MITSUBISHI ELECTRIC

700 series

INVERTER
FR-F700
INSTALLATION GUIDELINE
FR-F740-00023 to 12120-EC
FR-F746-00023 to 01160-EC

Thank you for choosing this Mitsubishi Inverter.
Please read through this Installation guideline and the enclosed CD ROM to operate this inverter correctly.
Do not use this product until you have a full knowledge of the equipment, the safety information and the instructions.
Please forward this Installation guideline and the CD ROM to the end user.

CONTENTS

Print Date	Art. no.	Revision	
August 2004	158537-A	First edition	
January 2006	158537-B	General	Extension of the capacity classes by the inverters FR-F740-02600 to 12120 Addition of the inverters FR-F746-00023 to 01160 with IP54 protection rating New parameter 299
02/2013 akl	158537-C	General	Additions: • Usage of a residual current device • Voltage/current input switch • Option connector 2 • Instructions for wiring of the main circuit of the FR-F740-05470 or more • Failsafe of the system which uses the inverter
		Parameter list	New setting values: Pr. 29, Pr. 30 , Pr. 52, Pr. 54, Pr. 59, Pr. 128, Pr. 158, Pr. 167, Pr. 178 to Pr. 189, Pr. 190 to Pr. 196, Pr. 261, Pr. 331, Pr. 332, Pr. 495, Pr. 549, Pr. 573 New parameters: Pr. 147, Pr. 296, Pr. 297, Pr. 390, Pr. 414, Pr. 415, Pr. 498, Pr. 502, Pr. 505 to Pr. 515, Pr. 522, Pr. 539, Pr. 553, Pr. 554, Pr. 561, Pr. 653, Pr. 654, Pr. 665, Pr. 726 to Pr. 729, Pr. 753 to Pr. 769, Pr. 774 to Pr. 779, Pr. 799, Pr. 826 to Pr. 865, Pr. 870, Pr. 986, Pr. 997, Pr. 999, C42 (Pr. 934), C43 (Pr. 934), C44 (Pr. 935), C45 (Pr. 935), PR.CH, AUTO Partial modification: • Pr. 153 setting range „0 to 10 s"
		Trouble-shooting	• Protective functions (E---, LOCD, E.OP2, E.2, E.5, E.PID, E.PCH, E.LCI) • Resetting the inverter
		Appendix	Additions: • Breaker selection when using the inverter as UL or cUL listed product • Electronic thermal relay function operation characteristic Partial modification: • Appendix 1 Instructions for compliance with the EU Directives

This section is specifically about safety matters

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

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

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

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

Electric Shock Prevention

⚠**WARNING**
• While power is on or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.
• Do not run the inverter with the front cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
• Even if power is off, do not remove the front cover except for wiring or periodic inspection.You may access the charged inverter circuits and get an electric shock.
• Before starting wiring or inspection, check to make sure that the operation panel indicator is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.
• This inverter must be earthed. Earthing must conform to the requirements of national and local safety regulations and electrical codes. (JIS, NEC section 250, IEC 536 class 1 and other applicable standards)
• Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
• Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.
• If your application requires by installation standards an RCD (residual current device) as up stream protection please select according to DIN VDE 0100-530 as following: Single phase inverter type A or B   Three phase inverter only type B   (Additional instructions on the use of a residual current device are contained on *page 25*.)
• Perform setting dial and key operations with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
• Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
• Do not replace the cooling fan while power is on. It is dangerous to replace the cooling fan while power is on.
• Do not touch the printed circuit board or handle the cables with wet hands. You may get an electric shock.

Fire Prevention

⚠**CAUTION**
• Mount the inverter to incombustible material. Install the inverter on a nonflammable wall without holes (so that nobody can touch the inverter heatsink on the rear side, etc.). Mounting it to or near combustible material can cause a fire.
• If the inverter has become faulty, switch off the inverter power. A continuous flow of large current could cause a fire.
• Do not connect a resistor directly to the DC terminals P/+, N/–. This could cause a fire and destroy the inverter. The surface temperature of braking resistors can far exceed 100°C for brief periods. Make sure that there is adequate protection against accidental contact and a safe distance is maintained to other units and system parts.

Injury Prevention

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

Additional Instructions

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

Transportation and installation

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

Operating condition	FR-F740	FR-F746
Ambient temperature	−10°C to +40/+50°C (non-freezing)	−10°C to +30/+40°C (non-freezing)
	The maximum temperature depends on the setting of the Pr. 570.	
Ambient humidity	90% RH or less (non-condensing)	
Storage temperature	−20°C to +65°C [1]	
Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)	
Altitude	Maximum 1000m above sea level for standard operation. After that derate by 3% for every extra 500m up to 2500m (91%)	
Vibration	5.9m/s^2 [2] or less at 10 to 55 Hz (directions of X, Y, Z axes)	

[1] Temperature applicable for a short time, e.g. in transit.
[2] 2.9m/s² or less for the 04320 or more.

Wiring

⚠**CAUTION**
- Do not install assemblies or components (e. g. power factor correction capacitors) on the inverter output side, which are not approved from Mitsubishi.   - The direction of rotation of the motor corresponds to the direction of rotation commands (STF/STR) only if the phase sequence (U, V, W) is maintained.

Test operation and adjustment

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

Operation

⚠**WARNING**
- When you have chosen the retry function, stay away from the equipment as it will restart suddenly after an alarm stop.   - Since pressing the ⬡ key may not stop output depending on the function setting status, provide a circuit and switch separately to make an emergency stop (power off, mechanical brake operation for emergency stop, etc).   - Make sure that the start signal is off before resetting the inverter alarm. A failure to do so may restart the motor suddenly.   - The inverter can be started and stopped via the serial port communications link or the field bus. However, please note that depending on the settings of the communications parameters it may not be possible to stop the system via these connections if there is an error in the communications system or the data line. In configurations like this it is thus essential to install additional safety hardware that makes it possible to stop the system in an emergency (e.g. controller inhibit via control signal, external motor contactor etc). Clear and unambiguous warnings about this must be posted on site for the operating and service staff.   - The load used should be a three-phase induction motor only. Connection of any other electrical equipment to the inverter output may damage the inverter as well as the equipment.   - Do not modify the equipment.   - Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the inverter.

⚠CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter. Otherwise, the life of the inverter decreases.
- Use a noise filter to reduce the effect of electromagnetic interference and follow the accepted EMC procedures for proper installation of frequency inverters. Otherwise nearby electronic equipment may be affected.
- Take appropriate measures regarding harmonics. Otherwise this can endanger compensation systems or overload generators.
- Use a motor designed for inverter operation. (The stress for motor windings is bigger than in line power supply).
- When parameter clear or all clear is performed, set again the required parameters before starting operations. Each parameter returns to the initial value.
- The inverter can be easily set for high-speed operation. Before changing its setting, fully examine the performances of the motor and machine.
- The DC braking function of the frequency inverter is not designed to continuously hold a load. Use an electro-mechanical holding brake on the motor for this purpose.
- Before running an inverter which had been stored for a long period, always perform inspection and test operation.
- For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

Emergency stop

⚠CAUTION

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.
- When the breaker on the inverter 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.
- When the protective function is activated (i. e. the frequency inverter switches off with an error message), take the corresponding corrective action as described in the inverter manual, then reset the inverter, and resume operation.

Maintenance, inspection and parts replacement

⚠CAUTION

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

Disposing of the inverter

⚠CAUTION

- Treat as industrial waste.

General instructions

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

1 INSTALLATION AND INSTRUCTIONS

1.1 Inverter Type

FR - F740 - 00126 - EC

Symbol	Voltage Class
F740	Three-phase 400V class

Symbol	Type number
00023 to 12120	Displays the rated current

FR - F746 - 00126 - EC

Symbol	Voltage Class
F746	Three-phase 400V class/ waterproof structure IP54 (standard IEC 60529: 2001) specification

Symbol	Type number
00023 to 01160	Displays the rated current

Rating plate example

Production year-month

Inverter type
Input rating
Output rating
Serial number

MITSUBISHI
INVERTER DATE：XXXX-XX
MODEL FR-F740-00126-EC
INPUT ： XXXXX
OUTPUT ： XXXXX
LD (50℃) XXA
SLD (40℃) XXA
SERIAL ：
PASSED

	Overload current rating	Ambient temperature
LD	120% 60s, 150% 3s	50°C
SLD	110% 60s, 120% 3s	40°C

Capacity plate example

FR-F740-00126-EC ×××××

Inverter type   Serial number
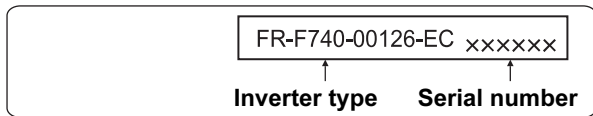
1.2 Installation of the inverter

Installation on the panel

00023 to 00620

00770 to 12120
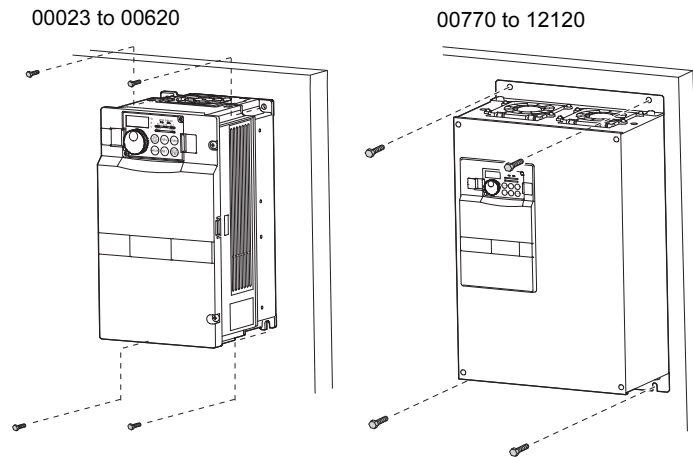
Fix six positions for the FR-F740-04320 to 08660 and fix eight positions for the FR-F740-09620 to 12120.

═══ CAUTION ═══
- When encasing multiple inverters, install them in parallel and leave clearance as a cooling measure.
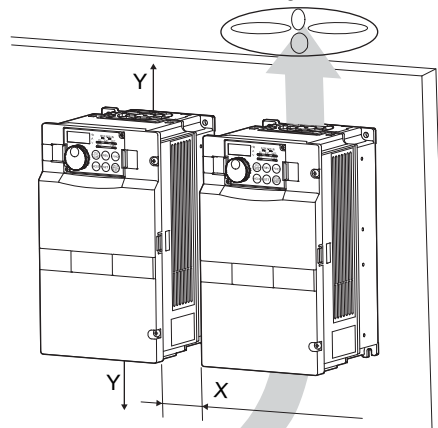
Inverter Capacity	X [cm]	Y [cm]
≤ 00083	≥ 1	≥ 10
00126–01160	≥ 5	≥ 10
≥ 01800	≥ 10	≥ 20

Notes
- It is not necessary to leave spaces on both sides of the inverter FR-F746.
- Some inverter models may be installed outside an enclosure. See Appendix A.2 for details.

1.3 General Precaution

The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/− with a meter etc., to avoid a hazard of electrical shock.

1.4 Environment

Before installation, check that the environment meets following specifications:

Ambient temperature [2]	−10°C to +50°C (+40°C for FR-F746) (non-freezing) for selected overload capability 150% (Pr. 570 = 0) −10°C to +40°C (+30°C for FR-F746) (non-freezing) for selected overload capability 120% (Pr. 570 = 1)
Ambient humidity	90% RH or less (non-condensing)
Storage temperature	−20°C to +65°C
Atmosphere	Indoors (No corrosive and flammable gases, oil mist, dust and dirt)
Altitude	Maximum 1000 m above sea level
Vibration	5.9m/s² [1] or less at 10 to 55 Hz (directions of X, Y, Z axes)

[1] 2.9m/s² or less for the 04320 or more.

[2] Temperature measured at a measurement position in an enclosure.

——— **CAUTION** ———
- Install the inverter on a strong surface securely and vertically with bolts.
- Leave enough clearances and take cooling measures.
- Avoid places where the inverter is subjected to direct sunlight, high temperature and high humidity.
- Install the inverter on a non-combustible surface.

