

700 series

FR-D700

GLOBAL STANDARD



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







GLOBAL STANDARD

New standard of inverter

High reliability is realized!

(1) Safety stop function (available soon)

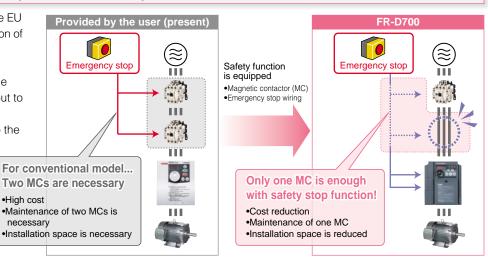
The FR-D700 series is compliant to the EU Machinery Directive without the addition of previously required external devices. Operation of an external Emergency Stop device results in a highly reliable immediate shutoff of the D700's output to

This safety stop function conforms to the following standards.

ISO13849-1 (EN954-1) Category 3

IEC60204-1 Stop Category 0

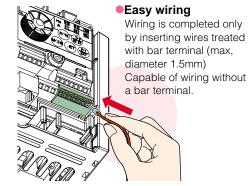
IEC61508 SIL2:Safety Integrity Level 2



(2) Spring clamp terminal (control circuit terminal)

Highly reliable and easy wiring is realized by the incorporation of spring clamp terminals.*

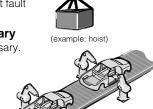
*: Main circuit terminal is screw terminal.



High reliability

Spring structure in terminal contact section inside prevents contact fault by vibration.

Maintenance is unnecessary Screw retightening is unnecessary.



Long-life design

- •The design life of the cooling fan has been extended to 10 years*1. The life of the fan can be further extended utilizing the it's ON/OFF
- •The longevity of the capacitors has been extended to 10 vears by the adoption of a capacitor with a specification of 5000 hours and 105°C ambient temperature*1,*2.
- *1: Ambient temperature : annual average 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt) Since the design life is a calculated value, it is not a guaranteed value. *2: Output current : 80% of the inverter rated current

Life indication of critical components

Components	Guideline of the FR-D700 Life	Guideline of JEMA*3
Cooling fan	10 years	2 to 3 years
Main circuit smoothing capacitor	10 years	5 years
Printed board smoothing capacitor	10 years	5 years

*3: Excerpts from "Periodic check of the transistorized inverter" of JEMA (Japan Electrical Manufacturerís Association)

(4) Most advanced life check

- Degrees of deterioration of main circuit capacitor, control circuit capacitor, and inrush current limit circuit can be monitored.
- •Trouble can be avoided with the self-diagnostic alarm*4 that is output when the life span is near.
- *4: If any one of main circuit capacitor, control circuit capacitor, inrush current restriction circuit or cooling fan reaches the output level, an alarm is output. Capacity of the main circuit capacitor can be measured by setting parameter at a stop and turning the power from off to on. Measuring the capacity enables alarm to be output. The cooling fan outputs alarm by using fan speed detection

5) Password function

Registering 4-digit password can limit parameter read/write. It is effective for parameter setting

protection.



This is Mitsubishi new standard

Equipped with small class highest level of function/performance!!

150%/1Hz high starting torque by general purpose magnetic flux vector control

General-purpose magnetic flux vector control and auto tuning function are available.

It ensures operation that requires high starting torque, such as transfer machine including conveyer, hoist, lift, etc., washing machine, and agitators.

•High torque 150%/1Hz and 200%/3Hz are realized

Auto tunina

Many kinds of motors can be optimally controlled with Mitsubishi original "non-rotation" auto tuning function. (R1 constants tuning)



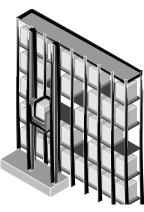
Enhanced function



(2) Brake resistor can be connected

A brake transistor is built-in to the 0.4K or more. Connecting an optional brake resistor increases regeneration capability.

It is useful for deceleration time reduction of a machine with a large inertia, such as fan, and operation of lift, etc.



Power failure-time deceleration-to-stop function

For fail-safe of machine tool, etc., it is effective to stop

(example: spindle)

Entering position detection signal of dancer roll to use

PID control enables tension control by dancer roll.

the motor when a power failure has occurred.

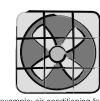
New functions and useful functions from superior models support all sorts of applications. The motor can be decelerated to a stop when a power failure or undervoltage occurred to prevent the motor

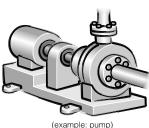
Regeneration avoidance function For a pressing machine and fan rotated faster than the set speed due to the effect of another fan, a trip can be made less likely to occur by automatically increasing frequency at regeneration.

Optimum excitation control

This control enables the motor efficiency to its optimum. More energy saving is possible in applications with variable load torque characteristic such as fan and pump.





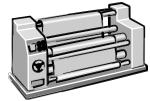


Traverse function Traverse function for wind-up drum of spinning

from coasting.

Dancer control

machine and wiredrawing machine prevents unevenness and deformation at thread winding.



(example: textile machine)



(example: wiredrawing machine)

Features

Standard specifications

Outline dimension drawings

Terminal connection diagram Terminal specification explanation

Operation panel Parameter unit

Parameter list

Protective functions

Option and peripheral devices

Precautions for operation/selection Precautions for peripheral

device selection

Easy use and time saving build in as standard

Quick setup with the setting dial

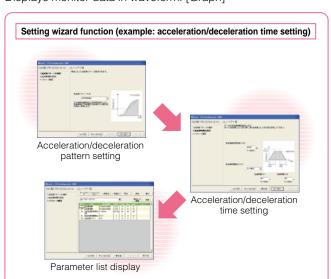
Mitsubishi inverter has a setting dial of course.

- •The scrolling speed of the dial was made to variable for more improved operability.
- •The nonslip setting dial is easier to turn.

Setting is easily done from a personal computer using the FR Configurator (option) (available soon)

Connecting a personal computer and the inverter via RS-485 communication realizes setting with wizard (interactive) function of the FR Configurator (inverter setup software).

In addition, a parameter setting can be converted from the FR-S500 series to the FR-D700 series by "convert" function. Displays monitor data in waveform. [Graph]





Enclosure surface operation panel FR-PA07 (option)

Optional enclosure surface operation panel (FR-PA07) can be connected. In addition, an operation panel for the FR-E500 series can be connected.

The operation panel of the inverter can not be removed. A parameter unit connection cable (FR-CB20□) is separately necessary

(4) Parameter unit FR-PU07 (option)

An optional parameter unit (FR-PU07) can be connected as well. A parameter unit connection cable (FR-CB20□) is separately necessary.

- Setting such as direct input method with a numeric keypad, operation status indication, and help function are usable. Eight languages can be displayed.
- Parameter setting values of maximum of three inverters can be stored.
- •A battery pack type (FR-PU07BB) allows parameter setting and parameter copy without powering on the inverter.



(5) Enhanced communication function

Modbus and Mitsubishi inverter protocol

Supports Modbus RTU

Communication speed of RS-485 has been improved (communication at 38.4kbps is available)

"Multi command mode" has been added to Mitsubishi inverter

(data processing time of the inverter has been reduced to 1/4)

Compact and space saving

(1) Easily replaceable compact body

Installation size is the same as that of the FR-S500 series which is the smallest model of the Mitsubishi inverter.



FR-D740-0.4K FR-S540E-0.4K

(2) Side by side installation saves space

Space can be saved by side by side no clearance installation* *: Use the inverter at the ambient temperature of 40°C or less.



5 Easy maintenance

(1) Easy replacement of cooling fan

A cooling fan is provided on top of the inverter of all capacities requiring a cooling fan (1.5K or more).

A cooling fan can be easily replaced without disconnecting main circuit wires.



(2) Combed shaped wiring cover

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



Global standard environment conscious

(1) RoHS Directive compliant

Human and environment-friendly inverter in compliant with RoHS Directive.

RoHS Directive requires member nations must guarantee that new electrical and electronic equipment sold in the market after July 1, 2006 do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PRDF) flame retardants

<G> mark indicating RoHS Directive compliance is printed on the package.

(2) EMC filter integrated model

EMC filter integrated models (to be released) which conform to the EMI level category 3 are line upped.

(3) Complies with UL, cUL, EN (LVD) standards





Lineup

The lineup of three phase 200V/400V class goes to 15K.

For the FR-D700 series, North American (NA), EU (EC), and Chinese (CHT) specifications also are supported.

*: This catalog explains based on the Japanese specifications. Consult our sales office for specifications of each country.

> FR-D740 -0.4K-Enclosed-type structure IP20 100V class None Three-phase input None Indicate capacity 200V class Single-phase input 0.1K to 15K Totally enclosed structure IP40 "kW". 400V class Single-phase input louble voltage output)

Power Supply	Inverter Type	Inverter Capacity	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Three phase		Enclosed structure (IP20)	0	0	0	0	0	0	0	0	0	0	0
200V	FR-D720-□K	Totally-enclosed structure (IP40)	0	0	0	0	0	0	0	0	0	0	0
Three phase		Enclosed structure (IP20)		_	•	•	•	•	•	•	•	0	0
400V	FR-D740-□K	Totally-enclosed structure (IP40)	_	_	0	0	0	0	0	0	0	0	0
Single phase 200V *	FR-D720S-□K	Enclosed structure (IP20)	0	0	0	0	0	0	_	_	_	_	_
Single phase 100V *	FR-D710W-□K	Enclosed structure (IP20)	0	0	0	0	_	_	_	_	_	_	_

^{*:} Output of the single-phase 200V and single-phase 100V input models is three-phase 200V.

