MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow eco Changes

INVERTER

Model

FR-F700P

700 series

EVOLVED ENERGY-SAVING PREMIUM INVERTER.

F700P

IM

IPM

The Next-Generation "F700P Inverter for Fans and Pumps" for Reducing CO_2 Emissions

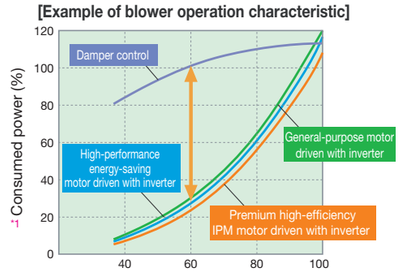
The "F700P inverter for fans and pumps" can drive both general-purpose motors (3-phase induction motors) and IPM motors. The F700P could be the solution to your energy saving needs.

1 Inverters for Dramatic Energy Saving (Energy saving)

(1) Energy saving with speed control (eco)

●The consumed power of a variable-torque load, such as fans, pumps, and blowers, is proportional to the cube of its rotation speed.
This means that controlling the rotation speed to adjust the air volume can lead to energy savings.

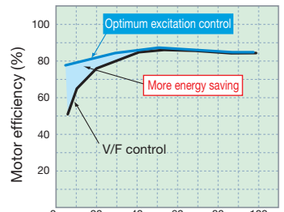
[Example of blower operation characteristic]



*1: Rated motor output is 100%. [Comparison of Mitsubishi products]

(2) Energy saving with Optimum excitation control (General-purpose motors) (eco eco)

●Optimum excitation control continuously adjusts the excitation current to an optimum level to provide the highest motor efficiency, and that leads to substantial energy savings. (Refer to page 47 for the details.)
At 10% motor load torque, for example, the motor efficiency under Optimum excitation control is about 15% higher than the motor efficiency under conventional V/F control.

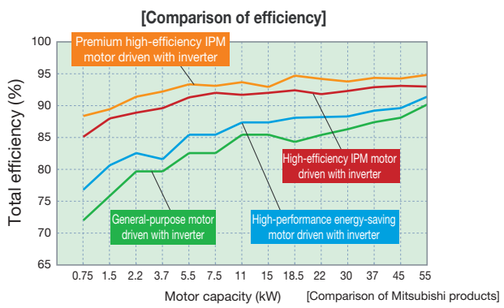


[Comparison of Mitsubishi products]

(3) Energy saving with IPM motors (eco eco eco)

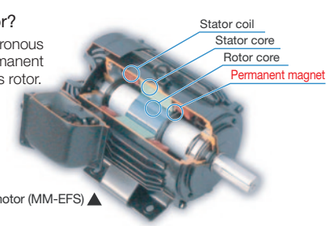
●High efficiency achieved with IPM motors
- The IPM motors that have permanent magnets embedded in their rotors are even more efficient than the high-performance energy-saving motors.

[Comparison of efficiency]



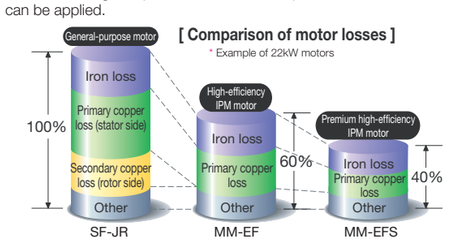
[Comparison of Mitsubishi products]

●What is an IPM motor?
An IPM motor is a synchronous motor with strong permanent magnets embedded in its rotor.

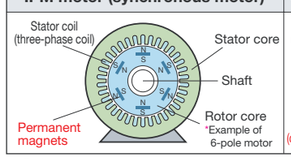
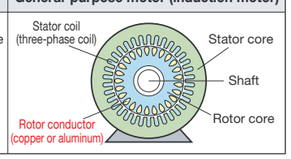


IPM motor (MM-EFS) ▲

●Why is an IPM motor more efficient?
- No current flows to the rotor (secondary side), and no secondary copper loss is generated.
- Magnetic flux is generated with permanent magnets, and less motor current is required.
- Embedded magnets provide reluctance torque*2, and the reluctance torque can be applied.



Motor structure (section view)

IPM motor (synchronous motor)	General-purpose motor (induction motor)
	

*2: **Reluctance torque**
Reluctance torque occurs due to magnetic imbalance on the rotor.

new 2 To Save More Energy — the MM-EFS Series is Now Available (Premium high-efficiency IPM motor)

(1) IE4-equivalent efficiency level

●A high-efficiency IPM motor "MM-EF series" is equivalent to IE3 (premium efficiency). A premium high-efficiency IPM motor "MM-EFS series" provides even better efficiency that is equivalent to IE4 (super premium efficiency), the highest efficiency class*.

*As of October 2012

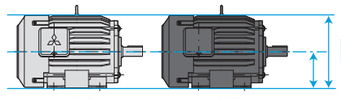
IEC 60034-30 Efficiency class	Efficiency of Mitsubishi motors	
	General-purpose motor	IPM motor
IE4 (super premium efficiency)*	—	Premium high-efficiency IPM (MM-EFS)
IE3 (premium efficiency)	—	High-efficiency IPM (MM-EF)
IE2 (high efficiency)	High-performance energy-saving motor (SF-HR)	—
IE1 (standard efficiency)	Standard three-phase motor (SF-JR)	—
Below the class		

High ↑ Efficiency ↓ Low

*: The details of IE4 can be found in IEC 60034-31.

(2) Smooth replacement from a general-purpose motor (with the same installation size)

●The frame number is the same (same size) as the Mitsubishi general-purpose motors (4-pole SF-JR/SF-HR series). Replacement is easy as the installation sizes are compatible. (55kW or lower)



SF-JR 3.7kW MM-EFS371M4

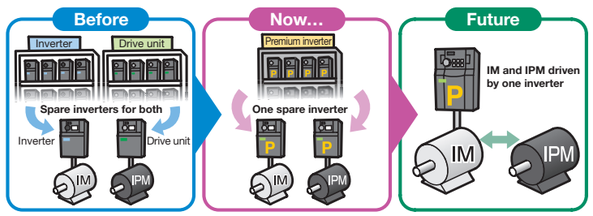
3 Driving IM and IPM Brings So Many Benefits (IM&IPM)

(1) The F700P series inverter can drive both a general-purpose motor (IM) and an IPM motor (IPM).

●The IM driving setting can be switched to IPM driving setting by only one setting "12" (MM-EFS) in the parameter [IPM]. (Refer to page 92 for details.)
Never drive an IPM motor in the IM drive setting.

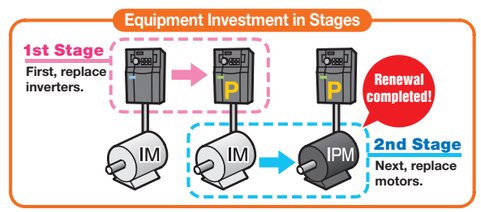
IPM parameter initialization

●One spare F700P inverter is enough for the two types of motors (IM and IPM); the number of required spare inverters is reduced by half.



(2) Simple and reliable transition from IM to IPM

●There is no need to replace the whole system at once; replace the inverters first, then replace the motors.
When the budget is limited, equipment investment can be made over several stages.

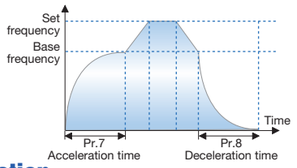


4 Various Functions for Fans and Pumps

Best Combination

(1) Variable-torque acceleration/deceleration pattern

●Variable torque loads such as fans and blowers can be accelerated/decelerated in a short period of time.
(Available with general-purpose motors)



(2) Full-scale PID function

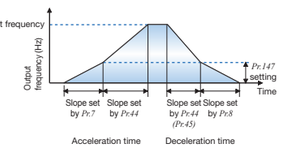
●To save energy in low-speed operation: PID output shutoff (sleep) function
●To shorten the start-up time of PID control: PID automatic switchover function
●For air conditioning applications: Forward/reverse rotation switching by external signals
●To use various types of detectors: PID set point and measured value outputs in voltage (0 to 5V / 0 to 10V) and current (4 to 20mA)

(3) Complete I/O terminals come standard

●Contact input (12 terminals), analog input (3 terminals), open collector output (5 terminals), relay output (2 terminals), analog output, and pulse train output come standard. Various functions can be assigned to these terminals.
●Voltage and current are selectable for analog input.
●ON/OFF status of the signals inputted to or outputted from the I/O terminals can be displayed on the operation panel.

(4) Automatic acceleration/deceleration time switchover

●A frequency where the acceleration/deceleration time is changed can be pre-set; an external switch is not required to switch the time setting.
This function is especially useful for an operation that requires high torque in a low speed operation.



(5) Password function

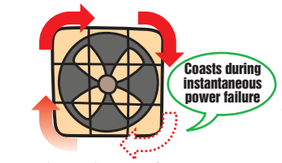
●Parameter writing/reading can be restricted with a 4-digit password.
This function is useful to prevent parameter values from being rewritten by misoperation.

(6) Keep running during instantaneous power failure

●Automatic restart after instantaneous power failure function / flying start function.
After an instantaneous power failure, the operation is re-startable from the coasting motor speed.
Even if the rotation direction has been forcibly reversed, the operation can be smoothly restarted in the original direction.

●Power failure time deceleration-to-stop function.
During operations of fans and blowers, the operation is continued at an instantaneous power failure without the motor coasting[*1].

*1: The inverter may trip and coast the motor under some load conditions.



Automatic restart after instantaneous power failure function

Power failure time deceleration-to-stop function

(7) Regeneration avoidance function

●The operation frequency is automatically increased to prevent the regenerative overvoltage fault from occurring. This function is useful when a load is forcibly rotated by another fan in the duct.

(8) Mechanical resonance suppression (speed smoothing)

●Vibration caused by mechanical resonance can be suppressed.
(Available with general-purpose motors)

(9) Simple magnetic flux vector control

●Simple magnetic flux vector control enables the high torque[*2] generation in a low-speed operation range.
This function is useful for a pump application, which requires large starting torque. (Available with general-purpose motors)

*2: Up to 120% torque at 3Hz is generatable in combination with the slip compensation function.

(10) Energy saving effect checked at a glance

●The energy saving effect can be checked on the energy saving monitor.
●The measured output power amount can be output in pulses.

5 Environmentally Friendly

Reinforced EMI measures

(1) Compliance with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS Directive) in Europe

●Being RoHS compliant, the FR-700P series inverters are friendly to people and the environment.

(2) EMI suppression (equipped with the EMC filter)

●By attaching the EMC filter connector to the ON or OFF position, the built-in EMC filter can be set enabled/disabled[*1*2]. When it is enabled, the inverter conforms to the EMC Directive (EN61800-3/2nd Environment Category C3[*3]) by itself.

*1: Leakage current is higher when the EMC filter is enabled.
*2: The EMC filter is always enabled for the 200V 0.75K and 1.5K inverters of which leakage current is generally low. (No connector is provided for these models.)
The common mode choke installed at the input side of the 55K- or lower-capacity inverter is always enabled and unaffected by the ON/OFF status of the EMC filter connector.
*2: Refer to the EMC Installation Guidelines for the required specification.

	Capacitive filter	Common mode choke	DC reactor
55K or lower	Standard (built-in)	Standard (built-in)	Option (sold separately)
75K or higher	Standard (built-in)	Option (sold separately)	Standard (accessory)

(3) Harmonic current suppression

●Harmonic current may adversely affect the power supply. To suppress such harmonic current, the power-factor-improving compact AC reactor (FR-HAL) and the DC reactor (FR-HEL) are available. (A DC reactor is provided for the 75K or higher as standard.)

AC reactor (FR-HAL)

DC reactor (FR-HEL)

●The F700P series inverters (55K or lower) are equipped with built-in capacitive filters and common mode chokes. By installing only an optional DC reactor (FR-HEL), they can conform to the Architectural Standard Specifications (Electric Installation) and Architectural Standard Specifications (Machinery Installation) (year 2009) issued by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.

Introducing the Mitsubishi magnetic contactor
●Selection of small frames ●Low level load (auxiliary contact) supported
●Wide line-up of safety contactors ●Conformed to many international standards

Refer to page 78 for the selection.

6 Long Life and Simple Maintenance

Easy & trouble-free

(1) Longer life parts

●The service life of the cooling fans is now 10 years[*1]. The service life can be further extended by ON/OFF control of the cooling fan.
●Capacitors with a design life of 10 years[*1*2] are adapted. (Using a surrounding air temperature of 105°C for 5000 hours). With these capacitors, the service life of the inverter is further extended.)

*1: Surrounding air temperature: Annual average of 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt). The design life is a calculated value and is not a guaranteed product life.
*2: Output current: 80% of the inverter rating.

(2) The leading-edge life diagnosis function

●The degree of deterioration of the main circuit capacitor, control circuit capacitor, and inrush current limit circuit can be diagnosed on the monitor.
●Using the self-diagnosis function, the part life warning[*3] can be output. With these warnings, the self-diagnosis function prevents troubles from occurring.

*3: A warning is output when any of the main circuit capacitor, control circuit capacitor, inrush current limit circuit, and cooling fan reaches its output level.

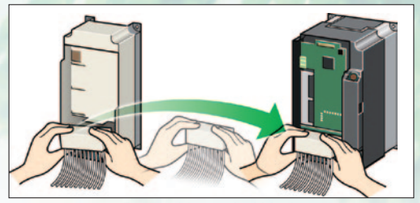
(3) Hands-free maintenance

●A fault can be initiated by setting a parameter.
This function is useful to check how the system operates at a fault.
●The maintenance timer output function notifies the user about the maintenance time of peripheral devices.

(4) Easier work

●Detachable operation panel
●Parameter copy with operation panel
●Removable terminal blocks
●Easy wiring with comb-shaped wiring cover
●Replaceable cooling fan

Cooling Fan



Removable terminal block

7 Easy Operation

Easy

(1) Operation panel equipped with the setting dial

●Operation can be easily performed with the popular Mitsubishi setting dial.

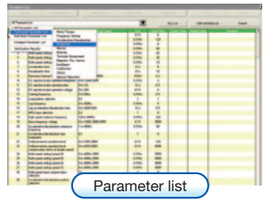
(2) Automatic parameter setting specific to the application

●Simple parameter setting (Pr.79 Operation mode selection)
●Communication setting for Mitsubishi HMI (GOT)
●Rated frequency change (60Hz → 50Hz)
●Unit change in acceleration/deceleration time setting (0.1s → 0.01s)

(3) Easy setting from personal computer with FR Configurator

●Inverter operations from start-up to maintenance are easily performed.
●Parameter settings can be printed or saved in a file. A file containing the FR-F700 parameter settings can be exported to an FR-F700P series inverter.
●The conversion function allows parameter copy from an FR-F500 inverter to FR-F700P.

MELSOFT



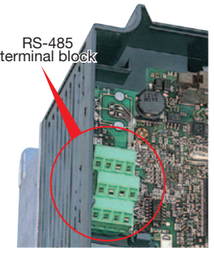
Parameter list

8 Supporting More Network Protocols

Extensibility

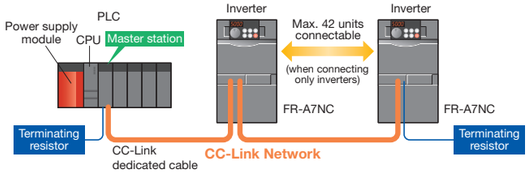
(1) RS-485 terminal block equipped as standard

●A RS-485 terminal block is equipped separately from the PU connector. Multi-drop connection can be easily performed with separate input and output terminals.
●The newly added "Multi-command Mode" of Mitsubishi inverter protocol cuts down the data processing time of the inverter from 1/3 to 1/4.
●The F700P inverters support Modbus-RTU (binary) protocol in addition to the conventional Mitsubishi inverter protocol.
●The 32-bit cumulative power monitor enables monitoring of a large cumulative power amount without letting it overflow.



(2) Main international network protocols supported

●LONWORKS®, CC-Link Ver.1.1, Ver.2.0, CC-Link IE Field, DeviceNet™, PROFIBUS-DP, FL Remote are supported through communication options.



9 How Much CO_2 Emission Is Reduced? Less CO_2

The longer the operating period with medium air volume is, the higher energy saving effect obtained with an inverter.

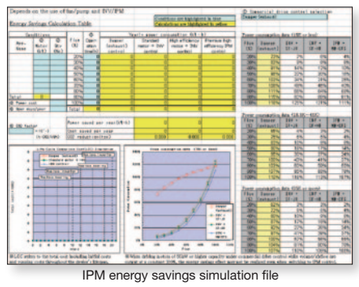
(Conditions: The electricity cost is 14 yen/kWh. The CO_2 emission is 1,000kWh 0.555ton - CO_2 emission)

	Water-cooling pump for a showcase	Air conditioning in a Mitsubishi plant	Air conditioning in a building
	Commercial power supply (valve) + General-purpose motor (SF-JR) / Inverter + General-purpose motor (SF-JR)	Inverter + General-purpose motor (SF-JR) / Inverter + IPM motor (MM-EFS)	Inverter + General-purpose motor (SF-JR) / Inverter + IPM motor (MM-EFS)
Condition	[Units to drive] ●Water-cooling pump 3.7kW × 1 unit ●Fans for the cooling tower 1.5kW × 1 unit ●Freezer 11kW × 3 unit 5.5kW × 2 unit 3.7kW × 1 unit 3.0kW × 1 unit	[Units to drive] ●Ventilator 0.75kW × 3 unit 1.5kW × 1 unit 2.2kW × 3 unit ●Air conditioner 15kW × 1 unit 18.5kW × 1 unit 30kW × 2 unit	[Units to drive] ●Fans for air conditioning 5.5kW × 10 unit 7.5kW × 10 unit 3.7kW × 100 unit
Operation patterns	Water volume (%) 100 75 50 25 Time Spring Summer Fall Winter 8760 hours/year	Air volume (%) 80 60 40 Time 0 6 8 10 18 2021 5475 hours/year	Air volume (%) 100 80 50 Time 0 6 9 12 15 18 21 24 5110 hours/year
	●With commercial power supply Approx. 0.15 million kWh Approx. 2.17 million yen ●With inverter Approx. 0.14 million kWh Approx. 1.9 million yen	●With general-purpose motor Approx. 0.25 million kWh Approx. 3.44 million yen ●With IPM motor Approx. 0.22 million kWh Approx. 3.02 million yen	●With general-purpose motor Approx. 2.39 million kWh Approx. 33.42 million yen ●With IPM motor Approx. 2.1 million kWh Approx. 29.43 million yen
(Annual) energy saving effect produced by replacing to IPM motors driven with inverters	●Annual energy saving effect (differences in the amount and cost) Approx. 0.019 million kWh Approx. **0.27** million yen ●Annual CO_2 emission reduction Approx. 0.019 million kWh **10.7** tons	●Annual energy saving effect Approx. 0.03 million kWh Approx. **0.42** million yen ●Annual CO_2 emission reduction Approx. 0.03 million kWh **16.7** tons	●Annual energy saving effect Approx. 0.28 million kWh Approx. **3.99** million yen ●Annual CO_2 emission reduction Approx. 0.28 million kWh **158** tons

Your best assistant — Mitsubishi inverter software

●IPM energy savings simulation file

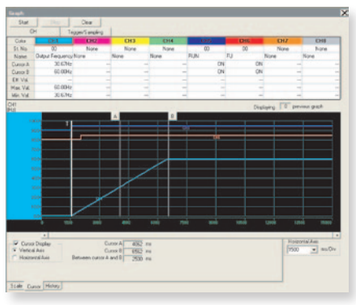
The IPM energy savings simulation file calculates the energy saving effect and CO_2 reduction rate achieved by replacing commercial power supply (damper/valve control) operation with IPM motor operation by inverter. This file requires inputs of motor capacity, quantity, air volume, operating time, etc.



IPM energy savings simulation file

●FR Configurator (Option) **(FR-SW3-SETUP-WE)**

Support tool for the inverter operations from start-up to maintenance.



LINE UP

●Inverter

F R - F 7 2 0 P - 3.7K

Symbol	Voltage class
2	200V class
4	400V class

Symbol	Inverter capacity
0.75K to 560K	Represents the capacity (kW).

Power supply specification	Inverter model	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
Three-phase 200V	FR-F720P-□K	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–
Three-phase 400V	FR-F740P-□K	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

●: Available –: Not available

■**Precautions**
- Never drive an IPM motor in the IM drive setting.
- Use the same IPM motor capacity as the inverter capacity.
- For IPM motor, use an MM-EFS or MM-EF series motor. Please contact us regarding a combination with other manufacturer's IPM motor.

ClassNK APPROVED

The 400V class is approved for the shipping classification of Class NK and CCS.

A noise filter (shown on page 79) is separately required.
*Please contact us for the detailed approved condition.

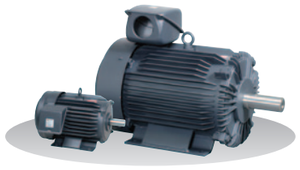
c UL us LISTED CE

Compatible with UL, cUL, EC Directives (CE marking)

*IPM motors are not compatible with the above regulations and directives.

●Premium high-efficiency IPM motor

M M - E F S 7 1M 4



Symbol	Output	Symbol	Output
7	0.75kW	15K	15kW
15	1.5kW	18K	18.5kW
22	2.2kW	22K	22kW
37	3.7kW	30K	30kW
55	5.5kW	37K	37kW
75	7.5kW	45K	45kW
11K	11kW	55K	55kW

Symbol	Rated speed*1
1M	1500r/min

Symbol	Voltage class
None	200V
4	400V

*1: Also applicable to an application with the rated speed of 1800r/min. Please contact your sales representative for a special specification such as long-axis type, flange shape, water-proof outdoor type, and salt-proof type.

Rated output (kW)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160
Motor model		7	15	22	37	55	75	11K	15K	18K	22K	30K	37K	45K	55K	75K	90K	110K	132K	160K
200V class	MM-EFS□1M	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	–	–	–	–
400V class	MM-EFS□1M4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○

●: Available ○: To be released –: Not applicable

■**Precautions**
- MM-EFS series IPM motors cannot be driven with commercial power supply.
- The total wiring length for an IPM motor should be 100m or less.
- Only one IPM motor can be connected to an inverter.

●High-efficiency IPM motor

M M - E F 4 2 4

Symbol	Output	Symbol	Output
4	0.4kW	11K	11kW
7	0.75kW	15K	15kW
15	1.5kW	⋮	⋮
⋮	⋮	110K	110kW

Symbol	Rated speed
2	1800r/min

Symbol	Voltage class
None	200V
4	400V

Symbol	Protective structure
None	IP44
P2	IP45

■**Precautions**
- MM-EF series IPM motors cannot be driven with commercial power supply.
- The total wiring length for an IPM motor should be 100m or less.
- Only one IPM motor can be connected to an inverter.

Connection example

Three-phase AC power supply
Use within the permissible power supply specifications of the inverter.
(Refer to page 8)

Moulded case circuit breaker (MCCB) or earth leakage circuit breaker (ELB), fuse
The breaker must be selected carefully since an inrush current flows in the inverter at power on.
(Refer to page 78)

Magnetic contactor(MC)
Install the magnetic contactor to ensure safety. Do not use this MC to frequently start and stop the inverter.
Doing so will cause the inverter life to be shortened.
(Refer to page 78)

Reactor (FR-HAL, FR-HEL)
Install reactors to suppress harmonics and to improve the power factor. An AC reactor (FR-HAL) (option) is required when installing the inverter near a large power supply system (1000kVA or more). The inverter may be damaged if you do not use reactors.
Select the reactor according to the model.
For the 55K or lower, remove the jumpers across terminals P/+ and P1 to connect to the DC reactor.
(Refer to page 69, 70)

Programmable controller **Human machine interface**

RS-485 terminal block
The inverter can be connected with a computer such as a programmable controller and with GOT (human machine interface).
They support Mitsubishi inverter protocol and Modbus-RTU (binary) protocol.

Inverter (FR-F700P)
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. Especially when mounting the inverter inside an enclosure, take cautions of the surrounding air temperature. *(Refer to page 10)*
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 24)*
Refer to the Instruction Manual for the built-in EMC filter.

AC reactor (FR-HAL)

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

EMC filter (ferrite core) (FR-BLF)
The 55K or lower has a built-in common mode choke.
(Refer to page 77)

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

IM connection U V W

Earth (Ground)

General-purpose motor

Earth (Ground)

IPM connection U V W

Earth (Ground)

EMC filter (ferrite core) (FR-BSF01, FR-BLF)
Install an EMC filter (ferrite core) to reduce the electromagnetic noise generated from the inverter. Effective in the range from about 0.5MHz to 5MHz.
A wire should be wound four turns at a maximum.
(Refer to page 77)

Contactor Example) No-fuse switch (DSN type)
Install a contactor in an application where the IPM motor is driven by the load even at power-OFF of the inverter. Do not open or close the contactor while the inverter is running (outputting).
(Refer to page 81)

Dedicated IPM motor (MM-EFS, MM-EF)
Use the specified motor. IPM motors cannot be driven by the commercial power supply.
(Refer to page 88, 90)

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

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

Brake unit (FR-BU2)

P/+ PR
P/+
PR

Resistor unit (FR-BR*1, MT-BR5*2)
The regeneration braking capability of the inverter can be exhibited fully.
Install this as required.
(Refer to page 72)

Power regeneration common converter (FR-CV*1)
Power regeneration converter (MT-RC*2)
Greater braking capability is obtained.
Install this as required.
(Refer to page 74)

High power factor converter (FR-HC2)
Power supply harmonics can be greatly suppressed.
Install this as required.
(Refer to page 75)

*1 Compatible with the 55K or lower.
*2 Compatible with the 75K or higher.

: Install these options as required.

CAUTION

- 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 are connected, immediately remove them.
- 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, set the EMC filter valid to minimize interference.
  (Refer to Chapter 2 of the Instruction Manual (Applied).)
- Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.
- An IPM motor cannot be driven by the commercial power supply.
- An IPM motor is a motor with permanent magnets embedded. High-voltage is generated at motor terminals while the motor is running even after the inverter power is turned OFF. Before closing the contactor at the output side, make sure that the inverter power is ON and the motor is stopped.

Rating

•200V class

Type FR-F720P-□□K			0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Applicable motor capacity (kW)*1			0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Output	Rated capacity (kVA)*2		1.6	2.7	3.7	5.8	8.8	11.8	17.1	22.1	27	32	43	53	65	81	110	132	165
	Rated current (A)*3		4.2 (3.6)	7.0 (6.0)	9.6 (8.2)	15.2 (13)	23 (20)	31 (26)	45 (38)	58 (49)	70.5 (60)	85 (72)	114 (97)	140 (119)	170 (145)	212 (180)	288 (244)	346 (294)	432 (367)
	Overload current rating*4		120% for 60s, 150% for 3s (inverse-time characteristics)																
	Rated voltage*5		Three-phase 200 to 240V																
Power supply	Rated input AC voltage/ frequency		Three-phase 200 to 220V 50Hz, 200 to 240V 60Hz																
	Permissible AC voltage fluctuation		170 to 242V 50Hz, 170 to 264V 60Hz																
	Permissible frequency fluctuation		±5%																
	Power supply system capacity (kVA)*6	Without DC reactor	2.1	4.0	4.8	8.0	11.5	16	20	27	32	41	52	65	79	99	—	—	—
		With DC reactor	1.2	2.6	3.3	5.0	8.1	10	16	19	24	31	41	50	61	74	110	132	165
Protective structure (JEM 1030)*8			Enclosed type (IP20) *7										Open type (IP00)						
Cooling system			Self-cooling		Forced air cooling														
Approx. mass (kg)			1.8	2.2	3.5	3.5	3.5	6.5	6.5	7.8	13	13	14	23	35	35	67	70	70

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor. To use a dedicated IPM motor, *refer to page 88, 90.*

*2 The rated output capacity indicated assumes that the output voltage is 220V.

*3 When operating the inverter with the carrier frequency set to 3kHz or more, the carrier frequency automatically decreases if the inverter output current exceeds the value in parentheses of the rated current. This may cause the motor noise to increase.

*4 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*5 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.

*6 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

*7 When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).

*8 FR-DU07: IP40 (except for the PU connector)

•400V class

Type FR-F740P-□□K			0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Applicable motor capacity (kW)*1			0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated capacity (kVA)*2		1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8
	Rated current (A)*3		2.1 (1.8)	3.5 (3.0)	4.8 (4.1)	7.6 (6.4)	11.5 (9.8)	16 (13)	23 (19)	29 (24)	35 (30)	43 (36)	57 (48)	70 (60)	85 (72)	106 (90)
	Overload current rating*4		120% 60s, 150% 3s (inverse-time characteristics)													
	Rated voltage*5		Three-phase 380 to 480V													
Power supply	Rated input AC voltage/ frequency		Three-phase 380 to 480V 50Hz/60Hz													
	Permissible AC voltage fluctuation		323 to 528V 50Hz/60Hz													
	Permissible frequency fluctuation		±5%													
	Power supply system capacity (kVA)*6	Without DC reactor	2.1	4.0	4.8	8.0	11.5	16	20	27	32	41	52	65	79	99
		With DC reactor	1.2	2.6	3.3	5.0	8.1	10	16	19	24	31	41	50	61	74
Protective structure (JEM 1030) *8			Enclosed type (IP20) *7											Open type (IP00)		
Cooling system			Self-cooling			Forced air cooling										
Approx. mass (kg)			3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13	13	23	35	35

Type FR-F740P-□□K			75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
Applicable motor capacity (kW)*1			75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
Output	Rated capacity (kVA)*2		110	137	165	198	247	275	329	366	416	464	520	586	659	733	833
	Rated current (A)*3		144 (122)	180 (153)	216 (183)	260 (221)	325 (276)	361 (306)	432 (367)	481 (408)	547 (464)	610 (518)	683 (580)	770 (654)	866 (736)	962 (817)	1094 (929)
	Overload current rating*4		120% 60s, 150% 3s (inverse-time characteristics)														
	Rated voltage*5		Three-phase 380 to 480V														
Power supply	Rated input AC voltage/ frequency		Three-phase 380 to 480V 50Hz/60Hz														
	Permissible AC voltage fluctuation		323 to 528V 50Hz/60Hz														
	Permissible frequency fluctuation		±5%														
	Power supply system capacity (kVA)*6	Without DC reactor	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		With DC reactor	110	137	165	198	247	275	329	366	416	464	520	586	659	733	833
Protective structure (JEM 1030)*8			Open type (IP00)														
Cooling system			Forced air cooling														
Approx. mass (kg)			37	50	57	72	72	110	110	175	175	175	260	260	370	370	370

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor. To use a dedicated IPM motor, *refer to page* 88, 90.

*2 The rated output capacity indicated assumes that the output voltage is 440V.

*3 When operating the inverter with the carrier frequency set to 3kHz or more, the carrier frequency automatically decreases if the inverter output current exceeds the value in parentheses of the rated current. This may cause the motor noise to increase.

*4 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*5 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.

*6 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

*7 When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).

*8 FR-DU07: IP40 (except for the PU connector)

Common specification

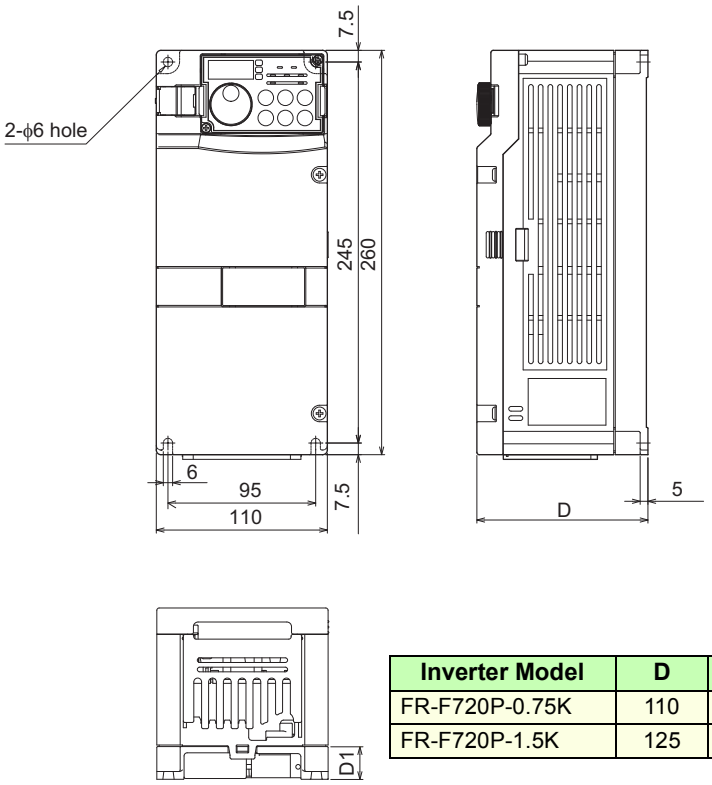
Control specifications	Control method		High carrier frequency PWM control (V/F control)/Optimum excitation control/Simple magnetic flux vector control/IPM motor control
	Output frequency range		0.5 to 400Hz
	Frequency setting resolution	Analog input	0.015Hz/60Hz (terminal 2 and 4: 0 to 10V/12-bit) 0.03Hz/60Hz (terminal 2 and 4: 0 to 5V/11bit, 0 to 20mA/approx.11-bit, terminal 1: 0 to ±10V/12-bit) 0.06Hz/60Hz (terminal 1: 0 to ±5V/11-bit)
		Digital input	0.01Hz
	Frequency accuracy	Analog input	Within ±0.2% of the maximum output frequency (25°C ±10°C)
		Digital input	Within 0.01% of the set output frequency
	Speed control range		1:10 under V/F control, 1:15 under Simple magnetic flux vector control, 1:10 under IPM motor control
	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	General-purpose motor control	Under Simple magnetic flux vector control and slip compensation: 120% (at 3Hz)
		IPM motor control	50%
	Acceleration/deceleration time setting		0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration modes are available.
	DC injection brake		General-purpose motor control: Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) can be changed.
	Stall prevention operation level		Operation current level can be set (0 to 150% variable). Whether to use the function or not can be set.
Operation specifications	Frequency setting signal	Analog input	Terminal 2 and 4: 0 to 10V, 0 to 5V, and 4 to 20mA are available. Terminal 1: -10 to +10V and -5 to 5V are available.
		Digital input	4-digit BCD or 16-bit binary using the setting dial of the operation panel or parameter unit (when used with the option FR-A7AX)
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signals (twelve terminals)		The following signals can be assigned to *Pr. 178 to Pr.189 (input terminal function selection)*: multi-speed selection, remote setting, second function selection, terminal 4 input selection, JOG operation selection, automatic restart after instantaneous power failure/flying start, external thermal relay input, inverter run enable signal (FR-HC2/FR-CV connection), FR-HC2 connection (instantaneous power failure detection), PU operation external interlock signal, PID control enable terminal, PU-External operation switchover, output stop, start self-holding selection, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward/reverse action switchover, PU/NET operation switchover, External/NET operation switchover, command source switchover, DC feeding operation permission, DC feeding cancel, and PID integral value reset.
	Operational functions		Maximum and minimum frequency settings, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, original operation continuation at an instantaneous power failure, electronic bypass operation, forward/reverse rotation prevention, remote setting, second and third function, multi-speed setting, regenerative avoidance, slip compensation, operation mode selection, PID control, and computer link operation (RS-485)
	Output signal Open collector output (five terminals) Relay output (two terminals)	Operating status	The following signals can be assigned to *Pr.190 to Pr.196 (output terminal function selection)*: inverter running, up to frequency, instantaneous power failure/undervoltage, overload warning, output frequency detection, second output frequency detection, regenerative brake prealarm*1, 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/reverse rotation output, electronic bypass MC1*2, electronic bypass MC2*2, electronic bypass MC3*2, fan fault output, heatsink overheat pre-alarm, inverter running start command is ON, during deceleration at occurrence of power failure, during PID control activated, PID deviation limit, IPM motor control*6, during retry, PID output interruption, pulse train output of output power, DC feeding, life alarm, fault output 3 (power-off signal), energy saving average value updated timing, current average value monitor, fault output 2, maintenance timer alarm, remote output, alarm output, and fault output. Fault 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 above, the following signals can be assigned to *Pr.313 to Pr.319 (extension output terminal function selection)*: control circuit capacitor life, main circuit capacitor life, cooling fan life, and inrush current limit circuit life. (Only positive logic can be set to the extension terminals of FR-A7AR.)
	For meter Pulse train output (Max. 2.4kHz: one terminal) Analog output (Max. 10VDC: one terminal)		The following signals can be assigned to *Pr.54 FM terminal function selection(pulse train output) and Pr. 158 AM terminal function selection (analog output)*: output frequency, motor current (steady or peak value), output voltage, frequency setting value, running speed, converter output voltage (steady or peak value), electronic thermal relay load factor, input power, output power, load meter, reference voltage output, motor load factor, energy saving effect, regenerative brake duty*1, PID set point, and PID measured value.
Indication	Operation panel (FR-DU07) Parameter unit (FR-PU07)	Operating status	Output frequency, motor current (steady or peak value), output voltage, fault display, frequency setting value, running speed, converter output voltage (steady or peak value), electronic thermal relay load factor, input power, output power, load meter, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative energy savings, regenerative brake duty*1, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*3, output terminal option monitor*3, option fitting status monitor*4, and terminal assignment status*4.
		Fault record	Fault record is displayed when a fault occurs. Past 8 fault records (output voltage/current/frequency/cumulative energization time right before the fault occurs) are stored.
		Interactive guidance	Function (help) for operation guide and troubleshooting*4

Protective/ warning function		Protective function	Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration/stop, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration/stop, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase loss*5, stall prevention stop, output side earth (ground) fault overcurrent, output phase loss, external thermal relay operation*5, PTC thermistor operation*5, option fault, parameter error, PU disconnection*5, retry count excess*5, CPU fault, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess*5, inrush current limit circuit fault, communication fault (inverter), analog input fault, PID signal fault*5, internal circuit fault (15V power supply), brake transistor alarm detection*1, loss of synchronism detection*6, overspeed occurrence*5*6.
		Warning function	Fan alarm, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm*5, electronic thermal relay function prealarm, PU stop, maintenance timer alarm*3*5, parameter write error, copy operation error, operation panel lock, parameter copy warning, password locked *5
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing)
	Ambient humidity		90% RH or less (non-condensing)
	Storage temperature*7		-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 *8 at 10 to 55Hz (directions of X, Y, Z axes)

*1 This function is only available for 75K or higher.
*2 This function is only available under general-purpose motor control.
*3 This can be displayed only on the operation panel (FR-DU07).
*4 This can be displayed only on the option parameter unit (FR-PU07).
*5 This protective function is not available in the initial status.
*6 This function is available only when an IPM motor is connected.
*7 Temperature applicable for a short time, e.g. in transit.
*8 2.9m/s^2 or less for 185K or higher.

Outline Dimension Drawing

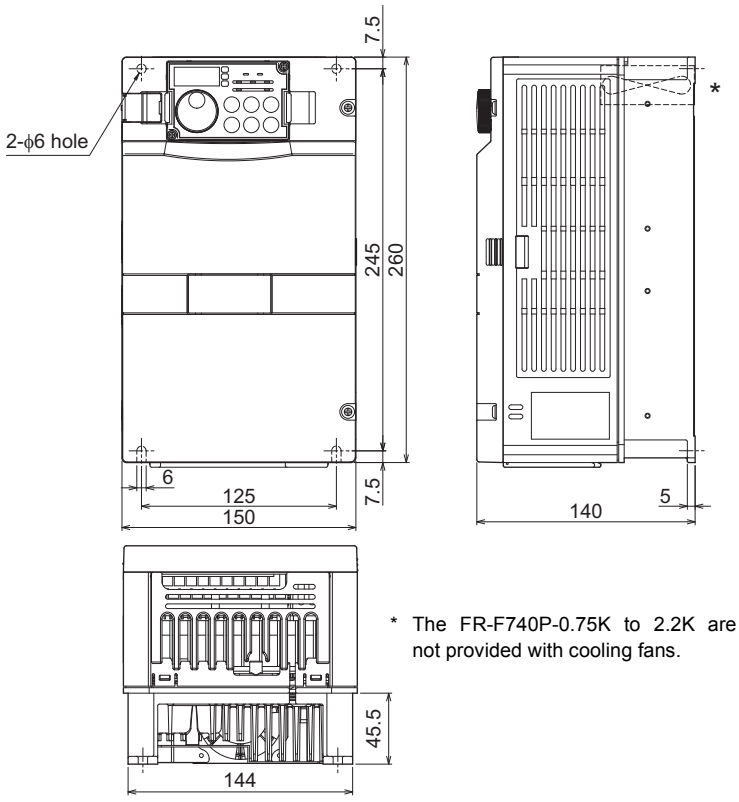
- **FR-F720P-0.75K, 1.5K**



Inverter Model	D	D1
FR-F720P-0.75K	110	21
FR-F720P-1.5K	125	36

(Unit: mm)

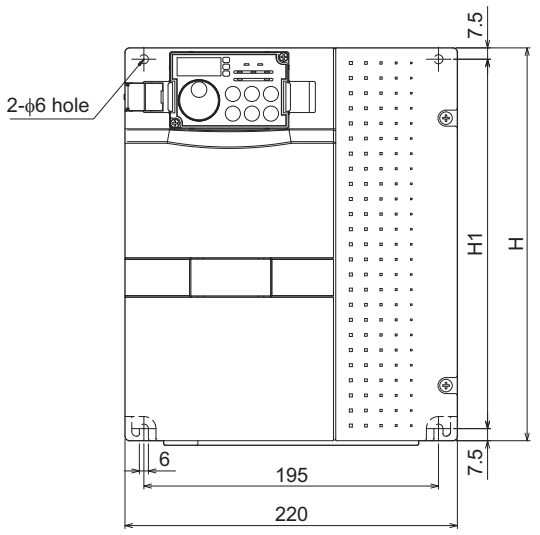
- **FR-F720P-2.2K, 3.7K, 5.5K**
- **FR-F740P-0.75K, 1.5K, 2.2K, 3.7K, 5.5K**

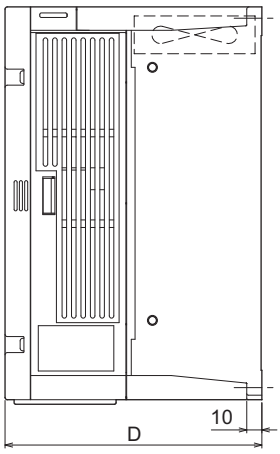


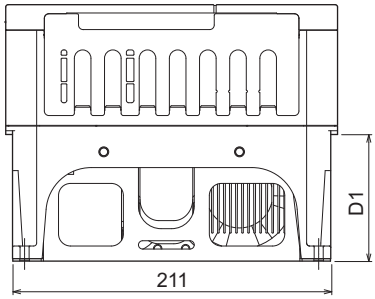
* The FR-F740P-0.75K to 2.2K are not provided with cooling fans.