2 OUTLINE DRAWING

(Unit: mm)
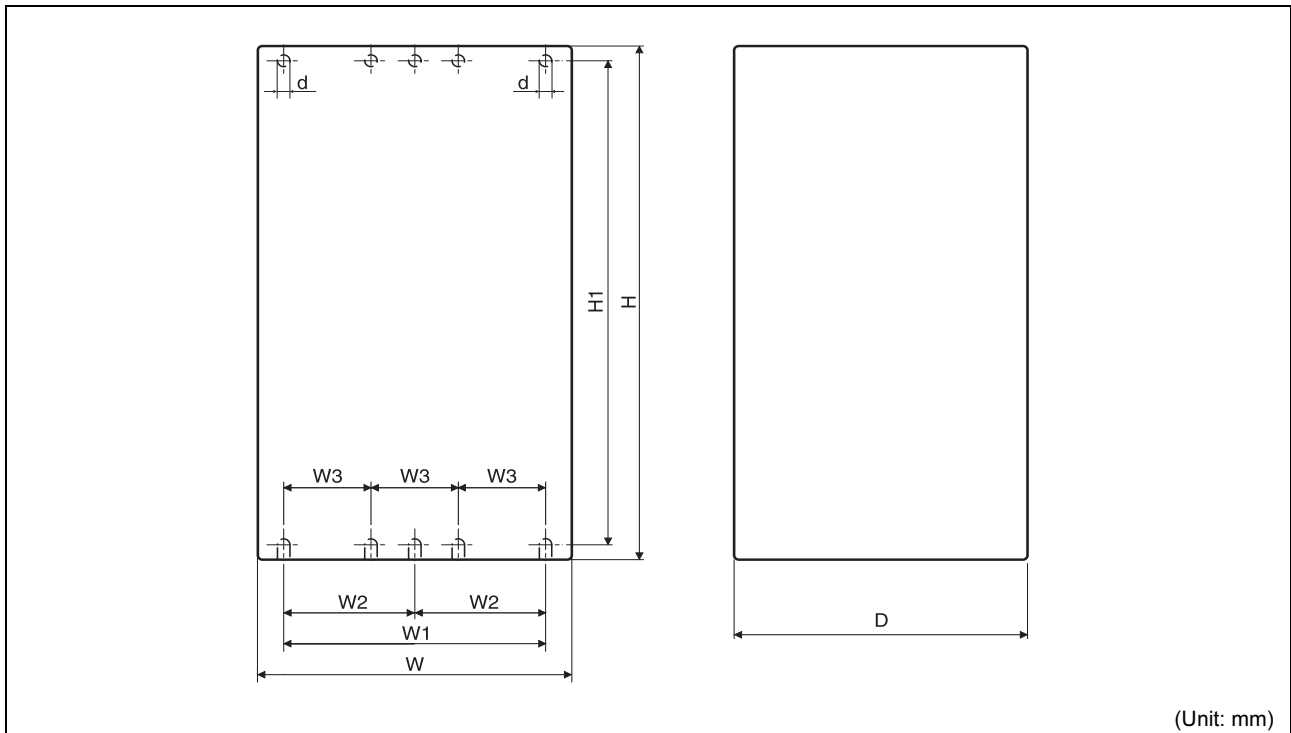
	Inverter Type	W	W1	W2	W3	H	H1	D	d
FR-F740	FR-F740-00023–00126-EC	150	125	—	—	260	245	140	6
	FR-F740-00170/00250-EC	220	195	—	—	260	245	170	6
	FR-F740-00310/00380-EC	220	195	—	—	300	285	190	6
	FR-F740-00470/00620-EC	250	230	—	—	400	380	190	10
	FR-F740-00770-EC	325	270	—	—	550	530	195	10
	FR-F740-00930/01160-EC	435	380	—	—	550	525	250	12
	FR-F740-01800-EC	465	380	—	—	550	525	250	12
	FR-F740-02160/02600-EC	465	400	—	—	620	595	300	12
	FR-F740-03250/03610-EC	465	400	—	—	740	715	360	12
	FR-F740-04320/04810-EC	498	400	200	—	1010	985	380	12
	FR-F740-05470/06830-EC	680	600	300	—	1010	985	380	12
	FR-F740-07700/08660-EC	790	630	315	—	1330	1300	440	12
	FR-F740-09620–12120-EC	995	900	—	300	1580	1550	440	12
FR-F746	FR-F746-00023–00126-EC	249	180	—	—	395	380	210	7
	FR-F746-00170/00250-EC	319	255	—	—	395	380	240	7
	FR-F746-00310/00380-EC	319	258	—	—	445	425	260	10
	FR-F746-00470/00620-EC	354	312	—	—	560	540	260	10
	FR-F746-00770-EC	360	300	—	—	590	570	265	10
	FR-F746-00930/01160-EC	471	411	—	—	660	635	320	12

3 WIRING

Source logic
◉ Main circuit terminal
○ Control circuit terminal

*1.DC reactor
Remove the jumper across P1 and P/+ for the 01160 or less if a DC reactor is connected. Be sure to connect the DC reactor supplied with the 01800 or more.

Brake resistor (Option)
Brake unit (Option)

*6.The CN8 connector (for MT-BU) is provided with the 01800 or more

*7 Do not use PR and PX terminals. Please do not remove the jumper connected to terminal PR and PX.

Earth
Jumper *1
Jumper

P1 | P/+ | PR*7 | PX*7 | N/- | CN8*6

MCCB | MC

3-phase AC power supply

R/L1
S/L2
T/L3

Inrush current limit circuit

Motor M 3~
U
V
W

R1/L11
S1/L21

ON / OFF
Connector for with/without internal EMC filter

Jumper *2

Main circuit

*2.To supply power to the control circuit separately, remove the jumper across R1/L11 and S1/L21.

Earth

Control circuit

Earth

Control input signals (No voltage input allowed)

Terminal functions vary with the input terminal assignment. (Pr. 178 to Pr. 189)

Forward rotation start — STF
Reverse rotation start — STR
Start self-holding selection — STOP

Multi-speed selection
High speed — RH
Middle speed — RM
Low speed — RL

Jog operation — JOG
Second function selection — RT

*3. AU terminal can be used as PTC input terminal.

Output stop — MRS
Reset — RES *3
Terminal 4 input selection (Current input selection) — AU
Selection of automatic restart after instantaneous power failure — CS

AU
PTC

SOURCE | SINK

Contact input common (Sink*) — SD
24VDC power supply/max. 100mA load current Contact input common(Source*) — PC

*(Common for external power supply transistor)

24V

Voltage/current input switch *4

Relay output

C1
B1
A1
Relay output 1 (Alarm output)

Terminal functions vary with the output terminal assignment. (Pr. 195, Pr. 196)

C2
B2
A2
Relay output 2

Open collector output

RUN — Running
SU — Up to frequency
IPF — Instantaneous power failure
OL — Overload
FU — Frequency detection
SE — Open collector output common Sink/source common

Terminal functions vary with the output terminal assignment. (Pr. 190 to Pr. 194)

PU connector

Frequency setting signal (Analog)

10E(+10V)

ON / OFF
4 2

10(+5V)

Frequency setting potentiometer 1/2W, 1kΩ *5

3
2
1

2 — 0 to 5VDC / 0 to 10VDC / 4 to 20mADC *4
5 — Analog common

*4.Terminal input specifications can be changed by analog input specifications switchover (Pr. 73, Pr. 267) (initial settings in frame). Set the voltage/current input switch in the OFF position to select voltage input (0 to 5V/0 to 10V) and ON to select current input (0 to 20mA). Terminal 2 and 10 can be used as PTC input terminal. (Pr. 561).

Auxiliary input (+)(-) — 1 — 0 to ±10VDC / 0 to ±5VDC *4
Terminal 4 input (Current input) (+)(-) — 4 — 4 to 20mADC / 0 to 5VDC / 0 to 10VDC *4

*5.It is recommended to use 2W, 1kΩ when the frequency setting signal is changed frequently.

CA — (+) Analog current output (0 to 20mADC) / (-)
AM — (+) Analog signal output (0 to 10VDC) / (-)
5

TXD+ / TXD- — RS-485 terminals, Data transmission
RXD+ / RXD- — Data reception
SG — GND

Connector for plug-in option connection
Option connector 1
Option connector 2

Terminating resistor VCC

5V (Permissible load current 100mA)

CAUTION
- To prevent a malfunction due to noise, keep the signal cables more than 10cm away 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 a control box etc., take care not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch in the correct position. An incorrect setting may cause a fault, failure or malfunction.
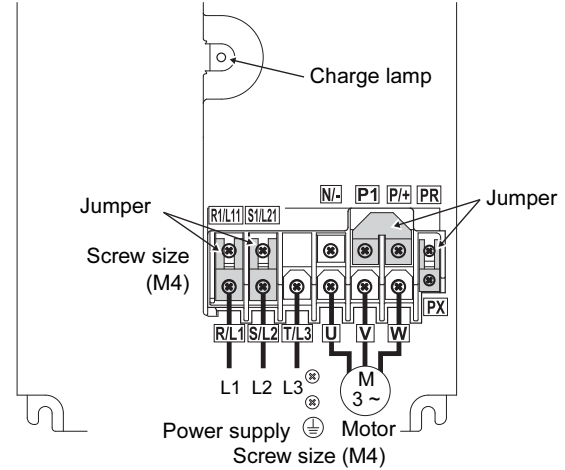
3.1 Main circuit terminal
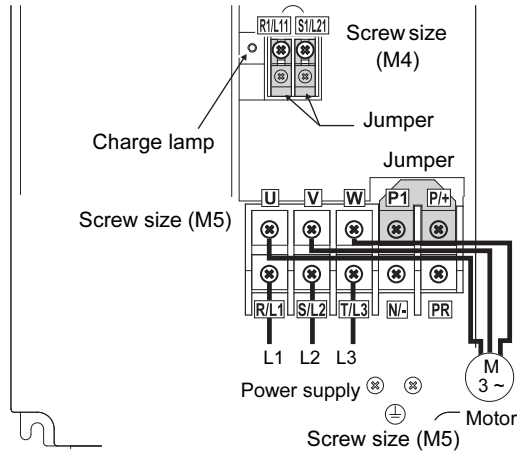
3.1.1 Terminal layout and wiring

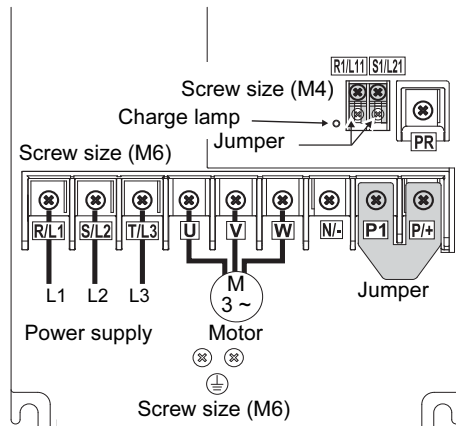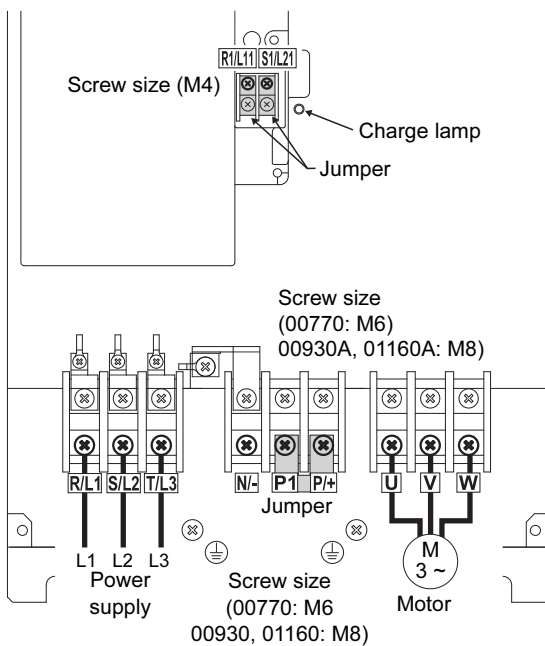FR-F740/746-00023, 00038, 00052, 00083, 00126-EC

