MITSUBISHI ELECTRIC
Changes for the Better

Automating the World

FACTORY AUTOMATION

INVERTER
FR-D800 Series

D800

This evolution paves the way for our future.

Automating the World

Our Factory Automation business is focused on "Automating the World" to make it a better, more sustainable environment supporting manufacturing and society, celebrating diversity and contributing towards an active and fulfilling role.

SUSTAINABLE DEVELOPMENT GOALS

The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

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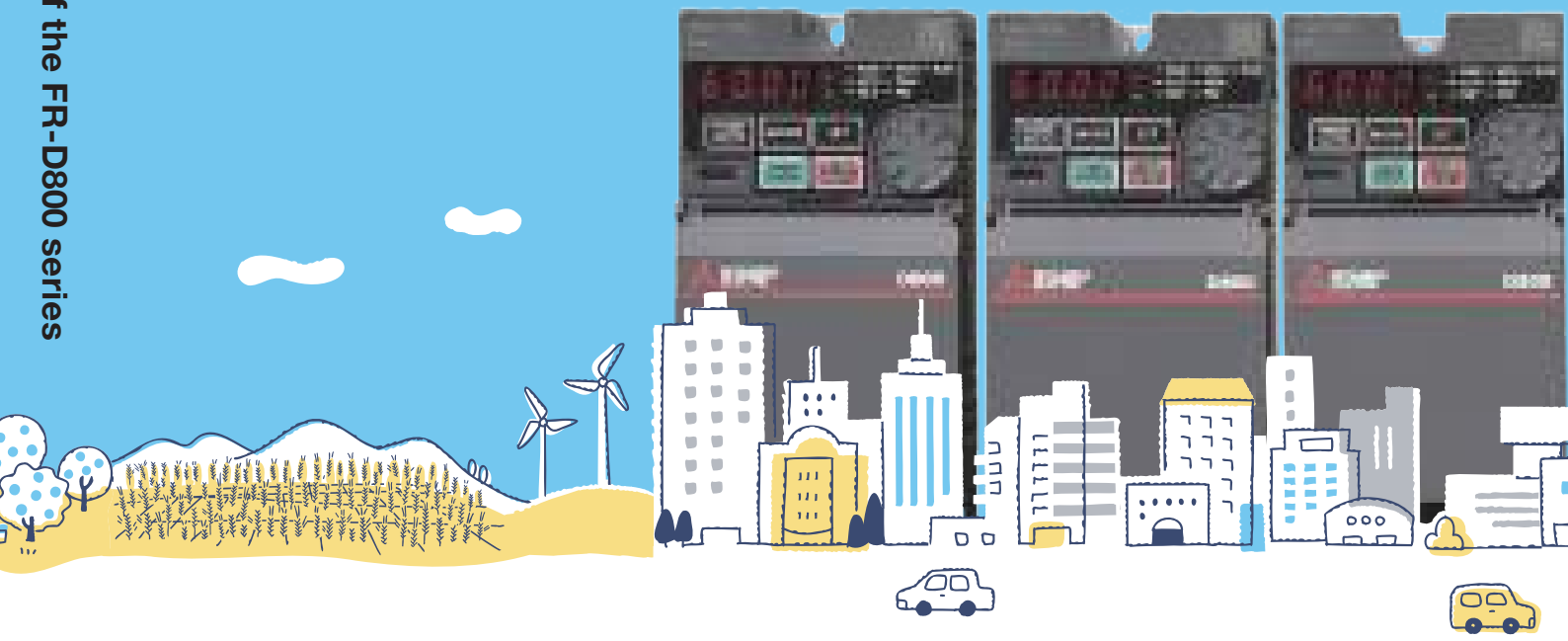
This evolution paves the way for our future.



D800

Inherits the advantages of the FR-D700 series.
Keeps the smallest class body,
becomes further easier to choose
and easier to use.
Environmentally friendly
"next-generation compact inverters"
help create the sustainable future.

Product video

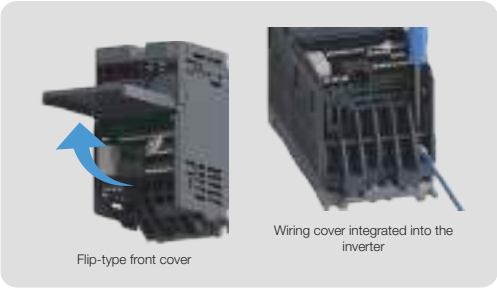
Features of the FR-D800 Series

The FR-D800 series inherits the advantages of the FR-D700 series.
While keeping the smallest class body, it becomes easier to choose, easier to use, and environmentally friendly.

Quest for ease of use

Quicker wiring

Improves wiring work efficiency with the flip-type front cover and the wiring cover integrated into the inverter.



Revolution in ease of selection

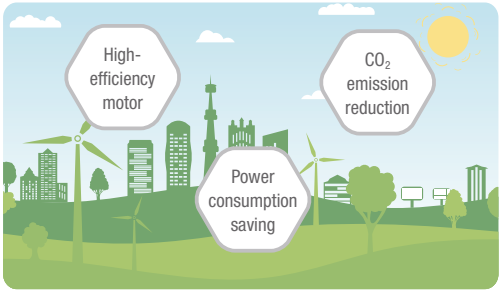
Easy to use, compact FR-D800 inverter

Inherits and enhances the functions of the FR-D700 and FR-F700PJ series.
For easy operation with compact body, just choose the FR-D800 inverter.

Advanced environmental performance

Eco-friendly choice

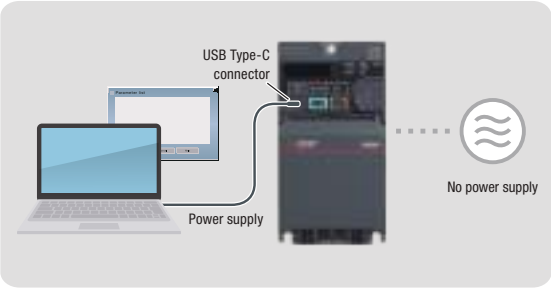
- Helps reduce the running cost and CO_2 emission by using high-efficiency motors and reducing the standby power.
- The CO_2 emission reduction amount can be monitored.



User Friendly

Settings using power supplied from the computer

With the power supplied from the computer (USB bus power connection)*1, parameters can be set*2. You can set parameters straight out of the box.

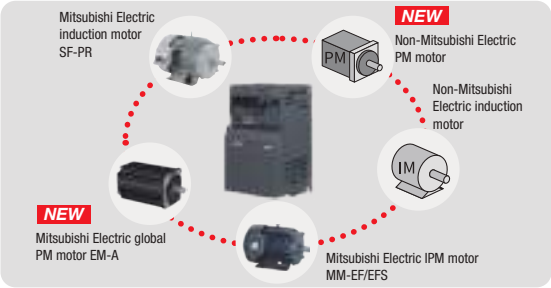


*1: The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.
*2: Use FR Configurator2 to set parameters.

Simple to Adapt

Various motor controls by the FR-D800 inverter

Not only induction motors, PM motors are also supported. As a single inverter supports various control methods, inverters need not be prepared according to the motor type.

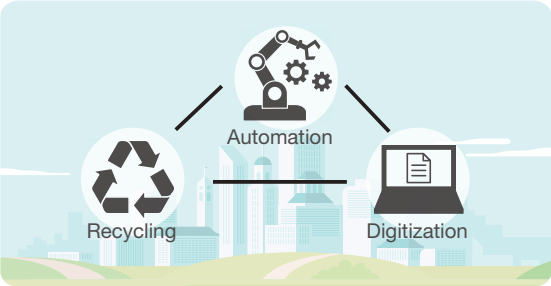


Eco-Friendly

Responsibility of manufacturing

Our activities to reduce the environmental load are as follows.

- Uses recycled materials such as resin.
- Reduces paper usage and promotes digitization.
- Promotes automation of the product production and packaging.
- Reduces the material usage by downsizing the products.



Inverters are used for various applications in our lives and play important roles.

Industry	Major system	Major user benefits	Description	Application example	Refer to page
Food and beverage	Conveyor/slicer/ fan/mixer/pump	System downsizing	A compact body contributes to system downsizing.	—	20
		Continuing the operation during a trouble	Even if an instantaneous power failure occurs, the system can be restarted smoothly after the power is restored.	CASE 03	31
		Energy saving	Speed control can save more energy compared to the commercial power supply operation.	—	—
Warehouse	Horizontal/vertical conveyor	Enabling quick downward operation	High regenerative braking operation is possible with the inverter and brake resistor.	CASE 02	21, 22
		Stable transfer operation	The shock at the start and stop of the machine is reduced.	CASE 01	—
		Operation capable of handling heavy objects	A stable operation is possible by the high-torque power in a low-speed range.	CASE 01	22
Livestock production and agriculture	Pump/fan	Early detection of signs of abnormalities	Signs of load failure can be detected early before systems fail.	CASE 05	29
		Providing an optimal environment in the facility	Maintaining a constant temperature in the facility provides a livestock-friendly environment.	CASE 06	—
		Energy saving	Speed control can save more energy compared to the commercial power supply operation.	—	—
Textile industry	Conveyor/pump/ fan/drier/ winding machine	Functions specialized for each system	Equipment-specific functions, such as control of the winding drums of spinning/wiring machines, are provided.	CASE 10	—
		Energy saving	Speed control can save more energy compared to the commercial power supply operation.	—	—

Industry	Major system	Major user benefits	Description	Application example	Refer to page
Everyday devices	Washing machine / platform screen door /car washers / multi-storied parking lot (turntable)	System downsizing	A compact body contributes to system downsizing.	—	20
		Supporting various speed commands	The speed command suited to each system can be input.	—	23
Crane	Small hoist	System downsizing	A compact body helps minimize the installation area.	—	20
		Slippage prevention for lifting	High-torque power in the low-speed range prevents slippage.	—	23
		Enabling quick downward operation	High regenerative braking operation is possible with the inverter and brake resistor.	CASE 02	21, 22
Metal processing machine	CNC spindle machine	High-speed operation	High machining accuracy and improved work efficiency are achieved through high-speed rotation of over 400 Hz.	—	23
Air conditioning system	Air handling unit fan / rooftop unit	Providing optimal cooling and heating	The speed adjustment of fans in air conditioning systems contributes to the creation of optimal air conditioning systems.	CASE 06	—
		Energy saving	Eco-friendly operation is achieved with a high-efficiency motor drive.	—	26

Application Examples

CASE 01 Conveyors

Problem

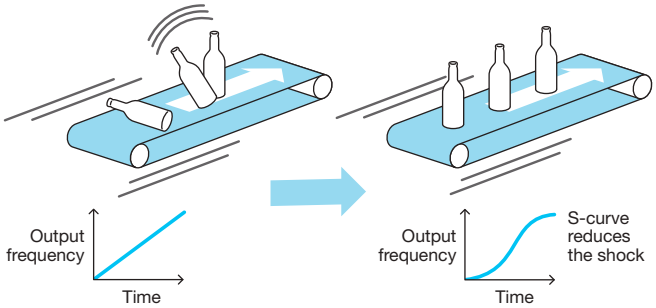
The load may fall at the start of conveyor movement.

Solution

S-curve acceleration/deceleration reduces shock at the start and during deceleration stop, preventing the load from collapsing.

Tips

This can be achieved by setting "2" in **Pr.29 (Acceleration/deceleration pattern selection)**.



Problem

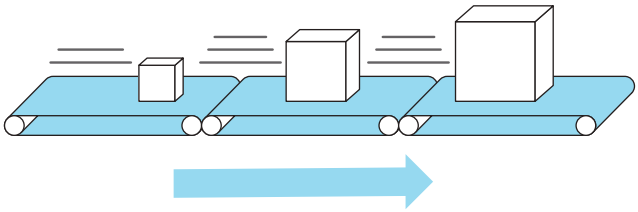
It is difficult to maintain stable transportation of a variety of loads, ranging from heavy to light.

Solution

Advanced magnetic flux vector control enables high torque power in the low-speed range, allowing stable transportation for a variety of loads.

Tips

Set **Pr.80 (Motor capacity)**, **Pr.81 (Number of motor poles)**, **Pr.83 (Rated motor voltage)**, and **Pr.84 (Rated motor frequency)** according to the motor specifications, and set "20" in **Pr.800 (Control mode selection)** to use this function.



Vertical transfer systems CASE 02

Problem

Overvoltage alarms need to be addressed when loads are lowered.

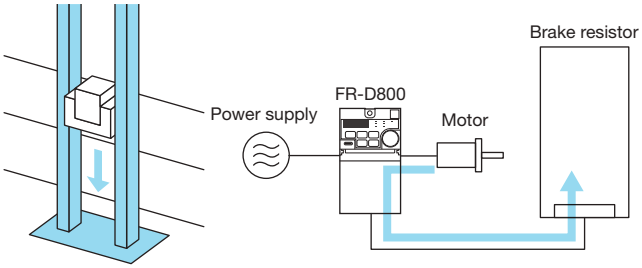
Solution

An overvoltage alarm may occur due to regenerative power generated when a load is lowered. For the 0.4K or higher inverter with a built-in brake transistor, using the high-duty brake resistor (FR-ABR) improves power regeneration capability. This not only mitigates wiring and space requirements but also reduces costs.

* Depending on the amount and frequency of regenerative power, the brake unit (FR-BU2) or the multifunction regeneration converter (FR-XC) may be used.

Tips

Set "1" in **Pr.30 (Regenerative function selection)** and "10% (0.4K or higher)" in **Pr.70 (Special regenerative brake duty)** to use this function.



Pumps CASE 03

Problem

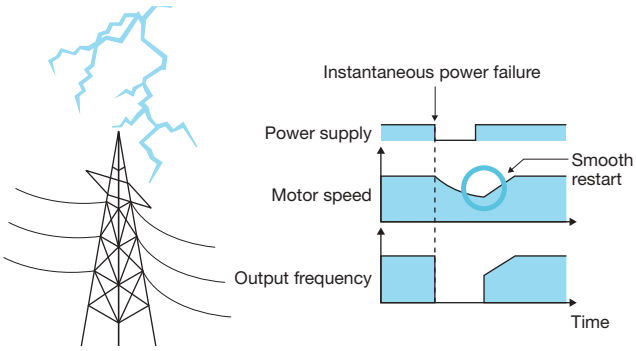
The system needs quick recovery after power is restored following an instantaneous power failure during operation.

Solution

Automatic restart after an instantaneous power failure enables quick recovery once power is restored, allowing the system to return to its original speed after the power restoration.

Tips

This can be achieved by setting "0" in **Pr.57 (Restart coasting time)**.



CASE 04 Restaurant kitchen fans

Problem

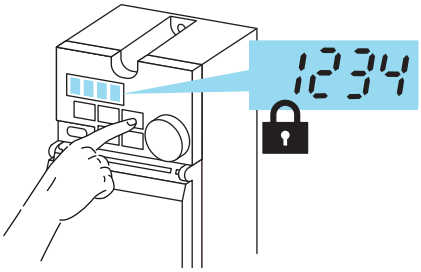
Accidental changes to the inverter settings must be prevented.

Solution

The password function prevents parameter settings from being accidentally changed. Setting a 4-digit password can restrict parameter reading and writing.

Tips

To enable the password function, set a value other than "9999" in **Pr.296 (Password lock level)** and set a 4-digit password in **Pr.297 (Password lock/unlock)**.



CASE 05 Greenhouse fans

Problem

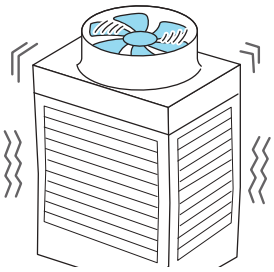
Signs of failure must be detected early to prevent systems or facilities from failing.

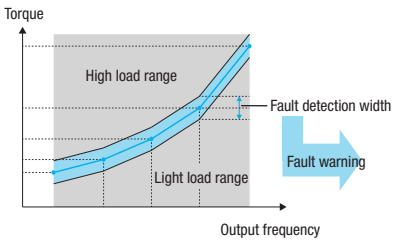
Solution

The load characteristic measurement function enables a warning or error output when the current load status is out of the normal range. Signs of mechanical faults such as filter clogging or worn fan blades can be easily detected, allowing for proactive actions to be taken.

Tips

This can be achieved by setting the **load characteristic measurement function (Pr.1480 to Pr.1492)**.





Livestock facility fans

CASE 06

Problem

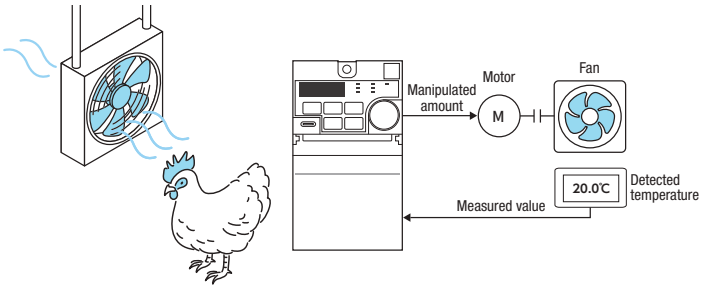
The temperature in the poultry house must be kept constant.

Solution

The PID function automatically adjusts the fan speed based on real-time measurements from temperature sensors. This ensures a stable indoor environment, creating optimal conditions for livestock production. In addition, the efficient fan speed control enables energy saving.

Tips

This can be achieved by setting parameters including **Pr.128 (PID action selection)**.



Air handling units

CASE 07

Problem

Automatic restarting is desired even if a fault occurs.

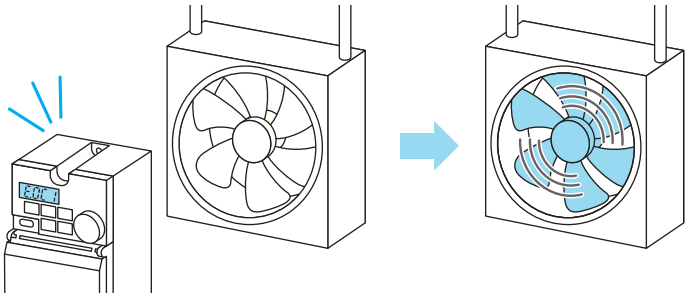
Solution

The retry function allows the inverter to reset itself and restart at activation of the protective function (fault indication).
The emergency drive function (fire mode) to forcibly continue operation is also available. (For details, refer to page 31.)

* Restarting is disabled for some faults.

Tips

This can be achieved by setting a value other than "0" in **Pr.67 (Number of retries at fault occurrence)**.



CASE 08 Mixers

Problem

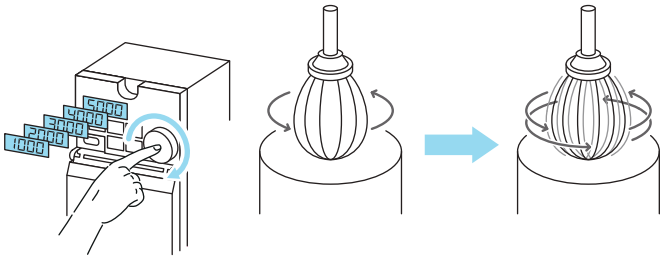
Easy control is required for the mixing speed.

Solution

The setting dial on the operation panel allows for intuitive control.
The speed can be optimized while monitoring the input amount of material.

Tips

This can be achieved by setting "1" in **Pr.161 (Frequency setting/key lock operation selection setting)**.



CASE 09 Food machinery

Problem

The machine must be stopped quickly.

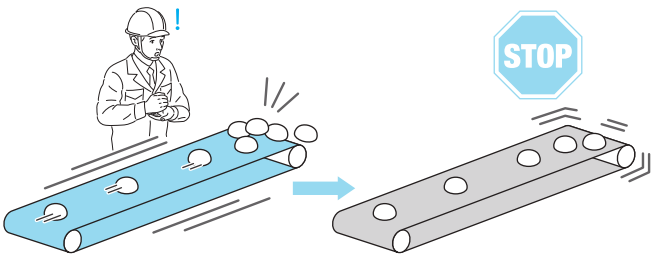
Solution

The increased excitation deceleration function shortens the deceleration time with the inverter alone.

* Depending on the amount and frequency of regenerative power, the brake resistor (FR-ABR), the brake unit (FR-BU2), or the multifunction regeneration converter (FR-XC) may be used.

Tips

This can be achieved by setting the **deceleration operation function (Pr.660 to Pr.662)**.

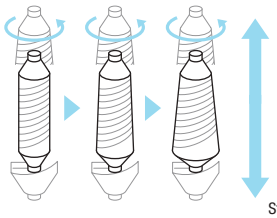


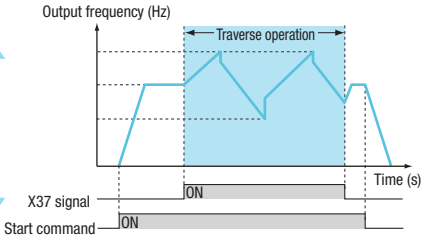
Fiber machinery CASE 10

Problem Unevenness and deformation of the reel must be suppressed.

Solution Using the traverse function for spinning or wiring machines prevents uneven winding or deformation.

Tips This can be achieved by setting the **traverse function selection (Pr.592)**.



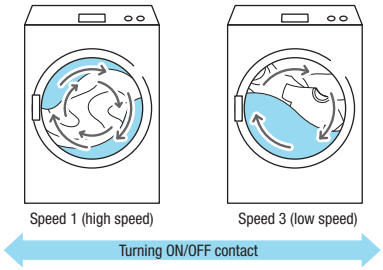


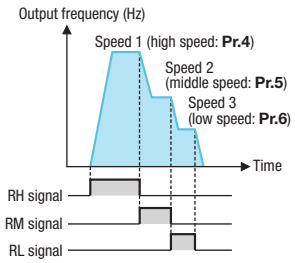
Industrial washing machines CASE 11

Problem Switching is required for the dewatering, washing, and other frequency commands.

Solution Operation speeds are pre-set via parameters. Turning ON/OFF the contact signals changes the speeds. Up to 15 speeds can be set.

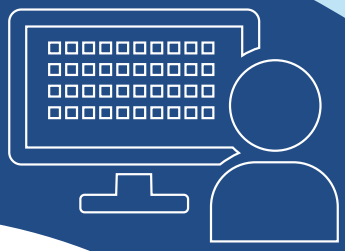
Tips When using the multi-speed setting for high-speed, medium-speed, or low-speed operation, set the speed in **Pr.4 to Pr.6 (multi-speed setting)**.



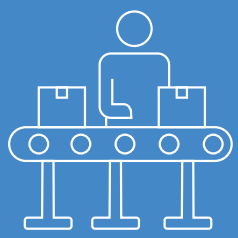


Introduction of Functions

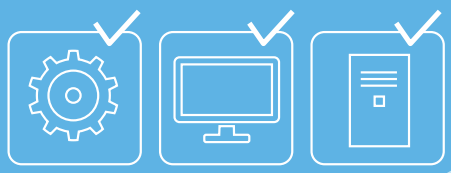
Useful functions for each of the design, operation, and maintenance processes of systems



01 Design



02 Operation



03 Maintenance

Easy setup
Allows easy wiring and simple startup of networking

Wide range of applications
Supports various types of applications with its compact size and layout options

Higher added values
Outstanding drive performance and various functions create higher added values

Improved safety
Humans and FA devices can work together by enhancing functional safety

Toward a decarbonized society
Use of PM motors contributes to energy saving

Improved maintainability
Functions for predictive/preventive maintenance support reliable maintenance

Reduced downtime
When a fault occurs, analysis functions solve the problem quickly

01 Design

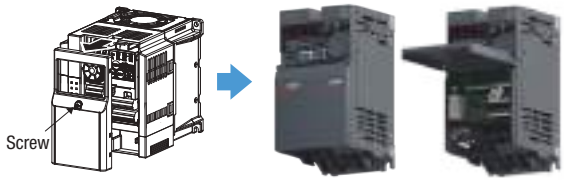
Easy setup

Allows easy wiring and simple startup of networking

Improved wiring work efficiency

Flip-type front cover / No screw tightening (all capacities) NEW

The new flip-type front cover has been adopted. This reduces the screw tightening work for the front cover and prevents incorrect use of the wrong cover.



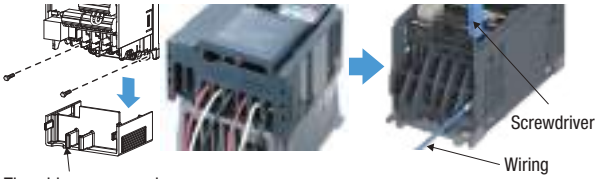
FR-D700/F700PJ
(Removable type, with a screw)

FR-D800
(Flip-type, with no screw)

Comb-shaped wiring cover integrated into the inverter (some capacities)

The wiring cover is integrated into the inverter, reducing removal and reinstallation work.

Capacity	Three-phase 200 V class	0.75K or lower	Single-phase 100 V	0.75K or lower
	Three-phase 400 V class	1.5K or lower	Single-phase 200 V	0.4K or lower



The wiring cover needs to be removed.

FR-D700/F700PJ
(with the wiring cover)

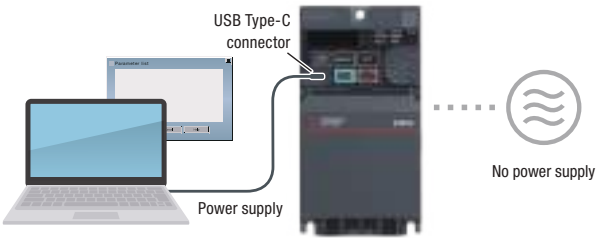
FR-D800
(Wiring cover is integrated.)

Parameters can be set without needing to power the main circuit

USB Type-C connector NEW

With the power supplied from the computer (USB bus power connection)*1, parameters can be set using FR Configurator2 while the main circuit power supply is OFF. You can set parameters straight out of the box.

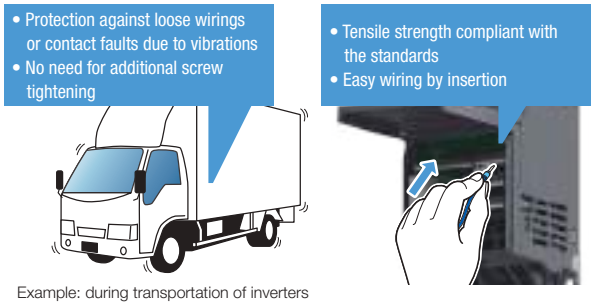
*1: The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.



Time-saving through easy wiring

Spring clamp control terminal block

Spring clamp terminals have been adopted for control circuit terminals for easy wiring. Wires can be protected against loosening or contact faults due to vibrations during operation on a bogie or during transport. No additional screw tightening is required.



Example: during transportation of inverters

Information can be obtained easily from smartphones

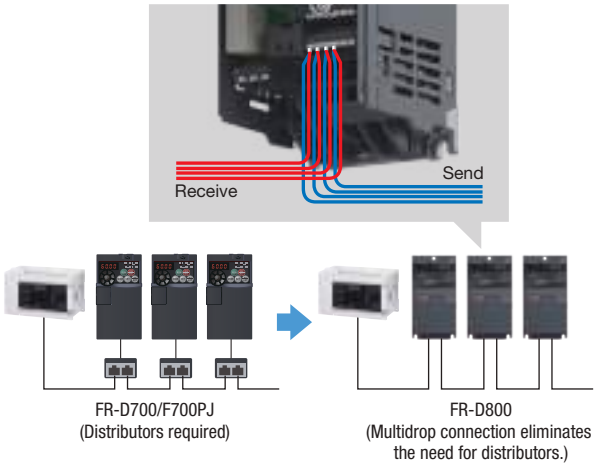
Setup information web page NEW

The setup information website can be accessed using a tablet or smartphone from the 2D code on the front of the product. Information required for setup, such as how to connect and use the inverter, can be easily obtained on the setup information website.

Simplifies the wiring for RS-485 communication

Multi-drop connection for RS-485 communication NEW

The multi-drop connection will be supported by adding the terminal block for RS-485 communication.
A distributor is not required when multiple units are connected.

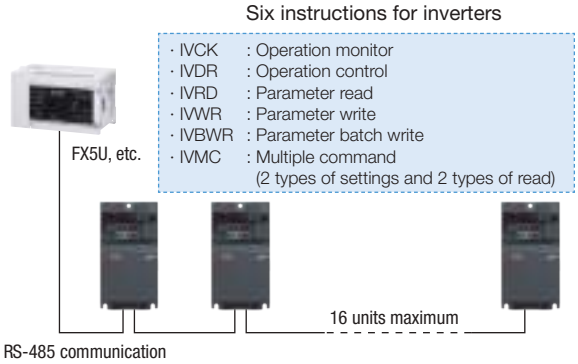


Fountain

Simplifies the programming for RS-485 communication

Inverter dedicated instructions (e.g. FX5U)

Six inverter dedicated instructions can be used in combination with the FX5U and others. The time and effort required to create programs can be reduced.

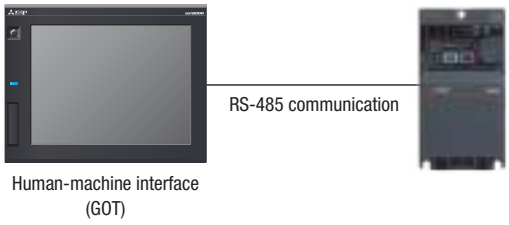


Fireworks for live performances

Easy connection to the GOT by setting only the station number

GOT automatic connection function

No complicated communication settings are required for the connection with the GOT. Connection can be made only by setting the station number, reducing the load of the setting work.

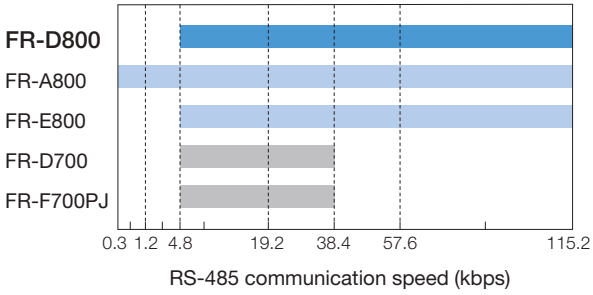


▶ Refer to page 35 for details.

Increase the speed of RS-485 communication

RS-485 communication speed

Although it is a compact and easy-to-use inverter, its communication speed is equivalent to that of the FR-A800/FR-E800 high-performance inverters. Information can be exchanged smoothly.



01 Design

Wide range of applications

Improved freedom of panel design through a compact body

Effective solution for downsizing of the enclosure

Side-by-side installation

Side-by-side installation is possible to install multiple inverters in close contact. Users can select the most suitable layout for the intended installation area.
ND rating: Allowed for the surrounding air temperature of 40˚C or lower
SLD rating: Allowed for the surrounding air temperature of 30˚C or lower

Further reducing the external size

The external size (width) of some capacity models have been reduced.
Installation interchange attachment options will be available for facilitating replacement.

Voltage class	Inverter capacity (K)								
	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Three-phase 200 V	—	—	—	—	—	—	○	—	—
Three-phase 400 V	\	\	○	○	○	—	—	—	—
Single-phase 200 V	—	—	—	—	—	○	\	\	\
Single-phase 100 V	—	—	—	—	\	\	\	\	\

○: Width reduced, –: Same width, \: Not provided

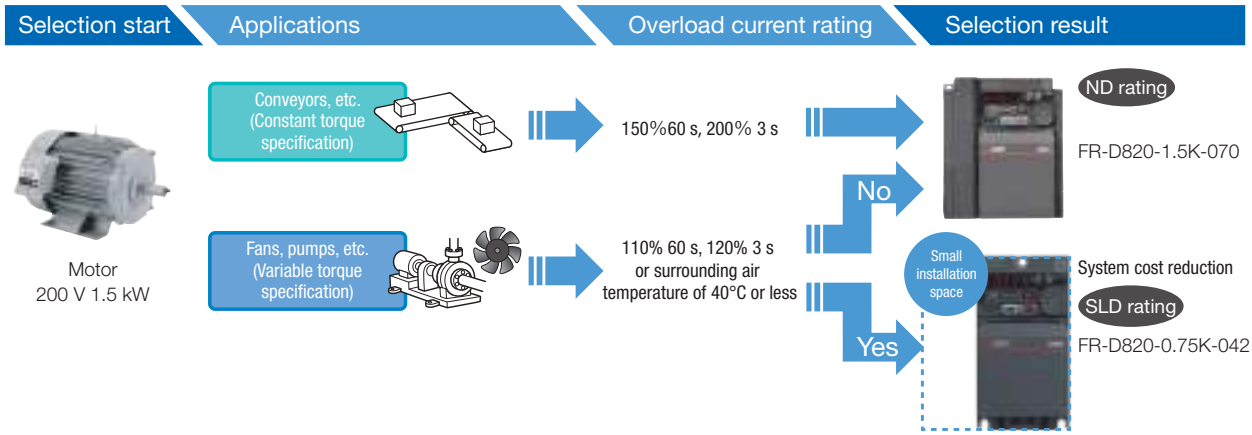
*: The depth is larger for the three-phase 400 V class 1.5K inverter.

*1: Example of the FR-D820-3.7K-165. The number differs by the capacity.

Double rating (ND rating, SLD rating) NEW

For the FR-D800, the SLD rating is added (double rating, the initial status is the ND rating), and the appropriate rating can be selected with parameters. For light-load applications such as fans and pumps, using an inverter with a capacity smaller than a motor by one rank with the SLD rating can reduce the size, weight, and cost of the system.

Tips Selection example of double rating models (for a 1.5 kW motor)



Selecting a resistor according to the application reduces the installation space inside the enclosure

Built-in brake transistor

The enhanced power regeneration capability (brake duty: 100% max.) is supported. High regenerative braking operation can be performed without a brake unit.

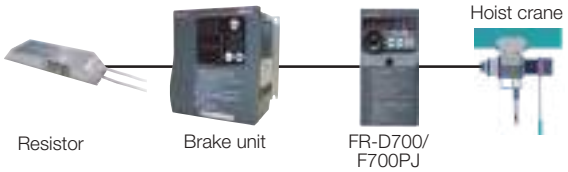
Built-in brake transistor models

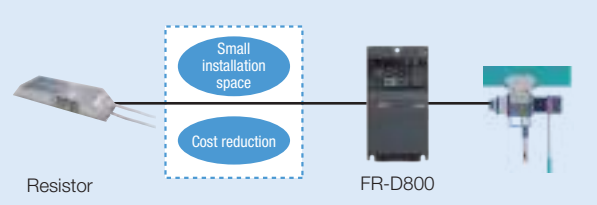
Voltage class	Inverter capacity (K)								
	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Three-phase 200 V	—	—	○*1	○*1	○	○	○	○	○
Three-phase 400 V	\	\	○	○	○	○	○	○	○
Single-phase 200 V	—	—	○*1	○*1	○	○	\	\	\
Single-phase 100 V	—	—	○*1	○*1	\	\	\	\	\

○: Built-in, -: Not built-in, \: Not provided

*1: The brake duty is 30% ED maximum when the lowest resistance value is used.
The brake resistor must have a sufficient capacity to consume the regenerative power.

(Application example)





Use in harsh environments

Circuit board coating NEW

Various applications are supported by allowing for corrosive environments or a wide range of surrounding air temperatures.
The circuit board coating (conforming to IEC 60721-3-3:1994 3C2/3S2) is provided for improved environmental resistance.

*2: Coated model (-60) only

<Application examples>

Water treatment plant

Painting line

Less wiring and smaller space for compliance with the Harmonic Suppression Guidelines

Filterpack is available

The Filterpack (FR-BFP2) is available as an option. The power factor improving DC reactor, common mode choke, and capacitive filter (radio noise filter), that are essential for air conditioning applications, are included in a Filterpack.

Air conditioning system

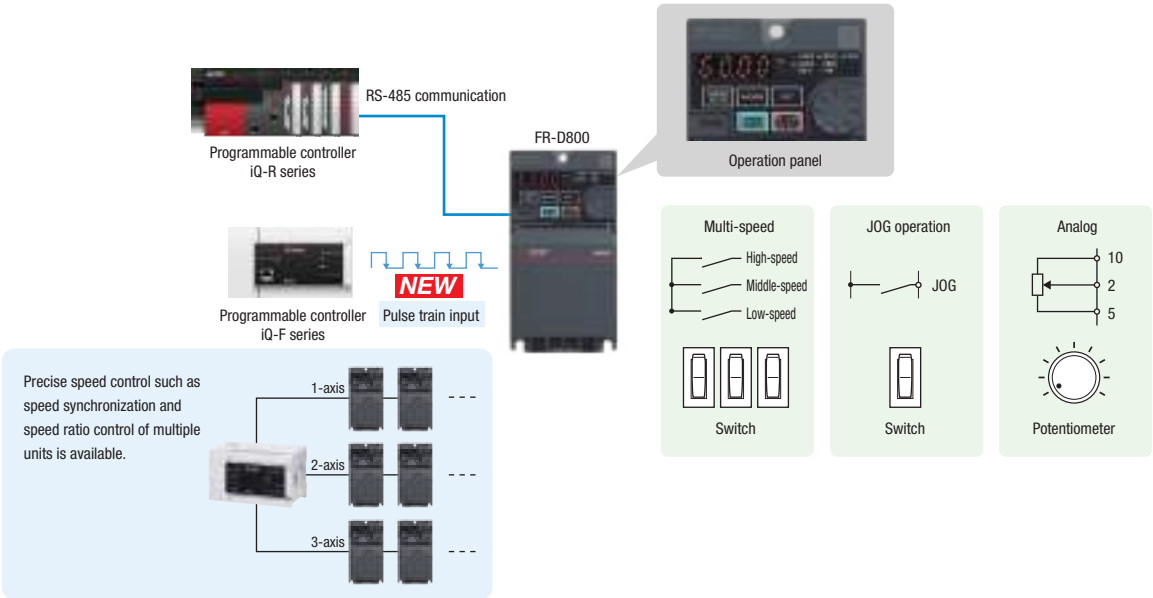
01 Design

Higher added values

Outstanding drive performance and various functions create higher added values

Supporting various speed commands Ver.UP

In addition to commands input from the operation panel, various other speed commands are supported, including those using the multi-speed operation by switches, JOG operation, RS-485 communication, and pulse train input.
The optimal speed command method can be chosen in accordance with the system specifications.



Improving productivity with shorter tact time by the enhanced regeneration function

Built-in brake transistor Ver.UP

With the enhanced power regeneration capability (brake duty: 100% max.), deceleration time can be shortened.

Built-in brake transistor models

Voltage class	Inverter capacity (K)								
	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Three-phase 200 V	—	—	○*1	○*1	○	○	○	○	○
Three-phase 400 V	\	\	○	○	○	○	○	○	○
Single-phase 200 V	—	—	○*1	○*1	○	○	\	\	\
Single-phase 100 V	—	—	○*1	○*1	\	\	\	\	\

○: Built-in, -: Not built-in, \: Not provided

*1: The brake duty is 30% ED maximum when the lowest resistance value is used.
The brake resistor must have a sufficient capacity to consume the regenerative power.

Airport baggage conveyor

Increased magnetic excitation deceleration

When the increased magnetic excitation deceleration function is used, the motor consumes the regenerative power and the deceleration time can be reduced without using a brake resistor.
The tact time can be reduced for a transfer line or the like.

For more precise processing Ver.UP

The maximum frequency of 590 Hz can be output under V/F control. (Up to 400 Hz can be output under other controls.)
The rotation speed can be set according to the material to be processed, and furthermore, stable high-speed rotation is possible. It is best suited for machine tools used to cut or polish various new materials.

Polisher

Supporting various motors

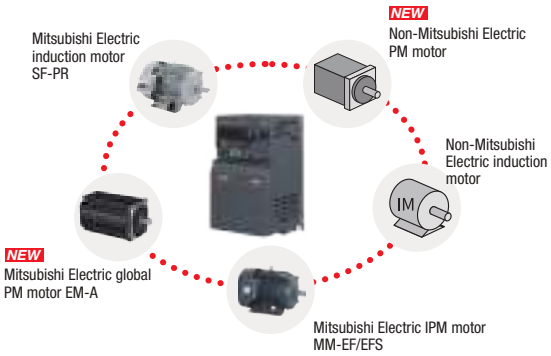
Driving an induction motor or synchronous motor Ver.UP

Not only induction motors but also PM motors are supported for synchronous motor drive.
The auto tuning function enables operation of non-Mitsubishi Electric PM motors*1.
Even if the control method differs depending on the application, such as V/F control for fans and pumps or Advanced magnetic flux vector control for conveyors, the FR-D800 can switch between control methods, reducing the number of required spare inverters.

	Mitsubishi Electric general-purpose (induction) motor SF-PR	Mitsubishi Electric IPM motor MM-EF/EFS	Mitsubishi Electric global PM motor EM-A	Non-Mitsubishi Electric induction motor	Non-Mitsubishi Electric PM motor
Compatibility	○	△	○	△	△

○: Tuning not required, △: Tuning required

*1: Tuning may be disabled depending on the motor characteristics.



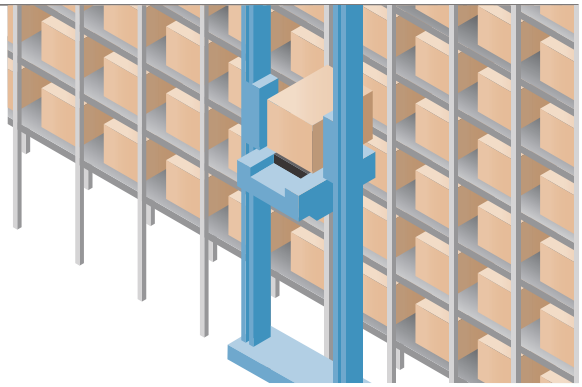
Stable operation under load variation

Advanced magnetic flux vector control

Selecting Advanced magnetic flux vector control enables stable operation in the lift application that requires high-torque in the low-speed range.

- Starting torque: 200%/0.5 Hz (3.7K or lower),
  150%/0.5 Hz (5.5K or higher)
- Speed fluctuation ratio*2: 1%
- Speed control range: 1:120

*2: Speed fluctuation ratio = $\frac{\text{speed with no load - speed with rated load}}{\text{Rated speed}} \times 100\ (\%)$



Improving work efficiency by powerful high-speed operation

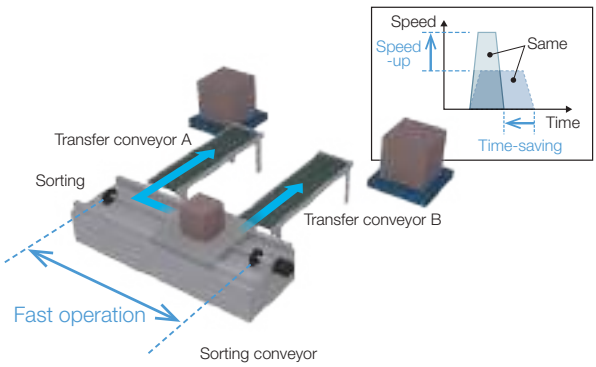
PM sensorless vector control NEW

The torque is not reduced in the high-speed range (up to the rated speed) during PM sensorless vector control as compared with operation using a stepper motor.
High-speed system operation improves the tact time.
The PM motor offline auto tuning*3 enables sensorless operation of other manufacturers' permanent magnet (PM) motors.

- Starting torque: 50%
- Speed fluctuation ratio*4: ±0.05%
- Speed control range: 1:120

*3: Tuning may be disabled depending on the motor characteristics.