(Unit: mm)

- **FR-F720P-7.5K, 11K, 15K**
- **FR-F740P-7.5K, 11K, 15K, 18.5K**



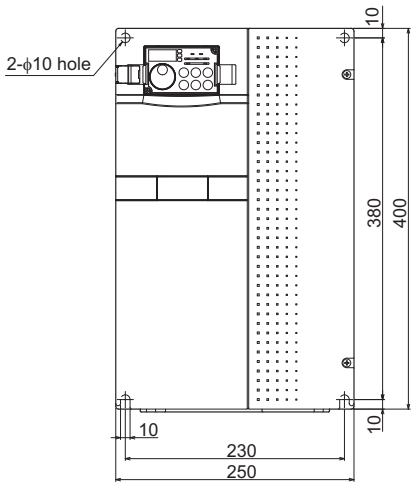


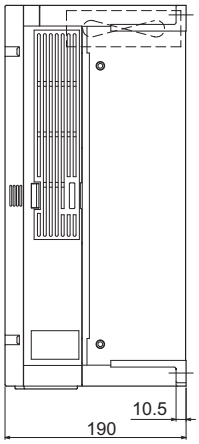


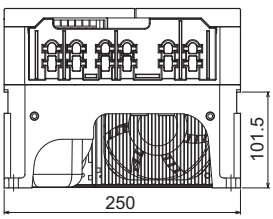
Inverter Model	H	H1	D	D1
FR-F720P-7.5K, 11K FR-F740P-7.5K, 11K	260	245	170	84
FR-F720P-15K FR-F740P-15K, 18.5K	300	285	190	101.5

(Unit: mm)

- **FR-F720P-18.5K, 22K, 30K**
- **FR-F740P-22K, 30K**



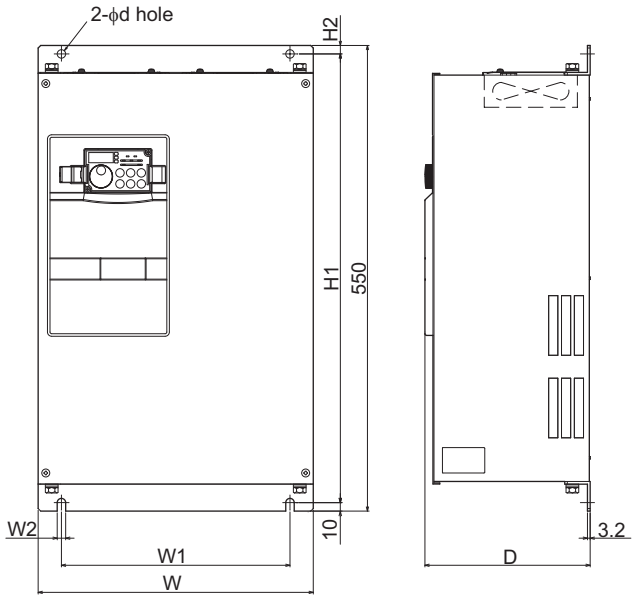




* The FR-F720P-30K is not provided with a wiring cover.

(Unit: mm)

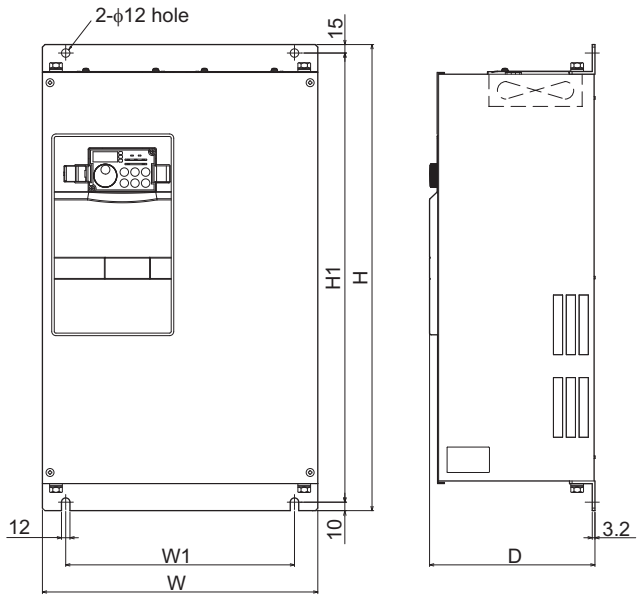
- **FR-F720P-37K, 45K, 55K**
- **FR-F740P-37K, 45K, 55K**



Inverter Model	W	W1	W2	H1	H2	d	D
FR-F720P-37K FR-F740P-37K	325	270	10	530	10	10	195
FR-F720P-45K, 55K FR-F740P-45K, 55K	435	380	12	525	15	12	250

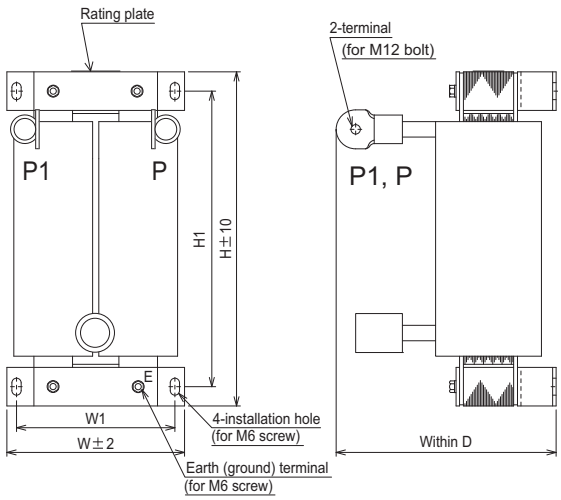
(Unit: mm)

- **FR-F740P-75K, 90K**



Inverter Model	W	W1	H	H1	D
FR-F740P-75K	435	380	550	525	250
FR-F740P-90K	465	400	620	595	300

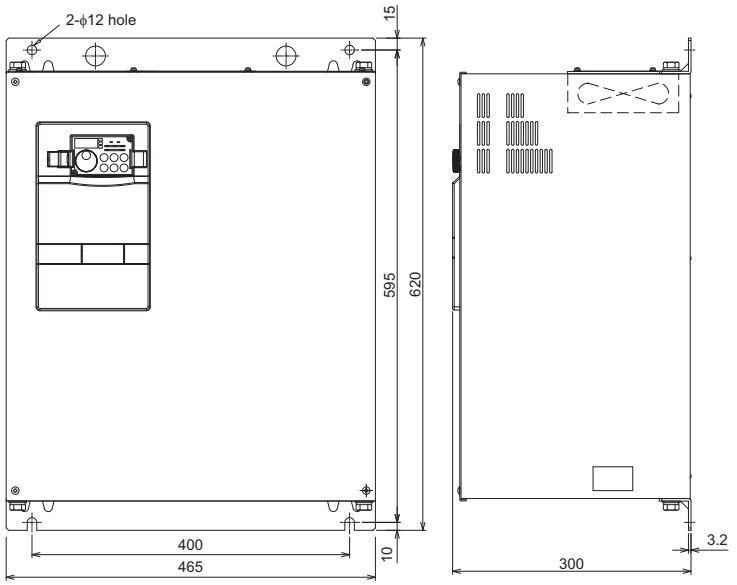
- **DC reactor supplied**



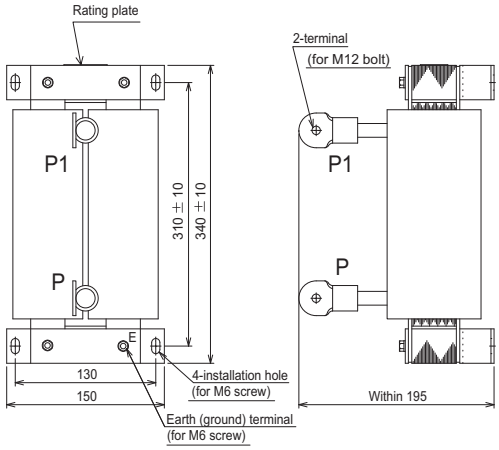
DC reactor Model	W	W1	H	H1	D	Mass (kg)
FR-HEL-H75K (FR-F740P-75K)	140	120	320	295	185	16
FR-HEL-H90K (FR-F740P-90K)	150	130	340	310	190	20

(Unit: mm)

• FR-F740P-110K



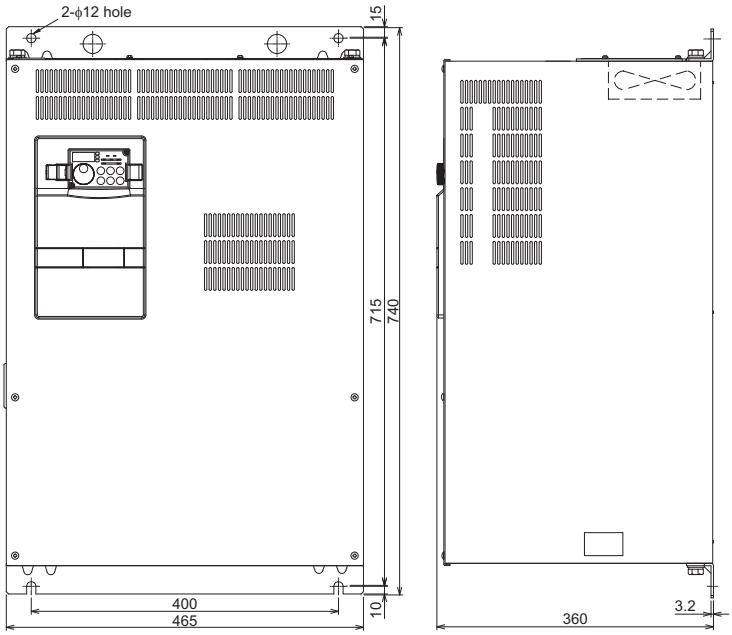
• DC reactor supplied



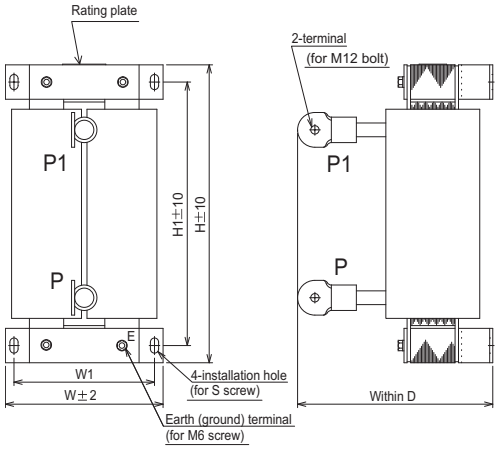
DC reactor Model	Mass (kg)
FR-HEL-H110K(FR-F740P-110K)	22

(Unit: mm)

• FR-F720P-75K, 90K, 110K
• FR-F740P-132K, 160K



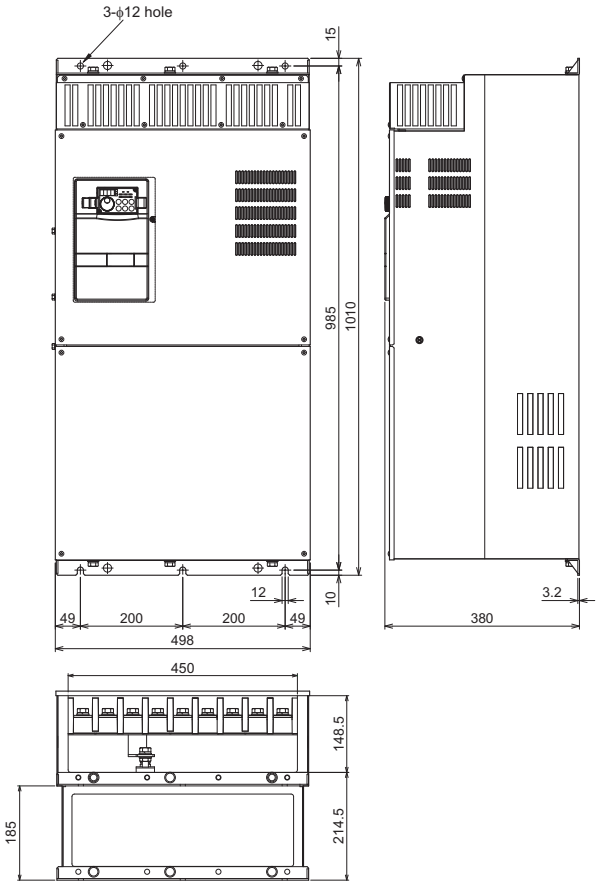
• DC reactor supplied



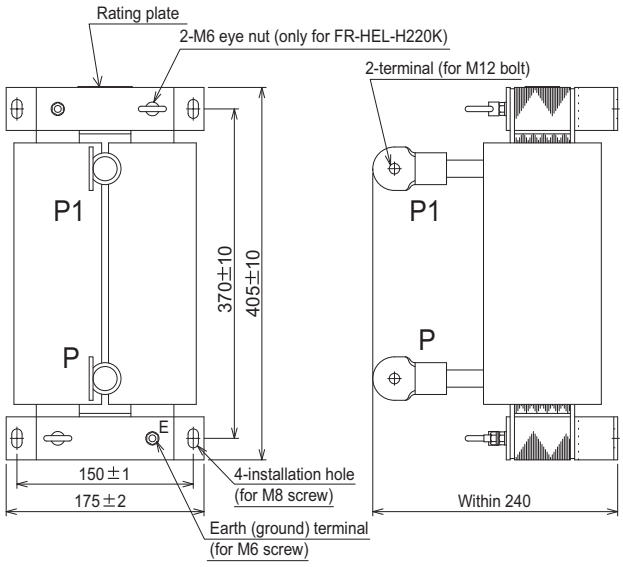
DC reactor Model	W	W1	H	H1	D	S	Mass (kg)
FR-HEL-75K(FR-F720P-75K)	150	130	340	310	190	M6	17
FR-HEL-90K(FR-F720P-90K)	150	130	340	310	200	M6	19
FR-HEL-110K(FR-F720P-110K)	175	150	400	365	200	M8	20
FR-HEL-H132K(FR-F740P-132K)	175	150	405	370	200	M8	26
FR-HEL-H160K(FR-F740P-160K)	175	150	405	370	205	M8	28

(Unit: mm)

• FR-F740P-185K, 220K



• DC reactor supplied

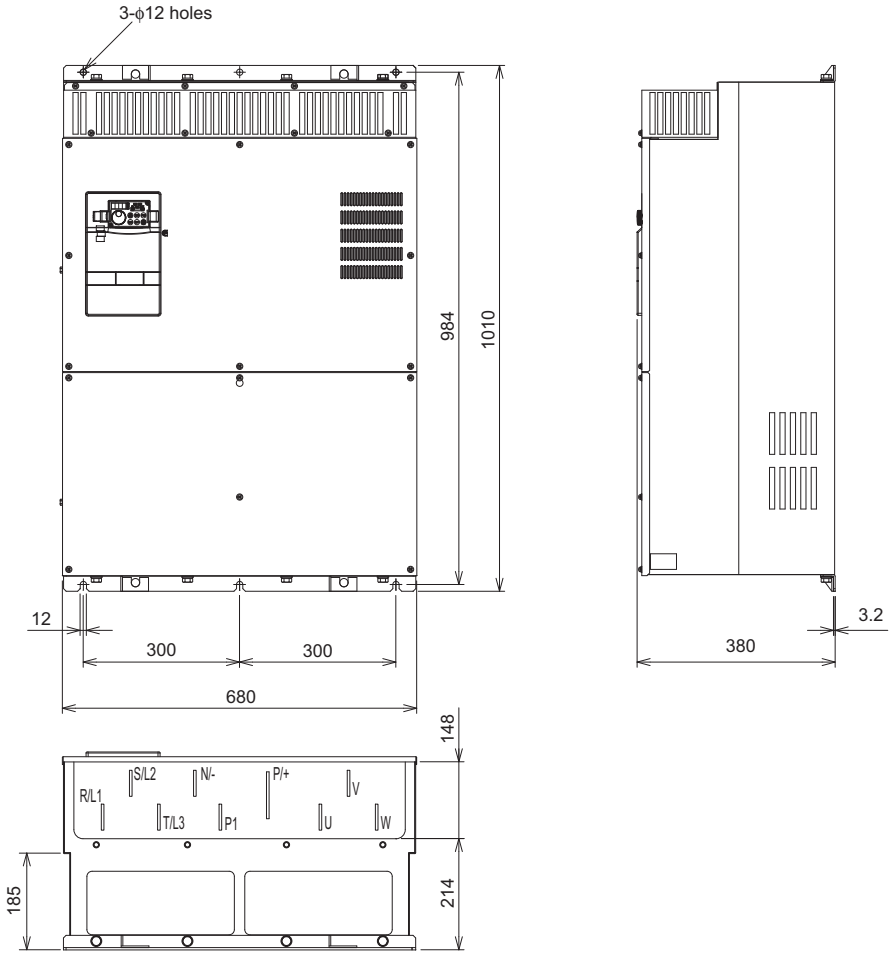


* Remove the eye nut after installation of the product.

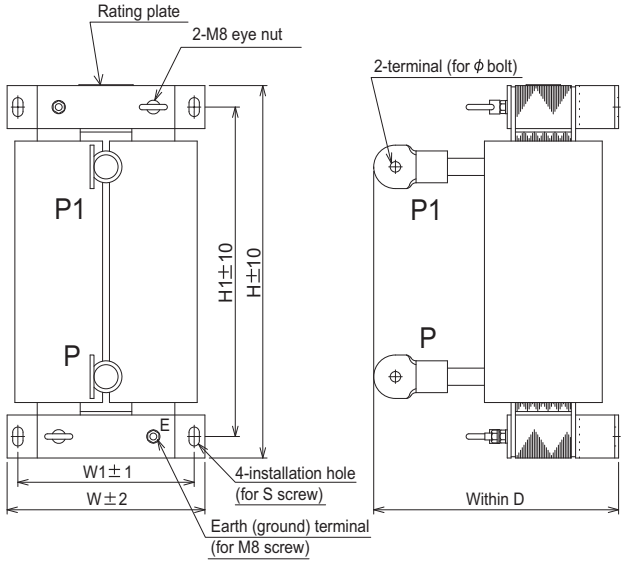
DC reactor Model	Mass (kg)
FR-HEL-H185K (FR-F740P-185K)	29
FR-HEL-H220K (FR-F740P-220K)	30

(Unit: mm)

• **FR-F740P-250K, 280K, 315K**



• **DC reactor supplied**

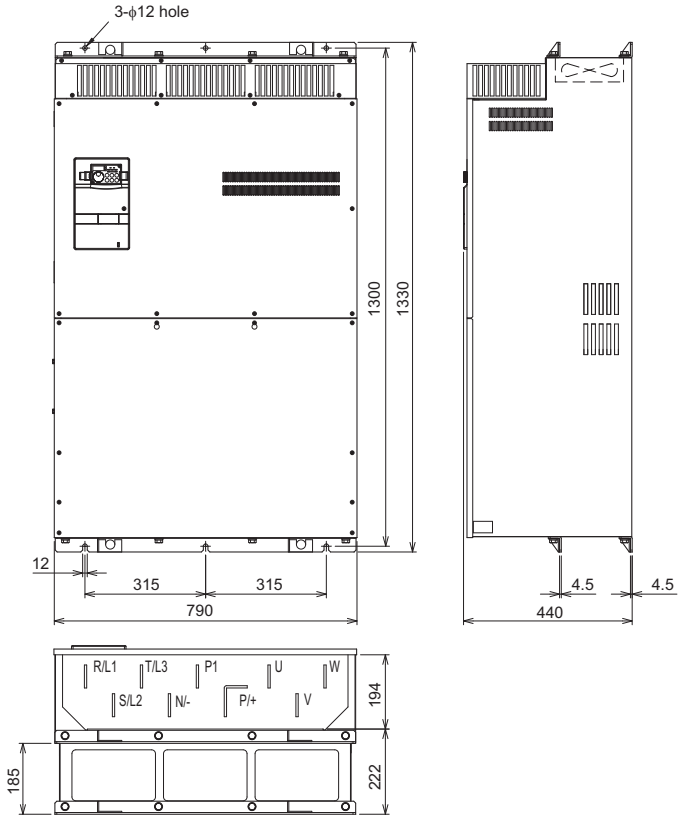


* Remove the eye nut after installation of the product.

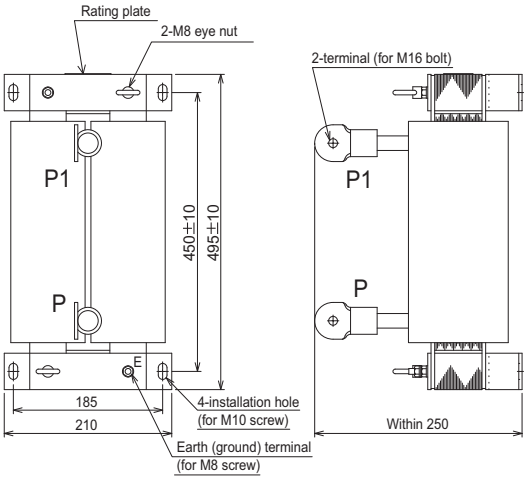
DC reactor Model	W	W1	H	H1	D	S	φ	Mass (kg)
FR-HEL-H250K(FR-F740P-250K)	190	165	440	400	250	M8	M12	35
FR-HEL-H280K(FR-F740P-280K)	190	165	440	400	255	M8	M16	38
FR-HEL-H315K(FR-F740P-315K)	210	185	495	450	250	M10	M16	42

(Unit: mm)

• FR-F740P-355K, 400K



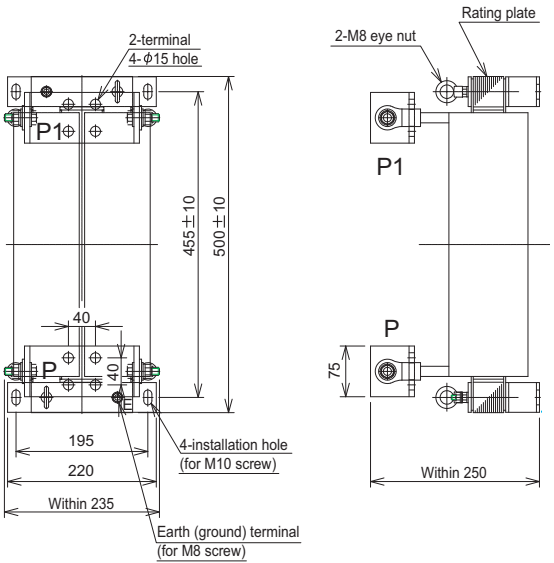
• DC reactor supplied



* Remove the eye nut after installation of the product.

DC reactor Model	Mass (kg)
FR-HEL-H355K (FR-F740P-355K)	46

• DC reactor supplied

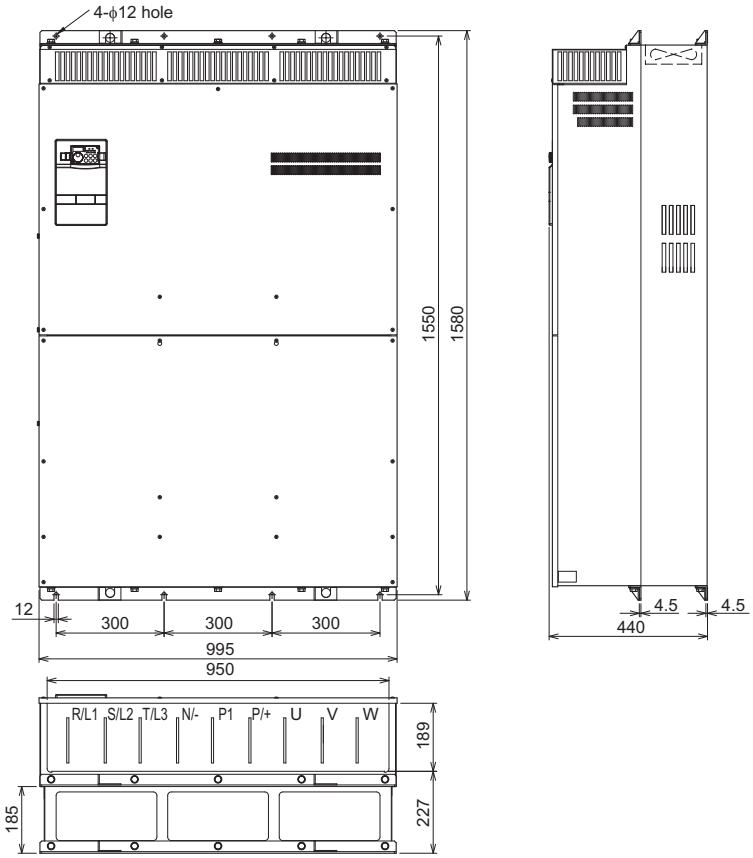


* Remove the eye nut after installation of the product.

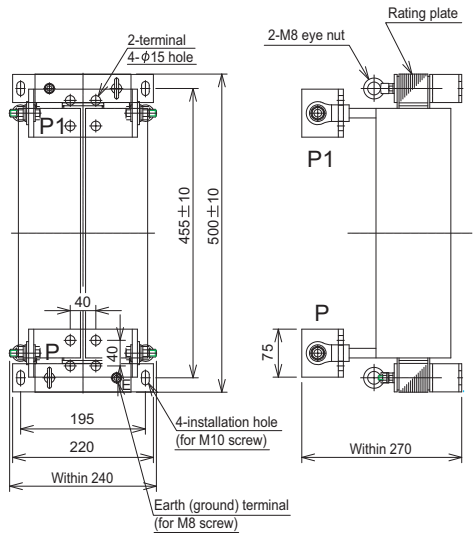
DC reactor Model	Mass (kg)
FR-HEL-H400K (FR-F740P-400K)	50

(Unit: mm)

• FR-F740P-450K, 500K, 560K



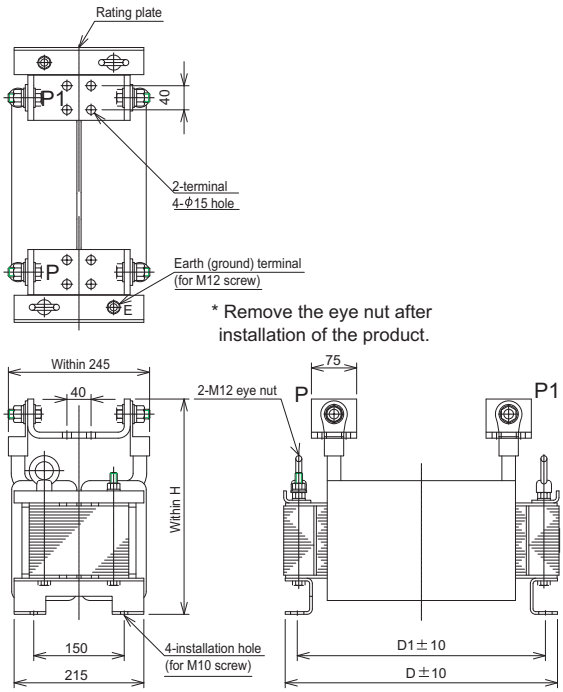
• DC reactor supplied



* Remove the eye nut after installation of the product.

DC reactor Model	Mass (kg)
FR-HEL-H450K(FR-F740P-450K)	57

• DC reactor supplied



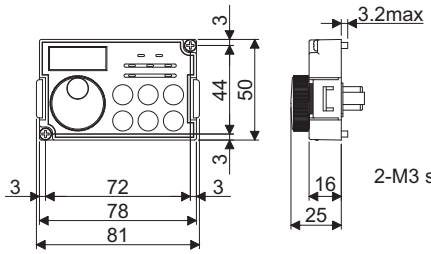
* Remove the eye nut after installation of the product.

DC reactor Model	H	D	D1	Mass (kg)
FR-HEL-H500K (FR-F740P-500K)	345	455	405	67
FR-HEL-H560K (FR-F740P-560K)	360	460	410	85

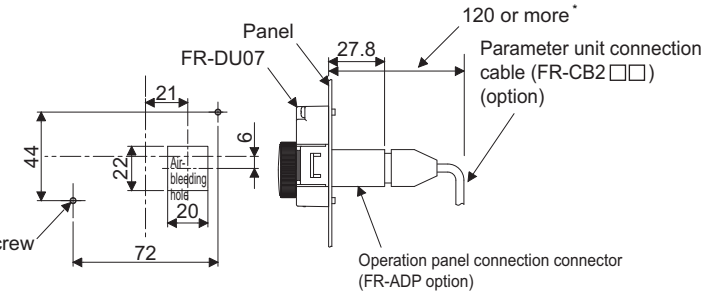
(Unit: mm)

• Operation panel (FR-DU07)

<Outline drawing>



<Panel cutting dimension drawing>

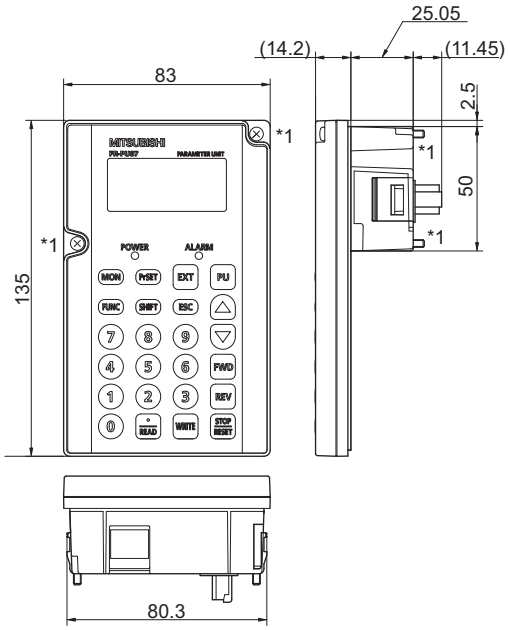


* Denotes the space required to connect an optional parameter unit connection cable (FR-CB2☐☐). When using another cable, leave the space required for the cable specification.

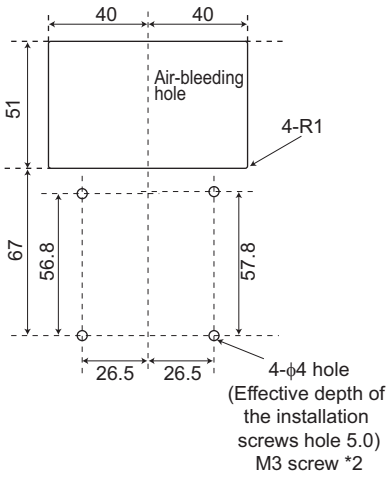
(Unit: mm)

• 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)

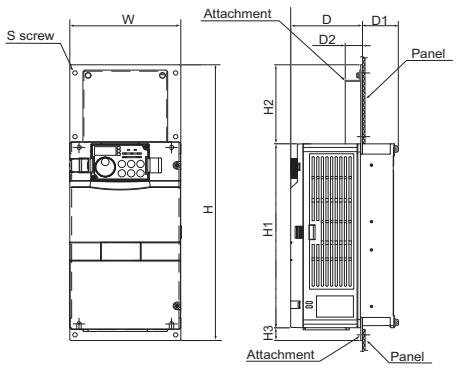
Heatsink protrusion procedure

When encasing the inverter in an enclosure, the generated heat amount in an enclosure can be greatly reduced by installing the heatsink portion of the inverter outside the enclosure. When installing the inverter in a compact enclosure, etc., this installation method is recommended.
For the 185K or higher, a heatsink can be protruded outside the enclosure without using an attachment.

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

For the FR-F720P-2.2K to 110K and FR-F740P-0.75K to 160K, a heatsink can be protruded outside the enclosure using a heatsink protrusion attachment (FR-A7CN).
Refer to the instruction manual of the heatsink protrusion attachment (FR-A7CN) for details.

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

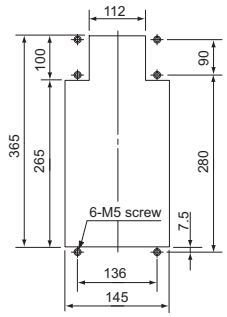


Type	W	H	H1	H2	H3	D	D1	D2	S
FR-A7CN01	150	389.5	260	111.5	18	97	48.4	23.3	M5
FR-A7CN02	245	408.5	260	116.5	32	86	89.4	12.3	M5
FR-A7CN03	245	448.5	300	116.5	32	89	106.4	20	M5
FR-A7CN04	280	554	400	122	32	88.5	110.6	45.3	M8
FR-A7CN05	338	645	480	130	35	123.5	71.5	105	M8
FR-A7CN06	338	645	480	130	35	123.5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

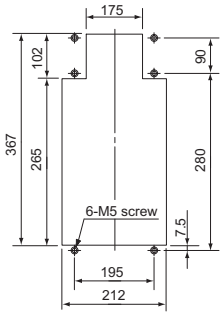
(Unit: mm)

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

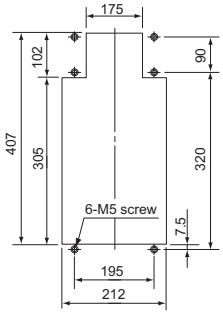
FR-A7CN01



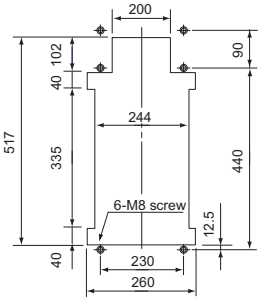
FR-A7CN02



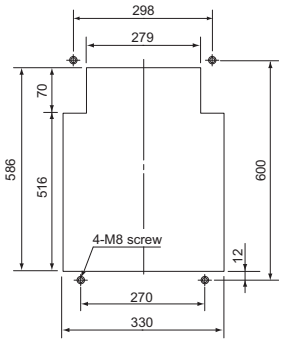
FR-A7CN03



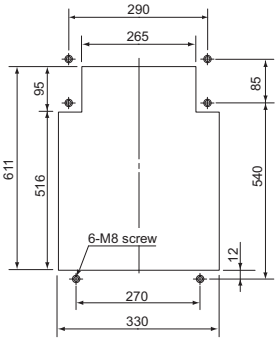
FR-A7CN04



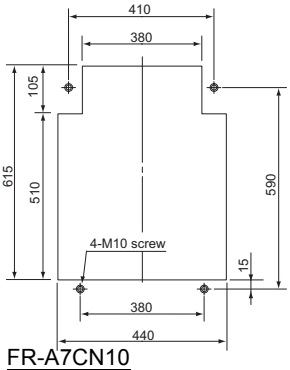
FR-A7CN05



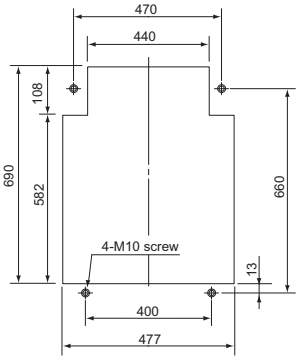
FR-A7CN06



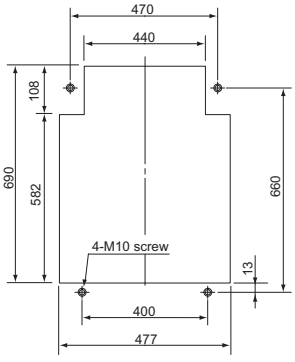
FR-A7CN07



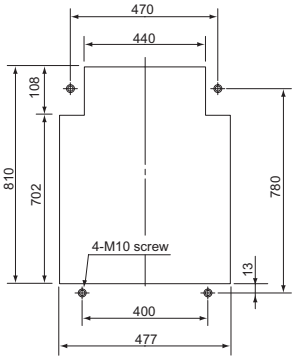
FR-A7CN08



FR-A7CN09



FR-A7CN10



Refer to *page 68* for the correspondence table of the attachment and inverter.

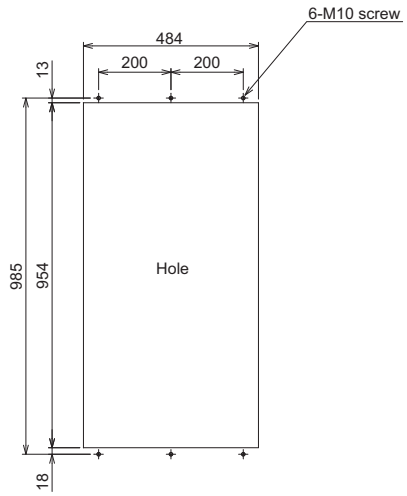
(Unit: mm)

●Protrusion of heatsink of the FR-F740P-185K or higher

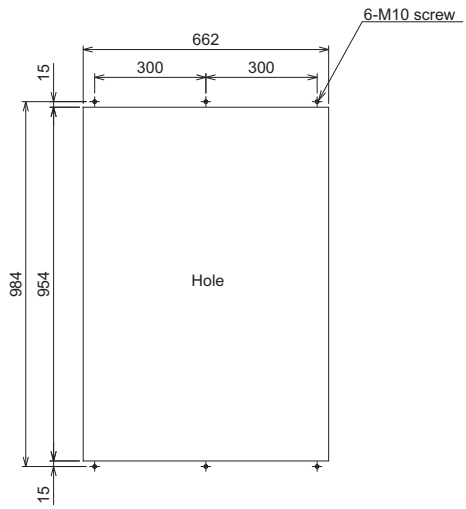
●Panel cutting

Cut the panel of the enclosure according to the inverter capacity.

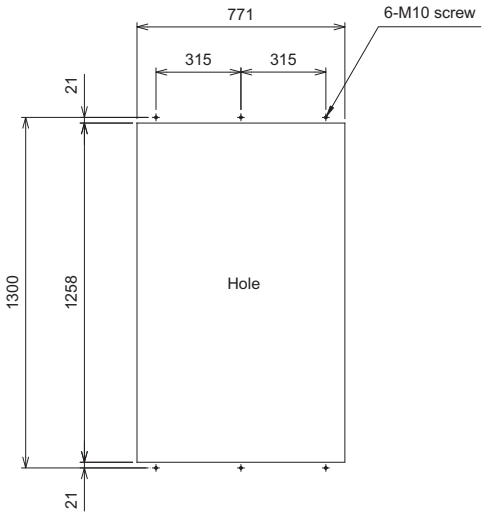
● FR-F740P-185K, 220K



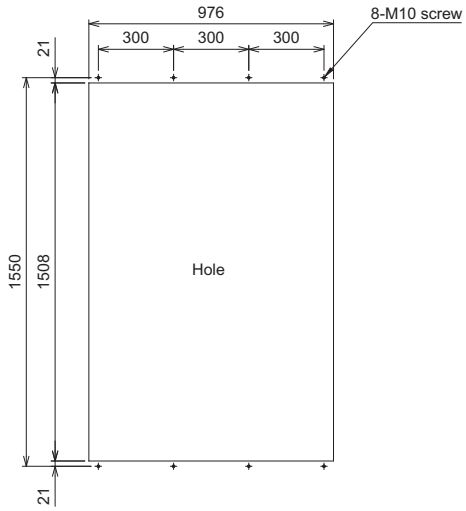
● FR-F740P-250K, 280K, 315K



● FR-F740P-355K, 400K



● FR-F740P-450K, 500K, 560K

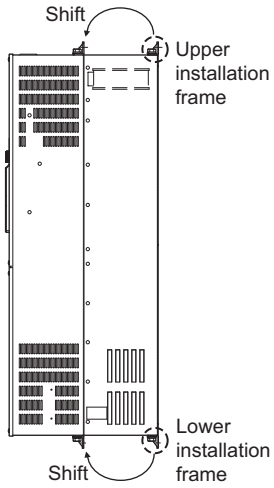


(Unit: mm)

● Shift and removal of a rear side installation frame

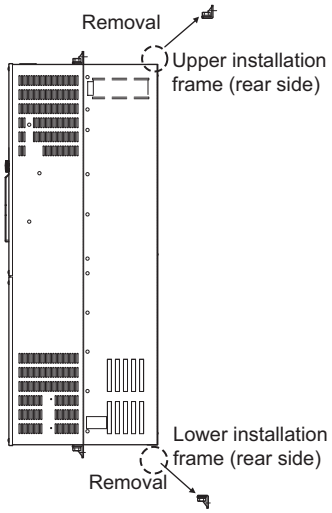
- FR-F740P-185K to 315K

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



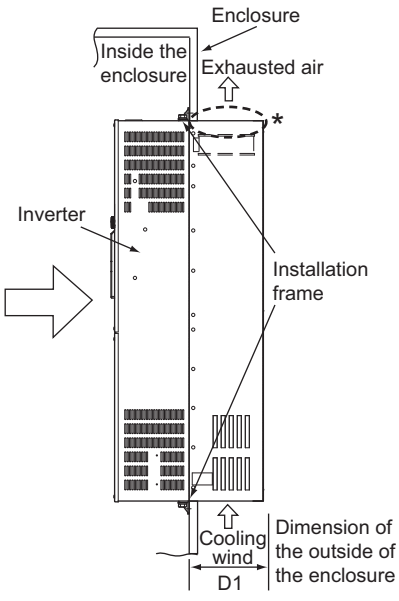
- FR-F740P-355K or higher

  Two installation frames each are attached to the upper and lower parts of the inverter. Remove the rear side installation frame on the upper and lower side of the inverter as shown below.

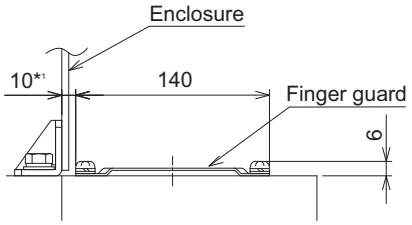


- Installation of the inverter

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



* For the FR-F740P-185K or higher, there are finger guards behind the enclosure. Therefore, the thickness of the panel should be less than 10mm(*1) and also do not place anything around finger guards to avoid contact with the finger guards.