FR-F740/746-00170, 00250-EC

FR-F740/746-00310, 00380-EC
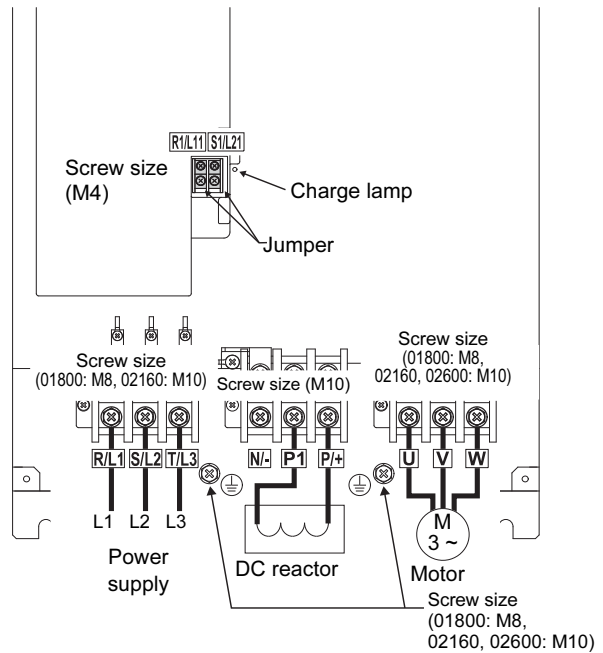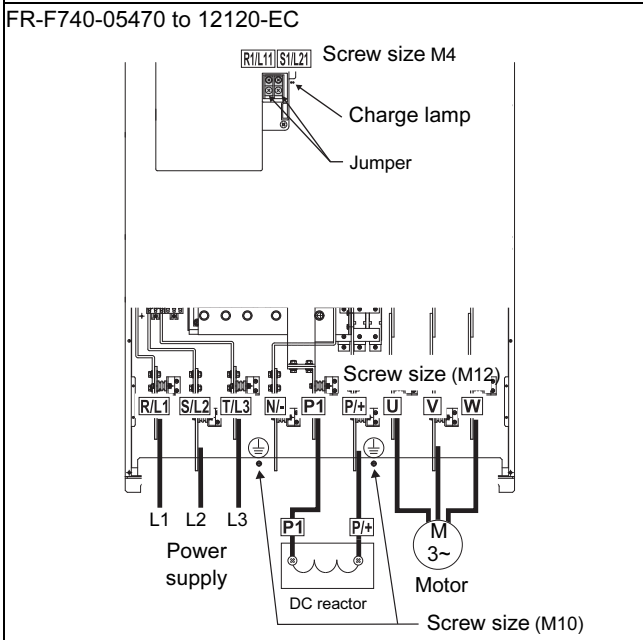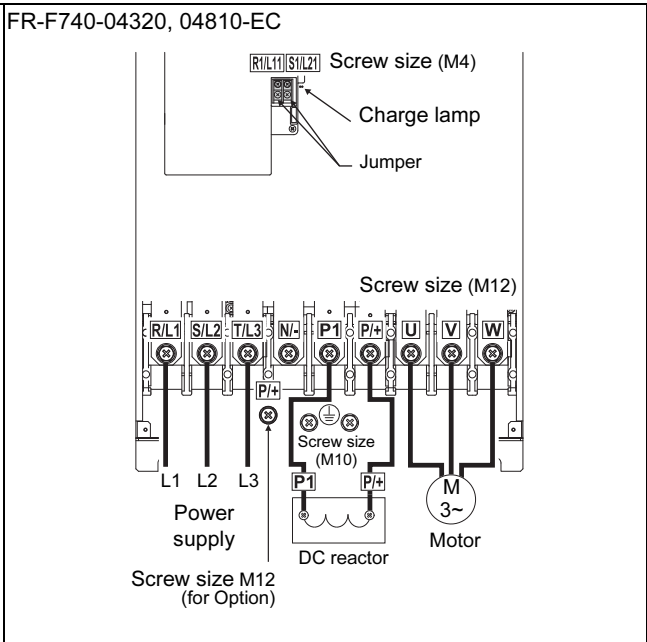

FR-F740/746-00470, 00620-EC

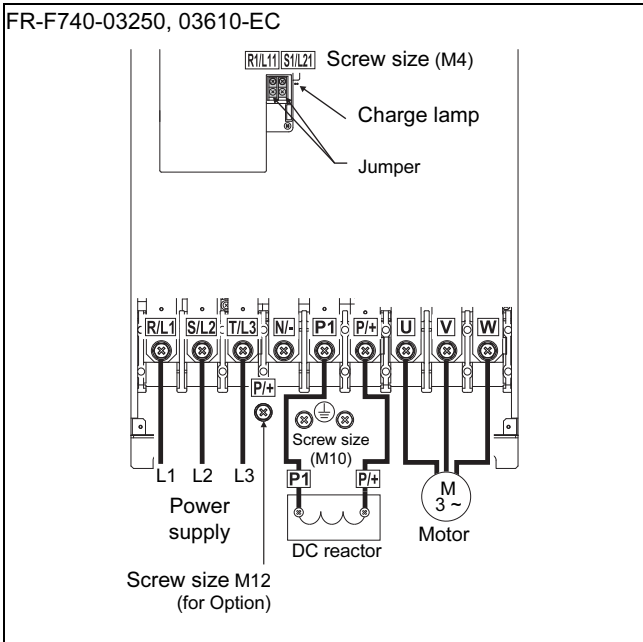FR-F740/746-00700 to 01160-EC


FR-F740-01800 to 02600-EC

FR-F740-03250, 03610-EC

R1/L11 S1/L21   Screw size (M4)

Charge lamp

Jumper

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

P/+

Screw size (M10)

L1   L2   L3   P1   P/+

Power supply

Screw size M12 (for Option)

DC reactor

M 3~

Motor

FR-F740-04320, 04810-EC

R1/L11 S1/L21   Screw size (M4)

Charge lamp

Jumper

Screw size (M12)

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

P/+

Screw size (M10)

L1   L2   L3   P1   P/+

Power supply

Screw size M12 (for Option)

DC reactor

M 3~

Motor

FR-F740-05470 to 12120-EC

R1/L11 S1/L21   Screw size M4

Charge lamp

Jumper

Screw size (M12)

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

L1   L2   L3   P1   P/+

Power supply

DC reactor

Screw size (M10)

M 3~

Motor

═══ **CAUTION** ═══

- The power supply cables must be connected to R/L1, S/L2, T/L3. Never connect the power cable to the U, V, W, of the inverter. Doing so will damaged the inverter. (Phase sequence needs not to be matched.)
- Connect the motor to U, V, W. At this time turning on the forward rotation switch (signal) rotates the motor in the counterclockwise direction when viewed from the motor shaft.
- When wiring the inverter main circuit conductor of the 05470 or more, tighten a nut from the right side of the conductor. When wiring two wires, place wires on both sides of the conductor (refer to the drawing). For wiring, use bolts (nuts) provided with the inverter.
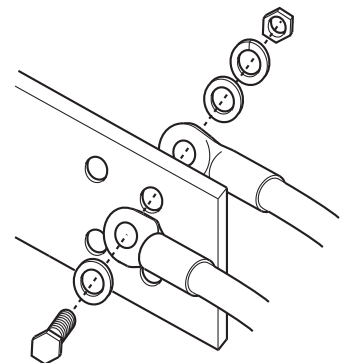
3.2 Wiring fundamentals

3.2.1 Cable size

Select the recommended cable size to ensure that a voltage drop will be 2% max.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.

The following table indicates a selection example for the wiring length of 20m.

400V class (when input power supply is 440V based on the rated current for 110% overload for 1 minute)

Applicable Inverter Type	Terminal Screw Size *4	Tightening Torque [N·m]	Crimping Terminal	
			R/L1, S/L2, T/L3	U, V, W
FR-F740/746-00023–00083-EC	M4	1.5	2-4	2-4
FR-F740/746-00126-EC	M4	1.5	2-4	2-4
FR-F740/746-00170-EC	M4	1.5	5.5-4	5.5-4
FR-F740/746-00250-EC	M4	1.5	5.5-4	5.5-4
FR-F740/746-00310-EC	M5	2.5	8-5	8-5
FR-F740/746-00380-EC	M5	2.5	14-5	8-5
FR-F740/746-00470-EC	M6	4.4	14-6	14-6
FR-F740/746-00620-EC	M6	4.4	22-6	22-6
FR-F740/746-00770-EC	M6	4.4	22-6	22-6
FR-F740/746-00930-EC	M8	7.8	38-8	38-8
FR-F740/746-01160-EC	M8	7.8	60-8	60-8
FR-F740-01800-EC	M8(M10)	7.8	60-8	60-8
FR-F740-02160-EC	M10	14.7	100-10	100-10
FR-F740-02600-EC	M10	14.7	100-10	150-10
FR-F740-03250-EC	M10(M12)	14.7	150-10	150-10
FR-F740-03610-EC	M10(M12)	14.7	150-10	150-10
FR-F740-04320-EC	M12(M10)	24.5	100-12	100-12
FR-F740-04810-EC	M12(M10)	24.5	100-12	100-12
FR-F740-05470-EC	M12(M10)	46	150-12	150-12
FR-F740-06100-EC	M12(M10)	46	150-12	150-12
FR-F740-06830-EC	M12(M10)	46	200-12	200-12
FR-F740-07700-EC	M12(M10)	46	C2-200	C2-200
FR-F740-08660-EC	M12(M10)	46	C2-250	C2-250
FR-F740-09620-EC	M12(M10)	46	C2-250	C2-250
FR-F740-10940-EC	M12(M10)	46	C2-200	C2-200
FR-F740-12120-EC	M12(M10)	46	C2-200	C2-200

Applicable Inverter Type	Cable Sizes								
	HIV, etc. [mm^2] *1				AWG *2		PVC, etc. [mm^2] *3		
	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earth Cable Gauge	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth Cable Gauge
FR-F740/746-00023–00083-EC	2	2	2	2	14	14	2.5	2.5	2.5
FR-F740/746-00126-EC	2	2	3,5	3.5	12	14	2.5	2.5	4
FR-F740/746-00170-EC	3.5	3.5	3,5	3.5	12	12	4	4	4
FR-F740/746-00250-EC	5.5	5.5	5,5	8	10	10	6	6	10
FR-F740/746-00310-EC	8	8	8	8	8	8	10	10	10
FR-F740/746-00380-EC	14	8	14	14	6	8	16	10	16
FR-F740/746-00470-EC	14	14	22	14	6	6	16	16	16
FR-F740/746-00620-EC	22	22	22	14	4	4	25	25	16
FR-F740/746-00770-EC	22	22	22	14	4	4	25	25	16
FR-F740/746-00930-EC	38	38	38	22	1	2	50	50	25
FR-F740/746-01160-EC	60	60	60	22	1/0	1/0	50	50	25
FR-F740-01800-EC	60	60	60	38	1/0	1/0	50	50	25
FR-F740-02160-EC	80	80	80	38	3/0	3/0	70	70	35
FR-F740-02600-EC	100	125	100	38	4/0	4/0	95	95	50
FR-F740-03250-EC	125	125	100	38	250	250	120	120	70
FR-F740-03610-EC	150	150	150	38	300	300	150	150	95
FR-F740-04320-EC	2 × 100	2 × 100	2 × 100	38	2 × 4/0	2 × 4/0	2 × 95	2 × 95	95
FR-F740-04810-EC	2 × 100	2 × 100	2 × 100	38	2 × 4/0	2 × 4/0	2 × 95	2 × 95	95
FR-F740-05470-EC	2 × 125	2 × 125	2 × 125	38	2 × 250	2 × 250	2 × 120	2 × 120	120
FR-F740-06100-EC	2 × 150	2 × 150	2 × 125	60	2 × 300	2 × 300	2 × 150	2 × 150	150
FR-F740-06830-EC	2 × 200	2 × 200	2 × 150	60	2 × 350	2 × 350	2 × 185	2 × 185	2 × 95
FR-F740-07700-EC	2 × 200	2 × 200	2 × 200	60	2 × 400	2 × 400	2 × 185	2 × 185	2 × 95
FR-F740-08660-EC	2 × 250	2 × 250	2 × 200	60	2 × 500	2 × 500	2 × 240	2 × 240	2 × 120
FR-F740-09620-EC	2 × 250	2 × 250	2 × 250	100	2 × 500	2 × 500	2 × 240	2 × 240	2 × 120
FR-F740-10940-EC	3 × 200	3 × 200	3 × 200	100	3 × 350	3 × 350	3 × 185	3 × 185	2 × 150
FR-F740-12120-EC	3 × 200	3 × 200	3 × 200	100	3 × 400	3 × 400	3 × 185	3 × 185	2 × 150

*1 For the 01160 or less, the recommended cable size is that of the HIV cable (600V class 2 vinyl-insulated cable) with continuous maximum permissible temperature of 75°C. Assumes that the ambient temperature is 50°C or less and the wiring distance is 20m or less.
For the 01800 or more, the recommended cable size is that of the LMFC cable (heat resistant flexible cross-linked polyethylene insulated cable) with continuous maximum permissible temperature of 90°C. Assumes that the ambient temperature is 50°C or less and wiring is performed in an enclosure.