*4: Speed fluctuation ratio = $\frac{\text{speed with no load - speed with rated load}}{\text{Rated speed}} \times 100\ (\%)$



02 Operation

Improved safety

Humans and FA devices can work together by supporting functional safety

Attaining both safety and productivity

Conformance to functional safety standards

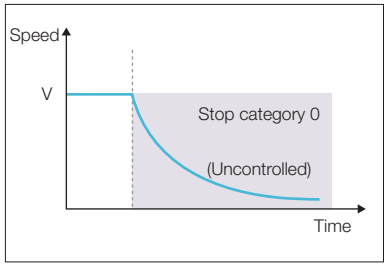
The product complies with the following safety standards to facilitate adherence to the EU Machinery Directive.
The shutoff circuit (hardware) securely shuts off the output in case of emergency.
The inverter that supports functional safety can comply with the safety standards without incurring significant expenses.

<Conformance level>

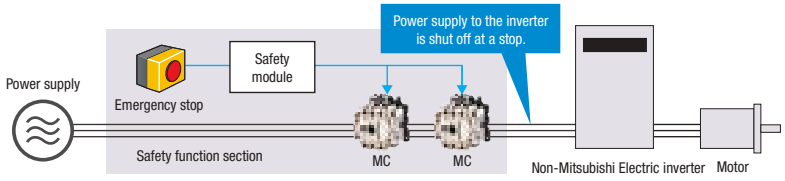
- EN ISO 13849-1, PLd/Cat.3
- EN 61508, EN 61800-5-2, SIL2

STO (safe torque off) function

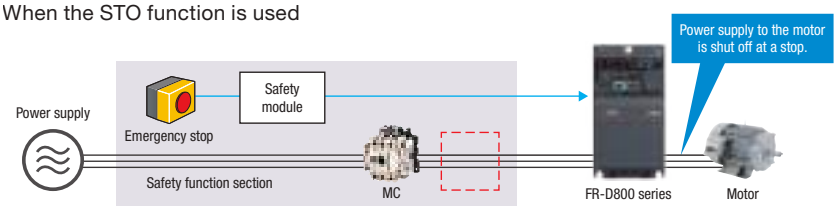
Driving power to the motor is electronically shut off by responding to the input signal from external equipment.
Compared with a system which does not support the STO function, the number of installed MCs can be reduced to one.*1
While ensuring the safety, the initial system cost, maintenance work, and installation space can be reduced.



When the STO function is not supported



When the STO function is used



*1: One MC is required to shut off the power at an activation of the protective function.

Prevents unexpected setting changes

Password function

Setting a 4-digit password can restrict parameter reading/writing.
This function is useful to prevent parameter values from being rewritten by misoperation.

No preparation is required for each destination, supporting shipments to the global market Ver.UP

Compliance with global standards

Item	Standard	Category
Protective structure	IEC 60529	IP20
Insulation distance	UL 61800-5-1 CSA C22.2 No.274	Overvoltage category III, pollution degree 2
	EN 61800-5-1	Overvoltage category III, pollution degree 2
EMC	EN 61800-3	2nd environment (Class 3)
	KS C 9800-3:2017	KN standards, Radio Waves Act (South Korea)
LVD	IEC/UL 61800-5-1	Overvoltage category III, pollution degree 2
RoHS II Directive	2011/65/EU, (EU)2015/863 EN IEC 63000:2018	—
Machine safety	IEC 61508 IEC 62061 ISO 13849-1 ISO 61800-5-2	SIL2 SIL CL 2 Cat.3, PL d. STO
Hazardous environment	IEC 60721-3-3	3C2, 3S2
China RoHS	Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products	—
EAC system	CU TR004/2011 CU TR020/2011	—
Ecodesign Directive	EN 61800-9-2:2017	—
WEEE Directive	2012/19/EU	—

02 Operation

Toward a decarbonized society

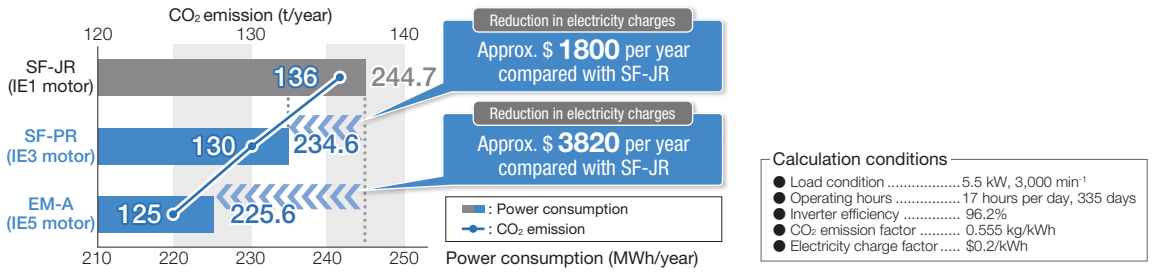
Use of PM motors contributes to energy saving

Contributing to a decarbonized society by driving energy-saving motors

Operation using the IE5 efficiency class motor NEW

The efficiency class IE5 motor drive achieves the energy saving operation. Power consumption can be reduced by approx. 9% compared with our SF-JR (IE1 efficiency class) motor and approx. 2% compared with our SF-PR (IE3 efficiency class) motor. Power consumption and CO_2 emission can be reduced compared to using the conventional motors.

■ Comparison of power consumption (MWh/year) and CO_2 emission (t/year)

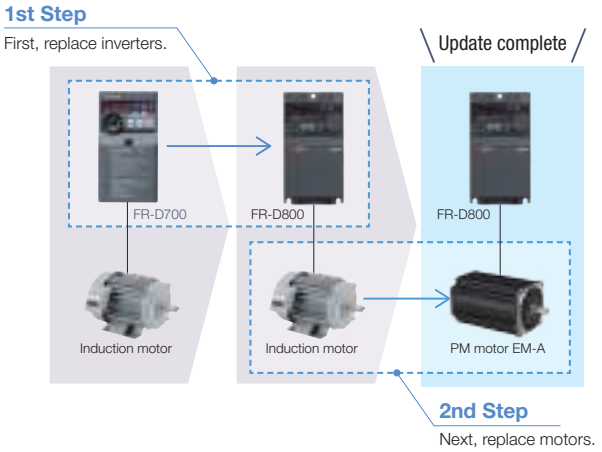


Supporting step-by-step energy saving solution

High-efficiency motor drive Ver.UP

Further energy saving operation is enabled by using IE3 induction motors or PM motors.
Step-by-step replacement of existing devices is enabled.
Users can replace inverters first and then motors. There is no need to replace them all at once.

Equipment investment in several stages

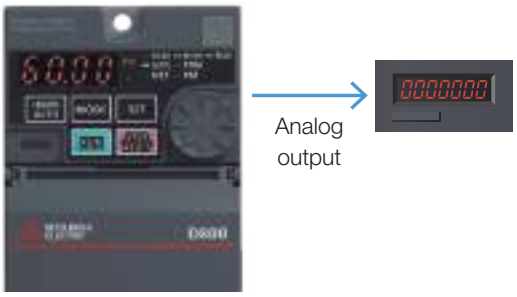


Monitoring the energy-saving effect and CO_2 emission reduction

Energy saving monitor and CO_2 emission reduction monitor Ver.UP

The effect of the energy saving (instantaneous value, average value, etc.) can be checked via the operation panel, output terminal, or RS-485 communication.
In addition, the amount of output power (CO_2 emission) can be measured in the inverter and output as an analog signal, enabling the checking of the cumulative electric power value.*1

*1: This function cannot be used as a meter to certify electricity billings.



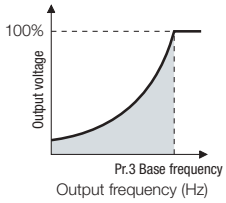
Optimizing the output voltage

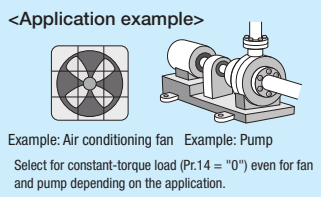
Load pattern selection

Optimal output characteristics (V/F characteristics) for application or load characteristics can be selected.

Energy saving For variable-torque load (Pr.14 = "1")

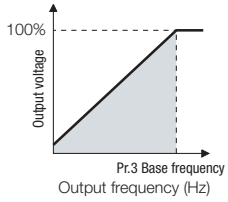
The output voltage will change in a square curve against the output frequency equal to or lower than the base frequency.

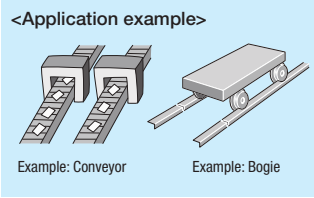




For constant-torque load (Pr.14 = "0")

The output voltage will change linearly against the output frequency equal to or lower than the base frequency.

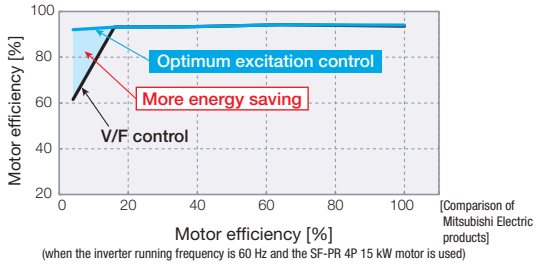




Increased energy saving with inverters

Advanced optimum excitation control NEW

A large starting torque can be provided with the same motor efficiency under Optimum excitation control.
Without the need of troublesome adjustment of parameters (acceleration/deceleration time, torque boost, etc.), acceleration is done in a short time. Also, energy saving operation with the utmost improved motor efficiency is performed during constant-speed operation.
When Advanced magnetic flux vector control is selected, Advanced optimum excitation control is available.



Eliminating cooling fans or using PWM fans NEW

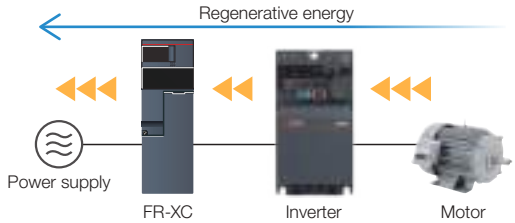
Cooling fans have been eliminated for 1.5K or lower inverters. Users need not worry about the life of the fan.
Using PWM fans enables the control of rotations per minute. They are designed to run at high speed only when cooling is required, such as during an overload, resulting in quiet operation and energy saving.

Energy saving with the regenerative option

Power regeneration function (optional)

While the motor rotates to drive the machine during power driving, the machine rotates the motor during regenerative driving, which results in energy saving since the motor serves as a generator which returns the power to the power supply.
By using the multifunction regeneration converter (FR-XC) as a common converter, the power returned from an inverter during regenerative drive can be supplied to another inverter, which in turn saves energy.

[Power regeneration]



Energy saving examples

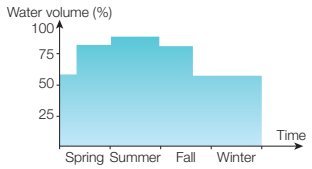
Water-cooling pump for a showcase

Commercial power supply (valve) + General-purpose motor (SF-PR)
▼
Inverter + general-purpose motor (SF-PR)

Conditions

[Units to drive]
- **Water-cooling pump**
  2.2 kW × 2 units

Operation pattern



8760 hours/year

- **With commercial power supply**
  Approx. 40,000 kWh, approx. 800,000 yen
- **With inverter**
  Approx. 20,000 kWh,
  approx. 400,000 yen

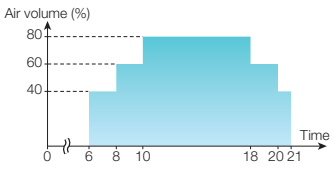
(Annual) energy saving effect produced by replacing to IPM motors driven with inverters

- **Annual energy saving effect (difference)**
  Approx. 20,000 kWh, approx. **400,000** yen
- **Annual CO_2 emission reduction**
  Approx. 20,000 kWh, **11.1** tons

Air conditioning in a Mitsubishi Electric plant

Inverter + general-purpose motor (SF-JR)
▼
Inverter + general-purpose motor (SF-PR)

[Units to drive]
- **Ventilator**
  0.75 kW × 3 units
  1.5 kW × 1 unit
  2.2 kW × 3 units
- **Air conditioner**
  15 kW × 1 unit
  18.5 kW × 1 unit
  30 kW × 2 units



5475 hours/year

- **With SF-JR**
  Approx. 250,000 kWh,
  approx. 5,000,000 yen

- **With SF-PR**
  Approx. 230,000 kWh,
  approx. 4,600,000 yen

- **Annual energy saving effect (difference)**
  Approx. 17,000 kWh, approx. **340,000** yen
- **Annual CO_2 emission reduction**
  Approx. 17,000 kWh, **9.4** tons

03 Maintenance

Improved maintainability

Functions for predictive/preventive maintenance support reliable maintenance

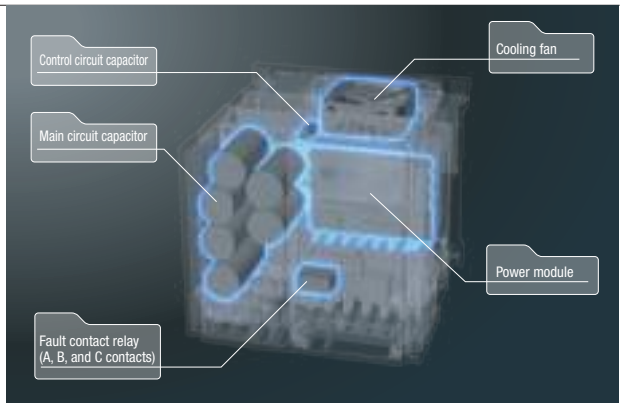
Enhanced monitoring functions for predictive maintenance and planned maintenance

Life diagnosis function **Ver.UP**

Monitoring functions for predictive maintenance and planned maintenance are enhanced.

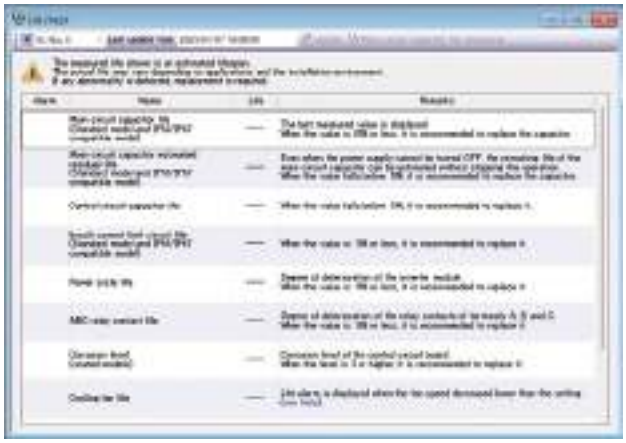
The life of the following parts can be diagnosed.

- Main circuit capacitor
- Cooling fan
- Control circuit capacitor
- Inrush current limit circuit
- Fault contact relay **NEW**
- Main circuit elements **NEW**

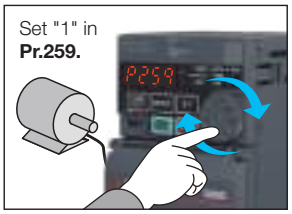


* The function is conceptually illustrated. It is not the actual layout.

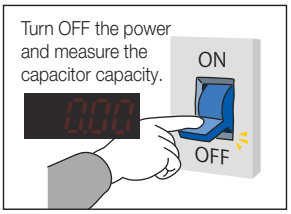
Parts service life data is displayed in a dedicated window in FR Configurator2. An alert icon is shown in the parts life alarm field for the parts recommended for replacement. This can be used as a guideline to replace long life parts.



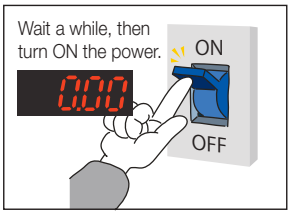
Tips Procedure for easy diagnosis check (main circuit capacitor life diagnosis)



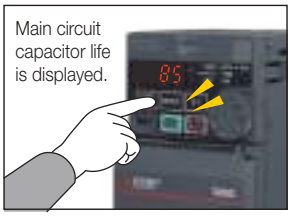
Check that the motor is connected and at a stop, then set "1" in **Pr.259**.



Turn OFF the power. The inverter applies DC voltage to measure the capacitor capacity while the inverter power is OFF.



After confirming that the LED of the inverter is OFF, power ON again.

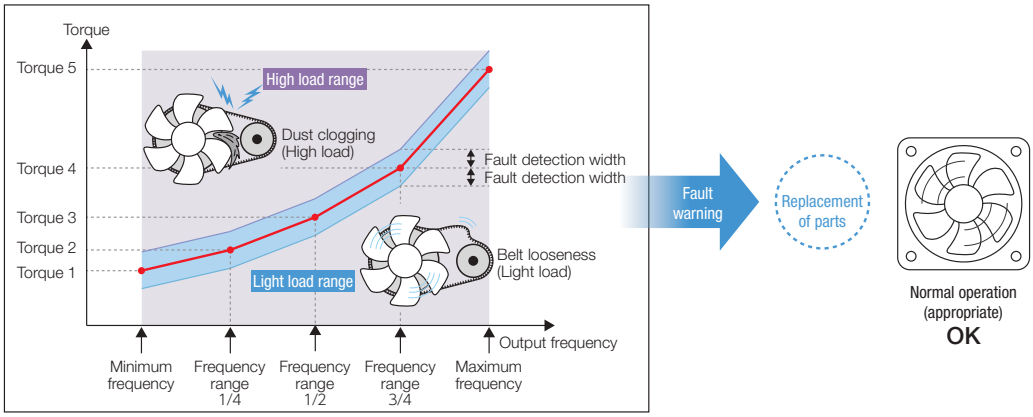


If the setting value of **Pr.259** becomes "3", it means that the measurement is completed. When **Pr.258** is read, the deterioration degree is displayed as a percentage, considering the capacitor capacity at shipment as 100%. Regard 85% or less as the end of part life.

Supporting scheduled maintenance planning

Load characteristics measurement function NEW

The speed–torque characteristic is stored while no fault occurs, enabling comparison between the measured data and the stored data.
When a mechanical fault such as clogging of the filter occurs, the inverter outputs a warning or shuts off the output to prevent system damage.



03 Maintenance

Reduced downtime

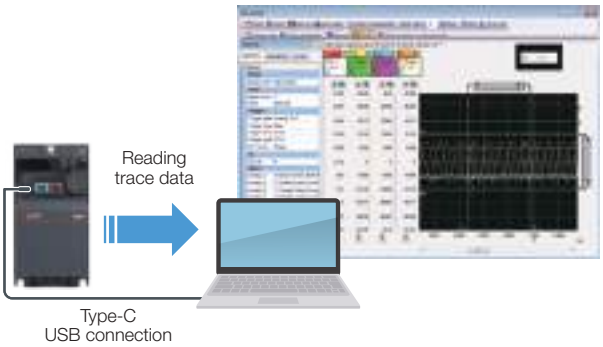
When a fault occurs, analysis functions solve the problem quickly

Troubleshooting support tool

FR Configurator2

- Graph function
  The graph function using high-speed sampling is supported, allowing inverter monitor data to be displayed graphically.
  Analyzing the waveform when a problem occurs contributes to identifying the cause.

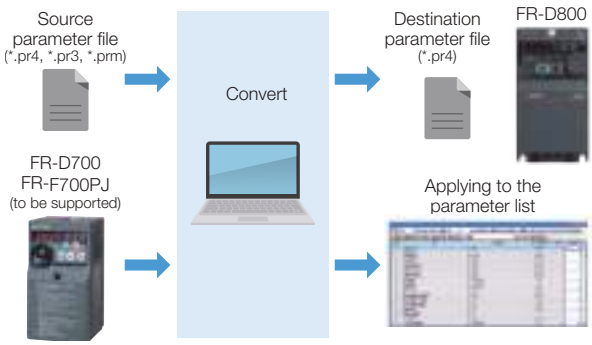
- Trace function **NEW**
  The operating status (output frequency or other data) immediately before the protective function is activated can be stored in the internal memory.
  Users can display a graph or send it by e-mail to headquarters from the worksite, facilitating trouble analysis.



Supporting replacement from the previous model

FR Configurator2 (Convert function)

The parameter settings of the FR-D700 and FR-F700PJ (to be supported in April 2026) can be converted to FR-D800 parameters using FR Configurator2, simplifying replacement.



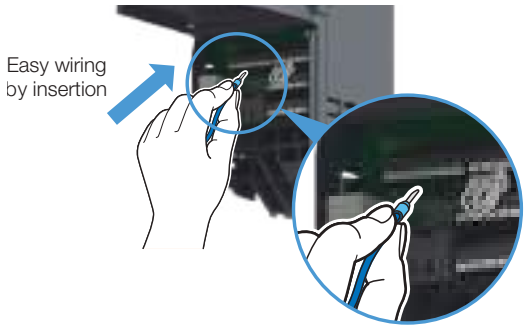
Input terminal filter

The terminal response adjustment function allows adjustment of the response time in accordance with the existing facility.

Time-saving for restoration work through easy wiring

Spring clamp terminals

Spring clamp terminals have been adopted for control circuit terminals for easy wiring.



Continuing the operation during a trouble

Emergency drive (Fire mode) NEW

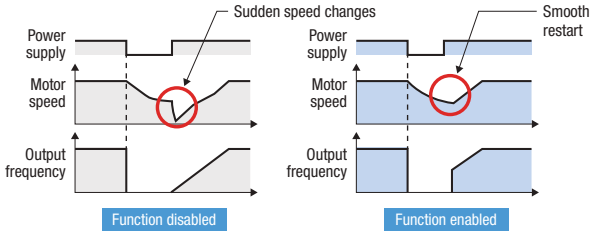
The inverter can continue driving the motor in case of emergency such as a fire, since protective functions are not activated even if the inverter detects a fault.

*: This function is disabled in the initial status. To enable this function, set Pr.523 (Emergency drive mode selection).
*: Using this function may damage the motor or inverter because driving the motor is given the highest priority.
Use this function for emergency operation only.
The operation can be switched to the commercial power supply operation at the occurrence of a fault which may cause damage of the inverter.

Air handling system

Automatic restart after instantaneous power failure function

After an instantaneous power failure, the motor speed is detected upon power restoration, enabling a smooth restart from the coasting motor speed.



Power failure time deceleration-to-stop function

In the event of an instantaneous power failure or undervoltage, the motor can be decelerated or decelerated to a stop, and reaccelerated to the set frequency upon power restoration.
This avoids the danger caused by coasting during a power failure.
This function is effective for grinders with large inertia.

Reliable quality

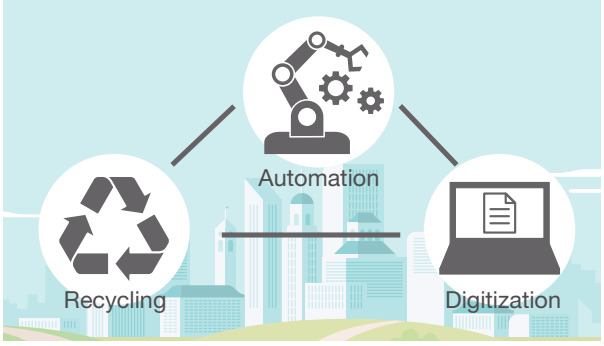
World-wide

Although the initial value settings (50/60 Hz reference, sink/source) differ depending on the sales region, users can switch the settings with a single switch and a single parameter.

Responsibility of manufacturing

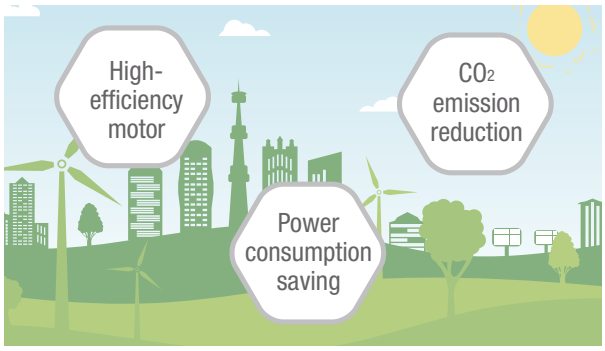
Our activities to reduce the environmental load are as follows.

- Uses recycled materials such as resin.
- Reduces paper usage and promotes digitization.
- Promotes automation of the product production and packaging.
- Reduces transportation volume by local procurement/ production.



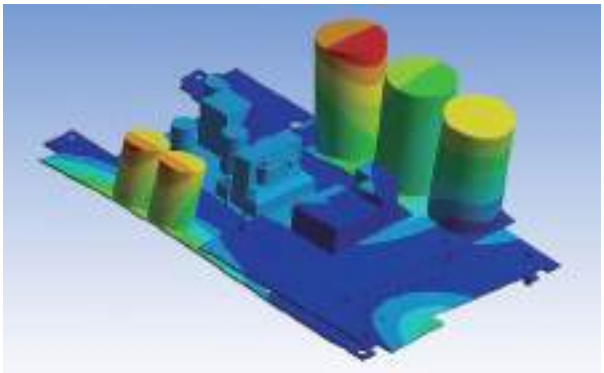
Eco-friendly choice

- Helps reduce the running cost and CO_2 emission by using high-efficiency motors such as PM motors, and reducing the standby power.
- The emission reduction amount can be monitored.



Simulation

High-quality Mitsubishi Electric inverters can be achieved by ensuring sufficient reliability at the design stage, using 3D-CAD and vibration analysis simulation to withstand harsh operating environments.



Three-dimensional vibration analysis

EMC test

EMC tests are conducted for all inverter series.
Equipped with one of the largest radio-frequency anechoic chambers in Japan, the high quality is assured through various tests such as conducted disturbance tests and radiated immunity tests.

One of the largest radio-frequency anechoic chambers in Japan

Peripheral tools

FR Configurator2 for further ease of operation

Using FR Configurator2, easy-to-use software assisting anything from setup to maintenance, much more useful functions are available for users.

Free trial version supported

The function is available in the free trial version (usable free of charge with limited functions).
It can be downloaded at Mitsubishi Electric FA Global Website.

Function	Free trial version
Parameter list	○
Diagnosis	○
AI fault diagnosis	×
Graph	×
Batch monitor	×
Test operation	○
I/O terminal monitor	×

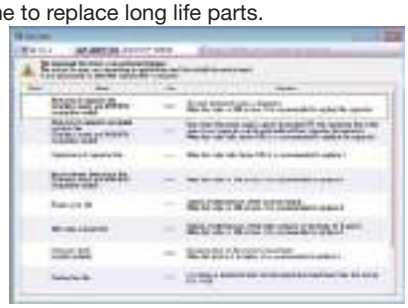
Function	Free trial version
Convert	○
Developer	×
USB memory parameter copy file edit	×
Help	○

○: Available ×: Not available

The trial version (usable for a limited period), for which all the functions of the product are available for 30 days, is also provided.

Life diagnosis check

Parts service life data is displayed in a dedicated window. An alert icon is shown in the parts life alarm field for the parts recommended for replacement. This can be used as a guideline to replace long life parts.



Graph function and trace function

Waveform graph data immediately before the protective function is activated can be automatically obtained. Graph display and log analysis are available using the stored trace data.

Further facilitating operation with your smartphone

Mitsubishi Electric FA SPEC Search

Users can select options and motors on the website.
Users can easily search for products using their smartphone or computer.

Model/specification search　Specification comparison　Offline search

Mitsubishi Electric Factory Automation SPEC Search
Download the app for free now

Download on the App Store

GET IT ON Google Play

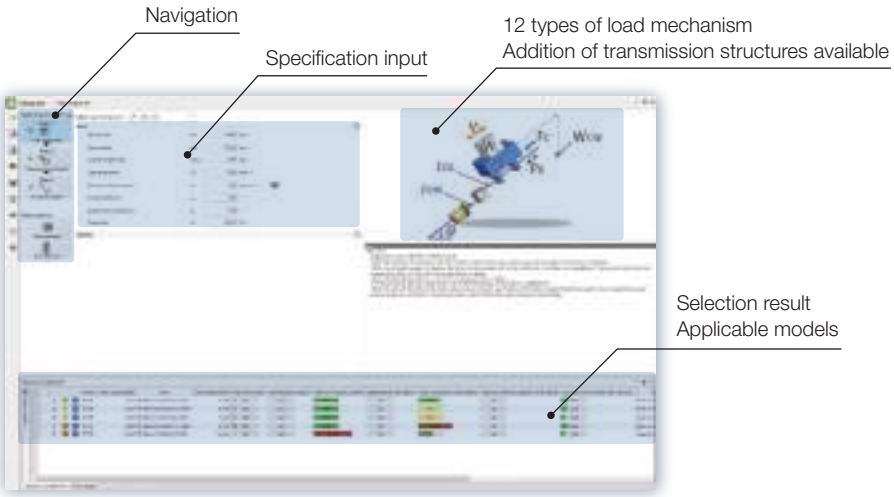
Setup information web page

The setup information website can be accessed directly from the 2D code on the front of the product.
The model name, serial number, and country of origin can be checked.
Manuals and videos can be viewed and obtained easily.

Further facilitating operation with Motorizer (capacity selection software) To be supported

Users can select motors by entering data of mechanical configuration, specifications, and operating patterns. Applicable combinations include inverters, sensorless servo drive units, and AC servo amplifiers. The most suitable combination can be selected from the selection result. The software also supports multi-axis systems.
Twelve types of load mechanism such as a ball screw or a rack and pinion are selectable. Selection is available by following the steps from 1 to 3.
When users include the power regeneration common converter or other applicable converter, the capacity of the converter can be selected at the same time.
The software can be downloaded from the Mitsubishi Electric FA Global Website.

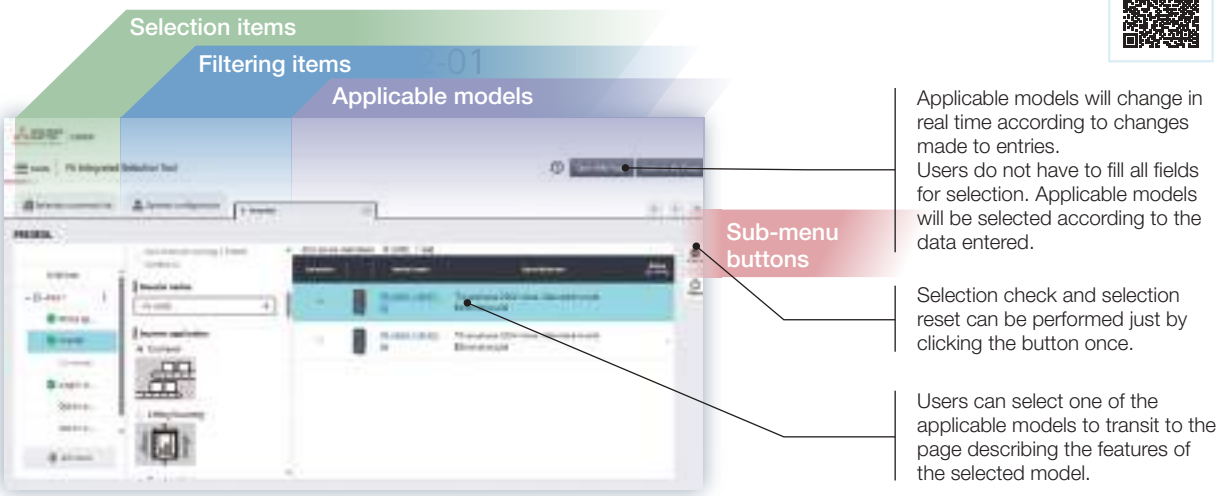
www.mitsubishielectric.com/fa/products/drv/servo/smerit/motorizer/index.html



Further facilitating operation with the selection guide software

Advanced search for optimum inverters is available. Users can select inverters by entering data such as the motor capacity and current value and specifying specifications. The time spent on inverter selection can be reduced.
This software can be used on the Mitsubishi Electric FA Global Website.

www.mitsubishielectric.com/fa/products/select/index.html



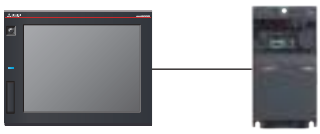
Further facilitating operation with GOT interaction functions To be supported

Enhanced compatibility between inverters and the GOT (human machine interface) brings various benefits to users.
Connection with the GOT2000 series can be established just by setting the station number.
Other necessary settings are automatically done.

STEP 1

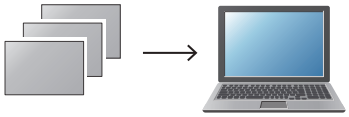
Select the GOT and the inverter and connect them.

Connection via RS-485 communication



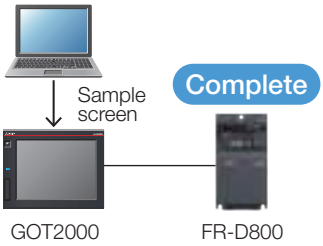
STEP 2

Sample screens for selected connection type available to be imported to user's project data.



STEP 3

Transfer the project data to the GOT.

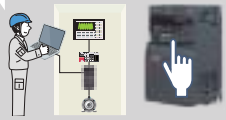


Improving work efficiency without using a computer

Users can use the GOT to set up, adjust, and perform maintenance for inverters without using a computer.

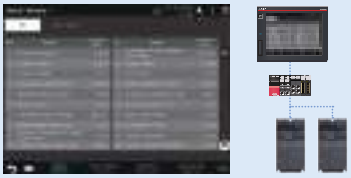
Before

Do I have to open the control panel and connect a computer just to check something trivial?



Users want to check the inverter settings easily.

After



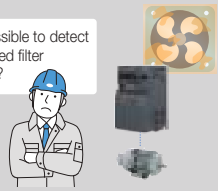
1. Instead of the control panel, users can check data on a GOT.
2. Multiple inverters can monitored using the inverter target station switching function.

Immediate warning of system errors

By storing the data of relationship between the output frequency and the torque during normal inverter operation, users can judge whether the load is operating in normal condition. By outputting out-of-range warnings if applicable, users can detect mechanical faults or perform maintenance.

Before

Is it possible to detect a clogged filter or pipe?



Users want to detect system errors using the inverter to facilitate maintenance.

After

Trend of failure monitored by the inverter to give a warning

1. System errors such as clogged filter/pipe can be detected.
2. Operation of the system can be monitored constantly.

Reducing downtime by interacting with the GOT

Faults occurred in the inverter can be displayed on the GOT screen.
When a fault occurs, it is possible to identify the fault details immediately, which contributes to downtime reduction.

Before

What is the meaning of this fault number?

Users want to identify causes of faults easily.

After

1. Fault records can be checked quickly on the monitor. (Maximum ten records)
2. Troubleshooting pages of manuals can be displayed.

Lineup

FR-D 8 [2] 0 [ ] - [0.1 K - 008] [ ]

Symbol	Voltage class
1	100 V
2	200 V
4	400 V

Symbol	Input power
None	Three-phase
S	Single-phase
W	Single-phase*1

Symbol	Rated capacity / rated current
0.1K-008 to 15K-580 (for 200 V)	Applicable motor capacity (ND) (kW) - Inverter rated current (ND) (A)*2

Symbol	Circuit board coating*3
None	Without coating
-60	With coating

Voltage class and applicable capacity

Model	Power supply / voltage class	Rated capacity	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
FR-D820-[]K-[]	Three-phase 200 V	Rated current	008	014	025	042	070	100	165	238	318	450	580
			●	●	●	●	●	●	●	●	●	○	○
FR-D840-[]K-[]	Three-phase 400 V	Rated current	—	—	012	022	037	050	081	120	163	230	295
					●	●	●	●	●	●	●	○	○
FR-D820S-[]K-[]	Single-phase 200 V	Rated current	008	014	025	042	070	100	—	—	—	—	—
			●	●	●	●	●	●					
FR-D810W-[]K-[]	Single-phase 100 V	Rated current	008	014	025	042	—	—	—	—	—	—	—
			●	●	●	●							

●: Released, ○: To be released

*1: Double voltage rectification / 200 V output
*2: "0.1K-008" means "0.1 kW, 0.8 A", and "15K-580" means "15 kW, 58.0 A".
*3: Conforming to IEC 60721-3-3:1994 3C2/3S2

Specifications

Comparison of major specifications

Specifications		FR-D800	FR-D700	FR-F700PJ	FR-E800
Lineup		Three-phase 200 V: 0.1K to 15K Three-phase 400 V: 0.4K to 15K Single-phase 200 V: 0.1K to 2.2K Single-phase 100 V: 0.1K to 0.75K	Three-phase 200 V: 0.1K to 15K Three-phase 400 V: 0.4K to 15K Single-phase 200 V: 0.1K to 2.2K Single-phase 100 V: 0.1K to 0.75K	Three-phase 200 V: 0.4K to 15K Three-phase 400 V: 0.4K to 15K	Three-phase 200 V: 0.1K to 22K Three-phase 400 V: 0.4K to 22K Three-phase 575 V: 0.75K to 7.5K Single-phase 200 V: 0.1K to 2.2K Single-phase 100 V: 0.1K to 0.75K
Control method		V/F control Advanced magnetic flux vector control PM sensorless vector control	V/F control General-purpose magnetic flux vector control	V/F control General-purpose magnetic flux vector control PM sensorless vector control	V/F control Advanced magnetic flux vector control Real sensorless vector control Vector control PM sensorless vector control
Starting torque		Advanced magnetic flux vector control: 150% at 0.5 Hz PM sensorless vector control: 50%	General-purpose magnetic flux vector control: 150% at 1 Hz, 200% at 3 Hz (3.7K or lower) with slip compensation enabled	General-purpose magnetic flux vector control: 120% at 1 Hz with slip compensation enabled PM sensorless vector control: 50%	Advanced magnetic flux vector control: 150% at 0.5 Hz Real sensorless vector control and Vector control: 200% at 0.3 Hz (3.7K or lower) 150% at 0.3 Hz (5.5K or higher) PM sensorless vector control: 200% (MM-GKR, EM-A), 50% (other than MM-GKR and EM-A)
Output frequency range		0.2 to 590 Hz	0.2 to 400 Hz	0.2 to 400 Hz	0.2 to 590 Hz
Built-in brake transistor		Built-in for 0.4K to 15K	Built-in for 0.4K to 15K	Built-in for 0.4K to 15K	Built-in for 0.4K to 22K
Input signal	Contact input	5	5	5	[E800]: 7 [E800-E]: 2 [E800-SCE]: 0
	Pulse train input	100k pulses/s	Unavailable	Unavailable	Unavailable
Output signal	Open collector output	2	2	1	[E800]: 2 [E800-E], [E800-SCE]: 0
	Contact output	1	1	1	1
Fault output		1 changeover contact (240 VAC 2A, 30VDC, 1A), open collector output	1 changeover contact (230 VAC 0.3A, 30 VDC 0.3 A), open collector output	1 changeover contact (230 VAC 0.3A, 30 VDC 0.3 A), open collector output	1 changeover contact (240 VAC 2A, 30VDC, 1A), open collector output
Monitor function	Pulse train output	Unavailable	1440 pulses/s, 1 mA	1440 pulses/s, 1 mA	1440 pulses/s, 1 mA
	Analog output	0 to 10 VDC / 12 bits	Unavailable	Unavailable	0 to ±10 VDC
Built-in communication function	RS-485 (Mitsubishi inverter protocol)	Available	Available	Available	Available
	RS-485 (MODBUS®RTU)	Available	Available	Available	Available
	Ethernet communication	Unavailable	Unavailable	Unavailable	Available
	Safety communication	Unavailable	Unavailable	Unavailable	Available
Functional safety	Function of ISO 61800-5-2	STO	STO	Unavailable	STO, SS1, etc.
	Safety level	SIL2, PLd, Cat.3	SIL2, PLd, Cat.3	Unavailable	SIL2, PLd, Cat.3 or SIL3, PLe, Cat.3 depending on the model
Surrounding air temperature		-20°C to +60°C * SLD rating: Derating is required for the temperature above 40°C. ND rating: Derating is required for the temperature above 50°C.	-10°C to +50°C	-10°C to +50°C	-20°C to +60°C * Derating is required for the temperature above 50°C.
USB		Type-C	Not provided.	Not provided.	mini-B
Plug-in option		Not supported	Not supported	Not supported	1

Standard Specifications

◆ Rating

◆ Three-phase 200 V power supply

Model FR-D820-[]				0.1K-008	0.2K-014	0.4K-025	0.75K-042	1.5K-070	2.2K-100	3.7K-165	5.5K-238	7.5K-318
Applicable motor capacity (kW)*1		SLD		0.2	0.4	0.75	1.1	2.2	3.7	5.5	7.5	11
		ND (initial setting)		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Output	Rated capacity (kVA)*2	SLD		0.5	1.0	1.6	2.3	3.8	6.3	9.1	12.1	17.1
		ND (initial setting)		0.3	0.5	1.0	1.6	2.7	3.8	6.3	9.1	12.1
	Rated current (A)*7	SLD		1.4 (1.1)	2.5 (2.0)	4.2 (3.5)	6.0 (5.1)	10 (8.5)	16.5 (12.0)	23.8 (19.6)	31.8 (26.0)	45 (37.0)
		ND (initial setting)		0.8	1.4	2.5	4.2	7	10	16.5	23.8	31.8
	Overload current rating*3	SLD		110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C								
		ND (initial setting)		150% 60 s, 200% 0.5 s (inverse-time characteristics) at surrounding air temperature of 50°C								
	Rated voltage*4			Three-phase 200 to 240 V								
	Regenerative braking	Brake transistor		Not used		Built-in						
		Maximum brake torque (ND reference)*5		150%		100%		50%	20%			
Power supply*9	Rated input AC voltage/frequency			Three-phase 200 to 240 V, 50/60 Hz								
	Permissible AC voltage fluctuation			170 to 264 V, 50/60 Hz								
	Permissible frequency fluctuation			±5%								
	Rated input current (A)*8	Without DC reactor	SLD	1.8	3.4	5.6	8.0	13.7	20.6	31.2	40.5	57.5
			ND	1.2	2.2	3.7	6.1	10.2	13.6	21.6	31.0	41.2
		With DC reactor	SLD	1.4	2.5	4.2	6.0	10.0	16.5	23.8	31.8	45.0
			ND	0.8	1.4	2.5	4.2	7.0	10.0	16.5	23.8	31.8
	Power supply capacity (kVA)*6	Without DC reactor	SLD	0.7	1.3	2.1	3.1	5.2	7.8	11.9	15.4	21.9
			ND	0.4	0.8	1.4	2.3	3.9	5.2	8.2	11.8	15.7
		With DC reactor	SLD	0.5	1.0	1.6	2.3	3.8	6.3	9.1	12.1	17.1
			ND	0.3	0.5	1.0	1.6	2.7	3.8	6.3	9.1	12.1
Protective structure				Open type IP20 (for IEC 60529 only)								
Cooling system				Natural					Forced air			
Approx. mass (kg)				0.5	0.5	0.6	0.7	1.2	1.3	1.4	2.4	2.5

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric standard 4-pole motor.
*2 The rated output capacity is the value with respect to 230 V output voltage.
*3 The percentage of the overload current rating 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. The maximum point of the voltage waveform at the output side of the inverter is approximately the power supply voltage multiplied by $\sqrt{2}$.
*5 The amount of braking torque is the average short-term torque (which varies depending on motor loss) that is generated when a motor decelerates in the shortest time by itself from 60 Hz. It is not continuous regenerative torque. The average deceleration torque becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a built-in brake resistor. Use an option brake resistor for an operation with large regenerative power (not available for the FR-D820-0.1K-008 and FR-D820-0.2K-014). The brake unit (FR-BU2) can be also used.
*6 The power supply capacity varies with the value of the input power impedance (including those of the input reactor and cables).
*7 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 30°C while a 3 kHz or higher value is selected in **Pr.72 PWM frequency selection**.
*8 The rated input current is the value at a rated output voltage. The input power impedances (including those of the input reactor and cables) affect the value.
*9 To be compliant with the standards, wire the inverter using the following earthing (grounding) and power supply methods:
FR-D820-wyz: TN-C, TN-S (corner earthed), IT (isolated, phase earthed over impedance)