^{■ ·}Available models O ·Models to be released — ·Not available

Standard specifications

Rating

• Three-phase 400V power supply

	Model FR-D740-□K(-C)∗6	0.4	0.75	1.5	2.2	3.7	5.5	7.5		
	Model FR-D740-□-NA	012	022	036	050	080	120	160		
	Model FR-D740-□-EC	012	022	036	050	080	120	160		
	Model FR-D740-□K-CHT	0.4	0.75	1.5	2.2	3.7	5.5	7.5		
App	olicable motor capacity (kW)*1	0.4	0.75	1.5	2.2	3.7	5.5	7.5		
	Rated capacity (kVA)*2	1.2	2.0	3.0	4.6	7.2	9.1	13.0		
Output	Rated current (A)	1.2	2.2	3.6	5.0	8.0	12.0	16.0		
Out	Overload current rating*3	150% 60s, 200% 3s (inverse-time characteristics)								
	Voltage*4	Three phase 380 to 480V								
- Si	Rated input voltage/frequency		Th	ree-phase	380 to 480	V 50Hz/60	Hz			
supply	Permissible AC voltage fluctuation			325 to	528V 50H	z/60Hz				
er s	Permissible frequency fluctuation				±5%					
Power	Power supply capacity (kVA)*5	1.5	2.5	4.5	5.5	9.5	12	17		
Pro	tective structure (JEM1030)	Encl	osed type ((IP20). IP40	o for totally	enclosed s	structure se	ries.		
Cod	oling system	Self-c	ooling		For	ced air coo	ling			
App	proximate mass (kg)	1.2	1.2	1.3	1.4	1.5	3.1	3.1		

- *1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
- *2 The rated output capacity indicated assumes that the output voltage is 440V.
- *3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
- *4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- *5 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- *6 Totally enclosed structure series ends with -C.

Common specifications

	۲۸۱	ntrol method		Soft-PWM control/high carrier frequency PWM control (V/F control, general-purpose magnetic flux vector control,
				optimum excitation control can be selected)
	Oui	tput frequency ra	ange	0.2 to 400Hz 0.06Hz/60Hz (terminal2, 4: 0 to 10V/10bit)
Control specifications		quency setting olution	Analog input	0.12Hz/60Hz (terminal2, 4: 0 to 5V/9bit) 0.06Hz/60Hz (terminal4: 4 to 20mA/10bit)
cat			Digital input	0.01Hz
ΞĘ		quency	Analog input	Within ±1% of the max. output frequency (25°C ±10°C)
be	acc	uracy	Digital input	Within 0.01% of the set output frequency
ol s	Vol	tage/frequency c	haracteristics	Base frequency can be set from 0 to 400Hz Constant torque/variable torque pattern can be selected
ntr	Sta	rting torque		150% or more (at 1Hz)when general-purpose magnetic flux vector control and slip compensation is set
ပိ	Tor	que boost		Manual torque boost
			ration time setting	0.1 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode can be selected.
-		injection brake		Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) variable
	Stall prevention operation level			Operation current level can be set (0 to 200% adjustable), whether to use the function or not can be selected
	Fre sig	.,	Analog input	Two points Terminal 2: 0 to 10V, 0 to 5V can be selected Terminal 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected
	Digital input		Digital input	Entered from operation panel and parameter unit. Frequency setting increments is selectable
	Sta	rt signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Inp	ut signal		Five points You can select from among multi-speed selection, remote setting, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, external thermal input, PU-external operation switchover, V/F switchover, output stop, start self-holding selection, traverse function selectiom, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, and PU operation external interlock
Operation specifications	Ор	erational function		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, second function, multi-speed operation, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS-485), optimum excitation control, power failure stop, speed smoothing control, Modbus-RTU
s uo		Output signal points	Open collector output	One point
rati		pointo	Relay output	One point
Ope	Operating status		3	You can select from among inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, fan alarm*2, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, PID output interruption, during retry, life alarm, current average value monitor, remote output, alarm output, fault output 3, and maintenance timer alarm
	Output	For meter Output points	Pulse output	MAX 2.4kHz: one point
		For meter		You can select from among output frequency, motor current (steady), output voltage, frequency setting, converter output voltage, regenerative brake duty, electronic thermal relay function load factor, output current peak value, converter output voltage peak value, reference voltage output, motor load factor, PID set point, PID measured value, output power, PID deviation, Motor thermal load factor, Inverter thermal load factor Pulse train output (1440 pulses/s/full scale)
	Par	ameter unit	Operating status	You can select from among output frequency, motor current (steady), output voltage, frequency setting, cumulative energization time, actual operation time, converter output voltage, regenerative brake duty, electronic thermal relay function load factor, output current peak value, converter output voltage peak value, motor load factor, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, output power, cumulative power, motor thermal load factor, inverter thermal load factor, PTC thermistor resistance.
Indication	(1 T	-PU07)	Fault definition	Fault definition is displayed when the fault occurs and the past 8 fault definitions (output voltage/current/ frequency/cumulative energization time right before the fault occurs) are stored
lnd	Add	ditional display	Operating status	Not used
			Fault definition	Output voltage/current/frequency/cumulative energization time immediately before the fault occurs
		t (FR-PU04/FR- 07) only	Interactive guidance	Function (help) for operation guide
Pro	Protective/warning function			<protective functions=""> Overcurrent during acceleration, overvoltage during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, input phase failure, output side earth (ground) fault overcurrent at start*4, output phase failure, external thermal relay operation *4, PTC thermistor operation*4, parameter error, PU disconnection, retry count excess *4, CPU fault, brake transistor alarm, inrush resistance overheat, analog input error, stall prevention operation, output current detection value exceeded <warning functions=""> Fan alarm*2, overcurrent stall prevention, overvoltage stall prevention, PU stop, parameter write error, regenerative brake prealarm *4, electronic thermal relay function prealarm, maintenance output *4, undervoltage, operation panel lock, password locked, inverter reset</warning></protective>
ent		bient temperatur	re	-10°C to +50°C (non-freezing) (-10°C to +40°C for totally-enclosed structure feature) *3
		bient humidity		90%RH maximum (non-condensing)
ron		rage temperature	e *1	-20°C to +65°C
ī		nosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)
Ш		tude/vibration	able for a short time	Maximum 1000m above sea level, 5.9m/s ² or less

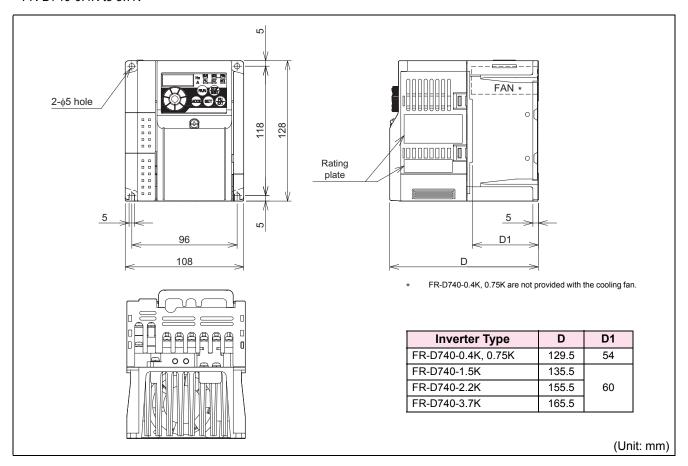
- *1 *2 *3 *4 Temperatures applicable for a short time, e.g. in transit.

 As the 0.75K or less is not provided with the cooling fan, this alarm does not function.

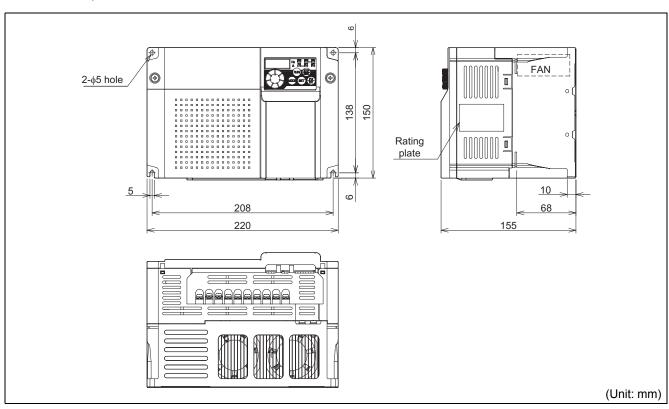
 When using the inverters at the ambient temperature of 40°C or less, the inverters can be installed closely attached (0cm clearance).
- This protective function does not function in the initial status.

