MITSUBISHI ELECTRIC
FACTORY AUTOMATION

INVERTERS
DRIVE SYSTEMS

Quick start and reference guide

Installation /// Wiring /// Settings ///
Basic parameters /// Simple error codes ///
Regular maintenance ///

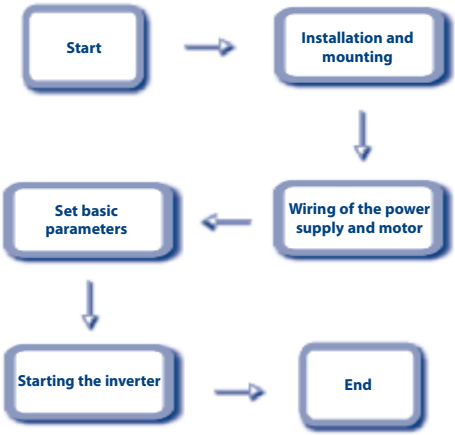
Drives to rely on

As a major global supplier of inverters, Mitsubishi has a reputation for using leading technology to produce the most reliable products. Did you know:

- Mitsubishi is the largest volume producer of inverters in the world.
- IMS, the International market research company, has voted Mitsubishi's inverters most reliable in the past years.
- Mitsubishi invests over 6 % of its turnover in research and development.

Contents

Start-up route map

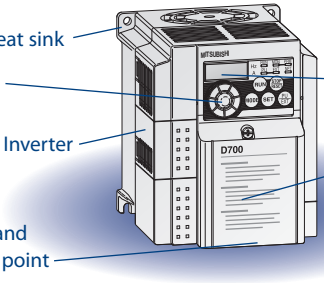


REGULAR MAINTENANCE

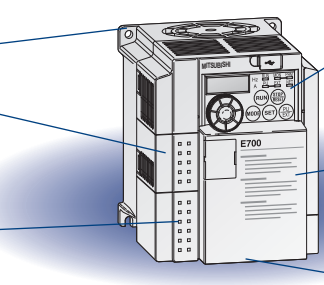
Once the Inverter has been set-up and commissioned a series of regular maintenance checks should be performed to monitor the Inverter and motor performance is still at an optimum.

Mitsubishi Inverter Ranges

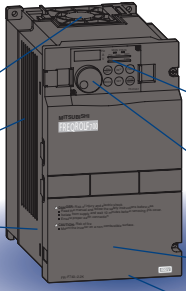
FR-D700



FR-E700



FR-F700
FR-A700



Replaceable fan

Aluminium heat sink

Main body of Inverter

Option and network boards are fitted underneath front cover

Programming and operation display – 7 segment

Quick setting control dial

Removable front cover

Power input and motor wiring point

Control Panels

FR-D700/E700 embedded control panel

FR-F700/A700 removable control panel

FR-DU07

Using the digital dial

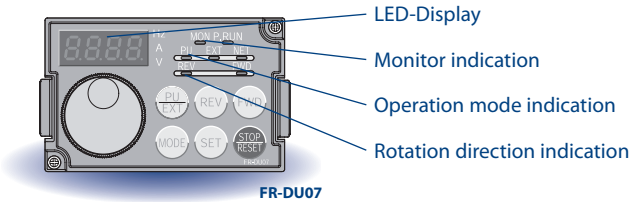
The digital setting dial allows quick and easy selection of parameters and the setting of parameter values.

The digital setting dial performs the function of the traditional ▲ ▼ keys as found on the FR-PU04 and FR-PU07 etc. All other buttons operate in a similar way to those found on traditional control units.

Using the setting key

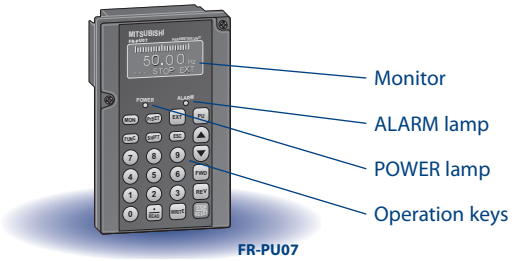
At power-on the inverter is put in the external operation mode. The operation mode can be changed between the PU and External operation mode by pressing the PU/EXT key or the EXT PU key (dependent on control panel model)

Standard FR-F700/A700 removable control panel



FR-DU07

Optional removable control panel



FR-PU07

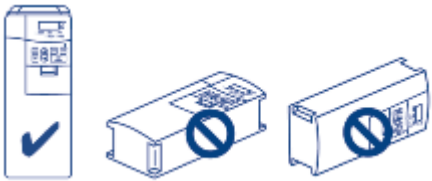
Optional comprehensive control panel for use with FR-D, FR-E, FR-F and FR-A series inverters. This unit can operate in 8 languages.