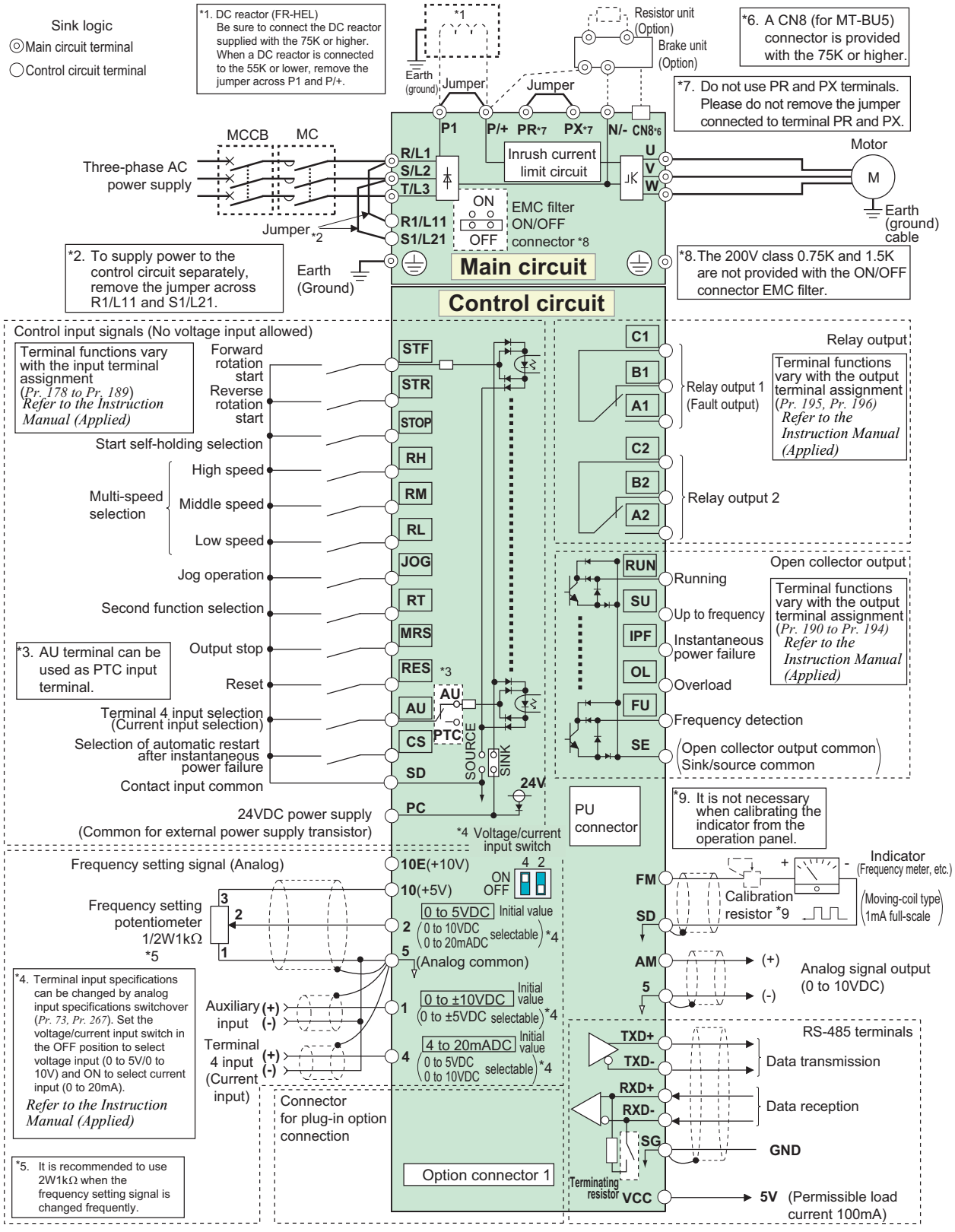
Inverter Model	D1
FR-F740P-185K, 220K	185
FR-F740P-250K to 560K	184

(Unit: mm)

CAUTION

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

Terminal Connection Diagram



CAUTION

- To prevent a malfunction 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. Operation with a wrong setting may cause a fault, failure or malfunction.

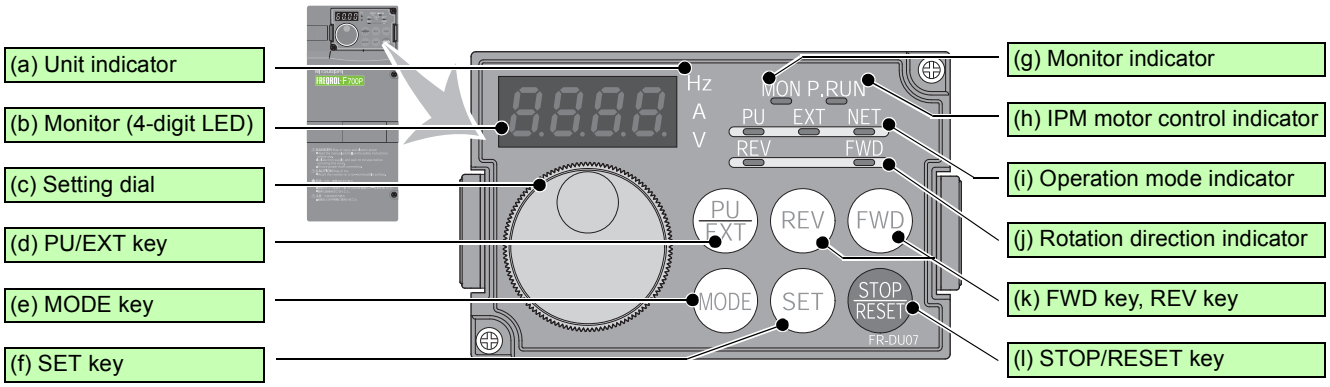
Terminal Specification Explanation

Type	Terminal Symbol	Terminal Name	Description	
Main circuit	R/L1, S/L2, T/L3	AC power input	Connect to the commercial power supply.	
	U, V, W	Inverter output	Connect a three-phase squirrel-cage motor or dedicated IPM motor.	
	R1/L11, S1/L21	Power supply for control circuit	Connected to the AC power supply terminals R/L1 and S/L2. To retain the alarm display and alarm output, apply external power to this terminal.	
	P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2), power regeneration common converter (FR-CV), power regeneration converter (MT-RC) or high power factor converter (FR-HC2).	
	P/+, P1	DC reactor connection	For the 55K or lower, remove the jumper across terminals P/+ - P1 and connect the DC reactor. (For the 75K or higher, a DC reactor is supplied as standard.)	
	PR, PX	Please do not remove or use terminals PR and PX or the jumper connected.		
	⏚	Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded).	
Control circuit input signal / Contact input	STF	Forward rotation start	Turn on the STF signal to start forward rotation and turn it off to stop.	When the STF and STR signals are turned on simultaneously, the stop command is given.
	STR	Reverse rotation start	Turn on the STR signal to start reverse rotation and turn it off to stop.	
	STOP	Start self-holding selection	Turn on the STOP signal to self-hold the start signal.	
	RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.	
	JOG	Jog mode selection	Turn on the JOG signal to select Jog operation (initial setting) and turn on the start signal (STF or STR) to start Jog operation.	
	RT	Second acceleration/ deceleration time selection	Turn on the RT signal to select second acceleration/deceleration time. When the second function such as "second torque boost" and "second V/F (base frequency)" are set, turning on the RT signal selects these functions.	
	MRS	Output stop	Turn on the MRS signal (20ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.	
	RES	Reset	Used to reset alarm output provided when protective function is activated. Turn on the RES signal for more than 0.1s, then turn it off. Recover about 1s after reset is cancelled.	
	AU	Terminal 4 input selection	Terminal 4 is made valid only when the AU signal is turned on. (The frequency setting signal can be set between 4 and 20mADC.) Turning the AU signal on makes terminal 2 (voltage input) invalid.	
		PTC input	AU terminal is used as PTC input terminal (thermal protection of the motor). When using it as PTC input terminal, set the AU/PTC switch to PTC.	
	CS	Selection of automatic restart after instantaneous power failure	When the CS signal is left on, the inverter restarts automatically at power restoration. Note that restart setting is necessary for this operation. In the initial setting, a restart is disabled.	
	SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.	
		External transistor common (source)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction 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)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable currents.	
		Contact input common (source)	Common terminal for contact input terminal (source logic).	
		24VDC power supply	Can be used as 24VDC 0.1A power supply.	
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 when connecting it to terminal 10E.	10VDC, permissible load current 10mA.
	10			5VDC, Permissible load current 10mA.
	2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V, 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).	Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC Current input: Input resistance 245Ω ± 5Ω Maximum permissible current 30mA
	4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA (5V, 10V) makes input and output proportional. This input signal is valid only when the AU signal is ON (terminal 2 input is invalid). Use *Pr. 267* to switch 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	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). Input resistance 10kΩ ± 1kΩ, Maximum permissible voltage ± 20VDC	
	5	Frequency setting common	Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground).	

Type		Terminal Symbol	Terminal Name	Description		
Control circuit/output signal	Relay	A1, B1, C1	Relay output 1 (alarm output)	Changeover contact output indicates that the inverter protective function has activated and the output stopped. Abnormal: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C) Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A		
		A2, B2, C2	Relay output 2	1 changeover contact output Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A		
	Open collector	RUN	Inverter running	Switched low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched high during stop or DC injection brake operation. *		Permissible load 24VDC 0.1A (a voltage drop is 3.4V maximum when the signal is on) * Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).
		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.*	Alarm code (4bit) output (Refer to *page 50*)	
		OL	Overload alarm	Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled.*		
		IPF	Instantaneous power failure	Switched low when an instantaneous power failure and under voltage protections are activated.*		
		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.*		
		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 1440 pulse/s at 60Hz (general-purpose motor control) 1440 pulse/s at 90Hz (IPM motor control with 30K or lower) 1440 pulse/s at 120Hz (IPM motor control with 37K or higher)	
	Analog	AM	Analog signal output		Output item: Output frequency (initial setting) Output signal 0 to 10VDC Permissible load current 1mA (load impedance 10kΩ or more) Resolution 8 bit	
Communication		PU connector	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 . Communication speed : 4800 to 38400bps . Overall length : 500m		
	RS-485 terminal	TXD+	Inverter transmission terminal	With the RS-485 terminal, 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		
		TXD-				
		RXD+	Inverter reception terminal			
		RXD-				
		SG	Earth (Ground)			

CAUTION

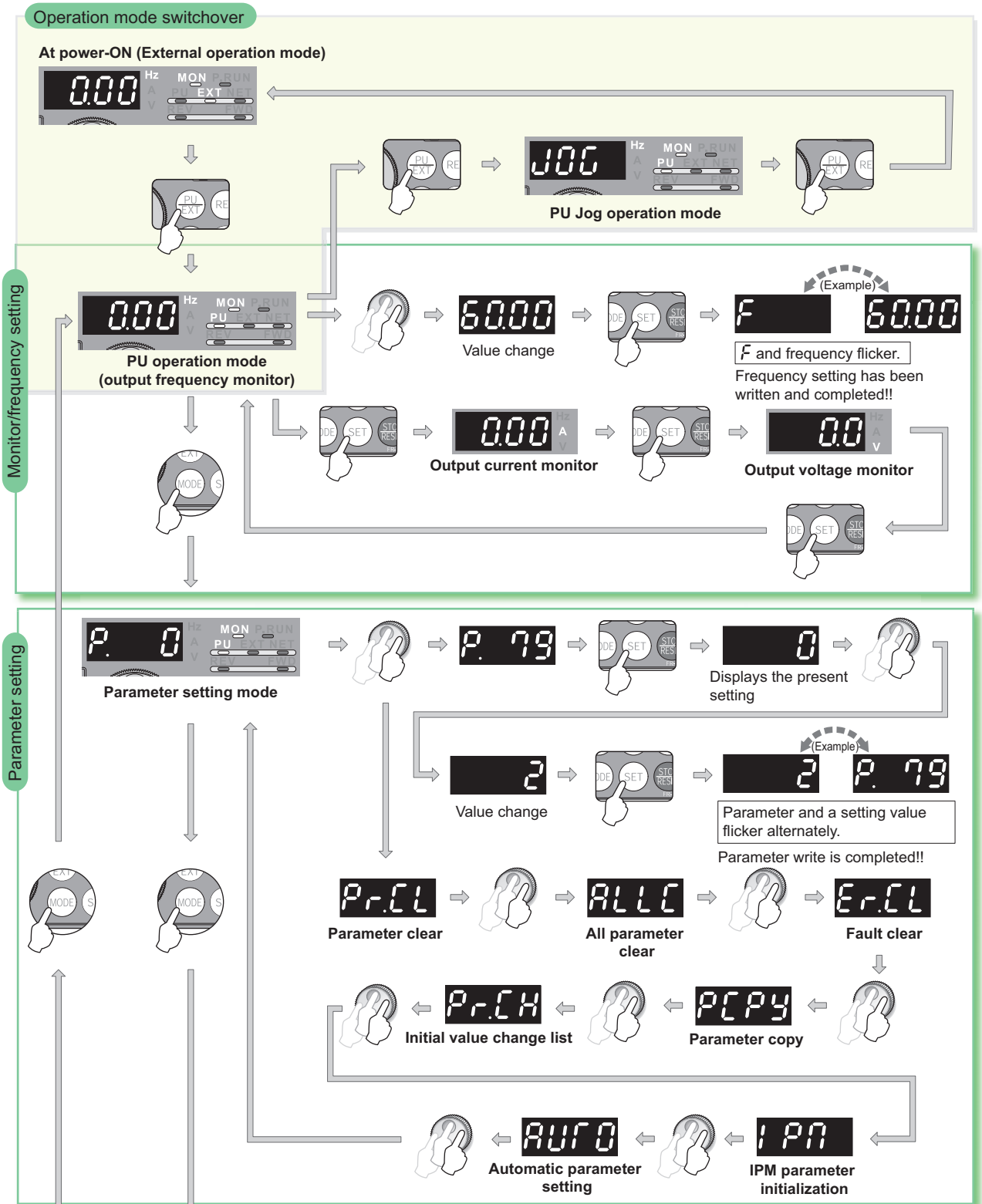
- The inverter will be damaged if power is applied to the inverter output terminals (U, V, W). Never perform such wiring.
- ▭ indicates that terminal functions can be selected from *Pr. 178 to Pr. 196* (I/O terminal function selection)



No.	Component	Name	Description
(a)	Hz A V	Unit indicator	Hz: Lit to indicate frequency. (Flickers when the set frequency monitor is displayed.) A: Lit to indicate current. V: Lit to indicate voltage.
(b)	8.8.8.8.	Monitor (4-digit LED)	Shows the frequency, parameter number, etc. (To monitor the output power, set frequency and other items, set *Pr.52*.)
(c)		Setting dial	The dial of the Mitsubishi inverters. The setting dial is used to change the frequency and parameter settings. Press the setting dial to perform the following operations: • To display a set frequency in the monitor mode • To display the present setting during calibration • To display a fault history number in the faults history mode
(d)	PU/EXT	PU/EXT key	Used to switch between the PU and External operation modes. To use the External operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indicator. (Press MODE simultaneously (0.5s), or change the *Pr.79* setting to change to the combined operation mode.) PU: PU operation mode EXT: External operation mode Used to cancel the PU stop also.
(e)	MODE	MODE key	Used to switch among different setting modes. Pressing PU/EXT simultaneously changes the operation mode. Holding this key for 2 seconds locks the operation. The key lock is invalid when *Pr.161* = "0 (initial setting)." (*Refer to page 55.*)
(f)	SET	SET key	Used to enter a setting. If pressed during the operation, monitored item changes as the following: Output frequency → Output current → Output voltage* * Energy saving monitor is displayed when the energy saving monitor is set with *Pr. 52*.
(g)	MON	Monitor indicator	Lit to indicate the monitor mode.
(h)	P.RUN	IPM motor control indicator	Lit to indicate IPM motor control. Flickers to indicate IPM motor test operation.
(i)	PU EXT NET	Operation mode indicator	PU: Lit to indicate the PU operation mode. EXT: Lit to indicate the External operation mode. (EXT is lit at power-ON in the initial setting.) NET: Lit to indicate the Network operation mode. PU and EXT: Lit to indicate EXT/PU combined operation mode 1 and 2
(j)	REV FWD	Rotation direction indicator	FWD: Lit to indicate the forward rotation. REV: Lit to indicate the reverse rotation. Lit: When the forward/reverse operation is being performed. Flickers: When the frequency command is not given even if the forward/reverse command is given. When the frequency command is lower than the starting frequency. When the MRS signal is being input.
(k)	FWD REV	FWD key, REV key	FWD key: Used to give a start command in forward rotation. REV key: Used to give a start command in reverse rotation.
(l)	STOP RESET	STOP/RESET key	Used to stop operation commands. Used to reset a fault when the protective function (fault) is activated.

Basic operation

Operation mode switchover



Parameter unit (FR-PU07), parameter unit with battery pack (FR-PU07BB(-L))

- The parameter unit is a convenient tool for inverter setting such as direct input method with a numeric keypad, operation status indication, and help function.
- Eight languages can be displayed.
- Parameter setting values of maximum of three inverters can be stored.
- With the FR-PU07BB(-L), parameter check and setting change can be made without connecting a power supply to the inverter. Use AA nickel hydride batteries, AA alkali batteries, or AC adapter separately available as power supply.
- Since the shape is specially designed for portable use, it is easy to work with the FR-PU07BB(-L) in hand.

* The parameter unit connection cable FR-CB20☐ is required for connecting to the inverter. (Parameter unit connection cable FR-CB203(3m) is enclosed with FR-PU07BB(-L).)

* To use a parameter unit with battery pack (FR-PU07BB) outside Japan, order a "FR-PU07BB-L" (parameter unit type indicated on the package has L at the end). Since enclosed batteries may conflict with laws in countries to be used (new EU Directive on batteries and accumulators, etc.), batteries are not enclosed with an FR-PU07BB-L.

Key	Description
PrSET	Use for parameter setting Press to choose the parameter setting mode.
MON	First priority monitor is displayed. In the initial setting, the output frequency is displayed.
ESC	Operation cancel key
FUNC	Used to display the function menu. A variety of functions can be used on the function menu.
SHIFT	Used to shift to the next item in the setting or monitoring mode.
0 to 9	Used to enter a frequency, parameter number or set value.
EXT	Inverter operates in the External operation mode.
PU	Used to select the PU operation mode to display the frequency setting screen.
▲ / ▼	• Used to keep on increasing or decreasing the running frequency. Hold down to vary the frequency. • Press either of these keys on the parameter setting mode screen to change the parameter setting value sequentially. • On the selecting screen, these keys are used to move the cursor.
FWD	Forward rotation command key.
REV	Reverse rotation command key.
STOP RESET	• Stop command key. • Used to reset the inverter when an alarm occurs.
WRITE	• Used to write a set value in the setting mode. • Used as a clear key in the all parameter clear or alarm history clear mode.
• READ	• Used as a decimal point when entering numerical value. • Press to read the item selected with the cursor.

FR-PU07

POWER lamp
Lit when the power turns on.

Monitor
- Liquid crystal display (16 characters x 4 lines with backlight)
- Interactive parameter setting
- Trouble shooting guidance
- Monitor (frequency, current, power, etc.)

ALARM lamp
Lit to indicate an inverter alarm occurrence.

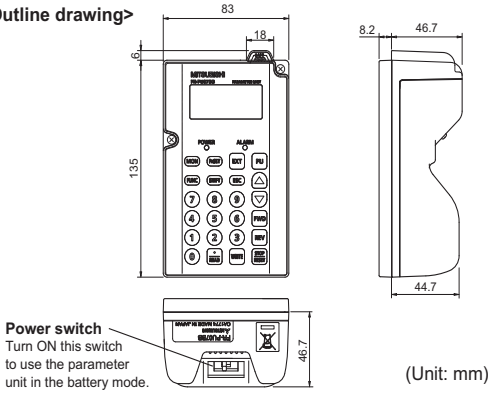
Operation keys
(Refer to the table on the right)

FR-PU07 attached to the inverter

FR-PU07BB(-L)

Low battery warning lamp
Lit when the battery is low.
Green: Normal condition
Orange: Low battery (lasts 50 min.)

<Outline drawing>



Power switch
Turn ON this switch to use the parameter unit in the battery mode.

(Unit: mm)

●Main functions

Function	Description
Monitor	6 types of monitors appear by simply pressing SHIFT.
Frequency setting	For PU operation mode and External/PU combined operation mode (*Pr.79* = "3"), frequency setting is available. Settings is performed by the direct setting, which sets frequency directly by 0 to 9, and the step setting, which sets frequency continuously by ▲ ▼.
Parameter Setting	Reading parameter and changing setting values are easily done. To change the setting value of an parameter, specify the parameter number, or select a parameter from the functional parameter list.
Batch copy	FR-PU07 (PU07BB) reads parameter settings of an inverter, and stores three different parameter settings. FR-PU07 (PU07BB) can also copy the stored parameter setting to another inverter of the same series, or verify its stored parameter setting against the parameter setting stored in an inverter.
Operation	Switching between External operation mode [EXT] and PU operation mode [PU] is easy. Start/stop is enabled during PU operation mode and External/PU operation mode (*Pr.79* = "3").

* Available function differs by the inverter. Please refer to the instruction manual of the inverter and the parameter unit

FR-SW3-SETUP-WE *1

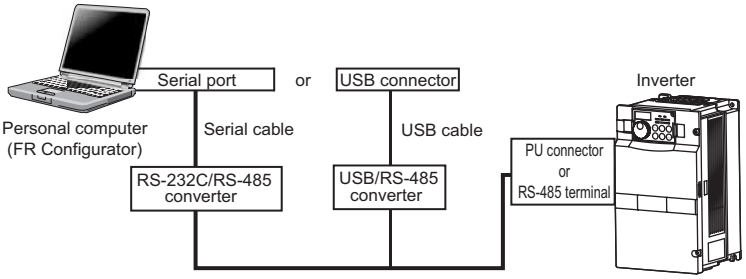
(Microsoft® Windows® 2000 Professional SP4 or later, XP Home Edition SP2 or later, XP Professional SP2 or later, Windows Vista® SP1 or later, Windows® 7 supported)

FR Configurator is software that offers an easy operating environment.
Can be utilized effectively from inverter setting up to maintenance.
Parameter setting, monitoring, etc. can be performed on a display of Windows* personal computer.
RS-485 communication connects a personal computer to an inverter.

* Windows and Windows Vista are registered trademarks of Microsoft Corporation in the United States and other countries

MITSUBISHI
Integrated FA Software
MELSOFT

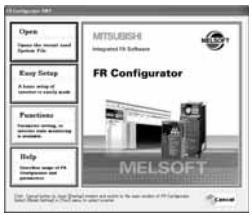
FR Configurator



Startup

Desired function can be performed just after a start-up of the software.

(1) Open the recent used System File
(2) Perform Easy Setup
(3) Perform each function
(4) Help



Easy Setup

From station number to parameter setting, setting with wizard style dialog (interactive) is available.
Procedure for Easy Setup

(1) System File setting
(2) Communication setting
(3) Inverter recognition
(4) Control method selection
(5) Motor setting
(6) Start command, frequency command setting
(7) Parameter setting

Navigation area

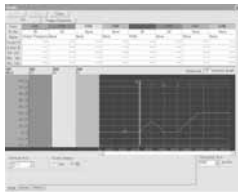
In Navigation area, switching ONLINE/ OFFLINE and changing operation mode can be performed.

(1) Frequency setting and forward/reverse rotation [Test operation]
(2) Display the connected inverter in tree view [System List]
(3) Function setting without regard to parameter number [Basic setting]
(4) Estimates the cause of trouble, and suggests counteraction. [Troubleshooting]

Monitor area

In Monitor area, inverter status can be monitored.

(1) Displays monitor data in waveform [Graph]
(2) Monitors the status of I/O terminals. [I/O Terminal Monitor]
(3) Displays multiple data in batch [Batch Monitor]



System area

In System area, parameter setting, Diagnosis, Troubleshooting, etc. can be performed.

(1) Parameter reading, writing, verification, Functional List and Individual List display are available. [Parameter List]
(2) Displays alarm history and monitor value at each alarm occurrence. [Diagnosis]
(3) Parameter setting conversion from conventional models [Convert]

Setting wizard

Setting wizard can set parameters with wizard style dialog (interactive). Inputting or selecting required items for each function, parameter setting can be made, without regard to parameter number.

Help

Displays operating instructions and details of each parameters.

FR-SW3-SETUP-WE is available for download (free of charge) from the below URL on the internet. FR Configurator SW3 (FR-SW3-SETUP-WE or FR-SW1-SETUP-WE) needs to be installed to the personal computer prior to updating the software. Also, user registration is required for the download (free of charge.) (Registration is free of charge.)
Homepage address http://www.MitsubishiElectric.co.jp/fa/
FR-SW3-SETUP-WE (for 700 series) and FR-SW1-SETUP-WE (500 series) can be installed from the FR Configurator SW3.

Parameter List

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

POINT

- Only simple mode parameters are displayed by the initial setting of *Pr.160 User group read selection.* Set *Pr.160 User group read selection* as required.
- To use the inverter under IPM motor control, *refer to page 93*.

●Simple mode parameter

Parameter Number	Name	Range	Increments	Initial Value	Refer to page
0	Torque boost	0 to 30%	0.1%	6/4/3/2/1.5/1% *1	39
1	Maximum frequency	0 to 120Hz	0.01Hz	120/60Hz *2	39
2	Minimum frequency	0 to 120Hz	0.01Hz	0Hz	39
3	Base frequency	0 to 400Hz	0.01Hz	60Hz	39
4	Multi-speed setting (high speed)	0 to 400Hz	0.01Hz	60Hz	39
5	Multi-speed setting (middle speed)	0 to 400Hz	0.01Hz	30Hz	39
6	Multi-speed setting (low speed)	0 to 400Hz	0.01Hz	10Hz	39
7	Acceleration time	0 to 3600/ 360s	0.1/0.01s	5s/15s *3	40
8	Deceleration time	0 to 3600/ 360s	0.1/0.01s	10s/30s *3	40
9	Electronic thermal O/L relay	0 to 500/0 to 3600A *2	0.01/0.1A *2	Rated inverter current	40
60	Energy saving control selection	0, 4, 9	1	0	47
79	Operation mode selection	0, 1, 2, 3, 4, 6, 7	1	0	51
125	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
126	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
160	User group read selection	0, 1, 9999	1	9999	55
998	IPM parameter initialization	0, 1, 12, 22, 32, 101, 112, 122, 132	1	0	92
999	Automatic parameter setting	10, 11, 20, 21, 30, 31, 9999	1	9999	63

●Extended mode parameter

Remarks

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

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Basic functions	◎ 0	Torque boost	0 to 30%	0.1%	6/4/3/2/1.5/1% *1	39
	◎ 1	Maximum frequency	0 to 120Hz	0.01Hz	120/60Hz *2	39
	◎ 2	Minimum frequency	0 to 120Hz	0.01Hz	0Hz	39
	◎ 3	Base frequency	0 to 400Hz	0.01Hz	60Hz	39
	◎ 4	Multi-speed setting (high speed)	0 to 400Hz	0.01Hz	60Hz	39
	◎ 5	Multi-speed setting (middle speed)	0 to 400Hz	0.01Hz	30Hz	39
	◎ 6	Multi-speed setting (low speed)	0 to 400Hz	0.01Hz	10Hz	39
	◎ 7	Acceleration time	0 to 3600/ 360s	0.1/0.01s	5s/15s *3	40
	◎ 8	Deceleration time	0 to 3600/ 360s	0.1/0.01s	10s/30s *3	40
	◎ 9	Electronic thermal O/L relay	0 to 500/0 to 3600A *2	0.01/0.1A *2	Rated inverter current	40
DC injection	10	DC injection brake operation frequency	0 to 120Hz, 9999	0.01Hz	3Hz	40
	11	DC injection brake operation time	0 to 10s	0.1s	0.5s	40
	12	DC injection brake operation voltage	0 to 30%	0.1%	4/2/1% *4	40
—	13	Starting frequency	0 to 60Hz	0.01Hz	0.5Hz	41
—	14	Load pattern selection	0, 1	1	1	41

*1 Differ according to capacities. (6%:0.75K, 4%:1.5K to 3.7K, 3%:5.5K, 7.5K, 2%:11K to 37K, 1.5%:45K, 55K, 1%:75K or higher)
*2 Differ according to capacities. (55K or lower / 75K or higher)
*3 Differ according to capacities. (7.5K or lower / 11K or higher)
*4 Differ according to capacities. (4%: 7.5K or lower, 2%: 11K to 55K , 1%: 75K or higher)

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Jog operation	15	Jog frequency	0 to 400Hz	0.01Hz	5Hz	41
	16	Jog acceleration/deceleration time	0 to 3600/360s	0.1/0.01s	0.5s	41
—	17	MRS input selection	0, 2, 4	1	0	41
—	18	High speed maximum frequency	120 to 400Hz	0.01Hz	120/60Hz *	39
—	19	Base frequency voltage	0 to 1000V, 8888, 9999	0.1V	9999	39
Acceleration/deceleration times	20	Acceleration/deceleration reference frequency	1 to 400Hz	0.01Hz	60Hz	40
	21	Acceleration/deceleration time increments	0, 1	1	0	40
Stall prevention	22	Stall prevention operation level	0 to 150%, 9999	0.1%	120%	42
	23	Stall prevention operation level compensation factor at double speed	0 to 200%, 9999	0.1%	9999	42
Multi-speed setting	24 to 27	Multi-speed setting (4 speed to 7 speed)	0 to 400Hz, 9999	0.01Hz	9999	39
—	28	Multi-speed input compensation selection	0, 1	1	0	42
—	29	Acceleration/deceleration pattern selection	0, 1, 2, 3, 6	1	0	43
—	30	Regenerative function selection	0, 2, 10, 20/ 0, 1, 2, 10, 11, 20, 21 *	1	0	43
Frequency jump	31	Frequency jump 1A	0 to 400Hz, 9999	0.01Hz	9999	44
	32	Frequency jump 1B	0 to 400Hz, 9999	0.01Hz	9999	44
	33	Frequency jump 2A	0 to 400Hz, 9999	0.01Hz	9999	44
	34	Frequency jump 2B	0 to 400Hz, 9999	0.01Hz	9999	44
	35	Frequency jump 3A	0 to 400Hz, 9999	0.01Hz	9999	44
	36	Frequency jump 3B	0 to 400Hz, 9999	0.01Hz	9999	44
—	37	Speed display	0, 1 to 9998	1	0	44
Frequency detection	41	Up-to-frequency sensitivity	0 to 100%	0.1%	10%	44
	42	Output frequency detection	0 to 400Hz	0.01Hz	6Hz	44
	43	Output frequency detection for reverse rotation	0 to 400Hz, 9999	0.01Hz	9999	44
Second functions	44	Second acceleration/deceleration time	0 to 3600/360s	0.1/0.01s	5s	40
	45	Second deceleration time	0 to 3600/360s, 9999	0.1/0.01s	9999	40
	46	Second torque boost	0 to 30%, 9999	0.1%	9999	39
	47	Second V/F (base frequency)	0 to 400Hz, 9999	0.01Hz	9999	39
	48	Second stall prevention operation current	0 to 150%	0.1%	120%	42
	49	Second stall prevention operation frequency	0 to 400Hz, 9999	0.01Hz	0Hz	42
	50	Second output frequency detection	0 to 400Hz	0.01Hz	30Hz	44
	51	Second electronic thermal O/L relay	0 to 500A, 9999/ 0 to 3600A, 9999 *	0.01/0.1A *	9999	40
Monitor functions	52	DU/PU main display data selection	0, 5, 6, 8 to 14, 17, 20, 23 to 25, 50 to 57, 100	1	0	45
	54	FM terminal function selection	1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53	1	1	45
	55	Frequency monitoring reference	0 to 400Hz	0.01Hz	60Hz	45
	56	Current monitoring reference	0 to 500/0 to 3600A *	0.01/0.1A *	Rated inverter current	45
Automatic restart functions	57	Restart coasting time	0, 0.1 to 5s, 9999/ 0, 0.1 to 30s, 9999 *	0.1s	9999	46, 47
	58	Restart cushion time	0 to 60s	0.1s	1s	46
—	59	Remote function selection	0, 1, 2, 3, 11, 12, 13	1	0	47
—	◎ 60	Energy saving control selection	0, 4, 9	1	0	47
—	65	Retry selection	0 to 5	1	0	48

* Differ according to capacities. (55K or lower / 75K or higher)

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
—	66	Stall prevention operation reduction starting frequency	0 to 400Hz	0.01Hz	60Hz	42
Retry	67	Number of retries at fault occurrence	0 to 10, 101 to 110	1	0	48
	68	Retry waiting time	0 to 10s	0.1s	1s	48
	69	Retry count display erase	0	1	0	48
—	70	Special regenerative brake duty *2	0 to 10%	0.1%	0%	43
—	71	Applied motor	0, 1, 2, 20, 120, 210, 2010, 2110	1	0	48
—	72	PWM frequency selection	0 to 15/0 to 6, 25 *1	1	2	48
—	73	Analog input selection	0 to 7, 10 to 17	1	1	49
—	74	Input filter time constant	0 to 8	1	1	49
—	75	Reset selection/disconnected PU detection/ PU stop selection	0 to 3, 14 to 17	1	14	50
—	76	Fault code output selection	0, 1, 2	1	0	50
—	77	Parameter write selection	0, 1, 2	1	0	50
—	78	Reverse rotation prevention selection	0, 1, 2	1	0	50
—	◎ 79	Operation mode selection	0, 1, 2, 3, 4, 6, 7	1	0	51
Simple magnetic flux vector control IPM motor control	80	Motor capacity	0.4 to 55kW, 9999/ 0 to 3600kW, 9999 *1	0.01/0.1kW *1	9999	51
	90	Motor constant (R1)	0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *1	0.001Ω/ 0.01mΩ *1	9999	51
Adjustable 5 points V/F	100	V/F1(first frequency)	0 to 400Hz, 9999	0.01Hz	9999	52
	101	V/F1(first frequency voltage)	0 to 1000V	0.1V	0V	52
	102	V/F2(second frequency)	0 to 400Hz, 9999	0.01Hz	9999	52
	103	V/F2(second frequency voltage)	0 to 1000V	0.1V	0V	52
	104	V/F3(third frequency)	0 to 400Hz, 9999	0.01Hz	9999	52
	105	V/F3(third frequency voltage)	0 to 1000V	0.1V	0V	52
	106	V/F4(fourth frequency)	0 to 400Hz, 9999	0.01Hz	9999	52
	107	V/F4(fourth frequency voltage)	0 to 1000V	0.1V	0V	52
	108	V/F5(fifth frequency)	0 to 400Hz, 9999	0.01Hz	9999	52
	109	V/F5(fifth frequency voltage)	0 to 1000V	0.1V	0V	52
PU connector communication	117	PU communication station number	0 to 31	1	0	52
	118	PU communication speed	48, 96, 192, 384	1	192	52
	119	PU communication stop bit length	0, 1, 10, 11	1	1	52
	120	PU communication parity check	0, 1, 2	1	2	52
	121	Number of PU communication retries	0 to 10, 9999	1	1	52
	122	PU communication check time interval	0, 0.1 to 999.8s, 9999	0.1s	9999	52
	123	PU communication waiting time setting	0 to 150ms, 9999	1	9999	52
	124	PU communication CR/LF selection	0, 1, 2	1	1	52
—	◎ 125	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
—	◎ 126	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
PID operation	127	PID control automatic switchover frequency	0 to 400Hz, 9999	0.01Hz	9999	53
	128	PID action selection	10, 11, 20, 21, 50, 51, 60, 61, 110, 111, 120, 121	1	10	53
	129	PID proportional band	0.1 to 1000%, 9999	0.1%	100%	53
	130	PID integral time	0.1 to 3600s, 9999	0.1s	1s	53
	131	PID upper limit	0 to 100%, 9999	0.1%	9999	53
	132	PID lower limit	0 to 100%, 9999	0.1%	9999	53
	133	PID action set point	0 to 100%, 9999	0.01%	9999	53
	134	PID differential time	0.01 to 10.00s, 9999	0.01s	9999	53

*1 Differ according to capacities. (7.5K or lower / 11K or higher)
*2 Setting can be made for the 75K or higher.

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Bypass	135	Electronic bypass sequence selection	0, 1	1	0	54
	136	MC switchover interlock time	0 to 100s	0.1s	1s	54
	137	Start waiting time	0 to 100s	0.1s	0.5s	54
	138	Bypass selection at a fault	0, 1	1	0	54
	139	Automatic switchover frequency from inverter to bypass operation	0 to 60Hz, 9999	0.01Hz	9999	54
Backlash measures	140	Backlash acceleration stopping frequency	0 to 400Hz	0.01Hz	1Hz	43
	141	Backlash acceleration stopping time	0 to 360s	0.1s	0.5s	43
	142	Backlash deceleration stopping frequency	0 to 400Hz	0.01Hz	1Hz	43
	143	Backlash deceleration stopping time	0 to 360s	0.1s	0.5s	43
—	144	Speed setting switchover	0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110	1	4	44
PU	145	PU display language selection	0 to 7	1	0	54
—	147	Acceleration/deceleration time switching frequency	0 to 400Hz, 9999	0.01Hz	9999	40
Current detection	148	Stall prevention level at 0V input	0 to 150%	0.1%	120%	42
	149	Stall prevention level at 10V input	0 to 150%	0.1%	150%	42
	150	Output current detection level	0 to 150%	0.1%	120%	54
	151	Output current detection signal delay time	0 to 10s	0.1s	0s	54
	152	Zero current detection level	0 to 150%	0.1%	5%	54
	153	Zero current detection time	0 to 10s	0.01s	0.5s	54
—	154	Voltage reduction selection during stall prevention operation	0, 1, 10, 11	1	1	42
—	155	RT signal function validity condition selection	0, 10	1	0	54
—	156	Stall prevention operation selection	0 to 31, 100, 101	1	0	42
—	157	OL signal output timer	0 to 25s, 9999	0.1s	0s	42
—	158	AM terminal function selection	1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53	1	1	45
—	159	Automatic switchover frequency range from bypass to inverter operation	0 to 10Hz, 9999	0.01Hz	9999	54
—	◎ 160	User group read selection	0, 1, 9999	1	9999	55
—	161	Frequency setting/key lock operation selection	0, 1, 10, 11	1	0	55
Automatic restart functions	162	Automatic restart after instantaneous power failure selection	0, 1, 10, 11	1	0	46, 47
	163	First cushion time for restart	0 to 20s	0.1s	0s	46
	164	First cushion voltage for restart	0 to 100%	0.1%	0%	46
	165	Stall prevention operation level for restart	0 to 150%	0.1%	120%	46
Current detection	166	Output current detection signal retention time	0 to 10s, 9999	0.1s	0.1s	54
	167	Output current detection operation selection	0, 1, 10, 11	1	0	54
—	168	Parameter for manufacturer setting. Do not set.				
—	169					
Cumulative monitor clear	170	Watt-hour meter clear	0, 10, 9999	1	9999	45
	171	Operation hour meter clear	0, 9999	1	9999	45
User group	172	User group registered display/batch clear	9999, (0 to 16)	1	0	55
	173	User group registration	0 to 999, 9999	1	9999	55
	174	User group clear	0 to 999, 9999	1	9999	55

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Input terminal function assignment	178	STF terminal function selection	0 to 8, 10 to 12, 14, 16, 24, 25, 60, 62, 64 to 67, 70 to 72, 9999	1	60	55
	179	STR terminal function selection	0 to 8, 10 to 12, 14, 16, 24, 25, 61, 62, 64 to 67, 70 to 72, 9999	1	61	55
	180	RL terminal function selection	0 to 8, 10 to 12, 14, 16, 24, 25, 62, 64 to 67, 70 to 72, 9999	1	0	55
	181	RM terminal function selection		1	1	55
	182	RH terminal function selection		1	2	55
	183	RT terminal function selection		1	3	55
	184	AU terminal function selection	0 to 8, 10 to 12, 14, 16, 24, 25, 62 to 67, 70 to 72, 9999	1	4	55
	185	JOG terminal function selection	0 to 8, 10 to 12, 14, 16, 24, 25, 62, 64 to 67, 70 to 72, 9999	1	5	55
	186	CS terminal function selection		1	6	55
	187	MRS terminal function selection		1	24	55
	188	STOP terminal function selection		1	25	55
	189	RES terminal function selection		1	62	55
Output terminal function assignment	190	RUN terminal function selection	0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 48, 57, 64, 67, 70, 79, 85, 90 to 96, 98, 99, 100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 148, 157, 164, 167, 170, 179, 185, 190 to 196, 198, 199, 9999	1	0	56
	191	SU terminal function selection		1	1	56
	192	IPF terminal function selection		1	2	56
	193	OL terminal function selection		1	3	56
	194	FU terminal function selection		1	4	56
	195	ABC1 terminal function selection	0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 48, 57, 64, 67, 70, 79, 85, 90, 91, 94 to 96, 98, 99, 100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 148, 157, 164, 167, 170, 179, 185, 190, 191, 194 to 196, 198, 199, 9999	1	99	56
	196	ABC2 terminal function selection		1	9999	56
Multi-speed setting	232 to 239	Multi-speed setting (8 speed to 15 speed)	0 to 400Hz, 9999	0.01Hz	9999	39
—	240	Soft-PWM operation selection	0, 1	1	1	48
—	241	Analog input display unit switchover	0, 1	1	0	53
—	242	Terminal 1 added compensation amount (terminal 2)	0 to 100%	0.1%	100%	49
—	243	Terminal 1 added compensation amount (terminal 4)	0 to 100%	0.1%	75%	49
—	244	Cooling fan operation selection	0, 1	1	1	56
Slip compensation	245	Rated slip	0 to 50%, 9999	0.01%	9999	56
	246	Slip compensation time constant	0.01 to 10s	0.01s	0.5s	56
	247	Constant-power range slip compensation selection	0, 9999	1	9999	56
—	250	Stop selection	0 to 100s, 1000 to 1100s, 8888, 9999	0.1s	9999	56
—	251	Output phase loss protection selection	0, 1	1	1	57
Frequency compensation function	252	Override bias	0 to 200%	0.1%	50%	49
	253	Override gain	0 to 200%	0.1%	150%	49