Outline Dimension Drawings

●FR-D740-0.4K to 3.7K

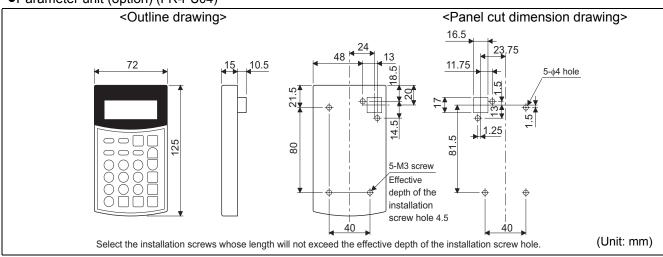


●FR-D740-5.5K, 7.5K

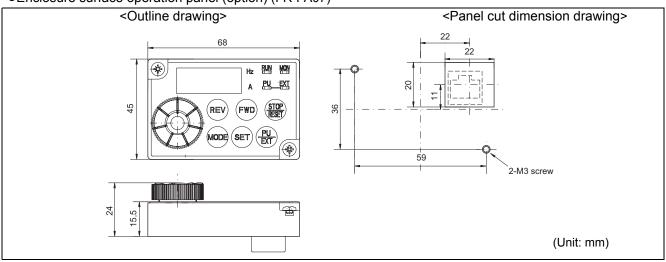


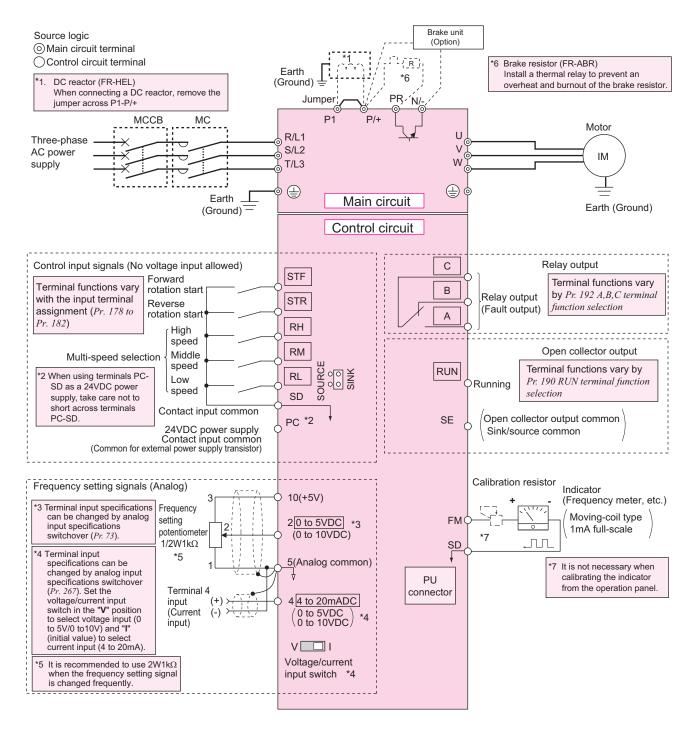
(Unit: mm)

●Parameter unit (option) (FR-PU04)



●Enclosure surface operation panel (option) (FR-PA07)





Note

- To prevent a malfunction caused by noise, separate the signal cables more than 10cm from the power cables.
- 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.

Terminal Symbol	Terminal Name	Description					
R/L1, S/L2, T/L3	AC power input	Connect to the commercial power supply. Keep these terminals ope factor converter (FR-HC) or power regeneration common converter					
U, V, W	Inverter output	Connect a three-phase squirrel-cage motor.					
P/+, PR	Brake resistor connection	Connect a brake transistor (FR-ABR) across terminals P/+-PR.					
P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2), power regeneration common confactor converter (FR-HC).	verter (FR-CV) or high power				
P/+, P1	DC reactor connection	Remove the jumper across terminals P/+-P1 and connect a DC read	ctor.				
	Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounding)	unded).				
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				
STR	Reverse rotation start	Turn on the STR signal to start reverse rotation and turn it off to stop.	are turned on simultaneously, the stop command is given.				
RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RI					
, ,	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal					
SD	External transistor common (source)	When connecting the transistor output (open collector output), such when source logic is selected, connect the external power supply co terminal to prevent a malfunction caused by undesirable currents.					
	24VDC power supply	Common output terminal for 24VDC 0.1A power supply (PC termina	ıl).				
	common	Isolated from terminals 5 and SE.					
	External transistor	When connecting the transistor output (open collector output), such	, ,				
PC	PC	PC	common (sink) (initial setting)	when sink logic is selected, connect the external power supply comit terminal to prevent a malfunction caused by undesirable currents.	mon for transistor output to this		
			PC (sink) (initial setting) Contact input common	,			
(source)		Common terminal for contact input terminal (source logic).					
	24VDC power supply	Can be used as 24VDC 0.1A power supply.					
10	Frequency setting power supply	Used as power supply when connecting potentiometer for frequency (speed setting) from outside of the inverter.	setting 5.0VDC ± 0.2V permissible load current 10mA				
2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V) provides the maximum output frequency at 5V (10V) and makes input and output proportional. Use <i>Pr. 73</i> to switch between input 0 to 5VDC (initial setting) and 0 to 10VDC input.	Input resistance $10k\Omega \pm 1k\Omega$ Permissible maximum voltage 20VDC				
4	Frequency setting (current)	Inputting 0 to 20mADC (or 0 to 5V / 0 to 10V) provides the maximum output frequency at 20mA makes input and output proportional. This input signal is valid only when the AU signal is on (terminal 2 input is invalid). Use <i>Pr. 267</i> 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 "V" position to select voltage input (0 to 5V/0 to 10V).	Voltage input: Input resistance $10k\Omega \pm 1k\Omega$ Permissible maximum voltage $20VDC$ Current input: Input resistance $233\Omega \pm 5\Omega$ Maximum permissible current $30mA$.				
5	Frequency setting common	Common terminal for the frequency setting signals (terminals 2 or 4					
A, B, C	Relay output (fault output)	1 changeover contact output indicates that the inverter fault occurs. Fault: discontinuity across B-C (continuity across A-C), Normal: con across A-C) Contact capacity 230VAC 0.3A (power factor = 0.4) 30V					
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. (Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct))	Permissible load 24VDC (Maximum 27VDC) 0.1A (a voltage drop is 3.4V maximum when the signal is on)				
SE	Open collector output common	Common terminal of terminal RUN and FU.					
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.	Permissible load current 1mA 1440 pulses/s at 60Hz				
_	PU connector	With the PU connector, RS-485 communication can be made. • Conforming standard: EIA-485 (RS-485) • Transmission format: Multi-drop link • Communication speed: 4800 to 38400bps • Overall extension: 500m					
S 1							
S2							
so	 Do not remove wires for short inverter cannot be operated. 	ing across terminal S1 and SC, across terminal S2 and SC. If one of	tnese wires is removed, the				
sc	1						
S2 SO		Do not remove wires for short inverter cannot be operated.					

- Set Pr. 267 and a voltage/current input switch correctly, then input an analog signal in accordance with the setting. Applying a voltage with voltage/current input switch in "I" position (current input is selected) or a current with switch in "V" position (voltage input is selected) could cause component damage of the inverter or analog circuit of output devices.
- 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 using *Pr. 178* to *Pr. 182*, *Pr. 190*, *Pr. 192* (I/O terminal function
- Terminal names and terminal functions are those of the factory set.

Explanation of the Operation Panel

The operation panel cannot be removed from the inverter.

Operation mode indication

PU: Lit to indicate PU operation mode. EXT: Lit to indicate external operation

NET: Lit to indicate network operation mode.

PU, EXT: Lit to indicate external/PU combined operation mode 1, 2.

Unit indication

Hz: Lit to indicate frequency. A: Lit to indicate current. (Off to indicate voltage and flicker to indicate set frequency monitor.)

Monitor (4-digit LED)

Shows the frequency, parameter number,

Setting dial

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

Press to display the following.

- Displays the set frequency in the monitor mode
- Currently set value is displayed during calibration
- Displays the order in the faults history mode

Mode switchover

Used to change each setting mode.



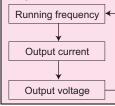
Pressing (PU simultaneously changes

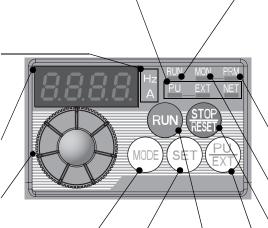
the operation mode.

Pressing for a while (2s) can lock operation.

Determination of each setting

If pressed during operation, monitor changes as below;





Operating status display

Lit or flicker during inverter operation.

On: Indicates that forward rotation operation is being performed. Slow flickering (1.4s cycle): Reverse rotation operation Fast flickering (0.2s cycle):

When (RUN) was pressed or the start

command was given, but the operation can not be made.

- · When the start command is given and the frequency command is less than the starting frequency.
- · When the MRS signal is input.

Parameter setting mode

Lit to indicate parameter setting mode.

Monitor indication

Lit to indicate monitoring mode.

Stop operation

Used to stop Run command. Fault can be reset when protective function is activated (fault).

Operation mode switchover

Used to switch between the PU and external operation mode.

When using the external operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indication.

(Press (MODE) simultanesouly (0.5s) or

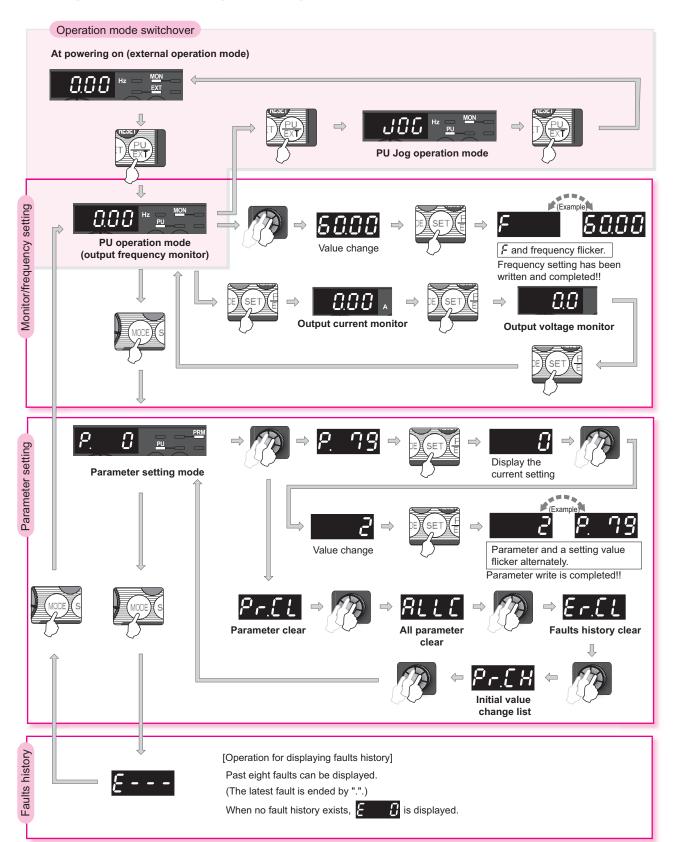
change Pr. 79 setting to change to combined mode .)