◆ Three-phase 400 V power supply

Model FR-D840-[]				0.4K-012	0.75K-022	1.5K-037	2.2K-050	3.7K-081	5.5K-120	7.5K-163
Applicable motor capacity (kW)*1		SLD		0.75	1.5	2.2	3.7	5.5	7.5	11
		ND (initial setting)		0.4	0.75	1.5	2.2	3.7	5.5	7.5
Output	Rated capacity (kVA)*2	SLD		1.7	2.8	3.8	6.2	9.1	12.4	17.5
		ND (initial setting)		0.9	1.7	2.8	3.8	6.2	9.1	12.4
	Rated current (A)*7	SLD		2.2 (1.8)	3.7 (3.0)	5 (4.2)	8.1 (6.8)	12 (10.0)	16.3 (13.8)	23 (19.5)
		ND (initial setting)		1.2	2.2	3.7	5	8.1	12	16.3
	Overload current rating*3	SLD		110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C						
		ND (initial setting)		150% 60 s, 200% 0.5 s (inverse-time characteristics) at surrounding air temperature of 50°C						
	Rated voltage*4			Three-phase 380 to 480 V						
	Regenerative braking	Brake transistor		Built-in						
		Maximum brake torque (ND reference)*5		100%		50%	20%			
Power supply*9	Rated input AC voltage/frequency			Three-phase 380 to 480 V, 50/60 Hz						
	Permissible AC voltage fluctuation			323 to 528 V, 50/60 Hz						
	Permissible frequency fluctuation			±5%						
	Rated input current (A)*8	Without DC reactor	SLD	3.1	6.0	7.8	11.9	16.1	21.3	29.1
			ND	1.8	3.2	5.7	7.6	11.4	16.3	20.9
		With DC reactor	SLD	2.2	3.7	5.0	8.1	12.0	16.3	23.0
			ND	1.2	2.2	3.6	5.0	8.0	12.0	16.0
	Power supply capacity (kVA)*6	Without DC reactor	SLD	2.4	4.2	6.1	9.0	12.5	16.2	22.2
			ND	1.4	2.7	4.4	5.8	8.6	12.4	15.9
		With DC reactor	SLD	1.7	2.8	3.8	6.2	9.1	12.4	17.5
			ND	0.9	1.7	2.7	3.8	6.1	9.1	12.2
Protective structure				Open type IP20 (for IEC 60529 only)						
Cooling system				Natural			Forced air			
Approx. mass (kg)				0.8	0.8	1.1	1.3	1.4	2.3	2.4

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric standard 4-pole motor.
*2 The rated output capacity is the value with respect to 440 V output voltage.
*3 The percentage of the overload current rating 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. The maximum point of the voltage waveform at the output side of the inverter is approximately the power supply voltage multiplied by $\sqrt{2}$.
*5 The amount of braking torque is the average short-term torque (which varies depending on motor loss) that is generated when a motor decelerates in the shortest time by itself from 60 Hz. It is not continuous regenerative torque. The average deceleration torque becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a built-in brake resistor. Use an option brake resistor for an operation with large regenerative power The brake unit (FR-BU2) can be also used.
*6 The power supply capacity varies with the value of the input power impedance (including those of the input reactor and cables).
*7 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 30°C while a 3 kHz or higher value is selected in **Pr.72 PWM frequency selection**.
*8 The rated input current is the value at a rated output voltage. The input power impedances (including those of the input reactor and cables) affect the value.
*9 To be compliant with the standards, wire the inverter using the following earthing (grounding) and power supply methods:
FR-D840-wyz: TN-C, TN-S (neutral earthed), IT (isolated, neutral over impedance)

◆ Single-phase 200 V power supply

Model FR-D820S-[]				0.1K-008	0.2K-014	0.4K-025	0.75K-042	1.5K-070	2.2K-100
Applicable motor capacity (kW)∗1			ND	0.1	0.2	0.4	0.75	1.5	2.2
Output	Rated capacity (kVA)∗2		ND	0.3	0.5	1.0	1.6	2.7	3.8
	Rated current (A)∗7		ND	0.8	1.4	2.5	4.2	7	10
	Overload current rating∗3		ND	150% 60 s, 200% 0.5 s (inverse-time characteristics) at surrounding air temperature of 50°C					
	Rated voltage∗4			Three-phase 200 to 240 V					
	Regenerative braking	Brake transistor		Not used		Built-in			
		Maximum brake torque (ND reference)∗5		150%		100%		50%	20%
Power supply ∗9	Rated input AC voltage/frequency			Single-phase 200 to 240 V, 50/60 Hz					
	Permissible AC voltage fluctuation			170 to 264 V, 50/60 Hz					
	Permissible frequency fluctuation			±5%					
	Rated input current (A)∗8	Without DC reactor	ND	2.3	3.9	6.6	10.9	17.4	24.2
		With DC reactor		1.1	2.1	3.7	6.7	12.6	17.8
	Power supply capacity (kVA)∗6	Without DC reactor	ND	0.5	0.9	1.4	2.4	3.8	5.3
		With DC reactor		0.2	0.5	0.8	1.5	2.8	3.9
Protective structure				Open type IP20 (for IEC 60529 only)					
Cooling system				Natural					Forced air
Approx. mass (kg)				0.5	0.5	0.7	0.8	1.3	1.4

∗1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric standard 4-pole motor.
∗2 The rated output capacity is the value with respect to 230 V output voltage.
∗3 The percentage of the overload current rating 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. For single-phase power input model, the bus voltage decreases to power failure detection level and the load of 100% or higher may not be available if the automatic restart after instantaneous power failure function (**Pr.57**) or the power failure stop function (**Pr.261**) is set and power supply voltage is low while the load increases.
∗4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. The maximum point of the voltage waveform at the output side of the inverter is approximately the power supply voltage multiplied by $\sqrt{2}$.
∗5 The amount of braking torque is the average short-term torque (which varies depending on motor loss) that is generated when a motor decelerates in the shortest time by itself from 60 Hz. It is not continuous regenerative torque. The average deceleration torque becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a built-in brake resistor. Use an option brake resistor for an operation with large regenerative power (not available for the FR-D820S-0.1K-008 and FR-D820S-0.2K-014). The brake unit (FR-BU2) can be also used.
∗6 The power supply capacity varies with the value of the input power impedance (including those of the input reactor and cables).
∗7 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 30°C while a 3 kHz or higher value is selected in **Pr.72 PWM frequency selection**.
∗8 The rated input current is the value at a rated output voltage. The input power impedances (including those of the input reactor and cables) affect the value.
∗9 To be compliant with the standards, wire the inverter using the following earthing (grounding) and power supply methods:
FR-D820S-wyz: TN-C, TN-S, IT (isolated, neutral or phase earthed over impedance)

◆ Single-phase 100 V power supply

Model FR-D810W-[]				0.1K-008	0.2K-014	0.4K-025	0.75K-042
Applicable motor capacity (kW)∗1			ND	0.1	0.2	0.4	0.75
Output	Rated capacity (kVA)∗2		ND	0.3	0.5	1.0	1.6
	Rated current (A)∗6		ND	0.8	1.4	2.5	4.2
	Overload current rating∗3		ND	150% 60 s, 200% 0.5 s (inverse-time characteristics) at surrounding air temperature of 50°C			
	Rated voltage∗8∗9			Three-phase 200 to 240 V			
	Regenerative braking	Brake transistor		Not used		Built-in	
		Maximum brake torque (ND reference)∗4		150%		100%	
Power supply ∗10	Rated input AC voltage/frequency			Single-phase 100 to 120 V, 50/60 Hz			
	Permissible AC voltage fluctuation			90 to 132 V, 50/60 Hz			
	Permissible frequency fluctuation			±5%			
	Rated input current (A)∗7		ND	3.8	6.2	10.5	18.8
	Power supply capacity (kVA)∗5		ND	0.4	0.6	1.1	1.8
Protective structure				Open type IP20 (for IEC 60529 only)			
Cooling system				Natural			
Approx. mass (kg)				0.5	0.6	0.7	1.3

∗1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric standard 4-pole motor.
∗2 The rated output capacity is the value with respect to 230 V output voltage.
∗3 The percentage of the overload current rating 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. For single-phase power input model, the bus voltage decreases to power failure detection level and the load of 100% or higher may not be available if the automatic restart after instantaneous power failure function (**Pr.57**) or the power failure stop function (**Pr.261**) is set and power supply voltage is low while the load increases.
∗4 The amount of braking torque is the average short-term torque (which varies depending on motor loss) that is generated when a motor decelerates in the shortest time by itself from 60 Hz. It is not continuous regenerative torque. The average deceleration torque becomes lower when a motor decelerates from a frequency higher than the base frequency. The inverter is not equipped with a built-in brake resistor. Use an option brake resistor for an operation with large regenerative power (not available for the FR-D810W-0.1K-008 and FR-D810W-0.2K-014). The brake unit (FR-BU2) can be also used.
∗5 The power supply capacity varies with the value of the input power impedance (including those of the input reactor and cables).
∗6 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 30°C while a 3 kHz or higher value is selected in **Pr.72 PWM frequency selection**.
∗7 The rated input current is the value at a rated output voltage. The input power impedances (including those of the input reactor and cables) affect the value.
∗8 For the single-phase 100 V power input models, the maximum output voltage is twice the amount of the power supply voltage.
∗9 For the single-phase 100 V power input models, output voltage decreases by applying motor load, and output current increases compared to the three-phase power input models. The load must be reduced so that output current does not exceed the rated motor current.
∗10 To be compliant with the standards, wire the inverter using the following earthing (grounding) and power supply methods:
FR-D810W-wyz: TN-C, TN-S, IT (isolated, neutral or phase earthed over impedance)

● Common specifications

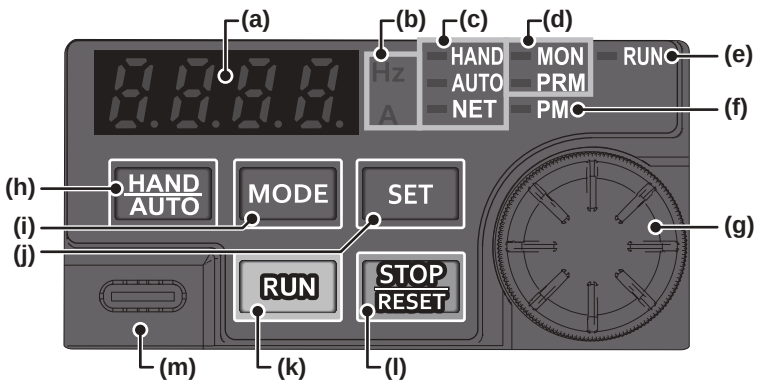
Control	Control method		Soft-PWM control / High carrier frequency PWM control
		Induction motor	Selectable among V/F control and Advanced magnetic flux vector control
		PM motor	PM sensorless vector control
	Output frequency range	Induction motor	0.2 to 590 Hz (The upper-limit frequency is 400 Hz under Advanced magnetic flux vector control.)
		PM motor	0.2 to 400 Hz (not operable at a frequency higher than the maximum motor frequency)
	Frequency setting and resolution	Analog input	0.015 Hz / 0 to 60 Hz at 0 to 10 V / 12 bits (terminals 2 and 4) 0.03 Hz / 0 to 60 Hz at 0 to 5 V / 11 bits or 0 to 20 mA / 11 bits (terminals 2 and 4)
		Digital input	0.01 Hz
	Frequency accuracy	Analog input	Within ±0.2% of the maximum output frequency (25°C ±10°C)
		Digital input	0.01% or less of the set output frequency
	Voltage/frequency characteristics		Base frequency can be set from 0 to 590 Hz. Constant-torque/variable-torque pattern can be selected (with induction motor only).
	Starting torque	Induction motor	150% at 0.5 Hz (Advanced magnetic flux vector control)
		PM motor	50%
	Torque boost		Manual torque boost (induction motor only)
	Acceleration/deceleration time setting		0 to 3600 s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration modes are available.
	DC injection brake	Induction motor	Operation frequency (0 to 120 Hz), operation time (0 to 10 s), operation voltage (0% to 30%) variable (The current is limited at the inverter rated current.)
		PM motor	Operation time (0 to 10 s) variable, operating voltage (operating current) fixed
	Stall prevention operation level		Operation current: 0% to 200% variable, with selectable availability of the function
	Torque limit level		Torque limit value can be set (0 to 400% variable). (Under PM sensorless vector control only)
Operation	Frequency setting signal	Analog input	Terminals 2 and 4: 0 to 10 V / 0 to 5 V / 4 to 20 mA (0 to 20 mA)
		Digital input	Input using the operation panel or parameter unit
		Pulse input	100k pulses/s (inverter)
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signal		5 — Low-speed operation command, middle-speed operation command, high-speed operation command, forward rotation command, reverse rotation command The input signal can be changed using **Pr.178** to **Pr.182 (Input terminal function selection)**.
	Operational function		Maximum and minimum frequency settings, multi-speed operation, acceleration/deceleration pattern, thermal protection, DC injection brake, starting frequency, JOG operation, output stop (MRS), stall prevention, regeneration avoidance, increased magnetic excitation deceleration, frequency jump, rotation display, automatic restart after instantaneous power failure, remote setting, retry function, carrier frequency selection, fast-response current limit, forward/reverse rotation prevention, operation mode selection, slip compensation, speed smoothing control, traverse, auto tuning, applied motor selection, RS-485 communication, PID control, easy dancer control, cooling fan operation selection, stop selection (deceleration stop/coasting), power failure time deceleration-to-stop function, life diagnosis, maintenance timer, current average monitor, multiple rating, speed control, torque limit, test operation, safety stop function, emergency drive, Optimum excitation control.
	Output signal	Open collector output	2 — Inverter running, Up to frequency, Fault The output signal can be changed using **Pr.190** to **Pr.192 (Output terminal function selection)**.
		Relay output	1
		Analog output	Terminal AM: 0 to +10 V / 12 bits
Protective/warning function		Protective functions	Overcurrent trip during acceleration, overcurrent trip during constant speed, overcurrent trip during deceleration/stop, regenerative overvoltage trip during acceleration, regenerative overvoltage trip during constant speed, regenerative overvoltage trip during deceleration or stop, inverter overload trip (electronic thermal relay function), motor overload trip (electronic thermal relay function), heat sink overheat, undervoltage, input phase loss∗1, stall prevention stop, loss of synchronism detection∗2, upper limit fault detection, lower limit fault detection, brake transistor fault, output side earth (ground) fault overcurrent, output short circuit, inrush resistance overheat, output phase loss, external thermal relay operation, PTC thermistor operation∗2, Internal storage device fault, parameter storage device fault, disconnected PU, retry count excess, CPU fault, abnormal output current detection, USB communication fault, analog input fault, safety circuit fault, speed deviation excess detection∗2, PID signal fault, internal circuit fault
		Warning functions	Fan alarm, stall prevention (overcurrent), stall prevention (overvoltage), regenerative brake pre-alarm∗2, electronic thermal relay function pre-alarm, PU stop, maintenance timer alarm, parameter write error, operation panel lock∗2, Password locked∗2, safety stop, load fault warning∗2, emergency drive in operation∗2, Continuous operation during communication fault∗2, incorrect parameter setting
Environment	Surrounding air temperature		-20°C to +60°C ND rating: The rated current must be reduced at a temperature above 50°C. SLD rating: The rated current must be reduced at a temperature above 40°C.
	Surrounding air humidity		95% RH or less (non-condensing) (With circuit board coating (conforming to IEC 60721-3-3:1994 3C2/3S2) 90% RH or less (non-condensing) (Without circuit board coating)
	Storage temperature∗3		-40°C to +70°C
	Ambience		Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude/vibration		Maximum 3000 m∗4, 5.9 m/s^2 or less at 10 to 55 Hz in X, Y, and Z directions

∗1 Available for the three-phase power input model.
∗2 Not activated in the inverter in the initial state.
∗3 Applicable to conditions for a short time, for example, in transit.
∗4 For the installation at an altitude above 1000 m, consider a 3% reduction in the rated current per 500 m increase in altitude.

Operation Panel

● Components of the operation panel

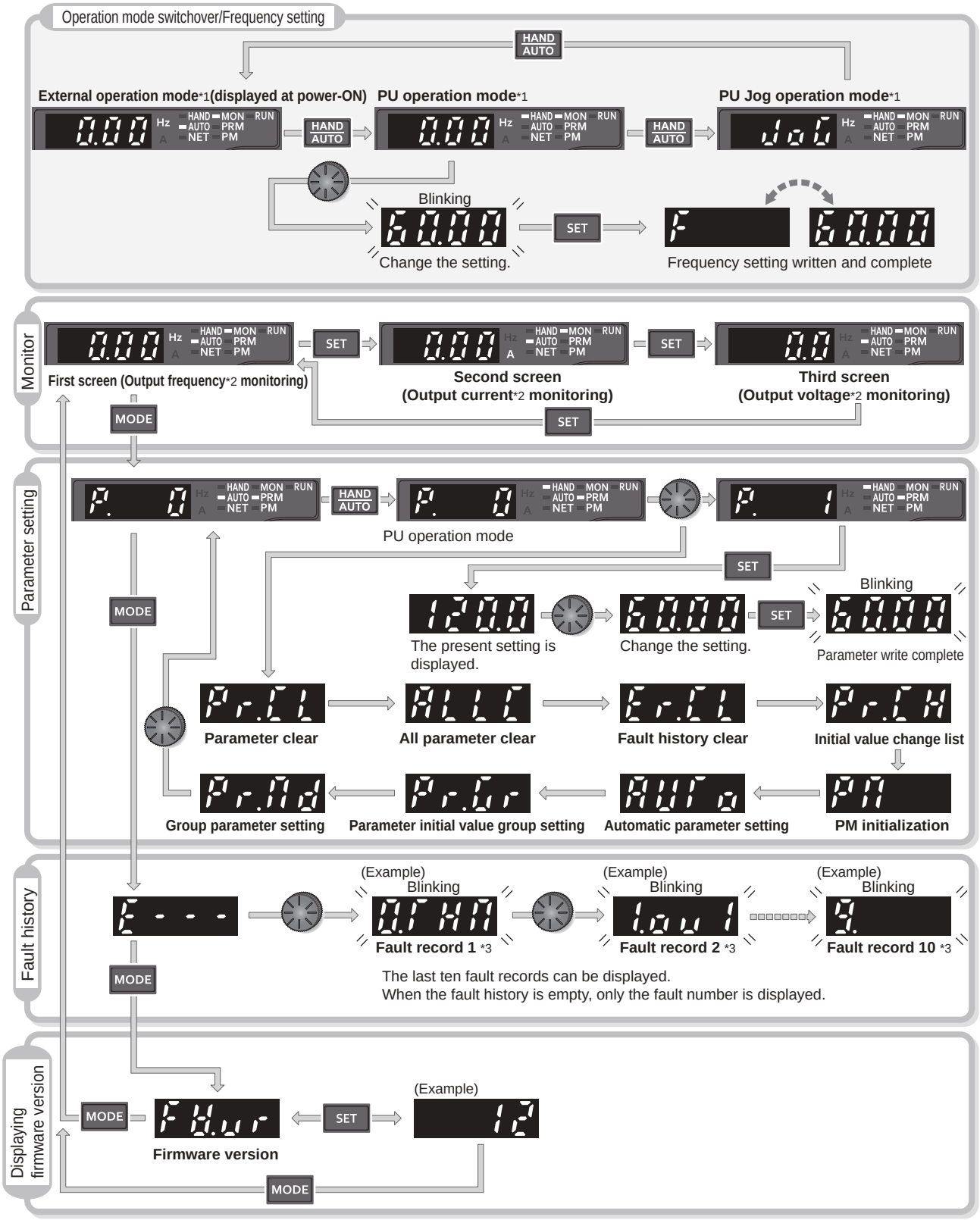
The operation panel cannot be removed from the inverter.



No.	Appearance	Name	Description
(a)		Monitor (4-digit LED)	Shows a numeric value (readout) of a monitor item such as the frequency or a parameter number. (The monitor item can be changed according to the settings of **Pr.52, Pr.774 to Pr.776**.)
(b)	Hz A	Unit indication	Hz: ON when the actual frequency is monitored. (Blinks when the set frequency is monitored.) A: ON when the current is monitored. (Both "Hz" and "A" are OFF to indicate a value other than the frequency or the current.)
(c)	HAND AUTO NET	Inverter operation mode LED indicator	HAND: ON when the inverter is in the PU operation mode. AUTO: ON when the inverter is in the External operation mode. (ON when the inverter in the initial setting is powered ON.) NET: ON when the inverter is in the Network operation mode. Both HAND and AUTO are ON when the inverter is in the External/PU combined operation mode 1 or 2.
(d)	MON PRM	Operation panel mode LED indicator	MON: ON only when the first, second, or third monitor is displayed. PRM: ON when the operation panel is in the parameter setting mode. The indicator blinks when the inverter is in the easy setting mode.
(e)	RUN	Operating status indicator	ON or blinks during inverter running. ON: During forward rotation operation. Blinks slowly (1.4-second cycle): During reverse rotation operation. Blinks quickly (0.2-second cycle): Operation is disabled although the start command is given.*1
(f)	PM	Controlled motor type LED indicator	ON when the PM sensorless vector control is selected. The indicator blinks during test operation. The indicator is OFF when the inverter controls the induction motor.
(g)		Setting dial	The setting dial of the Mitsubishi Electric inverters. Turn the setting dial to change the setting of frequency or parameter, etc. Press the setting dial to perform the following operations: To display a set frequency on the LED display in the monitor mode. (The monitor item shown on the display can be changed by using **Pr.992**.) To display the present setting during calibration.
(h)	HAND AUTO	HAND/AUTO key	Switches between the PU operation mode, the PUJOG operation mode, and the External operation mode. The easy setting of the inverter operation mode is enabled by pressing this key simultaneously with the MODE key. Also cancels the PU stop warning.
(i)	MODE	MODE key	Switches the operation panel to a different mode. The easy setting of the inverter operation mode is enabled by pressing this key simultaneously with the HAND/AUTO key. Every key on the operation panel becomes inoperable by holding this key for two seconds. The key lock function is disabled when **Pr.161** = "0 (initial setting)".
(j)	SET	SET key	Confirms each selection. When this key is pressed during inverter operation, the monitor item changes. (The monitor item on each screen can be changed according to the settings of **Pr.52, Pr.774 to Pr.776**.) Initial setting in the monitor mode Output frequency → Output current → Output voltage
(k)	RUN	RUN key	Start command The direction of motor rotation depends on the **Pr.40** setting. When **Pr.40** = "0 (initial value)", the motor starts forward rotation.
(l)	STOP RESET	STOP/RESET key	Stops the operation commands. Used to reset the inverter when the protective function is activated.
(m)		USB connector	FR Configurator2 is available by USB connection. (USB Type-C)

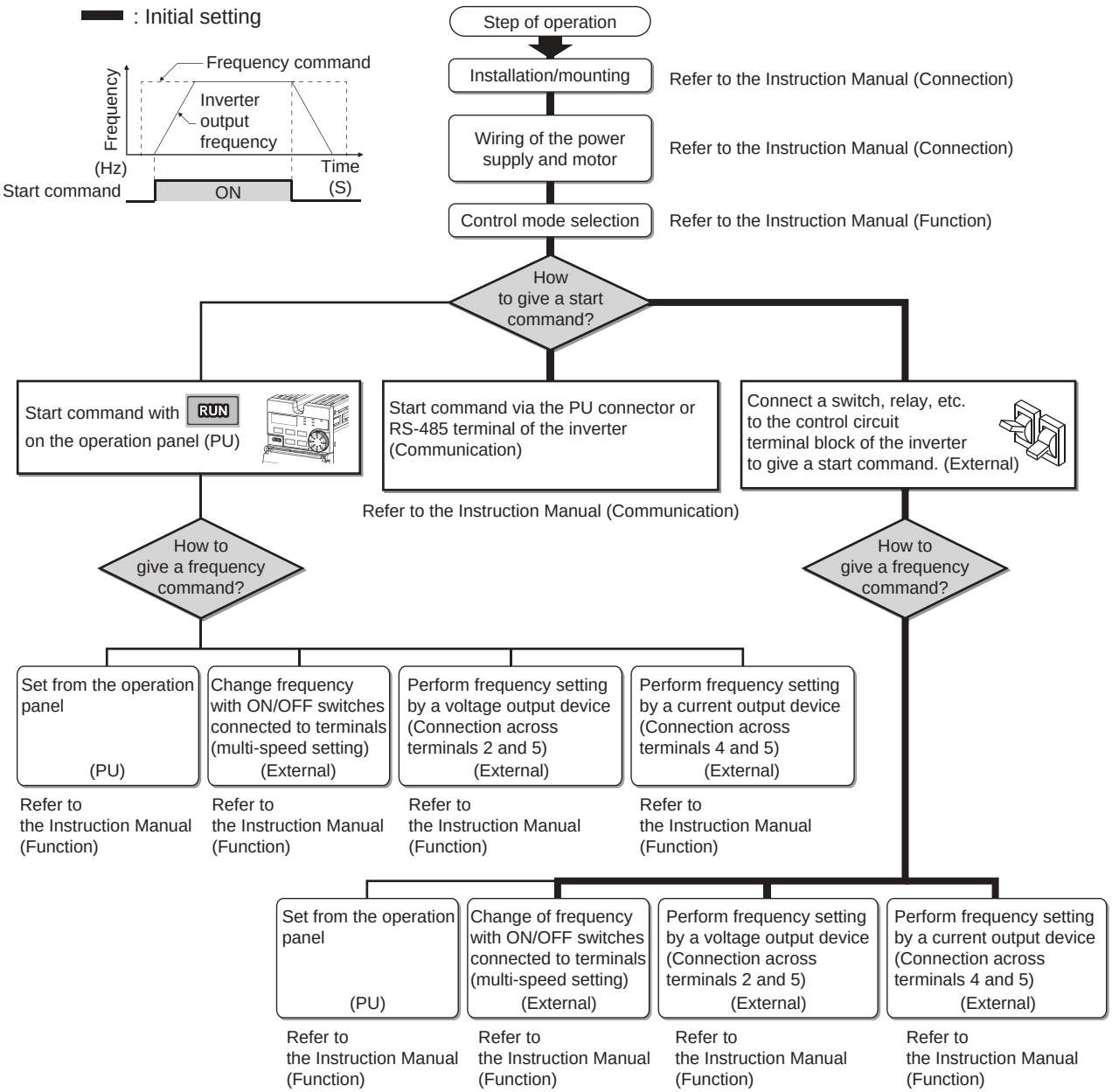
*1 Situations such as when the MRS/X10 signal is input, during the automatic restart after instantaneous power failure, after auto tuning is complete, when "SE" (incorrect parameter setting) alarm occurs.

● Basic operation of the operation panel



*1 For the details of operation modes, refer to the Instruction Manual (Function).
*2 The monitor item can be changed. (Refer to the Instruction Manual (Function).)
*3 For the details of the fault history, refer to the Instruction Manual (Maintenance).

Operation Steps



For more information on the product

Parameter list

For simple variable-speed operation of the inverter, the initial values of the parameters may be used as they are. Set the necessary parameters to meet the load and operational specifications. Parameter's setting, change and check can be made on the operation panel.

NOTE

- Simple indicates simple mode parameters. Use **Pr.160 User group read selection** to indicate the simple mode parameters only (initial setting is to indicate the extended mode parameters).
- The changing of the parameter settings may be restricted in some operating status. Use **Pr.77 Parameter write selection** to change the setting of the restriction.
- Refer to the Instruction Manual (Function) for instruction codes for communication and availability of Parameter clear, all clear, and Parameter copy.

◆ Notation

Mark	Description
[100/200 V class]	Available for the 100/200 V class.
[400 V class]	Available for the 400 V class.
[3-phase]	Available for the three-phase power input model.

Pr.	Name	Setting range	Initial value
0	Torque boost Simple	0% to 30%	6%∗1
			4%∗1
			3%∗1
1	Maximum frequency Simple	0 to 120 Hz	120 Hz
2	Minimum frequency Simple	0 to 120 Hz	0 Hz
3	Base frequency Simple	0 to 590 Hz	60 Hz
4	Multi-speed setting (high speed) Simple	0 to 590 Hz	60 Hz
5	Multi-speed setting (middle speed) Simple	0 to 590 Hz	30 Hz
6	Multi-speed setting (low speed) Simple	0 to 590 Hz	10 Hz
7	Acceleration time Simple	0 to 3600 s	5 s∗2
			10 s∗2
8	Deceleration time Simple	0 to 3600 s	5 s∗2
			10 s∗2
9	Electronic thermal O/L relay Simple	0 to 500 A	Inverter rated current
	Rated motor current Simple		
10	DC injection brake operation frequency	0 to 120 Hz	3 Hz
11	DC injection brake operation time	0 to 10 s	0.5 s
12	DC injection brake operation voltage	0% to 30%	6%∗3
			4%∗3
13	Starting frequency	0 to 60 Hz	0.5 Hz
14	Load pattern selection	0 to 3	0
15	Jog frequency	0 to 590 Hz	5 Hz
16	Jog acceleration/deceleration time	0 to 3600 s	0.5 s
17	MRS/X10 terminal input selection	0 to 5	0
18	High speed maximum frequency	0 to 590 Hz	120 Hz
19	Base frequency voltage	0 to 1000 V, 8888, 9999	9999
20	Acceleration/deceleration reference frequency	1 to 590 Hz	60 Hz
22	Stall prevention operation level (Torque limit level)	0% to 400%	150%
23	Stall prevention operation level compensation factor at double speed	0% to 200%, 9999	9999
24 to 27	Multi-speed setting (speed 4 to speed 7)	0 to 590 Hz, 9999	9999
29	Acceleration/deceleration pattern selection	0 to 2	0
30	Regenerative function selection	0 to 2	0
31	Frequency jump 1A	0 to 590 Hz, 9999	9999
32	Frequency jump 1B	0 to 590 Hz, 9999	9999
33	Frequency jump 2A	0 to 590 Hz, 9999	9999
34	Frequency jump 2B	0 to 590 Hz, 9999	9999
35	Frequency jump 3A	0 to 590 Hz, 9999	9999
36	Frequency jump 3B	0 to 590 Hz, 9999	9999
37	Speed display	0.01 to 9998	1800

Pr.	Name	Setting range	Initial value
40	RUN key rotation direction selection	0, 1	0
41	Up-to-frequency sensitivity	0% to 100%	10%
42	Output frequency detection	0 to 590 Hz	6 Hz
43	Output frequency detection for reverse rotation	0 to 590 Hz, 9999	9999
44	Second acceleration/ deceleration time	0 to 3600 s	5 s∗2
			10 s∗2
45	Second deceleration time	0 to 3600 s, 9999	9999
46	Second torque boost	0% to 30%, 9999	9999
47	Second V/F (base frequency)	0 to 590 Hz, 9999	9999
48	Second stall prevention operation level	0% to 400%, 9999	9999
51	Second electronic thermal O/L relay Rated second motor current	0 to 500 A, 9999	9999
52	Operation panel main monitor selection	0, 5 to 14, 17, 18, 20, 23 to 25, 32, 33, 37, 38, 44, 50 to 55, 61, 62, 64, 67, 68, 91, 97, 98, 100	0
53	Frequency / rotation speed unit switchover	0, 1, 4	0
55	Frequency monitoring reference	0 to 590 Hz	60 Hz
56	Current monitoring reference	0 to 500 A	Inverter rated current
57	Restart coasting time	0, 0.1 to 30 s, 9999	9999
58	Restart cushion time	0 to 60 s	1 s
59	Remote function selection	0 to 4	0
60	Energy saving control selection	0, 9	0
65	Retry selection	0 to 5	0
66	Stall prevention operation reduction starting frequency	0 to 590 Hz	60 Hz
67	Number of retries at fault occurrence	0 to 10, 101 to 110	0
68	Retry waiting time	0.1 to 600 s	1 s
69	Retry count display erase	0	0
70	Special regenerative brake duty	0% to 100%	0%
71	Applied motor	0, 3, 5, 6, 10, 13, 15, 16, 20, 23, 40, 43, 50, 53, 70, 73, 1140, 8090, 8093, 9090, 9093	0
72	PWM frequency selection	0 to 15	1
73	Analog input selection	0, 1, 6, 10, 11, 16	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	14
	Reset selection	0, 1	0
	Disconnected PU detection		
	PU stop selection		1
77	Parameter write selection	0 to 2	0
78	Reverse rotation prevention selection	0 to 2	0
79	Operation mode selection Simple	0 to 4, 6, 7	0
80	Motor capacity	0.1 to 18.5 kW, 9999	9999

Pr.	Name	Setting range	Initial value
81	Number of motor poles	2, 4, 6, 8, 10, 12, 9999	9999
82	Motor excitation current	0 to 500 A, 9999	9999
83	Rated motor voltage	0 to 1000 V	[100/200 V class] 200 V [400 V class] 400 V
84	Rated motor frequency	10 to 400 Hz, 9999	9999
89	Speed control gain (Advanced magnetic flux vector)	0% to 200%, 9999	9999
90	Motor constant (R1)	0 to 50 Ω, 9999	9999
91	Motor constant (R2)	0 to 50 Ω, 9999	9999
92	Motor constant (L1)/d-axis inductance (Ld)	0 to 6000 mH, 9999	9999
93	Motor constant (L2)/q-axis inductance (Lq)	0 to 6000 mH, 9999	9999
94	Motor constant (X)	0% to 100%, 9999	9999
96	Auto tuning setting/status	0, 1, 11	0
117	RS-485 communication station number	0 to 31 (0 to 247)	0
118	RS-485 communication speed	48, 96, 192, 384, 576, 768, 1152	192
119	RS-485 communication stop bit length / data length	0, 1, 10, 11	1
	RS-485 communication data length	0, 1	0
	RS-485 communication stop bit length	0, 1	1
120	RS-485 communication parity check	0 to 2	2
121	RS-485 communication retry count	0 to 10, 9999	1
122	RS-485 communication check time interval	0, 0.1 to 999.8 s, 9999	0
123	RS-485 communication waiting time setting	0 to 150 ms, 9999	9999
124	RS-485 communication CR/LF selection	0 to 2	1
125	Terminal 2 frequency setting gain frequency Simple	0 to 590 Hz	60 Hz
126	Terminal 4 frequency setting gain frequency Simple	0 to 590 Hz	60 Hz
127	PID control automatic switchover frequency	0 to 590 Hz, 9999	9999
128	PID action selection	0, 20, 21, 40 to 43, 1000, 1001, 1010, 1011, 2000, 2001, 2010, 2011	0
129	PID proportional band	0.1% to 1000%, 9999	100%
130	PID integral time	0.1 to 3600 s, 9999	1 s
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 s, 9999	9999
136	MC switchover interlock time	0 to 100 s	1 s
139	Automatic switchover frequency from inverter to bypass operation	0 to 60 Hz, 9999	9999
145	PU display language selection	0 to 7	—
150	Output current detection level	0% to 400%	150%
151	Output current detection signal delay time	0 to 10 s	0 s
152	Zero current detection level	0% to 400%	5%
153	Zero current detection time	0 to 10 s	0.5 s
154	Voltage reduction selection during stall prevention operation	1, 11	1
156	Stall prevention operation selection	0 to 31, 100, 101	0
157	OL signal output timer	0 to 25 s, 9999	0 s
158	AM terminal function selection	1 to 3, 5 to 14, 17, 18, 21, 24, 32, 33, 37, 50, 52, 53, 61, 62, 67, 97, 98	1
160	User group read selection Simple	0, 1, 9999	0
161	Frequency setting/key lock operation selection	0, 1, 10, 11	0

Pr.	Name	Setting range	Initial value
162	Automatic restart after instantaneous power failure selection	0, 1, 10, 11	0
165	Stall prevention operation level for restart	0% to 400%	150%
166	Output current detection signal retention time	0 to 10 s, 9999	0.1 s
167	Output current detection operation selection	0, 1, 10, 11	0
168	Parameter for manufacturer setting. Do not set.		
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 1999, 9999	9999
174	User group clear	0 to 1999, 9999	9999
178	STF terminal function selection	0 to 5, 7, 8, 10, 12, 14, 16, 18, 24, 25, 27, 30, 37, 46, 47, 60, 62, 64 to 67, 72, 84, 9999	60
179	STR terminal function selection	0 to 5, 7, 8, 10, 12, 14, 16, 18, 24, 25, 27, 30, 37, 46, 47, 61, 62, 64 to 67, 72, 84, 9999	61
180	RL terminal function selection	0 to 5, 7, 8, 10, 12, 14, 16, 18, 24, 25, 27, 30, 37, 46, 47, 62, 64 to 67, 72, 84, 9999	0
181	RM terminal function selection		1
182	RH terminal function selection		2
185	NET X1 input selection	0 to 4, 8, 14, 18, 24, 27, 30, 37, 46, 47, 64, 72, 84, 9999	9999
186	NET X2 input selection		
187	NET X3 input selection		
188	NET X4 input selection		
189	NET X5 input selection		
190	RUN terminal function selection	0, 1, 3, 4, 7, 8, 11 to 16, 18, 19, 25, 26, 34, 40, 41, 46 to 48, 57, 64 to 66, 70, 79 to 81, 90 to 93, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 125, 126, 134, 140, 141, 146 to 148, 157, 164 to 166, 170, 179 to 181, 190 to 193, 195, 196, 198, 199, 206, 207, 211 to 213, 306, 307, 311 to 313, 9999	0
191	FU terminal function selection		4
192	ABC terminal function selection	0, 1, 3, 4, 7, 8, 11 to 16, 18, 19, 25, 26, 34, 40, 41, 46 to 48, 57, 64 to 66, 70, 79 to 81, 90, 91, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 125, 126, 134, 140, 141, 146 to 148, 157, 164 to 166, 170, 179 to 181, 190, 191, 195, 196, 198, 199, 206, 207, 211 to 213, 306, 307, 311 to 313, 9999	99
193	NET Y1 output selection	0, 1, 3, 4, 7, 8, 11 to 16, 18, 19, 25, 26, 34, 40, 41, 46 to 48, 57, 64 to 66, 70, 79 to 81, 90 to 93, 95, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 125, 126, 134, 140, 141, 146 to 148, 157, 164 to 166, 170, 179 to 181, 190 to 193, 195, 198, 199, 206, 207, 211 to 213, 306, 307, 311 to 313, 9999	9999
194	NET Y2 output selection		9999
195	NET Y3 output selection		9999
196	NET Y4 output selection		9999
232 to 239	Multi-speed setting (speed 8 to speed 15)	0 to 590 Hz, 9999	9999

Pr.	Name	Setting range	Initial value
240	Soft-PWM operation selection	0, 1	1
241	Analog input display unit switchover	0, 1	0
244	Cooling fan operation selection	0, 1	1
245	Rated slip	0% to 50%, 9999	9999
246	Slip compensation time constant	0.01 to 10 s	0.5 s
247	Constant output range slip compensation selection	0, 9999	9999
249	Earth (ground) fault detection at start	0, 1	0
250	Stop selection	0 to 100 s, 1000 to 1100 s, 8888, 9999	9999
251	Output phase loss protection selection	0, 1	1
255	Life alarm status display	(0 to 367)	0
256	Inrush current limit 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 (2, 3, 8, 9)	0
260	PWM frequency automatic switchover	0, 10	10
261	Power failure stop selection	0 to 2	0
267	Terminal 4 input selection	0 to 2	0
268	Monitor decimal digits selection	0, 1, 9999	9999
269	Parameter for manufacturer setting. Do not set.		
289	Inverter output terminal filter	5 to 50 ms, 9999	9999
291	Pulse train input selection	0, 1	0
295	Frequency change increment amount setting	0, 0.01, 0.1, 1, 10	0
296	Password lock level	1 to 6, 99, 101 to 106, 199, 9999	9999
297	Password lock/unlock	(0 to 5), 1000 to 9998, 9999	9999
298	Frequency search gain	0 to 32767, 9999	9999
299	Rotation direction detection selection at restarting	0, 1, 9999	0
338	Communication operation command source	0, 1	0
339	Communication speed command source	0 to 2	0
340	Communication startup mode selection	0, 1, 10	0
342	Communication EEPROM write selection	0, 1	0
343	Communication error count	(0 to 999)	0
374	Overspeed detection level	0 to 400 Hz, 9999	9999
384	Input pulse division scaling factor	0 to 250	0
385	Frequency for zero input pulse	0 to 590 Hz	0 Hz
386	Frequency for maximum input pulse	0 to 590 Hz	60 Hz
450	Second applied motor	0, 10, 9999	9999
495	Remote output selection	0, 1, 10, 11	0
496	Remote output data 1	0 to 4095	0
502	Stop mode selection at communication error	0 to 2, 6	0
503	Maintenance timer	0 (1 to 9998)	0
504	Maintenance timer warning output set time	0 to 9998, 9999	9999
505	Speed setting reference	1 to 590 Hz	60 Hz
506	Display estimated main circuit capacitor residual life	(0% to 100%)	100%
507	Display/reset ABC relay contact life	(0% to 100%)	100%
509	Display power cycle life	(0% to 100%)	100%
514	Emergency drive dedicated retry waiting time	0.1 to 600 s, 9999	9999
515	Emergency drive dedicated retry count	1 to 200, 9999	1
523	Emergency drive mode selection	100, 111, 112, 121, 122, 200, 211, 212, 221, 222, 300, 311, 312, 321, 322, 400, 411, 412, 421, 422, 9999	9999
524	Emergency drive running speed	0 to 590 Hz, 9999	9999
547	USB communication station number	0 to 31	0

