

Installation Manual for Frequency Inverters FR-D700 EC

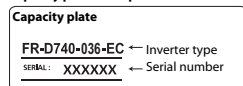
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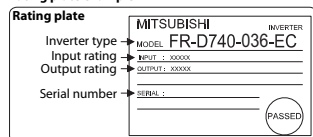
FR - D740 - 036 - EC

Symbol	Voltage Class	Symbol	Type number
D720S	Single-phase 200 V class	008 to 160	3-digit display
D740	Three-phase 400 V class		

Capacity plate example



Rating plate example



1 About this Document

This document is the original mounting instruction.

1.1 Documentations for the FR-D700 Inverter

These manuals describe the mounting of the FR-D700 frequency inverter. Mounting of any additional options is described in separated manuals. The installation, configuration and commissioning of the FR-D700 inverter are described in the "Inverter FR-D700 Instruction Manual" and "Inverter FR-D700 Installation Guideline". This document provides guidance on the safe use of the FR-D700. Detailed technical information not included here can be found in manuals referred to in this document. These can be obtained free of charge from our website at www.mitsubishi-automation.com.

The following manuals contain further information about the inverter:

- Instruction Manual of the frequency inverter FR-D700, Art.no.: 226857 (Document No. IB-0600353ENG)
- Installation Guideline of the frequency inverter FR-D700, Art.no.: 213451 (Document No. IB-0600352ENG)
- Transistorized Inverter FR-D700 Safety Stop Instructional Manual, Document No. BCN-A211508-000
- Beginners Manual of the Frequency Inverters FR-D700, FR-E700, FR-F700, and FR-A700, Art.no.: 203603
- Manual for Frequency Inverters and EMC, Art.no.: 061000

In addition mounting protective devices also requires specific technical skills which are not detailed in this documentation.


1.2 Function of this Document

These manuals instruct the technical staff of the machine manufacturer and/or of the machine operator on the safe mounting of the FR-D700 inverter. These manuals do not provide manuals for operating the machine in which the safety control system is, or will be, integrated. Information of this kind will be found in the operating manuals for the machine.


2 Safety Instructions

This chapter deals with your own safety and the safety of the equipment operators. Please read this chapter carefully before beginning with the mounting work.

In this manual special warnings that are important for the proper and safe use of the products are clearly identified as follows:



DANGER:
*Personnel health and injury warnings.
Failure to observe the precautions described here can result in serious health and injury hazards.*



CAUTION:
*Equipment and property damage warnings.
Failure to observe the precautions described here can result in serious damage to the equipment or other property.*

2.1 Safety Persons

The FR-D700 inverter may only be mounted by safety persons. Safety persons are defined as persons who ...

- have undergone the appropriate technical training. Please note appropriate technical training is available from your local Mitsubishi Electric office. Please contact your local office for locations and schedules.
- have been instructed by the responsible machine operator in the operation of the machine and the current valid safety guidelines and
- have access to the operating manuals of the FR-D700 inverter and have read and familiarised themselves with them and
- have access to the operating manuals for the protective devices (e.g. light curtain) connected to the safety control system and have read and familiarised themselves with them.

2.2 Applications of the Device

The FR-D700 is a variable speed drive, which can be used in safety installations. The FR-D700 series inverter includes the safety functionality "Safe Torque Off", which can be used

- in accordance with EN954-1 Category 3 IEC60204-1 Stop category 0


For any use in safety installation we refer to the Transistorized Inverter FR-D700 Safety stop instructional manual.

The degree of safety actually attained depends on the external circuit, the realisation of the wiring, the parameter configuration, the choice of the pick-ups and their location at the machine. Opto-electronic and tactile safety sensors (e.g. light curtains, laser scanners, safety switches, sensors, emergency-stop buttons) are connected to the modular safety control system and are linked logically. The corresponding actuators of the machines or systems can be switched off safely via the switching outputs of the safety control system.

2.3 Correct Use

The FR-D700 inverter may only be used within specific operating limits (voltage, temperature, etc., refer to the technical data and to the name plate on the device). It may only be used by specialist personnel and only at the machine at which it was mounted and initially commissioned by specialist personnel in accordance with the "Inverter FR-D700 Instruction Manual", "Inverter FR-D700 Installation Guideline" and "Transistorized Inverter FR-D700 Safety Stop Instructional Manual".