PU: PU operation mode EXT: External operation mode Cancels PU stop also.

Start command

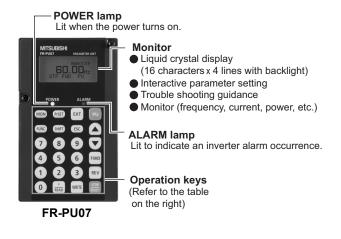
The rotation direction can be selected by setting Pr. 40.

Basic operation of the operation panel



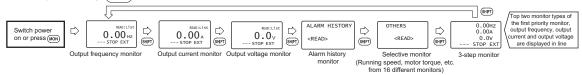
Parameter unit (FR-PU07)

- 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.
- The parameter unit connection cable FR-CB20□ is required for connecting to the inverter.



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. Hold down SHIFT and press either of these keys to advance or return the display screen one page.
FWD	Forward rotation command key.
REV	Reverse rotation command key.
STOP	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. Used as a parameter number read key in the setting mode. Used as an item select key on the menu screen such as parameter list or monitoring list. Used as an alarm definition display key in the alarm history display mode. Used as a command voltage read key in the calibration mode.

Monitor: Merely pressing (SHIFT) calls 6 different monitor screens in sequence.



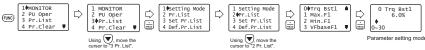
•Parameter setting: When changing 5s to 180s as the Pr. 8 Deceleration time setting



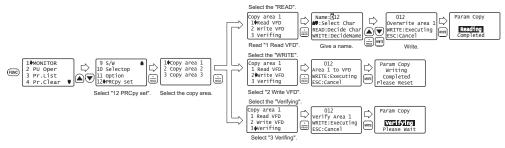
●Pr. List:

Displays the parameters list.

You can select the parameter from the list to read and write the parameter setting.



•Multiple copies: You can read the parameter settings of the inverter into the FR-PU07 and store the settings of maximum. three inverters. You can also copy the stored parameter settings to another inverter of the same series.



Features

Standard pecifications

Outline Dimensior Drawings

Terminal Connectior
Diagram
Terminal Specification
Explanation

Operation par Parameter ur

> Paramete 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. For details of parameters, refer to the instruction manual.

This catalog explains based on the Japanese specifications.



POINT

Only simple mode parameter can be displayed using Pr.~160 Extended function display selection. (All parameters are displayed with the initial setting. Set Pr.~160 Extended function display selection as required.

• Simple mode parameter

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Application
0	Torque boost	0 to 30%	0.1%	6%/4%/3%*	Set when you want to increase a starting torque or when the motor with a load will not rotate, resulting in an alarm [OL] and a trip [OC1]. * Initial values differ according to the inverter capacity. (0.75K or less/1.5K to 3.7K/5.5K, 7.5K)
1	Maximum frequency	0 to 120Hz	0.01Hz	120Hz	Set when the maximum output frequency need to be limited.
2	Minimum frequency	0 to 120Hz	0.01Hz	0Hz	Set when the minimum output frequency need to be limited.
3	Base frequency	0 to 400Hz	0.01Hz	60Hz	Set when the rated motor frequency is 50Hz. Check the motor rating plate.
4	Multi-speed setting (high speed)	0 to 400Hz	0.01Hz	60Hz	Set when changing the preset
5	Multi-speed setting (middle speed)	0 to 400Hz	0.01Hz	30Hz	speed in the parameter with a terminal.
6	Multi-speed setting (low speed)	0 to 400Hz	0.01Hz	10Hz	terminai.
7	Acceleration time	0 to 3600s	0.1s	5s/10s*	Acceleration/deceleration time can be set.
8	Deceleration time	0 to 3600s	0.1s	5s/10s*	 Initial values differ according to the inverter capacity. (3.7K or less/5.5K, 7.5K)
9	Electronic thermal O/L relay	0 to 500A	0.01A	Rated inverter current	The inverter protects the motor from overheat. Set the rated motor current.
79	Operation mode selection	0, 1, 2, 3, 4, 6, 7	1	0	Select the start command location and frequency command location.
125	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	Frequency for the maximum value of the potentiometer (5V initial value) can be changed.
126	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	Frequency for the maximum current input (20mA initial value) can be changed.
160	Extended function display selection	0, 9999	1	9999	Parameter which can be read from the operation panel and parameter unit can be restricted.

• Extended mode parameter

• REMARKS

- (a) indicates 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. 77Parameter write selection*.

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
	© 0	Torque boost	0 to 30%	0.1%	6/4/3% *1	
	© 1	Maximum frequency	0 to 120Hz	0.01Hz	120Hz	
	⊚ 2	Minimum frequency	0 to 120Hz	0.01Hz	0Hz	
	© 3	Base frequency	0 to 400Hz	0.01Hz	60Hz	
Basic functions	© 4	Multi-speed setting (high speed)	0 to 400Hz	0.01Hz	60Hz	
ncti	© 5	Multi-speed setting (middle speed)	0 to 400Hz	0.01Hz	30Hz	
Į.	© 6	Multi-speed setting (low speed)	0 to 400Hz	0.01Hz	10Hz	
asic	© 7	Acceleration time	0 to 3600s	0.1s	5/10s *2	
Ä	© 8	Deceleration time	0 to 3600s	0.1s	5/10s *2	
	© 9	Electronic thermal O/L relay	0 to 500A	0.01A	Rated inverter current	
tion	10	DC injection brake operation frequency	0 to 120Hz	0.01Hz	3Hz	
DC injection brake	11	DC injection brake operation time	0 to 10s	0.1s	0.5s	
20	12	DC injection brake operation voltage	0 to 30%	0.1%	4%	
_	13	Starting frequency	0 to 60Hz	0.01Hz	0.5Hz	
_	14	Load pattern selection	0 to 3	1	0	
JOG operation	15	Jog frequency	0 to 400Hz	0.01Hz	5Hz	
JC	16	Jog acceleration/deceleration time	0 to 3600s	0.1s	0.5s	
_	17	MRS input selection	0, 2, 4	1	0	
_	18	High speed maximum frequency	120 to 400Hz	0.01Hz	120Hz	
_	19	Base frequency voltage	0 to 1000V, 8888, 9999	0.1V	9999	
Acceleration/ deceleration time	20	Acceleration/deceleration reference frequency	1 to 400Hz	0.01Hz	60Hz	
all	22	Stall prevention operation level	0 to 200%	0.1%	150%	
Stall prevention	23	Stall prevention operation level compensation factor at double speed	0 to 200%, 9999	0.1%	9999	
ъ	24	Multi-speed setting (speed 4)	0 to 400Hz, 9999	0.01Hz	9999	
)ee(25	Multi-speed setting (speed 5)	0 to 400Hz, 9999	0.01Hz	9999	
ulti-spee setting	26	Multi-speed setting (speed 6)	0 to 400Hz, 9999	0.01Hz	9999	
Multi-speed setting	27	Multi-speed setting (speed 7)	0 to 400Hz, 9999	0.01Hz	9999	
_	29	Acceleration/deceleration pattern selection	0, 1, 2	1	0	
_	30	Regenerative function selection	0, 1, 2	1	0	
d d	31	Frequency jump 1A	0 to 400Hz, 9999	0.01Hz	9999	
jim	32	Frequency jump 1B	0 to 400Hz, 9999	0.01Hz	9999	
lcy]	33	Frequency jump 2A	0 to 400Hz, 9999	0.01Hz	9999	
nen	34	Frequency jump 2B	0 to 400Hz, 9999	0.01Hz	9999	
Frequency jump	35	Frequency jump 3A	0 to 400Hz, 9999	0.01Hz	9999	
正	36	Frequency jump 3B	0 to 400Hz, 9999	0.01Hz	9999	
_	37	Speed display	0, 0.01 to 9998	0.001	0	
_	40	RUN key rotation direction selection	0, 1	1	0	

