FR-A701

Inverter

Instruction Manual (Basic)

FR-A721-5.5K to 55K

FR-A741-5.5K to 55K

Art. no.: ib0600331
20102010
Version D

MITSUBISHI ELECTRIC

700 series

INVERTER FR-A701

INSTRUCTION MANUAL (BASIC)

FR-A721-5.5K to 55K
FR-A741-5.5K to 55K

Thank you for choosing this Mitsubishi Inverter.
This Instruction Manual is intended for users who "just want to run the inverter".
If you are going to utilize functions and performance, refer to *the FR-A701 Series Instruction Manual (applied)* [IB-0600337ENG]. The *Instruction Manual (applied)* is separately available from where you purchased the inverter or your Mitsubishi sales representative.

CONTENTS

1 OUTLINE 1
1.1 Product checking and parts identification 1
1.2 Inverter and peripheral devices 2
1.3 Method of removal and reinstallation of the front cover 4
1.4 Installation of the inverter and enclosure design 6

2 WIRING 12
2.1 Terminal connection diagram 12
2.2 Main circuit terminal specifications 13
2.3 Control circuit specifications 20
2.4 Connection of motor with encoder (vector control) 28

3 PRECAUTIONS FOR USE OF THE INVERTER 35
3.1 EMC and leakage currents 35
3.2 Power-off and magnetic contactor (MC) 41
3.3 Inverter-driven 400V class motor 42
3.4 Precautions for use of the inverter 43
3.5 Failsafe of the system which uses the inverter 45

4 DRIVE THE MOTOR 47
4.1 Step of operation 47
4.2 Operation panel (FR-DU07) 48
4.3 Before operation 56
4.4 Start/stop from the operation panel (PU operation mode) 83
4.5 Make a start and stop with terminals (external operation) 88
4.6 Parameter List 95

5 TROUBLESHOOTING 139
5.1 Reset method of protective function 139
5.2 List of fault or alarm display 140
5.3 Causes and corrective actions 141
5.4 Correspondences between digital and actual characters 156
5.5 Check and clear of the faults history 157
5.6 Check first when you have troubles 159

6 PRECAUTIONS FOR MAINTENANCE AND INSPECTION 162
6.1 Inspection item 162
6.2 Measurement of main circuit voltages, currents and powers 169

7 SPECIFICATIONS 174
7.1 Rating 174
7.2 Common specifications 177
7.3 Outline dimension drawings 178
7.4 Installation of the heatsink portion outside the enclosure for use 187

This instruction manual (Basic) provides handling information and precautions for use of the equipment.
Please forward this instruction manual (Basic) to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this instruction manual (Basic) and appended documents carefully and can use the equipment correctly. Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions. In this instruction manual (Basic), the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠WARNING Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

⚠CAUTION Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that even the **⚠CAUTION** level may lead to a serious consequence according to conditions. Please follow strictly the instructions of both levels because they are important to personnel safety.

1. Electric Shock Prevention

⚠WARNING

- While power is on or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is off, do not remove the front cover except for wiring or periodic inspection.You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, check to make sure that the operation panel indicator is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.
- This inverter must be earthed (grounded). Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards)
  Use a neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.
- Perform setting dial and key operations with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
- Do not replace the cooling fan while power is on. It is dangerous to replace the cooling fan while power is on.
- Do not touch the printed circuit board with wet hands. You may get an electric shock.
- When measuring the main circuit capacitor capacity, the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

2. Fire Prevention ⚠CAUTION

- Install the inverter on a nonflammable wall without holes (so that nobody can touch the inverter heatsink on the rear side, etc.).
  Mounting it to or near combustible material can cause a fire.
- If the inverter has become faulty, switch off the inverter power.
  A continuous flow of large current could cause a fire.

3. Injury Prevention ⚠CAUTION

- Apply only the voltage specified in the instruction manual to each terminal. Otherwise, burst, damage, etc. may occur.
- Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc. Otherwise, burst, damage, etc. may occur.
- While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

4. Additional Instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and installation

⚠CAUTION

- When carrying products, use correct lifting gear to prevent injury.
- Do not stack the inverter boxes higher than the number recommended.
- Ensure that installation position and material can withstand the weight of the inverter. Install according to the information in the instruction manual.
- Do not install or operate the inverter if it is damaged or has parts missing. This can result in breakdowns.
- When carrying the inverter, do not hold it by the front cover or setting dial; it may fall off or fail.
- Do not stand or rest heavy objects on the product.
- Check the inverter mounting orientation is correct.
- Prevent other conductive bodies such as screws and metal fragments or other flammable substance such as oil from entering the inverter.
- As the inverter is a precision instrument, do not drop or subject it to impact.
- Use the inverter under the following environmental conditions. Otherwise, the inverter may be damaged.

Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90% RH or less (non-condensing)
	Storage temperature	-20°C to +65°C *1
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude, vibration	Maximum 1000m above sea level for standard operation. 5.9m/s^2 or less

*1 Temperature applicable for a short time, e.g. in transit.

(2) Wiring ⚠CAUTION

- Do not install a power factor correction capacitor or surge suppressor/radio noise filter (capacitor type filter) on the inverter output side. The device on the inverter output side may be overheated or burn out.
- The connection orientation of the output cables U, V, W to the motor will affect the direction of rotation of the motor.

(3) Test operation and adjustment

⚠CAUTION

- Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

(4) Operation ⚠WARNING

- When you have chosen the retry function, stay away from the equipment as it will restart suddenly after an alarm stop.
- Since pressing STOP RESET key may not stop output depending on the function setting status *(refer to page 109)*, provide a circuit and switch separately to make an emergency stop (power off, mechanical brake operation for emergency stop, etc).
- Make sure that the start signal is off before resetting the inverter alarm. A failure to do so may restart the motor suddenly.
- The load used should be a three-phase induction motor only. Connection of any other electrical equipment to the inverter output may damage the inverter as well as equipment.
- Performing pre-excitation (LX signal and X13 signal) under torque control (real sensorless vector 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 modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the inverter.

⚠CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not use a magnetic contactor on the inverter input for frequent starting/ stopping of the inverter. Otherwise, the life of the inverter decreases.
- Use a noise filter to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- When a 400V class motor is inverter-driven, please use an insulation-enhanced motor or measures taken to suppress surge voltages. Surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
- When parameter clear or all clear is performed, reset the required parameters before starting operations. Each parameter returns to the initial value.
- The inverter can be easily set for high-speed operation. Before changing its setting, fully examine the performances of the motor and machine.
- In addition to the inverter's holding function, install a holding device to ensure safety.
- Before running an inverter which had been stored for a long period, always perform inspection and test operation.
- For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

(5) Emergency stop ⚠CAUTION

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.
- When the breaker on the inverter input side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.
- When the protective function is activated, take the corresponding corrective action, then reset the inverter, and resume operation.

(6) Maintenance, inspection and parts replacement

⚠CAUTION

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.

(7) Disposing of the inverter

⚠CAUTION

- Treat as industrial waste.

General instructions

Many of the diagrams and drawings in this instruction manual show the inverter without a cover, or partially open. Never run the inverter in this status. Always replace the cover and follow this instruction manual when operating the inverter.

— CONTENTS —

1 OUTLINE 1

1.1 Product checking and parts identification 1
1.2 Inverter and peripheral devices 2
1.2.1 Peripheral devices 3
1.3 Method of removal and reinstallation of the front cover 4
1.4 Installation of the inverter and enclosure design 6
1.4.1 Inverter installation environment 6
1.4.2 Cooling system types for inverter enclosure 9
1.4.3 Inverter placement 10

2 WIRING 12

2.1 Terminal connection diagram 12
2.2 Main circuit terminal specifications 13
2.2.1 Specification of main circuit terminal 13
2.2.2 Terminal arrangement of the main circuit terminal, power supply and the motor wiring. 14
2.2.3 Cables and wiring length 16
2.2.4 When connecting the control circuit and the main circuit separately to the power supply (separate power) 19
2.3 Control circuit specifications 20
2.3.1 Control circuit terminals 20
2.3.2 Changing the control logic 23
2.3.3 Control circuit terminal layout 25
2.3.4 Wiring instructions 26
2.3.5 When connecting the operation panel using a connection cable 26
2.3.6 RS-485 terminal block 27
2.3.7 Communication operation 27
2.4 Connection of motor with encoder (vector control) 28

3 PRECAUTIONS FOR USE OF THE INVERTER 35

3.1 EMC and leakage currents 35
3.1.1 Leakage currents and countermeasures 35
3.1.2 EMC measures 37
3.1.3 Power supply harmonics 39
3.1.4 Harmonic suppression guideline 39
3.2 Power-off and magnetic contactor (MC) 41
3.3 Inverter-driven 400V class motor 42
3.4 Precautions for use of the inverter 43
3.5 Failsafe of the system which uses the inverter 45

4 DRIVE THE MOTOR 47

4.1 Step of operation 47
4.2 Operation panel (FR-DU07) 48
4.2.1 Parts of the operation panel (FR-DU07) 48
4.2.2 Basic operation (factory setting) 49
4.2.3 Operation lock (Press [MODE] for an extended time (2s)) 50
4.2.4 Monitoring of output current and output voltage 51
4.2.5 First priority monitor 51
4.2.6 Setting dial push 51
4.2.7 Change the parameter setting value 52
4.2.8 Parameter clear, all parameter clear 53
4.2.9 Parameter copy and parameter verification 54
4.3 Before operation 56
4.3.1 Simple mode parameter list 56
4.3.2 Overheat protection of the motor by the inverter (Pr. 9) 57
4.3.3 When the rated motor frequency is 50Hz (Pr. 3) 58
4.3.4 Increase the starting torque (Pr. 0) 59
4.3.5 Limit the maximum and minimum output frequency (Pr. 1, Pr. 2) 60
4.3.6 Change acceleration and deceleration time (Pr. 7, Pr. 8) 61
4.3.7 Selection of the start command and frequency command locations (Pr. 79) 62
4.3.8 Large starting torque and low speed torque are necessary (advanced magnetic flux vector control, real sensorless vector control) (Pr. 71, Pr. 80, Pr. 81, Pr. 800) 63
4.3.9 Higher accuracy operation using a motor with encoder (Vector control) (Pr.71, Pr.80, Pr.81, Pr.359, Pr.369, Pr.800) 66
4.3.10 To exhibit the best performance of the motor performance (offline auto tuning) (Pr. 71, Pr. 83, Pr. 84, Pr. 96) 71
4.3.11 High accuracy operation unaffected by the motor temperature (online auto tuning) (Pr. 95) 76
4.3.12 To perform high accuracy/fast response operation (gain adjustment of real sensorless vector control and vector control) (Pr. 818 to Pr. 821, Pr. 880) 77
4.4 Start/stop from the operation panel (PU operation mode) 83
4.4.1 Set the set frequency to operate (example: performing operation at 30Hz) 83
4.4.2 Use the setting dial like a potentiometer to perform operation. 84
4.4.3 Use switches to give a start command and a frequency command (multi-speed setting) 85
4.4.4 Perform frequency setting by analog (voltage input) 86
4.4.5 Perform frequency setting by analog (current input) 87
4.5 Make a start and stop with terminals (external operation) 88
4.5.1 Use the set frequency set by the operation panel (Pr. 79 = 3) 88
4.5.2 Use switches to give a start command and a frequency command (multi-speed setting) (Pr. 4 to Pr. 6) 89
4.5.3 Perform frequency setting by analog (voltage input) 91
4.5.4 Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value) 92
4.5.5 Perform frequency setting by analog (current input) 93
4.5.6 Change the frequency (60Hz) of the maximum value of potentiometer (at 20mA, initial value) 94
4.6 Parameter List 95
4.6.1 List of parameters classified by purpose of use 95

4.6.2 Parameter list 98

5 TROUBLESHOOTING 139

5.1 Reset method of protective function 139
5.2 List of fault or alarm display 140
5.3 Causes and corrective actions 141
5.4 Correspondences between digital and actual characters 156
5.5 Check and clear of the faults history 157
5.6 Check first when you have troubles 159
5.6.1 Motor will not start 159
5.6.2 Motor generates abnormal noise 159
5.6.3 Inverter generates abnormal noise. 160
5.6.4 Motor generates heat abnormally 160
5.6.5 Motor rotates in opposite direction 160
5.6.6 Speed greatly differs from the setting 160
5.6.7 Acceleration/deceleration is not smooth 160
5.6.8 Motor current is large 160
5.6.9 Speed does not increase 160
5.6.10 The motor and machine vibrate. 160
5.6.11 Speed varies during operation 161
5.6.12 Operation mode is not changed properly 161
5.6.13 Operation panel (FR-DU07) display is not operating 161
5.6.14 POWER lamp is not lit 161
5.6.15 Parameter write cannot be performed 161

6 PRECAUTIONS FOR MAINTENANCE AND INSPECTION 162

6.1 Inspection item 162
6.1.1 Daily inspection 162
6.1.2 Periodic inspection 162
6.1.3 Daily and periodic inspection 163
6.1.4 Display of the life of the inverter parts 164
6.1.5 Checking the inverter and converter modules 165
6.1.6 Cleaning 166
6.1.7 Replacement of parts 166
6.2 Measurement of main circuit voltages, currents and powers 169
6.2.1 Measurement of powers 171
6.2.2 Measurement of voltages and use of PT 171
6.2.3 Measurement of currents 172
6.2.4 Use of CT and transducer 172
6.2.5 Measurement of inverter input power factor 172
6.2.6 Measurement of converter output voltage (across terminals P/+ - N/-) 173
6.2.7 Measurement of inverter output frequency 173
6.2.8 Insulation resistance test using megger 173
6.2.9 Pressure test 173

7 SPECIFICATIONS 174

7.1 Rating 174
7.1.1 Inverter rating 174
7.1.2 Motor rating 176
7.2 Common specifications 177
7.3 Outline dimension drawings 178
7.3.1 Inverter outline dimension drawings 178
7.3.2 Dedicated motor outline dimension drawings 183
7.4 Installation of the heatsink portion outside the enclosure for use 187
7.4.1 Protrusion of heatsink 187

APPENDICES 189

Appendix 1 Main differences and compatibilities with the FR-A700 series 189
Appendix 2 Instructions for UL and cUL Compliance 190
Appendix 3 Control mode-based parameter (function) correspondence table and instruction code list 192

<Abbreviations>
DU: Operation panel (FR-DU07)
PU: Operation panel(FR-DU07) and parameter unit (FR-PU04, FR-PU07)
Inverter: Mitsubishi inverter FR-A701 series
FR-A701: Mitsubishi inverter FR-A701 series
Pr.: Parameter Number
PU operation: Operation using the PU (FR-DU07/FR-PU04/FR-PU07).
External operation: Operation using the control circuit signals
Combined operation: Combined operation using the PU (FR-DU07/FR-PU04/FR-PU07) and external operation
Standard motor: SF-JR
Constant-torque motor: SF-HRCA
Vector dedicated motor: SF-V5RU

REMARKS

· For differences and compatibility between the FR-A701 series and FR-A700 series, *refer to page 189*.

MEMO

1 OUTLINE

1.1 Product checking and parts identification

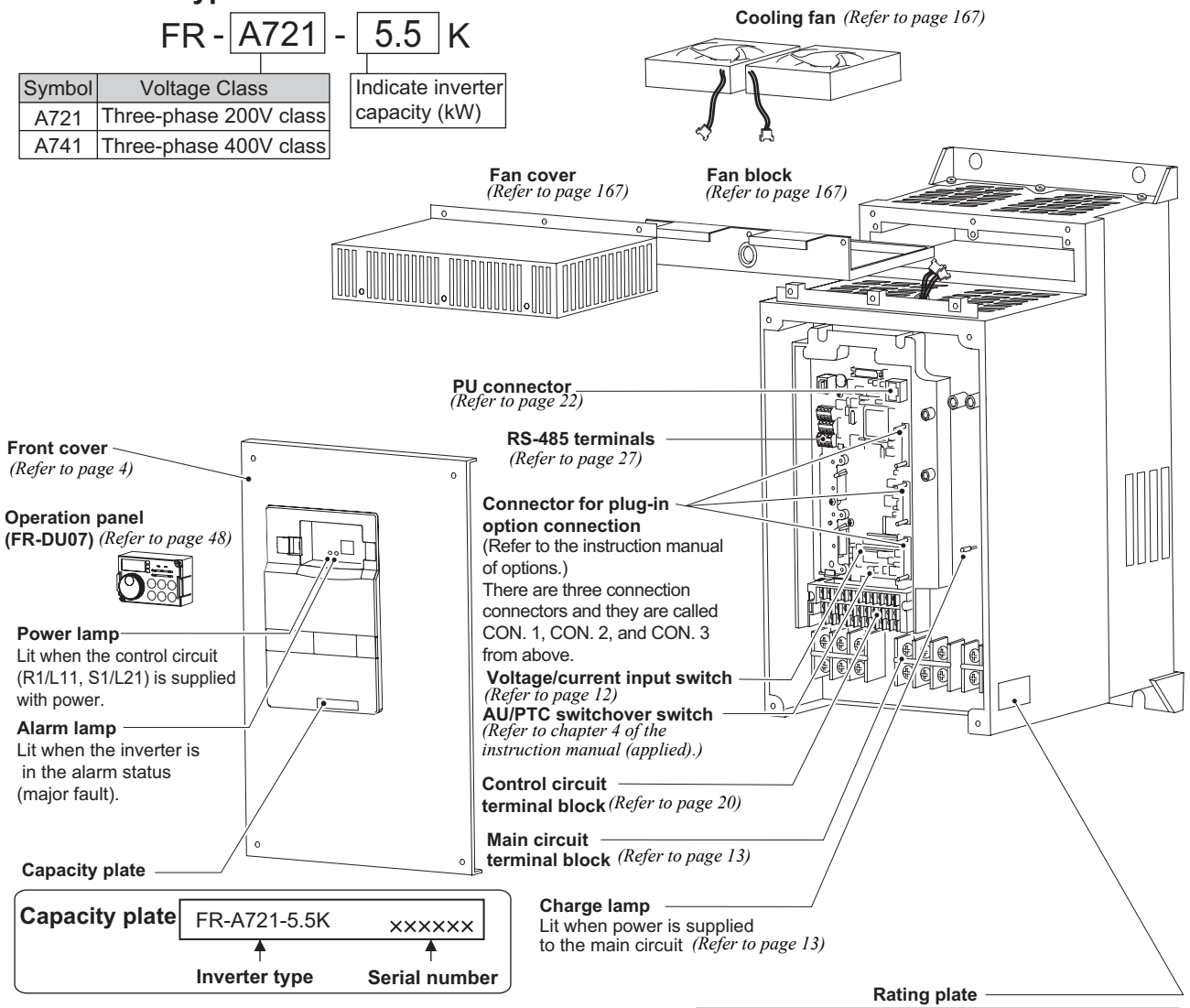
Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

- **Inverter Type**

FR - A721 - 5.5 K

Symbol	Voltage Class
A721	Three-phase 200V class
A741	Three-phase 400V class

Indicate inverter capacity (kW)



- **Accessory**
  - **Eyebolt for hanging the inverter**

Capacity	Eyebolt size	Number
11K, 15K	M8	2
18.5K to 30K	M10	2
37K to 55K	M12	2

* The 5.5K and 7.5K are not provided with eyebolts.

REMARKS

For removal and reinstallation of covers, refer to *page 4*.

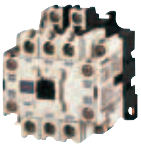
Harmonic suppression guideline (when inverters are used in Japan)
All models of general-purpose inverters used by specific consumers are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". (*For details, refer to page 39 .*)

1.2 Inverter and peripheral devices

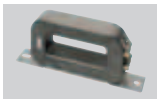
Three-phase AC power supply
Use within the permissible power supply specifications of the inverter.
(Refer to page 174)

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

(Refer to page 3)



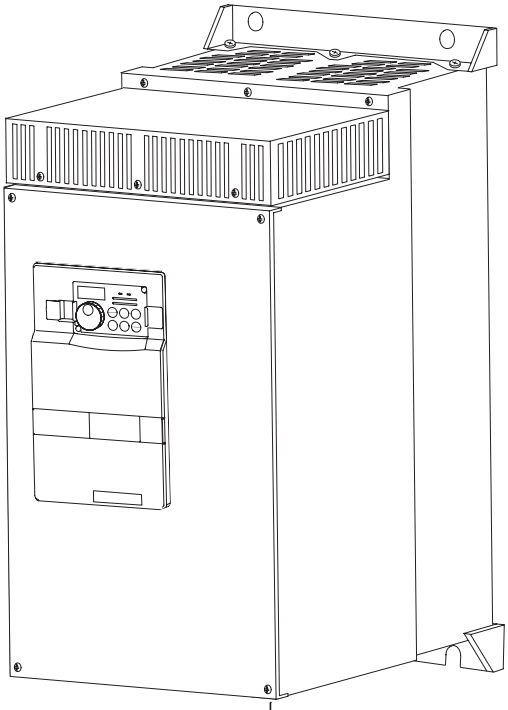
Magnetic contactor (MC)
Install the magnetic contactor to ensure safety. Do not use this magnetic contactor to start and stop the inverter. Doing so will cause the inverter life to be shorten.
(Refer to page 3)



Noise filter (FR-BLF)
Install a noise filter to reduce the electromagnetic noise generated from the inverter.
Effective in the range from about 1MHz to 10MHz.
When more wires are passed through, a more effective result can be obtained. The total number of wires passed through should be 4T or more.

Capacitor type filter (FR-BIF)
Reduces the radio noise.

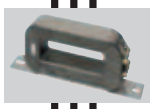
Inverter (FR-A701)
The life of the inverter is influenced by surrounding air temperature. The surrounding air temperature should be as low as possible within the permissible range. This must be noted especially when the inverter is installed in an enclosure. *(Refer to page 6)*
Wrong wiring might lead to damage of the inverter. The control signal lines must be kept fully away from the main circuit to protect them from noise.*(Refer to page 12)*



R/L1 S/L2 T/L3

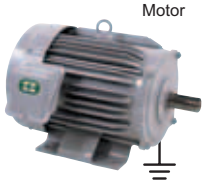
U V W

Earth (Ground)



Noise filter (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)

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.

CAUTION

- Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the inverter output side. This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices are connected, immediately remove them.
- This inverter has a built-in AC reactor (FR-HAL) and a circuit type specified in Harmonic suppression guideline in Japan is three-phase bridge (capacitor smoothed) and with reactor (AC side). *(Refer to page 39)* Do not use an AC reactor (FR-HAL) of a stand-alone option except following purpose. (Note that overload protection of the converter may operate when a thyristor load is connected in the power supply system. To prevent this, always install an optional stand-alone AC reactor (FR-HAL).) A DC reactor (FR-HEL) can not be connected to the inverter.
- Electromagnetic wave interference
  The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, connecting a capacitor type filter will reduce electromagnetic wave interference.
- Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.

1.2.1 Peripheral devices

Check the inverter type of the inverter you purchased. Appropriate peripheral devices must be selected according to the capacity. Refer to the following list and prepare appropriate peripheral devices:

200V class

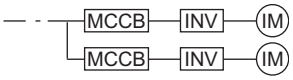
Motor Output (kW)*1	Applicable Inverter Type	Breaker Selection*2	Input Side Magnetic Contactor*3
5.5	FR-A721-5.5K	50AF 40A	S-N20, N21
7.5	FR-A721-7.5K	50AF 50A	S-N25
11	FR-A721-11K	100AF 75A	S-N35
15	FR-A721-15K	100AF 100A	S-N50
18.5	FR-A721-18.5K	225AF 125A	S-N50
22	FR-A721-22K	225AF 150A	S-N65
30	FR-A721-30K	225AF 175A	S-N80
37	FR-A721-37K	225AF 225A	S-N125
45	FR-A721-45K	400AF 300A	S-N150
55	FR-A721-55K	400AF 350A	S-N180

400V class

Motor Output (kW)*1	Applicable Inverter Type	Breaker Selection*2	Input Side Magnetic Contactor*3
5.5	FR-A741-5.5K	30AF 20A	S-N11, N12
7.5	FR-A741-7.5K	30AF 30A	S-N20
11	FR-A741-11K	50AF 40A	S-N20
15	FR-A741-15K	50AF 50A	S-N20
18.5	FR-A741-18.5K	100AF 60A	S-N25
22	FR-A741-22K	100AF 75A	S-N25
30	FR-A741-30K	100AF 100A	S-N50
37	FR-A741-37K	225AF 125A	S-N50
45	FR-A741-45K	225AF 150A	S-N65
55	FR-A741-55K	225AF 175A	S-N80

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

*2 Select the MCCB according to the inverter power supply capacity.
Install one MCCB per inverter.
For installations in the United States or Canada, use the appropriate UL and cUL listed class RK5, class T type fuse or UL489 molded case circuit breaker (MCCB).
(Refer to page 190.)



*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 MC with class AC-3 rated current for the motor rated current.

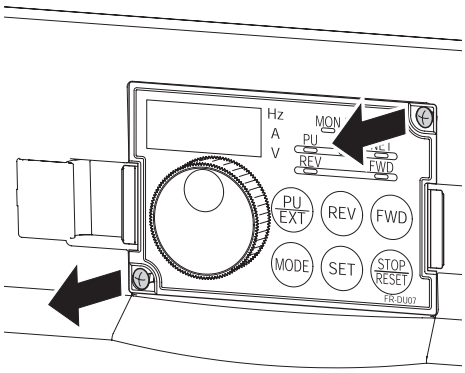
REMARKS

When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.

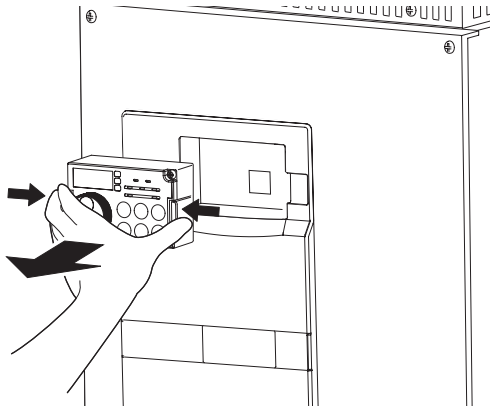
1.3 Method of removal and reinstallation of the front cover

•Removal of the operation panel

1) Loosen the two screws on the operation panel. (These screws cannot be removed.)



2) Push the left and right hooks of the operation panel and pull the operation panel toward you to remove.

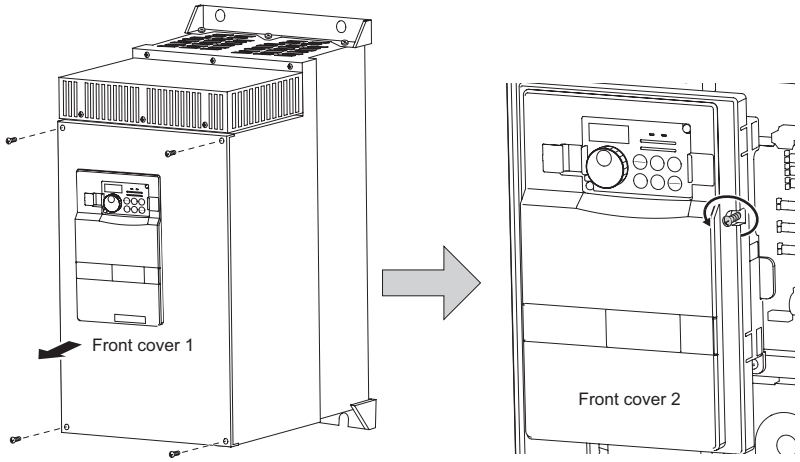


When reinstalling the operation panel, insert it straight to reinstall securely and tighten the fixed screws of the operation panel.

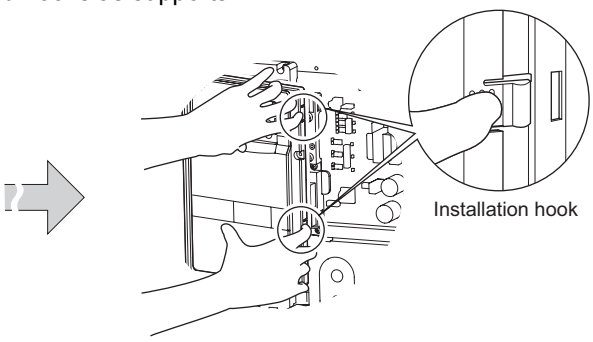
•Removal of the front cover

1) Remove installation screws on the front cover 1 to remove the front cover 1.

2) Loosen the installation screws of the front cover 2.



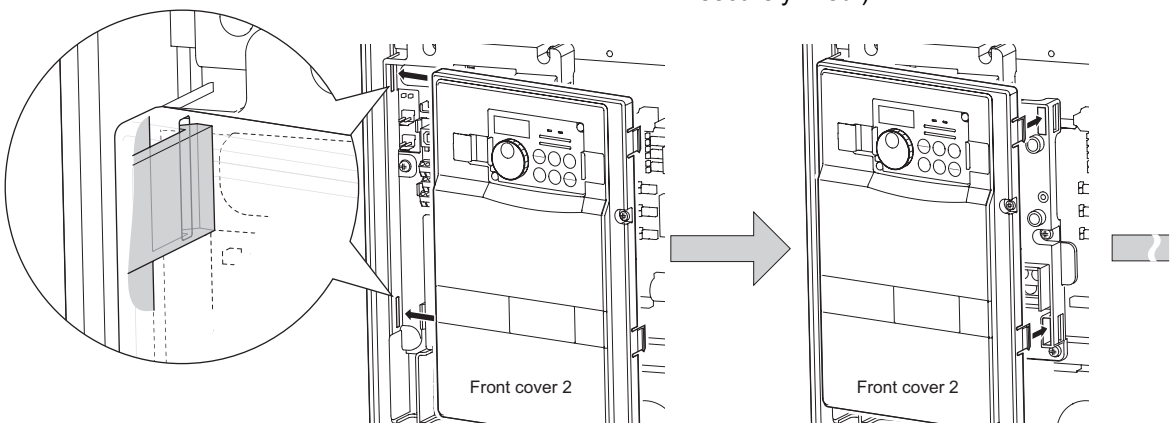
3) Pull the front cover 2 toward you to remove by pushing an installation hook on the right side using left fixed hooks as supports.



●**Reinstallation of the front cover**

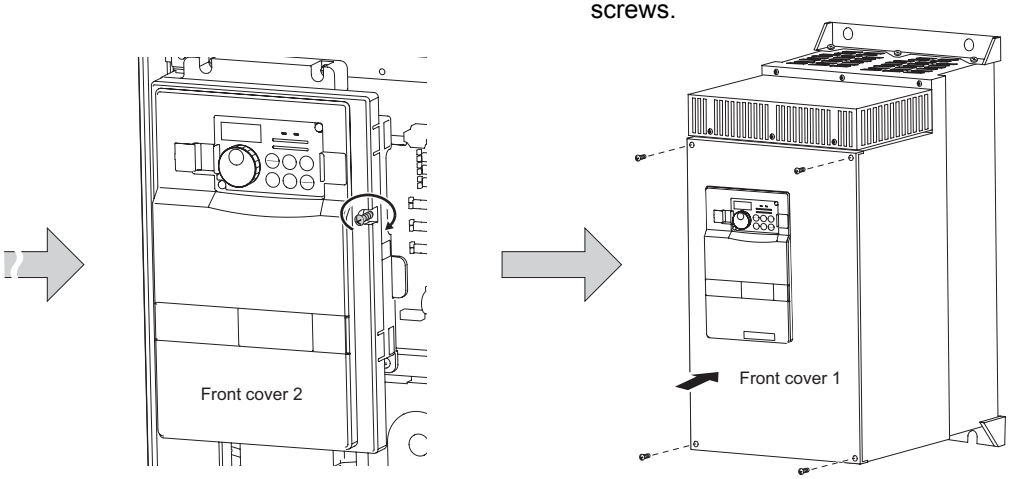
1) Insert the two fixed hooks on the left side of the front cover 2 into the sockets of the inverter.

2) Using the fixed hooks as supports, securely press the front cover 2 against the inverter.
(Although installation can be done with the operation panel mounted, make sure that a connector is securely fixed.)



3) Fix the front cover 2 with the installation screws.

4) Fix the front cover 1 with the installation screws.



REMARKS

· For the 55K, the front cover 1 is separated into two parts.

CAUTION

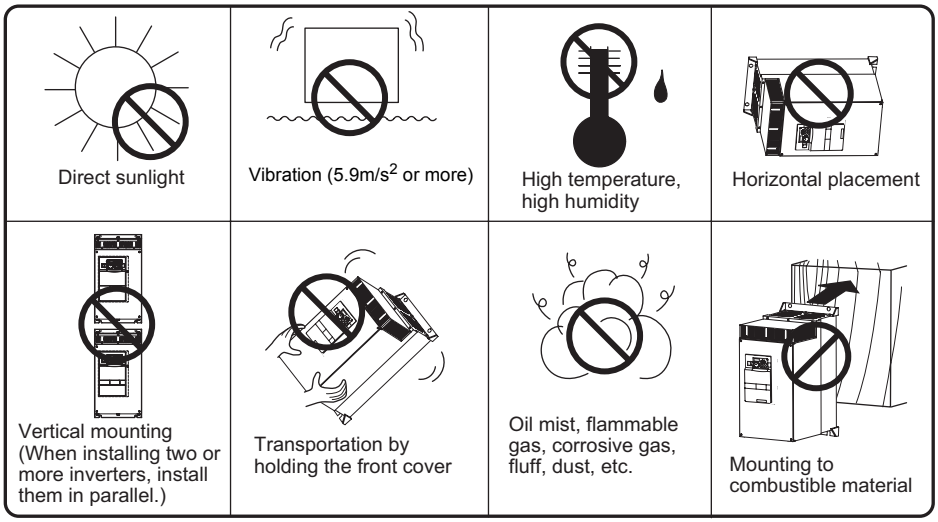
1. Fully make sure that the front cover has been reinstalled securely. Always tighten the installation screws of the front cover.
2. The same serial number is printed on the capacity plate of the front cover and the rating plate of the inverter. Before reinstalling the front cover, check the serial numbers to ensure that the cover removed is reinstalled to the inverter from where it was removed.

1.4 Installation of the inverter and enclosure design

When an inverter enclosure is to be designed and manufactured, heat generated by contained equipment, etc., the environment of an operating place, and others must be fully considered to determine the enclosure structure, size and equipment layout. The inverter unit uses many semiconductor devices. To ensure higher reliability and long period of operation, operate the inverter in the ambient environment that completely satisfies the equipment specifications.

1.4.1 Inverter installation environment

The inverter consists of precision mechanical and electronic parts. Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.



As the inverter installation environment should satisfiy the standard specifications indicated in the following table, operation in any place that does not meet these conditions not only deteriorates the performance and life of the inverter, but also causes a failure. Refer to the following points and take adequate measures.

Environmental standard specifications of inverter

Item	Description
Surrounding air temperature	-10°C to +50°C (non-freezing)
Ambient humidity	90% RH maximum (non-condensing)
Atmosphere	Free from corrosive and explosive gases, dust and dirt
Maximum Altitude	1,000m or less
Vibration	5.9m/s^2 or less

(1) Temperature

The permissible surrounding air temperature of the inverter is between -10°C and +50°C. Always operate the inverter within this temperature range. Operation outside this range will considerably shorten the service lives of the semiconductors, parts, capacitors and others. Take the following measures so that the surrounding air temperature of the inverter falls within the specified range.

1) Measures against high temperature
   - Use a forced ventilation system or similar cooling system. *(Refer to page 9.)*
   - Install the enclosure in an air-conditioned electrical chamber.
   - Block direct sunlight.
   - Provide a shield or similar plate to avoid direct exposure to the radiated heat and wind of a heat source.
   - Ventilate the area around the enclosure well.

2) Measures against low temperature
   - Provide a space heater in the enclosure.
   - Do not power off the inverter. (Keep the start signal of the inverter off.)

3) Sudden temperature changes
   - Select an installation place where temperature does not change suddenly.
   - Avoid installing the inverter near the air outlet of an air conditioner.
   - If temperature changes are caused by opening/closing of a door, install the inverter away from the door.

(2) Humidity

Normally operate the inverter within the 45 to 90% range of the ambient humidity. Too high humidity will pose problems of reduced insulation and metal corrosion. On the other hand, too low humidity may produce a spatial electrical breakdown. The insulation distance specified in JEM1103 "Control Equipment Insulator" is defined as humidity 45 to 85%.

1) Measures against high humidity
   - Make the enclosure enclosed, and provide it with a hygroscopic agent.
   - Take dry air into the enclosure from outside.
   - Provide a space heater in the enclosure.

2) Measures against low humidity
   What is important in fitting or inspection of the unit in this status is to discharge your body (static electricity) beforehand and keep your body from contact with the parts and patterns, besides blowing air of proper humidity into the enclosure from outside.

3) Measures against condensation
   Condensation may occur if frequent operation stops change the in-enclosure temperature suddenly or if the outside-air temperature changes suddenly.
   Condensation causes such faults as reduced insulation and corrosion.
   - Take the measures against high humidity in 1).
   - Do not power off the inverter. (Keep the start signal of the inverter off.)

(3) Dust, dirt, oil mist

Dust and dirt will cause such faults as poor contact of contact points, reduced insulation or reduced cooling effect due to moisture absorption of accumulated dust and dirt, and in-enclosure temperature rise due to clogged filter.
In the atmosphere where conductive powder floats, dust and dirt will cause such faults as malfunction, deteriorated insulation and short circuit in a short time.
Since oil mist will cause similar conditions, it is necessary to take adequate measures.

Countermeasures
- Place in a totally enclosed enclosure.
  Take measures if the in-enclosure temperature rises. *(Refer to page 9.)*
- Purge air.
  Pump clean air from outside to make the in-enclosure pressure higher than the outside-air pressure.

(4) Corrosive gas, salt damage

If the inverter is exposed to corrosive gas or to salt near a beach, the printed board patterns and parts will corrode or the relays and switches will result in poor contact.
In such places, take the measures given in Section (3).

(5) Explosive, flammable gases

As the inverter is non-explosion proof, it must be contained in an explosion proof enclosure.
In places where explosion may be caused by explosive gas, dust or dirt, an enclosure cannot be used unless it structurally complies with the guidelines and has passed the specified tests. This makes the enclosure itself expensive (including the test charges).
The best way is to avoid installation in such places and install the inverter in a non-hazardous place.

(6) Highland

Use the inverter at the altitude of within 1000m.
If it is used at a higher place, it is likely that thin air will reduce the cooling effect and low air pressure will deteriorate dielectric strength.

(7) Vibration, impact

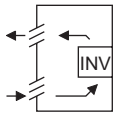
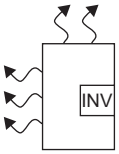
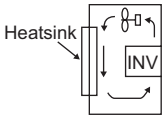
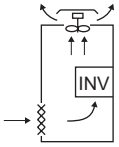
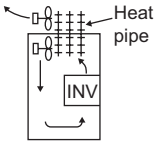
The vibration resistance of the inverter is up to 5.9m/s^2 at 10 to 55Hz frequency and 1mm amplitude.
Vibration or impact, if less than the specified value, applied for a long time may make the mechanism loose or cause poor contact to the connectors.
Especially when impact is imposed repeatedly, caution must be taken as the part pins are likely to break.

Countermeasures
- Provide the enclosure with rubber vibration isolators.
- Strengthen the structure to prevent the enclosure from resonance.
- Install the enclosure away from sources of vibration.

1.4.2 Cooling system types for inverter enclosure

From the enclosure that contains the inverter, the heat of the inverter and other equipment (transformers, lamps, resistors, etc.) and the incoming heat such as direct sunlight must be dissipated to keep the in-enclosure temperature lower than the permissible temperatures of the in-enclosure equipment including the inverter.
The cooling systems are classified as follows in terms of the cooling calculation method.

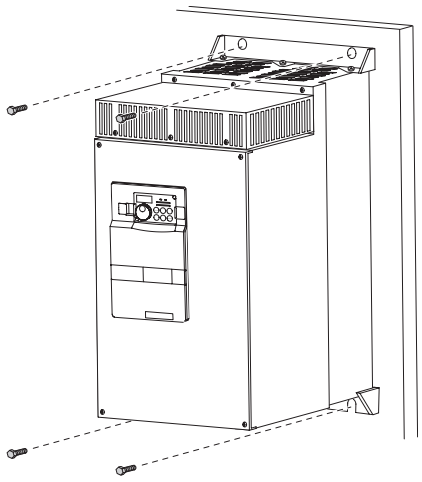
1) Cooling by natural heat dissipation from the enclosure surface (Totally enclosed type)
2) Cooling by heat sink (Aluminum heatsink, etc.)
3) Cooling by ventilation (Forced ventilation type, pipe ventilation type)
4) Cooling by heat exchanger or cooler (Heat pipe, cooler, etc.)

Cooling System		Enclosure Structure	Comment
Natural cooling	Natural ventilation (Enclosed, open type)		Low in cost and generally used, but the enclosure size increases as the inverter capacity increases. For relatively small capacities.
	Natural ventilation (Totally enclosed type)		Being a totally enclosed type, the most appropriate for hostile environment having dust, dirt, oil mist, etc. The enclosure size increases depending on the inverter capacity.
Forced cooling	Heatsink cooling		Having restrictions on the heatsink mounting position and area, and designed for relative small capacities.
	Forced ventilation		For general indoor installation. Appropriate for enclosure downsizing and cost reduction, and often used.
	Heat pipe		Totally enclosed type for enclosure downsizing.

1.4.3 Inverter placement

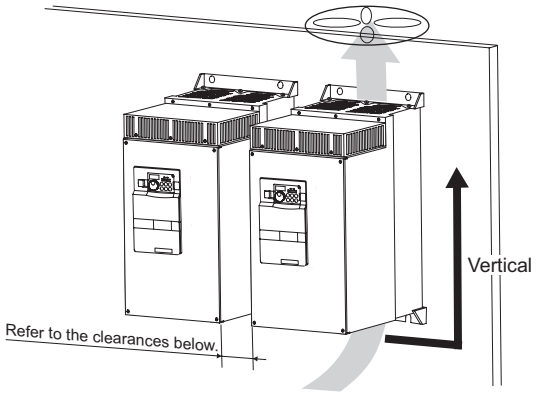
(1) Installation of the Inverter

Installation on the enclosure



CAUTION

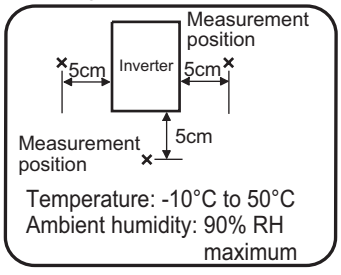
- When encasing multiple inverters, install them in parallel as a cooling measure.
- Install the inverter vertically.



(2) Clearances around the inverter

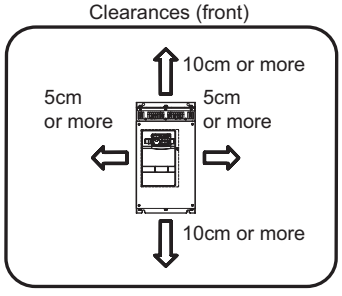
To ensure ease of heat dissipation and maintenance, leave at least the shown clearances around the inverter. At least the following clearances are required under the inverter as a wiring space, and above the inverter as a heat dissipation space.

Surrounding air temperature and humidity

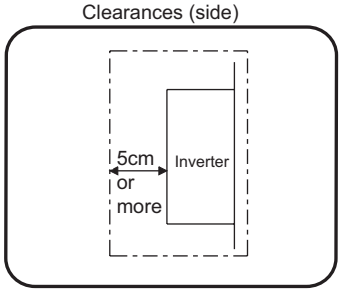


Leave enough clearances and take cooling measures.

Clearances (front)



Clearances (side)



REMARKS

For replacing the cooling fan, 30cm of space is necessary in front of the inverter. Refer to *page 167* for fan replacement.

(3) Inverter mounting orientation

Mount the inverter on a wall as specified. Do not mount it horizontally or any other way.

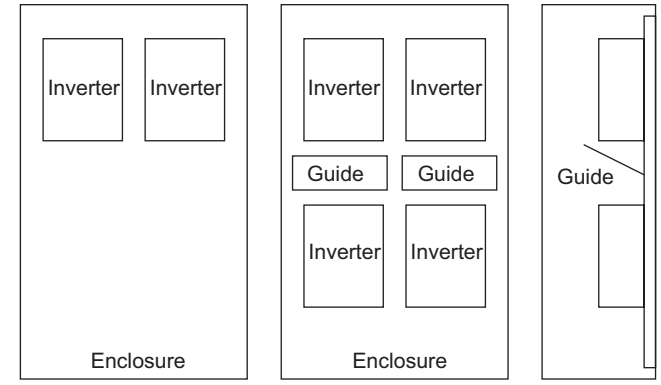
(4) Above the inverter

Heat is blown up from inside the inverter by the small fan built in the unit. Any equipment placed above the inverter should be heat resistant.

(5) Arrangement of multiple inverters

When multiple inverters are placed in the same enclosure, generally arrange them horizontally as shown in the figure below (a). When it is inevitable to arrange them vertically to minimize space, take such measures as to provide guides since heat from the bottom inverters can increase the temperatures in the top inverters, causing inverter failures.

When mounting multiple inverters, fully take caution not to make the surrounding air temperature of the inverter higher than the permissible value by providing ventilation and increasing the enclosure size.

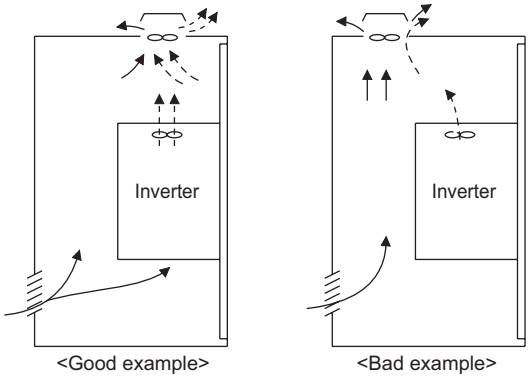


(a) Horizontal arrangement (b) Vertical arrangement

Arrangement of multiple inverters

(6) Placement of ventilation fan and inverter

Heat generated in the inverter is blown up from the bottom of the unit as warm air by the cooling fan. When intalling a ventilation fan for that heat, determine the place of ventilation fan installation after fully considering an air flow. (Air passes through areas of low resistance. Make an airway and airflow plates to expose the inverter to cool air.)

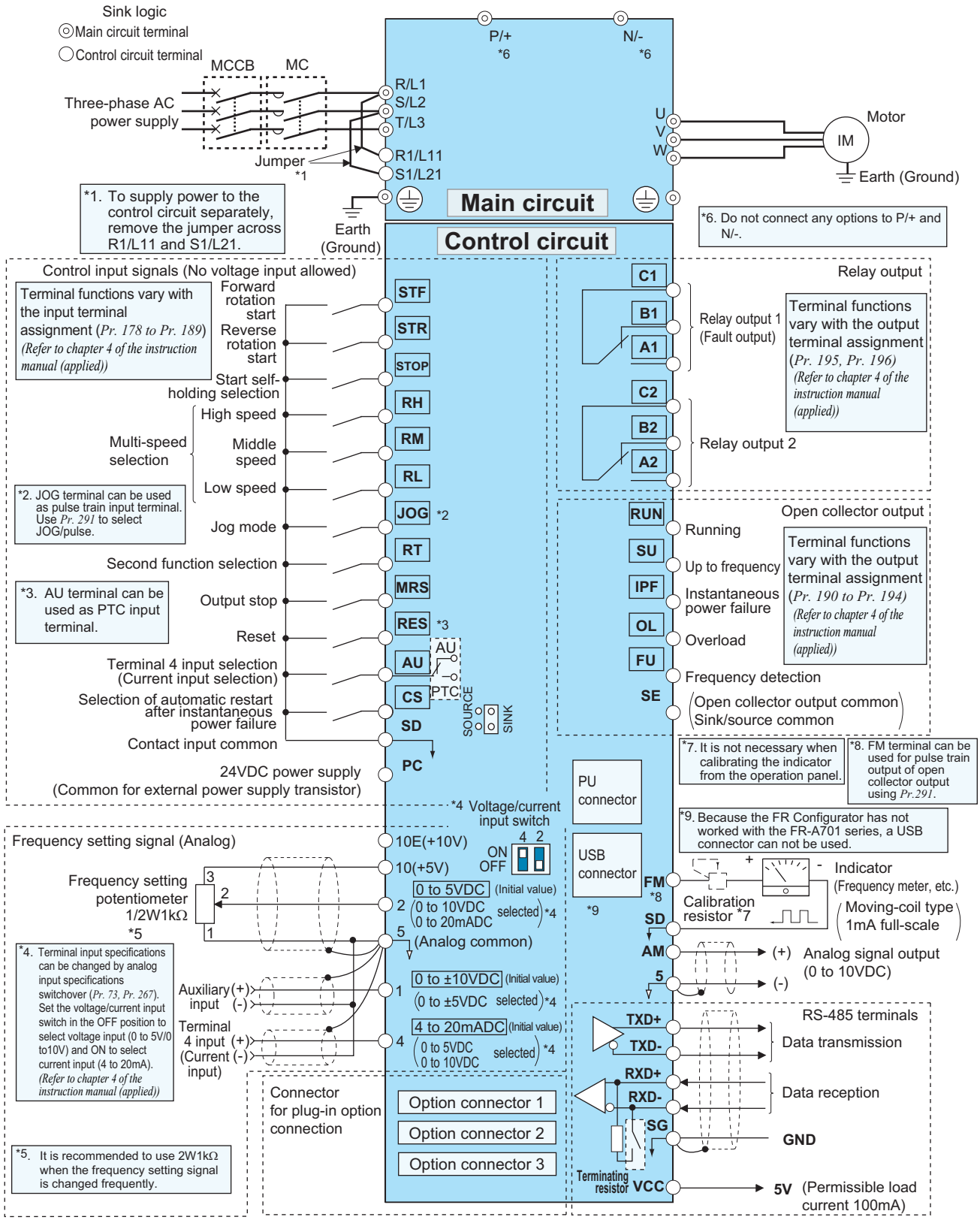


<Good example> <Bad example>

Placement of ventilation fan and inverter

2 WIRING

2.1 Terminal connection diagram



CAUTION

- To prevent a malfunction due to noise, keep the signal cables more than 10cm away from the power cables. Also separate the main circuit wire of the input side and the output side.
- After wiring, wire offcuts must not be left in the inverter.
  Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean.
  When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch correctly. Different setting may cause a fault, failure or malfunction.

2.2 Main circuit terminal specifications

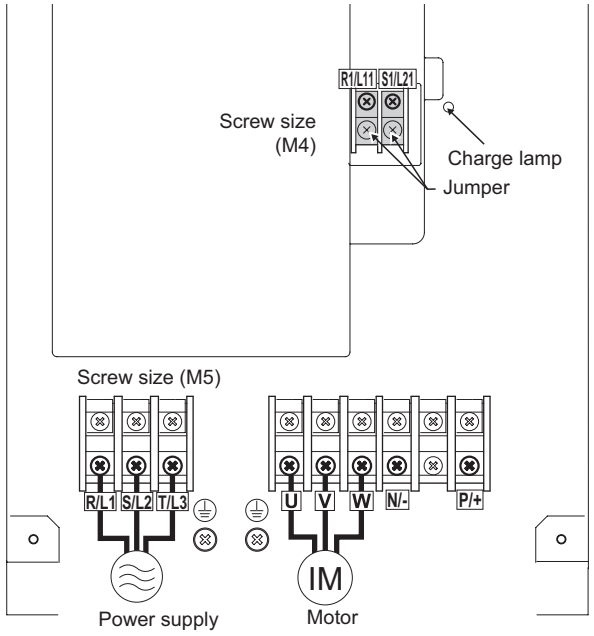
2.2.1 Specification of main circuit terminal

Terminal Symbol	Terminal Name	Description
R/L1, S/L2, T/L3	**AC power input**	Connect to the commercial power supply.
U, V, W	**Inverter output**	Connect a three-phase squirrel-cage motor.
R1/L11, S1/L21	**Power supply for control circuit**	Connected to the AC power supply terminals R/L1 and S/L2. To retain the fault display and fault output, remove the jumpers from terminals R/L1-R1/L11 and S/L2-S1/L21 and apply external power to these terminals. Do not turn off the power supply for control circuit (R1/L11, S1/L21) with the main circuit power (R/L1, S/L2, T/L3) on. Doing so may damage the inverter. The circuit should be configured so that the main circuit power (R/L1, S/L2, T/L3) is also turned off when the power supply for control circuit (R1/L11, S1/L21) is off. Power supply capacity for the 15K or less is 90VA and for the 18.5K or more is 100VA.
P/+, N/-	**DC terminal**	Do not connect any options.
⏚	**Earth (Ground)**	For earthing (grounding) the inverter chassis. Must be earthed (grounded).

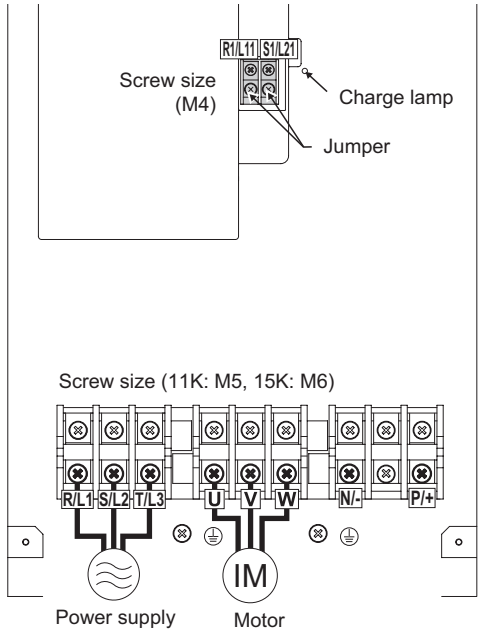
2.2.2 Terminal arrangement of the main circuit terminal, power supply and the motor wiring.

200V class

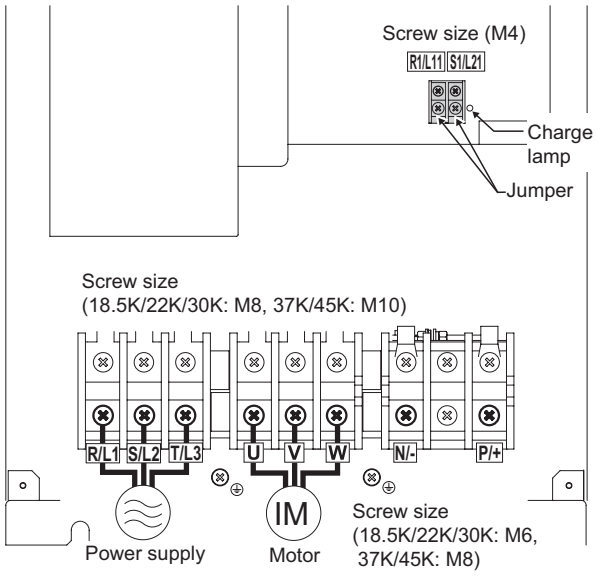
FR-A721-5.5K, 7.5K



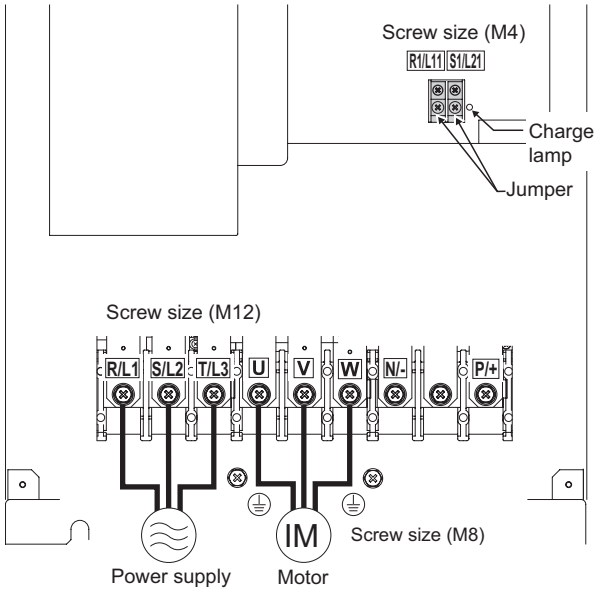
FR-A721-11K, 15K



FR-A721-18.5K to 45K

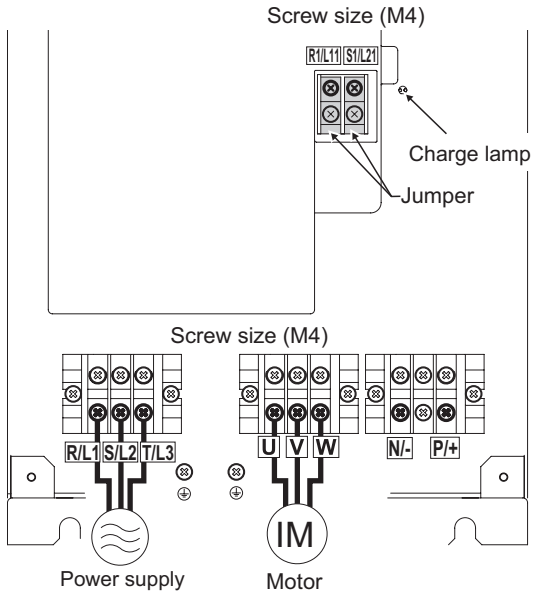


FR-A721-55K

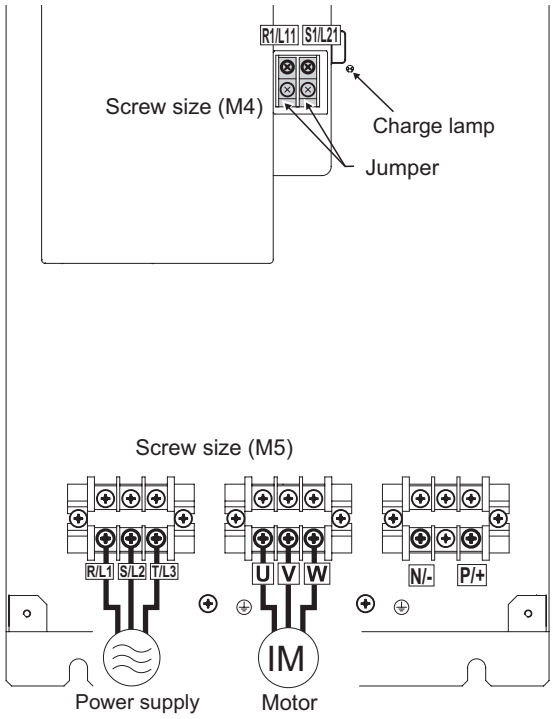


400V class

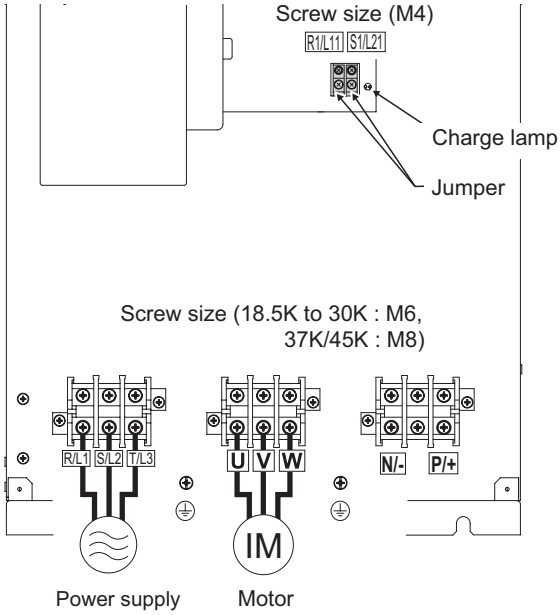
FR-A741-5.5K, 7.5K



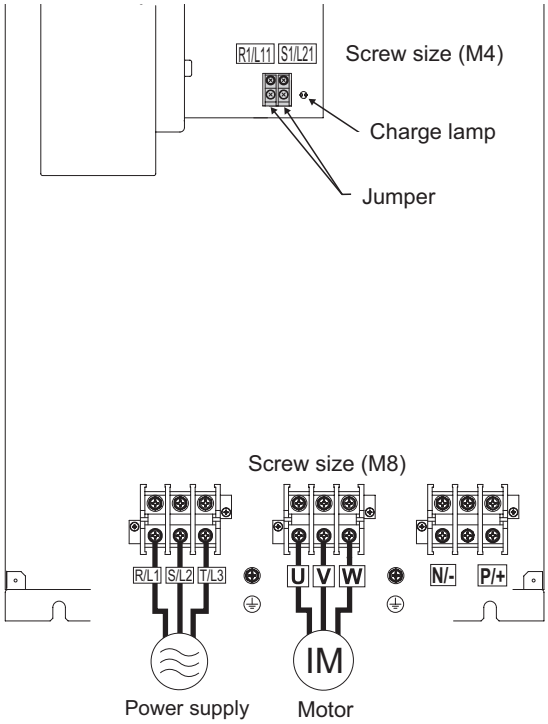
FR-A741-11K, 15K



FR-A741-18.5K to 45K



FR-A741-55K



CAUTION

- The power supply cables must be connected to R/L1, S/L2, T/L3. (Phase sequence needs not to be matched.) Never connect the power cable to the U, V, W of the inverter. Doing so will damage the inverter.
- Connect the motor to U, V, W. At this time, turning on the forward rotation switch (signal) rotates the motor in the counterclockwise direction when viewed from the motor shaft.

2.2.3 Cables and wiring length

(1) Applied cable size

Select the recommended cable size to ensure that a voltage drop will be 2% max.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
The following table indicates a selection example for the wiring length of 20m.

200V class (when input power supply is 220V)

Applicable Inverter Type	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes							
					HIV, etc. (mm^2) *1			AWG/MCM *2		PVC, etc. (mm^2) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) cable
FR-A721-5.5K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	10	10	6	6	6
FR-A721-7.5K	M5	2.5	14-5	8-5	14	8	14	6	8	16	10	16
FR-A721-11K	M5	2.5	14-5	14-5	14	14	14	6	6	16	16	16
FR-A721-15K	M6	4.4	22-6	22-6	22	22	14	4	4	25	25	16
FR-A721-18.5K	M8(M6)	7.8	38-8	38-8	38	38	22	2	2	35	35	25
FR-A721-22K	M8(M6)	7.8	38-8	38-8	38	38	22	2	2	35	35	25
FR-A721-30K	M8(M6)	7.8	60-8	60-8	60	60	38	1/0	1/0	50	50	25
FR-A721-37K	M10(M8)	14.7	80-10	80-10	80	80	38	3/0	3/0	70	70	35
FR-A721-45K	M10(M8)	14.7	100-10	100-10	100	100	60	4/0	4/0	95	95	50
FR-A721-55K	M12(M8)	24.5	100-12	100-12	100	100	60	4/0	4/0	95	95	50

*1 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 surrounding air temperature is 50°C or less and the wiring distance is 20m or less.

*2 The recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.
(Selection example for use mainly in the United States.)

*3 For the 15K or less, the recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.
For the 18.5K or more, the recommended cable size is that of the cable (XLPE cable) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, and a screw for earthing (grounding).
A screw for earthing (grounding) of the 18.5K or more is indicated in ( ).

400V class (when input power supply is 440V)

Applicable Inverter Type	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes							
					HIV, etc. (mm^2) *1			AWG/MCM *2		PVC, etc. (mm^2) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) Cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) Cable
FR-A741-5.5K	M4	1.5	2-4	2-4	2	2	3.5	12	14	2.5	2.5	4
FR-A741-7.5K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-A741-11K	M5	2.5	5.5-5	5.5-5	5.5	5.5	8	10	10	6	6	10
FR-A741-15K	M5	2.5	8-5	8-5	8	8	8	8	8	10	10	10
FR-A741-18.5K	M6	4.4	14-6	8-6	14	8	14	6	8	16	10	16
FR-A741-22K	M6	4.4	14-6	14-6	14	14	14	6	6	16	16	16
FR-A741-30K	M6	4.4	22-6	22-6	22	22	14	4	4	25	25	16
FR-A741-37K	M8	7.8	22-8	22-8	22	22	14	4	4	25	25	16
FR-A741-45K	M8	7.8	38-8	38-8	38	38	22	1	2	50	50	25
FR-A741-55K	M8	7.8	60-8	60-8	60	60	22	1/0	1/0	50	50	25

*1 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 surrounding air temperature is 50°C or less and the wiring distance is 20m or less.

*2 For the 45K or less, the recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.
For the 55K, the recommended cable size is that of the cable (THHN cable) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in the United States.)

*3 For the 45K or less, the recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C. Assumes that the ambient temperature is 40°C or less and the wiring distance is 20m or less.
For the 55K, the recommended cable size is that of the cable (XLPE cable) with continuous maximum permissible temperature of 90°C. Assumes that the ambient temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

The line voltage drop can be calculated by the following formula:

$$\text{line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance[m}\Omega\text{/m]} \times \text{wiring distance[m]} \times \text{current[A]}}{1000}$$

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

CAUTION

- Tighten the terminal screw to the specified torque.
  A screw that has been tighten too loosely can cause a short circuit or malfunction.
  A screw that has been tighten too tightly can cause a short circuit or malfunction due to the unit breakage.
- Use crimping terminals with insulation sleeve to wire the power supply and motor.

(2) Notes on earthing (grounding)

● Always earth (ground) the motor and inverter.

1)Purpose of earthing (grounding)

Generally, an electrical apparatus has an earth (ground) terminal, which must be connected to the ground before use.

An electrical circuit is usually insulated by an insulating material and encased. However, it is impossible to manufacture an insulating material that can shut off a leakage current completely, and actually, a slight current flow into the case. The purpose of earthing (grounding) the case of an electrical apparatus is to prevent operator from getting an electric shock from this leakage current when touching it.

To avoid the influence of external noises, this earthing (grounding) is important to audio equipment, sensors, computers and other apparatuses that handle low-level signals or operate very fast.

2)Earthing (grounding) methods and earthing (grounding) work

As described previously, earthing (grounding) is roughly classified into an electrical shock prevention type and a noise-affected malfunction prevention type. Therefore, these two types should be discriminated clearly, and the following work must be done to prevent the leakage current having the inverter's high frequency components from entering the malfunction prevention type earthing (grounding):

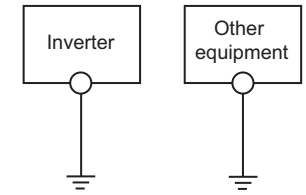
(a) Where possible, use independent earthing (grounding) for the inverter. If independent earthing (grounding) (I) is impossible, use joint earthing (grounding) (II) where the inverter is connected with the other equipment at an earthing (grounding) point. Joint earthing (grounding) as in (III) must be avoided as the inverter is connected with the other equipment by a common earth (ground) cable.
Also a leakage current including many high frequency components flows in the earth (ground) cables of the inverter and inverter-driven motor. Therefore, they must use the independent earthing (grounding) method and be separated from the earthing (grounding) of equipment sensitive to the aforementioned noises.
In a tall building, it will be a good policy to use the noise malfunction prevention type earthing (grounding) with steel frames and carry out electric shock prevention type earthing (grounding) in the independent earthing (grounding) method.

(b) This inverter must be earthed (grounded). Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards).
Use a neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard.

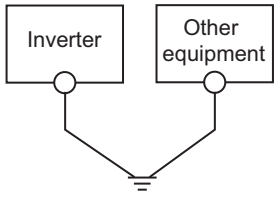
(c) Use the thickest possible earth (ground) cable. The earth (ground) cable should be of not less than the size indicated in the table on the previous page.

(d) The grounding point should be as near as possible to the inverter, and the ground wire length should be as short as possible.

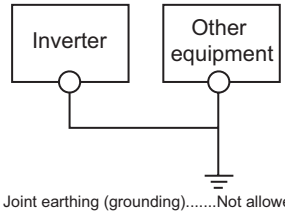
(e) Run the earth (ground) cable as far away as possible from the I/O wiring of equipment sensitive to noises and run them in parallel in the minimum distance.



(I) Independent earthing (grounding).....Good



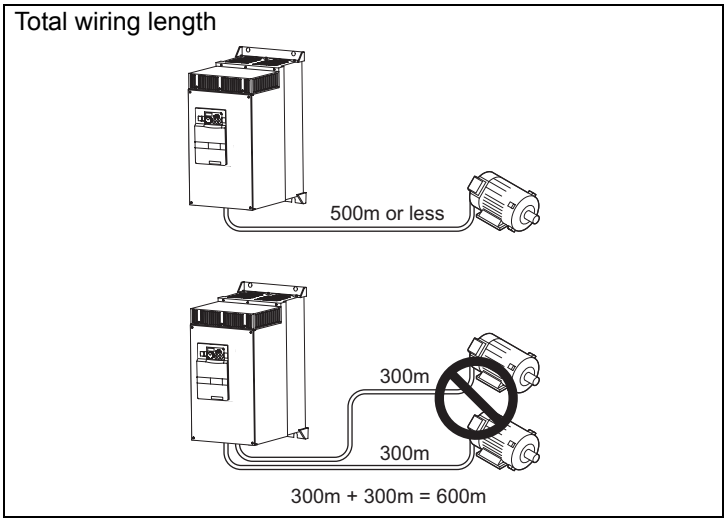
(II) Joint earthing (grounding).....Good



(III) Joint earthing (grounding).....Not allowed

(3) Total wiring length

The overall wiring length for connection of a single motor or multiple motors should be within 500m.
(The wiring length should be 100m maximum for vector control.)



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.
Refer to *page 42* for measures against deteriorated insulation.

CAUTION

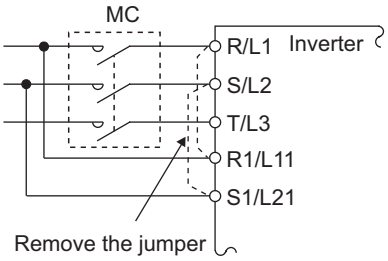
- Especially for long-distance wiring, the inverter may be affected by a charging current caused by the stray capacitances of the wiring, leading to a malfunction of the overcurrent protective function or fast response current limit function or a malfunction or fault of the equipment connected on the inverter output side. If fast response current limit function malfunctions, disable this function.
  (For *Pr. 156 Stall prevention operation selection, refer to chapter 4 of the instruction manual (applied).*)
  For explanation of surge voltage suppression filter (FR-ASF-H), refer to the manual of each option.
- Do not perform vector control with a surge voltage suppression filter (FR-ASF-H) connected.

(4) Cable size of the control circuit power supply (terminal R1/L11, S1/L21)

- Terminal screw size: M4
- Cable size: 0.75mm^2 to 2mm^2
- Tightening torque: 1.5N·m

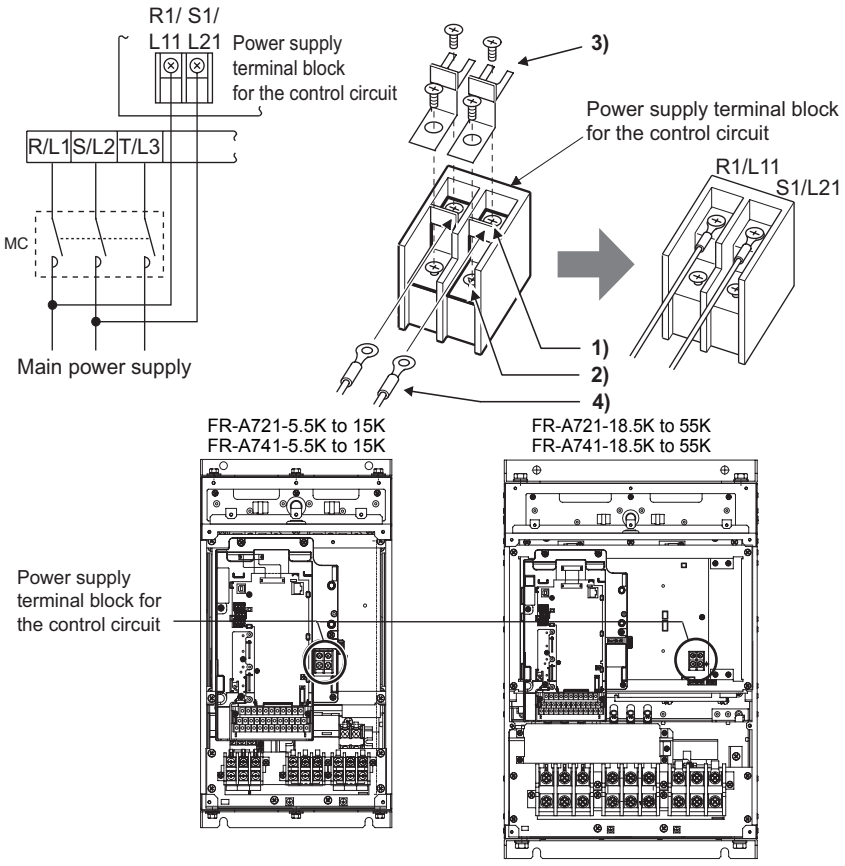
2.2.4 When connecting the control circuit and the main circuit separately to the power supply (separate power)

<Connection diagram>



1) Remove the upper screws.
2) Remove the lower screws.
3) Pull the jumper toward you to remove.
4) Connect the separate power supply cable for the control circuit to the **upper terminals (R1/L11, S1/L21). Never connect** the power cable to the terminals in the lower stand. Doing so will damage the inverter.

When fault occurs, opening of the electromagnetic contactor (MC) on the inverter power supply side results in power loss in the control circuit, disabling the fault output signal retention. Terminals R1/L11 and S1/L21 are provided to hold a fault signal. In this case, connect the power supply terminals R1/L11 and S1/L21 of the control circuit to the primary side of the MC.



CAUTION

- Do not turn off the control power (terminals R1/L11 and S1/L21) with the main circuit power (R/L1, S/L2, T/L3) on. Doing so may damage the inverter. Make up a circuit which will switch off the main circuit power supply terminals R/L1, S/L2, T/L3 when the control circuit power supply terminals R1/L11, S1/L21 are switched off.
- Be sure to use the inverter with the jumpers across terminals R/L1-R1/L11 and S/L2-S1/L21 removed when supplying power from other sources. The inverter may be damaged if you do not remove the jumper.
- The voltage should be the same as that of the main control circuit when the control circuit power is supplied from other than the primary side of the MC.
- When separate power is supplied from R1/L11 and S1/L21, the power capacity necessary for the 15K or less is 90VA, for the 18.5K or more is 100VA.
- If the main circuit power is switched off (for 0.1s or more) then on again, the inverter resets and a fault output will not be held.