Pr.	Name	Setting range	Initial value
548	USB communication check time interval	0 to 999.8 s, 9999	9999
549	Protocol selection	0, 1	0
551	PU mode operation command source selection	2 to 4, 9999	9999
552	Frequency jump range	0 to 30 Hz, 9999	9999
553	PID deviation limit	0% to 100%, 9999	9999
554	PID signal operation selection	0 to 3, 10 to 13	0
555	Current average time	0.1 to 1 s	1 s
556	Data output mask time	0 to 20 s	0 s
557	Current average value monitor signal output reference current	0 to 500 A	Inverter rated current
561	PTC thermistor protection level	0.5 to 30 kΩ, 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 [3-phase]	0, 2	2
571	Holding time at a start	0 to 10 s, 9999	9999
575	Output interruption detection time	0 to 3600 s, 9999	1 s
576	Output interruption detection level	0 to 590 Hz	0 Hz
577	Output interruption cancel level	900% to 1100%	1000%
592	Traverse function selection	0 to 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 3600 s	5 s
597	Amplitude deceleration time	0.1 to 3600 s	5 s
600	First free thermal reduction frequency 1	0 to 590 Hz, 9999	9999
601	First free thermal reduction ratio 1	1% to 100%	100%
602	First free thermal reduction frequency 2	0 to 590 Hz, 9999	9999
603	First free thermal reduction ratio 2	1% to 100%	100%
604	First free thermal reduction frequency 3	0 to 590 Hz, 9999	9999
607	Motor permissible load level	110% to 250%	150%
608	Second motor permissible load level	110% to 250%, 9999	9999
609	PID set point/deviation input selection	2, 3	2
610	PID measured value input selection	2, 3	3
611	Acceleration time at a restart	0 to 3600 s, 9999	9999
631	Inverter output fault detection enable/disable selection	0, 1	0
643	Voltage compensation amount setting	0% to 150%, 9999	9999
653	Speed smoothing control	0% to 200%	0%
654	Speed smoothing cutoff frequency	0 to 120 Hz	20 Hz
660	Increased magnetic excitation deceleration operation selection	0, 1	0
661	Magnetic excitation increase rate	0% to 40%, 9999	9999
662	Increased magnetic excitation current level	0% to 200%	100%
663	Control circuit temperature signal output level	0 to 100°C	0°C
665	Regeneration avoidance frequency gain	0% to 200%	100%
673	SF-PR slip amount adjustment operation selection	2, 4, 6, 9999	9999
674	SF-PR slip amount adjustment gain	0% to 500%	100%
692	Second free thermal reduction frequency 1	0 to 590 Hz, 9999	9999
693	Second free thermal reduction ratio 1	1% to 100%	100%
694	Second free thermal reduction frequency 2	0 to 590 Hz, 9999	9999
695	Second free thermal reduction ratio 2	1% to 100%	100%
696	Second free thermal reduction frequency 3	0 to 590 Hz, 9999	9999

Pr.	Name	Setting range	Initial value
699	Input terminal filter	5 to 50 ms, 9999	9999
702	Maximum motor frequency	0 to 400 Hz, 9999	9999
706	Motor induced voltage constant (phi f)	0 to 5000 mV (rad/s), 9999	9999
707	Motor inertia (integer)	10 to 999, 9999	9999
711	Motor Ld decay ratio	0% to 100%, 9999	9999
712	Motor Lq decay ratio	0% to 100%, 9999	9999
717	Starting resistance tuning compensation coefficient	0% to 200%, 9999	9999
721	Starting magnetic pole position detection pulse width	0 to 6000 μs, 9999	9999
724	Motor inertia (exponent)	0 to 7, 9999	9999
725	Motor protection current level	100% to 500%, 9999	9999
759	PID unit selection	0 to 43, 9999	9999
774	Operation panel monitor selection 1	1 to 3, 5 to 14, 17, 18, 20, 23 to 25, 32, 33, 37, 38, 44, 50 to 55, 61, 62, 64, 67, 68, 91, 97, 98, 100, 9999	9999
775	Operation panel monitor selection 2		9999
776	Operation panel monitor selection 3		9999
779	Operation frequency during communication error	0 to 590 Hz, 9999	9999
791	Acceleration time in low-speed range	0 to 3600 s, 9999	9999
792	Deceleration time in low-speed range	0 to 3600 s, 9999	9999
799	Pulse increment setting for output power	0.1, 1, 10, 100, 1000 kWh	1 kWh
800	Control method selection	10, 19, 20, 40	40
810	Torque limit input method selection	0	0
811	Set resolution switchover	0, 10	0
815	Torque limit level 2	0% to 400%, 9999	9999
820	Speed control P gain	0% to 1000%	25%
821	Speed control integral time	0 to 20 s	0.333 s
824	Torque control P gain (current loop proportional gain)	0% to 500%	50%
825	Torque control integral time (current loop integral time)	0 to 500 ms	20 ms
859	Torque current/Rated PM motor current	0 to 500 A, 9999	9999
865	Low speed detection	0 to 590 Hz	1.5 Hz
866	Torque monitoring reference	0% to 400%	150%
870	Speed detection hysteresis	0 to 15 Hz	0 Hz
872	Input phase loss protection selection [3-phase]	0, 1	1
874	OLT level setting	0% to 400%	150%
882	Regeneration avoidance operation selection	0 to 2	0
883	Regeneration avoidance operation level	300 to 800 V	[100/200 V class] 400 V [400 V class] 780 V
885	Regeneration avoidance compensation frequency limit value	0 to 45 Hz, 9999	6 Hz
886	Regeneration avoidance voltage gain	0% to 200%	100%
888	Free parameter 1	0 to 9999	9999
889	Free parameter 2	0 to 9999	9999
890	Internal storage device status indication	(0 to 255)	0
891	Cumulative power monitor digit shifted times	0 to 4, 9999	9999
892	Load factor	30% to 150%	100%
893	Energy saving monitor reference (motor capacity)	0.1 to 18.5 kW	Applicable motor capacity
894	Control selection during commercial power-supply operation	0 to 3	0
895	Power saving rate reference value	0, 1, 9999	9999
896	Power unit cost / CO2 emission coefficient	0 to 500, 9999	9999
897	Energy saving monitor average time	0 to 1000 h, 9999	9999
898	Energy saving cumulative monitor clear	0, 1, 10, 9999	9999

Pr.	Name	Setting range	Initial value
899	Operation time rate (estimated value)	0% to 100%, 9999	9999
990	PU buzzer control	0, 1	1
991	PU contrast adjustment	0 to 63	58
992	Operation panel setting dial push monitor selection	0 to 3, 5 to 14, 17, 18, 20, 23 to 25, 32, 33, 37, 38, 44, 50 to 55, 61, 62, 64, 67, 68, 91, 97, 98, 100	0
997	Fault initiation	0 to 255, 9999	9999
998	PM parameter initialization Simple	0, 3044, 3144, 8009, 8109, 9009, 9109	0
999	Automatic parameter setting Simple	10, 12, 20, 21, 9999	9999
1002	Lq tuning target current adjustment coefficient	50% to 150%, 9999	9999
1006	Clock (year)	2000 to 2099	2000
1007	Clock (month, day)	Jan. 1 to Dec. 31	101
1008	Clock (hour, minute)	0:00 to 23:59	0
1013	Running speed after recovery from emergency drive undervoltage	0 to 590 Hz	60 Hz
1015	Integral stop selection at limited frequency	0 to 2, 10 to 12	10
1016	PTC thermistor protection detection time	0 to 60 s	0 s
1020	Trace operation selection	0 to 3	0
1022	Sampling cycle	1, 2, 5, 10, 50, 100, 500, 1000	1
1023	Number of analog channels	1 to 8	4
1024	Sampling auto start	0, 1	0
1025	Trigger mode selection	0 to 4	0
1026	Number of sampling before trigger	0% to 100%	90%
1027	Analog source selection (1ch)	1 to 3, 5 to 14, 17, 18, 20, 23, 24, 32, 33, 37, 52 to 54, 61, 62, 64, 67, 68, 91, 97, 98, 201 to 210, 212, 213, 230 to 232, 235 to 238	201
1028	Analog source selection (2ch)		202
1029	Analog source selection (3ch)		203
1030	Analog source selection (4ch)		204
1031	Analog source selection (5ch)		205
1032	Analog source selection (6ch)		206
1033	Analog source selection (7ch)		207
1034	Analog source selection (8ch)		208
1035	Analog trigger channel	1 to 8	1
1036	Analog trigger operation selection	0, 1	0
1037	Analog trigger level	600 to 1400	1000
1038	Digital source selection (1ch)	0 to 255	0
1039	Digital source selection (2ch)		0
1040	Digital source selection (3ch)		0
1041	Digital source selection (4ch)		0
1042	Digital source selection (5ch)		0
1043	Digital source selection (6ch)		0
1044	Digital source selection (7ch)		0
1045	Digital source selection (8ch)		0
1046	Digital trigger channel	1 to 8	1
1047	Digital trigger operation selection	0, 1	0
1048	Display-off waiting time	0 to 60, 100 to 160 min	0 min
1106	Torque monitor filter	0 to 5 s, 9999	9999
1107	Running speed monitor filter	0 to 5 s, 9999	9999
1108	Excitation current monitor filter	0 to 5 s, 9999	9999
1200	AM output offset calibration	4000 to 5000	4499
1412	Motor induced voltage constant (phi f) exponent	0 to 2, 9999	9999
1480	Load characteristics measurement mode	0, 1 (2 to 5, 81 to 85)	0
1481	Load characteristics load reference 1	0% to 400%, 8888, 9999	9999
1482	Load characteristics load reference 2	0% to 400%, 8888, 9999	9999
1483	Load characteristics load reference 3	0% to 400%, 8888, 9999	9999
1484	Load characteristics load reference 4	0% to 400%, 8888, 9999	9999
1485	Load characteristics load reference 5	0% to 400%, 8888, 9999	9999
1486	Load characteristics maximum frequency	0 to 590 Hz	60 Hz

Pr.	Name	Setting range	Initial value
1487	Load characteristics minimum frequency	0 to 590 Hz	6 Hz
1488	Upper limit warning detection width	0% to 400%, 9999	20%
1489	Lower limit warning detection width	0% to 400%, 9999	20%
1490	Upper limit fault detection width	0% to 400%, 9999	9999
1491	Lower limit fault detection width	0% to 400%, 9999	9999
1492	Load status detection signal delay time / load reference measurement waiting time	0 to 60 s	1 s
1499	Parameter for manufacturer setting. Do not set.		
C1 (901)∗4	AM terminal calibration	—	—
C2 (902)∗4	Terminal 2 frequency setting bias frequency	0 to 590 Hz	0 Hz
C3 (902)∗4	Terminal 2 frequency setting bias	0% to 300%	0%
125 (903)∗4	Terminal 2 frequency setting gain frequency	0 to 590 Hz	60 Hz
C4 (903)∗4	Terminal 2 frequency setting gain	0% to 300%	100%
C5 (904)∗4	Terminal 4 frequency setting bias frequency	0 to 590 Hz	0 Hz
C6 (904)∗4	Terminal 4 frequency setting bias	0% to 300%	20%
126 (905)∗4	Terminal 4 frequency setting gain frequency	0 to 590 Hz	60 Hz
C7 (905)∗4	Terminal 4 frequency setting gain	0% to 300%	100%
C42 (934)∗4	PID display bias coefficient	0 to 500, 9999	9999
C43 (934)∗4	PID display bias analog value	0% to 300%	20%
C44 (935)∗4	PID display gain coefficient	0 to 500, 9999	9999
C45 (935)∗4	PID display gain analog value	0% to 300%	100%
PR.CL	Parameter clear	(0), 1	0
ALLC	All parameter clear	(0), 1	0
ER.CL	Fault history clear	(0), 1	0
PR.CH	Initial value change list	—	0
PM	PM parameter initialization	0	0
AUTO	Automatic parameter setting	—	—
PR.GR	Parameter initial value group setting	1, 2	1
PR.MD	Group parameter setting	(0), 1, 2	0

∗1 Differs depending on the capacity.
6%: FR-D820-0.75K-042 or lower, FR-D840-0.75K-022 or lower, FR-D820S-0.75K-042 or lower, and FR-D810W-0.75K-042 or lower
4%: FR-D820-1.5K-070 to FR-D820-3.7K-165, FR-D840-1.5K-037 to FR-D840-3.7K-081, and FR-D820S-1.5K-070 or higher
3%: FR-D820-5.5K-238, FR-D820-7.5K-318, FR-D840-5.5K-120, and FR-D840-7.5K-163

∗2 Differs depending on the capacity.
5 s: FR-D820-3.7K-165 or lower, FR-D840-3.7K-081 or lower, FR-D820S-2.2K-100 or lower, and FR-D810W-0.75K-042 or lower
10 s: FR-D820-5.5K-238, FR-D820-7.5K-318, FR-D840-5.5K-120, and FR-D840-7.5K-163

∗3 Differs depending on the capacity.
6%: FR-D820-0.2K-014 or lower, FR-D820S-0.2K-014 or lower, and FR-D810W-0.2K-014 or lower
4%: FR-D820-0.4K-025 to FR-D820-7.5K-318, FR-D840-0.4K-012 to FR-D840-7.5K-163, FR-D820S-0.4K-025 or higher, and FR-D810W-0.4K-025 or higher

∗4 On the LCD operation panel or the parameter unit used as the command source, the parameter number in parentheses appears instead of that starting with the letter C.

● Error message

A message regarding operational fault or setting fault on the operation panel is displayed. The inverter output is not shut off.

Operation panel indication		Name	Description
HoLd	HOLD	Operation panel lock	Operation lock is set. Operation other than pressing the STOP/RESET key is disabled.
LoCd	LOCD	Password locked	Password function is active. Display and setting of parameters are restricted.
Er1 to Er4	Er1 to Er4	Parameter write error	Appears when an error occurred during parameter writing.
Err.	Err.	Error	• The RES signal is turned ON. • This error may occur when the voltage at the input side of the inverter drops.

● Warning

The inverter output is not shut off even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.

Operation panel indication		Name	Data code	Description
oLC	OLC	Stall prevention (overcurrent)	1 (H01)	When the output current of the inverter increases, the stall prevention (overcurrent) function is activated.
oLu	OLV	Stall prevention (overvoltage)	2 (H02)	• When the output voltage of the inverter increases, the stall prevention (overvoltage) function is activated. • The regeneration avoidance function is activated due to excessive regenerative power of the motor.
rb	RB	Regenerative brake pre-alarm	3 (H03)	Appears if the actual regenerative brake duty reaches or exceeds 85% of the reference regenerative brake duty (100%) determined by the settings of **Pr.30 Regenerative function selection** and **Pr.70 Special regenerative brake duty**. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E.OV[]) occurs.
TH	TH	Electronic thermal relay function pre-alarm	4 (H04)	Appears if the cumulative value of the electronic thermal O/L relay reaches or exceeds 85% of the preset level of **Pr.9 Electronic thermal O/L relay**. If the specified value is reached, the protection circuit is activated to shut off the inverter output.
PS	PS	PU stop	6 (H06)	• The motor is stopped using the STOP/RESET key in the mode other than the PU operation mode. (To enable the STOP/RESET key in the mode other than the PU operation mode, set **Pr.75 Reset selection/disconnected PU detection/PU stop selection**.) • The motor is stopped by the emergency stop function.
MT	MT	Maintenance timer*1	8 (H08)	Appears when the inverter's cumulative energization time reaches or exceeds the parameter set value.
CF	CF	Continuous operation during communication fault	10 (H0A)	Appears when the operation continues while an error is occurring in the communication line (when **Pr.502** = "6").
SA	SA	Safety stop	12 (H0C)	Appears when safety stop function is activated (during output shutoff).
LdF	LDF	Load fault warning	26 (H1A)	Appears when the load is deviated from the detection width set in **Pr.1488 Upper limit warning detection width** or **Pr.1489 Lower limit warning detection width**.
SE	SE	Incorrect parameter setting	48 (H30)	Appears when a start command is input while the condition to start operation is not satisfied in the motor setting (**Pr.71, Pr.80, or Pr.81**) for the control method selected in **Pr.800**.
Uv	UV	Undervoltage	—	If the power supply voltage of the inverter decreases, the control circuit will not perform normal functions. In addition, the motor torque will be insufficient and/or heat generation will increase. To prevent this, if the power supply voltage decreases to about 115 VAC (230 VAC for the 400 V class, 58 VAC for the 100 V class) or below (when the PM sensorless vector control is selected: about 156 VAC (311 VAC for the 400 V class, 78 VAC for the 100 V class) or below), this function shuts off the inverter output and "UV" is displayed (on the operation panel only). The warning is removed when the voltage returns to normal.
Ed	ED	Emergency drive in operation	24 (H18)	Appears during emergency drive operation.

● Alarm

The inverter output is not shut off. An Alarm (LF) signal can also be output with a parameter setting.

Operation panel indication		Name	Description
Fn	FN	Fan alarm	For the inverter that contains a cooling fan, FN appears on the operation panel when the cooling fan stops due to a fault, low rotation speed, or different operation from the setting of **Pr.244 Cooling fan operation selection**.

● Fault

When a protective function is activated, the inverter output is shut off and a Fault (ALM) signal is output.
The data code is used for checking the fault detail via communication or with **Pr.997 Fault initiation**.

Operation panel indication		Name	Data code	Description
E.oC1	E.OC1	Overcurrent trip during acceleration	16 (H10)	When the inverter output current reaches or exceeds approximately 150% (SLD rating) or 230% (ND rating) of the rated current during acceleration, the protection circuit is activated and the inverter output is shut off.
E.oC2	E.OC2	Overcurrent trip during constant speed	17 (H11)	When the inverter output current reaches or exceeds approximately 150% (SLD rating) or 230% (ND rating) of the rated current during constant-speed operation, the protection circuit is activated and the inverter output is shut off.
E.oC3	E.OC3	Overcurrent trip during deceleration or stop	18 (H12)	When the inverter output current reaches or exceeds approximately 150% (SLD rating) or 230% (ND rating) of the rated current during deceleration (other than acceleration or constant speed), the protection circuit is activated and the inverter output is shut off.
E.ov1	E.OV1	Regenerative overvoltage trip during acceleration	32 (H20)	If regenerative power causes the inverter's internal main circuit DC voltage to reach or exceed approximately 415 V (200 V class) or 810 V (400 V class), the protection circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.
E.ov2	E.OV2	Regenerative overvoltage trip during constant speed	33 (H21)	
E.ov3	E.OV3	Regenerative overvoltage trip during deceleration or stop	34 (H22)	
E.THT	E.THT	Inverter overload trip (electronic thermal relay function)∗2	48 (H30)	If the temperature of the output transistor elements exceeds the protection level with a rated output current or higher flowing without the overcurrent trip (E.OC[]), the inverter output is stopped. (Overload capacity 150% 60 s)
E.THM	E.THM	Motor overload trip (electronic thermal relay function)∗2	49 (H31)	The electronic thermal O/L relay function in the inverter detects motor overheat, which is caused by overload or reduced cooling capability during low-speed operation. When the cumulative heat value reaches 85% of the **Pr.9 Electronic thermal O/L relay** setting, pre-alarm (TH) is output. When the accumulated value reaches the specified value, the protection circuit is activated to stop the inverter output.
E.Fin	E.FIN	Heat sink overheat	64 (H40)	When the heat sink overheats, the temperature sensor is activated, and the inverter output is stopped.
E.UvT	E.UVT	Undervoltage	81 (H51)	When a PM motor is used, the protective function is activated in the following case: a fault such as power failure or voltage drop occurs, the converter voltage drops to cause the motor to coast, and restarting and coasting are repeated by the automatic restart after instantaneous power failure function.
E.ILF	E.ILF	Input phase loss	82 (H52)	When **Pr.872 Input phase loss protection selection** = "1" (function enabled) and one of the three-phase power input is lost, the inverter output is shut off. This protective function is not available when "0" is set in **Pr.872**. (Available only for the three-phase power input model.)
E.oLT	E.OLT	Stall prevention stop	96 (H60)	When induction motors are used, if the output frequency has fallen to 1.0 Hz by stall prevention operation and remains for 3 seconds, a fault (E.OLT) appears and the inverter output is shut off. When speed control is performed for PM motors, a fault (E.OLT) appears and the inverter output is shut off if frequency drops to the **Pr.865 Low speed detection** (initial value is 1.5 Hz) setting by torque limit operation and the output torque exceeds the **Pr.874 OLT level setting** (initial value is 150%) setting and remains 3 seconds.
E.SoT	E.SOT	Loss of synchronism detection	97 (H61)	The inverter output is shut off when the motor operation is not synchronized. (This function is only available under PM sensorless vector control.)
E.LUP	E.LUP	Upper limit fault detection ∗1	98 (H62)	The inverter output is shut off when the load exceeds the upper limit fault detection range.
E.LdN	E.LDN	Lower limit fault detection ∗1	99 (H63)	The inverter output is shut off when the load falls below the lower limit fault detection range.
E.bE	E.BE	Brake transistor alarm detection	112 (H70)	The inverter output is shut off if a fault due to damage of the brake transistor and such occurs in the brake circuit. In such a case, the power supply to the inverter must be shut off immediately.
E.GF	E.GF	Output side earth (ground) fault overcurrent	128 (H80)	The inverter output is shut off if an earth (ground) fault overcurrent flows due to an earth (ground) fault that occurred on the inverter's output side (load side).
E.LF	E.LF	Output phase loss	129 (H81)	The inverter output is shut off if one of the three phases (U, V, W) on the inverter's output side (load side) is lost.
E.oHT	E.OHT	External thermal relay operation∗1	144 (H90)	The inverter output is shut off if the external thermal relay provided for motor overheat protection or the internally mounted thermal relay in the motor, etc. switches ON (contacts open).
E.PTC	E.PTC	PTC thermistor operation ∗1	145 (H91)	The inverter output is shut off if resistance of the PTC thermistor connected between terminal 2 and terminal 10 is equal to or higher than the **Pr.561 PTC thermistor protection level** setting for a continuous time equal to or longer than the setting value in **Pr.1016 PTC thermistor protection detection time**.

Operation panel indication		Name	Data code	Description
E.PE6	E.PE6	Internal storage device fault	172 (HAC)	This protective function is activated by an inverter reset if writing data fails due to power-OFF or a data fault occurs in the storage device during parameter operations*3 or while the set frequency is written.
E.PE	E.PE	Parameter storage device fault (control circuit board)	176 (HB0)	The inverter output is shut off if a fault occurs in the parameter stored. (EEPROM failure)
E.PUE	E.PUE	PU disconnection	177 (HB1)	• The inverter output is shut off if communication between the inverter and PU is suspended, e.g. the cable is disconnected from the PU connector, when the disconnected PU detection function is valid in **Pr.75 Reset selection/ disconnected PU detection/PU stop selection**. • The inverter output is shut off if communication errors occurred consecutively for more than permissible number of retries when **Pr.121 RS-485 communication retry count** ≠ "9999" during the RS-485 communication via the PU connector. • The inverter output is shut off if communication is broken within the period of time set in **Pr.122 RS-485 communication check time interval** during the RS-485 communication via the PU connector.
E.rET	E.RET	Retry count excess*1	178 (HB2)	The inverter output is shut off if the operation cannot be resumed properly within the number of retries set in **Pr.67 Number of retries at fault occurrence**. This function is available when **Pr.67** is set.
E.PE2	E.PE2	Parameter storage device fault (main circuit board)	179 (HB3)	The inverter output is shut off if a fault occurs in the inverter model information.
E.CPU	E.CPU	CPU fault	192 (HC0)	The inverter output is shut off if the communication fault of the built-in CPU occurs.
E.Cdo	E.CDO	Abnormal output current detection*1	196 (HC4)	The inverter output is shut off if the output current exceeds the **Pr.150 Output current detection level setting**. This function is available when "1" is set in **Pr.167 Output current detection operation selection**.
E.IoH	E.IOH	Inrush current limit circuit fault	197 (HC5)	The inverter output is shut off when a failure occurs in the inrush current limit circuit. The inrush current limit circuit is faulty.
E.AIE	E.AIE	Analog input fault	199 (HC7)	The inverter output is shut off when a 30 mA or higher current or a 7.5 V or higher voltage is input to terminal 2 while the current input is selected by **Pr.73 Analog input selection**, or to terminal 4 while the current input is selected by **Pr.267 Terminal 4 input selection**.
E.USb	E.USB	USB communication fault	200 (HC8)	The inverter output is shut off when the communication is cut off for the time set in **Pr.548 USB communication check time interval**.
E.SAF	E.SAF	Safety circuit fault	201 (HC9)	• The inverter output is shut off when a safety circuit fault occurs. • The inverter output is shut off if the either of the wire between S1 and PC or S2 and PC becomes non-conductive while using the safety stop function. • When the safety stop function is not used, the inverter output is shut off when the shorting wire between terminals S1 and PC or across S2 and PC is disconnected.
E.oS	E.OS	Overspeed occurrence	208 (HD0)	The inverter output is shut off when the motor speed exceeds **Pr.374 Overspeed detection level** setting under PM sensorless vector control. When **Pr.374** = "9999 (initial value)", the inverter output is shut off when the motor speed exceeds the "maximum motor frequency + 10 Hz".
E.Pid	E.PID	PID signal fault*1	230 (HE6)	The inverter output is shut off if the measured value exceeds the PID upper limit or PID lower limit parameter setting, or the absolute deviation value exceeds the PID deviation parameter setting during PID control.
E. 5	E.5	CPU fault	245 (HF5)	The inverter output is shut off if the communication fault of the built-in CPU occurs.
E. 6	E.6		246 (HF6)	
E. 7	E.7		247 (HF7)	
E. 10	E.10	Inverter output fault	250 (HFA)	The inverter output is shut off if the inverter detects an output current fault such as an earth (ground) fault that occurred on the inverter's output side (load side).
E. 13	E.13	Internal circuit fault	253 (HFD)	Appears when the internal circuit is faulty.

● Others

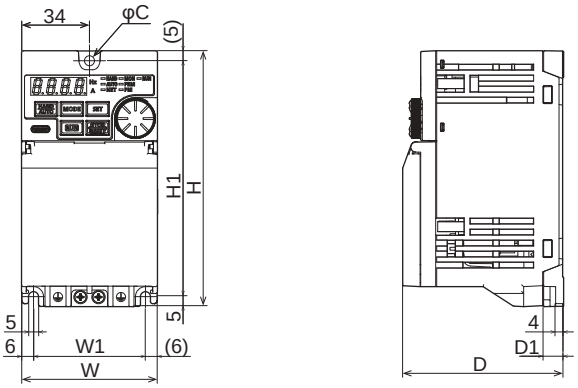
The fault history and the operation status of the inverter are displayed. It is not a fault indication.

Operation panel indication	Name	Description
E - - -	Fault history	The operation panel stores the fault indications which appear when a protective function is activated to display the fault record for the past 10 faults.
E. 0	No fault history	Appears when no fault records are stored. (Appears when the fault history is cleared after the protective function has been activated.)

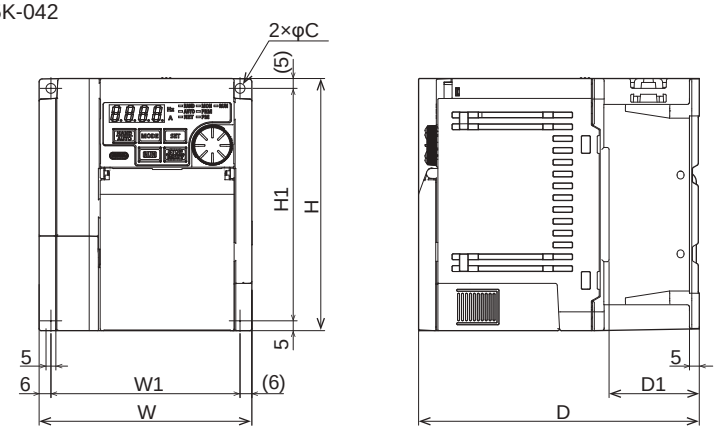
*1 This protective function is not available in the initial status.
*2 Resetting the inverter initializes the internal cumulative heat value of the electronic thermal relay function.
*3 For example, when parameter clear, All parameter clear, Parameter copy, or offline auto tuning is performed in the inverter, or when parameter batch write is performed in FR Configurator2.

Outline Dimensions

· FR-D820-0.1K-008, FR-D820-0.2K-014, FR-D820-0.4K-025, FR-D820-0.75K-042
· FR-D840-0.4K-012, FR-D840-0.75K-022, FR-D840-1.5K-037
· FR-D820S-0.1K-008, FR-D820S-0.2K-014, FR-D820S-0.4K-025, FR-D820S-0.75K-042
· FR-D810W-0.1K-008, FR-D810W-0.2K-014, FR-D810W-0.4K-025



· FR-D820-1.5K-070, FR-D820-2.2K-100, FR-D820-3.7K-165, FR-D820-5.5K-238, FR-D820-7.5K-318
· FR-D840-2.2K-050, FR-D840-3.7K-081, FR-D840-5.5K-120, FR-D840-7.5K-163
· FR-D820S-1.5K-070, FR-D820S-2.2K-100
· FR-D810W-0.75K-042



• Three-phase 200 V class

Inverter model	W	W1	H	H1	D	D1	C
FR-D820-0.1K-008 **FR-D820-0.2K-014**	68	56	128	118	80.5	10	5
FR-D820-0.4K-025					102.5	32	
FR-D820-0.75K-042					132.5	42	
FR-D820-1.5K-070 **FR-D820-2.2K-100**	108	96	128	118	132.5	36	5
FR-D820-3.7K-165					142.5	46	
FR-D820-5.5K-238 **FR-D820-7.5K-318**	220	208	150*1	138	155	68	5

• Three-phase 400 V class

Inverter model	W	W1	H	H1	D	D1	C
FR-D840-0.4K-012 **FR-D840-0.75K-022**	68	56	128	118	129.5	42	5
FR-D840-1.5K-037					167.5	62	
FR-D840-2.2K-050 **FR-D840-3.7K-081**	108	96	128	118	155.5	36	5
FR-D840-5.5K-120 **FR-D840-7.5K-163**	220	208	150*1	138	155	68	5

• Single-phase 200 V class

Inverter model	W	W1	H	H1	D	D1	C
FR-D820S-0.1K-008 **FR-D820S-0.2K-014**	68	56	128	118	80.5	10	5
FR-D820S-0.4K-025					132.5	32	
FR-D820S-0.75K-042					142.5	42	
FR-D820S-1.5K-070 **FR-D820S-2.2K-100**	108	96	128	118	145	36	5

• Single-phase 100 V class

Inverter model	W	W1	H	H1	D	D1	C
FR-D810W-0.1K-008	68	56	128	118	80.5	10	5
FR-D810W-0.2K-014					110.5	10	
FR-D810W-0.4K-025					132.5	32	
FR-D810W-0.75K-042	108	96	128	118	145	36	5

*1 The height dimension will be increased by about 2 mm as the fan cover fixing screw is installed.

(Unit: mm)

◆ Amount of heat generated by the inverter

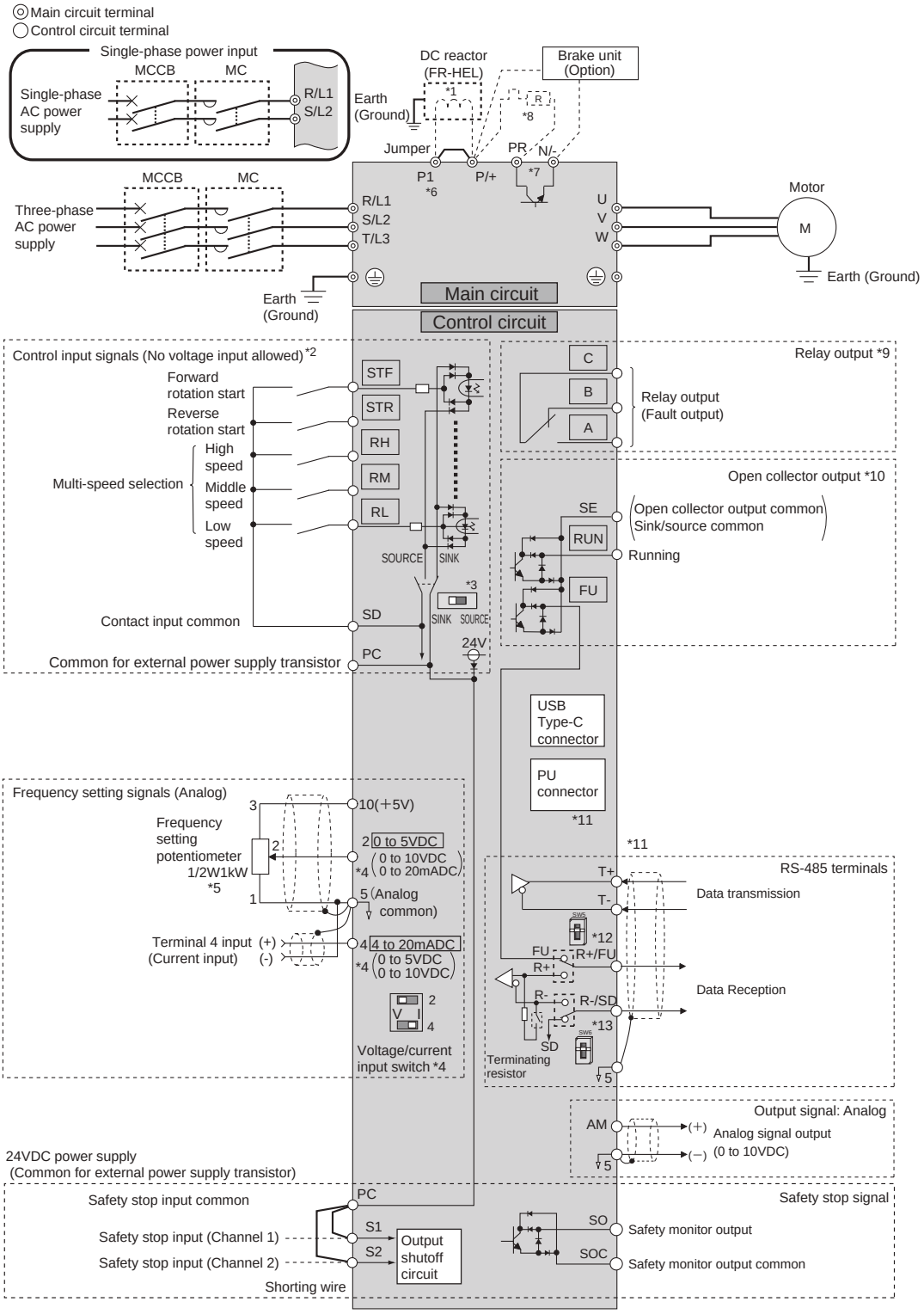
When the heat sink is installed inside the enclosure, the amount of heat generated by the inverter unit is shown in the following table.

Voltage	Inverter model	Amount of heat generated (W)	
		SLD	ND
Three-phase 200 V class	FR-D820-0.1K-008	15	10
	FR-D820-0.2K-014	24	15
	FR-D820-0.4K-025	39	23
	FR-D820-0.75K-042	56	38
	FR-D820-1.5K-070	87	59
	FR-D820-2.2K-100	142	78
	FR-D820-3.7K-165	234	149
	FR-D820-5.5K-238	277	196
	FR-D820-7.5K-318	339	262
Three-phase 400 V class	FR-D840-0.4K-012	30	18
	FR-D840-0.75K-022	45	27
	FR-D840-1.5K-037	61	43
	FR-D840-2.2K-050	98	59
	FR-D840-3.7K-081	155	103
	FR-D840-5.5K-120	193	135
	FR-D840-7.5K-163	260	168
Single-phase 200 V class	FR-D820S-0.1K-008	—	11
	FR-D820S-0.2K-014	—	16
	FR-D820S-0.4K-025	—	28
	FR-D820S-0.75K-042	—	45
	FR-D820S-1.5K-070	—	70
	FR-D820S-2.2K-100	—	98
Single-phase 100 V class	FR-D810W-0.1K-008	—	11
	FR-D810W-0.2K-014	—	17
	FR-D810W-0.4K-025	—	27
	FR-D810W-0.75K-042	—	43

NOTE

- The figures indicate the amount of heat generated when the output current is the rated current, power supply voltage is 110 V (100 V class), 220 V (200 V class), or 440 V (400 V class), and the carrier frequency is 1 kHz.

Terminal Connection Diagram



*1 Remove the jumper between P1 and P/+ to connect the DC reactor. (Single-phase 100 V power input model is not compatible with the DC reactor.)
*2 The function of these terminals can be changed using the Input terminal function selection (**Pr.178 to Pr.182**). (Refer to the Instruction Manual (Function).)
*3 The initial setting varies depending on the specification.
*4 Terminal input specifications can be changed by analog input specification switchover (**Pr.73, Pr.267**). To input voltage, set the voltage/current input switch to "V". To input current, set the switch to "I". The initial setting varies depending on the specification. (Refer to the Instruction Manual (Function).)
*5 It is recommended to use 2 W 1 kΩ when the frequency setting signal is changed frequently.
*6 Terminal P1 is not available for the single-phase 100 V power input models.
*7 A brake transistor is not built in to the FR-D820-0.1K-008, FR-D820-0.2K-014, FR-D820S-0.1K-008, FR-D820S-0.2K-014, FR-D810W-0.1K-008, and FR-D810W-0.2K-014.
*8 Brake resistor (FR-ABR, MRS, MYS)
Install a thermal relay to prevent overheating and damage of brake resistors. (A brake resistor cannot be connected to the FR-D820-0.1K-008, FR-D820-0.2K-014, FR-D820S-0.1K-008, FR-D820S-0.2K-014, FR-D810W-0.1K-008, and FR-D810W-0.2K-014.)
*9 The function of these terminals can be changed using the **Pr.192 ABC terminal function selection**.
*10 The function of these terminals can be changed using the Output terminal function selection (**Pr.190 or Pr.191**). (Refer to the Instruction Manual (Function).)
*11 The communication circuit is shared between the PU connector and the RS-485 terminals. The PU connector and the RS-485 terminals cannot be used simultaneously. Use either the connector or the terminals, and do not wire the other. RS-485 communication via the PU connector is enabled initially.
*12 Initially set to FU. Switch between R+ and FU. Both cannot be selected at the same time.
*13 Initially set to SD. Switch between R- and SD. Both cannot be selected at the same time.

Terminal Specifications

Type		Terminal Symbol	Common	Terminal Name	Description		
Main circuit		R/L1, S/L2, T/L3*1	—	AC power input	Connect these terminals to the commercial power supply.		
		U, V, W	—	Inverter output	Connect these terminals to a three-phase squirrel cage motor or a PM motor.		
		P/+, PR	—	Brake resistor connection	Connect an optional brake resistor (FR-ABR, MRS, or MYS model) across terminals P/+ and PR. (A brake resistor cannot be connected to the FR-D820-0.1K-008, FR-D820-0.2K-014, FR-D820S-0.1K-008, FR-D820S-0.2K-014, FR-D810W-0.1K-008, and FR-D810W-0.2K-014.)		
		P/+, N/-	—	Brake unit connection	Connect the brake unit (FR-BU2, FR-BU, or BU) or the multifunction regeneration converter (FR-XC in power regeneration mode) to these terminals.		
		P/+, P1*2	—	DC reactor connection	Remove the jumper across terminals P/+ and P1, and connect a DC reactor. (A DC reactor cannot be connected to the single-phase 100 V power input models.) When a DC reactor is not connected, the jumper across terminals P/+ and P1 should not be removed.		
		⏚	—	Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded).		
Input signal	Contact input	STF*3	SD (sink (negative common)) PC (source (positive common))	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop.	When the STF and STR signals are turned ON simultaneously, the stop command is given.	Input resistance: 4.7 kΩ, voltage when contacts are open: 21 to 26 VDC, current when contacts are short-circuited: 4 to 6 mADC
		STR*3		Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.		
		RH, RM, RL*3		Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.		
				Pulse train input	Terminal RM is also used as a pulse train input terminal. To use as a pulse train input terminal, change the **Pr.291** setting.		Input resistance: 2 kΩ, current when contacts are short-circuited: 8 to 13 mADC. Maximum input pulse: 100k pulses/s
	Frequency setting	10	5	Frequency setting power supply	Used as the power supply for an external frequency setting (speed setting) potentiometer.		5 VDC ± 0.5 V permissible load current 10 mA
		2	5	Frequency setting (voltage)	Inputting 0 to 5 VDC (or 0 to 10 VDC) provides the maximum output frequency at 5 V (or 10 V) and makes input and output proportional. Use **Pr.73** to switch among input 0 to 5 VDC (initial setting), 0 to 10 VDC, and 0 to 20 mA. * The initial setting varies depending on the specification. Set the voltage/current input switch to the "I" position to select current input (0 to 20 mA).		For voltage input, input resistance: 10 ± 1 kΩ, maximum permissible voltage: 20 VDC. For current input, input resistance: 245 ± 5 Ω, maximum permissible current: 30 mA.
		4	5	Frequency setting (current)	Inputting 4 to 20 mADC (or 0 to 5 VDC, 0 to 10 VDC) provides the maximum output frequency at 20 mA and makes input and output proportional. This input signal is valid only when the AU signal is ON (terminal 2 input is invalid). To use the terminal 4 (current input at initial setting), assign "4" to any parameter from **Pr.178 to Pr.182 (Input terminal function selection)** before turning ON the AU signal. Use **Pr.267** to switch among input 4 to 20 mA (initial setting), 0 to 5 VDC, and 0 to 10 VDC. * The initial setting varies depending on the specification. Set the voltage/current input switch to the "V" position to select voltage input (0 to 5 V / 0 to 10 V).		
Output signal	Relay	A, B, C*4	—	Relay output (fault output)	1 changeover contact output that indicates that an inverter's protective function has been activated and the outputs are stopped. Fault: discontinuity across B and C (continuity across A and C), Normal: continuity across B and C (discontinuity across A and C)		Contact capacity: 240 VAC 2 A (power factor = 0.4), 30 VDC 1 A
	Open collector	RUN*4	SE	Inverter running	The output is in LOW state when the inverter output frequency is equal to or higher than the starting frequency (initial value: 0.5 Hz). The output is in HIGH state during stop or DC injection brake operation.*6		Permissible load: 24 VDC (27 VDC at maximum), 0.1 A (The voltage drop is 3.4 V at maximum while the signal is ON.)
		R+/FU *4*5 — R+	—	Inverter reception terminal	RS-485 communication can be made through the RS-485 terminals. Since the RS-485 communication circuit is shared with the PU connector, the PU connector and this terminal cannot be used at the same time. The PU connector is initially enabled. When using the RS-485 terminals, if nothing is connected to the PU connector, switch the R+/FU switch and the R-/SD switch to R+ and R- respectively.		
		R+/FU *4*5 — FU	SE	Frequency detection			
	Analog	AM	5	Analog voltage output	Among several monitor items such as output frequency, select one to output it via this terminal. (The signal is not output during an inverter reset.) The output signal is proportional to the magnitude of the corresponding monitoring item.	Output item: Output frequency (initial setting)	Output signal: 0 to 10 VDC, permissible load current: 1 mA (load impedance 10 kΩ or more), resolution: 12 bits
Safety stop signal		S1	PC	Safety stop input (Channel 1)	Use terminals S1 and S2 to receive the safety stop signal input from the safety relay module. Terminals S1 and S2 can be used at a time (dual channel). The Inverter judges the condition of the internal safety circuit from the status (shorted/opened) between terminals S1 and PC, or between S2 and PC. When the status is opened, the inverter output is shut off. In the initial status, terminal S1 and S2 are shorted with terminal PC by shorting wires. Remove the shorting wires and connect the safety relay module when using the safety stop function.		Input resistance: 4.7 kΩ, voltage when contacts are open: 21 to 26 VDC, current when contacts are short-circuited: 4 to 6 mADC
		S2	PC	Safety stop input (channel 2)			
		SO	SOC	Safety monitor output (open collector output)	The output status varies depending on the input status of the safety stop signals. The output is in HIGH state during occurrence of the internal safety circuit fault. The output is in LOW state otherwise*6. Refer to the Instruction Manual (Functional Safety) when the signal is switched to HIGH while both terminals S1 and S2 are open. (Contact your sales representative for the manual.)		Permissible load: 24 VDC (27 VDC at maximum), 0.1 A (The voltage drop is 3.4 V at maximum while the signal is ON.)

