MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow

Jul. 2014

New Product RELEASE

No.14-6

INVERTER

Model

FR-F800

800 series

Enhanced Next-Generation Energy-Saving Inverter

F800

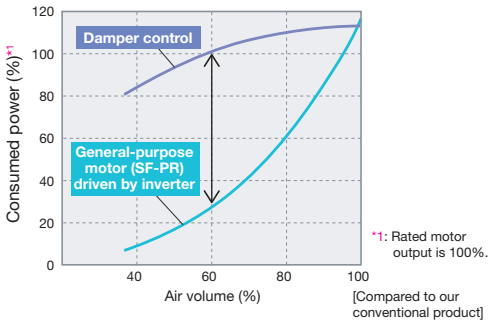
Released in July 2014

1 ENERGY SAVING

1 Energy Saving with Inverters

The consumed power of a variable-torque load, such as fans, pumps, and blowers, is proportional to the cube of its rotation speed.
Adjusting the air volume by the inverter rotation speed control can lead to energy savings.

[Example of blower operation characteristic]

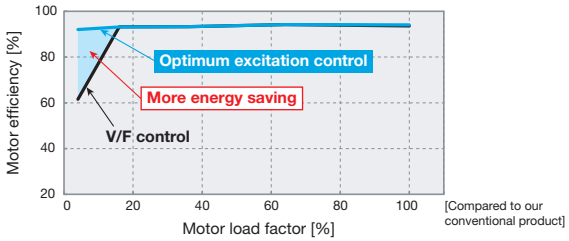


*1: Rated motor output is 100%.

Utilizing the motor capability to the full

Optimum excitation control

- Optimum excitation control continuously adjusts the excitation current to an optimum level to provide the highest motor efficiency. With a small load torque, a substantial energy saving can be achieved. For example, at 4% motor load torque for a general-purpose motor, the motor efficiency under Optimum excitation control is about 30% higher than the motor efficiency under V/F control.



(When the inverter running frequency is 60 Hz and the SF-PR 4P motor (15 kW) is used)

NEW Improving starting torque and saving energy at the same time

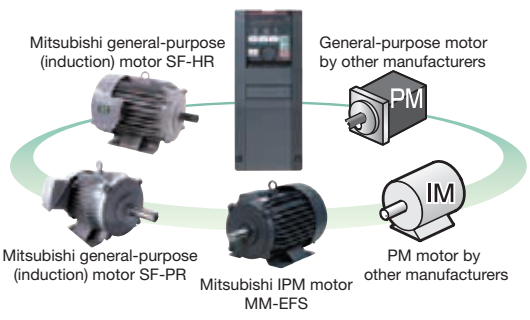
Advanced optimum excitation control

Advanced optimum excitation control, which has been newly developed, provides a large starting torque while maintaining the motor efficiency under the conventional 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.

NEW Supporting operations of various motors

Offline auto tuning

The offline auto tuning function to measure circuit constants of the motor enables optimal operation of motors even when motor constants vary, when a motor of other manufacturers is used, or when the wiring distance is long. As well as Mitsubishi general-purpose motors, Mitsubishi PM motors (MM-EFS, MM-THE4), sensorless operation can be performed for other manufacturers' general-purpose motors*2 and other manufacturers' permanent magnet (PM) motors*2.
The tuning function enables the Advanced optimum excitation control of other manufacturers' general-purpose motors*2, which increases the use in the energy saving applications.



*2: Depending on the motor characteristics, tuning may not be available.

Inverter Optimum for Fan and Pump Applications

2 Energy Saving with High-Efficiency Motor

In the international context of global warming prevention, many countries in the world have started to introduce laws and regulations to mandate manufacturing and sales of high-efficiency motors. With the use of high-efficiency motors, further energy saving is achieved.

[IE code]
As an international standard of the efficiency, IEC60034-30 (energy-efficiency classes for single-speed, three-phase, cage-induction motors) was formulated in October 2008. The efficiency is classified into four classes from IE1 to IE4. The larger number means the higher efficiency.

Efficiency class IEC 60034-30	Mitsubishi motor efficiency	
	General-purpose motor	IPM motor
IE4 (super premium efficiency)*3	—	Premium high-efficiency IPM (MM-EFS/MM-THE4)
IE3 (premium efficiency)	Superline premium series (SF-PR)	—
IE2 (high efficiency)	Superline eco series (SF-HR)	—
IE1 (standard efficiency)	Superline series (SF-JR)	—
Below the class		—

High / Efficiency / Low

*3: The details of IE4 are specified in IEC 60034-31.

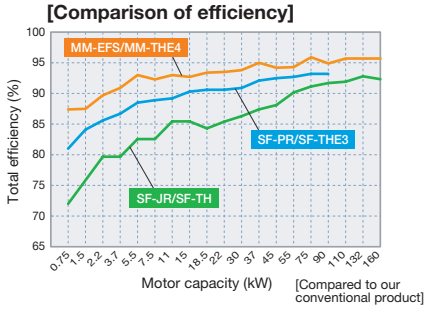
Further energy saving with the premium high-efficiency IPM motor

MM-EFS / MM-THE4

- The IPM motor, with permanent magnets embedded in the rotor, achieves even higher efficiency as compared to the general-purpose motor (SF-PR/SF-THE3).
- The IM driving setting can be switched to IPM driving setting by only one setting. ("12" (MM-EFS/MM-THE4) in the parameter [IPM]).