*2 For the 00930 or less, the recommended cable size is that of the THHW cable with continuous maximum permissible temperature of 75°C. Assumes that the ambient temperature is 40°C or less and the wiring distance is 20m or less.
For the 01160 or more, the recommended cable size is that of THHN cable with continuous maximum permissible temperature of 90°C. Assumes that the ambient temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in the United States.)

*3 For the 00930 or less, the recommended cable size is that of the PVC cable with continuous maximum permissible temperature of 70°C. Assumes that the ambient temperature is 40°C or less and the wiring distance is 20m or less.
For the 01160 or more, the recommended cable size is that of XLPE cable with continuous maximum permissible temperature of 90°C. Assumes that the ambient temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, and a screw for earthing.
A screw for P/+, N/–, and P1 of the 01800 is indicated in brackets.
A screw for P/+ terminal for option connection of the 03250 and 03610 is indicated in brackets.
A screw for earthing (grounding) of the 04320 or higher is indicated in brackets.

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

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

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

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

3.2.2 Total wiring length

The maximum possible length of the motor cables depends on the capacity of the inverter and the selected carrier frequency.

The lengths in the following table are for unshielded cables. When shielded cables are used divide the values listed in the table by 2. Note that the values are for the total wiring length – if you connect more than one motor in parallel you must add the lengths of the individual motor cables.

Pr. 72 *PWM frequency selection* setting (carrier frequency)	00023	00038	00052 or more
2 (2kHz) or less	300m	500m	500m
3 (3kHz), 4 (4kHz)	200m	300m	500m
5 (5kHz) to 9 (9kHz)	100m		
10 (10kHz) or more	50m		

Note

- For the 01800 or more, the setting range of *Pr. 72 PWM frequency selection* is "0 to 6".

Note that the motor windings in three-phase AC motors are subject to far more stress when operated via frequency inverters than with mains operation. The motor must have been approved by the manufacturer for operation on a frequency inverter.

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

- Use a "400V class inverter-driven insulation-enhanced motor" and set frequency in Pr. 72 *PWM frequency selection* according to wiring length.

	Wiring Length		
	$\leq$ **50 m**	**50 m–100 m**	$\geq$ **100 m**
Carrier frequency	$\leq$ 14.5 kHz	$\leq$ 9 kHz	$\leq$ 4 kHz

- Limiting the voltage rise speed of the frequency inverter output voltage (dV/dT):
  If the motor requires a rise speed of 500 V/µs or less you must install a filter in the output of the inverter. Please contact your Mitsubishi dealer for more details.

CAUTION

- Especially for long-distance wiring (particularly when employing shielded motor cables), the inverter may be affected by a charging current caused by the stray capacitances of the wiring, leading to a malfunction of the overcurrent protective function or fast response current limit function or a malfunction or fault of the equipment connected on the inverter output side.
  When the fast-response current limit function malfunctions, make the function invalid. (For Pr.156 *Stall prevention operation selection*, refer to the Instruction Manual (applied).)
- For details of Pr. 72 *PWM frequency selection*, refer to the Instruction Manual (applied).

3.2.3 Cable size of the control circuit power supply (terminal R1/L11, S1/L21)
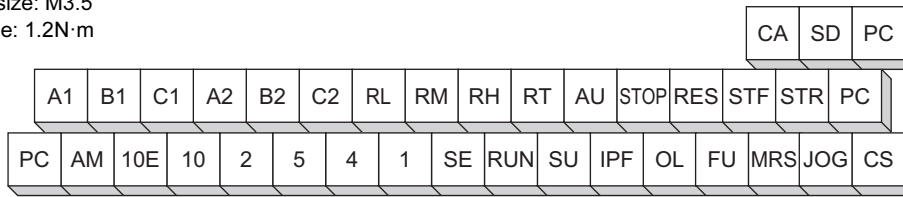
- Terminal screw size: M4
- Cable size: 0.75mm^2 to 2mm^2
- Tightening torque: 1.5N·m
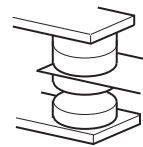
3.3 Control circuit terminals

3.3.1 Terminal layout

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

CA	SD	PC

A1	B1	C1	A2	B2	C2	RL	RM	RH	RT	AU	STOP	RES	STF	STR	PC

| PC	AM	10E	10	2	5	4	1	SE	RUN	SU	IPF	OL	FU	MRS	JOG	CS

3.3.2 Instructions for wiring of the control circuit terminal

- Terminals PC, 5, and SE are all common terminals (0V) for I/O signals and are isolated from each other. Avoid connecting the terminal PC and 5 and the terminal SE and 5. Terminal PC is a common terminal for the contact input terminals (STF, STR, STOP, RH, RM, RL, JOG, RT, MRS, RES,AU, CS).
- Use shielded or twisted cables for connection to the control circuit terminals and run them away from the main and power circuits (including the 230V relay sequence circuit).
- Use two or more parallel micro-signal contacts or twin contacts to prevent a contact faults when using contact inputs since the control circuit input signals are micro-currents.
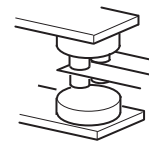
Micro signal contacts   Twin contacts

- Do not apply a voltage to the contact input terminals (e.g. STF) of the control circuit.
- Always apply a voltage to the alarm output terminals (A, B, C) via a relay coil, lamp, etc.
- It is recommended to use the cables of 0.75mm^2 gauge for connection to the control circuit terminals.
  If the cable gauge used is 1.25mm^2 or more, the front cover may be lifted when there are many cables running or the cables are run improperly, resulting in an operation panel contact fault.
- The wiring length should be 30m maximum.
- The level of the control signals can be switched over between positive (SOURCE) and negative (SINK) logic. The input signals are set to source logic when shipped from the factory. To change the control logic, the jumper connector on the control circuit terminal block must bemoved to the other position.

4 PRECAUTIONS FOR USE OF THE INVERTER

The FR-F700 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.

Before starting operation, always recheck the following items:

- Use crimping terminals with insulation sleeve to wire the power supply and motor.

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

- 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 a control box etc., take care not to allow chips and other foreign matter to enter the inverter.

- Use cables of the appropriate size to make a voltage drop of 2% maximum.
  If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
  Refer to *page 7* for the recommended cable size.

- The overall wiring length should be within the prescribed length.
  Especially for long distance wiring, the fast-response current limit function may be reduced or the equipment connected to the inverter output side may malfunction or become faulty under the influence of a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. (Refer to *page 9*)

- Electromagnetic Compatibility
  Operation of the frequency inverter can cause electromagnetic interference in the input and output that can be propagated by cable (via the power input lines), by wireless radiation to nearby equipment (e.g. AM radios) or via data and signal lines. Activate the integrated EMC filter (and an additional optional filter if present) to reduce air propagated interference on the input side of the inverter. Use AC or DC reactors to reduce line propagated noise (harmonics). Use shielded motor power lines to reduce output noise.

- Do not install a power factor correction capacitor, varistor or arrester on the inverter output side. This will cause the inverter to trip or the capacitor, varistor, or arrester to be damaged. If any of the above devices is installed, immediately remove it.

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

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

- Do not use the inverter input side magnetic contactor to start/stop the inverter.
  Since repeated inrush currents at power ON will shorten the life of the converter circuit (switching life is about 1,000,000 times), frequent starts and stops of the MC must be avoided.
  Always use the start signal (ON/OFF of STF and STR signals) to start/stop the inverter.

- Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.
  Contact to the inverter I/O signal circuits or opposite polarity may damage the I/O devices. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short terminals 10E and 5.

- Provide electrical and mechanical interlocks for MC1 and MC2 which are used for commercial power supply-inverter switch-over.
  When the wiring is incorrect or if there is a commercial power supply-inverter switch-over circuit as shown on the right, the inverter will be damaged by leakage current from the power supply due to arcs generated at the time of switch-over or chattering caused by a sequence error.

- If the machine must not be restarted when power is restored after a power failure, provide a magnetic contactor in the inverter's input side and also make up a sequence which will not switch on the start signal.
  If the start signal (start switch) remains on after a power failure, the inverter will automatically restart as soon as the power is restored.
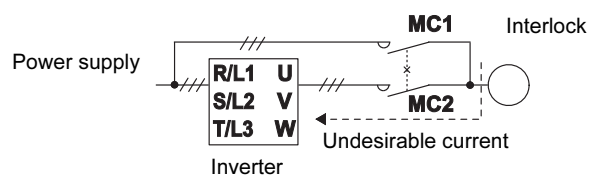
- Inverter input side magnetic contactor (MC)
  On the inverter input side, connect an MC for the following purposes. (Refer to the Instruction Manual.)
  - To release the inverter from the power supply when a fault occurs or when the drive is not functioning (e.g. emergency stop operation). For example, MC avoids overheat or burnout of the brake resistor when heat capacity of the resistor is insufficient or brake regenerative transistor is damaged with short while connecting an optional brake resistor.
  - To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
  - To separate the inverter from the power supply to ensure safe maintenance and inspection work. If using an MC for emergency stop during operation, select an MC regarding the inverter input side current as JEM1038-AC-3 class rated current.
- Handling of 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 MC is provided for switching to the commercial power supply, for example, switch it ON/OFF after the inverter and motor have stopped.
- Instructions for overload operation
  When performing operation of frequent start/stop of the inverter, increase/decrease in the temperature of the transistor element of the inverter may repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing bound current, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. Therefore, increase the inverter capacity to have enough allowance for current.
- Make sure that the specifications and rating match the system requirements.
- When the motor speed is unstable, due to change in the frequency setting signal caused by electromagnetic noises from the inverter, take the following measures when applying the motor speed by the analog signal:
  - Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
  - Run signal cables as far away as possible from power cables (inverter I/O cables).
  - Use shielded cables as signal cables.
  - Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).

5 FAILSAFE OF THE SYSTEM WHICH USES THE INVERTER

When a fault occurs, the inverter trips to output a fault signal. However, a fault output signal may not be output at an inverter fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi assures best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to machine when the inverter fails for some reason.

