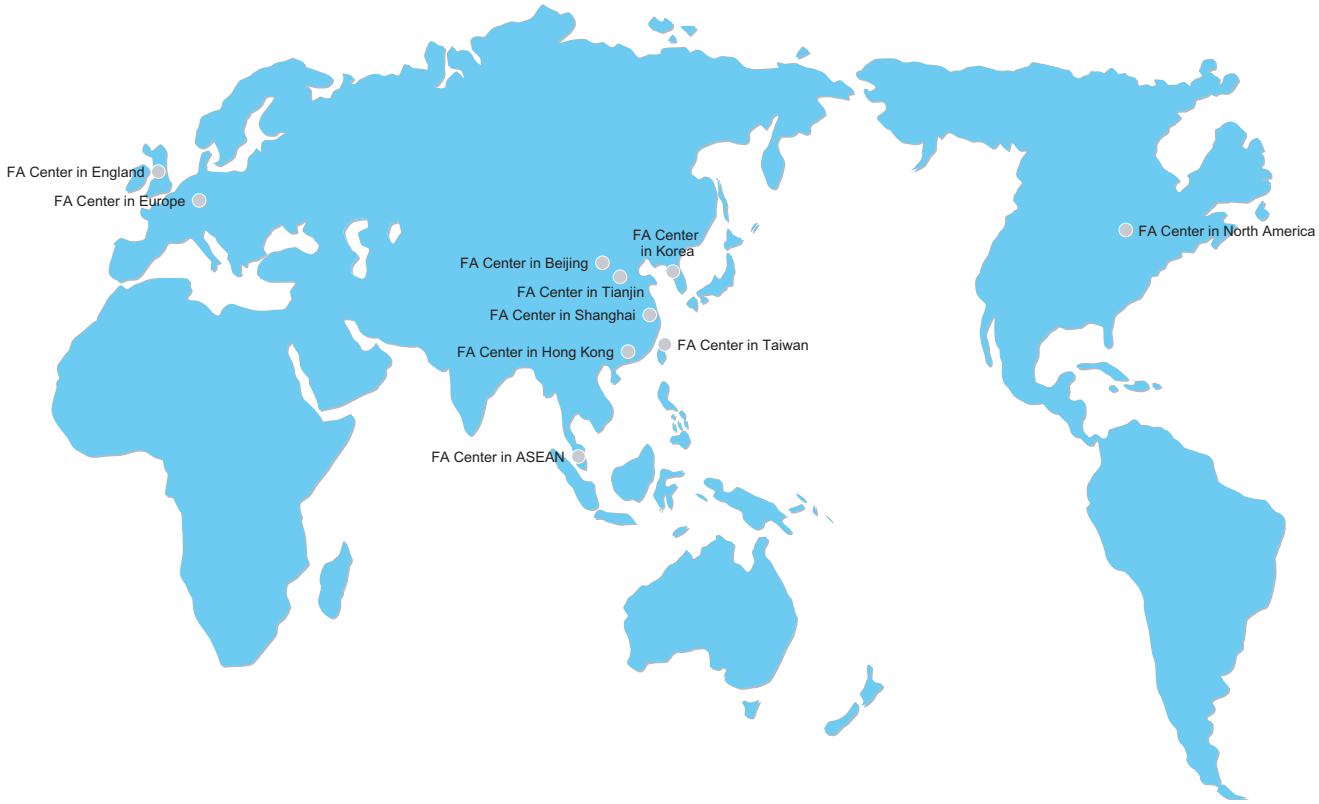
3. Repair period after production is discontinued

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.

## International FA center

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