Type	Terminal Symbol	Common	Terminal Name	Description
Common terminal	SD	—	Contact input common (sink (negative common))	Common terminal for the contact input terminal (sink logic).
			External transistor common (source (positive common))	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current.
			24VDC power supply common	Common terminal for the 24 VDC power supply (terminal PC). Isolated from terminals 5 and SE.
	PC	—	External transistor common (sink (negative common))	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable current. — Power supply voltage range: 22 to 26.5 VDC, permissible load current: 100 mA
			Safety stop input terminal common	Common terminal for safety stop input terminals.
			Contact input common (source (positive common))	Common terminal for contact input terminal (source logic).
		SD	24 VDC power supply	Can be used as a 24 VDC 0.1 A power supply.
	5	—	Frequency setting common	Common terminal for frequency setting signal (terminal 2 or 4) and terminal AM. Do not earth (ground).
	SE	—	Open collector output common	Common terminal of terminal RUN and FU.
	SOC	—	Safety monitor output terminal common	Common terminal for terminal SO.
Communication	—	—	PU connector	RS-485 communication can be made through the PU connector Conforming standard: EIA-485 (RS-485) Transmission format: Multidrop link Communication speed: 300 to 115200 bps Wiring length: 500 m
	RS-485 T+	—	Inverter transmission terminal	RS-485 communication can be made through the RS-485 terminals. Since the RS-485 communication circuit is shared with the PU connector, the PU connector and this terminal cannot be used at the same time. The PU connector is initially enabled. When using the RS-485 terminals, if nothing is connected to the PU connector, switch the R+/FU switch and the R-/SD switch to R+ and R- respectively.
	RS-485 T-			
	RS-485 R+/FU*5 R+		Inverter reception terminal	
	RS-485 R+/FU*5 FU		—	
	RS-485 R-/SD*7 R-		Inverter reception terminal	
	RS-485 R-/SD*7 SD		—	
	—	—	USB Type-C connector*8	USB Type-C connector (receptacle) By connecting the inverter to a personal computer via this connector, FR Configurator2 installed on the computer can be used for setting the inverter, or monitoring or testing the inverter operation. Interface: conforms to USB 2.0 Power supply: 5 V, 100 mA (500 mA maximum)

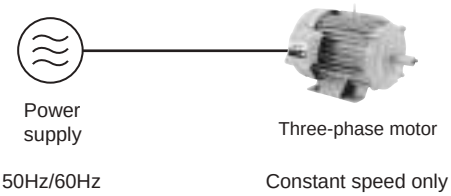
*1 Terminal T/L3 is not available for the single-phase power input models.
*2 Terminal P1 is not available for the single-phase 100 V power input models.
*3 Terminal functions can be selected using **Pr.178 to Pr.182 (Input terminal function selection)**.
*4 Terminal functions can be selected using **Pr.190 to Pr.192 (Output terminal function selection)**.
*5 Terminal R+/FU functions as the open collector output terminal FU in the initial setting. To use the terminal as the RS-485 terminal R+, set the switch to R+.
*6 An open collector transistor is ON (conductive) in LOW state. The transistor is OFF (not conductive) in HIGH state.
*7 Terminal R-/SD functions as the common terminal SD for contact input terminals in the initial setting. To use the terminal as the RS-485 terminal R-, set the switch to R-.
*8 USB bus power connection is available. The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.

Power of Inverters (Principles and Features)

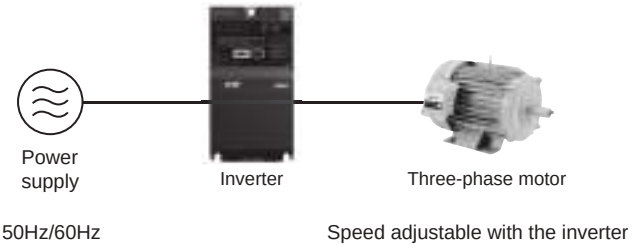
● What is an inverter?

The power supply (AC) at factories and houses are fixed according to the countries and areas, such as 200 V/60 Hz, 200 V/50 Hz, 100 V/60 Hz and 100 V/50 Hz. With the fixed voltage and frequency obtained from the power supply, the motor can be rotated only at a single speed. However, with an inverter which freely changes the voltage and frequency, the standard motor can be rotated at different speeds.
Thus, inverters are commonly used in various applications, for example to control conveyor speed and fan's air volume, exhibiting their ability to freely change standard motor's speed.

◆ Commercial power supply operation (without inverter)

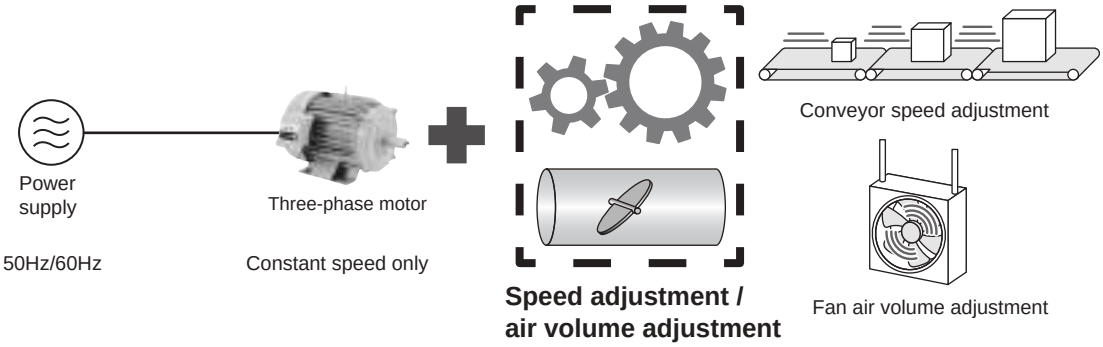


◆ Inverter operation



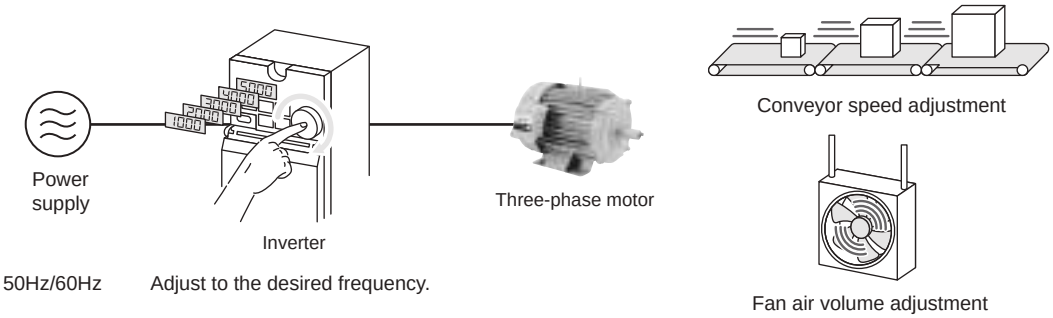
◆ Speed change during commercial power supply operation

Equipment such as transmissions and dampers are used to adjust conveyor speed or fan's air volume.



◆ Inverter operation eliminates the need for a transmission or damper

Since the inverter can control frequency output, variable-speed operation is possible. This eliminates the need for a transmission, damper, and other equipment, reducing the size of the system.
It also decreases the maintenance time and cost.

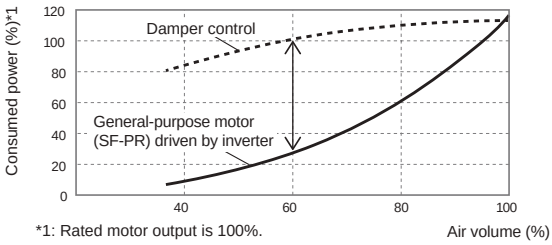


● Advantages of using inverters

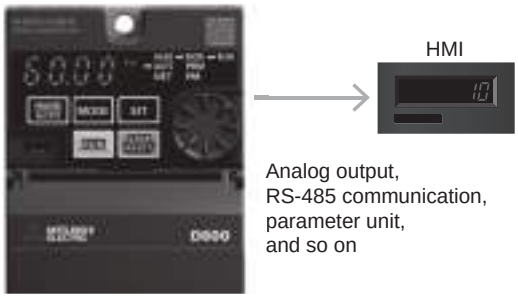
◆ Energy saving

Compared to commercial power supply operation, significant energy savings can be gained by decreasing the rotation speed. The consumed power of a square variable-torque load, such as fans, pumps, and blowers, is proportional to the cube of its rotation speed. This means that controlling the rotation speed to adjust the air volume can lead to energy savings.
This enables checking the effect of energy saving (instantaneous value, average value, etc.).

Example of blower operation characteristic

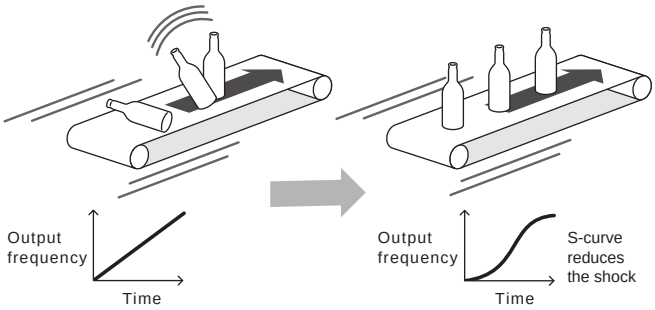


*1: Rated motor output is 100%.



◆ Soft start and soft stop

An S-curve pattern is maintained in the frequency change from the present frequency to the target frequency.
Therefore, it is possible to reduce shock during acceleration/deceleration and prevent load shifts.



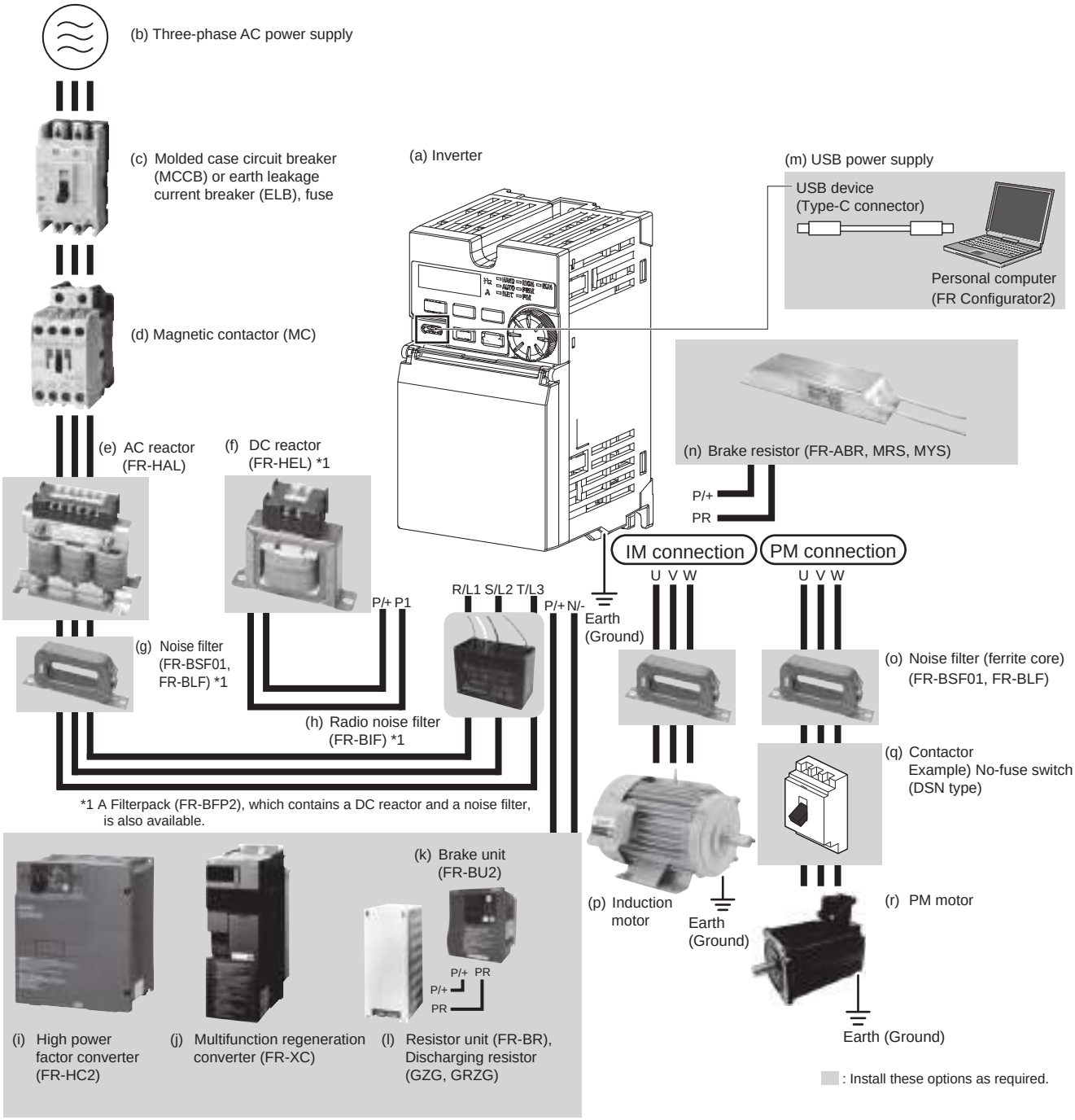
◆ Support for stable operations

The degree of deterioration can be monitored for the main circuit capacitor, control circuit capacitor, inrush current limit circuit, inverter module, relay contact terminals A, B, and C, and cooling fan.
With inverter self-diagnostics, a warning when parts have reached their service life is output so that parts or inverters can be replaced before faults occur.

Item	Life diagnosis check method	Judgment level	Replacement method
Main circuit capacitor	With the motor connected but not running, DC voltage is applied to the motor at inverter power OFF and the capacitor's capacity is measured.	85% of the initial capacity	Replaced by our after service team. (Contact your sales representative.)
Control circuit capacitor	The life is calculated from the energization time and temperature, and is counted down from 100%.	Estimated remaining life 9%	
Inrush current limit circuit	The number of contact ON times is counted down from 100%.	Estimated remaining life 10% (Power ON: 100,000 times left)	
Inverter module	The degree of deterioration of the inverter module is determined by the change in the surrounding air temperature of the module. (The degree is counted down from 100% (no deterioration).)	Estimated remaining life 15%	
ABC relay contact	The number of contact (relay) ON times is counted down from 100% (0 times).	Estimated remaining life 10%	
Cooling fan	The speed of the cooling fan is constantly monitored and any reduction in speed is detected.	Not more than the specified speed	User replaceable

Using FR Configurator2, easy-to-use software assisting anything from setup to maintenance, much more useful functions are available for users.

Example Connections



Symbol	Name	Overview
(a)	Inverter (FR-D800)	The life of the inverter is influenced by the surrounding air temperature. The surrounding air temperature should be as low as possible within the permissible range. This must be noted especially when the inverter is installed in an enclosure. Incorrect wiring may lead to damage of the inverter. The control signal lines must be kept fully away from the main circuit lines to protect them from noise.
(b)	Three-phase AC power supply	Must be within the permissible power supply specifications of the inverter.
(c)	Molded case circuit breaker (MCCB), earth leakage circuit breaker (ELB), or fuse	Must be selected carefully since an inrush current flows in the inverter at power ON.
(d)	Magnetic contactor (MC)	Install this to ensure safety. Do not use this to start and stop the inverter. Doing so will shorten the life of the inverter.
(e)	AC reactor (FR-HAL)	Install this to suppress harmonics and to improve the power factor. An AC reactor (FR-HAL) (option) is required when installing the inverter near a large power supply system (500 kVA or more). Under such condition, the inverter may be damaged if you do not use a reactor. Select a reactor according to the applied motor capacity. (When using a motor with capacity lower than 0.4 kW, select the reactor for a 0.4 kW motor. For the single-phase 200 V power input models, select the reactor whose capacity is one rank higher than the motor capacity. For the single-phase 100 V power input models, select the reactor whose capacity is three ranks higher than the motor capacity.)
(f)	DC reactor (FR-HEL)	Install this to suppress harmonics and to improve the power factor. Select a reactor according to the applied motor capacity. (When using a motor with capacity lower than 0.4 kW, select the reactor for a 0.4kW motor. For the single-phase 200 V power input models, select the reactor whose capacity is one rank higher than the motor capacity.) When using a DC reactor, remove the jumper across terminals P/+ and P1 before connecting a DC reactor to the inverter.*1
(g)	Noise filter (ferrite core) (FR-BSF01, FR-BLF)	Install this to reduce the electromagnetic noise generated from the inverter.
(h)	Radio noise filter (FR-BIF)	Install this to reduce the radio noise.
(i)	High power factor converter (FR-HC2)	Suppresses the power supply harmonics significantly. Install this as required.
(j)	Multifunction regeneration converter (FR-XC)	Provides a large braking capability. Install this as required.
(k)	Brake unit (FR-BU2)	Allows the inverter to provide the optimal regenerative braking capability. Install this as required.
(l)	Resistor unit (FR-BR), discharge resistor (GZG, GRZG)	
(m)	USB connection	Connect between the inverter and a personal computer with a USB Type-C cable.
(n)	Brake resistor (FR-ABR, MRS, MYS)	Increases the braking capability. (0.4K or higher)
(o)	Noise filter (ferrite core) (FR-BSF01, FR-BLF)	Install this to reduce the electromagnetic noise generated from the inverter. The noise filter is effective in the range from about 0.5 to 5 MHz. A wire should be wound four turns at maximum.
(p)	Induction motor	Connect a squirrel-cage induction motor.
(q)	Contactor Example) No-fuse switch (DSN type)	Connect this for an application where a PM motor is driven by the load even while the inverter power is OFF. Do not open or close the contactor while the inverter is running (outputting).
(r)	PM motor	An IPM motor cannot be driven by the commercial power supply.

*1 A DC reactor (FR-HEL) cannot be connected to the single-phase 100 V power input models.

NOTE

- To prevent an electric shock, always earth (ground) the motor and inverter.
- Do not install a power factor correction capacitor, surge suppressor, or capacitor type filter on the inverter's output side. Doing so will cause the inverter shut off or damage the capacitor or surge suppressor. If any of the above devices is connected, immediately remove it. When installing a molded case circuit breaker on the output side of the inverter, contact the manufacturer of the molded case circuit breaker.
- Electromagnetic wave interference:
- The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. Connect the optional radio noise filter FR-BIF (for use in the input side only), line noise filter FR-BSF01/FR-BLF, Filterpack, or EMC filter to minimize interference. A Filterpack (FR-BFP2), which contains a DC reactor and a noise filter, is also available.
- For details of options and peripheral devices, refer to the respective Instruction Manual.
- A PM motor cannot be driven by the commercial power supply.
- A PM motor is a motor with permanent magnets embedded inside. High voltage is generated at the motor terminals while the motor is running. Before closing the contactor at the output side, make sure that the inverter power is ON and the motor is stopped.

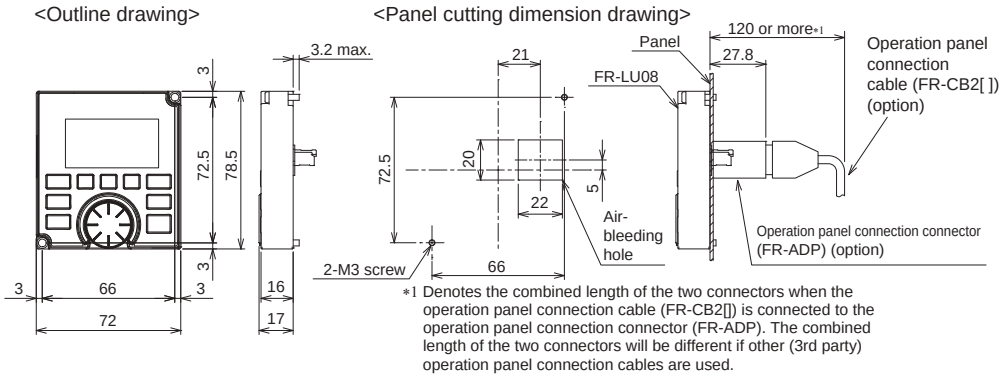
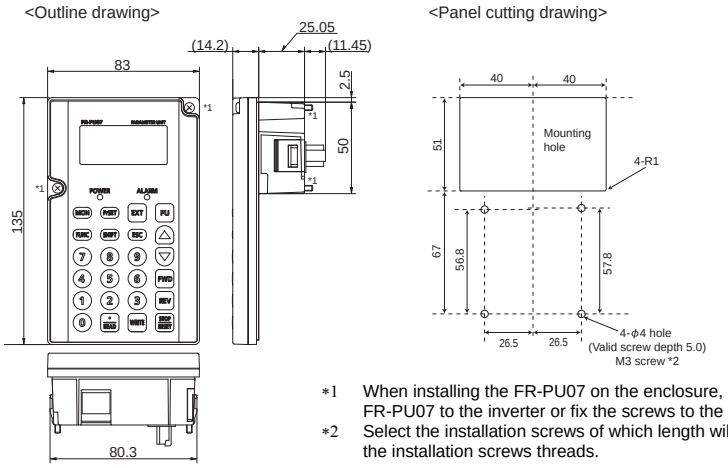
Options

● Option List

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

	Name	Type	Applications	Remarks
Stand-alone type	LCD operation panel	FR-LU08 (-01)	Graphical operation panel with liquid crystal display	
	Parameter unit	FR-PU07	Interactive parameter unit with LCD display	
	Parameter unit with battery pack	FR-PU07BB (-L)	This parameter unit enables parameter setting without connecting the inverter to power supply.	
	Enclosure surface operation panel	FR-PA07	This operation panel enables inverter operation and monitoring of frequency, etc. from the enclosure surface	
	Parameter unit connection cable	FR-CB20[]	Cable for connection of operation panel or parameter unit [] indicates a cable length. (1m, 3m, 5m)	
	DIN rail attachment	FR-UDA 01, 02	Attachment for installation on DIN rail	3.7K or lower.
	Intercompatibility attachment	To be supported soon		
	Panel through attachment			
	AC reactor	FR-HAL	For harmonic current reduction and inverter input power factor improvement	
	DC reactor	FR-HEL		
	Radio noise filter	FR-BIF(H)	For radio noise reduction (connect to the input side)	
	Line noise filter	FR-BSF01, FR-BLF	For line noise reduction	
	Filterpack	FR-BFP2	Combination of power factor improving DC reactor, common mode choke, and capacitive filter	0.4K to 15K of the three-phase power input model.
	Brake resistor	MRS type, MYS type	For increasing the regenerative braking capability (permissible duty 3%ED)	0.4K or higher.
	High-duty brake resistor	FR-ABR	For increasing the regenerative braking capability (permissible duty 10%/6%ED)	
	Brake unit, Resistor unit, Discharging resistor	FR-BU2, FR-BR, GZG, GRZG type	For increasing the braking capability of the inverter (for high-inertia load or negative load) Brake unit, electrical-discharge resistor and resistor unit are used in combination	
	Multifunction regeneration converter Dedicated stand-alone reactor Dedicated box-type reactor	FR-XC, FR-XCL/FR-XCG, FR-XCB	One inverter can handle harmonic suppression and power regeneration. Functions that match the application can be selected by combining the inverter/converter with the dedicated reactor FR-XCB (box-type) or FR-XCL/FR-XCG.	
	High power factor converter	FR-HC2	The high power factor converter switches the converter section on/off to reshape an input current waveform into a sine wave, greatly suppressing harmonics. (Used in combination with the standard accessory.)	
	Surge voltage suppression filter	FR-ASF	Filter for suppressing surge voltage on motor	400V
		FR-BMF		400V: 5.5K or higher
Others	Pilot generator	QVAH-10	For tracking operation. 70 V / 35 VAC 500 Hz (at 2500 r/min)	
	Deviation sensor	YVGC-500WNS	For continuous speed control operation (mechanical deviation detection) Output 90 VAC /90°	
	Calibration resistor	RV24YN 10kΩ	For frequency meter calibration. Carbon film type B characteristic	
	FR Configurator2 (Inverter setup software)	SW1DND-FRC2	Supports an inverter startup to maintenance.	

● Stand-alone option

Name (model)	Specification and structure
LCD operation panel FR-LU08(-01) **Operation panel connection connector FR-ADP**	The LCD operation panel is capable of displaying text and menus. • Features Replacement with the operation panel (FR-DU08) and installation on the enclosure surface using a connection cable (FR-CB2) are possible. (To connect the FR-LU08, an optional operation panel connection connector (FR-ADP) is required.) Parameter settings of one inverter can be stored. When the FR-LU08 is connected to the inverter, the internal clock of the inverter can be synchronized with the clock of FR-LU08. (Real time clock function) With a battery (CR1216), the FR-LU08 time count continues even if the main power of the inverter is turned OFF. (The time count of the inverter internal clock does not continue when the inverter power is turned OFF.) • Outline dimension (Unit: mm)  *1 Denotes the combined length of the two connectors when the operation panel connection cable (FR-CB2[]) is connected to the operation panel connection connector (FR-ADP). The combined length of the two connectors will be different if other (3rd party) operation panel connection cables are used.
Parameter unit FR-PU07 	Interactive parameter unit with LCD display. • Features Setting functionality such as direct input method with a numeric keypad, operation status indication, and help function are usable. Eight languages can be displayed. Parameter settings of one inverter can be stored. • Outline dimension (Unit: mm)  *1 When installing the FR-PU07 on the enclosure, etc., remove screws for fixing the FR-PU07 to the inverter or fix the screws to the FR-PU07 with M3 nuts. *2 Select the installation screws of which length will not exceed the effective depth of the installation screws threads.

Name (model)	Specification and structure

Parameter unit with battery pack FR-PU07BB(-L)

This parameter unit enables parameter setting without connecting the inverter to power supply.
Uses 4 × AA batteries. Can also be powered by an external 100 VAC power supply.

• Specifications

Item	Description
Power supply	• When driven by batteries AA batteries four (nickel hydride (NiMH) / alkali) • When driven by external power supply (100 VAC) AC adaptor ∗1 • When power is applied to the inverter Power is supplied from the PU connector of the inverter.
Battery life ∗2	

	Alkaline battery	Nickel metal hydride battery
Battery life	Approx. 260 min	Approx. 340 min
Battery exhaustion warning lamp color changing start time From green to orange (at lowering of battery power)	Approx. 50 min before	Approx. 10 min before

Switch · connector	Battery ON/OFF switch Modular connector for inverter connection and connector for AC adaptor connection
Display functions	Alarm LED for battery exhaustion, Other display is the same as the FR-PU07.
Provided appliances	AA alkali battery (for operation check) four ∗3 Connection cable (FR-CB203) one

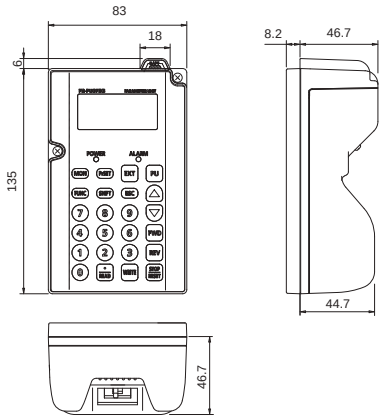
∗1 Use an AC adapter with the following specifications.

Output specifications	**Rated voltage**	5.0 VDC±5% or less
	Rated current	2 A or more
	Polarity	Plus polarity in the center.
	Plug	JEITA RC-5320A compliant

∗2 The battery life is a reference value. It differs depending on the battery and the usage.
∗3 Batteries are not included in FR-PU07BB-L.

• Outline dimension (Unit: mm)

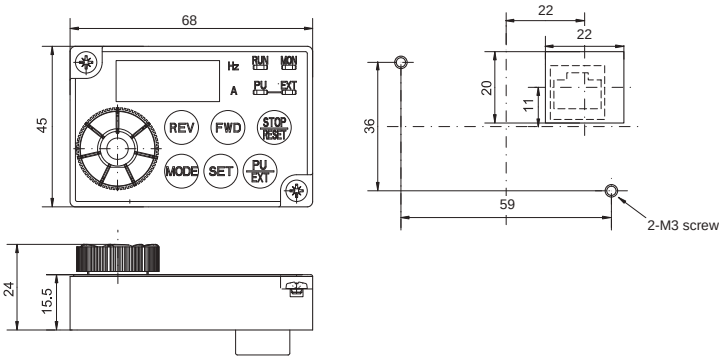
<Outline drawing>



Enclosure surface operation panel FR-PA07

This operation panel can be mounted to an enclosure surface to enable inverter operation and monitoring of frequency, etc. (This product does not have the parameter copy function.)

• Outline dimension (Unit: mm)



Parameter unit connection cable FR-CB20[]

This cable is for connection of operation panel or parameter unit

• Specifications

Model	Length
FR-CB201	1 m
FR-CB203	3 m
FR-CB205	5 m

Name (model)	Specification and structure

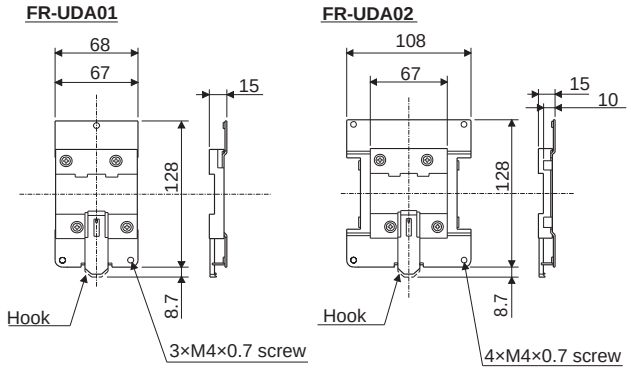
DIN rail installation attachment FR-UDA01, 02

Use of attachment enables the inverter to be installed on DIN rail.

• Selection table

Attachment model	Inverter capacity			
	D820	D840	D820S	D810W
FR-UDA01	0.1K-008, 0.2K-014, 0.4K-025, 0.75K-042	0.4K-012, 0.75K-022, 1.5K-037	0.1K-008, 0.2K-014, 0.4K-025, 0.75K-042	0.1K-008, 0.2K-014, 0.4K-025
FR-UDA02	1.5K-070, 2.2K-100, 3.7K-165	2.2K-050, 3.7K-081	1.5K-070, 2.2K-100	0.75K-042

• Outline dimension (Unit: mm)



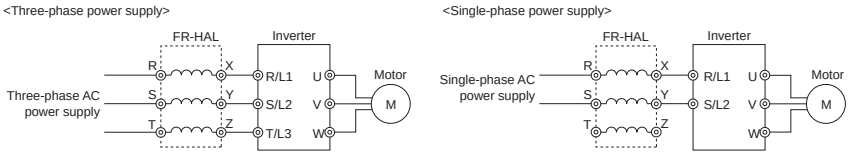
AC reactor (for power supply coordination) FR-HAL

Improves the power factor and reduces the harmonic current at the input side. Connect an AC reactor at the input side of the inverter.

• Selection method

Select an AC reactor according to the applied motor capacity. (Select the AC reactor according to the motor capacity even if the capacity is smaller than the inverter capacity.)

• Connection diagram



• Outline dimension (Unit: mm)

	Model	W	W1	H	D	D1	d	Mass (kg)
200V	**0.4K**	104	84	99	72	40	M5	0.6
	0.75K	104	84	99	74	44	M5	0.8
	1.5K	104	84	99	77	50	M5	1.1
	2.2K	115	40	115	77	57	M6	1.5
	3.7K	115	40	115	83	67	M6	2.2
	5.5K	115	40	115	83	67	M6	2.3
	7.5K	130	50	135	100	86	M6	4.2
	11K	160	75	164	111	92	M6	5.2

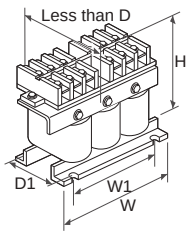
	Model	W	W1	H	D	D1	d	Mass (kg)
400V	**H0.4K**	135	120	115	64	45	M4	1.5
	H0.75K	135	120	115	64	45	M4	1.5
	H1.5K	135	120	115	64	45	M4	1.5
	H2.2K	135	120	115	64	45	M4	1.5
	H3.7K	135	120	115	74	57	M4	2.5
	H5.5K	160	145	150	76	55	M4	3.5
	H7.5K	160	145	150	96	75	M4	5.0
	H11K	160	145	146	96	75	M4	6.0

(a) Approximately 88% of the power factor improving effect can be obtained (92.3% when calculated with 1 power factor for the fundamental wave according to the Architectural Standard Specifications (Electrical Installation) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan).

(b) This is a sample outline dimension drawing. The shape differs by the model. W1 and D1 indicate distances between installation holes. The installation hole size is indicated by d.

(c) Install AC reactors (FR-HAL) on a horizontal or vertical surface.

(d) Keep enough clearance around the reactor because it heats up. (Keep a clearance of minimum 10 cm each on top and bottom and minimum 5 cm each on right and left regardless of the installation orientation.)

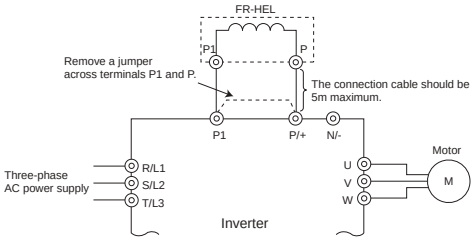


Name (model)	Specification and structure

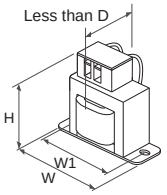
DC reactor (for power supply coordination) FR-HEL-(H)[]K

Improves the power factor and reduces the harmonic current at the input side.

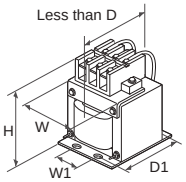
- Selection method
  Select a DC reactor according to the applied motor capacity. (Select it according to the motor capacity even if the capacity is smaller than the inverter capacity.) (Refer to **page 91**)
- Connection diagram
  Connect a DC reactor to the inverter terminals P1 and P. Remove the jumper across terminals P1 and P. If the jumper is left attached, no power factor improvement can be obtained.
  The connection cable between the reactor and the inverter should be as short as possible (5 m or less).



- Outline dimension (Unit: mm)



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

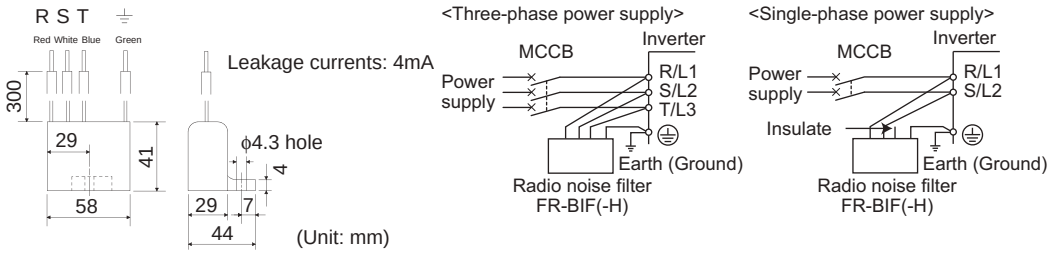
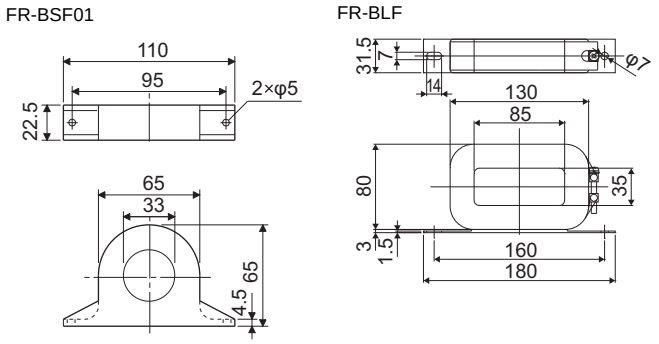
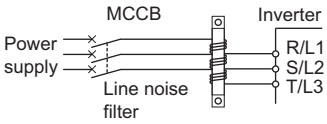


FR-HEL-3.7K to 11K
FR-HEL-H0.75K to H11K

	Model	W	W1	H	D	D1	d	Mass (kg)
200V	**0.4K**	70	60	71	61	—	M4	0.34
	0.75K	85	74	81	61	—	M4	0.5
	1.5K	85	74	81	70	—	M4	0.7
	2.2K	85	74	81	70	—	M4	0.8
	3.7K	77	55	92	82	56	M4	1.4
	5.5K	77	55	92	92	66	M4	1.7
	7.5K	86	60	122	98	73	M4	2.3
	11K	105	64	138	112	78	M6	3.1

	Model	W	W1	H	D	D1	d	Mass (kg)
400V	**H0.4K**	90	75	77	60	—	M5	0.6
	H0.75K	66	50	100	70	48	M4	0.85
	H1.5K	66	50	100	80	54	M4	1
	H2.2K	76	50	110	80	54	M4	1.3
	H3.7K	86	55	128	95	69	M4	2.3
	H5.5K	96	60	136	100	75	M5	3
	H7.5K	96	60	136	105	80	M5	3.5
	H11K	105	75	137	110	85	M5	4.5

(a) The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3). (Refer to **page 84**)
(b) Approximately 93% of the power factor improving effect can be obtained (94.4% when calculated with 1 power factor for the fundamental wave according to the Architectural Standard Specifications (Electrical Installation) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan).
(c) This is a sample outline dimension drawing. The shape differs by the model.
W1 and D1 indicate distances between installation holes. The installation hole size is indicated by d.
(d) Install DC reactors (FR-HEL) on a horizontal or vertical surface.
(e) Keep enough clearance around the reactor because it heats up.
(Keep a clearance of minimum 10 cm each on top and bottom and minimum 5 cm each on right and left regardless of the installation orientation.)
A DC reactor cannot be connected to the single-phase 100 V power input models.

Name (model)	Specification and structure
Radio noise filter FR-BIF(H)	• Outline dimension  (a) Cannot be connected to the inverter output side. (b) The wire should be cut as short as possible, and connected to the inverter terminal block. (c) To use the radio noise filter (FR-BIF) for the single-phase input model, ensure the insulation of the T-phase before connecting the filter to the input side of the inverter.
Line noise filter FR-BSF01, FR-BLF	Install an EMC filter (ferrite core) to reduce the electromagnetic noise generated from the inverter. Effective in the range from about 0.5 MHz to 5 MHz. • Outline dimension (Unit: mm)  (a) Wind each phase for three times (4T) in the same direction. (The greater the number of turns, the more effective result is obtained.) When using several line noise filters to make 4T or more, wind the phases (cables) together. Do not use a different line noise filter for different phases. (b) When the cables are too thick to be winded, run each cable (phase) through four or more filters installed in series in one direction. (c) The filter can be used in the same way as the output side. When using filters at the output side, do not wind the cable more than 3 times (4T) for each filter because the filter may overheat. (d) A thick cable of 38 mm^2 or more is not applicable to the FR-BSF01. Use FR-BLF for a larger diameter cable. (e) Do not wind the earthing (grounding) cable. 
Filterpack FR-BFP2	Using the option, the inverter may conform to the Japanese guideline for reduction of harmonic emission. The option is available for three-phase 200V/400V class inverters with 0.4K or higher capacity. • Specification

• Three-phase 200V power input model

Model FR-BFP2-[]K		0.4	0.75	1.5	2.2	3.7	5.5	7.5
Permissible inverter output current (A) ∗1		2.5	4.2	7	10	16.5	23.8	31.8
Approximate mass (kg)		1.3	1.4	2.0	2.2	2.8	3.8	4.5
Power factor improving reactor		Install a DC reactor on the DC side. 93% to 95% of power supply power factor under 100% load (94.4% ∗3)						
Noise filter	**Common mode choke**	Install a ferrite core on the input side.						
	Capacitive filter	About 4mA of capacitor leakage current ∗2						
Protective structure (JEM 1030)		Open type (IP00)						

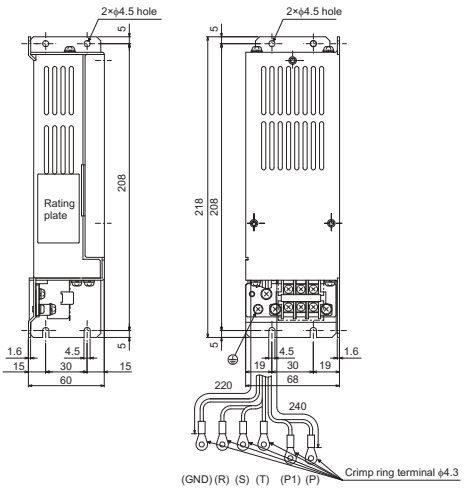
• Three-phase 400V power input model

Model FR-BFP2-H[]K		0.4	0.75	1.5	2.2	3.7	5.5	7.5
Permissible inverter output current (A) ∗1		1.2	2.2	3.7	5	8.1	12	16.3
Approximate mass (kg)		1.6	1.7	1.9	2.3	2.6	4.5	5.0
Power factor improving reactor		Install a DC reactor on the DC side. 93% to 95% of power supply power factor under 100% load (94.4% ∗3)						
Noise filter	**Common mode choke**	Install a ferrite core on the input side.						
	Capacitive filter	About 8mA of capacitor leakage current ∗2						
Protective structure (JEM 1030)		Open type (IP00)						

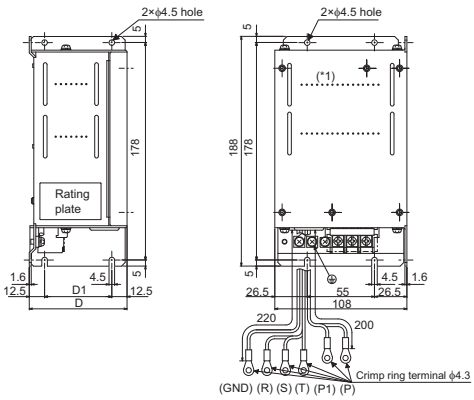
∗1 Select a capacity for the load (inverter output) current to be equal to or less than the permissible inverter output current.
∗2 The indicated leakage current is for one phase of the three-phase three-wire star-connection power supply.
∗3 The values in parentheses are calculated by applying 1 power factor to the reference waveform in accordance with the Architectural Standard Specifications (Electrical Installation) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.)

Name (model)	Specification and structure
Filterpack FR-BFP2	• Outline dimension (Unit: mm)

<FR-BFP2-0.4K, 0.75K>



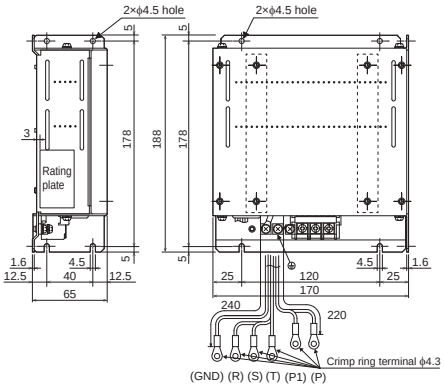
<FR-BFP2-1.5K, 2.2K>
<FR-BFP2-H0.4K, H0.75K, H1.5K, H2.2K, H3.7K>



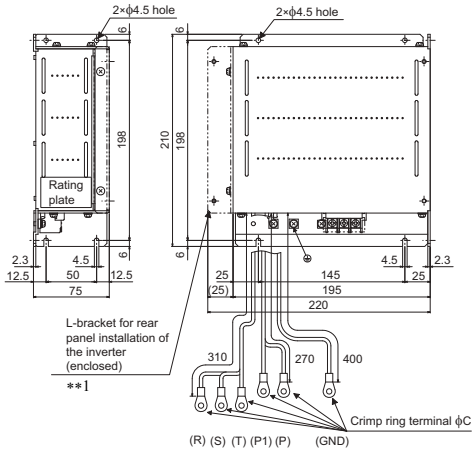
	Capacity	D	D1
200V	1.5K, 2.2K	80	55
400V	H0.4K, H0.75K∗1	55	30
	H1.5K, H2.2K, H3.7K	80	55

∗1 The 400V class H0.4K and H0.75K have no slit.