Do not drive an IPM motor in the induction motor control settings.

[Comparison of efficiency]



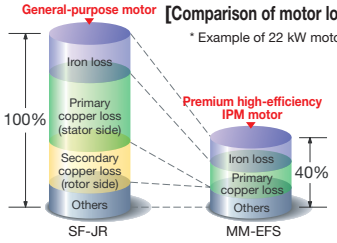
[Compared to our conventional product]

Why is an IPM motor more efficient?

·No current flows to the rotor (secondary side), and no secondary copper loss is generated.
·Magnetic flux is generated with permanent magnets, and less motor current is required.
·Embedded magnets provide reluctance torque*4, and the reluctance torque can be applied.

*4: Reluctance torque occurs due to magnetic imbalance on the rotor.

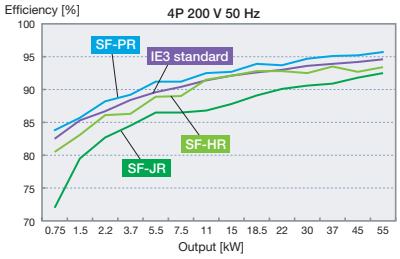
[Comparison of motor losses]
* Example of 22 kW motors



Excellent compatibility with the high-performance energy-saving motor

SF-PR

Motor constants are stored in the inverter. Energy-saving operation can be started just by setting parameters. The SF-PR motor conforms to the Japanese domestic Top Runner Standard (IE3 equivalent). Its energy-saving operation contributes reduction in the electricity charges, which in turn lowers the running cost.

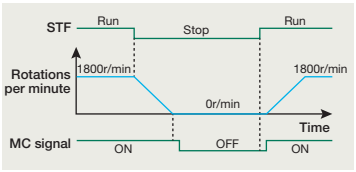


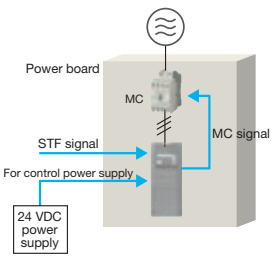
3 Energy-Saving Functions Suitable for Various Systems

Standby power reduction

NEW

- With the 24 VDC external power supply, the input MC signal can be turned OFF after the motor is stopped, and turned ON before activating the motor. The inverter enables self power management to reduce standby power.
- The inverter cooling fan can be controlled depending on the temperature of the inverter heatsink. Also, signals can be output in accordance with the inverter cooling fan operation. When the fan is installed on the enclosure, the enclosure fan can be synchronized with the inverter cooling fan. Extra power consumption when the motor is stopped can be reduced.



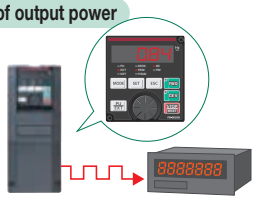


Energy saving at a glance

Energy saving monitor / Pulse train output of output power

- Energy saving monitor is available. The energy saving effect can be checked using an operation panel, output terminal, or network.
- The output power amount measured by the inverter can be output in pulses. The cumulative power amount can be easily checked.

(This function cannot be used as a meter to certify electricity billings.)

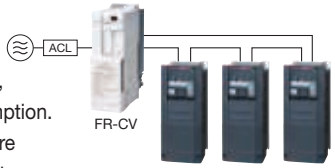


Furthermore, With the Mitsubishi energy measuring module, the energy saving effect can be displayed, measured, and collected.

Effective use of the regenerative energy Option

FR-CV / FR-HC2

Multiple inverters can be connected to the power regeneration common converter (FR-CV) or the high power factor converter (FR-HC2) through a common PN bus. The regenerated energy is used by another inverter, and if there is still an excess, it is returned to the power supply, saving on the energy consumption. The 355K or higher models are inverter-converter separated types, which are suitable for power regeneration.



2 FUNCTIONS IDEAL FOR FANS AND PUMPS

1 Optimum Inverter Capacity Selection

Multiple rating

The rating can be selected between the two types (LD (light duty) or SLD (superlight duty)) depending on the load of the fan/pump to be used. The optimum inverter capacity can be selected suitable for the motor to be used.
For the 200 V class 90K or higher and the 400 V class 75K or higher, a motor with one-rank higher capacity can be combined.

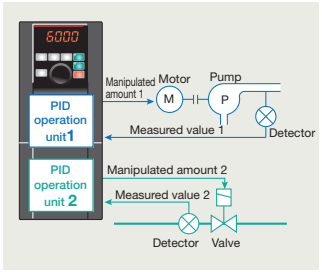
Load	Rating	Overload current rating
Superlight duty	SLD rating	110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature 40°C
Light duty	LD rating	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature 50°C

For the list of inverters by rating, refer to page 11.

2 Further Enhanced PID Control

System cost reduction — PID multiple loops (two loops)

Two PID operation units are available in the inverter. The inverter can perform PID control of the motor operation and control the external equipment at the same time. The system cost can be reduced because no external PID controller is required for controlling the external equipment.