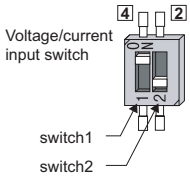
2.3 Control circuit specifications

2.3.1 Control circuit terminals

indicates that terminal functions can be selected using *Pr. 178 to Pr. 196 (I/O terminal function selection) (Refer to chapter 4 of the instruction manual (applied)*.)

(1) Input signals

Type	Terminal Symbol	Terminal Name	Description		Rated Specifications	Refer to page
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.	Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	88
	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.			*2
	RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.			89
	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.			*2
		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)		Input resistance 2kΩ Contacts at short-circuited: 8 to 13mADC	*2
	RT	Second function selection	Turn on the RT signal to select second function. 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.		Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	*2
	MRS	Output stop	Turn on the MRS signal (20ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.			*2
	RES	Reset	Used to reset fault output provided when fault occurs. Turn on the RES signal for more than 0.1s, then turn it off. Initial setting is for reset always. By setting *Pr. 75*, reset can be set to enabled only at fault occurrence. Recover about 1s after reset is cancelled.			139
	AU	Terminal 4 input selection	Terminal 4 is made valid only when the AU signal is turned on. (The frequency setting signal can be set between 4 and 20mADC.) Turning the AU signal on makes terminal 2 (voltage input) invalid.			93
		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.			*2
	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. *(Refer to Pr. 57 Restart coasting time in chapter 4 of the instruction manual (applied).)*			*2
	SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.		———	—
		External transistor common (source)	When connecting the transistor output (open collector output), such as a programmable controller, when source logic is selected, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.			
		24VDC power supply common	Common output terminal for 24VDC 0.1A power supply (PC terminal). Isolated from terminals 5 and SE.			
	PC	External transistor common (sink) (initial setting)	When connecting the transistor output (open collector output), such as a programmable controller, 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.		Power supply voltage range 19.2 to 28.8VDC Permissible load current 100mA	24
		Contact input common (source)	Common terminal for contact input terminal (source logic).			
		24VDC power supply	Can be used as 24VDC 0.1A power supply.			

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page
Frequency setting	10E	Frequency setting power supply	When connecting the frequency setting potentiometer at an initial status, connect it to terminal 10. Change the input specifications of terminal 2 when connecting it to terminal 10E. *(Refer to Pr. 73 Analog input selection in chapter 4 of the instruction manual (applied).)*	10VDC Permissible load current 10mA	*2
	10			5VDC Permissible load current 10mA	86, 91
	2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V, 0 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 0 to 20mA. Set the voltage/current input switch in the ON position to select current input (0 to 20mA). *1	Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC Current input: Input resistance 245Ω ± 5Ω Maximum permissible current 30mA  	86, 91
	4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA 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. Set the voltage/current input switch in the OFF position to select voltage input (0 to 5V/0 to 10V). *1 *(Refer to chapter 4 of the instruction manual (applied).)* Use *Pr. 858* to switch terminal functions.		87, 93
	1	Frequency setting auxiliary	Inputting 0 to ±5 VDC or 0 to ±10VDC adds this signal to terminal 2 or 4 frequency setting signal. Use *Pr. 73* to switch between the input 0 to ±5VDC and 0 to ±10VDC (initial setting). Use *Pr. 868* to switch terminal functions.	Input resistance 10kΩ ± 1kΩ Maximum permissible voltage ± 20VDC	*2
	5	Frequency setting common	Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground).	———	—

*1 Set *Pr. 73*, *Pr. 267*, and a voltage/current input switch correctly, then input an analog signal in accordance with the setting.
Applying a voltage signal with voltage/current input switch on (current input is selected) or a current signal with switch off (voltage input is selected) could cause component damage of the inverter or analog circuit of signal output devices.

*2 *Refer to chapter 4 of the instruction manual (applied).*

(2) Output signals

Type	Terminal Symbol	Terminal Name	Description		Rated Specifications	Refer to page
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. Abnormal: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C)		Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A	*2
	A2, B2, C2	Relay output 2	1 changeover contact output			*2
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 (27VDC maximum) 0.1A (A voltage drop is 2.8V maximum when the signal is on.) *1 Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).	*2
	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		*2
	OL	Overload warning	Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled. *1			*2
	IPF	Instantaneous power failure	Switched low when an instantaneous power failure and under voltage protections are activated. *1			*2
	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			*2
	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. Not output during inverter reset. The output signal is proportional to the magnitude of the corresponding monitoring item.	Output item: Output frequency (initial setting)	Permissible load current 2mA 1440pulses/s at 60Hz	*2
		NPN open collector output		Signals can be output from the open collector terminals by setting *Pr. 291*.	Maximum output pulse: 50kpulses/s Permissible load current : 80mA	*2
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	*2

*2 *Refer to chapter 4 of the instruction manual (applied).*

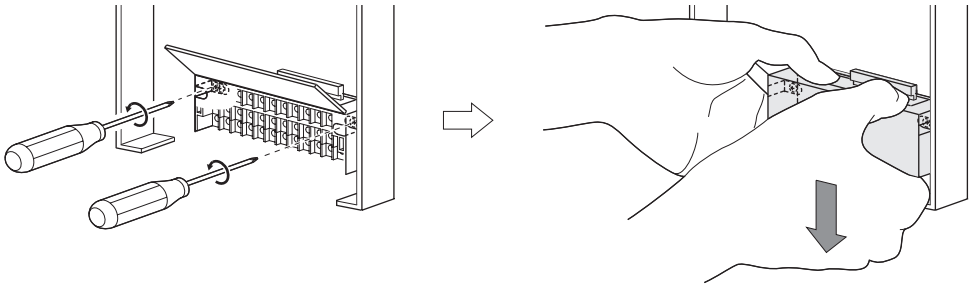
(3) Communication

Type	Terminal Symbol		Terminal Name	Description	Refer to page
RS-485	———		PU connector	With the PU connector, communication can be made through RS-485. (for connection on a 1:1 basis only) . Conforming standard : EIA-485 (RS-485) . Transmission format : Multidrop link . Communication speed : 4800 to 38400bps . Overall length : 500m	26
	RS-485 terminals	TXD+	Inverter transmission terminal	With the RS-485 terminals, communication can be made through RS-485. Conforming standard : EIA-485 (RS-485) Transmission format : Multidrop link Communication speed : 300 to 38400bps Overall length : 500m	27
		TXD-			
		RXD+	Inverter reception terminal		
		RXD-			
		SG	Earth (Ground)		

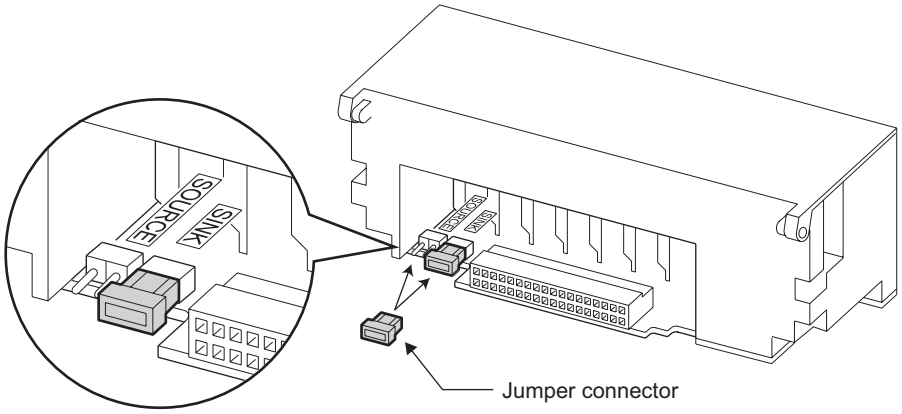
2.3.2 Changing the control logic

The input signals are set to sink logic (SINK) when shipped from the factory.
To change the control logic, the jumper connector on the back of the control circuit terminal block must be moved to the other position.
(The output signals may be used in either the sink or source logic independently of the jumper connector position.)

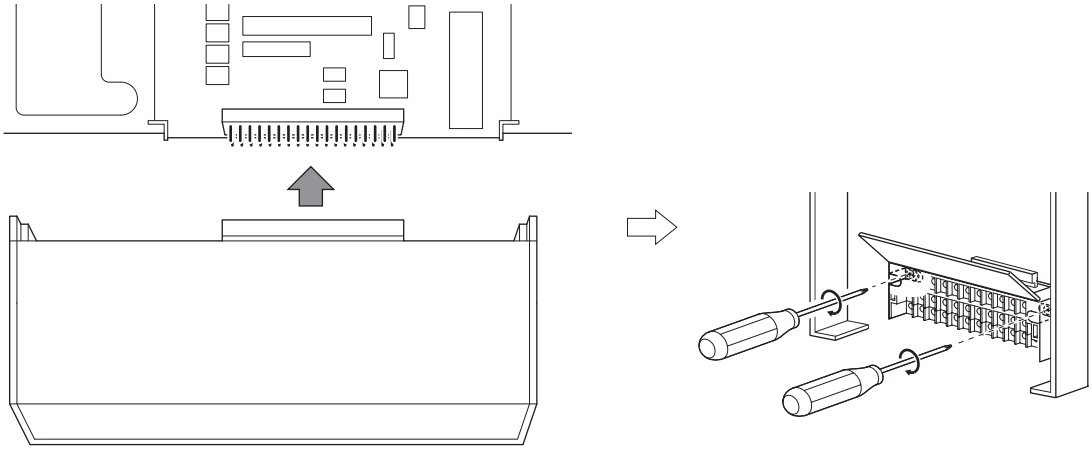
1) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.)
   Pull down the terminal block from behind the control circuit terminals.



2) Change the jumper connector set to the sink logic (SINK) on the rear panel of the control circuit terminal block to source logic (SOURCE).



3) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control circuit terminal block and fix it with the mounting screws.



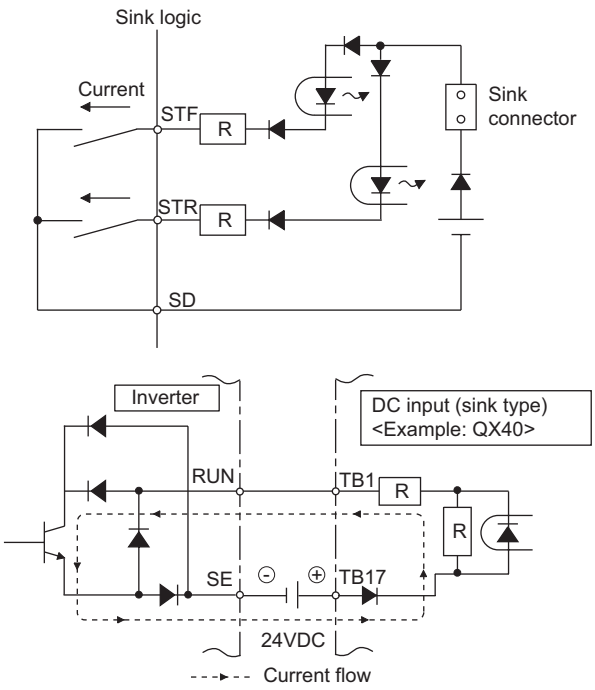
CAUTION

1. Make sure that the control circuit connector is fitted correctly.
2. While power is on, never disconnect the control circuit terminal block.

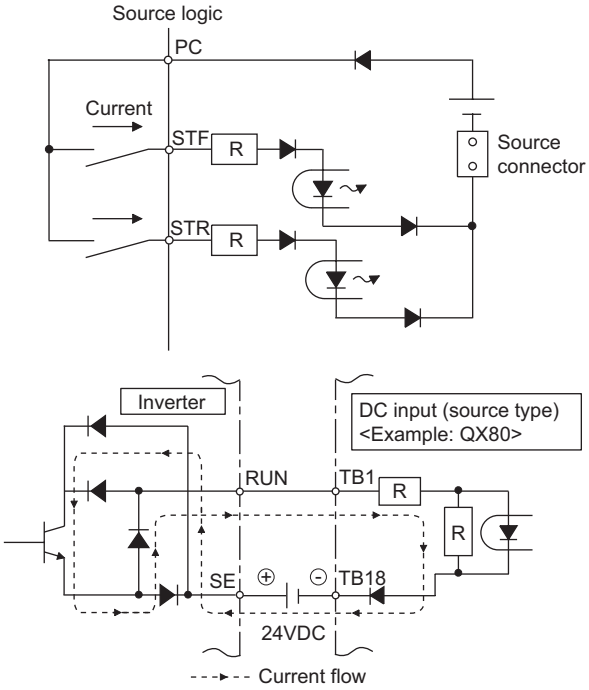
4) Sink logic and source logic

- In sink logic, a signal switches on when a current flows from the corresponding signal input terminal. Terminal SD is common to the contact input signals. Terminal SE is common to the open collector output signals.
- In source logic, a signal switches on when a current flows into the corresponding signal input terminal. Terminal PC is common to the contact input signals. Terminal SE is common to the open collector output signals.

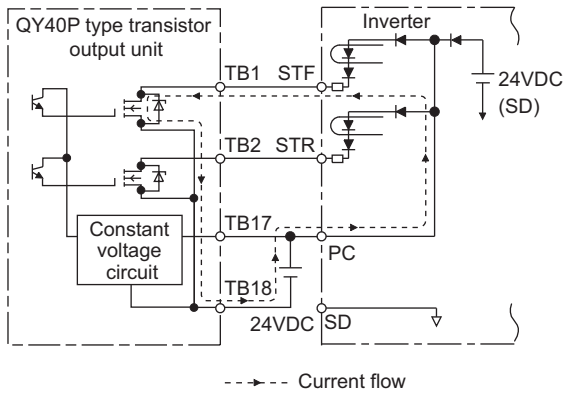
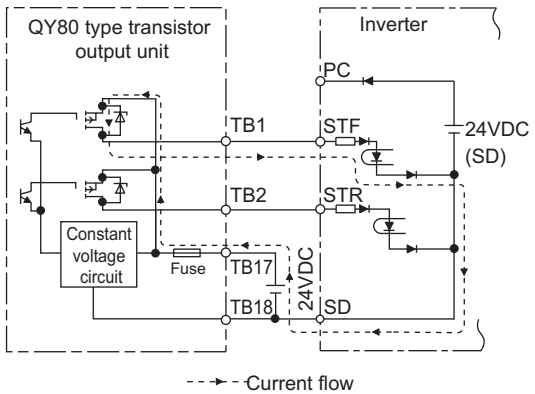
●Current flow concerning the input/output signal when sink logic is selected



●Current flow concerning the input/output signal when source logic is selected

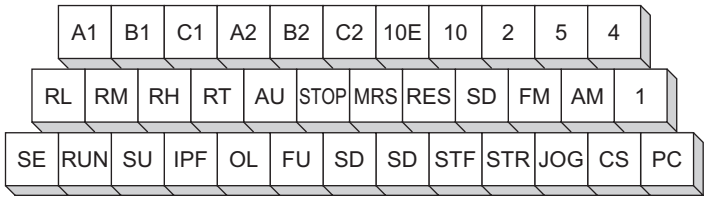


- When using an external power supply for transistor output

· Sink logic type Use terminal PC as a common terminal, and perform wiring as shown below. (Do not connect terminal SD of the inverter with terminal 0V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install a power supply in parallel in the outside of the inverter. Doing so may cause a malfunction due to undesirable current.)	· Source logic type Use terminal SD as a common terminal, and perform wiring as shown below. (Do not connect terminal PC of the inverter with terminal +24V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install an external power supply in parallel with the inverter. Doing so may cause a malfunction in the inverter due to undesirable currents.)
	

2.3.3 Control circuit terminal layout

Terminal screw size: M3.5
Tightening torque: 1.2N·m

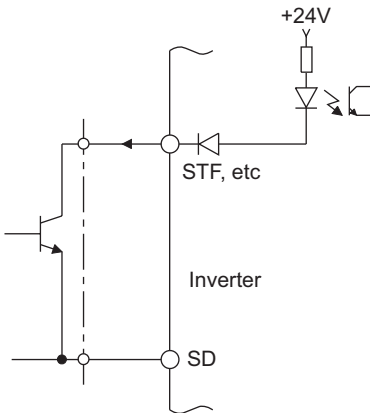


(1) Common terminals of the control circuit (SD, 5, SE)

Terminals SD, 5, and SE are all common terminals (0V) for I/O signals and are isolated from each other. Do not earth (ground) these terminals.
Avoid connecting the terminal SD and 5 and the terminal SE and 5.
Terminal SD is a common terminal for the contact input terminals (STF, STR, STOP, RH, RM, RL, JOG, RT, MRS, RES, AU, CS) and frequency output signal (FM).
The open collector circuit is isolated from the internal control circuit by photocoupler.
Terminal 5 is a common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM.
It should be protected from external noise using a shielded or twisted cable.
Terminal SE is a common terminal for the open collector output terminal (RUN, SU, OL, IPF, FU).
The contact input circuit is isolated from the internal control circuit by photocoupler.

(2) Signal inputs by contactless switches

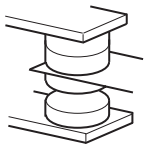
The contacted input terminals of the inverter (STF, STR, STOP, RH, RM, RL, JOG, RT, MRS, RES, AU, CS) can be controlled using a transistor instead of a contacted switch as shown on the right.



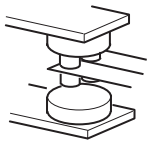
External signal input using transistor

2.3.4 Wiring instructions

1) Use shielded or twisted cables for connection to the control circuit terminals and run them away from the main and power circuits (including the 200V relay sequence circuit).
2) Use two or more parallel micro-signal contacts or twin contacts to prevent a contact faults when using contact inputs since the control circuit input signals are micro-currents.



Micro signal contacts

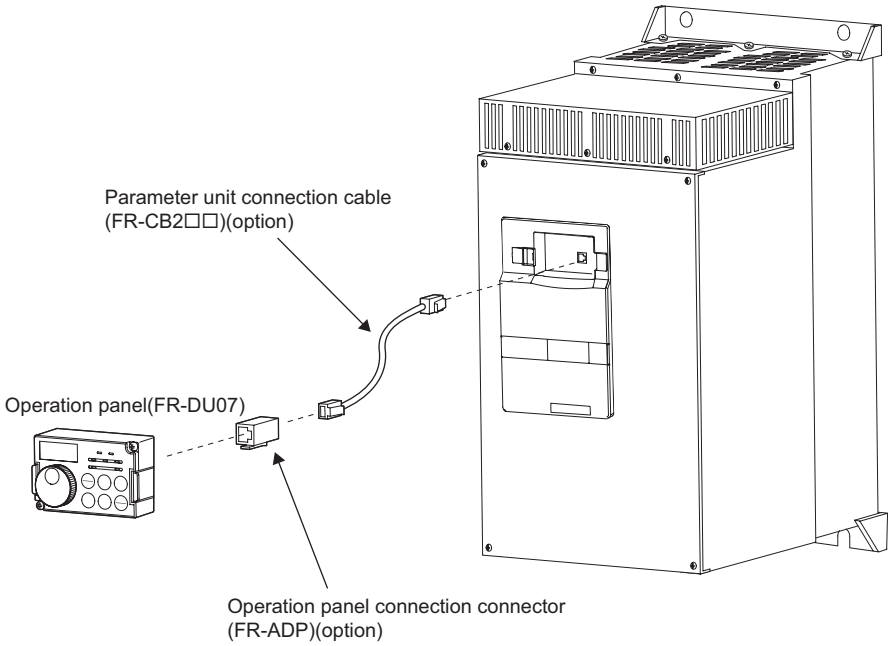


Twin contacts

3) Do not apply a voltage to the contact input terminals (e.g. STF) of the control circuit.
4) Always apply a voltage to the fault output terminals (A, B, C) via a relay coil, lamp, etc.
5) It is recommended to use the cables of 0.75mm^2 gauge for connection to the control circuit terminals.
   If the cable gauge used is 1.25mm^2 or more, the front cover may be lifted when there are many cables running or the cables are run improperly, resulting in an operation panel contact fault.
6) The wiring length should be 30m(200m for terminal FM) maximum.

2.3.5 When connecting the operation panel using a connection cable

When connecting the operation panel (FR-DU07) to the inverter using a cable, the operation panel can be mounted on the enclosure surface and operationality improves.



CAUTION

Do not connect the PU connector to the computer's LAN port, FAX modem socket or telephone connector.
The inverter and machine could be damaged due to differences in electrical specifications.

REMARKS

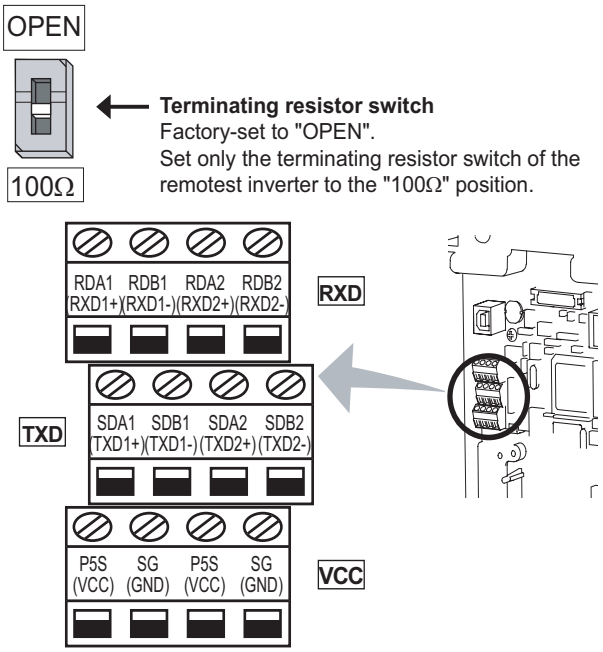
- Refer to *page 4* for removal method of the operation panel.
- Overall wiring length when the operation panel is connected: 20m maximum
- Refer to the following when fabricating the cable on the user side.
  Commercially available product examples (as of Feb., 2008)

	Product	Type	Maker
1)	10BASE-T cable	SGLPEV-T 0.5mm × 4P	Mitsubishi Cable Industries, Ltd.
2)	RJ-45 connector	5-554720-3	Tyco Electronics Corporation

- The inverter can be connected to the computer and FR-PU04/FR-PU07.

2.3.6 RS-485 terminal block

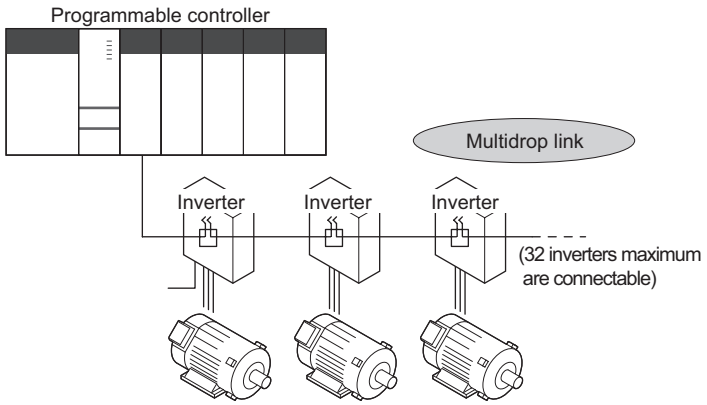
- Conforming standard: EIA-485(RS-485)
- Transmission format: Multidrop link
- Communication speed: MAX 38400bps
- Overall length: 500m
- Connection cable: Twisted pair cable (4 paires)



2.3.7 Communication operation

Using the PU connector or RS-485 terminal, you can perform communication operation from a personal computer etc. When the PU connector is connected with a personal, FA or other computer by a communication cable, a user program can run and monitor the inverter or read and write to parameters.
For the Mitsubishi inverter protocol (computer link operation), communication can be performed with the PU connector and RS-485 terminal.
For the Modbus RTU protocol, communication can be performed with the RS-485 terminal.

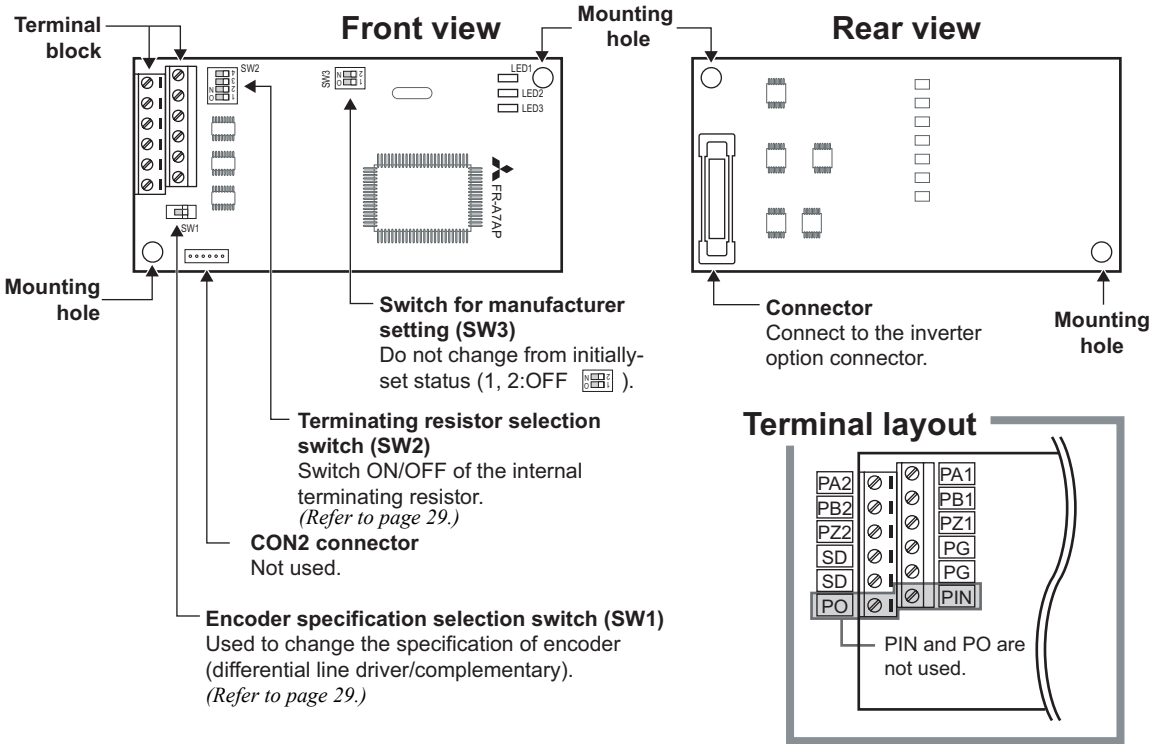
For further details, refer to *chapter 4 of the instruction manual (applied)*.



2.4 Connection of motor with encoder (vector control)

Orientation control and encoder feedback control, and speed control, torque control and position control by full-scale vector control operation can be performed using a motor with encoder and a plug-in option FR-A7AP.

(1) Structure of the FR-A7AP

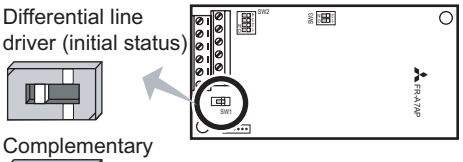


(2) Terminals of the FR-A7AP

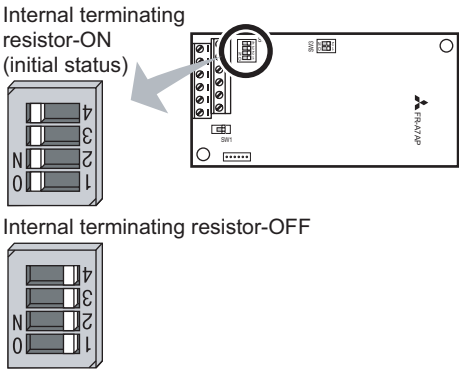
Terminal	Terminal Name	Description
PA1	Encoder A-phase signal input terminal	A-, B- and Z-phase signals are input from the encoder.
PA2	Encoder A-phase inverse signal input terminal	
PB1	Encoder B-phase signal input terminal	
PB2	Encoder B-phase inverse signal input terminal	
PZ1	Encoder Z-phase signal input terminal	
PZ2	Encoder Z-phase inversion signal input terminal	
PG	Encoder power supply (positive side) input terminal	Input terminal for the encoder power supply. Connect the external power supply (5V, 12V, 15V, 24V) and the encoder power cable.
SD	Encoder power supply ground terminal	
PIN	Not used.	
PO		

(3) Switches of the FR-A7AP

- Encoder specification selection switch (SW1)
  Select either differential line driver or complementary
  It is initially set to the differential line driver. Switch its position according to output circuit.



- Terminating resistor selection switch (SW2)
  Select ON/OFF of the internal terminating resistor. Set the switch to ON (initial status) when an encoder output type is differential line driver and set to OFF when complementary.
  ON : with internal terminating resistor (initial status)
  OFF : without internal terminating resistor



REMARKS

- Set all swithces to the same setting (ON/OFF).
- If the encoder output type is differential line driver, set the terminating resistor switch to the "OFF" position when sharing the same encoder with other unit (NC (numerical controller), etc) or a terminating resistor is connected to other unit.

- Motor used and switch setting

Motor		Encoder Specification Selection Switch (SW1)	Terminating Resistor Selection Switch (SW2)	Power Specifications *2
Mitsubishi standard motor with encoder Mitsubishi high efficiency motor with encoder	SF-JR	Differential	ON	5V
	SF-HR	Differential	ON	5V
	Others	*1	*1	*1
Mitsubishi constant-torque motor with encoder	SF-JRCA	Differential	ON	5V
	SF-HRCA	Differential	ON	5V
	Others	*1	*1	*1
Vector control dedicated motor	SF-V5RU	Complimentary	OFF	12V
Other manufacturer motor with encoder	–	*1	*1	*1

*1 Set according to the motor (encoder) used.
*2 Choose a power supply (5V/12V/15V/24V) for encoder according to the encoder used.

CAUTION

SW3 switch is for manufacturer setting. Do not change the setting.

- Encoder specification

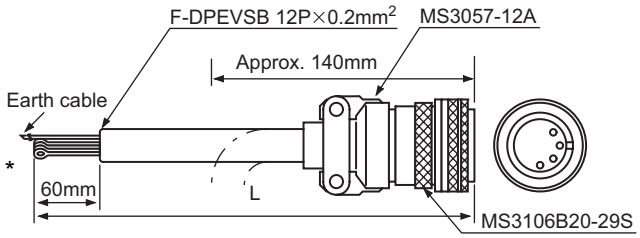
Item	Encoder for SF-JR/HR/JRCA/HRCA	Encoder for SF-V5RU
Resolution	1024 Pulse/Rev	2048 Pulse/Rev
Power supply voltage	5VDC±10%	12VDC±10%
Current consumption	150mA	150mA
Output signal form	A, B phases (90° phase shift) Z phase: 1 pulse/rev	A, B phases (90° phase shift) Z phase: 1 pulse/rev
Output circuit	Differential line driver 74LS113 equivalent	Complimentary
Output voltage	H level: 2.4V or more L level: 0.5V or less	H level: "Power supply for encoder-3V" or more L level: 3V or less

CAUTION

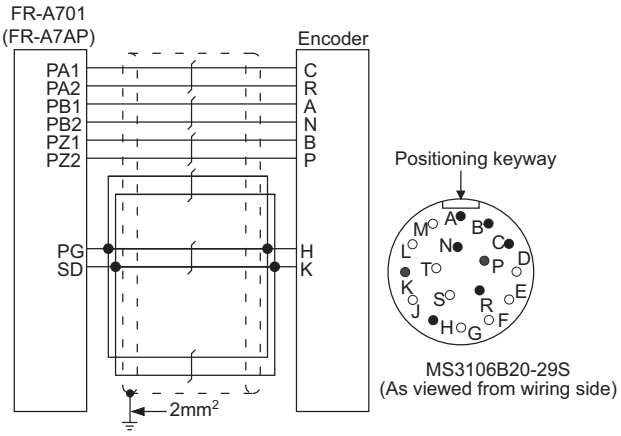
Encoder with resolution of 1000 to 4096 pulse/rev is recommended.

(4) Encoder Cable

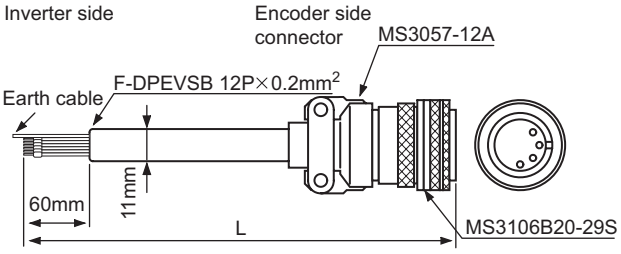
SF-JR/HR/JRCA/HRCA Motor with Encoder



Type	Length L (m)
FR-JCBL5	5
FR-JCBL15	15
FR-JCBL30	30

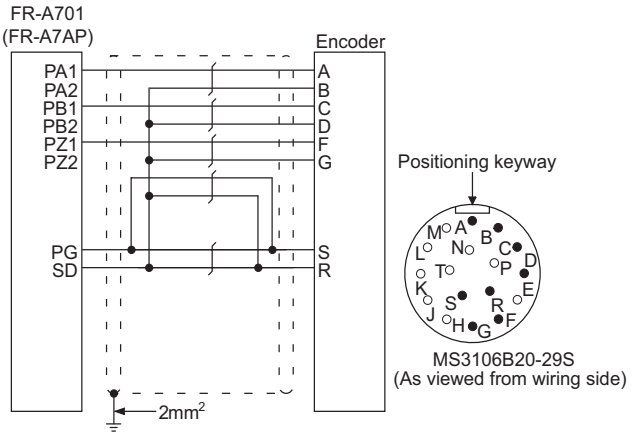


SF-V5RU, SF-THY



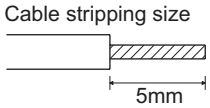
· A P clip for earthing (grounding) a shielded cable is provided.

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



* As the terminal block of the FR-A7AP is an insertion type, earth cables need to be modified. (See below)

- When using the dedicated encoder cable (FR-JCBL, FR-V5CBL, etc.) for the conventional motor, cut the crimpling terminal of the encoder cable and strip its sheath to make its cables loose.
  Also, protect the shielded cable of the twisted pair shielded cable to ensure that it will not make contact with the conductive area.



Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.
Use a bar terminal as necessary.

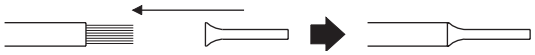
REMARKS

Information on bar terminals
Commercially available product examples (as of Mar., 2008)

Terminal Screw Size	Wire Size (mm^2)	Bar Terminal Model		Maker
		with insulation sleeve	without insulation sleeve	
M2	0.3, 0.5	AI 0,5-6WH	A 0,5-6	Phoenix Contact Co.,Ltd.

· Bar terminal crimping tool: CRIMPFOX ZA3 (Phoenix Contact Co., Ltd.)

When using the bar terminal (without insulation sleeve), use care so that the twisted wires do not come out.

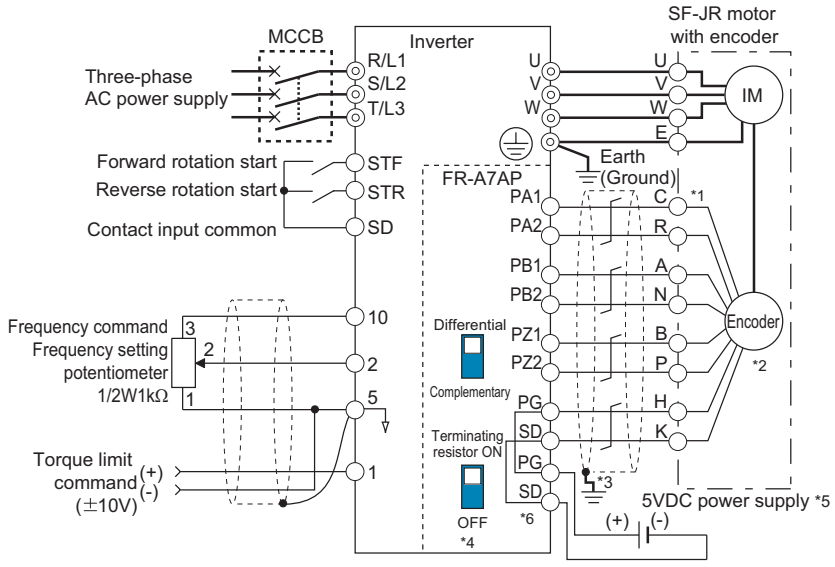
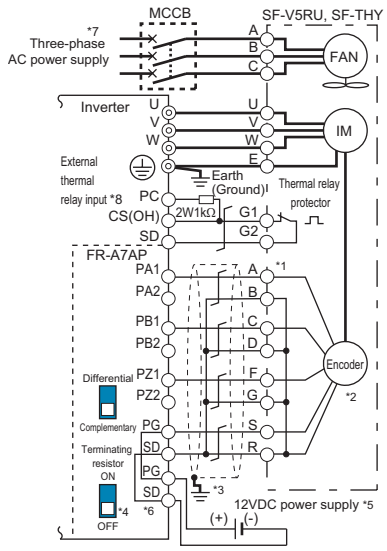


Connection terminal compatibility table

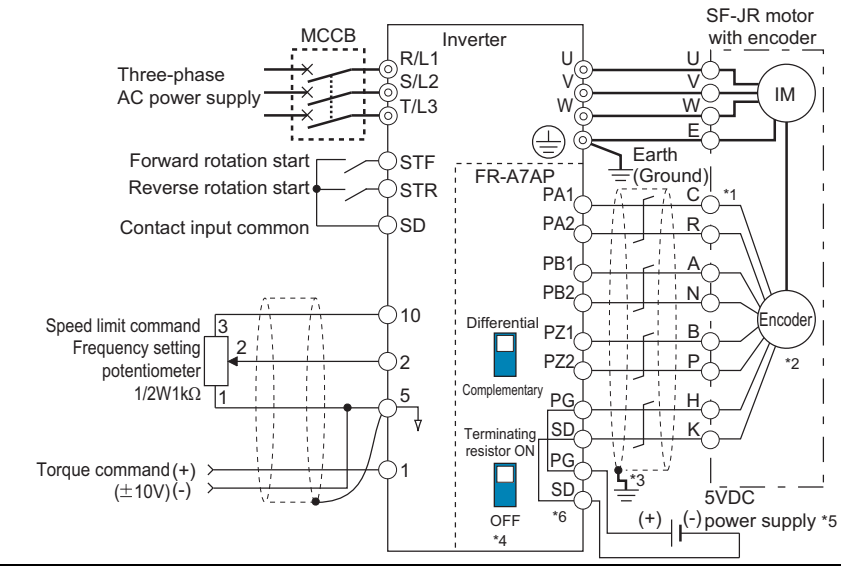
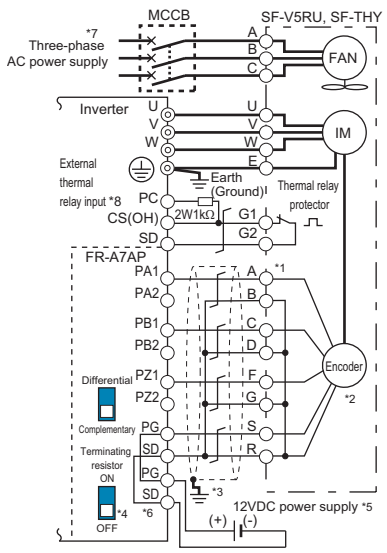
Motor		SF-V5RU, SF-THY	SF-JR/HR/JRCA/HRCA (with Encoder)
Encoder cable		FR-V7CBL	FR-JCBL
FR-A7AP terminal	PA1	PA	PA
	PA2	Keep this open.	PAR
	PB1	PB	PB
	PB2	Keep this open.	PBR
	PZ1	PZ	PZ
	PZ2	Keep this open.	PZR
	PG	PG	5E
	SD	SD	AG2

(5) Wiring

• Speed control

Standard motor with encoder (SF-JR), 5V differential line driver	Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary
	

• Torque control

Standard motor with encoder (SF-JR), 5V differential line driver	Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary
	

*1 The pin number differs according to the encoder used.
Speed control and torque control are properly performed even without connecting Z phase.

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

*3 Earth (Ground) the shielded cable of the encoder cable to the enclosure with a P clip, etc. *(Refer to page 33.)*

*4 For the complementary, set the terminating resistor selection switch to off position. *(Refer to page 29.)*

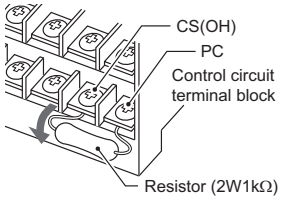
*5 A separate power supply of 5V/12V/15V/24V is necessary according to the encoder power specification.

*6 For terminal compatibility of the FR-JCBL, FR-V7CBL and FR-A7AP, refer to *page 30*.

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

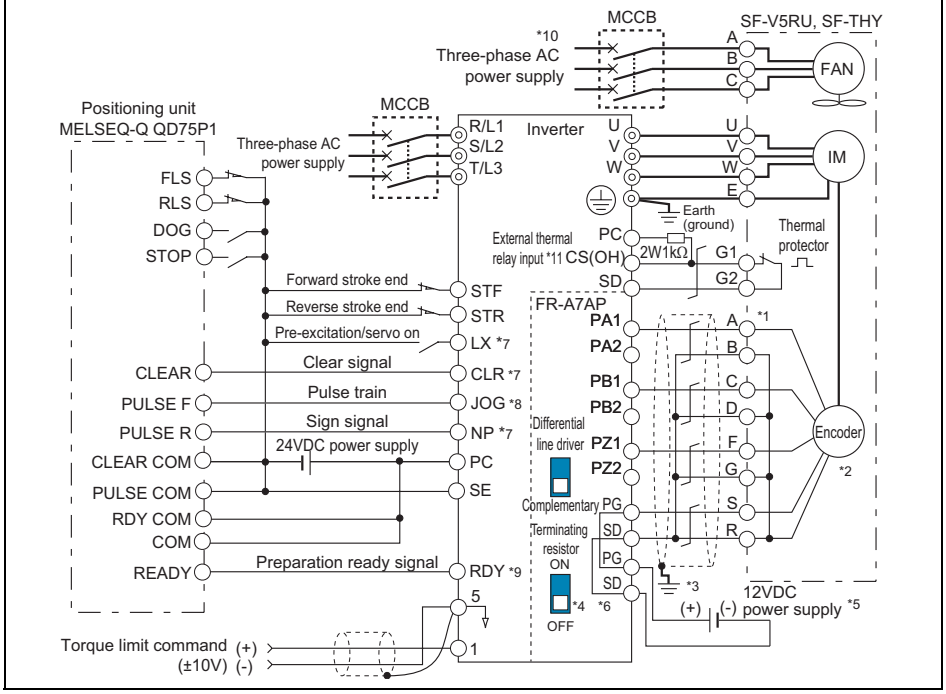
*8 Assign OH (external thermal input) signal to the terminal CS. (Set "7" in *Pr. 186*)
Connect a 2W1kΩ resistor between the terminal PC and CS (OH). Install the resistor pushing against the bottom part of the terminal block so as to avoid a contact with other cables.

Refer to chapter 4 of the instruction manual (applied) for details of Pr. 186 CS terminal function selection.



- Position control

Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary



*1 The pin number differs according to the encoder used.
Position control by pulse train input is properly performed even without connecting Z phase.

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

*3 Earth (Ground) the shielded cable of the encoder cable to the enclosure with a P clip, etc. *(Refer to page 33.)*

*4 For the complementary, set the terminating resistor selection switch to off position. *(Refer to page 29.)*

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

*6 For terminal compatibility of the FR-JCBL, FR-V7CBL and FR-A7AP, refer to *page 30*.

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

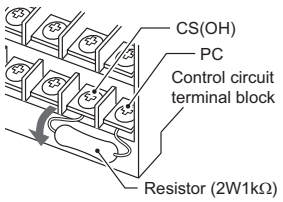
*8 When position control is selected, terminal JOG function is made invalid and conditional position pulse train input terminal becomes valid.

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

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

*11 Assign OH (external thermal input) signal to the terminal CS. (Set "7" in *Pr. 186*)
Connect a 2W1kΩ resistor between the terminal PC and CS (OH). Install the resistor pushing against the bottom part of the terminal block so as to avoid a contact with other cables.

Refer to chapter 4 of the instruction manual (applied) for details of Pr. 186 CS terminal function selection.



(6) Instructions for encoder cable wiring

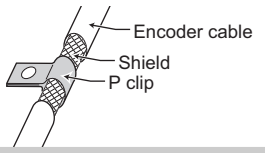
• Use twisted pair shield cables (0.2mm^2 or larger) to connect the FR-A7AP and position detector. Cables to terminals PG and SD should be connected in paralell or be larger in size according to the cable length.
To protect the cables from noise, run them away from any source of noise (e.g. the main circuit and power supply voltage).

Wiring Length	Paralell Connection		Larger-Size Cable
Within 10m	At least two cables in parallel	Cable gauge 0.2mm^2	0.4mm^2 or larger
Within 20m	At least four cables in parallel		0.75mm^2 or larger
Within 100m *	At least six cables in parallel		1.25mm^2 or larger

* When differential line driver is set and a wiring length is 30m or more
The wiring length can be extended to 100m by slightly increasing the power by 5V (approx. 5.5V) using six or more cables with gauge size of 0.2mm^2 in parallel or a cable with gauge size of 1.25mm^2 or more. Note that the voltage applied should be within power supply specifications of encoder.

• To reduce noise of the encoder cable, earth (ground) the encoder shielded cable to the enclosure (as near as the inverter) with a P clip or U clip made of metal.

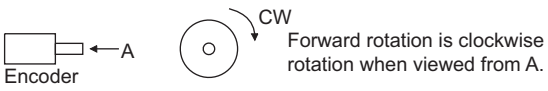
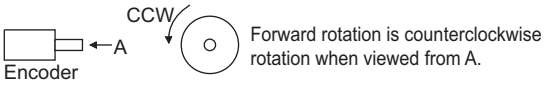
Earthing (grounding) example using a P clip



REMARKS

- For details of the optional encoder dedicated cable (FR-JCBL/FR-V7CBL), refer to *page 30*.
- The FR-V7CBL is provided with a P clip for earthing (grounding) shielded cable.

(7) Parameter for encoder *(Pr. 359, Pr. 369)*

Parameter Number	Name	Initial Value	Setting Range	Description
359	**Encoder rotation direction**	1	0	 Forward rotation is clockwise rotation when viewed from A.
			1	 Forward rotation is counterclockwise rotation when viewed from A.
369	**Number of encoder pulses**	1024	0 to 4096	Set the number of encoder pulses output. Set the number of pulses before it is multiplied by 4.

The above parameters can be set when the FR-A7AP (option) is mounted.

(8) Motor for vector control and parameter setting

Motor Name		*Pr. 9* Electronic thermal O/L relay	*Pr. 71* Applied motor	*Pr. 80* Motor capacity	*Pr. 81* Number of motor poles	*Pr. 359* Encoder rotation direction	*Pr. 369* Number of encoder pulses
Mitsubishi standard motor	SF-JR	Motor rated current	0	Motor capacity	Number of motor poles	1	1024
	SF-HR	Motor rated current	40	Motor capacity	Number of motor poles	1	1024
	Others	Motor rated current	3 *1	Motor capacity	Number of motor poles	*2	*2
Mitsubishi constant-torque motor	SF-JRCA 4P	Motor rated current	1	Motor capacity	4	1	1024
	SF-HRCA	Motor rated current	50	Motor capacity	Number of motor poles	1	1024
	Others	Motor rated current	13 *1	Motor capacity	Number of motor poles	*2	*2
Mitsubishi vector control dedicated motor	SF-V5RU (1500r/min series)	0 *3	30	Motor capacity	4	1	2048
	SF-V5RU (except for 1500r/min series)	0 *3	13 *1	Motor capacity	4	1	2048
	SF-THY	0 *3	33 *1	Motor capacity	4	1	2048
Other manufacturer's standard motor	—	Motor rated current	3 *1	Motor capacity	Number of motor poles	*2	*2
Other manufacturer's constant torque motor	—	Motor rated current	13 *1	Motor capacity	Number of motor poles	*2	*2

Values in the bolded frame are initial values.

*1 Offline auto tuning is necessary. *(Refer to page 71)*
*2 Set this parameter according to the motor (encoder) used.
*3 Use thermal protector input provided with the motor.

♦Parameters referred to♦

• *Vector control (speed control, torque control, position control), orientation control, encoder feedback control*
☞Refer to chapter 4 of the instruction manual (applied).

(9) Combination with a vector control dedicated motor
Refer to the table below when using with a vector control dedicated motor.

• Combination with the SF-V5RU

Voltage	200V class			400V class		
Rated speed	1500r/min					
Base frequency	50Hz					
Maximum speed	3000r/min					
Motor capacity	Motor frame number	Motor type	Inverter type	Motor frame number	Motor type	Inverter type
3.7kW	112M	SF-V5RU3K	FR-A721-5.5K	—	—	—
5.5kW	132S	SF-V5RU5K	FR-A721-7.5K	132S	SF-V5RUH5K	FR-A741-7.5K
7.5kW	132M	SF-V5RU7K	FR-A721-11K	132M	SF-V5RUH7K	FR-A741-11K
11kW	160M	SF-V5RU11K	FR-A721-15K	160M	SF-V5RUH11K	FR-A741-15K
15kW	160L	SF-V5RU15K	FR-A721-18.5K	160L	SF-V5RUH15K	FR-A741-18.5K
18.5kW	180M	SF-V5RU18K	FR-A721-22K	180M	SF-V5RUH18K	FR-A741-22K
22kW	180M	SF-V5RU22K	FR-A721-30K	180M	SF-V5RUH22K	FR-A741-30K
30kW	200L *2	SF-V5RU30K	FR-A721-37K	200L *2	SF-V5RUH30K	FR-A741-37K
37kW	200L *2	SF-V5RU37K	FR-A721-45K	200L *2	SF-V5RUH37K	FR-A741-45K
45kW	200L *2	SF-V5RU45K	FR-A721-55K	200L *2	SF-V5RUH45K	FR-A741-55K

• Combination with the SF-V5RU1, 3, 4 and SF-THY

	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
3.7kW	132S	SF-V5RU3K1	FR-A721-5.5K	132M	SF-V5RU3K3	FR-A721-5.5K	160L	SF-V5RU3K4	FR-A721-7.5K
5.5kW	132M	SF-V5RU5K1	FR-A721-7.5K	160M	SF-V5RU5K3	FR-A721-7.5K	180L	SF-V5RU5K4	FR-A721-7.5K
7.5kW	160M	SF-V5RU7K1	FR-A721-11K	160L	SF-V5RU7K3	FR-A721-11K	200L	SF-V5RU7K4	FR-A721-11K
11kW	160L	SF-V5RU11K1	FR-A721-15K	180M	SF-V5RU11K3	FR-A721-15K	225S	SF-V5RU11K4	FR-A721-15K
15kW	180M	SF-V5RU15K1	FR-A721-18.5K	180L	SF-V5RU15K3	FR-A721-18.5K	225S	SF-V5RU15K4	FR-A721-22K
18.5kW	180L	SF-V5RU18K1	FR-A721-22K	200L	SF-V5RU18K3	FR-A721-22K	250MD	SF-THY	FR-A721-22K
22kW	200L	SF-V5RU22K1	FR-A721-30K	200L	SF-V5RU22K3	FR-A721-30K	280MD	SF-THY	FR-A721-30K
30kW	200L*3	SF-V5RU30K1	FR-A721-37K	225S*1	SF-V5RU30K3	FR-A721-37K	280MD	SF-THY	FR-A721-37K
37kW	225S	SF-V5RU37K1	FR-A721-45K	250MD*1	SF-THY	FR-A721-45K	280MD	SF-THY	FR-A721-45K
45kW	250MD	SF-THY	FR-A721-55K	250MD*1	SF-THY	FR-A721-55K	280MD	SF-THY	FR-A721-55K

Models surrounded by black borders 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.)

*3 90% output in the high-speed range. (The output is reduced when the speed is 1000r/min or more.)

3 PRECAUTIONS FOR USE OF THE INVERTER

3.1 EMC and leakage currents

3.1.1 Leakage currents and countermeasures

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 circuit breaker according to its rated sensitivity current, independently of the carrier frequency setting.

(1) To-earth (ground) leakage currents

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.

- Suppression technique
  - If the carrier frequency setting is high, decrease the *Pr. 72 PWM frequency selection* setting. Note that motor noise increases. Selecting *Pr. 240 Soft-PWM operation selection* makes the sound inoffensive.
  - 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).
- To-earth (ground) leakage currents
  - Take caution as long wiring will increase the leakage current. Decreasing the carrier frequency of the inverter reduces the leakage current.
  - Increasing the motor capacity increases the leakage current. The leakage current of the 400V class is larger than that of the 200V class.

(2) Line-to-line leakage currents

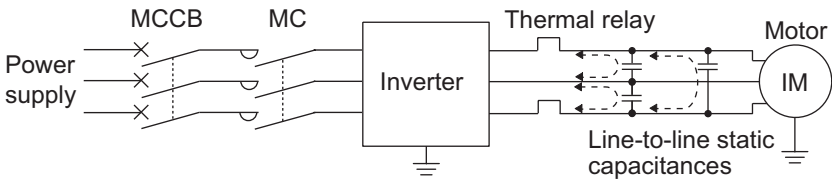
Harmonics of leakage currents flowing in static capacitances between the inverter output cables may operate the external thermal relay unnecessarily. When the wiring length is long (50m or more) for the 400V class small-capacity model (7.5K or less), the external thermal relay is likely to operate unnecessarily because the ratio of the leakage current to the rated motor current increases.

- Line-to-line leakage current data example (200V class)

Motor Capacity (kW)	Rated Motor Current(A)	Leakage Currents(mA)	
		Wiring length 50m	Wiring length 100m
3.7	12.8	440	630
5.5	19.4	490	680
7.5	25.6	535	725

·Motor SF-JR 4P
·Carrier frequency: 14.5kHz
·Used wire: 2mm^2, 4cores Cabtyre cable

*The leakage currents of the 400V class are about twice as large.



Line-to-line leakage currents path

- Measures
  - Use *Pr. 9 Electronic thermal O/L relay*.
  - If the carrier frequency setting is high, decrease the *Pr. 72 PWM frequency selection* setting. Note that motor noise increases. Selecting *Pr. 240 Soft-PWM operation selection* makes the sound inoffensive. 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.
- Installation and selection of moulded case circuit breaker

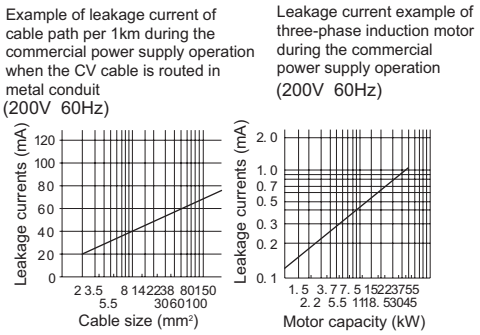
  Install a moulded case circuit breaker (MCCB) on the power receiving side to protect the wiring of the inverter input side. Select the MCCB according to the inverter input side power factor (which depends on the power supply voltage, output frequency and load). Especially for a completely electromagnetic 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 circuit breaker, use the Mitsubishi earth leakage circuit breaker designed for harmonics and surge suppression.

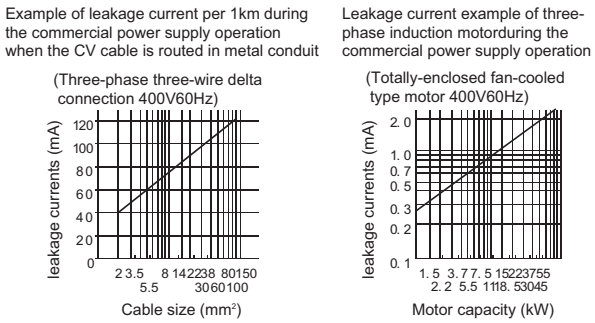
(3) Selection of rated sensitivity current of earth leakage circuit breaker

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

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

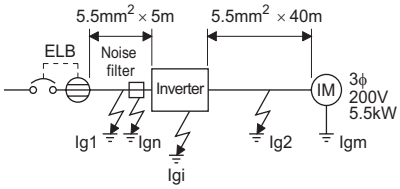
Ig1, Ig2: Leakage currents in wire path during commercial power supply operation
Ign: Leakage current of inverter input side noise filter
Igm: Leakage current of motor during commercial power supply operation
Igi: Leakage current of inverter unit





For "⅄" connection, the amount of leakage current is appox.1/3 of the above value.

<Example>



	Breaker Designed for Harmonic and Surge Suppression	Standard Breaker
Leakage current Ig1 (mA)	$33 \times \frac{5m}{1000m} = 0.17$	
Leakage current Ign (mA)	0 (without noise filter)	
Leakage current Igi (mA)	1	
Leakage current Ig2 (mA)	$33 \times \frac{40m}{1000m} = 1.32$	
Motor leakage current Igm (mA)	0.29	
Total leakage current (mA)	2.78	6.00
Rated sensitivity current (mA) (≥ Ig × 10)	30	100

CAUTION

- Install the earth leakage circuit breaker (ELB) on the input side of the inverter.
- In the ⅄ connection earthed-neutral system, the sensitivity current is blunt 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. (NEC section 250, IEC 536 class 1 and other applicable standards)
  Use a neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard.
- When the breaker is installed on the output side of the inverter, it may be unnecessarily operated by harmonics even if the effective value is less than the rating. In this case, do not install the breaker since the eddy current and hysteresis loss will increase, leading to temperature rise.
- The following models are standard breakers....BV-C1, BC-V, NVB, NV-L, NV-G2N, NV-G3NA and NV-2F earth leakage relay (except NV-ZHA), NV with AA neutral wire open-phase protection
  The other models are designed for harmonic and surge suppression....NV-C/NV-S/MN series, NV30-FA, NV50-FA, BV-C2, earth leakage alarm breaker (NF-Z), NV-ZHA, NV-H

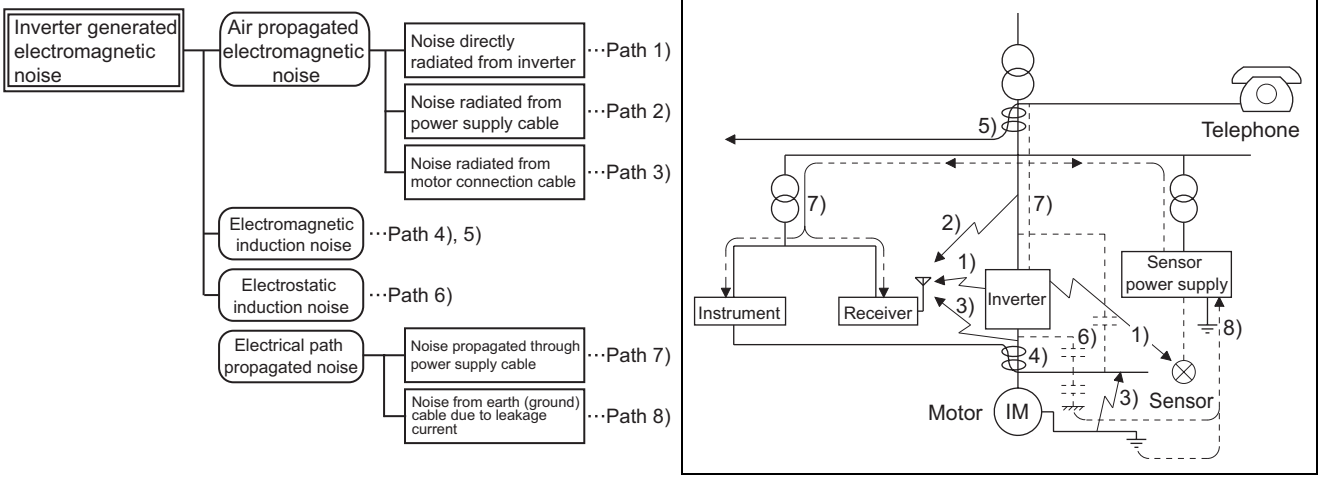
3.1.2 EMC measures

Some electromagnetic noises enter the inverter to malfunction it and others are radiated by the inverter to malfunction peripheral devices. Though the inverter is designed to have high immunity performance, it handles low-level signals, so it requires the following basic techniques. Also, since the inverter chops outputs at high carrier frequency, that could generate electromagnetic noises. If these electromagnetic noises cause peripheral devices to malfunction, EMI measures should be taken to suppress noises. These techniques differ slightly depending on EMI paths.

1) Basic techniques
- Do not run the power cables (I/O cables) and signal cables of the inverter in parallel with each other and do not bundle them.
- Use twisted shield cables for the detector connecting and control signal cables and connect the sheathes of the shield cables to terminal SD.
- Earth (Ground) the inverter, motor, etc. at one point.

2) Techniques to reduce electromagnetic noises that enter and malfunction the inverter (Immunity measures))
When devices that generate many electromagnetic noises (which use magnetic contactors, magnetic brakes, many relays, for example) are installed near the inverter and the inverter may be malfunctioned by electromagnetic noises, the following measures must be taken:
- Provide surge suppressors for devices that generate many electromagnetic noises to suppress electromagnetic noises.
- Fit data line filters (*page 38*) to signal cables.
- Earth (Ground) the shields of the detector connection and control signal cables with cable clamp metal.

3) Techniques to reduce electromagnetic noises that are radiated by the inverter to malfunction peripheral devices (EMI measures)
Inverter-generated electromagnetic noises are largely classified into those radiated by the cables connected to the inverter and inverter main circuits (I/O), those electromagnetically and electrostatically induced to the signal cables of the peripheral devices close to the main circuit power supply, and those transmitted through the power supply cables.

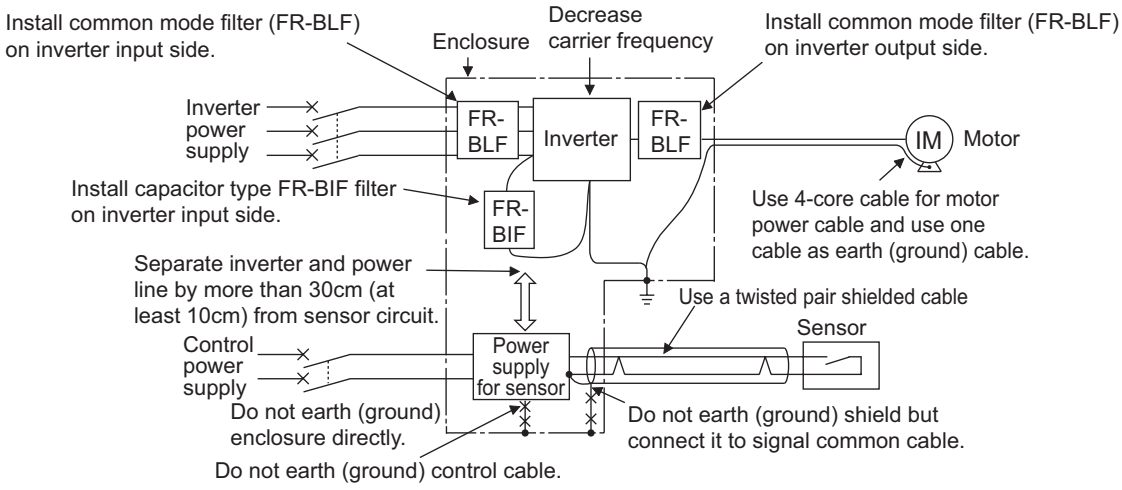


Propagation Path	Measures
1) 2) 3)	When devices that handle low-level signals and are liable to malfunction due to electromagnetic noises, e.g. instruments, receivers and sensors, are contained in the enclosure that contains the inverter or when their signal cables are run near the inverter, the devices may be malfunctioned by air-propagated electromagnetic noises. The following measures must be taken: (1) Install easily affected devices as far away as possible from the inverter. (2) Run easily affected signal cables as far away as possible from the inverter and its I/O cables. (3) Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them. (4) Insert common mode filters into I/O and capacitors between the input lines to suppress cable-radiated noises. (5) Use shield cables as signal cables and power cables and run them in individual metal conduits to produce further effects.
4) 5) 6)	When the signal cables are run in parallel with or bundled with the power cables, magnetic and static induction noises may be propagated to the signal cables to malfunction the devices and the following measures must be taken: (1) Install easily affected devices as far away as possible from the inverter. (2) Run easily affected signal cables as far away as possible from the I/O cables of the inverter. (3) Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them. (4) Use shield cables as signal cables and power cables and run them in individual metal conduits to produce further effects.
7)	When the power supplies of the peripheral devices are connected to the power supply of the inverter in the same line, inverter-generated noises may flow back through the power supply cables to malfunction the devices. In such a case, installing the common mode filter (FR-BLF) to the power cables (output cable) of the inverter will prevent malfunction.
8)	When a closed loop circuit is formed by connecting the peripheral device wiring to the inverter, leakage currents may flow through the earth (ground) cable of the inverter to malfunction the device. In such a case, disconnection of the earth (ground) cable of the device may cause the device to operate properly.

● **Data line filter**

As immunity measures it may effective, provide a data line filter for the detector cable etc.

● **EMC measures**



3.1.3 Power supply harmonics

The inverter may generate power supply harmonics from its converter circuit to affect the power generator, power capacitor etc. Power supply harmonics are different from noise and leakage currents in source, frequency band and transmission path. Take the following countermeasure suppression techniques.
This inverter has a built-in AC reactor (FR-HAL) and a circuit type specified in Harmonic suppression guideline in Japan is three-phase bridge (capacitor smoothed) and with reactor (AC side).

3.1.4 Harmonic suppression guideline

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" (hereinafter referred to as "Guideline for specific consumers").

"Guideline for specific consumers"

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.

Table 1 Maximum Values of Outgoing Harmonic Currents per 1kW Contract Power

Received Power Voltage	5th	7th	11th	13th	17th	19th	23rd	Over 23rd
6.6kV	3.5	2.5	1.6	1.3	1.0	0.9	0.76	0.70
22kV	1.8	1.3	0.82	0.69	0.53	0.47	0.39	0.36
33kV	1.2	0.86	0.55	0.46	0.35	0.32	0.26	0.24

(1) Application of the harmonic suppression guideline for specific consumers

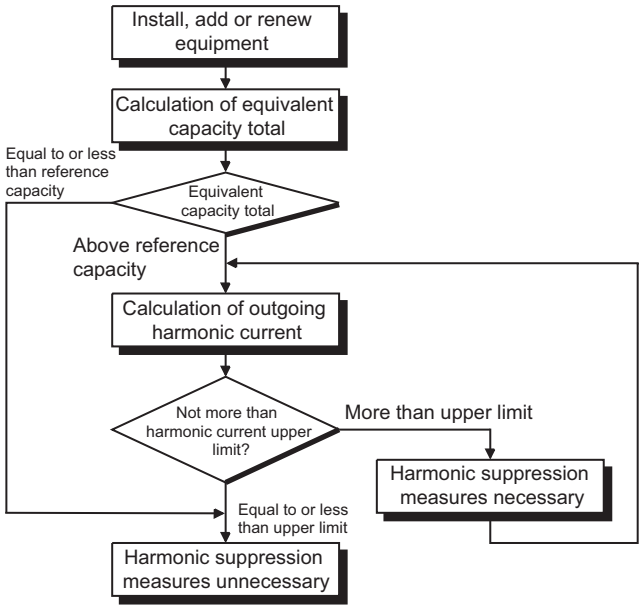


Table 2 Conversion factors for FR-A701 series

Class	Circuit Type		Conversion Factor (Ki)
3	Three-phase bridge (Capacitor smoothing)	With reactor (AC side)	K32 = 1.8

Table 3 Equivalent Capacity Limits

Received Power Voltage	Reference Capacity
6.6kV	50kVA
22/33kV	300kVA
66kV or more	2000kVA

Table 4 Harmonic content (Values of the fundamental current is 100%)

Reactor	5th	7th	11th	13th	17th	19th	23rd	25th
Used (AC side)	38	14.5	7.4	3.4	3.2	1.9	1.7	1.3

1) Calculation of equivalent capacity P0 of harmonic generating equipment

The "equivalent capacity" is the capacity of a 6-pulse converter converted from the capacity of consumer's harmonic generating equipment and is calculated with the following equation. If the sum of equivalent capacities is higher than the limit in Table 3, harmonics must be calculated with the following procedure:

$P0 = \Sigma (Ki \times Pi)$ [kVA]

Ki: Conversion factor(According to Table 2)

Pi: Rated capacity of harmonic generating equipment* [kVA]

i : Number indicating the conversion circuit type

* Rated capacity: Determined by the capacity of the applied motor and found in Table 5. It should be noted that the rated capacity used here is used to calculate generated harmonic amount and is different from the power supply capacity required for actual inverter drive.

2) 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 4.

Table 5 Rated capacities and outgoing harmonic currents of inverter-driven motors

Applied Motor (kW)	Rated Current (A)		Fundamental Wave Current Converted from 6.6kV (mA)	Rated Capacity (kVA)	Outgoing Harmonic Current Converted from 6.6kV (mA) (With reactor, 100% operation ratio)							
	200V	400V			5th	7th	11th	13th	17th	19th	23rd	25th
5.5	19.1	9.55	579	6.77	220.0	83.96	42.85	19.69	18.53	11.00	9.843	7.527
7.5	25.6	12.8	776	9.07	294.9	112.5	57.42	26.38	24.83	14.74	13.19	10.09
11	36.9	18.5	1121	13.1	426.0	162.5	82.95	38.11	35.87	21.30	19.06	14.57
15	49.8	24.9	1509	17.6	573.4	218.8	111.7	51.31	48.29	28.67	25.65	19.62
18.5	61.4	30.7	1860	21.8	706.8	269.7	137.6	63.24	59.52	35.34	31.62	24.18
22	73.1	36.6	2220	25.9	843.6	321.9	164.3	75.48	71.04	42.18	37.74	28.86
30	98.0	49.0	2970	34.7	1129	430.7	219.8	101.0	95.04	56.43	50.49	38.61
37	121	60.4	3660	42.8	1391	530.7	270.8	124.4	117.1	69.54	62.22	47.58
45	147	73.5	4450	52.1	1691	645.3	329.3	151.3	142.4	84.55	75.65	57.85
55	180	89.9	5450	63.7	2071	790.3	403.3	185.3	174.4	103.6	92.65	70.85

3) Harmonic suppression technique requirement

If the outgoing harmonic current is higher than the maximum value per 1kW (contract power) × contract power, a harmonic suppression technique is required.

4) Harmonic suppression techniques

No.	Item	Description
1	Installation of power factor improving capacitor	When used with a series reactor, the power factor improving capacitor has an effect of absorbing harmonic currents.
2	Transformer multi-phase operation	Use two transformers with a phase angle difference of 30° as in 人 - △, △ - △ combination to provide an effect corresponding to 12 pulses, reducing low-degree harmonic currents.
3	Passive filter (AC filter)	A capacitor and a reactor are used together to reduce impedances at specific frequencies, producing a great effect of absorbing harmonic currents.
4	Active filter	This filter detects the current of a circuit generating a harmonic current and generates a harmonic current equivalent to a difference between that current and a fundamental wave current to suppress a harmonic current at a detection point, providing a great effect of absorbing harmonic currents.

3.2 Power-off and magnetic contactor (MC)

(1) Inverter input side magnetic contactor (MC)

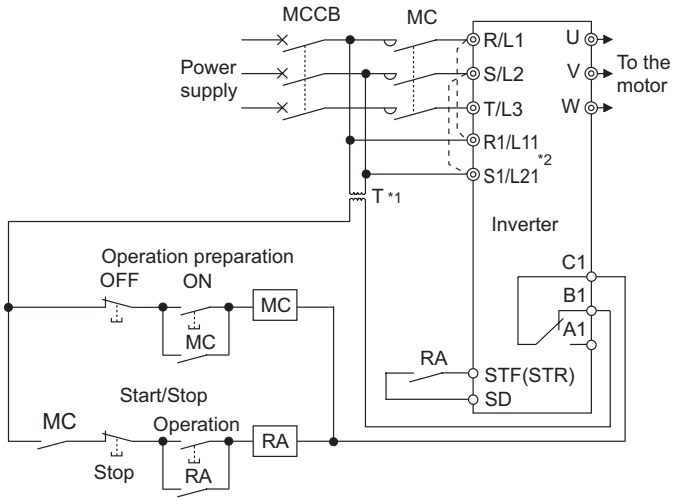
On the inverter input side, it is recommended to provide an MC for the following purposes.

(Refer to *page 3* for selection.)

1) To release the inverter from the power supply when the fault occurs or when the drive is not functioning (e.g. emergency stop operation).
2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
3) To reset the inverter for an extended period of time
   The control power supply for inverter is always running and consumes a little power. When stopping the inverter for an extended period of time, powering off the inverter will save power slightly.
4) To separate the inverter from the power supply to ensure safe maintenance and inspection work
   The inverter's input side MC is used for the above purpose, select class JEM1038-AC3MC for the inverter input side current when making an emergency stop during normal operation.

REMARKS

Since repeated inrush currents at power on will shorten the life of the converter circuit (switching life is about 500,000 times.), frequent starts and stops of the MC must be avoided. Turn on/off the inverter start controlling terminals (STF, STR) to run/stop the inverter.



• Inverter start/stop circuit example

As shown on the left, always use the start signal (ON or OFF across terminals STF or STR-SD) to make a start or stop.

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

*2 Connect the power supply terminals R1/L11, S1/L21 of the control circuit to the primary side of the MC to hold an alarm signal when the inverter's protective circuit is activated. At this time, remove jumpers across terminals R/L1-R1/L11 and S/L2-S1/L21. (Refer to *page 19* for removal of the jumper.)

(2) Handling of the inverter output 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 bypass-inverter switchover function *Pr. 135 to Pr. 139 (chapter 4 of the instruction manual (applied))*.