General Precautions

A major component of an Inverter's design is a capacitor bank.
The capacitors used can hold their charge for up to 15 minutes after power down. For your own protection from electrical shock please wait at least 15 minutes before checking the residual voltage level by placing a meter between terminals P/+ and N/- (resp. + and - for FR-D700 series). The voltage measured should not be more than 30 V DC.

General installation notes

- Install the inverter securely, using bolts, in a vertical plane



- Install the inverter on a non combustable surface

NOTE
For specific installation information please refer to the dedicated installation, hardware or operation manual for your inverter

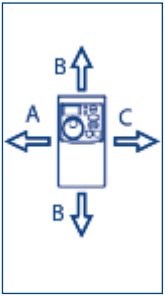
- Avoid installing the inverter in places where it will be exposed to direct sunlight, high temperatures or high humidity/moisture

Ambient temperature	-10 °C to +50 °C, 14 °F to 122 °F (non freezing) see note 1
Ambient humidity	90 % RH or less (non condensating)
Storage temperature	-20 °C to +65 °C (-4 °F to 149 °F) for short time e.g. during transit
Ambience	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
Altitude	Up to 1000 m (3280 ft). Above this level de-rate by 3 % for every 500 m (1690 ft) upto a maximum 2500 m (8202 ft) or 91 % of operation
Vibration	5.9 m/s² or less

- Leave enough clearance around the inverter to allow it to self-cool

	Model	A	B	C
D700	< 5.5 kW	1	10	1
	>= 5.5 kW	5	10	5
E700	< 5.5 kW	1	10	1
	>= 5.5 kW	5	10	5
F700/A700	<= 00083	1	10	10
		5	10	10
	>= 01800	10	20	20

Clearance in cm

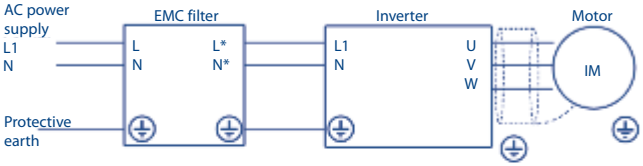


Note 1: This temperature may vary if the inverter is de-rated. Please refer to the full instruction manual for details.

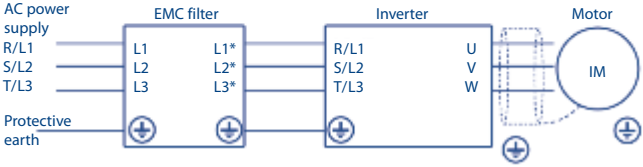
General Wiring

All electrical products have to comply with European EMC regulations, but an important part of keeping that compliance is to use good wiring practice. The wiring schematics used in this section are shown demonstrating some of these practises, i.e the use of good earthing, and where required the use of filters.

General wiring for single-phase inverter



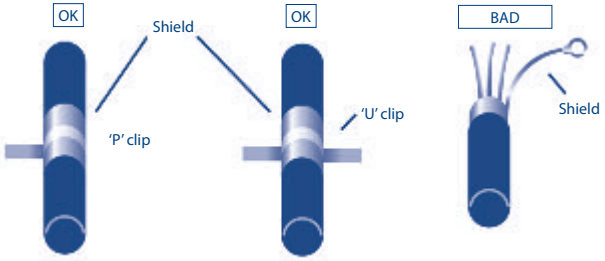
General wiring for three-phase inverter



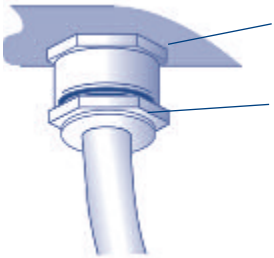
Good earthing practice

From both LVD and EMC and a safety point of view it is essential that earthing connections are always made in the most thorough way possible. See below for examples of good EMC grounding.