Direct setting of the PID set point

The PID set point can be set directly from the operation panel. The setting can be easily changed at hand.

Visibility improvement — Option

With the optional LCD operation panel (FR-LU08), the unit can be changed from "%" to other easy-to-see units. Maintenance and adjustment is facilitated by using a familiar unit of air volume, temperature, etc. for indication.

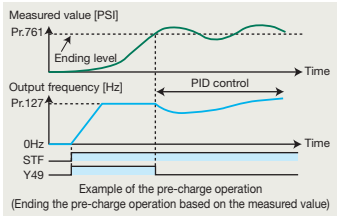
LCD operation panel (FR-LU08) (Option)

Unit conversion

Avoidance of rapid acceleration/deceleration using PID action

PID pre-charge function

Before PID action, the water flow to the pipe is controlled by operating the motor at a constant speed until the measured value (pressure, etc.) reaches the set level. This function is used to avoid rapid acceleration/deceleration caused by starting the PID action while the pipe is empty, and prevent a water hammer action, etc.

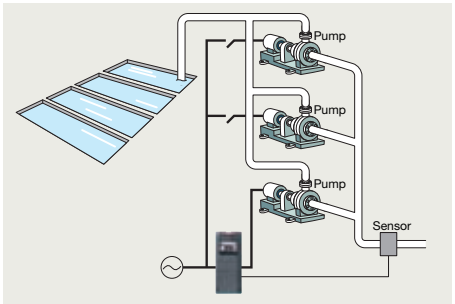


Example of the pre-charge operation
(Ending the pre-charge operation based on the measured value)

Water volume control with multiple pumps

Multi-pump function

By controlling the pumps connected in parallel (up to four pumps) by the PID control by one inverter, water volume, etc. can be adjusted.
One of the connected pumps is driven by the inverter. Other pumps are driven by commercial power supply. The number of pumps to be driven by commercial power supply is automatically adjusted according to the water volume.



Energy saving in low-speed operation

PID output shutoff (sleep) function

During PID control, the operation is stopped when the deviation (set point - measured value) is small and the output frequency is low, and the operation is restarted when the deviation becomes large. This function restricts energy consumption during low-speed operation with low motor efficiency.

Shorter start-up time under PID control

PID automatic switchover function

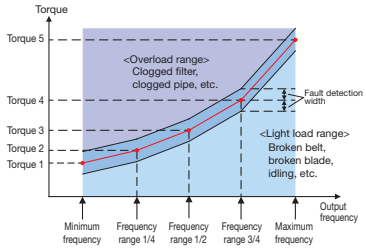
The operation is started without PID control until the output frequency reaches the specified frequency. PID control is automatically started when the output frequency reaches the specified frequency.
The system can be started faster at the start of operation.

3 Operating Status Monitoring

NEW Detection of mechanical faults

Load characteristics measurement function

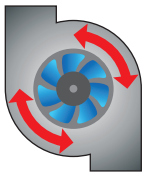
The speed/torque relationship is stored while no fault occurs. By comparing the present load status with the stored load characteristics, out-of-range warnings can be output if applicable. Mechanical faults such as clogging of the filter or breakage of the belt can be easily detected, and maintenance is facilitated.



NEW Cleaning of fans and pumps

Cleaning function

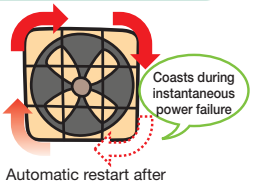
Foreign matter on the impellers or fans of pumps can be removed by repeating forward/reverse rotation and stopping of the motor. (Use this function when a back flush does not pose a problem.) This function can be also automatically started when the result of load characteristics measurement is out of range (overload).



4 Smooth Restart

Automatic restart after instantaneous power failure / flying start function

After an instantaneous power failure, the operation is restartable from the coasting motor speed. With the advanced flying start function, the operation can be smoothly started from low speed.



Automatic restart after instantaneous power failure function

5 Keep Running during Flying Start Operation

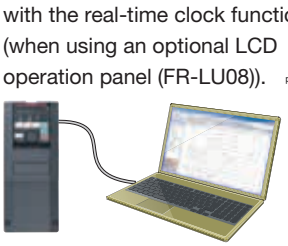
Regeneration avoidance function

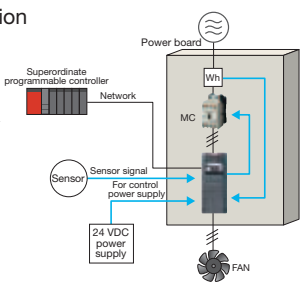
The operation frequency is automatically increased to prevent the regenerative overvoltage fault from occurring. This function is useful when a load is forcibly rotated by another fan in the duct.

6 PLC Control with an Inverter

NEW PLC function in the inverter

- Parameters and setting frequency can be changed at the program. Control programs can be created in sequence ladders using the inverter setup software (FR Configurator2).
- Inverter control such as inverter operations triggered by input signals, signal output based on inverter operation status, and monitor output can be freely customized based on the machine specifications.
- All machines can be controlled by the inverter alone, and control can also be dispersed.
- Time-based operation is possible by using in combination with the real-time clock function (when using an optional LCD operation panel (FR-LU08)).