3.3 Inverter-driven 400V class motor

In the PWM type inverter, a surge voltage attributable to wiring constants is generated at the motor terminals. Especially for a 400V class motor, the surge voltage may deteriorate the insulation. When the 400V class motor is driven by the inverter, consider the following measures:

●Measures

It is recommended to take either of the following measures:

(1) Rectifying the motor insulation and limiting the PWM carrier frequency according to the wiring length
For the 400V class motor, use an insulation-enhanced motor.
Specifically,
1)Specify the "400V class inverter-driven insulation-enhanced motor".
2)For the dedicated motor such as the constant-torque motor and low-vibration motor, use the "inverter-driven, dedicated motor".
3)Set *Pr. 72 PWM frequency selection* as indicated below according to the wiring length

	Wiring Length		
	50m or less	**50m to 100m**	**exceeding 100m**
Pr. 72 PWM frequency selection	15 (14.5kHz) or less	9 (9kHz) or less	4 (4kHz) or less

(2) Suppressing the surge voltage on the inverter side
Connect the surge voltage suppression filter (FR-ASF-H) on the inverter output side.

CAUTION

- For explanation of surge voltage suppression filter (FR-ASF-H), refer to the manual of each option.
- Do not perform vector control with a surge voltage suppression filter (FR-ASF-H) connected.

3.4 Precautions for use of the inverter

The FR-A701 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.
Before starting operation, always recheck the following items.

(1) Use crimping terminals with insulation sleeve to wire the power supply and motor.

(2) Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Never perform such wiring.

(3) After wiring, wire offcuts must not be left in the inverter.
Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.

(4) Use cables of the size to make a voltage drop 2% maximum.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
Refer to *page 16* for the recommended cable sizes.

(5) The overall wiring length should be 500m maximum.
(The wiring length should be 100m maximum for vector control.)
Especially for long distance wiring, the fast-response current limit function may decrease or the equipment connected to the secondary side may malfunction or become faulty under the influence of a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. *(Refer to page 18.)*

(6) Electromagnetic wave interference
The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, connecting a capacitor type filter will reduce electromagnetic wave interference.

(7) Do not install a power factor correction capacitor, surge suppressor or capacitor type filter on the inverter output side.
This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices is installed, immediately remove it.

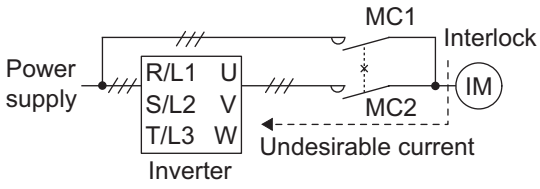
(8) Before starting wiring or other work after the inverter is operated, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.

(9) A short circuit or earth (ground) fault on the inverter output side may damage the inverter modules.
- Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter modules.
- Fully check the to-earth (ground) insulation and inter-phase insulation of the inverter output side before power-on. Especially for an old motor or use in hostile atmosphere, securely check the motor insulation resistance etc.

(10) Do not use the inverter input side magnetic contactor to start/stop the inverter.
Always use the start signal (ON/OFF of STF and STR signals) to start/stop the inverter. *(Refer to page 12)*

(11) Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.
Application of permissible voltage to the inverter I/O signal circuit and incorrect polarity may damage the I/O terminal. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short terminals 10E-5.

(12) Provide electrical and mechanical interlocks for MC1 and MC2 which are used for bypass operation.
When the wiring is incorrect or if there is an electronic bypass circuit as shown on the right, the inverter will be damaged by leakage current from the power supply due to arcs generated at the time of switch-over or chattering caused by a sequence error.
(Commercial operation can not be performed with the vector dedicated motor (SF-V5RU, SF-THY).)



(13) If the machine must not be restarted when power is restored after a power failure, provide a magnetic contactor in the inverter's input side and also make up a sequence which will not switch on the start signal.
If the start signal (start switch) remains on after a power failure, the inverter will automatically restart as soon as the power is restored.

(14) Instructions for overload operation
When performing an operation of frequent start/stop with the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing 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 (up to 2 rank larger in capacity).

(15) Make sure that the specifications and rating match the system requirements.

(16) A motor with encoder is necessary for vector control. In addition, connect the encoder directly to the backlash-free motor shaft. (An encoder is not necessary for real sensorless vector control.)

(17) When the motor speed is unstable, due to change in the frequency setting signal caused by electromagnetic noises from the inverter, take the following measures when applying the motor speed by the analog signal.
- Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
- Run signal cables as far away as possible from power cables (inverter I/O cables).
- Use shield cables as signal cables.
- Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).

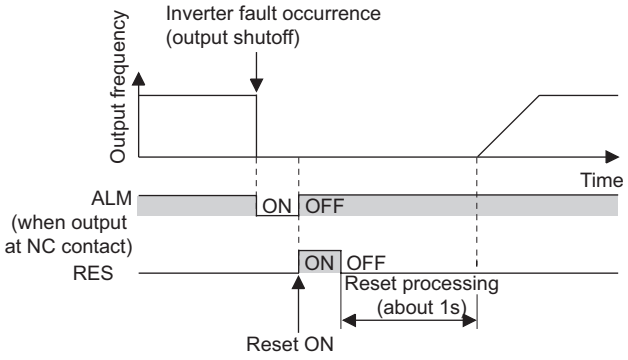
3.5 Failsafe of the system which uses the inverter

When a fault occurs, the inverter trips to output a fault signal. However, a fault output signal may not be output at an inverter fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi assures best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to machine when the inverter fails for some reason and at the same time consider the system configuration where failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

(1) Interlock method which uses the inverter status output signals
By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

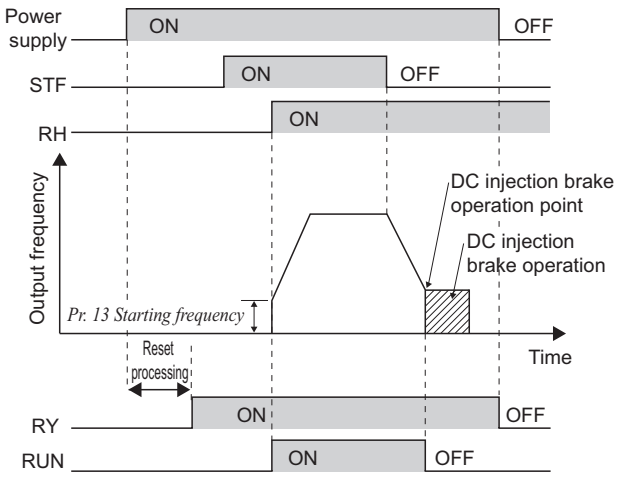
No	Interlock Method	Check Method	Used Signals	Refer to Page
1)	Inverter protective function operation	Operation check of an alarm contact Circuit error detection by negative logic	Fault output signal (ALM signal)	*Refer to chapter 4 of the instruction manual (applied)*
2)	Inverter running status	Operation ready signal check	Operation ready signal (RY signal)	*Refer to chapter 4 of the instruction manual (applied)*
3)	Inverter running status	Logic check of the start signal and running signal	Start signal (STF signal, STR signal) Running signal (RUN signal)	*Refer to chapter 4 of the instruction manual (applied)*
4)	Inverter running status	Logic check of the start signal and output current	Start signal (STF signal, STR signal) Output current detection signal (Y12 signal)	*Refer to chapter 4 of the instruction manual (applied)*

1) Check by the output of the inverter fault signal
When the fault occurs and trips the inverter, the fault output signal (ALM signal) is output (ALM signal is assigned to terminal A1B1C1 in the initial setting).
Check that the inverter functions properly.
In addition, negative logic can be set (on when the inverter is normal, off when the fault occurs).



2) Checking the inverter operating status by the inverter operation ready completion signal
Operation ready signal (RY signal) is output when the inverter power is on and the inverter becomes operative.
Check if the RY signal is output after powering on the inverter.

3) Checking the inverter operating status by the start signal input to the inverter and inverter running signal.
The inverter running signal (RUN signal) is output when the inverter is running (RUN signal is assigned to terminal RUN in the initial setting).
Check if RUN signal is output when inputting the start signal to the inverter (forward signal is STF signal and reverse signal is STR signal). For logic check, note that RUN signal is output for the period from the inverter decelerates until output to the motor is stopped, configure a sequence considering the inverter deceleration time



4) Checking the motor operating status by the start signal input to the inverter and inverter output current detection signal.

The output current detection signal (Y12 signal) is output when the inverter operates and currents flows in the motor. Check if Y12 signal is output when inputting the start signal to the inverter (forward signal is STF signal and reverse signal is STR signal). Note that the current level at which Y12 signal is output is set to 150% of the inverter rated current in the initial setting, it is necessary to adjust the level to around 20% using no load current of the motor as reference with *Pr. 150 Output current detection level*.

For logic check, as same as the inverter running signal (RUN signal), the inverter outputs for the period from the inverter decelerates until output to the motor is stopped, configure a sequence considering the inverter deceleration time.

Output Signal	*Pr. 190 to Pr. 196* Setting	
	Positive logic	Negative logic
ALM	99	199
RY	11	111
RUN	0	100
Y12	12	112

- When using various signals, assign functions to *Pr.190* to *Pr. 196 (output terminal function selection)* referring to the table on the left.

CAUTION

- Changing the terminal assignment using *Pr. 190 to Pr. 196 (output terminal function selection)* may affect the other functions. Make setting after confirming the function of each terminal.

(2) Backup method outside the inverter

Even if the interlock is provided by the inverter status signal, enough failsafe is not ensured depending on the failure status of the inverter iteself. For example, even if the interlock is provided using the inverter fault output signal, start signal and RUN signal output, there is a case where a fault output signal is not output and RUN signal is kept output even if an inverter fault occurs.

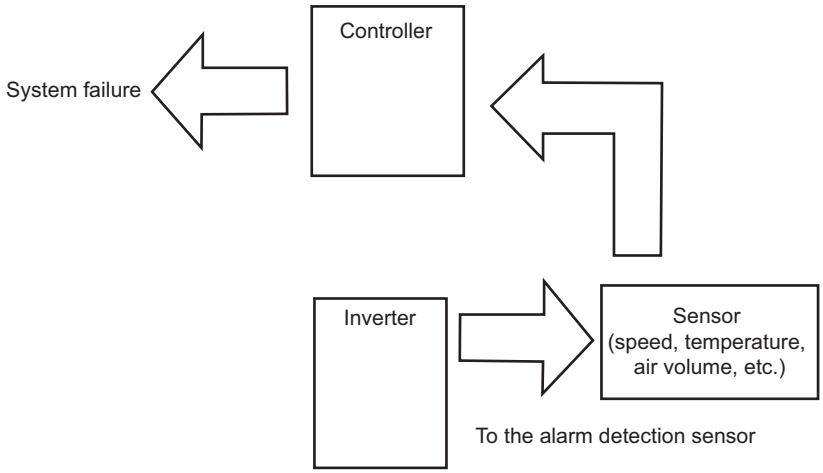
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as cheking up as below according to the level of importance of the system.

1) Start signal and actual operation check

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the motor current runs as the motor is running for the period until the motor stops since the inverter starts decelerating even if the start signal turns off. For the logic check, configure a sequence considering the inverter deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.

2) Command speed and actual operation check

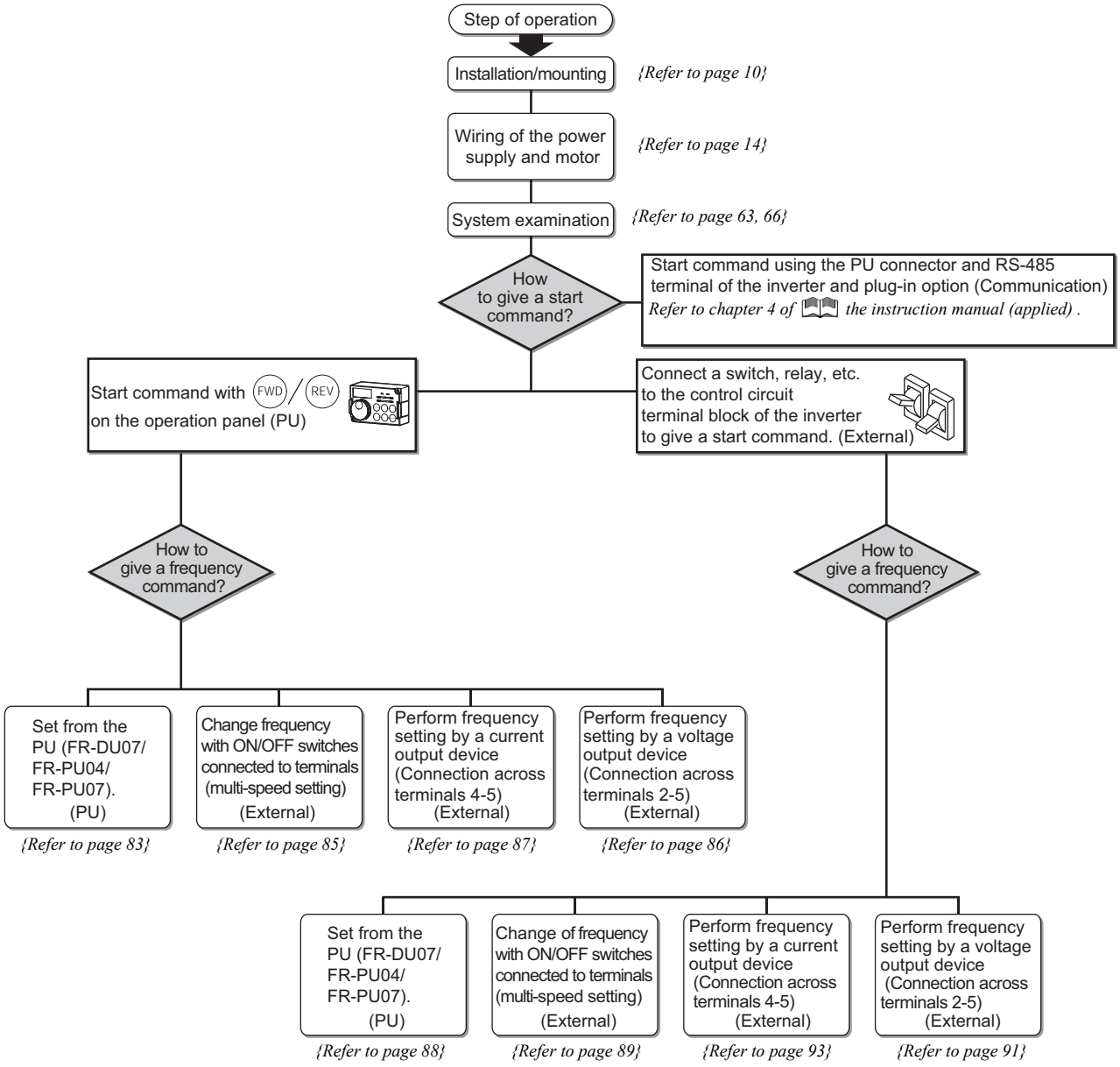
Check if there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.



4 DRIVE THE MOTOR

4.1 Step of operation

The inverter needs frequency command and start command. Turning the start command on start the motor rotating and the motor speed is determined by the frequency command (set frequency).
Refer to the flow chart below to perform setting.



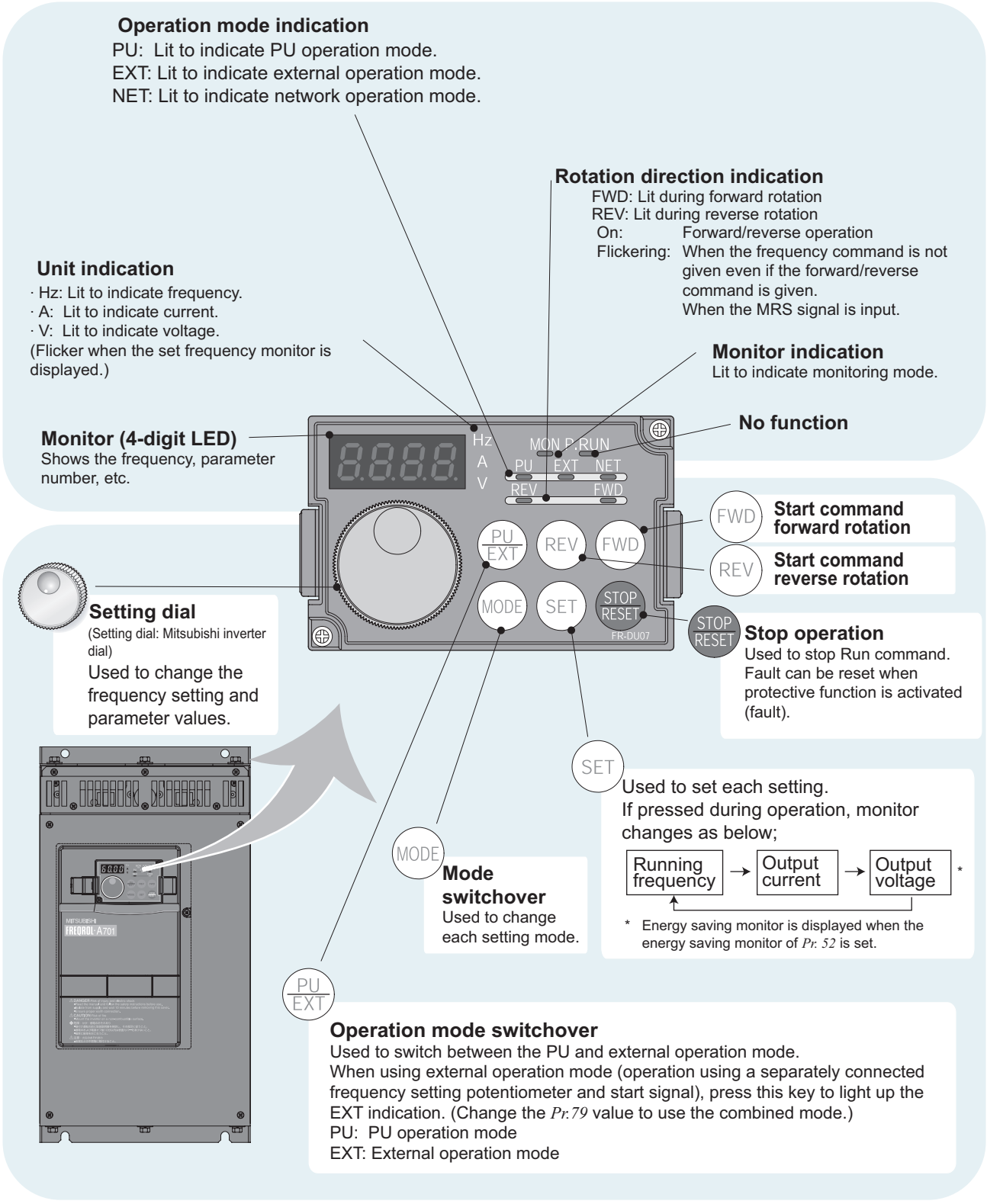
CAUTION

Check the following items before powering on the inverter.
- Check that the inverter is installed correctly in a correct place. *(Refer to page 10)*
- Check that wiring is correct. *(Refer to page 12)*
- Check that no load is connected to the motor.

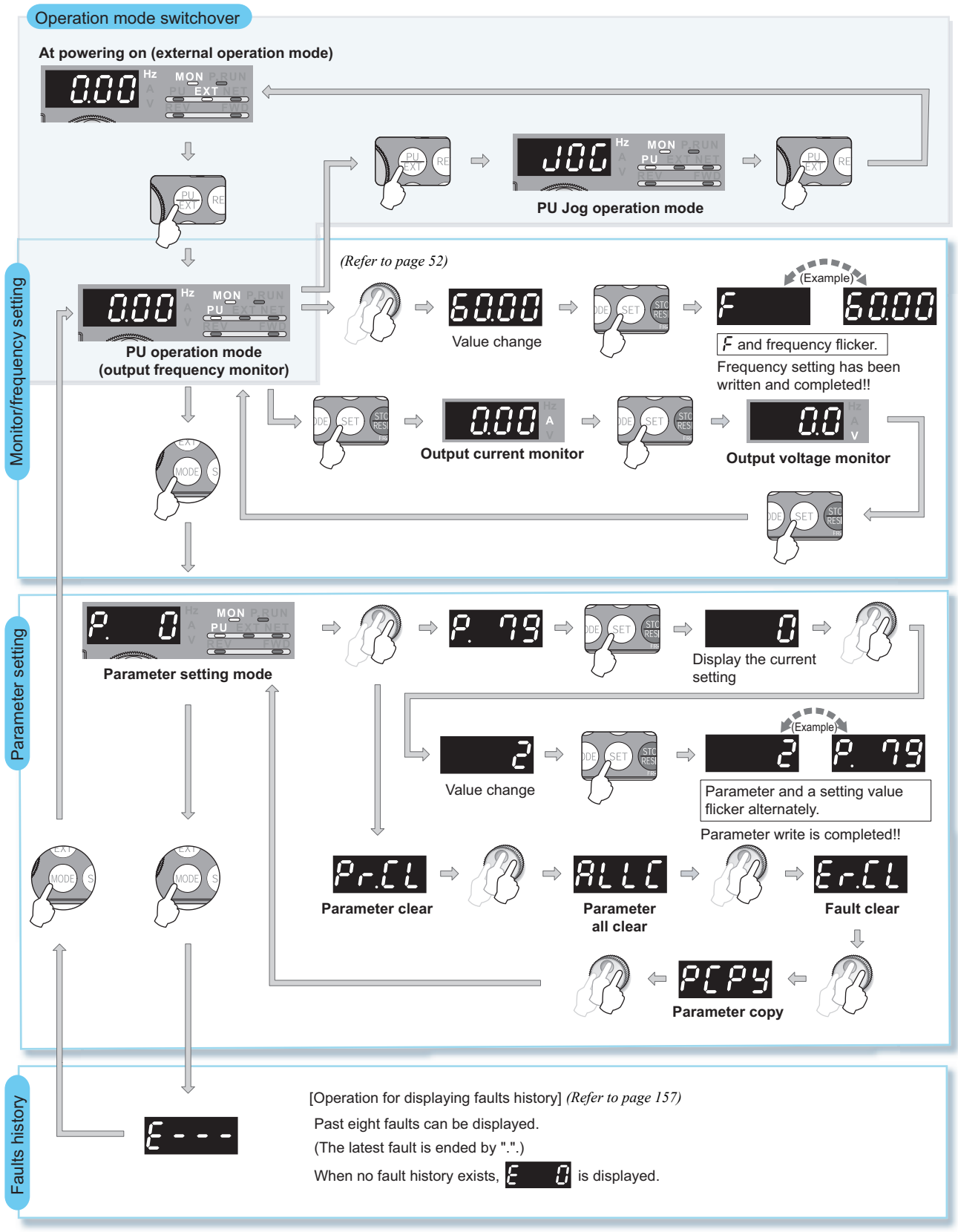
- *When protecting the motor from overheat by the inverter, set Pr.9 Electronic thermal O/L relay (Refer to page 57)*
- *When the rated frequency of the motor is 50Hz, set Pr.3 Base frequency (Refer to page 58)*

4.2 Operation panel (FR-DU07)

4.2.1 Parts of the operation panel (FR-DU07)



4.2.2 Basic operation (factory setting)



4.2.3 Operation lock (Press [MODE] for an extended time (2s))

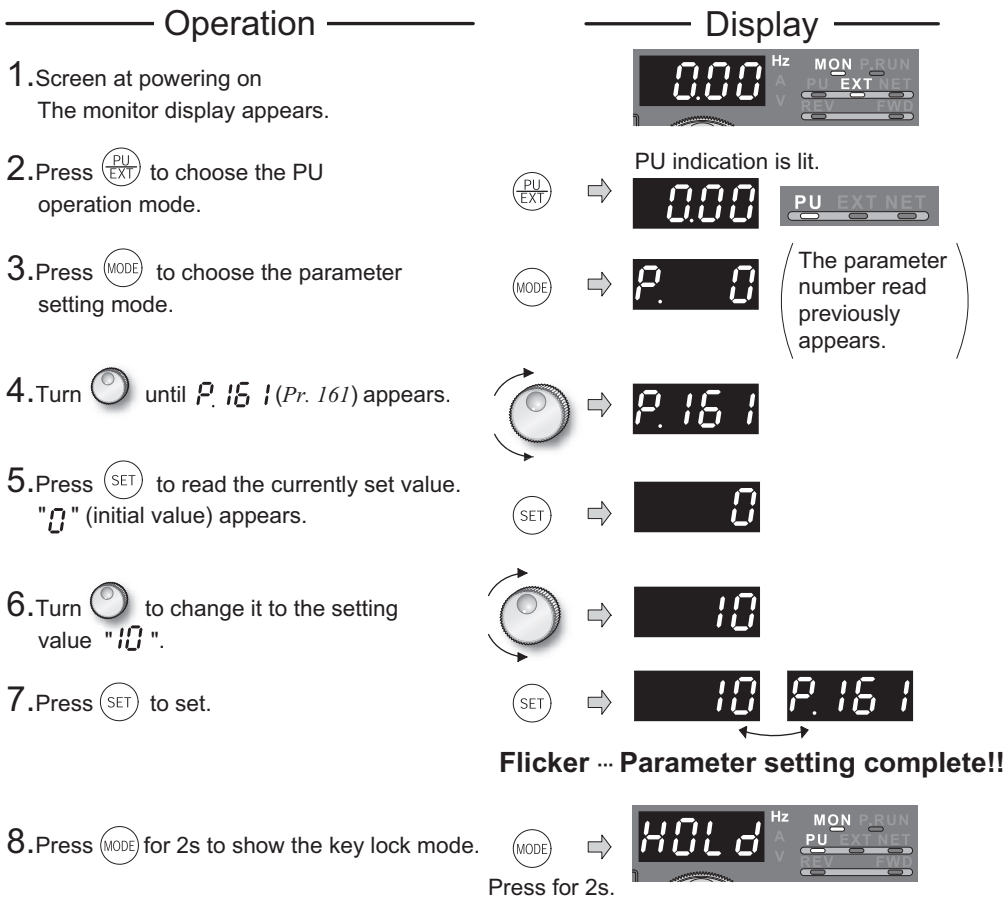
Operation using the setting dial and key of the operation panel can be made invalid to prevent parameter change, and unexpected start or frequency setting.

- Set "10 or 11" in *Pr. 161*, then press (MODE) for 2s to make the setting dial and key operation invalid.
- When the setting dial and key operation is made invalid, HOLd appears on the operation panel.

  When the setting dial and key operation is invalid, HOLd appears if the setting dial or key operation is performed. (When the setting dial or key operation is not performed for 2s, the monitor display appears.)
- To make the setting dial and key operation valid again, press (MODE) for 2s.

POINT

Set "10 or 11" (key lock mode valid) in *Pr.161 Frequency setting/key lock operation selection*.



Functions valid even in the operation lock status

Stop and reset with (STOP/RESET).

CAUTION

Release the operation lock to release the PU stop by key operation.

4.2.4 Monitoring of output current and output voltage

POINT

Monitor display of output frequency, output current and output voltage can be changed by pushing (SET) during monitoring mode.

Operation — Display

1. Press (MODE) during operation to choose the output frequency monitor

2. Independently of whether the inverter is running in any operation mode or at a stop, the output current monitor appears by pressing (SET).

(SET) ⇨

3. Press (SET) to show the output voltage monitor.

(SET) ⇨

4.2.5 First priority monitor

Hold down (SET) for 1s to set monitor description to be appeared first in the monitor mode.

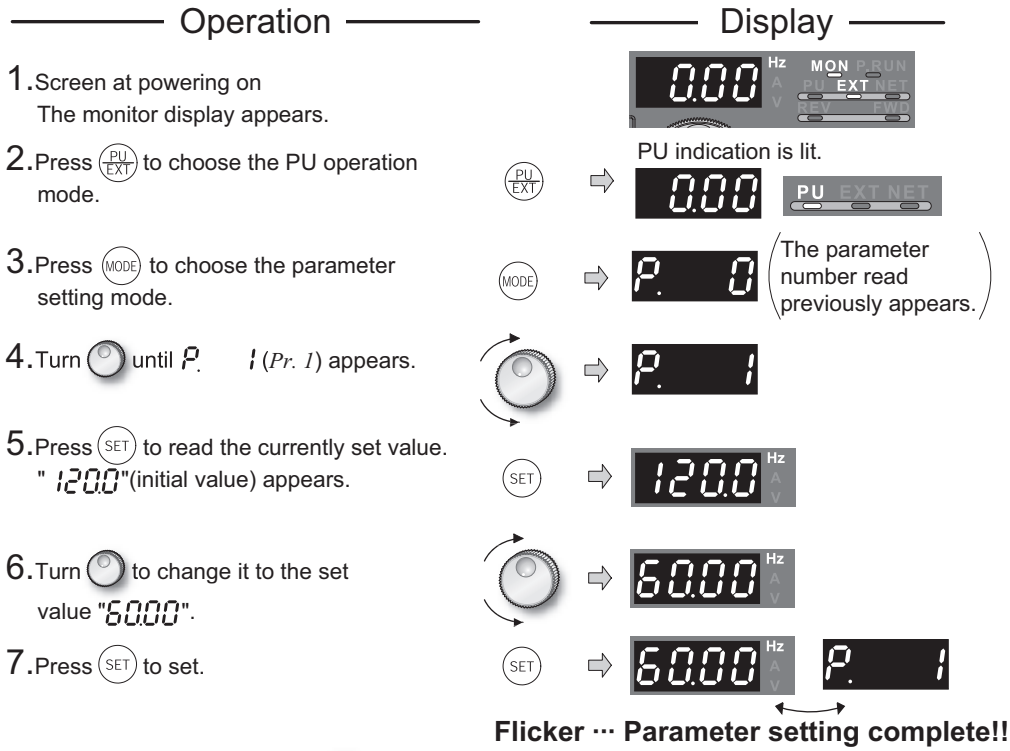
(To return to the output frequency monitor, hold down (SET) for 1s after displaying the output frequency monitor.)

4.2.6 Setting dial push

Push the setting dial () to display the set frequency currently set.

4.2.7 Change the parameter setting value

Changing example | Change the *Pr. 1 Maximum frequency* .



· By turning , you can read another parameter.
· Press SET to show the setting again.
· Press SET twice to show the next parameter.
· Press MODE twice to return the monitor to frequency monitor.

? Er 1 to Er 4 are displayed ... Why?

☞ Er 1 appears. ..... Write disable error
Er2 appears. ..... Write error during operation
Er 3 appears. ..... Calibration error
Er 4 appears. ..... Mode designation error

For details refer to *page 141*.

REMARKS

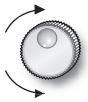
The number of digits displayed on the operation panel (FR-DU07) is four.
If the values to be displayed have five digits or more including decimal places, the fifth or later numerals can not be displayed nor set.

(Example) When *Pr. 1*
When 60Hz is set, 60.00 is displayed.
When 120Hz is set, 120.0 is displayed and second decimal place is not displayed nor set.

4.2.8 Parameter clear, all parameter clear

POINT

- Set "1" in *Pr. CL parameter clear , ALLC all parameter clear* to initialize all parameters. (Parameters are not cleared when "1" is set in *Pr. 77 Parameter write selection*.)
- Refer to the parameter list on *page 98* and later for parameters to be cleared with this operation.

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU/EXT ⇨  PU indication is lit.
3. Press MODE to choose the parameter setting mode.	MODE ⇨  (The parameter number read previously appears.)
4. Turn dial until "Pr.CL", "ALLC" appears.	 ⇨   Parameter clear All parameter clear
5. Press SET to read the currently set value. "0" (initial value) appears.	SET ⇨ 
6. Turn dial clockwise to change it to the setting value of "1".	 ⇨ 
7. Press SET to set.	SET ⇨    Parameter clear All parameter clear **Flicker ··· Parameter setting complete!!**

- Turn dial to read another parameter.
- Press SET to show the setting again.
- Press SET twice to show the next parameter.

?  and  are displayed alternately ... Why?

☞ The inverter is not in PU operation mode.

1. Press PU/EXT.

    is lit and the monitor (4 digit LED) displays "0" (*Pr. 79* = "0" (initial value)).
2. Carry out operation from step 6 again.

4.2.9 Parameter copy and parameter verification

PCPY Setting	Description
0	Cancel
1	Copy the source parameters to the operation panel.
2	Write the parameters copied to the operation panel into the destination inverter.
3	Verify parameters in the inverter and operation panel. *(Refer to page 55.)*

REMARKS

- When the copy destination inverter is not the FR-A701 series or parameter copy write is performed after parameter copy read is stopped, "model error (rE4)" is displayed.
- Refer to the parameter list on *page 98* and later for availability of parameter copy.
- When the power is turned off or an operation panel is disconnected, etc. during parameter copy write, perform write again or check the values by parameter verification.

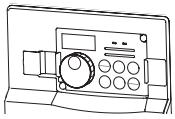
(1) Parameter copy

Parameter settings can be copied to multiple inverters.

Operation

1. Connect the operation panel to the copy source inverter.
   - **Connect it during a stop.**
2. Press (MODE) to choose the parameter setting mode.
3. Turn dial until PCPY (parameter copy) appears.
4. Press (SET) to read the currently set value. "0"(initial value) appears.
5. Turn dial to change it to the setting value "1".
6. Press (SET) to copy the source parameters to the operation panel.
7. Connect the operation panel to the copy source inverter.
8. After performing steps 2 to 5, turn dial to change it to "2".
9. Press (SET) to write the parameters copied to the operation panel to the destination inverter.
10. When copy is completed, "2" and "PCPY" flicker.
11. After writing the parameter values to the copy destination inverter, always reset the inverter, e.g. switch power off once, before starting operation.

Display



MODE → P. 0 (The parameter number previously read appears.)

dial → PCPY

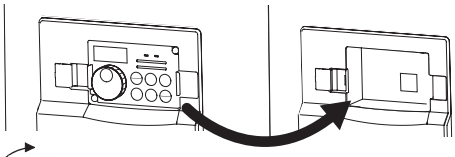
SET → 0

dial → 1

SET → 1 (Flickers for about 30s)

About 30s later → 1 PCPY

Flicker ··· Parameter copy complete!!



dial → 2

SET → 2 (The frequency flickers for about 30s)

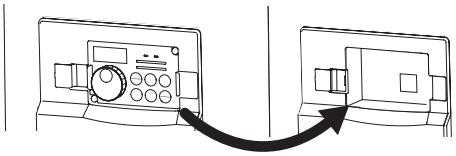
2 PCPY

Flicker ··· Parameter copy complete!!

? rE1 appears...Why? ☞ Parameter read error. Perform operation from step 3 again.
? rE2 appears...Why? ☞ Parameter write error. Perform operation from step 8 again.

(2) Parameter verification

Whether same parameter values are set in other inverters or not can be checked.

Operation	Display
1. Replace the operation panel on the inverter to be verified. • **Replace it during a stop.**	
2. Screen at powering on The monitor display appears.	
3. Press (MODE) to choose the parameter setting mode.	(MODE) ⇨ P. 0 (The parameter number read previously appears.)
4. Turn dial until PCPY (parameter copy) appears.	⇨ PCPY
5. Press (SET) to read the currently set value. "0"(initial value) appears.	(SET) ⇨ 0
6. Turn dial to change it to the set value "3"(parameter copy verification mode).	⇨ 3
7. Press (SET) to read the parameter setting of the verified inverter to the operation panel.	(SET) ⇨ 3 Flickers for about 30s
• If different parameters exist, different parameter numbers and rE3 flicker.	P 1 ↔ rE3
• Hold down (SET) to verify.	(SET) ⇨ 3 Flickering
8. It there is no difference, "PCPY" and "3" flicker to complete verification.	3 ↔ PCPY

Flicker ··· Parameter verification complete!!

REMARKS

When the copy destination inverter is not the FR-A701 series, "model error (rE4)" is displayed.

? rE3 flickers ... Why?
☞ Set frequencies, etc. may be different. Check set frequencies.

4.3 Before operation

4.3.1 Simple mode 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 *chapter 4 of the instruction manual (applied)*.

POINT

Only simple mode parameter can be displayed using *Pr.160 User group read selection*. (All parameters are displayed with the initial setting.) Set *Pr. 160 User group read selection* as required. (Refer to *page 52* for parameter change.)

Pr. 160	Description
9999	Only the simple mode parameters can be displayed.
0 (Initial Value)	Simple mode and extended mode parameters can be displayed.
1	Only the parameters registered in the user group can be displayed.

Parameter Number	Name	Increments	Initial Value	Range	Applications	Refer to
0	Torque boost	0.1%	3/2%*1	0 to 30%	Set to increase a starting torque or when the motor with a load will not rotate, resulting in an alarm [OL] and a trip [OC1] *1 The initial value differs according to the inverter capacity. (7.5K or less/11K or more)	59
1	Maximum frequency	0.01Hz	120Hz	0 to 120Hz	Set when the maximum output frequency need to be limited.	60
2	Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Set when the minimum output frequency need to be limited.	60
3	Base frequency	0.01Hz	60Hz	0 to 400Hz	Set when the rated motor frequency is 50Hz. Check the motor rating plate.	58
4	Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Set when changing the preset speed in the parameter with a terminal.	89
5	Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz		
6	Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz		
7	Acceleration time	0.1s	5/15s*2	0 to 3600s	Acceleration/deceleration time can be set. *2 The initial value differs according to the inverter capacity. (7.5K or less/11K or more)	61
8	Deceleration time	0.1s	5/15s*2	0 to 3600s		
9	Electronic thermal O/L relay	0.01A	Inverter rated current	0 to 500A	Protect the motor from overheat by the inverter. Set the rated motor current.	57
79	Operation mode selection	1	0	0, 1, 2, 3, 4, 6, 7	Select the operation command location and frequency command location.	62
125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum value of the potentiometer (5V initial value) can be changed.	92
126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum current input (20mA initial value) can be changed.	94
160	User group read selection	1	0	0, 1, 9999	Parameter which can be read from the operation panel and parameter unit can be restricted.	—

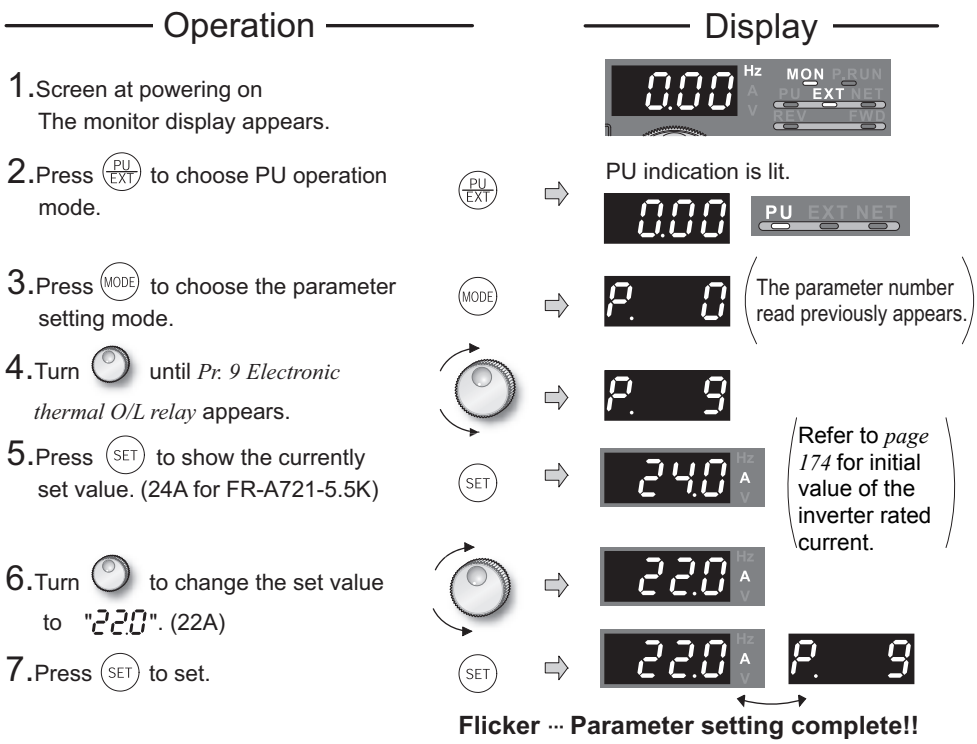
4.3.2 Overheat protection of the motor by the inverter (Pr. 9)

Set the rated motor current in *Pr. 9 Electronic thermal O/L relay* to protect the motor from overheat.

Parameter Number	Name	Initial Value	Setting Range *2	Description
9	**Electronic thermal O/L relay**	Inverter rated current *1	0 to 500A	Set the rated motor current.

*1 Refer to *page 174* for the rated inverter current value.
*2 The minimum setting increments are 0.01A.

Changing example — Change the *Pr. 9 Electronic thermal O/L relay* setting to 22A according to the motor rated current. (FR-A721-5.5K)



· By turning , you can read another parameter.
· Press SET to show the setting again.
· Press SET twice to show the next parameter.

REMARKS

· Since a thermal protector is provided for a vector control dedicated motor (SF-V5RU), set "0" in *Pr. 9*.

CAUTION

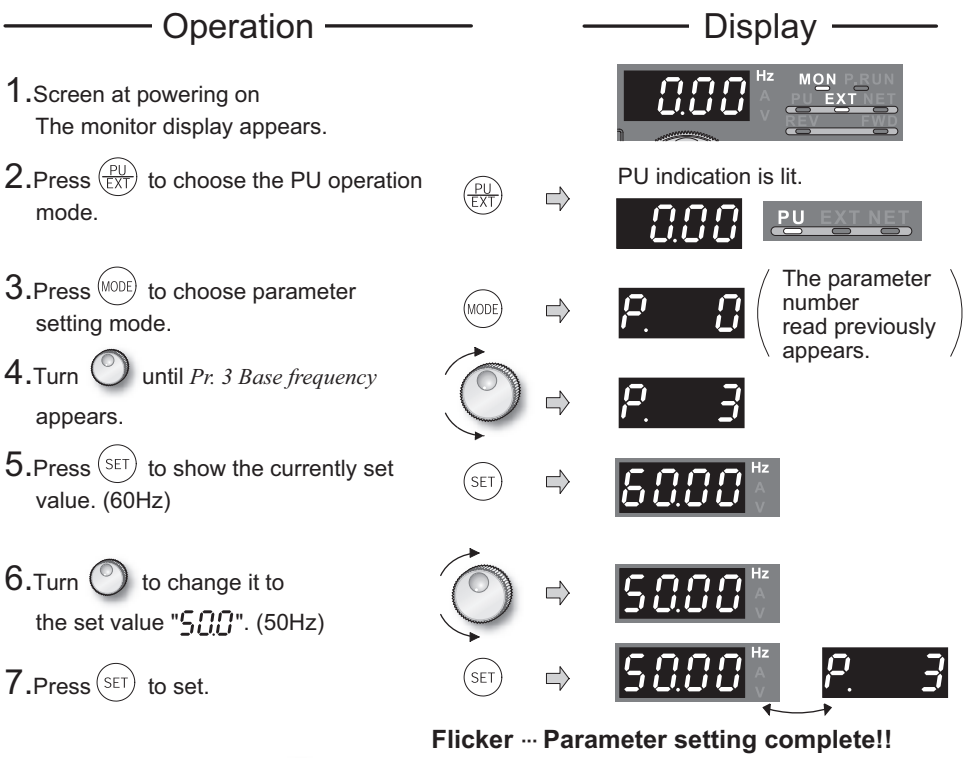
· Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
· When two or more motors are connected to the inverter, they cannot be protected by the electronic thermal relay function. Install an external thermal relay to each motor.
· When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
· A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.
· PTC thermistor output built-in the motor can be input to the PTC signal (AU terminal). For details, refer to *chapter 4 of the instruction manual (applied)*.

4.3.3 When the rated motor frequency is 50Hz (Pr. 3) V/F

First, check the motor rating plate. If a frequency given on the rating plate is "50Hz" only, always set *Pr. 3 Base frequency* to "50Hz". Leaving the base frequency unchanged from "60Hz" may make the voltage low and the torque insufficient. It may result in an inverter trip (E.OC☐) due to overload.

Parameter Number	Name	Initial Value	Setting Range	Description
3	**Base frequency**	60Hz	0 to 400Hz	Set the frequency when the motor rated torque is generated.

Changing example Change *Pr. 3 Base frequency* to 50Hz according to the motor rated frequency.



· By turning , you can read another parameter.

· Press SET to show the setting again.

· Press SET twice to show the next parameter.

REMARKS

· *Pr. 3* is invalid under advanced magnetic flux vector control, real sensorless vector control, and vector control and *Pr.84 Rated motor frequency* is valid.

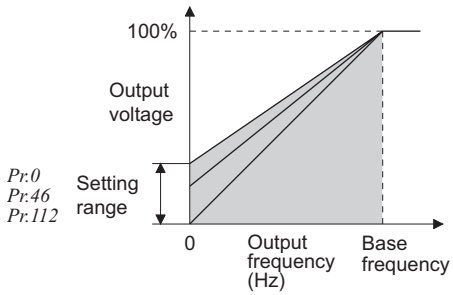
4.3.4 Increase the starting torque (Pr. 0) V/F

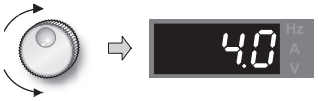
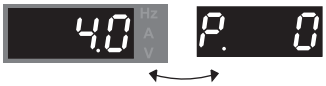
Set this parameter when "the motor with a load will not rotate", "an alarm [OL] is output, resulting in an inverter trip due to [OC1], etc.

Parameter Number	Name	Initial Value		Setting Range	Description
0	Torque boost	7.5K or less	3%	0 to 30%	Motor torque in the low-frequency range can be adjusted to the load to increase the starting motor torque.
		11K or more	2%		

Changing example

When the motor with a load will not rotate, increase the *Pr. 0* value 1% by 1% unit by looking at the motor movement. (The guideline is for about 10% change at the greatest.)



Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose PU operation mode.	PU indication is lit. 
3. Press MODE to choose the parameter setting mode.	 (The parameter number read previously appears.)
4. Turn dial until P. 0 (*Pr. 0*) appears.	
5. Press SET to read the currently set value. "3.0"(initial value is 3% for the 5.5K) appears.	 (The initial value differs according to the capacity.)
6. Turn dial to change it to the set value "4.0".	
7. Press SET to set.	

Flicker ··· Parameter setting complete!!

· By turning dial, you can read another parameter.

· Press SET to show the setting again.

· Press SET twice to show the next parameter.

REMARKS

· A too large setting may cause the motor to overheat, resulting in an overcurrent trip (OL (overcurrent alarm) then E.OC1 (overcurrent trip during acceleration)), overload trip (E.THM (motor overload trip), and E.THT (inverter overload trip)). (When a fault occurs, release the start command, and decrease the *Pr. 0* setting 1% by 1% to reset.)

POINT

If the inverter still does not operate properly after the above measures, adjust *Pr. 80*, *Pr. 81* (Advanced magnetic flux vector control), *Pr.800* (Real sensorless vector control). The *Pr.0* setting is invalid under advanced magnetic flux vector control, real sensorless vector control and vector control. *(Refer to chapter 4 of the instruction manual (applied).)*

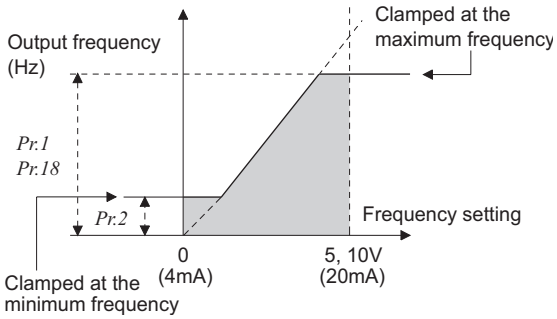
4.3.5 Limit the maximum and minimum output frequency (Pr. 1, Pr. 2)

Motor speed can be limitted.

Parameter Number	Name	Initial Value	Setting Range	Description
1	**Maximum frequency**	120Hz	0 to 120Hz	Set the upper limit of the output frequency.
2	**Minimum frequency**	0Hz	0 to 120Hz	Set the lower limit of the output frequency.

Changing example

Limit the frequency set by the potentiometer, etc. to 60Hz maximum.
(Set "60"Hz in *Pr. 1 Maximum frequency*.)



Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU indication is lit. 
3. Press MODE to choose the parameter setting mode.	 (The parameter number read previously appears.)
4. Turn dial until P. 1 (*Pr. 1*) appears.	
5. Press SET to read the currently set value. " 120.0"(initial value) appears.	
6. Turn dial to change it to the set value "60.00".	
7. Press SET to set.	

Flicker ··· Parameter setting complete!!

· By turning dial, you can read another parameter.
· Press SET to show the setting again.
· Press SET twice to show the next parameter.

REMARKS

- The output frequency is clamped by the *Pr. 2* setting even if the set frequency is lower than the *Pr. 2* setting (The frequency will not decrease to the *Pr. 2* setting.)
  Note that *Pr. 15 Jog frequency* has higher priority than the minimum frequency.
- When the *Pr. 1* setting is changed, frequency higher than the *Pr. 1* setting can not be set by dial.
- When performing a high speed operation at 120Hz or more, setting of *Pr. 18 High speed maximum frequency* is necessary.
  (Refer to chapter 4 of the instruction manual (applied).)

⚠ CAUTION

⚠ If the *Pr. 2* setting is higher than the *Pr. 13 Starting frequency* value, note that the motor will run at the set frequency according to the acceleration time setting by merely switching the start signal on, without entry of the command frequency.

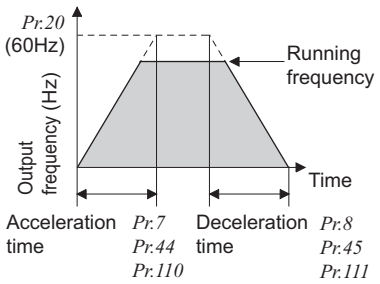
4.3.6 Change acceleration and deceleration time (Pr. 7, Pr. 8)

Set in *Pr. 7 Acceleration time* a larger value for a slower speed increase and a smaller value for a faster speed increase.
Set in *Pr. 8 Deceleration time* a larger value for a slower speed decrease and a smaller value for a faster speed decrease.

Parameter Number	Name	Initial Value		Setting Range	Description
7	Acceleration time	7.5K or less	5s	0 to 3600/360s *	Set the motor acceleration time.
		11K or more	15s		
8	Deceleration time	7.5K or less	5s	0 to 3600/360s *	Set the motor deceleration time.
		11K or more	15		

* Depends on the *Pr. 21 Acceleration/deceleration time increments* setting. The initial value for the setting range is "0 to 3600s" and setting increments is "0.1s".

Changing example — Change the *Pr. 7 Acceleration time* setting from "5s" to "10s".



Operation — **Display**

1. Screen at powering on
   The monitor display appears.

2. Press PU/EXT to choose the PU operation mode.

PU indication is lit.

3. Press MODE to choose the parameter setting mode.

(The parameter number read previously appears.)

4. Turn dial until P. 7 (*Pr. 7*) appears.

5. Press SET to read the currently set value.
   "5.0"(initial value) appears.

(The initial value differs according to the capacity.)

6. Turn dial to change it to the set value "10.0".

7. Press SET to set.

Flicker ··· Parameter setting complete!!

· By turning dial, you can read another parameter.
· Press SET to show the setting again.
· Press SET twice to show the next parameter.

4.3.7 Selection of the start command and frequency command locations (Pr. 79)

Select the start command location and frequency command location.

<table>
<tr><th>Parameter Number</th><th>Name</th><th>Initial Value</th><th>Setting Range</th><th>Description</th><th>LED Indication
: Off
: On</th></tr>
<tr><td rowspan="7">79</td><td rowspan="7">Operation mode selection</td><td rowspan="7">0</td><td>0</td><td>Use external/PU switchover mode (press PU/EXT to switch between the PU and external operation mode. (Refer to page 83))
At power on, the inverter is placed in external operation mode.</td><td>External operation mode
PU EXT NET
PU operation mode
PU EXT NET</td></tr>
<tr><td>1</td><td>Fixed to PU operation mode</td><td>PU EXT NET</td></tr>
<tr><td>2</td><td>Fixed to external operation mode
Operation can be performed by switching between the external and NET operation mode.</td><td>External operation mode
PU EXT NET
NET operation mode
PU EXT NET</td></tr>
<tr><td rowspan="3">3</td><td>External/PU combined operation mode 1</td><td rowspan="4">PU EXT NET</td></tr>
<tr><td>Frequency command | Start command</td></tr>
<tr><td>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)). *1 | External signal input (terminal STF, STR)</td></tr>
<tr><td rowspan="3">4</td><td>External/PU combined operation mode 2</td></tr>
<tr><td>Frequency command | Start command</td></tr>
<tr><td>External signal input (Terminal 2, 4, 1, JOG, multi-speed selection, etc.) | Input from the PU (FR-DU07/FR-PU04/FR-PU07) (FWD, REV)</td><td>PU operation mode
PU EXT NET
External operation mode
PU EXT NET
NET operation mode
PU EXT NET</td></tr>
<tr><td>6</td><td>Switchover mode
Switch among PU operation, external operation, and NET operation while keeping the same operating status.</td></tr>
<tr><td>7</td><td>External operation mode (PU operation interlock)
X12 signal ON *2
Operation mode can be switched to PU operation mode.
(output stop during external operation)
X12 signal OFF *2
Operation mode can not be switched to the PU operation mode.</td><td>PU operation mode
PU EXT NET
External operation mode
PU EXT NET</td></tr>
</table>

*1 The priorities of the frequency commands when *Pr. 79* = "3" are "Multi-speed operation (RL/RM/RH/REX) > PID control (X14) > terminal 4 analog input (AU) > digital input from the operation panel".

*2 For the terminal used for the X12 signal (PU operation interlock signal) input, set "12" in *Pr. 178 to Pr. 189 (input terminal function selection)* to assign functions.

For *Pr. 178 to Pr. 189*, refer to *chapter 4 of* 📖 *the instruction manual (applied).*
When the X12 signal is not assigned, function of the MRS signal switches from MRS (output stop) to PU operation interlock signal.

4.3.8 Large starting torque and low speed torque are necessary (advanced magnetic flux vector control, real sensorless vector control) (Pr. 71, Pr. 80, Pr. 81, Pr. 800)

Magnetic flux Sensorless

Advanced magnetic flux vector control can be selected by setting the capacity, poles and type of the motor used in *Pr. 80* and *Pr. 81*. Real sensorless vector control can be selected for applications requiring high accuracy and fast response control. Perform offline auto tuning and online auto tuning when using real sensorless vector control.

- What is advanced magnetic flux vector control?
  The low speed torque can be improved by providing voltage compensation so that the motor current which meets the load torque to flow. Output frequency compensation (slip compensation) is made so that the motor actual speed approximates a speed command value. Effective when load fluctuates drastically, etc.
  Low-speed torque is improved as compared to V/F control. In addition, speed accuracy is improved when load is applied.
- What is real sensorless vector control?
  This function enables vector control with a general-purpose motor without encoder. Low speed torque and speed accuracy are improved as compared to advanced magnetic flux vector control. Always perform offline auto tuning and online auto tuning when using real sensorless vector control.
  Real sensorless vector control is suitable for the following applications.
  · To minimize the speed fluctuation even at a severe load fluctuation
  · To generate low speed torque
  · To prevent machine from damage due to too large torque (torque limit)
  · To perform torque control

Parameter Number	Name	Initial Value	Setting Range	Description	
71	Applied motor	0	0 to 8, 13 to 18, 30, 33, 34, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant torque motor, thermal characteristic and motor constants of each motor are set.	
80	Motor capacity	9999	0.4 to 55kW	Set the applied motor capacity.	
			9999	V/F control	
81	Number of motor poles	9999	2, 4, 6, 8, 10	Set the number of motor poles.	
			12, 14, 16, 18, 20	X18 signal-ON:V/F control *	Set 10 + number of motor poles.
			9999	V/F control	
800	Control method selection	20	0 to 5	Vector control *(Refer to page 66)*	
			9	Vector control test operation	
			10	Speed control	Real sensorless vector control
			11	Torque control	
			12	MC signal-ON:torque MC signal-OFF:speed *	
			20	V/F control (advanced magnetic flux vector control)	

* Use *Pr. 178 to Pr. 189* to assign the terminals used for the X18 and MC signal. *(Refer to chapter 4 of the instruction manual (applied).)*

POINT

If the following conditions are not satisfied, select V/F control since malfunction such as insufficient torque and uneven rotation may occurr.

- The motor capacity should be equal to or one rank lower than the inverter capacity.
- Motor to be used is either Mitsubishi standard motor, high efficiency motor (SF-JR, SF-HR two-pole, four-pole, six-pole 3.7kW or more) or Mitsubishi constant torque motor (SF-JRCA four-pole, SF-HRCA 3.7kW or more). When using a motor other than the above (other manufacturer's motor), perform offline auto tuning without fail. (advanced magnetic flux vector control)
  When performing real sensorless vector control, offline auto tuning are necessary even when Mitsubishi motor is used.
- Single-motor operation (one motor run by one inverter) should be performed.
- The wiring length from inverter to motor should be within 30m. (Perform offline auto tuning in the state where actual wiring work is performed when the wiring length exceeds 30m.)

CAUTION

- Uneven rotation slightly increases as compared to the V/F control. (It is not suitable for machines such as grinding machine and wrapping machine which requires less uneven rotation at low speed.)
- Changing the terminal assignment using *Pr. 178 to Pr. 189 (input terminal function selection)* may affect the other functions. Please make setting after confirming the function of each terminal.
- When advanced magnetic flux vector control is performed with a surge voltage suppression filter (FR-ASF-H) connected, output torque may decrease.
- Do not perform real sensorless vector control with a surge voltage suppression filter (FR-ASF-H) connected.

<Selection method of advanced magnetic flux vector control>

Perform secure wiring. *(Refer to page 12.)*

↓

Set the motor. *(Pr. 71) (Refer to page 63.)*

Motor		*Pr. 71* Setting *1	Remarks
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR	0 (initial value)	
	SF-HR	40	
	Others	3	Offline auto tuning is necessary.*2
Mitsubishi constant-torque motor	SF-JRCA 4P	1	
	SF-HRCA	50	
	Others (SF-JRC, etc.)	13	Offline auto tuning is necessary. *2
Other manufacturer's standard motor	–	3	Offline auto tuning is necessary. *2
Other manufacturer's constant torque motor	–	13	Offline auto tuning is necessary. *2

*1 For other settings of *Pr. 71* , refer to *chapter 4 of the instruction manual (applied).*

*2 Refer to *page 71* for offline auto tuning.

↓

Set the motor capacity and the number of motor poles according as required.
(Pr. 80, Pr. 81) (Refer to page 63.)

↓

Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).

Set the run command. *(Refer to page 83.)*

↓

Select the start command and speed command.
(1) Start command

1) Operation panel: Setting by pressing FWD/REV of the operation panel
2) External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)

(2)Speed command

1) Operation panel: Setting by pressing of the operation panel
2) External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).
3) Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

↓

Test run

As required

- Perform offline auto tuning. *(Pr.96) (refer to page 71).*
- Select online auto tuning. *(Pr.95) (refer to page 76).*

REMARKS

- When higher accuracy operation is necessary, set real sensorless vector control after performing offline auto tuning and select real sensorless vector control.
- Use *Pr. 89* to adjust the motor speed fluctuation at load fluctuation. *(Refer to chapter 4 of the instruction manual (applied).)*

<Selection method of real sensorless vector control (speed control) >

Speed control is exercised to match the speed command and actual motor speed.

Perform secure wiring. *(Refer to page 12.)*

↓

Set the motor. *(Pr. 71)* *(Refer to page 64.)*

↓

Set "3" (standard motor) or "13" (constant torque motor) in *Pr. 71 Applied motor*.

Set the motor capacity and the number of motor poles. *(Pr. 80, Pr. 81)* *(Refer to page 75.)*

↓

Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*.
(V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 63)*

↓

Set "10" (speed control) or "12" (speed-torque switchover) in *Pr. 800* and make speed control valid.

Set the operation command. *(Refer to page 83)*

↓

Select the start command and speed command.

(1) Start command

1) Operation panel: Setting by pressing FWD / REV of the operation panel

2) External command: Setting by forward rotation and reverse rotation command (terminal STF or STR)

(2) Speed command

1) Operation panel: Setting by turning of the operation panel

2) External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).

3) Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

Set the torque limit. *(Pr. 810)*
(Refer to chapter 4 of the instruction manual (applied).)

↓

Perform offline auto tuning. *(Pr. 96)* *(Refer to page 71.)*

↓

Test run

As required

- Easy gain tuning *(Refer to page 77)*
- Select online auto tuning. *(Pr. 95)* *(Refer to page 76)*
- Manual input speed control gain adjustment *(Refer to page 79)*

CAUTION

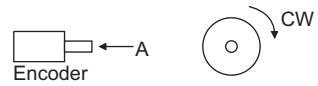
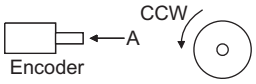
- Make sure to perform offline auto tuning before performing real sensorless vector control.
- Speed command setting range is 0 to 120Hz for real sensorless vector control.
- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for real sensorless vector control.
- Torque control can not be performed in the low speed (approx. 10Hz or less) regeneration range and with light load at low speed (approx. 20% or less of rated torque at approx. 5Hz or less). 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 trip (E.OC☐) or opposite rotation deceleration fault (E.11) occurs.
- 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").
- Enough torque may not be generated in the ultra-low speed range less than approx. 2Hz when performing real sensorless vector control.
  The guideline of speed control range is as shown below.

Driving:	1:200	(2, 4, 6 poles)	Can be used at 0.3Hz or more at rated 60Hz
	1:30	(8, 10 poles)	Can be used at 2Hz or more at rated 60Hz
Regeneration:	1:12	(2 to 10 poles)	Can be used at 5Hz or more at rated 60Hz

4.3.9 Higher accuracy operation using a motor with encoder (Vector control) (Pr.71, Pr.80, Pr.81, Pr.359, Pr.369, Pr.800) Vector

Full-scale vector control can be performed fitting the FR-A7AP and using a motor with encoder. Fast response/ high accuracy speed control (zero speed control, servo lock), torque control, and position control can be performed.

- What is vector control?
  Excellent control characteristics when compared to V/F control and other control techniques, achieving the control characteristics equal to those of DC machines.
  It is suitable for applications below.
  · To minimize the speed fluctuation even at a severe load fluctuation
  · To generate low speed torque
  · To prevent machine from damage due to too large torque (torque limit)
  · To perform torque control or position control
  · Servo-lock torque control which generates a torque at zero speed (i.e. status of motor shaft = stopped)

Parameter Number	Name	Initial Value	Setting Range	Description	
71	Applied motor	0	0 to 8, 13 to 18, 30, 33, 34, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant torque motor, thermal characteristic and motor constants of each motor are set.	
80	Motor capacity	9999	0.4 to 55kW	Set the applied motor capacity.	
			9999	V/F control	
81	Number of motor poles	9999	2, 4, 6, 8, 10	Set the number of motor poles.	
			12, 14, 16, 18, 20	X18 signal-ON:V/F control *	Set 10 + number of motor poles.
			9999	V/F control	
359	Encoder rotation direction	1	0	 Clockwise direction as viewed from A is forward rotation	
			1	 Counter clockwise direction as viewed from A is forward rotation	
369	Number of encoder pulses	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	
800	Control method selection	20	0	Speed control	Vector control
			1	Torque control	
			2	MC signal-ON:torque MC signal-OFF:speed *	
			3	Position control	
			4	MC signal-ON:position MC signal-OFF:speed *	
			5	MC signal-ON:torque MC signal-OFF:position *	
			9	Vector control test operation *(Refer to chapter 4 of the instruction manual (applied).)*	
			10 to 12	Real sensorless vector control *(Refer to page 64)*	
			20	V/F control (advanced magnetic flux vector control)	

* Use *Pr. 178 to Pr. 189* to assign the terminals used for the X18 and MC signal. *(Refer to chapter 4 of the instruction manual (applied).)*

POINT

If the conditions below are not satisfied, malfunction such as insufficient torque and uneven rotation may occur.

- The motor capacity should be equal to or one rank lower than the inverter capacity.
- Motor to be used is either Mitsubishi standard motor with encoder, high efficiency motor (SF-JR, SF-HR two-pole, four-pole, six-pole 3.7kW or more) or Mitsubishi constant torque motor (SF-JRCA four-pole, SF-HRCA 3.7kW or more) or vector control dedicated motor (SF-V5RU). When using a motor other than the above (other manufacturer's motor), perform offline auto tuning without fail.
- Single-motor operation (one motor run by one inverter) should be performed.
- Wiring length from inverter to motor should be within 30m. (Perform offline auto tuning in the state where wiring work is performed when the wiring length exceeds 30m.)

CAUTION

- Changing the terminal assignment using *Pr. 178 to Pr. 189 (input terminal function selection)* may affect the other functions. Make setting after confirming the function of each terminal.
- Do not perform vector control with a surge voltage suppression filter (FR-ASF-H) connected.

<Selection method of speed control>

Speed control is exercised to match the speed command and actual motor speed.

Perform secure wiring. *(Refer to page 31.)*

↓ Mount the FR-A7AP.

Set the motor and encoder. *(Pr. 71, Pr. 359, Pr. 369)*

↓ Set *Pr. 71 Applied motor*, *Pr. 359 Encoder rotation direction* and *Pr. 369 Number of encoder pulses* according to the motor and encoder used. *(Refer to page 33.)*

Set the motor capacity and the number of motor poles *(Pr. 80, Pr. 81) (Refer to page 66.)*

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 66.)*

↓ Make speed control valid by selecting "0" (speed control), "2" (speed-torque switchover), or "4" (speed-position switchover) for *Pr. 800*.

Set the run command. *(Refer to page 84.)*

↓ Select the start command and speed command.

(1) Start command

1)Operation panel: Setting by pressing FWD / REV of the operation panel

2)External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)

(2)Speed command

1)Operation panel: Setting by pressing of the operation panel

2)External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).

3)Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

Set the torque limit. *(Pr. 810)*

(Refer to chapter 4 of the instruction manual (applied).)

↓

Test run

As required

- Perform offline auto tuning. *(Pr. 96) (refer to page 71)*.
- Select online auto tuning. *(Pr. 95) (refer to page 76)*.
- Easy gain tuning *(refer to page 77)*
- Manual input speed control gain adjustment *(refer to page 79)*

CAUTION

- Speed command setting range is 0 to 120Hz for vector control.
- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control.

<Selection method of torque control>

- Torque control is exercised to develop torque as set in the torque command.
- The motor speed becomes constant when the motor output torque and load torque are balanced. For torque control, therefore, the speed is determined by the load.
- For torque control, the motor gains speed as the motor output torque becomes greater than the motor load. To prevent overspeed, set the speed limit value so that the motor speed does not increase too high. (Speed control is exercised during speed limit and torque control is disabled.)
- When speed limit is not set, the speed limit value setting is regarded as 0Hz to disable torque control.

Perform secure wiring. *(Refer to page 31.)*

↓ Mount the FR-A7AP.

Set the motor and encoder. *(Pr. 71, Pr. 359, Pr. 369)*

↓ Set *Pr. 71 Applied motor*, *Pr. 359 Encoder rotation direction* and *Pr. 369 Number of encoder pulses* according to the motor and encoder used. *(Refer to page 33.)*

Set the motor capacity and the number of motor poles. *(Pr. 80, Pr. 81)*
(Refer to page 66.)

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles in *Pr. 81 Number of motor poles*.
(V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 66.)*

↓ Set either "1" (torque control), "2" (speed-torque switchover) or "5" (position-torque switchover) in *Pr. 800* and make torque control valid.

Set the torque command. *(Pr. 804)*
(Refer to chapter 4 of the instruction manual (applied).)

↓

Set the speed limit. *(Pr. 807)*
(Refer to chapter 4 of the instruction manual (applied).)

↓

Test run

As required

- Perform offline auto tuning. *(Pr. 96) (refer to page 71).*
- Select online auto tuning. *(Pr. 95) (refer to page 76).*
- Manual input torque control gain adjustment *(refer to chapter 4 of the instruction manual (applied))*

CAUTION

- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control.

<Selection method of position control>

- In the position control, the speed command is calculated so that the difference between command pulse (or parameter setting) and the number of feedback pulses from the encoder is zero to run the motor.
- This inverter can perform conditional position feed by contact input and position control by inverter conditional pulse input.

Perform secure wiring. *(Refer to page 32.)*

↓ Mount the FR-A7AP.

Set the motor and encoder. *(Pr. 71, Pr. 359, Pr. 369)*

↓ Set *Pr. 71 Applied motor*, *Pr. 359 Encoder rotation direction* and *Pr. 369 Number of encoder pulses* according to the motor and encoder used. *(Refer to page 33.)*

Set the motor capacity and the number of motor poles. *(Pr. 80, Pr. 81) (Refer to page 66.)*

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 66.)*

↓ Make speed control valid by selecting "3" (position control) "4" (speed-position switchover) or "5" (position-torque switchover) for *Pr. 800*.

Selection of position command source. *(Pr. 419)*

↓ Position command by contact input
Set "0" (initial value) in *Pr. 419*.

Setting of parameter for position feed *(Pr. 465 to Pr. 494)*. *(Refer to chapter 4 of the instruction manual (applied).)*

↓ Position command by inverter pulse train input
Set "2" in *Pr. 419*.

Selection of command pulse form. *(Pr. 428)* *(Refer to chapter 4 of the instruction manual (applied).)*

↓

Test run

As required

- Set the electronic gear. *(refer to chapter 4 of the instruction manual (applied))*
- Setting of positioning adjustment parameter *(refer to chapter 4 of the instruction manual (applied))*
- Gain adjustment of position control *(refer to chapter 4 of the instruction manual (applied))*

CAUTION

- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control.

4.3.10 To exhibit the best performance of the motor performance (offline auto tuning) (Pr. 71, Pr. 83, Pr. 84, Pr. 96) Magnetic flux Sensorless Vector

The motor performance can be maximized with offline auto tuning.

- What is offline auto tuning?
  When performing advanced magnetic flux vector control, real sensorless vector control or vector control, the motor can be run with the optimum operating characteristics by automaticaly measuring the motor constants (offline auto tuning) even when each motor constants differs, other manufacturer's motor is used, or the wiring length is long.

Parameter Number	Name	Initial Value	Setting Range	Description
71	**Applied motor**	0	0 to 8, 13 to 18, 30, 33, 34, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant torque motor, thermal characteristic and motor constants of each motor are set.
83	**Rated motor voltage**	200/400V *	0 to 1000V	Set the rated motor voltage(V). * The initial value differs according to the voltage level. (200V/400V)
84	**Rated motor frequency**	60Hz	10 to 120Hz	Set the rated motor frequency (Hz).
96	**Auto tuning setting/ status**	0	0	Offline auto tuning is not performed
			1	Offline auto tuning is performed without motor running
			101	Offline auto tuning is performed with motor running

POINT

- This function is made valid only when a value other than "9999" is set in *Pr. 80* and *Pr. 81* and advanced magnetic flux vector control, real sensorless vector control or vector control is selected.
- You can copy the offline auto tuning data (motor constants) to another inverter with the PU (FR-DU07/FR-PU07).
- Even when motors (other manufacturer's motor, SF-JRC, etc.) other than Mitsubishi standard motor, high efficiency motor (SF-JR SF-HR 3.7kW or more), Mitsubishi constant-torque motor (SF-JRCA four-pole, SF-HRCA 3.7kW or more) and vector control dedicated motor (SF-V5RU (1500r/min series)) are used or the wiring length is long, using the offline auto tuning function runs the motor with the optimum operating characteristics.
- Tuning is enabled even when a load is connected to the motor. (As the load is lighter, tuning accuracy is higher. Tuning accuracy does not change even if the inertia is large.)
- For the offline auto tuning, you can select either the motor non-rotation mode (*Pr. 96* = "1") or rotation mode (*Pr. 96* = "101").
- The rotation mode has higher tuning accuracy than the non-rotation mode.
- Reading/writing/copy of motor constants tuned by offline auto tuning are enabled.
- The offline auto tuning status can be monitored with the PU (FR-DU07/FR-PU07/FR-PU04).
- Do not use an inverter with a surge voltage suppression filter (FR-ASF-H) connected between the inverter and motor.

(1) Before performing offline auto tuning

Check the following before performing offline auto tuning.

- Make sure advanced magnetic flux vector control *(Pr. 80, Pr. 81)*, real sensorless vector control or vector control *(Pr. 800)* is selected. *(Refer to page 63)*
- A motor should be connected. Note that the motor should be at a stop at a tuning start.
- The motor capacity should be equal to or one rank lower than the inverter capacity.
- The maximum frequency is 120Hz.
- Motors such as high-slip motor, high-speed motor and special motor cannot be tuned.
- Even if tuning is performed without motor running (*Pr. 96 Auto tuning setting/status* = "1"), 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. (Caution is required especially in vertical lift applications). Note that if the motor runs slightly, tuning performance is unaffected.
- Note the following when selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status* = "101").
  Torque is not enough during tuning.
  The motor may be run at nearly its rated speed.
  The brake is open.
  No external force is applied to rotate the motor.
- Offline auto tuning will not be performed properly if it is performed with a surge voltage suppression filter (FR-ASF-H) connected between the inverter and motor. Remove it before starting tuning.
- When exercising vector control, use the encoder that is coupled directly to the motor shaft without looseness.
  Speed ratio should be 1:1.

(2) Setting

1) Select the advanced magnetic flux vector control, real sensorless vector control or vector control.
2) Set "1" or "101" in *Pr. 96 Auto tuning setting/status* .
   · When the setting is "1" . . . . . Tuning is performed without motor running.
   It takes approximately 25 to 120s * until tuning is completed.
   (Excitation noise is produced during tuning.)
   *Tuning time differs according to the inverter capacity and motor type.
   · When the setting is "101" . . . . . Tuning is performed with motor running.
   It takes approximately 40s until tuning is completed.
   The motor runs at nearly its rated frequency.
3) Set the rated motor current (initial value is rated inverter current) in *Pr. 9 Electronic thermal O/L relay*.
4) Set the rated voltage of motor (initial value is 200V/400V) in *Pr. 83 Rated motor voltage* and rated frequency of motor (initial value is 60Hz) in *Pr. 84 Rated motor frequency* .
   (For a Japanese standard motor, etc. which has both 50Hz and 60Hz rated values, set 200V/60Hz or 400V/60Hz).)
   For vector control dedicated motor SF-V5RU1 / V5RU3 / V5RU4, set as the following table.