At the same time consider the system configuration where failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

Interlock method which uses the inverter status output signals

By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

Interlock Method	Check Method	Used Signals	Refer to
Inverter protective function operation	Operation check of an alarm contact Circuit error detection by negative logic	Fault output signal (ALM signal)	Refer to chapter „Parameter" of the Instruction Manual
Inverter running status	Operation ready signal check	Operation ready signal (RY signal)	
	Logic check of the start signal and running signal	Start signal (STF signal, STR signal) Running signal (RUN signal)	
	Logic check of the start signal and output current	Start signal (STF signal, STR signal) Output current detection signal (Y12 signal)	

Backup method outside the inverter

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

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

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the motor current runs as the motor is running for the period until the motor stops since the inverter starts decelerating even if the start signal turns off. For the logic check, configure a sequence considering the inverter deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.
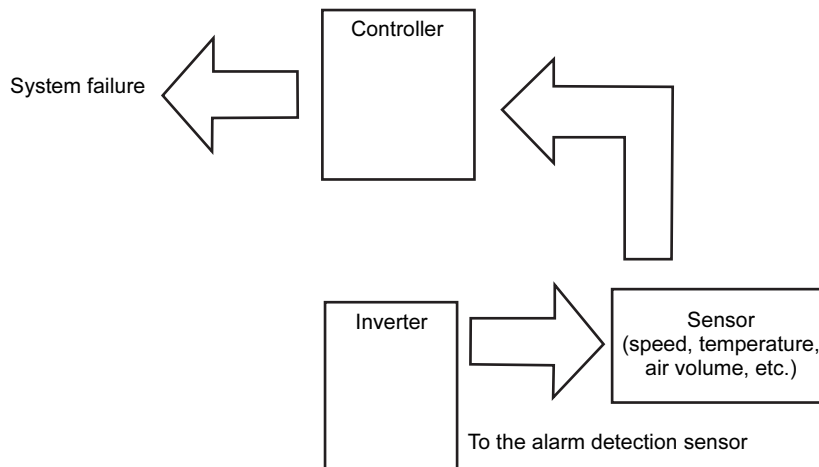
Check if there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.

6 PARAMETER

6.1 Parameter list

In the initial setting, only the simple mode parameters are displayed.

Set Pr. 160 *User group read selection* as required.

Parameter	Name	Initial Value	Setting Range	Remarks
160	**User group read selection**	9999	9999	Only the simple mode parameters can be displayed.
			0	Simple mode and extended mode parameters can be displayed.
			1	Only parameters registered in the user group can be displayed.

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

Parameter	Name	Setting Range	Initial Value
◎ 0	**Torque boost**	0 to 30%	6/4/3/2/1.5/1% *2
◎ 1	**Maximum frequency**	0 to 120Hz	120/60Hz *1
◎ 2	**Minimum frequency**	0 to 120Hz	0Hz
◎ 3	**Base frequency**	0 to 400Hz	50Hz
◎ 4	**Multi-speed setting (high speed)**	0 to 400Hz	50Hz
◎ 5	**Multi-speed setting (middle speed)**	0 to 400Hz	30Hz
◎ 6	**Multi-speed setting (low speed)**	0 to 400Hz	10Hz
◎ 7	**Acceleration time**	0 to 3600/360s	5s/15s *3
◎ 8	**Deceleration time**	0 to 3600/360s	10s/30s *3
◎ 9	**Electronic thermal O/L relay**	0 to 500/0 to 3600A *1	Rated inverter current
10	**DC injection brake operation frequency**	0 to 120Hz, 9999	3Hz
11	**DC injection brake operation time**	0 to 10s, 8888	0.5s
12	**DC injection brake operation voltage**	0 to 30%	4/2/1% *4
13	**Starting frequency**	0 to 60Hz	0.5Hz
14	**Load pattern selection**	0, 1	1
15	**Jog frequency**	0 to 400Hz	5Hz
16	**Jog acceleration/ deceleration time**	0 to 3600/360s	0.5s
17	**MRS input selection**	0, 2	0
18	**High speed maximum frequency**	120 to 400Hz	120/60Hz *1

Parameter	Name	Setting Range	Initial Value
19	**Base frequency voltage**	0 to 1000V, 8888, 9999	8888
20	**Acceleration/ deceleration reference frequency**	1 to 400Hz	50Hz
21	**Acceleration/ deceleration time increments**	0, 1	0
22	**Stall prevention operation level**	0 to 120%, 9999	110%
23	**Stall prevention operation level compensation factor at double speed**	0 to 150%, 9999	9999
24 to 27	**Multi-speed setting (4 speed to 7 speed)**	0 to 400Hz, 9999	9999
28	**Multi-speed input compensation selection**	0, 1	0
29	**Acceleration/ deceleration pattern selection**	0, 1, 2, 3, 6	0
30	**Regenerative function selection**	0, 2, 10, 20, 100, 120/0, 1, 2, 10, 11, 20, 21, 100, 101, 120, 121 *1	0
31	**Frequency jump 1A**	0 to 400Hz, 9999	9999
32	**Frequency jump 1B**	0 to 400Hz, 9999	9999
33	**Frequency jump 2A**	0 to 400Hz, 9999	9999
34	**Frequency jump 2B**	0 to 400Hz, 9999	9999
35	**Frequency jump 3A**	0 to 400Hz, 9999	9999

*1 The setting depends on capacities. (01160 or less/01800 or more)

*2 The setting depends on capacities. (00023/00038 to 00083/00126, 00170/00250 to 00770/00930, 01160/01800 or more)

*3 The setting depends on capacities. (00170 or less/00250 or more)

*4 The setting depends on capacities. (00170 or less/00250 to 01160/01800 or more).

Parameter	Name	Setting Range	Initial Value
36	Frequency jump 3B	0 to 400Hz, 9999	9999
37	Speed display	0, 1 to 9998	0
41	Up-to-frequency sensitivity	0 to 100%	10%
42	Output frequency detection	0 to 400Hz	6Hz
43	Output frequency detection for reverse rotation	0 to 400Hz, 9999	9999
44	Second acceleration/ deceleration time	0 to 3600/360s	5s
45	Second deceleration time	0 to 3600/360s, 9999	9999
46	Second torque boost	0 to 30%, 9999	9999
47	Second V/F (base frequency)	0 to 400Hz, 9999	9999
48	Second stall prevention operation current	0 to 120%	110%
49	Second stall prevention operation frequency	0 to 400Hz, 9999	0Hz
50	Second output frequency detection	0 to 400Hz	30Hz
51	Second electronic thermal O/L relay	0 to 500A, 9999/ 0 to 3600A, 9999 *1	9999
52	DU/PU main display data selection	0, 5, 6, 8 to 14, 17, 20, 23 to 25, 50 to 57, 64, 67, 81 to 86, 100 *2	0
54	CA terminal function selection	1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53, 67, 70, 85 *2	1
55	Frequency monitoring reference	0 to 400Hz	50Hz
56	Current monitoring reference	0 to 500A/ 0 to 3600A *1	Rated inverter current
57	Restart coasting time	0, 0.1 to 5s, 9999/ 0, 0.1 to 30s, 9999 *1	9999
58	Restart cushion time	0 to 60s	1s
59	Remote function selection	0, 1, 2, 3, 11, 12, 13	0
◎ 60	Energy saving control selection	0, 4, 9	0
65	Retry selection	0 to 5	0
66	Stall prevention operation reduction starting frequency	0 to 400Hz	50Hz

Parameter	Name	Setting Range	Initial Value
67	Number of retries at alarm occurrence	0, 1 to 10, 101 to 110	0
68	Retry waiting time	0 to 10s	1s
69	Retry count display erase	0	0
70	Special regenerative brake duty *3	0 to 10%	0%
71	Applied motor	0, 1, 2, 20	0
72	PWM frequency selection	0 to 15/ 0 to 6, 25 *1	2
73	Analog input selection	0 to 7, 10 to 17	1
74	Input filter time constant	0 to 8	1
75	Reset selection/ disconnected PU detection/PU stop selection	0 to 3, 14 to 17, 100 to 103, 114 to 117 *4	14
76	Alarm code output selection	0, 1, 2	0
77	Parameter write selection	0, 1, 2	0
78	Reverse rotation prevention selection	0, 1, 2	0
◎ 79	Operation mode selection	0, 1, 2, 3, 4, 6, 7	0
80	Motor capacity	0.4 to 55kW, 9999/ 0 to 3600kW, 9999 *1	9999
90	Motor constant (R1)	0 to 50Ω, 9999/ 0 to 400mΩ, 9999 *1	9999
100	V/F1 (first frequency)	0 to 400Hz, 9999	9999
101	V/F1 (first frequency voltage)	0 to 1000V	0V
102	V/F2 (second frequency)	0 to 400Hz, 9999	9999
103	V/F2 (second frequency voltage)	0 to 1000V	0V
104	V/F3 (third frequency)	0 to 400Hz, 9999	9999
105	V/F3 (third frequency voltage)	0 to 1000V	0V
106	V/F4 (fourth frequency)	0 to 400Hz, 9999	9999
107	V/F4 (fourth frequency voltage)	0 to 1000V	0V
108	V/F5 (fifth frequency)	0 to 400Hz, 9999	9999
109	V/F5 (fifth frequency voltage)	0 to 1000V	0V
117	PU communication station number	0 to 31	0

*1 The setting depends on capacities. (01160 or less/01800 or more)

*2 Setting of "9" can be made for the 01800 or more.

*3 Setting can be made for the 01800 or more.

*4 Setting of "100 to 103", "114 to 117" can be made for the 01800 or more.

Parameter	Name	Setting Range	Initial Value
118	PU communication speed	48, 96, 192, 384	192
119	PU communication stop bit length.	0, 1, 10, 11	1
120	PU communication parity check	0, 1, 2	2
121	Number of PU communication retries	0 to 10, 9999	1
122	PU communication check time interval	0, 0.1 to 999.8s, 9999	9999
123	PU communication waiting time setting	0 to 150ms, 9999	9999
124	PU communication CR/LF presence/ absence selection	0, 1, 2	1
◎ 125	Terminal 2 frequency setting gain frequency	0 to 400Hz	50Hz
◎ 126	Terminal 4 frequency setting gain frequency	0 to 400Hz	50Hz
127	PID control automatic switchover freqency	0 to 400Hz, 9999	9999
128	PID action selection	10, 11, 20, 21, 40, 41, 50, 51, 60, 61, 70, 71, 80, 81, 90, 91, 100, 101, 110, 111, 120, 121, 140, 141	10
129	PID proportional band	0.1 to 1000%, 9999	100%
130	PID integral time	0.1 to 3600s, 9999	1s
131	PID upper limit	0 to 100%, 9999	9999
132	PID lower limit	0 to 100%, 9999	9999
133	PID action set point	0 to 100%, 9999	9999
134	PID differential time	0.01 to 10.00s, 9999	9999
135	Commercial power-supply switchover sequence output terminal selection	0, 1	0
136	MC switchover interlock time	0 to 100s	1s
137	Start waiting time	0 to 100s	0.5s
138	Commercial power-supply operation switchover selection at an alarm	0, 1	0
139	Automatic switcho-ver frequency between inverter and commercial power-supply operation	0 to 60Hz, 9999	9999
140	Backlash acceleration stopping frequency	0 to 400Hz	1Hz
141	Backlash acceleration stopping time	0 to 360s	0.5s

Parameter	Name	Setting Range	Initial Value
142	Backlash deceleration stopping frequency	0 to 400Hz	1Hz
143	Backlash deceleration stopping time	0 to 360s	0.5s
144	Speed setting switchover	0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110	4
145	PU display language selection	0 to 7	1
147	Acceleration/ deceleration time switching frequency	0 to 400Hz, 9999	9999
148	Stall prevention level at 0V input	0 to 120%	110%
149	Stall prevention level at 10V input	0 to 120%	120%
150	Output current detection level	0 to 120%	110%
151	Output current detection signal delay time	0 to 10s	0s
152	Zero current detection level	0 to 150%	5%
153	Zero current detection time	0 to 10s	0.5s
154	Voltage reduction selection during stall prevention operation	0, 1	1
155	RT signal function validity condition selection	0, 10	0
156	Stall prevention operation selection	0 to 31, 100, 101	0
157	OL signal output timer	0 to 25s, 9999	0s
158	AM terminal function selection	1 to 3, 5, 6, 8 to 14, 17, 21, 24, 50, 52, 53, 67, 70, 86 *1	1
159	Automatic switchover frequency range from bypass to inverter operation	0 to 10Hz, 9999	9999
◎160	User group read selection	0, 1, 9999	9999
161	Frequency setting/ key lock operation selection	0, 1, 10, 11	0
162	Automatic restart after instantaneous power failure selection	0, 1, 10, 11	0
163	First cushion time for restart	0 to 20s	0s
164	First cushion voltage for restart	0 to 100%	0%
165	Stall prevention operation level for restart	0 to 120%	110%
166	Output current detection signal retention time	0 to 10s, 9999	0.1s

*1 Setting of "9" can be made for the 01800 or more.