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
>	41	Up-to-frequency sensitivity	0 to 100%	0.1%	10%	
enc	42	Output frequency detection	0 to 400Hz	0.01Hz	6Hz	
Frequency detection	43	Output frequency detection for reverse rotation	0 to 400Hz, 9999	0.01Hz	9999	
	44	Second acceleration/deceleration time	0 to 3600s	0.1s	5/10s *2	
sus	45	Second deceleration time	0 to 3600s, 9999	0.1s	9999	
ctic	46	Second torque boost	0 to 30%, 9999	0.1%	9999	
fun	47	Second V/F (base frequency)	0 to 400Hz, 9999	0.01Hz	9999	
Second functions	48	Second stall prevention operation current	0 to 200%, 9999	0.1%	9999	
S	51	Second electronic thermal O/L relay	0 to 500A, 9999	0.01A	9999	
	52	DU/PU main display data selection	0, 5, 8 to 12, 14, 20, 23 to 25, 52 to 55, 61,	1	0	
Monitor functions	54	FM terminal function selection	62, 64, 100 1 to 3, 5, 8 to 12, 14, 21,	1	1	
or f	55	Frequency monitoring reference	24, 52, 53, 61, 62 0 to 400Hz	0.01Hz	60Hz	
Moni	56	Current monitoring reference	0 to 500A	0.01A	Rated inverter current	
Automatic restart functions	57	Restart coasting time	0, 0.1 to 5s, 9999	0.1s	9999	
Auto res func	58	Restart cushion time	0 to 60s	0.1s	1s	
_	59	Remote function selection	0, 1, 2, 3	1	0	
_	60	Energy saving control selection	0, 9	1	0	
_	65	Retry selection	0 to 5	1	0	
_	66	Stall prevention operation reduction starting frequency	0 to 400Hz	0.01Hz	60Hz	
>	67	Number of retries at fault occurrence	0 to 10, 101 to 110	1	0	
Retry	68	Retry waiting time	0.1 to 600s	0.1s	1s	
	69	Retry count display erase	0	1	0	
_	70	Special regenerative brake duty	0 to 30%	0.1%	0%	
_	71	Applied motor	0, 1, 3, 13, 23, 40, 43, 50, 53	1	0	
_	72	PWM frequency selection	0 to 15	1	1	
_	73	Analog input selection	0, 1, 10, 11	1	1	
_	74	Input filter time constant	0 to 8	1	1	
_	75	Reset selection/disconnected PU detection/PU stop selection	0 to 3, 14 to 17	1	14	
_	77	Parameter write selection	0, 1, 2	1	0	
_	78	Reverse rotation prevention selection	0, 1, 2	1	0	
_	© 79	Operation mode selection	0, 1, 2, 3, 4, 6, 7	1	0	
ţ	80	Motor capacity	0.1 to 7.5kW, 9999	0.01kW	9999	
itan	82	Motor excitation current	0 to 500A, 9999	0.01A	9999	
ons	83	Motor rated voltage	0 to 1000V	0.1V	400V	
or o	84	Rated motor frequency	10 to 120Hz	0.01Hz	60Hz	
Motor constants	90	Motor constant (R1)	0 to 50Ω , 9999	0.001Ω	9999	
	96	Auto tuning setting/status	0, 11, 21	1	0	
ion	117	PU communication station number	0 to 31 (0 to 247)	1	0	
cat	118	PU communication speed	48, 96, 192, 384	1	192	
iun	119	PU communication stop bit length	0, 1, 10, 11	1	1	
mm	120	PU communication parity check	0, 1, 2	1	2	
00 0	121	Number of PU communication retries	0 to 10, 9999	1	1	
ctol	122	PU communication check time interval	0, 0.1 to 999.8s, 9999	0.1s	0	
PU connector communication	123 124	PU communication waiting time setting PU communication CR/LF selection	0 to 150ms, 9999 0, 1, 2	1	9999	
PU	127	1 3 communication order sciention	0, 1, 2		ı	

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
_	© 125	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	
_	© 126	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	
	127	PID control automatic switchover frequency	0 to 400Hz, 9999	0.01Hz	9999	
uo	128	PID action selection	0, 20, 21, 40 to 43	1	0	
PID operation	129	PID proportional band	0.1 to 1000%, 9999	0.1%	100%	
odc	130	PID integral time	0.1 to 3600s, 9999	0.1s	1s	
Õ	131	PID upper limit	0 to 100%, 9999	0.1%	9999	
۵	132	PID lower limit	0 to 100%, 9999	0.1%	9999	
	133	PID action set point	0 to 100%, 9999	0.01%	9999	
	134	PID differential time	0.01 to 10.00s, 9999	0.01s	9999	
₽	145	PU display language selection	0 to 7	1	0	
_	146 *3	Built-in potentiometer switching	0, 1	1	1	
Current	150 151	Output current detection level Output current detection signal delay time	0 to 200% 0 to 10s	0.1% 0.1s	150% 0s	
Cul	152	Zero current detection level	0 to 200%	0.1%	5%	
	153	Zero current detection time	0 to 1s	0.01s	0.5s	
_	156	Stall prevention operation selection	0 to 31, 100, 101	1	0	
_	157	OL signal output timer	0 to 25s, 9999	0.1s	0s	
_	© 160	Extended function display selection	0, 9999	1	9999	
_	161	Frequency setting/key lock operation selection	0, 1, 10, 11	1	0	
c restart ons	162	Automatic restart after instantaneous power failure selection	0, 1, 10, 11	1	1	
Automatic restart functions	165	Stall prevention operation level for restart	0 to 200%	0.1%	150%	
detection	166	Output current detection signal retention time	0 to 10s, 9999	0.1s	0.1s	
Current d	167	Output current detection operation selection	0, 1	1	0	
	168 169	Parameter for manufacturer setting. Do	not set.			
lative r clear	170	Watt-hour meter clear	0, 10, 9999	1	9999	
Cumulative monitor clear	171	Operation hour meter clear	0, 9999	1	9999	
nction t	178	STF terminal function selection	0 to 5, 7, 8, 10, 12, 14, 16, 18, 24, 25, 60, 62, 65 to 67, 9999	1	60	
Input terminal function assignment	179	STR terminal function selection	0 to 5, 7, 8, 10, 12, 14, 16, 18, 24, 25, 61, 62, 65 to 67, 9999	1	61	
out 1	180	RL terminal function selection	0 to 5, 7, 8, 10, 12,	1	0	
ᆸ	181	RM terminal function selection	14, 16, 18, 24, 25,	1	1	
	182	RH terminal function selection	62, 65 to 67, 9999	1	2	

Operation panel Parameter unit

> rarameter List

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
Output terminal function assignment	190	RUN terminal function selection	0, 1, 3, 4, 7, 8, 11 to 16, 25, 26, 46, 47, 64, 70, 90, 91, 93, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 125, 126, 146, 147, 164, 170, 190, 191, 193, 195, 196, 198, 199, 9999	1	0	
Output terminal	192	A,B,C terminal function selection	0, 1, 3, 4, 7, 8, 11 to 16, 25, 26, 46, 47, 64, 70, 90, 91, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 125, 126, 146, 147, 164, 170, 190, 191, 195, 196, 198, 199, 9999	1	99	
	232	Multi-speed setting (speed 8)	0 to 400Hz, 9999	0.01Hz	9999	
БL	233	Multi-speed setting (speed 9)	0 to 400Hz, 9999	0.01Hz	9999	
Multi-speed setting	234	Multi-speed setting (speed 10)	0 to 400Hz, 9999	0.01Hz	9999	
p sc	235	Multi-speed setting (speed 11)	0 to 400Hz, 9999	0.01Hz	9999	
ee	236	Multi-speed setting (speed 12)	0 to 400Hz, 9999	0.01Hz	9999	
ds-	237	Multi-speed setting (speed 12)	0 to 400Hz, 9999	0.01Hz	9999	
Ħ			·			
Σ	238	Multi-speed setting (speed 14)	0 to 400Hz, 9999	0.01Hz	9999	
	239	Multi-speed setting (speed 15)	0 to 400Hz, 9999	0.01Hz	9999	
_	240	Soft-PWM operation selection	0, 1	1	1	
_	241	Analog input display unit switchover	0, 1	1	0	
_ [244	Cooling fan operation selection	0, 1	1	1	
ation	245	Rated slip	0 to 50%, 9999	0.01%	9999	
Slip compensation	246	Slip compensation time constant	0.01 to 10s	0.01s	0.5s	
corr	247	Constant-power range slip compensation selection	0, 9999	1	9999	
_	249	Earth (ground) fault detection at start	0, 1	1	0	
_	250	Stop selection	0 to 100s, 1000 to 1100s, 8888, 9999	0.1s	9999	
	251	Output phase loss protection selection	0, 1	1	1	
. <u>s</u>	255	Life alarm status display	(0 to 15)	1	0	
Life diagnosis	256	Inrush current limit circuit life display	(0 to 100%)	1%	100%	
iagi	257	Control circuit capacitor life display	(0 to 100%)	1%	100%	
e) G	258	Main circuit capacitor life display	(0 to 100%)	1%	100%	
Life	259	Main circuit capacitor life measuring	0, 1 (2, 3, 8, 9)	1	0	
_	260	PWM frequency automatic switchover	0, 1	1	0	
Power failure stop	261	Power failure stop selection	0, 1, 2	1	0	
_	267	Terminal 4 input selection	0, 1, 2	1	0	
_	268	Monitor decimal digits selection	0, 1, 9999	1	9999	
_	269	Parameter for manufacturer setting. Do				
_	295	Magnitude of frequency change setting	0, 0.01, 0.10, 1.00, 10.00	0.01	0	
vord	296	Password lock level	1 to 6, 101 to 106, 9999	1	9999	
sw	007	Password lock/unlock	1000 to 9999 (0 to 5,	1	9999	
Password function	297	1 assword lock/drillock	9999)	•	0000	