	***Pr. 83* Setting**	***Pr. 84* Setting**
SF-V5RU1-30kW or less	160V	33.33Hz
SF-V5RU1-37kW	170V	
SF-V5RU3-22kW or less	160V	
SF-V5RU3-30kW	170V	
SF-V5RU4-3.7kW, 7.5kW	150V	16.67Hz
SF-V5RU4-other than the above	160V	

REMARKS

· When using the vector control dedicated motor SF-V5RU (1500r/min series) or SF-THY, setting 33 and 34 in *Pr. 71* selects internal constants appropriate for dedicated motors. Therefore, *Pr. 83* and *Pr. 84* settings are unnecessary.
· Perform auto tuning for SF-V5RU (except for 1500 r/min series) with setting 13 or 14 in *Pr. 71* (For perform auto tuning, set *Pr. 83* and *Pr. 84*)

5) Set *Pr. 71 Applied motor* according to the motor used.

Motor		***Pr. 71* Setting** *
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR	3
	SF-HR	43
	Others	3
Mitsubishi constant-torque motor	SF-JRCA 4P	13
	SF-HRCA	53
	Others (SF-JRC, etc.)	13
Vector control dediated motor	SF-V5RU (1500r/min series) SF-THY	33
	SF-V5RU (except for 1500r/min series)	13
Other manufacturer's standard motor	–	3
Other manufacturer's constant torque motor	–	13

* For other settings of *Pr. 71*, refer to *chapter 4 of the instruction manual (applied)*.

(3) Execution of tuning

CAUTION

· Before performing tuning, check the monitor display of the operation panel (FR-DU07) or parameter unit (FR-PU04/FR-PU07) if the inverter is in the state ready for tuning. (Refer to 2) below) When the start command is turned on under V/F control, the motor starts.

1)When performing PU operation, press (FWD)/(REV) of the operation panel.

For external operation, turn on the start command (STF signal or STR signal). Tuning starts.

CAUTION

· When selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status* = "101"), caution must be taken since the motor runs.

· To force tuning to end, use the MRS or RES signal or press (STOP/RESET) of the operation panel.
(Turning the start signal (STF signal or STR signal) off also ends tuning.)

· During offline auto tuning, only the following I/O signals are valid: (initial value)
· Input signals <valid signal> STOP, OH, MRS, RT, CS, RES, STF, STR
· Output terminal RUN, OL, IPF, FM, AM, A1B1C1
Note that the progress status of offline auto tuning is output in fifteen steps from AM and FM when speed and output frequency are selected.

· Since the RUN signal turns on when tuning is started, caution is required especially when a sequerence which releases a mechanical brake by the RUN signal has been designed.

· When executing offline auto tuning, input the run command after switching on the main circuit power (R/L1, S/L2, T/L3) of the inverter.

· Do not perform ON/OFF switching of the second function selection signal (RT) during execution of offline auto tuning. Auto tuning is not excecuted properly.

· Setting offline auto tuning (*Pr. 96 Auto tuning setting/status* = "1 or 101") will make pre-excitation invalid.

2)Monitor is displayed on the operation panel (FR-DU07) and parameter unit (FR-PU07/FR-PU04) during tuning as below.

	Parameter Unit (FR-PU07/FR-PU04) Display		Operation Panel (FR-DU07) Display	
Pr. 96 setting	1	101	1	101
(1) Setting	1 --- STOP PU	101 --- STOP PU		
(2) Tuning in progress	TUNE 2 STF FWD PU	TUNE 102 STF FWD PU		
(3) Normal end	TUNE 3 COMPLETION STF STOP PU	TUNE 103 COMPLETION STF STOP PU	 Flickering	 Flickering
(4) Error end (when the inverter protective function is activated)	TUNE 9 ERROR STF STOP PU			

· Reference: Offline auto tuning time (when the initial value is set)

Offline Auto Tuning Setting	Time
Non-rotation mode (*Pr. 96* = "1")	Approximately 25 to 120s (Tuning time differs according to the inverter capacity and motor type.)
Rotation mode (*Pr. 96* = "101")	Approximately 40s (Offline auto tuning time varies with the acceleration and deceleration time settings as indicated below. Offline auto tuning time = acceleration time + deceleration time + approx. 30s)

3)When offline auto tuning ends, press STOP RESET of the operation panel during PU operation. For external operation, turn off the start signal (STF signal or STR signal).
This operation resets the offline auto tuning and the PU's monitor display returns to the normal indication. (Without this operation, next operation cannot be started.)

REMARKS

- Do not change the *Pr. 96* setting after completion of tuning (3 or 103).
  If the *Pr. 96* setting is changed, tuning data is made invalid.
  If the *Pr. 96* setting is changed, tuning must be performed again.

4)If offline auto tuning ended in error (see the table below), motor constants are not set.
Perform an inverter reset and restart tuning.

Error Display	Error Cause	Remedy
8	Forced end	Set "1" or "101" in *Pr. 96* and perform tuning again.
9	Inverter protective function operation	Make setting again.
91	Current limit (stall prevention) function was activated.	Increase acceleration/deceleration time. Set "1" in *Pr. 156* .
92	Converter output voltage reached 75% of rated value.	Check for fluctuation of power supply voltage.
93	Calculation error A motor is not connected.	Check the motor wiring and make setting again. Set the rated current of the motor in *Pr.9*.

5)When tuning is ended forcibly by pressing STOP RESET or turning off the start signal (STF or STR) during tuning, offline auto tuning does not end normally. (The motor constants have not been set.)
Perform an inverter reset and restart tuning.

6)When using the motor corresponding to the following specifications and conditions, reset *Pr.9 Electronic thermal O/L relay* as below after tuning is completed.

a) When the rated power specifications of the motor is 200/220V (400/440V) 60Hz, set 1.1 times rated motor current value in *Pr.9*.

b) When performing motor protection from overheat using a PTC thermistor or motor with temperature detector such as Klixon, set "0" (motor overheat protection by the inverter is invalid) in *Pr.9*.

CAUTION

- The motor constants measured once in the offline auto tuning are stored as parameters and their data are held until the offline auto tuning is performed again.
- An instantaneous power failure occurring during tuning will result in a tuning error.
  After power is restored, the inverter goes into the normal operation mode. Therefore, when STF (STR) signal is on, the motor runs in the forward (reverse) rotation.
- Any alarm occurring during tuning is handled as in the ordinary mode. Note that if a fault retry has been set, retry is ignored.
- The set frequency monitor displayed during the offline auto tuning is 0Hz.

⚠ CAUTION

⚠ Note that the motor may start running suddenly.

⚠ When the offline auto tuning is used in vertical lift application, e.g. a lifter, it may drop due to insufficient torque.

4.3.11 High accuracy operation unaffected by the motor temperature (online auto tuning) (Pr. 95) Magnetic flux Sensorless Vector

When online auto tuning is selected under advanced magnetic flux vector control, real sensorless vector control or vector control, 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.

Parameter Number	Name	Initial Value	Setting Range	Description
95	Online auto tuning selection	0	0	Online auto tuning is not performed
			1	Start-time online auto tuning
			2	Magnetic flux observer (normal tuning)

(1) Start-time online auto tuning (setting is "1")

- By quickly tuning the motor constants at a start, high accuracy operation unaffacted by the motor temperature and stable operation with high torque down to ultra low speed can be performed.
- Make sure advanced magnetic flux vector control (*Pr. 80, Pr. 81*), real sensorless vector control or vector control (*Pr. 800*) is selected. (*Refer to page 63*.)
- Before performing online auto tuning, perform offline auto tuning without fail.

<Operation method>

1) Check that "3" or "103" (offline auto tuning completion) is set in *Pr. 96 Auto tuning setting/status*.
2) Set "1" (start-time online auto tuning) in *Pr. 95 Online auto tuning selection*.
   Online auto tuning is performed from the next starting.
3) When performing PU operation, press FWD / REV of the operation panel.
   For external operation, turn on the run command (STF signal or STR signal).

CAUTION

- For using start-time online auto 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.
  It is recommended to perform tuning using a start time tuning signal (X28). *(Refer to chapter 4 of the instruction manual (applied).)*

(2) Magnetic flux observer (normal tuning) (setting value is "2")

- When exercising vector control using a motor with encoder, it is effective for torque accuracy improvement.
  The current flowing in the motor and the inverter output voltage are used to estimate/observe the magnetic flux in the motor.
  The magnetic flux of the motor is always (including during operation) detected with high accuracy so that an excellent characteristic is provided regardless of the change in the temperature of the secondary resistance.
- Vector control *(Pr. 80, Pr. 81, Pr. 800)* should be selected. *(Refer to page 75.)*

CAUTION

- For the SF-V5RU, SF-JR (with encoder), SF-HR (with encoder), SF-JRCA (with encoder) or SF-HRCA (with encoder), it is not necessary to perform offline auto tuning to select adaptive magnetic flux observer. (Note that it is necessary to perform offline auto tuning (non-rotation mode) for the wiring length resistance to be reflected on the control when the wiring length is long (30m or longer as reference).

REMARKS

- Online auto tuning does not operate if the MRS signal is input, if the preset speed is less than the *Pr. 13 Starting frequency* (V/F control or advanced magnetic flux vector control), or if the starting conditions of the inverter are not satisfied, e.g. inverter error.
- Online auto tuning does not operate during deceleration or at a restart during DC brake operation.
- Invalid for jog operation.
- Automatic restart after instantaneous power failure overrides when automatic restart after instantaneous power failure is selected. (Start-time online auto tuning is not performed at frequency search.)
  Perform online auto tuning at a stop with the X28 signal when using automatic restart after instantaneous power failure together.
  (Refer to *chapter 4 of the instruction manual (applied)* for details.)
- Zero current detection and output current detection are valid during online auto tuning.
- The RUN signal is not output during online auto tuning. The RUN signal turns on at a start.
- If the period from an inverter stop to a restart is within 4s, start-time tuning is performed but the tuning results are not reflected.

4.3.12 To perform high accuracy/fast response operation (gain adjustment of real sensorless vector control and vector control) (Pr. 818 to Pr. 821, Pr. 880)

Sensorless Vector

The ratio of the load inertia to the motor inertia (load moment of inertia) is estimated in real time from the torque command and speed during motor operation by vector control. As optimum gain of speed control and position control are automatically set from the load inertia ratio and response level, time and effort of making gain adjustment are reduced. (Easy gain tuning)
When the load inertia ratio can not be estimated due to load fluctuation or real sensorless vector control is exercised, control gain is automatically set by manually inputting the load inertia ratio.
Make a manual input adjustment when vibration, noise or any other unfavorable phenomenon occurs due to large load inertia or gear backlash, for example, or when you want to exhibit the best performance that matches the machine.

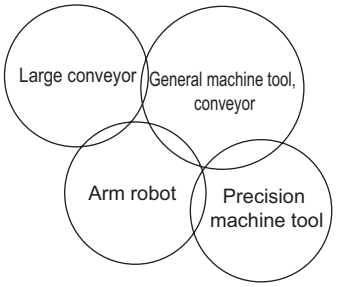
Parameter Number	Name	Initial Value	Setting Range	Description
818	Easy gain tuning response level setting	2	1 to 15	Set the response level. 1: Slow response to 15: Fast response
819	Easy gain tuning selection	0	0	Without easy gain tuning
			1	With load estimation, with gain calculation (valid only during vector control)
			2	With load *(Pr. 880)* manual input, gain calculation
820	Speed control P gain 1	60%	0 to 1000%	Set the proportional gain for speed control. (Increasing the value improves trackability in response to a speed command change and reduces speed variation with disturbance.)
821	Speed control integral time 1	0.333s	0 to 20s	Set the integral time during speed control. (Decrease the value to shorten the time taken for returning to the original speed if speed variation with disturbance occurs.)
880	Load inertia ratio	7 times	0 to 200 times	Set the load intertia ratio to the motor.

(1) Easy gain tuning execution procedure (*Pr. 819* = "1" load inertia ratio automatic estimation)

Easy gain tuning (load inertia ratio automatic estimation) is valid only in the speed control or position control mode under vector control.
It is invalid under torque control, V/F control, advanced magnetic flux vector control and real sensorless vector control.

1) Set the response level using *Pr. 818 Easy gain tuning response level setting*.
Refer to the diagram on the right and set the response level.
Increasing the value will improve trackability to the command, but too high value will generate vibration. The relationship between the setting and response level are shown on the right.

Pr. 818 setting	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Response level	Slow response ⟷							Middle response			⟷				Fast response
Guideline of mechanical resonance frequency (Hz)	8	10	12	15	18	22	28	34	42	52	64	79	98	122	150



2) Each control gain is automatically set from the load inertia ratio estimated during acceleration/deceleration operation and the *Pr. 818 Easy gain tuning response level setting* value.
Pr. 880 Load inertia ratio is used as the initial value of the load inertia ratio for tuning. Estimated value is set in *Pr. 880* during tuning.
The load inertia ratio may not be estimated well, e.g. it takes a long time for estimation, if the following conditions are not satisfied.
· Time taken for acceleration/deceleration to reach 1500r/min is 5s or less.
· Speed is 150r/min or more.
· Acceleration/deceleration torque is 10% or more of the rated torque.
· Abrupt disturbance is not applied during acceleration/deceleration.
· Load inertia ratio is approx. 30 times or less.
· No gear backlash nor belt looseness is found.

3) Press (FWD) or (REV) to estimate the load inertia ratio or calculate gain any time. (The operation command for external operation is the STF or STR signal.)

(2) Easy gain tuning execution procedure (*Pr. 819* = "2" load inertia manual input)

Easy gain tuning (load inertia ratio manual input) is valid only in the speed control mode under real sensorless vector control or in the speed control or position control mode under vector control.

1) Set the load inertia ratio to the motor in *Pr. 880 Load inertia ratio*.
2) Set "2" (with easy gain tuning) in *Pr. 819 Easy gain tuning selection*. Then, *Pr. 820 Speed control P gain 1* and *Pr. 821 Speed control integral time 1* are automaticaly set by gain calculation.
Operation is performed in a gain adjusted status from the next operation.
3) Perform a test run and set the response level in *Pr. 818 Easy gain tuning response level setting*. Increasing the value will improve trackability to the command, but too high value will generate vibration. (When "2" (parameter write enabled during operation) is set in *Pr. 77 Parameter write selection* , response level adjustment can be made during operation.)

REMARKS

· When "1 or 2" is set in *Pr. 819* and then returned the *Pr. 819* setting to "0" after tuning is executed, tuning results which are set in each parameter remain unchanged.
· When good tuning accuracy is not obtained after executing easy gain tuning due to disturbance and such, perform fine adjustment by manual input. Set "0" (without easy gain tuning) in *Pr. 819*.

(3) Parameters automatically set by easy gain tuning

The following table indicates the relationship between easy gain tuning function and gain adjustment parameter.

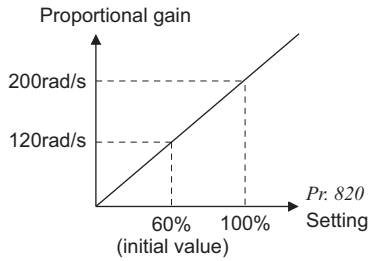
	Easy Gain Tuning Selection *(Pr. 819)* Setting		
	0	**1**	**2**
Load inertia ratio *(Pr. 880)*	Manual input	a) Inertia estimation result (RAM) by easy gain tuning is dispayed. b) Set the value in the following cases: • Every hour after power-on • When a value other than "1" is set in *Pr. 819* • When vector control is changed to other control (V/F control etc.) using *Pr. 800* c) Write is enabled only during a stop (manual input)	Manual input
Speed control P gain 1 *(Pr. 820)* Speed control integral time 1 *(Pr. 821)* Model speed control gain *(Pr. 828)* Position loop gain *(Pr. 422)*	Manual input	a) Tuning result (RAM) is displayed. b) Set the value in the following cases: • Every hour after power-on • When a value other than "1" is set in *Pr. 819* • When vector control is changed to other control (V/F control etc.) using *Pr. 800* c) Write (manual input) disabled	a) Gain is calculated when "2" is set in *Pr. 819* and the result is set in the parameter. b) When the value is read, the tuning result (parameter setting value) is displayed. c) Write (manual input) disabled

CAUTION

· Performing easy gain tuning with larger inertia than the specified value during vector control may cause malfunction such as hunting. In addition, when the motor shaft is fixed with servo lock or position control, bearing may be damaged. To prevent these, make gain adjustment by manual input without performing easy gain tuning.

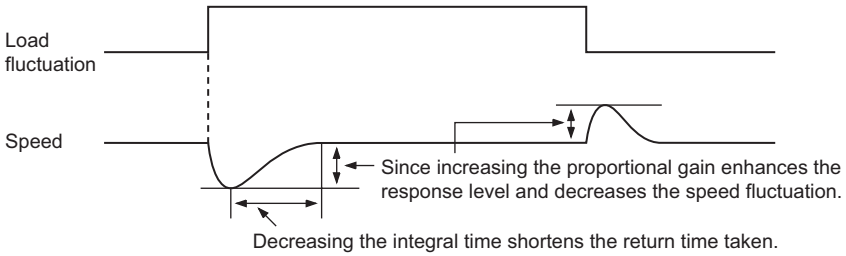
(4) Manual input speed control gain adjustment

· Make adjustment when any of such phenomena as unusual machine vibration/noise, low response level and overshoot has occurred.



· *Pr. 820 Speed control P gain 1* = "60%" (initial value) is equivalent to 120rad/s (speed responce of the motor alone). Increasing the setting value improves the response level, but a too large gain will produce vibration and/or unusual noise.
· Decreasing the *Pr. 821 Speed control integral time 1* shortens the return time taken at a speed change. However, a too short time will generate an overshoot.

· When there is load inertia, the actual speed gain is as given below.



$$\text{Actual speed gain} = \text{speed gain of motor without load} \times \frac{JM}{JM+JL}$$

JM: Inertia of the motor
JL: Motor shaft-equivalent load inertia

· Adjustment procedures are as below:
1)Check the conditions and simultaneously change the *Pr. 820* value.
2)If you cannot make proper adjustment, change the *Pr. 821* value and repeat step 1).

No.	Phenomenon/ Condition	Adjustment Method	
1	Load inertia is large	Set the *Pr. 820* and *Pr. 821* values a little higher.	
		Pr. 820	When a speed rise is slow, increase the value 10% by 10% until just before vibration/noise is produced, and set about 0.8 to 0.9 of that value.
		Pr. 821	If an overshoot occurs, double the value until an overshoot does not occur, and set about 0.8 to 0.9 of that value.
2	Vibration/noise generated from mechanical system	Set the *Pr. 820* value a little lower and the *Pr. 821* value a little higher.	
		Pr. 820	Decrease the value 10% by 10% until just before vibration/noise is not produced, and set about 0.8 to 0.9 of that value.
		Pr. 821	If an overshoot occurs, double the value until an overshoot does not occur, and set about 0.8 to 0.9 of that value.
3	Slow response	Set the *Pr. 820* value a little higher.	
		Pr. 820	When a speed rise is slow, increase the value 5% by 5% until just before vibration/noise is produced, and set about 0.8 to 0.9 of that value.
4	Long return time (response time)	Set the *Pr. 821* value a little lower.	
		Decrease the *Pr. 821* value by half until just before an overshoot or the unstable phenomenon does not occur, and set about 0.8 to 0.9 of that value.	
5	Overshoot or unstable phenomenon occurs.	Set the *Pr. 821* value a little higher.	
		Increase the *Pr. 821* value double by double until just before an overshoot or the unstable phenomenon does not occur, and set about 0.8 to 0.9 of that value.	

REMARKS

· When making manual input gain adjustment, set "0" (without easy gain tuning) (initial value) in *Pr. 819 Easy gain tuning selection*.

(5) When using a multi-pole motor (8 poles or more)

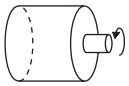
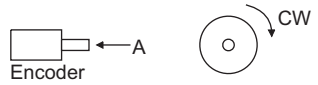
Specially when using a multi-pole motor with more than 8 poles under real sensorless vector control or vector control, adjust *Pr. 820 Speed control P gain 1* and *Pr. 824 Torque control P gain 1* according to the motor referring to the following methods.

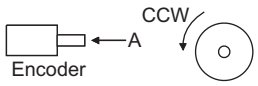
- For *Pr. 820 Speed control P gain 1*, increasing the setting value improves the response level, but a too large gain will produce vibration and/or unusual noise.
- For *Pr. 824 Torque control P gain 1*, note that a too low value will produce current ripples, causing the motor to generate sound synchronizing the cycle of current ripples.

Adjustment method

No.	Phenomenon/Condition	Adjustment Method
1	The motor rotation is unstable in the low speed range.	Set a higher value in *Pr. 820 Speed control P gain 1* according to the motor inertia. Since the self inertia of a multi-pole motor tends to become large, make adjustment to improve the unstable phenomenon, then make fine adjustment in consideration of the response level using that setting as reference. In addition, when performing vector control with encoder, gain adjustment according to the inertia can be easily done using easy gain tuning (*Pr. 819* = 1).
2	Speed trackability is poor	Set a higher value in *Pr. 820 Speed control P gain 1*. Increase the value 10% by 10% until just before vibration or unusual noise is produced, and set about 0.8 to 0.9 of that value. If you cannot make proper adjustment, increase the value of *Pr. 821 Speed control integral time 1* double by double and make adjustment of *Pr. 820* again.
3	Speed variation at the load fluctuation is large	
4	Torque becomes insufficient or torque ripple occurs at starting or in the low speed range under real sensorless vector control.	Set the speed control gain a little higher. (same as No. 1) If the problem still persists after gain adjustment, increase *Pr. 13 Starting frequency* or set the acceleration time shorter if the inverter is starting to avoid continuous operation in the ultra low speed range.
5	Unusual motor and machine vibration, noise or overcurrent occurs.	Set a lower value in *Pr. 824 Torque control P gain 1*. Decrease the value 10% by 10% until just before the phenomenon is improved, and set about 0.8 to 0.9 of that value.
6	Overcurrent or overspeed (E.OS) occurs at a start under real sensorless vector control.	

(6) Troubleshooting (speed)

<table>
<tr><th></th><th>Phenomenon</th><th>Cause</th><th>Countermeasures</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Motor does not rotate.
(Vector control)</td><td>(1) The motor wiring is wrong</td><td>(1) Wiring check
Select V/F control (set "9999" in Pr. 80 or Pr. 81) and check the rotation direction of the motor.
For the SF-V5RU (1500r/min series), set "160V (320V)" in Pr. 19 Base frequency voltage, and set "50Hz" in Pr. 3 Base frequency.
 
When the forward rotation signal is input, the motor running in the counterclockwise direction as viewed from the motor shaft is normal. (If it runs in the clockwise direction, the phase sequence of the inverter secondary side wiring is incorrect.)</td></tr>
<tr><td>(2) Encoder specifications (encoder specification selection switch FR-A7AP) are wrong</td><td>(2) Check the encoder specifications.
Check the encoder specifications selection switch (FR-A7AP) of differential/complementary</td></tr>
<tr><td>(3) The encoder wiring is wrong.</td><td>(3) Check that FWD is displayed when running the motor in the counter-clockwise direction from outside during a stop of the inverter with vector control setting.
If REV is displayed, the encoder phase sequence is wrong.
Perform the correct wiring or match the Pr. 359 Encoder rotation direction.
<table><tr><th>Pr. 359 Setting</th><th>Relationship between the Motor and Encoder</th></tr><tr><td>0</td><td> 

Clockwise direction as viewed from A is forward rotation</td></tr><tr><td>1
(Initial value)</td><td> 

Counter clockwise direction as viewed from A is forward rotation</td></tr></table></td></tr>
<tr><td>(4) The Pr. 369 Number of encoder pulses setting and the number of encoder used are different.</td><td>(4) The motor will not run if the parameter setting is smaller than the number of encoder pulses used. Set the Pr. 369 Number of encoder pulses correctly.</td></tr>
<tr><td>(5) Encoder power specifications are wrong. Or, power is not input.</td><td>(5) Check the power specifications (5V/12V/15V/24V) of encoder and input the external power supply.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Motor does not run at correct speed. (Speed command does not match actual speed)</td><td>(1) The speed command from the command device is incorrect. The speed command is compounded with noise.</td><td>(1) Check that a correct speed command comes from the command device.
Decrease Pr. 72 PWM frequency selection.</td></tr>
<tr><td>(2) The speed command value does not match the inverter-recognized value.</td><td>(2) Readjust speed command bias/gain Pr. 125, Pr. 126, C2 to C7 and C12 to C15.</td></tr>
<tr><td>(3) The number of encoder pulses setting is incorrect.</td><td>(3) Check the setting of Pr. 369 Number of encoder pulses. (vector control)</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Speed does not rise to the speed command.</td><td>(1) Insufficient torque.
Torque limit is actuated.</td><td>(1) -1 Increase the torque limit value.
(Refer to torque limit of speed control on chapter 4 of the instruction manual (applied))
(1) -2 Insufficient capacity</td></tr>
<tr><td>(2) Only P (proportional) control is selected.</td><td>(2) When the load is heavy, speed deviation will occur under P (proportional) control. Select PI control.</td></tr>
</table>

	Phenomenon	Cause	Countermeasures
4	Motor speed is unstable.	(1) The speed command varies.	(1) -1 Check that a correct speed command comes from the command device. (Take measures against noises.) (1) -2 Decrease *Pr. 72 PWM frequency selection*. (1) -3 Increase *Pr. 822 Speed setting filter 1*. *(Refer to chapter 4 of the instruction manual (applied))*
		(2) Insufficient torque.	(2) Increase the torque limit value. (Refer to torque limit of speed control on *schapter 4 of the instruction manual (applied)*)
		(3) The speed control gains do not match the machine. (mechanical resonance)	(3) -1 Perform easy gain tuning. *(Refer to page 77)* (3) -2 Adjust *Pr. 820, Pr. 821*. *(Refer to page 79)* (3) -3 Perform speed feed forward/model adaptive speed control.
5	Motor or machine hunts (vibration/noise is produced).	(1) The speed control gain is high.	(1) -1 Perform easy gain tuning. *(Refer to page 77)* (1) -2 Decrease *Pr. 820* and increase *Pr. 821*. (1) -3 Perform speed feed foward control and model adaptive speed control.
		(2) The torque control gain is high.	(2) Decrease the *Pr. 824* value.
		(3) The motor wiring is wrong.	(3) Check the wiring
6	Acceleration/deceleration time does not match the setting.	(1) Insufficient torque.	(1) -1 Increase the torque limit value. (Refer to torque limit of speed control on *chapter 4 of the instruction manual (applied)*) (1) -2 Perform speed feed foward control.
		(2) Large load inertia.	(2) Set the acceleration/deceleration time that meets the load.
7	Machine operation is unstable	(1) The speed control gains do not match the machine.	(1) -1 Perform easy gain tuning. *(Refer to page 77)* (1) -2 Adjust *Pr. 820, Pr. 821*. *(Refer to page 79)* (1) -3 Perform speed feed foward control and model adaptive speed control.
		(2) Slow response because of improper acceleration/ deceleration time of the inverter.	(2) Change the acceleration/deceleration time to an optimum value.
8	Speed fluctuates at low speed.	(1) Adverse effect of high carrier frequency.	(1) Decrease *Pr. 72 PWM frequency selection*.
		(2) Low speed control gain.	(2) Increase *Pr. 820 Speed control P gain 1*.

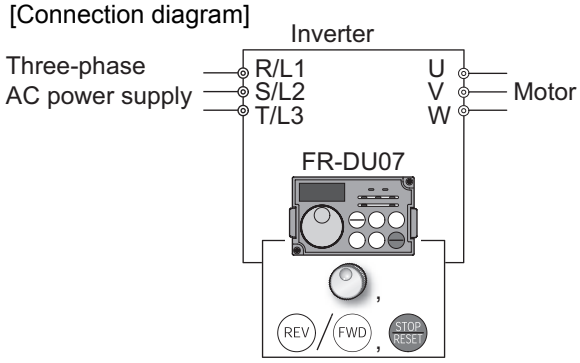
4.4 Start/stop from the operation panel (PU operation mode)

POINT

From where is the frequency command given?

- **Operation at the frequency set in the frequency setting mode of the operation panel**
  →Refer to 4.4.1 (Refer to page 83)
- **Operation using the setting dial as the potentiometer**
  →Refer to 4.4.2 (Refer to page 84)
- **Change of frequency with ON/OFF switches connected to terminals** *→Refer to 4.4.3 (Refer to page 85)*
- **Frequency setting with a voltage output device**
  →Refer to 4.4.4 (Refer to page 86)
- **Frequency setting with a current output device**
  →Refer to 4.4.5 (Refer to page 87)

[Connection diagram]



4.4.1 Set the set frequency to operate (example: performing operation at 30Hz)

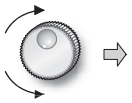
Operation

1. Screen at powering on
   The monitor display appears.

2. Press PU/EXT to choose PU operation mode.

PU indication is lit.

3. Turn the setting dial to show the frequency you want to set.
   The frequency flickers for about 5s.

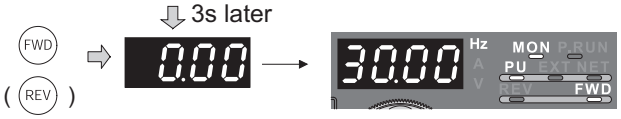


4. While the value is flickering, press SET to set the frequency.

Flicker ··· Frequency setting complete!!

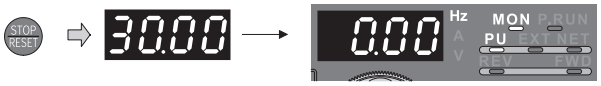
If you do not press SET, the value flickers for about 5s and the display then returns to 0.00 (display) Hz. At this time, return to "Step 3" and set the frequency again.

5. After the value flickered for about 3s, the display returns to 0.00 (monitor display). Press FWD (or REV) to start operation.



6. To change the set frequency, perform the operation in above steps 3 and 4.
   (Starts from the previously set frequency.)

7. Press STOP RESET to stop.



? Operation cannot be performed at the set frequency ... Why?
  ☞ Did you carry out step 4 within 5s after step 3? (Did you press SET within 5s after turning the setting dial ?)

? The frequency does not change by turning the setting dial ... Why?
  ☞ Check to see if the operation mode selected is external operation mode. (Press PU/EXT to change to PU operation mode.)

? Operation does not change to the PU operation mode ... Why?
  ☞ Check that "0" (initial value) is set in *Pr. 79 Operation mode selection*.
  ☞ Check that the start command is not on.

? Change acceleration time ☞*Pr. 7 (Refer to page 61)*

? Change deceleration time ☞*Pr. 8 (Refer to page 61)*

For example, limit the motor speed to 60Hz maximum. ☞Set "60Hz" in *Pr. 1. (Refer to page 60)*

REMARKS

- Press the setting dial to show the set frequency.

- The setting dial can also be used like a potentiometer to perform operation. *(Refer to page 84)*

4.4.2 Use the setting dial like a potentiometer to perform operation.

POINT

Set "1" (setting dial potentiometer mode) in *Pr. 161 Frequency setting/key lock operation selection*.

Operation example | Change the frequency from 0Hz to 60Hz during operation

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press (PU/EXT) to choose PU operation mode.	(PU/EXT) ⇨  PU indication is lit.
3. Change *Pr. 161* to the setting value " 1 ". *(Refer to page 52 for change of the setting.)*	
4. Press (FWD) (or (REV)) to start the inverter.	(FWD) ⇨ 
5. Turn  until "60.00" appears. The flickering frequency is the set frequency. You need not press (SET).	 ⇨  The frequency flickers for about 5s.

REMARKS

· If flickering "60.00" turns to "0.0", the *Pr. 161 Frequency setting/key lock operation selection* setting may not be "1".

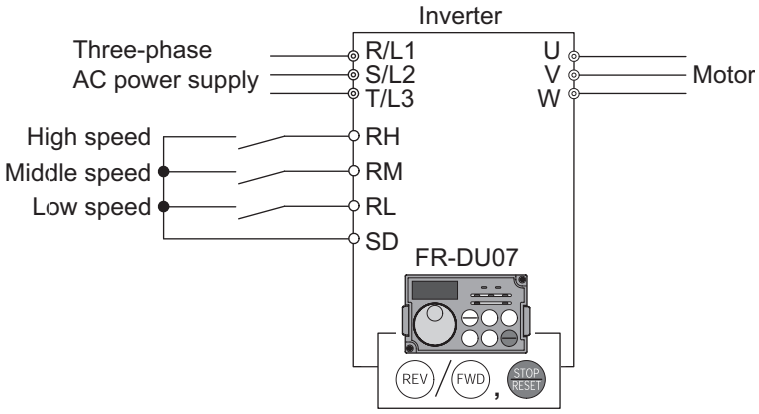
· Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning  .

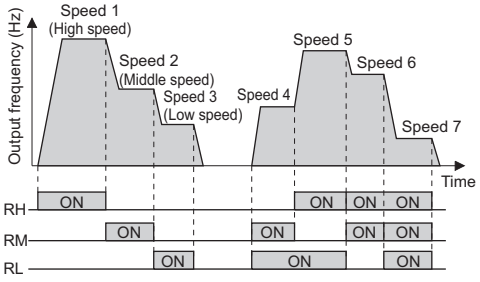
4.4.3 Use switches to give a start command and a frequency command (multi-speed setting)

POINT

- Use (FWD)/(REV) to give a start command.
- *Pr. 79 Operation mode selection* must be set to "4" (external/PU combined operation mode 2)
- The initial values of the terminals RH, RM, RL are 60Hz, 30Hz, and 10Hz. *(Refer to page 89 to change frequencies using Pr. 4, Pr. 5 and Pr. 6.)*
- Operation at 7-speed can be performed by turning on two (or three) terminals simultaneously.
  (Refer to chapter 4 of the instruction manual (applied).)

[Connection diagram]





Operation

1. Screen at powering on
   The monitor display appears.

2. Change the *Pr. 79* setting to "4".
   (Refer to page 52 for change of the setting.)

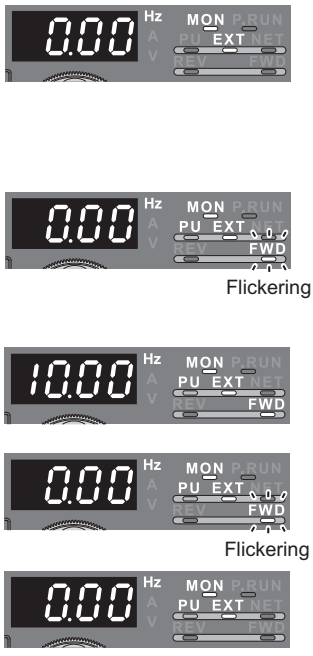
3. Press the start switch (FWD) (or (REV)).
   FWD (or REV) flickers.
   When the frequency command is not given, it flickers.

4. Turn on the low speed switch (RL).
   The output frequency increases to 10Hz according to *Pr. 7 Acceleration time*.

5. Turn off the low speed switch (RL).
   The output frequency decreases to 0Hz according to *Pr. 8 Deceleration time*.

6. Turn off the start switch (STOP RESET).
   FWD (or REV) turns off.

Display



? 60Hz for the RH, 30Hz for the RM and 10Hz for the RL are not output when they are turned on ... Why?
- ☞ Check for the setting of *Pr. 4*, *Pr. 5*, and *Pr. 6* once again.
- ☞ Check for the setting of *Pr. 1 Maximum frequency* and *Pr. 2 Minimum frequency* once again. *(Refer to page 60.)*
- ☞ Check that *Pr. 180 RL terminal function selection* = "0", *Pr. 181 RM terminal function selection* = "1", *Pr. 182 RH terminal function selection* = "2" and *Pr. 59 Remote function selection* = "0". (all are initial values)

? [FWD (or REV)] lamp is not lit ... Why?
- ☞ Check that wiring is correct. Check the wiring once again.
- ☞ Check for the *Pr. 79* setting once again. (*Pr. 79* must be set to "4".) *(Refer to page 62.)*

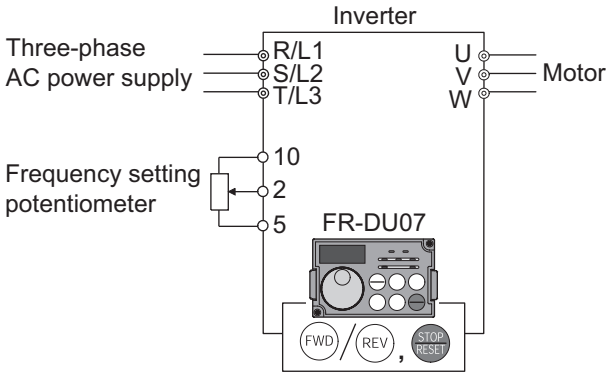
? Change the frequency of the terminal RL, RM, and RH. ... How?
- ☞ Refer to *page 89* to change the running frequency at each terminal in *Pr. 4 Multi-speed setting (high speed), Pr. 5 Multi-speed setting (middle speed),* and *Pr. 6 Multi-speed setting (low speed)*.

4.4.4 Perform frequency setting by analog (voltage input)

POINT

- Use (FWD)/(REV) to give a start command.
- *Pr. 79 Operation mode selection* must be set to "4" (external/PU combined operation mode 2)

[Connection diagram]
(The inverter supplies 5V of power to the frequency setting potentiometer.(Terminal 10))



Operation — Display

1. Screen at powering on
   The monitor display appears.

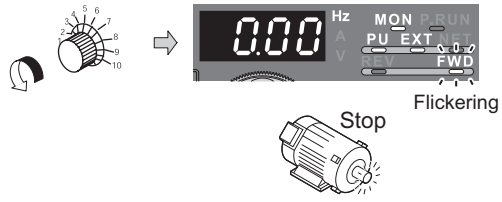
2. Change the *Pr. 79* setting to "4".
   (Refer to page 52 for change of the setting.)

3. Start
   Press the start switch (FWD) (or (REV)).
   Operating status indication of FWD (or REV) flickers.

   CAUTION
   When both the forward switch and reverse switch turn on, the inverter will not start. Also, if both switch turn on while running, the inverter stops.

4. Acceleration → constant speed
   Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full.
   The frequency value on the indication increases according to *Pr. 7 Acceleration time* until 60.00

5. Deceleration
   Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full.
   The frequency value on the indication decreases according to *Pr. 8 Deceleration time* unitl 0.00 (0.00Hz) is displayed and operating status indication of FWD or REV flickers.
   The motor stops.



6. Stop
   Press STOP RESET.
   Operating status indication of FWD (or REV) turns off.

? Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value)
☞ Adjust the frequency in *Pr. 125 Terminal 2 frequency setting gain frequency. (Refer to page 92.)*

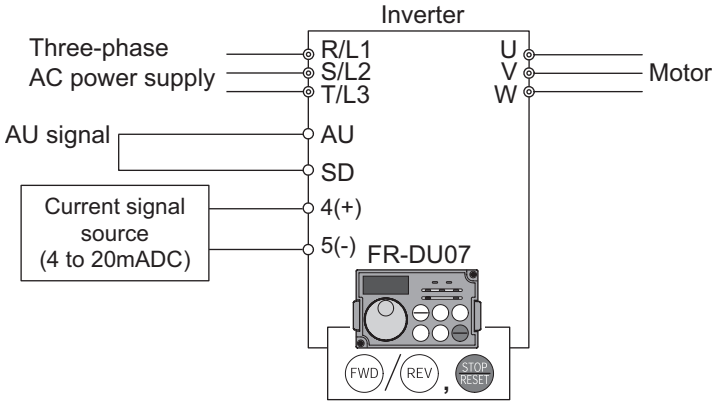
? Change the frequency (0Hz) of the minimum value of potentiometer (at 0V, initial value)
☞ Adjust the frequency in *calibration parameter C2 Terminal 2 frequency setting bias frequency. (Refer to chapter 4 of the instruction manual (applied).)*

4.4.5 Perform frequency setting by analog (current input)

POINT

- Use (FWD)/(REV) to give a start command.
- Turn the AU signal on.
- *Pr. 79 Operation mode selection* must be set to "4" (external/PU combined operation mode 2)

[Connection diagram]



Operation

Display

1. Screen at powering on
   The monitor display appears.

2. Change the *Pr. 79* setting to "4".
   (Refer to page 52 for change of the setting.)

3. Start
   Check that the terminal 4 input selection signal (AU) is on.
   Press the start switch (FWD) (or (REV)).
   FWD or REV of operating status indication flickers.

(FWD) or ((REV))

Flickering

CAUTION

When both the forward switch and reverse switch turn on, the inverter will not start.
Also, if both switch turn on while running, the inverter stops.

4. Acceleration → constant speed
   Perform 20mA input.
   The frequency value on the indication increases according to *Pr. 7 Acceleration time* until 60.00 (60.00Hz) is displayed.

Current signal source (4 to 20mADC)

5. Deceleration
   Perform 4mA input.
   The frequency value on the indication decreases according to *Pr. 8 Deceleration time* until 0.00 (0.00Hz) is displayed and the operating status indication of FWD or REV flickers.
   The motor stops.

Current signal source (4 to 20mADC)

Flickering

Stop

6. Stop
   Press STOP RESET.
   FWD or REV of the operating status indication turns off.

STOP RESET

REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). *(Refer to chapter 4 of Instruction Manual (applied).)*

? Change the frequency (60Hz) at the maximum value of potentiometer (at 20mA, initial value)
☞ Adjust the frequency in *Pr. 126 Terminal 4 frequency setting gain frequency. (Refer to page 94.)*

? Change the frequency (0Hz) at the minimum value of potentiometer (at 4mA, initial value)
☞ Adjust the frequency in *calibration parameter C5 Terminal 4 frequency setting bias frequency. (Refer to chapter 4 of the instruction manual (applied).)*

4.5 Make a start and stop with terminals (external operation)

POINT

From where is the frequency command given?

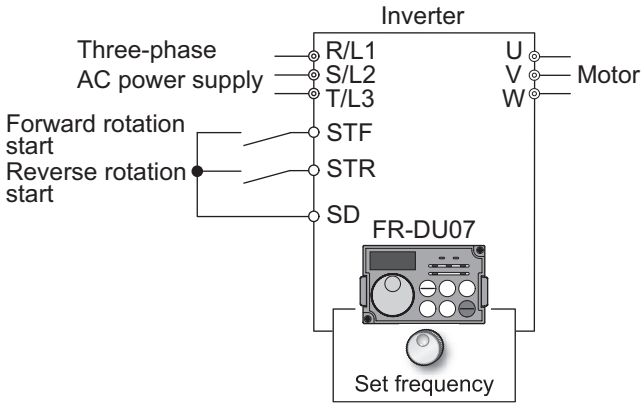
- **Operation at the frequency set in the frequency setting mode of the operation panel** → *Refer to 4.5.1(Refer to page 88)*
- **Give a frequency command by switch (multi-speed setting)** → *Refer to 4.5.2 (Refer to page 89)*
- **Perform frequency setting by a voltage output device** → *Refer to 4.5.3 (Refer to page 91)*
- **Perform frequency setting by a current output device** → *Refer to 4.5.5 (Refer to page 93)*

4.5.1 Use the set frequency set by the operation panel (Pr. 79 = 3)

POINT

- Switch terminal STF(STR)-SD on to give a start command.
- Set "3" in *Pr. 79* (External/PU combined operation mode 1).
- Refer to *page 83* for the set frequency by the operation panel.

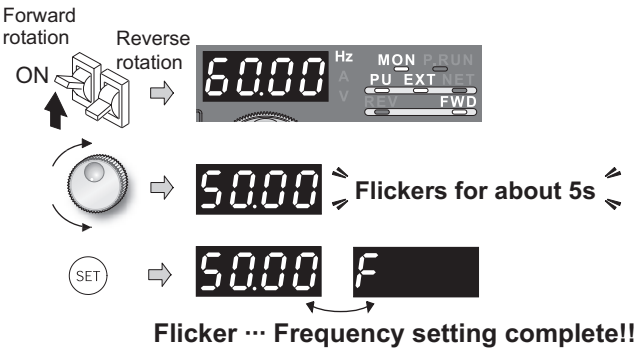
[Connection diagram]



Operation

1. Screen at powering on
   The monitor display appears.
2. Change the *Pr. 79* setting to "3".
   (Refer to page 52 for change of the setting.)
3. Turn the start switch (STF or STR) on.
   - The motor runs at the frequency set in the set frequency mode of the operation panel.
4. Turn to change running frequency.
   Display the frequency you want to set.
   The frequency flickers for about 5s.
5. While the value is flickering, press (SET) to set the frequency.
   (If you do not press (SET), the value flickers for about 5s and the display then returns to "60.00" (frequency set last time). At this time, return to "Step 3" and set the frequency again.)
6. Turn the start switch (STF or STR) off.
   The motor decelerates according to *Pr. 8 Deceleration time* to stop.

Display



REMARKS

- *Pr. 178 STF terminal function selection* must be set to "60" (or *Pr. 179 STR terminal function selection* must be set to "61"). (all are initial values)
- When *Pr. 79 Operation mode selection* is set to "3", multi-speed operation (refer to *page 89*) is also made valid.

? When the inverter is stopped by (STOP/RESET) of the operation panel (FR-DU07), PS and 0.00 are displayed alternately.

☞ 1. Turn the start switch (STF or STR) off.
2. The display can be reset by (PU/EXT).

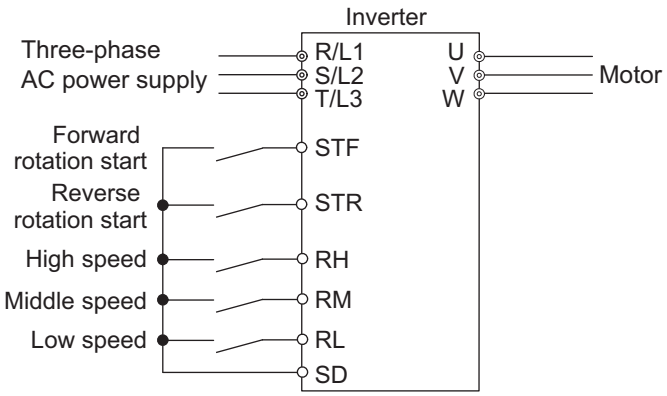
Flickering

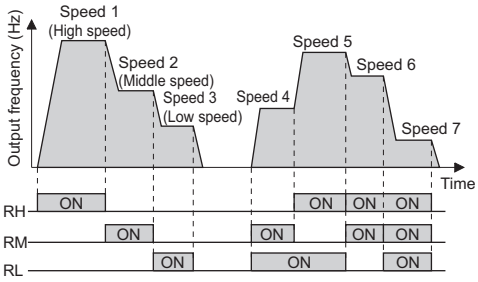
4.5.2 Use switches to give a start command and a frequency command (multi-speed setting) (Pr. 4 to Pr. 6)

POINT

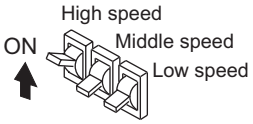
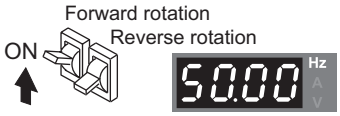
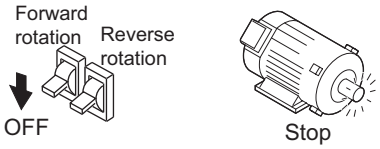
- Start command by terminal STF (STR)-SD
- Frequency command by terminal RH, RM, RL and STR-SD
- [EXT] must be lit. (When [PU] is lit, switch it to [EXT] with (PU/EXT).)
- The initial values of the terminals RH, RM, RL are 60Hz, 30Hz, and 10Hz. (Use *Pr. 4*, *Pr. 5 and Pr. 6* to change.)
- Operation at 7-speed can be performed by turning two (or three) terminals simultaneously. *(Refer to chapter 4 of the instruction manual (applied).)*

[Connection diagram]





Changing example Set "50Hz" in *Pr. 4 Multi-speed setting (high speed)* and turn on terminal RH and STF (STR)-SD to operate.

Operation	Display
1. Power on → operation mode check For the initial setting, the inverter operates in external operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press (PU/EXT) to change to the external [EXT] operation mode. If the operation mode still does not change, set *Pr. 79* to change to external operation mode.	
2. Change the *Pr. 4* setting to "50.00". *(Refer to page 52 for change of the setting.)*	
3. Turn on the high speed switch (RH).	
4. Turn the start switch (STF or STR) on. 50Hz appears. • 30Hz appears when RM is on and 10Hz appears when RL is on.	
5. Stop Turn the start switch (STF or STR) off. The motor stops according to *Pr. 8 Deceleration time*.	

? [EXT] is not lit even when (PU/EXT) is pressed ... Why?

☞ Switchover of the operation mode with (PU/EXT) is valid when *Pr. 79* = "0" (initial value).

? 50Hz, 30Hz and 10Hz are not output from RH, RM and RL respectively when they are turned on. ... Why?

☞ Check for the setting of *Pr. 4*, *Pr. 5*, *and Pr. 6* once again.

☞ Check for the setting of *Pr. 1 Maximum frequency* and *Pr. 2 Minimum frequency* once again. *(Refer to page 60)*

☞ Check for the *Pr. 79* setting once again. (*Pr. 79* must be set to "0" or "2".) *(Refer to page 62)*

☞ Check that *Pr. 180 RL terminal function selection* = "0", *Pr. 181 RM terminal function selection* = "1", *Pr. 182 RH terminal function selection* = "2" and *Pr. 59 Remote function selection* = "0". (all are initial values)

? [FWD (or REV)] is not lit. ... Why?

☞ Check that wiring is correct. Check it again.

☞ Check that "60" is set in *Pr. 178 STF terminal function selection* (or "61" is set in *Pr. 179 STR terminal function selection)*?
(all are initial values)

? How is the frequency setting from 4 to 7 speed ?

☞ The setting differs according to *Pr. 24 to Pr. 27* (multi-speed setting). *Refer to chapter 4 of the instruction manual (applied)*.

? Perform multi-speed operation higher than 8 speed. ... How?

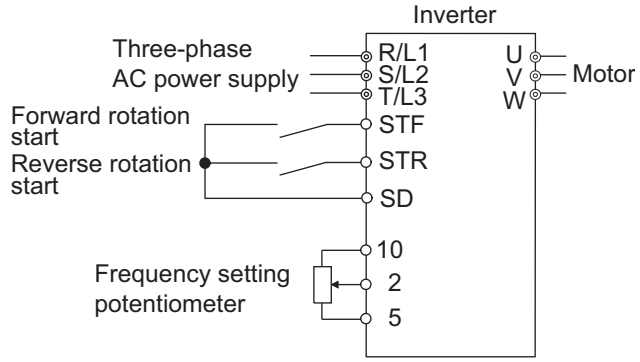
☞ Use the REX signal to perform the operation. *Refer to chapter 4 of the instruction manual (applied)*.

REMARKS

· External operation is fixed by setting "2" (external operation mode) in *Pr. 79 Operation mode selection* when you do not want to take time pressing (PU/EXT) or when you want to use the current start command and frequency command. *(Refer to page 62)*

4.5.3 Perform frequency setting by analog (voltage input)

[Connection diagram]
(The inverter supplies 5V of power to frequency setting potentiometer. (Terminal 10))



Operation

Display

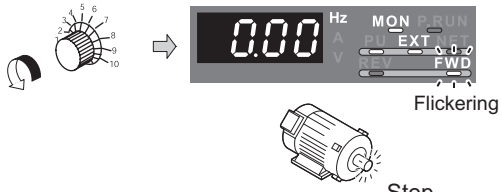
1. Power on → operation mode check
For the initial setting, the inverter operates in external operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press (PU/EXT) to change to the external [EXT] operation mode. If the operation mode still does not change, set *Pr. 79* to change to external operation mode. *(Refer to page 62.)*

2. Start
Turn the start switch (STF or STR) on.
Operating status indication of FWD (or REV) flickers.

CAUTION
When both the forward switch and reverse switch are on, the inverter will not start. Also, if both switches turn on while running, the inverter decelerates to stop.

3. Acceleration → constant speed
Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full.
The frequency value on the indication increases according to *Pr. 7 Acceleration time* until 60.00 (60Hz) is displayed.

4. Deceleration
Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full.
The frequency value of the indication decreases according to *Pr. 8 Deceleration time* until 0.00 (0.00Hz) is displayed.
The motor stops.



5. Stop
Turn the start switch (STF or STR) off.

When you want to operate in external operation mode always at powering on or when you want to save the trouble of (PU/EXT) input, set "2" (external operation mode) in Pr. 79 Operation mode selection to choose external operation mode always.

REMARKS

Pr. 178 STF terminal function selection must be set to "60" (or *Pr. 179 STR terminal function selection* must be set to "61").
(all are initial values)

? The motor will not rotate ... Why?

☞ Check that [EXT] is lit.
[EXT] is valid when *Pr. 79* = "0" (initial value) or "2".

Use (PU/EXT) to lit [EXT].

☞ Check that wiring is correct. Check once again.

? Change the frequency (0Hz) at the minimum voltage input (at 0V, initial value)

☞Adjust the frequency in *calibration parameter C2 Terminal 2 frequency setting bias frequency*. *(Refer to chapter 4 of the instruction manual (applied).)*

When you want to compensate frequency setting, use terminal 1.
For details, refer to *chapter 4 of the instruction manual (applied)*.

4.5.4 Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value)

<How to change the maximum frequency?>

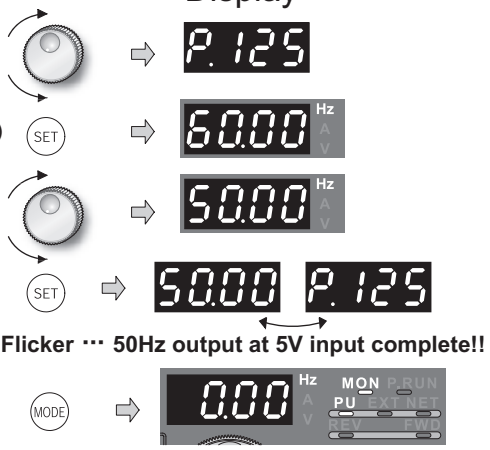
Changing example

When you want to use the 0 to 5VDC input frequency setting potentiometer to change the 5V-time frequency from 60Hz (initial value) to 50Hz
Adjust to output 50Hz at 5V voltage input.
Set "50Hz" in *Pr. 125*.

Operation

1. Turn until P.125 (*Pr. 125*) appears.
2. Press (SET) to show the currently set value. (60.00Hz)
3. Turn to change the set value to " 50.00 ". (50.00Hz).
4. Press (SET) to set.
5. Mode/monitor check
   Press (MODE) twice to choose the monitor/frequency monitor.
6. Turn the start switch (STF or STR) on and turn the potentiometer (frequency setting potentiometer) clockwise to full slowly.
   (Refer to 4.5.3 steps 2 to 5)

Display

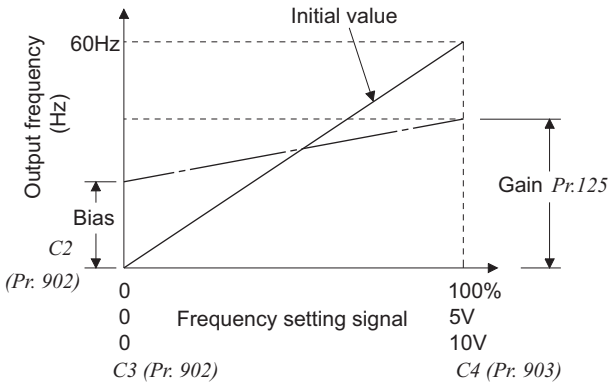


? The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz ... Why?

☞ The meter can be adjusted by *calibration parameter C0 FM terminal calibration*. *(Refer to chapter 4 of the instruction manual (applied).)*

? Set frequency at 0V using *calibration parameter C2* and adjust the indicator using *calibration parameter C0*.

(Refer to chapter 4 of the instruction manual (applied).)



REMARKS

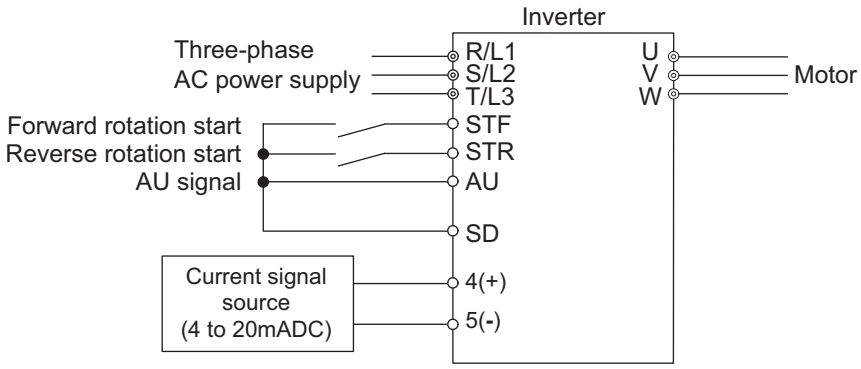
As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied to across terminals 2-5 and adjust at any point without a voltage applied.
(Refer to *chapter 4 of the instruction manual (applied)* for the setting method of *calibration parameter C4*.)

4.5.5 Perform frequency setting by analog (current input)

POINT

- Switch terminal STF(STR)-SD on to give a start command.
- Turn the AU signal on.
- Set "2" (external operation mode) in *Pr. 79 Operation mode selection*

[Connection diagram]



Operation

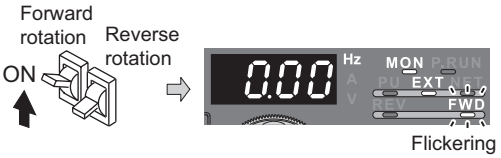
Display

1. Power on → operation mode check
   For the initial setting, the inverter operates in external operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press (PU/EXT) to change to the external [EXT] operation mode. If the operation mode still does not change, set *Pr. 79* to change to external operation mode. *(Refer to page 62.)*

2. Start
   Turn the start switch (STF or STR) on.
   FWD or REV of operation indication flickers.

CAUTION

When both the forward switch and reverse switch are on, the inverter will not start. Also, if both switches turn on while running, the inverter decelerates to stop.

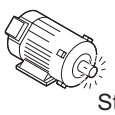


Flickering

3. Acceleration → constant speed
   Perform 20mA input.
   The frequency value on the indication increases according to *Pr. 7 Acceleration time* until "60.00" (60.00Hz) is displayed.

4. Deceleration
   Perform 4mA input.
   The frequency value on the indication decreases according to *Pr. 8 Deceleration time* until "0.00" (0.00Hz) is displayed and FWD or REV of the operating status indication flickers. The motor stops.

Flickering



Stop

5. Stop
   Turn the start switch (STF or STR) off.

REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). *(Refer to chapter 4 of the instruction manual (applied).)*

? The motor will not rotate ... Why?

☞ Check that [EXT] is lit.
[EXT] is valid when *Pr. 79* = "0" (initial value) or "2".

Use (PU/EXT) to lit [EXT].

☞ Check that the AU signal is on.
Turn the AU signal on.

☞ Check that wiring is orrect. Check it again.

? Change the frequency (0Hz) at the minimum current input (at 4mA, initial value)

☞ Adjust the frequency in *calibration parameter C5 Terminal 4 frequency setting bias frequency*.
(Refer to chapter 4 of the instruction manual (applied).)

4.5.6 Change the frequency (60Hz) of the maximum value of potentiometer (at 20mA, initial value)

<How to change the maximum frequency?>

Changing example

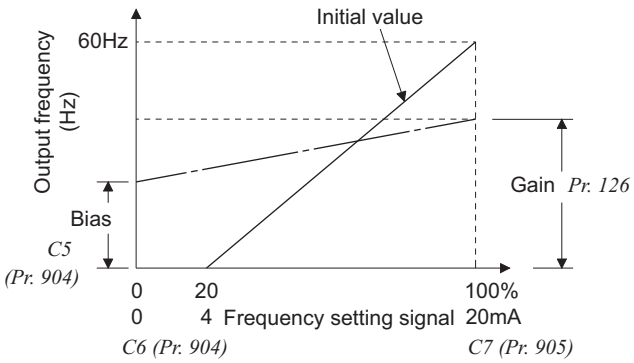
When you want to use the 4 to 20mA input frequency setting potentiometer to change the 20mA-time frequency from 60Hz (initial value) to 50Hz
Adjust to output 50Hz at 20mA current input.
Set "50Hz" in *Pr. 126*.

Operation	Display
1. Turn dial until P.126 (*Pr. 126*) appears.	P.126
2. Press SET to show the currently set value. (60.00Hz)	60.00 Hz
3. Turn dial to change the set value to "50.00". (50.00Hz)	50.00 Hz
4. Press SET to set the value.	50.00 ⇔ P.126
	Flicker ··· 50Hz output at 20mA input complete!!
5. Mode/monitor check Press MODE twice to choose the monitor/frequency monitor.	0.00 Hz MON PU EXT NET
6. Turn the start switch (STF or STR) on to allow 20mA current to flow. (Refer to 4.5.5 steps 2 to 5)	

? The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz ... Why?

☞ The meter can be adjusted by *calibration parameter C0 FM terminal calibration*.
(Refer to chapter 4 of the instruction manual (applied).)

? Set frequency at 4mA using *calibration parameter C5* and adjust the indicator using *calibration parameter C0*.
(Refer to chapter 4 of the instruction manual (applied).)



REMARKS

As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied to across terminals 4-5 and adjust at any point without a voltage applied.
(Refer to *chapter 4 of the instruction manual (applied)* for the setting method of *calibration parameter C7*.)

4.6 Parameter List

4.6.1 List of parameters classified by purpose of use

This instruction manual provides basic explanation of parameters. For parameters not stated, refer to *the "chapter 4 Parameter" of the instruction manual (applied)*.
Set the parameters according to the operating conditions. The following list indicates purpose of use and corresponding parameters.

Purpose of Use		Parameter Number
Control mode	Change the control method	Pr. 80, Pr. 81, Pr. 451, Pr. 800
Speed control by real sensorless vector control and vector control	Torque limit level setting for speed control	Pr. 22, Pr. 803, Pr. 810 to Pr. 817, Pr. 858, Pr. 868, Pr. 874
	To perform high accuracy/fast response operation (gain adjustment of real sensorless vector control and vector control)	Pr. 818 to Pr. 821, Pr. 830, Pr. 831, Pr. 880
	Speed feed forward control, model adaptive speed control	Pr. 828, Pr. 877 to Pr. 881
	Torque bias function	Pr. 840 to Pr. 848
	Prevent the motor from overrunning	Pr. 285, Pr. 853, Pr. 873
	Notch filter	Pr. 862, Pr. 863
Torque control by real sensorless vector control and vector control	Torque command	Pr. 803 to Pr. 806
	Speed limit	Pr. 807 to Pr.809
	Gain adjustment for torque control	Pr. 824, Pr. 825, Pr. 834, Pr. 835
Position control by vector control	Conditional position feed function by contact input	Pr. 419, Pr. 464 to Pr. 494
	Position control by pulse train input of the inverter	Pr. 419, Pr. 428 to Pr. 430
	Setting the electronic gear	Pr. 420, Pr. 421, Pr. 424
	Setting of positioning adjustment parameter	Pr. 426, Pr. 427
	Gain adjustment of position control	Pr. 422, Pr. 423, Pr. 425
Adjust the output torque of the motor (current)	Manual torque boost	Pr. 0, Pr. 46, Pr. 112
	Advanced magnetic flux vector control	Pr. 80, Pr. 81, Pr. 89, Pr. 453, Pr. 454, Pr. 569
	Real sensorless vector control	Pr. 80, Pr. 81, Pr. 451, Pr. 800
	Slip compensation	Pr. 245 to Pr. 247
	Stall prevention operation	Pr. 22, Pr. 23, Pr. 48, Pr. 49, Pr. 66, Pr. 114, Pr. 115, Pr. 148, Pr. 149, Pr. 154, Pr. 156, Pr. 157, Pr. 858, Pr. 868
	Torque limit	Pr. 22, Pr. 803, Pr. 810, Pr. 812 to Pr. 817, Pr. 858, Pr. 868, Pr. 874
Limit the output frequency	Maximum/minimum frequency	Pr. 1, Pr. 2, Pr. 18
	Avoid mechanical resonance points (frequency jump)	Pr. 31 to Pr. 36
	Speed limit	Pr. 807 to Pr. 809
Set V/F pattern	Base frequency, voltage	Pr. 3, Pr. 19, Pr. 47, Pr. 113
	V/F pattern matching applications	Pr. 14
	Adjustable 5 points V/F	Pr. 71, Pr. 100 to Pr. 109
Frequency setting with terminals (contact input)	Multi-speed setting operation	Pr. 4 to Pr. 6, Pr. 24 to Pr. 27, Pr. 232 to Pr. 239
	Jog operation	Pr. 15, Pr. 16
	Input compensation of multi-speed and remote setting	Pr. 28
	Remote setting function	Pr. 59

Purpose of Use		Parameter Number
Acceleration/deceleration time/pattern adjustment	Acceleration/deceleration time setting	Pr. 7, Pr. 8, Pr. 20, Pr. 21, Pr. 44, Pr. 45, Pr. 110, Pr. 111
	Starting frequency	Pr. 13, Pr. 571
	Acceleration/deceleration pattern and backlash measures	Pr. 29, Pr. 140 to Pr. 143, Pr.380 to Pr. 383, Pr. 516 to Pr. 519
	Set a shortest and optimum acceleration/deceleration time automatically. (Automatic acceleration/deceleration)	Pr. 61 to Pr. 64, Pr. 292, Pr. 293
	Regeneration avoidance functions at deceleration	Pr. 882 to Pr.886, Pr.665
Selection and protection of a motor	Motor protection from overheat (electronic thermal relay function)	Pr. 9, Pr. 51
	Use the constant torque motor (applied motor)	Pr. 71, Pr. 450
	Offline auto tuning	Pr. 82 to Pr. 84, Pr. 90 to Pr. 94, Pr. 96, Pr. 455 to Pr. 463, Pr. 684, Pr. 859, Pr. 860
	Online auto tuning	Pr. 95, Pr. 574
	Easy gain tuning	Pr. 818, Pr. 819
Motor brake and stop operation	DC injection brake	Pr. 10 to Pr. 12, Pr. 850
	Selection of motor stopping method	Pr. 250
	Decelerate the motor to a stop at instantaneous power failure	Pr. 261 to Pr. 266, Pr. 294
	Stop-on-contact control	Pr. 6, Pr. 270, Pr. 275, Pr. 276
	Brake sequence function	Pr. 278 to Pr. 285, Pr. 292
Function assignment of external terminal and control	Function assignment of input terminal	Pr. 178 to Pr. 189
	Start signal selection	Pr. 250
	Logic selection of output stop signal (MRS)	Pr. 17
	Selection of action conditions of the second (third) function signal (RT(X9))	Pr. 155
	Terminal assignment of output terminal	Pr. 190 to Pr. 196
	Output frequency detection (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	Pr. 41 to Pr. 43, Pr. 50, Pr. 116, Pr. 865
	Output current detection (Y12 signal) Zero current detection (Y13 signal)	Pr. 150 to Pr. 153, Pr. 166, Pr. 167
	Remote output function (REM signal)	Pr. 495 to Pr. 497
Monitor display and monitor output signal	Initial settings of RS-485 communication	Pr. 37, Pr. 144
	Change of DU/PU monitor descriptions Cumulative monitor clear	Pr. 52, Pr. 170, Pr. 171, Pr. 563, Pr. 564, Pr. 891
	Change of the monitor output from terminal FM and AM	Pr. 54 to Pr. 56, Pr. 158, Pr. 866, Pr. 867
	Adjustment of terminal FM and AM (calibration)	C0 (Pr. 900), C1 (Pr. 901)
	Energy saving monitor	Pr. 891 to Pr. 899
Output frequency detection, current and torque	Output frequency detection (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	Pr. 41 to Pr. 43, Pr. 50, Pr. 116, Pr. 865
	Output current detection (Y12 signal) Zero current detection (Y13 signal)	Pr. 150 to Pr. 153, Pr. 166, Pr. 167
	Torque detection (TU signal)	Pr. 864
Operation selection at power failure and instantaneous power failure	Restart operation after instantaneous power failure/Flying start	Pr. 57, Pr. 58, Pr. 162 to Pr. 165, Pr. 299, Pr. 611
	Decelerate the motor to a stop at instantaneous power failure	Pr. 261 to Pr. 266, Pr. 294
Operation setting at fault occurrence	Retry function at fault occurrence	Pr. 65, Pr. 67 to Pr. 69
	Output function of fault code	Pr. 76
	Input/output phase failure protection selection	Pr. 251, Pr. 872
	Fault definition	Pr. 875
	Regeneration avoidance function	Pr. 882 to Pr. 886, Pr. 665

Purpose of Use		Parameter Number
Energy saving operation	Energy saving control selection	Pr. 60
	How much energy can be saved (energy saving monitor)	Pr. 891 to Pr. 899
Reduction of the motor noise Measures against noise and leakage currents	Carrier frequency and SoftPWM selection	Pr. 72, Pr. 240
	Noise elimination at the analog input	Pr. 74, Pr. 822, Pr. 826, Pr. 832, Pr. 836, Pr. 849
Frequency setting by analog input	Analog input selection	Pr. 73, Pr. 267
	Override function	Pr. 73, Pr. 252, Pr. 253
	Noise elimination at the analog input	Pr. 74, Pr. 822, Pr. 826, Pr. 832, Pr. 836, Pr. 849
	Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	Pr. 125, Pr. 126, Pr. 241, C2 to C7 (Pr. 902 to Pr. 905)
	Compensation at the analog input	Pr. 242, Pr. 243
Misoperation prevention and parameter setting restriction	Reset selection, disconnected PU detection	Pr. 75
	Prevention of parameter rewrite	Pr. 77
	Prevention of reverse rotation of the motor	Pr. 78
	Display necessary parameters only. (user group)	Pr. 160, Pr. 172 to Pr. 174
	Control of parameter write by communication	Pr. 342
Selection of operation mode and operation location	Operation mode selection	Pr. 79
	Operation mode when power is on	Pr. 79, Pr. 340
	Operation command source and speed command source during communication operation	Pr. 338, Pr. 339
	Selection of the NET mode operation control source	Pr. 550
	Selection of the PU mode operation control source	Pr. 551
Communication operation and setting	Initial settings of RS-485 communication	Pr. 117 to Pr. 124, Pr. 331 to Pr. 337, Pr. 341
	Control of parameter write by communication	Pr. 342
	ModbusRTU communication specifications	Pr. 343, Pr. 539
	Operation command source and speed command source during communication operation	Pr. 338, Pr. 339
	Selection of the NET mode operation control source	Pr. 550
	ModbusRTU protocol (communication protocol selection)	Pr. 549
Special operation and frequency control	PID control	Pr. 127 to Pr. 134, Pr. 575 to Pr. 577
	Switch between the inverter operation and commercial power-supply operation to use	Pr. 135 to Pr. 139, Pr. 159
	Operate at a high speed when a load is light. (load torque high speed frequency control)	Pr. 4, Pr. 5, Pr. 270 to Pr. 274
	Droop control	Pr. 286 to Pr. 288
	Frequency control by pulse train input	Pr. 291, Pr. 384 to Pr. 386
Useful functions	Free parameter	Pr. 888, Pr. 889
	Increase cooling fan life	Pr. 244
	To determine the maintenance time of parts.	Pr. 255 to Pr. 259, Pr. 503, Pr. 504
	How much energy can be saved (energy saving monitor)	Pr. 60, Pr. 891 to Pr. 899
Setting from the parameter unit and operation panel	Parameter unit language switchover	Pr. 145
	Operation selection of the operation panel	Pr. 161
	Buzzer control of the operation panel	Pr. 990
	Contrast adjustment of the parameter unit	Pr. 991

4.6.2 Parameter list

· ◎ indicates simple mode parameters.
· The abbreviations in the explanations below indicate:

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)
· "○" indicates enabled and "×" indicates disabled of "parameter copy", "parameter clear", and "all parameter clear".