Mitsubishi Electric Co. accepts no claims for liability if the equipment is used in any other way or if modifications are made to the device, even in the context of mounting and installation.



DANGER

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 + and - with a meter etc., to avoid a hazard of electrical shock.

2.3.1 For UL/CSA Applications (UL 508C, CSA C22.2 No.14)

This inverter is designed to comply with UL 508C and CSA C22.2 No.14 standard. For further details for complying with UL/CUL standard please refer to the Installation Guideline of the inverter FR-D700-EC.


2.4 General Protective Notes and Protective Measures

Observe the protective notes and measures!

Please observe the following items in order to ensure proper use of the FR-D700 inverter.

- When mounting, installing and using the FR-D700 inverter, observe the standards and directives applicable in your country.
- The national rules and regulations apply to the installation, use and periodic technical inspection of the FR-D700, in particular:
 - Machinery Directive 98/37/EC (from 29.12.2009 Machinery Directive 2006/42/EC),
 - EMC Directive 2004/108/EC
 - Provision and Use of Work Equipment Directive 89/655/EC
 - Low-Voltage Directive 2006/95/EC
 - Work safety regulations/safety rules.
- Manufacturers and owners of the machine on which a FR-D700 inverter is used are responsible for obtaining and observing all applicable safety regulations and rules.
- It is imperative that the notices, in particular the test notices of the manuals be observed.
- The tests must be carried out by specialised personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time by third parties.


Electric Shock Prevention



DANGER

- *While power is on or when the inverter is running, do not open the front cover or wiring 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 (grounded). Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards)*
- *Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.*
- *Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.*
- *Perform setting dial and key operations with dry hands to prevent an electric shock. Otherwise you may get an electric shock.*
- *Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.*
- *Do not replace the cooling fan while power is on. It is dangerous to replace the cooling fan while power is on.*
- *Do not touch the printed circuit board with wet hands. You may get an electric shock.*
- *When measuring the main circuit capacitor capacity, the DC voltage is applied to the motor for 1 s at powering off. Never touch the motor terminal, etc. right after powering off to prevent 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.*
- *When using a brake resistor, make up a sequence that will turn off power when an alarm signal is output. Otherwise, the brake resistor may excessively overheat due to damage of the brake transistor and such, causing a fire.*
- *Do not connect a resistor directly to the DC terminals +, -. 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
<ul style="list-style-type: none"> ● 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
<ul style="list-style-type: none"> ● Transport the product using the correct method that corresponds to the weight. Failure to observe this could lead to injuries. ● 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 environmental conditions listed in chapter 6. Otherwise, the inverter may be damaged


Wiring

⚠ CAUTION
<ul style="list-style-type: none"> ● 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
<p>Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.</p>

Operation

⚠ DANGER
<ul style="list-style-type: none"> ● When you have chosen the retry function, stay away from the equipment as it will restart suddenly after an alarm stop. ● Since pressing  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
<ul style="list-style-type: none"> ● 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. ● When a 400 V class motor is inverter-driven, please use an insulation-enhanced motor or measures taken to suppress surge voltages. Surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor. ● When parameter clear or all clear is performed, 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
<ul style="list-style-type: none"> ● 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
<p>Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.</p>

It is recommended to make the following checks periodically:

- Check for loose screws in the terminal block. Retighten any loose screws.
- Check for dust accumulation on the inverter. Clean the heat sink and the cooling fan of the inverter.
- Check for unusual noise generated from the inverter. Retighten installation screw.
- Check for the operation condition. Keep the operation condition of inverter as written in the manual.

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 this Installation Guideline when operating the inverter.

NOTES

- The FR-D700 complies to the EMC Directive 2004/108/EC and the relevant requirements of EN61800-3:2004 (Second environment/PDS category "C3"). The FR-D700 is therefore only suitable for use in an industrial environment and not for private use. If you want to use FR-D700 inverter in first environment you will have to add an external RFI filter.
- The FR-D700 complies to the Low Voltage Directive 2006 and the relevant requirements of EN61800-5-1:2007.

2.5 Disposal

Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste-disposal regulations (e.g. European Waste Code 16 02 14).