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
_	299	Rotation direction detection selection at restarting	0, 1, 9999	1	0	
ation	338	Communication operation command source	0, 1	1	0	
RS-485 communication	339	Communication speed command source	0, 1, 2	1	0	
8	340	Communication startup mode selection	0, 1, 10	1	0	
S-485	342	Communication EEPROM write selection	0, 1	1	0	
<u> </u>	343	Communication error count	_	1	0	
Second motor constant	450	Second applied motor	0, 1, 9999	1	9999	
Remote Output	495	Remote output selection	0, 1, 10, 11	1	0	
Rel	496	Remote output data 1	0 to 4095	1	0	
_	502	Stop mode selection at communication error	0, 1, 2	1	0	
nance	503	Maintenance timer	0 (1 to 9998)	1	0	
Maintenance	504	Maintenance timer alarm output set time	0 to 9998, 9999	1	9999	
tion	549	Protocol selection	0, 1	1	0	
Communication	551	PU mode operation command source selection	2, 4, 9999	1	9999	
ige r	555	Current average time	0.1 to 1s	0.1s	1s	
urrent average time monitor	556	Data output mask time	0 to 20s	0.1s	0s	
Current time n	557	Current average value monitor signal output reference current	0 to 500A	0.01A	Rated inverter current	
	561	PTC thermistor protection level	0.5 to 30 k Ω , 9999	0.01Ω	9999	
	563	Energization time carrying-over times	(0 to 65535)	1	0	
	564	Operating time carrying-over times	(0 to 65535)	1	0	
	571	Holding time at a start	0 to 10s, 9999	0.1s	9999	
PID operation	575	Output interruption detection time	0 to 3600s, 9999	0.1s	1s	
PID perati	576	Output interruption detection level	0 to 400Hz	0.01Hz	0Hz	
Ю	577	Output interruption cancel level	900 to 1100%	0.1%	1000%	
_	611	Acceleration time at a restart	0 to 3600s, 9999	0.1s	9999	
_	653	Speed smoothing control	0 to 200%	0.1%	0	
_	665	Regeneration avoidance frequency gain	0 to 200%	0.1%	100	
Protective functions	872	Input phase loss protection selection	0, 1	1	1	

Func- tion	Parameter	Name	Setting Range	Minimum Setting Increments	Initial Value	Customer Setting
ance	882	Regeneration avoidance operation selection	0, 1, 2	1	0	
Regeneration avoidance function	883	Regeneration avoidance operation level	300 to 800V	0.1V	780VDC	
neratio	885	Regeneration avoidance compensation frequency limit value	0 to 10Hz, 9999	0.01Hz	6Hz	
Rege	886	Regeneration avoidance voltage gain	0 to 200%	0.1%	100%	
Free parameter	888	Free parameter 1	0 to 9999	1	9999	
Fı	889	Free parameter 2	0 to 9999	1	9999	
_	891	Cumulative power monitor digit shifted times	0 to 4, 9999	1	9999	
	C0 (900) *4	FM terminal calibration	_	_	_	
	C2 (902) *4	Terminal 2 frequency setting bias frequency	0 to 400Hz	0.01Hz	0Hz	
	C3 (902) *4	Terminal 2 frequency setting bias	0 to 300%	0.1%	0%	
	125 (903) *4	Terminal 2 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	
တ	C4 (903) *4	Terminal 2 frequency setting gain	0 to 300%	0.1%	100%	
amete	C5 (904) *4	Terminal 4 frequency setting bias frequency	0 to 400Hz	0.01Hz	0Hz	
on par	C6 (904) *4	Terminal 4 frequency setting bias	0 to 300%	0.1%	20%	
Calibration parameters	126 (905) *4	Terminal 4 frequency setting gain frequency	0 to 400Hz	0.01Hz	60Hz	
O	C7 (905) *4	Terminal 4 frequency setting gain	0 to 300%	0.1%	100%	
	C22 (922) *3*4	Frequency setting voltage bias frequency (built-in potentiometer)	0 to 400Hz	0.01Hz	0	
	C23 (922) *3*4	Frequency setting voltage bias (built-in potentiometer)	0 to 300%	0.1%	0	
	C24 (923) *3*4	Frequency setting voltage gain frequency (built-in potentiometer)	0 to 400Hz	0.01Hz	60Hz	
	C25 (923) *3 *4	Frequency setting voltage gain (built-in potentiometer)	0 to 300%	0.1%	100%	
	990	PU buzzer control	0, 1	1	1	
PU	991	PU contrast adjustment	0 to 63	1	58	
ers ge list	Pr.CL	Parameter clear	0, 1	1	0	
Clear parameters Initial value change list	ALLC	All parameter clear	0, 1	1	0	
ear pa I value	Er.CL	Faults history clear	0, 1	1	0	
	Pr.CH ffer according to	Initial value change list	_	_	_	

^{*1} Differ according to capacities.

6%: 0.75K or less

4%: 1.5K to 3.7K

3%: 5.5K, 7.5K

*2 Differ according to capacities.

5s: 3.7K or less

10s: 5.5K, 7.

^{*3} Set this parameter when calibrating the operation panel built-in potentiometer for the FR-E500 series operation panel (PA02) connected with cable.

^{*4} The parameter number in parentheses is the one for use with the operation panel (PA02) for the FR-E500 series or parameter unit (FR-PU04/FR-PU07).

Protective Functions

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

	Function Name	Description	Display				
e g	Operation panel lock	Appears when operation was tried during operation panel lock.	HOLd				
Error message	Password locked	Appears when a password restricted parameter is read/written.	F009				
	Parameter write error	Appears when an error occurred during parameter writing.	Er 1 to Er 4				
ш	Inverter reset	Appears when the RES signal is on.					
	Stall prevention (overcurrent)	Appears during overcurrent stall prevention.					
	Stall prevention (overvoltage)	Appears during overvoltage stall prevention. Appears while the regeneration avoidance function is activated.					
sf	Regenerative brake prealarm *7	Appears if the regenerative brake duty reaches or exceeds 85% of the <i>Pr. 70 Special regenerative brake duty</i> value. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs.					
ning *3	Electronic thermal relay function prealarm	Appears when the electronic thermal O/L relay has reached 85% of the specified value.	ГН				
Warnings *3	PU stop	Appears when (STOP) on the operation panel was pressed during external operation.	ρς				
	Maintenance signal output *7	Appears when the cumulative energization time has exceeded the maintenance output timer set value.	nr				
	Undervoltage	Appears when the main circuit power became low voltage.	Uu				
Alarms *4	Fan fault	Appears when the cooling fan remains stopped when operation is required or when the speed has decreased.	Fn				
	Overcurrent trip during acceleration	Appears when an overcurrent occurred during acceleration.	E.DC 1				
	Overcurrent trip during constant speed	Appears when an overcurrent occurred during constant speed operation.	5.002				
	Overcurrent trip during deceleration or stop	Appears when an overcurrent occurred during deceleration and at a stop.	E.D.C. 3				
	Regenerative overvoltage trip during acceleration	Appears when an overvoltage occurred during acceleration.					
	Regenerative overvoltage trip during constant speed	Appears when an overvoltage occurred during constant speed operation.					
	Regenerative overvoltage trip during deceleration or stop	Appears when an overvoltage occurred during deceleration and at a stop.					
	Inverter overload trip (electronic thermal relay function)	Appears when the electronic thermal relay function for inverter element protection was activated.					
	Motor overload trip (electronic thermal relay function) *1	Appears when the electronic thermal relay function for motor protection was activated.					
	Fin overheat	Appears when the heatsink overheated.	8.51 n 8.1 L.F				
	Input phase loss	Appears if one of the three phases on the inverter input side opened.					
	Stall prevention	Appears when the output frequency drops to 1Hz as a result of deceleration due to the excess motor load.					
Fault *5	Brake transistor alarm detection	This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. In this case, the inverter must be powered off immediately.	Е. ЬЕ				
	Output side earth (ground) fault overcurrent at start *7	Appears when an earth (ground) fault occurred on the inverter's output side. (detects only at a start)	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 OH signal was activated.	E.DHC				
	PTC thermistor operation *7	Appears when resistance of PTC thermistor connected between terminal 2 and terminal 10 is more than the value set in <i>Pr. 561 PTC thermistor protection level</i> .	E.P.C.C				
	Parameter storage device fault	Appears when operation of the element where parameters stored became abnormal. (control board)	E. PE				
	PU disconnection	Appears when a communication error between the PU and inverter occurred, the communication interval exceeded the permissible time during the RS-485 communication with the PU connector, 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.	8,-81				
	CPU fault	Appears during the CPU and peripheral circuit errors occurred.	E.C.P.U				
	Output current detection value exceeded *7	Appears when output current exceeded the output current detection level set by the parameter.	063.3				
	Inrush current limit circuit fault	Appears when the resistor of the inrush current limit circuit overheated.	EJ 0H				
	Analog input fault Appears when voltage is input (7.3V or more for 5s or more) with the terminal 4 set to current input.						
	<u> </u>	thermal integrated data of the electronic thermal relay function	E.RI E				

- *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 fault occur. The inverter output is not shut off.
 *4 Alarms 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 inverter trip and output the fault signals.
- *6 The external thermal operates only when the OH signal is set in *Pr. 178* to *Pr. 182 (input terminal function selection).* *7 This protective function does not function in the initial status.

Option list

By fitting the following options to the inverter, the inverter is provided with more functions.