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Manual torque boost V/F	0 ◎		Torque boost	0.1%	3/2% *	0 to 30%	Set the output voltage at 0Hz as %. * The initial value differs according to the inverter capacity. (7.5K or less / 11K or more)	○	○	○
		46	Second torque boost	0.1%	9999	0 to 30%	Set the torque boost when the RT signal is on.	○	○	○
						9999	Without second torque boost			
		112	Third torque boost	0.1%	9999	0 to 30%	Set the torque boost when the X9 signal is on.	○	○	○
						9999	Without third torque boost			
Maximum/minimum frequency	1 ◎		Maximum frequency	0.01Hz	120Hz	0 to 120Hz	Set the upper limit of the output frequency.	○	○	○
	2 ◎		Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Set the lower limit of the output frequency.	○	○	○
		18	High speed maximum frequency	0.01Hz	120Hz	120 to 400Hz	Set when performing the operation at 120Hz or more.	○	○	○
Base frequency, voltage V/F	3 ◎		Base frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency when the motor rated torque is generated. (50Hz/60Hz)	○	○	○
		19	Base frequency voltage	0.1V	9999	0 to 1000V	Set the base voltage.	○	○	○
						8888	95% of power supply voltage			
						9999	Same as power supply voltage			
		47	Second V/F (base frequency)	0.01Hz	9999	0 to 400Hz	Set the base frequency when the RT signal is on.	○	○	○
						9999	Second V/F is invalid			
		113	Third V/F (base frequency)	0.01Hz	9999	0 to 400Hz	Set the base frequency when the X9 signal is ON.	○	○	○
						9999	Third V/F is invalid			
Multi-speed setting operation	4 ◎		Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Set frequency when the RH signal is on.	○	○	○
	5 ◎		Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz	Set frequency when the RM signal is on.	○	○	○
	6 ◎		Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz	Set frequency when the RL signal is on.	○	○	○
		24 to 27	Multi-speed setting (4 speed to 7 speed)	0.01Hz	9999	0 to 400Hz, 9999	Frequency from 4 speed to 15 speed can be set according to the combination of the RH, RM, RL and REX signals. 9999: not selected	○	○	○
		232 to 239	Multi-speed setting (8 speed to 15 speed)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Acceleration/deceleration time setting	7	◎	Acceleration time	0.1/ 0.01s	5/15s *	0 to 3600/ 360s	Set the motor acceleration time. * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)	○	○	○
	8	◎	Deceleration time	0.1/ 0.01s	5/15s *	0 to 3600/ 360s	Set the motor deceleration time. * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)	○	○	○
		20	Acceleration/ deceleration reference frequency	0.01Hz	60Hz	1 to 400Hz	Set the frequency referenced as acceleration/deceleration time. Set the frequency change time from stop to *Pr. 20* for acceleration/deceleration time.	○	○	○
		21	Acceleration/ deceleration time increments	1	0	0	Increments: 0.1s Range: 0 to 3600s	The increments and setting range of acceleration/ deceleration time setting can be changed.	○	○	○
						1	Increments: 0.01s Range: 0 to 360s				
		44	Second acceleration/ deceleration time	0.1/ 0.01s	5s	0 to 3600/ 360s	Set the acceleration/deceleration time when the RT signal is on.		○	○	○
		45	Second deceleration time	0.1/ 0.01s	9999	0 to 3600/ 360s	Set the deceleration time when the RT signal is on.		○	○	○
						9999	Acceleration time = deceleration time				
		110	Third acceleration/ deceleration time	0.1/ 0.01Hz	9999	0 to 3600/ 360s	Set the acceleration/deceleration time when the X9 signal is on.		○	○	○
						9999	Function invalid				
		111	Third deceleration time	0.1/ 0.01Hz	9999	0 to 3600/ 360s	Set the deceleration time when the X9 signal is on.		○	○	○
						9999	Acceleration time = deceleration time				
Motor protection from overheat (electronic thermal relay function)	9	◎	Electronic thermal O/L relay	0.01A	Inverter rated current	0 to 500A	Set the rated motor current.		○	○	○
		51	Second electronic thermal O/L relay	0.01A	9999	0 to 500A	Made valid when the RT signal is on. Set the rated motor current.		○	○	○
						9999	Second electronic thermal O/L relay invalid				
DC injection brake	10		DC injection brake operation frequency	0.01Hz	3/0.5Hz*	0 to 120Hz	Set the operation frequency of the DC injection brake. * The initial value changes from 3Hz to 0.5Hz when a control mode other than vector is changed to vector control.		○	○	○
						9999	Operate when the output frequency becomes less than or equal to *Pr. 13 Starting frequency*.				
	11		DC injection brake operation time	0.1s	0.5s	0	DC injection brake disabled		○	○	○
						0.1 to 10s	Set the operation time of the DC injection brake.				
						8888	Operated while the X13 signal is on.				
	12		DC injection brake operation voltage	0.1%	4/2% *	0	DC injection brake disabled		○	○	○
						0.1 to 30%	Set the DC injection brake voltage (torque). * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)				
		802	Pre-excitation selection	1	0	0	Zero speed control	Setting can be made under vector control.	○	○	○
						1	Servo lock				
		850	Brake operation selection	1	0	0	DC injection brake		○	○	○
						1	Zero speed control (under real sensorless vector control)				
Starting frequency	13		Starting frequency	0.01Hz	0.5Hz	0 to 60Hz	Starting frequency can be set.		○	○	○
		571	Holding time at a start	0.1s	9999	0.0 to 10.0s	Set the holding time of *Pr. 13 Starting frequency*.		○	○	○
						9999	Holding function at a start is invalid				

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
V/F pattern matching applications V/F	14		Load pattern selection	1	0	0	For constant torque load	○	○	○
						1	For variable-torque load			
						2	For constant torque lift: Boost for reverse rotation 0%			
						3	For constant torque lift: Boost for forword rotation 0%			
						4	RT signal ON ....For constant-torque load (Same as in setting 0) RT signal OFF ...For constant-torque lift Boost for reverse rotation 0% (Same as in setting 2)			
						5	RT signal ON ....For constant-torque load (Same as in setting 0) RT signal OFF ...For constant-torque lift Boost for forward rotation 0% (Same as in setting 3)			
Jog operation	15		Jog frequency	0.01Hz	5Hz	0 to 400Hz	Set the frequency for jog operation.	○	○	○
	16		Jog acceleration/ deceleration time	0.1/ 0.01s	0.5s	0 to 3600/ 360s	Set the acceleration/deceleration time for jog operation. Set the time taken to reach the frequency set in *Pr. 20 Acceleration/ deceleration reference frequency* for acceleration/deceleration time. (Initial value is 60Hz) In addition, acceleration/deceleration time can not be set separately.	○	○	○
Logic selection of output stop signal (MRS)	17		MRS input selection	1	0	0	Open input always	○	○	○
						2	Normally closed input (NC contact input specifications)			
						4	External terminal:Normally closed input (NC contact input specifications) Communication .:Normally open input			
—	18		Refer to *Pr. 1 and Pr. 2*.							
	19		Refer to *Pr. 3*.							
	20, 21		Refer to *Pr. 7 and Pr. 8*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Stall prevention operation Magnetic flux V/F	22		Stall prevention operation level	0.1%	150%	0	Stall prevention operation selection becomes invalid.	○	○	○
						0.1 to 400%	Function as stall prevention operation under V/F control and advanced magnetic flux vector control. Set the current value at which stall prevention operation is started. Refer to *page 102* for torque limit level.			
	23		Stall prevention operation level compensation factor at double speed	0.1%	9999	0 to 200%	The stall operation level can be reduced when operating at a high speed above the rated frequency.	○	○	○
						9999	Constant according to *Pr. 22*			
		48	Second stall prevention operation current	0.1%	150%	0	Second stall prevention operation invalid	○	○	○
						0.1 to 220%	The stall prevention operation level can be set.			
		49	Second stall prevention operation frequency	0.01Hz	0Hz	0	Second stall prevention operation invalid	○	○	○
						0.01 to 400Hz	Set the frequency at which stall prevention operation of *Pr. 48* is started.			
						9999	*Pr.48* is valid when the RT signal is on.			
		66	Stall prevention operation reduction starting frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency at which the stall operation level is started to reduce.	○	○	○
		114	Third stall prevention operation current	0.1%	150%	0	Third stall prevention operation invalid	○	○	○
						0.1 to 220%	The stall prevention operation level can be set.			
		115	Third stall prevention operation frequency	0.01Hz	0	0	Third stall prevention operation invalid	○	○	○
						0.01 to 400Hz	Set the frequency at which stall prevention operation of *Pr. 114* is started.			
		148	Stall prevention level at 0V input	0.1%	150%	0 to 220%	When "4" is set in *Pr. 868* (*Pr. 858*), stall prevention operation level can be changed by the analog signal input to terminal 1 (terminal 4).	○	○	○
		149	Stall prevention level at 10V input	0.1%	200%	0 to 220%		○	○	○
		154	Voltage reduction selection during stall prevention operation	1	1	0	With voltage reduction	○	○	○
						1	Without voltage reduction			
							You can select whether to use output voltage reduction during stall prevention operation or not.			
		156	Stall prevention operation selection	1	0	0 to 31, 100, 101	*Pr. 156* allows you to select whether to use stall prevention or not according to the acceleration/deceleration status.	○	○	○
		157	OL signal output timer	0.1s	0s	0 to 25s	Set the output start time of the OL signal output when stall prevention is activated.	○	○	○
						9999	Without the OL signal output			
		858	Terminal 4 function assignment	Refer to *page 134.*						
		868	Terminal 1 function assignment							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Torque limit level (Vector / Sensorless)	22		Torque limit level	0.1%	150%	0 to 400%	This functions as torque limit level under real sensorless vector control. Refer to *page 101* for stall prevention operation level.	○	○	○
		803	Constant power range torque characteristic selection	1	0	0	Constant output limit (torque current limit and control)	○	○	○
						1	Constant torque limit (torque limit and control)			
		810	Torque limit input method selection	1	0	0	Internal torque limit Parameter-set torque limit operation is performed.	○	○	○
						1	External torque limit Torque limit based on the analog input from terminal 1 and 4.			
		811	Set resolution switchover	1	0		**Running speed increments** / **Torque limit increments**	○	○	○
						0	1r/min / 0.1% increments			
						1	0.1r/min			
						10	1r/min / 0.01% increments			
						11	0.1r/min			
		812	Torque limit level (regeneration)	0.1%	9999	0 to 400%	Set the torque limit level for forward rotation regeneration.	○	○	○
						9999	*Pr. 22* value is used for limit.			
		813	Torque limit level (3rd quadrant)	0.1%	9999	0 to 400%	Set the torque limit level for reverse rotation driving.	○	○	○
						9999	*Pr. 22* value is used for limit.			
		814	Torque limit level (4th quadrant)	0.1%	9999	0 to 400%	Set the torque limit level for reverse rotation regeneration.	○	○	○
						9999	*Pr. 22* value is used for limit.			
		815	Torque limit level 2	0.1%	9999	0 to 400%	When the torque limit selection (TL) signal is on, the *Pr. 815* value is a torque limit value regardless of *Pr. 810*.	○	○	○
						9999	Depending on *Pr. 22* setting			
		816	Torque limit level during acceleration	0.1%	9999	0 to 400%	Set the torque limit value during acceleration.	○	○	○
						9999	Same torque limit as at constant speed			
		817	Torque limit level during deceleration	0.1%	9999	0 to 400%	Set the torque limit value during deceleration.	○	○	○
						9999	Same torque limit as at constant speed			
		874	OLT level setting	0.1%	150%	0 to 200%	This function can make an inverter trip if the torque limit is activated to stall the motor. Set the output torque at which an inverter trip is made in *Pr. 874* .	○	○	○
—	24 to 27		Refer to *Pr. 4 to Pr. 6*.							
Input compensation of multi-speed and remote setting	28		Multi-speed input compensation selection	1	0	0	Without compensation	○	○	○
						1	With compensation			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Acceleration/deceleration pattern and backlash measures	29		Acceleration/ deceleration pattern selection	1	0	0	Linear acceleration/ deceleration	○	○	○
						1	S-pattern acceleration/deceleration A			
						2	S-pattern acceleration/deceleration B			
						3	Backlash measures			
						4	S-pattern acceleration/deceleration C			
						5	S-pattern acceleration/deceleration D			
		140	Backlash acceleration stopping frequency	0.01Hz	1Hz	0 to 400Hz	Set the stopping frequency and time for backlash measures. Valid when *Pr. 29* = "3"	○	○	○
		141	Backlash acceleration stopping time	0.1s	0.5s	0 to 360s		○	○	○
		142	Backlash deceleration stopping frequency	0.01Hz	1Hz	0 to 400Hz		○	○	○
		143	Backlash deceleration stopping time	0.1s	0.5s	0 to 360s		○	○	○
		380	Acceleration S-pattern 1	1%	0%	0 to 50%	Valid when S-pattern acceleration/ deceleration C (*Pr. 29* = 4) is set. Set the time taken for S-pattern from starting of acceleration/deceleration to linear acceleration as % to the acceleration/deceleration time (*Pr. 7*, *Pr. 8*, etc.) An acceleration/deceleration pattern can be changed with the X20 signal.	○	○	○
		381	Deceleration S-pattern 1	1%	0%	0 to 50%		○	○	○
		382	Acceleration S-pattern 2	1%	0%	0 to 50%		○	○	○
		383	Deceleration S-pattern 2	1%	0%	0 to 50%		○	○	○
		516	S-pattern time at a start of acceleration	0.1s	0.1s	0.1 to 2.5s	Valid when S-pattern acceleration/ deceleration D (*Pr. 29* = 5) is set. Set the time taken for S-pattern acceleration/deceleration (S-pattern operation).	○	○	○
		517	S-pattern time at a completion of acceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
		518	S-pattern time at a start of deceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
		519	S-pattern time at a completion of deceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
Avoid mechanical resonance points (frequency jump)	31		Frequency jump 1A	0.01Hz	9999	0 to 400Hz, 9999	1A to 1B, 2A to 2B, 3A to 3B is frequency jumps 9999: Function invalid	○	○	○
	32		Frequency jump 1B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	33		Frequency jump 2A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	34		Frequency jump 2B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	35		Frequency jump 3A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	36		Frequency jump 3B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
Speed display and speed setting	37		Speed display	1	0	0	Frequency display, setting	○	○	○
						1 to 9998	Set the machine speed for *Pr.505* Set frequency.			
		144	Speed setting switchover	1	4	0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110	Set the number of motor poles when displaying the motor speed. A setting value is automatically changed depending on the *Pr.81* setting.	○	○	○
		505	Speed setting reference	0.01Hz	60Hz	1 to 120Hz	Set the frequency that will be the basis of machine speed display.	○	○	○
		811	Easy gain tuning response level setting	1	0		**Running speed increments** / **Torque limit increments**	○	○	○
						0	1r/min / 0.1% increments			
						1	0.1r/min			
						10	1r/min / 0.01% increments			
						11	0.1r/min			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Output frequency detection and motor speed (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	41		Up-to-frequency sensitivity	0.1%	10%	0 to 100%	Set the level where the SU signal turns on.	○	○	○
	42		Output frequency detection	0.01Hz	6Hz	0 to 400Hz	Set the frequency where the FU (FB) signal turns on.	○	○	○
	43		Output frequency detection for reverse rotation	0.01Hz	9999	0 to 400Hz	Set the frequency where the FU (FB) signal turns on in reverse rotation.	○	○	○
						9999	Same as *Pr. 42* setting			
		50	Second output frequency detection	0.01Hz	30Hz	0 to 400Hz	Set the frequency where the FU2 (FB2) signal turns on.	○	○	○
		116	Third output frequency detection	0.01Hz	60Hz	0 to 400Hz	Set the frequency where the FU3 (FB3) signal turns on.	○	○	○
		865	Low speed detection	0.01Hz	1.5Hz	0 to 400Hz	Set the frequency where the LS signal turns on.	○	○	○
—	44, 45		Refer to *Pr. 7 and Pr. 8*.							
	46		Refer to *Pr. 0*.							
	47		Refer to *Pr. 3*.							
	48, 49		Refer to *Pr. 22 and Pr. 23*.							
	50		Refer to *Pr. 41 to Pr. 43*.							
	51		Refer to *Pr. 9*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Change of DU/PU monitor descriptions Cumulative monitor clear	52		DU/PU main display data selection	1	0	0, 5 to 8, 10 to 14, 17 to 20, 22 to 25, 32 to 35, 50 to 57,100	Select monitor to be displayed on the operation panel and parameter unit and monitor to be output to the terminal FM and AM. 0 : Output frequency *(Pr. 52)* 1 : Output frequency *(Pr. 54, Pr. 158)* 2 : Output current *(Pr. 54, Pr. 158)* 3 : Output voltage *(Pr. 54, Pr. 158)* 5 : Frequency setting 6 : Running speed 7 : Motor torque 8 : Converter output voltage 10 : Electronic thermal relay function load factor 11 : Output current peak value 12 : Converter output voltage peak value 13 : Input power 14 : Output power 17 : Load meter 18 : Motor excitation current 19 : Position pulse *1 *(Pr. 52)* 20 : Cumulative energization time *(Pr. 52)* 21 : Reference voltage output *(Pr. 54, Pr. 158)* 22 : Orientation status *1 *(Pr. 52)* 23 : Actual operation time *(Pr. 52)* 24 : Motor load factor 25 : Cumulative power *(Pr. 52)* 32 : Torque command 33 : Torque current command 34 : Motor output 35 : Feedback pulse *1 *(Pr. 52)* 50 : Power saving effect 51 : Cumulative saving power *(Pr. 52)* 52 : PID set point 53 : PID measured value 54 : PID deviation (*Pr. 52*) 55 : Input/output terminal status *(Pr. 52)* 56 : Option input terminal status *(Pr. 52)* 57 : Option output terminal status *(Pr. 52)* 100 : Set frequency is displayed during a stop and output frequency is displayed during operation *(Pr. 52)* *1 Available only when the FR-A7AP is mounted.	○	○	○
	54		FM terminal function selection	1	1	1 to 3, 5 to 8, 10 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53		○	○	○
		158	AM terminal function selection	1	1	1 to 3, 5 to 8, 10 to 14, 17, 18, 21, 24, 32 to 34, 50, 52, 53		○	○	○
		170	Watt-hour meter clear	1	9999	0	Set "0" to clear the watt-hour meter monitor.	○	×	○
						10	Set the maximum value when monitoring from communication to 0 to 9999kWh.			
						9999	Set the maximum value when monitoring from communication to 0 to 65535kWh.			
		171	Operation hour meter clear	1	9999	0, 9999	Set "0" to clear the operation time monitor. Setting "9999" has no effect.	×	×	×
		268	Monitor decimal digits selection	1	9999	0	Displays the monitor as integral value.	○	○	○
						1	Displays the monitor in increments of 0.1.			
						9999	No fixed decimal position			
		563	Energization time carrying-over times	1	0	(0 to 65535)	The numbers of cumulative energization time monitor exceeded 65535h is displayed. Reading only	×	×	×
		564	Operating time carrying-over times	1	0	(0 to 65535)	The numbers of operation time monitor exceeded 65535h is displayed. Reading only	×	×	×
		867	AM output filter	0.01s	0.01s	0 to 5s	Set the output filter of terminal AM.	○	○	○
		891	Cumulative power monitor digit shifted times	1	9999	0 to 4	Set the number of times to shift the cumulative power monitor digit. Clamps the monitor value at maximum.	○	○	○
						9999	No shift Clears the monitor value when it exceeds the maximum value.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Change of the monitor output from terminal FM and AM	55		Frequency monitoring reference	0.01Hz	60Hz	0 to 400Hz	Set the full-scale value to output the output frequency monitor value to terminal FM and AM.	○	○	○
	56		Current monitoring reference	0.01A	Inverter rated current	0 to 500A	Set the full-scale value to output the output current monitor value to terminal FM and AM.	○	○	○
		866	Torque monitoring reference	0.1%	150%	0 to 400%	Set the full-scale value to output the torque monitor value to terminal FM and AM.	○	○	○
Restart operation after instantaneous power failure	57		Restart coasting time	0.1s	9999	0	The coasting time is as follows: 7.5K or less ..... 1.0s, 11K or more 3.0s	○	○	○
						0.1 to 5s	Set the waiting time for inverter-triggered restart after an instantaneous power failure.			
						9999	No restart			
	58		Restart cushion time	0.1s	1s	0 to 60s	Set a voltage starting time at restart.	○	○	○
		162	Automatic restart after instantaneous power failure selection	1	0	0	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	First cushion time for restart	0.1s	0s	0 to 20s	Set a voltage starting time at restart. Consider according to the magnitude of load (moment of inertia/torque).	○	○	○
		164	First cushion voltage for restart	0.1%	0%	0 to 100%		○	○	○
		165	Stall prevention operation level for restart	0.1%	150%	0 to 220%	Consider the rated inverter current as 100% and set the stall prevention operation level during restart operation.	○	○	○
		299	Rotation direction detection selection at restarting	1	0	0	Without rotation direction detection	○	○	○
						1	With rotation direction detection			
						9999	When *Pr. 78* = "0", the rotation direction is detected. When *Pr. 78* = "1", "2", the rotation direction is not detected.			
		611	Acceleration time at a restart	0.1s	5s	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*).			
Remote setting function	59		Remote function selection	1	0		**RH, RM, RL signal function** / **Frequency setting storage function**	○	○	○
						0	Multi-speed setting / —			
						1	Remote setting / Yes			
						2	Remote setting / No			
						3	Remote setting / No (Turning STF/STR off clears remotely-set frequency.)			
Energy saving control selection V/F	60		Energy saving control selection	1	0	0	Normal operation mode	○	○	○
						4	Energy saving operation mode			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Automatic acceleration/deceleration	61		Reference current	0.01A	9999	0 to 500A	Setting value (rated motor current) is referenced		○	○	○
						9999	Rated inverter current is referenced				
	62		Reference value at acceleration	0.1%	9999	0 to 220%	Setting value is a limit value	Shortest acceleration/ deceleration mode	○	○	○
							Setting value is an optimum value	Optimum acceleration/ deceleration mode			
						9999	150% is a limit value	Shortest acceleration/ deceleration mode			
							100% is an optimum value	Optimum acceleration/ deceleration mode			
	63		Reference value at deceleration	0.1%	9999	0 to 220%	Setting value is a limit value	Shortest acceleration/ deceleration mode	○	○	○
							Setting value is an optimum value	Optimum acceleration/ deceleration mode			
						9999	150% is a limit value	Shortest acceleration/ deceleration mode			
							100% is an optimum value	Optimum acceleration/ deceleration mode			
	64		Starting frequency for elevator mode	0.01Hz	9999	0 to 10Hz	0 to 10Hz are starting frequency		○	○	○
						9999	2Hz is starting frequency				
		292	Automatic acceleration/ deceleration	1	0	0	Normal mode		○	○	○
						3	Optimum acceleration/deceleration mode				
						5	Elevator mode 1				
						6	Elevator mode 2				
						7	Brake sequence mode 1				
						8	Brake sequence mode 2				
						11	Shortest acceleration/deceleration mode				
		293	Acceleration/ deceleration separate selection	1	0	0	Calculate acceleration/deceleration time of both acceleration and deceleration for the shortest and optimum acceleration/ deceleration mode.		○	○	○
						1	Calculate only acceleration time for the shortest and optimum acceleration/ deceleration mode				
						2	Calculate only deceleration time for the shortest and optimum acceleration/ deceleration mode				
Retry function at alarm occurrence	65		Retry selection	1	0	0 to 5	A fault for retry can be selected.		○	○	○
		67	Number of retries at fault occurrence	1	0	0	No retry function		○	○	○
						1 to 10	Set the number of retries at fault occurrence. A fault output is not provided during retry operation.				
						101 to 110	Set the number of retries at fault occurrence. (The setting value -100 is the number of retries.) A fault output is provided during retry operation.				
		68	Retry waiting time	0.1s	1s	0 to 10s	Set the waiting time from when an inverter fault occurs until a retry is made.		○	○	○
		69	Retry count display erase	1	0	0	Clears the number of restarts succeeded by retry.		○	○	○
—	66		Refer to *Pr. 22 and Pr. 23*.								
	67 to 69		Refer to *Pr. 65*.								

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled × : disabled		
Motor selection (applied motor)	71		Applied motor	1	0	0	Thermal characteristics of a standard motor		○	○	○
						1	Thermal characteristics of the Mitsubishi constant-torque motor				
						2	Thermal characteristic of standard motor Adjustable 5 points V/F				
						30	Thermal characteristics of the Mitsubishi vector motor SF-V5RU (1500r/min series)				
						40	Thermal characteristic of Mitsubishi high efficiency motor (SF-HR)				
						50	Thermal characteristic of Mitsubishi constant-torque motor (SF-HRCA)				
						3	Standard motor	Select "offline auto tuning setting"			
						13	Constant-torque motor Mitsubishi vector motor SF-V5RU (except for 1500 r/min series)				
						33	Mitsubishi vector motor SF-V5RU (1500r/min series), SF-THY				
						43	Mitsubishi high efficiency motor (SF-HR)				
						53	Mitsubishi constant-torque motor (SF-HRCA)				
						4	Standard motor	Auto tuning data can be read, changed, and set.			
						14	Constant-torque motor Mitsubishi vector motor SF-V5RU (except for 1500 r/min series)				
						34	Mitsubishi vector motor SF-V5RU (1500r/min series), SF-THY				
						44	Mitsubishi high efficiency motor (SF-HR)				
						54	Mitsubishi constant-torque motor (SF-HRCA)				
						5	Standard motor	Star connection Direct input of motor constants is enabled			
						15	Constant-torque motor				
						6	Standard motor	Delta connection Direct input of motor constants is enabled			
						16	Constant-torque motor				
						7	Standard motor	Star connection Motor constants direct input + Offline auto tuning			
						17	Constant-torque motor				
						8	Standard motor	Delta connection Motor constants direct input + Offline auto tuning			
						18	Constant-torque motor				
		450	Second applied motor	1	9999	0 to 8, 13 to 18, 30, 33, 34, 40, 43, 44, 50, 53, 54	Set when using the second motor. (same specifications as *Pr. 71*)		○	○	○
						9999	Second motor is invalid				

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Carrier frequency and SoftPWM selection	72		PWM frequency selection	1	2	0 to 15	PWM carrier frequency can be changed. The setting displayed is in [kHz]. Note that 0 indicates 0.7kHz, 15 indicates 14.5kHz. The following settings are for real sensorless vector control and vector control. 0 to 5: 2kHz, 6 to 9: 6kHz, 10 to 13: 10kHz, 14 to 15: 14kHz	○	○	○
		240	Soft-PWM operation selection	1	1	0	Soft-PWM invalid	○	○	○
						1	When *Pr. 72* = "0 to 5", Soft-PWM is valid.			
Analog input selection	73		Analog input selection	1	1	0 to 7, 10 to 17	You can select the input specifications of terminal 2 (0 to 5V, 0 to 10V, 0 to 20mA) and input specifications of terminal 1 (0 to ±5V, 0 to ±10V). To change the terminal 2 to the voltage input specification (0 to 5V/ 0 to 10V), turn OFF (initial status) the voltage/current input switch 2. To change it to the current input (0 to 20mA), turn ON the voltage/ current input switch 2. Override and reversible operation can be selected.	○	×	○
		242	Terminal 1 added compensation amount (terminal 2)	0.1%	100%	0 to 100%	Set the ratio of added compensation amount when terminal 2 is the main speed.	○	○	○
		243	Terminal 1 added compensation amount (terminal 4)	0.1%	75%	0 to 100%	Set the ratio of added compensation amount when terminal 4 is the main speed.	○	○	○
		252	Override bias	0.1%	50%	0 to 200%	Set the bias side compensation value of override function.	○	○	○
		253	Override gain	0.1%	150%	0 to 200%	Set the gain side compensation value of override function.	○	○	○
		267	Terminal 4 input selection	1	0	0	Terminal 4 input 4 to 20mA	Turn ON the voltage/current input switch 1(initial status).	○	×	○
						1	Terminal 4 input 0 to 5V	Turn OFF the voltage/current input switch 1.			
						2	Terminal 4 input 0 to 10V				
Response level of analog input and noise elimination	74		Input filter time constant	1	1	0 to 8	The primary delay filter time constant for the analog input can be set. A larger setting results slower response.	○	○	○
		822	Speed setting filter 1	0.001s	9999	0 to 5s, 9999	Set the time constant of the primary delay filter relative to the external speed command (analog input command).	○	○	○
		826	Torque setting filter 1	0.001s	9999	0 to 5s, 9999	Set the time constant of the primary delay filter relative to the external torque command (analog input command).	○	○	○
		832	Speed setting filter 2	0.001s	9999	0 to 5s, 9999	Second function of *Pr. 822* (valid when the RT terminal is on)	○	○	○
		836	Torque setting filter 2	0.001s	9999	0 to 5s, 9999	Second function of *Pr. 826* (valid when the RT terminal is on)	○	○	○
		849	Analog input offset adjustment	0.1%	100%	0 to 200%	This function provides speed command by analog input (terminal 2) with offset and avoids frequency command to be given due to noise under 0 speed command.	○	○	○
Reset selection, disconnected PU detection	75		Reset selection/ disconnected PU detection/PU stop selection	1	14	0 to 3, 14 to 17	You can select the reset input acceptance, disconnected PU (FR-DU07/FR-PU07/FR-PU04) connector detection function and PU stop function. For the initial value, reset always enabled, without disconnected PU detection, and with PU stop function are set.	○	×	×

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Output function of alarm code	76		Fault code output selection	1	0	0	Without fault code output	○	○	○
						1	With fault code output			
						2	Fault code output at fault occurrence only			
Prevention of parameter rewrite	77		Parameter write selection	1	0	0	Write is enabled only during a stop	○	○	○
						1	Parameter write is disabled.			
						2	Parameter write is enabled in any operation mode regardless of operating status.			
Prevention of reverse rotation of the motor	78		Reverse rotation prevention selection	1	0	0	Both forward and reverse rotations allowed	○	○	○
						1	Reverse rotation disallowed			
						2	Forward rotation disallowed			
Operation mode selection	79	◎	Operation mode selection	1	0	0	External/PU switchover mode	○	○	○
						1	Fixed to PU operation mode			
						2	Fixed to External operation mode			
						3	External/PU combined operation mode 1			
						4	External/PU combined operation mode 2			
						6	Switchover mode			
						7	External operation mode (PU operation interlock)			
		340	Communication startup mode selection	1	0	0	As set in *Pr. 79*.	○	○	○
						1, 2	Started in the network operation mode. When the setting is "2", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.			
						10, 12	Started in the network operation mode. Operation mode can be changed between PU operation mode and network operation mode from the operation panel. When the setting is "12", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Selection of control method (Vector / Sensorless / Magnetic flux)	80		Motor capacity	0.01kW	9999	0.4 to 55kW	Set the applied motor capacity.		○	○	○
						9999	V/F control is performed				
	81		Number of motor poles	1	9999	2, 4, 6, 8, 10	Set the number of motor poles.		○	○	○
						12, 14, 16, 18, 20	X18 signal-ON:V/F control	Set 10 + number of motor poles.			
						9999	V/F control is performed				
		89	Speed control gain (magnetic flux vector)	0.1%	9999	0 to 200%	Motor speed fluctuation due to load fluctuation is adjusted during advanced magnetic flux vector control. 100% is a referenced value.		○	×	○
						9999	Gain matching with the motor set in *Pr.71*.				
		451	Second motor control method selection	1	9999	10, 11, 12	Select the method of controlling the second motor. (same as *Pr.800*)		○	○	○
						20, 9999	V/F Control (advanced magnetic flux vector control)				
		453	Second motor capacity	0.01kW	9999	0.4 to 55kW	Set the capacity of the second motor.		○	○	○
						9999	V/F control is performed				
		454	Number of second motor poles	1	9999	2, 4, 6, 8, 10	Set the number of poles of the second motor.		○	○	○
						9999	V/F control is performed				
		569	Second motor speed control gain	0.1%	9999	0 to 200%	Second motor speed fluctuation due to load fluctuation is adjusted during advanced magnetic flux vector control. 100% is a referenced value.		○	×	○
						9999	Gain matching with the motor set in *Pr.450*.				
		800	Control method selection	1	20	0	Speed control	Vector control (FR-A7AP)	○	○	○
						1	Torque control				
						2	MC signal-ON:torque MC signal-OFF:speed				
						3	Position control				
						4	MC signal-ON:position MC signal-OFF:speed				
						5	MC signal-ON:torque MC signal-OFF:position				
						9	Vector control test operation Test operation of vector control (speed control) can be performed without connecting a motor.				
						10	Speed control	Real sensorless vector control			
						11	Torque control				
						12	MC signal-ON : Torque MC signal-OFF : Speed				
						20	V/F Control (advanced magnetic flux vector control)				

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Offline auto tuning Vector Sensorless Magnetic flux	82		Motor excitation current	0.01A	9999	0 to 500A	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
	83		Rated motor voltage	0.1V	200/400V *	0 to 1000V	Set the rated motor voltage(V). * The initial values differ according to the voltage level. (200V/400V)	○	○	○
	84		Rated motor frequency	0.01Hz	60Hz	10 to 120Hz	Set the rated motor frequency (Hz).	○	○	○
		90	Motor constant (R1)	0.001Ω	9999	0 to 50Ω	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		91	Motor constant (R2)	0.001Ω	9999	0 to 50Ω	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		92	Motor constant (L1)	0.001Ω (0.1mH)	9999	0 to 50Ω (0 to 1000mH)	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		93	Motor constant (L2)	0.001Ω (0.1mH)	9999	0 to 50Ω (0 to 1000mH)	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		94	Motor constant (X)	0.01Ω (0.1%)	9999	0 to 500Ω (0 to 100%)	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		96	Auto tuning setting/status	1	0	0	Auto tuning is not performed	○	×	○
						1	Tuning performed without motor running			
						101	Tuning performed with motor running			
		455	Second motor excitation current	0.01A	9999	0 to 500A	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		456	Rated second motor voltage	0.1V	200/400V *	0 to 1000V	Set the rated voltage (V) of the second motor. * The initial values differ according to the voltage level. (200V/400V)	○	○	○
		457	Rated second motor frequency	0.01Hz	60Hz	10 to 120Hz	Set the rated frequency (Hz) of the second motor.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Offline auto tuning Vector Sensorless Magnetic flux		458	Second motor constant (R1)	0.001Ω	9999	0 to 50Ω	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		459	Second motor constant (R2)	0.001Ω	9999	0 to 50Ω	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		460	Second motor constant (L1)	0.001Ω (0.1mH)	9999	0 to 50Ω (0 to 1000mH)	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		461	Second motor constant (L2)	0.001Ω (0.1mH)	9999	0 to 50Ω (0 to 1000mH)	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		462	Second motor constant (X)	0.01Ω (0.1%)	9999	0 to 500Ω (0 to 100%)	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		463	Second motor auto tuning setting/status	1	0	0, 1, 101	Set the tuning mode of the second motor. (same as *Pr. 96*)	○	×	○
		684	Tuning data unit switchover	1	0	0	Internal data converter value	○	○	○
						1	Displayed in "A, Ω, mH, %".			
		859	Torque current	0.01A	9999	0 to 500A	Tuning data (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
		860	Second motor torque current	0.01A	9999	0 to 500A	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA, SF-V5RU (1500r/min series)) constants			
—	89		Refer to *Pr. 81*.							
	90 to 94		Refer to *Pr. 82* to *Pr. 84*.							
Online auto tuning Vector Sensorless Magnetic flux	95		Online auto tuning selection	1	0	0	Online auto tuning is not performed	○	○	○
						1	Start-time tuning (at start-up)			
						2	Magnetic flux observer (normal)			
		574	Second motor online auto tuning	1	0	0, 1	Select the second motor online auto tuning. (same as *Pr. 95*)	○	○	○
—	96		Refer to *Pr. 82* to *Pr. 84*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Adjustable 5 points V/F (V/F)	100		V/F1(first frequency)	0.01Hz	9999	0 to 400Hz, 9999	Set each points (frequency, voltage) of V/F pattern. 9999: No V/F setting	○	○	○
	101		V/F1(first frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	102		V/F2(second frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	103		V/F2(second frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	104		V/F3(third frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	105		V/F3(third frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	106		V/F4(fourth frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	107		V/F4(fourth frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	108		V/F5(fifth frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	109		V/F5(fifth frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
		71	Refer to *page 108*.							
—	110, 111		Refer to *Pr. 7*.							
	112		Refer to *Pr. 0*.							
	113		Refer to *Pr. 3*.							
	114, 115		Refer to *Pr. 22*.							
	116		Refer to *Pr. 41*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
PU connector communication	117		PU communication station number	1	0	0 to 31	Specify the inverter station number. Set the inverter station numbers when two or more inverters are connected to one personal computer.	○	○	○
	118		PU communication speed	1	192	48, 96, 192, 384	Set the communication speed. The setting value × 100 equals the communication speed. For example, the communication speed is 19200bps when the setting value is "192".	○	○	○
	119		PU communication stop bit length	1	1	0	Stop bit length: 1bit data length: 8bit	○	○	○
						1	Stop bit length: 2bit data length: 8bit			
						10	Stop bit length: 1bit data length: 7bit			
						11	Stop bit length: 2bit data length: 7bit			
	120		PU communication parity check	1	2	0	Without parity check	○	○	○
						1	With odd parity check			
						2	With even parity check			
	121		Number of PU communication retries	1	1	0 to 10	Set the permissible number of retries at occurrence of a data receive error. If the number of consecutive errors exceeds the permissible value, the inverter will come to trip.	○	○	○
						9999	If a communication error occurs, the inverter will not come to trip.			
	122		PU communication check time interval	0.1s	9999	0	No PU connector communication	○	○	○
						0.1 to 999.8s	Set the communication check time interval. If a no-communication state persists for longer than the permissible time, the inverter will come to trip.			
						9999	No communication check (signal loss detection)			
	123		PU communication waiting time setting	1	9999	0 to 150ms	Set the waiting time between data transmission to the inverter and response.	○	○	○
						9999	Set with communication data.			
	124		PU communication CR/LF selection	1	1	0	Without CR/LF	○	○	○
						1	With CR			
						2	With CR/LF			
		342	Communication EEPROM write selection	1	0	0	Parameter values written by communication are written to the EEPROM and RAM.	○	○	○
						1	Parameter values written by communication are written to the RAM.			
		551	PU mode operation command source selection	1	2	1	Select the RS-485 terminals as PU operation mode control source.	○	○	○
						2	Select the PU connector as PU operation mode control source.			
						3	For manufacturer setting. Do not set.			
Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	125 ◎		Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 2 input gain (maximum).	○	×	○
	126 ◎		Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 4 input gain (maximum). (Valid when *Pr. 858* = 0 (initial value))	○	×	○
		241	Analog input display unit switchover	1	0	0	Displayed in %	Select the unit for analog input display.	○	○	○
						1	Displayed in V/mA			
		C2 (902)	Terminal 2 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 2 input.		○	×	○
		C3 (902)	Terminal 2 frequency setting bias	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 2 input.		○	×	○
		C4 (903)	Terminal 2 frequency setting gain	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage of terminal 2 input.		○	×	○
		C5 (904)	Terminal 4 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○
		C6 (904)	Terminal 4 frequency setting bias	0.1%	20%	0 to 300%	Set the converted % of the bias side current (voltage) of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○
		C7 (905)	Terminal 4 frequency setting gain	0.1%	100%	0 to 300%	Set the converted % of the gain side current (voltage) of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
PID control	127		PID control automatic switchover frequency	0.01Hz	9999	0 to 400Hz	Set the frequency at which the control is automatically changed to PID control.	○	○	○
						9999	Without PID automatic switchover function			
	128		PID action selection	1	10	10	PID reverse action — Deviation value signal (terminal 1)	○	○	○
						11	PID forward action — Deviation value signal (terminal 1)			
						20	PID reverse action — Measured value input (terminal 4) Set value (terminal 2 or *Pr. 133*)			
						21	PID forward action — Measured value input (terminal 4) Set value (terminal 2 or *Pr. 133*)			
						50	PID reverse action — Deviation value signal input (LONWORKS, CC-Link communication)			
						51	PID forward action — Deviation value signal input (LONWORKS, CC-Link communication)			
						60	PID reverse action — Measured value, set value input (LONWORKS, CC-Link communication)			
						61	PID forward action — Measured value, set value input (LONWORKS, CC-Link communication)			
	129		PID proportional band	0.1%	100%	0.1 to 1000%	If the proportional band is narrow (parameter setting is small), the manipulated variable varies greatly with a slight change of the measured value. Hence, as the proportional band narrows, the response sensitivity (gain) improves but the stability deteriorates, e.g. hunting occurs. Gain K = 1/proportional band	○	○	○
						9999	No proportional control			
	130		PID integral time	0.1s	1s	0.1 to 3600s	For deviation step input, time (Ti) required for only the integral (I) action to provide the same manipulated variable as that for the proportional (P) action. As the integral time decreases, the set point is reached earlier but hunting occurs more easily.	○	○	○
						9999	No integral control.			
	131		PID upper limit	0.1%	9999	0 to 100%	Set the upper limit value. If the feedback value exceeds the setting, the FUP signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○
						9999	No function			
	132		PID lower limit	0.1%	9999	0 to 100%	Set the lower limit value. If the measured value falls below the setting range, the FDN signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○
						9999	No function			
	133		PID action set point	0.01%	9999	0 to 100%	Used to set the set point for PID control.	○	○	○
						9999	Terminal 2 input voltage is the set point.			
	134		PID differential time	0.01s	9999	0.01 to 10.00s	For deviation lamp input, time (Td) required for providing only the manipulated variable for the proportional (P) action. As the differential time increases, greater response is made to a deviation change.	○	○	○
						9999	No differential control.			
		575	Output interruption detection time	0.1s	1s	0 to 3600s	If the output frequency after PID operation remains lower than the *Pr. 576* setting for longer than the time set in *Pr. 575*, the inverter stops operation.	○	○	○
						9999	Without output interruption function			
		576	Output interruption detection level	0.01Hz	0Hz	0 to 400Hz	Set the frequency at which the output interruption processing is performed.	○	○	○
		577	Output interruption cancel level	0.1%	1000%	900 to 1100%	Set the level (*Pr. 577* -1000%) to release the PID output interruption function.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Switch between the inverter operation and electronic bypass operation to use	135		Electronic bypass sequence selection	1	0	0	Without electronic bypass sequence	○	○	○
						1	With electronic bypass sequence			
	136		MC switchover interlock time	0.1s	1s	0 to 100s	Set the operation interlock time of MC2 and MC3.	○	○	○
	137		Start waiting time	0.1s	0.5s	0 to 100s	Set the time slightly longer (0.3 to 0.5s or so) than the time from when the ON signal enters MC3 until it actually turns on.	○	○	○
	138		Bypass selection at a fault	1	0	0	Inverter output is stopped (motor coast) at inverter fault.	○	○	○
						1	Operation is automatically switched to bypass operation at inverter fault (Not switched when an external thermal relay operation (E.OHT) or CPU fault (E.CPU) occurs)			
	139		Automatic switchover frequency from inverter to bypass operation	0.01Hz	9999	0 to 60Hz	Set the frequency to switch inverter operation to bypass operation.	○	○	○
						9999	Without automatic switchover			
		159	Automatic switchover frequency range from bypass to inverter operation	0.01Hz	9999	0 to 10Hz	Valid during automatic switchover operation (*Pr. 139* ≠ 9999) When the frequency command decreases below (*Pr. 139* - *Pr. 159*) after operation is switched from inverter operation to bypass operation, the inverter automatically switches operation to inverter operation and operates at the frequency of frequency command. When the inverter start command (STF/STR) is turned off, operation is switched to inverter operation also.	○	○	○
						9999	Valid during automatic switchover operation (*Pr. 139* ≠ 9999) When the inverter start command (STF/STR) is turned off after operation is switched from inverter operation to bypass operation, operation is switched to inverter operation and the motor decelerates to stop.			
—	140 to 143		Refer to *Pr. 29*.							
	144		Refer to *Pr. 37*.							
Parameter unit language switchover	145		PU display language selection	1	0	0	Japanese	○	×	×
						1	English			
						2	Germany			
						3	French			
						4	Spanish			
						5	Italian			
						6	Swedish			
						7	Finnish			
—	148,149		Refer to *Pr. 22*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Output current detection (Y12 signal) Zero current detection (Y13 signal)	150		Output current detection level	0.1%	150%	0 to 220%	Set the output current detection level. 100% is the rated inverter current.	○	○	○
	151		Output current detection signal delay time	0.1s	0s	0 to 10s	Set the output current detection period. Set the time from when the output current has risen above the setting until the output current detection signal (Y12) is output.	○	○	○
	152		Zero current detection level	0.1%	5%	0 to 220%	Set the zero current detection level. Suppose that the rated inverter current is 100%.	○	○	○
	153		Zero current detection time	0.01s	0.5s	0 to 1s	Set this parameter to define the period from when the output current drops below the *Pr. 152* value until the zero current detection signal (Y13) is output.	○	○	○
		166	Output current detection signal retention time	0.1s	0.1s	0 to 10s	Set the retention time when the Y12 signal is on.	○	○	○
						9999	The Y12 signal on status is retained. The signal is turned off at the next start.			
		167	Output current detection operation selection	1	0	0	Operation continues when the Y12 signal is on	○	○	○
						1	The inverter is brought to trip when the Y12 signal is on. (E.CDO)			
—	154		Refer to *Pr. 22*.							
Condition selection of function validity by the second function selection signal (RT) and third function(X9)	155		RT signal function validity condition selection	1	0	0	Second (third) function is immediately made valid with on of the RT (X9) signal.	○	○	○
						10	Second (third) function is valid only during the RT (X9) signal is on and constant speed operation. (invalid during acceleration/deceleration)			
—	156, 157		Refer to *Pr. 22* .							
	158		Refer to *Pr. 54* .							
	159		Refer to *Pr. 135* .							
User group function	160	◎	User group read selection	1	0	0	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.			
		172	User group registered display/ batch clear	1	0	(0 to 16)	Displays the number of cases registered as a user group (reading only).	○	×	×
						9999	Batch clear the user group registration			
		173	User group registration	1	9999	0 to 999, 9999	Set the parameter numbers to be registered to the user group. Read value is always "9999".	×	×	×
		174	User group clear	1	9999	0 to 999, 9999	Set the parameter numbers to be cleared from the user group. Read value is always "9999".	×	×	×
Operation selection of the operation panel	161		Frequency setting/ key lock operation selection	1	0	0	Setting dial frequency setting mode — Key lock mode invalid	○	×	○
						1	Setting dial potentiometer mode — Key lock mode invalid			
						10	Setting dial frequency setting mode — Key lock mode valid			
						11	Setting dial potentiometer mode — Key lock mode valid			
—	162 to 165		Refer to *Pr. 57*.							
	166, 167		Refer to *Pr. 150*.							
	168, 169		Parameter for manufacturer setting. Do not set.							
	170, 171		Refer to *Pr. 52*.							
	172 to 174		Refer to *Pr. 160*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Function assignment of input terminal	178		STF terminal function selection	1	60	0 to 9, 12 to 20, 22 to 28, 42 to 44, 60, 62, 64 to 69, 74, 9999	0: Low-speed operation command 1: Middle-speed operation command 2: High-speed operation command 3: Second function selection 4: Terminal 4 input selection 5: Jog operation selection 6: Selection of automatic restart after instantaneous power failure, flying start 7: External thermal relay input 8: Fifteen speed selection 9: Third function 12: PU operation external interlock 13: External DC injection brake start 14: PID control valid terminal 15: Brake opening completion signal 16: PU-external operation switchover 17: Load pattern selection forward/reverse rotation boost 18: V/F switch over 19: Load torque high-speed frequency 20: S-pattern acceleration/deceleration C switching terminal 22: Orientation command 23: Pre-excitation 24: Output stop 25: Start self-holding selection 26: Control mode changing 27: Torque limit selection 28: Start time tuning 42: Torque bias selection 1 * 43: Torque bias selection 2 * 44: P/PI control switchover 60: Forward rotation command (assigned to STF terminal (*Pr. 178*) only) 61: Reverse rotation command (assigned to STR terminal (*Pr. 179*) only) 62: Inverter reset 63: PTC thermistor input (assigned to AU terminal (*Pr. 184*) only) 64: PID forward/reverse action switchover 65: PU-NET operation switchover 66: External-NET operation switchover 67: Command source switchover 68: Conditional position pulse train sign * 69: Conditional position droop pulse clear * 74: Magnetic flux decay output shutoff 9999:No function * Available only when used with the FR-A7AP.	○	×	○
	179		STR terminal function selection	1	61	0 to 9, 12 to 20, 22 to 28, 42 to 44, 61, 62, 64 to 69, 74, 9999		○	×	○
	180		RL terminal function selection	1	0	0 to 9, 12 to 20, 22 to 28, 42 to 44, 62, 64 to 69, 74, 9999		○	×	○
	181		RM terminal function selection	1	1			○	×	○
	182		RH terminal function selection	1	2			○	×	○
	183		RT terminal function selection	1	3			○	×	○
	184		AU terminal function selection	1	4	0 to 9, 12 to 20, 22 to 28, 42 to 44, 62 to 69, 74, 9999		○	×	○
	185		JOG terminal function selection	1	5	0 to 9, 12 to 20, 22 to 28, 42 to 44, 62, 64 to 69, 74, 76, 9999		○	×	○
	186		CS terminal function selection	1	6	0 to 9, 12 to 20, 22 to 28, 42 to 44, 62, 64 to 69, 74, 9999		○	×	○
	187		MRS terminal function selection	1	24			○	×	○
	188		STOP terminal function selection	1	25			○	×	○
	189		RES terminal function selection	1	62			○	×	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Terminal assignment of output terminal	190		RUN terminal function selection	1	0	0 to 6, 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70, 84, 90 to 99, 100 to 106, 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184, 190 to 199, 9999	0, 100: Inverter running 1, 101: Up to frequency 2, 102: Instantaneous power failure/ undervoltage 3, 103: Overload alarm 4, 104: Output frequency detection 5, 105: Second output frequency detection 6, 106: Third output frequency detection 8, 108: Electronic thermal relay function pre-alarm 10, 110:PU operation mode 11, 111: Inverter operation ready 12, 112:Output current detection 13, 113:Zero current detection 14, 114:PID lower limit 15, 115:PID upper limit 16, 116:PID forward/reverse rotation output 17, —: Electronic bypass MC1 18, —: Electronic bypass MC2 19, —: Electronic bypass MC3 20, 120:Brake opening request 25, 125:Fan fault output 26, 126:Heatsink overheat pre-alarm 27, 127:Orientation in-position * 28, 128:Orientation error * 30, 130:Forward rotation output * 31, 131:Reverse rotation output * 32, 132:Regenerative status output * 33, 133:Operation ready 2 34, 134:Low speed output 35, 135:Torque detection 36, 136:In-position * 39, 139:Start time tuning completion 41, 141:Speed detection 42, 142:Second speed detection 43, 143:Third speed detection 44, 144:Inverter running 2 45, 145:Inverter running and start command is on 46, 146:During deceleration at occurrence of power failure (retained until release) 47, 147:During PID control activated 64, 164:During retry 70, 170:PID output interruption 84, 184:Position control preparation ready * 90, 190:Life alarm 91, 191:Fault output 3 (power-off signal) 92, 192:Energy saving average value updated timing 93, 193:Current average monitor signal 94, 194:Fault output 2 95, 195:Maintenance timer signal 96, 196:Remote output 97, 197:Alarm output 2 98, 198:Alarm output 99, 199:Fault output 9999: No function 0 to 99: Positive logic 100 to 199: Negative logic * Available only when used with the FR-A7AP.	○	×	○
	191		SU terminal function selection	1	1			○	×	○
	192		IPF terminal function selection	1	2			○	×	○
	193		OL terminal function selection	1	3			○	×	○
	194		FU terminal function selection	1	4			○	×	○
	195		ABC1 terminal function selection	1	99	0 to 6, 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70, 84, 90, 91, 94 to 99, 100 to 106, 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184, 190, 191, 194 to 199, 9999		○	×	○
	196		ABC2 terminal function selection	1	9999			○	×	○
—	232 to 239		Refer to *Pr. 4 to Pr. 6*.							
	240		Refer to *Pr. 72*.							
	241		Refer to *Pr. 125 and Pr. 126*.							
	242, 243		Refer to *Pr. 73*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Increase cooling fan life	244		Cooling fan operation selection	1	1	0	Operates at power on Cooling fan on/off control invalid (The cooling fan is always on at power on)		○	○	○
						1	Cooling fan on/off control valid The fan is normally on during inverter operation. The fan switches on/off according to the temperature during a stop of the inverter whose status is monitored.				
Slip compensation V/F	245		Rated slip	0.01%	9999	0 to 50%	Used to set the rated motor slip.		○	○	○
						9999	No slip compensation				
	246		Slip compensation time constant	0.01s	0.5s	0.01 to 10s	Used to set the response time of slip compensation. When the value is made smaller, response will be faster. However, as load inertia is greater, a regenerative overvoltage (E.OV□) error is more liable to occur.		○	○	○
	247		Constant-power range slip compensation selection	1	9999	0	Slip compensation is not made in the constant power range (frequency range above the frequency set in *Pr. 3*)		○	○	○
						9999	Slip compensation is made in the constant power range.				
Selection of motor stopping method	250		Stop selection	0.1s	9999	0 to 100s	The motor is coasted to a stop when the preset time elapses after the start signal is turned off.	STF signal: Forward rotation start STR signal: Reverse rotation start	○	○	○
						1000 to 1100s	The motor is coasted to a stop (*Pr. 250* - 1000)s after the start signal is turned off.	STF signal: Start signal STR signal: Forward/reverse signal			
						9999	When the start signal is turned off, the motor decelerates to stop.	STF signal: Forward rotation start STR signal: Reverse rotation start			
						8888		STF signal: Start signal STR signal: Forward/reverse signal			
Input/output phase failure protection selection	251		Output phase failure protection selection	1	1	0	Without output phase failure protection		○	○	○
						1	With output phase failure protection				
		872	Input phase failure protection selection	1	1	0	Without input phase failure protection		○	○	○
						1	With input phase failure protection				
—	252, 253		Refer to *Pr. 73*.								

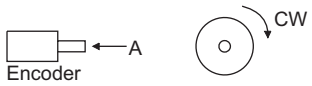
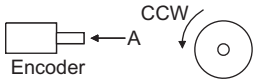
Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled × : disabled		
Display of the life of the inverter parts	255		Life alarm status display	1	0	(0 to 15)	Displays whether the control circuit capacitor, 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		Inrush current limit circuit life display	1%	100%	(0 to 100%)	Displays the deterioration degree of the inrush current limit circuit. Reading only	×	×	×
	257		Control circuit capacitor life display	1%	100%	(0 to 100%)	Displays the deterioration degree of the control circuit capacitor. Reading only	×	×	×
	258		Main circuit capacitor life display	1%	100%	(0 to 100%)	Displays the deterioration degree of the main circuit capacitor. Reading only The value measured by *Pr. 259* is displayed.	×	×	×
	259		Main circuit capacitor life measuring	1	0	0, 1	Setting "1" and turning the power supply off starts the measurement of the main circuit capacitor life. When the *Pr.259* value is "3" after powering on again, the measuring is completed. Read the deterioration degree in *Pr.258*.	○	○	○
Operation at instantaneous power failure	261		Power failure stop selection	1	0	0	Coasting to stop 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		Subtracted frequency at deceleration start	0.01Hz	3Hz	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		Subtraction starting frequency	0.01Hz	60Hz	0 to 120Hz	When output frequency ≥ *Pr. 263* Decelerate from the speed obtained from output frequency - *Pr. 262*. When output frequency < *Pr. 263* Decelerate from output frequency	○	○	○
						9999	Decelerate from the speed obtained from output frequency - *Pr. 262*.			
	264		Power-failure deceleration time 1	0.1/ 0.01s	5s	0 to 3600/ 360s	Set a deceleration slope down to the frequency set in *Pr. 266*.	○	○	○
	265		Power-failure deceleration time 2	0.1/ 0.01s	9999	0 to 3600/ 360s	Set a deceleration slope below the frequency set in *Pr. 266*.	○	○	○
						9999	Same slope as in *Pr. 264*			
	266		Power failure deceleration time switchover frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency at which the deceleration slope is switched from the *Pr. 264* setting to the *Pr. 265* setting.	○	○	○
		294	UV avoidance voltage gain	0.1%	100%	0 to 200%	Adjust response level at UV avoidance operation. A larger setting will improve responsiveness to the bus voltage change.	○	○	○
—	267		Refer to *Pr. 73*.							
	268		Refer to *Pr. 52*.							
	269		Parameter for manufacturer setting. Do not set.							

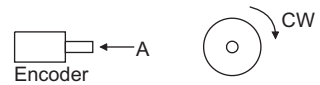
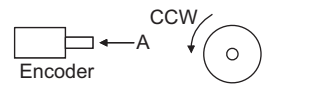
Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Load torque high speed frequency control	270		Stop-on contact/ load torque high-speed frequency control selection	1	0	0	Without stop-on 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			
	271		High-speed setting maximum current	0.1%	50%	0 to 220%	Set the upper and lower limits of the current at high and middle speeds.	○	○	○
	272		Middle-speed setting minimum current	0.1%	100%	0 to 220%		○	○	○
	273		Current averaging range	0.01Hz	9999	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		Current averaging filter time constant	1	16	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 initial value is 12ms.) A larger setting provides higher stability but poorer response.	○	○	○
Stop-on contact control Sensorless Magnetic flux	270		Stop-on contact/ load torque high-speed frequency control selection	1	0	0	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			
	275		Stop-on contact excitation current low-speed multiplying factor	0.1%	9999	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		PWM carrier frequency at stop-on contact	1	9999	0 to 9	Set a PWM carrier frequency for stop-on-contact control. (Valid at the output frequency of 3Hz or less.)	○	○	○
						9999	As set in *Pr. 72 PWM frequency selection*.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Brake sequence function (Vector, Sensorless, Magnetic flux)	278		Brake opening frequency	0.01Hz	3Hz	0 to 30Hz	Set to the rated slip frequency of the motor + about 1.0Hz. This parameter may be only set if *Pr. 278* ≤ *Pr. 282*.	○	○	○
	279		Brake opening current	0.1%	130%	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. Suppose that the rated inverter current is 100%.	○	○	○
	280		Brake opening current detection time	0.1s	0.3s	0 to 2s	Generally, set this parameter to about 0.1 to 0.3s.	○	○	○
	281		Brake operation time at start	0.1s	0.3s	0 to 5s	*Pr. 292* = 7: Set the mechanical delay time until the brake is loosened. *Pr. 292* = 8: Set the mechanical delay time until the brake is loosened + about 0.1 to 0.2s.	○	○	○
	282		Brake operation frequency	0.01Hz	6Hz	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. Setting is enabled only when *Pr. 282* ≥ *Pr. 278*.	○	○	○
	283		Brake operation time at stop	0.1s	0.3s	0 to 5s	*Pr. 292* = 7: Set the mechanical delay time until the brake is closed + 0.1s. *Pr. 292* = 8: Set the mechanical delay time until the brake is closed + about 0.2 to 0.3s.	○	○	○
	284		Deceleration detection function selection	1	0	0	Deceleration is not detected.	○	○	○
						1	If deceleration is not normal during deceleration operation, the inverter fault (E.MB2) is provided to trip and turn off the brake opening request signal (BOF).			
	285		Overspeed detection frequency	0.01Hz	9999	0 to 30Hz	When brake sequence function is made valid under encoder feedback control If (detected frequency) - (output frequency) > *Pr. 285* under encoder feedback control, the inverter fault (E.MB1) is provided to trip and turn off the brake opening request signal (BOF).	○	○	○
						9999	Overspeed is not detected.			
		292	Automatic acceleration/ deceleration	1	0	0, 3, 5 to 8, 11	Brake sequence function is made valid when a setting is "7 or 8".			
Speed deviation excess detection (Vector)	285		Excessive speed deviation detection frequency	0.01Hz	9999	9999	Without speed deviation excessive	○	○	○
						0 to 30Hz	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.			
		853	Speed deviation time	0.1s	1s	0 to 100s		○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Droop control (Vector / Sensorless / Magnetic flux)	286		Droop gain	0.1%	0%	0	Droop control is invalid		○	○	○
						0.1 to 100%	Set the drooping amount at the rated torque as a percentage with respect to the rated frequency.				
	287		Droop filter time constant	0.01s	0.3s	0 to 1s	Set the time constant of the primary delay filter applied to the torque current.		○	○	○
	288		Droop function activation selection	1	0		**Real sensor less vector /vector control**	**Advanced magnetic flux vector control**	○	○	○
						0, 10	Droop control is not exercised during acceleration/ deceleration. (When *Pr.288* = 10, droop compensation amount is determined using the motor speed as reference.)	Droop control is not exercised during acceleration/ deceleration. Droop compensation amount is determined using the rated motor frequency 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)				
Pulse train I/O	291		Pulse train I/O selection	1	0		**Input**	**Output**	○	×	○
						0	JOG terminal	FM output			
						1	Pulse train input	FM output			
						10	JOG terminal	Pulse train open collector output (50% duty)			
						11	Pulse train input				
						20	JOG terminal	Pulse train open collector output (ON width is always same)			
						21	Pulse train input				
						100		Pulse train open collector output (ON width is always same (independently of *Pr. 54*))			
		384	Input pulse division scaling factor	1	0	0 to 250	Indicates division scaling factor to the input pulse and the frequency resolution to the input pulse changes according to the value.		○	○	○
		385	Frequency for zero input pulse	0.01Hz	0	0 to 400Hz	Set the frequency when the input pulse is 0 (bias).		○	○	○
		386	Frequency for maximum input pulse	0.01Hz	60Hz	0 to 400Hz	Set the frequency when the input pulse is maximum (gain).		○	○	○
—	292, 293		Refer to *Pr. 61*.								
—	294		Refer to *Pr. 261*.								
—	299		Refer to *Pr. 57*.								