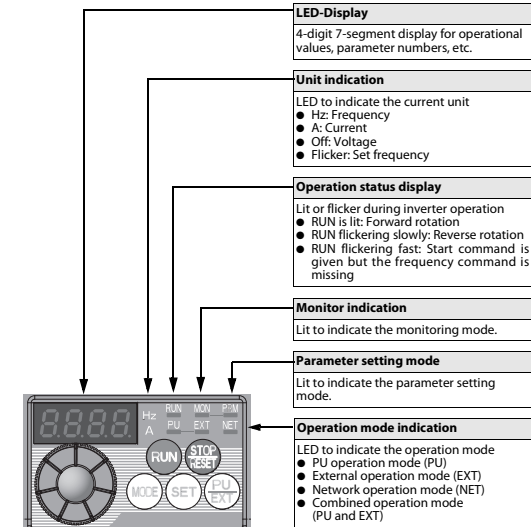
3 Product description

3.1 FR-D700 inverter

A FR-D700 frequency inverter is a device that converts the fixed voltage and frequency of the mains power supply into a variable voltage with a variable frequency. It is installed between the mains supply and the motor and makes continuously-variable speed adjustment possible.

The adjustable frequency AC drive generates the rotational energy of the motor, which in turn generates the torque of the motor. It controls induction motors for a variety of automation applications such as air conditioning, conveyor, washing machine, machine tools, lift machines, etc.

3.2 Operation Panel

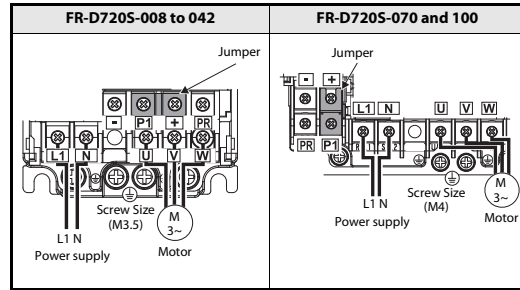


NOTE

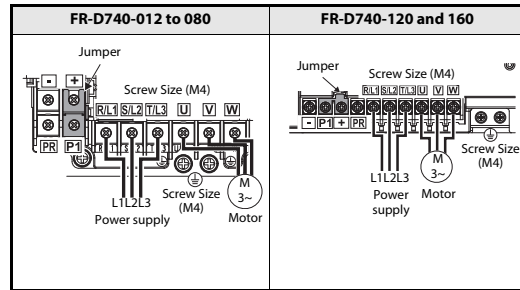
For detailed description of the operation panel please refer to the Instruction Manual of the inverter FR-D700.

3.3 Main circuit terminal specification

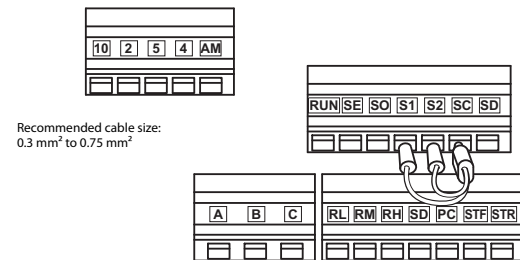
Single-phase 200 V class



Three-phase 400 V class



3.4 Control circuit terminal diagram



Recommended cable size:
0.3 mm² to 0.75 mm²

3.4.1 Terminal assignment

Input signal

Type	Terminal Symbol	Terminal Name
Contact input	STF	Forward rotation start
	STR	Reverse rotation start
	RH, RM, RL	Multi-speed selection
Reference point	SD	Contact input common (sink) 24 V DC power supply common
	PC	24 V DC power supply, contact input common (source)
Frequency setting	10	Frequency setting power supply
	2	Frequency setting (voltage)
	4	Frequency setting (current)
	5	Frequency setting common

Output signal

Type	Terminal Symbol	Terminal Name
Relay	A, B, C	Relay output (alarm output)
Open collector	RUN	Inverter running
	SE	Open collector output common
Analog output	AM	Analog voltage output

Communication

Type	Terminal Symbol	Terminal Name
RS485	—	PU connector

Safety stop signal

Terminal Symbol	Terminal Name
S1	Safe stop input (Channel 1)
S2	Safe stop input (Channel 2)
SO	Safe monitor output (open collector output)
SC	Safe stop input terminal common

NOTE

For detailed description and reference on any input or output signal refer to *Instruction Manual and the and Safety Stop Instructional Manual of the inverter FR-D700.*

4 Mounting/Dismantling

DANGER

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 + and - with a meter etc., to avoid a hazard of electrical shock.