Parameter	Name	Setting Range	Initial Value
167	Output current detection operation selection	0, 1, 10, 11	0
168	Parameter for manufacturer setting. Do not make setting.		
169			
170	Watt-hour meter clear	0, 10, 9999	9999
171	Operation hour meter clear	0, 9999	9999
172	User group registered display/ batch clear	9999, (0 to 16)	0
173	User group registration	0 to 999, 9999	9999
174	User group clear	0 to 999, 9999	9999
178	STF terminal function selection	0 to 8, 10 to 14, 16, 24, 25, 37, 50, 51, 60, 62, 64 to 67, 70 to 72, 77, 78, 9999	60
179	STR terminal function selection	0 to 8, 10 to 14, 16, 24, 25, 37, 50, 51, 61, 62, 64 to 67, 70 to 72, 77, 78, 9999	61
180	RL terminal function selection	0 to 8, 10 to 14, 16, 24, 25, 37, 50, 51, 62, 64 to 67, 70 to 72, 77, 78, 9999	0
181	RM terminal function selection		1
182	RH terminal function selection		2
183	RT terminal function selection		3
184	AU terminal function selection	0 to 8, 10 to 14, 16, 24, 25, 37, 50, 51, 62 to 67, 70 to 72, 77, 78, 9999	4
185	JOG terminal function selection	0 to 8, 10 to 14, 16, 24, 25, 37, 50, 51, 62, 64 to 67, 70 to 72, 77, 78, 9999	5
186	CS terminal function selection		6
187	MRS terminal function selection		24
188	STOP terminal function selection		25
189	RES terminal function selection		62
190	RUN terminal function selection	0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 54, 64, 67, 70 to 79, 82, 85, 90 to 96, 98, 99, 100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 154, 164, 167,170, 179, 182, 185, 190 to 196, 198, 199, 9999 *1	0
191	SU terminal function selection		1
192	IPF terminal function selection		2
193	OL terminal function selection		3
194	FU terminal function selection		4

Parameter	Name	Setting Range	Initial Value
195	ABC1 terminal function selection	0 to 5, 7, 8, 10 to 19, 25, 26, 45 to 54, 64, 67, 70 to 79, 82, 85, 90, 91, 94 to 96, 98, 99,100 to 105, 107, 108, 110 to 116, 125, 126, 145 to 154, 164, 167, 170, 179, 182, 185, 190, 191, 194 to 196,198, 199, 9999 *1	99
196	ABC2 terminal function selection		9999
232 to 239	Multi-speed setting (speeds 8 to 15)	0 to 400Hz, 9999	9999
240	Soft-PWM operation selection	0, 1	1
241	Analog input display unit switchover	0, 1	0
242	Terminal 1 added compensation amount (terminal 2)	0 to 100%	100%
243	Terminal 1 added compensation amount (terminal 4)	0 to 100%	75%
244	Cooling fan operation selection	0, 1	1
245	Rated slip	0 to 50%, 9999	9999
246	Slip compensation time constant	0.01 to 10s	0.5s
247	Constant-output region slip compensation selection	0, 9999	9999
250	Stop selection	0 to 100s, 1000 to 1100s, 8888, 9999	9999
251	Output phase failure protection selection	0, 1	1
252	Override bias	0 to 200%	50%
253	Override gain	0 to 200%	150%
255	Life alarm status display	(0 to 15)	0
256	Inrush current suppression circuit life display	(0 to 100%)	100%
257	Control circuit capacitor life display	(0 to 100%)	100%
258	Main circuit capacitor life display	(0 to 100%)	100%
259	Main circuit capacitor life measuring	0, 1	0
260	PWM frequency automatic switchover	0, 1	1
261	Power failure stop selection	0, 1, 2, 21, 22	0
262	Subtracted frequency at deceleration start	0 to 20Hz	3Hz
263	Subtraction starting frequency	0 to 400Hz, 9999	50Hz

*1 Setting of "7, 107" can be made for the 01800 or more.

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Parameter	Name	Setting Range	Initial Value
264	Power-failure deceleration time 1	0 to 3600/ 360s	5s
265	Power-failure deceleration time 2	0 to 3600/ 360s, 9999	9999
266	Power failure deceleration time switchover frequency	0 to 400Hz	50Hz
267	Terminal 4 input selection	0, 1, 2	0
268	Monitor decimal digits selection	0, 1, 9999	9999
269	Parameter for manufacturer setting. Do not make setting.		
296	Password lock level	0 to 6, 99, 100 to 106, 199, 9999	9999
297	Password lock/ unlock	(0 to 5), 1000 to 9998, 9999	9999
299	Rotation direction detection selection at restarting	0, 1, 9999	9999
331	RS-485 communication station	0 to 31 (0 to 127 or 0 to 247)	0
332	RS-485 communication speed	3, 6, 12, 24, 48, 96, 192, 384 (96, 192, 384, 768)	96
333	RS-485 communication stop bit length	0, 1, 10, 11	1
334	RS-485 communication parity check selection	0, 1, 2	2
335	RS-485 communication number of retries	0 to 10, 9999	1
336	RS-485 communication check time interval	0 to 999.8s, 9999	0s
337	RS-485 communication waiting time setting	0 to 150ms, 9999	9999
338	Communication operation command source	0, 1	0
339	Communication speed command source	0, 1, 2	0
340	Communication startup mode selection	0, 1, 2, 10, 12	0
341	RS-485 communication CR/LF selection	0, 1, 2	1
342	Communication EEPROM write selection	0, 1	0
343	Communication error count	—	0
390	% setting reference frequency	1 to 400Hz	50Hz

Parameter	Name	Setting Range	Initial Value
414	PLC function operation selection	0/1	0
415	Inverter operation lock mode setting	0/1	0
495	Remote output selection	0, 1, 10, 11	0
496	Remote output data 1	0 to 4095	0
497	Remote output data 2	0 to 4095	0
498	PLC function flash memory clear	0 to 9999	0
502	Stop mode selection at communication error	0 to 3	0
503	Maintenance timer	0 (1 to 9998)	0
504	Maintenance timer alarm output set time	0 to 9998, 9999	9999
505	Speed setting reference	1 to 120Hz	50Hz
506 to 515	Parameter 1 to 10 for user	0 to 65535	0
522	Output stop frequency	0 to 400Hz, 9999	9999
539	Modbus-RTU communication check time interval	0 to 999.8s, 9999	9999
549	Protocol selection	0, 1, 2	0
550	NET mode operation command source selection	0, 1, 9999	9999
551	PU mode operation command source selection	1, 2	2
553	PID deviation limit	0 to 100.0%, 9999	9999
554	PID signal operation selection	0 to 3, 10 to 13	0
555	Current average time	0.1 to 1.0s	1s
556	Data output mask time	0.0 to 20.0s	0s
557	Current average value monitor signal output reference current	0 to 500A/ 0 to 3600A *1	Rated inverter current
561	PTC thermistor protection level	0.5 to 30kΩ, 9999	9999
563	Energization time carrying-over times	(0 to 65535)	0
564	Operating time carrying-over times	(0 to 65535)	0
570	Multiple rating setting	0, 1	0
571	Holding time at a start	0.0 to 10.0s, 9999	9999
573	4mA Input check selection	1, 2, 3, 4, 9999	9999
575	Output interruption detection time	0 to 3600s, 9999	1s
576	Output interruption detection level	0 to 400Hz	0Hz
577	Output interruption release level	900 to 1100%	1000%

*1 The setting depends on capacities. (01160 or less/01800 or more)

Parameter	Name	Setting Range	Initial Value
578	Auxiliary motor operation selection	0 to 3	0
579	Motor swichover selection	0 to 3	0
580	MC switching interlock time	0 to 100s	1s
581	Start waiting time	0 to 100s	1s
582	Auxiliary motor connection-time deceleration time	0 to 3600s/360s, 9999	1s
583	Auxiliary motor disconnection-time acceleration time	0 to 3600s/360s, 9999	1s
584	Auxiliary motor 1 starting frequency	0 to 400Hz	50Hz
585	Auxiliary motor 2 starting frequency	0 to 400Hz	50Hz
586	Auxiliary motor 3 starting frequency	0 to 400Hz	50Hz
587	Auxiliary motor 1 stopping frequency	0 to 400Hz	0Hz
588	Auxiliary motor 2 stopping frequency	0 to 400Hz	0Hz
589	Auxiliary motor 3 stopping frequency	0 to 400Hz	0Hz
590	Auxiliary motor start detection time	0 to 3600s	5s
591	Auxiliary motor stop detection time	0 to 3600s	5s
592	Traverse function selection	0, 1, 2	0
593	Maximum amplitude amount	0 to 25%	10%
594	Amplitude compensation amount during deceleration	0 to 50%	10%
595	Amplitude compensation amount during acceleration	0 to 50%	10%
596	Amplitude acceleration time	0.1 to 3600s	5s
597	Amplitude deceleration time	0.1 to 3600s	5s
611	Acceleration time at a restart	0 to 3600s, 9999	5/15s [1]
653	Speed smoothing control	0 to 200%	0%
654	Speed smoothing cutoff frequency	0 to 120Hz	20Hz
665	Regeneration avoidance frequency gain	0 to 200%	100%
726	Auto Baudrate/Max Master	0 to 255	255
727	Max Info Frames	1 to 255	1
728	Device instance number (Upper 3 digit)	0 to 419 (0 to 418)	0
729	Device instance number (Lower 4 digit)	0 to 9999 (0 to 4302)	0

Parameter	Name	Setting Range	Initial Value
753	Second PID action selection	10, 11, 20, 21, 40, 41, 50, 51, 60, 61, 70, 71, 80, 81, 90, 91, 100, 101, 110, 111, 120, 121, 140, 141, 9999	9999
754	Second PID control automatic switchover frequency	0 to 400Hz, 9999	9999
755	Second PID action set point	0 to 100%, 9999	9999
756	Second PID proportional band	0.1 to 1000%, 9999	100 %
757	Second PID integral time	0.1 to 3600s, 9999	1 s
758	Second PID differential time	0.01 to 10.00s, 9999	9999
759	PID unit selection	0 to 43, 9999	9999
760	Pre-charge fault selection	0, 1	0
761	Pre-charge ending level	0 to 100%, 9999	9999
762	Pre-charge ending time	0 to 3600, /9999	9999
763	Pre-charge upper detection level	0 to 100%, 9999	9999
764	Pre-charge time limit	0 to 3600s, 9999	9999
765	Second pre-charge fault selection	0, 1	0 %
766	Second pre-charge ending level	0 to 100%, 9999	9999
767	Second pre-charge ending time	0 to 3600, 9999	9999
768	Second pre-charge upper detection level	0 to 100%, 9999	9999
769	Second pre-charge time limit	0 to 3600s, 9999	9999
774	PU/DU monitor selection 1	1 to 3, 5, 6, 8 to 14, 17, 20, 23 to 25, 40 to 42, 50 to 57, 64, 67, 81 to 86, 100, 9999 [2]	9999
775	PU/DU monitor selection 2		9999
776	PU/DU monitor selection 3		9999
777	4mA input fault operation frequency	0 to 400Hz, 9999	9999
778	Current input check filter	0 to 10s	0
779	Operation frequency during communication error	0 to 400Hz, 9999	9999
799	Pulse increment setting for output power	0.1kWh, 1kWh, 10kWh, 100kWh, 1000kWh	1 kWh
826 – 865	Parameter 11 to 50 for user	0 to 65535	0
867	AM output filter	0 to 5s	0.01s
869	Current output filter	0 to 5s	0.02s
870	Speed detection hysteresis	0 to 5Hz	0Hz

[1] The setting depends on capacities. (01160 or less/01800 or more)
[2] Setting of "9" can be made for the 01800 or more.