<FR-BFP2-3.7K>



<FR-BFP2-5.5K, 7.5K>
<FR-BFP2-H5.5K, H7.5K>



	Capacity	C
200V	5.5K, 7.5K	5.3
400V	H5.5K, H7.5K	4.3

∗1 L-bracket is not attached when shipped from the factory but is enclosed with the option. L-bracket is required to install the option to the back of inverter.

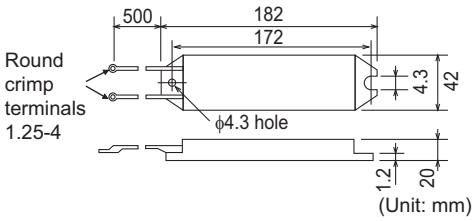
(a) A Filterpack can be installed on the side or rear panel of the inverter.
(b) Above outline dimension drawings are examples. Dimensions differ by model.

Name (model)	Specification and structure

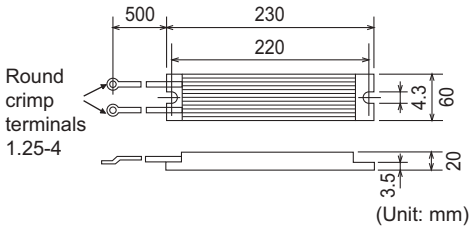
Brake resistor MRS type, MYS type

• Outline dimension

• MRS type



• MYS type



Resistor model			Control torque / permissible duty	Resistance value (Ω)	Permissible power (W)	Applicable motor capacity (kW)
200V∗1	MRS type	MRS120W200	150% torque 3%ED	200	15	0.4
		MRS120W100		100	30	0.75
		MRS120W60		60	55	1.5
			100% torque 3%ED			2.2
		MRS120W40	150% torque 3%ED	40	80	2.2
			100% torque 3%ED			3.7
	MYS type	MYS220W50 ∗2	150% torque 3%ED	50/2	2×80	3.7
			100% torque 6%ED			

∗1 The option can be connected to the single-phase 100 V class inverters.
∗2 Two unit in parallel

(a) The temperature of the brake resistor becomes 200°C or more depending on the operation frequency, care must be taken for installation and heat dissipation.
(b) The brake resistor cannot be used with the 0.1K and 0.2K.
(c) Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

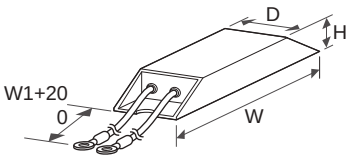
High-duty brake resistor FR-ABR

Connecting the option improves the regenerative braking capability of the inverter.

• Outline dimension (Unit: mm)

Brake resistor model		Permissible brake duty	Outline dimension W	W1	D	H	Resistance value (Ω)	Approx. mass (kg)
200V∗1	FR-ABR-0.4K	10%	140	500	40	21	200	0.2
	FR-ABR-0.75K	10%	215	500	40	21	100	0.4
	FR-ABR-2.2K ∗2	10%	240	500	50	26	60	0.5
		10%						
	FR-ABR-3.7K	10%	215	500	61	33	40	0.8
	FR-ABR-5.5K	10%	335	500	61	33	25	1.3
	FR-ABR-7.5K	10%	400	500	80	40	20	2.2

Brake resistor model		Permissible brake duty	Outline dimension W	W1	D	H	Resistance value (Ω)	Approx. mass (kg)
400V	FR-ABR-H0.4K	10%	115	500	40	21	1200	0.2
	FR-ABR-H0.75K	10%	140	500	40	21	700	0.2
	FR-ABR-H1.5K	10%	215	500	40	21	350	0.4
	FR-ABR-H2.2K	10%	240	500	50	26	250	0.5
	FR-ABR-H3.7K	10%	215	500	61	33	150	0.8
	FR-ABR-H5.5K	10%	335	500	61	33	110	1.3
	FR-ABR-H7.5K	10%	400	500	80	40	75	2.2



∗1 The option can be connected to the single-phase 100 V class inverters.
∗2 For the 1.5K and 2.2K inverter.

(a) The regenerative brake duty setting should be less than permissible brake duty in the table above.
(b) The temperature of the brake resistor becomes 300°C or more depending on the operation frequency, care must be taken for installation and heat dissipation.
(c) MYS type resistor can be also used. Note the permissible brake duty.
(d) The brake resistor cannot be used with the 0.1K and 0.2K.
(e) Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

Name (model)	Specification and structure

Brake unit
FR-BU2
Resistor unit
FR-BR
Discharging resistor
GZG type, GRZG type

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

• Specification

[Brake unit]

Model: FR-BU2-[]	200V∗1					400V		
	1.5K	3.7K	7.5K	15K	30K	H7.5K	H15K	H30K
Applicable motor capacity	The applicable capacity differs by the braking torque and the operation rate (%ED).							
Connected brake resistor	GRZG type, FR-BR (For the combination, refer to the table below.)							
Multiple (parallel) driving	Max. 10 units (However, the torque is limited by the permissible current of the connected inverter.)							
Approximate mass (kg)	0.9	0.9	0.9	0.9	1.4	0.9	0.9	1.4

[Discharging resistor]

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

[Resistor unit]

Model: FR-BR-[]	200 V		400 V	
	15K	30K	H15K	H30K
Discharging resistor combined resistance (Ω)	8	4	32	16
Continuous operation permissible power (W)	990	1990	990	1990
Approximate mass (kg)	15	30	15	30

∗1 The option can be connected to the single-phase 100 V class inverters.
∗2 The 1 set contains the number of units in the parentheses. For the 400 V class, 2 sets are required.

• Combination between the brake unit and the resistor unit

Brake unit model		Discharging resistor model or resistor unit model		
		GRZG type		FR-BR
		Model ∗1	Number of connectable units	
200V	**FR-BU2-1.5K**	GZG 300W-50Ω (1 unit)	1 unit	-
	FR-BU2-3.7K	GRZG 200-10Ω (3 units)	3 in series (1 set)	-
	FR-BU2-7.5K	GRZG 300-5Ω (4 units)	4 in series (1 set)	-
	FR-BU2-15K	GRZG 400-2Ω (6 units)	6 in series (1 set)	FR-BR-15K
	FR-BU2-30K	-	-	FR-BR-30K
400V	**FR-BU2-H7.5K**	GRZG 200-10Ω (3 units)	6 in series (2 sets)	-
	FR-BU2-H15K	GRZG 300-5Ω (4 units)	8 in series (2 sets)	FR-BR-H15K
	FR-BU2-H30K	GRZG 400-2Ω (6 units)	12 in series (2 sets)	FR-BR-H30K

∗1 The 1 set contains the number of units in the parentheses. For the 400 V class, 2 sets are required.

• Selection method

[GRZG type]

The maximum temperature rise of the discharging resistors is about 200°C. Use heat-resistant wires to perform wiring, and make sure that they will not come in contact with resistors.

Do not touch the discharging resistor while the power is ON or for about 10 minutes after the power supply turns OFF. Doing so may cause an electric shock.

Power supply voltage	Braking torque	Motor capacity (kW)							
		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
200V	50% 30s	FR-BU2-1.5K			FR-BU2-3.7K		FR-BU2-7.5K		FR-BU2-15K
	100% 30s	FR-BU2-1.5K		FR-BU2-3.7K	FR-BU2-7.5K		FR-BU2-15K		2×FR-BU2-15K ∗1
400V	50% 30s	-∗2			FR-BU2-H7.5K				FR-BU2-H15K
	100%% 30s	-∗2			FR-BU2-H7.5K		FR-BU2-H15K		FR-BU2-H30K

∗1 The number next to the model name indicates the number of connectable units in parallel.
∗2 The inverter for 400V class 1.5K or lower cannot be used in combination with a brake unit. To use in combination with a brake unit, use the inverter of 2.2K or higher.

Name (model)	Specification and structure

Brake unit
FR-BU2
Resistor unit
FR-BR
Discharging resistor
GZG type, GRZG type

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

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

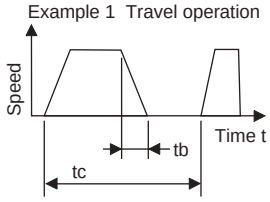
Model			Motor capacity(kW)			
			5.5kW	7.5kW	11kW	15kW
200V	FR-BU2-15K	%ED	80	40	15	10
	FR-BU2-30K		-	-	65	30
400V	FR-BU2-H15K	%ED	80	40	15	10
	FR-BU2-H30K		-	-	65	30

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

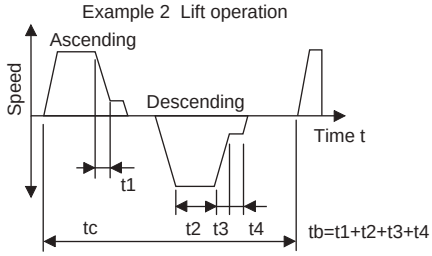
Model			Motor capacity(kW)			
			5.5kW	7.5kW	11kW	15kW
200V	FR-BU2-15K	Braking torque (%)	280	200	120	100
	FR-BU2-30K		-	-	260	180
400V	FR-BU2-H15K	Braking torque (%)	280	200	120	100
	FR-BU2-H30K		-	-	260	180

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

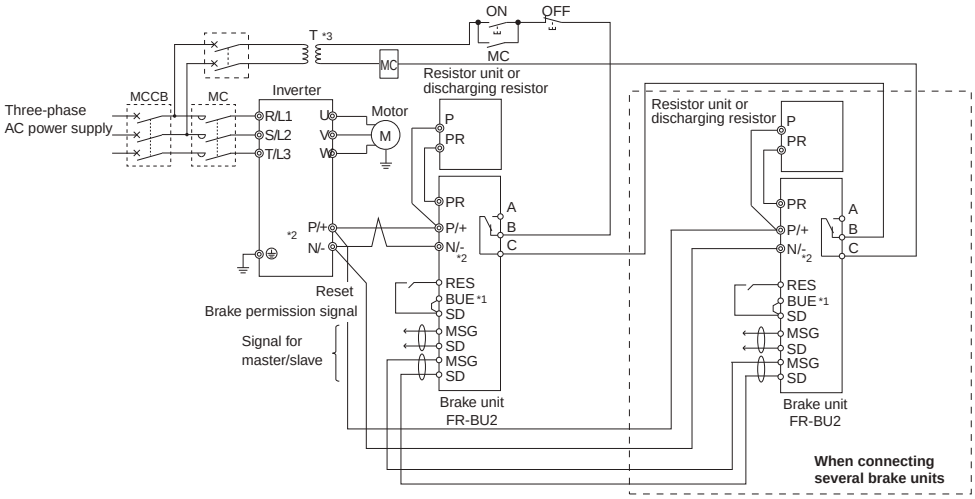
Example 1 Travel operation



Example 2 Lift operation



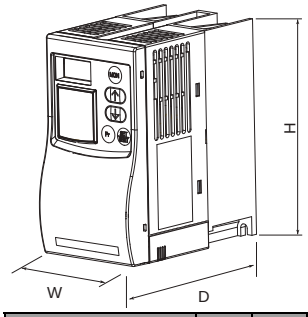
• Connection diagram



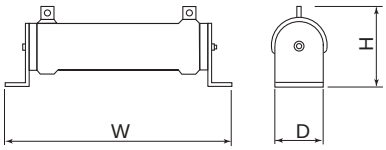
*1 A jumper is connected across BUE and SD in the initial status.
*2 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal symbols match with each other. Incorrect connection will damage the inverter. Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.
*3 When the power supply is 400V class, install a step-down transformer.

• Outline dimension (Unit: mm)

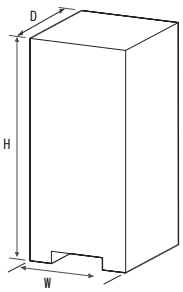
<FR-BU2>



<GZG, GRZG>



<FR-BR>



Model	W	H	D
FR-BU2-1.5K to 15K	68	128	132.5
FR-BU2-30K	108	128	129.5
FR-BU2-H7.5K, H15K	68	128	132.5
FR-BU2-H30K	108	128	129.5

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

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

Name (model)	Specification and structure

Multifunction regeneration converter FR-XC
Dedicated stand-alone reactor FR-XCL/FR-XCG

Dedicated box-type reactor FR-XCB

One inverter can handle harmonic suppression and power regeneration.
Functions that match the application can be selected by combining the inverter/converter with the dedicated reactor FR-XCB (box-type) or FR-XCL/FR-XCG.

• Combination

<<Combination matrix of FR-XCL/FR-XCG and FR-XC(-PWM)>>

Dedicated standalone reactor	Multifunction regeneration converter	
FR-XCL-[ ] FR-XCG-[]	FR-XC-[ ]	FR-XC-[ ]-PWM ∗1
7.5K	7.5K	-
11K	11K	-
15K	15K	-
22K	22K	18.5K
30K	30K	22K
37K	37K	37K
55K	55K	55K
H7.5K	H7.5K	-
H11K	H11K	-
H15K	H15K	-
H22K	H22K	H18.5K
H30K	H30K	H22K
H37K	H37K	H37K
H55K	H55K	H55K
H75K	50°C rating H75K	50°C rating H75K
H90K	40°C rating H75K	40°C rating H75K

<<Combination matrix of FR-XCB and FR-XC(-PWM)>>

Dedicated box-type reactor	Multifunction regeneration converter	
FR-XCB-[ ]	FR-XC-[ ] ∗2	FR-XC-[ ]-PWM
18.5K	22K	18.5K
22K	30K	22K
37K	37K	37K
55K	55K	55K
H18.5K	H22K	H18.5K
H22K	H30K	H22K
H37K	H37K	H37K
H55K	H55K	H55K
H75K	H75K	H75K

<<Combination matrix of FR-MCB and FR-XC>>

Dedicated contactor box	Multifunction regeneration converter
FR-MCB-H[ ]	FR-XC-[ ] (-PWM)
150	H75K

<<Combination matrix of FR-XCCP and FR-XC(-PWM)>>

Converter installation attachment for enclosure	Multifunction regeneration converter
FR-XCCP[ ]	FR-XC-[ ]
01	(H) 7.5K
	(H) 11K
02	(H) 15K
03	(H) 22K
	(H) 30K
	(H) 18.5K-PWM
	(H) 22K-PWM

<<Combination matrix of FR-XCCU and FR-XC(-PWM)>>

IP20 compatible attachment	Multifunction regeneration converter
FR-XCCU[ ]	FR-XC-[ ] (-PWM)
01	37K
	H55K
02	55K
03	H37K

∗1 The harmonic suppression function is pre-enabled in this model. Change the setting value of **Pr.416 Control method selection** to "0" (harmonic suppression disabled).
∗2 The harmonic suppression function is not pre-enabled in this model. Change the setting value of **Pr.416 Control method selection** to "1" (harmonic suppression enabled).

• Specifications

<<200V class>>

Model ∗1			FR-XC-[ ]K							FR-XC-[ ]K-PWM			
		Harmonic suppression	7.5	11	15	22	30	37	55	18.5	22	37	55
Common bus regeneration mode	Applicable inverter capacity (kW)	Disabled	7.5	11	15	22	30	37	55	22	30	37	55
		Enabled	-	-	-	18.5	22	37	55	18.5	22	37	55
	Overload current rating		100% continuous /150% 60 s							100% continuous /150% 60 s			
Power regeneration mode ∗2	Potential regenerative capacity (kW)		5.5	7.5	11	18.5	22	30	45	18.5	22	30	45
	Overload current rating		100% continuous /150% 60 s							100% continuous /150% 60 s			
Power source	Rated input AC voltage/ frequency	Disabled	Three-phase 200 to 240 V 50 Hz/60 Hz							Three-phase 200 to 240 V 50 Hz/60 Hz			
		Enabled	-	-	-	Three-phase 200 to 230 V 50 Hz/60 Hz ∗3				Three-phase 200 to 230 V 50 Hz/60 Hz ∗4			
	Permissible AC voltage fluctuation	Disabled	Three-phase 70 to 264 V 50 Hz/60 Hz							Three-phase 170 to 264 V 50 Hz/60 Hz			
		Enabled	-	-	-	Three-phase 170 to 253 V 50 Hz/60 Hz				Three-phase 170 to 253 V 50 Hz/60 Hz			
	Permissible frequency fluctuation	Disabled	±5%							±5%			
		Enabled	-	-	-	±5%				±5%			
Input power factor		Enabled	-	-	-	0.99 or more (when load ratio is 100%)				0.99 or more (when load ratio is 100%)			
Approx. mass (kg) ∗5			5	5	6	10.5	10.5	28	38	10.5	10.5	28	38

Name (model)	Specification and structure

Multifunction regeneration converter FR-XC
Dedicated stand-alone reactor FR-XCL/FR-XCG

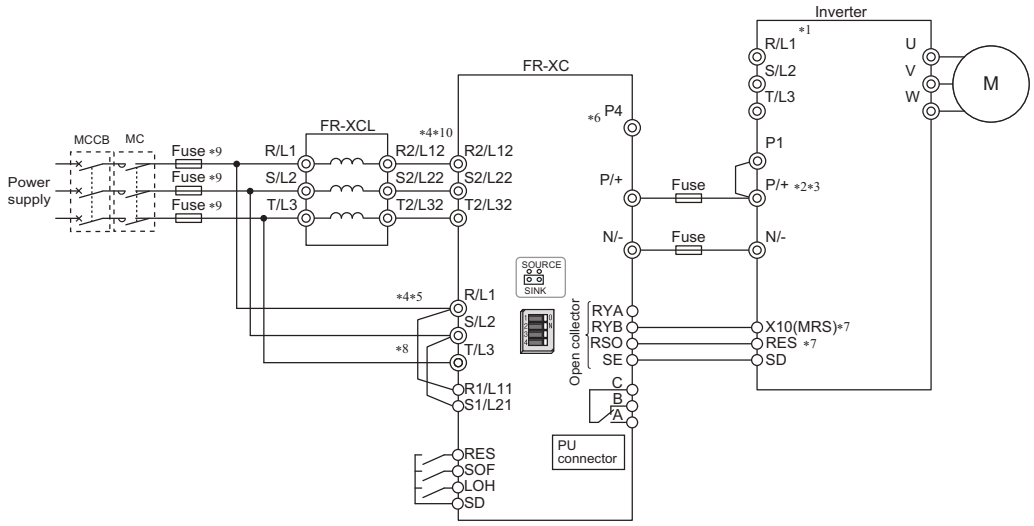
Dedicated box-type reactor FR-XCB

<<400V class>>

Model*1		Harmonic suppression	FR-XC-H[ ]K 7.5	11	15	22	30	37	55	75	FR-XC-H[ ]K-PWM 18.5	22	37	55	75
Common bus regeneration mode	Applicable inverter capacity (kW)	Disabled	7.5	11	15	22	30	37	55	75*6	22	30	37	55	75*6
		Enabled	-	-	-	18.5	22	37	55	75*6	18.5	22	37	55	75*6
	Overload current rating		100% continuous /150% 60 s								100% continuous /150% 60 s				
Power regeneration mode *2	Potential regenerative capacity (kW)		5.5	7.5	11	18.5	22	30	45	75*6	18.5	22	30	45	75*6
	Overload current rating		100% continuous /150% 60 s								100% continuous /150% 60s				
Power source	Rated input AC voltage/ frequency	Disabled	Three-phase 380 to 500 V 50 Hz/60 Hz								Three-phase 380 to 500 V 50 Hz/60 Hz				
		Enabled	-	-	-	Three-phase 380 to 480 V 50 Hz/60 Hz *3					Three-phase 380 to 480 V 50 Hz/60 Hz *4				
	Permissible AC voltage fluctuation	Disabled	Three-phase 323 to 550 V 50 Hz/60 Hz								Three-phase 323 to 550 V 50 Hz/60 Hz				
		Enabled	-	-	-	Three-phase 323 to 506 V 50 Hz/60 Hz					Three-phase 323 to 506 V 50 Hz/60 Hz				
	Permissible frequency fluctuation	Disabled	±5%								±5%				
		Enabled	-	-	-	±5%					±5%				
Input power factor		Enabled	-	-	-	0.99 or more (when load ratio is 100%)					0.99 or more (when load ratio is 100%)				
Approx. mass (kg) *5			5	5	6	10.5	10.5	28	28	45	10.5	10.5	28	28	45

*1 The harmonic suppression function is not pre-enabled in this model.
*2 The power regeneration mode is selectable when the harmonic suppression function is disabled.
*3 The DC bus voltage is approx. 297 VDC at an input voltage of 200 VAC, approx. 327 VDC at 220 VAC, and approx. 342 VDC at 230 VAC.
*4 The DC bus voltage is approx. 594 VDC at an input voltage of 400 VAC, approx. 653 VDC at 440 VAC, and approx. 713 VDC at 480 VAC.
*5 Mass of the FR-XC alone.
*6 90 kW for the 40°C rating

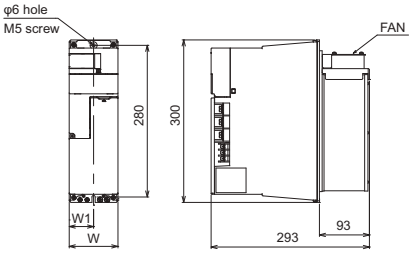
• Connection diagram
<<Common bus regeneration mode with harmonic suppression disabled>>



*1 Never connect the power supply to terminals R/L1, S/L2, and T/L3 on the inverter. Doing so will damage the inverter and the converter.
*2 When the FR-XC is connected, the jumper across terminals P/+ and P1 does not affect the function. (The FR-XC can be connected with the jumper connected.)
*3 Connect between the inverter terminal P/+ and the converter terminal P/+ and between the inverter terminal N/- and the converter terminal N/- for polarity consistency. Failure to do so will damage the converter and the inverter.
*4 Confirm the correct phase sequence of three-phase current to connect between the reactor and the converter, and between the power supply and terminals R/L1, S/L2, and T/L3. Failure to do so will damage the converter.
*5 Be sure to connect the power supply and terminals R/L1, S/L2, and T/L3 of the converter. Operating the inverter without connecting them will damage the converter.
*6 Do not connect anything to terminal P4.
*7 Assign the X10 and RES signals to any of the input terminals.
*8 To use separate power supply for the control circuit, remove each jumper at terminal R1/L11 and terminal S1/L21.
*9 Install UL listed fuses on the input side of the reactor to meet the UL/cUL standards (refer to the FR-XC Instruction Manual for information about the fuse).
*10 Do not install an MCCB or MC between the reactor and the converter. Doing so disrupts proper operation.

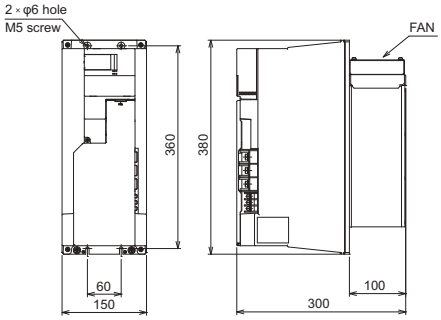
Name (model)	Specification and structure
Multifunction regeneration converter FR-XC **Dedicated stand-alone reactor FR-XCL/FR-XCG** **Dedicated box-type reactor FR-XCB** 	• Outline dimension (Unit: mm) This is an example of the outer appearance, which differs depending on the model. <<Multifunction regeneration converter FR-XC (-PWM)>>

•FR-XC-(H)7.5K, (H)11K, (H)15K

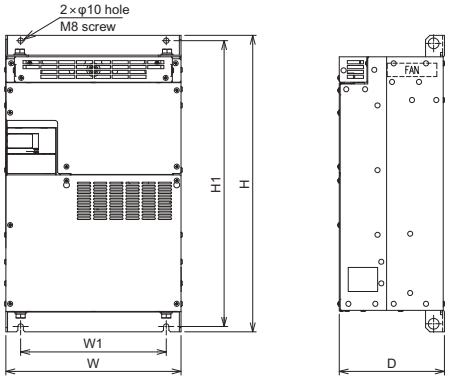


Model	W	W1
FR-XC-(H)7.5K, (H)11K	90	45
FR-XC-(H)15K	120	60

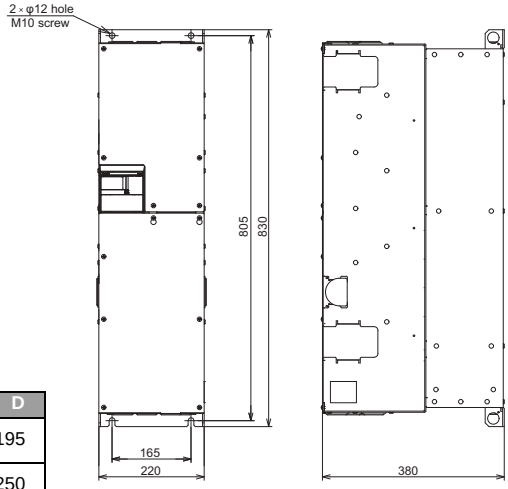
•FR-XC-(H)22K, (H)30K
•FR-XC-(H)18.5K-PWM, (H)22K-PWM



•FR-XC-(H)37K, (H)55K
•FR-XC-(H)37K-PWM, (H)55K-PWM



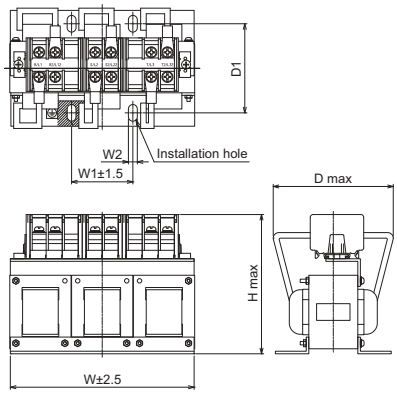
•FR-XC-H75K
•FR-XC-H75K-PWM



Model	W	W1	H	H1	D
FR-XC-(H)37K, H55K FR-XC-(H)37K-PWM, H55K-PWM	325	270	550	530	195
FR-XC-55K FR-XC-55K-PWM	370	300	620	600	250

Name (model)	Specification and structure
Multifunction regeneration converter FR-XC **Dedicated stand-alone reactor FR-XCL/FR-XCG** **Dedicated box-type reactor FR-XCB**	

<<Dedicated stand-alone reactor FR-XCL>>



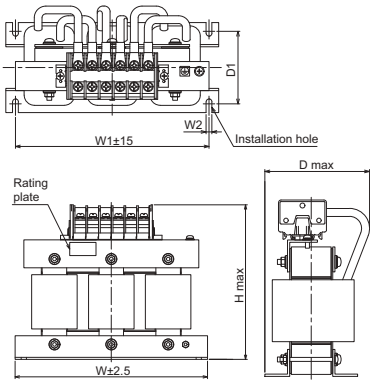
200 V class

Model	W	W1	W2	H	D	D1	Mounting screw size	Terminal screw size	Mass (kg)
FR-XCL-7.5K	165	55	8	125	120	80±2	M6	M5	3.9
FR-XCL-11K						73±2			3.6
FR-XCL-15K	192			130	130	100±2		M6	5.5
FR-XCL-22K					140	110±2			6.3
FR-XCL-30K	240	70		150	160	119±2			10.0
FR-XCL-37K	248	200	10	190	240	120±5	M8	M10	12.0
FR-XCL-55K	250	225			260	135±5			15.5

400 V class

Model	W	W1	W2	H	D	D1	Mounting screw size	Terminal screw size	Mass (kg)
FR-XCL-H7.5K	165	55	8	125	120	73±2	M6	M5	3.7
FR-XCL-H11K						80±2			4.2
FR-XCL-H15K					135	110±2			6.0
FR-XCL-H22K	240	70		150	150	109±2		M6	9.0
FR-XCL-H30K					170	129±2			12.0
FR-XCL-H37K	220	200	10	190	230	120±5	M8	M8	12.0
FR-XCL-H55K	250	225				135±5			16.0
FR-XCL-H75K	300	270	10	335	200	140±2	M8	M8	50.0
FR-XCL-H90K	300	270	10	360	210	150±2	M8	M8	60.0

<<Dedicated stand-alone reactor FR-XCG>>



200 V class

Model	W	W1	W2	H	D	D1	Mounting screw size	Terminal screw size	Mass (kg)
FR-XCG-7.5K	220	200	6	185	115	60±1.5	M5	M5	5
FR-XCG-11K					120	75±1.5			8
FR-XCG-15K				190	130	90±1.5		M6	11
FR-XCG-22K	255	225	8	240	140	85±1.5	M6		16
FR-XCG-30K					155	100±1.5			20
FR-XCG-37K	300	270	10	285	180		M8	M10	25
FR-XCG-55K					190	130±1.5			40

400 V class

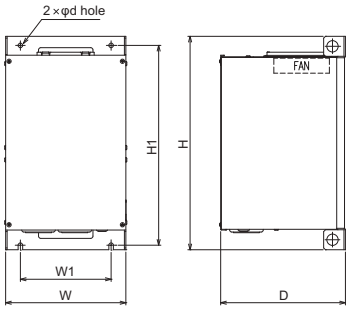
Model	W	W1	W2	H	D	D1	Mounting screw size	Terminal screw size	Mass (kg)
FR-XCG-H7.5K	220	200	6	185	115	60±1.5	M5	M5	5
FR-XCG-H11K					120	75±1.5			8
FR-XCG-H15K					130	90±1.5			11
FR-XCG-H22K	255	225	8	240		85±1.5	M6	M6	16
FR-XCG-H30K					140	100±1.5			20
FR-XCG-H37K	300	270	10	285	180		M8	M8	25
FR-XCG-H55K					190	130±1.5			40
FR-XCG-H75K	300	270	10	335	200	140±2	M8	M8	50
FR-XCG-H90K	300	270	10	360	210	150±2	M8	M8	60

Name (model)	Specification and structure

Multifunction regeneration converter FR-XC
Dedicated stand-alone reactor FR-XCL/FR-XCG

Dedicated box-type reactor FR-XCB

<<Dedicated box-type reactor FR-XCB>>
FR-XCB-(H)55K or less



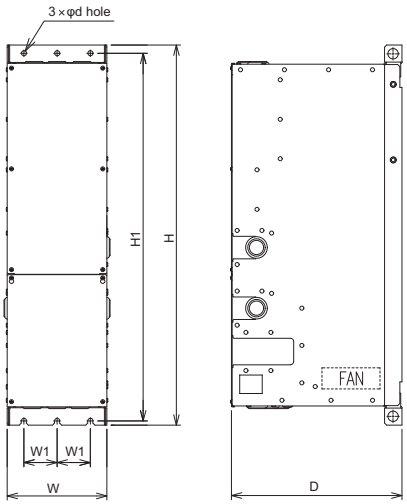
200 V class

Model	W	W1	H	H1	D	d	Screw size	Mass (kg)
FR-XCB-18.5K	265	200	470	440	275	10	M8	26.0
FR-XCB-22K								
FR-XCB-37K	350	270	600	575	330	12	M10	56.9
FR-XCB-55K								68.5

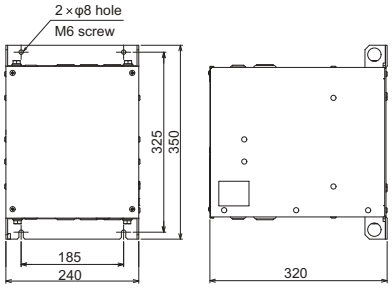
400 V class

Model	W	W1	H	H1	D	d	Screw size	Mass (kg)
FR-XCB-H18.5K	265	200	470	440	275	10	M8	26.9
FR-XCB-H22K								
FR-XCB-H37K	350	270	600	575	330	12	M10	63.0
FR-XCB-H55K								73.0
FR-XCB-H75K	240	80	915	885	410	12	M10	120.0

FR-XCB-H75K

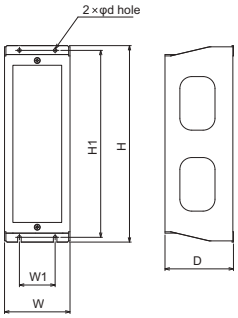


<<Dedicated contactor box FR-MCB>>



Model	Mass(kg)
FR-MCB-H150	17.0

<<Converter installation enclosure attachment FR-XCCP>>



Model	W	W1	H	H1	D	d	Screw size
FR-XCCP01	110	60	330	314	115	6	M5
FR-XCCP02	130	90			120		
FR-XCCP03	160	120	410	396	116	7	M6

Name (model)	Specification and structure

High power factor converter FR-HC2

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

• Selection method

Select the model according to capacity of the inverter or the applicable motor, whichever larger.

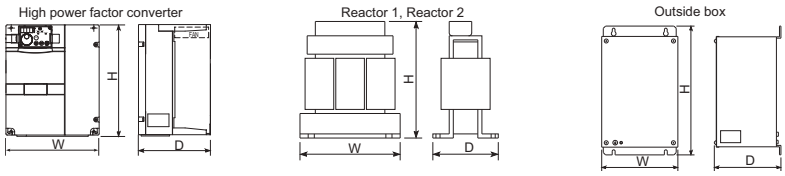
• Specifications

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

*1 The total capacity of the connected inverters.
*2 If a high power factor converter (FR-HC2) is purchased, it comes with reactor 1 (FR-HCL21), reactor 2 (FR-HCL22), and an outside box (FR-HCB2). Do not connect the DC reactor to the inverter when using a high power factor converter.
(If an H280K or higher is purchased, it comes with FR-HCL21, FR-HCL22, FR-HCC2, FR-HCR2, and FR-HCM2.)

• Outline dimension (Unit: mm)

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



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

Name (model)	Specification and structure
Surge voltage suppression filter FR-ASF	A surge voltage suppression filter limits surge voltage applied to motor terminals when driving the 400 V class motor by the inverter.

• Selection method

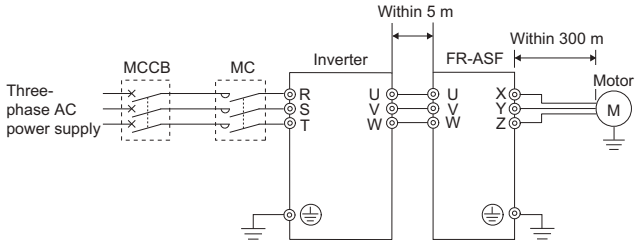
Select the model according to the applied motor capacity.

• Specifications

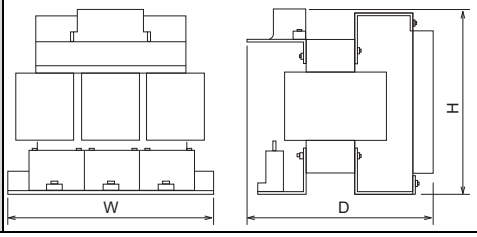
Model: FR-ASF-[]		400 V			
		H1.5K	H3.7K	H7.5K	H15K
Applicable motor capacity (kW)		0.4 to 1.5	2.2 to 3.7	5.5 to 7.5	11 to 15
Rated input current (A)		4.0	9.0	17.0	31.0
Overload current rating ∗1		150% 60 s, 200% 0.5 s			
Rated input AC voltage ∗1		Three-phase 380 V to 460 V 50 Hz/60 Hz			
Maximum AC voltage fluctuation ∗1		Three-phase 506 V 50 Hz/60 Hz			
Maximum frequency ∗1		400 Hz			
PWM frequency permissible range		0.5 kHz to 14.5 kHz			
Maximum wiring length between the filter and motor		300 m			
Approx. mass (kg)		8.0	11.0	20.0	28.0
Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)			
	Surrounding air humidity	90% RH or less (non-condensing)			
	Atmosphere	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt, etc.)			
	Altitude/vibration	Maximum 1000 m, 5.9 m/s^2 or less at 10 to 55 Hz (directions of X, Y, Z axes)			

∗1 Determined by the specification of the connected inverter (400 V class).

• Connection diagram



• Outline dimension (Unit: mm)



Model	W ∗1	H ∗1	D ∗1
FR-ASF-H1.5K	221	193	160
FR-ASF-H3.7K	221	200	180
FR-ASF-H7.5K	281	250	215
FR-ASF-H15K ∗2	336	265	290

∗1 This indicates the maximum dimension.
∗2 The H15K or higher has a different shape.

Name (model)	Specification and structure

Surge voltage suppression filter FR-BMF

Limits surge voltage applied to motor terminals when driving a 400 V class motor with an inverter.
This filter is compatible with the 5.5 to 37 kW motors.

• Selection method

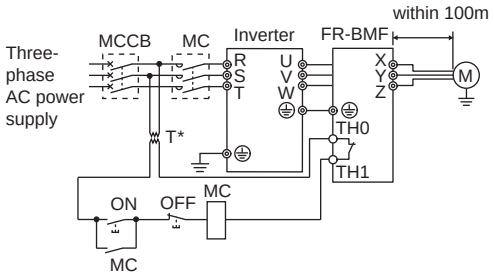
Select the model according to the applied motor capacity.

• Specifications

Model: FR-BMF-H□K		7.5		15
Applicable motor capacity (kW) ∗1		5.5	7.5	11
Rated current (A)		17		31
Overload current rating ∗2		150% 60 s, 200% 0.5 s (inverse-time characteristics)		
Rated AC input voltage ∗2		Three-phase 380 to 480 V		
Permissible AC voltage fluctuation ∗2		323 to 528 V		
Maximum frequency ∗2		120 Hz		
PWM carrier frequency		2 kHz or lower ∗3		
Protective structure (JEM 1030)		Open type (IP00)		
Cooling system		Self-cooling		
Maximum wiring length		100m or lower		
Approx. mass (kg)		5.5		9.5
Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)		
	Surrounding air humidity	90% RH or less (non-condensing)		
	Atmosphere	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt, etc.)		
	Altitude/vibration	Maximum 1000 m, 5.9 m/s^2 or less ∗4 at 10 to 55 Hz (directions of X, Y, Z axes)		

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

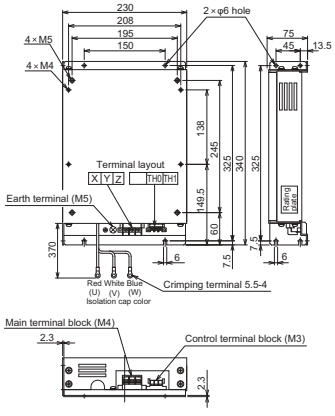
• Connection diagram



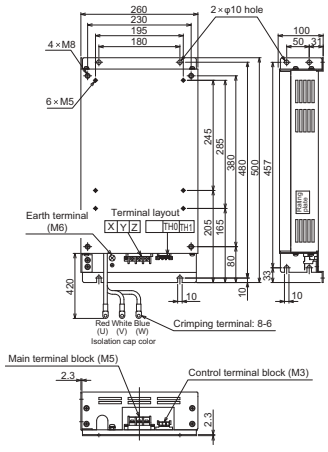
* Install a step-down transformer.

• Outline dimension (Unit: mm)

FR-BMF-H7.5K

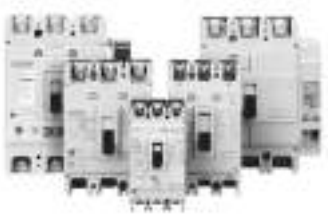


FR-BMF-H15K



● Mitsubishi Electric Molded Case Circuit Breakers and Earth Leakage Circuit Breakers WS-V Series

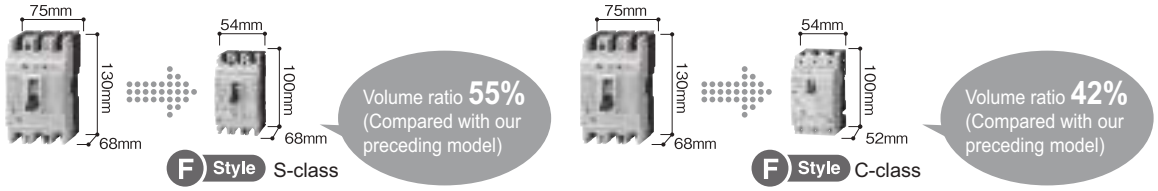
Our main series of products in the industry's smallest class with high breaking capability enabled by a new breaking technology.
The new WS-V series breaker has enhanced usability by further standardizing internal parts, meets international standards, and addresses environmental and energy-saving issues.



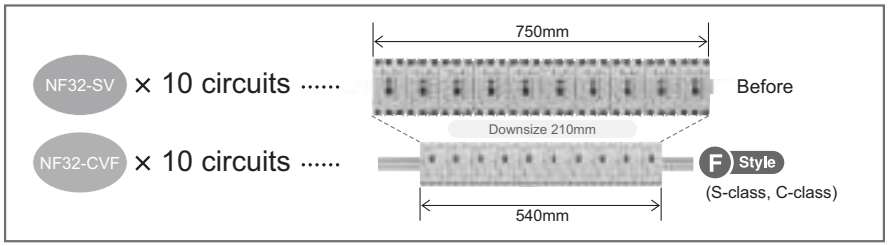
◆ Features

◆ A 54-mm-wide body, which belongs to the smallest class in the industry

The compact body allows for downsizing of the equipment and enclosure.
The breakers have been downsized to 54 mm wide and 52 mm depth (decreased by 16 mm compared with S-class general-purpose products).



When multiple units are used, the width becomes significantly smaller.



◆ Conforms to various global standards

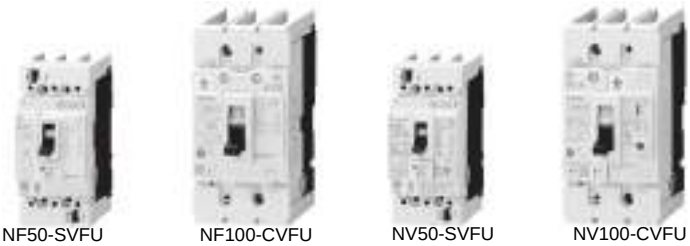
- New JIS standard: JIS C 8201-2-1 (NF) Annex 1 and Annex 2
- Electrical Appliances and Materials Safety Act (PSE)
- IEC standard: IEC 60947-2
- EN (Europe): EN 60947-2, CE marking (TÜV certification, self declaration)
- GB standard (China): GB/T 14048.2 CCC certification
- Safety certification (Korea): KC marking

◆ Three-phase power supply supported by CE/CCC marked earth leakage circuit breakers

GB/T 14048.2-2008 was established in China, requiring the earth leakage circuit breaker to fulfill its function even if a phase is lost as is the case with the EN standard in Europe. CE/CCC marked earth leakage circuit breakers of the WS-V series support three phase power supply. Compliance with the revised standard is certified.

◆ Lineup of UL 489 listed circuit breakers with 54 mm width "Small Fit" F Style

The compact breakers contribute to a size reduction of machines, and IEC 35 mm rail mounting is standard.

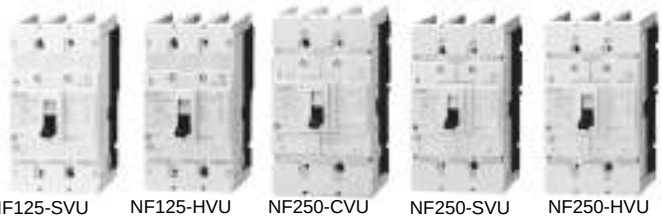


NF50-SVFU NF100-CVFU NV50-SVFU NV100-CVFU

For security and standard compliance of machines, F-type and V-type operating handles are available for breakers with 54 mm width.

◆ Lineup of UL 489 listed circuit breakers for 480 V AC "High Performance"

The breaking capacity has been improved to satisfy the request for SCCR upgrading.