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Life check	255	Life alarm status display	(0 to 15)	1	0	57
	256	Inrush current limit circuit life display	(0 to 100%)	1%	100%	57
	257	Control circuit capacitor life display	(0 to 100%)	1%	100%	57
	258	Main circuit capacitor life display	(0 to 100%)	1%	100%	57
	259	Main circuit capacitor life measuring	0, 1	1	0	57
—	260	PWM frequency automatic switchover	0, 1	1	1	48
Power failure stop	261	Power failure stop selection	0, 1, 2, 21, 22	1	0	57
	262	Subtracted frequency at deceleration start	0 to 20Hz	0.01Hz	3Hz	57
	263	Subtraction starting frequency	0 to 400Hz, 9999	0.01Hz	60Hz	57
	264	Power-failure deceleration time 1	0 to 3600/ 360s	0.1/0.01s	5s	57
	265	Power-failure deceleration time 2	0 to 3600/ 360s, 9999	0.1/0.01s	9999	57
	266	Power failure deceleration time switchover frequency	0 to 400Hz	0.01Hz	60Hz	57
—	267	Terminal 4 input selection	0, 1, 2	1	0	49
—	268	Monitor decimal digits selection	0, 1, 9999	1	9999	45
—	269	Parameter for manufacturer setting. Do not set.				
Password function	296	Password lock level	0 to 6, 99, 100 to 106, 199, 9999	1	9999	58
	297	Password lock/unlock	(0 to 5), 1000 to 9998, 9999	1	9999	58
—	299	Rotation direction detection selection at restarting	0, 1, 9999	1	9999	46
RS-485 communication	331	RS-485 communication station number	0 to 31(0 to 247)	1	0	52
	332	RS-485 communication speed	3, 6, 12, 24, 48, 96, 192, 384	1	96	52
	333	RS-485 communication stop bit length	0, 1, 10, 11	1	1	52
	334	RS-485 communication parity check selection	0, 1, 2	1	2	52
	335	RS-485 communication retry count	0 to 10, 9999	1	1	52
	336	RS-485 communication check time interval	0, 0.1 to 999.8s, 9999	0.1s	0s	52
	337	RS-485 communication waiting time setting	0 to 150ms, 9999	1ms	9999	52
	338	Communication operation command source	0, 1	1	0	59
	339	Communication speed command source	0, 1, 2	1	0	59
	340	Communication startup mode selection	0, 1, 2, 10, 12	1	0	51
	341	RS-485 communication CR/LF selection	0, 1, 2	1	1	52
	342	Communication EEPROM write selection	0, 1	1	0	52
	343	Communication error count	—	1	0	52
—	374	Overspeed detection level	0 to 400Hz, 9999	0.01Hz	9999	59
Remote output	495	Remote output selection	0, 1, 10, 11	1	0	59
	496	Remote output data 1	0 to 4095	1	0	59
	497	Remote output data 2	0 to 4095	1	0	59
—	502	Stop mode selection at communication error	0 to 3	1	0	52
Maintenance	503	Maintenance timer	0(1 to 9998)	1	0	60
	504	Maintenance timer alarm output set time	0 to 9998, 9999	1	9999	60
—	505	Speed setting reference	1 to 120Hz	0.01Hz	60Hz	44
—	522	Output stop frequency	0 to 400Hz, 9999	0.01Hz	9999	60
—	539	Modbus-RTU communication check time interval	0, 0.1 to 999.8s, 9999	0.1s	9999	52
Communication	549	Protocol selection	0, 1	1	0	52
	550	NET mode operation command source selection	0, 1, 9999	1	9999	59
	551	PU mode operation command source selection	1, 2	1	2	59

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
PID operation	553	PID deviation limit	0 to 100.0%, 9999	0.1%	9999	53
	554	PID signal operation selection	0 to 3, 10 to 13	1	0	53
Current average monitor	555	Current average time	0.1 to 1.0s	0.1s	1s	60
	556	Data output mask time	0.0 to 20.0s	0.1s	0s	60
	557	Current average value monitor signal output reference current	0 to 500/0 to 3600A *2	0.01/0.1A *2	Rated inverter current	60
—	563	Energization time carrying-over times	(0 to 65535)	1	0	45
—	564	Operating time carrying-over times	(0 to 65535)	1	0	45
—	571	Holding time at a start	0.0 to 10.0s, 9999	0.1s	9999	41
PID control	575	Output interruption detection time	0 to 3600s, 9999	0.1s	1s	53
	576	Output interruption detection level	0 to 400Hz	0.01Hz	0Hz	53
	577	Output interruption cancel level	900 to 1100%	0.1%	1000%	53
—	611	Acceleration time at a restart	0 to 3600s, 9999	0.1s	5/15s *2	46, 47
Speed smoothing control	653	Speed smoothing control	0 to 200%	0.1%	0%	60
	654	Speed smoothing cutoff frequency	0 to 120Hz	0.01Hz	20Hz	60
—	665	Regeneration avoidance frequency gain	0 to 200%	0.1%	100%	61
—	779	Operation frequency during communication error	0 to 400Hz, 9999	0.01Hz	9999	52
—	791	Acceleration time in low-speed range	0 to 3600/360s, 9999	0.1/0.01s	9999	40
—	792	Deceleration time in low-speed range	0 to 3600/360s, 9999	0.1/0.01s	9999	40
—	799	Pulse increment setting for output power	0.1kWh, 1kWh, 10kWh, 100kWh, 1000kWh	0.1kWh	1kWh	61
—	800	Control method selection	9, 20	1	20	61
Adjustment function	820	Speed control P gain 1	0 to 1000%	1%	25%	61
	821	Speed control integral time 1	0 to 20s	0.001s	0.333s	61
—	867	AM output filter	0 to 5s	0.01s	0.01s	45
—	870	Speed detection hysteresis	0 to 5Hz	0.01Hz	0Hz	44
—	872	Input phase loss protection selection	0, 1	1	0	57
Regeneration avoidance function	882	Regeneration avoidance operation selection	0, 1, 2	1	0	61
	883	Regeneration avoidance operation level	300 to 800V	0.1V	DC380V/ DC760V*1	61
	884	Regeneration avoidance at deceleration detection sensitivity	0 to 5	1	0	61
	885	Regeneration avoidance compensation frequency limit value	0 to 30Hz, 9999	0.01Hz	6Hz	61
	886	Regeneration avoidance voltage gain	0 to 200%	0.1%	100%	61
Free parameter	888	Free parameter 1	0 to 9999	1	9999	61
	889	Free parameter 2	0 to 9999	1	9999	61

*1 Differ according to the voltage class. (200V class/400V class).
*2 Differ according to capacities. (55K or lower / 75K or higher)

Function	Parameters	Name	Setting Range	Increments	Initial Value	Refer to page
Energy saving monitor	891	Cumulative power monitor digit shifted times	0 to 4, 9999	1	9999	45
	892	Load factor	30 to 150%	0.1%	100%	62
	893	Energy saving monitor reference (motor capacity)	0.1 to 55/0 to 3600kW *1	0.01/ 0.1kW *1	Rated inverter current	62
	894	Control selection during commercial power-supply operation	0, 1, 2, 3	1	0	62
	895	Power saving rate reference value	0, 1, 9999	1	9999	62
	896	Power unit cost	0 to 500, 9999	0.01	9999	62
	897	Power saving monitor average time	0, 1 to 1000h, 9999	1h	9999	62
	898	Power saving cumulative monitor clear	0, 1, 10, 9999	1	9999	62
	899	Operation time rate (estimated value)	0 to 100%, 9999	0.1%	9999	62
Calibration parameters	C0 (900) *2	FM terminal calibration	—	—	—	62
	C1 (901) *2	AM terminal calibration	—	—	—	62
	C2 (902) *2	Terminal 2 frequency setting bias frequency	0 to 400Hz	0.01Hz	0Hz	53
	C3 (902) *2	Terminal 2 frequency setting bias	0 to 300%	0.1%	0%	53
	125 (903) *2	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
	C4 (903) *2	Terminal 2 frequency setting gain	0 to 300%	0.1%	100%	53
	C5 (904) *2	Terminal 4 frequency setting bias frequency	0 to 400Hz	0.01Hz	0Hz	53
	C6 (904) *2	Terminal 4 frequency setting bias	0 to 300%	0.1%	20%	53
	126 (905) *2	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	53
	C7 (905) *2	Terminal 4 frequency setting gain	0 to 300%	0.1%	100%	53
PID operation	C42 (934) *2	PID display bias coefficient	0 to 500.00, 9999	0.01	9999	53
	C43 (934) *2	PID display bias analog value	0 to 300.0%	0.1%	20%	53
	C44 (935) *2	PID display gain coefficient	0 to 500.00, 9999	0.01	9999	53
	C45 (935) *2	PID display gain analog value	0 to 300.0%	0.1%	100%	53
—	989	Parameter copy alarm release	10/100	1	10/100 *1	63
PU	990	PU buzzer control	0, 1	1	1	63
	991	PU contrast adjustment	0 to 63	1	58	63
—	997	Fault initiation	16 to 18, 32 to 34, 48, 49, 64, 80 to 82, 96, 97, 112, 128, 129, 144, 145, 160, 161, 176 to 179, 192 to 194, 196 to 199, 208, 230, 241, 245 to 247, 253, 9999	1	9999	63
—	◎ 998	IPM parameter initialization	0, 1, 12, 22, 32, 101, 112, 122, 132	1	0	92
—	◎ 999	Automatic parameter setting	10, 11, 20, 21, 30, 31, 9999	1	9999	63
Clear parameters	Pr.CL	Parameter clear	0, 1	1	0	63
	ALLC	All parameter clear	0, 1	1	0	63
	Er.CL	Faults history clear	0, 1	1	0	63
—	PCPY	Parameter copy	0, 1, 2, 3	1	0	63
—	Pr.CH	Initial value change list	—	—	—	63
—	IPM	IPM parameter initialization	0, 1, 12, 22, 32	1	0	92
—	AUTO	Automatic parameter setting	—	—	—	63

*1 Differ according to capacities. (55K or lower / 75K or higher)
*2 The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

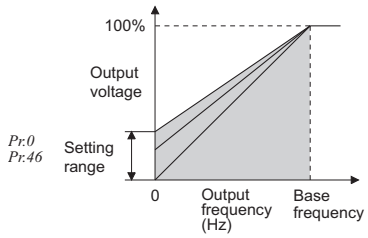
In the following section, the following marks indicate the operable controls:
V/F ..... V/F control (general-purpose motor), S-MFVC ..... Simple magnetic flux vector control,
IPM ..... IPM motor control (dedicated IPM motor). (Parameters without any marks are valid for all controls.)
Also the following marks indicate parameter types:
Pr. ..... Simple mode parameters, Pr. ..... Extended parameters

Pr. 0 Pr. 46 Manual torque boost V/F

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

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

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



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

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

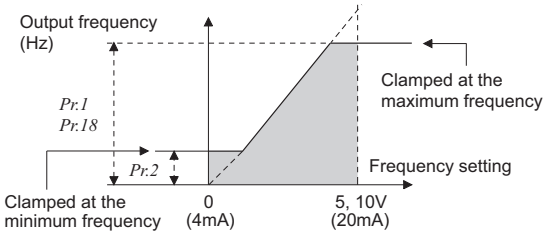
Pr. 1, 2 Pr. 18 Maximum/minimum frequency

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

Pr.18 High speed maximum frequency

You can limit the motor speed.

- Clamp the upper and lower limits of the output frequency.
- To operate at a frequency higher than the *Pr.1* setting, adjust the upper output frequency limit with *Pr.18*.
  (When *Pr. 18* is set, *Pr. 1* automatically switches to the frequency of *Pr. 18*. When *Pr. 1* is set, *Pr. 18* is automatically changed to the frequency set in *Pr. 1*.)

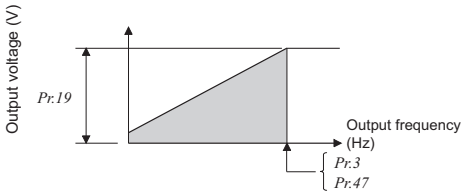


Pr. 3 Pr. 19, 47 Base frequency, voltage V/F

Pr.3 Base frequency

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

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



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

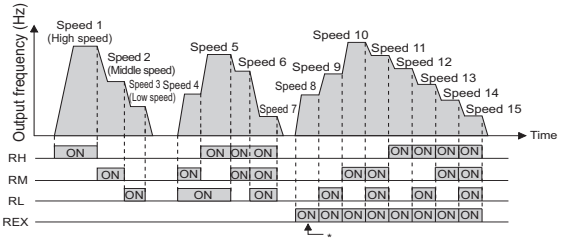
Pr.4 Multi-speed setting (high speed) *Pr.5 Multi-speed setting (middle speed)*

Pr.6 Multi-speed setting (low speed)

Pr.24 Multi-speed setting (speed 4) *Pr.25 Multi-speed setting (speed 5)*
Pr.26 Multi-speed setting (speed 6) *Pr.27 Multi-speed setting (speed 7)*
Pr.232 Multi-speed setting (speed 8) *Pr.233 Multi-speed setting (speed 9)*
Pr.234 Multi-speed setting (speed 10) *Pr.235 Multi-speed setting (speed 11)*
Pr.236 Multi-speed setting (speed 12) *Pr.237 Multi-speed setting (speed 13)*
Pr.238 Multi-speed setting (speed 14) *Pr.239 Multi-speed setting (speed 15)*

Can be used to change the preset speed in the parameter with the contact signals.
Any speed can be selected by merely turning on-off the contact signals (RH, RM, RL, REX signals).

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



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

Pr. 7, 8 Pr. 20, 21, 44, 45, 147, 791, 792
Acceleration/deceleration time setting

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

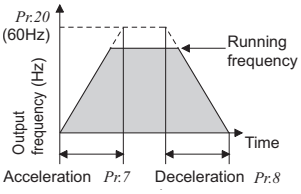
Pr.20 Acceleration/deceleration reference frequency
Pr.21 Acceleration/deceleration time increments *Pr.44 Second acceleration/deceleration time*
Pr.45 Second deceleration time
Pr.147 Acceleration/deceleration time switching frequency

Pr.791 Acceleration time in low-speed range IPM

Pr.792 Deceleration time in low-speed range IPM

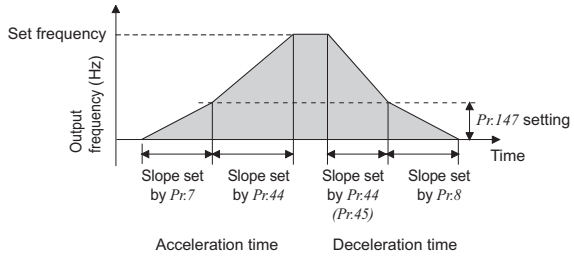
Used to set motor acceleration/deceleration time.
Set a larger value for a slower speed increase/decrease or a smaller value for a faster speed increase/decrease.

- Use *Pr. 7 Acceleration time* to set the acceleration time required to reach *Pr. 20 Acceleration/deceleration reference frequency* from 0Hz.
- Use *Pr. 8 Deceleration time* to set the deceleration time required to stop from the *Pr. 20 Acceleration/deceleration reference frequency*.

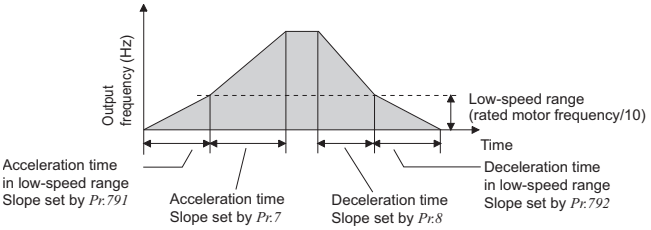


Pr.21 Setting	Description	
0 (initial value)	Increments: 0.1s Range: 0 to 3600s	Increments and setting range of acceleration/deceleration time setting can be changed.
1	Increments: 0.01s Range: 0 to 360s	

- Acceleration/deceleration time changes when the RT signal turns ON or the output frequency reaches the *Pr. 147* setting or higher.



- If torque is required in the low-speed range (rated motor frequency *(Refer to page 93)*/10) under IPM motor control, set the *Pr.791 Acceleration time in low-speed range* and *Pr.792 Deceleration time in low-speed range* settings higher than the *Pr.7 Acceleration time* and *Pr.8 Deceleration time* settings so that the slow acceleration/deceleration is performed in the low-speed range.



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

Pr.9 Electronic thermal O/L relay

Pr.51 Second electronic thermal O/L relay V/F S MFVC

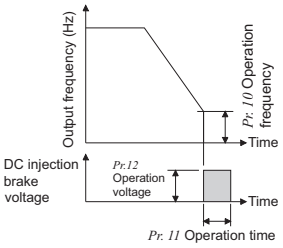
Set the current of the electronic overcurrent protection to protect the motor from overheat.This feature provides the optimum protective characteristics, including reduced motor cooling capability, at low speed.

- This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.
- Set the rated current [A] of the motor in *Pr.9*.
  (If the general-purpose motor has both 50Hz and 60Hz ratings and the *Pr.3 Base frequency* is set to 60Hz, set the 1.1 times of the 60Hz rated motor current.)
- When using a motor with an external thermal relay, etc., set "0" in *Pr. 9* to make the electronic thermal relay function invalid. (Note that the output transistor protection of the inverter (E.THT) functions.)
- When using the Mitsubishi constant-torque motor
  1) Set "1" in *Pr.71* .
     (This provides a 100% continuous torque characteristic in the low-speed range.)
  2) Set the rated motor current in *Pr. 9*.
- When the RT signal is ON in a general-purpose motor operation, thermal protection is provided based on the *Pr. 51* setting.
  Use this function when rotating two motors of different rated currents individually by a single inverter. (When rotating two motors together, use external thermal relays.)

Pr. 10 to 12 DC injection brake of general-purpose motor control V/F S MFVC

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

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



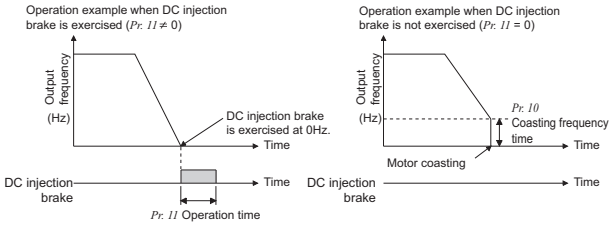
Pr.12 Initial Value		When Using the Mitsubish Constant Torque Motor	When Using the Energy Saving Motor
3.7K or lower	4%	←	←
5.5K to 7.5K	4%	2% *	3%
11K to 55K	2%	←	←
75K or higher	1%	←	←

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

Pr. 10, 11
DC injection brake of IPM motor control IPM

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

At a motor stop, DC injection brake operates to apply braking torque to the motor.

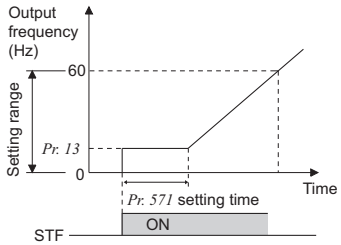


Pr. 13, 571 Starting frequency

V/F S MFVC

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

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

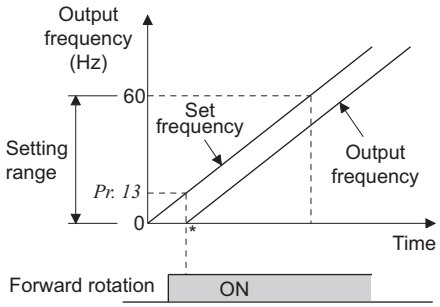


Pr. 13 Minimum motor rotation frequency

IPM

Pr.13 Starting frequency

Set the frequency where the motor starts running.
Set the deadband in the low-speed range to eliminate noise and offset deviation when setting a frequency with analog input.



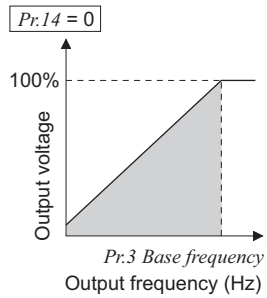
* Output from 0.01Hz

Pr. 14 V/F pattern matching applications

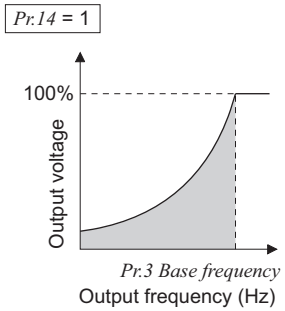
V/F

Pr. 14 Load pattern selection

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



- For constant-torque load (setting "0")
  - At or less than the base frequency voltage, the output voltage varies linearly with the output frequency.
  - Set this value when driving the load whose load torque is constant if the speed varies, e.g. conveyor, cart or roll drive.

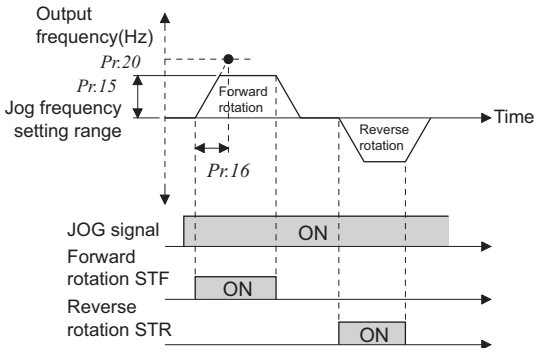


- For variable-torque load (setting "1", initial value)
  - At or less than the base frequency voltage, the output voltage varies with the output frequency in a square curve.
  - Set this value when driving the load whose load torque varies in proportion to the square of the speed, e.g. fan or pump.

Pr. 15, 16 Jog operation

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

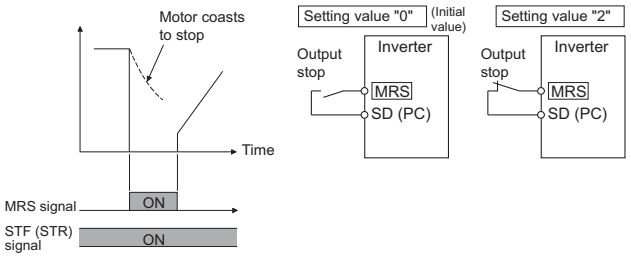
You can set the frequency and acceleration/decelertion time for jog operation. Jog operation can be performed from either the outside or PU.
Can be used for conveyor positioning, test operation, etc.



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

Pr.17 MRS input selection

The inverter output can be shut off by the MRS signal. The logic of the MRS signal can also be selected.
When *Pr. 17* is set to "4", the MRS signal from external terminal (output stop) can be changed to the normally closed (NC contact) input, and the MRS signal from communication can be changed to the normally open (NO contact) input.



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

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

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

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

Stall prevention operation

Pr.22 Stall prevention operation level

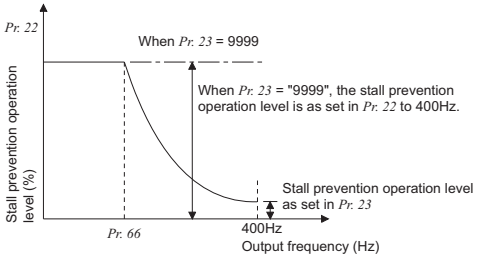
Pr.23 Stall prevention operation level compensation factor at double speed V/F S-MFVC
Pr.48 Second stall prevention operation current *Pr.49 Second stall prevention operation frequency*

Pr.66 Stall prevention operation reduction starting frequency V/F S-MFVC
Pr.148 Stall prevention level at 0V input *Pr.149 Stall prevention level at 10V input*

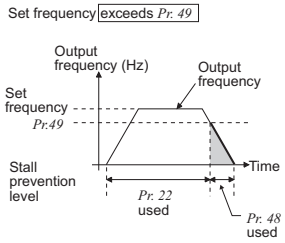
Pr.154 Voltage reduction selection during stall prevention operation V/F S-MFVC
Pr.156 Stall prevention operation selection *Pr.157 OL signal output timer*

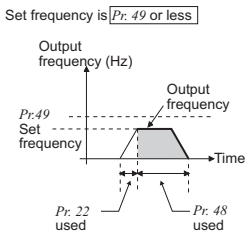
This function monitors the output current and automatically changes the output frequency to prevent the inverter from coming to an alarm stop due to overcurrent, overvoltage, etc. It can also limit stall prevention and fast-response current limit operation during acceleration/deceleration, driving or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

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



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





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

- Under general-purpose motor control, setting *Pr.154* can further prevent inverter trips (E.OC☐, E.OV☐) during stall prevention operation.
- Stall prevention operation and fast response current restriction function can be restricted according to the operation condition using *Pr. 156*.
  (The fast-response current limit operation is disabled under IPM motor control.)

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

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

Pr.28 Multi-speed input compensation selection

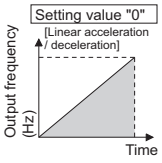
By inputting the frequency setting compensation signal (terminal 1, 2), the speed (frequency) can be compensated for relative to the multi-speed setting or the speed setting by remote setting function.

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

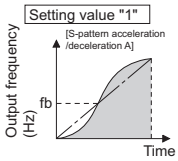
Pr. 29, 140 to 143 Acceleration/ deceleration pattern and backlash measures

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

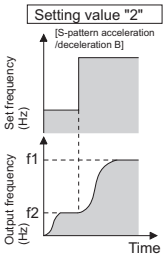
You can set the acceleration/deceleration pattern suitable for application.
You can also set the backlash measures that stop acceleration/deceleration once at the parameter-set frequency and time during acceleration/deceleration.



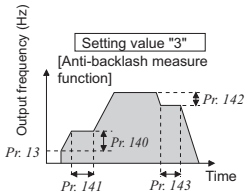
- Linear acceleration/deceleration (setting "0", initial value)
  - When the frequency is changed for acceleration, deceleration, etc. in inverter operation, the output frequency is changed linearly (linear acceleration/deceleration) to reach the set frequency without straining the motor and inverter.



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

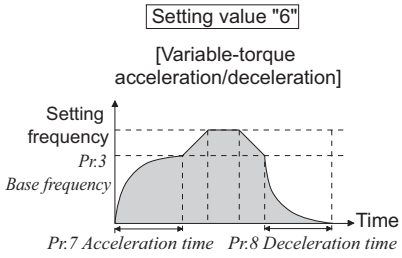


- S-pattern acceleration/deceleration B (setting "2")
  - For prevention of load shifting in conveyor and other applications
    Since acceleration/deceleration is always made in an S shape from current frequency (f2) to target frequency (f1), this function eases shock produced at acceleration/deceleration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



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

- Variable-torque acceleration/deceleration (*Pr.29* = "6")
  V/F S-MFVC
  - This function is useful for variable-torque load such as a fan and blower to accelerate/decelerate in short time.
    In areas where output frequency > base frequency, the speed accelerates/decelerates linearly.



Pr. 30, 70 Selection of regeneration unit

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

- When making frequent starts/stops, use the optional brake unit (FR-BU2, BU, FR-BU, MT-BU5) to increase the regenerative brake duty.
- Use a power regeneration common converter (FR-CV) or power regeneration converter (MT-RC) for continuous operation in regenerative status.
  Use a high power factor converter (FR-HC2) to reduce harmonics, improve the power factor, or continuously use the regenerative mode.
- You can select DC feeding mode 1, which operates with DC power supply (terminal P/+, N/-), or DC feeding mode 2, which normally operates with AC power supply (terminal R/L1, S/L2, T/L3) and with DC power supply such as battery at power failure occurrence.

<55K or lower>

Regeneration Unit	Power Supply to the Inverter	*Pr. 30* Setting
Inverter without regenerative function, brake unit (FR-BU2, FR-BU, BU)	R/L1, S/L2, T/L3	0 (initial value)
	P/+, N/-	10
	R/L1, S/L2, T/L3 - P/+, N/-	20
High power factor converter (FR-HC2), power regeneration common converter (FR-CV)	P/+, N/-	2

<75K or higher>

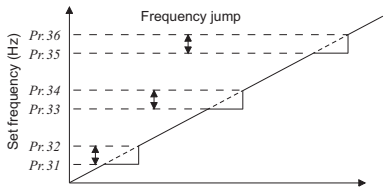
Regeneration Unit	Power Supply to the Inverter	*Pr. 30* Setting	*Pr. 70* Setting*
Brake unit (FR-BU2)	R/L1, S/L2, T/L3	1	—
	P/+, N/-	11	
	R/L1, S/L2, T/L3 / P/+, N/-	21	
Power regeneration converter (MT-RC)	R/L1, S/L2, T/L3	1*	0% (initial value)
Brake unit (MT-BU5)	R/L1, S/L2, T/L3	1*	10%
	P/+, N/-	11*	
	R/L1, S/L2, T/L3 - P/+, N/-	21*	
High power factor converter (FR-HC2)	P/+, N/-	2	—

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

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

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

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



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

Pr. 37, 144, 505 Speed display and speed setting

Pr.37 Speed display
Pr.144 Speed setting switchover
Pr.505 Speed setting reference

You can change the PU (FR-DU07/FR-PU04/FR-PU07) monitor display or frequency setting to motor speed or machine speed.

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

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

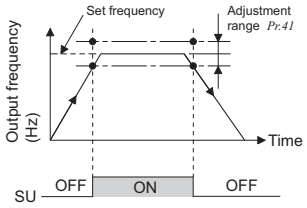
*1 Motor speed r/min conversion formula
..... Frequency × 120/number of motor poles *(Pr. 144)*
Machine speed conversion formula
..... *Pr. 37* × frequency/*Pr. 505* setting (Hz)
For *Pr. 144* in the above formula, the value is "*Pr. 144*-100" when "102 to 110" is set in *Pr. 144* and the value is "4" when *Pr. 37*=0 and *Pr.144*=0.
*2 The increments for Hz are 0.01Hz, machine speed are 1m/min and r/min are 1r/min
*3 *Pr. 505* is always set as frequency (Hz).

Pr. 41 to 43, 50, 870 Detection of output frequency (SU, FU, FU2 signal)

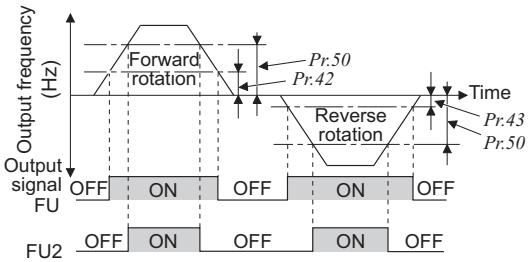
Pr.41 Up-to-frequency sensitivity
Pr.42 Output frequency detection
Pr.43 Output frequency detection for reverse rotation
Pr.50 Second output frequency detection
Pr.870 Speed detection hysteresis

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

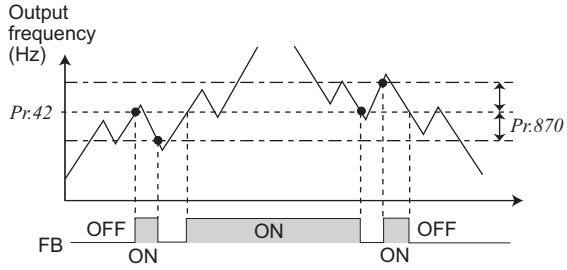
- If the set frequency is considered as 100%, output frequency can be adjusted between ±1% and ±100% with *Pr. 41*.
- This parameter can be used to ensure that the running frequency has been reached to provide the operation start signal etc. for related equipment.



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



- Setting a hysteresis width at the output frequency in *Pr.870* prevents chattering of the speed detection signals.



Example of output frequency detection signal (FB)

Pr. 44, 45 → Refer to the section about *Pr.7*, *Pr.8*
Pr. 46 → Refer to the section about *Pr. 0*
Pr. 47 → Refer to the section about *Pr. 3*
Pr. 48, 49 → Refer to the section about *Pr. 22*
Pr. 50 → Refer to the section about *Pr. 41*
Pr. 51 → Refer to the section about *Pr. 9*

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

Change of DU/PU monitor descriptions Cumulative monitor clear

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

The monitor to be displayed on the main screen of the operation panel (FR-DU07)/parameter unit (FR-PU04/FR-PU07) can be selected.

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

*1 Selected by the parameter unit(FR-PU04/FR-PU07)
*2 The cumulative energization time and actual operation time are accumulated from 0 to 65535 hours, then cleared, and accumulated again from 0.
When the operation panel (FR-DU07) is used, up to 65.53 (65530h) is displayed as 1h=0.001 and then accumulated from 0.
*3 The actual operation time is not added up if the cumulative operation time before power supply-off is less than 1h.
*4 When using the parameter unit (FR-PU04/FR-PU07), "kW" is displayed.
*5 Setting can be made for the 75K or higher.
*6 The setting depends on the inverter capacity.(55K or lower/75K or higher)

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

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

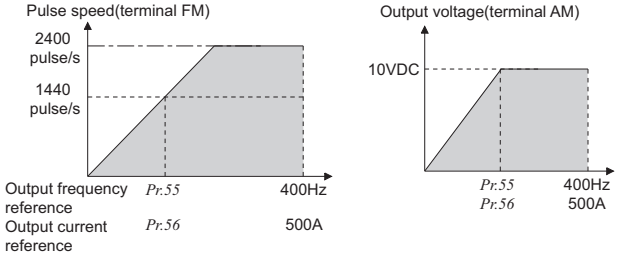
- When *Pr. 52* is set to "100", the set frequency monitor is displayed during a stop and the output frequency monitor is displayed during operation. (LED of Hz flickers during stop and is lit during operation.)

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

Pr. 55, 56, 867 Change of the monitor output from terminal FM and AM

Pr.55 Frequency monitoring reference *Pr.56 Current monitoring reference*
Pr.867 AM output filter

For *Pr. 55*, set a full-scale value for outputting the output current monitor value to the terminal FM or AM.
Set the full-scale value to output the output current monitor value to terminal FM and AM in *Pr. 56*.



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

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

Automatic restart after instantaneous power failure/flying start under general-purpose motor control

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

The inverter can be restarted without stopping the motor under V/F control and Simple magnetic flux vector control in the following cases:

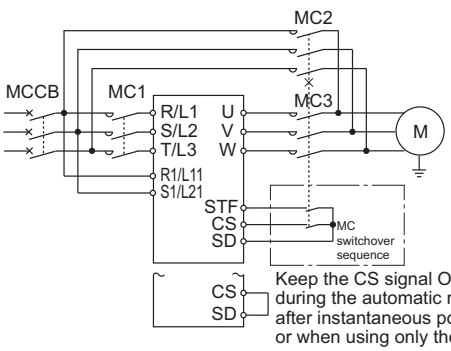
- when commercial power supply operation is switched to inverter operation
- when power comes back on after an instantaneous power failure
- when motor is coasting at start

For the operation under IPM motor control, refer to the next page.

Pr. Number	Setting Range	Description
57	0	1.5K or lower .....0.5s, 2.2K to 7.5K.....1s, 11K to 55K .....3.0s 75K or higher .....5.0s The above times are coasting time.
	0.1 to 5s/ 0.1 to 30s *	Set the waiting time for inverter-triggered restart after an instantaneous power failure.
	9999 (initial value)	No restart
58	0 to 60s	Set a voltage starting time at restart.
162	0 (initial value)	With frequency search
	1	Reduced voltage start only at the first start (no frequency search)
	10	Frequency search at every start
	11	Reduced voltage start at every start (no frequency search)
163	0 to 20s	Set a voltage starting time at restart. Consider using these parameters according to the load (inertia moment, torque) magnitude.
164	0 to 100%	
165	0 to 150%	Consider the rated inverter current as 100% and set the stall prevention operation level during restart operation.
299	0	Without rotation direction detection
	1	With rotation direction detection
	9999 (initial value)	When *Pr. 78* =0, the rotation direction is detected. When *Pr. 78* =1,2, the rotation direction is not detected.
611	0 to 3600s	Set the acceleration time that takes to reach *Pr.20 Acceleration/deceleration reference frequency* setting at a restart.
	9999	Acceleration time for restart is the normal acceleration time (e.g. *Pr. 7*).

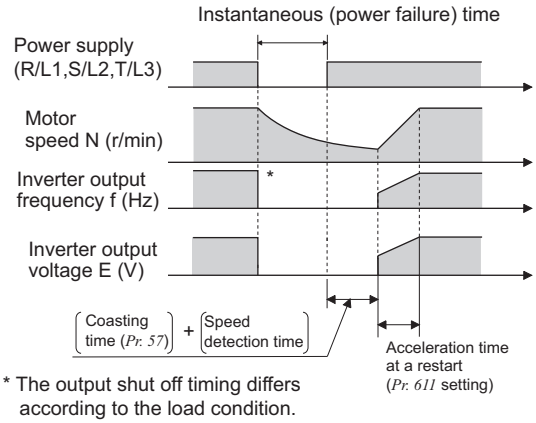
* The setting range varies according to the inverter capacity. (55K or lower/ 75K or higher)

<Connection diagram>



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

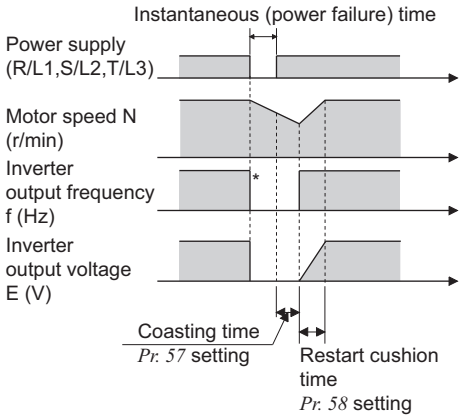
When *Pr.162* = 0, 10 (with frequency search)



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

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

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



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

Pr. 57, 162, 611

Automatic restart after instantaneous power failure/flying start under IPM motor control IPM

Pr.57 Restart coasting time

Pr.162 Automatic restart after instantaneous power failure selection

Pr.611 Acceleration time at a restart

The inverter can be restarted without stopping the IPM motor in the following cases:

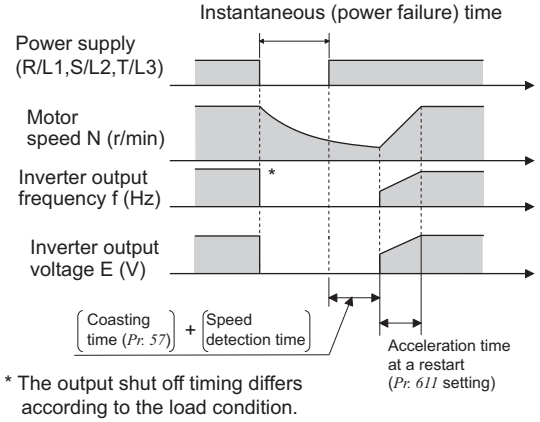
- When power comes back ON during inverter driving after an instantaneous power failure
- When the motor is coasting at start

For V/F control and Simple magnetic flux vector control, refer to the previous page.

Pr. Number	Setting Range	Description
57	0	No waiting time
	0.1 to 5s/ 0.1 to 30s *	Set the waiting time for inverter-triggered restart after an instantaneous power failure.
	9999 (initial value)	No restart
162	0 (initial value), 1	With frequency search
	10, 11	Frequency search at every start
611	0 to 3600s	Set the acceleration time that takes to reach *Pr.20 Acceleration/deceleration reference frequency* setting at a restart.
	9999	Acceleration time for restart is the normal acceleration time (e.g. *Pr. 7*).

* Differ according to capacities. (55K or lower/75K or higher)

- Automatic restart operation selection (*Pr.162*)
  The inverter smoothly starts after detecting the motor speed (frequency search) upon power restoration.
  During reverse rotation, the inverter can be restarted smoothly as the direction of rotation is detected.



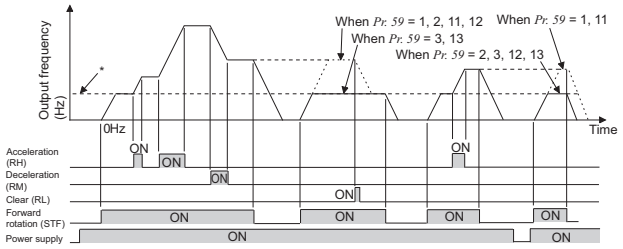
* The output shut off timing differs according to the load condition.

Pr. 59 Remote setting function

Pr.59 Remote function selection

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

Pr.59 Setting	Description		
	RH, RM, RL signal function	Frequency setting storage function	Deceleration to the frequency lower than the set frequency
0 (initial value)	Multi-speed setting	—	—
1	Remote setting	Used	Disabled
2	Remote setting	Not used	Disabled
3	Remote setting	Not used (Turning STF/STR off clears remotely-set frequency.)	Disabled
11	Remote setting	Used	Enabled
12	Remote setting	Not used	Enabled
13	Remote setting	Not used (Turning STF/STR OFF clears remotely-set frequency.)	Enabled



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

Pr. 60 Energy saving control selection

V/F

Pr.60 Energy saving control

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

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

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

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

If an alarm occurs, the inverter resets itself automatically to restart. You can also select the alarm description for a retry.
When selection of automatic restart after instantaneous power failure is selected (*Pr. 57 Restart coasting time* ≠ 9999), restart operation is performed at retry operation as at an instantaneous power failure.

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

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

* This function is available only under IPM motor control.

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

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

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

Pr. 66 → Refer to the section about *Pr. 22*
Pr. 67 to 69 → Refer to the section about *Pr. 65*
Pr. 70 → Refer to the section about *Pr. 30*

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

Pr.71 Applied motor

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

Pr.71 Setting	Motor used)	Thermal Characteristic of the Electronic Thermal Relay Function		
		Standard	Constant torque	IPM
0 (initial value)	Standard motor (SF-JR, etc.)	○		
1	Mitsubishi constant-torque motor (SF-HRCA, etc.)		○	
2	Standard motor (SF-JR, etc.) Adjustable 5 points V/F	○		
20	Mitsubishi standard motor SF-JR4P (1.5kW or lower)		○	
120	High-efficiency IPM motor (MM-EF)			○
210	Premium high-efficiency IPM motor (MM-EFS)			○
2010, 2110	For manufacturer setting (setting not required)			

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

Pr.71	Standard Motor Setting 0, 2, 20, 120, 210	Constant Torque Motor Setting 1
Pr. 0	3%	2%
Pr. 12	4%	2%

Pr. 72, 240, 260 Carrier frequency and SoftPWM selection

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

You can change the motor sound.

Pr. Number	Setting Range	Description
72	0 to 15/ 0 to 6, 25 *	You can change the PWM carrier frequency. The setting values indicate [kHz] values during general-purpose motor control. Note that 0 indicates 0.7kHz, 15 indicates 14.5kHz and 25 indicates 2.5kHz. Under IPM motor control, the setting values indicate the following [kHz] values. "0 to 5": 2kHz "6 to 9": 6kHz "10 to 13": 10kHz "14 to 15": 14kHz Cannot be set to "25".
240	0	Soft-PWM is invalid
	1 (initial value)	When "0 to 5" ("0 to 4" for the 75K or higher) is set in *Pr. 72*, Soft-PWM is valid
260	0	PWM carrier frequency is constant, independent of load. When the carrier frequency is set to 3kHz or more (*Pr.72* ≥ "3") during general-purpose control, performs continuous operation at less than 85% of the rated inverter current.
	1 (initial value)	Decreases PWM carrier frequency automatically when load increases. If continuous operation is performed at 85% of the rated inverter current (the rated current shown in parentheses on *page 8*) or higher with inverter carrier frequency set to 3kHz is higher (*Pr.72* ≥ "3") (6kHz or higher under IPM motor control (*Pr.72* ≥ "6")), E.THT (inverter overload trip) is likely to occur. To avoid that, the carrier frequency is automatically lowered as low as 2kHz.