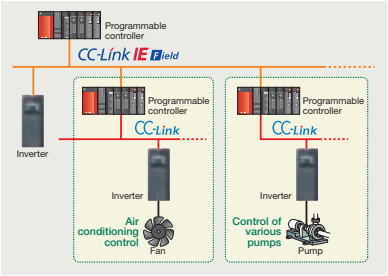


7 Compatibility with Various Systems

Compatibility with various networks

It supports BACnet® MS/TP as standard, as well as Mitsubishi inverter protocol and Modbus-RTU (binary) protocol. Communication options are also available for the major network protocols such as CC-Link, CC-Link IE Field, LONWORKS® (to be supported soon), FL-net remote I/O (to be supported soon), PROFIBUS-DPV0, and DeviceNet™.

BACnet® is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), LONWORKS® is a registered trademark of Echelon Corporation, DeviceNet™ is a trademark of the ODVA, and PROFIBUS is a trademark of the PROFIBUS User Organization.



Simplified external equipment

The CA-type inverters are available. For the CA type, the monitor output terminal FM/CA operates as terminal CA (analog current output 0 to 20 mA), not as terminal FM (pulse train output). An external converter is not required.
(The factory setting is different for the CA type and the FM type. (Refer to page 10.))

8 Mechanical Resonance Suppression

Speed smoothing control

Vibration caused by mechanical resonance can be reduced. (Available with general-purpose motors)

NEW 9 Extended Functions

Support for up to three types of options

Three types of plug-in options can be attached.
The functions of the inverter can be extended through network. For example, additional I/O terminals can be used.

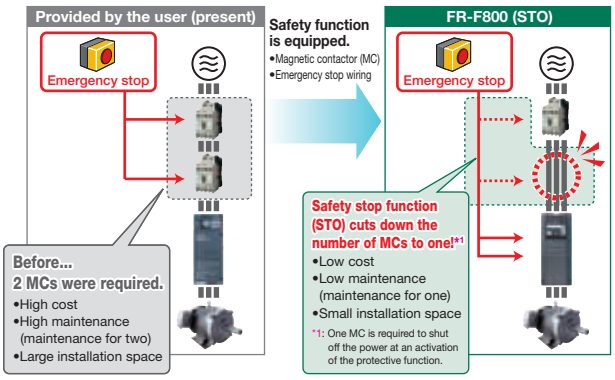
3 SECURITY & SAFETY

1 Improved System Safety

NEW Safety standards compliance

Controls with safety functions can be easily performed. PLd and SIL2 are supported as standard. (STO)

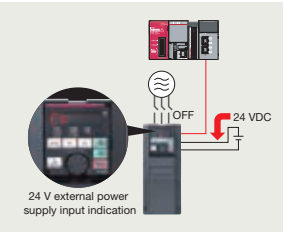
- EN ISO 13849-1 PLd / Cat.3
- EN 61508, EN61800-5-2 SIL2



2 Reliable and Secure Maintenance

NEW Standard 24 VDC power supply for the control circuit

In addition to the existing power supply input terminals (R1 and S1) of the control circuit, 24 VDC input is equipped as standard. The 24 VDC power supplied from outside can be fed to the control circuit locally. The parameter setting and communication operation can be done without turning ON the main power.



NEW Prevention of trouble with temperature monitoring

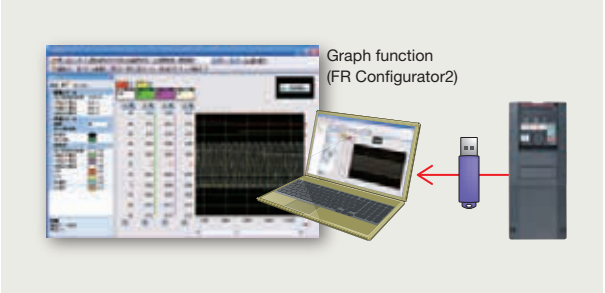
The inverter is equipped with an internal temperature sensor, which outputs a signal when the internal temperature is high. This facilitates the detection of rises in temperature inside the inverter following cooling fan malfunction, or rises in the surrounding air temperature due to inverter operating conditions.

3 Quick Reaction to Troubles

NEW Easy fault diagnosis

- The operating status (output frequency, etc.) immediately before the protection function activates can be stored in the inverter built-in RAM with the trace function. Stored data (trace data) can be copied to a USB memory device, facilitating easy trouble analysis at a separate location by reading into FR Configurator2.

  Trace data stored in the built-in RAM is deleted when the power is turned OFF or the inverter is reset.



- Clock setting is now available in addition to the already-available cumulative energization time. The time and date at a protective function activation are easily identified. (The clock is reset at power-OFF.) The date and time are also saved with the trace data, making the fault analysis easier.
  By using the real-time clock function with the optional LCD operation panel (FR-LU08) (when using battery), the time is not reset even when the power supply is turned OFF.

FR-LU08 (LCD type)
(Option)

4 Protection of Critical Parameter Settings

Misoperation prevention by setting a password

•Setting a 4-digit password can restrict parameter reading/writing.