NF125-SVU NF125-HVU NF250-CVU NF250-SVU NF250-HVU

Breaking capacity of UL 489 listed circuit breakers for 480 V AC (UL 489) (Example of 240 V AC)
NF125-SVU/NV125-SVU .....50 kA
NF125-HVU/NV125-HVU .....100 kA
NF250-CVU/NV250-CVU .....35 kA
NF250-SVU/NV250-SVU .....65 kA
NF250-HVU/NV250-HVU .....100 kA

● Mitsubishi Electric Magnetic Motor Starters and Magnetic Contactors MS-T Series

Mitsubishi Electric magnetic motor starters have been newly designed and the MS-T series has been released.
The MS-T series is smaller than ever, enabling more compact control panel. The MS-T series is suitable for other Mitsubishi Electric FA equipment. In addition, the MS-T conforms to a variety of global standards, supporting the global use.

S-T10

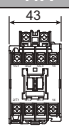
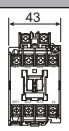
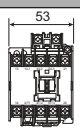
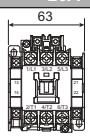
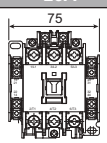
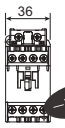
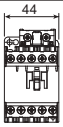
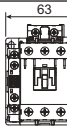
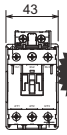
◆ Features

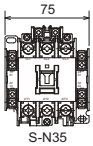
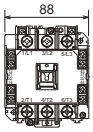
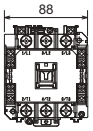
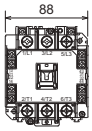
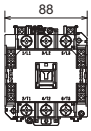
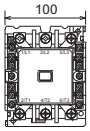
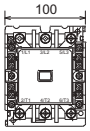
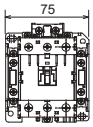
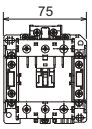
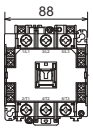
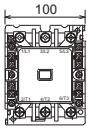
◆ Compact

General-purpose magnetic contactor with smallest width∗1 in the industry.
The width of MS-T series is reduced by 32% as compared to the prior MS-N series, enabling a more compact panel.
For selection, refer to **page 84**.

∗1 Based on Mitsubishi Electric research as of November 2020 in the general-purpose magnetic contactor industry for 10 A-frame class.

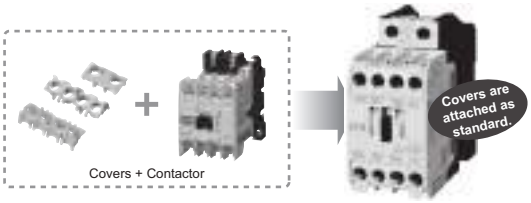
[Unit: mm]

Frame size	11A	13A		20A	25A	32A
MS-N series	 43 S-N10	 43 S-N11 (Auxiliary 1-pole)	 53 S-N12 (Auxiliary 2-pole)	 63 S-N20	 75 S-N25	None
New MS-T series	 36 −7mm! S-T10	 44 −9mm! S-T12 (Auxiliary 2-pole)		44 −19mm! S-T20	 63 −12mm! S-T25	 43 New S-T32

Frame size	35A	50A		65A		80A	100A
MS-N series	 75 S-N35	 88 S-N50	 88 S-N50AE	 88 S-N65	 88 S-N65AE	 100 S-N80	 100 S-N95
New MS-T series	 75 S-T35	 75 −13mm! S-T50		 88 S-T65		88 −12mm! S-T80	 100 S-T100

◆ Standardization

- Terminal covers are provided as standard to ensure safety inside the enclosure. Users do not have to make arrangements to specify and obtain options separately. Covers are provided also for the auxiliary contact unit. Users can reduce their inventory.



(Conventional product) (MS-T series)

- Widened range of operation coil ratings (AC operated model)
  The widened range reduces the number of operation coil rating types from 13 (MS-N series) to 7.
  The reduced number of the operation coil types enables more simplified customers' ordering process and the faster delivery.
- Customers can select the operation coil more easily.

(Conventional product)

Coil designation	Rated voltage [V]	
	50 Hz	60 Hz
24 VAC	24	24
48 VAC	48 to 50	48 to 50
100 VAC	100	100 to 110
120 VAC	110 to 120	115 to 120
127 VAC	125 to 127	127
200 VAC	200	200 to 220
220 VAC	208 to 220	220
230 VAC	220 to 240	230 to 240
260 VAC	240 to 260	260 to 280
380 VAC	346 to 380	380
400 VAC	380 to 415	400 to 440
440 VAC	415 − 440	460 to 480
500 VAC	500	500 to 550

(MS-T series)

Coil designation	Rated voltage [V]
	50 Hz/60 Hz
24 VAC	24
48 VAC	48 to 50
100 VAC	100 to 127
200 VAC	200 to 240
300 VAC	260 to 300
400 VAC	380 to 440
500 VAC	460 to 550

Integrated coil ratings facilitate selection!

∗Seven types are available without change for the 50 A frame model or higher.

◆ Global Standard

- Conforms to various global standards
  Our magnetic contactors are certified as compliant not only with major international standards such as IEC, JIS, UL, CE, and CCC but also with ship classification standards and country specific standards.
  This will help our customers expand their business overseas.

Standard	Applicable standard					Safety standard
	International	Japan	Europe		China	U.S.A./ Canada
	IEC∗2	JIS	EN EC Directive	Certification body	GB	
			CE	TÜV Rheinland	CCC	c UL us

∗2 Compliant with the requirements for mirror contacts in standards such as IEC 60947-4-1, and TÜV-certified.

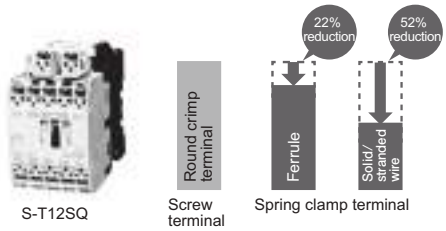
● Spring Clamp Terminal Models Available for Mitsubishi Electric Magnetic Contactor and Magnetic Relay

Spring clamp terminal:
Easy-to-connect terminal that ensures connection with the contact pressure of the spring just by pushing wire into the conductive terminal. Solid wires and ferrules can be connected simply by inserting them into the terminals.
Stranded wires can be connected by opening the spring with a tool, inserting wire, and removing the tool.

◆ Features

Key features of the screwless terminals:

- Significant reduction in the time required for wiring
  Comparison with the terminal screw model (with round crimp terminal)
  Wiring with ferrules: 22% reduction
  Wiring with solid or stranded wire: 52% reduction
  Reduction in the time required for wiring
  Wiring performed by non-experts (with 2-year experience) (The research conducted by Japan Switchboard & control system Industries Association)
- Easy wiring for whoever works on
  Push-in connection eliminates the need for the screw-tightening skills.
- Enhanced maintenance efficiency
  Screw retightening is not necessary for installation and maintenance of enclosures and machines.
- Reliable wire connection
  There is no risk of terminal screw loosening due to vibration or shocks, or long-term service.



● Motor Circuit Breaker MMP-T Series

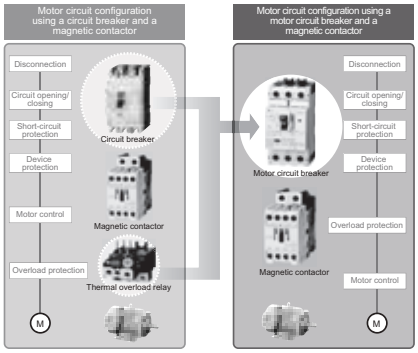
Motor circuit protection (against overload / phase loss / short-circuit) is achievable the MMP-T series alone.
The wire-saving, space-saving design enables downsizing of the enclosure.
The MMP-T series can be used in combination with the MS-T series.

MMP-T32

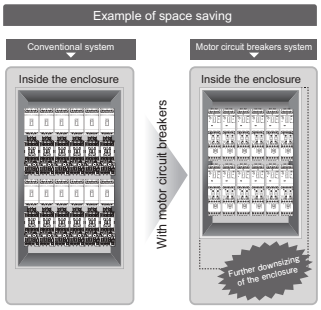
◆ Features

◆ What is the motor circuit breaker?

The motor circuit breaker, applicable to the motor circuit, has the functions of a circuit breaker and a thermal overload relay in one unit. The motor circuit breaker provides protection against overload, phase loss, and short circuit.



◆ Space-saving design for downsizing of the enclosure

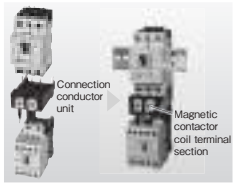


◆ Wire saving

Using a connection conductor unit (option) for connecting a motor circuit breaker and a contactor reduces work hours required for wiring.
A connection conductor unit for the high sensitivity contactor (SD-Q) is also available. (Model: UT-MQ12)

Example of wire saving

Conductor unit connection example



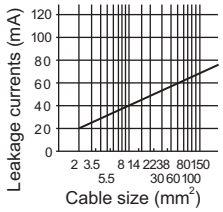
UT-MQ12 application example

● Selecting the rated sensitivity current for the earth leakage circuit breaker

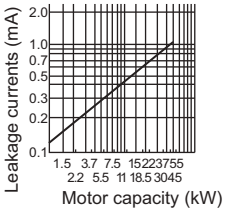
When using an earth leakage circuit breaker with the inverter circuit, select its rated sensitivity current as follows, independently of the PWM carrier frequency.

- Breaker designed for harmonic and surge suppression
  Rated sensitivity current
  $I\Delta n \geq 10 \times (Ig1+Ign+Igi+Ig2+Igm)$
- Standard breaker
  Rated sensitivity current
  $I\Delta n \geq 10 \times \{Ig1+Ign+Igi+3 \times (Ig2+Igm)\}$
  Ig1, Ig2: Leakage currents in wire path during commercial power supply operation
  Ign: Leakage current of inverter input side noise filter
  Igm: Leakage current of motor during commercial power supply operation
  Igi: Leakage current of inverter unit

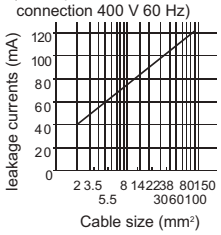
Example of leakage current of cable path per 1 km during the commercial power supply operation when the CV cable is routed in metal conduit
(200 V 60 Hz)



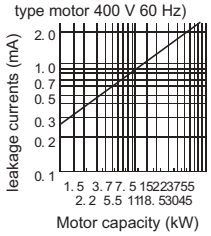
Leakage current example of three-phase induction motor during the commercial power supply operation
(200 V 60 Hz)



Example of leakage current per 1 km during the commercial power supply operation when the CV cable is routed in metal conduit
(Three-phase three-wire delta connection 400 V 60 Hz)

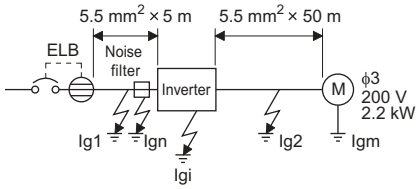


Leakage current example of three-phase induction motor during the commercial power supply operation
(Totally-enclosed fan-cooled type motor 400 V 60 Hz)



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

<Example>



(a) Install the earth leakage circuit breaker (ELB) on the input side of the inverter.

(b) In the ⅄ connection earthed-neutral system, the sensitivity current is blunt against a ground fault in the inverter output side. Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 61140 class 1 and other applicable standards)

◆ Selection example (in the case of the above figure)

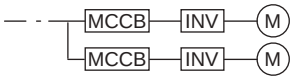
	Breaker designed for harmonic and surge suppression	Standard breaker
Leakage current Ig1 (mA)	$33 \times \frac{5\ m}{1000\ m} = 0.17$	
Leakage current Ign (mA)	0 (without noise filter)	
Leakage current Igi (mA)	1	
Leakage current Ig2 (mA)	$33 \times \frac{50\ m}{1000\ m} = 1.65$	
Motor leakage current Igm (mA)	0.18	
Total leakage current (mA)	3.00	6.66
Rated sensitivity current (mA) (≥Ig × 10)	30	100

● Molded case circuit breaker, magnetic contactor, cable gauge

Voltage	Motor output (kW) *1	Applicable inverter model (ND rating)	Molded case circuit breaker (MCCB) *2 or earth leakage circuit breaker (ELB) (NF, NV type)		Input side magnetic contactor *3		Recommended cable gauge (mm^2) *4		
							R/L1, S/L2, T/L3		U, V, W
			Power factor improving (AC or DC) reactor connection		Power factor improving (AC or DC) reactor connection		Power factor improving (AC or DC) reactor connection		
			Without	With	Without	With	Without	With	
Three-phase 200 V	0.1	FR-D820-0.1K-008	5A	5A	S-T10	S-T10	2	2	2
	0.2	FR-D820-0.2K-014	5A	5A	S-T10	S-T10	2	2	2
	0.4	FR-D820-0.4K-025	5A	5A	S-T10	S-T10	2	2	2
	0.75	FR-D820-0.75K-042	10A	5A	S-T10	S-T10	2	2	2
	1.5	FR-D820-1.5K-070	15A	10A	S-T10	S-T10	2	2	2
	2.2	FR-D820-2.2K-100	20A	15A	S-T10	S-T10	2	2	2
	3.7	FR-D820-3.7K-165	30A	30A	S-T21	S-T10	3.5	3.5	3.5
	5.5	FR-D820-5.5K-238	50A	40A	S-T35	S-T21	5.5	5.5	5.5
	7.5	FR-D820-7.5K-318	60A	50A	S-T35	S-T35	14	8	8
Three-phase 400 V	0.4	FR-D840-0.4K-012	5A	5A	S-T10	S-T10	2	2	2
	0.75	FR-D840-0.75K-022	5A	5A	S-T10	S-T10	2	2	2
	1.5	FR-D840-1.5K-037	10A	10A	S-T10	S-T10	2	2	2
	2.2	FR-D840-2.2K-050	15A	10A	S-T10	S-T10	2	2	2
	3.7	FR-D840-3.7K-081	20A	15A	S-T10	S-T10	2	2	2
	5.5	FR-D840-5.5K-120	30A	20A	S-T21	S-T12	3.5	2	2
	7.5	FR-D840-7.5K-163	30A	30A	S-T21	S-T21	3.5	3.5	3.5
Single-phase 200 V	0.1	FR-D820S-0.1K-008	5A	5A	S-T10	S-T10	2	2	2
	0.2	FR-D820S-0.2K-014	5A	5A	S-T10	S-T10	2	2	2
	0.4	FR-D820S-0.4K-025	10A	10A	S-T10	S-T10	2	2	2
	0.75	FR-D820S-0.75K-042	15A	10A	S-T10	S-T10	2	2	2
	1.5	FR-D820S-1.5K-070	20A	20A	S-T10	S-T10	2	2	2
	2.2	FR-D820S-2.2K-100	40A	30A	S-T21	S-T10	3.5	3.5	2
Single-phase 100 V	0.1	FR-D810W-0.1K-008	10A	5A	S-T10	S-T10	2	2	2
	0.2	FR-D810W-0.2K-014	10A	10A	S-T10	S-T10	2	2	2
	0.4	FR-D810W-0.4K-025	15A	15A	S-T10	S-T10	2	2	2
	0.75	FR-D810W-0.75K-042	30A	20A	S-T10	S-T10	3.5	3.5	2

*1 Assumes the use of a standard 4-pole motor.

*2 Select an MCCB according to the power supply capacity.
Install one MCCB per inverter.
(For the use in the United States or Canada, refer to "Instructions for UL and cUL" in the document enclosed with the product and select appropriate fuses.)



*3 The magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times.
When the magnetic contactor is used for emergency stops during motor driving, the electrical durability is 25 times.
If using an MC for emergency stop during motor driving or using it on the motor side during commercial power supply operation, select an MC with the class AC-3 rated current for the rated motor current.

*4 Cables
HIV cable (600 V grade heat-resistant PVC insulated wire) with a continuous maximum permissible temperature of 75°C. It assumes a surrounding air temperature of 50°C or lower and the wiring distance of 20 m or shorter.

NOTE

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model, and select cables and reactors according to the motor output.
- When the breaker on the inverter's input side trips, check for wiring faults (such as short circuits) and, damage to internal parts of the inverter etc. The cause of the trip must be identified and removed before turning ON the power of the breaker.

Precaution on Selection and Operation

● Precautions for use

⚠ Safety instructions

- To use the product safely and correctly, make sure to read the "Instruction Manual" before the use.
- This product has not been designed or manufactured for use with any equipment or system operated under life-threatening conditions.
- Please contact our sales representative when considering using this product in special applications such as passenger mobile, medical, aerospace, nuclear, power or undersea relay equipment or system.
- Although this product was manufactured under conditions of strict quality control, install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product or other failures are likely to cause a serious accident.
- Do not use the inverter for a load other than the three-phase induction motor and the PM motor.
- Do not connect a PM motor in the induction motor control settings (initial settings). Do not use an induction motor in the PM sensorless vector control settings. It will cause a failure.
- When using a PM motor, the precautions for using a PM motor must be observed as well.

◆ Operation

- When a magnetic contactor (MC) is installed on the input side, do not use the MC for frequent starting/stopping. Otherwise the inverter may be damaged.
- When a fault occurs in the inverter, the protective function is activated to stop the inverter output. However, the motor cannot be immediately stopped. For machinery and equipment that require an immediate stop, provide a mechanical stop/holding mechanism.
- Even after turning OFF the inverter, it takes time to discharge the capacitor. Before performing an inspection, wait 10 minutes or longer after the power supply turns OFF, then check the voltage using a tester, etc.
- To maintain the security (confidentiality, integrity, and availability) of the inverter and the system against unauthorized access, DoS*1 attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. (Refer to the FA System Security Guideline -Separate Volume [FREQROL]-.)

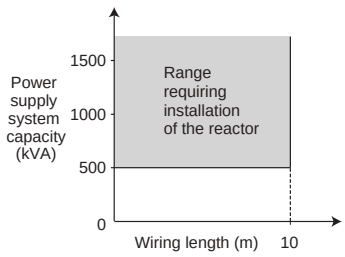
*1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

◆ Wiring

- Applying the power to the inverter output terminals (U, V, W) causes a damage to the inverter. Before power-on, thoroughly check the wiring and sequence to prevent incorrect wiring, etc.
- Terminals P/+, P1, N/-, and PR are for connection to dedicated options and DC power supplies. Do not connect anything other than a dedicated option and DC power supply. Do not short-circuit between the frequency setting power supply terminal 10 and the common terminal 5, and between terminals PC and SD.
- To remove the wire connected to the control circuit terminal, pull the wire while pressing down the open/close button firmly with a flathead screwdriver. Otherwise, the terminal block may be damaged.
- To prevent a malfunction due to noise, keep the signal cables 10 cm or more away from the power cables. Also, separate the main circuit cables at the input side from the main circuit cables at the output side.
- After wiring, wire offcuts must not be left in the inverter. Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take caution not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch correctly. Incorrect setting may cause a fault, failure or malfunction.
- The output of the single-phase power input model is three-phase 200 V.

◆ Power supply

- When the inverter is connected near a large-capacity power transformer (500 kVA or more) or when a power factor correction capacitor is to be switched over, an excessive peak current may flow in the power input circuit, damaging the inverter. To prevent this, always install an optional AC reactor (FR-HAL).



  For the single-phase 200 V power input models, select the reactor whose capacity is one rank higher than the motor capacity.
  When connecting a single-phase 100 V power input model to power transformer (exceeding 50 kVA), install an AC reactor (FR-HAL) so that the performance is more reliable.
- If surge voltage occurs in the power supply system, this surge energy may flow into an inverter, and the inverter may display the overvoltage protection (E. OV[]) and trip. To prevent this, install an optional AC reactor (FR-HAL).

◆ Installation

- Install the inverter in a clean place with no floating oil mist, cotton fly, dust and dirt, etc. Alternatively, install the inverter inside the "sealed type" enclosure that prevents entry of suspended substances. For installation in the enclosure, decide the cooling method and the enclosure size to keep the surrounding air temperature of the inverter within the permissible range (for specifications, refer to **page 38**).
- Some parts of the inverter become extremely hot. Do not install the inverter to inflammable materials (wood etc.).
- Attach the inverter vertically.

◆ Setting

- Depending on the parameter setting, high-speed operation (up to 590 Hz) is available. Incorrect setting will lead to a dangerous situation. Set the upper limit by using the upper frequency limit setting.
- Setting the DC injection brake operation voltage and operating time larger than their initial values causes motor overheating (electronic thermal O/L relay trip).
- Do not set **Pr. 70 Special regenerative brake duty** except for using the optional brake resistor. This function is used to protect the brake resistor from overheating. Do not set the value exceeding permissible duty of the brake resistor.

● Precautions for use of PM motor

When using the PM motor, the following precautions must be observed as well.

⚠ Safety instructions

- Do not use a PM motor for an application where the motor is driven by the load.

◆ Combination of motor and inverter

- For the motor capacity, the rated motor current should be equal to or less than the rated inverter current.
  If a motor with substantially low rated current compared with the inverter rated current is used, speed and torque accuracies may deteriorate due to torque ripples, etc. Set the rated motor current to about 40% or higher of the inverter rated current.
- Only one PM motor can be connected to an inverter.
- A PM motor cannot be driven by the commercial power supply.

◆ Installation

- While power is ON or for some time after power-OFF, do not touch the motor since the motor may be extremely hot. Doing so may cause burns.

◆ Wiring

- Connecting a commercial power supply to the input terminals (U, V, W) of a motor will burn it out. The motor must be connected with the output terminals (U, V, W) of the inverter.
- A PM motor is a motor with permanent magnets embedded inside. High voltage is generated at the motor terminals while the motor is running. Before wiring or inspection, confirm that the motor is stopped.
  In an application, such a as fan or blower, where the motor is driven by the load, a low-voltage manual contactor must be connected at the inverter's output side, and wiring and inspection must be performed while the contactor is open. Otherwise an electric shock may be caused. The inverter power must be turned ON before closing the contacts of the contactor at the output side.
- Match the input terminals (U, V, W) of the motor and the output terminals (U, V, W) of the inverter when connecting.
- Use the wiring length of 30 m or shorter when connecting a PM motor.

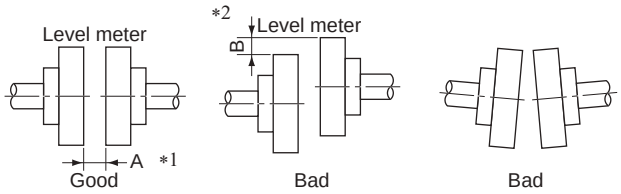
◆ Operation

- About 0.1 s (magnetic pole detection time) takes to start a motor after inputting a start signal.
- A PM motor is a motor with embedded permanent magnets. Regression voltage is generated when the motor coasts at an instantaneous power failure or other incidents.
  The inverter's DC bus voltage increases if the motor coasts fast in this condition. When using the automatic restart after instantaneous power failure function, it is recommended to also use the regeneration avoidance operation to make startups stable.
- Thus, the relation between the rotation speed and the frequency setting is:
  Rotation speed = 120 × frequency setting value / number of motor poles

◆ Connection with machine

◆ Direct connection

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



*1 Set so that the A dimensions become the same dimension even when any position is measured by feeler gauge (inequality in A width 3/100 mm or lower).
*2 Do not set parts with a vertical gap like B (maximum runoff degree: 3/100 mm).

NOTE

- When a fan or blower is directly connected to the motor shaft or to the machine, the machine side may become unbalanced. When the unbalanced degree becomes larger, the motor vibration becomes larger and may result in a damage of the bearing or other area. The balance quality with the machine should meet the class G2.5 or lower of JIS B0905 (the Balance Quality Requirements of Rigid Rotors).

◆ Connected by belt

- When installing, place the motor shaft and the machine shaft in parallel, and mount them to a position where their pulley centers are aligned. Their pulley centers should also have a right angle to each shaft.
- An excessively stretched belt may damage the bearing and break the shafts. A loose belt may slip off and easily deteriorate. A flat belt should be rotated lightly when it is pulled by one hand.
  For details, refer to the Instruction Manual of the motor.

◆ Connected by gear couplings

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

◆ Permissible vibration during operation

During operation, the motor coupled to a load machine may vibrate according to the degree of coupling between the motor and the load, and the degree of vibration created by the load. The degree of the motor's vibration varies depending on the condition of the foundations and baseplate of the motor. If the motor has higher vibration than the permissible level, investigate the cause, take measure, and take action.
For further details on vibration, refer to the Instruction Manual of the motor.

● Selection precautions

◆ Inverter capacity selection

- When operating a special motor or multiple motors in parallel by one inverter, select the inverter capacity so that 1.05 times of the total of the rated motor current becomes less than the rated output current of the inverter.
  (Multiple PM motors cannot be connected to an inverter.)
- Do not set **Pr. 70 Special regenerative brake duty** except for using the optional brake resistor. This function is used to protect the brake resistor from overheating. Do not set the value exceeding permissible duty of the brake resistor.

◆ Starting torque of the motor

- The starting and acceleration characteristics of the motor driven by an inverter are restricted by the overload current rating of the inverter. In general, the torque characteristic has small value compared to when the motor is started by a commercial power supply. When a large starting torque is required, and torque boost adjustment and Advanced magnetic flux vector control cannot generate the sufficient torque, increase both the motor and inverter capacities.

◆ Acceleration/deceleration time

- The motor acceleration/deceleration time is decided by the torque generated by the motor, load torque, and moment of inertia (J) of load.
- The required time may increase when the torque limit function or stall prevention function operates during acceleration/deceleration. In such a case, set the acceleration/deceleration time longer.
- When shorter acceleration/deceleration time is required, increase the torque boost value (setting too large value may cause activation of the stall prevention function, resulting in longer acceleration time), apply Advanced magnetic flux vector control, or increase the motor and inverter capacities. To decrease the deceleration time, it is necessary to add optional brake resistor MRS type, MYS type, or FR-ABR (for the 0.4K or higher), the brake unit (FR-BU2), multifunction regeneration converter (FR-XC), or a similar device to absorb braking energy.

◆ Power transfer mechanisms (reduction gear, belt, chain, etc.)

- Caution is required for the low-speed continuous operation of the motor with an oil lubricated gear box, transmission, reduction gear, etc. in the power transfer mechanism. Such an operation may degrade the oil lubrication and cause seizing. On the other hand, the high-speed operation at more than 60 Hz may cause problems with the noise of the power transfer mechanism, life, or insufficient strength due to centrifugal force, etc. Fully take necessary precautions.

◆ Instructions for overload operation

- When performing frequent starts/stops by the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a repeated flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current at locked condition, starting current, etc. Reducing current may extend the service life but may also cause torque shortage, which leads to a start failure. Adding a margin to the current can eliminate such a condition. For an induction motor, use an inverter of a higher capacity (up to two ranks for the ND rating). For a PM motor, use an inverter and PM motor of higher capacities.

● Precautions on peripheral device selection

◆ Selection and installation of molded case circuit breaker

Install a molded case circuit breaker (MCCB) on the power receiving side to protect the wiring at the inverter input side. Select an MCCB according to the inverter power supply side power factor, which depends on the power supply voltage, output frequency and load. Refer to **page 84**. Especially for a completely electromagnetic MCCB, a slightly large capacity must be selected since its operation characteristic varies with harmonic currents. (Check the reference material of the applicable breaker.) As an earth leakage circuit breaker, use the Mitsubishi Electric earth leakage circuit breaker designed for harmonics and surge suppression. (Refer to **page 83**.)
When installing a molded case circuit breaker on the inverter output side, contact the manufacturer of each product for selection.

◆ Handling of the input side magnetic contactor (MC)

- For the operation using external terminals (using terminal STF or STR), install the input-side magnetic contactor to prevent accidents due to automatic restart when the power is restored after power failures such as an instantaneous power failure, or for safety during maintenance works. Do not use this magnetic contactor for frequent starting/stopping of the inverter. (The switching life of the converter part is about 1 million times.)
  In the operation by operation panel, the automatic restart after power restoration is not performed and the magnetic contactor cannot be used to start the motor. The input-side magnetic contactor can stop the motor. However, the regenerative brake of the inverter does not operate, and the motor coasts to a stop.
- Installation of a magnetic contactor at the input side is recommended. A magnetic contactor avoids overheat or burnout of a brake resistor when heat capacity of the resistor is insufficient or a brake regenerative transistor is damaged with short while connecting an optional brake resistor. In this case, shut-off the magnetic contactor when fault occurs and inverter trips.

◆ Handling of the output side magnetic contactor (MC)

- Switch the MC between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned ON while the inverter is operating, overcurrent protection of the inverter and such will activate. When an MC is provided to switch to a commercial power supply, switch it ON/OFF after the inverter and motor have stopped.
- Do not install a magnetic contactor at the inverter's output side when using a PM motor.

◆ Installation of thermal relay

In order to protect the motor from overheating, the inverter has an electronic thermal O/L relay. However, install an external thermal overcurrent relay (OCR) between the inverter and motors to operate several motors or a multi-pole motor with one inverter. In this case, set 0 A to the electronic thermal O/L relay setting of the inverter. For the external thermal overcurrent relay, determine the setting value in consideration of the current indicated on the motor's rating plate and the line-to-line leakage current. **(Refer to page 89.)**
Self cooling ability of a motor reduces in the low-speed operation. Installation of a thermal protector or a use of a motor with built-in thermistor is recommended.

◆ Output side measuring instrument

When the inverter-to-motor wiring length is long, especially for the 400 V class, small-capacity models, the meters and CTs may generate heat due to line-to-line leakage current. Therefore, choose the equipment which has enough allowance for the current rating.
When measuring and displaying the output voltage and output current of the inverter, use of terminals AM and 5 output function of the inverter is recommended.

◆ Disuse of power factor improving capacitor (power factor correction capacitor)

The power factor improving capacitor and surge absorber on the inverter output side may be overheated or damaged by the harmonic components of the inverter output. Also, since an excessive current flows in the inverter to activate overcurrent protection, do not provide a capacitor and surge absorber. To improve the power factor, use an AC reactor (on **page 65**), a DC reactor (on **page 66**), or a high power factor converter (on **page 77**).

◆ Electrical corrosion of the bearing

When a motor is driven by the inverter, axial voltage is generated on the motor shaft, which may cause electrical corrosion of the bearing in rare cases depending on the wiring, load, operating conditions of the motor or specific inverter settings (high carrier frequency, use of a capacitive filter ∗1). Contact your sales representative to take appropriate countermeasures for the motor.
The following shows examples of countermeasures for the inverter.

- Decrease the carrier frequency.
- Remove the capacitive filter.
- Provide a common mode choke on the output side of the inverter.∗2
  (This is effective regardless of the use of the capacitive filter.)

∗1 Mitsubishi Electric capacitive filter: FR-BIF, SF[], FR-E5NF-[], FR-S5NFSA[], FR-BFP2-[]

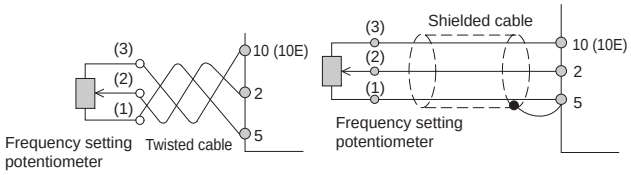
∗2 Recommended common mode choke: FT-3KM F series FINEMET® common mode choke cores manufactured by Proterial, Ltd.
FINEMET is a registered trademark of Proterial, Ltd.

◆ Cable gauge and wiring distance

If the wiring distance is long between the inverter and motor, during the output of a low frequency in particular, use a large cable gauge for the main circuit cable to suppress the voltage drop to 2% or less. (The table on **page 84** indicates a selection example for the wiring length of 20 m.) Especially for long-distance wiring or wiring with shielded cables, the inverter may be affected by a charging current caused by stray capacitances of the wiring, leading to an incorrect activation of the overcurrent protective function. Refer to the maximum wiring length shown in the following table.
(When multiple motors are connected, use the total wiring length shown in the table or shorter.)

Cable type	Pr.72 setting (carrier frequency)	Voltage class	0.1K	0.2K	0.4K	0.75K	1.5K	2.2K	3.7K or higher
Unshielded	1 (1 kHz) or lower	100V 200V	200m	200m	300m	500m	500m	500m	500m
		400V	-	-	200m	200m	300m	500m	500m
	2 (2 kHz)	100V 200V	30m	100m	200m	300m	500m	500m	500m
		400V	-	-	30m	100m	200m	300m	500m
Shielded	1 (1 kHz) or lower	100V 200V	50m	50m	75m	100m	100m	100m	100m
		400V	-	-	50m	50m	75m	100m	100m
	2 (2 kHz)	100V 200V	10m	25m	50m	75m	100m	100m	100m
		400V	-	-	10m	25m	50m	75m	100m

When using the automatic restart after instantaneous power failure function with wiring length exceeding 100 m, select without frequency search (**Pr.162** = "1, 11").
For the remote operation using analog signals, keep the control cable distance between the operation signal transmitter and the inverter to 30 m or less. Also, to prevent induction from other devices, keep the wiring away from the power circuits (main circuit and relay sequential circuit).
When the frequency setting is performed using the external potentiometer, not using the parameter unit, use a shielded or twisted cable as shown in the figure below. Connect the shield cable to terminal 5, not to the earth (ground).



◆ Earth (ground)

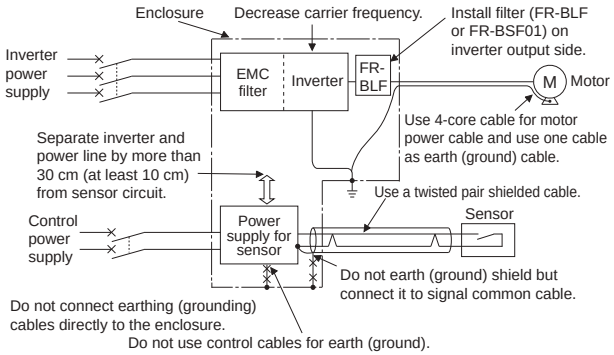
When the inverter is set for the low acoustic noise operation, the leakage current increases compared to in the normal operation due to the high speed switching operation. Always earth (ground) the inverter and the motor. Also, always use the earth (ground) terminal of the inverter for earthing (grounding). (Do not use a case or chassis.)

◆ Electromagnetic interference (EMI)

For the low acoustic noise operation with high carrier frequency, electromagnetic noise tends to increase. Take countermeasures by referring to the following examples. Depending on an installation condition, noise may affect the inverter also in the normal operation (initial status).

- Decrease the carrier frequency (**Pr.72**) setting to lower the EMI level.
- As measures against AM radio broadcasting noise, radio noise filter FR-BIF produces an effect.
- As measures against sensor malfunction, line noise filter FR-BSF01, FR-BLF produces an effect.
- For effective reduction of induction noise from the power cable of the inverter, secure the distance of 30 cm (at least 10 cm) from the power line and use a shielded twisted pair cable for the signal cable. Do not earth (ground) the shield, and connect the shield to a common terminal by itself.

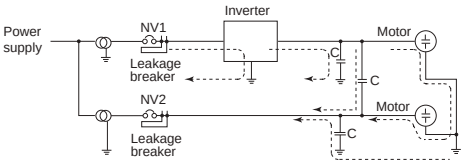
EMI measure example



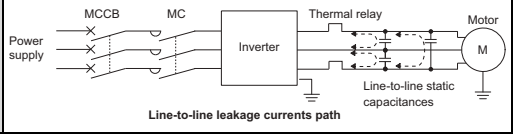
◆ Leakage current

Capacitances exist between the I/O cables or other cables of the inverter and earth, and in the motor, through which a leakage current flows. The amount of current leakage depends on the factors such as the size of the capacitance and the carrier frequency. Low acoustic noise operation at an increased carrier frequency of the inverter will increase current leakage. Take the following precautions to prevent current leakage. Earth leakage circuit breakers should be selected based on their rated current sensitivity, independently of the carrier frequency setting.

◆ To-earth (ground) leakage currents

Type	Influence and countermeasure
Influence and precautions	• Leakage currents may flow not only into the power system of the inverter but also into other power systems through the earthing (grounding) cable, etc. These leakage currents may operate earth leakage circuit breakers and earth leakage relays unnecessarily. Precautions • If the carrier frequency setting is high, decrease the **Pr.72 PWM frequency selection** setting. However, the motor noise increases. Selecting **Pr.240 Soft-PWM operation selection** makes the sound inoffensive. • By using earth leakage circuit breakers designed to suppress harmonics and surge voltage in the power system of the inverter and other devices, operation can be performed with the carrier frequency kept high (with low noise).
Transmission path	

◆ Line-to-line leakage current

Type	Influence and countermeasure
Influence and precautions	• Line-to-line leakage current flows through the capacitance between the inverter output lines. • Harmonic component of the leaked current may cause unnecessary operation of an external thermal relay. Long wiring length (50 m or longer) for the 400V class small capacity models (7.5 kW or lower) will increase the rate of leakage current against the rated motor current. In such a case, an unnecessary operation of the external thermal relay may be more liable to occur. Precautions • Use **Pr.9 Electronic thermal O/L relay**. • If the carrier frequency setting is high, decrease the **Pr.72 PWM frequency selection** setting. However, the motor noise increases. Selecting **Pr.240 Soft-PWM operation selection** makes the sound inoffensive. To protect motor securely without being subject to the influence of the line-to-line leakage current, direct detection of the motor temperature using a temperature sensor is recommended.
Transmission path	 Line-to-line leakage currents path

◆ Harmonic Suppression Guidelines

Inverters have a converter section (rectifier circuit) and generate a harmonic current.

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

The three-phase 200 V input specifications 3.7 kW or lower (or single-phase 200 V input specifications 2.2 kW or lower and single-phase 100 V input specifications 0.75 kW or lower) were previously covered by the Harmonic Suppression Guidelines for Household Appliances and General-purpose Products and other models were covered by the Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage. However, the transistorized inverter has been excluded from the target products covered by the Harmonic Suppression Guidelines for Household Appliances and General-purpose Products in January 2004 and the Harmonic Suppression Guideline for Household Appliances and General-purpose Products was repealed on September 6, 2004.

All capacity and all models of general-purpose inverter used by specific consumers are now covered by the "Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage".

- "Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage"
  This guideline sets the maximum values of outgoing harmonic currents generated from a high-voltage or specially high-voltage receiving consumer who will install, add or renew harmonic generating equipment. If any of the maximum values is exceeded, this guideline requires that consumer to take certain suppression measures.

The users who are not subjected to the above guidelines do not need follow the guidelines, but the users are recommended to connect a DC reactor and an AC reactor as usual.

Compliance with the "Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage"

Input power	Target capacity	Countermeasure
Single-phase 100V Single-phase 200 V Three-phase 200 V Three-phase 400 V	All capacities	Confirm the compliance with the "Harmonic Suppression Guidelines for Consumers Who Receive High Voltage or Special High Voltage" published in September 1994 by the Ministry of International Trade and Industry (the present Japanese Ministry of Economy, Trade and Industry). Take countermeasures if required. Use the following materials as reference to calculate the power supply harmonics. Reference materials • "Harmonic Suppression Measures of the General-purpose Inverter" January 2004, Japan Electrical Manufacturers' Association • "Calculation Method of Harmonic Current of the General-purpose Inverter Used by Specific Consumers" JEM-TR201 (Revised in December 2003), Japan Electrical Manufacturers' Association

For compliance to the "Harmonic Suppression Guideline of the General-purpose Inverter (Input Current of 20A or Less) for Consumers Other Than Specific Consumers" published by JEMA

Input power	Target capacity	Measures
Single-phase 100 V	0.75 kW or lower	Connect the AC reactor or DC reactor recommended in the Catalogs and Instruction Manuals. Reference materials • "Harmonic Suppression Guideline of the General-purpose Inverter (Input Current of 20A or Less)" JEM-TR226 (Published in December 2003), Japan Electrical Manufacturers' Association
Single-phase 200 V	2.2 kW or lower	
Three-phase 200 V	3.7 kW or lower	

◆ Calculation of outgoing harmonic current

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

- Operation ratio: Operation ratio = actual load factor × operation time ratio during 30 minutes
- Harmonic content: Found in the table below.

- Harmonic contents (values when the fundamental wave current is 100%)

	Reactor	5th	7th	11th	13th	17th	19th	23rd	25th
Three-phase bridge (capacitor smoothing)	Not used	65	41	8.5	7.7	4.3	3.1	2.6	1.8
	Used (AC side)	38	14.5	7.4	3.4	3.2	1.9	1.7	1.3
	Used (DC side)	30	13	8.4	5.0	4.7	3.2	3.0	2.2
	Used (AC, DC sides)	28	9.1	7.2	4.1	3.2	2.4	1.6	1.4
Single-phase bridge (capacitor smoothing, full-wave rectification)	Not used	60	33.5	6.1	6.4	2.6	2.7	1.5	1.5
	Used (AC side)	31.9	8.3	3.8	3.0	1.7	1.4	1.0	0.7

- Rated capacities and outgoing harmonic currents when driven by inverter

Applied motor (kW)	Fundamental wave current (A)		Fundamental wave current converted from 6.6 kV (mA)	Rated capacity (kVA)	Outgoing harmonic current converted from 6.6 kV (mA) (No reactor, 100% operation ratio)							
	200 V	400 V			5th	7th	11th	13th	17th	19th	23rd	25th
0.4	1.61	0.81	49	0.57	31.85	20.09	4.165	3.773	2.107	1.519	1.274	0.882
0.75	2.74	1.37	83	0.97	53.95	34.03	7.055	6.391	3.569	2.573	2.158	1.494
1.5	5.50	2.75	167	1.95	108.6	68.47	14.20	12.86	7.181	5.177	4.342	3.006
2.2	7.93	3.96	240	2.81	156.0	98.40	20.40	18.48	10.32	7.440	6.240	4.320
3.7	13.0	6.50	394	4.61	257.1	161.5	33.49	30.34	16.94	12.21	10.24	7.092
5.5	19.1	9.55	579	6.77	376.1	237.4	49.22	44.58	24.90	17.95	15.05	10.42
7.5	25.6	12.8	776	9.07	504.4	318.2	65.96	59.75	33.37	24.06	20.18	13.97
11	36.9	18.5	1121	13.1	728.7	459.6	95.29	86.32	48.20	34.75	29.15	20.18

- Conversion factors

Classification	Circuit type		Conversion coefficient Ki
3	Three-phase bridge (capacitor smoothing)	Without reactor	K31 = 3.4
		With reactor (AC side)	K32 = 1.8
		With reactor (DC side)	K33 = 1.8
		With reactors (AC, DC sides)	K34 = 1.4
4	Single-phase bridge (capacitor smoothing, full-wave rectification)	Without reactor	K43=2.9
		With reactor (AC side)	K44=1.3
5	Self-excitation three-phase bridge	When a high power factor converter is used	K5 = 0

Compatible Motors

● List of applicable inverter models by rating (motor capacity→inverter model)

◆ Three-phase 200 V class

Motor capacity (kW) *1	DC reactor	SLD		ND (initial settings)	
	FR-HEL-[]	Model FR-D820-[]	Rated current (A) *3	Model FR-D820-[]	Rated current (A)
0.1	0.4K*2	0.1K-008	1.4(1.1)	0.1K-008	0.8
0.2	0.4K*2	0.1K-008	1.4(1.1)	0.2K-014	1.4
0.4	0.4K	0.2K-014	2.5(2.0)	0.4K-025	2.5
0.75	0.75K	0.4K-025	4.2(3.5)	0.75K-042	4.2
1.1	1.5K	0.75K-042	6.0(5.1)	1.5K-070	7
1.5	1.5K	1.5K-070	10(8.5)	1.5K-070	7
2.2	2.2K	1.5K-070	10(8.5)	2.2K-100	10
3.7	3.7K	2.2K-100	16.5(12.0)	3.7K-165	16.5
5.5	5.5K	3.7K-165	23.8(19.6)	5.5K-238	23.8
7.5	7.5K	5.5K-238	31.8(26.0)	7.5K-318	31.8
11	11K	7.5K-318	45(37.0)	-	-

◆ Three-phase 400 V class

Motor capacity (kW) *1	DC reactor	SLD		ND (initial settings)	
	FR-HEL-[]	Model FR-D840-[]	Rated current (A) *3	Model FR-D840-[]	Rated current (A)
0.4	H0.4K	0.4K-012	2.2(1.8)	0.4K-012	1.2
0.75	H0.75K	0.4K-012	2.2(1.8)	0.75K-022	2.2
1.5	H1.5K	0.75K-022	3.7(3.0)	1.5K-037	3.7
2.2	H2.2K	1.5K-037	5(4.2)	2.2K-050	5
3.7	H3.7K	2.2K-050	8.1(6.8)	3.7K-081	8.1
5.5	H5.5K	3.7K-081	12(10.0)	5.5K-120	12
7.5	H7.5K	5.5K-120	16.3(13.8)	7.5K-163	16.3
11	H11K	7.5K-163	23(19.5)	-	-

◆ Single-phase 200 V class

Motor capacity (kW) *1	DC reactor	ND	
	FR-HEL-[]	Model FR-D820S-[]	Rated current (A)
0.1	0.4K*2	0.1K-008	0.8
0.2	0.4K*2	0.2K-014	1.4
0.4	0.75K*2	0.4K-025	2.5
0.75	1.5K*2	0.75K-042	4.2
1.5	2.2K*2	1.5K-070	7
2.2	3.7K*2	2.2K-100	10

◆ Single-phase 100 V class

Motor capacity (kW) *1	ND	
	Model FR-D810W-[]	Rated current (A)
0.1	0.1K-008	0.8
0.2	0.2K-014	1.4
0.4	0.4K-025	2.5
0.75	0.75K-042	4.2

*1 The motor capacity indicates the maximum capacity of a standard 4-pole motor driven by all of the inverters in parallel connection.
*2 The power factor may be slightly lower.
*3 The value in parentheses is the rated output current when the low acoustic noise operation is performed with the surrounding air temperature exceeding 30°C while a 3 kHz or higher value is selected in **Pr.72 PWM frequency selection**.