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

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

Pr.73 Analog input selection
Pr.242 Terminal 1 added compensation amount (terminal 2)
Pr.243 Terminal 1 added compensation amount (terminal 4)

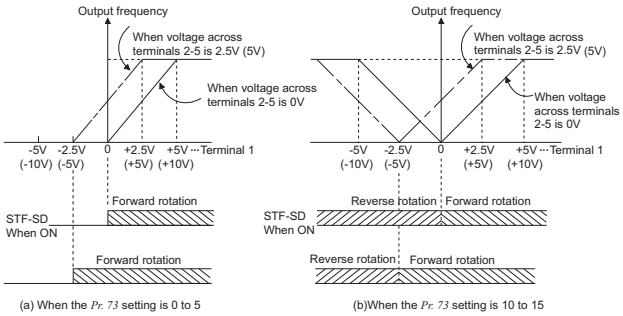
Pr.252 Override bias *Pr.253 Override gain*
Pr.267 Terminal 4 input selection

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

Pr. 73 Setting	Terminal 2 Input	Terminal 1 Input	Terminal 4 Input	Compensation Input Terminal and Compensation Method	Polarity Reversible
0	0 to 10V	0 to ±10V	When the AU signal is off ×	Terminal 1 added compensation	Not function (Indicates that a frequency command signal of negative polarity is not accepted.)
1 (Initial value)	0 to 5V	0 to ±10V			
2	0 to 10V	0 to ±5V			
3	0 to 5V	0 to ±5V			
4	0 to 10V	0 to ±10V		Terminal 2 override	
5	0 to 5V	0 to ±5V			
6	0 to 20mA	0 to ±10V		Terminal 1 added compensation	
7	0 to 20mA	0 to ±5V			
10	0 to 10V	0 to ±10V			Function
11	0 to 5V	0 to ±10V			
12	0 to 10V	0 to ±5V			
13	0 to 5V	0 to ±5V			
14	0 to 10V	0 to ±10V		Terminal 2 override	
15	0 to 5V	0 to ±5V			
16	0 to 20mA	0 to ±10V		Terminal 1 added compensation	
17	0 to 20mA	0 to ±5V			
0	0 to 10V	0 to ±10V	When the AU signal is on According to the *Pr. 267* setting (Initial value) 1:0 to 5V 2:0 to 10V	Terminal 1 added compensation	Not function (Indicates that a frequency command signal of negative polarity is not accepted.)
1 (Initial value)	×	0 to ±10V			
2		0 to ±5V			
3		0 to ±5V			
4	0 to 10V	×		Terminal 2 override	
5	0 to 5V				
6	×	0 to ±10V		Terminal 1 added compensation	
7		0 to ±5V			
10	×	0 to ±10V			Function
11		0 to ±10V			
12		0 to ±5V			
13		0 to ±5V			
14	0 to 10V	×		Terminal 2 override	
15	0 to 5V				
16	×	0 to ±10V		Terminal 1 added compensation	
17		0 to ±5V			

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

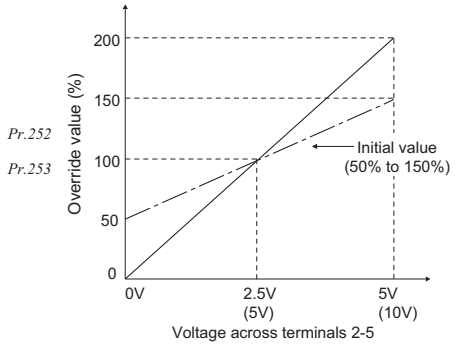
· A compensation signal can be added to the main speed setting for synchronous operation, etc.



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

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

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



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

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

Pr. 74 Noise elimination at the analog input

Pr.74 Input filter time constant

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

- Valid for eliminating noise of the frequency setting circuit.
- Increase the filter time constant if steady operation cannot be performed due to noise.
  A larger setting results in slower response. (The time constant can be set between approximately 5ms to 1s with the setting of 0 to 8.)

Pr. 75 Reset selection, disconnected PU detection

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

You can select the reset input acceptance, disconnected PU (FR-DU07/FR-PU04/FR-PU07) connector detection function and PU stop function.

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

- Reset selection
  - · You can select the operation timing of reset function (RES signal, reset command through communication) input
- Disconnected PU detection
  - · This function detects that the PU (FR-DU07/FR-PU04/FR-PU07) has been disconnected from the inverter for longer than 1s and causes the inverter to provide an alarm output (E.PUE) and come to an alarm stop.
- PU stop selection
  - · In any of the PU operation, external operation and network operation modes, the motor can be stopped by pressing STOP RESET of the PU.

Pr. 76 Output function of alarm code

Pr. 76 Fault code output selection

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

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

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

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

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

Pr. 77 Prevention of parameter rewrite

Pr. 77 Parameter write selection

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

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

Pr. 78 Prevention of reverse rotation of the motor

Pr. 78 Reverse rotation prevention selection

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

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

Pr. 79 Pr. 340 Operation mode selection

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

●Used to select the operation mode of the inverter.
You can freely change between operation by external signal (external operation), operation by PU (FR-DU07/FR-PU04/FR-PU07) (PU operation), operation by combination of PU operation and external operation (external/PU combined operation) and network operation (when RS-485 terminals or a communication option is used).

Pr.79 Setting	Description	LED Indication :Off :On
0 (initial value)	External/PU switchover mode (Press PU/EXT to switch between the PU and external operation mode.) External operation mode at power-on	PU operation mode / External operation mode / NET operation mode
1	Fixed to PU operation mode	PU operation mode
2	Fixed to external operation mode Operation can be performed by switching between the external and Net operation mode.	External operation mode / NET operation mode
3	External/PU combined operation mode 1 — Running frequency: 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)); Start signal: External signal input (terminal STF, STR)	External/PU combined operation mode
4	External/PU combined operation mode 2 — Running frequency: External signal input (terminal 2, 4, 1, Jog, multi-speed setting, etc); Start signal: Input from the PU (FR-DU07 / FR-PU04 / FR-PU07) (FWD, REV)	
6	Switch-over mode Switch among PU operation, external operation, and NET operation while keeping the same operation status.	PU operation mode / External operation mode / NET operation mode
7	External operation mode (PU operation interlock) X12 signal ON: Operation mode can be switched to the PU operation mode. (output stop during external operation) X12 signal OFF: Operation mode can not be switched to the PU operation mode.	

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

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

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

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

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

Pr. 80, 90 Simple magnetic flux vector control SMFVC

Pr.80 Regenerative function selection
Pr.90 Motor constant (R1)

Providing optimum excitation to the motor can also produce high torque in a low-speed region.

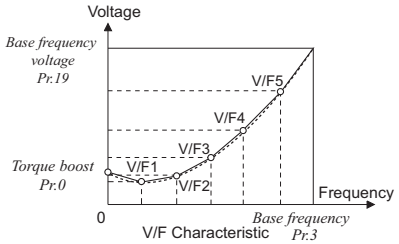
- Set the used motor capacity (equal to or one rank higher than the inveter capacity) in *Pr. 80*.
  ·The number of motor poles should be any of 2, 4 and 6 poles.
  ·Single-motor operation (one motor for one inverter)
  ·Wiring length from inverter to motor should be within 30m.
- When simple magnetic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

Pr. 100 to 109

Adjustable 5 points V/F

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

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



V/F Characteristic

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

Pr. 117 to 124, 331 to 337, 341 to 343, 502, 539, 549, 779

Communication initial setting

Pr.117 PU communication station number *Pr.118 PU communication speed*
Pr.119 PU communication stop bit length *Pr.120 PU communication parity check*
Pr.121 Number of PU communication retries *Pr.122 PU communication check time interval*
Pr.123 PU communication waiting time setting
Pr.124 PU communication CR/LF selection
Pr.331 RS-485 communication station number *Pr.332 RS-485 communication speed*
Pr.333 RS-485 communication stop bit length
Pr.334 RS-485 communication parity check selection
Pr.335 RS-485 communication retry count *Pr.336 RS-485 communication check time interval*
Pr.337 RS-485 communication waiting time setting
Pr.341 RS-485 communication CR/LF selection *Pr.342 Communication EEPROM write selection*
Pr.343 Communication error count *Pr.502 Stop mode selection at communication error*
Pr.539 Modbus-RTU communication check time interval
Pr.549 Protocol selection
Pr.779 Operation frequency during communication error

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

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

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

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

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

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

When parameter write is performed from PU connector, RS-485 terminal, and communication option connected to the inverter, parameter's storage device can be changed from EEPROM + RAM to only RAM. When performing parameter change frequently, set "1" in *Pr. 342*.

(3) Modbus-RTU communication specifications (*Pr.343, Pr.539, Pr.549*)

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

Pr. Number	Setting Range	Description
343	—	Display the number of communication errors during Modbus-RTU communication. Reading only
539	0	Modbus-RTU communication is available, but the inverter trips in the NET operation mode.
	0.1 to 999.8s	Sets the interval of communication check time. (same specifications as *Pr. 122*).
	9999 (initial value)	No communication check (signal loss detection)
549	0 (initial value)	Mitsubishi inverter (computer link) protocol
	1	Modbus-RTU protocol

(4) operation selection at communication error (*Pr.502, Pr.779*)

For communication using RS-485 terminals or a communication option, operation at a communication error can be selected. The operation is active under the Network operation mode.

Pr. Number	Setting Range	Description			
		At error occurrence	Indication	Fault output	At error removal
502	0 (initial value)	Coasts to stop	E.SER*	Output	Stops (E.SER)*
	1	Decelerates to stop	E.SER after stop*	Output after stop	Stops (E.SER)*
	2	Decelerates to stop	E.SER after stop*	Without output	Restarts
	3	Continues running at *Pr.779*	—	Without output	Operates normally
779	0 to 400Hz	Motor runs at the specified frequency at a communication error.			
	9999 (initial value)	Motor runs at the frequency used before the communication error.			

* E.OP1 appears when using a communication option.

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

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

Pr.125 Terminal 2 frequency setting gain frequency

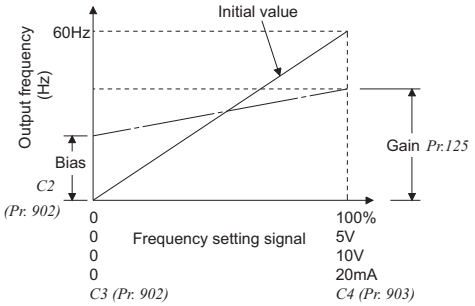
Pr.126 Terminal 4 frequency setting gain frequency

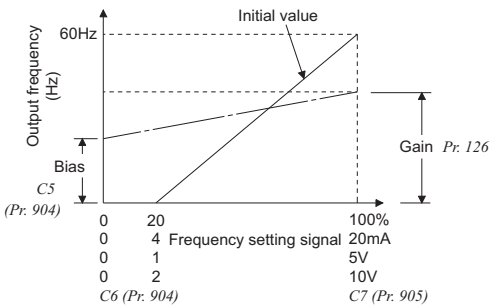
Pr. 241 Analog input display unit switchover
C2(Pr.902) Terminal 2 frequency setting bias frequency
C3(Pr.902) Terminal 2 frequency setting bias *C4(Pr.903) Terminal 2 frequency setting gain*
C5(Pr.904) Terminal 4 frequency setting bias frequency
C6(Pr.904) Terminal 4 frequency setting bias *C7(Pr.905)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

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

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

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





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

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

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

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

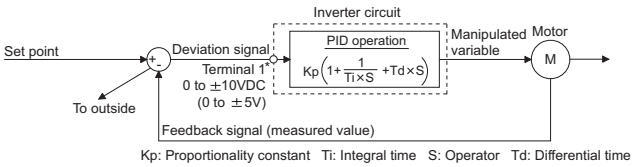
Pr. 127 to 134, 241, 553, 554, 575 to 577, C42 (934) to C45 (935)

PID control

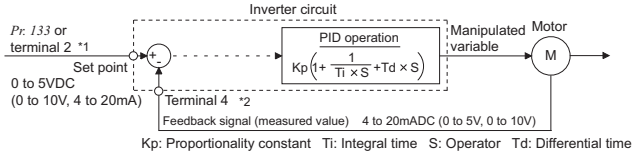
Pr.127 PID control automatic switchover frequency
Pr.128 PID action selection *Pr.129 PID proportional band*
Pr.130 PID integral time *Pr.131 PID upper limit*
Pr.132 PID lower limit *Pr.133 PID action set point*
Pr.134 PID differential time *Pr.241 Analog input display unit switchover*
Pr.553 PID deviation limit *Pr.554 PID signal operation selection*
Pr.575 Output interruption detection time *Pr.576 Output interruption detection level*
Pr.577 Output interruption cancel level *C42(Pr.934) PID display bias coefficient*
C43(Pr.934) PID display bias analog value *C44(Pr.935) PID display gain coefficient*
C45(Pr.935) PID display gain analog value

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

- *Pr.128* = "10, 11, 110, 111" (Deviation value signal input)



- *Pr.128* = "20, 21, 120, 121" (Measured value input)



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

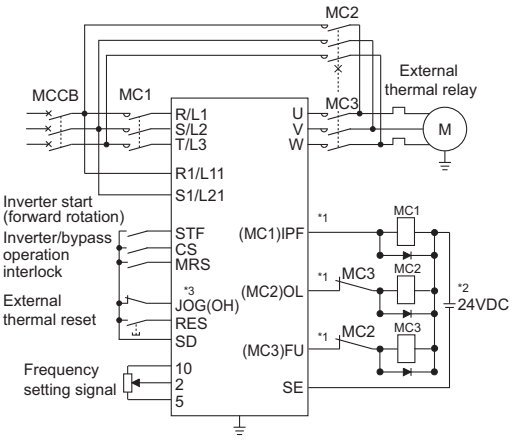
V/F S MFVC

Pr.135 Electronic bypass sequence selection
Pr.136 MC switchover interlock time *Pr.137 Start waiting time*
Pr.138 Bypass selection at a fault
Pr.139 Automatic switchover frequency from inverter to bypass operation
Pr.159 Automatic switchover frequency range from bypass to inverter operation

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

Pr.135 Setting	Description
0 (initial value)	Without commercial power-supply switchover sequence
1	With commercial power-supply switchover sequence

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



Commercial power-supply switchover sequence connection diagram

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

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

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

Pr. 145 Parameter unit display language selection

Pr.145 PU display language selection

You can switch the display language of the parameter unit (FR-PU04/FR-PU07) to another.

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

Pr. 148, 149 → **Refer to the section about** *Pr. 22*

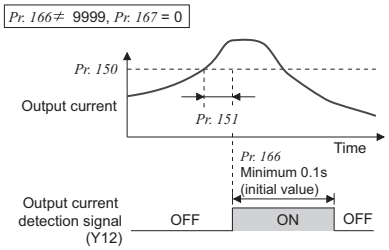
Pr. 150 to 153, 166, 167 Detection of output current (Y12 signal) detection of zero current (Y13 signal)

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

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

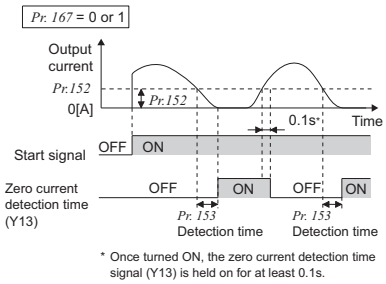
(1) Output current detection (Y12 signal, *Pr. 150, Pr. 151, Pr. 166, Pr. 167*)

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



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

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



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

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

Pr.155 RT signal function validity condition selection

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

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

- The functions that can be set as second functions (When the RT signal is ON, the following second functions are selected at the same time.)

Function	First Function Parameter Number	Second Function Parameter Number	Applied control mode (O: Valid, —: Invalid) V/F	S MFVC	IPM
Torque boost	*Pr.0*	*Pr.46*	○	—	—
Base frequency	*Pr.3*	*Pr.47*	○	○	—
Acceleration time	*Pr.7*	*Pr.44*	○	○	○
Deceleration time	*Pr.8*	*Pr.44, Pr.45*	○	○	○
Electronic thermal O/L relay	*Pr.9*	*Pr.51*	○	○	— (*Pr.9* is valid)
Stall prevention	*Pr.22*	*Pr.48, Pr.49*	○	○	○

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

Pr. 158 → **Refer to the section about** *Pr. 54*

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

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

Pr.160 User group read selection

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

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

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

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

- When *Pr. 160* = "9999" (initial value), only the simple mode parameters can be displayed on the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07).
- When "0" is set in *Pr. 160*, simple mode parameters and extended parameters can be displayed.

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

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

Pr. 161 Operation selection of the operation panel

Pr.161 Frequency setting/key lock operation selection

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

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

Pr. 162 to 165 → **Refer to the section about** *Pr. 57*

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

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

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

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

Pr. 178 to 189 Function assignment of input terminal

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

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

Pr.178 to *Pr.189* Setting	Signal Name	Function	
0	RL	*Pr.59* =0 (initial value)	Low speed operation command
		Pr.59 =1, 2 *1	Remote setting (setting clear)
1	RM	*Pr.59* =0 (initial value)	Middle speed operation command
		Pr.59 =1, 2 *1	Remote setting (deceleration)
2	RH	*Pr.59* =0 (initial value)	High speed operation command
		Pr.59 =1, 2 *1	Remote setting (acceleration)
3	RT	Second function selection	
4	AU	Terminal 4 input selection	
5	JOG	Jog operation selection	
6	CS	Selection of automatic restart after instantaneous power failure, flying start	
		Electronic bypass function	
7	OH	External thermal relay input *2	
8	REX	15 speed selection (combination with three speeds RL, RM, RH)	
10	X10	Inverter operation enable signal (FR-HC2, FR-CV connection)	
11	X11	FR-HC2 connection, instantaneous power failure detection	
12	X12	PU operation external interlock	
14	X14	PID control valid terminal	
16	X16	PU-external operation switchover	
24	MRS	Output stop	
		Electronic bypass function	
25	STOP	Start self-holding selection *3	
60	STF	Forward rotation command (assigned to STF terminal *(Pr. 178)* only)	
61	STR	Reverse rotation command (assigned to STR terminal *(Pr. 179)* only)	
62	RES	Inverter reset	
63	PTC	PTC thermistor input (assigned to AU terminal *(Pr. 184)* only)	
64	X64	PID forward/reverse action switchover	
65	X65	NET/PU operation switchover	
66	X66	External/NET operation switchover	
67	X67	Command source switchover	
70	X70	DC feeding operation permission	
71	X71	DC feeding cancel	
72	X72	PID integral value reset	
9999	—	No function	

*1 When *Pr. 59 Remote function selection* = "1" or "2", the functions of the RL, RM and RH signals are changed as given in the table.
*2 The OH signal turns on when the relay contact "opens".
*3 These signals are available under V/F control and Simple magnetic flux vector control.

Pr. 190 to 196 Terminal assignment of output terminal

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

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

Pr.190 to Pr.196 Setting		Signal Name	Function
Positive logic	Negative logic		
0	100	RUN	Inverter running
1	101	SU	Up to frequency
2	102	IPF	Instantaneous power failure/ undervoltage
3	103	OL	Overload alarm
4	104	FU	Output frequency detection
5	105	FU2	Second output frequency detection
7	107	RBP	Regenerative brake prealarm *1
8	108	THP	Electronic thermal relay function prealarm
10	110	PU	PU operation mode
11	111	RY	Inverter operation ready
12	112	Y12	Output current detection
13	113	Y13	Zero current detection
14	114	FDN	PID lower limit
15	115	FUP	PID upper limit
16	116	RL	PID forward/reverse rotation output
17	—	MC1	Commercial power-supply switchover MC1 *2
18	—	MC2	Commercial power-supply switchover MC2 *2
19	—	MC3	Commercial power-supply switchover MC3 *2
25	125	FAN	Fan fault output
26	126	FIN	Heatsink overheat pre-alarm
45	145	RUN3	During inverter running and start command is on
46	146	Y46	During deceleration at occurrence of power failure (retained until release)
47	147	PID	During PID control activated
48	148	Y48	PID deviation limit
57	157	IPM	IPM motor control *3
64	164	Y64	During retry
67	167	Y67	During power failure
70	170	SLEEP	During PID output suspension
79	179	Y79	Pulse train output of output power
85	185	Y85	DC current feeding
90	190	Y90	Life alarm
91	191	Y91	Alarm output 3 (power-off signal)
92	192	Y92	Energy saving average value updated timing
93	193	Y93	Current average monitor signal
94	194	ALM2	Alarm output 2
95	195	Y95	Maintenance timer signal
96	196	REM	Remote output
98	198	LF	Minor fault output
99	199	ALM	Alarm output
9999		—	No function

*1 Setting can be made for the 75K or higher.
*2 These signals are available under V/F control and Simple magnetic flux vector control.
*3 This function is available only under IPM motor control.

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

Pr. 240 → **Refer to the section about** *Pr. 72*

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

Pr. 242, 243 → **Refer to the section about** *Pr. 73*

Pr. 244 Increase cooling fan life

Pr.244 Cooling fan operation selection

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

Pr. 244 Setting	Description
0	The cooling fan operates at power on. Cooling fan on/off control invalid (The cooling fan is always on at power on)
1 (initial value)	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.

Pr. 245 to 247 Slip compensation

V/F S MFVC

Pr.245 Stop selection *Pr.246 Slip compensation time constant*
Pr.247 Constant-power range slip compensation selection

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

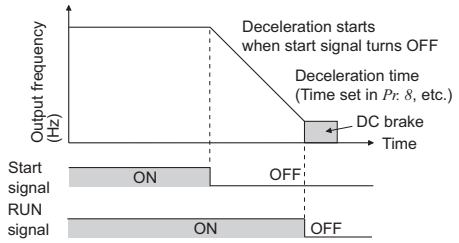
Pr. 250 Selection of motor stopping method and start signal

Pr.250 Stop selection

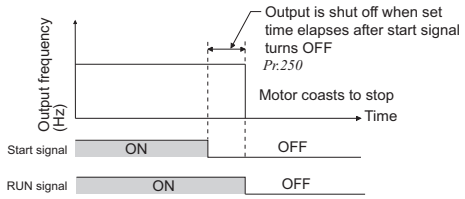
Used to select the stopping method (deceleration to a stop or coasting) when the start signal turns off.
Used to stop the motor with a mechanical brake, etc. together with switching off of the start signal.
You can also select the operations of the start signals (STF/STR).

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

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



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



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

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

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

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

Pr. 252, 253 → **Refer to the section about** *Pr. 73*

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

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

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

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

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

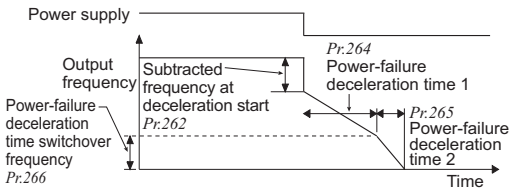
Pr. 261 to 266 Operation at instantaneous power failure

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

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

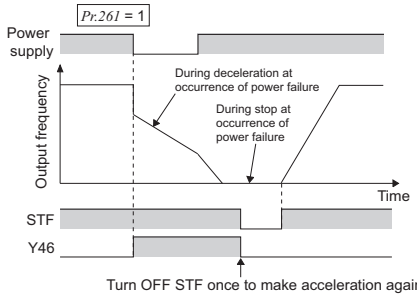
Pr. Number	Setting Range	Description		
		Operation at undervoltage or power failure	At power restoration during power failure deceleration	Deceleration time to a stop
261	0 (initial value)	Coasts to a stop	Coasts to a stop	—
	1	Decelerates to a stop	Decelerates to a stop	Depends on *Pr. 262 to Pr. 266* settings
	2	Decelerates to a stop	Accelerates again	Depends on *Pr. 262 to Pr. 266* settings
	21	Decelerates to a stop	Decelerates to a stop	Automatically adjusts the deceleration time
	22	Decelerates to a stop	Accelerates again	Automatically adjusts the deceleration time
262	0 to 20Hz	Normally operation can be performed with the initial value unchanged. But adjust the frequency according to the magnitude of the load specifications (moment of inertia, torque).		
263	0 to 120Hz	When output frequency ≥ *Pr. 263* Decelerate from the speed obtained from output frequency minus *Pr. 262*. When output frequency < *Pr. 263* Decelerate from output frequency		
	9999	Decelerate from the speed obtained from output frequency minus *Pr. 262*.		
264	0 to 3600/ 360s *	Set a deceleration slope down to the frequency set in *Pr. 266*.		
265	0 to 3600/ 360s *	Set a deceleration slope below the frequency set in *Pr. 266*.		
	9999	Same slope as in *Pr. 264*		
266	0 to 400Hz	Set the frequency at which the deceleration slope is switched from the *Pr. 264* setting to the *Pr. 265* setting.		

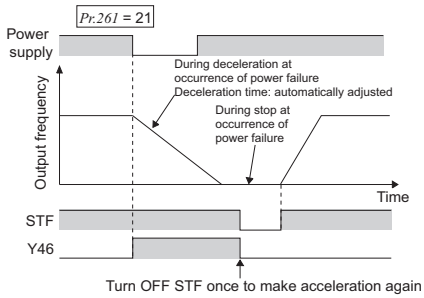
* When the setting of *Pr. 21 Acceleration/deceleration time increments* is "0" (initial value), the setting range is "0 to 3600s" and the setting increments are "0.1s", and when the setting is "1", the setting range is "0 to 360s" and the setting increments are "0.01s"



(1) Power failure stop mode (*Pr.261* = "1, 21")

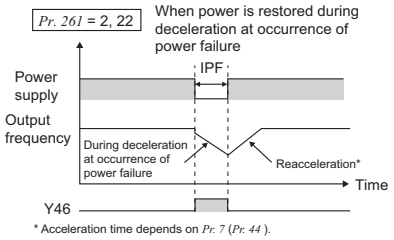
- If power is restored during power failure deceleration, deceleration to a stop is continued and the inverter remains stopped.To restart, turn off the start signal once, then turn it on again.
- With the *Pr.261* = "21" setting, the deceleration time is automatically adjusted to keep (DC bus) voltage constant in the converter when the motor decelerates to a stop at a power failure. (The *Pr.262 to Pr.266* settings become invalid.)

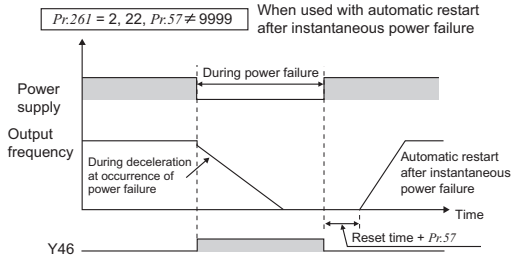




(2) Instantaneous power failure-time operation continuation function (*Pr.261* = "2, 22")

- When power is restored during deceleration after an instantaneous power failure, acceleration is made again up to the set frequency.
- When this function is used in combination with the automatic restart after instantaneous power failure operation, deceleration can be made at a power failure and acceleration can be made again after power restoration.
  When power is restored after a stop by deceleration at an instantaneous power failure, automatic restart operation is performed if automatic restart after instantaneous power failure has been selected (*Pr. 57* ≠ "9999")
- With the *Pr.261* = "22" setting, the deceleration time is automatically adjusted to keep (DC bus) voltage constant in the converter when the motor decelerates to a stop at a power failure. The motor re-accelerates to the set frequency if the power is restored during the deceleration to stop. (Setting *Pr. 261* = "22" disables the settings of *Pr. 262* to *Pr. 266*.)





Pr. 267 → **Refer to the section about** *Pr. 73*

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

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

Pr. 296, 297 Password function

Pr.296 Password lock level *Pr.297 Password lock/unlock*

Registering a 4-digit password can restrict parameter reading/writing.

- Level of reading/writing restriction by PU/Network(NET) mode operation command can be selected by *Pr. 296*.

Pr. 296 Setting	PU Mode Operation Command		NET Mode Operation Command			
			RS-485 terminal		Communication option	
	Read	Write	Read	Write	Read	Write
9999 (initial value)	○	○	○	○	○	○
0, 100	×	×	×	×	×	×
1, 101	○	×	○	×	○	×
2, 102	○	×	○	○	○	○
3, 103	○	○	○	×	○	×
4, 104	×	×	×	×	○	×
5, 105	×	×	○	○	○	○
6, 106	○	○	×	×	○	×
99, 199	Only the parameters registered in the user group can be read/written. (For the parameters not registered in the user group, same restriction level as "4, 104" applies.)					

○: enabled, ×: restricted

Pr. Number	Setting Range	Description
297 *1	1000 to 9998	Register a 4-digit password
	(0 to 5) *2	Displays password unlock error count. (Reading only) (Valid when *Pr. 296* = "100" to "106")
	9999 (initial value)	Password being unlocked

*1 If the password has been forgotten, perform all parameter clear to unlock the parameter restriction. In that case, other parameters are also cleared.

*2 "0 or 9999" can be set to *Pr. 297* at any time although the setting is invalid (the displayed value does not change).

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

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

Pr. 338, 339, 550, 551

Operation command source and speed command source during communication operation

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

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

Pr. Number	Setting Range	Description
338	0 (initial value)	Start command source communication
	1	Start command source external
339	0 (initial value)	Frequency command source communication
	1	Frequency command source external
	2	Frequency command source external (Frequency command from communication is valid, frequency command from terminal 2 is invalid)
550 *	0	The communication option is the command source when NET operation mode.
	1	RS-485 terminals are the command source when NET operation mode.
	9999 (initial value)	Automatic communication option recognition Normally, RS-485 terminals are the command source. When a communication option is mounted, the communication option is the command source.
551 *	1	RS-485 terminals are the command source when PU operation mode.
	2 (initial value)	PU connector is the command source when PU operation mode.

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

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

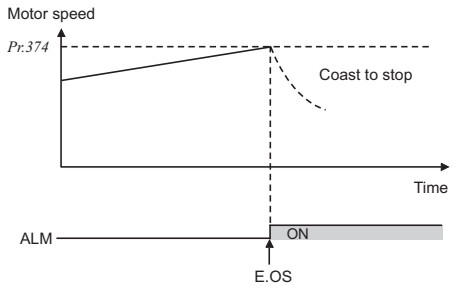
Pr. 341 to 343 → **Refer to the section about** *Pr. 117*

Pr. 374 Overspeed detection IPM

Pr.374 Overspeed detection level

Inverter outputs are stopped when the motor speed exceeds the *Pr.374 Overspeed detection level* under IPM motor control.

Pr.374 Setting	Description
0 to 400Hz	When the motor speed exceeds the speed set in *Pr.374*, overspeed (E.OS) occurs, and the inverter outputs are stopped.
9999 (initial value)	No function



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

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

You can utilize the ON/OFF of the inverter's output signals instead of the remote output terminal of the programmable controller.

Pr. Number	Setting Range	Description	
495	0 (initial value)	Remote output data clear at powering OFF	Remote output data is cleared during an inverter reset
	1	Remote output data retention even at powering OFF	
	10	Remote output data clear at powering OFF	Remote output data is retained during an inverter reset
	11	Remote output data retention even at powering OFF	
496	0 to 4095	Refer to the following diagram.	
497	0 to 4095		

* This parameter allows its setting to be changed during operation in any operation mode even if "0" (initial value) is set in *Pr. 77 Parameter write selection*.

<Remote output data>

Pr.496

b11											b0
*1	*1	*1	*1	*1	ABC2	ABC1	FU	OL	IPF	SU	RUN

Pr.497

b11											b0
*1	*1	RA3 *3	RA2 *3	RA1 *3	Y6 *2	Y5 *2	Y4 *2	Y3 *2	Y2 *2	Y1 *2	Y0 *2

*1 As desired
*2 Y0 to Y6 are available only when the extension output option (FR-A7AY) is fitted
*3 RA1 to RA3 are available only when the relay output option (FR-A7AR) is fitted

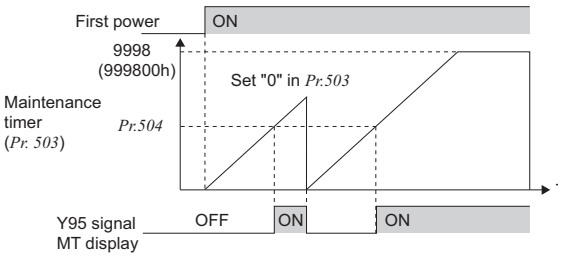
Pr. 502 → **Refer to the section about** *Pr. 117*

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

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

When the cumulative energization time of the inverter reaches the parameter set time, the maintenance timer output signal (Y95) is output. MT (MT) is displayed on the operation panel (FR-DU07)

This can be used as a guideline for the maintenance time of peripheral devices.



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

Pr. 522 Output stop function

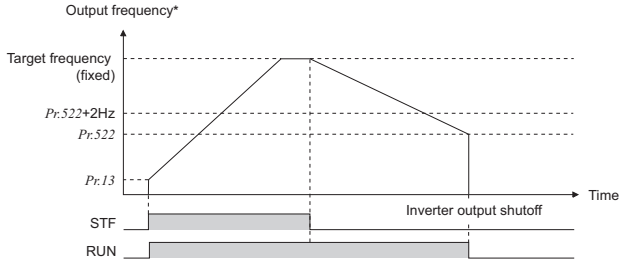
Pr.522 Output stop frequency

The motor coasts to a stop (inverter output shutoff) when inverter output frequency falls to *Pr. 522* setting or lower.

Pr.522 Setting	Description
0 to 400Hz	Set the frequency to start coasting to a stop (output shutoff).
9999 (initial value)	No function

- When both of the frequency setting signal and output frequency falls to the frequency set in *Pr.522* or lower, the inverter stops the output and the motor coasts to a stop.

Example of when target frequency>*Pr.522*+2Hz, and start signal is ON/OFF



* The output frequency before the slip compensation is compared with the *Pr.522* setting.

- At a stop condition, the motor starts running when the frequency setting signal exceeds *Pr.522* +2Hz. The motor is accelerated at the *Pr.13 Starting frequency* (0.01Hz under IPM motor control) at the start.

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

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

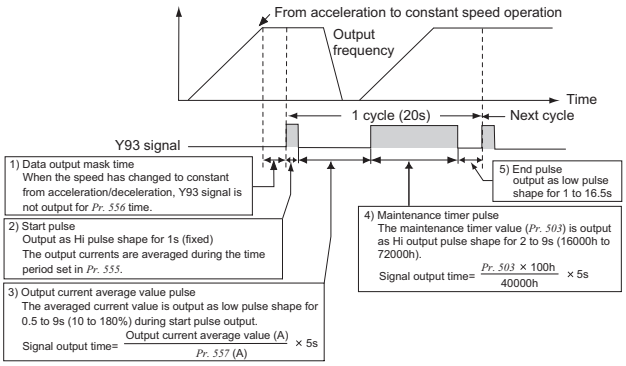
Pr. 555 to 557 Current average value monitor signal

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

The average value of the output current during constant speed operation and the maintenance timer value are output as a pulse to the current average value monitor signal (Y93).

The pulse width output to the I/O module of the PLC or the like can be used as a guideline due to abrasion of machines and elongation of belt and for aged deterioration of devices to know the maintenance time.

The current average value monitor signal (Y93) is output as pulse for 20s as 1 cycle and repeatedly output during constant speed operation.



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

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

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

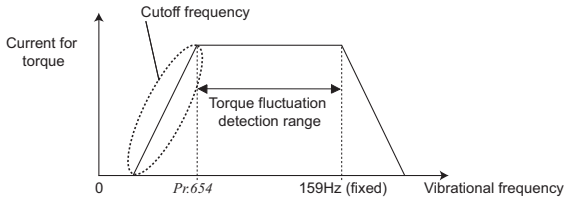
Pr. 653, 654 Machine resonance suppression

V/F S MFVC

Pr.653 Speed smoothing control *Pr.654 Speed smoothing cutoff frequency*

The vibration (resonance) of the machine during motor operation can be suppressed.

- Set "100%" in *Pr.653* and check the vibration. Lower the setting gradually and adjust to the point where the vibration is minimum.
- When the vibrational frequency due to the mechanical resonance (fluctuation of torque, speed, and converter output voltage) is known using a tester and such, set 1/2 to 1 time of the vibrational frequency to *Pr.654*. (Setting vibrational frequency range can suppress the vibration better.)



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

Pr. 779 → **Refer to the section about** *Pr.117*

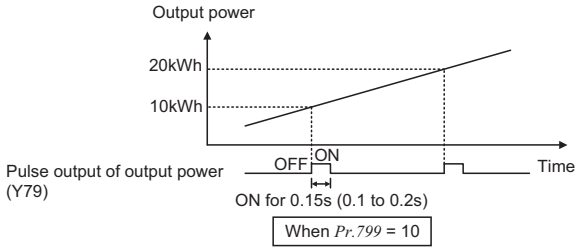
Pr. 799 Pulse train output of output power (Y79 signal)

Pr.799 Pulse increment setting for output power

After power ON or inverter reset, output signal (Y79 signal) is output in pulses every time accumulated output power, which is counted after the *Pr.799 Pulse increment setting for output power* is set, reaches the specified value (or its integral multiples).

Pr.799 setting	Description
0.1kWh, 1kWh (initial value) 10kWh, 100kWh, 1000kWh	Pulse train output of output power (Y79) is output in pulses at every output power (kWh) that is specified.

- The inverter continues to count the output power at retry function or when automatic restart after instantaneous power failure function works without power OFF of output power (power failure that is too short to cause an inverter reset), and it does not reset the count.
- If power failure occurs, output power is counted from 0kWh again.
- Assign pulse output of output power (Y79: setting value 79 (positive logic), 179 (negative logic)) to any of *Pr.190 to Pr.196 (Output terminal function selection)*.



Pr. 800 IPM motor test operation

IPM

Pr.800 Control method selection

Two types of operation can be selected using this parameter: an actual operation by connecting an IPM motor, or a test operation without connecting an IPM motor to simulate a virtual operation. Without connecting an IPM motor, the frequency movement can be checked by the monitor or analog signal output.

Pr.800 setting	Description
9	IPM motor test operation (Motor is not driven even if it is connected.)
20 (initial value)	Normal operation (Motor can be driven.)

Pr. 820, 821 Speed loop gain P gain, integral time adjustment

IPM

Pr.820 Speed control P gain 1 *Pr.821 Speed setting filter 1*

Manual adjustment of gain is useful to exhibit the optimum performance of the machine or to improve unfavorable conditions such as vibration and acoustic noise during the operation with high load inertia or gear backlashes.

- Speed control P gain (*Pr.820*)
  The proportional gain during speed control is set. Setting this parameter higher improves the trackability for speed command changes. It also reduces the speed fluctuation due to a load fluctuation.
- Speed control integral time(*Pr.821*)
  The integral time during speed control is set.
  Setting this parameter lower shortens the return time to the original speed when the speed fluctuates due to a load fluctuation.

Pr. 870 → Refer to the section about *Pr.41*

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

Pr. 882 to 886, 665 Regeneration avoidance function

Pr.882 Regeneration avoidance operation selection
Pr.883 Regeneration avoidance operation level
Pr.884 Regeneration avoidance at deceleration detection sensitivity
Pr.885 Regeneration avoidance compensation frequency limit value
Pr.886 Regeneration avoidance voltage gain
Pr.665 Regeneration avoidance frequency gain

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

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

Pr. Number	Setting Range	Description
882	0 (initial value)	Regeneration avoidance function invalid
	1	Regeneration avoidance function valid
	2	Regeneration avoidance function valid only during constant-speed operation
883	300 to 800V	Set the bus voltage level at which regeneration avoidance operates. When the bus voltage level is set to low, overvoltage error will be less apt to occur. However, the actual deceleration time increases. The set value must be higher than the power supply voltage × $\sqrt{2}$.
884	0 (initial value)	Regeneration avoidance by bus voltage change ratio is invalid
	1 to 5	Set sensitivity to detect the bus voltage change Setting 1 → 5 Detection sensitivity low → high
885	0 to 10Hz	Set the limit value of frequency which rises at activation of regeneration avoidance function.
	9999	Frequency limit invalid
886	0 to 200%	Adjust responsiveness at activation of regeneration avoidance. A larger setting will improve responsiveness to the bus voltage change. However, the output frequency could become unstable. When vibration is not suppressed by decreasing the *Pr. 886* setting, set a smaller value in *Pr. 665*.
665	0 to 200%	

Pr. 888, 889 Free parameter

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

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

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

Pr. 891 → Refer to the section about *Pr. 52*.

Pr. 892 to 899 Energy saving monitor

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

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

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

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

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

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

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

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

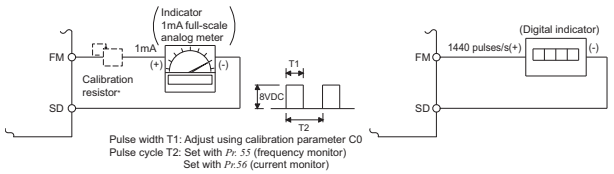
C0(Pr.900) FM terminal calibration *C1(Pr.901) AM terminal calibration*

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

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

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

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



* Not needed when the operation panel (FR-DU07) or parameter unit (FR-PU04/FR-PU07) is used for calibration. Use a calibration resistor when the indicator (frequency meter) needs to be calibrated by a neighboring device because the indicator is located far from the inverter. However, the frequency meter needle may not deflect to full-scale if the calibration resistor is connected. In this case, perform calibration using the operation panel or parameter unit.

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

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

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

Pr. C42(934) to C45(935) → Refer to the section about *Pr.127*

Pr. 989, CL, ALLC, Er.CL, PCPY, CH

Parameter clear, parameter copy, Initial value change list

Pr.989 Parameter copy alarm release
Pr.CL Parameter clear
Er.CL Faults history clear
Pr.CH Initial value change list
ALLC All parameter clear
PCPY Parameter copy

- Set "1" in *Pr.CL Parameter clear* to initialize all parameters. (Calibration parameters are not cleared.)
- Set "1" in *ALLC All parameter clear* to initialize all parameters. *
- Set "1" in *Er.CL Faults history clear* to clear alarm history.
- Parameter settings can be copied to multiple inverters by using *PCPY*.
  When parameters are copied to the 75K or higher inverter from the 55K or lower inverter or vice versa, an CP alarm appears on the operation panel.
  For the parameters whose setting range differ, set *Pr.989* as below after reset.

	55K or lower	75K or higher
Pr.989 setting	10	100

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

- Using *Pr.CH Initial value change list*, only the parameters changed from the initial value can be displayed.

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

Pr. 990 Buzzer control of the operation panel

Pr.990 PU buzzer control

You can make the buzzer "beep" when you press key of the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07).

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

Pr. 991 PU contrast adjustment

Pr.991 PU contrast adjustment

Contrast adjustment of the LCD of the parameter unit (FR-PU04/FR-PU07) can be performed.
Decreasing the setting value makes the contrast lighter.

Pr.991 Setting	Description
0 to 63	0 : Light ↓ 63 : Dark

Pr. 997 Initiating a fault

Pr.997 Fault initiation

A fault is initiated by setting the parameter.
This function is useful to check how the system operates at a fault.
The read value is always "9999." Setting "9999" does not initiate a fault.