5 Long Life Components and Life Check Function

Long life components

•The service life of the cooling fans is now 10 years*1.
The service life can be further extended by ON/OFF control of the cooling fan.
•Capacitors with a design life of 10 years *1*2 are adapted.
•Life indication of life components

Components	Estimated lifespan of the FR-F800*1	Guideline of JEMA*3
Cooling fan	10 years	2 to 3 years
Main circuit smoothing capacitor	10 years*2	5 years
Printed board smoothing capacitor	10 years*2	5 years

*1 Surrounding air temperature: Annual average of 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt).
The design life is a calculated value and is not a guaranteed product life.
*2 Output current: 80% of the inverter rating
*3 Excerpts from "Periodic check of the transistorized inverter" of JEMA (Japan Electrical Manufacturer's Association).

NEW Enhanced life check function

•An internal thermal sensor is equipped to all inverters as standard, which enables monitoring of the installation environment. Use this function as a guide for the life diagnosis.
•Maintenance timers are available for up to three peripheral devices, such as a motor and bearings.

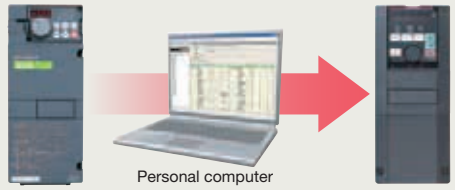

"Maintenance 1 output" warning

6 Renewal Assurance

Compatibility with existing models

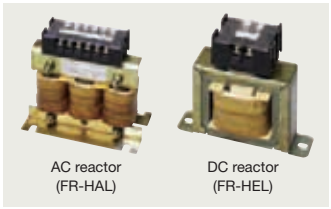
•The inverter installation method is the same as that for the FR-F700(P) series, eliminating any concerns over replacement (except for some capacity models).
Furthermore, the FR-F700(P) series control circuit terminal blocks can be installed with the use of an option (FR-A8TAT).

NEW •The terminal response adjustment function allows a user to adjust the response speed in accordance with the existing facility. (The response time is shorter for the FR-F800 series.)
•In addition to the FR-F700(P) series' parameter settings, the FR-F500 series parameter settings (to be supported soon) can be easily copied to the FR-F800 series by using the conversion function of FR Configurator2.



4 COMPATIBILITY WITH THE ENVIRONMENT

1 Suppression of Outgoing Harmonic Current and EMI



AC reactor (FR-HAL)

DC reactor (FR-HEL)

- Harmonic current may adversely affect the power supply. To suppress such harmonic current, the power-factor-improving compact AC reactor (FR-HAL) and the DC reactor (FR-HEL) are available. (For the 75K or higher inverter, always connect a DC reactor. Select a DC reactor according to the applied motor capacity.)
- By attaching the EMC filter connector to the ON or OFF position, the built-in EMC filter can be set enabled/disabled*1*2. When it is enabled, the inverter conforms to the EMC Directive (EN61800-3/2nd Environment Category C3*3) by itself.

*1: Enabling the EMC filter increases leakage current.
*2: The input side common mode choke, which is built in the 55K or lower inverter, is always enabled regardless of the EMC filter ON/OFF connector setting.
*3: Refer to the EMC Installation Guidelines for the required specifications.

	Capacitive filter	Common mode choke	DC reactor
55K or lower	Standard (built-in)	Standard (built-in)	Option (sold separately)
75K or higher	Standard (built-in)	Option (sold separately)	Option (sold separately)

- The F800 series inverters are equipped with built-in capacitive filters (capacitors) and common mode chokes (55K or lower). By installing a DC reactor (FR-HEL), which is available as an option, they can confirm to the Architectural Standard Specifications (Electric Installation) and the Architectural Standard Specifications (Machinery Installation) (2010 revision) supervised by the Ministry of Land, Infrastructure, Transport and Tourism of Japan.
- With a high power factor converter (FR-HC2), the inverter is equivalent to a self-excitation three-phase bridge circuit in the "Harmonic Suppression Guidelines for Specific Consumers" in Japan, and realizes the equivalent capacity conversion coefficient K5=0. For the 355K or higher, the converter is separated. Therefore, installation space can be saved when connecting the FR-HC2.

2 Protected in Hazardous Environments

Special-purpose inverters with circuit board coating (IEC60721-3-3 3C2/3S2) and plated conductors are available for improved environmental resistance.
For the details, please contact your sales representative.