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
RS-485 communication	331		RS-485 communication station number	1	0	0 to 31 (0 to 247)	Set the inverter station number. (same specifications as *Pr. 117*) When "1" (Modbus-RTU protocol) is set in *Pr. 551*, the setting range within parenthesis is applied.	○	○	○
	332		RS-485 communication speed	1	96	3, 6, 12, 24, 48, 96, 192, 384	Used to select the communication speed. (same specifications as *Pr. 118*)	○	○	○
	333		RS-485 communication stop bit length	1	1	0, 1, 10, 11	Select stop bit length and data length. (same specifications as *Pr. 119*)	○	○	○
	334		RS-485 communication parity check selection	1	2	0, 1, 2	Select the parity check specifications. (same specifications as *Pr. 120*)	○	○	○
	335		RS-485 communication retry count	1	1	0 to 10, 9999	Set the permissible number of retries at occurrence of a data receive error. (same specifications as *Pr. 121*)	○	○	○
	336		RS-485 communication check time interval	0.1s	0s	0	RS-485 communication can be made, but the inverter will come to trip in the NET operation mode.	○	○	○
						0.1 to 999.8s	Set the communication check time interval. (same specifications as *Pr. 122*)			
						9999	No communication check (signal loss detection)			
	337		RS-485 communication waiting time setting	1	9999	0 to 150ms, 9999	Set the waiting time between data transmission to the inverter and response. (same specifications as *Pr. 123*)	○	○	○
	338		Communication operation command source	1	0	0	Operation command source communication	○	○	○
						1	Operation command source external			
	339		Communication speed command source	1	0	0	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)			
	341		RS-485 communication CR/LF selection	1	1	0, 1, 2	Select presence/absence of CR/LF. (same specifications as *Pr. 124*)	○	○	○
	342		Communication EEPROM write selection	1	0	0	Parameter values written by communication are written to the EEPROM and RAM.	○	○	○
						1	Parameter values written by communication are written to the RAM.			
	343		Communication error count	1	0	—	Displays the number of communication errors during Modbus-RTU communication. Read only. Displayed only when Modbus-RTU protocol is selected.	×	×	×
		539	Modbus-RTU communication check time interval	0.1s	9999	0	Modbus-RTU communication can be made, but the inverter will come to trip in the NET operation mode.	○	○	○
						0.1 to 999.8s	Set the communication check time interval. (same specifications as *Pr. 122*)			
						9999	No communication check (signal loss detection)			
		549	Protocol selection	1	0	0	Mitsubishi inverter (computer link) protocol	○	○	○
						1	Modbus-RTU protocol			
							After setting change, reset (switch power off, then on) the inverter. The setting change is reflected after a reset.			
		550	NET mode operation command source selection	1	9999	0	Communication option valid	○	○	○
						1	Inverter RS-485 terminal valid			
						9999	Automatic recognition of the communication option Normally, the RS-485 terminals are valid. Communication option is valid when the communication option is mounted.			
		551	PU mode operation command source selection	1	2	1	Select the RS-485 terminals as PU operation mode control source.	○	○	○
						2	Select the PU connector as PU operation mode control source.			
						3	For manufacturer setting. Do not set.			
—	340		Refer to *Pr. 79*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Orientation control (Vector, Magnetic flux, V/F)	350		Stop position command selection	1	9999	0	Internal stop position command *(Pr.356)*	○	○	○
						1	External stop position command (FR-A7AX 16-bit data)			
						9999	Orientation control invalid			
	351		Orientation speed	0.01Hz	2Hz	0 to 30Hz	Decrease the motor speed to the set value when the orientation command (X22) is given.	○	○	○
	352		Creep speed	0.01Hz	0.5Hz	0 to 10Hz	As soon as the current position pulse reaches the creep switchover position set in *Pr.353* after the speed has reached the orientation speed, the speed decelerates down to the creep speed set in *Pr.352*.	○	○	○
	353		Creep switchover position	1	511	0 to 16383		○	○	○
	354		Position loop switchover position	1	96	0 to 8191	As soon as the current position pulse reaches the set position loop switchover position, control is changed to position loop.	○	○	○
	355		DC injection brake start position	1	5	0 to 255	After changed to position loop, DC injection brake is applied and the motor stops as soon as the current position pulse reaches the set DC injection brake start position.	○	○	○
	356		Internal stop position command	1	0	0 to 16383	When "0" is set in *Pr. 350*, the internal position command is activated and the setting value of *Pr. 356* becomes a stop position.	○	○	○
	357		Orientation in-position zone	1	5	0 to 255	Set the in-position zone at a stop of the orientation.	○	○	○
	358		Servo torque selection	1	1	0 to 13	Functions at orientation completion can be selected.	○	○	○
	359		Encoder rotation direction	1	1	0	 Clockwise direction as viewed from A is forward rotation	○	○	○
						1	 Counter clockwise direction as viewed from A is forward rotation			
	360		16 bit data selection	1	0	0	Speed command	○	○	○
						1	Position command 16 bit data is used as external position command as is.			
						2 to 127	Set the stop position dividing up to 128 stop positions at regular intervals.			
							When 1 is set in *Pr.350* and the option FR-A7AX is mounted, set a stop position using 16-bit data. Stop position command is input as binary regardless of the *Pr.304* setting.			
	361		Position shift	1	0	0 to 16383	Shift the origin using a compensation value without changing the origin of the encoder. The stop position is a position obtained by adding the setting value of *Pr. 361* to the position command.	○	○	○
	362		Orientation position loop gain	0.1	1	0.1 to 10	When servo torque function is selected using *Pr.358*, output frequency for generating servo torque increases to the creep speed of *Pr.352* gradually according to the slope set in *Pr.362*. Although the operation becomes faster when the value is increased, a machine may hunt, etc.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Orientation control (Vector, Magnetic flux, V/F)	363		Completion signal output delay time	0.1s	0.5s	0 to 5s	The orientation complete signal (ORA) is output delaying the set time after in-position zone is entered. Also, the signal turns off delaying the set time after in-position zone is out.	○	○	○
	364		Encoder stop check time	0.1s	0.5s	0 to 5s	Orientation fault signal (ORM) is output when the encoder remains stopped for the set time without orientation completion in the state where no orientation complete signal (ORA) is output. ORM signal is output when orientation is not completed again in the set time in the state where ORA signal is output.	○	○	○
	365		Orientation limit	1s	9999	0 to 60s	Measure the time taken after passing the creep switchover position and output the orientation fault signal (ORM) if orientation is not completed within the set time.	○	○	○
						9999	Set to 120s.			
	366		Recheck time	0.1s	9999	0 to 5s	Turning off the start signal with orientation command (X22) on after stopping the motor by orientation control, the present position is checked again after the set time elapses and the orientation complete signal (ORA) or orientation fault signal (ORM) is output.	○	○	○
						9999	Not checked.			
		369	Number of encoder pulses	1	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○
		393	Orientation selection	1	0	0	Orientation is executed from the current rotation direction.	○	○	○
						1	Orientation is executed from the forward rotation direction.			
						2	Orientation is executed from the reverse rotation direction.			
		396	Orientation speed gain (P term)	1	60	0 to 1000	Servo rigidity is (response level during position control loop) at orientation stop can be adjusted.	○	○	○
		397	Orientation speed integral time	0.001s	0.333s	0 to 20.0s		○	○	○
		398	Orientation speed gain (D term)	0.1%	1%	0 to 100.0%	Lag/advance compensation gain can be adjusted.	○	○	○
		399	Orientation deceleration ratio	1	20	0 to 1000	Make adjustment when the motor runs back at orientation stop or the orientation time is long.	○	○	○
Encoder feedback control (Magnetic flux, V/F)	359		Encoder rotation direction	1	1	0	 Clockwise direction as viewed from A is forward rotation	○	○	○
						1	 Counter clockwise direction as viewed from A is forward rotation			
	367		Speed feedback range	0.01Hz	9999	0 to 400Hz	Set the range of speed feedback control.	○	○	○
						9999	Encoder feedback control is invalid			
	368		Feedback gain	0.1	1	0 to 100	Set when the rotation is unstable or response is slow.	○	○	○
	369		Number of encoder pulses	1	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○
Overspeed detection	374		Overspeed detection level	0.01Hz	140Hz	0 to 400Hz	When the motor speed reaches or exceeds the speed set in *Pr.374* during encoder feedback control, real sensorless vector control, or vector control, over speed (E.OS) occurs and stops the inverter output.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Encoder signal loss detection Vector Magnetic flux V/F	376		Encoder signal loss detection enable/ disable selection	1	0	0	Signal loss detection is invalid	○	○	○
						1	Signal loss detection is valid When the cable of the encoder signal is broken during encoder feedback control, orientation control, or vector control, signal loss detection (E.ECT) is activated to stop the inverter output.			
—	380 to 383		Refer to *Pr. 29*.							
	384 to 386		Refer to *Pr. 291*.							
Position control Vector	419		Position command source selection	1	0	0	Conditional position control function by contact input	○	○	○
						2	Conditional position pulse train command by pulse train input from the JOG terminal			
	420		Command pulse scaling factor numerator	1	1	0 to 32767	Set the electronic gear. *Pr. 420* is a numerator and *Pr. 421* is a denominator.	○	○	○
	421		Command pulse scaling factor denominator	1	1	0 to 32767		○	○	○
	422		Position loop gain	$1s^{-1}$	$25s^{-1}$	0 to $150s^{-1}$	Set the gain of the position loop.	○	○	○
	423		Position feed forward gain	1%	0%	0 to 100%	Function to cancel a delay caused by the droop pulses of the deviation counter.	○	○	○
	424		Position command acceleration/deceleration time constant	0.001s	0s	0 to 50s	Used when rotation has become unsmooth at a large electronic gear ratio (about 10 times or more) and low speed.	○	○	○
	425		Position feed forward command filter	0.001s	0s	0 to 5s	Enters the primary delay filter in response to the feed forward command.	○	○	○
	426		In-position width	1 pulse	100 pulse	0 to 32767 pulse	The in-position signal (Y36) turns on when the droop pulses become less than the setting.	○	○	○
	427		Excessive level error	1	40K	0 to 400K	A position error excessive (E.OD) occurs when the droop pulses exceed the setting.	○	○	○
						9999	Function invalid			
	428		Command pulse selection	1	0	0 to 2	Pulse train + sign: Negative logic	○	○	○
						3 to 5	Pulse train + sign: Positive logic			
	429		Clear signal selection	1	1	0	Deviation counter is cleared at trailing edge (at the moment when H level is changed to L level)	○	○	○
						1	eviation counter is cleared at L level			
	430		Pulse monitor selection	1	9999	0	The cumulative command pulse value is displayed. — Lower 4(5) digits	○	○	○
						1	The cumulative command pulse value is displayed. — Upper 4(5) digits			
						2	The cumulative feedback pulse value is displayed. — Lower 4(5) digits			
						3	The cumulative feedback pulse value is displayed. — Upper 4(5) digits			
						4	The droop pulses are monitored. — Lower 4(5) digits			
						5	The droop pulses are monitored. — Upper 4(5) digits			
						9999	Frequency monitor is displayed.			
		464	Digital position control sudden stop deceleration time	0.1s	0	0 to 360.0s	Set the time until the inverter stops when the forward rotation (reverse rotation) command is turned off with the position feed forward function.	○	○	○
—	450		Refer to *Pr. 71*.							
	451		Refer to *Pr. 80*.							
	453, 454		Refer to *Pr. 80*.							
	455 to 463		Refer to *Pr. 82*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
							Selection Method	Position Feed Speed			
Conditional position feed function Vector	465		First position feed amount lower 4 digits	1	0	0 to 9999	RH	High speed *(Pr.4)*	○	○	○
	466		First position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	467		Second position feed amount lower 4 digits	1	0	0 to 9999	RM	Middle speed *(Pr.5)*	○	○	○
	468		Second position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	469		Third position feed amount lower 4 digits	1	0	0 to 9999	RL	Low speed *(Pr.6)*	○	○	○
	470		Third position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	471		Fourth position feed amount lower 4 digits	1	0	0 to 9999	RM, RL	Speed 4 *(Pr.24)*	○	○	○
	472		Fourth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	473		Fifth position feed amount lower 4 digits	1	0	0 to 9999	RH, RL	Speed 5 *(Pr.25)*	○	○	○
	474		Fifth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	475		Sixth position feed amount lower 4 digits	1	0	0 to 9999	RH, RM	Speed 6 *(Pr.26)*	○	○	○
	476		Sixth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	477		Seventh position feed amount lower 4 digits	1	0	0 to 9999	RH, RM, RL	Speed 7 *(Pr.27)*	○	○	○
	478		Seventh position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	479		Eighth position feed amount lower 4 digits	1	0	0 to 9999	REX	Speed 8 *(Pr.232)*	○	○	○
	480		Eighth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	481		Ninth position feed amount lower 4 digits	1	0	0 to 9999	REX, RL	Speed 9 *(Pr.233)*	○	○	○
	482		Ninth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	483		Tenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RM	Speed 10 *(Pr.234)*	○	○	○
	484		Tenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	485		Eleventh position feed amount lower 4 digits	1	0	0 to 9999	REX, RM, RL	Speed 11 *(Pr.235)*	○	○	○
	486		Eleventh position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	487		Twelfth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH	Speed 12 *(Pr.236)*	○	○	○
	488		Twelfth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	489		Thirteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RL	Speed 13 *(Pr.237)*	○	○	○
	490		Thirteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	491		Fourteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RM	Speed 14 *(Pr.238)*	○	○	○
	492		Fourteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	493		Fifteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RM, RL	Speed 15 *(Pr.239)*	○	○	○
	494		Fifteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Remote output function (REM signal)	495		Remote output selection	1	0	0	Remote output data clear at powering off	No remote output data held at resetting	○	○	○
						1	Remote output data held at powering off				
						10	Remote output data clear at powering off	Remote output data held at resetting			
						11	Remote output data held at powering off				
	496		Remote output data 1	1	0	0 to 4095	Output terminal can be switched on and off.		×	×	×
	497		Remote output data 2	1	0	0 to 4095			×	×	×
Maintenance of parts	503		Maintenance timer	1	0	0 (1 to 9998)	Displays the cumulative energization time of the inverter in 100h increments. Reading only Writing the setting of "0" clears the cumulative energization time.		×	×	×
	504		Maintenance timer alarm output set time	1	9999	0 to 9998	Set the time taken until when the maintenance timer alarm output signal (Y95) is output.		○	×	○
						9999	No function				
—	505		Refer to *Pr. 37*.								
—	516 to 519		Refer to *Pr. 29*.								
	539		Refer to *Pr. 343*.								
—	547, 548		Parameter for manufacturer setting. Do not set.								
	549 to 551		Refer to *Pr. 343*.								
Current average value monitor signal	555		Current average time	0.1s	1s	0.1 to 1.0s	Set the time taken to average the current during start bit output (1s).		○	○	○
	556		Data output mask time	0.1s	0s	0.0 to 20.0s	Set the time for not obtaining (mask) transient state data.		○	○	○
	557		Current average value monitor signal output reference current	0.01A	Rated inverter current	0 to 500A	Set the reference (100%) for outputting the signal of the current average value.		○	○	○
—	563, 564		Refer to *Pr. 52*.								
	569		Refer to *Pr. 80*.								
	571		Refer to *Pr. 13*.								
	574		Refer to *Pr. 95*.								
	575 to 577		Refer to *Pr. 127*.								
	611		Refer to *Pr. 57*.								
	665		Refer to *Pr. 882*.								
	684		Refer to *Pr. 82*.								
	800		Refer to *Pr. 81*.								
	802		Refer to *Pr. 10*.								
	803		Refer to *Pr. 22*.								
Torque command source selection Vector Sensorless	804		Torque command source selection	1	0	0	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 using CC-Link (FR-A7NC)				
						4	Digital input from the option (FR-A7AX)				
						5	Torque command by using CC-Link (FR-A7NC)				
						6					
	805		Torque command value (RAM)	1%	1000%	600 to 1400%	Digital setting of the torque command can be made by setting *Pr. 805* or *Pr. 806*. (Setting from communication option, etc. can be made.) In this case, set the speed limit value to an appropriate value to prevent overspeed.		×	○	○
	806		Torque command value (RAM,EEPROM)	1%	1000%	600 to 1400%			○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Speed limit Vector Sensorless	807		Speed limit selection	1	0	0	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.			
						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*.			
	808		Forward rotation speed limit	0.01Hz	60Hz	0 to 120Hz	Set the speed limit level during forward rotation. (valid when *Pr. 807* = 1)	○	○	○
	809		Reverse rotation speed limit	0.01Hz	9999	0 to 120Hz	Set the speed limit level during reverse rotation. (valid when *Pr. 807* = 1)	○	○	○
						9999	The setting is the same as that of the torque limit in the forward rotation direction.			
—	810		Refer to *Pr. 22*.							
—	811		Refer to *Pr. 22* and *Pr. 37*.							
—	812 to 817		Refer to *Pr. 22*.							
Easy gain tuning selection Vector Sensorless	818		Easy gain tuning response level setting	1	2	1 to 15	1 : Slow response ↓ 15 : Fast response	○	○	○
	819		Easy gain tuning selection	1	0	0	No tuning	○	×	○
						1	With load estimation (only under vector control)	The optimum gain is automatically set from the torque command and speed during motor operation.		
						2	Manual input of load (*Pr. 880*)			
Speed loop proportional gain setting Vector Sensorless	820		Speed control P gain 1	1%	60%	0 to 1000%	Set the proportional gain for speed control. (Increasing the value improves trackability in response to a speed command change and reduces speed variation with disturbance.)	○	○	○
		830	Speed control P gain 2	1%	9999	0 to 1000%	Second function of *Pr. 820* (valid when RT signal is on)	○	○	○
						9999	No function			
Speed control integral time setting Vector Sensorless	821		Speed control integral time 1	0.001s	0.333s	0 to 20s	Set the integral time during speed control. (Decrease the value to shorten the time taken for returning to the original speed if speed variation with disturbance occurs.)	○	○	○
		831	Speed control integral time 2	0.001s	9999	0 to 20s	Second function of *Pr. 821* (valid when the RT terminal is on)	○	○	○
						9999	No function			
—	822		Refer to *Pr. 74*.							
Speed detection filter function Vector	823		Speed detection filter 1	0.001s	0.001s	0 to 0.1s	Set the primary delay filter for the speed feedback.	○	○	○
		833	Speed detection filter 2	0.001s	9999	0 to 0.1s	Second function of *Pr. 823* (valid when RT signal is on)	○	○	○
						9999	No function	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Current loop proportional gain setting (Vector / Sensorless)	824		Torque control P gain 1	1%	100%	0 to 200%	Set the proportional gain for the current control of the q and d axes. (Increasing the value improves trackability in response to a current command change and reduces current variation with disturbance.)	○	○	○
		834	Torque control P gain 2	1%	9999	0 to 200%	Second function of *Pr. 824* (valid when the RT terminal is on)	○	○	○
						9999	No function			
Current control integral time setting (Vector / Sensorless)	825		Torque control integral time 1	0.1ms	5ms	0 to 500ms	Set the integral time for the current control of the q and d axes. (Decreasing the value shortens the time taken to return to the original torque if current variation with disturbance occurs.)	○	○	○
		835	Torque control integral time 2	0.1ms	9999	0 to 500ms	Second function of *Pr. 825* (valid when the RT signal is on)	○	○	○
						9999	No function			
—	826		Refer to *Pr. 74*.							
Torque detection filter function (Vector / Sensorless)	827		Torque detection filter 1	0.001s	0s	0 to 0.1s	Set the primary delay filter for the current feedback.	○	○	○
		837	Torque detection filter 2	0.001s	9999	0 to 0.1s	Second function of *Pr. 827* (valid when the RT signal is on)	○	○	○
						9999	No function			
Speed feed forward control, model adaptive speed control (Vector / Sensorless)	828		Model speed control gain	1%	60%	0 to 1000%	Set the gain for model speed controller.	○	○	○
		877	Speed feed forward control/model adaptive speed control selection	1	0	0	Normal speed control is exercised	○	○	○
						1	Speed feed forward control is exercised.			
						2	Model adaptive speed control is enabled.			
		878	Speed feed forward filter	0.01s	0s	0 to 1s	Set the primary delay filter for the speed feed forward result calculated using the speed command and load inertia ratio.	○	○	○
		879	Speed feed forward torque limit	0.1%	150%	0 to 400%	Limits the maximum value of the speed feed forward torque.	○	○	○
		880	Load inertia ratio	0.1	7	0 to 200 times	Set the load inertia ratio. Inertia ratio found by easy gain turning.	○	×	○
		881	Speed feed forward gain	1%	0%	0 to 1000%	Set the feed forward calculation result as a gain.	○	○	○
—	830		Refer to *Pr. 820*.							
	831		Refer to *Pr. 821*.							
	832		Refer to *Pr. 74*.							
	833		Refer to *Pr. 823*.							
	834		Refer to *Pr. 824*.							
	835		Refer to *Pr. 825*.							
	836		Refer to *Pr. 74*.							
	837		Refer to *Pr. 827*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Torque bias function (Vector)	840		Torque bias selection	1	9999	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	Without torque bias, rated torque 100%			
	841		Torque bias 1	1%	9999	600 to 999%	Negative torque bias amount (-400% to -1%)	○	○	○
	842		Torque bias 2			1000 to 1400%	Positive torque bias amount (0% to 400%)			
	843		Torque bias 3			9999	Without torque bias setting			
	844		Torque bias filter	0.001s	9999	0 to 5s	Time until torque rises.	○	○	○
						9999	Same operation as when 0s is set.			
	845		Torque bias operation time	0.01s	9999	0 to 5s	Time for maintaining torque equivalent to the torque bias amount.	○	○	○
						9999	Same operation as when 0s is set.			
	846		Torque bias balance compensation	0.1V	9999	0 to 10V	Set the voltage under balanced load.	○	○	○
						9999	Same operation as when 0V is set.			
	847		Fall-time torque bias terminal 1 bias	1%	9999	0 to 400%	Set the bias value of the torque command.	○	○	○
						9999	Same as at a rise time (*C16*, *C17*).			
	848		Fall-time torque bias terminal 1 gain	1%	9999	0 to 400%	Set the gain value of the torque command.	○	○	○
						9999	Same as at a rise time (*C18*, *C19*).			
—	849		Refer to *Pr. 74*.							
	850		Refer to *Pr. 10*.							
	853		Refer to *Pr. 285*.							
Excitation ratio (Vector, Sensorless)	854		Excitation ratio	1%	100%	0 to 100%	Set the excitation ratio under no load.	○	○	○
Function assignment of analog input terminal	858		Terminal 4 function assignment	1	0	0	Frequency/speed command	○	×	○
						1	Magnetic flux command			
						4	Stall prevention/torque limit			
						9999	No function			
		868	Terminal 1 function assignment	1	0	0	Frequency setting auxiliary	○	×	○
						1	Magnetic flux command			
						2	Regenerative torque limit			
						3	Torque command			
						4	Stall prevention/torque limit/torque command			
						5	Forward/reverse rotation speed limit			
						6	Torque bias			
						9999	No function			
—	859, 860		Refer to *Pr. 82*.							
Notch filter (Vector)	862		Notch filter time constant	1	0	0 to 60	You can use the mechanical resonance speed to make this setting to reduce the response level of the mechanical resonance frequency band, avoiding mechanical resonance.	○	○	○
Notch filter (Sensorless)	863		Notch filter depth	1	0	0	Deep (-40dB)	○	○	○
						1	↑ (-14dB)			
						2	↓ (-8dB)			
						3	Sharrow (-4dB)			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Torque detection Vector Sensorless	864		Torque detection	0.1%	150%	0 to 400%	You can make setting to output a signal if the motor torque exceeds the predetermined value.	○	○	○
—	865		Refer to *Pr. 41*.							
	866		Refer to *Pr. 55*.							
	867		Refer to *Pr. 52*.							
	868		Refer to *Pr. 858*.							
—	872		Refer to *Pr. 251*.							
Speed limit during speed control Vector	873		Speed limit	0.01Hz	20Hz	0 to 120Hz	Frequency is limited at the set frequency + *Pr.873* during vector control.	○	○	○
—	874		Refer to *Pr. 22*.							
Fault definition	875		Fault definition	1	0	0	At occurrence of any fault, output is shut off immediately. At this time, the fault output also turns on.	○	○	○
						1	At occurrence of external thermal operation (OHT), electronic thermal relay function (THM) or PTC thermistor function (PTC) fault, the motor is decelerated to a stop. At occurrence of fault other than OHT, THM and PTC, trips immediately. Same operation as when "0" is set is performed under position control.			
—	877 to 881		Refer to *Pr. 828*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Regeneration avoidance function	882		Regeneration avoidance operation selection	1	0	0	Regeneration avoidance function invalid	○	○	○
						1	Regeneration avoidance function is always valid			
						2	Regeneration avoidance function is valid only at constant speed			
	883		Regeneration avoidance operation level	0.1V	380/760VDC *	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 × $\sqrt{2}$ * The initial value differs according to the voltage level. (200V class / 400V class)	○	○	○
	884		Regeneration avoidance at deceleration detection sensitivity	1	0	0	Regeneration avoidance by bus voltage change ratio is invalid	○	○	○
						1 to 5	Set sensitivity to detect the bus voltage change. Setting: 1 → 5 Detection sensitivity: Low → High			
	885		Regeneration avoidance compensation frequency limit value	0.01Hz	6Hz	0 to 10Hz	Set the limit value of frequency which rises at activation of regeneration avoidance function.	○	○	○
						9999	Frequency limit invalid			
	886		Regeneration avoidance voltage gain	0.1%	100%	0 to 200%	Adjust responsiveness at activation of regeneration avoidance. Setting a larger value in *Pr.886* will improve responsiveness to the bus voltage change. However, the output frequency could become unstable. When vibration is not suppressed by decreasing the *Pr.886* setting, set a smaller value in *Pr.665*.	○	○	○
		665	Regeneration avoidance frequency gain	0.1%	100%	0 to 200%		○	○	○
Free parameter	888		Free parameter 1	1	9999	0 to 9999	Parameters you can use for your own purposes. Used for maintenance, management, etc. by setting a unique number to each inverter when multiple inverters are used. Data is held even if the inverter power is turned off.	○	×	×
	889		Free parameter 2	1	9999	0 to 9999		○	×	×
—	891		Refer to *Pr. 52*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Energy saving monitor	892		Load factor	0.1%	100%	30 to 150%	Set the load factor for commercial power-supply operation. This value is used to calculate the power consumption estimated value during commercial power supply operation.	○	○	○
	893		Energy saving monitor reference (motor capacity)	0.01kW	Inverter rated capacity	0.1 to 55kW	Set the motor capacity (pump capacity). Set when calculating power saving rate and average power saving rate value.	○	○	○
	894		Control selection during commercial power-supply operation	1	0	0	Discharge damper control (fan)	○	○	○
						1	Inlet damper control (fan)			
						2	Valve control (pump)			
						3	Commercial power-supply drive (fixed value)			
	895		Power saving rate reference value	1	9999	0	Consider the value during commercial power-supply operation as 100%	○	○	○
						1	Consider the *Pr. 893* setting as 100%.			
						9999	No function			
	896		Power unit cost	0.01	9999	0 to 500	Set the power unit cost. Displays the power saving rate on the energy saving monitor	○	○	○
						9999	No function			
	897		Power saving monitor average time	1h	9999	0	Average for 30 minutes	○	○	○
						1 to 1000h	Average for the set time			
						9999	No function			
	898		Power saving cumulative monitor clear	1	9999	0	Cumulative monitor value clear	○	×	○
						1	Cumulative monitor value hold			
						10	Cumulative monitor continue (communication data upper limit 9999)			
						9999	Cumulative monitor continue (communication data upper limit 65535)			
	899		Operation time rate (estimated value)	0.1%	9999	0 to 100%	Use for calculation of annual power saving amount. Set the annual operation ratio (consider 365 days × 24hr as 100%).	○	○	○
						9999	No function			
Adjustment of terminal FM and AM (calibration)	C0 (900)		FM terminal calibration	–	–	–	Calibrate the scale of the meter connected to terminal FM. (Only when *Pr. 291* = 0, 1)	○	×	○
	C1 (901)		AM terminal calibration	–	–	–	Calibrate the scale of the analog meter connected to terminal AM.	○	×	○
—	C2(902) to C7(905)		Refer to *Pr. 125 and Pr. 126*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled × : disabled		
Adjustment of analog input speed limit (calibration)	C12 (917)		Terminal 1 bias frequency (speed)	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
	C13 (917)		Terminal 1 bias (speed)	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
	C14 (918)		Terminal 1 gain frequency (speed)	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 1 input gain (maximum). (valid when *Pr.868* = 5)	○	×	○
	C15 (918)		Terminal 1 gain (speed)	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage (current) of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
Adjustment of analog input torque magnetic flux command (calibration)	C16 (919)		Terminal 1 bias command (torque/ magnetic flux)	0.1%	0%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C17 (919)		Terminal 1 bias (torque/magnetic flux)	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C18 (920)		Terminal 1 gain command (torque/ magnetic flux)	0.1%	150%	0 to 400%	Set the torque/magnetic flux command value on the gain side of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C19 (920)		Terminal 1 gain (torque/magnetic flux)	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage (current) of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C38 (932)		Terminal 4 bias command (torque/ magnetic flux)	0.1%	0%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C39 (932)		Terminal 4 bias (torque/magnetic flux)	0.1%	20%	0 to 300%	Set the converted % of the bias side current (voltage) of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C40 (933)		Terminal 4 gain command (torque/ magnetic flux)	0.1%	150%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C41 (933)		Terminal 4 gain (torque/magnetic flux)	0.1%	100%	0 to 300%	Set the converted % of the gain side current (voltage) of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
—	989		Parameter for manufacturer setting. Do not set.							
Buzzer control of the operation panel	990		PU buzzer control	1	1	0	Without buzzer	○	○	○
						1	With buzzer			
PU contrast adjustment	991		PU contrast adjustment	1	58	0 to 63	Contrast adjustment of the LCD of the parameter unit (FR-PU04/FR-PU07) can be performed. 0 (Light) → 63 (Dark)	○	×	○
Parameter clear, parameter copy	Pr.CL		Parameter clear	1	0	0, 1	Setting "1" returns all parameters except calibration parameters to the initial values.			
	ALLC		All parameter clear	1	0	0, 1	Setting "1" returns all parameters to the initial values.			
	Er.CL		Faults history clear	1	0	0, 1	Setting "1" will clear eight past faults.			
	PCPY		Parameter copy	1	0	0	Cancel			
						1	Read 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.			

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

5 TROUBLESHOOTING

When a fault occurs in the inverter, the inverter trips and the PU display automatically changes to any of the following fault or alarm indications.

If the fault does not correspond to any of the following faults or if you have any other problem, please contact your sales representative.

- Retention of fault output signal... When the magnetic contactor (MC) provided on the input side of the inverter is opened when a fault occurs, the inverter's control power will be lost and the fault output will not be held.
- Fault or alarm indication ..... When a fault or alarm occurs, the operation panel display automatically switches to the fault or alarm indication.
- Resetting method ..... When a fault occurs, the inverter output is kept stopped. Unless reset, therefore, the inverter cannot restart. *(Refer to page 139)*
- When any fault occurs, take the appropriate corrective action, then reset the inverter, and resume operation. Not doing so may lead to the inverter fault and damage.

Inverter fault or alarm indications are roughly divided as below.

(1) Error message
A message regarding operational fault and setting fault by the operation panel (FR-DU07) and parameter unit (FR-PU04 /FR-PU07) is displayed. The inverter does not trip.

(2) Warnings
The inverter does not trip even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.

(3) Alarm
The inverter does not trip. You can also output an alarm signal by making parameter setting.

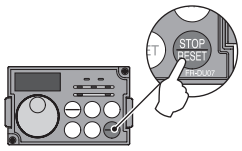
(4) Fault
When a fault occurs, the inverter trips and a fault signal is output.

5.1 Reset method of protective function

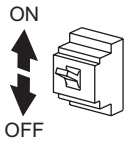
(1) Resetting the inverter

The inverter can be reset by performing any of the following operations. Note that the internal thermal integrated value of the electronic thermal relay function and the number of retries are cleared (erased) by resetting the inverter. Recover about 1s after reset is cancelled.

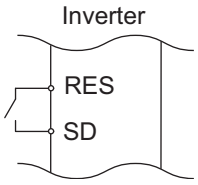
Operation 1: ..... Using the operation panel, press STOP RESET to reset the inverter.
(This may only be performed when a fault occurs (Refer to *page 145* for fault.))



Operation 2: ..... Switch power off once, then switch it on again.



Operation 3: ..... Turn on the reset signal (RES) for more than 0.1s. (If the RES signal is kept on, "Err." appears (flickers) to indicate that the inverter is in a reset status.)



5.2 List of fault or alarm display

Operation Panel Indication			Name	Refer to
Error message	E - - -	E - - -	Faults history	157
	HOLd	HOLD	Operation panel lock	141
	Er1 to Er4	Er1 to 4	Parameter write error	141
	rE1 to rE4	rE1 to 4	Copy operation error	142
	Err.	Err.	Error	142
Warnings	OL	OL	Stall prevention (overcurrent)	143
	oL	oL	Stall prevention (overvoltage)	143
	TH	TH	Electronic thermal relay function prealarm	144
	PS	PS	PU stop	143
	MT	MT	Maintenance signal output	144
	CP	CP	Parameter copy	144
	SL	SL	Speed limit indication (Output during speed limit)	144
Alarm	FN	FN	Fan fault	145
Fault	E.OC1	E.OC1	Overcurrent trip during acceleration	145
	E.OC2	E.OC2	Overcurrent trip during constant speed	145
	E.OC3	E.OC3	Overcurrent trip during deceleration or stop	146
	E.OV1	E.OV1	Regenerative overvoltage trip during acceleration	146
	E.OV2	E.OV2	Regenerative overvoltage trip during constant speed	146
	E.OV3	E.OV3	Regenerative overvoltage trip during deceleration or stop	147
	E.THT	E.THT	Inverter overload trip (electronic thermal relay function)	147
	E.THM	E.THM	Motor overload trip (electronic thermal relay function)	147
	E.FIN	E.FIN	Fin overheat	148
	E.IPF	E.IPF	Instantaneous power failure	148
	E.UVT	E.UVT	Undervoltage	148
	E.ILF	E.ILF*	Input phase failure	148
	E.OLT	E.OLT	Stall prevention	149
	E. GF	E.GF	Output side earth (ground) fault overcurrent	149
	E. LF	E.LF	Output phase failure	149
	E.OHT	E.OHT	External thermal relay operation *2	149

Operation Panel Indication			Name	Refer to
Fault	E.PTC	E.PTC*	PTC thermistor operation	149
	E.OPT	E.OPT	Option alarm	150
	E.OP3	E.OP3	Communication option alarm	150
	E. 1 to E. 3	E. 1 to E. 3	Option fault	150
	E. PE	E.PE	Parameter storage device fault	150
	E.PUE	E.PUE	PU disconnection	151
	E.rET	E.RET	Retry count excess	151
	E.PE2	E.PE2*	Parameter storage device fault	150
	E. 6/ E. 7/ E.CPU	E. 6 / E. 7 / E.CPU	CPU error	151
	E.CTE	E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	151
	E.P24	E.P24	24VDC power output short circuit	153
	E.CDO	E.CDO*	Output current detection value exceeded	153
	E.IOH	E.IOH*	Inrush current limit circuit fault	153
	E.SER	E.SER*	Communication error (inverter)	153
	E.AIE	E.AIE*	Analog input error	154
	E. OS	E.OS	Overspeed occurence	152
	E.OSD	E.OSD	Speed deviation excess detection	152
	E.ECT	E.ECT	Signal loss detection	152
	E. Od	E.OD	Excessive position error	152
	E.MB1 to E.MB7	E.MB1 to E.MB7	Brake sequence error	151
	E.EP	E.EP	Encoder phase error	153
	E. 4	E.4	Converter overcurrent	154
	E. 8	E.8	Power supply fault	154
	E. 10	E.10	Converter transistor protection thermal operation (electronic thermal)	154
	E. 11	E.11	Opposite rotation deceleration fault	155
	E. 13	E.13	Internal circuit error	155
	E. 15	E.15	Converter circuit fault	155

* If an error occurs when using the FR-PU04, "Fault 14" is displayed on the FR-PU04.

5.3 Causes and corrective actions

(1) Error message

A message regarding operational troubles is displayed. Output is not shut off.

Operation Panel Indication	HOLD	HOLd
Name	Operation panel lock	
Description	Operation lock mode is set. Operation other than STOP RESET is made invalid. *(Refer to page 50.)*	
Check point	—	
Corrective action	Press MODE for 2s to release lock.	

Operation Panel Indication	Er1	Er 1
Name	Write disable error	
Description	1. You attempted to make parameter setting when *Pr. 77 Parameter write selection* has been set to disable parameter write. 2. Frequency jump setting range overlapped. 3. Adjustable 5 points V/F settings overlapped 4. The PU and inverter cannot make normal communication	
Check point	1. Check the setting of *Pr. 77 Parameter write selection (Refer to chapter 4 of the instruction manual (applied).)* 2. Check the settings of *Pr. 31 to 36 (frequency jump). (Refer to chapter 4 of the instruction manual (applied).)* 3. Check the settings of *Pr. 100 to Pr. 109 (adjustable 5 points V/F). (Refer to chapter 4 of the instruction manual (applied).)* 4. Check the connection of the PU and inverter.	

Operation Panel Indication	Er2	Er2
Name	Write error during operation	
Description	When parameter write was performed during operation with a value other than "2" (writing is enabled independently of operating status in any operation mode) is set in *Pr. 77* and the STF (STR) is on.	
Check point	1. Check the *Pr. 77* setting. *(Refer to chapter 4 of the instruction manual (applied).)* 2. Check that the inverter is not operating.	
Corrective action	1. Set "2" in *Pr. 77*. 2. After stopping operation, make parameter setting.	

Operation Panel Indication	Er3	Er3
Name	Calibration error	
Description	Analog input bias and gain calibration values are too close.	
Check point	Check the settings of C3, C4, C6 and C7 (calibration functions). *(Refer to chapter 4 of the instruction manual (applied).)*	

Operation Panel Indication	Er4	Er4
Name	Mode designation error	
Description	You attempted to make parameter setting in the NET operation mode when *Pr. 77* is not "2".	
Check point	1. Check that operation mode is "PU operation mode". 2. Check the *Pr. 77* setting. *(Refer to chapter 4 of the instruction manual (applied).)*	
Corrective action	1. After setting the operation mode to "PU operation mode", make parameter setting. *(Refer to page 62.)* 2. After setting "2" in *Pr. 77*, make parameter setting.	

Operation Panel Indication	rE1	rE1
Name	Parameter read error	
Description	An error occurred in the EEPROM on the operation panel side during parameter copy reading.	
Check point	—	
Corrective action	· Make parameter copy again. *(Refer to page 54.)* · Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

Operation Panel Indication	rE2	rE2
Name	Parameter write error	
Description	1. You attempted to perform parameter copy write during operation. 2. An error occurred in the EEPROM on the operation panel side during parameter copy writing.	
Check point	Is the FWD or REV LED of the operation panel (FR-DU07) lit or flickering?	
Corrective action	1. After stopping operation, make parameter copy again. *(Refer to page 54.)* 2. Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

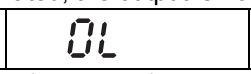
Operation Panel Indication	rE3	rE3
Name	Parameter verification error	
Description	1. Data on the operation panel side and inverter side are different. 2. An error occurred in the EEPROM on the operation panel side during parameter verification.	
Check point	Check for the parameter setting of the source inverter and inverter to be verified.	
Corrective action	1. Press (SET) to continue verification. Make parameter verification again. *(Refer to page 55.)* 2. Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

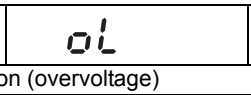
Operation Panel Indication	rE4	rE4
Name	Model error	
Description	1. A different model was used for parameter write and verification during parameter copy. 2. When parameter copy write is stopped after parameter copy read is stopped	
Check point	1. Check that the verified inverter is the same model. 2. Check that the power is not turned off or an operation panel is not disconnected, etc. during parameter copy read.	
Corrective action	1. Use the same model (FR-A701 series) for parameter copy and verification. 2. Perform parameter copy read again.	

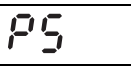
Operation Panel Indication	Err.	Err.
Description	1. The RES signal is on 2. The PU and inverter cannot make normal communication (contact fault of the connector) 3. When the control circuit power (R1/L11, S1/L21) and the main circuit power (R/L1, S/L2, T/L3) are connected to a separate power, it may appear at turning on of the main circuit. It is not a fault.	
Corrective action	1. Turn off the RES signal. 2. Check the connection of the PU and inverter.	

(2) Warnings

When the protective circuit is activated, the output is not shut off.

Operation Panel Indication	OL		FR-PU04 FR-PU07	OL
Name	Stall prevention (overcurrent)			
Description	During acceleration	When the output current (output torque during real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function stops the increase in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency again.		
	During constant-speed operation	When the output current (output torque during real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function reduces frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency up to the set value.		
	During deceleration	When the output current (output torque during real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function stops the decrease in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function decreases the frequency again.		
Check point	1. Check that the *Pr. 0 Torque boost* setting is not too large. 2. Check that the *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time* settings are not too small. 3. Check that the load is not too heavy. 4. Are there any failure in peripheral devices? 5. Check that the *Pr. 13 Starting frequency* is not too large. · Check the motor for use under overload. 6. Check that the *Pr. 22 Stall prevention operation level* is appropriate.			
Corrective action	1. Increase or decrease the *Pr. 0 Torque boost* value 1% by 1% and check the motor status. *(Refer to page 59.)* 2. Set a larger value in *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time*. *(Refer to page 61.)* 3. Reduce the load weight. 4. Try advanced magnetic flux vector control, real sensorless vector control or vector control. 5. Change the *Pr. 14 Load pattern selection* setting. 6. Set stall prevention operation current in *Pr. 22 Stall prevention operation level*. (The initial value is 150%.) The acceleration/deceleration time may change. Increase the stall prevention operation level with *Pr. 22 Stall prevention operation level*, or disable stall prevention with *Pr. 156 Stall prevention operation selection*. (Use *Pr. 156* to set either operation continued or not at OL operation.)			

Operation Panel Indication	oL		FR-PU04 FR-PU07	oL
Name	Stall prevention (overvoltage)			
Description	During deceleration	· If the regenerative energy of the motor becomes excessive and exceeds the regenerative energy consumption capability, this function stops the decrease in frequency to prevent overvoltage trip. As soon as the regenerative energy has decreased, deceleration resumes. · If the regenerative energy of the motor becomes excessive when regeneration avoidance function is selected (*Pr. 882* = 1), this function increases the speed to prevent overvoltage trip. *(Refer to chapter 4 of 🕮 the instruction manual (applied).)*		
Check point	· Check for sudden speed reduction. · Regeneration avoidance function *(Pr. 882 to Pr. 886)* is being used? *(Refer to chapter 4 of 🕮 the instruction manual (applied).)*			
Corrective action	The deceleration time may change. Increase the deceleration time using *Pr. 8 Deceleration time*.			

Operation Panel Indication	PS		FR-PU04 FR-PU07	PS
Name	PU stop			
Description	Stop with STOP RESET of the PU is set in *Pr. 75 Reset selection/disconnected PU detection/PU stop selection*. (For *Pr. 75*, refer to *chapter 4 of 🕮 the instruction manual (applied)*.)			
Check point	Check for a stop made by pressing STOP RESET of the operation panel.			
Corrective action	Turn the start signal off and release with PU EXT.			

Operation Panel Indication	TH	rH	FR-PU04 / FR-PU07	TH
Name	Electronic thermal relay function prealarm			
Description	Appears if the cumulative value of the *Pr. 9 Electronic thermal O/L relay* reaches or exceeds 85% of the preset level. If it reaches 100% of the *Pr. 9 Electronic thermal O/L relay* setting, a motor overload trip (E. THM) occurs. The THP signal can be simultaneously output with the [TH] display. For the terminal used for the THP signal output, assign the function by setting "8" (positive logic) or "108" (negative logic) in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to chapter 4 of the instruction manual (applied))*			
Check point	1. Check for large load or sudden acceleration. 2. Is the *Pr. 9 Electronic thermal O/L relay* setting is appropriate? *(Refer to page 57.)*			
Corrective action	1. Reduce the load weight or the number of operation times. 2. Set an appropriate value in *Pr. 9 Electronic thermal O/L relay*. *(Refer to page 57.)*			

Operation Panel Indication	MT	nr	FR-PU04	———
			FR-PU07	MT
Name	Maintenance signal output			
Description	Indicates that the cumulative energization time of the inverter has reached a given time. When the setting of *Pr. 504 Maintenance timer alarm output set time* is the initial value (*Pr. 504* = "9999"), this protective function does not function.			
Check point	The *Pr. 503 Maintenance timer* setting is larger than the *Pr. 504 Maintenance timer alarm output set time* setting. *(Refer to chapter 4 of the instruction manual (applied).)*			
Corrective action	Setting "0" in *Pr. 503 Maintenance timer* erraces the signal.			

Operation Panel Indication	CP	CP	FR-PU04	———
			FR-PU07	CP
Name	Parameter copy			
Description	Displayed when parameters are copied between the FR-A701 series and FR-A700 series 75K or more.			
Check point	Check that parameters are not copied between the FR-A701 series and FR-A700 series 75K or more.			
Corrective action	Copy between the same FR-A701 series.			

Operation Panel Indication	SL	SL	FR-PU04	———
			FR-PU07	SL
Name	Speed limit indication (output during speed limit)			
Description	Output if the speed limit level is exceeded during torque control.			
Check point	• Check that the torque command is not larger than required. • Check that the speed limit level is not low.			
Corrective action	• Decrease the torque command. • Increase the speed limit level.			

(3) Alarm

When an alarm occurs, the output is not shut off. You can also output an alarm signal by making parameter setting. (Set "98" in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to chapter 4 of the instruction manual (applied).)*)

Operation Panel Indication	FN	Fn	FR-PU04 FR-PU07	FN
Name	Fan fault			
Description	For the inverter that contains a cooling fan, Fn appears on the operation panel when the cooling fan stops due to a fault or different operation from the setting of *Pr. 244 Cooling fan operation selection*.			
Check point	Check the cooling fan for a fault.			
Corrective action	Check for fan fault. Please contact your sales representative.			

(4) Fault

When a fault occurs, the inverter trips and a fault signal is output.

Operation Panel Indication	E.OC1	E.OC 1	FR-PU04 FR-PU07	OC During Acc
Name	Overcurrent trip during acceleration			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during acceleration, the protective circuit is activated to stop the inverter output.			
Check point	1. Check for sudden acceleration. 2. Check that the downward acceleration time is not long in vertical lift application. 3. Check for output short circuit. 4. Check that the *Pr. 3 Base frequency* setting is not 60Hz when the motor rated frequency is 50Hz. 5. Check that stall prevention operation is correct. 6. Check that the regeneration is not performed frequently. (Check that the output voltage becomes larger than the V/F reference voltage at regeneration and overcurrent due to increase in motor current occurs.) 7. Check that the power supply for RS-485 terminal is not shorted. (under vector control) 8. Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under real sensorless vector control.			
Corrective action	1. Increase the acceleration time. (Shorten the downward acceleration time in vertical lift application.) 2. When "E.OC1" is always lit at starting, disconnect the motor once and start the inverter. If "E.OC1" is still lit, contact your sales representative. 3. Check the wiring to make sure that output short circuit does not occur. 4. Set the *Pr. 3 Base frequency* to 50Hz. *(Refer to page 58.)* 5. Perform a correct stall prevention operation. *(Refer to chapter 4 of the instruction manual (applied).)* 6. Set base voltage (rated voltage of the motor, etc.) in *Pr. 19 Base frequency voltage*. *(Refer to chapter 4 of the instruction manual (applied).)* 7. Check RS-485 terminal connection. (under vector control) 8. Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under real sensorless vector control.			

Operation Panel Indication	E.OC2	E.OC2	FR-PU04 FR-PU07	Stedy Spd OC
Name	Overcurrent trip during constant speed			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during constant speed operation, the protective circuit is activated to stop the inverter output.			
Check point	1. Check for sudden load change. 2. Check for output short circuit. 3. Check that stall prevention operation is correct 4. Check that the power supply for RS-485 terminal is not shorted. (under vector control) 5. Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under real sensorless vector control.			
Corrective action	1. Keep load stable. 2. Check the wiring to make sure that output short circuit does not occur. 3. Check that stall prevention operation setting is correct. *(Refer to chapter 4 of the instruction manual (applied).)* 4. Check RS-485 terminal connection. (under vector control) 5. Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under real sensorless vector control.			

Operation Panel Indication	E.OC3	E.OC3	FR-PU04 FR-PU07	OC During Dec
Name	Overcurrent trip during deceleration or stop			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated inverter current during deceleration (other than acceleration or constant speed), the protective circuit is activated to stop the inverter output.			
Check point	1. Check for sudden speed reduction. 2. Check for output short circuit. 3. Check for too fast operation of the motor's mechanical brake. 4. Check that stall prevention operation setting is correct. 5. Check that the power supply for RS-485 terminal is not shorted. (under vector control) 6. Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under real sensorless vector control.			
Corrective action	1. Increase the deceleration time. 2. Check the wiring to make sure that output short circuit does not occur. 3. Check the mechanical brake operation. 4. Check that stall prevention operation setting is correct. *(Refer to chapter 4 of 📖 the instruction manual (applied).)* 5. Check RS-485 terminal connection. (under vector control) 6. Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under real sensorless vector control.			

Operation Panel Indication	E.OV1	E.OV1	FR-PU04 FR-PU07	OV During Acc
Name	Regenerative overvoltage trip during acceleration			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system. Protective circuit may activate even if the regeneration converter is not activated due to power supply failure (Input phase failure and instantaneous power failure).			
Check point	1. Check for power supply fault or wrong wiring. 2. Check for too slow acceleration. (e.g. during descending acceleration in vertical lift load) 3. Check that the *Pr. 22 Stall prevention operation level* is not lower than the no load current.			
Corrective action	1. Perform wiring correctly. 2. · Decrease the acceleration time. · Use regeneration avoidance function *(Pr. 882 to Pr. 886)*. *(Refer to chapter 4 of 📖 the instruction manual (applied).)* 3. Set a value larger than the no load current in *Pr. 22 Stall prevention operation level*.			

Operation Panel Indication	E.OV2	E.OV2	FR-PU04 FR-PU07	Stedy Spd OV
Name	Regenerative overvoltage trip during constant speed			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system. Protective circuit may activate even if the regeneration converter is not activated due to power supply failure (Input phase failure and instantaneous power failure).			
Check point	· Check for power supply fault or wrong wiring. · Check for sudden load change. · Check that the *Pr. 22 Stall prevention operation level* is not lower than the no load current.			
Corrective action	· Perform wiring correctly. · Keep load stable. · Use regeneration avoidance function *(Pr. 882 to Pr. 886)*. *(Refer to chapter 4 of 📖 the instruction manual (applied).)* · Set a value larger than the no load current in *Pr. 22 Stall prevention operation level*.			

Operation Panel Indication	E.OV3	E.OV3	FR-PU04 FR-PU07	OV During Dec
Name	Regenerative overvoltage trip during deceleration or stop			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system. Protective circuit may activate even if the regeneration converter is not activated due to power supply failure (Input phase failure and instantaneous power failure).			
Check point	· Check for power supply fault or wrong wiring. · Check for sudden speed reduction.			
Corrective action	· Perform wiring correctly. · Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) · Decrease the braking duty. · Use regeneration avoidance function *(Pr. 882 to Pr. 886)*. *(Refer to chapter 4 of the instruction manual (applied).)*			

Operation Panel Indication	E.THT	E.THT	FR-PU04 FR-PU07	Inv. Overload
Name	Inverter overload trip (electronic thermal relay function) *1			
Description	If a current not less than 150% of the rated output current flows and overcurrent trip does not occur (220% or less), the electronic thermal relay activate to stop the inverter output in order to protect the output transistors. (Overload capacity 150% 60s inverse-time characteristics)			
Check point	1.Check that acceleration/deceleration time is not too short. 2.Check that torque boost setting is not too large (small). 3.Check that load pattern selection setting is appropriate for the load pattern of the using machine. 4.Check the motor for use under overload.			
Corrective action	1.Increase acceleration/deceleration time. 2.Adjust the torque boost setting. 3.Set the load pattern selection setting according to the load pattern of the using machine. 4.Reduce the load weight.			

Operation Panel Indication	E.THM	E.THM	FR-PU04 FR-PU07	Motor Ovrload
Name	Motor overload trip (electronic thermal relay function) *1			
Description	The electronic thermal relay function in the inverter detects motor overheat due to overload or reduced cooling capability during constant-speed operation and pre-alarm (TH display) is output when the I^2t value reaches 85% of the *Pr. 9 Electronic thermal O/L relay* setting and the protection circuit is activated to stop the inverter output when the I^2t value reaches the specified value. When running a special motor such as a multi-pole motor or two motors, provide a thermal relay on the inverter output side since such motor(s) cannot be protected by the electronic thermal relay function.			
Check point	1. Check the motor for use under overload. 2. Check that the setting of *Pr. 71 Applied motor* for motor selection is correct. *(Refer to chapter 4 of the instruction manual (applied).)* 3. Check that stall prevention operation setting is correct.			
Corrective action	1. Reduce the load weight. 2. For a constant-torque motor, set the constant-torque motor in *Pr. 71 Applied motor*. 3. Check that stall prevention operation setting is correct. *(Refer to chapter 4 of the instruction manual (applied).)*			

*1 Resetting the inverter initializes the internal thermal integrated data of the electronic thermal relay function.

Operation Panel Indication	E.FIN	E.FI n	FR-PU04 FR-PU07	H/Sink O/Temp
Name	Fin overheat			
Description	If the heatsink overheats, the temperature sensor is actuated to stop the inverter output. The FIN signal can be output when the temperature becomes approximately 85% of the heatsink overheat protection operation temperature. For the terminal used for the FIN signal output, assign the function by setting "26" (positive logic) or "126" (negative logic) in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to chapter 4 of the instruction manual (applied))*			
Check point	1. Check for too high surrounding air temperature. 2. Check for heatsink clogging. 3. Check that the cooling fan is stopped. (Check that Fn is displayed on the operation panel.)			
Corrective action	1. Set the surrounding air temperature to within the specifications. 2. Clean the heatsink. 3. Replace the cooling fan.			

Operation Panel Indication	E.IPF	E.I PF	FR-PU04 FR-PU07	Inst. Pwr. Loss
Name	Instantaneous power failure			
Description	If a power failure occurs for longer than 15ms (this also applies to inverter input shut-off), the instantaneous power failure protective function is activated to trip the inverter in order to prevent the control circuit from malfunctioning. If a power failure persists for longer than 100ms, the fault output is not provided, and the inverter restarts if the start signal is on upon power restoration. (The inverter continues operating if an instantaneous power failure is within 15ms.) In some operating status (load magnitude, acceleration/deceleration time setting, etc.), overcurrent or other protection may be activated upon power restoration. When instantaneous power failure protection is activated, the IPF signal is output. *(Refer to chapter 4 of the instruction manual (applied))*			
Check point	Find the cause of instantaneous power failure occurrence.			
Corrective action	· Remedy the instantaneous power failure. · Prepare a backup power supply for instantaneous power failure. · Set the function of automatic restart after instantaneous power failure (*Pr. 57*). *(Refer to chapter 4 of the instruction manual (applied) .)*			

Operation Panel Indication	E.UVT	E.UuT	FR-PU04 FR-PU07	Under Voltage
Name	Undervoltage			
Description	If the power supply voltage of the inverter decreases, the control circuit will not perform normal functions. In addition, the motor torque will be insufficient and/or heat generation will increase. To prevent this, if the power supply voltage decreases below about 150VAC (300VAC for the 400V class), this function stops the inverter output. When undervoltage protection is activated, the IPF signal is output. *(Refer to chapter 4 of the instruction manual (applied))*			
Check point	Check for start of large-capacity motor.			
Corrective action	· Check the power supply system equipment such as the power supply. · If the problem still persists after taking the above measure, please contact your sales representative.			

Operation Panel Indication	E.ILF	E.I LF	FR-PU04	Fault 14
			FR-PU07	Input phase loss
Name	Input phase failure			
Description	This fault is output when function valid setting (= 1) is set in *Pr. 872 Input phase loss protection selection* and one phase of the three phase power input is lost. *(Refer to chapter 4 of the instruction manual (applied).)*			
Check point	Check for a break in the cable for the three-phase power supply input.			
Corrective action	· Wire the cables properly. · Repair a break portion in the cable. · Check the *Pr. 872 Input phase loss protection selection* setting.			

Operation Panel Indication	E.OLT	E.OLT	FR-PU04 FR-PU07	Stll Prev STP (OL shown during stall prevention operation)
Name	Stall prevention			
Description	If the frequency has fallen to 0.5Hz by stall prevention operation and remains for 3s, a fault (E.OLT) appears and trips the inverter. OL appears while stall prevention is being activated. When speed control is performed by real sensorless vector control or vector control, a fault (E.OLT) is displayed and the inverter output is stopped if frequency drops to the *Pr. 865 Low speed detection* (initial value is 1.5Hz) setting by torque limit operation and the output torque exceeds *Pr. 874 OLT level setting* (initial value is 150%) setting and remains for more than 3s.			
Check point	· Check the motor for use under overload. *(Refer to chapter 4 of the instruction manual (applied) .)* · Check that the *Pr. 865 Low speed detection* and *Pr. 874 OLT level setting* values are correct. (Check the *Pr. 22 Stall prevention operation level* setting if V/F control is exercised.)			
Corrective action	· Reduce the load weight. · Change the *Pr. 22 Stall prevention operation level*, *Pr. 865 Low speed detection* and *Pr. 874 OLT level setting* values. (Check the *Pr. 22 Stall prevention operation level* setting if V/F control is exercised.)			

Operation Panel Indication	E.GF	E. GF	FR-PU04 FR-PU07	Ground Fault
Name	Output side earth (ground) fault overcurrent			
Description	This function stops the inverter output if an earth (ground) fault overcurrent flows due to an earth (ground) fault that occurred on the inverter's output (load) side.			
Check point	Check for an earth (ground) fault in the motor and connection cable.			
Corrective action	Remedy the earth (ground) fault portion.			

Operation Panel Indication	E.LF	E. LF	FR-PU04 FR-PU07	E. LF
Name	Output phase loss			
Description	This function stops the inverter output if one of the three phases (U, V, W) on the inverter's output side (load side) is lost.			
Check point	· Check the wiring (Check that the motor is normal.) · Check that the capacity of the motor used is not smaller than that of the inverter.			
Corrective action	· Wire the cables properly. · Check the *Pr. 251* `Output phase loss protection selection` setting.			

Operation Panel Indication	E.OHT	E.OHT	FR-PU04 FR-PU07	OH Fault
Name	External thermal relay operation			
Description	If the external thermal relay provided for motor overheat protection, or the internally mounted temperature relay in the motor, etc. switches on (contacts open), the inverter output is stopped. Functions when "7" (OH signal) is set in any of *Pr. 178* to *Pr. 189 (input terminal function selection)*. When the initial value (without OH signal assigned) is set, this protective function does not function.			
Check point	· Check for motor overheating. · Check that the value of 7 (OH signal) is set correctly in any of *Pr. 178 to Pr. 189 (input terminal function selection)*.			
Corrective action	· Reduce the load and operating duty. · Even if the relay contacts are reset automatically, the inverter will not restart unless it is reset.			

Operation Panel Indication	E.PTC	E.PTC	FR-PU04	Fault 14
			FR-PU07	PTC activated
Name	PTC thermistor operation			
Description	Stops the inverter output when the motor overheat status is detected for 10s or more by the external PTC thermistor input connected to the terminal AU. This fault functions when "63" is set in *Pr. 184 AU terminal function selection* and AU/PTC switchover switch is set in PTC side. When the initial value (*Pr. 184* = "4") is set, this protective function does not function.			
Check point	· Check the connection between the PTC thermistor switch and thermal protector. · Check the motor for operation under overload. · Is valid setting (= 63) selected in *Pr. 184 AU terminal function selection* ? *(Refer to chapter 4 of the instruction manual (applied).)*			
Corrective action	Reduce the load weight.			

Operation Panel Indication	E.OPT	E.OPT	FR-PU04 FR-PU07	Option Fault
Name	Option alarm			
Description	Appears when torque command by the plug-in option is selected using *Pr. 804 Torque command source selection* and no plug-in option is mounted. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	· Check that the plug-in option for torque command setting is connected.			
Corrective action	· Check for connection of the plug-in option. Check the *Pr. 804 Torque command source selection* setting. · Return the switch for the manufacturer setting of the plug-in option to the initial status. *(Refer to instruction manual of each option)*			

Operation Panel Indication	E.OP3	E.OP3	FR-PU04 FR-PU07	Option 3 Fault
Name	Communication option alarm			
Description	Stops the inverter output when a communication line error occurs in the communication option.			
Check point	· Check for a wrong option function setting and operation. · Check that the plug-in option is plugged into the connector securely. · Check for a break in the communication cable. · Check that the terminating resistor is fitted properly.			
Corrective action	· Check the option function setting, etc. · Connect the plug-in option securely. · Check the connection of communication cable.			

Operation Panel Indication	E. 1 to E. 3	E. 1 to E. 3	FR-PU04 FR-PU07	Fault 1 to Fault 3
Name	Option fault			
Description	Stops the inverter output if a contact faullt, etc. of the connector between the inverter and plug-in option occurs or if a communication option is fitted to the connector 1 or 2. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	1. Check that the plug-in option is plugged into the connector securely. (1 to 3 indicate the option connector numbers.) 2. Check for excess electrical noises around the inverter. 3. Check that the communication option is not fitted to the connector 1 or 2.			
Corrective action	1. Connect the plug-in option securely. 2. Take measures against noises if there are devices producing excess electrical noises around the inverter. If the problem still persists after taking the above measure, please contact your sales representative or distributor. 3. Fit the communication option to the connector 3. 4. Return the switch for the manufacturer setting of the plug-in option to the initial status. *(Refer to instruction manual of each option)*			

Operation Panel Indication	E.PE	E.PE	FR-PU04 FR-PU07	Corrupt Memry
Name	Parameter storage device fault (control circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	Check for too many number of parameter write times.			
Corrective action	Please contact your sales representative. When performing parameter write frequently for communication purposes, set "1" in *Pr. 342* to enable RAM write. Note that powering off returns the inverter to the status before RAM write.			

Operation Panel Indication	E.PE2	E.PE2	FR-PU04	Fault 14
			FR-PU07	PR storage alarm
Name	Parameter storage device fault (main circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	————————			
Corrective action	Please contact your sales representative.			

Operation Panel Indication	E.PUE	E.PUE	FR-PU04 FR-PU07	PU Leave Out
Name	PU disconnection			
Description	· This function stops the inverter output if communication between the inverter and PU is suspended, e.g. the operation panel and parameter unit is disconnected, when "2", "3", "16" or "17" was set in *Pr. 75 Reset selection/disconnected PU detection/PU stop selection*. · This function stops the inverter output when communication errors occurred consecutively for more than permissible number of retries when a value other than "9999" is set in *Pr. 121 Number of PU communication retries* during the RS-485 communication with the PU connector. · This function stops the inverter output if communication is broken within the period of time set in *Pr. 122 PU communication check time interval* during the RS-485 communication with the PU connector.			
Check point	· Check that the FR-DU07 or parameter unit (FR-PU04/FR-PU07) is fitted tightly. · Check the *Pr. 75* setting.			
Corrective action	Fit the FR-DU07 or parameter unit (FR-PU04/FR-PU07) securely.			

Operation Panel Indication	E.RET	E.rET	FR-PU04 FR-PU07	Retry No Over
Name	Retry count excess			
Description	If operation cannot be resumed properly within the number of retries set, this function trips the inverter. Functions only when *Pr. 67 Number of retries at fault occurrence* is set. When the initial value (*Pr. 67* = "0") is set, this protective function does not function.			
Check point	Find the cause of alarm occurrence.			
Corrective action	Eliminate the cause of the error preceding this error indication.			

Operation Panel Indication	E. 6	E. 6	FR-PU04 FR-PU07	Fault 6
	E. 7	E. 7		Fault 7
	E.CPU	E.CPU		CPU Fault
Name	CPU error			
Description	Stops the inverter output if the communication error of the built-in CPU occurs.			
Check point	Check for devices producing excess electrical noises around the inverter.			
Corrective action	· Take measures against noises if there are devices producing excess electrical noises around the inverter. · Please contact your sales representative.			

Operation Panel Indication	E.CTE	E.CTE	FR-PU04	——
			FR-PU07	E.CTE
Name	Operation panel power supply short circuit, RS-485 terminal power supply short circuit			
Description	When the operation panel power supply (PU connector) is shorted, this function shuts off power output and stops the inverter output. At this time, the operation panel (parameter unit) cannot be used and RS-485 communication from the PU connector cannot be made. When the internal power supply for the RS-485 terminals are shorted, this function shuts off the power output. At this time, communication from the RS-485 terminals cannot be made. To reset, enter the RES signal or switch power off, then on again.			
Check point	1. Check for a short circuit in the PU connector cable. 2. Check that the RS-485 terminals are connected correctly.			
Corrective action	1. Check the PU and cable. 2. Check the connection of the RS-485 terminals			

Operation Panel Indication	E.MB1 to 7	E.MB1 to E.MB7	FR-PU04	——
			FR-PU07	E.MB1 Fault to E.MB7 Fault
Name	Brake sequence error			
Description	The inverter output is stopped when a sequence error occurs during use of the brake sequence function (*Pr. 278* to *Pr. 285*). This protective function does not function in the initial status (brake sequence function is invalid).			
Check point	Find the cause of alarm occurrence.			
Corrective action	Check the set parameters and perform wiring properly.			

Operation Panel Indication	E.OS	E. OS	FR-PU04 FR-PU07	E. OS
Name	Overspeed occurence			
Description	Stops the inverter output when the motor speed exceeds the *Pr. 374 Overspeed detection level* during encoder feedback control real sensorless vector control and vector control. This protective function does not function in the initial status.			
Check point	· Check that the *Pr. 374 Overspeed detection level* value is correct. · Check that the number of encoder pulses does not differ from the actual number of encoder pulses.			
Corrective action	· Set the *Pr. 374 Overspeed detection level* value correctly. · Set the correct number of encoder pulses in *Pr. 369 Number of encoder pulses*.			

Operation Panel Indication	E.OSD	E.OSd	FR-PU04 FR-PU07	E. OSd
Name	Speed deviation excess detection			
Description	Stops the inverter output if the motor speed is increased or decreased under the influence of the load etc. during vector control with *Pr. 285 Speed deviation excess detection frequency* set and cannot be controlled in accordance with the speed command value. This protective function does not function in the initial status.			
Check point	· Check that the values of *Pr. 285 Speed deviation excess detection frequency* and *Pr. 853 Speed deviation time* are correct. · Check for sudden load change. · Check that the number of encoder pulses does not differ from the actual number of encoder pulses.			
Corrective action	· Set *Pr. 285 Speed deviation excess detection frequency* and *Pr. 853 Speed deviation time* correctly. · Keep load stable. · Set the correct number of encoder pulses in *Pr. 369 Number of encoder pulses*.			

Operation Panel Indication	E.ECT	E.ECT	FR-PU04 FR-PU07	E. ECT
Name	Signal loss detection			
Description	Trips the inverter output when the encoder signal is shut off under orientation control, encoder feedback control or vector control. This protective function does not function in the initial status.			
Check point	· Check for the encoder signal loss. · Check that the encoder specifications are correct. · Check for a loose connector. · Check that the switch setting of the FR-A7AP is correct. · Check that the power is supplied to the encoder. Or, check that the power is not supplied to the encoder later than the inverter.			
Corrective action	· Remedy the signal loss. · Use an encoder that meets the specifications. · Make connection securely. · Make a switch setting of the FR-A7AP correctly. *(Refer to page 29)* · Supply the power to the encoder. Or supply the power to the encoder at the same time when the power is supplied to the inverter. If the power is supplied to the encoder after the inverter, check that the encoder signal is securely sent and set "0" in *Pr. 376*.			

Operation Panel Indication	E.OD	E. Od	FR-PU04 FR-PU07	Fault 14 E. Od
Name	Excessive position error			
Description	Stops the inverter output when the difference between the position command and position feedback exceeds *Pr. 427 Excessive level error* under position control. This protective function does not function in the initial status.			
Check point	· Check that the position detecting encoder mounting orientation matches the parameter. · Check that the load is not large. · Check that the *Pr. 427 Excessive level error* and *Pr. 369 Number of encoder pulses* are correct.			
Corrective action	· Check the parameters. · Reduce the load weight. · Set the *Pr. 427 Excessive level error* and *Pr. 369 Number of encoder pulses* correctly.			

Operation Panel Indication	E.EP	E.EP	FR-PU04	Fault 14
			FR-PU07	E.EP
Name	Encoder phase error			
Description	Stops the inverter output when the rotation command of the inverter differs from the actual motor rotation direction detected from the encoder. This protective function does not function in the initial status.			
Check point	· Check for mis-wiring of the encoder cable. · Check for wrong setting of *Pr. 359 Encoder rotation direction*.			
Corrective action	· Perform connection and wiring securely. · Change the *Pr. 359 Encoder rotation direction* value.			

Operation Panel Indication	E.P24	E.P24	FR-PU04 FR-PU07	E.P24
Name	24VDC power output short circuit			
Description	When the 24VDC power output from the PC terminal is shorted, this function shuts off the power output. At this time, all external contact inputs switch off. The inverter cannot be reset by entering the RES signal. To reset it, use the operation panel or switch power off, then on again.			
Check point	· Check for a short circuit in the PC terminal output.			
Corrective action	· Remedy the earth (ground) fault portion.			

Operation Panel Indication	E.CDO	E.CdO	FR-PU04	Fault 14
			FR-PU07	OC detect level
Name	Output current detection value exceeded			
Description	Stops the inverter output when the output current exceeds the setting of *Pr. 150 Output current detection level*. Functions when *Pr. 167 Output current detection operation selection* is set to "1". When the initial value (*Pr. 167* = "0") is set, this protective function does not function.			
Check point	Check the settings of *Pr. 150 Output current detection level*, *Pr. 151 Output current detection signal delay time*, *Pr. 166 Output current detection signal retention time*, *Pr. 167 Output current detection operation selection*. *(Refer to chapter 4 of 🕮 the instruction manual (applied).)*			

Operation Panel Indication	E.IOH	E.IOH	FR-PU04	Fault 14
			FR-PU07	Inrush overheat
Name	Inrush current limit circuit fault			
Description	Stops the inverter output when the resistor of inrush current limit circuit overheated. The inrush current limit circuit failure			
Check point	· Check that frequent power ON/OFF is not repeated. · Check that the power supply circuit of inrush current limit circuit contactor is not damaged.			
Corrective action	Configure a circuit where frequent power ON/OFF is not repeated. If the problem still persists after taking the above measure, please contact your sales representative.			

Operation Panel Indication	E.SER	E.SEr	FR-PU04	Fault 14
			FR-PU07	VFD Comm error
Name	Communication error (inverter)			
Description	This function stops the inverter output when communication error occurs consecutively for more than permissible retry count when a value other than "9999" is set in *Pr. 335 RS-485 communication retry count* during RS-485 communication from the RS-485 terminals. This function also stops the inverter output if communication is broken for the period of time set in *Pr. 336 RS-485 communication check time interval*.			
Check point	Check the RS-485 terminal wiring.			
Corrective action	Perform wiring of the RS-485 terminals properly.			

Operation Panel Indication	E.AIE	E.AI E	FR-PU04	Fault 14
			FR-PU07	Analog in error
Name	Analog input error			
Description	Stops the inverter output when 30mA or more is input or a voltage (7.5V or more) is input with the terminal 2/4 set to current input.			
Check point	Check the setting of *Pr. 73 Analog input selection*, *Pr. 267 Terminal 4 input selection* and voltage/current input switch. *(Refer to chapter 4 of the instruction manual (applied).)*			
Corrective action	Either give a frequency command by current input or set *Pr. 73 Analog input selection*, *Pr. 267 Terminal 4 input selection*, and voltage/current input switch to voltage input.			

Operation Panel Indication	E.4	E. 4	FR-PU04 FR-PU07	Fault 4
Name	Converter overcurrent			
Description	The current flows in the regeneration converter module exceeds the specified value, protective circuit activates and stops the inverter output.			
Check point	1. Check that sudden acceleration/deceleration is not performed. 2. Check for sudden load change. 3. Check that wiring is correct. 4. Check that instantaneous power failure did not occur. 5. Check that the thyristor load does not exist in the same power supply system.			
Corrective action	1. Increase acceleration/deceleration time. 2. Keep load stable. 3. Wire the cables properly. 4. When a thyristor load exist in the same power supply system, install an AC reactor (FR-HAL).			

Operation Panel Indication	E.8	E. 8	FR-PU04 FR-PU07	Fault 8
Name	Power supply fault			
Description	· When overvoltage occurs in the converter side during input phase failure detection · When overvoltage occurs in the converter side during instantaneous power failure detection · When fault of power supply frequency is detected · When phase shift is not detected When any of the above conditions applied, it is judged as power supply and the inverter output is stopped.			
Check point	Check the power supply and wiring.			
Corrective action	Perform wiring correctly.			

Operation Panel Indication	E.10	E. 10	FR-PU04 FR-PU07	Fault 10
Name	Converter transistor protection thermal operation (electronic thermal)			
Description	Current flowing in the module of the regeneration converter is less than the overcurrent shutoff level and exceeds the specified value, electronic thermal relay activates for protection and the inverter output is stopped.			
Check point	· Check the motor for use under overload. (excess regeneration amount) · Check that the thyristor load does not exist in the same power supply system.			
Corrective action	· Reduce the load weight. · When a thyristor load exists in the same power supply system, install an AC reactor (FR-HAL).			

Operation Panel Indication	E.11	E. 11	FR-PU04 FR-PU07	Fault 11
Name	Opposite rotation deceleration fault			
Description	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 during torque control under real sensorless vector control. At this time, the inverter output is stopped if the rotation direction will not change, causing overload. This protective function does not function in the initial status (V/F control). (It functions only during real sensorless vector control.)			
Check point	Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under real sensorless vector control.			
Corrective action	· Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under real sensorless vector control. · Please contact your sales representative.			

Operation Panel Indication	E.13	E. 13	FR-PU04 FR-PU07	Fault 13
Name	Internal circuit error			
Description	Stop the inverter output when an internal circuit fault occurred.			
Corrective action	Please contact your sales representative.			

Operation Panel Indication	E.15	E. 15	FR-PU04 FR-PU07	Fault 15
Name	Converter circuit fault			
Description	· When a fault occurs in the peripheral circuit of the regeneration converter CPU · When a fault occurs in the control power supply circuit. · When a fault occurs in the inrush current limit circuit. If any of the above conditions applied, it is judged as converter circuit fault and the inverter output is stopped.			
Check point	Check for devices producing excess electrical noises around the inverter.			
Corrective action	· Take measures against noises if there are devices producing excess electrical noises around the inverter. · Please contact your sales representative.			

CAUTION

- If protective functions of E.ILF, E.PTC, E.PE2, E.EP, E.OD, E.CDO, E.IOH, E.SER, E.AIE are activated when using the FR-PU04, "Fault 14" appears.
  Also when the faults history is checked on the FR-PU04, the display is "E.14".
- If faults other than the above appear, contact your sales representative.

5.4 Correspondences between digital and actual characters

There are the following correspondences between the actual alphanumeric characters and the digital characters displayed on the operation panel.

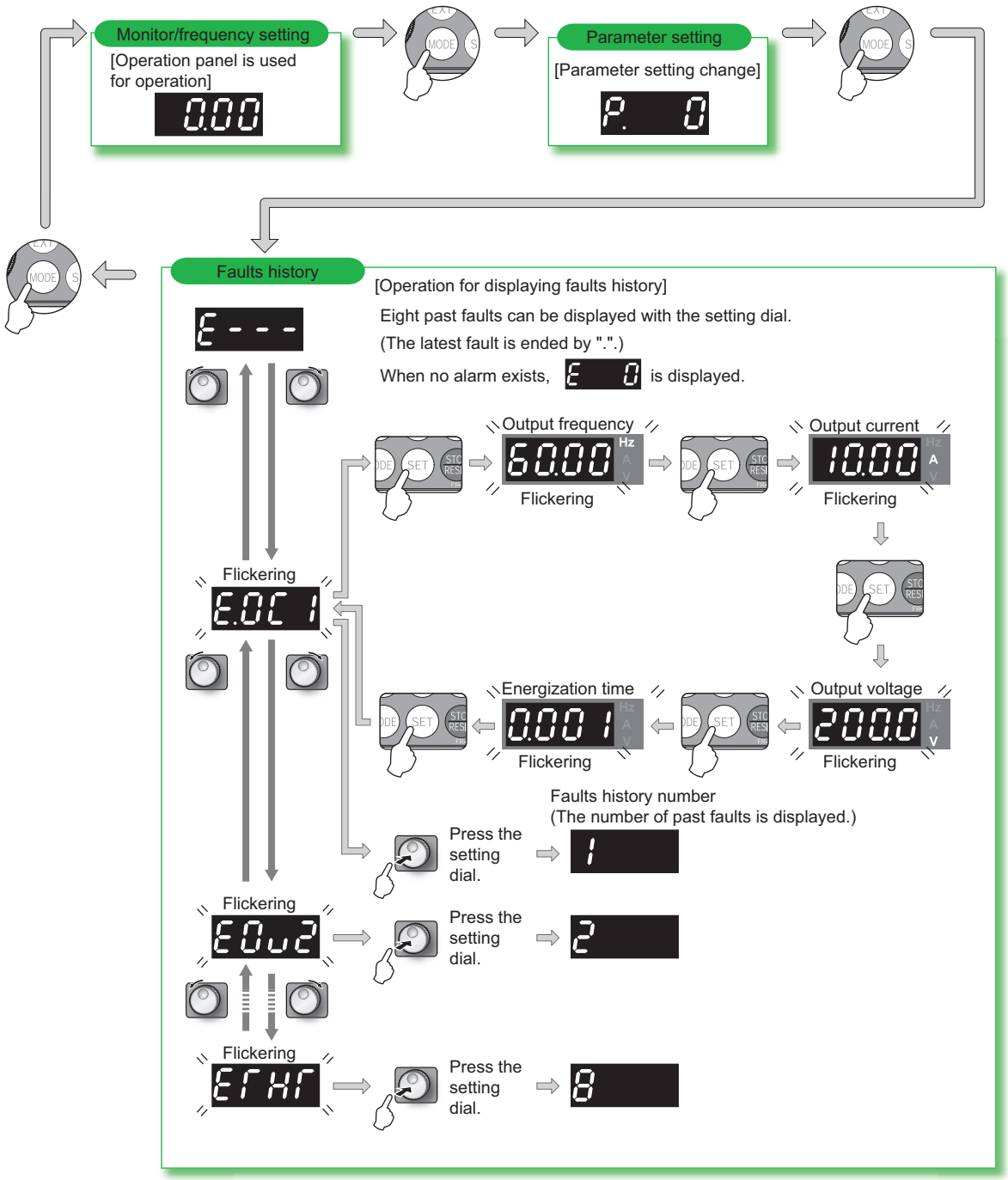
Actual	Digital
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

Actual	Digital
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
L	

Actual	Digital
M	
N	
O	
o	
P	
S	
T	
U	
V	
r	
-	

5.5 Check and clear of the faults history

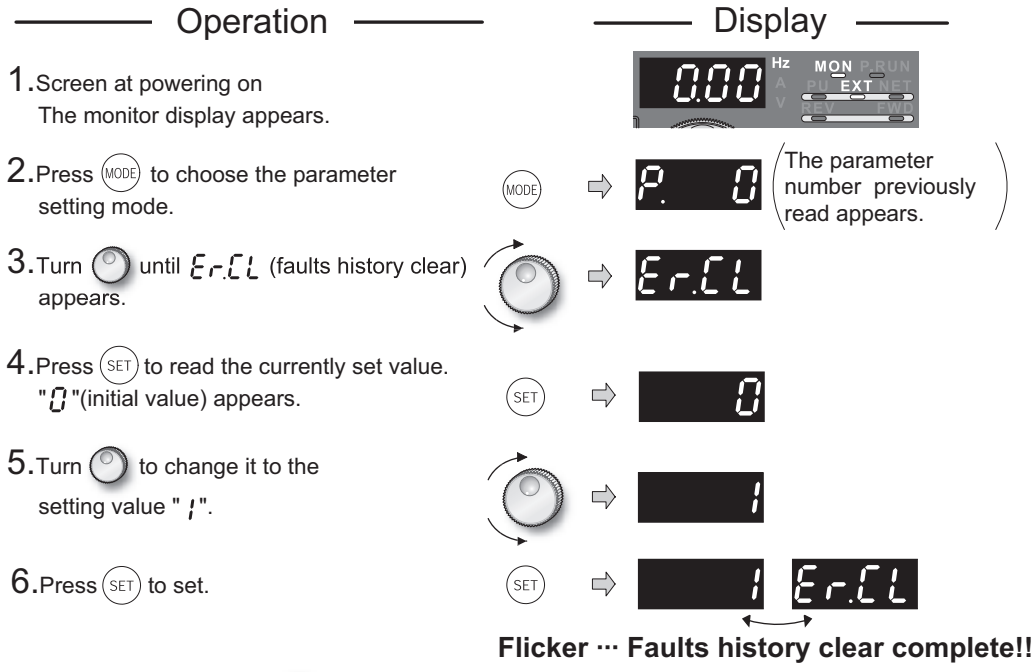
(1) Check for the faults history



(2) Clearing procedure

POINT

· The faults history can be cleared by setting "1" in *Er.CL Faults history clear*.



5.6 Check first when you have troubles

POINT

If the cause is still unknown after every check, it is recommended to initialize the parameters (initial value) then reset the required parameter values and check again.

5.6.1 Motor will not start

1) Check the *Pr.0 Torque boost* setting if V/F control is exercised. *(Refer to page 59)*

2) Check the main circuit
- Check that a proper power supply voltage is applied (operation panel display is provided).
- Check that the motor is connected properly.

3) Check the input signals
- Check that start signal is input.
- Check that both the forward and reverse rotation start signals are not input simultaneously.
- Check that the frequency setting signal is not zero. (When the frequency command is 0Hz and the start command is entered, FWD or REV LED on the operation panel flickers.)
- Check that the AU signal is on when terminal 4 is used for frequency setting.
- Check that the output stop signal (MRS) or reset signal (RES) is not on.
- Check that the CS signal is not OFF with automatic restart after instantaneous power failure function is selected (*Pr. 57* ≠ "9999").
- Check that the sink or source jumper connector is fitted securely. *(Refer to page 23)*
- Check that the encoder wiring is correct. (during encoder feedback control or vector control)
- Check that the voltage/current input switch is correctly set for analog input signal (0 to 5V/0 to 10V, 4 to 20mA).

4) Check the parameter settings
- Check that *Pr. 78 Reverse rotation prevention selection* is not selected.
- Check that the *Pr. 79 Operation mode selection* setting is correct.
- Check that the bias and gain *(calibration parameter C2 to C7)* settings are correct.
- Check that the *Pr. 13 Starting frequency* setting is not greater than the running frequency.
- Check that frequency settings of each running frequency (such as multi-speed operation) are not zero. Check that especially the *Pr. 1 Maximum frequency* setting is not zero.
- Check that the *Pr. 15 Jog frequency* setting is not lower than the *Pr. 13 Starting frequency* setting.
- Check that the *Pr. 359 Encoder rotation direction* setting under encoder feed back control or vector control is correct.
- Set "1" in *Pr. 359* if "REV" on the operation panel is on when the forward command is given.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.

(Refer to chapter 4 of the instruction manual (applied))

5) Inspection of load
- Check that the load is not too heavy.
- Check that the shaft is not locked.

5.6.2 Motor generates abnormal noise

No carrier frequency noises (metallic noises) are generated.
- Soft-PWM control to change the motor tone into an unoffending complex tone is factory-set to valid by *Pr. 72 PWM frequency selection*.
  Adjust *Pr. 72 PWM frequency selection* to change the motor tone.

Check that the gain value under real sensorless vector control or vector control is not too high. Check the setting of *Pr. 820 (Pr. 830) Speed control P gain* when speed control is exercised and *Pr. 824 (Pr. 834) Torque control P gain* when torque control is exercised.

Check for any mechanical looseness.

Contact the motor manufacturer.

5.6.3 Inverter generates abnormal noise.

- Check that a fan cover is correctly reinstalled when replacing a cooling fan.
- An AC reactor is built-in and a greater noise than at driving is produced during regeneration operation. But it is not a fault.

5.6.4 Motor generates heat abnormally

- Is the fan for the motor is running? (Check for accumulated dust.)
- Check that the load is not too heavy. Lighten the load.
- Check that the inverter output voltages (U, V, W) balanced.
- Check that the *Pr. 0 Torque boost* setting is correct.
- Was the motor type set? Check the setting of *Pr. 71 Applied motor*.
- When using any other manufacturer's motor, perform offline auto tuning. *(Refer to page 71.)*

5.6.5 Motor rotates in opposite direction

- Check that the phase sequence of output terminals U, V and W is correct.
- Check that the start signals (forward rotation, reverse rotation) are connected properly. *(Refer to page 88)*

5.6.6 Speed greatly differs from the setting

- Check that the frequency setting signal is correct. (Measure the input signal level.)
- Check that the *Pr. 1, Pr. 2, Pr. 19, Calibration parameter C2 to C7* settings are correct.
- Check that the input signal lines are not affected by external noise.
  (Use shielded cables)
- Check that the load is not too heavy.
- Check that the *Pr. 31* to *Pr. 36* (frequency jump) settings are correct.

5.6.7 Acceleration/deceleration is not smooth

- Check that the acceleration and deceleration time settings are not too short.
- Check that the load is not too heavy.
- Check that the torque boost (*Pr. 0, Pr. 46, Pr. 112*) setting is not too large and the stall prevention function is not activated under V/F control.

5.6.8 Motor current is large

- Check that the load is not too heavy.
- Check that the *Pr. 0 Torque boost* setting is appropriate.
- Check that the *Pr. 3 Base frequency* setting is appropriate.
- Check that the *Pr. 14 Load pattern selection* setting is appropriate.
- Check that the *Pr. 19 Base frequency voltage* setting is appropriate.

5.6.9 Speed does not increase

- Check that the maximum frequency *(Pr. 1)* setting is correct. (If you want to run the motor at 120Hz or more, set *Pr. 18 High speed maximum frequency*. *(Refer to chapter 4 of 🕮 the instruction manual (applied).)*)
- Check that the load is not too heavy.
  (In agitators, etc., load may become heavier in winter.)
- Check that the torque boost *(Pr. 0, Pr. 46, Pr. 112)* setting is not too large and the stall prevention function is not activated under V/F control.

5.6.10 The motor and machine vibrate.

- Set *Pr. 19 Base frequency voltage* to the rated motor voltage under V/F control.
- Check for any mechanical looseness.

5.6.11 Speed varies during operation

When advanced magnetic flux vector control, real sensorless vector control, vector control or encoder feedback control is exercised, the output frequency varies with load fluctuation between 0 and 2Hz. This is a normal operation and is not a fault.

1) Inspection of load

- Check that the load is not varying.

2) Check the input signals

- Check that the frequency setting signal is not varying.
- Check that the frequency setting signal is not affected by noise. Input filter to the analog input terminal using *Pr. 74 Input filter time constant* and *Pr. 822 Speed setting filter 1*.
- Check for a malfunction due to undesirable currents when the transistor output unit is connected. *(Refer to page 24)*

3) Others

- Check that the settings of *Pr. 80 Motor capacity* and *Pr. 81 Number of motor poles* are correct to the inverter capacity and motor capacity under advanced magnetic flux vector control, real sensorless vector control or vector control.
- Check that the wiring length is not exceeding 30m when advanced magnetic flux vector control, real sensorless vector control or vector control is exercised. Perform offline auto tuning. *(Refer to chapter 4 of the instruction manual (applied))*
- Check that the wiring length is not too long for V/F control.
- Change the *Pr. 19 Base frequency voltage* setting (about 3%) under V/F control.

5.6.12 Operation mode is not changed properly

If the operation mode does not change correctly, check the following:

1) Inspection of load

- Check that the STF or STR signal is off.
  When it is on, the operation mode cannot be changed.

2) Parameter setting

- Check the *Pr. 79* setting.
  When the *Pr. 79 Operation mode selection* setting is "0" (initial value), the inverter is placed in external operation mode at input power-on. At this time, press PU/EXT on the operation panel (press PU when the parameter unit (FR-PU04/FR-PU07) is used) to switch to PU operation mode.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.
  (Refer to chapter 4 of the instruction manual (applied))

5.6.13 Operation panel (FR-DU07) display is not operating

- Check that the operation panel is connected to the inverter securely.