- Setting for *Pr. 997 Fault initiation* and corresponding faults

Pr.997 Setting	Fault	*Pr.997* Setting	Fault	*Pr.997* Setting	Fault
16	E.OC1	97	E.SOT	193	E.CTE
17	E.OC2	112	E.BE	194	E.P24
18	E.OC3	128	E.GF	196	E.CDO
32	E.OV1	129	E.LF	197	E.IOH
33	E.OV2	144	E.OHT	198	E.SER
34	E.OV3	145	E.PTC	199	E.AIE
48	E.THT	160	E.OPT	208	E.OS
49	E.THM	161	E.OP1	230	E.PID
64	E.FIN	176	E.PE	241	E.1
80	E.IPF	177	E.PUE	245	E.5
81	E.UVT	178	E.RET	246	E.6
82	E.ILF	179	E.PE2	247	E.7
96	E.OLT	192	E.CPU	253	E.13

Pr. 998, IPM → Refer to page 92

Pr. 999, AUTO Automatic parameter setting

Pr.999 Automatic parameter setting
AUTO Automatic parameter setting

Parameter settings are changed as a batch. Those include communication parameter settings for the Mitsubishi human machine interface (GOT) connection, rated frequency settings of 50Hz/60Hz, and acceleration/deceleration time increment settings.
Multiple parameters are changed automatically. Users do not have to consider each parameter number. (Parameter setting mode)

Pr.999 setting	Description		Operation in the parameter setting mode (AUTO)
9999 (Initial value)	No action		—
10	Automatically sets the communication parameters for the GOT connection with a PU connector		"AUTO" → "GOT" → Write "1"
11	Automatically sets the communication parameters for the GOT connection with RS-485 terminals		—
20	50Hz rated frequency	Sets the related parameters of the rated frequency according to the power supply frequency	"AUTO" → "F50" → Write "1"
21	60Hz rated frequency		—
30	0.1s increment	Changes the setting increments of acceleration/deceleration time parameters without changing acceleration/deceleration settings	—
31	0.01s increment		"AUTO" → "T0.01" → Write "1"

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

	Function Name	Description	Indication
Error message *2	Operation panel lock	Appears when operation is tried during operation panel lock.	HOLd
	Password locked	Appears when a password restricted parameter is read/written.	LOCd
	Parameter write error	Appears when an error occurs at parameter writing.	Er1 to Er4
	Copy operation error	Appears when an error occurs at parameter copying.	rE1 to rE4
	Error	Appears when the RES signal is on or the PU and inverter can not make normal communication.	Err.
Warnings *3	Stall prevention (overcurrent)	Appears during overcurrent stall prevention.	OL
	Stall prevention (overvoltage)	Appears during overvoltage stall prevention Appears while the regeneration avoidance function is activated.	oL
	Regenerative brake prealarm *7	Appears if the regenerative brake duty reaches or exceeds 85% of the *Pr. 70* "*Special regenerative brake duty*" value. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs. (displayed only for the 75K or higher)	rb
	Electronic thermal relay function pre-alarm *1	Appears when the electronic thermal O/L relay has reached 85% of the specified value.	TH
	PU stop	Appears when STOP RESET on the operation panel was pressed during external operation.	PS
	Maintenance signal output *7	Appears when the cumulative energization time has exceeded the maintenance output timer set value.	MT
	Parameter copy	Appears when parameters are copied between models with capacities of 55K or lower and 75K or higher.	CP
Alarm*4	Fan alarm	Appears when the cooling fan remains stopped when operation is required or when the speed has decreased.	FN
Fault *5	Overcurrent trip during acceleration	Appears when an overcurrent occurred during acceleration.	E.OC1
	Overcurrent trip during constant speed	Appears when an overcurrent occurred during constant speed operation.	E.OC2
	Overcurrent trip during deceleration or stop	Appears when an overcurrent occurred during deceleration and at a stop.	E.OC3
	Regenerative overvoltage trip during acceleration	Appears when an overvoltage occurred during acceleration.	E.OV1
	Regenerative overvoltage trip during constant speed	Appears when an overvoltage occurred during constant speed operation.	E.OV2
	Regenerative overvoltage trip during deceleration or stop	Appears when an overvoltage occurred during deceleration and at a stop.	E.OV3
	Inverter overload trip (electronic thermal relay function) *1	Appears when the electronic thermal relay function for inverter element protection was activated.	E.THT
	Motor overload trip (electronic thermal relay function) *1	Appears when the electronic thermal relay function for motor protection was activated.	E.THM
	Heatsink overheat	Appears when the heatsink overheated.	E.FIN
	Instantaneous power failure	Appears when an instantaneous power failure occurred at an input power supply.	E.IPF
	Undervoltage	Appears when the main circuit DC voltage became low.	E.UVT
	Input phase loss *7	Appears if one of the three phases on the inverter input side opened.	E.ILF
	Stall prevention stop	Appears when the output frequency drops to 0.5Hz (1.5Hz under IPM motor control) due to the deceleration with an overloaded motor.	E.OLT
	Loss of synchronism detection *8	Appears when the operation is not synchronized.	E.SOT
	Brake transistor alarm detection/internal circuit fault	This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. In this case, the inverter must be powered off immediately. (Internal circuit error for the model 55K or lower)	E. BE
	Output side earth (ground) fault overcurrent	Appears when an earth (ground) fault occurred on the inverter's output side.	E. GF
	Output phase loss	Appears if one of the three phases on the inverter output side opened.	E. LF
	External thermal relay operation *6, *7	Appears when the external thermal relay connected to the terminal OH operated.	E.OHT
	PTC thermistor operation *7	Appears when the motor overheat status is detected for 10s or more by the external PTC thermistor input connected to the terminal AU.	E.PTC
	Option fault	Appears when an alarm occurred in the option card or an AC power supply is connected to the R/L1, S/L2, T/L3 when the high power factor converter connection is set.	E.OPT
	Communication option fault	Appears when a communication error occurred in the communication option.	E.OP1
	Option fault	Appears when a functional error occurred in the plug-in option.	E. 1
	Parameter storage device fault	Appears when operation of the element where parameters are stored became abnormal. (control circuit board)	E. PE

Function Name		Description	Indication
Fault *5	PU disconnection	Appears when a communication error between the PU and inverter occurred, the communication interval exceeded the permissible time during the RS-485 communication with the PU connecter, or communication errors exceeded the number of retries during the RS-485 communication.	E.PUE
	Retry count excess *7	Appears when the operation was not restarted within the set number of retries.	E.rET
	Parameter storage device fault	Appears when operation of the element where parameters stored became abnormal. (main circuit board)	E.PE2
	CPU fault	Appears during the CPU and peripheral circuit errors.	E. 5 to E. 7, E.CPU
	RS-485 terminal power supply short circuit	Appears when the RS-485 terminal power supply was shorted.	E.CTE
	24VDC power output short circuit	Appears when terminals PC-SD were shorted.	E.P24
	Output current detection value exceeded *7	Appears when output current exceeded the output current detection level set by the parameter.	E.CdO
	Inrush current limit circuit fault	Appears when the resistor of the inrush current limit circuit overheated.	E.IOH
	Communication fault (inverter)	Appears when a communication error occurred during the RS-485 communication with the RS-485 terminals.	E.SEr
	Analog input fault	Stops the inverter output when a 30mA or higher current or a 7.5V or higher voltage is input to terminal 2 while the current input is selected by *Pr. 73 Analog input selection*, or to terminal 4 while the current input is selected by *Pr.267 Terminal 4 input selection*.	E.AIE
	Overspeed occurrence *7, *8	Stops the inverter outputs when the motor speed exceeds the *Pr. 374 Overspeed detection level* under IPM motor control.	E. OS
	PID signal fault	Appears when any of during PID control, PID upper limit (FUP), PID lower limit (FDN), and PID deviation limit (Y48) turns ON during PID control.	E.PId
	Internal circuit fault	Appears when an internal circuit error occurred.	E. 13

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

Options

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

	Name		Type	Applications, Specifications, etc.	Applicable Inverter
Plug-in Type	16-bit digital input		FR-A7AX	· This input interface sets the high frequency accuracy of the inverter using an external BCD or binary digital signal. BCD code 3 digits (maximum 999) BCD code 4 digits (maximum 9999) Binary 12 bits (maximum FFFH) Binary 16 bits (maximum FFFFH)	Shared among all models
	Digital output Extension analog output		FR-A7AY	· This option provides the inverter with open collector outputs selected from among the standard output signals. · This option adds two different signals that can be monitored at the terminals FM and AM, such as the output frequency, output voltage and output current. · 20mADC or 5VDC (10V) meter can be connected.	
	Relay output		FR-A7AR	· Output any three output signals available with the inverter as standard from the relay contact terminals	
	Communication	CC-Link communication	FR-A7NC	· This option allows the inverter to be operated or monitored or the parameter setting to be changed from a computer or PLC. * For the FR-A7NC (CC-Link), the above operations can be done from the PLC only.	
		CC-Link IE Field Network communication	FR-A7NCE		
		LONWORKS communication	FR-A7NL		
		DeviceNet communication	FR-A7ND		
		PROFIBUS-DP communication	FR-A7NP		
		FL remote communication	FR-A7NF		
Stand-alone Shared	Parameter unit (Eight languages)		FR-PU07 FR-PU04	Interactive parameter unit with LCD display	Shared among all models
	Parameter unit with battery pack		FR-PU07BB(-L)	Enables parameter setting without supplying power to the inverter.	
	Parameter unit connection cable		FR-CB20☐	Cable for connection of operation panel or parameter unit ☐ indicates a cable length. (1m, 3m, 5m)	
	Operation panel connection connector		FR-ADP	Connector to connect the operation panel (FR-DU07) and connection cable	
	Heatsink protrusion attachment		FR-A7CN	The inverter heatsink section can be protruded outside of the rear of the enclosure.	FR-F720P-2.2K to 110K FR-F740P-0.75K to 160K
	Intercompatibility attachment		FR-AAT	Attachment for replacing with the FR-F700P series using the installation holes of the FR-F500.	According to capacities
			FR-A5AT	Attachment for replacing with the FR-F700P series using the installation holes of the FR-A100<Excellent> and FR-A200<Excellent>	
	AC reactor		FR-HAL	For harmonic current reduction and inverter input power factor improvement	According to capacities
	DC reactor		FR-HEL		For the 55K or lower
	Brake unit Resistor unit		FR-BU2	For increasing the braking capability of the inverter (for high inertia load or negative load) Brake unit and resistor unit are used in combination	According to capacities
			FR-BR		For the 55K or lower
			MT-BR5		For the 75K or higher
	Power regeneration common converter		FR-CV	Unit which can return motor-generated braking energy back to the power supply in common converter system	For the 55K or lower
	Dedicated stand-alone reactor for the FR-CV		FR-CVL		
	Power regeneration converter		MT-RC	Energy saving type high performance brake unit which can regenerate the braking energy generated by the motor to the power supply.	For the 75K or higher

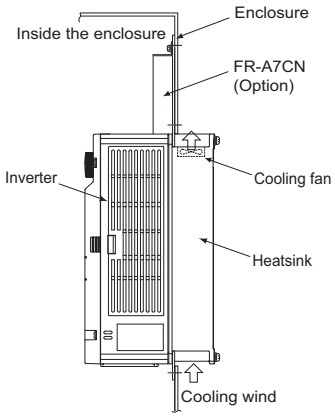
	Name		Type	Applications, Specifications, etc.	Applicable Inverter
Stand-alone Shared	High power factor converter		FR-HC2	The high power factor converter switches the converter section on/off to reshape an input current waveform into a sine wave, greatly suppressing harmonics. (Used in combination with the standard accessory.)	According to capacities
	Line noise filter		FR-BSF01 FR-BLF	For line noise reduction	Shared among all models
	Surge voltage suppression filter		FR-ASF	Filter for suppressing surge voltage on motor	For 400V class 55K or lower
			FR-BMF		
	Sine wave filter	Reactor	MT-BSL	Reduces the motor noise during inverter driving Use in combination with a reactor and a capacitor	For the 75K or higher
		Capacitor	MT-BSC		
FR Series Manual Controller/Speed Controller	Manual controller		FR-AX	For independent operation. With frequency meter, frequency setting potentiometer and start switch.	Shared among all models
	DC tach. follower		FR-AL	For synchronous operation (1VA) by external signal (0 to 5V, 0 to 10V DC)	
	Three speed selector		FR-AT	For three speed switching, among high, middle and low speed operation (1.5VA)	
	Motorized speed setter		FR-FK	For remote operation. Allows operation to be controlled from several places (5VA)	
	Ratio setter		FR-FH	For ratio operation. Allows ratios to be set to five inverters. (3VA)	
	PG follower		FR-FP	For tracking operation by a pilot generator (PG) signal (3VA)	
	Master controller		FR-FG	Master controller (5VA) for parallel operation of multiple (maximum 35) inverters.	
	Soft starter		FR-FC	For soft start and stop. Enables acceleration/deceleration in parallel operation (3VA)	
	Deviation detector		FR-FD	For continuous speed control operation. Used in combination with a deviation sensor or synchro (5VA)	
	Preamplifier		FR-FA	Used as an A/V converter or arithmetic amplifier (3VA)	
Others	Pilot generator		QVAH-10	For tracking operation. 70V/35VAC 500Hz (at 2500r/min)	
	Deviation sensor		YVGC-500W-NS	For continuous speed control operation (mechanical deviation detection). Output 90VAC/90°	
	Frequency setting potentiometer		WA2W 1kΩ	For frequency setting. Wirewound 2W 1kΩ B characteristic	
	Frequency meter		YM206NRI 1mA	Dedicated frequency meter (graduated to 120Hz). Moving-coil type DC ammeter	
	Calibration resistor		RV24YN 10kΩ	For frequency meter calibration. Carbon film type B characteristic	
	FR Configurator (Inverter setup software)		FR-SW3-SETUP-WE	Supports an inverter startup to maintenance.	Shared among all models

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

Stand-alone option

Heatsink protrusion attachment FR-A7CN□□

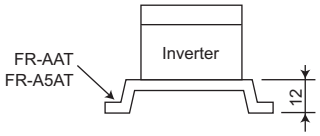
- Allows the heatsink, which is the exothermic section of the inverter, to be protruded outside the enclosure. Since the heat generated in the inverter can be radiated to the rear of the enclosure, the enclosure size can be downsized.
- This attachment requires larger attachment area. Refer to the dimension of the inverter with the attachment (on *page 21*).
- Refer to *page 21* for the enclosure cut dimensions.



Model	Applicable Inverter	
	200V class	400V class
FR-A7CN01	FR-F720P-2.2K to 5.5K	FR-F740P-0.75K to 5.5K
FR-A7CN02	FR-F720P-7.5K, 11K	FR-F740P-7.5K, 11K
FR-A7CN03	FR-F720P-15K	FR-F740P-15K, 18.5K
FR-A7CN04	FR-F720P-18.5K to 30K	FR-F740P-22K, 30K
FR-A7CN05	FR-F720P-37K	—
FR-A7CN06	—	FR-F740P-37K
FR-A7CN07	FR-F720P-45K, 55K	FR-F740P-45K, 55K, 75K
FR-A7CN08	—	FR-F740P-90K
FR-A7CN09	—	FR-F740P-110K
FR-A7CN10	FR-F720P-75K to 110K	FR-F740P-132K, 160K

Intercompatibility attachment FR-AAT□□ FR-A5AT□□

- Intercompatibility attachment
  Enables FR-F700P to be attached using the mounting holes made for the conventional FR-F500/A100E series inverter. This attachment is useful when replacing a conventional inverter with FR-F700P.
  * The inverter with this attachment requires greater installation depth.



[Models replaceable with FR-F720P]

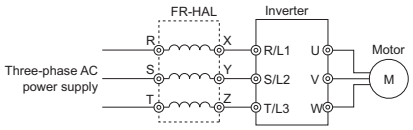
Conventional model and capacity			FR-F720P						
			0.75K/1.5K	2.2K to 5.5K	7.5K/11K	15K	18.5K to 30K	37K	45K/55K
	FR-A120E	0.75K	FR-A5AT01	—	—	—	—	—	—
		1.5K to 3.7K	FR-A5AT02	FR-A5AT02	—	—	—	—	—
		5.5K to 11K	—	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K/18.5K	—	—	FR-AAT02	FR-AAT24	○	—	—
		22K/30K	—	—	—	FR-A5AT04	FR-A5AT04	—	—
		37K	—	—	—	—	FR-AAT27	○	—
		45K	—	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	—	FR-A5AT05
	FR-F520	0.75K	○	—	—	—	—	—	—
		1.5K to 3.7K	FR-AAT21	○	—	—	—	—	—
		5.5K/7.5K	—	FR-AAT22	○	—	—	—	—
		11K	—	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K to 22K	—	—	FR-AAT02	FR-AAT24	○	—	—
		30K	—	—	—	FR-A5AT04	FR-A5AT04	—	—
		37K	—	—	—	—	FR-AAT27	○	—
		45K	—	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	—	FR-A5AT05

[Models replaceable with FR-F740P]

Conventional model and capacity			FR-F740P					
			0.75K to 5.5K	7.5K/11K	15K/18.5K	22K/30K	37K	45K/55K
	FR-A140E	0.75K to 3.7K	FR-A5AT02	—	—	—	—	—
		5.5K to 11K	FR-A5AT03	FR-A5AT03	—	—	—	—
		15K/18.5K	—	FR-AAT02	FR-AAT24	—	—	—
		22K	—	—	FR-A5AT04	FR-A5AT04	—	—
		30K	—	—	—	FR-AAT27	—	—
		37K/45K	—	—	—	—	FR-AAT23	○
		55K	—	—	—	—	—	FR-A5AT05
	FR-F540	0.75K to 3.7K	○	—	—	—	—	—
		5.5K to 11K	FR-AAT22	○	—	—	—	—
		15K to 22K	—	FR-AAT02	FR-AAT24	○	—	—
		30K/37K	—	—	—	FR-AAT27	○	—
		45K/55K	—	—	—	—	FR-AAT23	○

○: Replaceable without the intercompatibility attachment
FR-A5AT□□, FR-AAT□□: Replaceable with the intercompatibility attachment.

Name (model)	Specification and Structure
AC reactor (for power supply coordination) FR-HAL-(H)☐☐K	● Improves the power factor and reduces the harmonic current at the input side. Connect an AC reactor at the input side of the inverter. ● Selection method Select an AC reactor according to the applied motor capacity. (Select the AC reactor according to the motor capacity even if the capacity is smaller than the inverter capacity.) ● Connection diagram

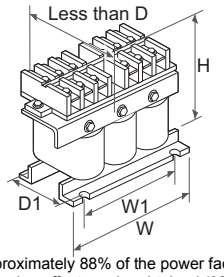


● Outline dimension

(Unit: mm)

	Model	W	W1	H	D	D1	d	Mass (kg)
200V	0.4K	104	84	99	72	40	M5	0.6
	0.75K	104	84	99	74	44	M5	0.8
	1.5K	104	84	99	77	50	M5	1.1
	2.2K	115	40	115	77	57	M6	1.5
	3.7K	115	40	115	83	67	M6	2.2
	5.5K	115	40	115	83	67	M6	2.3
	7.5K	130	50	135	100	86	M6	4.2
	11K	160	75	164	111	92	M6	5.2
	15K	160	75	167	126	107	M6	7.0
	18.5K	160	75	128	175	107	M6	7.1
	22K	185	75	150	158	87	M6	9.0
	30K	185	75	150	168	87	M6	9.7
	37K	210	75	175	174	82	M6	12.9
	45K	210	75	175	191	97	M6	16.4
	55K	210	75	175	201	97	M6	17.4
	75K	240	150	210	215.5	109	M8	23
	110K	330	170	325	259	127	M10	40

	Model	W	W1	H	D	D1	d	Mass (kg)
400V	H0.4K	135	120	115	64	45	M4	1.5
	H0.75K	135	120	115	64	45	M4	1.5
	H1.5K	135	120	115	64	45	M4	1.5
	H2.2K	135	120	115	64	45	M4	1.5
	H3.7K	135	120	115	74	57	M4	2.5
	H5.5K	160	145	142	76	55	M4	3.5
	H7.5K	160	145	142	96	75	M4	5.0
	H11K	160	145	146	96	75	M4	6.0
	H15K	220	200	195	105	70	M5	9.0
	H18.5K	220	200	215	170	70	M5	9.0
	H22K	220	200	215	170	70	M5	9.5
	H30K	220	200	215	170	75	M5	11
	H37K	220	200	214	170	100	M5	12.5
	H45K	280	255	245	165	80	M6	15
	H55K	280	255	245	170	90	M6	18
	H75K	210	75	170	210.5	105	M6	20
	H110K	240	150	225	220	99	M8	28
	H185K	330	170	325	271	142	M10	55
	H280K	330	170	325	321	192	M10	80
	H355K	330	170	325	346	192	M10	90
	H560K	450	300	540	635	345	M12	190



(Note)1. Approximately 88% of the power factor improving effect can be obtained (92.3% when calculated with 1 power factor for the fundamental wave according to the Architectural Standard Specifications (Electrical Installation) (2010 revision) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan).
2. This is a sample outline dimension drawing. The shape differs by the model. W1 and D1 indicate distances between installation holes. The installation hole size is indicated by d.
3. When installing an AC reactor (FR-HAL), install in the orientation shown below.
   · (H)55K or lower: Horizontal installation or vertical installation
   · (H)75K or higher: Horizontal installation
4. Keep enough clearance around the reactor because it heats up. (Keep a clearance of minimum 10cm each on top and bottom and minimum 5cm each on right and left regardless of the installation orientation.)

Name (model)	Specification and Structure

DC reactor
(for power supply coordination)
FR-HEL-(H)☐☐K

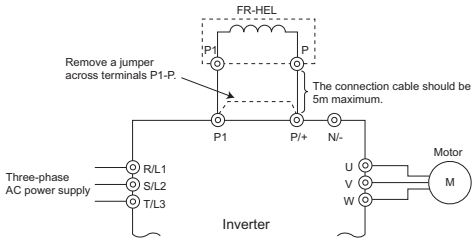
- Improves the power factor and reduces the harmonic current at the input side. Connect a DC reactor in the DC section of the inverter.

Selection method

- Select a DC reactor according to the applied motor capacity. (Select it according to the motor capacity even if the capacity is smaller than the inverter capacity.)
- The 75K or higher DC reactors come with the corresponding inverters. *(Refer to page 12.)*

Connection diagram

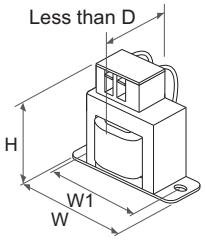
- Connect a DC reactor to the inverter terminals P1 and P. Before connecting, make sure to remove the jumper across the terminals P1 and P. (If the jumper is left attached, no power factor improvement can be obtained.)
- The connection cable between the reactor and the inverter should be as short as possible (5m or less).



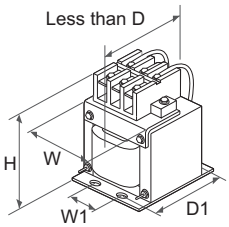
Outline dimension

(Unit: mm)

	Model	W	W1	H	D	D1	d	Mass (kg)		Model	W	W1	H	D	D1	d	Mass (kg)
200V	0.4K	70	60	71	61	—	M4	0.4	400V	H0.4K	90	75	78	60	—	M5	0.6
	0.75K	85	74	81	61	—	M4	0.5		H0.75K	66	50	100	70	48	M4	0.8
	1.5K	85	74	81	70	—	M4	0.8		H1.5K	66	50	100	80	54	M4	1
	2.2K	85	74	81	70	—	M4	0.9		H2.2K	76	50	110	80	54	M4	1.3
	3.7K	77	55	92	82	57	M4	1.5		H3.7K	86	55	120	95	69	M4	2.3
	5.5K	77	55	92	92	67	M4	1.9		H5.5K	96	60	128	100	75	M5	3
	7.5K	86	60	113	98	72	M4	2.5		H7.5K	96	60	128	105	80	M5	3.5
	11K	105	64	133	112	79	M6	3.3		H11K	105	75	137	110	85	M5	4.5
	15K	105	64	133	115	84	M6	4.1		H15K	105	75	152	125	95	M5	5
	18.5K	105	64	93	165	94	M6	4.7		H18.5K	114	75	162	120	80	M5	5
	22K	105	64	93	175	104	M6	5.6		H22K	133	90	178	120	75	M5	6
	30K	114	72	100	200	101	M6	7.8		H30K	133	90	178	120	80	M5	6.5
	37K	133	86	117	195	98	M6	10		H37K	133	90	187	155	100	M5	8.5
	45K	133	86	117	205	108	M6	11		H45K	133	90	187	170	110	M5	10
	55K	153	126	132	209	122	M6	12.6		H55K	152	105	206	170	106	M6	11.5



FR-HEL-0.4K to 2.2K
FR-HEL-H0.4K



FR-HEL-3.7K to 55K
FR-HEL-H0.75K to H55K

(Note)1. The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3). (*Refer to page 78.*)
2. Approximately 93% of the power factor improving effect can be obtained (94.4% when calculated with 1 power factor for the fundamental wave according to the Architectural Standard Specifications (Electrical Installation) (2010 revision) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan).
3. This is a sample outline dimension drawing. The shape differs by the model.
W1 and D1 indicate distances between installation holes. The installation hole size is indicated by d.
4. When installing a DC reactor (FR-HEL), install in the orientation shown below.
· (H)55K or lower: Horizontal installation or vertical installation
· (H)75K or higher: Horizontal installation
5. Keep enough clearance around the reactor because it heats up.
(Keep a clearance of minimum 10cm each on top and bottom and minimum 5cm each on right and left regardless of the installation orientation.)

Name (model)	Specification and Structure

Brake unit
FR-BU2-(H)☐☐K

Resistor unit
FR-BR-(H)☐☐K
MT-BR5-(H)☐☐K

Discharging resistor
GZG type
GRZG type

- Provides a braking capability greater than that is provided by an external brake resistor. This option can also be connected to the inverters without built-in brake transistors. Three types of discharging resistors are available. Make a selection according to the required braking torque.

● Specification

[Brake unit]

Model FR-BU2-☐	200V						400V						
	1.5K	3.7K	7.5K	15K	30K	55K	H7.5K	H15K	H30K	H55K	H75K	H220K	H280K
Applicable motor capacity	The applicable capacity differs by the braking torque and the operation rate (%ED).												
Connected brake resistor	GRZG type, FR-BR, MT-BR5 (For the combination, refer to the table below.)											MT-BR5 *	
Multiple (parallel) driving	Max. 10 units (However, the torque is limited by the permissible current of the connected inverter.)												
Approximate mass (kg)	0.9	0.9	0.9	0.9	1.4	2.0	0.9	0.9	1.4	2.0	2.0	13	13

* Please contact your sales representative to use a brake resistor other than MT-BR5.

[Resistor unit]

Model GRZG type	200V				400V		
	GZG300W-50Ω	GRZG200-10Ω	GRZG300-5Ω	GRZG400-2Ω	GRZG200-10Ω	GRZG300-5Ω	GRZG400-2Ω
Number of connectable units	1 unit	3 in series	4 in series	6 in series	6 in series	8 in series	12 in series
Discharging resistor combined resistance (Ω)	50	30	20	12	60	40	24
Continuous operation permissible power (W)	100	300	600	1200	600	1200	2400

Model FR-BR-☐	200V			400V		
	15K	30K	55K	H15K	H30K	H55K
Discharging resistor combined resistance (Ω)	8	4	2	32	16	8
Continuous operation permissible power (W)	990	1990	3910	990	1990	3910
Approximate mass (kg)	15	30	70	15	30	70

Model (MT-BR5-☐)	200V	400V
	55K	H75K
Discharging resistor combined resistance (Ω)	2	6.5
Continuous operation permissible power (W)	5500	7500
Approximate mass (kg)	50	70

● Combination between the brake unit and the resistor unit

Brake unit model		Discharging resistor model or resistor unit model		
		GRZG type	FR-BR	MT-BR5
200V class	FR-BU2-1.5K	GZG 300W-50Ω (1 unit)	—	—
	FR-BU2-3.7K	GRZG 200-10Ω (3 in parallel)	—	—
	FR-BU2-7.5K	GRZG 300-5Ω (4 in parallel)	—	—
	FR-BU2-15K	GRZG 400-2Ω (6 in parallel)	FR-BR-15K	—
	FR-BU2-30K	—	FR-BR-30K	—
	FR-BU2-55K	—	FR-BR-55K	MT-BR5-55K
400V class	FR-BU2-H7.5K	GRZG 200-10Ω (6 in parallel)	—	—
	FR-BU2-H15K	GRZG 300-5Ω (8 in parallel)	FR-BR-H15K	—
	FR-BU2-H30K	GRZG 400-2Ω (12 in parallel)	FR-BR-H30K	—
	FR-BU2-H55K	—	FR-BR-H55K	—
	FR-BU2-H75K	—	—	MT-BR5-H75K
	FR-BU2-H220K	—	—	3 × MT-BR5-H75K *
	FR-BU2-H280K	—	—	4 × MT-BR5-H75K *

* The number next to the model name indicates the number of connectable units in parallel.

● Selection method

[GRZG type]

- The maximum temperature rise of the discharging resistors is about 100°C. Use heat-resistant wires to perform wiring, and make sure that they will not come in contact with resistors.

Power supply voltage	Motor (kW) / Braking torque	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
200V class	50% 30s	FR-BU2-1.5K		FR-BU2-3.7K		FR-BU2-7.5K		FR-BU2-15K		2 × FR-BU2-15K *1			3 × FR-BU2-15K *1		4 × FR-BU2-15K *1
	100% 30s	FR-BU2-1.5K	FR-BU2-3.7K	FR-BU2-7.5K		FR-BU2-15K		2 × FR-BU2-15K *1		3 × FR-BU2-15K *1		4 × FR-BU2-15K *1	5 × FR-BU2-15K *1	6 × FR-BU2-15K *1	7 × FR-BU2-15K *1
400V class	50% 30s	— *2		FR-BU2-H7.5K				FR-BU2-H15K		FR-BU2-H30K			2 × FR-BU2-H30K *1		
	100% 30s	— *2		FR-BU2-H7.5K		FR-BU2-H15K		FR-BU2-H30K		2 × FR-BU2-H30K *1			3 × FR-BU2-H30K *1		4 × FR-BU2-H30K *1

*1 The number next to the model name indicates the number of connectable units in parallel.
*2 The 400V class 1.5K or lower capacity inverters cannot be used with brake units. When using brake units with inverters, use 2.2K or higher capacity inverters.

Name (model)	Specification and Structure

Brake unit
FR-BU2-(H)☐☐K

Resistor unit
FR-BR-(H)☐☐K
MT-BR5-(H)☐☐K

Discharging resistor
GZG type
GRZG type

[FR-BR]

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

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

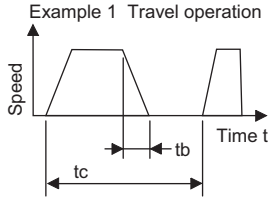
Motor capacity			5.5kW	7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
200V	FR-BU2-15K	%ED	80	40	15	10	—	—	—	—	—	—
	FR-BU2-30K		—	—	65	30	25	15	10	—	—	—
	FR-BU2-55K		—	—	—	—	90	60	30	20	15	10
400V	FR-BU2-H15K	%ED	80	40	15	10	—	—	—	—	—	—
	FR-BU2-H30K		—	—	65	30	25	15	10	—	—	—
	FR-BU2-H55K		—	—	—	—	90	60	30	20	15	10

Braking torque (%) at 10%ED in short-time rating of 15s(%)

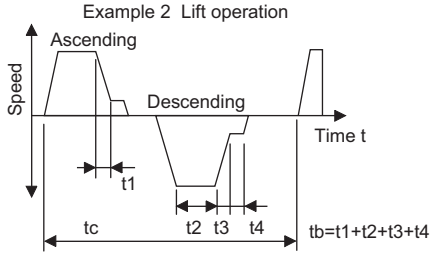
Motor capacity			5.5kW	7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
200V	FR-BU2-15K	Braking torque (%)	280	200	120	100	80	70	—	—	—	—
	FR-BU2-30K		—	—	260	180	160	130	100	80	70	—
	FR-BU2-55K		—	—	—	—	300	250	180	150	120	100
400V	FR-BU2-H15K	Braking torque (%)	280	200	120	100	80	70	—	—	—	—
	FR-BU2-H30K		—	—	260	180	160	130	100	80	70	—
	FR-BU2-H55K		—	—	—	—	300	250	180	150	120	100

Regeneration duty factor (operation frequency)%ED $= \frac{tb}{tc} \times 100$ tb<15s (continuous operation time)

Example 1 Travel operation



Example 2 Lift operation



[MT-BR5]

- Be sure to select a well-ventilated place for the installation of the resistor unit. Ventilation is necessary when installing the resistor in a place such as enclosure, where heat is not well diffused.
- The maximum temperature rise of the resistor unit is about 300deg. When wiring, be careful not to touch the resistor. Also, keep any heat-sensitive component away from the resistor (minimum 40 to 50cm).
- The temperature of the resistor unit abnormally increases if the brake unit is operated exceeding the specified duty. Since the resistor unit may result in overheat if the temperature of the brake unit is left unchanged, switch off the inverter.
- A resistor unit is equipped with thermostat (NO contact) for overheat protection. If this protective thermostat activates in normal operation, the deceleration time may be too short. Set the inverter's deceleration time longer.

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

Motor capacity / Number of connectable units*1		75kW	90kW	110kW	132kW	160kW	185kW	220kW	250kW	280kW	315kW	355kW	375kW	400kW	450kW	500kW	560kW
200V class FR-BU2-55K	1	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	20	15	10	—	—	—	—	—	—	—	—	—	—	—	—	—
400V class FR-BU2-H75K	1	10	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	40	25	20	10	5	5	—	—	—	—	—	—	—	—	—	—
400V class FR-BU2-H220K	1	80	60	40	25	15	10	10	5	—	—	—	—	—	—	—	—
	2	—	—	—	—	—	—	20	20	15	15	15	10	10	10	5	—
400V class FR-BU2-H280K	1	—	80	65	40	30	20	15	10	10	10	5	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	—	20	20	15	15	15	10	10

Braking torque (%) in short-time rating of 15s(%)

Motor capacity / Number of connectable units*1		75kW	90kW	110kW	132kW	160kW	185kW	220kW	250kW	280kW	315kW	355kW	375kW	400kW	450kW	500kW	560kW
200V class FR-BU2-55K	1	70	60	50	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	150	120	100	—	—	—	—	—	—	—	—	—	—	—	—	—
400V class FR-BU2-H75K	1	100	80	70	55	45	40	35	—	25	—	—	20	—	—	—	—
	2	150	150	135	110	90	80	70	60	50	45	40	40	—	—	—	—
400V class FR-BU2-H220K	1	—	—	150	150	135	115	100	80	55	—	—	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	150	150	140	120	110	100	90	80
400V class FR-BU2-H280K	1	—	—	—	—	150	150	150	125	100	70	—	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	—	—	—	150	150	130	115	100

*1 The number next to the model name indicates the number of connectable units in parallel.
*2 To obtain a large braking torque, the motor has to have a torque characteristic that meets the braking torque. Check the torque characteristic of the motor.

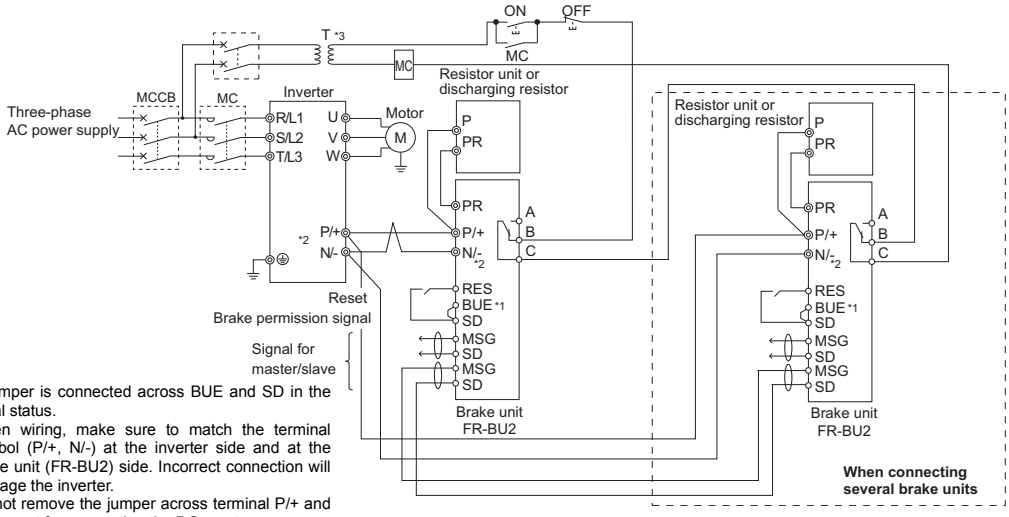
Name (model)	Specification and Structure

Brake unit
FR-BU2-(H)□□K

Resistor unit
FR-BR-(H)□□K
MT-BR5-(H)□□K

Discharging resistor
GZG type
GRZG type

● Connection diagram



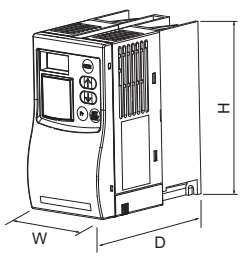
*1 A jumper is connected across BUE and SD in the initial status.

*2 When wiring, make sure to match the terminal symbol (P/+, N/-) at the inverter side and at the brake unit (FR-BU2) side. Incorrect connection will damage the inverter.
Do not remove the jumper across terminal P/+ and P1 except for connecting the DC reactor.

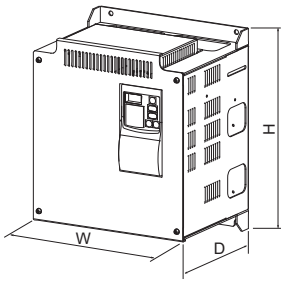
*3 When the power supply is 400V class, install a step-down transformer.

● Outline dimensions

[FR-BU2]



FR-BU2-1.5K to 55K
FR-BU2-H7.5K to H75K

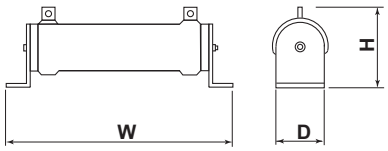


FR-BU2-H220K, H280K

(Unit: mm)

Model	W	H	D
FR-BU2-1.5K to 15K	68	128	132.5
FR-BU2-30K	108	128	129.5
FR-BU2-55K	170	128	142.5
FR-BU2-H7.5K, H15K	68	128	132.5
FR-BU2-H30K	108	128	129.5
FR-BU2-H55K, H75K	170	128	142.5
FR-BU2-H220K, H280K	250	300	200

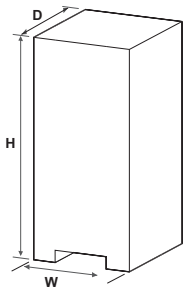
[GZG, GRZG]



(Unit: mm)

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

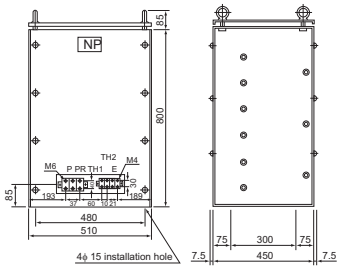
[FR-BR]



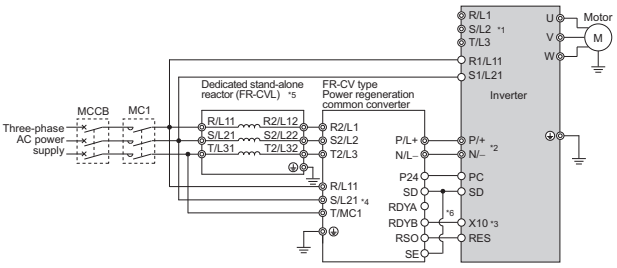
(Unit: mm)

Model	W	H	D
FR-BR-15K	170	450	220
FR-BR-30K	340	600	220
FR-BR-55K	480	700	450
FR-BR-H15K	170	450	220
FR-BR-H30K	340	600	220
FR-BR-H55K	480	700	450

[MT-BR5]



Name (model)	Specification and Structure
Power regeneration common converter FR-CV-(H)☐☐K	● Enables continuous regenerative operation at 100% torque. This option can support continuous regenerative operations including line operation. ● This converter eliminates the need of preparing brake units per inverter. This converter can cut down the total space and the cost. ● The regenerated energy is used by another inverter, and if there is still an excess, it is returned to the power supply, saving on the energy consumption. ● Connection diagram



*1 Remove jumpers between terminal R/L1 and R/L11as well as between S/L2 and S1/L21, and connect the power supply for the control circuit to terminals R1/L11 and S1/L21. Do not connect anything to power input terminals (R/L1, S/L2, T/L3). Incorrect connection will damage the inverter. Connecting the opposite polarity of terminals N/- and P/+ will damage the inverter.

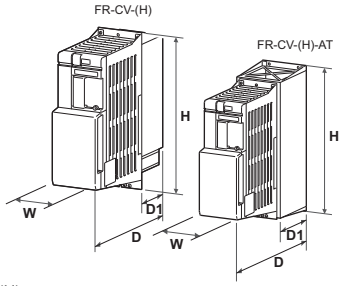
*2 Do not insert an MCCB between the terminals P/+ and N/- (between terminals P/L+ and P/+ or between N/L- and N/-).
Always match the terminal symbols (P/+, N/-) at the inverter side and at the power regeneration common converter side. Incorrect connection will damage the inverter.
Do not remove the jumper across P/+ and P1.

*3 Assign the terminal for X10 signal using any of *Pr. 178 to Pr. 189 (input terminal function selection)*.

*4 Be sure to connect the power supply and terminals R/L11, S/L21, and T/MC1. Operating the inverter without connecting them will damage the power regeneration common converter.

*5 Install the dedicated stand-alone reactor (FR-CVL) on a horizontal place.

*6 Always connect terminal RDYB of the FR-CV to an inverter terminal where the X10 signal or the MRS signal is assigned to. Always connect terminal SE of the FR-CV to the inverter terminal SD. Not connecting these terminals may damage the FR-CV.

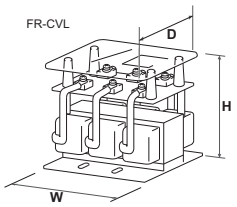


FR-CV-(H) (Unit: mm)

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

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

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



FR-CVL (Unit: mm)

	Voltage/ capacity	W	H	D		Voltage/ capacity	W	H	D
200V	7.5K/11K/ 15K	165	155	130	400V	7.5K/11K	220	200	135
						15K	220	205	135
	22K	165	155	140		22K	220	215	150
	30K	215	175	160		30K	245	220	185
	37K	220	200	320		37K	245	265	230
	55K	250	225	335		55K	290	280	230

* The maximum dimensions.

Name (model)	Specification and Structure

High power factor converter
FR-HC2-(H)☐☐K

- Substantially suppresses power harmonics to realize the equivalent capacity conversion coefficient K5 = 0 in "the Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage" in Japan.
- The power regeneration function comes standard.
- The common converter driving with several inverters is possible.