3 Global Compatibility

- The F800 series inverters are compatible with UL, cUL, EC Directives (CE marking).
  (The Radio Waves Act (South Korea) (KC mark) will be supported soon.)
- Being RoHS compliant, the FR-F800 inverters are friendly to people and the environment.

c UL us LISTED

CE

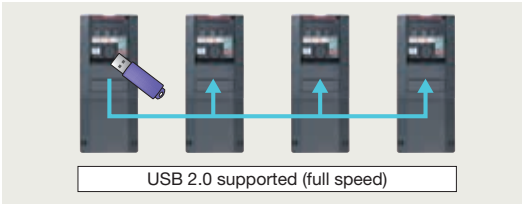
Compatible with UL, cUL, EC Directives (CE marking)

5 EASY SETUP & EASY TO USE

1 Streamlining the Startup Process

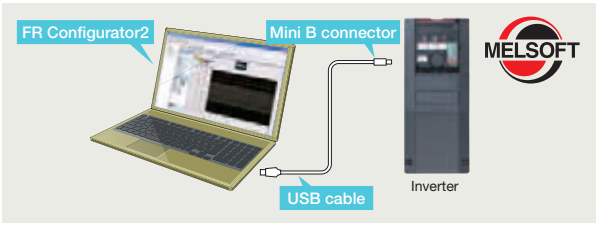
NEW Parameter copy with a USB memory device

A USB host connecter (A type), which allows external device connections, has been added.
Parameters can be copied to commercial USB memory devices.



NEW Easy setup with FR Configurator2

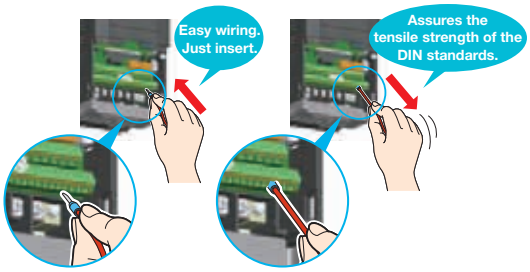
- With the sense of unity with other Mitsubishi FA products with common MELSOFT design and operability, the software is easy to use.
- Easy plug-and-play connection is available to the USB terminal equipped as standard.



- A trial version, which contains start-up functions, is available. It can be downloaded at Mitsubishi Electric FA Global Website.

NEW Easy wiring to the control circuit

Spring clamp terminals have been adopted for control circuit terminals.
As compared to the conventional screw terminals, spring clamp terminals are highly reliable and can be easily wired.
Round crimping terminals can also be used by employing a control terminal option (to be released soon).



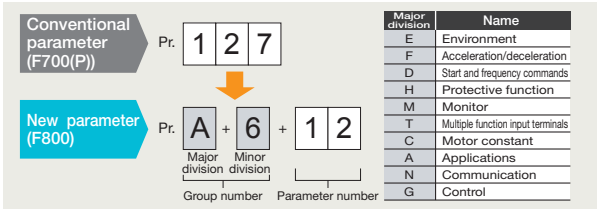
2 Easy-to-follow Display Improves the Operability

NEW Easy operation with GOT

- When the automatic connection is enabled in the GOT2000 series, the inverter can communicate with the GOT2000 series simply by connecting the GOT.
- The PLC function device monitor can be displayed at the GOT2000 series. Batch control of multiple inverter device monitors is possible with a single GOT unit.
- The sample screen data for the FR-F800 can be found in the screen design software of the GOT2000 series. The newest version of the screen design software can be downloaded from the Mitsubishi Electric FA Global Website. (to be supported soon).

NEW Easy-to-follow parameter configuration

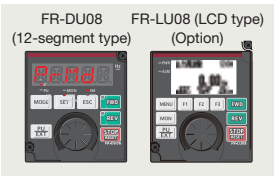
With the parameter setting mode selection of the operation panel, the group parameter mode can be selected to provide intuitive and simple parameter settings. (The conventional parameter setting mode is selected by default.)



Major division	Name
E	Environment
F	Acceleration/deceleration
D	Start and frequency commands
H	Protective function
M	Monitor
T	Multiple function input terminals
C	Motor constant
A	Applications
N	Communication
G	Control

NEW Easy-to-read operation panel

A 5-digit, 12-segment display has been adopted for the operation panel (FR-DU08) for a more natural character display. Furthermore, an optional operation panel (FR-LU08) adopting an LCD panel capable of displaying Kanji characters and menus is also available.



3 To Aid with Maintenance

Reduced wiring check time

Split-type covers are adapted for all capacity models. Maintenance is now easy because all an operator has to do is to remove the cover for the target wiring area.

NEW Maintenance and control of multiple inverters Option

Serial number reading is possible using the optional LCD operation panel (FR-LU08) or the inverter setup software (FR Configurator2). Administration of different inverters has become much more simple.

Trial Calculation Example of Energy Saving Effect

The longer the operating period with medium air volume is, the higher energy saving effect obtained with an inverter.

(Conditions: The electricity cost is 14 yen/kWh. The CO_2 emission is 1,000 kWh ≈ 0.55 ton-CO_2)