Using 'P' and 'U' clips for maximum surface contact and stable connection



Ensure that paint or other surface treatments are removed where a cable gland connects to the body of an enclosure.



Insulating material, such as paint, should be scraped away from the cable gland area

Cable gland
Metal cable gland designed for shield connection

Note regarding symbols used

When a value or parameter needs to be set, the following symbol has been used. For inverters without a digital setting dial, the value should be set using their ▲▼ keys.

Setting a frequency

1. Press the PU/EXT to put the inverter into PU operation – this is indicated by the PU LED being lit e.g.

2. Adjust the frequency value with the setting dial/keys. When the desired value is found press SET. The display will alternate between 'F' for frequency and the value set in Hz, e.g.

3. Press the RUN or FWD/REV keys to start the inverter/motor rotation

4. Press the STOP key to stop rotation

6.2 Setting a parameter

1. Ensure step #1 is completed as before.

2. Press the MODE key to put the inverter into parameter mode – the display will change like this

3. Select the desired parameter with the setting dial/keys.

When the desired parameter is found press the SET key to see the current value for the selected parameter, e.g.

To adjust the setting, move the setting dial/keys to the required value. To set the value, press the SET key, e.g.

The display will alternate between the parameter number and its new set value, e.g.

6.3 Monitoring operation

1. Ensure step #1 is completed.

2. Press the SET key, current being drawn by the motor in Amps and present voltage level in Volts, e.g.

Each inverter has a wide range of parameters that can be set to tune the inverter-motor system to the very best performance necessary, but to get an inverter working and to check it is installed correctly etc. you only need a handful of parameters.

Basic parameters for FR-D700 and FR-E700

Parameter	Factory setting	Description
0	6/4/3/2 % *1	Torque boost
1	120 Hz	Maximum frequency
2	0 Hz	Minimum frequency
3	50 Hz	Base frequency
4	50 Hz	Multi-speed setting (high speed)
5	30 Hz	Multi-speed setting (middle speed)
6	10 Hz	Multi-speed setting (low speed)
7	5/10 s *1	Acceleration time
8	5/10 s *1	Deceleration time
9	Rated inverter output current	Electronic thermal O/L relay
19	8888	Base frequency voltage
20	50 Hz	Acceleration/deceleration reference frequency
79	0	Operation mode selection

*1 – differ according to capacities

Basic parameters for FR-F700 and FR-A700

Parameter	Factory setting	Description
0	6/4/3/2/ 1.5/1 % *1	Torque boost
1	60/120 Hz	Maximum frequency
2	0 Hz	Minimum frequency
3	50 Hz	Base frequency
4	50 Hz	Multi-speed setting (high speed)
5	30 Hz	Multi-speed setting (middle speed)
6	10 Hz	Multi-speed setting (low speed)
7	5/15 s *1	Acceleration time
8	10/30 s *1	Deceleration time
9	Rated inverter output current	Electronic thermal O/L relay
19	8888	Base frequency voltage
20	50 Hz	Acceleration/deceleration reference frequency
79	0	Operation mode selection

* 1 – differ according to capacities, 1.5 % for FR-F700 only

Model	Error code
FR-D700, FR-E700, FR-F700, FR-A700	E.OC[]

Error
A) The output current of the inverter has reached or exceeded 200 % of the rated current.
B) The temperature of the main circuits of the inverter rises rapidly.

Remedy
Look for one of the following faults:
A) A short circuit or ground fault across the main outputs.
B) An excessive moment of inertia from the Load.
C) Acceleration or deceleration times are too short.
D) A restart during motor idling occurred.
E) A motor with an excessive capacity has been used.
F) Over heating occurred due to insufficient cooling (defective cooling fan or choked heat sink)

Model	Error code
FR-D700, FR-E700, FR-F700, FR-A700	E.OV[]

Error
The converter voltage has increased highly due to regenerative energy. The overvoltage limit was exceeded during acceleration, constant speed or deceleration.

Remedy
In most cases the protective function is activated due to a too short deceleration time preset causing a regenerative overload. Increase the deceleration time or connect an external brake unit. An overvoltage in the mains power supply activates this protective function.