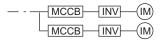
	Name	Туре	Applications, Specifications, etc.	Applicable Inverter	
	Parameter unit (8 languages)	FR-PU07 FR-PU04	Interactive parameter unit with LCD display	Shared among all models	
	Enclosure surface operation panel	FR-PA07	etc. from the enclosure surface		
	Parameter unit connection cable	FR-CB20□	Cable for connection of operation panel or parameter unit ☐ indicates a cable length. (1m, 3m, 5m)	all models	
	AC reactor	FR-HAL	For harmonic current reduction and inverter input power factor improvement (total power factor approx. 88%)	According to	
	DC reactor	FR-HEL	For harmonic current reduction and inverter input power factor improvement (total power factor approx. 93%)	capacities	
	Radio noise filter	FR-BIF(H)	For radio noise reduction (connect to the input side)	Shared among	
	Line noise filter	FR- BSF01 FR- BLF	For line noise reduction	all models	
	High-duty brake resistor	FR-ABR	For increasing the regenerative braking capability (permissible duty 10%/6%ED)		
shared	Brake unit Resistor unit Discharging resistor	FR-BU2 FR-BR GZG, GRZG type	For increasing the braking capability of the inverter (for high-inertia load or negative load) Brake unit, electrical-discharge resistor and resistor unit are used in combination	For the 0.4K or more	
Stand-alone shared	Power regeneration common converter Stand-alone reactor dedicated for the FR-CV	FR-CV FR-CVL	Unit which can return motor-generated braking energy back to the power supply in common converter system	According to	
Sta	High power factor converter FR-HC		The high power factor converter switches the converter section on/off to reshape an input current waveform into a sine wave, greatly suppressing harmonics. (Used in combination with the standard accessory.)	- capacities	
	Surge voltage suppression filter	FR-ASF FR-BMF	Filter for suppressing surge voltage on motor	400V: According to capacities 400V: For the	
	DIN rail attachment FR-UDA01		Attachment for installation on DIN rail	5.5K or more Compatible with the 3.7K or less	
	Manual controller	FR-AX	For independent operation. With frequency meter, frequency potentiometer and start switch.	the 3.7K of less	
	DC tach. follower	FR-AL	For synchronous operation (1.5VA) by external signal (0 to 5V, 0 to 10V DC)*	-	
oller/	Three speed selector	FR-AT	For three speed switching, among high, middle and low speed operation (1.5VA)*	-	
contro	Motorized speed setter	FR-FK	For remote operation. Allows operation to be controlled from several places (5VA)*	1	
重量	Ratio setter	FR-FH	For ratio operation. The ratios of five inverters can be set (3VA)*	1	
2 a	Speed detector	FR-FP	For tracking operation by a pilot generator (PG) signal (3VA)*	1	
eries manual controller/ speed controller	Master controller	FR-FG	Master controller (5VA) for parallel operation of multiple (maximum 35) inverters.*	Observation	
FR se	Soft starter	FR-FC	For soft start and stop. Enables acceleration/deceleration in parallel operation (3VA)*	Shared among all models	
	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)*]	
	Pilot generator QVAH-10		For tracking operation. 70V/35VAC 500Hz (at 2500r/min)]	
	Deviation sensor YVGC-500W-N		For continuous speed control operation (mechanical deviation detection) Output 90VAC/90°C		
S	Frequency setting potentiometer WA2W 1kΩ		For frequency setting. Wire-wound 2W 1k Ω type B characteristic]	
Others	Analog frequency meter 64mm × 60mm) YM206NRI 1mA		Dedicated frequency meter (graduated to 120Hz). Moving-coil type DC ammeter		
J	Calibration resistor	RV24YN 10kΩ	For frequency meter calibration. Carbon film type B characteristic		
	FR Configurator (VFD setup software)	FR-SW3-SETUP- WE	Supports an inverter startup to maintenance.	Shared among all models (Available soon	

^{*} 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.

Peripheral devices/cable size list

	Inverter type	Motor Output	Moulded Case Circui or Earth Leakage Curr Reactor co	rent Breaker (ELÉ)*4	Mag Contactor Reactor c	HIV Cables, etc. (mm²)		Reactor		
		(kŴ)	Without	With	Without	With	R/L1, S/L2, T/L3	U, V, W	FR-HAL	FR-HEL
	FR-D740-0.4K	0.4	30AF 5A	30AF 5A	S-N10	S-N10	2	2	H0.4K	H0.4K
400V	FR-D740-0.75K	0.75	30AF 5A	30AF 5A	S-N10	S-N10	2	2	H0.75K	H0.75K
9. 4	FR-D740-1.5K	1.5	30AF 10A	30AF 10A	S-N10	S-N10	2	2	H1.5K	H1.5K
phas	FR-D740-2.2K	2.2	30AF 15A	30AF 10A	S-N10	S-N10	2	2	H2.2K	H2.2K
g-b	FR-D740-3.7K	3.7	30AF 20A	30AF 15A	S-N10	S-N10	2	2	H3.7K	H3.7K
Thre	FR-D740-5.5K	5.5	30AF 30A	30AF 20A	S-N20	S-N11, S-N12	3.5	2	H5.5K	H5.5K
ľ	FR-D740-7.5K	7.5	30AF 30A	30AF 30A	S-N20	S-N20	3.5	3.5	H7.5K	H7.5K

^{*1} Select an MCCB according to the inverter power supply capacity.
Install one MCCB per inverter.



- *2 When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter type and cable and reactor according to the motor output.
- *3 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.
- *4 For installations in the United States or Canada, use the class T type fuse certified by the UL and cUL.
- *5 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
 - When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

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∆n≥10×(Ig1+Ign+Igi+Ig2+Igm)

Standard breaker

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

lg1, lg2: Leakage currents in wire path during commercial power supply

operation

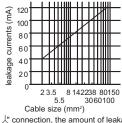
Ign : Leakage current of inverter input side noise filter

Igm : Leakage current of motor during commercial power supply operation

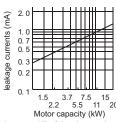
: Leakage current of inverter unit

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)

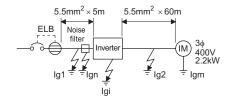


Example of leakage current of threephase induction motor during the commercial power supply operation (Totally-enclosed fan-cooled type motor 400V60Hz)



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

Example



(Note) 1 Install the earth leakage breaker (ELB) on the input side of the inverter.

2 In the \(\int \) 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 above figure)

	Breaker Designed for Harmonic and Surge Suppression	Standard Breaker				
Leakage current Ig1 (mA)	$\frac{1}{3} \times 66 \times \frac{5m}{1000m} = 0.11$					
Leakage current Ign (mA)	0 (without noise filter)					
Leakage current Igi (mA)	1					
Leakage current	1 × 66 × 60r	n —— = 1.32				
Ig2 (mA)	3 × 66 × 1000					
Motor leakage current lgm (mA)	0.3	6				
Total leakage current (mA)	2.79	6.15				
Rated sensitivity current (mA) (≥ Ig × 10)	30	100				

Precautions for Operation/Selection

Precautions for use of the inverter

⚠ Safety Precautions

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

Operation

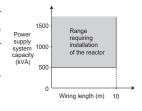
- A magnetic contactor (MC) provided on the input side should not be used to make frequent starts and stops. It could cause the inverter to fail.
- However, at this time, the motor cannot be brought to a sudden stop. Hence, provide a mechanical stopping/holding mechanism for the machine/equipment which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

Wiring

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

Power supply

 When the inverter is connected under a large-capacity power transformer (500kVA or more transformer) or when a power capacitor is to be switched over, an excessive peak current may flow in the power input circuit, damaging the inverter.



To prevent this, always install an optional AC reactor (FR-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 panel dimensions so that the ambient temperature of the inverter is within the permissble value. (refer to page 6 for the specified value)
- Do not install the inverter on wood or other combustible material as it will be hot partly.
- 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 error).
- Do not set Pr. 70 Special regenerative brake duty except for using the optional brake resistor. This function is used to protect the brake resistor from overheating. Do not set the value exceeding permissible duty of the brake resistor.

Precautions for selection

Inverter capacity selection

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

Starting torque of the motor

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

Acceleration/deceleration times

- The acceleration/deceleration time of the motor depends on the motor-generated torque, load torque and moment of inertia of the load (J).
- When the 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 general-purpose magnetic flux vector control or increase the inverter and motor capacities. To decrease the deceleration time, it is necessary to add optional brake resistor FR-ABR (for the 0.4K or more), the brake unit (FR-BU2), power regeneration common converter (FR-CV), or a similar device to absorb braking energy.

Power transfer mechanism (reduction gear, belt, chain, etc.)

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

Instructions for overload operation

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

Installation and selection of moulded case circuit breaker

Install a moulded case circuit breaker (MCCB) on the power receiving side to protect the wiring of the inverter input side. For MCCB selection, refer to page 23 since it depends on the inverter power supply side power factor (which changes depending on the power supply voltage, output frequency and load). Especially for a completely electromagnetic MCCB, one of a slightly large capacity must be selected since its operation characteristic varies with harmonic currents. (Check it in the data of the corresponding breaker.) As an earth leakage current breaker, use the Mitsubishi earth leakage current breaker designed for harmonics and surge suppression. (Refer to page 24)

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

Handling of the inverter input side magnetic contactor

- For operation via external terminal (terminal STF or STR used), provide an input side MC to prevent an accident caused by a natural restart at power recovery after a power failure, such as an instantaneous power failure, and to ensure safety for maintenance work. Do not use this magnetic contactor to make frequent starts and stops. (The switching life of the inverter input circuit is about 1,000,000 times.) For parameter unit operation, an automatic restart after power failure is not made and the MC cannot be used to make a start. Note that the primary side MC may be used to make a stop but the regenerative brake specific to the inverter does not operate and the motor is coasted to a stop.
- Installation of a magnetic contactor on the primary side is recommended. Since when cycle operation or heavy-duty operation is performed with an optional brake resistor connected, overheat and burnout of the electrical-discharge resistor can be prevented if a regenerative brake transistor is damaged due to insufficient heat capacity of the electricaldischarge resistor and excess regenerative brake duty. In this case, shut-off the magnetic contactor when fault occurs and inverter trips.