5.6.14 POWER lamp is not lit

- Check that wiring is securely performed and installation is correct.

5.6.15 Parameter write cannot be performed

- Make sure that operation is not being performed (signal STF or STR is not ON).
- Make sure that you are not attempting to set the parameter in external operation mode.
- Check *Pr. 77 Parameter write selection.*
- Check *Pr. 161 Frequency setting/key lock operation selection*.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.
  (Refer to chapter 4 of the instruction manual (applied))

6 PRECAUTIONS FOR MAINTENANCE AND INSPECTION

The inverter is a static unit mainly consisting of semiconductor devices. Daily inspection must be performed to prevent any fault from occurring due to the adverse effects of the operating environment, such as temperature, humidity, dust, dirt and vibration, changes in the parts with time, service life, and other factors.

- **Precautions for maintenance and inspection**

For some short time after the power is switched off, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched off, and then make sure that the voltage across the main circuit terminals P/+-N/− of the inverter is not more than 30VDC using a tester, etc.

6.1 Inspection item

6.1.1 Daily inspection

Basically, check for the following faults during operation.
(1) Motor operation fault
(2) Improper installation environment
(3) Cooling system fault
(4) Unusual vibration and noise
(5) Unusual overheat and discoloration
During operation, check the inverter input voltages using a tester.

6.1.2 Periodic inspection

Check the areas inaccessible during operation and requiring periodic inspection.
Consult us for periodic inspection.
1) Check for cooling system fault.....Clean the air filter, etc.
2) Tightening check and retightening.....The screws and bolts may become loose due to vibration, temperature changes, etc.
Tighten them according to the specified tightening torque. *(Refer to page 16)*
3) Check the conductors and insulating materials for corrosion and damage.
4) Measure insulation resistance.
5) Check and change the cooling fan and relay.

6.1.3 Daily and periodic inspection

Area of Inspection	Inspection Item	Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check
			Daily	Periodic *2		
General	Surrounding environment	Check the surrounding air temperature, humidity, dirt, corrosive gas, oil mist , etc.	○		Improve emvironment	
	Overall unit	Check for unusual vibration and noise.	○		Check alarm location and retighten	
	Power supply voltage	Check that the main circuit voltages and control voltages are normal.*1	○		Inspect the power supply	
Main circuit	General	(1) Check with megger (across main circuit terminals and earth (ground) terminal).		○	Contact the manufacturer	
		(2) Check for loose screws and bolts.		○	Retighten	
		(3) Check for overheat traces on the parts.		○	Contact the manufacturer	
		(4) Check for stain.		○	Clean	
	Conductors, cables	(1) Check conductors for distortion.		○	Contact the manufacturer	
		(2) Check cable sheaths for breakage and deterioration (crack, discoloration, etc.).		○	Contact the manufacturer	
	Transformer/reactor	Check for unusual odor and abnormal increase in whining sound.	○		Stop the device and contact the manufacturer.	
	Terminal block	Check for damage.		○	Stop the device and contact the manufacturer.	
	Smoothing aluminum electrolytic capacitor	(1) Check for liquid leakage.		○	Contact the manufacturer	
		(2) Check for safety valve projection and bulge.		○	Contact the manufacturer	
		(3) Visual check and judge by the life check of the main circuit capacitor. *(Refer to page 164)*		○		
	Relay/contactor	Check that the operation is normal and no chatter is heard.		○	Contact the manufacturer	
	Resistor	(1) Check for crack in resistor insulation.		○	Contact the manufacturer	
		(2) Check for a break in the cable.		○	Contact the manufacturer	
Control circuit protective circuit	Operation check	(1) Check that the output voltages across phases with the inverter operated alone is balanced.		○	Contact the manufacturer	
		(2) Check that no fault is found in protective and display circuits in a sequence protective operation test.		○	Contact the manufacturer	
	Parts check: Overall	(1) Check for unusual odor and discoloration.		○	Stop the device and contact the manufacturer.	
		(2) Check for serious rust development.		○	Contact the manufacturer	
	Parts check: Aluminum electrolytic capacitor	(1) Check for liquid leakage in a capacitor and deformation trance.		○	Contact the manufacturer	
		(2) Visual check and judge by the life check of the control circuit capacitor. *(Refer to page 164.)*		○		
Cooling system	Cooling fan	(1) Check for unusual vibration and noise.	○		Replace the fan	
		(2) Check for loose screws and bolts.		○	Retighten	
		(3) Check for stain.		○	Clean	
	Heatsink	(1) Check for clogging.		○	Clean	
		(2) Check for stain.		○	Clean	
	Air filter, etc.	(1) Check for clogging.		○	Clean or replace	
		(2) Check for stain.		○	Clean or replace	
Display	Indication	(1) Check that display is normal.	○		Contact the manufacturer	
		(2) Check for stain.		○	Clean	
	Meter	Check that reading is normal.	○		Stop the device and contact the manufacturer.	
Load motor	Operation check	Check for vibration and abnormal increase in operation noise.	○		Stop the device and contact the manufacturer.	

*1 It is recommended to install a device to monitor voltage for checking the power supply voltage to the inverter.

*2 One to two years of periodic inspection cycle is recommended. However, it differs according to the installation environment. Consult us for periodic inspection.

6.1.4 Display of the life of the inverter parts

The self-diagnostic alarm is output when the life span of the control circuit capacitor, cooling fan, each parts of the inrush current limit circuit is near to give an indication of replacement time .

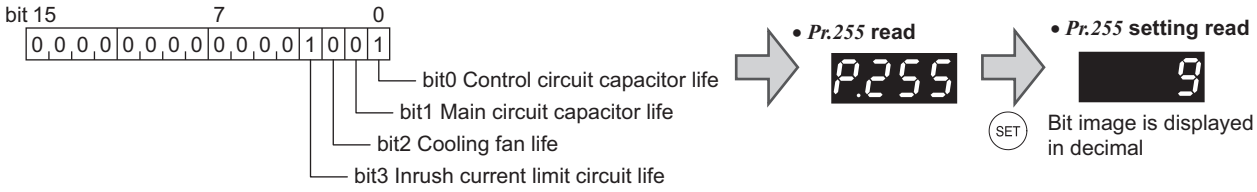
The life alarm output can be used as a guideline for life judgement.

Parts	Judgement Level
Main circuit capacitor	85% of the initial capacity
Control circuit capacitor	Estimated 10% life remaining
Inrush current limit circuit	Estimated 10% life remaining (Power on: 100,000 times left)
Cooling fan	Less than 50% of the predetermined speed

For the life check of the main circuit capacitor, the alarm signal (Y90) will not be output if a measuring method of (2) is not performed. *(Refer to page 165.)*

(1) Display of the life alarm

· *Pr. 255 Life alarm status display* can be used to confirm that 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.



Pr. 255 (decimal)	Bit (binary)	Inrush Current Limit Circuit Life	Cooling Fan Life	Main Circuit Capacitor Life	Control Circuit Capacitor Life
15	1111	○	○	○	○
14	1110	○	○	○	×
13	1101	○	○	×	○
12	1100	○	○	×	×
11	1011	○	×	○	○
10	1010	○	×	○	×
9	1001	○	×	×	○
8	1000	○	×	×	×
7	0111	×	○	○	○
6	0110	×	○	○	×
5	0101	×	○	×	○
4	0100	×	○	×	×
3	0011	×	×	○	○
2	0010	×	×	○	×
1	0001	×	×	×	○
0	0000	×	×	×	×

○: with alarm, ×: without alarm

POINT

Life check of the main circuit capacitor needs to be done by *Pr. 259*. (Refer to the following.)

(2) Measuring method of life of the main circuit capacitor

- If the value of capacitor capacity measured before shipment is considered as 100%, *Pr. 255* bit1 is turned on when the measured value falls below 85%.
- Measure the capacitor capacity according to the following procedure and check the deterioration level of the capacitor capacity.
  1) Check that the motor is connected and at a stop.
  2) Set "1" (measuring start) in *Pr. 259*
  3) Switch power off. The inverter applies DC voltage to the motor to measure the capacitor capacity while the inverter is off.
  4) After confirming that the LED of the operation panel is off, power on again.
  5) Check that "3" (measuring completion) is set in *Pr. 259*, then read *Pr .258* and check the life of the main circuit capacitor.

REMARKS

- When the main circuit capacitor life is measured under the following conditions, "forced end" (*Pr. 259* = "8") or "measuring error" (*Pr. 259* = "9") occurs or it remains in "measuring start" (*Pr. 259* = "1"). When measuring, avoid the following conditions to perform. In addition, even when "measurement completion" (*Pr. 259* = "3") is confirmed under the following conditions, normal measurement can not be done.
  (a)Terminal R1/L11, S1/L21 is connected to the terminals P/+ and N/–.
  (b)Switch power on during measuring.
  (c)The motor is not connected to the inverter.
  (d)The motor is running.(The motor is coasting.)
  (e)The motor capacity is two rank smaller as compared to the inverter capacity.
  (f)The inverter is at an alarm stop or an alarm occurred while power is off.
  (g)The inverter output is shut off with the MRS signal.
  (h)The start command is given while measuring.
- Operating environment: Surrounding air temperature (annual average 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt))
  Output current (80% of the inverter rated current)

POINT

For the accurate life measuring of the main circuit capacitor, perform after more than 3h passed since the turn off of the power as it is affected by the capacitor temperature.

⚠ WARNING

⚠ When measuring the main circuit capacitor capacity (*Pr. 259 Main circuit capacitor life measuring* = "1"), the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

6.1.5 Checking the inverter and converter modules

<Preparation>

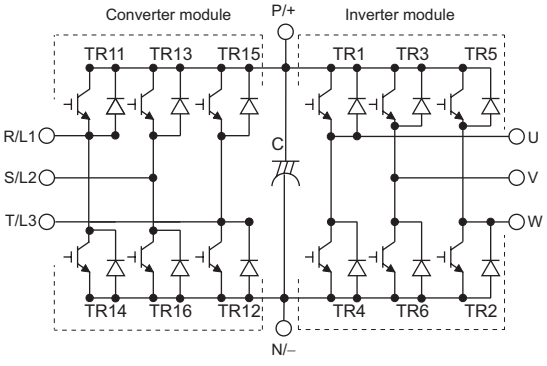
(1) Disconnect the external power supply cables (R/L1, S/L2, T/L3) and motor cables (U, V, W).
(2) Prepare a tester. (Use 100Ω range.)

<Checking method>

Change the polarity of the tester alternately at the inverter terminals R/L1, S/L2, T/L3, U, V, W, P/+ and N/–, and check for continuity.

<Module device numbers and terminals to be checked>

		Tester Polarity ⊕	Tester Polarity ⊖	Measured Value		Tester Polarity ⊕	Tester Polarity ⊖	Measured Value
Converter module	TR11	R/L1	P/+	Discontinuity	TR14	R/L1	N/–	Continuity
		P/+	R/L1	Continuity		N/–	R/L1	Discontinuity
	TR13	S/L2	P/+	Discontinuity	TR16	S/L2	N/–	Continuity
		P/+	S/L2	Continuity		N/–	S/L2	Discontinuity
	TR15	T/L3	P/+	Discontinuity	TR12	T/L3	N/–	Continuity
		P/+	T/L3	Continuity		N/–	T/L3	Discontinuity
Inverter module	TR1	U	P/+	Discontinuity	TR4	U	N/–	Continuity
		P/+	U	Continuity		N/–	U	Discontinuity
	TR3	V	P/+	Discontinuity	TR6	V	N/–	Continuity
		P/+	V	Continuity		N/–	V	Discontinuity
	TR5	W	P/+	Discontinuity	TR2	W	N/–	Continuity
		P/+	W	Continuity		N/–	W	Discontinuity



(Assumes the use of an analog meter.)

6.1.6 Cleaning

Always run the inverter in a clean status.
When cleaning the inverter, gently wipe dirty areas with a soft cloth immersed in neutral detergent or ethanol.

CAUTION

Do not use solvent, such as acetone, benzene, toluene and alcohol, as they will cause the inverter surface paint to peel off.
The display, etc. of the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07) are vulnerable to detergent and alcohol. Therefore, avoid using them for cleaning.

6.1.7 Replacement of parts

The inverter consists of many electronic parts such as semiconductor devices.
The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or fault of the inverter. For preventive maintenance, the parts must be replaced periodically.
Use the life check function as a guidance of parts replacement.

Part Name	Standard Replacement Interval *1	Description
Cooling fan	10 years	Replace (as required)
Main circuit smoothing capacitor	10 years *2	Replace (as required)
On-board smoothing capacitor	10 years	Replace the board (as required)
Relays	–	as required

*1 Replacement years for when the yearly average surrounding air temperature is 40°C (without corrosive gas, flammable gas, oil mist, dust and dirt etc)
*2 Output current : 80% of the inverter rated current

CAUTION

For parts replacement, consult the nearest Mitsubishi FA Center.

(1) Cooling fan

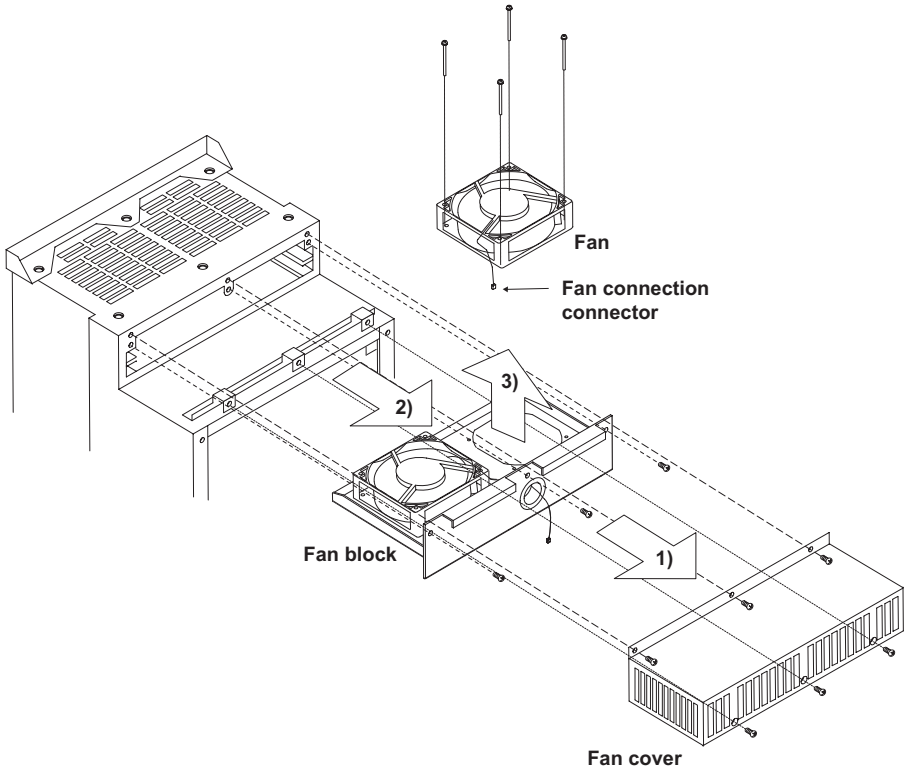
The replacement interval of the cooling fan used for cooling the parts generating heat such as the main circuit semiconductor is greatly affected by the surrounding air temperature. When unusual noise and/or vibration is noticed during inspection, the cooling fan must be replaced immediately.

CAUTION

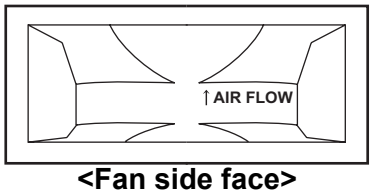
For parts replacement, consult the nearest Mitsubishi FA Center.

Inverter Type		Fan Type	Units
A721	5.5K to 15K	MMF-08D24ES-RP4 BKO-CA1639H11	2
	18.5K, 22K	MMF-12D24DS-CP2 BKO-CA1619H11	1
		MMF-09D24TS-RP7 BKO-CA1640H11	1
	30K	MMF-12D24DS-CP2 BKO-CA1619H11	2
	37K to 55K		3
A741	5.5K to 15K	MMF-08D24ES-RP4 BKO-CA1639H11	2
	18.5K, 22K	MMF-09D24TS-RP7 BKO-CA1640H11	2
	30K	MMF-12D24DS-CP2 BKO-CA1619H11	2
	37K to 55K		3

- Removal
  1) Remove a fan cover.
  2) After removing a fan connector, remove a fan block.
  3) Remove the fan.



- Reinstallation
  1) After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.



<Fan side face>

  2) Install fans referring to the above figure.

CAUTION

- Installing the fan in the opposite air flow direction can cause the inverter life to be shorter.
- Prevent the cable from being caught when installing a fan.
- Switch the power off before replacing fans. Since the inverter circuits are charged with voltage even after power off, replace fans only when the inverter cover is on the inverter to prevent an electric shock accident.

(2) Smoothing capacitors

A large-capacity aluminum electrolytic capacitor is used for smoothing in the main circuit DC section, and an aluminum electrolytic capacitor is used for stabilizing the control power in the control circuit. Their characteristics are deteriorated by the adverse effects of ripple currents, etc.
The replacement intervals greatly vary with the surrounding air temperature and operating conditions. When the inverter is operated in air-conditioned, normal environment conditions, replace the capacitors about every 10 years.
The appearance criteria for inspection are as follows:

1) Case: Check the side and bottom faces for expansion
2) Sealing plate: Check for remarkable warp and extreme crack.
3) Check for external crack, discoloration, fluid leakage, etc. Judge that the capacitor has reached its life when the measured capacitance of the capacitor reduced below 80% of the rating.

Refer to page 166 to perform the life check of the main circuit capacitor.

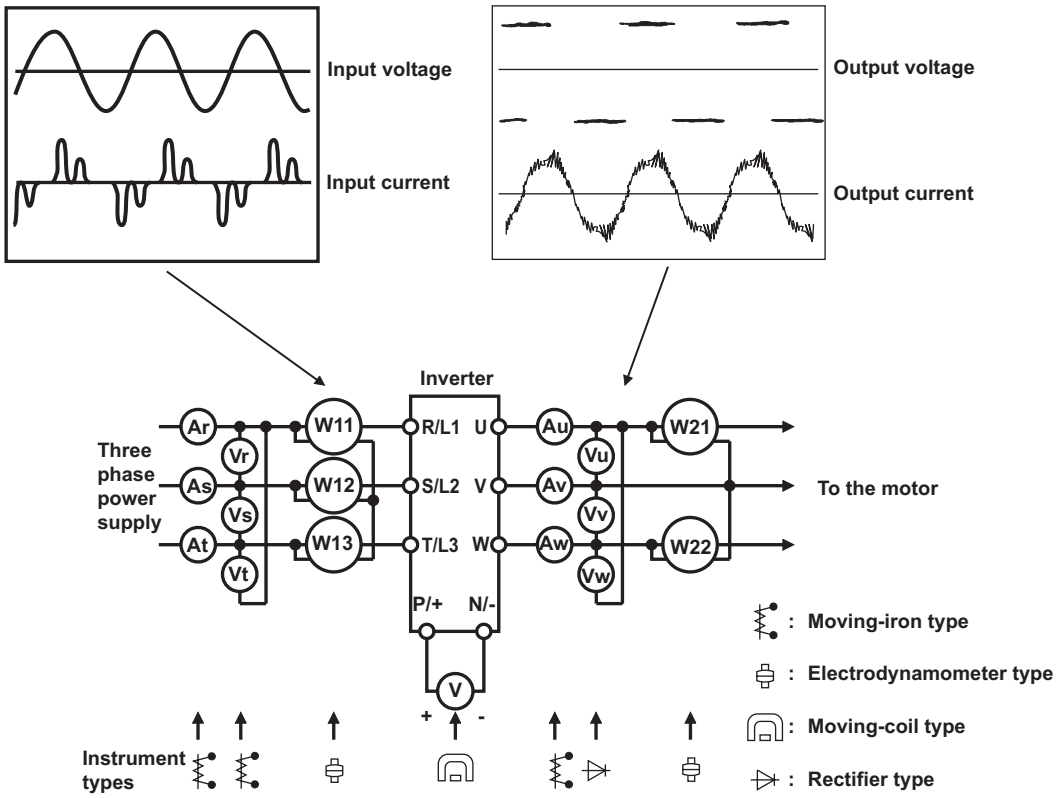
(3) Relays

To prevent a contact fault, etc., relays must be replaced according to the cumulative number of switching times (switching life).

6.2 Measurement of main circuit voltages, currents and powers

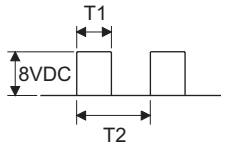
Since the voltages and currents on the inverter power supply and output sides include harmonics, measurement data depends on the instruments used and circuits measured.
When instruments for commercial frequency are used for measurement, measure the following circuits with the instruments given on the next page.

- When installing meters etc. on the inverter 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.
  When measuring and indicating the output voltage and output current of the inverter, it is recommended to utilize the AM-5 and FM-SD terminal output function of the inverter.



Examples of Measuring Points and Instruments

Measuring points and instruments

Item	Measuring Point	Measuring Instrument	Remarks (Reference Measured Value)	
Power supply voltage V1	Across R/L1-S/L2, S/L2-T/L3, T/L3-R/L1	Moving-iron type AC voltmeter	Commercial power supply Within permissible AC voltage fluctuation (Refer to *page 174*)	
Power supply side current I1	R/L1, S/L2, and T/L3 line currents	Moving-iron type AC ammeter		
Power supply side power P1	R/L1, S/L2, T/L3 and R/L1-S/L2, S/L2-T/L3, T/L3-R/L1	Electrodynamic type single-phase wattmeter	P1=W11+W12+W13 (3-wattmeter method)	
Power supply side power factor Pf1	Calculate after measuring power supply voltage, power supply side current and power supply side power. $Pf_1 = \frac{P_1}{\sqrt{3}\, V_1 \times I_1} \times 100\%$			
Output side voltage V2	Across U-V, V-W and W-U	Rectifier type AC voltage meter *1 (Moving-iron type cannot measure)	Difference between the phases is within ±1% of the maximum output voltage.	
Output side current I2	U, V and W line currents	Moving-iron type AC ammeter *2	Difference between the phases is 10% or lower of the rated inverter current.	
Output side power P2	U, V, W and U-V, V-W	Electrodynamic type single-phase wattmeter	P2 = W21 + W22 2-wattmeter method (or 3-wattmeter method)	
Output side power factor Pf2	Calculate in similar manner to power supply side power factor. $Pf_2 = \frac{P_2}{\sqrt{3}\, V_2 \times I_2} \times 100\%$			
Converter output	Across P/+-N/−	Moving-coil type (such as tester)	Inverter LED display is lit. 1.35 × V1	
Frequency setting signal	Across 2, 4(+)-5	Moving-coil type (Tester and such may be used) (Internal resistance: 50kΩ or larger)	0 to 10VDC, 4 to 20mA	"5" is common
	Across 1(+)-5		0 to ±5VDC, 0 to ±10VDC	
Frequency setting power supply	Across 10 (+) -5		5.2VDC	
	Across 10E(+)-5		10VDC	
Frequency meter signal	Across AM(+)-5		Approximately 10VDC at maximum frequency (without frequency meter)	
	Across FM(+)-SD		Approximately 5VDC at maximum frequency (without frequency meter)  Pulse width T1: Adjusted by *C0 (Pr. 900)* Pulse cycle T2: Set by *Pr. 55* (Valid for frequency monitoring only)	"SD" is common
Start signal Select signal	Across STF, STR, RH, RM, RL, JOG, RT, AU, STOP, CS (+) -SD		When open 20 to 30VDC ON voltage: 1V or less	
Reset	Across RES (+) -SD			
Output stop	Across MRS (+) -SD			
Alarm signal	Across A1-C1 Across B1-C1	Moving-coil type (such as tester)	Continuity check*3 <Normal> <Abnormal> Across A1-C1 Discontinuity Continuity Across B1-C1 Continuity Discontinuity	

*1 Use an FFT to measure the output voltage accurately. A tester or general measuring instrument cannot measure accurately.

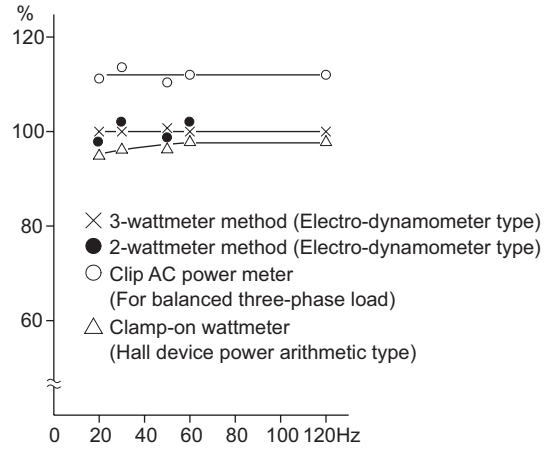
*2 When the carrier frequency exceeds 5kHz, do not use this instrument since using it may increase eddy-current losses produced in metal parts inside the instrument, leading to burnout. If the wiring length between the inverter and motor is long, the instrument and CT may generate heat due to line-to-line leakage current.

*3 When the setting of *Pr. 195 ABC1 terminal function selection* is positive logic

6.2.1 Measurement of powers

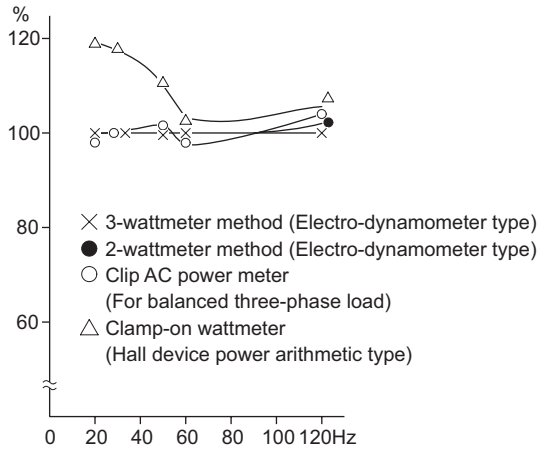
Using an electro-dynamometer type meter, measure the power in both the input and output sides of the inverter using the two- or three-wattmeter method. As the current is liable to be imbalanced especially in the input side, it is recommended to use the three-wattmeter method.
Examples of measured value differences produced by different measuring meters are shown below.
An error will be produced by difference between measuring instruments, e.g. power calculation type and two- or three-wattmeter type three-phase wattmeter. When a CT is used in the current measuring side or when the meter contains a PT on the voltage measurement side, an error will also be produced due to the frequency characteristics of the CT and PT.

[Measurement conditions]
Constant-torque (100%) load, constant-power at 60Hz or more.
3.7kW, 4-pole motor, value indicated in 3-wattmeter method is 100%.



Example of measuring inverter input power

[Measurement conditions]
Constant-torque (100%) load, constant-power at 60Hz or more.
3.7kW, 4-pole motor, value indicated in 3-wattmeter method is 100%.



Example of measuring inverter output power

6.2.2 Measurement of voltages and use of PT

(1) Inverter input side

As the input side voltage has a sine wave and it is extremely small in distortion, accurate measurement can be made with an ordinary AC meter.

(2) Inverter output side

Since the output side voltage has a PWM-controlled rectangular wave, always use a rectifier type voltmeter. A needle type tester can not be used to measure the output side voltage as it indicates a value much greater than the actual value. A moving-iron type meter indicates an effective value which includes harmonics and therefore the value is larger than that of the fundamental wave. The value monitored on the operation panel is the inverter-controlled voltage itself. Hence, that value is accurate and it is recommended to monitor values (provide analog output) using the operation panel.

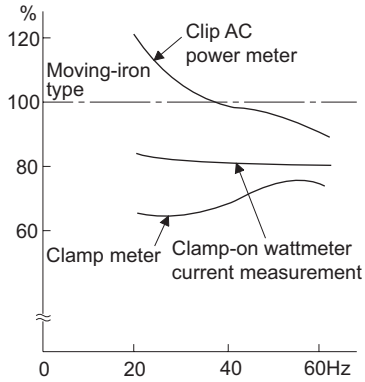
(3) PT

No PT can be used in the output side of the inverter. Use a direct-reading meter. (A PT can be used in the input side of the inverter.)

6.2.3 Measurement of currents

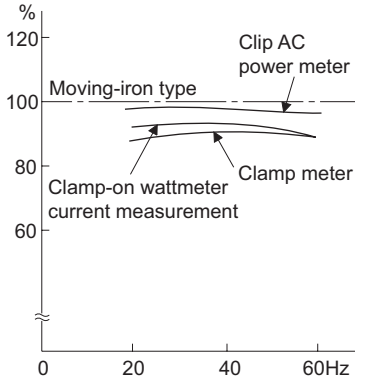
Use a moving-iron type meter on both the input and output sides of the inverter. However, if the carrier frequency exceeds 5kHz, do not use that meter since an overcurrent losses produced in the internal metal parts of the meter will increase and the meter may burn out. In this case, use an approximate-effective value type.
As the inverter input side current is easily imbalanced, measurement of currents in all three phases is recommended. Correct values can not be measured in one or two phases. On the other hand, the phase imbalanced ratio of the output side current must be within 10%.
When using a clamp ammeter, always use an effective value detection type. A mean value detection type produces a large error and may indicate an extremely smaller value than the actual value. The value monitored on the operation panel is accurate if the output frequency varies, and it is recommended to monitor values (provide analog output) using the operation panel.
An example of the measured value difference produced by different measuring meters is shown below.

[Measurement conditions]
Value indicated by moving-iron type ammeter is 100%.



Example of measuring inverter input current

[Measurement conditions]
Value indicated by moving-iron type ammeter is 100%.



Example of measuring inverter output current

6.2.4 Use of CT and transducer

A CT may be used in both the input and output sides of the inverter, but the one used should have the largest possible VA ability because an error will increase if the frequency gets lower.
When using a transducer, use the effective value calculation type which is immune to harmonics.

6.2.5 Measurement of inverter input power factor

Use the effective power and apparent power to calculate the inverter input power factor. A power-factor meter can not indicate an exact value.

$$\text{Total power factor of the inverter} = \frac{\text{Effective power}}{\text{Apparent power}}$$

$$= \frac{\text{Three-phase input power found by 3-wattmeter method}}{\sqrt{3} \times \text{V (power supply voltage)} \times \text{I (input current effective value)}}$$

6.2.6 Measurement of converter output voltage (across terminals P/+ - N/-)

The output voltage of the converter is developed across terminals P/+ - N/- and can be measured with a moving-coil type meter (tester). Although the voltage varies according to the power supply voltage, approximately 270V to 300V (approximately 540V to 600V for the 400V class) is output when no load is connected and voltage decreases when a load is connected.
When regenerative energy is returned from the motor during deceleration, for example, the converter output voltage rises to nearly 400V to 450V (800V to 900V for the 400V class) maximum.

6.2.7 Measurement of inverter output frequency

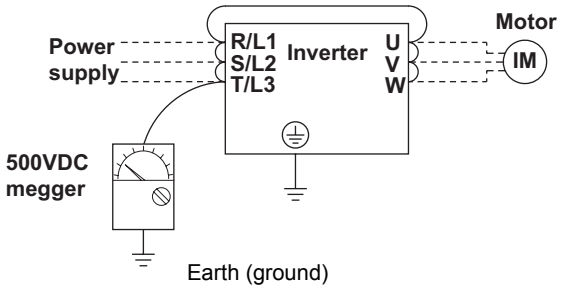
A pulse train proportional to the output frequency is output across the frequency meter signal output terminal FM-SD of the inverter. This pulse train output can be counted by a frequency counter, or a meter (moving-coil type voltmeter) can be used to read the mean value of the pulse train output voltage. When a meter is used to measure the output frequency, approximately 5VDC is indicated at the maximum frequency.
For detailed specifications of the frequency meter signal output terminal FM, refer to *page 22*.

6.2.8 Insulation resistance test using megger

For the inverter, conduct the insulation resistance test on the main circuit only as shown below and do not perform the test on the control circuit. (Use a 500VDC megger.)

CAUTION

- Before performing the insulation resistance test on the external circuit, disconnect the cables from all terminals of the inverter so that the test voltage is not applied to the inverter.
- For the continuity test of the control circuit, use a tester (high resistance range) and do not use the megger or buzzer.



6.2.9 Pressure test

Do not conduct a pressure test. Deterioration may occur.

7 SPECIFICATIONS

7.1 Rating

7.1.1 Inverter rating

●200V class

Type FR-A721-□□K		5.5	7.5	11	15	18.5	22	30	37	45	55
Applicable motor capacity (kW) *1		5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated capacity (kVA) *2	9.2	12.6	17.6	23.3	29	34	44	55	67	82
	Rated current (A)	24	33	46	61	76	90	115	145	175	215
	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics) surrounding air temperature 50°C									
	Voltage *4	Three-phase 200 to 240V									
	Regenerative braking torque	100% continuous 150% 60s									
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) *5	12	17	20	28	34	41	52	66	80	100
Protective structure (JEM 1030) *6		Open type (IP00)									
Cooling system		Forced air cooling									
Approx. mass (kg)		20	22	33	35	50	52	69	87	90	120

*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.
*3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
*4 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.
*5 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
*6 FR-DU07:IP40 (except for the PU connector)

●400V class

Type FR-A741-□□K		5.5	7.5	11	15	18.5	22	30	37	45	55
Applicable motor capacity (kW) *1		5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated capacity (kVA) *2	9.1	13	17.5	23.6	29	32.8	43.4	54	65	84
	Rated current (A)	12	17	23	31	38	44	57	71	86	110
	Overload current rating *5	150% 60s, 200% 3s (inverse time characteristics) surrounding air temperature 50°C									
	Voltage *6	Three-phase 380 to 480V									
	Regenerative braking torque	100% continuous 150% 60s									
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	12	17	20	28	34	41	52	66	80	100
Protective structure *9		Open type (IP00)									
Cooling system		Forced air cooling									
Approx. mass (kg)		25	26	37	40	48	49	65	80	83	115

*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 440V.
*3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
*4 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.
*5 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
*6 FR-DU07:IP40 (except for the PU connector)

7.1.2 Motor rating

(1) SF-V5RU

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

Motor type SF-V5RU□□K		3	5	7	11	15	18	22	30	37	45
Applicable inverter type FR-A721-□□K		5.5	7.5	11	15	18.5	22	30	37	45	55
Rated output (kW)		3.7	5.5	7.5	11	15	18.5	22	30 *1	37 *1	45 *1
Rated torque (N•m)		23.6	35.0	47.7	70.0	95.5	118	140	191	235	286
Maximum torque 150% 60s (N•m)		35.4	52.4	71.6	105	143	176	211	287	353	429
Rated speed (r/min)		1500									
Maximum speed (r/min)		3000									
Frame No.		112M	132S	132M	160M	160L	180M	180M	200L	200L	200L
Inertia moment J ($\times10^{-4}$kg•m^2)		175	275	400	750	875	1725	1875	3250	3625	3625
Noise *4		75dB or less							80dB or less		
Cooling fan (with thermal protector)	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/60Hz			Three-phase 200V/50Hz Three-phase 200 to 230V/60Hz						
	Input *2	36/55W (0.26/ 0.32A)	22/28W (0.11/0.13A)		55/71W (0.37/0.39A)				100/156W (0.47/0.53A)		
Surrounding air temperature, humidity		-10 to +40°C (non-freezing), 90%RH or less (non-condensing)									
Structure (Protective structure)		Totally enclosed forced draft system (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)		41	52	62	99	113	138	160	238	255	255

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

Motor type SF-V5RUH□□K		5	7	11	15	18	22	30	37	45
Applicable inverter type FR-A741-□□K		7.5	11	15	18.5	22	30	37	45	55
Rated output (kW)		5.5	7.5	11	15	18.5	22	30 *1	37 *1	45 *1
Rated torque (N•m)		35.0	47.7	70.0	95.5	118	140	191	235	286
Maximum torque 150% 60s (N•m)		52.4	71.6	105	143	176	211	287	353	429
Rated speed (r/min)		1500								
Maximum speed (r/min)		3000								
Frame No.		132S	132M	160M	160L	180M	180M	200L	200L	200L
Inertia moment J ($\times10^{-4}$kg•m^2)		275	400	750	875	1725	1875	3250	3625	3625
Noise *4		75dB or less						80dB or less		
Cooling fan (with thermal protector)	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/ 60Hz		Three-phase 380 to 400V/50Hz Three-phase 400 to 460V/60Hz						
	Input *1	22/28W (0.11/0.13A)		55/71W (0.19/0.19A)				100/156W (0.27/0.30A)		
Surrounding air temperature, humidity		-10 to +40°C (non-freezing), 90%RH or less (non-condensing)								
Structure (Protective structure)		Totally enclosed forced draft system (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)		52	62	99	113	138	160	238	255	255

*1 80% output in the high-speed range. (The output is reduced when the speed is 2400r/min or more. Contact us separately for details.)

*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 protection from water intrusion is established only when a cooling fan is not operating.

*4 The value when high carrier frequency is set (*Pr.72* = 6, *Pr.240* = 0).

7.2 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 *1
	Output frequency range		0.2 to 400Hz (The maximum frequency is 120Hz under real sensorless vector control and vector control *1.)
	Frequency setting resolution	Analog input	0.015Hz/0 to 60Hz (terminal 2, 4: 0 to 10V/12bit) 0.03Hz/0 to 60Hz (terminal 2, 4: 0 to 5V/11bit, 0 to 20mA/about 11bit, terminal 1: 0 to ±10V/12bit) 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		150% 0.3Hz (under real sensorless vector control or vector control *1)
	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 (0 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 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, 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, conditional position pulse train sign *1, conditional position droop pulse clear *1, magnetic flux decay output shutoff.
		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, electronic bypass 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, 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, 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, electronic bypass MC1, electronic bypass MC2, electronic bypass MC3, orientation complete*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, fault 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, alarm output and fault 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, 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, 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
		Fault definition	Fault definition is displayed during the fault occurs, the output voltage/current/frequency/cumulative energization time right before the fault occurs and past 8 fault 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*5, PTC thermistor operation*5, option alarm, parameter error, PU disconnection, retry count excess*5, CPU alarm, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess*5, inrush current limit circuit alarm, communication alarm (inverter), opposite rotation deceleration error*5, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, electronic thermal relay function prealarm, PU stop, maintenance timer alarm*2*5, parameter write error, copy operation error, operation panel lock, parameter copy alarm, speed limit indication, signal loss detection*1*5, speed deviation large*1*5, overspeed*1*5, excessive position error*1*5, brake sequence error*5, encoder phase error*1*5, regeneration converter overcurrent, regeneration converter circuit fault, regeneration converter transistor protection thermal
Environment	Surrounding air 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

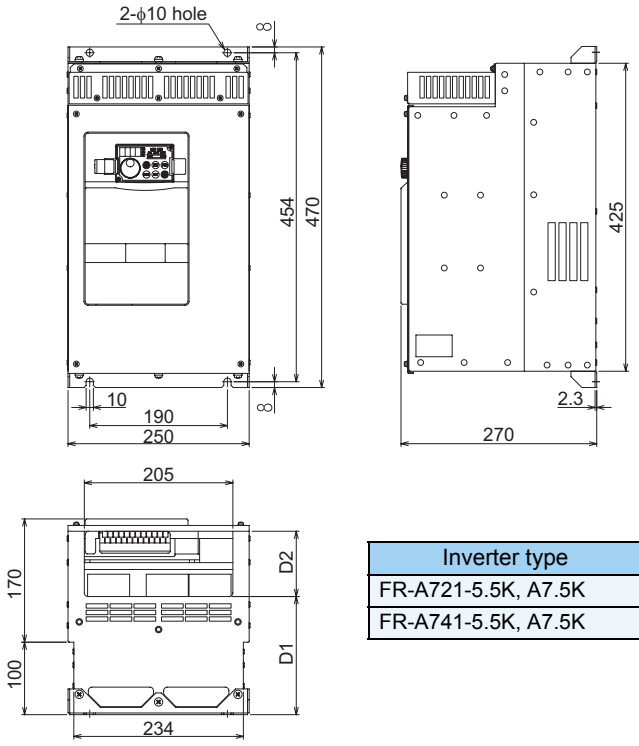
*1 Available only when the option (FR-A7AP) is mounted
*2 Can be displayed only on the operation panel (FR-DU07).
*3 Can be displayed only on the parameter unit (FR-PU07/FR-PU04).
*4 Temperature applicable for a short period in transit, etc.
*5 This protective function does not function in the initial status.

7.3 Outline dimension drawings

7.3.1 Inverter outline dimension drawings

●FR-A721-5.5K, 7.5K

●FR-A741-5.5K, 7.5K

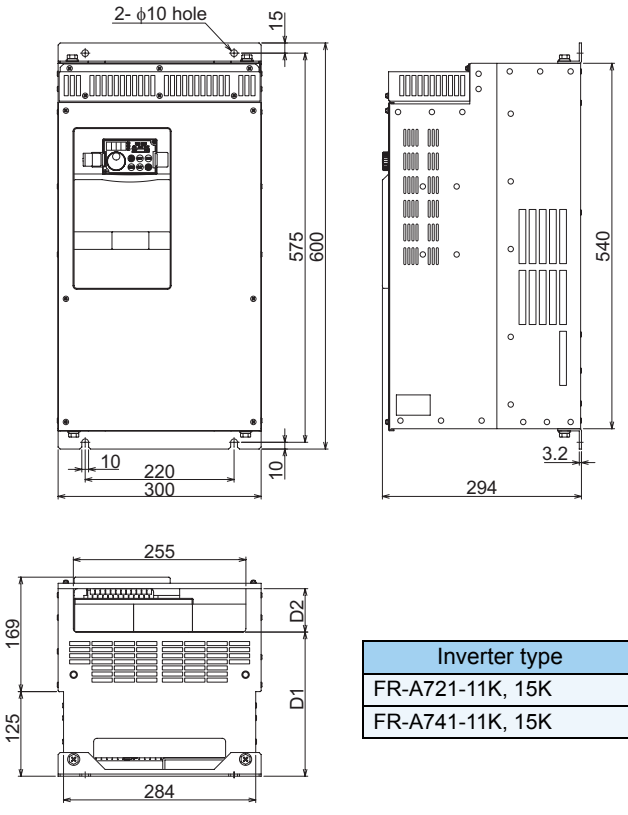


Inverter type	D1	D2
FR-A721-5.5K, A7.5K	163	90
FR-A741-5.5K, A7.5K	168	85

(Unit: mm)

●FR-A721-11K, 15K

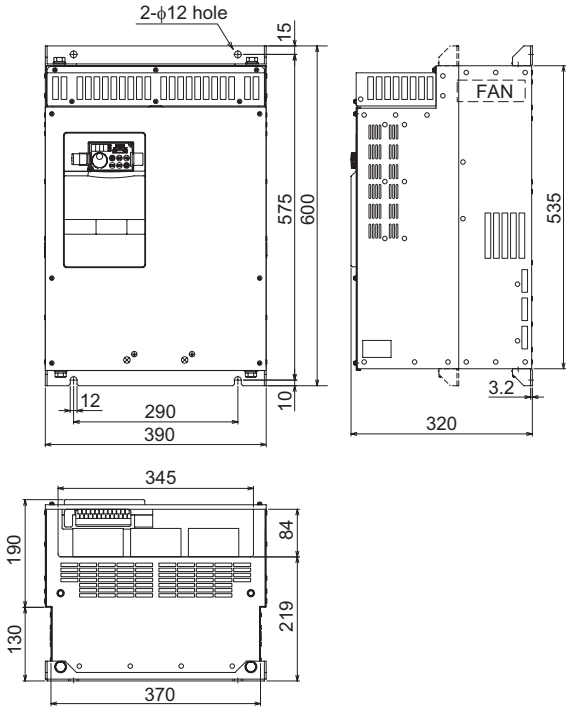
●FR-A741-11K, 15K



Inverter type	D1	D2
FR-A721-11K, 15K	213	64
FR-A741-11K, 15K	224	53

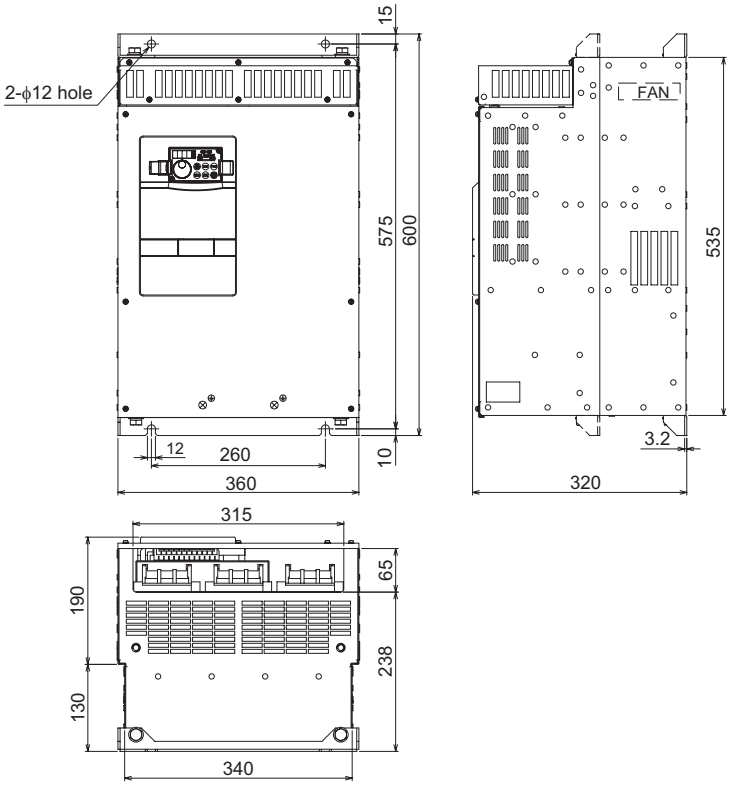
(Unit: mm)

●FR-A721-18.5K, 22K



(Unit: mm)

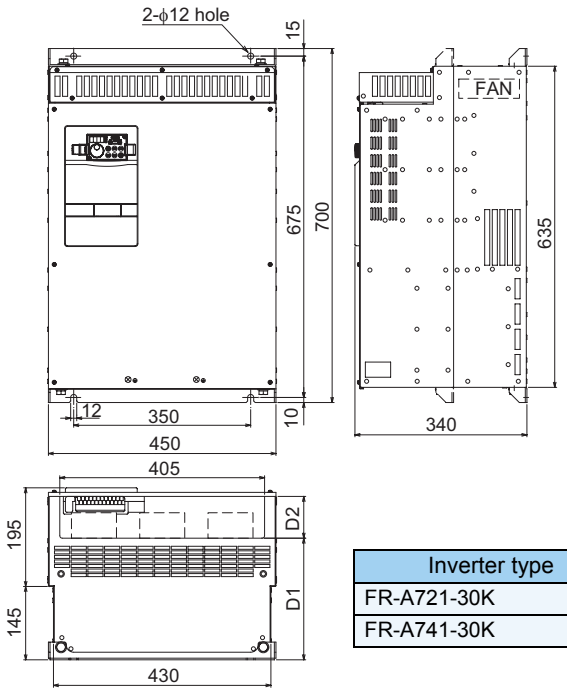
●FR-A741-18.5K, 22K



(Unit: mm)

●FR-A721-30K

●FR-A741-30K

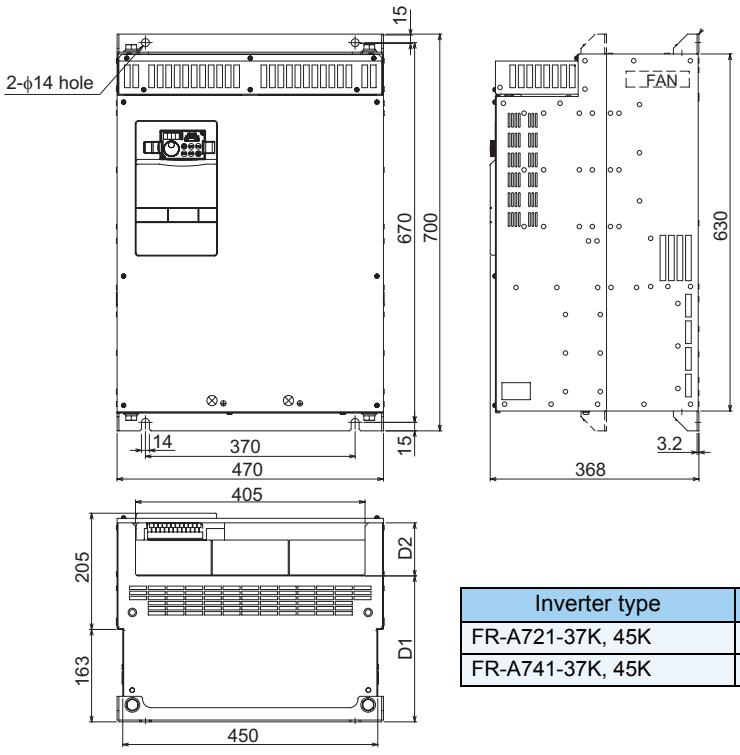


Inverter type	D1	D2
FR-A721-30K	240.5	82.5
FR-A741-30K	252.5	70.5

(Unit: mm)

●FR-A721-37K, 45K

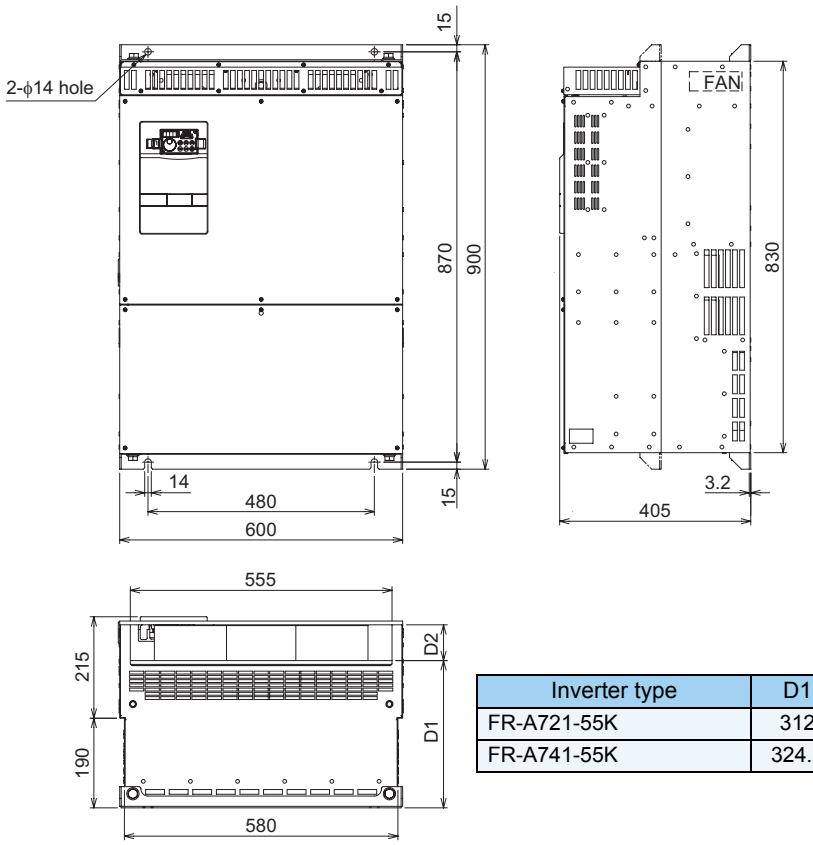
●FR-A741-37K, 45K



Inverter type	D1	D2
FR-A721-37K, 45K	257.5	93.5
FR-A741-37K, 45K	281.5	69.5

(Unit: mm)

●FR-A721-55K
●FR-A741-55K

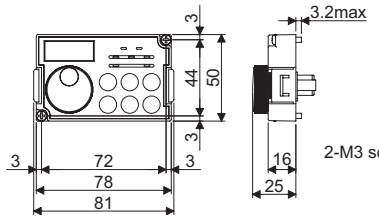


Inverter type	D1	D2
FR-A721-55K	312	76
FR-A741-55K	324.5	64

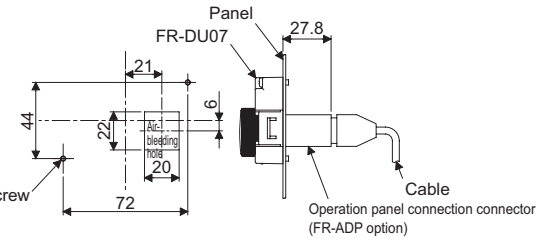
(Unit: mm)

● Operation panel (FR-DU07)

<Outline drawing>



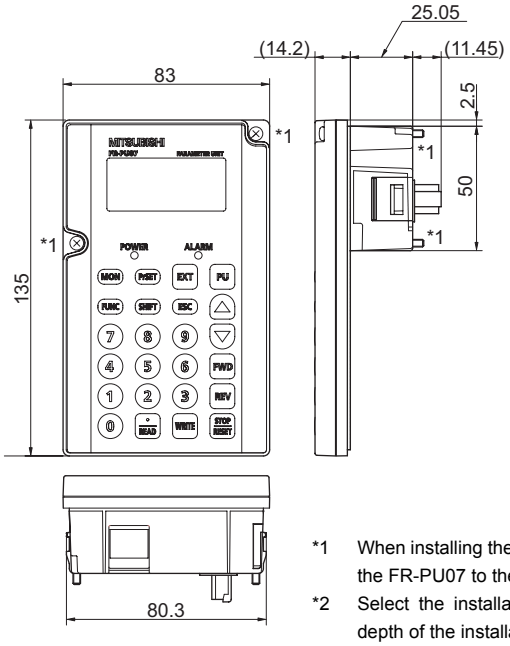
<Panel cutting dimension drawing>



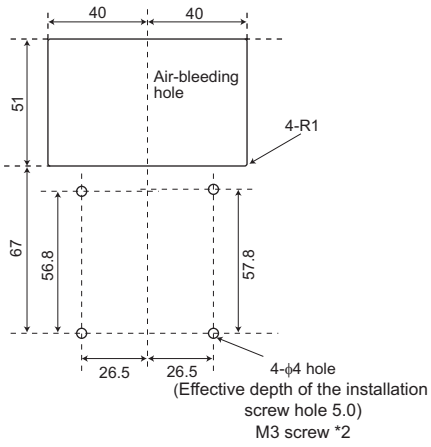
(Unit: mm)

● Parameter unit (option) (FR-PU07)

<Outline drawing>



<Panel cutting dimension drawing>



*1 When installing the FR-PU07 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.

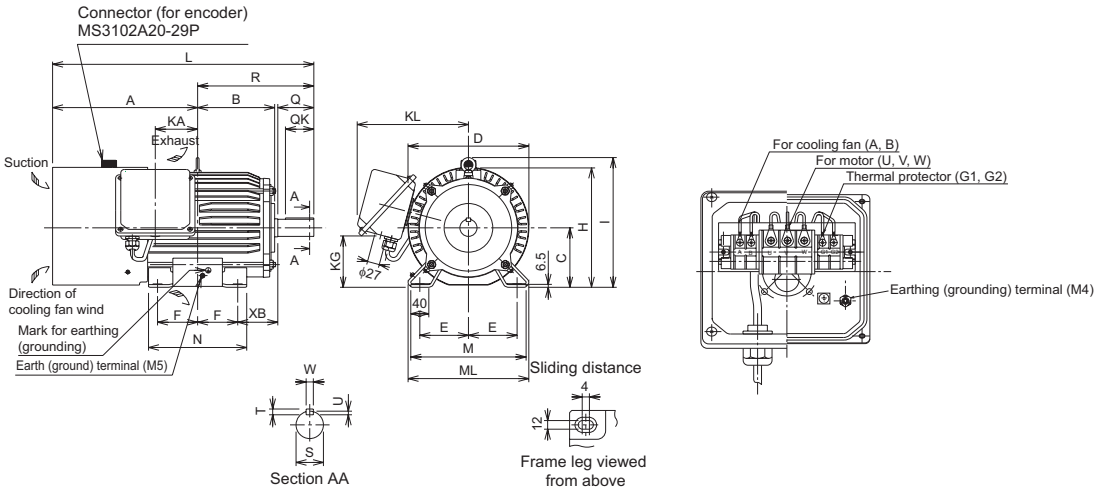
*2 Select the installation screws whose length will not exceed the effective depth of the installation screw hole.

(Unit: mm)

7.3.2 Dedicated motor outline dimension drawings

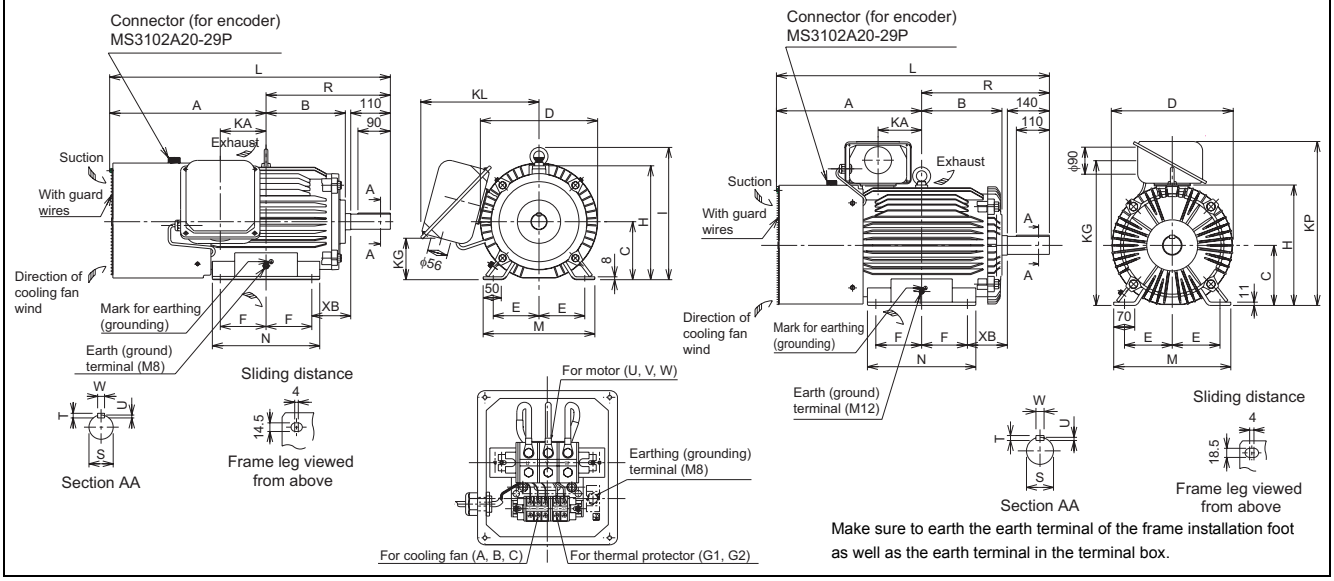
● Dedicated motor (SF-V5RU(H)) outline dimension drawings (standard horizontal type)

Frame Number 112M, 132S, 132M
SF-V5RU(H) 3K , 5K , 7K



Frame Number 160M, 160L, 180M, 180L
SF-V5RU(H) 11K , 15K , 18K , 22K

Frame Number 200L
SF-V5RU(H) 30K , 37K , 45K



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

Dimensions table

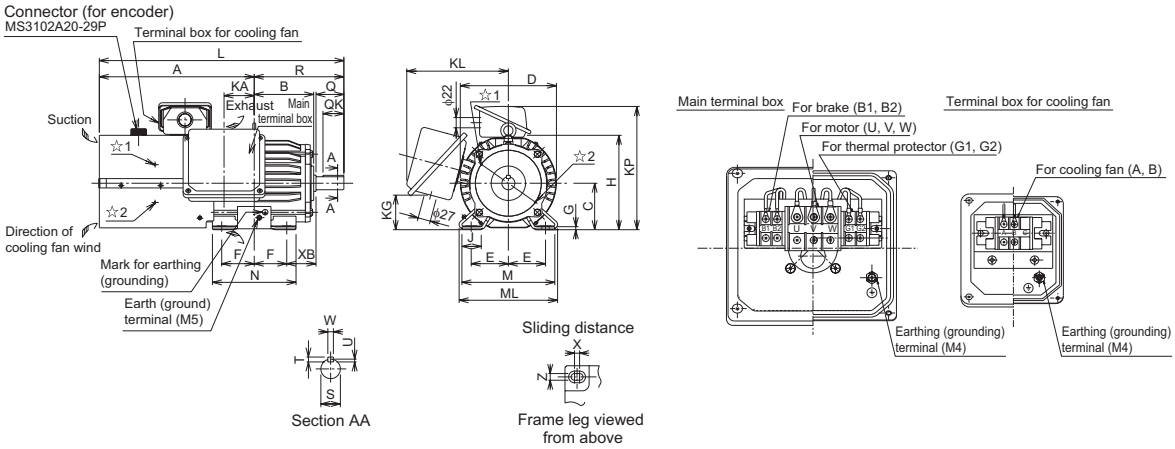
(Unit: mm)

SF-V5RU □K	SF-V5RU □K1	SF-V5RU □K3	SF-V5RU □K4	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
3	—	—	—	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	3	—	—	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	3	—	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	—	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	3	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	—	—	—	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	15	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	—	—	7	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
37, 45	22, 30	18, 22	—		255																										
—	37	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.

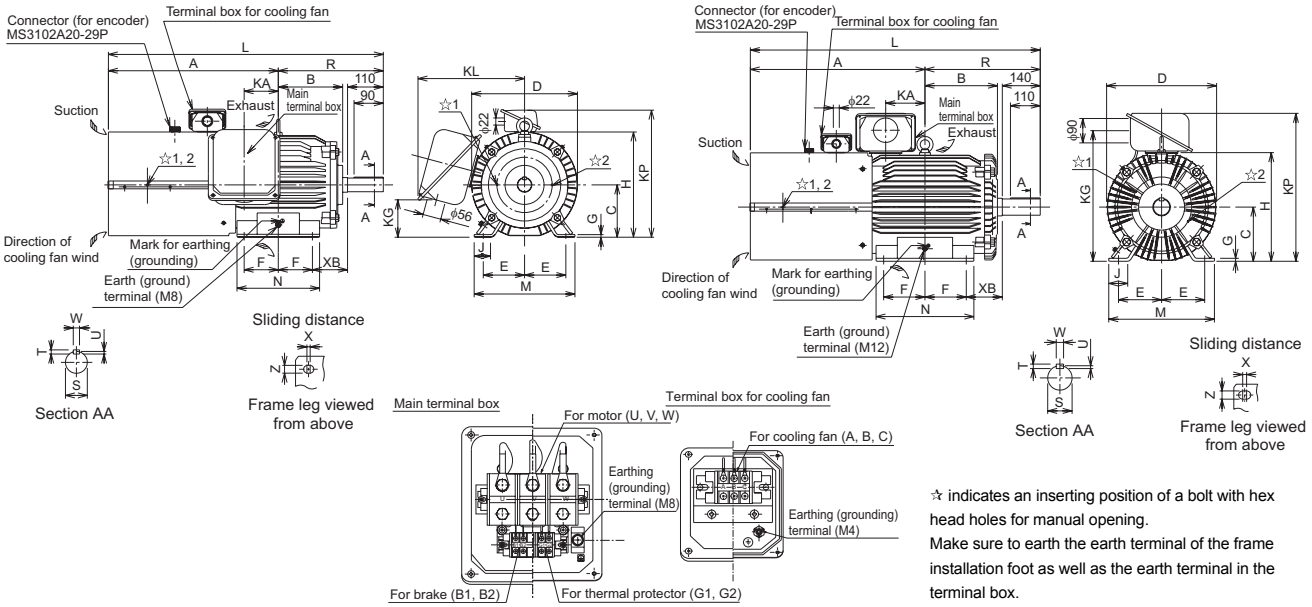
● Dedicated motor (SF-V5RU(H)) outline dimension drawings (standard horizontal type with brake)

Frame Number 112M, 132S, 132M
SF-V5RU(H) 3KB , 5KB , 7KB



Frame Number 160M, 160L, 180M, 180L
SF-V5RU(H) 11KB , 15KB , 18KB , 22KB

Frame Number 200L
SF-V5RU(H) 30KB , 37KB , 45KB



☆ 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

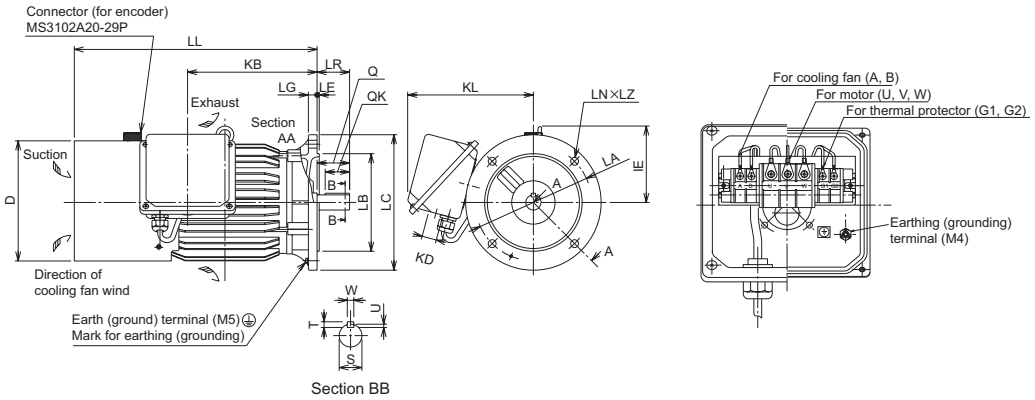
(Unit: mm)

SF-V5RU □K	SF-V5RU □K1	SF-V5RU □K3	SF-V5RU □K4	Frame No.	Mass (kg)	Motor																							Shaft End							Terminal Screw Size			
						A	B	C	D	E	F	G	H	I	J	KA	KD	KG	KL	KP	L	M	ML	N	X	XB	Z	Q	QK	R	S	T	U	W	U,V,W	A,B,(C)	G1,G2	B1,B2
3	—	—	—	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	3	—	—	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	3	—	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	—	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	3	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	—	—	—	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	15	5	180L	255	587.5	242.5	180	363	139.5	139.5	8	—	—	50	146	56	139	352	428	958	335	—	323	4	121	14.5	110	90	370.5	55m6	10	6	16	M8	M4	M4	M4
30	—	—	7	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
37, 45	22, 30	18, 22	—		330																																	
—	37	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

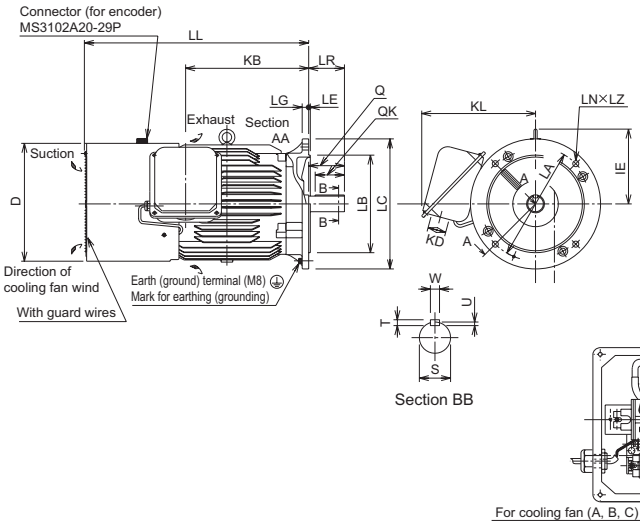
Note) 1. Install the motor on the floor and use it with the shaft horizontal.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3. The size difference of top 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.)

● Dedicated motor (SF-V5RU(H)) outline dimension drawings (flange type)

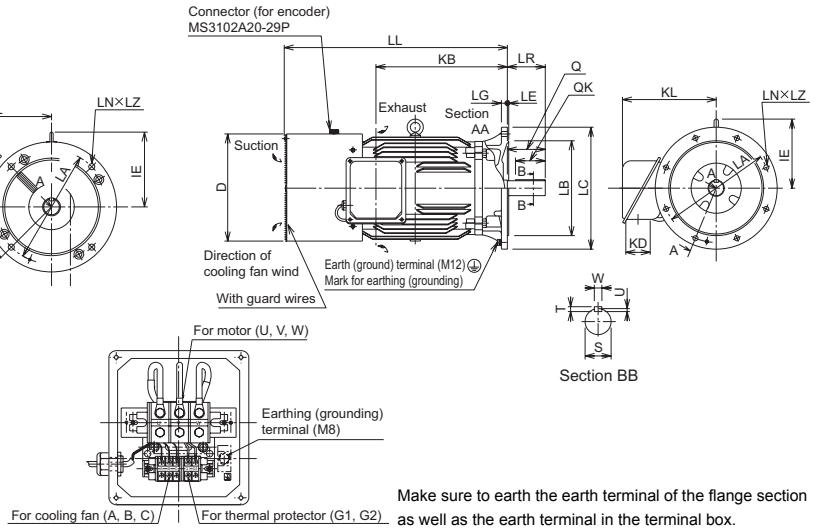
Frame Number 112M, 132S, 132M
SF-V5RUF(H) 3K, 5K, 7K



Frame Number 160M, 160L, 180M, 180L
SF-V5RUF(H) 11K, 15K, 18K, 22K



Frame Number 200L
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

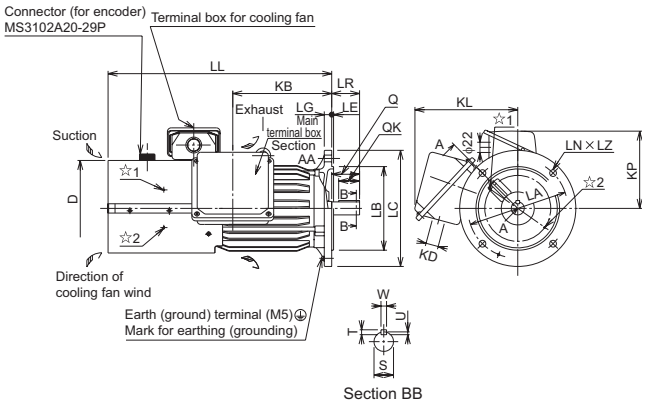
(Unit: mm)

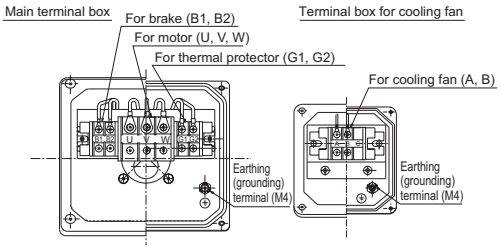
SF-V5RU □K	SF-V5RU □K1	SF-V5RU □K3	SF-V5RU □K4	Flange Number	Frame No.	Mass (kg)	Motor													Shaft End							Terminal Screw Size		
							D	IE	KB	KD	KL	LA	LB	LC	LE	LG	LL	LN	LZ	LR	Q	QK	S	T	U	W	U,V,W	A,B,(C)	G1,G2
3	—	—	—	FF215	112M	46	228	141	239	27	242	215	180j6	250	4	16	448	4	14.5	60	60	45	28j6	7	4	8	M6	M4	M4
5	3	—	—	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	3	—	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	—	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	3	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	—	—	—	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	15	5	FF350	180L	225	363	230	416.5	56	352	350	300j6	400	5	20	728	4	18.5	110	110	90	55m6	10	6	16	M8	M4	M4
30	—	—	7	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, 22	—			290																							

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.

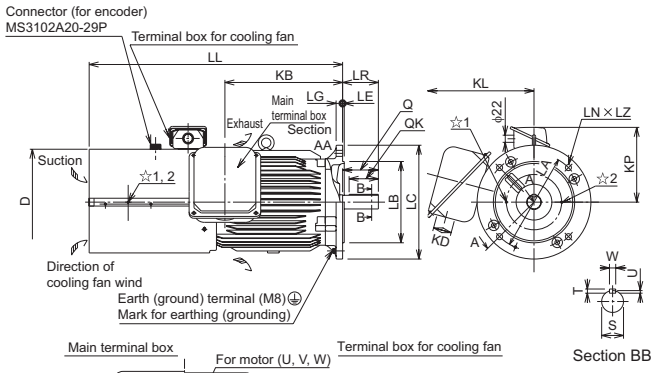
● Dedicated motor (SF-V5RU(H)) outline dimension drawings (flange type with brake)

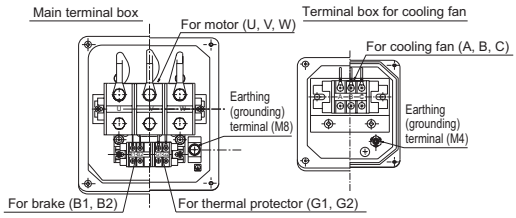
Frame Number 112M, 132S, 132M
SF-V5RUF(H) 3KB, 5KB, 7KB





Frame Number 160M, 160L
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-V5RU □K	SF-V5RU □K1	SF-V5RU □K3	SF-V5RU □K4	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
3	—	—	—	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	3	—	—	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	3	—	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	—	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	3	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.
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.)

7.4 Installation of the heatsink portion outside the enclosure for use

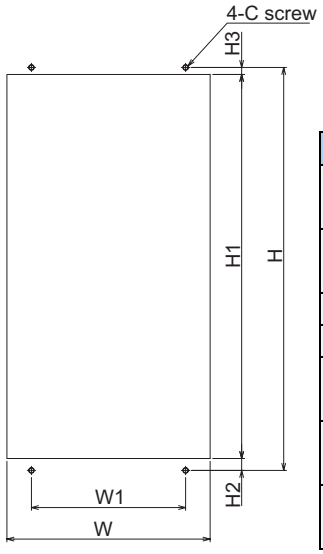
When encasing the inverter in an enclosure, the generated heat amount in an enclosure can be greatly reduced by installing the heatsink portion of the inverter outside the enclosure. When installing the inverter in a compact enclosure, etc., this installation method is recommended.

7.4.1 Protrusion of heatsink

(1) Panel cutting

Cut the panel of the enclosure according to the inverter capacity.