Specification

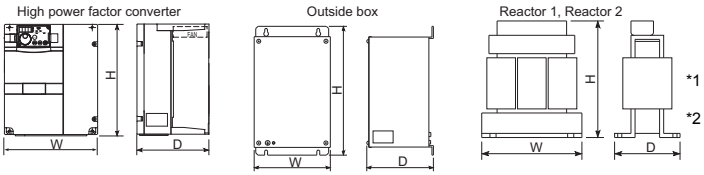
Model FR-HC2☐☐ (*2)	200V					400V										
	7.5K	15K	30K	55K	75K	H7.5K	H15K	H30K	H55K	H75K	H110K	H160K	H220K	H280K	H400K	H560K
Applicable inverter capacity (*1)	3.7K to 7.5K	7.5K to 15K	15K to 30K	30K to 55K	37K to 75K	3.7K to 7.5K	7.5K to 15K	15K to 30K	30K to 55K	37K to 75K	55K to 110K	90K to 60K	110K to 220K	160K to 280K	200K to 400K	280K to 560K
Rated input voltage/frequency	Three-phase 200V to 220V 50Hz 200V to 230V 60Hz					Three-phase 380V to 460V 50/60Hz										
Rated input current (A)	33	61	115	215	278	17	31	57	110	139	203	290	397	506	716	993

*1 The total capacity of the connected inverters.
*2 If a high power factor converter (FR-HC2) is purchased, it comes with reactor 1 (FR-HCL21), reactor 2 (FR-HCL22), and an outside box (FR-HCB2). (If an H280K or higher is purchased, it comes with FR-HCL21, FR-HCL22, FR-HCC2, FR-HCR2, and FR-HCM2.)

Outline dimension

(Unit: mm)

Voltage	Capacity	High power factor converter FR-HC2			Reactor 1 FR-HCL21 (*1)			Reactor 2 FR-HCL22 (*1)			Outside box FR-HCB2 (*2)		
		W	H	D	W	H	D	W	H	D	W	H	D
200V	7.5K	220	260	170	132	150	100	237.5	230	140	190	320	165
	15K	250	400	190	162	172	126	257.5	260	165			
	30K	325	550	195	195	210	150	342.5	305	180	270	450	203
	55K	370	620	250	210	180	200.5	432.5	380	280			
	75K	465	620	300	240	215	215.5	474	460	280	400	450	250
400V	H7.5K	220	300	190	132	140	100	237.5	220	140	190	320	165
	H15K	220	300	190	162	170	126	257.5	260	165			
	H30K	325	550	195	182	195	101	342.5	300	180			
	H55K	370	670	250	282.5	245	165	392.5	365	200	270	450	203
	H75K	325	620	250	210	175	210.5	430	395	280	300	350	250
	H110K	465	620	300	240	230	220	500	440	370	350	450	380
	H160K	498	1010	380	280	295	274.5	560	520	430	400	450	440
	H220K	498	1010	380	330	335	289.5	620	620	480			
	H280K	680	1010	380	330	335	321	690	700	560	—	—	—
	H400K	790	1330	440	402	460	550	632	675	705	—	—	—
	H560K	790	1330	440	452	545	645	632	720	745	—	—	—



*1 Install reactors (FR-HCL21 and 22) on a horizontal surface.
*2 FR-HCB2 is not provided for H280K or higher. A filter capacitor and inrush current limit resistors are provided instead.

Name (model)	Specification and Structure

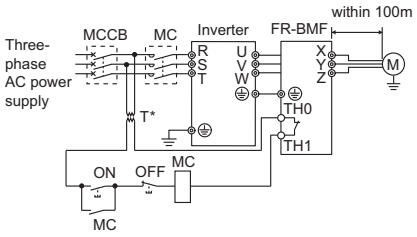
Surge voltage suppression filter FR-BMF-H□□K

- Limits surge voltage applied to motor terminals when driving a 400V class motor with an inverter (available only with general-purpose motors).
- Supports FR-F740P-5.5K to 37K.

● Specification

Model FR-BMF-H□K		7.5		15		22		37	
Applicable motor capacity (kW)1		5.5	7.5	11	15	18.5	22	30	37
Rated current (A)		17		31		43		71	
Overload current rating*2		150 60s 200 0.5s (inverse-time characteristics)							
Rated input AC voltage*2		Three-phase 380 to 480V							
Permissible AC voltage fluctuation*2		323 to 528V							
Maximum frequency *2		120Hz							
PWM carrier frequency		2kHz or less *3							
Protective structure (JEM 1030)		Open type (IP00)							
Cooling system		Self-cooling							
Maximum wiring length		100m or shorter							
Approx. mass (kg)		5.5		9.5		11.5		19	
Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)							
	Ambient humidity	90% RH or less (non-condensing)							
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)							
	Altitude/ vibration	Maximum 1000m above sea level, 5.9m/s^2 or less*4 at 10 to 55Hz (directions of X, Y, Z axes)							

● Connection diagram

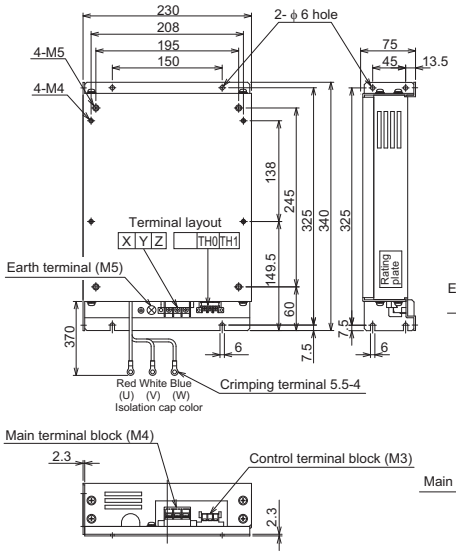


* Install a step-down transformer.

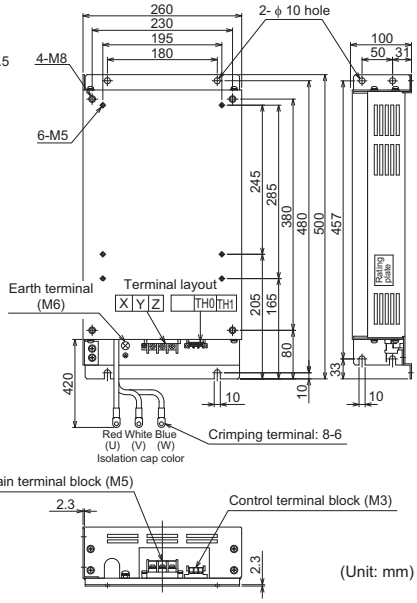
*1 Indicates the maximum capacity applicable with the Mitsubishi 4-pole standard motor.(IPM motors are not applicable.)
*2 Determined by the specification of the connected inverter (400V class).
*3 Set *Pr.72 PWM frequency selection* to 2kHz or less.
*4 When an inverter has a filter mounted on its back, do not use such an inverter on a moving object or in a place that vibrates (exceeding 1.96m/s^2).

● Outline dimension

●FR-BMF-H7.5K

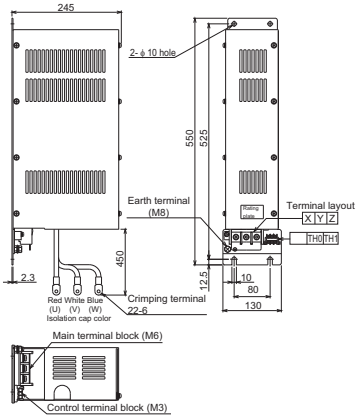


●FR-BMF-H15K, H22K



(Unit: mm)

●FR-BMF-H37K



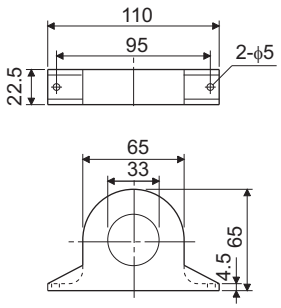
(Unit: mm)

Name (model)	Specification and Structure

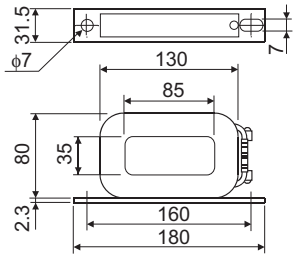
Line noise filter
FR-BSF01
....for small capacities
FR-BLF

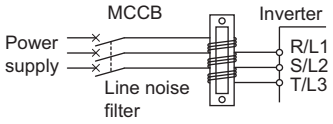
● Outline dimension

FR-BSF01



FR-BLF





(Note)1. Wind each phase for three times (4T) in the same direction. (The greater the number of turns, the more effective result is obtained.) When using several line noise filters to make 4T or more, wind the phases (cables) together. Do not use a different line noise filter for different phases.
2. When the cables are too thick to be winded, run each cable (phase) through four or more filters installed in series in one direction.
3. The filter can be used in the same way as the output side. When using filters at the output side, do not wind the cable more than 3 times (4T) for each filter because the filter may overheat.
4. Use FR-BSF01 for small-capacity inverters. A thick cable of 38mm^2 or more is not applicable. For such cable, use FR-BLF.
5. Do not wind the earthing (grounding) cable.

Sine wave filter
MT-BSL-(H)□□K
MT-BSC-(H)□□K

● Sine wave filter application

Adjusts the motor voltage and current waveforms to be almost a sine wave. For a 75K or higher capacity inverter, installing it at the output side (available with general-purpose motors).
A sine wave filter will bring operation characteristic equivalent to the operation with a sign-wave power supply and also will provide the following benefits.

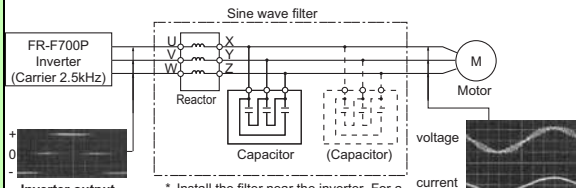
1) Low noise
2) No surge current
3) Small motor losses (for a standard motor)

● Operating condition

The following settings and conditions are required to use a sine wave filter.

1) Set "25" in *Pr.72*. (The initial value is "2".)
This setting changes the carrier frequency to 2.5kHz. (A sine wave filter is designed on the assumption of 2.5kHz carrier frequency. Always change this setting.) The operation with *Pr.72* ≠ "25" setting may damage inverter and the sine wave filter.
2) A sine wave filter can be used for the operation with an inverter output frequency of 60Hz or lower.
It cannot be used for the operation with higher frequency. (Using it with the higher frequency will increases the filter loss.)
3) Use a one-rank higher capacity inverter.*2
4) When a sine wave filter and FR-HC2 are required, use MT-BSL-HC instead.

● Circuit configuration and connection



Inverter output voltage wave form

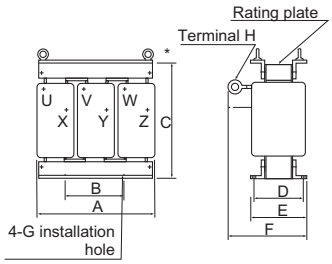
* Install the filter near the inverter. For a capacitor cable, use a cable with size larger than indicated in the table below "recommended cable size ".

Wave form at a motor terminal

Motor capacity (kW) (*1)		Model: Reactor for filter	Model: Capacitor for filter (*2)	Applicable Inverter (*3)
200V class	75	MT-BSL-75K	1 × MT-BSC-75K	FR-F720P-90K
	90	MT-BSL-90K	1 × MT-BSC-90K	FR-F720P-110K
400V class	75	MT-BSL-H75K(-HC)	1 × MT-BSC-H75K	FR-F740P-90K
	90	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-F740P-110K
	110	MT-BSL-H110K(-HC)	1 × MT-BSC-H110K	FR-F740P-132K
	132	MT-BSL-H150K(-HC)	2 × MT-BSC-H75K	FR-F740P-160K
	160	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-F740P-185K
	185	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-F740P-220K
	220	MT-BSL-H220K(-HC)	2 × MT-BSC-H110K	FR-F740P-250K
	250	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-F740P-280K
	280	MT-BSL-H280K(-HC)	3 × MT-BSC-H110K	FR-F740P-315K

*1 Only general-purpose motors (three-phase induction motors) are applicable. IPM motors are not applicable.
*2 When using two capacitors, install them in parallel as shown in the wiring diagram.
*3 When the rated motor current × (1.05 to 1.1) equals to 90% or less of the rated inverter current, the inverter capacity can be the same as the motor kW.

● Reactor for sine wave filter

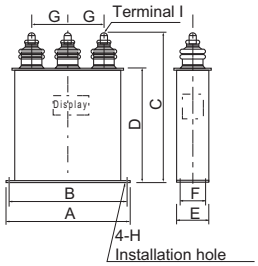


* Remove the eye nut after the product is installed.

Model		A	B	C	D	E	F	G	H	Mass (kg)
200V class	MT-BSL-75K	330	150	285	185	216	328	M10	M12	80
	MT-BSL-90K	390	150	320	180	220	330	M12	M12	120
400V class	MT-BSL-H75K	330	150	285	185	216	318	M10	M10	80
	MT-BSL-H110K	390	150	340	195	235	368	M12	M12	140
	MT-BSL-H150K	455	200	397	200	240	380	M12	M12	190
	MT-BSL-H220K	495	200	405	250	300	420	M12	M12	240
	MT-BSL-H280K	575	200	470	310	370	485	M12	M12	340
	MT-BSL-H75K-HC	385	150	345	185	216	315	M10	M10	110
	MT-BSL-H110K-HC	420	170	400	195	235	370	M12	M12	180
	MT-BSL-H150K-HC	450	300	455	390	430	500	M12	M12	250
	MT-BSL-H220K-HC	510	350	540	430	485	555	M12	M12	310
	MT-BSL-H280K-HC	570	400	590	475	535	620	M12	M12	480

Install the reactor on a horizontal surface.

● Capacitor for sine wave filter



Model		A	B	C	D	E	F	G	H	I	Mass (kg)
200V class	MT-BSC-75K	207	191	285	233	72	41	45	ϕ7	M8	3.9
	MT-BSC-90K	282	266	240	183	92	56	85	ϕ7	M12	5.5
400V class	MT-BSC-H75K	207	191	220	173	72	41	55	ϕ7	M6	3.0
	MT-BSC-H110K	207	191	280	233	72	41	55	ϕ7	M6	4.0

* Keep 25mm or more space between capacitors.

Recommended cable size

The cable gauge of the cables used between INV and MT-BSL as well as MT-BSL and IM varies according to U, V, and W as indicated on *page 78.*

The following table shows the cable gauge of the BSC connecting cable.

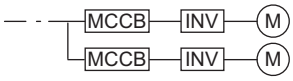
MT-BSC-75K	MT-BSC-90K	MT-BSC-H75K	MT-BSC-H110K
38mm^2	38mm^2	22mm^2	22mm^2

Moulded Case Circuit Breaker (MCCB), Earth Leakage Circuit Breaker (ELB), Input Side Magnetic Contactor, Cable size

Voltage	Motor Output (kW) *1	Applicable Inverter Model	Moulded Case Circuit Breaker (MCCB)*2 or Earth Leakage Circuit Breaker (ELB) (NF or NV type)		Input Side Magnetic Contactor *3		Recommended Cable size *4	
			Power factor improving (AC or DC) reactor					
			Without	With	Without	With	R/L1, S/L2, T/L3	U, V, W
200V class	0.75	FR-F720P-0.75K	10A	10A	S-N10	S-N10	2	2
	1.5	FR-F720P-1.5K	15A	15A	S-N10	S-N10	2	2
	2.2	FR-F720P-2.2K	20A	15A	S-N10	S-N10	2	2
	3.7	FR-F720P-3.7K	30A	30A	S-N20, N21	S-N10	3.5	3.5
	5.5	FR-F720P-5.5K	50A	40A	S-N25	S-N20, N21	5.5	5.5
	7.5	FR-F720P-7.5K	60A	50A	S-N25	S-N25	14	8
	11	FR-F720P-11K	75A	75A	S-N35	S-N35	14	14
	15	FR-F720P-15K	125A	100A	S-N50	S-N50	22	22
	18.5	FR-F720P-18.5K	150A	125A	S-N65	S-N50	38	38
	22	FR-F720P-22K	175A	150A	S-N80	S-N65	38	38
	30	FR-F720P-30K	225A	175A	S-N95	S-N80	60	60
	37	FR-F720P-37K	250A	225A	S-N150	S-N125	80	80
	45	FR-F720P-45K	300A	300A	S-N180	S-N150	100	100
	55	FR-F720P-55K	400A	350A	S-N220	S-N180	100	100
	75	FR-F720P-75K	—	400A	—	S-N300	125	125
	90	FR-F720P-90K	—	400A	—	S-N300	150	150
	110	FR-F720P-110K	—	500A	—	S-N400	2 × 100	2 × 100
400V class	0.75	FR-F740P-0.75K	5A	5A	S-N10	S-N10	2	2
	1.5	FR-F740P-1.5K	10A	10A	S-N10	S-N10	2	2
	2.2	FR-F740P-2.2K	10A	10A	S-N10	S-N10	2	2
	3.7	FR-F740P-3.7K	20A	15A	S-N10	S-N10	2	2
	5.5	FR-F740P-5.5K	30A	20A	S-N20, N21	S-N11, N12	2	2
	7.5	FR-F740P-7.5K	30A	30A	S-N20, N21	S-N20, N21	3.5	3.5
	11	FR-F740P-11K	50A	40A	S-N20, N21	S-N20, N21	5.5	5.5
	15	FR-F740P-15K	60A	50A	S-N25	S-N20, N21	8	8
	18.5	FR-F740P-18.5K	75A	60A	S-N25	S-N25	14	8
	22	FR-F740P-22K	100A	75A	S-N35	S-N25	14	14
	30	FR-F740P-30K	125A	100A	S-N50	S-N50	22	22
	37	FR-F740P-37K	150A	125A	S-N65	S-N50	22	22
	45	FR-F740P-45K	175A	150A	S-N80	S-N65	38	38
	55	FR-F740P-55K	200A	175A	S-N80	S-N80	60	60
	75	FR-F740P-75K	—	225A	—	S-N95	60	60
	90	FR-F740P-90K	—	225A	—	S-N150	60	60
	110	FR-F740P-110K	—	225A	—	S-N180	80	80
	132	FR-F740P-132K	—	400A	—	S-N220	100	100
	160	FR-F740P-160K	—	400A	—	S-N300	125	125
	185	FR-F740P-185K	—	400A	—	S-N300	150	150
	220	FR-F740P-220K	—	500A	—	S-N400	2 × 100	2 × 100
	250	FR-F740P-250K	—	600A	—	S-N600	2 × 100	2 × 100
	280	FR-F740P-280K	—	600A	—	S-N600	2 × 125	2 × 125
	315	FR-F740P-315K	—	700A	—	S-N600	2 × 150	2 × 150
	355	FR-F740P-355K	—	800A	—	S-N600	2 × 200	2 × 200
	400	FR-F740P-400K	—	900A	—	S-N800	2 × 200	2 × 200
	450	FR-F740P-450K	—	1000A	—	1000A Rated product	2 × 250	2 × 250
	500	FR-F740P-500K	—	1200A	—	1000A Rated product	2 × 250	2 × 250
	560	FR-F740P-560K	—	1500A	—	1200A Rated product	3 × 200	3 × 200

*1 Assumes the use of a dedicated IPM motor or a Mitsubishi 4-pole standard motor with the power supply voltage of 200VAC (200V class) / 400VAC (400V class) 50Hz.

*2 Select the MCCB according to the power supply capacity.
Install one MCCB per inverter.
For using commercial-power supply operation, select a breaker with capacity which allows the motor to be directly power supplied.
For installation in the United States or Canada, select a fuse in accordance with UL, cUL, the National Electrical Code and any applicable local codes, or use UL 489 Molded Case Circuit Breaker (MCCB). (*Refer to the Instruction Manual (basic)*)



*3 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
If using an MC for emergency stop during motor driving, select an MC regarding the inverter input side current as JEM1038-AC-3 class rated current. When using an MC on the inverter output side for commercial-power supply operation switching using a general purpose motor, select an MC regarding the motor rated current as JEM1038-AC-3 class rated current.

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

CAUTION

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model, and select cable and reactor according to the motor output.
- 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.

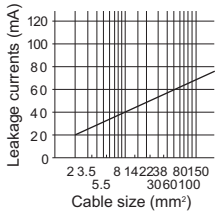
Selection of rated sensitivity current of earth leakage circuit breaker

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

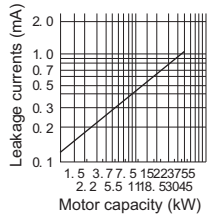
- Breaker designed for harmonic and surge suppression
  Rated sensitivity current:
  $I\Delta n \geq 10 \times (Ig1 + Ign + Igi + Ig2 + Igm)$
- Standard breaker
  Rated sensitivity current:
  $I\Delta n \geq 10 \times \{Ig1 + Ign + Igi + 3 \times (Ig2 + Igm)\}$

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

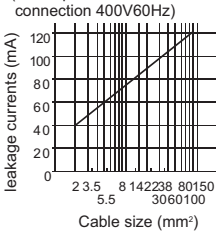
Example of leakage current of cable path per 1km during the commercial power supply operation when the CV cable is routed in metal conduit (200V 60Hz)



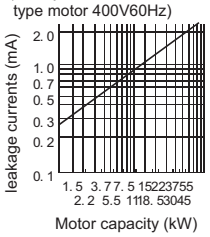
Leakage current example of three-phase induction motor during the commercial power supply operation (200V 60Hz)



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

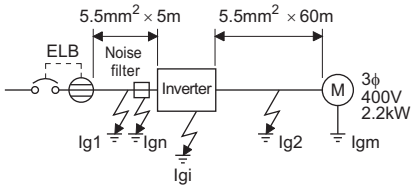


Leakage current example of three-phase induction motor during the commercial power supply operation (Totally-enclosed fan-cooled type motor 400V60Hz)



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

Example



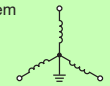
(Note)1. Install the earth leakage circuit breaker (ELB) on the input side of the inverter.
2. In the 人 connection earthed-neutral system, the sensitivity current is blunt against an earth (ground) fault in the inverter output side.
Earthing (Grounding) must conform to the requirements of national and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

● **Selection example (in the case of the left figure (400V class 人 connection))**

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

● **Inverter leakage current (with and without EMC filter)**

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

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

* For the FR-F720P-0.75K and 1.5K, the EMC filter is always valid. The leakage current is 1mA.

Noise filter by Soshin Electric Co., Ltd. (for the shipping classifications of Class NK and CCS)

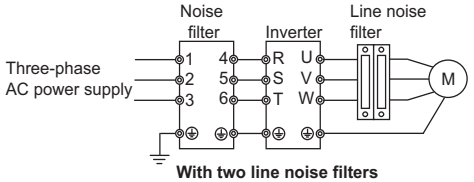
The following table lists the noise filters to be used in combination with inverters. These noise filters enable compliance with the shipping classifications of Class NK and CCS.
To purchase, contact the noise filter manufacturer. *(Refer to page 78)*

Inverter model FR-F740P-□	Noise filter model
0.75K	HF3010C-SZA
1.5K	HF3010C-SZA
2.2K	HF3020C-SZA
3.7K	HF3020C-SZA
5.5K	HF3020C-SZA
7.5K	HF3020C-SZA
11K	HF3030C-SZA
15K	HF3040C-SZA
18.5K	HF3040C-SZA
22K	HF3060C-SZA
30K	HF3080C-SZA
37K	HF3100C-SZA
45K	HF3100C-SZA
55K	HF3150C-SZA
75K	HF3200C-SZA

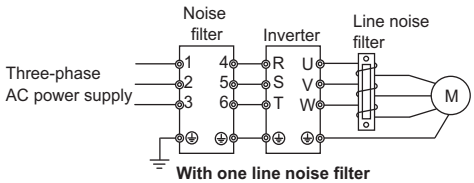
Inverter model FR-F740P-□	Noise filter model
90K	HF3250C-SZA
110K	HF3300C-SZA
132K	HF3400C-UQ
160K	HF3400C-UQ
185K	HF3600C-UQ
220K	HF3600C-UQ
250K	HF3600C-UQ
280K	HF3900C-UQ
315K	HF3900C-UQ
355K	HF3900C-UQ
400K	HF3900C-UQ
450K	HF31200C-UQ
500K	HF31200C-UQ
560K	HF31600C-UQ

●Noise filter wiring example

Install a noise filter by Soshin Electric Co., Ltd. in the input side of the inverter. For 160K or lower capacity inverter, install a line noise filter (FR-BSF01 or FR-BLF) at the inverter's output side, and wind it make the total pass-through time of twice (2T) or more, as shown below.



With two line noise filters



With one line noise filter

Precautions for use of the inverter

⚠ Safety Precautions

- To operate the inverter correctly and safely, be sure to read the "instruction manual" before starting operation.
- This product has not been designed or manufactured for use with any equipment or system operated under life-threatening conditions.
- Please contact our sales office when you are considering using this product in special applications such as passenger mobile, medical, aerospace, nuclear, power or undersea relay equipment or system.
- Although this product is manufactured under strict quality control, safety devices should be installed when a serious accident or loss is expected by a failure of this product.
- Do not use the F700P inverter with a load other than a three-phase induction motor or a dedicated IPM motor.
- Do not connect an IPM motor under the general-purpose motor control settings (initial settings). Do not use a general-purpose motor in the IPM motor control settings. Doing so will cause a failure.

When using a dedicated IPM motor, *the precautions for the use of the dedicated IPM motor* must be observed as well.

Operation

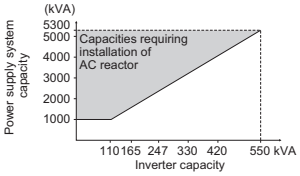
- A magnetic contactor (MC) provided on the primary side should not be used to make frequent starts and stops. It could cause the inverter to fail.
- However, at this time, the motor cannot be brought to a sudden stop. Hence, provide a mechanical stopping/holding mechanism for the machine/equipment which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

Wiring

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

Power supply

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



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

Installation

- Avoid hostile environment where oil mist, fluff, dust particles, etc. are suspended in the air, and install the inverter in a clean place or put it in an ingress-protected "enclosed" enclosure. When placing the inverter in an enclosure, determine the cooling system and enclosure dimensions so that the ambient temperature of the inverter is within the permissible value. (refer to *page 10* for the specified value)
- Do not install the inverter on wood or other combustible material as it will be hot locally.
- Install the inverter in the vertical orientation.

Setting

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

Precautions for the use of a dedicated IPM motor

When using the dedicated IPM motor (MM-EFS, MM-EF), the following precautions must be observed as well.

⚠ SAFETY INSTRUCTIONS

■ Do not use an IPM motor for an application where the motor is driven by the load and runs at a speed higher than the maximum motor speed.

Combination of Motor and Inverter

■ Use the same dedicated IPM motor capacity as the inverter capacity (except the combination of 0.75K inverter with MM-EF-0.4kW)

■ Only one IPM motor can be connected to an inverter.

■ A dedicated IPM motor cannot be driven by the commercial power supply.

■ Do not use a synchronized or induction-synchronized motor, that is not a dedicated IPM motor.

Installation

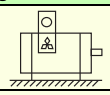
■ While power is ON or for some time after power-OFF, do not touch the motor since the motor will be extremely hot. Touching these devices may cause a burn.

■ The outline dimensions of MM-EF motors and standard motors are different.
(It is the same for the 55kW or lower MM-EFS and the standard motors.)

Output (kW)	Frame number		
	IPM motor		Standard motor
	MM-EF 1800r/min spec.	MM-EFS 1500r/min spec.	SF-JR4P
0.4	80M	—	71M
0.75		80M	
1.5		90L	
2.2	90L	100L	
3.7	100L	112M	
5.5	112M	132S	
7.5		132M	
11	132S	160M	
15		160L	
18.5, 22	160M	180M	
30	160L	180L	
37, 45	180L	200L	
55	200L	225S	
75		—	250SA *
90	225S	—	250MA *
110		—	280SA *

* The motor model name is SF-TH.

■ The following table indicates the available installation orientations.

	Frame number / Simplified diagram		80M to 180L	200L 225S
Floor installation *1	Terminal direction		○	○
Wall installation *2	Shaft going up		Δ	×
	Shaft horizontal		○	×
	Shaft going down		○	×
Ceiling installation	Ceiling installation		○	×

○ Standard models can be installed as they are.
Δ Dedicated models are required.
× Not available as installation strength is insufficient.

*1 The floor installation condition is applicable to a slope of up to 30°. If the slope is steeper, apply the wall installation condition.
*2 To install a horizontal motor to a wall, first attach a shelf that supports the motor legs.

Wiring

■ Applying the commercial power supply to input terminals (U, V, W) of an IPM motor will burn the IPM motor. The IPM motor must be connected with the output terminals (U, V, W) of the inverter.

■ An IPM motor is a motor with interior permanent magnets. High voltage is generated at motor terminals while the motor is running. Before wiring or inspection, the motor must be confirmed to be stopped.
In an application, such as fan and blower, where the motor is driven by the load, a low-voltage manual contactor must be connected at the inverter's output side, and wiring and inspection must be performed while the contactor is open. Otherwise you may get an electric shock. The inverter power must be turned ON before closing the contacts of the contactor at the output side.

■ Match the input terminals (U, V, W) of the motor and the output terminals (U, V, W) of the inverter when connecting.

■ Use the following length of wiring or shorter when connecting an IPM motor.

Applied inverter	Wiring Length	
	50m or less	50m to 100m
FR-F740P-0.75K to 1.5K	0(2kHz) to 15(14kHz)	5(2kHz) or lower
Other	0(2kHz) to 15(14kHz)	9(6kHz) or lower

Use one dedicated IPM motor for one inverter.
Multiple IPM motors cannot be connected to an inverter.

Operation

■ It takes approx. 0.1s (magnetic pole detection time) to start a motor after a start signal is input.

■ An IPM motor is a motor with embedded permanent magnets. Regression voltage is generated when the motor coasts at an instantaneous power failure or other incidents. The inverter's DC bus voltage increases if the motor coasts fast in this condition. When using the automatic restart after instantaneous power failure function, it is recommended to also use the regenerative avoidance operation to make startups stable.

■ The number of IPM motor poles differs by the capacity. Thus, the relation between the rotation speed and the frequency setting is:

$$\text{Rotation speed} = 120 \times \frac{\text{frequency setting value}}{\text{number of motor poles}}$$

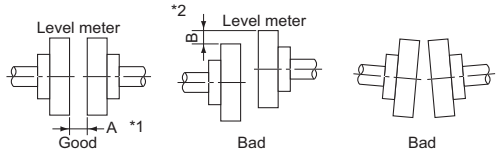
Speed [r/min]	Frequency setting value [Hz]				
	MM-EF			MM-EFS	
	0.4kW to 30kW	37kW to 75kW	90kW, 110kW	0.75kW to 15kW	18.5kW to 55kW
300	15	20	20	15	20
600	30	40	40	30	40
900	45	60	60	45	60
1200	60	80	80	60	80
1500	75	100	100	75	100
1800	90	120	120	90	120
2250	112.5	150	150	112.5	150
2400	120	160	160	—*2	—*2
2700	135	180	—*1	—*2	—*2

*1 The maximum speed of MM-EF90kW and 110kW is 2400r/min.
*2 The maximum speed of MM-EFS is 2250r/min.

Connection with machine

Direct connection

■ When installing, align the motor shaft center and the machine shaft. Insert a liner underneath the motor or the machine legs as required to make a perfect alignment.



*1 Use a feeler gauge to check the gaps in a few places, and make sure that all the gap sizes are the same (3/100mm or less difference except the gap A).

*2 Unevenness shown in B is unacceptable (3/100mm or smaller difference)

CAUTION

When a fan or blower is directly connected to the motor shaft or to the machine, the machine side may become unbalanced. When the unbalanced degree becomes larger, the motor vibration becomes larger and may result in a damage of the bearing or other area. The balance quality with the machine should meet the class G2.5 or lower of JISB0905 (the Balance Quality Requirements of Rigid Rotors).

Connected by belt

■ When installing, place the motor shaft and the machine shaft in parallel, and mount them to a position where their pulley centers are aligned. Their pulley centers should also have a right angle to each shaft.

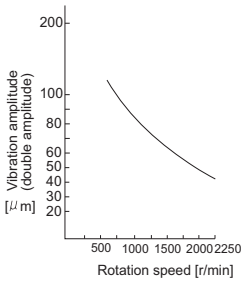
■ An excessively stretched belt may damage the bearing and break the shafts. A loose belt may slip off and easily deteriorate. A flat belt should be rotated lightly when it is pulled by one hand.
For details, refer to the Instruction Manual of the motor.

Connected by gear couplings

■ Place the motor and machine shafts in parallel, and engage the gear teeth properly.

Permissible vibration of the motor

■ Bearing is subjected to fretting while the motor is stopped. Suppress the vibration to about the half of the permissible value.
Amplitude at each vibration condition is as shown right.



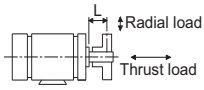
Permissible load of the shaft

MM-EFS□1M(4)	7	15	22	37	55	75	11K
L [mm] *1	40	50	60		80		110
Permissible radial load [N] *2	535	585	830	1070	1710		2150
Permissible thrust load [N] *2	470	500	695	900	1420		1810

MM-EFS□1M(4)	15K	18K	22K	30K	37K	45K	55K
L [mm] *1	110				140		
Permissible radial load [N] *2	2150	2940		3230	4900		5880
Permissible thrust load [N] *2	1810	2350		2740	2940		2740

*1 For the symbols used in the table, refer to the diagram at right.

*2 The permissible radial load and the permissible thrust load are the permissible values when they are applied individually.



Precautions for selection

Inverter capacity selection

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

* Multiple IPM motors cannot be connected to an inverter.

Starting torque of the motor

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

Acceleration and deceleration times

■ The acceleration/deceleration time of the motor depends on the motor-generated torque, load torque and moment of inertia of the load (GD^2).

■ When the current limit function or stall prevention function is activated during acceleration/deceleration, increase the acceleration/deceleration time as the actual time may become longer.

■ To decrease the acceleration/deceleration time, increase the torque boost value (setting of a too large value may activate the stall prevention function at a start, longer the acceleration time), use the simple magnetic flux vector control, or increase the inverter and motor capacities. To decrease the deceleration time, it is necessary to add the brake unit (FR-BU2, MT-BU5), power regeneration common converter (FR-CV), power regeneration unit (MT-RC) or a similar device to absorb braking energy.

Power transfer mechanism

(gear, belt, chain, etc.)

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

Instructions for overload operation

■ When performing operation of frequent start/stop of the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing bound current, starting current, etc. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current. However, decreasing current will result in insufficient toque and the inverter may not start. A counter action for this to raise the permissible current level by increasing the inverter capacity when using a general-purpose motor, and by increasing the inverter and IPM capacities when using an IPM motor.

Installation and selection of moulded case circuit breaker

Install a moulded case circuit breaker (MCCB) on the power receiving side to protect the wiring of the inverter primary side. For MCCB selection, refer to *page 78* since it depends on the inverter power supply side power factor (which changes depending on the power supply voltage, output frequency and load). Note that the operation characteristics of the completely electromagnetic MCCB changes according to the higher harmonic current, so a larger capacity must be selected. (Check it in the data of the corresponding breaker.) As an earth (ground) leakage breaker, use the Mitsubishi earth (ground) leakage breaker designed for harmonics and surges. *(Refer to page 79.)*

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

Handling of primary side magnetic contactor

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

Handling of secondary side magnetic contactor

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

* An IPM motor cannot be driven by the commercial power supply.

Thermal relay installation

The inverter has an electronic thermal relay function to protect the motor from overheating. However, when running multiple motors with one inverter or operating a multi-pole motor, provide a thermal relay (OCR) between the inverter and motor. In this case, set the electronic thermal relay function of the inverter to 0A. And for the setting of the thermal relay, add the line-to-line leakage current *(refer to page 84)* to the current value on the motor rating plate.

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

* Multiple IPM motors cannot be connected to an inverter.

Secondary side measuring instrument

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

Disuse of power factor improving capacitor (power capacitor)

The power factor improving capacitor and surge suppressor on the inverter output side may be overheated or damaged by the harmonic components of the inverter output. Also, since an excessive current flows in the inverter to activate overcurrent protection, do not install a capacitor or surge suppressor. For power factor improvement, use the power factor improving DC reactor (see *page 70*).

Wire thickness and wiring distance

When the wiring length between the inverter and motor is long, use thick wires so that the voltage drop of the main circuit cable is 2% or less especially at low frequency output. (A selection example for the wiring distance of 20m is shown on *page 78*)

Especially at a long wiring distance, the maximum wiring length should be within 500m since the overcurrent protection function may be misactivated by the influence of a charging current due to the stray capacitances of the wiring.

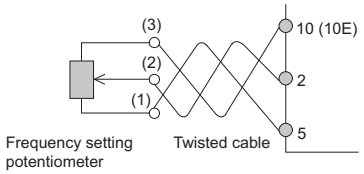
The overall wiring length for connection of multiple motors should be within the value in the table below. (Refer to *page 81* for IPM motors.)

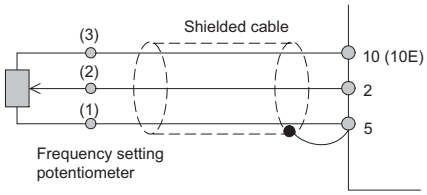
***Pr. 72 PWM frequency selection* setting (carrier frequency)**	**0.75K**	**1.5K**	**2.2K or higher**
2	300m	500m	500m
3 to 15	200m	300m	500m

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

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

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





Earth (Ground)

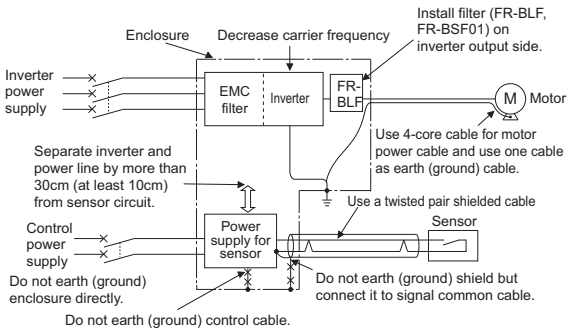
When the inverter is run in the low acoustic noise mode, more leakage currents occur than in the non-low acoustic noise mode due to high-speed switching operation. Be sure to use the inverter and motor after grounding (earthing) them. In addition, always use the earth (ground) terminal of the inverter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

Noise

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

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

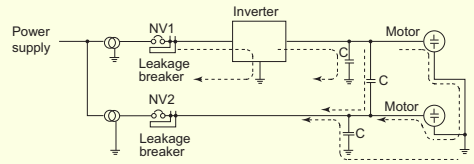
Noise reduction examples



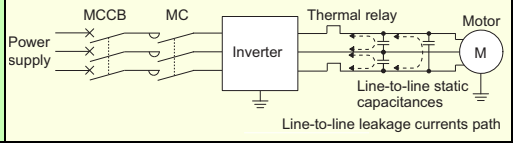
Leakage currents

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

To-earth (ground) leakage currents

Type	Influence and Measures
Influence and measures	· Leakage currents may flow not only into the inverter's own line but also into the other lines through the earth (ground) cable, etc.These leakage currents may operate earth (ground) leakage circuit breakers and earth leakage relays unnecessarily. ● Countermeasures · If the carrier frequency setting is high, decrease the *Pr. 72 PWM frequency selection* setting. Note that motor noise increases. Select *Pr. 240 Soft-PWM operation selection* to make 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).
Undesirable current path	

Line leakage current

Type	Influence and Measures
Influence and measures	· This leakage current flows via a static capacitance between the inverter output cables. · The external thermal relay may be operated unnecessarily by the harmonics of the leakage current.When the wiring length is long (50m or more) for the 400V class small-capacity model (7.5kW or less), the external thermal relay is likely to operate unnecessarily because the ratio of the leakage current to the rated motor current increases. ● Countermeasures · 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. Select *Pr. 240 Soft-PWM operation selection* to make 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.
Undesirable current path	

● Harmonic suppression guideline

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

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

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

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

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

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

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

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

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

● Calculation of outgoing harmonic current

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

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

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

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

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

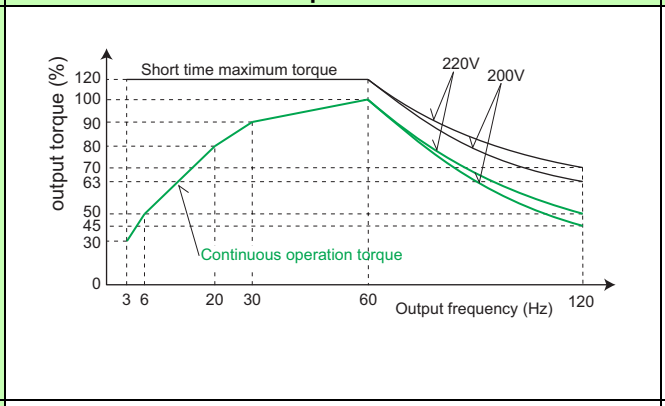
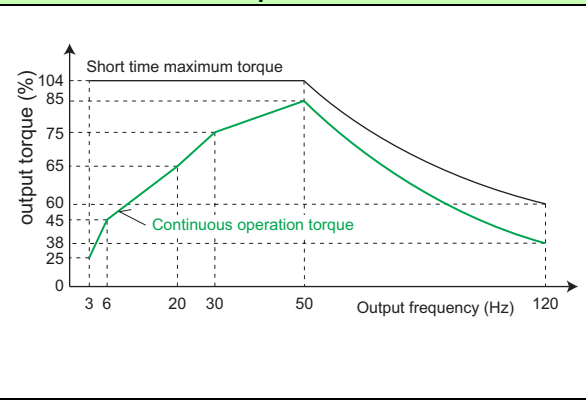
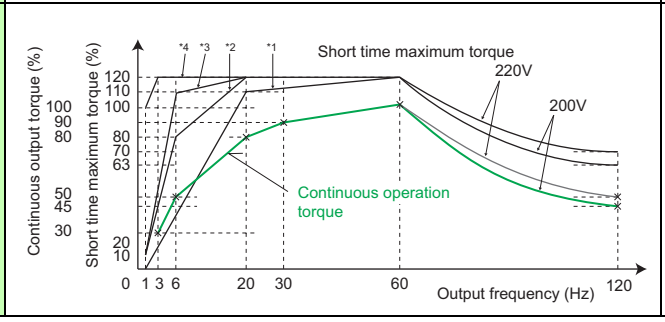
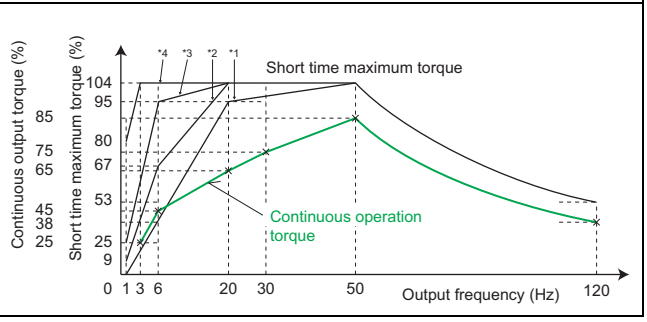
Applied Motor kW	Rated Current [A]		Fundamental Wave Current Converted from 6.6kV (mA)	Rated Capacity (kVA)	Fundamental Wave Current Converted from 6.6kV (No reactor, 100% operation ratio)							
	200V	400V			5th	7th	11th	13th	17th	19th	23rd	25th
0.75	2.74	1.37	83	0.97	53.95	34.03	7.055	6.391	3.569	2.573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

Applied Motor kW	Rated Current [A]		Fundamental Wave Current Converted from 6.6kV (mA)	Rated Capacity (kVA)	Fundamental Wave Current Converted from 6.6kV (With DC reactor , 100% operation ratio)							
	200V	400V			5th	7th	11th	13th	17th	19th	23rd	25th
75	245	123	7455	87.2	2237	969	626	373	350	239	224	164
90	293	147	8909	104	2673	1158	748	445	419	285	267	196
110	357	179	10848	127	3254	1410	911	542	510	347	325	239
132	—	216	13091	153	3927	1702	1100	655	615	419	393	288
160	—	258	15636	183	4691	2033	1313	782	735	500	469	344
220	—	355	21515	252	6455	2797	1807	1076	1011	688	645	473
250	—	403	24424	286	7327	3175	2052	1221	1148	782	733	537
280	—	450	27273	319	8182	3545	2291	1364	1282	873	818	600
315	—	506	30667	359	9200	3987	2576	1533	1441	981	920	675
355	—	571	34606	405	10382	4499	2907	1730	1627	1107	1038	761
400	—	643	38970	456	11691	5066	3274	1949	1832	1247	1169	857
450	—	723	43818	512	13146	5696	3681	2191	2060	1402	1315	964
500	—	804	48727	570	14618	6335	4093	2436	2290	1559	1462	1072
560	—	900	54545	638	16364	7091	4582	2727	2564	1746	1636	1200

Application to standard motor

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

Output characteristics

	60Hz torque reference	50Hz torque reference
Simple magnetic flux vector control		
V/F control		

*1 Torque boost minimum (0%)
*2 Torque boost standard (initial value)
*3 Torque boost large (0.75K... 10%, 1.5K to 3.7K... 7%, 5.5K, 7.5K... 6%, 11K or higher... 4%)
*4 Enabled for torque boost adjustment (3.7kW or lower) or simple magnetic flux vector control (slip compensation setting)

- The 60Hz torque reference indicates that the rated torque of the motor running at 60Hz is 100%, and the 50Hz torque reference indicates that the rated torque of the motor running at 50Hz is 100%
- A general-purpose, squirrel-cage motor must be used at lower continuous operating torque in rated operation as shown in the chart since the cooling capability of the fan installed on the rotor reduces at a lower speed. (Instantaneous torque occurs)
- 200/220V 60Hz or 200V 50Hz in the chart indicates a motor torque standard (base frequency set in *Pr.3* of the inverter) and is not the frequency of the power supply.
  You can also set 60Hz in a 50Hz power supply area.
- As shown in the chart, the 60Hz torque reference setting allows you to use the motor more efficiently as it can bring out the 100% torque of the motor continuously.
- To operate continuously with the 50Hz torque reference, reduce the load torque to 85% or less.
- This chart shows the characteristic available when a constant-torque load is selected for load pattern selection *(Pr. 14)*.