Parameter	Name	Setting Range	Initial Value		Parameter	Name	Setting Range	Initial Value
872	Input phase failure protection selection	0, 1	0		C6 (904) *2	Terminal 4 frequency setting bias	0 to 300%	20%
882	Regeneration avoidance operation selection	0, 1, 2	0		126 (905) *2	Terminal 4 frequency setting gain frequency	0 to 400Hz	50Hz
883	Regeneration avoidance operation level	300 to 800V	760V DC/ 785V DC *1		C7 (905) *2	Terminal 4 frequency setting gain	0 to 300%	100%
884	Regeneration avoidance at deceleration detection sensitivity	0 to 5	0		C8 (930) *2	Current output bias signal	0 to 100%	0%
885	Regeneration avoidance compensation frequency limit value	0 to 30Hz, 9999	6Hz		C9 (930) *2	Current output bias current	0 to 100%	0%
886	Regeneration avoidance voltage gain	0 to 200%	100%		C10 (931) *2	Current output gain signal	0 to 100%	100%
888	Free parameter 1	0 to 9999	9999		C11 (931) *2	Current output gain current	0 to 100%	100%
889	Free parameter 2	0 to 9999	9999		◎ C42 (934) *2	PID display bias coefficient	0 to 500.00, 9999	9999
891	Cumulative power monitor digit shifted times	0 to 4, 9999	9999		◎ C43 (934) *2	PID display bias analog value	0 to 300.0%	20%
892	Load factor	30 to 150%	100%		◎ C44 (935) *2	PID display gain coefficient	0 to 500.00, 9999	9999
893	Energy saving monitor reference (motor capacity)	0.1 to 55kW/ 0 to 3600kW *1	LD/SLD value of applied motor capacity		◎ C45 (935) *2	PID display gain analog value	0 to 300.0%	100%
894	Control selection during commercial power-supply operation	0, 1, 2, 3	0		986	Terminal 10 calibration for PTC thermistor	4 to 6V, 8888, 9999	5.00V
895	Power saving rate reference value	0, 1, 9999	9999		989	Parameter copy alarm release	10/100 *1	10/100 *1
896	Power unit cost	0 to 500, 9999	9999		990	PU buzzer control	0, 1	1
897	Power saving monitor average time	0, 1 to 1000h, 9999	9999		991	PU contrast adjustment	0 to 63	58
898	Power saving cumulative monitor clear	0, 1, 10, 9999	9999		997	Fault initiation	16 to 18, 32 to 34, 48, 49, 64, 80 to 82, 96, 112, 128, 129, 144, 145, 160, 161, 162, 164 to 168, 176 to 179, 192 to 194, 196 to 199, 228, 229, 230, 241, 242, 245 to 247, 253, 9999	9999
899	Operation time rate (estimated value)	0 to 100%, 9999	9999					
C0 (900) *2	CA terminal calibration	—	—		◎ 999	Automatic parameter setting	1, 2, 10, 11, 20, 21, 30, 31, 9999	9999
C1 (901) *2	AM terminal calibration	—	—		Pr.CL	Parameter clear	0, 1	0
C2 (902) *2	Terminal 2 frequency setting bias frequency	0 to 400Hz	0Hz		ALLC	All parameter clear	0, 1	0
C3 (902) *2	Terminal 2 frequency setting bias	0 to 300%	0%		Er.CL	Alarm history clear	0, 1	0
125 (903) *2	Terminal 2 frequency setting gain frequency	0 to 400Hz	50Hz		PCPY	Parameter copy	0, 1, 2, 3	0
C4 (903) *2	Terminal 2 frequency setting gain	0 to 300%	100%		PR.CH	Initial value change list	—	—
C5 (904) *2	Terminal 4 frequency setting bias frequency	0 to 400Hz	0Hz		AUTO	Automatic parameter setting	—	—

*1 The setting depends on capacities. (01160 or less/01800 or more)
*2 The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

7 TROUBLESHOOTING

The frequency inverter FR-F700 has a multitude of protective functions which protect the drive and the inverter from damage in case of a fault. 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.
If the fault does not correspond to any of the following errors or if you have any other problem, please contact your sales representative.

- Retention of alarm output signal........When the magnetic contactor (MC) provided on the input side of the inverter is opened at the activation of the protective function, the inverter's control power will be lost and the alarm output will not be held.
- Alarm display....................................When the protective function is activated, the operation panel display automatically switches to the fault or alarm indication.
- Resetting method ....When a protective function of the inverter is activated, the power output of the inverter is blocked (motor is coasting). The inverter cannot start up again unless an automatic restart has been configured or the inverter is reset. Please observe carefully the warnings contained below in the configuration of an automatic restart or the execution of a reset.
- If protective functions were activated (i. e. the inverter switched off with an error message) follow the instructions for error correction provided in the manual for the inverter. Especially in the case of short circuits or earth contacts in the inverter output and mains overvoltages the cause of the fault must be determined prior to switching on again as a recurrence of such faults at short intervals can lead to premature aging of components or even the complete breakdown of the device. After the cause of the fault has been found and corrected the inverter can be reset and operations continue.

Inverter fault or alarm indications are roughly divided as below:
- Error Message
  A message regarding operational fault and setting fault by the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07) is displayed. The inverter does not shut off output.
- Warning
  The inverter does not shut off output even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.
- Alarm
  The inverter does not shut off output. You can also output an alarm signal by making parameter setting.
- Fault
  When the protective function is activated, the inverter output is shut off and an fault signal is output.

> **NOTES**
> - For the details of fault displays and other malfunctions, also refer to the Instruction Manual.
> - Past eight faults can be displayed using the setting dial.

# 7.1 Reset Method of Protective Function

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

Three different methods can be used to reset an inverter.

- Using the operation panel, press the STOP/RESET key to reset the inverter.
  (This may only be performed when a fault occurs.)
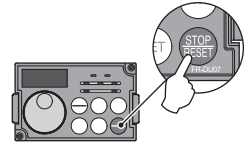
- Switch OFF the power once, then switch it ON again after the indicator of the operation panel turns OFF.
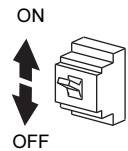
- Turn ON the reset signal (RES) for more than 0.1 s. (If the RES signal is kept ON, "Err." appears (flickers) to indicate that the inverter is in a reset status.)
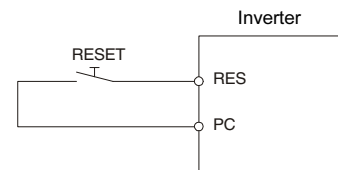
NOTE

When a fault occurs during PLC function, turning ON of X51 signal can release fault without interrupting PLC function. (Refer to FR-F700 PLC function programming manual.)

CAUTION

OFF status of the start signal must be confirmed before resetting the inverter fault. Resetting inverter fault with the start signal ON restarts the motor suddenly. This may cause injury.

7.2 List of alarm display

Operation Panel Indication		Name	Fault Data Code
E - - -	E - - -	Faults history	—
HOLd	HOLD	Operation panel lock	—
LOCd	LOCD	Password locked	—
Er1 to *Er4*	Er1 to 4	Parameter write error	—
rE1 to *rE4*	rE1 to 4	Copy operation error	—
Err.	Err.	Error	—
OL	OL	Stall Prevention (overcurrent)	—
oL	oL	Stall prevention (overvoltage)	—
rb	RB	Regenerative brake prealarm	—
rH	TH	Electronic thermal relay function prealarm	—
PS	PS	PU Stop	—
MT	MT	Maintenance signal output	—
CP	CP	Parameter copy	—
Fn	FN	Fan alarm	—
E.OC1	E.OC1	Overcurrent shut-off during acceleration	16 (H10)
E.OC2	E.OC2	Overcurrent shut-off during constant speed	17 (H11)
E.OC3	E.OC3	Overcurrent shut-off during deceleration or stop	18 (H12)
E.OV1	E.OV1	Regenerative overvoltage shut-off during acceleration	32 (H20)
E.OV2	E.OV2	Regenerative overvoltage shut-off during constant speed	33 (H21)
E.OV3	E.OV3	Regenerative overvoltage shut-off during deceleration or stop	34 (H22)
E.THT	E.THT	Inverter overload shut-off (electronic thermal relay function)	48 (H30)
E.THM	E.THM	Motor overload shut-off (electronic thermal relay function)	49 (H31)
E.FIn	E.FIN	Fin overheat	64 (H40)
E.IPF	E.IPF	Instantaneous power failure protection	80 (H50)
E. bE	E.BE	Brake transistor alarm detection/Internal circuit error	112 (H70)

(The left table column labels "Error message", "Warning", "Alarm", "Fault" appear vertically.)

Operation Panel Indication		Name	Fault Data Code
E.UVT	E.UVT	Undervoltage protection	81 (H51)
E.ILF	E.ILF*	Input phase failure	82 (H52)
E.OLT	E.OLT	Stall prevention	96 (H60)
E. GF	E.GF	Output side earth (ground) fault overcurrent protection	128 (H80)
E. LF	E.LF	Output phase failure protection	129 (H81)
E.OHT	E.OHT	External thermal relay operation	144 (H90)
E.PTC	E.PTC*	PTC thermistor operation	145 (H91)
E.OPT	E.OPT	Option fault	160 (HA0)
E.OP1 *E.OP2*	E.OP1 E.OP2	Communication option fault (e. g. communication error)	161 (HA1) 162 (HA2)
E. 1 *E. 2*	E. 1 E. 2	Option fault (e. g. connection or contact fault)	241 (HF1) 242 (HF2)
E. PE	E.PE	Parameter storage device fault	176 (HB0)
E.PUE	E.PUE	PU disconnection	177 (HB1)
E.rET	E.RET	Retry count excess	178 (HB2)
E.PE2	E.PE2*	Parameter storage device fault	179 (HB3)
E. 5 *E. 6* *E. 7* *E.CPU*	E. 5 E. 6 E. 7 E.CPU	CPU fault	245 (HF5) 246 (HF6) 247 (HF7) 192 (HC0)
E.CTE	E.CTE	RS-485 terminal power supply short circuit	193 (HC1)
E.P24	E.P24	24V DC power output short circuit	194 (HC2)
E.CdO	E.CDO*	Output current detection value exceeded	196 (HC4)
E.IOH	E.IOH*	Inrush current limit circuit fault	197 (HC5)
E.SEr	E.SER*	Communication fault (inverter)	198 (HC6)
E.AIE	E.AIE*	Analog input fault	199 (HC7)
E.PId	E.PID*	PID signal fault	230 (HE6)
E. 13	E.13	Internal circuit fault	253 (HFD)
E.PCH	E.PCH*	Pre-charge fault	229 (HE5)
E.LCI	E.LCI*	4mA input fault	228 (HE4)

(The right table column label "Fault" appears vertically.)

* If an "E.ILF, E.PTC, E.PE2, E.CDO, E.IOH, E.SER, E.AIE, E.PID, E.PCH, E.LCI" fault occurs when using the FR-PU04, "Fault 14" is displayed on the FR-PU04.

A APPENDIX

A.1 Instructions for Compliance with the EU Directives

The EU Directives are issued to standardize different national regulations of the EU Member States and to facilitate free movement of the equipment, whose safety is ensured, in the EU territory.

Since 1996, compliance with the EMC Directive that is one of the EU Directives has been legally required. Since 1997, compliance with the Low Voltage Directive, another EU Directive, has been also legally required. When a manufacturer confirms its equipment to be compliant with the EMC Directive and the Low Voltage Directive, the manufacturer must declare the conformity and affix the CE marking.

- The authorized representative in the EU
  Name: Mitsubishi Electric Europe B.V.
  Address: Gothaer Strasse 8, 40880 Ratingen, Germany

> **NOTE**
>
> We declare that this inverter, conforms with the EMC Directive in industrial environments and affix the CE marking on the inverter. When using the inverter in a residential area, take appropriate measures and ensure the conformity of the inverter used in the residential area.

A.1.1 EMC Directive

We declare that this inverter conforms with the EMC Directive and affix the CE marking on the inverter.