4.1 Environment

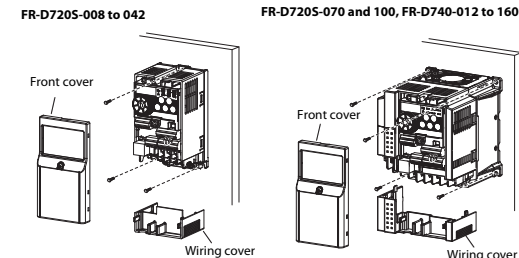
Before installation, check that the environment meets the specifications listed in chapter 6.

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.

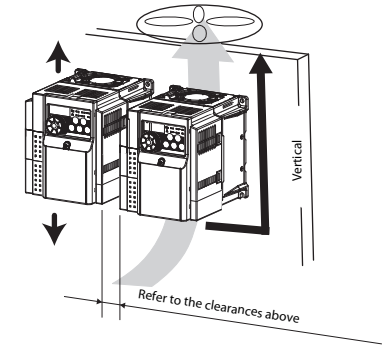
4.2 Installation of the Inverter

Enclosure surface mounting
Remove the front cover and wiring cover to fix the inverter to the surface.



NOTES

- When encasing multiple inverters, install them in parallel and leave clearance as a cooling measure.
- When using the inverters at the ambient temperature of 40 °C or less, the inverters can be installed closely attached (0 cm clearance). When ambient temperature exceeds 40 °C, clearances between the inverter should be 1 cm or more (5 cm or more for the FR-D740-120 or more).
- Install the inverter vertically.



5 Electrical installation

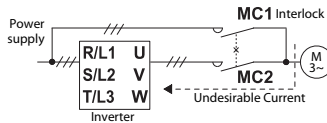
The FR-D700 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.
Before starting operation, always recheck the following items.

- 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 size to make a voltage drop 2 % maximum. If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
- The overall wiring length should be 500 m maximum. 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.
- 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. Install an 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. For EMC correct installation refer to the Manual for Frequency Inverters and EMC.
- 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. Always use the start signal (ON/OFF of STF and STR signals) to start/stop the inverter.
- Across + and PR terminals, connect only an external regenerative brake discharge resistor. Do not connect a mechanical brake. The brake resistor can not be connected to the FR-D720S-008 and 014. Leave terminals + and PR open. Also, never short between + and PR.
- Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits. Application of a voltage higher than the permissible voltage 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 10-5.

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



- 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.
- 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 shield cables as signal cables.
 - Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).

6 Specifications

Category of Safe Torque of Function:

The FR-D700 adjustable frequency AC drive family is suitable for emergency stop according to EN 60204-1, stop category 0 within safety related applications according to EN 954-1 up to safety category 3.

Environment

Before installation, check that the environment meets following specifications.

Ambient temperature	-10 °C to +50 °C (non-freezing)
Ambient humidity	90 % RH or less (non-condensing)
Storage temperature	-20 °C to +65 °C ^①
Atmosphere	Free from corrosive and explosive gases, free from dust and dirt
Maximum altitude	Maximum 1000 m above sea level for standard operation. After that derate by 3 % for every extra 500 m up to 2500 m (91 %).
Vibration	5.9 m/s ² or less at 10 to 55Hz (directions of X, Y, Z axes)

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

Single-phase 200 V power supply

FR-D720S-□□□-EC	008	014	025	042	070	100	
Rated motor capacity [kW] ^①	0.1	0.2	0.4	0.75	1.5	2.2	
Output	Output capacity [kVA] ^②	0.3	0.6	1.0	1.7	2.8	4.0
	Rated current [A]	0.8	1.4	2.5	4.2	7.0	10.0
	Overload current rating ^③	200 % of rated motor capacity for 0.5 s; 150 % for 60 s					
	Voltage ^④	3-phase AC, 0 V to power supply voltage					
Power supply	Power supply voltage	1-phase, 200–240 V AC					
	Voltage range	170–264 V AC at 50/60 Hz					
	Power supply frequency	50/60 Hz ± 5 %					
	Rated input capacity [kVA] ^⑤	0.5	0.9	1.5	2.3	4.0	5.2
Protective structure	IP20						
Cooling system	Self cooling			Forced air cooling			
Weight [kg]	0.5	0.5	0.9	1.1	1.5	2.0	