	Water-cooling pump for a showcase	Air conditioning in a Mitsubishi plant	Air conditioning in a building
	Commercialpower supply (valve) + General-purpose motor (SF-JR) ▼ Inverter + General-purpose motor (SF-JR)	Inverter + General-purpose motor (SF-JR) ▼ Inverter + General-purpose motor (SF-PR)	Inverter + General-purpose motor (SF-PR) ▼ Inverter + IPM motor (MM-EFS)
Condition	**[Units to drive]** •Water-cooling pump 3.7 kW x 1 unit •Fan for the cooling tower 1.5 kW x 1 unit •Freezer 11 kW x 3 units 5.5 kW x 2 units 3.7 kW x 1 unit 3.0 kW x 1 unit	**[Units to drive]** •Ventilator 0.75 kW x 3 units 1.5 kW x 1 unit 2.2 kW x 3 units •Air conditioner 15 kW x 1 unit 18.5 kW x 1 unit 30 kW x 2 units	**[Units to drive]** •Fan for air conditioning 5.5 kW x 10 units 7.5 kW x 10 units 3.7 kW x 100 units
Operation patterns	Water volume (%) 100 75 50 25 Time Spring Summer Fall Winter 8760 hours/year **•With commercial power supply** Approx. 0.15 million kWh Approx. 2.17 million yen **•With inverter** Approx. 0.14 million kWh Approx. 1.9 million yen	Water volume (%) 80 60 40 Time 0 6 8 10 18 2021 5475 hours/year **•With SF-JR** Approx. 0.25 million kWh Approx. 3.44 million yen **•With SF-PR** Approx. 0.23 million kWh Approx. 3.20 million yen	Water volume (%) 100 80 50 Time 0 6 9 12 15 18 21 24 5110 hours/year **•With SF-PR** Approx. 2.23 million kWh Approx. 31.27 million yen **•With IPM motor** Approx. 2.10 million kWh Approx. 29.43 million yen
(Annual) energy saving effect produced by replacing to IPM motors driven with inverters	**•Annual energy saving effect** (differences in the amount and cost) Approx. 0.019 million kWh **Approx. 0.27 million yen** **•Annual CO_2 emission reduction** Approx. 0.019 million kWh **10.6 tons**	**•Annual energy saving effect** (differences in the amount and cost) Approx. 0.017 million kWh **Approx. 0.24 million yen** **•Annual CO_2 emission reduction** Approx. 0.017 million kWh **9.5 tons**	**•Annual energy saving effect** (differences in the amount and cost) Approx. 0.131 million kWh **Approx. 1.84 million yen** **•Annual CO_2 emission reduction** Approx. 0.131 million kWh **72.3 tons**

Your best assistant - Mitsubishi inverter software

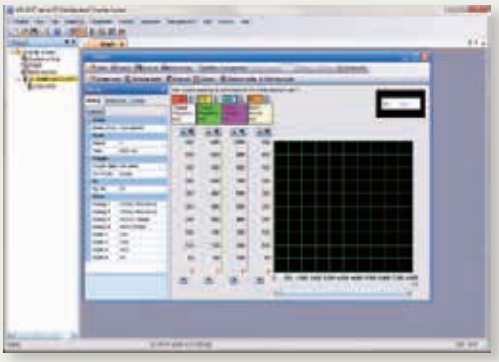
IPM energy savings simulation file

The IPM energy savings simulation file calculates the energy saving effect and CO2 reduction rate achieved by replacing commercial power supply (damper/valve control) operation with IPM motor operation by inverter. This file requires inputs such as the capacity, quantity, air volume, and operating time of motors.

IPM energy savings simulation file

FR Configurator2 (SW1DND-FRC2) Option

Support tool for the inverter operations from start-up to maintenance.



Wide range of lineup

Inverter

Standard model

F R - F 8 [2] [0] - [0.75K] [-1] [ ]

Symbol	Voltage class
2	200 V class
4	400 V class

Symbol	Structure, functionality
0	Standard model

Symbol*1	Description
0.75K to 315K	LD rated inverter capacity (kW)

Symbol	Type
-1	FM
-2	CA*2

Symbol	Circuit board coating (IEC60721-3-3 3C2/3S2 compatible)	Plated conductor
None	Without	Without
-60	With	Without
-06	With	With

Three-phase 200 V class FR-F820-[]*3	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K	90K	110K
	00046	00077	00105	00167	00250	00340	00490	00630	00770	00930	01250	01540	01870	02330	03160	03800	04750
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Three-phase 400 V class FR-F840-[]*3	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K	90K	110K
	00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	01800	02160	02600
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	132K	160K	185K	220K	250K	280K	315K										
	03250	03610	04320	04810	05470	06100	06830										
	●	●	●	●	●	●	●										

Separated converter type

F R - F 8 [4] [2] - [355K] [-1] [ ]

Symbol	Voltage class
4	400 V class

Symbol	Structure, functionality
2	Separated converter type

Symbol*1	Description
355K to 560K	LD rated inverter capacity (kW)

Symbol	Type
-1	FM
-2	CA*2

Symbol	Circuit board coating (IEC60721-3-3 3C2/3S2 compatible)	Plated conductor
None	Without	Without
-60	With	Without
-06	With	With

Three-phase 400 V class FR-F842-[]*4	355K	400K	450K	500K	560K
	07700	08660	09620	10940	12120
	●	●	●	●	●

*1: Models can be alternatively indicated with the rated inverter current (SLD rating).
*2: Specification differs by the type as follows.