- EMC Directive: 2004/108/EC
- Standard(s): EN61800-3:2004 (Second environment / PDS Category "C3")

> **NOTES**
>
> - First environment
>   Environment including residential buildings. Includes buildings directly connected without a transformer to the low voltage power supply network which supplies power to residential buildings.
> - Second environment
>   Environment including all buildings except buildings directly connected without a transformer to the low voltage power supply network which supplies power to residential buildings.

> **NOTES**
>
> Install the inverter (and if necessary optional radio interference suppression filters) and perform wiring according to the following instructions:
> - The inverter is equipped with a built-in EMC filter. Set the EMC filter valid (initial setting).
> - Connect the inverter to an earthed power supply.
> - Install a motor and a control cable according to the EMC Installation Guidelines (BCN-A21041-204).
> - The maximum cable length (shielded cable) between the frequency inverter and motor required to maintain the limiting values of the second environment is 5m when using the internal radio interference suppression filter.
> - Make sure that the frequency inverter, if required (optional external) radio interference suppression filters and the motor are installed in compliance with generally recognised EMC installation regulations. It is not permitted to start up the device unless the EMC guidelines are complied with.

A.1.2 Low Voltage Directive

We have self-confirmed our inverters as products compliant to the Low Voltage Directive (conforming standard EN 50178) and place the CE mark on the inverters.

Outline of instructions

- If your application requires by installation standards an RCD (residual current device) as up stream protection please select according to DIN VDE 0100-530 as following:
  Single phase inverter type A or B
  Three phase inverter only type B.
  – Additionally, when selecting a residual current device (RCD), leakage current caused by the mains filter, the length of the shielded motor cable and the carrier frequency must be taken into consideration.
  – When connecting AC current using switches without a step function, brief asymmetrical loads may result in unwanted triggering of the residual current device (RCD). It is recommendable here to use a Type B residual current device (RCD) with delayed actuation or to switch on all three phases simultaneously using a main contactor.
- If you do not use a residual current operated protectice device, provide double or reinforced insulation between the inverter and other equipment, or put a transformer between the main power supply and inverter.
- Do not use an earth leakage current breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
- Wire the earth terminal independently. (Do not connect two or more cables to one terminal.)
- Use the cable sizes on *page 7* under the following conditions.
  – Ambient temperature: 40°C maximum
  If conditions are different from above, select appropriate wire according to EN60204 Appendix C TABLE 5.
- Use a tinned (plating should not include zinc) crimping terminal to connect the earth cable. When tightening the screw, be careful not to damage the threads.
- For use as a product compliant with the Low Voltage Directive, use PVC cable whose size is indicated on *page 7*.
- Use the moulded case circuit breaker and magnetic contactor which conform to the EN or IEC Standard.
- Use the inverter under the conditions of overvoltage category II (usable regardless of the earth condition of the power supply), overvoltage category III (usable with the earthed-neutral system power supply) and pollution degree 2 or lower specified in IEC664.
  – To use the inverter FR-F740 EC of 00770 or more (IP00) under the conditions of pollution degree 2, install it in the enclosure of IP 2X or higher.
  – To use the inverter FR-F740 EC under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher.
  – To use the inverter FR-F740 EC of 00620 or less (IP20) outside of an enclosure in the environment of pollution degree 2, fix a fan cover with fan cover fixing screws enclosed.

00083 to 00126   **00170 to 00380**   **00470, 00620**   **04320, 04810**   **05470 or more**
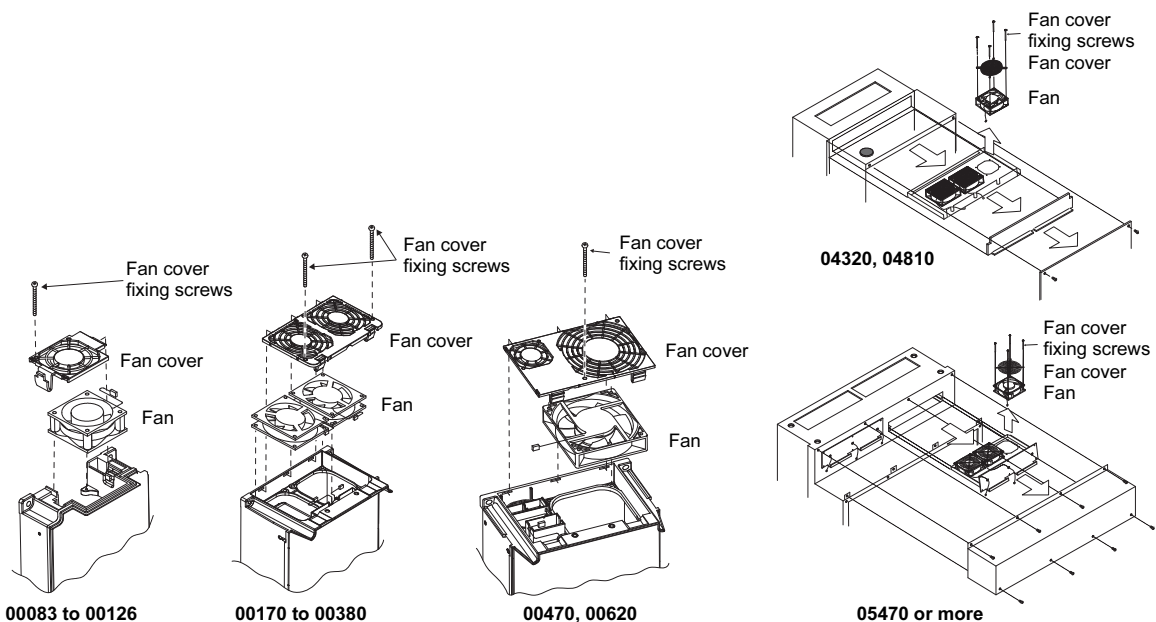
- On the input and output of the inverter, use cables of the type and size set forth in EN60204 Appendix C.
- The operating capacity of the relay outputs (terminal symbols A1, B1, C1, A2, B2, C2) should be 30VDC, 0.3A. (Relay outputs are basically isolated from the inverter internal circuit.)
- Control circuit terminals on *page 4* are safely isolated from the main circuit.

• Environment

	During Operation		In Storage	During Transportation
Ambient temperature	−10 °C to +40/+50°C	−10 °C to +30/+40°C	−20°C to +65°C	−20°C to +65°C
	The maximum temperature depends on the setting of the Pr. 570.			
Ambient humidity	90% RH or less	90% RH or less	90% RH or less	90% RH or less
Maximum altitude	1000m	1000m	1000m	10000m

Details are given in the technical information "Low Voltage Directive Conformance Guide" (BCN-A21041-203). Please contact your sales representative.

A.1.3 Machine directive

The frequency inverter itself is not a machine in the spirit of the EU machine directive. The start up of the frequency inverter in a machine is prohibited so long until it has been confirmed that the entire machine complies with the provisions of Directive 98/37/EC (from 29.12.2009 Machinery Directive 2006/42/EC).

A.2 Instructions for UL and cUL

(Conforming standard UL 508C, CSA C22.2 No.14)

A.2.1 General Precaution

The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/− with a meter etc., to avoid a hazard of electrical shock.

A.2.2 Environment

Before installation, check that the environment meets following specifications:

Environment	**Ambient temperature ***	−10°C to +50°C (+40°C for FR-F746) (non-freezing) for selected overload capability 150% (Pr. 570 = 0) −10°C to +40°C (+30°C for FR-F746) (non-freezing) for selected overload capability 120% (Pr. 570 = 1)	Enclosure x = Measurement position 5 cm Inverter 5 cm 5 cm
	Ambient humidity	90 % RH or less (non-condensing)	
	Storage temperature	−20 °C to +65 °C	
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)	
	Altitude	Maximum 1000 m above sea level	
	Vibration	5.9 m/s² or less at 10 to 55 Hz (directions of X, Y, Z axes), (2.9m/s² or less for the 04320 or more)	

* Temperature measured at a measurement position in an enclosure.

A.2.3 Installation

The inverter FR-F740 EC is UL-listed as a product for use in an enclosure. Design an enclosure so that the inverter ambient temperature, humidity and atmosphere satisfy the specifications. (Refer to *page 2*)

Wiring protection

For installation in the United States, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided in accordance with the National Electrical Code and any applicable provincial codes.

For installation in Canada, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided in accordance with the Canada Electrical Code and any applicable provincial codes.

FR-F740/746-□□□□□-EC		00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160
Rated fuse voltage [V]		480V or more													
Fuse maximum allowable rating [A] *	Without power factor improving reactor	6	10	15	20	30	40	70	80	90	110	150	175	200	250
	With power factor improving reactor	6	10	10	15	25	35	60	70	90	100	125	150	175	200
Molded case circuit breaker (MCCB) Maximum allowable rating [A] *		15	15	15	20	30	40	60	70	90	100	150	175	225	250

Class RK5 or Class T or Class L fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided.

FR-F740-□□□□□-EC		01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Rated fuse voltage [V]		500 V or more														
Fuse maximum allowable rating [A] *	Without power factor improving reactor	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	With power factor improving reactor	300	350	400	500	600	700	800	900	1000	1100	1200	1350	1500	1800	2000
Molded case circuit breaker (MCCB) Maximum allowable rating [A] *		450	500	600	800	900	1000	1200	1200	1200	1600	1600	2000	2000	2500	3000

* Maximum allowable rating by US National Electrical Code. Exact size must be chosen for each installation.

A.2.4 Wiring of the power supply and motor

For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL-listed copper wires (rated at 75°C) and round crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal maker.

A.2.5 Short circuit ratings

- 01160 or less
  Suitable for use in a circuit capable of delivering not more than 100kA rms symmetrical amperes, 528V maximum.
- 01800 or more
  Suitable for use in a circuit capable of delivering not more than 100kA rms symmetrical amperes, 550V maximum.

A.2.6 Motor overload protection

This inverter is certified as a motor overload protection device by UL.

When using the electronic thermal relay function as motor overload protection, set the rated motor current to Pr. 9 *Electronic thermal O/L relay.*

Electronic thermal relay function operation characteristic
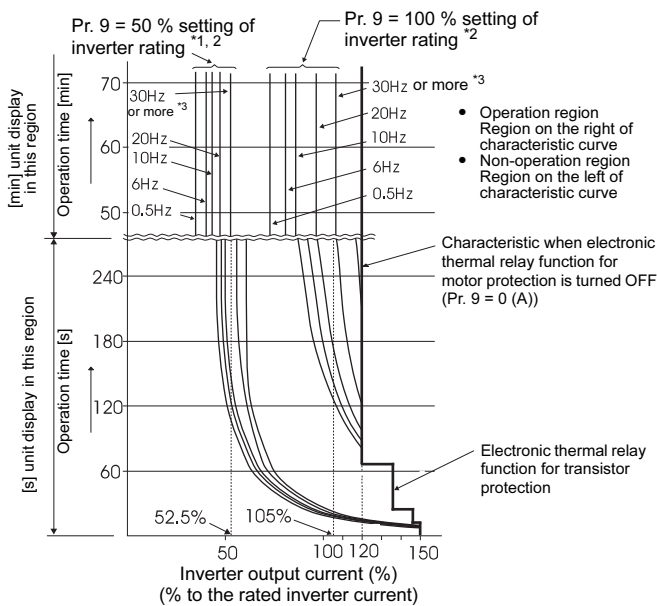
This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.

When using the Mitsubishi constant-torque motor set "1" in Pr. 71. This provides a 100 % continuous torque characteristic in the low-speed range. Set the rated current of the motor in Pr. 9.

[1] When 50% of the inverter rated output current (current value) is set in Pr. 9.

[2] The % value denotes the percentage to the inverter rated output current. It is not the percentage to the motor rated current.

[3] When you set the electronic thermal relay function dedicated to the Mitsubishi constant-torque motor, this characteristic curve applies to operation at 6 Hz or higher.

CAUTION

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-OFF.
- When using multiple motors with one inverter, or using a multi-pole motor or a specialized motor, provide an external thermal relay (OCR) between the inverter and motor. And for the setting of the thermal relay, add the line-to line leakage current 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.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.

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