◆ Overload current rating

SLD	110% 60s, 120% 3s (inverse-time characteristics) at surrounding air temperature of 40°C
ND	150% 60s, 200% 0.5s (inverse-time characteristics) at surrounding air temperature of 50°C

● IE5 compliant energy-saving high-accuracy PM motor EM-A series

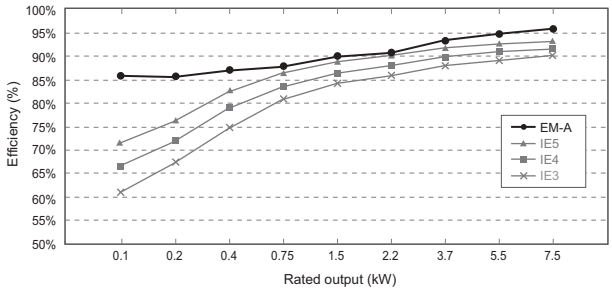
The EM-A series high-performance magnet motors have Mitsubishi Electric's unique salient pole core∗1 and enable speed control without using sensors.

∗1 Japanese Patent No. 5646119

◆ Compact and energy-saving

- Adopting an optimal motor core shape for sensorless control reduces the volume by 50 to 60% and the mass by 30 to 50% compared with induction motors.
- This energy-saving motor is compliant with IE5 efficiency class for variable speed motors∗2.

∗2 Based on the efficiency standard (%) for variable speed motors (rated speed: 1801 to 6000 r/min) specified in IEC 60034-30-2.



◆ Global

- This magnet motor does not need to be certified as compliant with high-efficiency standards in each country∗3.
- The motor has already been certified as compliant with international safety standards (UL, CE).∗4

∗3 As of April 2021 (For the shipment to China, the China Energy Label must be attached to the product.)

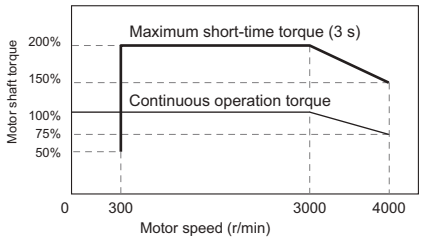
∗4 For the 400 V class, 0.4kW or higher motors are to be certified.

◆ High performance

- The EM-A series enables highly accurate speed control with less speed fluctuations due to load change by using Mitsubishi Electric's unique PM sensorless vector control.
- The motor can be used for high-accuracy transport applications such as production lines of semiconductors or liquid crystals.
- Operation at stable speed under load variation is possible.
  Speed fluctuation: ±0.05%∗5
  Speed control range: 1:10 (current synchronization operation)
- Holding torque is generated by the servo lock function when the motor stops, preventing movements caused by external forces.
- This new salient pole type magnet motor and Mitsubishi Electric's unique high-performance sensorless control technique enable highly accurate speed control without using an encoder.

∗5 During the load fluctuation of 0 to 100%
Speed fluctuation ratio = (actual speed - command speed) / rated speed × 100 (%)

[Operation torque characteristics]



When the input voltage is low, the torque may be reduced.
In the low-speed range, torque ripples or uneven rotation occur. Adjust the setting of **Pr.820 Speed control P gain** as required.

◆ Lineup

EM-AMF □ □ □ 0.1kW 3000r/min 200V

Symbol	Electromagnetic brake
None	Without
B	With

Symbol	Shaft end
None	Standard
K	Key shaft

Symbol	Protective structure
None	IP44
W	IP65
T	With terminal block (only for models without brake)

Output
0.1 to 7.5kW

Symbol	Description
200V	200 V class
400V	400 V class

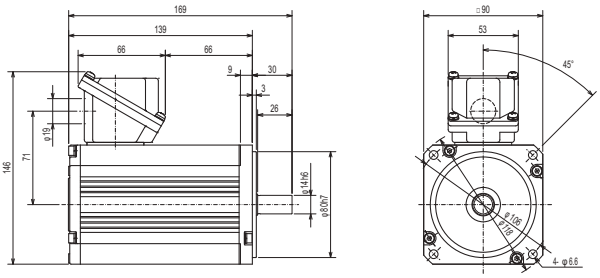
◆ Compatibility between EM-A motors and FR-D800 inverters

Model	Applicable motor capacity (kW)								
	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Three-phase 200 V FR-D820	○	○	○	○	○	○	○	○	○
Three-phase 400 V FR-D840	-	-	○	○	○	○	○	○	○
Single-phase 200 V FR-D820S	○	○	○	○	○	○	-	-	-
Single-phase 100 V FR-D810W	○	○	○	○	-	-	-	-	-

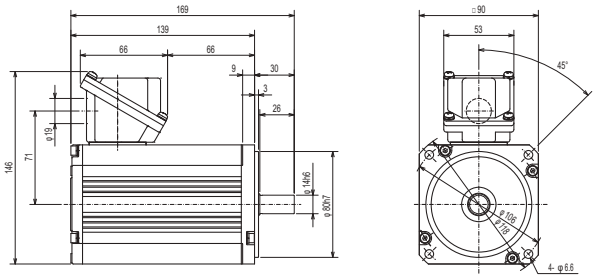
○: Compatible, -: Not applicable

◆ Outline Dimensions

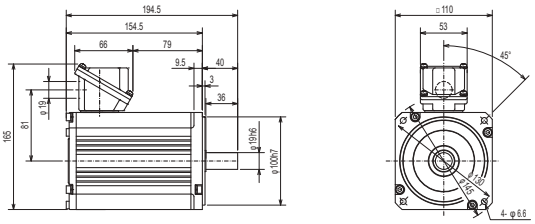
●EM-AMF 0.1kW



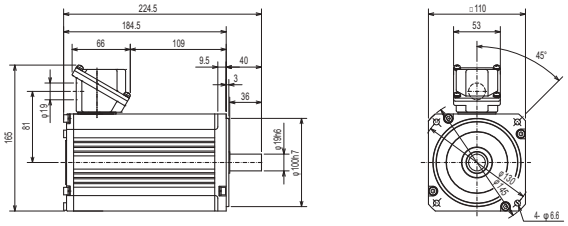
●EM-AMF 0.2kW



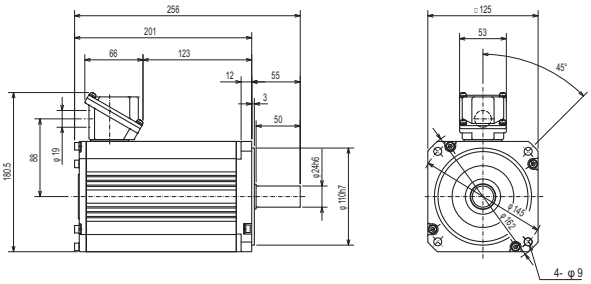
●EM-AMF 0.4kW



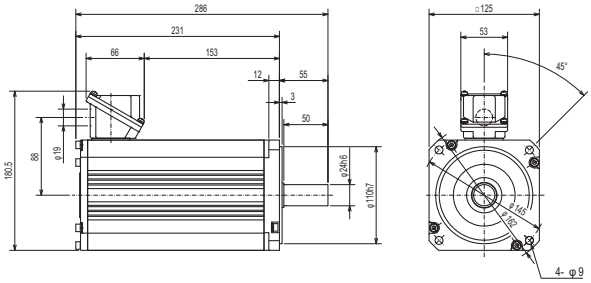
●EM-AMF 0.75kW



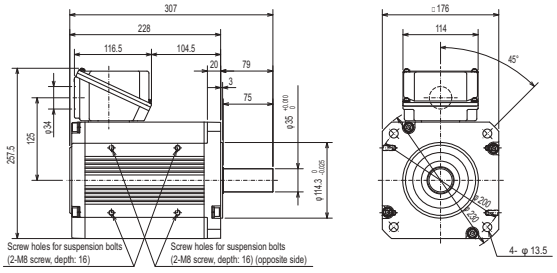
●EM-AMF 1.5kW



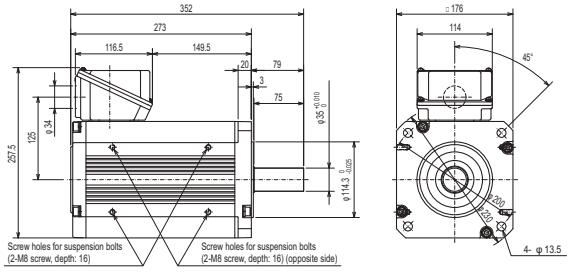
●EM-AMF 2.2kW



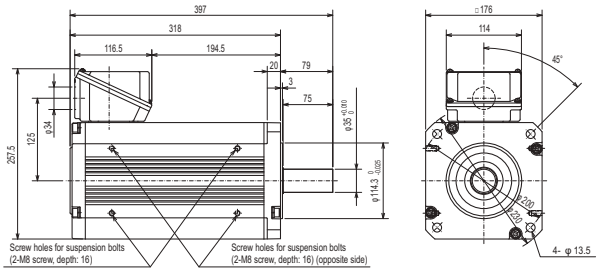
●EM-AMF 3.7kW



●EM-AMF 5.5kW

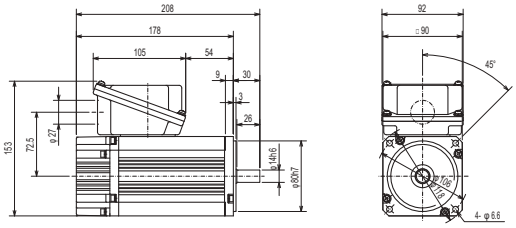


●EM-AMF 7.5kW

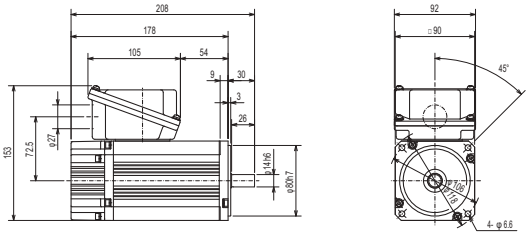


(Unit: mm)

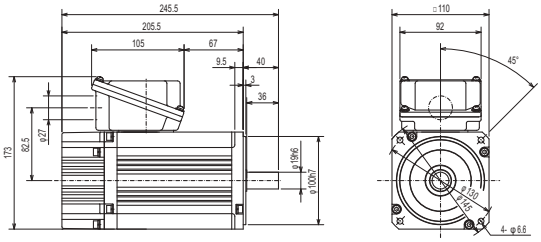
●EM-AMFB 0.1kW



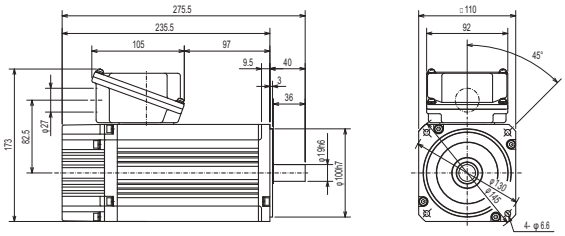
●EM-AMFB 0.2kW



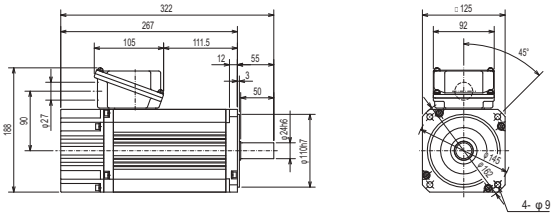
●EM-AMFB 0.4kW



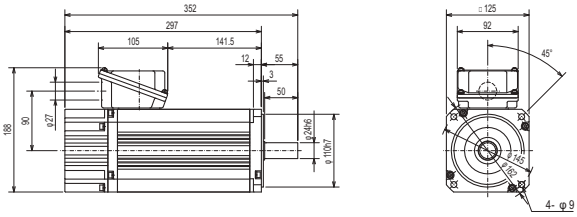
●EM-AMFB 0.75kW



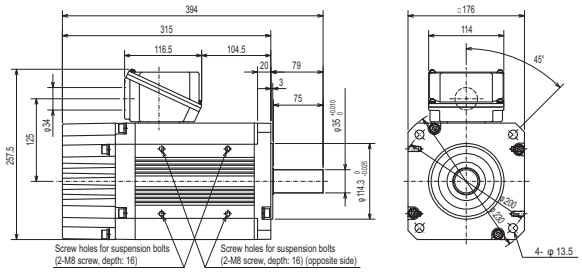
●EM-AMFB 1.5kW



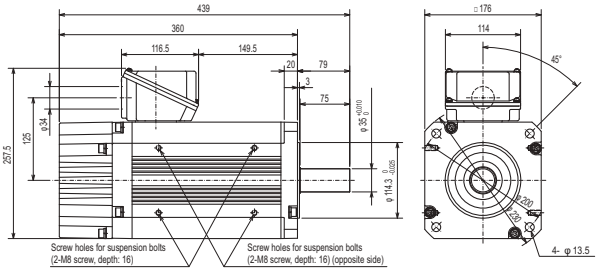
●EM-AMFB 2.2kW



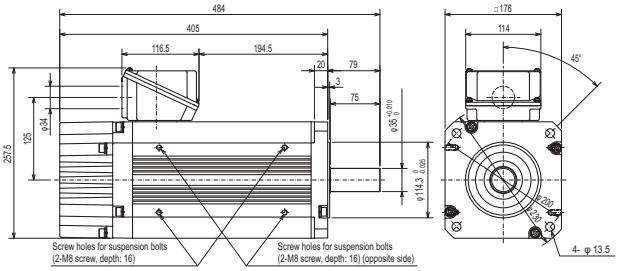
●EM-AMFB 3.7kW



●EM-AMFB 5.5kW



●EM-AMFB 7.5kW



(Unit: mm)

◆ Specification comparison between PM sensorless vector control and induction motor control

Item	PM sensorless vector control	Induction motor control
Applicable motor	IPM motor or PM motor∗1	Induction motor∗1
Starting torque	50%	200% (FR-D820-3.7K-165 or lower, FR-D840-3.7K-081 or lower, FR-D820S-2.2K-100 or lower, FR-D810W-0.75K-042 or lower) and 150% (FR-D820-5.5K-238 or higher, FR-D840-5.5K-120 or higher) under Advanced magnetic flux vector control
Startup delay	Startup delay of about 0.1 s for magnetic pole position detection.	No startup delay.
Operation during coasting	While the motor is coasting, potential is generated across motor terminals.	While the motor is coasting, potential is not generated across motor terminals.

∗1 The rated motor current should be equal to or less than the inverter rated current.
If a motor with substantially low rated current compared with the inverter rated current is used, speed accuracy may deteriorate due to torque ripples, etc. Set the rated motor current to about 40% or higher of the inverter rated current.

- Before wiring, make sure that the motor is stopped. Otherwise you may get an electric shock.
- Never connect a PM motor to a commercial power supply.
- No slippage occurs with a PM motor because of its characteristic. If a PM motor, which took over an induction motor, is driven at the same speed as for the general-purpose motor, the running speed of the PM motor becomes faster by the amount of the general-purpose motor's slippage. Adjust the speed command to run the PM motor at the same speed as the induction motor, as required.

● Countermeasures against deterioration of the 400 V class motor insulation

When driving a 400 V class motor by the inverter, surge voltage, which is attributed to the length and thickness of wire, may occur at the motor terminals, causing the motor insulation to deteriorate. When the 400 V class motor is driven by the inverter, consider the following countermeasures:

◆ With induction motor

It is recommended to take one of the following countermeasures:

◆ Rectifying the motor insulation and limiting the PWM carrier frequency according to the wiring length

For the 400 V class motor, use an insulation-enhanced motor.

Specifically,

- Order a "400 V class inverter-driven insulation-enhanced motor".
- For the dedicated motor such as the constant-torque motor and low-vibration motor, use an "inverter-driven dedicated motor".
- Set **Pr.72 PWM frequency selection** as indicated below according to the wiring length.

Wiring length 50 m or shorter	Wiring length 50 m to 100 m	Wiring length Longer than 100 m
14.5 kHz or lower	8 kHz or lower	2 kHz lower

◆ Suppressing the surge voltage on the inverter side

- Connect a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) at the output side of the inverter.

◆ With PM motor

Use the wiring length of 30 m or shorter when connecting a PM motor.

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

● Application to special motors

◆ Motors with brake

Use the motor with brake having independent power supply for the brake, connect the brake power supply to the inverter primary side power and make the inverter output off using the output stop terminal (MRS) when the brake is applied (motor stop). Rattle may be heard according to the type of the brake in the low speed region but it is not a fault.

◆ Pole changing motor

As this motor differs in rated current from the standard motor, confirm the maximum current of the motor and select the inverter. Be sure to change the number of poles after the motor has stopped. If the number of poles is changed during rotation, the regenerative overvoltage protection circuit may be activated to cause an inverter alarm, coasting the motor to a stop.

◆ Submersible motor

Since the motor rated current is larger than that of the standard motor, make selection of the inverter capacity carefully. In addition, the wiring distance between the motor and inverter may become longer, refer to **page 84** to perform wiring with a cable thick enough. Leakage current may flow more than the land motor, take care when selecting the earth leakage current breaker.

◆ Explosion-proof motor

To drive an explosion-proof type motor, an explosion-proof test of the motor and inverter together is necessary. The test is also necessary when driving an existing explosion-proof motor.

The inverter is a non-explosion proof structure, install it in a safety location.

◆ Geared motor

The continuous operating rotation range of this motor changes depending on the lubrication system and maker. Especially in the case of oil lubrication, continuous operation in the low-speed range only can cause gear seizure. For fast operation at higher than 60 Hz, please consult the motor maker.

◆ Synchronous motor other than PM motor

This motor is not suitable for applications of large load variation or impact, where out-of-sync is likely to occur. Please contact your sales representative when using this motor because its starting current and rated current are greater than those of the standard motor and will not rotate stably at low speed.

◆ Single-phase motor

The Single-phase motor is not suitable for variable operation by the inverter.

For the capacitor starting system, the capacitor may be damaged due to harmonic current flowing to the capacitor. For the split-phase starting system and repulsion starting system, not only output torque is not generated at low speed but it will result in starting coil burnout due to failure of centrifugal force switch inside. Replace with a three-phase motor for use.

Compatibility

● Major differences from the FR-D700 series

Item		FR-D800	FR-D700
Applicable rating		Two ratings (SLD/ND) ND rating only for the single-phase 100/200 V power input models	Not available (ND only)
Overload current rating	SLD rating	110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature of 40°C	Not available
	ND rating	150% 60 s, 200% 0.5 s (inverse-time characteristics) at surrounding air temperature of 50°C	150% 60 s, 200% 0.5 s (inverse-time characteristics)
Built-in brake transistor		Provided in FR-D820-0.4K-025 to 7.5K-318, FR-D840-0.4K-012 to 7.5K-163, FR-D820S-0.4K-025 to 2.2K-100, FR-D810W-0.4K-025 and 0.75K-042	Provided in FR-D720-0.4K to 15K, FR-D740-0.4K to 15K, FR-D720S-0.4K to 2.2K, FR-D710W-0.4K and 0.75K
Protective structure		Open type IP20 (for IEC 60529 only)	Enclosed type IP20 (for JEM 1030 only)
Control method	—	Soft-PWM control / High carrier frequency PWM control	
	V/F control	Available	
	Advanced magnetic flux vector control	Available	Not available
	General-purpose magnetic flux vector control	Not available	Available
	PM sensorless vector control	Available	Not available
Control mode	Speed control	Available	
Output frequency		Induction motor: 0.2 to 590 Hz (The upper-limit frequency is 400 Hz under Advanced magnetic flux vector control.) PM motor: 0.2 to 400 Hz (not operable at a frequency higher than the maximum motor frequency)	0.2 to 400 Hz
Frequency setting resolution	Terminal 2	0.015 Hz / 0 to 60 Hz (0 to 10 V / 12 bits) 0.03 Hz / 0 to 60 Hz (0 to 5 V / 11 bits) 0.03 Hz / 0 to 60 Hz (0 to 20 mA / 11 bits)	0.06 Hz / 0 to 60 Hz (0 to 10 V / 10 bits) 0.12 Hz / 0 to 60 Hz (0 to 5 V / 9 bits)
	Terminal 4	0.015 Hz / 0 to 60 Hz (0 to 10 V / 12 bits) 0.03 Hz / 0 to 60 Hz (0 to 5 V / 11 bits) 0.03 Hz / 0 to 60 Hz (0 to 20 mA / 11 bits)	0.06 Hz / 60 Hz (0 to 10 V / 10 bits) 0.12 Hz / 60 Hz (0 to 5 V / 9 bits) 0.06 Hz / 60 Hz (0 to 20 mA / 10 bits)
Output signal	Via terminal FM (pulse output)	Not available	1440 pulses/s at full scale
	Via terminal AM (analog output)	0 to +10 V / 12 bits	Not available
Operation panel	Standard equipment	Operation panel installed as standard (not removable). 7-segment LED 4-digit display.	
	Option	Enclosure surface operation panel (FR-PA07) LCD operation panel (FR-LU08) Parameter unit (FR-PU07(BB))	Enclosure surface operation panel (FR-PA07) Parameter unit (FR-PU07)
Main circuit terminals		R, S, T, U, V, W, P, PR, N, P1, earth (ground) (screw terminal)	
Control circuit terminal	Shape of terminal block	Spring clamp type	
	Contact input	5	
	Analog input	2	
	Relay output	1	
	Open collector output	2	1
	Pulse output	Not available	1
	Analog output	1	Not available
	Safety input/output	S1, S2, PC, SO, SOC	S1, S2, SC, SO
Communication	RS-485	PU connector / RS-485 terminals Mitsubishi inverter protocol, MODBUS RTU	PU connector Mitsubishi inverter protocol, MODBUS RTU
	USB	USB Type-C connector: USB bus power available (Maximum SCCR: 500 mA)	Not available
Surrounding air temperature		-20°C to +60°C (non-freezing) SLD rating: The rated current must be reduced at a temperature above 40°C. ND rating: The rated current must be reduced at a temperature above 50°C.	-10°C to +50°C (non-freezing)
Storage temperature		-40°C to +70°C	-20°C to +65°C
Machine speed display		The rotation speed is displayed when **Pr.53** = "1". The machine speed is displayed when **Pr.53** = "4". Use **Pr.37** and **Pr.505** to set the reference for machine speed.	The machine speed is displayed when **Pr.37** ≠ "0".
Built-in potentiometer switching		**Pr.146** unavailable (PA02 not supported)	**Pr.146** available
Control mode selection		V/F control when "40" is set in **Pr.800**.	V/F control when "9999" is set in **Pr.80**.
MRS input selection		Use **Pr.17** to change the input specifications of the MRS and X10 signals.	Use **Pr.17** to change the input specification of the MRS signal.
Offline auto tuning		Set **Pr.96** = "11" to enable offline auto tuning for V/F control (frequency search for the automatic restart after instantaneous power failure).	Set **Pr.96** = "21" to enable offline auto tuning for V/F control (frequency search for the automatic restart after instantaneous power failure).
Applicable motor		Offline auto tuning is enabled regardless of the **Pr.71** setting. Set **Pr.71** to a value whose last digit is 3 to change the setting range of the motor constant.	Set **Pr.71** to a value whose last digit is 3 to enable offline auto tuning.
		Set "10" for the constant-torque motor.	Set "1" for the constant-torque motor.

◆ Installation precautions

- Installation/removal procedures of the front cover and wiring cover are different. (Refer to the Instruction Manual (Connection).)

◆ Wiring instructions

- To use the PU connector, note that wiring methods are different. (Refer to the Instruction Manual (Connection).)

◆ Copying parameter settings

- The FR-D700 series' parameter settings can be easily copied to the FR-D800 series by using the setup software (FR Configurator2). (Not supported by the setup software FR-SW3-SETUP or older.)

● Comparison with the FR-D700 series in functions

Parameter/Function	Differences with the FR-D700 series				Remarks
	Addition	Modifi-cation	Deletion	Related parameter	
Parameters/functions related to the output frequency (such as Base frequency)		○		**Pr.3** and others	The upper limit of the setting range is changed from 400 Hz to 590 Hz for V/F control. For other control, the upper limit is 400 Hz.
MRS input selection		○		**Pr.17**	NC contact input specification can be selected for terminal X10.
Stall prevention operation level, etc.		○		**Pr.22, Pr.150, Pr.165**	Multiple ratings are supported. SLD: 110% ND: 150%
Operation panel main monitor selection, AM terminal function selection, etc.		○		**Pr.52, Pr.158**, and others	Monitor items are added (control circuit temperature and energy saving effect).
Frequency / rotation speed unit switchover	○			**Pr.53**	
Restart coasting time, etc.		○		**Pr.57, Pr.165**	The setting range is changed.
Remote function selection		○		**Pr.59**	The setting range is changed.
Special regenerative brake duty		○		**Pr.70**	The setting range of the brake duty is changed.
Applied motor		○		**Pr.71**	Addition of motors: • Mitsubishi Electric PM motor EM-A series
Analog input selection		○		**Pr.73**	Input current: 0 to 20 mA
Motor capacity, number of motor poles, etc.	○	○		**Pr.80, Pr.81**, and others	The number of motor poles can be set.
Speed control gain (Advanced magnetic flux vector)	○			**Pr.89**	
Motor constant (R2)	○			**Pr.91**	
Motor constant (L1)/d-axis inductance (Ld)	○			**Pr.92**	
Motor constant (L2)/q-axis inductance (Lq)	○			**Pr.93**	
Motor constant (X)	○			**Pr.94**	
Auto tuning setting/status		○		**Pr.96**	Setting values are added. 0, 1, 11
RS-485 communication speed		○		**Pr.118**	Communication speed settings are added. 57600 bps, 76800 bps, 115200 bps
PID action selection		○		**Pr.128**	Forward and reverse actions using **Pr.609 and Pr.610** are added.
MC switchover interlock time	○			**Pr.136**	
Automatic switchover frequency from inverter to bypass operation	○			**Pr.139**	
Output current / zero current detection level		○		**Pr.150, Pr.152**	The detection level is extended to 400%.
Voltage reduction selection during stall prevention operation	○			**Pr.154**	
Output current detection operation selection		○		**Pr.167**	The Y13 status is added.
User group registered display/batch clear	○			**Pr.172 to Pr.174**	
Input/output terminal function selection		○		**Pr.178 to Pr.192**	Input/output signals are added.
NET output selection	○			**Pr.193 to Pr.196**	
ABC terminal function selection		○		**Pr.192**	
Output terminal filter	○			**Pr.289**	The terminal response can be adjusted.
Pulse train input selection	○			**Pr.291**	
Overspeed detection level	○			**Pr.374**	
Input pulse division scaling factor / frequency for zero input pulse / frequency for maximum input pulse	○			**Pr.384 to Pr.386**	
Speed setting reference	○			**Pr.505**	
Display estimated main circuit capacitor residual life	○			**Pr.506**	
Display/reset ABC relay contact life	○			**Pr.507**	
Display power cycle life	○			**Pr.509**	
Emergency drive	○			**Pr.514, Pr.515** **Pr.523, Pr.524** **Pr.1013**	

Parameter/Function	Differences with the FR-D700 series				Remarks
	Addition	Modifi-cation	Deletion	Related parameter	
PID signal operation selection	○			**Pr.553, Pr.554**	
Multiple rating setting	○			**Pr.570**	
Motor overheat protection	○			**Pr.600 to Pr.604, Pr.607, Pr.608** **Pr.692 to Pr.696** **Pr.1016**	
Functions related to PID set point	○			**Pr.609, Pr.610**	
Inverter output fault detection enable/ disable selection	○			**Pr.631**	
Voltage compensation amount setting	○			**Pr.643**	
Speed smoothing cutoff frequency	○			**Pr.654**	
Increased magnetic excitation deceleration	○			**Pr.660 to Pr.662**	
Control circuit temperature signal output level	○			**Pr.663**	
SF-PR slip amount adjustment operation	○			**Pr.673, Pr.674**	
Input terminal filter	○			**Pr.699**	The terminal response can be adjusted.
Pulse increment setting for output power	○			**Pr.799**	
Control mode selection	○	○	○	**Pr.800,** **Pr.702, Pr.706, Pr.707, Pr.711, Pr.712, Pr.717, Pr.721, Pr.724, Pr.725**, and others	• Advanced magnetic flux vector control added. • PM sensorless vector control, speed control added. • The setting value to select V/F control is changed to "40". • General-purpose magnetic flux vector control deleted.
Torque limit parameters	○			**Pr.810, Pr.811, Pr.815**	
Speed control parameters	○			**Pr.820, Pr.821**	Proportional gain, integral time
Torque control parameters	○			**Pr.824, Pr.825**	Proportional gain, integral time
Torque current/Rated PM motor current	○			**Pr.859**	
Low speed detection	○			**Pr.865**	
Torque monitoring reference	○			**Pr.866**	
Speed detection hysteresis	○			**Pr.870**	
OLT level setting	○			**Pr.874**	
Regeneration avoidance compensation frequency limit value		○		**Pr.885**	The setting range is extended to 45 Hz.
Internal storage device status indication	○			**Pr.890**	
Energy saving monitoring	○			**Pr.892 to Pr.899**	
Integral stop selection at limited frequency	○			**Pr.1015**	
Trace function	○			**Pr.1020, Pr.1022 to Pr.1047**	
Display-off waiting time	○			**Pr.1048**	
Monitor filter	○			**Pr.1106 to Pr.1108**	Monitor filters for the torque monitor, running speed monitor, and excitation current monitor.
Motor induced voltage constant (phi f) exponent	○			**Pr.1412**	
Load characteristics fault detection	○			**Pr.1480 to Pr.1492**	

◆ Related manuals

When using this inverter for the first time, prepare the following manuals as required and use the inverter safely. The latest version of e-Manual Viewer and the latest PDF manuals can be downloaded from the Mitsubishi Electric FA Global Website.
https://www.mitsubishielectric.com/app/fa/download/search.do?kisyu=/inv&mode=manual

NOTE

- e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed using a dedicated tool.
- e-Manual has the following features:
  Required information can be cross-searched in multiple manuals.
  Pages that users often browse can be bookmarked.

Manuals related to the FR-D800 inverter are shown in the following table.

Inverter Safety Guideline	
FR-D800 Instruction Manual (Startup)	Manual describing the basic information from unpacking the product to driving the motor.
FR-D800 Instruction Manual (Connection)	Manuals describing installation, wiring, specifications, outline dimensions, standards, and how to connect options.
FR-D800 Instruction Manual (Function)	Manual describing details of the functions.
FR-D800 Instruction Manual (Communication)	Manual describing details of the communications.
FR-D800 Instruction Manual (Maintenance)	Manual describing how to identify causes of faults and warnings.
FR-D800 Instruction Manual (Functional Safety)	Manual describing the functional safety.
FA System Security Guideline -Separate Volume [FREQROL]-	Document summarizing recommendations for customers when using our FA products.
FR Configurator2 Instruction Manual	Manual describing details of the software used to set inverter parameters using a personal computer.

Name	Manual number
FR-D800 Inverter Safety Guideline	IB-0601019
FR-D800 Instruction Manual (Startup)	IB-0601026ENG
FR-D800 Instruction Manual (Connection)	IB-0601029ENG
FR-D800 Instruction Manual (Function)	IB-0601034ENG
FR-D800 Instruction Manual (Communication)	IB-0601039ENG
FR-D800 Instruction Manual (Maintenance)	IB-0601044ENG
FR-D800 Instruction Manual (Functional Safety)	BCN-A23498-007(E)
FA System Security Guideline -Separate Volume [FREQROL]-	BCN-C22005-1054
FR Configurator2 Instruction Manual	IB-0600516ENG

Warranty

When using this product, make sure to understand the warranty described below.

1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged.
However, it will not be charged if we are responsible for the cause of the failure.
(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
1) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
2) a failure caused by any alteration, etc. to the Product made on your side without our approval
3) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
4) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
5) any replacement of consumable parts (condenser, cooling fan, etc.)
6) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
7) a failure caused by using the emergency drive function
8) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
9) any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production
(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas

Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:
(1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.
(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.
(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product
(1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.

(2) Our product is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

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Italy FA Center
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Europe B.V. Italian Branch

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EUROPE B.V.
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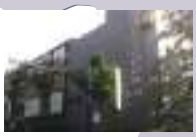
Turkey FA Center
Mitsubishi Electric
Turkey A.Ş. Ümraniye

India Gurgaon FA Center
MITSUBISHI ELECTRIC INDIA PVT.LTD.
Gurgaon Head Office



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MITSUBISHI ELECTRIC INDIA PVT.LTD.
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Production bases

Under the lead of Nagoya Works, we form a powerful network to optimize our manufacturing processes.

Domestic bases

Nagoya Works

Shinshiro Factory

Kani Factory

Production bases overseas

MDI Mitsubishi Electric Dalian Industrial Products Co., Ltd.

MEI Mitsubishi Electric India Pvt.

MEAMC Mitsubishi Electric Automation Manufacturing (Changshu) Co., Ltd.

MEATH Mitsubishi Electric Automation (Thailand) Co., Ltd.

Service bases are established around the world to provide the same services as in Japan globally. Overseas bases are opening one after another to support our customers' business expansion.

Area	Our overseas	FA centers
EMEA	39	7
China	25	4
Asia	49	16
Americas	19	6
Total	132	33

·As of March 2021

Thailand FA Center
MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO.,LTD

Korea FA Center
MITSUBISHI ELECTRIC AUTOMATION KOREA CO.,LTD.

MITSUBISHI ELECTRIC CORPORATION
Factory Automation Systems Group

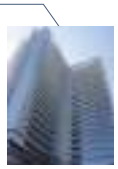
Taichung FA Center
MITSUBISHI ELECTRIC TAIWAN CO.,LTD

Taipei FA Center
SETSUYO ENTERPRISE CO.,LTD

Philippines FA Center
MELCO FACTORY AUTOMATION PHILIPPINES INC.

Hanoi FA center
Mitsubishi Electric Vietnam Company Limited Hanoi Branch

Malaysia FA Center



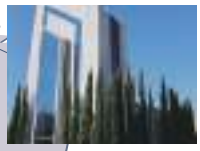
Ho Chi Minh FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED

ASEAN FA Center
MITSUBISHI ELECTRIC ASIA PTE.LTD.

North America FA Center
MITSUBISHI ELECTRIC AUTOMATION,INC.

Mexico Monterrey FA Center
Monterrey Office, Mitsubishi Electric Automation, Inc.

Mexico FA Center
Querétaro Office, Mitsubishi Electric Automation, Inc.



Mexico City FA Center
Mexico FA Center
Mexico Branch, Mitsubishi Electric Automation, Inc.

Brazil FA Center
Mitsubishi Electric do Brasil Comércio e Serviços Ltda.

Brazil Votorantim FA Center
MELCO CNC do Brasil Comércio e Serviços S.A.

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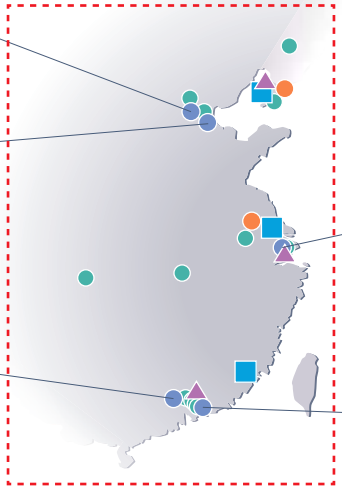

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Utilizing our FA and IT technologies and collaborating with e-F@ctory Alliance partners, we reduce the total cost across the entire supply chain and engineering chain, and support the improvement initiatives and one-step-ahead manufacturing of our customers.

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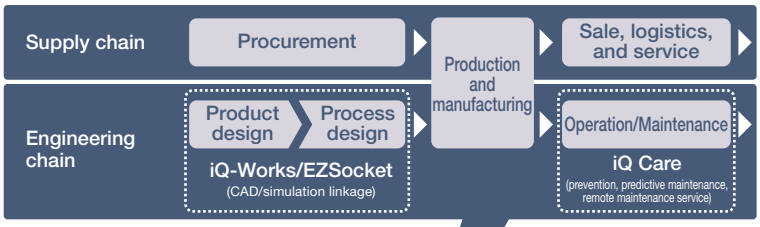
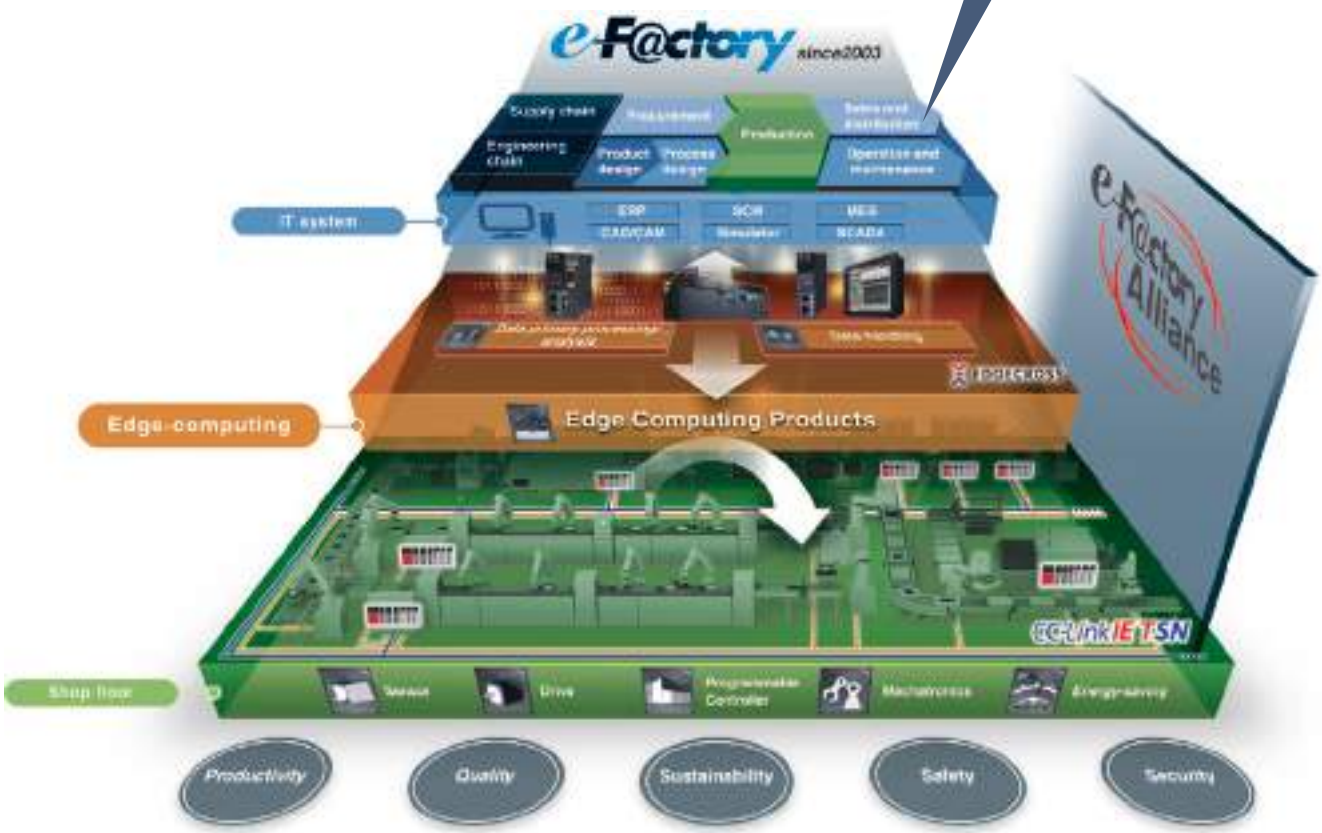
FA integrated solutions reduce total cost





Overall production information is captured in addition to energy information, enabling the realization of efficient production and energy use (energy savings).

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⚠Safety Warning

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

Creating Solutions Together.

Low-voltage Power Distribution Products

Transformers, Med-voltage Distribution Products

Power Monitoring and Energy Saving Products

Power (UPS) and Environmental Products

Compact and Modular Controllers

Servos, Motors and Inverters

Visualization: HMIs

Edge Computing Products

Numerical Control (NC)

Collaborative and Industrial Robots

Processing machines: EDM, Lasers

SCADA, analytics and simulation software

Mitsubishi Electric's product lineup, from various controllers and drives to energy-saving devices and processing machines, all help you to automate your world. They are underpinned by software, innovative data monitoring, and modelling systems supported by advanced industrial networking and Edgecross IT/OT connectivity. Together with a worldwide partner ecosystem, Mitsubishi Electric factory automation (FA) has everything to make IoT and Digital Manufacturing a reality.

With a complete portfolio and comprehensive capabilities that combine synergies with diverse business units, Mitsubishi Electric provides a one-stop approach to how companies can tackle the shift to clean energy and energy conservation, carbon neutrality and sustainability, which are now a universal requirement of factories, buildings, and social infrastructure.

We at Mitsubishi Electric FA are your solution partners waiting to work with you as you take a step toward the realization of sustainable manufacturing and society through the application of automation.
Let's automate the world together!

Note: not all products are available in all countries

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

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