Handling of the inverter output side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned on while the inverter is operating, overcurrent protection of the inverter and such will activate. When an MC is provided for switching to the commercial power supply, for example, switch it on/off after the inverter and motor have stopped.

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 28) 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 relay protector incorporated motor.

Measuring instrument on the output side

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

Disuse of power factor improving capacitor (power capacitor)

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

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 23)

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

(The overall wiring length for connection of multiple motors should be within the value in the table below.)

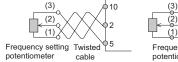
Pr. 72 Setting (carrier frequency)		0.4K	0.75K	1.5K	2.2K	3.7K or more	
1 or less	400V	200m	200m	300m	500m	500m	
2 to 15	400V	30m	100m	200m	300m	500m	

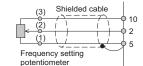
When using the automatic restart after instantaneous power failure function with wiring length exceeding than 100m, select "without frequency search".

Use the recommended connection cable 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)

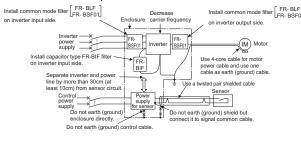
When the inverter is run in the low acoustic noise mode, more leakage currents occur than in the non-low acoustic noise mode due to high-speed switching operation. Be sure to earth (ground) the inverter and motor before use. In addition, always use the earth (ground) terminal of the inverter to earth (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, radio noise filter FR-BIF produces an effect.
- As measures against sensor malfunction, line noise filter FR-BSF01, FR-BLF produces an effect.
- 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 static capacitances, carrier frequency, etc., low acoustic noise operation at the increased carrier frequency of the inverter will increase the leakage current. Therefore, take the following measures. Select the earth leakage current breaker according to its rated sensitivity current, independently of the carrier frequency setting. (Refer to page 24)

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 line 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	Power supply Leakage breaker NV2 Leakage breaker Leakage breaker Leakage breaker Leakage breaker

Line leakage current

T	In flace and Management					
Type	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 model, the external thermal relay is likely to					
	operate unnecessarily because the ratio of the leakage					
	current to the rated motor current increases.					
Influence and	Countermeasures					
measures	• Use Pr.9 Electronic thermal O/L relay.					
	If the carrier frequency setting is high, decrease the Pr.					
	72 PWM frequency selection setting.					
	Note that motor noise increases. 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.					
	MCCB MC Thermal relay Motor					
Undesirable	supply Inverter IM					
current path	Line-to-line static capacitances					
	Line-to-line leakage currents path					

Harmonic suppression guideline

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

The three-phase 200V input specifications 3.7kW or less are previously covered by "Harmonic suppression guideline for household appliances and general-purpose products" and other models are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". However, the transistorized inverter has been excluded from the target products covered by "Harmonic suppression guideline for household appliances and general-purpose products" in January 2004 and "Harmonic suppression guideline for household appliances and general-purpose products" was repealed on September 6, 2004.

All capacity and all models of general-purpose inverter used by specific consumers are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage".

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

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

Users who use models other than the target models are not covered by the guideline. However, we ask to connect an AC reactor or a DC reactor as before to the users who are not covered by the guideline. For compliance to the harmonic suppression guideline for consumers who receive high voltage or special high voltage

Input Power Supply	Target Capacity	Countermeasures
Three-phase 400V	All capacities	Make a judgment based on "Harmonic suppression guideline for consumers who receive high voltage or special high voltage" issued by the Japanese Ministry of Economy, Trade and Industry (formerly Ministry of International Trade and Industry) in September 1994 and take measures if necessary. For calculation method of power supply harmonics, refer to materials below. Reference materials • "Harmonic suppression measures of the 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 Dec. 2003): Japan Electrical Manufacturer's Association Japan Electrical Manufacturer's Association

Calculation of outgoing harmonic current

Outgoing harmonic current = fundamental wave current (value converted from received power voltage) \times operation ratio \times harmonic content

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

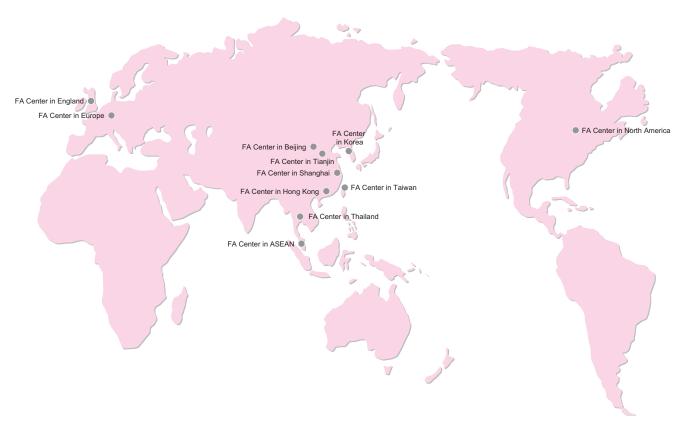
Table 1: Harmonic Contents (Values at the fundamental current of 100%)

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 for Inverter Drive

_ >	Rated Current [A]	e Current 6kV (mA)	/ (KVA)	Ou		onic Current Converted from 6.6kV (mA) r, 100% operation ratio)					
Applied Motor kW	400V	Fundamental Wave Current Converted from 6.6kV (mA)	Rated Capacity (kVA)	5th	7th	11th	13th	17th	19th	23rd	25th
0.4	0.81	49	0.57	31.85	20.09	4.165	3.773	2.107	1.519	1.274	0.882
0.75	1.37	83	0.97	53.95	34.03	7.055	6.391	3.569	2.573	2.158	1.494
1.5	2.75	167	1.95	108.6	68.47	14.20	12.86	7.181	5.177	4.342	3.006
2.2	3.96	240	2.81	156.0	98.40	20.40	18.48	10.32	7.440	6.240	4.320
3.7	6.50	394	4.61	257.1	161.5	33.49	30.34	16.94	12.21	10.24	7.092
5.5	9.55	579	6.77	376.1	237.4	49.22	44.58	24.90	17.95	15.05	10.42
7.5	12.8	776	9.07	504.4	318.2	65.96	59.75	33.37	24.06	20.18	13.97

International FA Center



●FA Center in North America

Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway, Vernon Hills, IL60061 TEL. +1-847-478-2100 FAX. +1-847-478-0327

●FA Center in Taiwan

Setsuyo Enterprise Co., Ltd. 6F No.105, Wu Kung 3rd RD, Wu-Ku Hsiang Taipei Hsien, •FA Center in Hong Kong Taiwan(R.O.C.)

TEL. +886-2-2299-2499 FAX. +886-2-2299-2509

●FA Center in Korea

MITSUBISHI ELECTRIC AUTOMATION KOREA Co., Ltd. (Service)

B1F,2F, 1480-6, Gayang-Dong, Gangseo-Gu, Seoul, 157-200, **KORFA**

TEL. +82-2-3660-9607 FAX. +82-2-3664-0475

FA Center in Beijing

Mitsubishi Electric Automation (SHANGHAI) Ltd. Beijing Office Unit 908, 9F, Office Tower 1, Henderson Centre, 18 Jianguomennei Avenue, Dongcheng District, Beijing, China 100005

TEL. +86-10-6518-8830 FAX. +86-10-6518-8030

●FA Center in Tianjin

Mitsubishi Electric Automation (SHANGHAI) Ltd. Tianjin Office B-2-801-802, Youyi Building, 50 Youyi Road, Hexi District, Tianjin, China 300061

TEL +86-22-2813-1015 FAX. +86-22-2813-1017

●FA Center in Shanghai

Mitsubishi Electric Automation (SHANGHAI) Ltd. 4/F Zhi Fu Plazz, No.80 Xin Chang Road, Shanghai, China 200003

TEL. +86-21-6121-2460 FAX. +86-21-6121-2424

●FA Center in ASEAN

Mitsubishi Electric Asia Pte. Ltd. ASEAN Factory Automation Centre

307 Alexandra Road #05-01/02, Mitsubishi Electric Building, Singapore 159943

TEL. +65-6470-2480 FAX. +65-6476-7439

Mitsubishi Electric Automation (HONGKONG) Ltd. 10th Floor, Manulife Tower, 169 Electric Road, North Point, Hong Kong

TEL.+852-2887-8870 FAX. +852-2887-7984

●FA Center in Europe

Mitsubishi Electric Europe B.V. - German Branch Factory Automation European Business Group Gothaer Strasse 8, D-40880 Ratingen, Germany TEL. +49-2102-486-0 FAX. +49-2102-486-1120

●FA Center in England

Mitsubishi Electric Europe B.V. UK Branch Automation Systems Division

Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, UK. TEL. +44-1707-276100 FAX. +44-1707-278695

●FA Center in Thailand

Mitsubishi Electric Automation(Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111, Soi Serithai 54, T.Kannayao, A.Kannayao, Bangkok 10230 TEL. +66-2-906-3238 FAX. +66-2-906-3239

⚠ Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