The number in the parenthesis, indicates
[]= 1 – acceleration, 2 – constant speed, 3 – deceleration

Model	Error code
FR-D700, FR-E700, FR-F700, FR-A700	E.THM

Error

The electronic motor protection switch continually detects the motor current and the output frequency of the inverter.
If a self-cooling motor operates over a long period at low speed but high torque, the motor is thermally overloaded and the protective function is activated.
If several motors are operated by one inverter, use independent motor thermal protection.

Remedy

Decrease the motor load to avoid fault activation.

Check whether the performance range of the motor and inverter correspond.

Increase the thermal setting in Pr. 9

An inverter is a static unit mainly consisting of semiconductor devices processing high voltages and currents. Daily inspection should be performed to prevent faults from occuring due to adverse effects of the operating environment and to monitor the service life of the inverter.
Other specific inspections should be carried out periodically.

General

- Check there is no change in the ambient environment and that it remains within the specified levels (see installation & mounting)
- Check for unusual vibration and audible noise
- Check that the main circuit voltages are normal – measure across inverter terminals R/L1, S/L2 and T/L3 (values should be in accordance with those specified in the specific product manual)

Cooling system

- Check the cooling fan (where fitted) for unusual vibration and noise – turn by hand with the power off and perform a visual check

Display

- Check for blown LED lamps
- Display-meter: check that readings of the current and voltage meters are within specified limits

Motor

- Check for unusual vibration and noise
- Check for unusual odour

Don't guess!
If you do not know or you are not sure check the manual or ask!

Get the right voltage!
Always check the voltage requirements of the inverter before wiring it to the supply. A simple check of the model name will identify the required input voltage.

40 = 400 V, three phase ... e.g. FR-F740
20S = 200 V, single phase ... e.g. FR-D720S

Don't forget to connect the earth!
It's for your safety and it's good EMC practice

Installing brake units
Some form of braking may be needed to help the application's performance. In these cases please be aware of the following "brake" configuration rules.

- FR-D700/E700 series – A brake resistor can be fitted (not for FR-D720S-008/014). Alternatively a full brake unit can be added.
- FR-F700 series – A full brake unit can be added.
- FR-A700 series – A brake transistor and low duty resistor is included on units up to 00250. Transistors are fitted from 00310 to 00620 activated by an additional resistor. A full brake unit can be added to any size.

Mitsubishi Electric makes all possible efforts to provide only the highest quality automation products, meeting appropriate European legislation and requirements for Safety, EMC and hazardous materials etc. Before using any Mitsubishi automation product, installers and users should read the appropriate related installation, hardware, users and operation manuals where available.

IMPORTANT SAFETY WARNINGS

- You should only be installing electrical equipment if you have been trained to do so.
- All installations should be made in accordance to the specific manufacturers installation, hardware and operation manuals and be compliant to local wiring rules and regulations.
- If you have any doubt about how to install and commission an inverter – stop immediately and seek advice from a trained and qualified installer.

My drive settings

Note: .....

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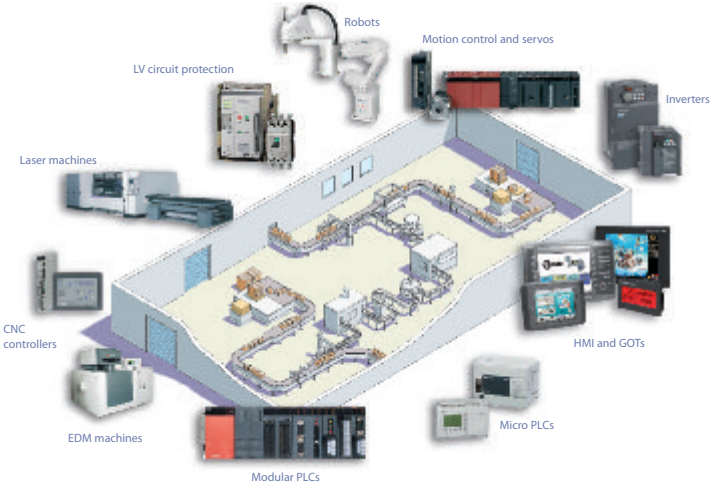
Parameter	Description	Setting

A world of automation solutions



Mitsubishi offer a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

A name to trust

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation represents space development, transportation, semiconductors, energy systems, communications and information processing, audio visual equipment, home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

Global **Partner.** Local **Friend.**

MITSUBISHI ELECTRIC
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