- ^① The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
- ^② The rated output capacity indicated assumes that the output voltage is 230 V.
- ^③ The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.
- ^④ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ^⑤ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

Three-phase 400V power supply

FR-D740-□□□-EC	012	022	036	050	080	120	160	
Rated motor capacity [kW] ^①	0.4	0.75	1.5	2.2	3.7	5.5	7.5	
Output	Output capacity [kVA] ^②	0.9	1.7	2.7	3.8	6.1	9.1	12.2
	Rated current [A] ^③	1.2 (1.4)	2.2 (2.6)	3.6 (4.3)	5.0 (6.0)	8.0 (9.6)	12.0 (14.4)	16.0 (19.2)
	Overload current rating ^④	200 % of rated motor capacity for 0.5 s; 150 % for 60 s						
	Voltage ^⑤	3-phase AC, 0V to power supply voltage						
Power supply	Power supply voltage	3-phase, 380–480 V AC						
	Voltage range	325–528 V AC at 50/60 Hz						
	Power supply frequency	50/60 Hz ± 5 %						
	Rated input capacity [kVA] ^⑥	1.5	2.5	4.5	5.5	9.5	12	17
Protective structure	IP20							
Cooling system	Self cooling			Forced air cooling				
Weight [kg]	1.3	1.3	1.4	1.5	1.5	3.3	3.3	

- ^① The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
- ^② The rated output capacity indicated assumes that the output voltage is 440 V.
- ^③ When operating the inverter with an ambient temperature of 40 °C, the rated output current is the value in parenthesis.
- ^④ The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current (ambient temperature of 50 °C). For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.
- ^⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- ^⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

6.1 Cables and wiring length

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

Single-phase 200 V class (when input power supply is 220 V)

Applicable Inverter Type	Terminal Screw Size ^④	Tightening Torque [Nm]	Crimping Terminal	
			L1, N	U, V, W
FR-D720S-008 to 042	M3.5	1.2	2-3.5	2-3.5
FR-D720S-070	M4	1.5	2-4	2-4
FR-D720S-100	M4	1.5	5.5-4	2-4

Applicable Inverter Type	Cable Sizes							
	HIV [mm ²] ^①			AWG ^②		PVC [mm ²] ^③		
	L1, N	U, V, W	Earth Cable Gauge	L1, N	U, V, W	L1, N	U, V, W	Earth Cable Gauge
FR-D720S-008 to 042	2	2	2	14	14	2.5	2.5	2.5
FR-D720S-070	2	2	2	14	14	2.5	2.5	2.5
FR-D720S-100	3.5	2	3.5	12	14	4	2.5	4

Three-phase 400 V class (when input power supply is 440 V)

Applicable Inverter Type	Terminal Screw Size ^④	Tightening Torque [Nm]	Crimping Terminal	
			R/L1, S/L2, T/L3	U, V, W
FR-D740-012 to 080	M4	1.5	2-4	2-4
FR-D740-120	M4	1.5	2-4	2-4
FR-D740-160	M4	1.5	5.5-4	5.5-4

Applicable Inverter Type	Cable Sizes							
	HIV [mm ²] ^①			AWG ^②		PVC [mm ²] ^③		
	R/L1, S/L2, T/L3	U, V, W	Earth Cable Gauge	R/L1, S/L2, T/L3	U, V, W	Earth Cable Gauge		
FR-D740-012 to 080	2	2	2	14	14	2.5	2.5	2.5
FR-D740-120	3.5	2	3.5	12	14	4	2.5	4
FR-D740-160	3.5	3.5	3.5	12	12	4	4	4

- ^① The recommended cable size is that of the HIV cable (600 V 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 20 m or less.
- ^② 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 20 m or less. (Selection example for use mainly in the United States.)
- ^③ 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 20 m or less. (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, PR, +, -, P1 and a screw for earthing. (For single-phase power input, the terminal screw size indicates the size of terminal screw for L1, N, U, V, W, and a screw for earthing (grounding).)

NOTES

- Tighten the terminal screw to the specified torque. A screw that has been tightened too loosely can cause a short circuit or malfunction. A screw that has been tightened 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.