• FR-A721-5.5K to 55K, FR-A741-5.5K to 55K

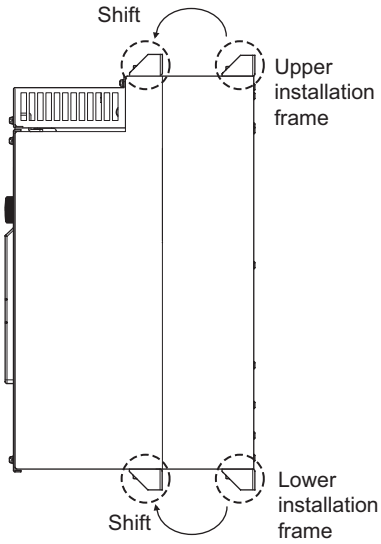


Inverter type	W	W1	H	H1	H2	H3	C
FR-A721-5.5K, 7.5K FR-A741-5.5K, 7.5K	240	190	454	434	12	8	M8
FR-A721-11K, 15K FR-A741-11K, 15K	290	220	575	548	17	10	M8
FR-A721-18.5K, 22K	376	290	575	546	17	12	M10
FR-A741-18.5K, 22K	346	260	575	546	17	12	M10
FR-A721-30K FR-A741-30K	436	350	675	646	17	12	M10
FR-A721-37K, 45K FR-A741-37K, 45K	456	370	670	641	17	12	M12
FR-A721-55K FR-A741-55K	586	480	870	841	17	12	M12

Unit: mm

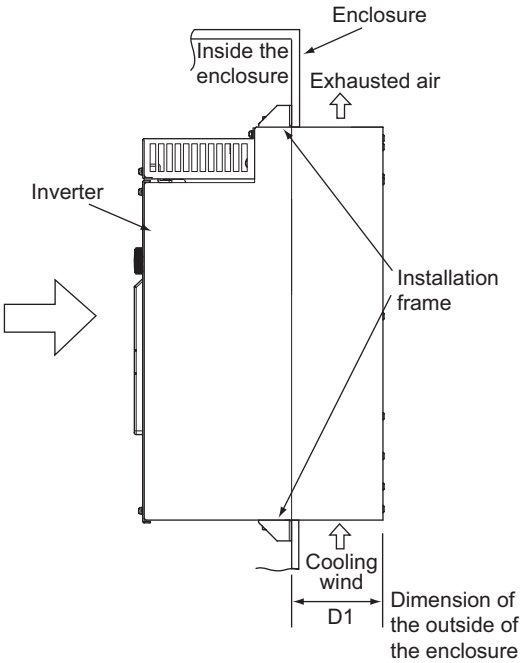
(2) Shift and removal of a rear side installation frame

One installation frame is attached to each of the upper and lower parts of the inverter. Change the position of the rear side installation frame on the upper and lower sides 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.



(3) Installation of the inverter

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



Inverter type	D1
FR-A721-5.5K, 7.5K FR-A741-5.5K, 7.5K	100
FR-A721-11K, 15K FR-A741-11K, 15K	125
FR-A721-18.5K, 22K FR-A741-18.5K, 22K	130
FR-A721-30K FR-A741-30K	145
FR-A721-37K, 45K FR-A741-37K, 45K	163
FR-A721-55K FR-A741-55K	190

(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.

APPENDICES

Appendix 1 Main differences and compatibilities with the FR-A700 series

Item	FR-A700	FR-A701
Model configuration	200V class.....0.4K to 90K 400V class.....0.4K to 500K	200V class ..... 5.5K to 55K 400V class ..... 5.5K to 55K
Regenerative braking torque	5.5/7.5K.....100%torque 2%ED 11K to 55K.....20%torque continuous	100% torque/continuous 150% torque 60s
Built-in EMC filter	With	Without
Changed/cleared functions	*Pr. 30 Regenerative function selection, Pr. 70 Special regenerative brake duty*	Deleted
	Pr. 872 Input phase loss protection selection Initial value "0" (without input phase protection)	The initial value is changed to "1" (with input phase failure protection)
	Protective functions E.BE	Deleted E.4, E.10, E.8, E.15 added
Stand-alone option	· AC reactor (FR-HAL) · DC reactor (FR-HEL) · High-duty brake resistor (FR-ABR) · Power regeneration common converter (FR-CV) · High power factor converter (FR-HC) · Power regeneration converter (FR-RC)	Not available (AC reactor (FR-HAL) is built-in) * Note that an AC reactor (FR-HAL) should be used only when a thyristor load exists in the same power supply system and protective function E.4 and E.10 activate.
Outline dimension Installation size	Not compatible	

Appendix 2 Instructions for UL and cUL Compliance

(Conforming standard UL 508C, CSA C22.2 No.14)

(1) Installation

This inverter is UL-listed as a product for use in an enclosure.
Design an enclosure so that the inverter surrounding air temperature, humidity and atmosphere satisfy the specifications. *(Refer to page 177.)*

Wiring protection

For branch circuit protection, use UL 489 Molded Case Circuit Breakers (MCCB) with the appropriate rating or UL Listed fuses, Type RK5, Class T any faster acting fuse class in accordance with the National Electrical Code (NEC) or any other applicable code requirements.

FR-A721-□□K	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated fuse voltage(V)	240V or more									
Fuse maximum allowable rating (A)*	70	125	150	200	200	250	300	350	400	500
Molded case circuit breaker (MCCB) maximum allowable rating (A)*	60	80	110	150	175	225	250	350	400	500

FR-A741-□□K	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated fuse voltage(V)	480V or more									
Fuse maximum allowable rating (A)*	35	60	70	90	100	125	150	175	200	250

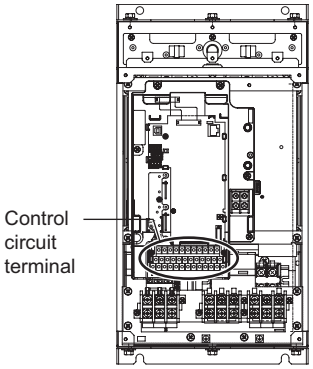
* Maximum allowable rating by US National Electrical Code.
Exact size must be chosen for each installation.

(2) Wiring of the power supply and motor

For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL Listed copper, stranded wires (rated at 75°C) and round ring crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal maker.

(3) Wiring of control circuit

Use a 16-18AWG cupper cable and perform wiring without using crimping terminals.



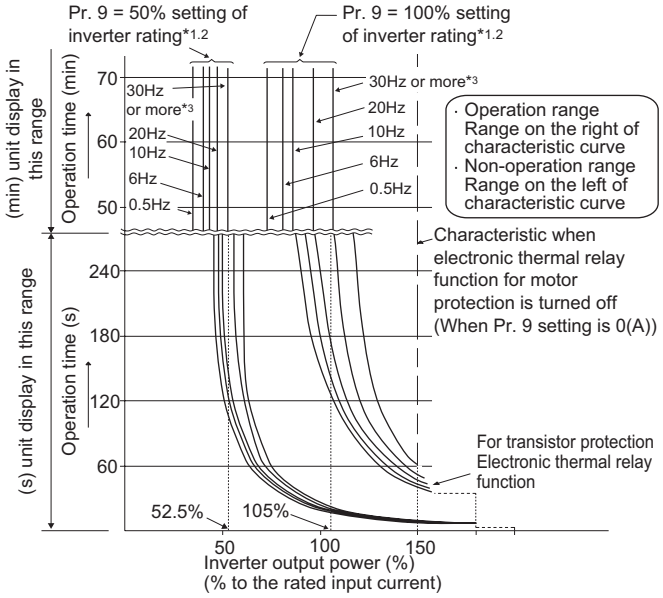
(4) Short circuit ratings

- 200V class
  Suitable For Use in A Circuit Capable Of Delivering Not More Than 100kA rms Symmetrical Amperes, 264V Maximum.
- 400V class
  Suitable For Use in A Circuit Capable Of Delivering Not More Than 100kA rms Symmetrical Amperes, 528V Maximum.

(5) Motor overload protection

This inverter is certified as a motor overload protection device by UL.
When using the electronic thermal relay function as motor overload protection, set the rated motor current to *Pr. 9 Electronic thermal O/L relay*.

Electronic thermal relay function operation characteristic



This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.
(The operation characteristic is shown on the left)

When using the Mitsubishi constant-torque motor

1) Set "1" or any of "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*.

*1 When a value 50% of the inverter rated output current (current value) is set in *Pr. 9*

*2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the motor rated current.

*3 When you set the electronic thermal relay function dedicated to the Mitsubishi constant-torque motor, this characteristic curve applies to operation at 6Hz or higher.

CAUTION

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
- When multiple motors are operated by a single inverter, protection cannot be provided by the electronic thermal relay function. Install an external thermal relay to each motor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use the external thermal relay.
- Electronic thermal relay does not function when 5% or less of inverter rated current is set to electronic thermal relay setting.

Appendix 3 Control mode-based parameter (function) correspondence table and instruction code list

*1 These instruction codes are used for parameter read and write by using Mitsubishi inverter protocol with the RS-485 communication.
(Refer to *chapter 4 of* 📖 *the instruction manual (applied)* for RS-485 communication)

*2 Validity and invalidity according to operation mode are as follows:
○:Usable parameter
×:Unusable parameter
Δ:Parameters available only during position control set by parameter

*3 "○" indicates valid and "×" indicates invalid of "parameter copy", "parameter clear", and "all parameter clear".

*4 Parameters can be used with conditions. Refer to *chapter 4 of* 📖 *the instruction manual (applied)* for details.

*5 These parameters are communication parameters that are not cleared when parameter clear (all clear) is executed from RS-485 communication.
(Refer to *chapter 4 of* 📖 *the instruction manual (applied)* for RS-485 communication)

Symbols in the table indicate parameters which function when an option is mounted.
AX ..... FR-A7AX, AY ..... FR-A7AY, AR ..... FR-A7AR, AP ..... FR-A7AP, AZ ..... FR-A7AZ, NC FR-A7NC,
ND ..... FR-A7ND, NL ..... FR-A7NL, NP ..... FR-A7NP, NS FR-A7NS

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
0	Torque boost	00	80	0	○	×	×	×	×	×	×	○	○	○
1	Maximum frequency	01	81	0	○	○	○	○	○	○	○	○	○	○
2	Minimum frequency	02	82	0	○	○	○	○	×	○	○	○	○	○
3	Base frequency	03	83	0	○	×	×	×	×	×	×	○	○	○
4	Multi-speed setting (high speed)	04	84	0	○	○	○	○	Δ	○	○	○	○	○
5	Multi-speed setting (middle speed)	05	85	0	○	○	○	○	Δ	○	○	○	○	○
6	Multi-speed setting (low speed)	06	86	0	○	○	○	○	Δ	○	○	○	○	○
7	Acceleration time	07	87	0	○	○	○	○	Δ	○	○	○	○	○
8	Deceleration time	08	88	0	○	○	○	○	Δ	○	○	○	○	○
9	Electronic thermal O/L relay	09	89	0	○	○	○	○	○	○	○	○	○	○
10	DC injection brake operation frequency	0A	8A	0	○	○	○	○	×	○	○	○	○	○
11	DC injection brake operation time	0B	8B	0	○	○	○	○	×	○	○	○	○	○
12	DC injection brake operation voltage	0C	8C	0	○	○	×	×	×	○*4	○*4	○	○	○
13	Starting frequency	0D	8D	0	○	○	○	○	×	○	○	○	○	○
14	Load pattern selection	0E	8E	0	○	×	×	×	×	×	×	○	○	○
15	Jog frequency	0F	8F	0	○	○	○	○	×	○	○	○	○	○
16	Jog acceleration/ deceleration time	10	90	0	○	○	○	○	×	○	○	○	○	○
17	MRS input selection	11	91	0	○	○	○	○	○	○	○	○	○	○
18	High speed maximum frequency	12	92	0	○	○	×	×	×	×	×	○	○	○
19	Base frequency voltage	13	93	0	○	×	×	×	×	×	×	○	○	○
20	Acceleration/deceleration reference frequency	14	94	0	○	○	○	○	Δ	○	○	○	○	○
21	Acceleration/deceleration time increments	15	95	0	○	○	○	○	Δ	○	○	○	○	○
22	Stall prevention operation level (Torque limit level)	16	96	0	○	○	○	×	○	○	×	○	○	○
23	Stall prevention operation level compensation factor at double speed	17	97	0	○	○	×	×	×	×	×	○	○	○
24	Multi-speed setting (speed 4)	18	98	0	○	○	○	○	Δ	○	○	○	○	○
25	Multi-speed setting (speed 5)	19	99	0	○	○	○	○	Δ	○	○	○	○	○
26	Multi-speed setting (speed 6)	1A	9A	0	○	○	○	○	Δ	○	○	○	○	○
27	Multi-speed setting (speed 7)	1B	9B	0	○	○	○	○	Δ	○	○	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
28	Multi-speed input compensation selection	1C	9C	0	○	○	○	○	×	○	○	○	○	○
29	Acceleration/deceleration pattern selection	1D	9D	0	○	○	○	○	×	○	○	○	○	○
31	Frequency jump 1A	1F	9F	0	○	○	○	○	×	○	○	○	○	○
32	Frequency jump 1B	20	A0	0	○	○	○	○	×	○	○	○	○	○
33	Frequency jump 2A	21	A1	0	○	○	○	○	×	○	○	○	○	○
34	Frequency jump 2B	22	A2	0	○	○	○	○	×	○	○	○	○	○
35	Frequency jump 3A	23	A3	0	○	○	○	○	×	○	○	○	○	○
36	Frequency jump 3B	24	A4	0	○	○	○	○	×	○	○	○	○	○
37	Speed display	25	A5	0	○	○	○	○	○	○	○	○	○	○
41	Up-to-frequency sensitivity	29	A9	0	○	○	○	×	×	○	×	○	○	○
42	Output frequency detection	2A	AA	0	○	○	○	○	○	○	○	○	○	○
43	Output frequency detection for reverse rotation	2B	AB	0	○	○	○	○	○	○	○	○	○	○
44	Second acceleration/ deceleration time	2C	AC	0	○	○	○	○	Δ	○	○	○	○	○
45	Second deceleration time	2D	AD	0	○	○	○	○	Δ	○	○	○	○	○
46	Second torque boost	2E	AE	0	○	×	×	×	×	×	×	○	○	○
47	Second V/F (base frequency)	2F	AF	0	○	×	×	×	×	×	×	○	○	○
48	Second stall prevention operation current	30	B0	0	○	○	×	×	×	×	×	○	○	○
49	Second stall prevention operation frequency	31	B1	0	○	○	×	×	×	×	×	○	○	○
50	Second output frequency detection	32	B2	0	○	○	○	○	○	○	○	○	○	○
51	Second electronic thermal O/L relay	33	B3	0	○	○	○	○	○	○	○	○	○	○
52	DU/PU main display data selection	34	B4	0	○	○	○	○	○	○	○	○	○	○
54	FM terminal function selection	36	B6	0	○	○	○	○	○	○	○	○	○	○
55	Frequency monitoring reference	37	B7	0	○	○	○	○	○	○	○	○	○	○
56	Current monitoring reference	38	B8	0	○	○	○	○	○	○	○	○	○	○
57	Restart coasting time	39	B9	0	○	○	○	○	×	○	○	○	○	○
58	Restart cushion time	3A	BA	0	○	○	×	×	×	×	×	○	○	○
59	Remote function selection	3B	BB	0	○	○	○	○	×	○	○	○	○	○
60	Energy saving control selection	3C	BC	0	○	×	×	×	×	×	×	○	○	○
61	Reference current	3D	BD	0	○	○	○	×	×	○	×	○	○	○
62	Reference value at acceleration	3E	BE	0	○	○	○	×	×	○	×	○	○	○
63	Reference value at dcceleration	3F	BF	0	○	○	○	×	×	○	×	○	○	○
64	Starting frequency for elevator mode	40	C0	0	○	×	×	×	×	×	×	○	○	○
65	Retry selection	41	C1	0	○	○	○	○	×	○	○	○	○	○
66	Stall prevention operation reduction starting frequency	42	C2	0	○	○	×	×	×	×	×	○	○	○
67	Number of retries at fault occurrence	43	C3	0	○	○	○	○	×	○	○	○	○	○
68	Retry waiting time	44	C4	0	○	○	○	○	×	○	○	○	○	○
69	Retry count display erase	45	C5	0	○	○	○	○	×	○	○	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
71	Applied motor	47	C7	0	○	○	○	○	○	○	○	○	○	○
72	PWM frequency selection	48	C8	0	○	○	○	○	○	○	○	○	○	○
73	Analog input selection	49	C9	0	○	○	○	○	×	○	○	○	○	○
74	Input filter time constant	4A	CA	0	○	○	○	○	×	○	○	○	○	○
75	Reset selection/ disconnected PU detection/ PU stop selection	4B	CB	0	○	○	○	○	○	○	○	○	×	×
76	Alarm code output selection	4C	CC	0	○	○	○	○	○	○	○	○	○	○
77 *	Parameter write selection	4D	CD	0	○	○	○	○	○	○	○	○	○	○
78	Reverse rotation prevention selection	4E	CE	0	○	○	○	○	○	○	○	○	○	○
79 *	Operation mode selection	4F	CF	0	○	○	○	○	○	○	○	○	○	○
80	Motor capacity	50	D0	0	×	○	○	○	○	○	○	○	○	○
81	Number of motor poles	51	D1	0	×	○	○	○	○	○	○	○	○	○
82	Motor excitation current	52	D2	0	×	○	○	○	○	○	○	○	×	○
83	Rated motor voltage	53	D3	0	×	○	○	○	○	○	○	○	○	○
84	Rated motor frequency	54	D4	0	×	○	○	○	○	○	○	○	○	○
89	Speed control gain (magnetic flux vector)	59	D9	0	×	○	×	×	×	×	×	○	×	○
90	Motor constant (R1)	5A	DA	0	×	○	○	○	○	○	○	○	×	○
91	Motor constant (R2)	5B	DB	0	×	○	○	○	○	○	○	○	×	○
92	Motor constant (L1)	5C	DC	0	×	○	○	○	○	○	○	○	×	○
93	Motor constant (L2)	5D	DD	0	×	○	○	○	○	○	○	○	×	○
94	Motor constant (X)	5E	DE	0	×	○	○	○	○	○	○	○	×	○
95	Online auto tuning selection	5F	DF	0	×	○	○	○	○	○	○	○	○	○
96	Auto tuning setting/status	60	E0	0	×	○	○	○	○	○	○	○	×	○
100	V/F1(first frequency)	00	80	1	○	×	×	×	×	×	×	○	○	○
101	V/F1(first frequency voltage)	01	81	1	○	×	×	×	×	×	×	○	○	○
102	V/F2(second frequency)	02	82	1	○	×	×	×	×	×	×	○	○	○
103	V/F2(second frequency voltage)	03	83	1	○	×	×	×	×	×	×	○	○	○
104	V/F3(third frequency)	04	84	1	○	×	×	×	×	×	×	○	○	○
105	V/F3(third frequency voltage)	05	85	1	○	×	×	×	×	×	×	○	○	○
106	V/F4(fourth frequency)	06	86	1	○	×	×	×	×	×	×	○	○	○
107	V/F4(fourth frequency voltage)	07	87	1	○	×	×	×	×	×	×	○	○	○
108	V/F5(fifth frequency)	08	88	1	○	×	×	×	×	×	×	○	○	○
109	V/F5(fifth frequency voltage)	09	89	1	○	×	×	×	×	×	×	○	○	○
110	Third acceleration/ deceleration time	0A	8A	1	○	○	○	○	△	○	○	○	○	○
111	Third deceleration time	0B	8B	1	○	○	○	○	△	○	○	○	○	○
112	Third torque boost	0C	8C	1	○	×	×	×	×	×	×	○	○	○
113	Third V/F (base frequency)	0D	8D	1	○	×	×	×	×	×	×	○	○	○
114	Third stall prevention operation current	0E	8E	1	○	○	×	×	×	×	×	○	○	○
115	Thrid stall prevention operation frequency	0F	8F	1	○	○	×	×	×	×	×	○	○	○

* Read and write from communication with PU connector only is enabled.

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
116	Third output frequency detection	10	90	1	○	○	○	○	○	○	○	○	○	○
117	PU communication station number	11	91	1	○	○	○	○	○	○	○	○	○*5	○*5
118	PU communication speed	12	92	1	○	○	○	○	○	○	○	○	○*5	○*5
119	PU communication stop bit length	13	93	1	○	○	○	○	○	○	○	○	○*5	○*5
120	PU communication parity check	14	94	1	○	○	○	○	○	○	○	○	○*5	○*5
121	Number of PU communication retries	15	95	1	○	○	○	○	○	○	○	○	○*5	○*5
122	PU communication check time interval	16	96	1	○	○	○	○	○	○	○	○	○*5	○*5
123	PU communication waiting time setting	17	97	1	○	○	○	○	○	○	○	○	○*5	○*5
124	PU communication CR/LF presence/absence selection	18	98	1	○	○	○	○	○	○	○	○	○*5	○*5
125	Terminal 2 frequency setting gain frequency	19	99	1	○	○	○	○	×	○	○	○	×	○
126	Terminal 4 frequency setting gain frequency	1A	9A	1	○	○	○	○	×	○	○	○	×	○
127	PID control automatic switchover freqeuncy	1B	9B	1	○	○	○	×	×	○	×	○	○	○
128	PID action selection	1C	9C	1	○	○	○	×	×	○	×	○	○	○
129	PID proportional band	1D	9D	1	○	○	○	×	×	○	×	○	○	○
130	PID integral time	1E	9E	1	○	○	○	×	×	○	×	○	○	○
131	PID upper limit	1F	9F	1	○	○	○	×	×	○	×	○	○	○
132	PID lower limit	20	A0	1	○	○	○	×	×	○	×	○	○	○
133	PID action set point	21	A1	1	○	○	○	×	×	○	×	○	○	○
134	PID differential time	22	A2	1	○	○	○	×	×	○	×	○	○	○
135	Electronic bypass sequence selection	23	A3	1	○	○	○	×	×	○	×	○	○	○
136	MC switchover interlock time	24	A4	1	○	○	○	×	×	○	×	○	○	○
137	Start waiting time	25	A5	1	○	○	○	×	×	○	×	○	○	○
138	Bypass selection at a fault	26	A6	1	○	○	○	×	×	○	×	○	○	○
139	Automatic switchover frequency from inverter to bypass operation	27	A7	1	○	○	○	×	×	○	×	○	○	○
140	Backlash acceleration stopping frequency	28	A8	1	○	○	○	○	×	○	○	○	○	○
141	Backlash acceleration stopping time	29	A9	1	○	○	○	○	×	○	○	○	○	○
142	Backlash deceleration stopping frequency	2A	AA	1	○	○	○	○	×	○	○	○	○	○
143	Backlash deceleration stopping time	2B	AB	1	○	○	○	○	×	○	○	○	○	○
144	Speed setting switchover	2C	AC	1	○	○	○	○	○	○	○	○	○	○
145	PU display language selection	2D	AD	1	○	○	○	○	○	○	○	○	×	×
148	Stall prevention level at 0V input	30	B0	1	○	○	×	×	×	×	×	○	○	○
149	Stall prevention level at 10V input	31	B1	1	○	○	×	×	×	×	×	○	○	○
150	Output current detection level	32	B2	1	○	○	○	○	○	○	○	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
151	Output current detection signal delay time	33	B3	1	○	○	○	○	○	○	○	○	○	○
152	Zero current detection level	34	B4	1	○	○	○	○	○	○	○	○	○	○
153	Zero current detection time	35	B5	1	○	○	○	○	○	○	○	○	○	○
154	Voltage reduction selection during stall prevention operation	36	B6	1	○	○	×	×	×	×	×	○	○	○
155	RT signal function validity condition selection	37	B7	1	○	○	○	×	×	○	×	○	○	○
156	Stall prevention operation selection	38	B8	1	○	○	×	×	×	×	×	○	○	○
157	OL signal output timer	39	B9	1	○	○	○	○	○	○	○	○	○	○
158	AM terminal function selection	3A	BA	1	○	○	○	○	○	○	○	○	○	○
159	Automatic switchover frequency range from bypass to inverter operation	3B	BB	1	○	○	○	×	×	○	×	○	○	○
160	User group read selection	00	80	2	○	○	○	○	○	○	○	○	○	○
161	Frequency setting/key lock operation selection	01	81	2	○	○	○	○	○	○	○	○	×	○
162	Automatic restart after instantaneous power failure selection	02	82	2	○	○	○	○	×	○	○	○	○	○
163	First cushion time for restart	03	83	2	○	○	×	×	×	×	×	○	○	○
164	First cushion voltage for restart	04	84	2	○	○	×	×	×	×	×	○	○	○
165	Stall prevention operation level for restart	05	85	2	○	○	×	×	×	×	×	○	○	○
166	Output current detection signal retention time	06	86	2	○	○	○	○	○	○	○	○	○	○
167	Output current detection operation selection	07	87	2	○	○	○	○	○	○	○	○	○	○
168	Parameter for manufacturer setting. Do not set.													
169														
170	Watt-hour meter clear	0A	8A	2	○	○	○	○	○	○	○	○	×	○
171	Operation hour meter clear	0B	8B	2	○	○	○	○	○	○	○	×	×	×
172	User group registered display/batch clear	0C	8C	2	○	○	○	○	○	○	○	○	×	×
173	User group registration	0D	8D	2	○	○	○	○	○	○	○	×	×	×
174	User group clear	0E	8E	2	○	○	○	○	○	○	○	×	×	×
178	STF terminal function selection	12	92	2	○	○	○	○	○	○	○	○	×	○
179	STR terminal function selection	13	93	2	○	○	○	○	○	○	○	○	×	○
180	RL terminal function selection	14	94	2	○	○	○	○	○	○	○	○	×	○
181	RM terminal function selection	15	95	2	○	○	○	○	○	○	○	○	×	○
182	RH terminal function selection	16	96	2	○	○	○	○	○	○	○	○	×	○
183	RT terminal function selection	17	97	2	○	○	○	○	○	○	○	○	×	○
184	AU terminal function selection	18	98	2	○	○	○	○	○	○	○	○	×	○
185	JOG terminal function selection	19	99	2	○	○	○	○	○	○	○	○	×	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
186	CS terminal function selection	1A	9A	2	○	○	○	○	○	○	○	○	×	○
187	MRS terminal function selection	1B	9B	2	○	○	○	○	○	○	○	○	×	○
188	STOP terminal function selection	1C	9C	2	○	○	○	○	○	○	○	○	×	○
189	RES terminal function selection	1D	9D	2	○	○	○	○	○	○	○	○	×	○
190	RUN terminal function selection	1E	9E	2	○	○	○	○	○	○	○	○	×	○
191	SU terminal function selection	1F	9F	2	○	○	○	○	○	○	○	○	×	○
192	IPF terminal function selection	20	A0	2	○	○	○	○	○	○	○	○	×	○
193	OL terminal function selection	21	A1	2	○	○	○	○	○	○	○	○	×	○
194	FU terminal function selection	22	A2	2	○	○	○	○	○	○	○	○	×	○
195	ABC1 terminal function selection	23	A3	2	○	○	○	○	○	○	○	○	×	○
196	ABC2 terminal function selection	24	A4	2	○	○	○	○	○	○	○	○	×	○
232	Multi-speed setting (speed 8)	28	A8	2	○	○	○	○	Δ	○	○	○	○	○
233	Multi-speed setting (speed 9)	29	A9	2	○	○	○	○	Δ	○	○	○	○	○
234	Multi-speed setting (speed 10)	2A	AA	2	○	○	○	○	Δ	○	○	○	○	○
235	Multi-speed setting (speed 11)	2B	AB	2	○	○	○	○	Δ	○	○	○	○	○
236	Multi-speed setting (speed 12)	2C	AC	2	○	○	○	○	Δ	○	○	○	○	○
237	Multi-speed setting (speed 13)	2D	AD	2	○	○	○	○	Δ	○	○	○	○	○
238	Multi-speed setting (speed 14)	2E	AE	2	○	○	○	○	Δ	○	○	○	○	○
239	Multi-speed setting (speed 15)	2F	AF	2	○	○	○	○	Δ	○	○	○	○	○
240	Soft-PWM operation selection	30	B0	2	○	○	○	○	○	○	○	○	○	○
241	Analog input display unit switchover	31	B1	2	○	○	○	○	○	○	○	○	○	○
242	Terminal 1 added compensation amount (terminal 2)	32	B2	2	○	○	○	○	×	○	○	○	○	○
243	Terminal 1 added compensation amount (terminal 4)	33	B3	2	○	○	○	○	×	○	○	○	○	○
244	Cooling fan operation selection	34	B4	2	○	○	○	○	○	○	○	○	○	○
245	Rated slip	35	B5	2	○	×	×	×	×	×	×	○	○	○
246	Slip compensation time constant	36	B6	2	○	×	×	×	×	×	×	○	○	○
247	Constant-power region slip compensation selection	37	B7	2	○	×	×	×	×	×	×	○	○	○
250	Stop selection	3A	BA	2	○	○	○	○	×	○	○	○	○	○
251	Output phase loss protection selection	3B	BB	2	○	○	○	○	○	○	○	○	○	○
252	Override bias	3C	BC	2	○	○	○	○	×	○	○	○	○	○
253	Override gain	3D	BD	2	○	○	○	○	×	○	○	○	○	○
255	Life alarm status display	3F	BF	2	○	○	○	○	○	○	○	×	×	×
256	Inrush current limit circuit life display	40	C0	2	○	○	○	○	○	○	○	×	×	×

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
257	Control circuit capacitor life display	41	C1	2	○	○	○	○	○	○	○	×	×	×
258	Main circuit capacitor life display	42	C2	2	○	○	○	○	○	○	○	×	×	×
259	Main circuit capacitor life measuring	43	C3	2	○	○	○	○	○	○	○	○	○	○
261	Power failure stop selection	45	C5	2	○	○	○	○	×	○	○	○	○	○
262	Subtracted frequency at deceleration start	46	C6	2	○	○	○	○	×	○	○	○	○	○
263	Subtraction starting frequency	47	C7	2	○	○	○	○	×	○	○	○	○	○
264	Power-failure deceleration time 1	48	C8	2	○	○	○	○	×	○	○	○	○	○
265	Power-failure deceleration time 2	49	C9	2	○	○	○	○	×	○	○	○	○	○
266	Power failure deceleration time switchover frequency	4A	CA	2	○	○	○	○	×	○	○	○	○	○
267	Terminal 4 input selection	4B	CB	2	○	○	○	○	○	○	○	○	×	○
268	Monitor decimal digits selection	4C	CC	2	○	○	○	○	○	○	○	○	○	○
269	Parameter for manufacturer setting. Do not set.													
270	Stop-on contact/load torque high-speed frequency control selection	4E	CE	2	○	○	○	×	×	○	×	○	○	○
271	High-speed setting maximum current	4F	CF	2	○	○	○	×	×	○	×	○	○	○
272	Middle-speed setting minimum current	50	D0	2	○	○	○	×	×	○	×	○	○	○
273	Current averaging range	51	D1	2	○	○	○	×	×	○	×	○	○	○
274	Current averaging filter time constant	52	D2	2	○	○	○	×	×	○	×	○	○	○
275	Stop-on contact excitation current low-speed multiplying factor	53	D3	2	×	○	×	×	×	×	×	○	○	○
276	PWM carrier frequency at stop-on contact	54	D4	2	×	○	×	×	×	×	×	○	○	○
278	Brake opening frequency	56	D6	2	×	○	○	×	×	○	×	○	○	○
279	Brake opening current	57	D7	2	×	○	○	×	×	○	×	○	○	○
280	Brake opening current detection time	58	D8	2	×	○	○	×	×	○	×	○	○	○
281	Brake operation time at start	59	D9	2	×	○	○	×	×	○	×	○	○	○
282	Brake operation frequency	5A	DA	2	×	○	○	×	×	○	×	○	○	○
283	Brake operation time at stop	5B	DB	2	×	○	○	×	×	○	×	○	○	○
284	Deceleration detection function selection	5C	DC	2	○	○	○	×	×	×	×	○	○	○
285	Overspeed detection frequency (Speed deviation excess detection frequency)	5D	DD	2	○	○	○	×	×	○	×	○	○	○
286	Droop gain	5E	DE	2	×	○	○	×	×	○	×	○	○	○
287	Droop filter time constant	5F	DF	2	×	○	○	×	×	○	×	○	○	○
288	Droop function activation selection	60	E0	2	×	×	○	×	×	○	×	○	○	○
291	Pulse train I/O selection	63	E3	2	○	○	○	○	×	○	○	○	×	○
292	Automatic acceleration/ deceleration	64	E4	2	○	○	○	×	×	○	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
293	Acceleration/deceleration time individual calculation selection	65	E5	2	○	○	○	×	×	○	×	○	○	○
294	UV avoidance voltage gain	66	E6	2	○	○	○	○	×	○	○	○	○	○
299	Rotation direction detection selection at restarting	6B	EB	2	○	○	×	×	×	○	×	○	○	○
300	BCD input bias AX	00	80	3	○	○	○	○	×	○	○	○	○	○
301	BCD input gain AX	01	81	3	○	○	○	○	×	○	○	○	○	○
302	BIN input bias AX	02	82	3	○	○	○	○	×	○	○	○	○	○
303	BIN input gain AX	03	83	3	○	○	○	○	×	○	○	○	○	○
304	Digital input and analog input compensation enable/ disable selection AX	04	84	3	○	○	○	○	×	○	○	○	○	○
305	Read timing operation selection AX	05	85	3	○	○	○	○	×	○	○	○	○	○
306	Analog output signal selection AY	06	86	3	○	○	○	○	○	○	○	○	○	○
307	Setting for zero analog output AY	07	87	3	○	○	○	○	○	○	○	○	○	○
308	Setting for maximum analog output AY	08	88	3	○	○	○	○	○	○	○	○	○	○
309	Analog output signal voltage/current switchover AY	09	89	3	○	○	○	○	○	○	○	○	○	○
310	Analog meter voltage output selection AY	0A	8A	3	○	○	○	○	○	○	○	○	○	○
311	Setting for zero analog meter voltage output AY	0B	8B	3	○	○	○	○	○	○	○	○	○	○
312	Setting for maximum analog meter voltage output AY	0C	8C	3	○	○	○	○	○	○	○	○	○	○
313	DO0 output selection AY NC	0D	8D	3	○	○	○	○	○	○	○	○	○	○
314	DO1 output selection AY NC	0E	8E	3	○	○	○	○	○	○	○	○	○	○
315	DO2 output selection AY NC	0F	8F	3	○	○	○	○	○	○	○	○	○	○
316	DO3 output selection AY	10	90	3	○	○	○	○	○	○	○	○	○	○
317	DO4 output selection AY	11	91	3	○	○	○	○	○	○	○	○	○	○
318	DO5 output selection AY	12	92	3	○	○	○	○	○	○	○	○	○	○
319	DO6 output selection AY	13	93	3	○	○	○	○	○	○	○	○	○	○
320	RA1 output selection AR	14	94	3	○	○	○	○	○	○	○	○	○	○
321	RA2 output selection AR	15	95	3	○	○	○	○	○	○	○	○	○	○
322	RA3 output selection AR	16	96	3	○	○	○	○	○	○	○	○	○	○
323	AM0 0V adjustment AY	17	97	3	○	○	○	○	○	○	○	○	×	○
324	AM1 0mA adjustment AY	18	98	3	○	○	○	○	○	○	○	○	×	○
329	Digital input increments selection AX	1D	9D	3	○	○	○	○	×	○	○	○	×	○
331	RS-485 communication station	1F	9F	3	○	○	○	○	○	○	○	○	○*5	○*5
332	RS-485 communication speed	20	A0	3	○	○	○	○	○	○	○	○	○*5	○*5

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
333	RS-485 communication stop bit length	*21*	*A1*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
334	RS-485 communication parity check selection	*22*	*A2*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
335	RS-485 communication retry count	*23*	*A3*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
336	RS-485 communication check time interval	*24*	*A4*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
337	RS-485 communication waiting time setting	*25*	*A5*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
338	Communication operation command source	*26*	*A6*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
339	Communication speed command source	*27*	*A7*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
340	Communication startup mode selection	*28*	*A8*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
341	RS-485 communication CR/LF selection	*29*	*A9*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
342	Communication EEPROM write selection	*2A*	*AA*	*3*	○	○	○	○	○	○	○	○	○	○
343	Communication error count	*2B*	*AB*	*3*	○	○	○	○	○	○	○	×	×	×
345	DeviceNet address ND	*2D*	*AD*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
346	DeviceNet baud rate ND	*2E*	*AE*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
349	Communication reset selection NC ND NL NP	*31*	*B1*	*3*	○	○	○	○	○	○	○	○	○*5	○*5
350	Stop position command selection AP	*32*	*B2*	*3*	○	○	○	×	×	×	×	○	○	○
351	Orientation speed AP	*33*	*B3*	*3*	○	○	○	×	×	×	×	○	○	○
352	Creep speed AP	*34*	*B4*	*3*	○	○	○	×	×	×	×	○	○	○
353	Creep switchover position AP	*35*	*B5*	*3*	○	○	○	×	×	×	×	○	○	○
354	Position loop switchover position AP	*36*	*B6*	*3*	○	○	○	×	×	×	×	○	○	○
355	DC injection brake start position AP	*37*	*B7*	*3*	○	○	○	×	×	×	×	○	○	○
356	Internal stop position command AP	*38*	*B8*	*3*	○	○	○	×	×	×	×	○	○	○
357	Orientation in-position zone AP	*39*	*B9*	*3*	○	○	○	×	×	×	×	○	○	○
358	Servo torque selection AP	*3A*	*BA*	*3*	○	○	○	×	×	×	×	○	○	○
359	Encoder rotation direction AP	*3B*	*BB*	*3*	○	○	○	○	○	×	×	○	○	○
360	16 bit data selection AP	*3C*	*BC*	*3*	○	○	○	×	×	×	×	○	○	○
361	Position shift AP	*3D*	*BD*	*3*	○	○	○	×	×	×	×	○	○	○
362	Orientation position loop gain AP	*3E*	*BE*	*3*	○	○	○	×	×	×	×	○	○	○
363	Completion signal output delay time AP	*3F*	*BF*	*3*	○	○	○	×	×	×	×	○	○	○
364	Encoder stop check time AP	*40*	*C0*	*3*	○	○	○	×	×	×	×	○	○	○
365	Orientation limit AP	*41*	*C1*	*3*	○	○	○	×	×	×	×	○	○	○
366	Recheck time AP	*42*	*C2*	*3*	○	○	○	×	×	×	×	○	○	○
367	Speed feedback range AP	*43*	*C3*	*3*	○	○	○	×	×	×	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
368	Feedback gain AP	44	C4	3	○	○	×	×	×	×	×	○	○	○
369	Number of encoder pulses AP	45	C5	3	○	○	○	○	○	×	×	○	○	○
374	Overspeed detection level	4A	CA	3	×	×	○	○	○	○	○	○	○	○
376	Encoder signal loss detection enable/disable selection AP	4C	CC	3	○	○	○	○	○	×	×	○	○	○
379	SSCNET III rotation direction selection NS	4F	CF	3	×	×	○	○	○	×	×	○	○	○
380	Acceleration S-pattern 1	50	D0	3	○	○	○	○	×	○	○	○	○	○
381	Deceleration S-pattern 1	51	D1	3	○	○	○	○	×	○	○	○	○	○
382	Acceleration S-pattern 2	52	D2	3	○	○	○	○	×	○	○	○	○	○
383	Deceleration S-pattern 2	53	D3	3	○	○	○	○	×	○	○	○	○	○
384	Input pulse division scaling factor	54	D4	3	○	○	○	○	×	○	○	○	○	○
385	Frequency for 0 input pulse	55	D5	3	○	○	○	○	×	○	○	○	○	○
386	Frequency for maximum input pulse	56	D6	3	○	○	○	○	×	○	○	○	○	○
387	Initial communication delay time NL	57	D7	3	○	○	○	○	○	○	○	○	○	○
388	Send time interval at heart beat NL	58	D8	3	○	○	○	○	○	○	○	○	○	○
389	Minimum sending time at heart beat NL	59	D9	3	○	○	○	○	○	○	○	○	○	○
390	% setting reference frequency NL	5A	DA	3	○	○	○	○	○	○	○	○	○	○
391	Receive time interval at heart beat NL	5B	DB	3	○	○	○	○	○	○	○	○	○	○
392	Event driven detection width NL	5C	DC	3	○	○	○	○	○	○	○	○	○	○
393	Orientation selection AP	5D	DD	3	×	×	○	×	×	×	×	○	○	○
396	Orientation speed gain (P term) AP	60	E0	3	×	×	○	×	×	×	×	○	○	○
397	Orientation speed integral time AP	61	E1	3	×	×	○	×	×	×	×	○	○	○
398	Orientation speed gain (D term) AP	62	E2	3	×	×	○	×	×	×	×	○	○	○
399	Orientation deceleration ratio AP	63	E3	3	×	×	○	×	×	×	×	○	○	○
406	High resolution analog input selection AZ	06	86	4	○	○	○	○	○	○	○	○	×	○
407	Motor temperature detection filter AZ	07	87	4	○	○	○	○	○	○	○	○	○	○
408	Motor thermistor selection AZ	08	88	4	○	○	○	○	○	○	○	○	○	○
419	Position command source selection AP	13	93	4	×	×	×	×	○	×	×	○	○	○
420	Command pulse scaling factor numerator AP	14	94	4	×	×	×	×	○	×	×	○	○	○
421	Command pulse scaling factor denominator AP	15	95	4	×	×	×	×	○	×	×	○	○	○
422	Position loop gain AP	16	96	4	×	×	×	×	○	×	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
423	Position feed forward gain AP	17	97	4	×	×	×	×	○	×	×	○	○	○
424	Position command acceleration/deceleration time constant AP	18	98	4	×	×	×	×	○	×	×	○	○	○
425	Position feed forward command filter AP	19	99	4	×	×	×	×	○	×	×	○	○	○
426	In-position width AP	1A	9A	4	×	×	×	×	○	×	×	○	○	○
427	Excessive level error AP	1B	9B	4	×	×	×	×	○	×	×	○	○	○
428	Command pulse selection AP	1C	9C	4	×	×	×	×	○	×	×	○	○	○
429	Clear signal selection AP	1D	9D	4	×	×	×	×	○	×	×	○	○	○
430	Pulse monitor selection AP	1E	9E	4	×	×	×	×	○	×	×	○	○	○
447	Digital torque command bias AX	2F	AF	4	×	×	×	○	×	×	○	○	○	○
448	Digital torque command gain AX	30	B0	4	×	×	×	○	×	×	○	○	○	○
449	SSCNET III input filter setting NS	31	B1	4	×	×	○	○	○	×	×	○	○	○
450	Second applied motor	32	B2	4	○	○	×	×	×	○	○	○	○	○
451	Second motor control method selection	33	B3	4	○	○	×	×	×	○	○	○	○	○
453	Second motor capacity	35	B5	4	×	○	×	×	×	○	○	○	○	○
454	Number of second motor poles	36	B6	4	×	○	×	×	×	○	○	○	○	○
455	Second motor excitation current	37	B7	4	×	○	×	×	×	○	○	○	×	○
456	Rated second motor voltage	38	B8	4	×	○	×	×	×	○	○	○	○	○
457	Rated second motor frequency	39	B9	4	×	○	×	×	×	○	○	○	○	○
458	Second motor constant (R1)	3A	BA	4	×	○	×	×	×	○	○	○	×	○
459	Second motor constant (R2)	3B	BB	4	×	○	×	×	×	○	○	○	×	○
460	Second motor constant (L1)	3C	BC	4	×	○	×	×	×	○	○	○	×	○
461	Second motor constant (L2)	3D	BD	4	×	○	×	×	×	○	○	○	×	○
462	Second motor constant (X)	3E	BE	4	×	○	×	×	×	○	○	○	×	○
463	Second motor auto tuning setting/status	3F	BF	4	×	○	×	×	×	○	○	○	×	○
464	Digital position control sudden stop deceleration time AP	40	C0	4	×	×	×	×	○	×	×	○	○	○
465	First position feed amount lower 4 digits AP	41	C1	4	×	×	×	×	○	×	×	○	○	○
466	First position feed amount upper 4 digits AP	42	C2	4	×	×	×	×	○	×	×	○	○	○
467	Second position feed amount lower 4 digits AP	43	C3	4	×	×	×	×	○	×	×	○	○	○
468	Second position feed amount upper 4 digits AP	44	C4	4	×	×	×	×	○	×	×	○	○	○
469	Third position feed amount lower 4 digits AP	45	C5	4	×	×	×	×	○	×	×	○	○	○
470	Third position feed amount upper 4 digits AP	46	C6	4	×	×	×	×	○	×	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
471	Fourth position feed amount lower 4 digits AP	47	C7	4	×	×	×	×	○	×	×	○	○	○
472	Fourth position feed amount upper 4 digits AP	48	C8	4	×	×	×	×	○	×	×	○	○	○
473	Fifth position feed amount lower 4 digits AP	49	C9	4	×	×	×	×	○	×	×	○	○	○
474	Fifth position feed amount upper 4 digits AP	4A	CA	4	×	×	×	×	○	×	×	○	○	○
475	Sixth position feed amount lower 4 digits AP	4B	CB	4	×	×	×	×	○	×	×	○	○	○
476	Sixth position feed amount upper 4 digits AP	4C	CC	4	×	×	×	×	○	×	×	○	○	○
477	Seventh position feed amount lower 4 digits AP	4D	CD	4	×	×	×	×	○	×	×	○	○	○
478	Seventh position feed amount upper 4 digits AP	4E	CE	4	×	×	×	×	○	×	×	○	○	○
479	Eighth position feed amount lower 4 digits AP	4F	CF	4	×	×	×	×	○	×	×	○	○	○
480	Eighth position feed amount upper 4 digits AP	50	D0	4	×	×	×	×	○	×	×	○	○	○
481	Ninth position feed amount lower 4 digits AP	51	D1	4	×	×	×	×	○	×	×	○	○	○
482	Ninth position feed amount upper 4 digits AP	52	D2	4	×	×	×	×	○	×	×	○	○	○
483	Tenth position feed amount lower 4 digits AP	53	D3	4	×	×	×	×	○	×	×	○	○	○
484	Tenth position feed amount upper 4 digits AP	54	D4	4	×	×	×	×	○	×	×	○	○	○
485	Eleventh position feed amount lower 4 digits AP	55	D5	4	×	×	×	×	○	×	×	○	○	○
486	Eleventh position feed amount upper 4 digits AP	56	D6	4	×	×	×	×	○	×	×	○	○	○
487	Twelfth position feed amount lower 4 digits AP	57	D7	4	×	×	×	×	○	×	×	○	○	○
488	Twelfth position feed amount upper 4 digits AP	58	D8	4	×	×	×	×	○	×	×	○	○	○
489	Thirteenth position feed amount lower 4 digits AP	59	D9	4	×	×	×	×	○	×	×	○	○	○
490	Thirteenth position feed amount upper 4 digits AP	5A	DA	4	×	×	×	×	○	×	×	○	○	○
491	Fourteenth position feed amount lower 4 digits AP	5B	DB	4	×	×	×	×	○	×	×	○	○	○
492	Fourteenth position feed amount upper 4 digits AP	5C	DC	4	×	×	×	×	○	×	×	○	○	○
493	Fifteenth position feed amount lower 4 digits AP	5D	DD	4	×	×	×	×	○	×	×	○	○	○
494	Fifteenth position feed amount upper 4 digits AP	5E	DE	4	×	×	×	×	○	×	×	○	○	○
495	Remote output selection	5F	DF	4	○	○	○	○	○	○	○	○	○	○
496	Remote output data 1	60	E0	4	○	○	○	○	○	○	○	×	×	×
497	Remote output data 2	61	E1	4	○	○	○	○	○	○	○	×	×	×
499	SSCNET III operation selection NS	63	E3	4	×	×	○	○	○	×	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
500	Communication error execution waiting time NC ND NL NP	00	80	5	○	○	○	○	○	○	○	○	○	○
501	Communication error occurrence count display NC ND NL NP	01	81	5	○	○	○	○	○	○	○	×	○	○
502	Stop mode selection at communication error NC ND NL NP	02	82	5	○	○	○	○	○	○	○	○	○	○
503	Maintenance timer	03	83	5	○	○	○	○	○	○	○	×	×	×
504	Maintenance timer alarm output set time	04	84	5	○	○	○	○	○	○	○	○	×	○
505	Speed setting reference	05	85	5	○	○	○	○	○	○	○	○	○	○
516	S-pattern time at a start of acceleration	10	90	5	○	○	○	○	×	○	○	○	○	○
517	S-pattern time at a completion of acceleration	11	91	5	○	○	○	○	×	○	○	○	○	○
518	S-pattern time at a start of deceleraiton	12	92	5	○	○	○	○	×	○	○	○	○	○
519	S-pattern time at a completion of deceleraiton	13	93	5	○	○	○	○	×	○	○	○	○	○
539	Modbus-RTU communication check time interval	27	A7	5	○	○	○	○	○	○	○	○	○*5	○*5
541	Frequency command sign selection (CC-Link) NC	29	A9	5	○	○	○	×	×	○	×	○	○*5	○*5
542	Communication station number (CC-Link) NC	2A	AA	5	○	○	○	○	○	○	○	○	○*5	○*5
543	Baud rate (CC-Link) NC	2B	AB	5	○	○	○	○	○	○	○	○	○*5	○*5
544	CC-Link extended setting NC	2C	AC	5	○	○	○	○	○	○	○	○	○*5	○*5
547	Parameter for manufacturer setting. Do not set.													
548														
549	Protocol selection	31	B1	5	○	○	○	○	○	○	○	○	○*5	○*5
550	NET mode operation command source selection	32	B2	5	○	○	○	○	○	○	○	○	○*5	○*5
551	PU mode operation command source selection	33	B3	5	○	○	○	○	○	○	○	○	○*5	○*5
555	Current average time	37	B7	5	○	○	○	○	○	○	○	○	○	○
556	Data output mask time	38	B8	5	○	○	○	○	○	○	○	○	○	○
557	Current average value monitor signal output reference current	39	B9	5	○	○	○	○	○	○	○	○	○	○
563	Energization time carrying-over times	3F	BF	5	○	○	○	○	○	○	○	×	×	×
564	Operating time carrying-over times	40	C0	5	○	○	○	○	○	○	○	×	×	×
569	Second motor speed control gain	45	C5	5	×	○	×	×	×	×	×	○	×	○
571	Holding time at a start	47	C7	5	○	○	○	○	×	○	○	○	○	○
574	Second motor online auto tuning	4A	CA	5	×	○	×	×	×	○	○	○	○	○
575	Output interruption detection time	4B	CB	5	○	○	○	×	×	○	×	○	○	○
576	Output interruption detection level	4C	CC	5	○	○	○	×	×	○	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
577	Output interruption cancel level	4D	CD	5	○	○	○	×	×	○	×	○	○	○
611	Acceleration time at a restart	0B	8B	6	○	○	○	×	×	○	×	○	○	○
665	Regeneration avoidance frequency gain	41	C1	6	○	○	○	×	×	○	×	○	○	○
684	Tuning data increments switchover	54	D4	6	×	○	○	○	○	○	○	○	○	○
800	Control method selection	00	80	8	○	○	○	○	○	○	○	○	○	○
802	Pre-excitation selection AP	02	82	8	×	×	○	×	×	×	×	○	○	○
803	Constant power range torque characteristic selection	03	83	8	×	×	○	○	○	○	○	○	○	○
804	Torque command source selection	04	84	8	×	×	×	○	×	×	○	○	○	○
805	Torque command value (RAM)	05	85	8	×	×	×	○	×	×	○	×	○	○
806	Torque command value (RAM,EEPROM)	06	86	8	×	×	×	○	×	×	○	○	○	○
807	Speed limit selection	07	87	8	×	×	×	○	×	×	○	○	○	○
808	Forward rotation speed limit	08	88	8	×	×	×	○	×	×	○	○	○	○
809	Reverse rotation speed limit	09	89	8	×	×	×	○	×	×	○	○	○	○
810	Torque limit input method selection	0A	8A	8	×	×	○	×	○	○	×	○	○	○
811	Set resolution switchover	0B	8B	8	○	○	○	○	○	○	○	○	○	○
812	Torque limit level (regeneration)	0C	8C	8	×	×	○	×	○	○	×	○	○	○
813	Torque limit level (3rd quadrant)	0D	8D	8	×	×	○	×	○	○	×	○	○	○
814	Torque limit level (4th quadrant)	0E	8E	8	×	×	○	×	○	○	×	○	○	○
815	Torque limit level 2	0F	8F	8	×	×	○	×	○	○	×	○	○	○
816	Torque limit level during acceleration	10	90	8	×	×	○	×	○	○	×	○	○	○
817	Torque limit level during deceleration	11	91	8	×	×	○	×	○	○	×	○	○	○
818	Easy gain tuning response level setting	12	92	8	×	×	○	×	○	○	×	○	○	○
819	Easy gain tuning selection	13	93	8	×	×	○	×	○	○	×	○	×	○
820	Speed control P gain 1	14	94	8	×	×	○	×	○	○	×	○	○	○
821	Speed control integral time 1	15	95	8	×	×	○	×	○	○	×	○	○	○
822	Speed setting filter 1	16	96	8	×	×	○	○	×	○	○	○	○	○
823	Speed detection filter 1 AP	17	97	8	×	×	○	○	○	×	×	○	○	○
824	Torque control P gain 1	18	98	8	×	×	○	○	○	○	○	○	○	○
825	Torque control integral time 1	19	99	8	×	×	○	○	○	○	○	○	○	○
826	Torque setting filter 1	1A	9A	8	×	×	○	○	○	○	○	○	○	○
827	Torque detection filter 1	1B	9B	8	×	×	○	○	○	○	○	○	○	○
828	Model speed control gain	1C	9C	8	×	×	○	×	○	○	×	○	○	○
830	Speed control P gain 2	1E	9E	8	×	×	○	×	○	○	×	○	○	○
831	Speed control integral time 2	1F	9F	8	×	×	○	×	○	○	×	○	○	○
832	Speed setting filter2	20	A0	8	×	×	○	○	×	○	○	○	○	○
833	Speed detection filter 2 AP	21	A1	8	×	×	○	×	○	×	×	○	○	○
834	Torque control P gain 2	22	A2	8	×	×	○	○	○	○	○	○	○	○
835	Torque control integral time 2	23	A3	8	×	×	○	○	○	○	○	○	○	○
836	Torque setting filter2	24	A4	8	×	×	○	○	○	○	○	○	○	○
837	Torque detection filter 2	25	A5	8	×	×	○	○	○	○	○	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
838	DA1 terminal function selection AZ	26	A6	8	○	○	○	○	○	○	○	○	○	○
839	DA1 output filter AZ	27	A7	8	○	○	○	○	○	○	○	○	○	○
840	Torque bias selection AP	28	A8	8	×	×	○	×	×	×	×	○	○	○
841	Torque bias 1 AP	29	A9	8	×	×	○	×	×	×	×	○	○	○
842	Torque bias 2 AP	2A	AA	8	×	×	○	×	×	×	×	○	○	○
843	Torque bias 3 AP	2B	AB	8	×	×	○	×	×	×	×	○	○	○
844	Torque bias filter AP	2C	AC	8	×	×	○	×	×	×	×	○	○	○
845	Torque bias operation time AP	2D	AD	8	×	×	○	×	×	×	×	○	○	○
846	Torque bias balance compensation AP	2E	AE	8	×	×	○	×	×	×	×	○	○	○
847	Fall-time torque bias terminal 1 bias AP	2F	AF	8	×	×	○	×	×	×	×	○	○	○
848	Fall-time torque bias terminal 1 gain AP	30	B0	8	×	×	○	×	×	×	×	○	○	○
849	Analog input off set adjustment	31	B1	8	○	○	○	○	○	○	○	○	○	○
850	Control operation selection	32	B2	8	×	×	×	×	×	○	○	○	○	○
853	Speed deviation time AP	35	B5	8	×	×	○	×	×	×	×	○	○	○
854	Excitation ratio	36	B6	8	×	×	○	○	○	○	○	○	○	○
857	DA1-0V adjustment AZ	39	B9	8	○	○	○	○	○	○	○	○	×	○
858	Terminal 4 function assignment	3A	BA	8	○	○	○	○	○	○	○	○	×	○
859	Torque current	3B	BB	8	×	○	○	○	○	○	○	○	×	○
860	Second motor torque current	3C	BC	8	×	○	×	×	×	○	○	○	×	○
862	Notch filter time constant	3E	BE	8	×	×	○	×	○	○	×	○	○	○
863	Notch filter depth	3F	BF	8	×	×	○	×	○	○	×	○	○	○
864	Torque detection	40	C0	8	×	×	○	○	○	○	○	○	○	○
865	Low speed detection	41	C1	8	×	×	○	○	○	○	○	○	○	○
866	Torque monitoring reference	42	C2	8	×	○	○	○	○	○	○	○	○	○
867	AM output filter	43	C3	8	○	○	○	○	○	○	○	○	○	○
868	Terminal 1 function assignment	44	C4	8	○	○	○	○	○	○	○	○	×	○
872	Input phase failure protection selection	48	C8	8	○	○	○	○	○	○	○	○	○	○
873	Speed limit AP	49	C9	8	×	×	○	×	×	×	×	○	○	○
874	OLT level setting	4A	CA	8	×	×	○	×	○	○	×	○	○	○
875	Fault definition	4B	CB	8	○	○	○	○	×	○	○	○	○	○
877	Speed feed forward control/ model adaptive speed control selection	4D	CD	8	×	×	○	×	○	○	×	○	○	○
878	Speed feed forward filter	4E	CE	8	×	×	○	×	○	○	×	○	○	○
879	Speed feed forward torque limit	4F	CF	8	×	×	○	×	○	○	×	○	○	○
880	Load inertia ratio	50	D0	8	×	×	○	×	○	○	×	○	×	○
881	Speed feed forward gain	51	D1	8	×	×	○	×	○	○	×	○	○	○
882	Regeneration avoidance operation selection	52	D2	8	○	○	○	×	×	○	×	○	○	○
883	Regeneration avoidance operation level	53	D3	8	○	○	○	×	×	○	×	○	○	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
884	Regeneration avoidance at deceleration detection sensitivity	54	D4	8	○	○	○	×	×	○	×	○	○	○
885	Regeneration avoidance compensation frequency limit value	55	D5	8	○	○	○	×	×	○	×	○	○	○
886	Regeneration avoidance voltage gain	56	D6	8	○	○	○	×	×	○	×	○	○	○
888	Free parameter 1	58	D8	8	○	○	○	○	○	○	○	○	×	×
889	Free parameter 2	59	D9	8	○	○	○	○	○	○	○	○	×	×
891	Cumulative power monitor digit shifted times	5B	DB	8	○	○	○	○	○	○	○	○	○	○
892	Load factor	5C	DC	8	○	○	○	○	○	○	○	○	○	○
893	Energy saving monitor reference (motor capacity)	5D	DD	8	○	○	○	○	○	○	○	○	○	○
894	Control selection during commercial power-supply operation	5E	DE	8	○	○	○	○	○	○	○	○	○	○
895	Power saving rate reference value	5F	DF	8	○	○	○	○	○	○	○	○	○	○
896	Power unit cost	60	E0	8	○	○	○	○	○	○	○	○	○	○
897	Power saving monitor average time	61	E1	8	○	○	○	○	○	○	○	○	○	○
898	Power saving cumulative monitor clear	62	E2	8	○	○	○	○	○	○	○	○	×	○
899	Operation time rate (estimated value)	63	E3	8	○	○	○	○	○	○	○	○	○	○
C0 (900)	FM terminal calibration	5C	DC	1	○	○	○	○	○	○	○	○	×	○
C1 (901)	AM terminal calibration	5D	DD	1	○	○	○	○	○	○	○	○	×	○
C2 (902)	Terminal 2 frequency setting bias frequency	5E	DE	1	○	○	○	○	○	○	○	○	×	○
C3 (902)	Terminal 2 frequency setting bias	5E	DE	1	○	○	○	○	○	○	○	○	×	○
125 (903)	Terminal 2 frequency setting gain frequency	5F	DF	1	○	○	○	○	○	○	○	○	×	○
C4 (903)	Terminal 2 frequency setting gain	5F	DF	1	○	○	○	○	○	○	○	○	×	○
C5 (904)	Terminal 4 frequency setting bias frequency	60	E0	1	○	○	○	○	○	○	○	○	×	○
C6 (904)	Terminal 4 frequency setting bias	60	E0	1	○	○	○	○	○	○	○	○	×	○
126 (905)	Terminal 4 frequency setting gain frequency	61	E1	1	○	○	○	○	○	○	○	○	×	○
C7 (905)	Terminal 4 frequency setting gain	61	E1	1	○	○	○	○	○	○	○	○	×	○
C12 (917)	Terminal 1 bias frequency (speed)	11	91	9	×	×	○	○	○	○	○	○	×	○
C13 (917)	Terminal 1 bias frequency (speed)	11	91	9	×	×	○	○	○	○	○	○	×	○
C14 (918)	Terminal 1 gain frequency (speed)	12	92	9	×	×	○	○	○	○	○	○	×	○
C15 (918)	Terminal 1 gain (speed)	12	92	9	×	×	○	○	○	○	○	○	×	○

Parameter	Name	Instruction Code *1			Control Mode-based Correspondence Table *2							Parameter Copy *3	Parameter Clear *3	All Parameter Clear *3
		Read	Write	Extended	V/F Control	Advanced magnetic flux vector control	Vector control			Real sensorless vector control				
							Speed control	Torque control	Position control	Speed control	Torque control			
C16 (919)	Terminal 1 bias command (torque/magnetic flux)	*13*	*93*	*9*	×	×	○	○	○	○	○	○	×	○
C17 (919)	Terminal 1 bias (torque/ magnetic flux)	*13*	*93*	*9*	×	×	○	○	○	○	○	○	×	○
C18 (920)	Terminal 1 gain command (torque/magnetic flux)	*14*	*94*	*9*	×	×	○	○	○	○	○	○	×	○
C19 (920)	Terminal 1 gain (torque/ magnetic flux)	*14*	*94*	*9*	×	×	○	○	○	○	○	○	×	○
C29 (925)	Motor temperature detection calibration (analog input) AZ	*19*	*99*	*9*	○	○	○	○	○	○	○	○	×	○
C30 (926)	Terminal 6 bias frequency (speed) AZ	*1A*	*9A*	*9*	○	○	○	○	○	○	○	○	×	○
C31 (926)	Terminal 6 bias (speed) AZ	*1A*	*9A*	*9*	○	○	○	○	○	○	○	○	×	○
C32 (927)	Terminal 6 gain frequency (speed) AZ	*1B*	*9B*	*9*	○	○	○	○	○	○	○	○	×	○
C33 (927)	Terminal 6 gain (speed) AZ	*1B*	*9B*	*9*	○	○	○	○	○	○	○	○	×	○
C34 (928)	Terminal 6 bias command (torque) AZ	*1C*	*9C*	*9*	×	×	○	○	○	○	○	○	×	○
C35 (928)	Terminal 6 bias (torque) AZ	*1C*	*9C*	*9*	×	×	○	○	○	○	○	○	×	○
C36 (929)	Terminal 6 gain command (torque) AZ	*1D*	*9D*	*9*	×	×	○	○	○	○	○	○	×	○
C37 (929)	Terminal 6 gain (torque) AZ	*1D*	*9D*	*9*	×	×	○	○	○	○	○	○	×	○
C38 (932)	Terminal 4 bias command (torque/magnetic flux)	*20*	*A0*	*9*	×	×	○	○	○	○	○	○	×	○
C39 (932)	Terminal 4 bias (torque/ magnetic flux)	*20*	*A0*	*9*	×	×	○	○	○	○	○	○	×	○
C40 (933)	Terminal 4 gain command (torque/magnetic flux)	*21*	*A1*	*9*	×	×	○	○	○	○	○	○	×	○
C41 (933)	Terminal 4 gain (torque/ magnetic flux)	*21*	*A1*	*9*	×	×	○	○	○	○	○	○	×	○
989	Parameter for manufacturer setting. Do not set.													
990	PU buzzer control	*5A*	*DA*	*9*	○	○	○	○	○	○	○	○	○	○
991	PU contrast adjustment	*5B*	*DB*	*9*	○	○	○	○	○	○	○	○	×	○

MEMO

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Aug., 2007	IB(NA)-0600331ENG-A	First edition
Apr., 2008	IB(NA)-0600331ENG-B	Additions · FR-A721-18.5K to 55K
Apr., 2008	IB(NA)-0600331ENG-C	Additions ·FR-A741-5.5K to 15K
Jul., 2008	IB(NA)-0600331ENG-D	Additions ·FR-A741-18.5K to 55K

⚠ For Maximum Safety

- Mitsubishi inverters are not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product are likely to cause a serious accident.
- Please do not use this product for loads other than three-phase induction motors.

HEADQUARTERS

MITSUBISHI ELECTRIC EUROPE B.V. **EUROPE**
German Branch
Gothaer Straße 8
D-40880 Ratingen
Phone: +49 (0)2102 / 486-0
Fax: +49 (0)2102 / 486-1120

MITSUBISHI ELECTRIC EUROPE B.V. **CZECH REPUBLIC**
Czech Branch
Avenir Business Park, Radlická 714/113a
CZ-158 00 Praha 5
Phone: +420 - 251 551 470
Fax: +420 - 251-551-471

MITSUBISHI ELECTRIC EUROPE B.V. **FRANCE**
French Branch
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 (0)1 / 55 68 55 68
Fax: +33 (0)1 / 55 68 57 57

MITSUBISHI ELECTRIC EUROPE B.V. **IRELAND**
Irish Branch
Westgate Business Park, Ballymount
IRL-Dublin 24
Phone: +353 (0)1 4198800
Fax: +353 (0)1 4198890

MITSUBISHI ELECTRIC EUROPE B.V. **ITALY**
Italian Branch
Viale Colleoni 7
I-20041 Agrate Brianza (MB)
Phone: +39 039 / 60 53 1
Fax: +39 039 / 60 53 312

MITSUBISHI ELECTRIC EUROPE B.V. **POLAND**
Poland Branch
Krakowska 50
PL-32-083 Balice
Phone: +48 (0)12 / 630 47 00
Fax: +48 (0)12 / 630 47 01

MITSUBISHI ELECTRIC EUROPE B.V. **SPAIN**
Spanish Branch
Carretera de Rubí 76-80
E-08190 Sant Cugat del Vallés (Barcelona)
Phone: 902 131121 // +34 935653131
Fax: +34 935891579

MITSUBISHI ELECTRIC EUROPE B.V. **UK**
UK Branch
Travellers Lane
UK-Hatfield, Herts. AL10 8XB
Phone: +44 (0)1707 / 27 61 00
Fax: +44 (0)1707 / 27 86 95

MITSUBISHI ELECTRIC CORPORATION **JAPAN**
Office Tower "Z" 14 F
8-12,1 chome, Harumi Chuo-Ku
Tokyo 104-6212
Phone: +81 3 622 160 60
Fax: +81 3 622 160 75

MITSUBISHI ELECTRIC AUTOMATION, Inc. **USA**
500 Corporate Woods Parkway
Vernon Hills, IL 60061
Phone: +1 847 478 21 00
Fax: +1 847 478 22 53

EUROPEAN REPRESENTATIVES

GEVA **AUSTRIA**
Wiener Straße 89
AT-2500 Baden
Phone: +43 (0)2252 / 85 55 20
Fax: +43 (0)2252 / 488 60

TEHNIKON **BELARUS**
Oktyabrskaya 16/5, Off. 703-711
BY-220030 Minsk
Phone: +375 (0)17 / 210 46 26
Fax: +375 (0)17 / 210 46 26

ESCO DRIVES & AUTOMATION **BELGIUM**
Culliganlaan 3
BE-1831 Diegem
Phone: +32 (0)2 / 717 64 30
Fax: +32 (0)2 / 717 64 31

Koning & Hartman b.v. **BELGIUM**
Woluwelaan 31
BE-1800 Vilvoorde
Phone: +32 (0)2 / 257 02 40
Fax: +32 (0)2 / 257 02 49

INEA BH d.o.o. **BOSNIA AND HERZEGOVINA**
Aleja Lipa 56
BA-71000 Sarajevo
Phone: +387 (0)33 / 921 164
Fax: +387 (0)33 / 524 539

AKHNATON **BULGARIA**
4 Andrej Ljapchev Blvd. Pb 21
BG-1756 Sofia
Phone: +359 (0)2 / 817 6004
Fax: +359 (0)2 / 97 44 06 1

INEA CR d.o.o. **CROATIA**
Losinjska 4 a
HR-10000 Zagreb
Phone: +385 (0)1 / 36 940 - 01/ -02/ -03
Fax: +385 (0)1 / 36 940 - 03

AutoCont C.S. s.r.o. **CZECH REPUBLIC**
Technologická 374/6
CZ-708 00 Ostrava-Pustkovec
Phone: +420 595 691 150
Fax: +420 595 691 199

B:ELECTRIC, s.r.o. **CZECH REPUBLIC**
Mladoboleslavská 812
CZ-197 00 Praha 19 - Kbely
Phone: +420 286 850 848, +420 724 317 975
Fax: +420 286 850 850

Beijer Electronics A/S **DENMARK**
Lykkegårdsvej 17
DK-4000 Roskilde
Phone: +45 (0)46/ 75 76 66
Fax: +45 (0)46 / 75 56 26

Beijer Electronics Eesti OÜ **ESTONIA**
Pärnu mnt.160i
EE-11317 Tallinn
Phone: +372 (0)6 / 51 81 40
Fax: +372 (0)6 / 51 81 49

Beijer Electronics OY **FINLAND**
Peltoie 37
FIN-28400 Ulvila
Phone: +358 (0)207 / 463 540
Fax: +358 (0)207 / 463 541

UTECO A.B.E.E. **GREECE**
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +30 211 / 1206 900
Fax: +30 211 / 1206 999

MELTRADE Kft. **HUNGARY**
Fertő utca 14.
HU-1107 Budapest
Phone: +36 (0)1 / 431-9726
Fax: +36 (0)1 / 431-9727

Beijer Electronics SIA **LATVIA**
Ritausmas iela 23
LV-1058 Riga
Phone: +371 (0)784 / 2280
Fax: +371 (0)784 / 2281

Beijer Electronics UAB **LITHUANIA**
Savanoriu Pr. 187
LT-02300 Vilnius
Phone: +370 (0)5 / 232 3101
Fax: +370 (0)5 / 232 2980

EUROPEAN REPRESENTATIVES

ALFATRADE Ltd. **MALTA**
99, Paola Hill
Malta- Paola PLA 1702
Phone: +356 (0)21 / 697 816
Fax: +356 (0)21 / 697 817

INTEHSIS srl **MOLDOVA**
bld. Traian 23/1
MD-2060 Kishinev
Phone: +373 (0)22 / 66 4242
Fax: +373 (0)22 / 66 4280

HIFLEX AUTOM.TECHNIEK B.V. **NETHERLANDS**
Wolweverstraat 22
NL-2984 CD Ridderkerk
Phone: +31 (0)180 – 46 60 04
Fax: +31 (0)180 – 44 23 55

Koning & Hartman b.v. **NETHERLANDS**
Haarlerbergweg 21-23
NL-1101 CH Amsterdam
Phone: +31 (0)20 / 587 76 00
Fax: +31 (0)20 / 587 76 05

Beijer Electronics AS **NORWAY**
Postboks 487
NO-3002 Drammen
Phone: +47 (0)32 / 24 30 00
Fax: +47 (0)32 / 84 85 77

Sirius Trading & Services srl **ROMANIA**
Aleea Lacul Morii Nr. 3
RO-060841 Bucuresti, Sector 6
Phone: +40 (0)21 / 430 40 06
Fax: +40 (0)21 / 430 40 02

Craft Con. & Engineering d.o.o. **SERBIA**
Bulevar Svetog Cara Konstantina 80-86
SER-18106 Nis
Phone: +381 (0)18 / 292-24-4/5
Fax: +381 (0)18 / 292-24-4/5

INEA SR d.o.o. **SERBIA**
Izletnicka 10
SER-113000 Smederevo
Phone: +381 (0)26 / 617 163
Fax: +381 (0)26 / 617 163

AutoCont Control s.r.o. **SLOVAKIA**
Radlinského 47
SK-02601 Dolny Kubin
Phone: +421 (0)43 / 5868210
Fax: +421 (0)43 / 5868210

CS MTrade Slovensko, s.r.o. **SLOVAKIA**
Vajanskeho 58
SK-92101 Piestany
Phone: +421 (0)33 / 7742 760
Fax: +421 (0)33 / 7735 144

INEA d.o.o. **SLOVENIA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8100
Fax: +386 (0)1 / 513 8170

Beijer Electronics AB **SWEDEN**
Box 426
SE-20124 Malmö
Phone: +46 (0)40 / 35 86 00
Fax: +46 (0)40 / 93 23 01

Omni Ray AG **SWITZERLAND**
Im Schörli 5
CH-8600 Dübendorf
Phone: +41 (0)44 / 802 28 80
Fax: +41 (0)44 / 802 28 28

GTS **TURKEY**
Bayraktar Bulvari Nutuk Sok. No:5
TR-34775 Yukarı Dudullu-Ümraniye-İSTANBUL
Phone: +90 (0)216 526 39 90
Fax: +90 (0)216 526 3995

CSC Automation Ltd. **UKRAINE**
4-B, M. Raskovoyi St.
UA-02660 Kiev
Phone: +380 (0)44 / 494 33 55
Fax: +380 (0)44 / 494-33-66

EURASIAN REPRESENTATIVES

Kazpromautomatics Ltd. **KAZAKHSTAN**
Mustafina Str. 7/2
KAZ-470046 Karaganda
Phone: +7 7212 / 50 11 50
Fax: +7 7212 / 50 11 50

MIDDLE EAST REPRESENTATIVE

SHERF Motion Techn. Ltd. **ISRAEL**
Rehov Hamerkava 19
IL-58851 Holon
Phone: +972 (0)3 / 559 54 62
Fax: +972 (0)3 / 556 01 82

CEG INTERNATIONAL **LEBANON**
Cebaco Center/Block A Autostrade DORA
Lebanon - Beirut
Phone: +961 (0)1 / 240 430
Fax: +961 (0)1 / 240 438

AFRICAN REPRESENTATIVE

CBI Ltd. **SOUTH AFRICA**
Private Bag 2016
ZA-1600 Isando
Phone: + 27 (0)11 / 977 0770
Fax: + 27 (0)11 / 977 0761