Motor loss and temperature rise

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

Torque characteristic

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

Vibration

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

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

Inverter-driven 400V class motor

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

(Under general-purpose motor control)

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". (Mitsubishi standard motors (SF-JR, SB-JR 4-pole) are the 400V class inverter-driven reinforced insulation models.)

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	9(9kHz) or less

(2) Suppressing the surge voltage on the inverter side

Connect the surge voltage suppression filter (FR-ASF-H/FR-BMF-H) to the 55K or lower and the sine wave filter (MT-BSL/BSC) to the 75K or higher on the inverter output side.

(Under IPM motor control)

Set *Pr.72 PWM frequency selection* according to the wiring length as shown below.

Applied inverter	**Wiring Length**	
	50m or less	**50m to 100m**
FR-F740P-0.75K, 1.5K	0(2kHz) to 15(14kHz)	5(2kHz) or less
Other	0(2kHz) to 15(14kHz)	9(6kHz) or less

CAUTION

- The surge voltage suppression filter (FR-ASF-H/FR-BMF-H) option and sine wave filter (MT-BSL/BSC) cannot be used under IPM motor control, so do not connect them.

Application to constant-torque motor

Since a constant-torque motor is greater in current than the standard motor, the inverter capacity may be one rank higher.

For a constant-torque motor, decrease the torque boost setting.

Recommended value 0.75kW... 6%, 1.5 to 3.7kW... 4%,
5.5 to 7.5kW...3%, 11 to 37kW...2%,
45 to 55kW...1.5%, 75k or higher...1%

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

Application to special motors

Pole changing motor

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

Geared motor

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

Synchronous motor other than a dedicated IPM motor

This motor is not suitable for applications of large load variation or impact, where out-of-sync is likely to occur.

Please contact us when using this motor because its starting current and rated current are greater than those of the standard motor and will not rotate stably at low speed.

Application to premium high-efficiency IPM motor [MM-EFS (1500r/min) series]

Motor specification

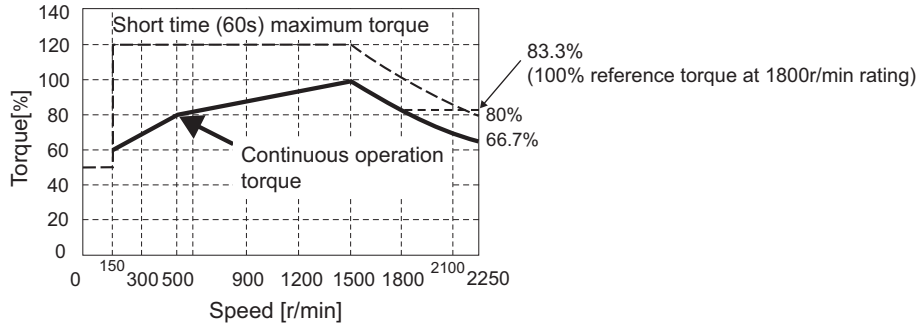
Motor model	200V class MM-EFS□1M / 400V class MM-EFS□1M4	7	15	22	37	55	75	11K	15K	18K	22K	30K	37K	45K	55K
Compatible inverter	200V class FR-F720P-□K / 400V class FR-F740P-□K	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Continuous characteristic *1	Rated output (kW)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated torque (N·m)	4.77	9.55	14	23.6	35	47.7	70	95.5	118	140	191	236	286	350
Rated speed (r/min)		1500													
Maximum speed (r/min)		2250													
Number of poles		6								8					
Maximum torque		120% 60s													
Frame number		80M	90L	100L	112M	132S	132M	160M	160L	180M		180L	200L		225S
Moment of inertia ($\times 10^{-4}$kg·m^2)		20	40	55	110	275	280	760	770	1700	1700	1900	3400	3850	6500
Rated current (A)	200V class	3	6.0	8.2	13.4	20	27	40	54	66	79	110	128	157	194
	400V class	1.5	3.0	4.1	6.7	10	13.5	20	27	33	39.5	55	64	78.5	97
Structure		Totally-enclosed fan-cooled motor. With steel framed legs. (protective structure IP44 *2)													
Insulation class		F class													
Vibration class		V-15													
Environment	Surrounding air temperature and humidity	-10°C to +40°C (non-freezing) · 90%RH or less (non-condensing)													
	Storage temperature and humidity	-20°C to +70°C (non-freezing) · 90%RH or less (non-condensing)													
	Atmosphere	Indoors (not under direct sunlight), and free from corrosive gas, flammable gas, oil mist, dust and dirt.													
	Altitude	Maximum 1,000m above sea level													
	Vibration	4.9m/s^2													
Mass(kg)		11	15	22	31	50	53	95	100	135		155	215	230	285

*1 The above characteristics apply when the rated AC voltage is input from the inverter. (*Refer to page 8.*)
Output and rated motor speed are not guaranteed when the power supply voltage drops.

*2 This excludes the part where the axis passes through.

Motor torque characteristic

The following figure shows the torque characteristic of the premium high-efficiency IPM motor [MM-EFS (1500r/min) series] when used with an inverter.



REMARKS

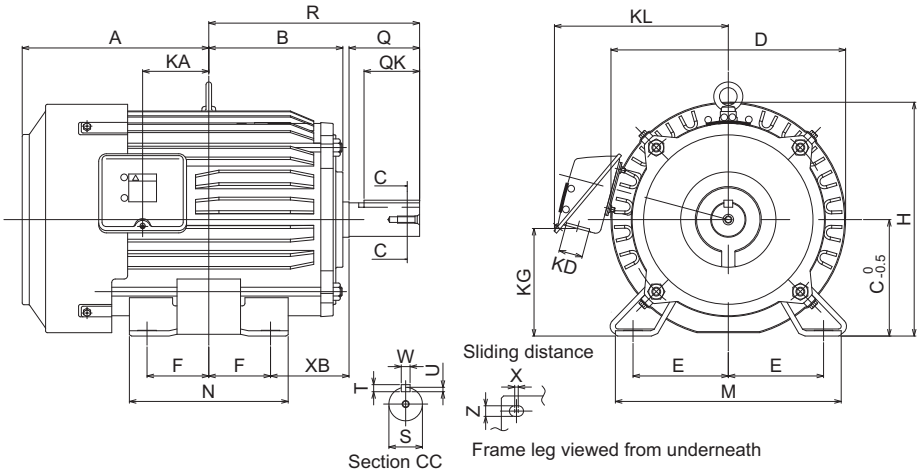
· The motor can also be used for applications which require the rated speed of 1800r/min.

CAUTION

- The torque characteristic is when the armature winding temperature is 20°C, and the input voltage to the inverter is 200VAC or 400VAC.
- Constant-speed operation cannot be performed for the speed of 150r/min or less.

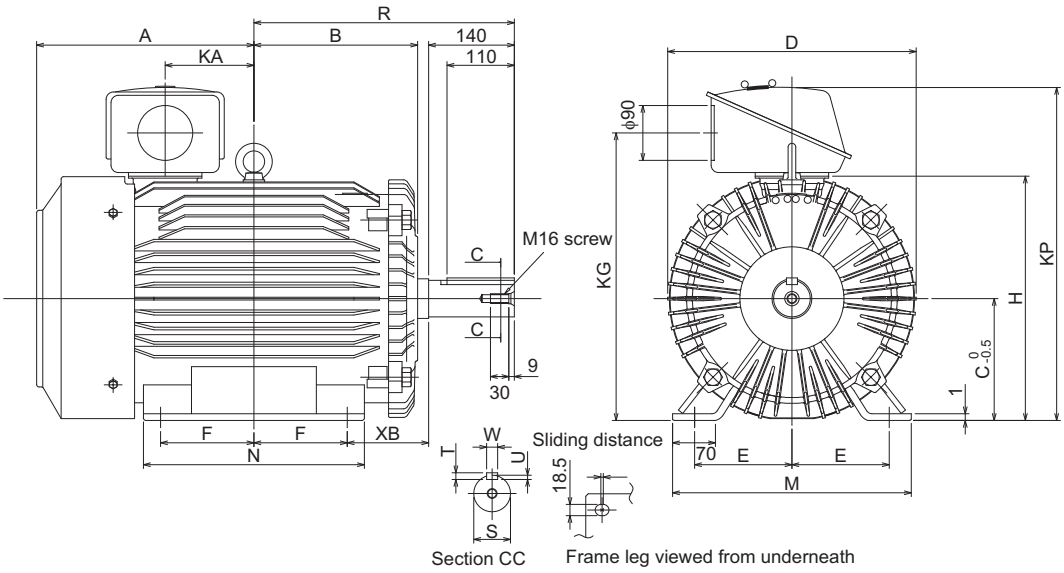
Outline drawing of motors

(1) 30K or lower



Model		Output (kW)	Frame number	Outline Dimension (mm)																						
				A	B	C	D	E	F	H	KA	KD	KG	KL	M	N	XB	Q	QK	R	S	T	U	W	X	Z
200V class MM-EFS□1M	7	0.75	80M	122	95	80	161.6	62.5	50	164	39.5	27	63	145	160	125	50	40	32	140	ϕ19j6	6	3.5	6	15	9
	15	1.5	90L	143	110.5	90	183.6	70	62.5	182	53	27	76	158	175	150	56	50	40	168.5	ϕ24j6	7	4	8	15	9
	22	2.2	100L	173	128	100	207	80	70	203.5	65	27	88	169	200	180	63	60	45	193	ϕ28j6	7	4	8	4	12
	37	3.7	112M	181	135	112	228	95	70	226	69	27	103	180	230	180	70	60	45	200	ϕ28j6	7	4	8	4	12
	55	5.5	132S	211.5	152	132	266	108	70	265	75	27	120	197	256	180	89	80	63	239	ϕ38k6	8	5	10	4	12
	75	7.5	132M	230.5	171	132	266	108	89	265	94	27	120	197	256	218	89	80	63	258	ϕ38k6	8	5	10	4	12
400V class MM-EFS□1M4	11K	11	160M	252	198	160	318	127	105	316	105	56	142	266	310	254	108	110	90	323	ϕ42k6	8	5	12	4	14.5
	15K	15	160L	274	220	160	318	127	127	316	127	56	142	266	310	298	108	110	90	345	ϕ42k6	8	5	12	4	14.5
	18K	18.5	180M	292.5	225.5	180	363	139.5	120.5	359	127	56	168	289	335	285	121	110	90	351.5	ϕ48k6	9	5.5	14	4	14.5
	22K	22																								
	30K	30	180L	311.5	242.5	180	363	139.5	139.5	359	146	56	168	289	335	323	121	110	90	370.5	ϕ55m6	10	6	16	4	14.5

(2) 37K to 55K



Model		Output (kW)	Frame number	Outline Dimension (mm)																	
				A	B	C	D	E	F	H	KA	KG	KP	M	N	XB	R	S	T	U	W
200V class MM-EFS□1M	37K	37	200L	355	267.5	200	406	159	152.5	401	145	472	548	390	361	133	425.5	ϕ60m6	11	7	18
	45K	45																			
400V class MM-EFS□1M4	55K	55	225S	365	277	225	446	178	143	446	145	517	593	428	342	149	432	ϕ65m6	11	7	18

CAUTION

· The outline dimensions are the dimensions of typical motors. The outer appearance may differ according the frame number.

Application to high-efficiency IPM motor [MM-EF (1800r/min) series]

Motor specification

Motor model	200V class MM-EF□2	4	7	15	22	37	55	75	11K	15K	18K	22K	30K	37K	45K	55K	75K	—	—
	400V class MM-EF□24																	90K	110K
Compatible inverter	200V class FR-F720P-□K	0.75	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	—	—
	400V class FR-F740P-□K																	90	110
Continuous characteristic *1	Rated output (kW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
	Rated torque (N·m)	2.12	3.98	7.96	11.7	19.6	29.2	39.8	58.4	79.6	98.1	117	159	196	239	292	398	477	584
Rated speed (r/min)		1800 (90Hz)												1800 (120Hz)					
Maximum speed (r/min)		2700 (135Hz)												2700 (180Hz)				2400 (160Hz)	
Number of poles		6												8					
Maximum torque		120% 60s																	
Frame number		80M			90L	100L	112M		132S		160M		160L	180L		200L		225S	
Moment of inertia ($\times10^{-4}$kg·m^2)		10.4	10.4	18.4	36.9	51.2	125	153	274	354	815		1050	2215	2400	4300	5200	8700	9500
Rated current (A)	200V class	1.6	3.0	5.9	8.7	14.4	22	29	43	55	70.5	83.5	109	136	162	195	272	—	—
	400V class	0.8	1.5	3.0	4.4	7.2	11	14.5	21.5	27.5	35	42	57	68	81	96.5	136	160	197
Structure		Totally-enclosed fan-cooled motor (protective structure IP44 *2)																	
Insulation class		B class									F class								
Environment	Surrounding air temperature and humidity	-10°C to +40°C (non-freezing) · 90%RH or less (non-condensing)																	
	Storage temperature and humidity	-20°C to +70°C (non-freezing) · 90%RH or less (non-condensing)																	
	Atmosphere	Indoors (not under direct sunlight), and free from corrosive gas, flammable gas, oil mist, dust and dirt.																	
	Altitude	Maximum 1,000m above sea level																	
	Vibration	4.9m/s^2(0.5G)																	
Mass(kg)		8.5	9.0	11	15	23	33	38	52	60	105	105	119	167	178	240	290	360	390

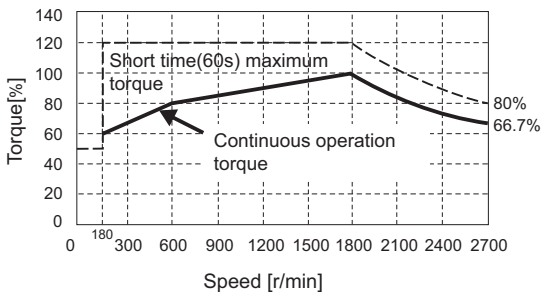
*1 The above characteristics apply when the rated AC voltage is input from the inverter. *(Refer to page 8.)*
Output and rated motor speed are not guaranteed when the power supply voltage drops.

*2 This excludes the part where the axis passes through.

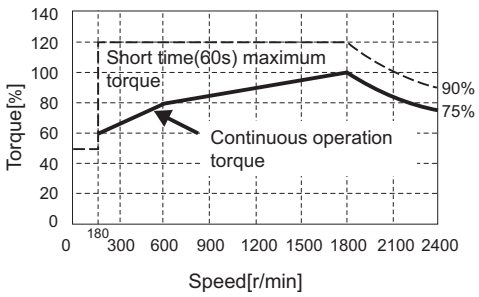
Motor torque characteristic

The following figures show the torque characteristics of high-efficiency IPM motors [MM-EF (1800r/min) series] when used with inverters.

• 75K or lower



• 90K or higher

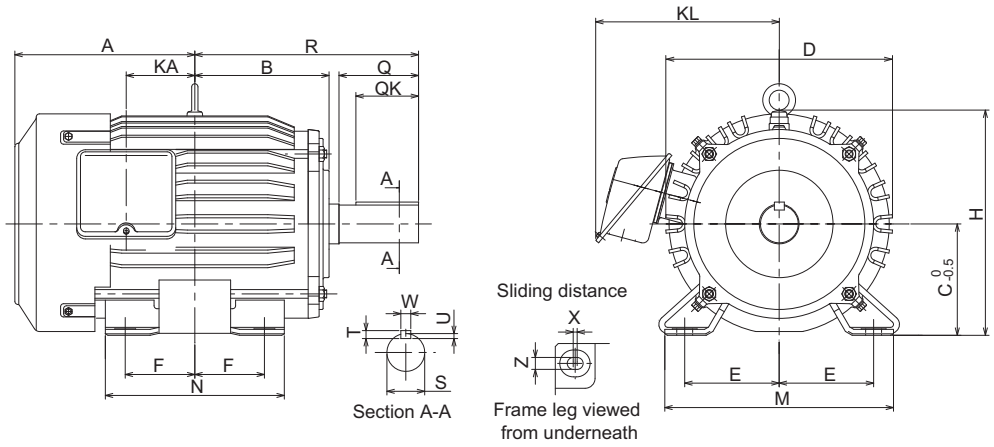


CAUTION

- The torque characteristic is when the armature winding temperature is 20°C, and the input voltage to the inverter is 200VAC or 400VAC.
- Constant-speed operation cannot be performed for the speed of 180r/min or less.

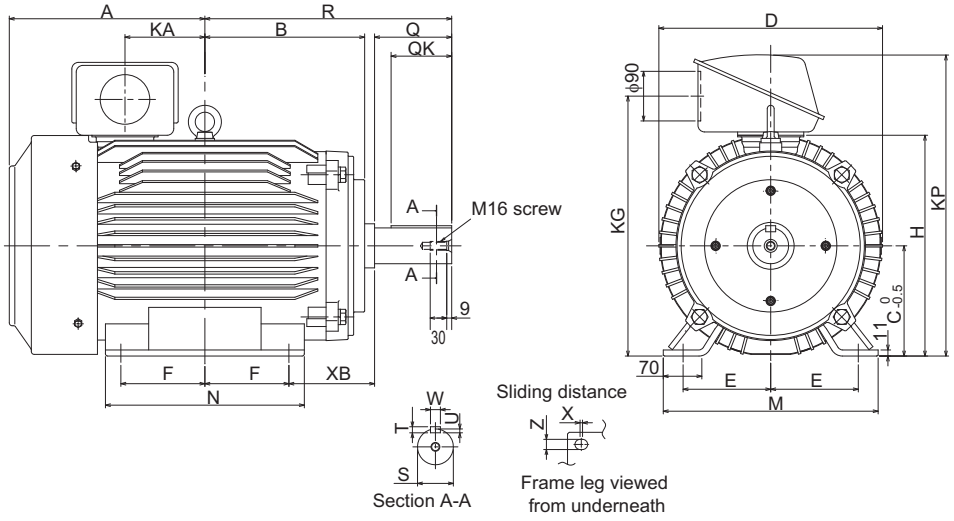
Outline drawing of motors

(1) 45K or lower



Model		Output (kW)	Frame number	Outline Dimension (mm)																			Moment of inertia J (kg·m²)
				A	B	C	D	E	F	H	KA	KL	M	N	Q	QK	R	S	T	U	W	X	Z	
200V class MM-EF□2	4	0.4	80M	95	95	80	161.6	62.5	50	164	39.5	145	160	125	30	25	135	14j6	5	3	5	15	9	0.00104
	7	0.75		122											40	32	145	19j6	6	3.5	6	15	9	
	15	1.5													50	40	155	24j6	7	4	8	15	9	0.00184
	22	2.2	90L	143	110.5	90	183.6	70	62.5	186.3	53	158	175	150	60	45	180.5	28j6	7	4	8	4	9	0.00369
	37	3.7	100L	173	128	100	207	80	70	203.5	65	169	200	180	60	45	198	28j6	7	4	8	4	12	0.00512
	55	5.5	112M	181	135	112	228	95	70	226	69	185	230	180	80	63	225	38k6	8	5	10	4	12	0.0125
	75	7.5																						0.0153
400V class MM-EF□24	11K	11	132S	211.5	152	132	266	108	70	265	75	237	256	180	110	90	272	42k6	8	5	12	4	12	0.0274
	15K	15																						0.0354
	18K	18.5	160M	252	198	160	318	127	105	316	105	266	310	254	110	90	326	48k6	9	5.5	14	4	14.5	0.0815
	22K	22																						
	30K	30	160L	274	220	160	318	127	127	316	127	266	310	298	110	90	348	55m6	10	6	16	4	14.5	0.105
	37K	37	180L	311.5	244.5	180	363	139.5	139.5	359	146	351	335	323	140	110	402.5	60m6	11	7	18	4	14.5	0.2215
	45K	45																						0.24

(2) 55K or higher



Model		Output (kW)	Frame number	Outline Dimension (mm)																					Moment of inertia J (kg·m²)
				A	B	C	D	E	F	H	KA	KG	KP	M	N	XB	Q	QK	R	S	T	U	W	X	Z	
200V class MM-EF□2	55K	55	200L	355	290	200	406	159	152.5	401	145	472	548	390	361	155.5	140	110	448	65m6	11	7	18	4	18.5	0.43
	75K	75	200L	355	290	200	406	159	152.5	401	145	472	548	390	361	155.5	140	110	448	75m6	12	7.5	20	4.5	18.5	0.52
400V class MM-EF□24	90K	90	225S	365	297	225	446	178	143	446	145	517	593	428	342	174	140	110	457	75m6	12	7.5	20	4	18.5	0.87
	110K	110	225S	365	297	225	446	178	143	446	145	517	593	428	342	174	170	140	487	85m6	14	9	22	4	18.5	0.95

CAUTION

- The outline dimensions are the dimensions of typical motors. The outer appearance may differ according the frame number.
- The available 200V class capacity is up to 75K.

Pr. 998, IPM IPM motor control, IPM parameter initialization IPM

Pr.998 IPM parameter initialization *IPM IPM parameter initialization*

An IPM (interior permanent magnet) motor is a highly efficient motor compared to a general-purpose motor. Highly efficient motor control and highly accurate motor speed control can be performed by using the inverter with an IPM motor.

- For the motor model, dedicated IPM motor (MM-EFS model or MM-EF model) must be used.
- The motor capacity must be equivalent to the inverter capacity. (The 0.75K inverter can be used with the 0.4kW MM-EF.)
- Single-motor operation (one motor run by one inverter) must be performed.
- The overall wiring length with the motor must be within the specified value. *(Refer to page 81)*

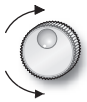
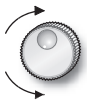
Setting procedure of IPM motor control

This inverter is set for a general-purpose motor in the initial setting. Follow the following procedure to change the setting for the IPM motor control.

- IPM motor (MM-EFS) control setting from the operation panel (parameter setting mode)

POINT

- The parameters required to drive an IPM motor are automatically changed as a batch.
- To switch to the IPM motor control, initialize the parameter settings in the parameter setting mode or by setting *Pr.998*. If parameter initialization is performed after setting other parameters, some of those parameters will be initialized too. (Refer to the next page for the parameters initialized with this operation.)

Operation	Display
1. Screen at power-ON The monitor display appears.	
2. Parameter setting mode Press (MODE) to choose the parameter setting mode.	(MODE) ⇨  The parameter number read previously appears.
3. Selecting the parameter Turn dial until "IPN" (IPM parameter initialization) appears.	 ⇨ 
4. Displaying the setting Press (SET) to read the currently set value. "0" (initial value) appears.	(SET) ⇨ 
5. Selecting the setting Turn dial to change it to the set value "12".	 ⇨ 
6. Parameter setting Press (SET) to set.	(SET) ⇨  Flicker ... Parameter setting complete!!

Setting	Description
0 (initial value)	Parameter settings for a general-purpose motor
1	Parameter settings for a high-efficiency IPM motor MM-EF (rotations per minute)
12	Parameter settings for a premium high-efficiency IPM motor MM-EFS (rotations per minute)
22, 32	For manufacturer setting (setting not required)

P.RUN indicator is lit.

REMARKS

- Performing IPM parameter initialization by selecting the parameter setting mode on the operation panel automatically changes the *Pr. 998 IPM parameter initialization* setting.
- The parameter initialization sets the same capacity as the inverter capacity to *Pr. 80 Motor capacity*. To use a 0.4kW MM-EF, set *Pr. 80 Motor capacity* = "0.4" before performing IPM parameter initialization by selecting the parameter setting mode on the operation panel.
- The IPM parameter setting is displayed as "1, 12" in the parameter setting mode even if *Pr.998 IPM parameter initialization* = "101, 112."

- Initialization can be performed by setting *Pr.998 IPM parameter initialization* or by choosing the mode on the operation panel.

Pr.998 Setting	Description	Operation in the parameter setting mode ("IPN")
0 (Initial value)	Parameter settings for a general-purpose motor (frequency)	"IPM" ⇒ Write "0"
1	Parameter settings for a high-efficiency IPM motor MM-EF (rotations per minute)	"IPM" ⇒ Write "1"
12	Parameter settings for a premium high-efficiency IPM motor MM-EFS (rotations per minute)	"IPM" ⇒ Write "12"
101	Parameter settings for a high-efficiency IPM motor MM-EF (frequency)	Invalid
112	Parameter settings for a premium high-efficiency IPM motor MM-EFS (frequency)	Invalid
22, 32, 122, 132	For manufacturer setting (setting not required)	

IPM parameter initialization list

By selecting IPM motor control from the parameter setting mode or with *Pr.998 IPM parameter initialization*, the parameter settings in the following table change to the settings required to drive an IPM motor. The changed settings differ according to the IPM motor specification (capacity). Refer to the IPM motor specification list shown below.
Performing parameter clear or all parameter clear sets back the parameter settings to the settings required to drive a general-purpose motor.

Parameter	Name		Setting			Setting increments	
			General-purpose motor	IPM motor (rotations per minute)	IPM motor (frequency)		
		Pr.998	0 (Initial setting)	1 (MM-EF), 12 (MM-EFS)	101 (MM-EF), 112 (MM-EFS)	1, 12	0, 101, 112
1	Maximum frequency		120/60Hz *3	Maximum motor rotations per minute	Maximum motor frequency	1r/min	0.01Hz
4	Multi-speed setting (high speed)		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
9	Electronic thermal O/L relay		Rated inverter current	Rated motor current		0.01A/0.1A *3	
13	Starting frequency		0.5Hz	Minimum rotations per minute	Minimum frequency	1r/min	0.01Hz
15	Jog frequency		5Hz	Minimum rotations per minute	Minimum frequency	1r/min	0.01Hz
18	High speed maximum frequency		120/60Hz *3	Maximum motor rotations per minute	Maximum motor frequency	1r/min	0.01Hz
20	Acceleration/deceleration reference frequency		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
22	Stall prevention operation level		120%	Short-time motor torque		0.1%	
37	Speed display		0	0		1	
55	Frequency monitoring reference		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
56	Current monitoring reference		Rated inverter current	Rated motor current		0.01A/0.1A *3	
71	Applied motor		0	120 (when *Pr.998* = "1 or 101") 210 (when *Pr.998* = "12 or 112")		1	
80	Motor capacity		9999	Inverter capacity *2		0.01kW/0.1kW *3	
125 (903)	Terminal 2 frequency setting gain frequency		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
126 (905)	Terminal 4 frequency setting gain frequency		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
144	Speed setting switchover		4	Number of motor poles + 100	Number of motor poles	1	
240	Soft-PWM operation selection		1	0		1	
260	PWM frequency automatic switchover		1	1		1	
263	Subtraction starting frequency		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
266	Power failure deceleration time switchover frequency		60Hz	Rated motor rotations per minute	Rated motor frequency	1r/min	0.01Hz
374	Overspeed detection level		9999	Maximum motor rotation per minute × 105%	Maximum motor frequency × 105%	1r/min	0.01Hz
390 *1	% setting reference frequency		60Hz	Rated motor frequency		0.01Hz	
505	Speed setting reference		60Hz	Rated motor frequency		0.01Hz	
557	Current average value monitor signal output reference current		Rated inverter current	Rated motor current		0.01A/0.1A *3	
870	Speed detection hysteresis		0Hz	Speed detection hysteresis rotations per minute	Speed detection hysteresis frequency	1r/min	0.01Hz
885	Regeneration avoidance compensation frequency limit value		6Hz	Minimum rotations per minute	Minimum frequency	1r/min	0.01Hz
893	Energy saving monitor reference (motor capacity)		Rated inverter capacity	Motor capacity *(Pr. 80)*		0.01kW/0.1kW *3	

*1 This parameter can be set when FR-A7NL is mounted.
*2 When *Pr.80 Motor capacity* ≠ "9999," the *Pr.80 Motor capacity* setting is not changed by IPM parameter initialization.
*3 Initial values and setting increments differ according to the inverter capacity. (55K or lower/75K or higher)

REMARKS

If IPM parameter initialization is performed in rotations per minute (*Pr. 998* = "1" or "12"), the frequency-related parameters not listed in the table above and the monitored items are also set and displayed in rotations per minute.

<IPM motor specification list>

	MM-EF (30kW or lower)	MM-EF (37kW to 75kW)	MM-EF (90kW or higher)	MM-EFS (15kW or lower)	MM-EFS (18.5kW to 55kW)
Rated motor frequency (rotations per minute)	90Hz (1800r/min)	120Hz (1800r/min)	120Hz (1800r/min)	75Hz (1500r/min)	100Hz (1500r/min)
Maximum motor frequency (rotations per minute)	135Hz (2700r/min)	180Hz (2700r/min)	160Hz (2400r/min)	112.5Hz (2250r/min)	150Hz (2250r/min)
Number of motor poles	6	8	8	6	8
Short-time motor torque	120%	120%	120%	120%	120%
Minimum frequency (rotations per minute)	9Hz (180r/min)	12Hz (180r/min)	12Hz (180r/min)	7.5Hz (150r/min)	10Hz (150r/min)
Speed detection hysteresis frequency (rotations per minute)	0.5Hz (10r/min)	0.5Hz (8r/min)	0.5Hz (8r/min)	0.5Hz (10r/min)	0.5Hz (8r/min)

Specification comparison with the general-purpose motor

Item		IPM motor control		General-purpose motor control
Applicable motor		Premium high-efficiency IPM motor MM-EFS series (the same capacity as the inverter capacity)	High-efficiency IPM motor MM-EF series (the same capacity as the inverter capacity)	General-purpose motor SF-JR, HR series, etc. (the same or one-rank higher capacity compared to the inverter)
Number of connectable motors		1: 1		Several motors can be driven under V/F control.
Number of motor poles		15kW or lower: 6 poles 18.5kW or higher: 8 poles	30kW or lower: 6 poles 37kW or higher: 8 poles	Normally 2, 4, or 6 poles.
Rated motor frequency		15kW or lower: 75Hz 18.5kW or higher: 100Hz	30kW or lower: 90Hz 37kW or higher: 120Hz	Normally 50Hz or 60Hz
Maximum output frequency		15K or lower: 112.5Hz (6P 2250r/min) 18K or higher: 150Hz (8P 2250r/min)	30K or lower: 135Hz (6P 2700r/min) 37K to 75K: 180Hz (8P 2700r/min) 90K or higher: 160Hz (8P 2400r/min)	400Hz (12000r/min with 4P) (Set the upper limit frequency *(Pr.1, Pr.18)* according to the motor and machine specifications.)
Permissible load		120% 60s, 150% 3s (inverse-time characteristics) (The % value is a ratio to the rated motor current.)		120% 60s, 150% 3s (inverse-time characteristics) (The % value is a ratio to the rated inverter current.)
Maximum starting torque		50%		120% (Simple magnetic flux vector control)
Frequency setting resolution	**Analog input**	0.018Hz/0 to 75Hz (1500r/min)/ 0.025Hz/0 to 100Hz (1500r/min) (0 to 10V / 12 bits) *1 0.036Hz/0 to 75Hz (1500r/min)/ 0.05Hz/0 to 100Hz (1500r/min) (0 to 5V / 11 bits, 0 to 20mA / 11 bits, 0 to ±10V / 12 bits)*1 0.072Hz/0 to 75Hz (1500r/min)/ 0.1Hz/0 to 100Hz (1500r/min) (0 to ±5V / 11 bits) *1	0.02Hz/0 to 90Hz (1800r/min)/ 0.03Hz/0 to 120Hz (1800r/min) (0 to 10V / 12 bits) *2 0.04Hz/0 to 90Hz (1800r/min)/ 0.06Hz/0 to 120Hz (1800r/min) (0 to 5V / 11 bits, 0 to 20mA / 11 bits, 0 to ±10V / 12 bits) *2 0.09Hz/0 to 90Hz (1800r/min)/ 0.12Hz/0 to 120Hz (1800r/min) (0 to ±5V / 11 bits) *2	0.015Hz/0 to 60Hz (1800r/min with 4P) (0 to 10V / 12 bits) 0.03Hz/0 to 60Hz (1800r/min with 4P) (0 to 5V / 11 bits, 0 to 20mA / 11 bits, 0 to ±10V / 12 bits) 0.06Hz/0 to 60Hz (1800r/min with 4P) (0 to ±5V / 11 bits)
Output signal	**Pulse output for meter**	In the initial setting, 1mA is output at 75Hz for 15K or lower, and at 100Hz*1 for 18K or higher. The signal is output from across terminals FM and SD. (SD is a common terminal.) The permissible frequency load current is 2mA. 1440 pulses/s is output at 75Hz for 15K or lower, and at 100Hz*1 for 18K or higher.	In the initial setting, 1mA is output at 90Hz for 30K or lower, and at 120Hz*2 for 37K or higher. The signal is output from across terminals FM and SD. (SD is a common terminal.) The permissible frequency load current is 2mA. 1440 pulses/s is output at 90Hz for 30K or lower, and at 120Hz*2 for 37K or higher.	In the initial setting, 1mA is output at 60Hz from across terminals FM and SD. (SD is a common terminal.) The permissible frequency load current is 2mA. For pulse specification, 1440 pulses/s is output at 60Hz.
Carrier frequency		55K or lower: four patterns of 2kHz, 6kHz, 10kHz, and 14kHz 75K or higher: two patterns of 2kHz and 6kHz		55K or lower: 0.75kHz to 14.5kHz 75K or higher: 0.75kHz to 6kHz

Item	IPM motor control	General-purpose motor control
Automatic restart after instantaneous power failure	No startup waiting time. Using the regeneration avoidance function together is recommended.	Startup waiting time exists.
Startup delay	Startup delay of about 0.1s for initial tuning.	No startup delay.
Driving by the commercial power supply	Not available. Never connect an IPM motor to the commercial power supply.	Can be driven by the commercial power supply.
Operation during coasting	While the motor is coasting, potential is generated across motor terminals. Before wiring, make sure that the motor is stopped.	While the motor is coasting, no potential is generated across motor terminals.
Maximum motor wiring length	100m or shorter	500m or shorter in total

*1 The values differ for the 15K and lower capacity premium high-efficiency IPM motor, which requires 6 poles to run at the rated motor speed (1500r/min), or for 18K and higher, which requires 8 poles to run at the speed.

*2 The values differ for the 30K and lower capacity high-efficiency IPM motor, which requires 6 poles to run at the rated motor speed (1800r/min), or for 37K and higher, which requires 8 poles to run at the speed.

CAUTION

No slippage occurs with an IPM motor because of its characteristic.
If an IPM motor, which took over a general-purpose motor, is driven at the same speed as for the general-purpose motor, the running speed of the IPM motor becomes faster by the amount of the general-purpose motor's slippage.
Adjust the speed command to run the IPM motor at the same speed as the general-purpose motor, as required.

Item	FR-F500(L)	FR-F700P
Changed/Deleted function	Simple mode parameter 61 parameters	Simple mode parameter 17 parameters
	Pr.0 Torque boost initial value 11K to 55K: 2%	*Pr.0 Torque boost* initial value 11K to 37K: 2%, 45K, 55K: 1.5% (If the torque boost setting was being used in the initial setting in the FR-F500 series, the setting does not need to be changed from the initial setting after the inverter is replaced with the FR-F700P series.)
	User group 1 (16 parameters), User group 2 (16 parameters) (*Pr. 160*, *Pr. 173 to Pr. 175*)	User group (16 parameters) only Setting methods were partially changed (*Pr. 160*, *Pr. 172 to Pr. 173*)
	User initial value setting (*Pr.199*)	User's initial value setting *(Pr.199)* is deleted. Substitutable with the copy function of the operation panel (FR-DU07)
	DC injunction function with terminal (X13 signal) (Setting value "8888" for *Pr. 11*, setting value "13" for *Pr. 180 to Pr. 186*)	DC injunction function with terminal is deleted. Start in the reverse rotation is possible with the flying start function (frequency search of the automatic restart after instantaneous power failure function)
	Long wire mode (Setting values "10 and 11" for *Pr. 240*)	Setting is not necessary (Setting values "10 and 11" for *Pr. 240* are deleted.)
	Intelligent optimum acceleration/deceleration (*Pr.60* setting "3" and *Pr. 61 to Pr. 63)*	The function is deleted. For deceleration time, overvoltage fault can be avoided with the regeneration avoidance function (*Pr. 882 to Pr. 885*).
	Automatic torque boost *(Pr.38, Pr.39)*	The automatic torque boost is deleted because the Simple magnetic flux vector (*Pr.80*) has been added.
	PID action set point (Pr. 133)	The setting value "9999" is added for the PID action set point (*Pr. 133*). (Terminal 2 input is the set point.)
	Performing the parameter clear or all parameter clear (H5A96 or HAA99) from the DeviceNet communication option (FR-A5ND) clears the *Pr. 345* and *Pr. 346* settings.	Performing the parameter clear or all parameter clear (H5A96 or HAA99) from the DeviceNet communication option (FR-A7ND) does not clear the *Pr. 345* and *Pr. 346* settings.
Terminal block	Removable terminal block	Removable terminal block Upward compatibility (Terminal block of the F500 can be mounted)
PU	FR-PU04, DU04	FR-PU07 FR-DU07 FR-DU04 unavailable (Partly restricted when the FRPU04 is used.)
Plug-in option	Dedicated plug-in option (not compatible)	
	Computer link, relay output option FR-A5NR	Built into the inverter (RS-485 terminal, relay output 2 points)
	Three boards can be mounted	One board can be mounted
Installation size	FR-F720P-0.75K, 2.2K, 3.7K, 7.5K, 18.5K, 22K, 37K, 45K, FR-F740P-0.75K to 3.7K, 7.5K, 11K, 22K, 37K to 55K are compatible in mounting dimensions For other capacities, an optional intercompatibility attachment (FR-AAT) is necessary.	

1. Gratis warranty period and coverage

[Gratis warranty period]

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

[Coverage]

(1) Diagnosis of failure

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

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

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

(2) Breakdown repairs

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

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

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

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

2. Exclusion of chance loss from warranty liability

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

3. Repair period after production is discontinued

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

4. Terms of delivery

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

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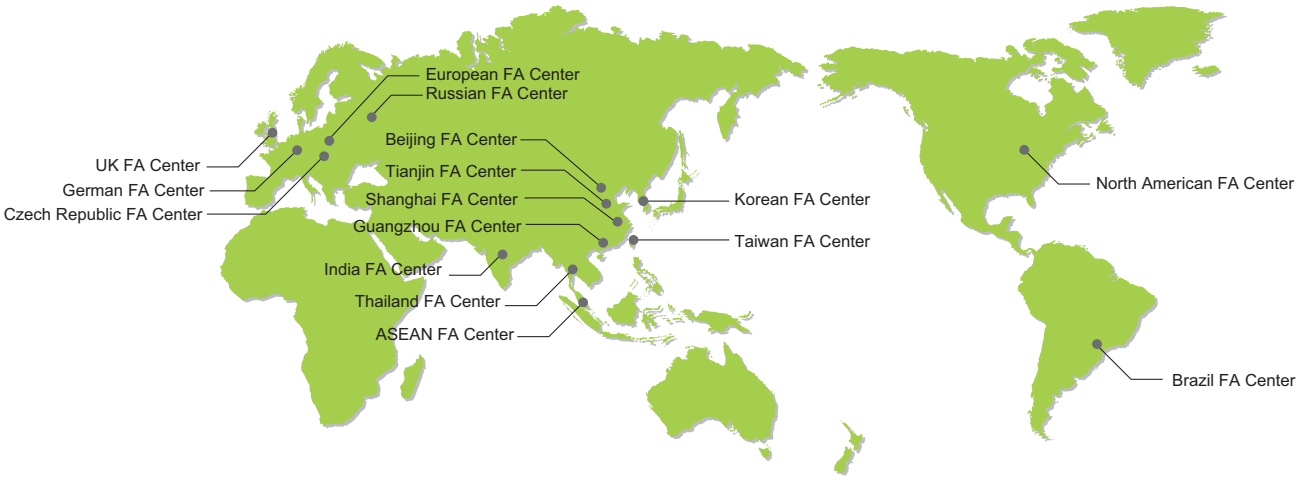

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To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

eco Changes

for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

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