Type	Monitor output	Initial setting				
		Built-in EMC filter	Control logic	Rated frequency	Pr.19 Base frequency voltage	Pr.570 Multiple rating setting
FM (terminal FM equipped model)	Terminal FM (pulse train output) Terminal AM (analog voltage output (0 to ±10 VDC))	OFF	Sink logic	60Hz	9999 (same as the power supply voltage)	1 (LD rating)
CA (terminal CA equipped model)	Terminal CA (analog current output (0 to 20 mADC)) Terminal AM (analog voltage output (0 to ±10 VDC))	ON	Source logic	50Hz	8888 (95% of the power supply voltage)	0 (SLD rating)

*3: For the 75K or higher inverter, always connect a DC reactor (FR-HEL), which is available as an option.
Select a DC reactor according to the applied motor capacity.
*4: Always install the converter unit (FR-CC2). (Not required when a high power factor converter (FR-HC2) is used)

Converter unit

F R - C C 2 - [H] [355K] [-60]

Symbol	Voltage class
H	400 V class

Symbol	Description
355K to 630K	Applicable motor capacity (kW)

Symbol	Circuit board coating (IEC60721-3-3 3C2/3S2 compatible)	Plated conductor
-60	With	Without
-06	With	With

Three-phase 400 V class FR-CC2-H[] (with the built-in DC reactor)	355K	400K	450K	500K	560K	630K
	●	●	●	●	●	●

●: Released model

Wide range of lineup

Premium high-efficiency IPM motor

55 kW or lower **MM-EFS 7 1M 4 □ □**

Symbol	Output	Symbol	Output	Symbol	Output
7	0.75 kW	75	7.5 kW	30K	30 kW
15	1.5 kW	11K	11 kW	37K	37 kW
22	2.2 kW	15K	15 kW	45K	45 kW
37	3.7 kW	18K	18.5 kW	55K	55 kW
55	5.5 kW	22K	22 kW		

Symbol	Rated speed*1
1M	1500 r/min

Symbol	Voltage class
None	200 V
4	400 V

Symbol	Specifications*2
None	Standard model
Q	Class B

Symbol	Specifications*2
None	Standard model
P1	Outdoor type

*1: The motor can also be used for applications which required the rated speed of 1800 r/min.
*2: The outdoor type and class B are semi-standard models.

75 kW or higher **MM-THE4**

- The motor can be used for applications which required the rated speed of 1500 r/min and 1800 r/min.
- For dedicated motors such as the outdoor type, the long-axis type, the flange type, the waterproof outdoor type, and the corrosion proof type, contact your sales representative.

Rated output (kW)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160
Motor model		7	15	22	37	55	75	11K	15K	18K	22K	30K	37K	45K	55K	—	—	—	—	—
200 V class	MM-EFS[]1M	●	●	●	●	●	●	●	●	●	●	●	●	●	●	—	—	—	—	—
400 V class	MM-EFS[]1M4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	—	—	—	—	—
200 V class	MM-THE4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	●	—	—	—	—
400 V class	MM-THE4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	●	●	●	●	●

< Note > •The IPM motor MM-EFS/MM-THE4 series cannot be driven by the commercial power supply.
•For IPM motors, the total wiring length is 100 m maximum.
•Only one IPM motor can be connected to an inverter.

●: Released model —: Not applicable

Inverter by rating

•200 V class

Inverter model FR-F820-[]		SLD (superlight duty) Motor capacity (kW)*1	SLD (superlight duty) Rated current (A)	LD (light duty, initial value) Motor capacity (kW)*1	LD (light duty, initial value) Rated current (A)
0.75K	00046	0.75	4.6	0.75	4.2
1.5K	00077	1.5	7.7	1.5	7
2.2K	00105	2.2	10.5	2.2	9.6
3.7K	00167	3.7	16.7	3.7	15.2
5.5K	00250	5.5	25	5.5	23
7.5K	00340	7.5	34	7.5	31
11K	00490	11	49	11	45
15K	00630	15	63	15	58
18.5K	00770	18.5	77	18.5	70.5
22K	00930	22	93	22	85
30K	01250	30	125	30	114
37K	01540	37	154	37	140
45K	01870	45	187	45	170
55K	02330	55	233	55	212
75K	03160	75	316	75	288
90K	03800	90/110	380	90	346
110K	04750	132	475	110	432

•400 V class

Inverter model FR-F84[]-[]		SLD (superlight duty) Motor capacity (kW)*1	SLD (superlight duty) Rated current (A)	LD (light duty, initial value) Motor capacity (kW)*1	LD (light duty, initial value) Rated current (A)
0.75K	00023	0.75	2.3	0.75	2.1
1.5K	00038	1.5	3.8	1.5	3.5
2.2K	00052	2.2	5.2	2.2	4.8
3.7K	00083	3.7	8.3	3.7	7.6
5.5K	00126	5.5	12.6	5.5	11.5
7.5K	00170	7.5	17	7.5	16
11K	00250	11	25	11	23
15K	00310	15	31	15	29
18.5K	00380	18.5	38	18.5	35
22K	00470	22	47	22	43
30K	00620	30	62	30	57
37K	00770	37	77	37	70
45K	00930	45	93	45	85
55K	01160	55	116	55	106
75K	01800	75/90	180	75	144

Inverter model FR-F84[]-[]		SLD (superlight duty) Motor capacity (kW)*1	SLD (superlight duty) Rated current (A)	LD (light duty, initial value) Motor capacity (kW)*1	LD (light duty, initial value) Rated current (A)
90K	02160	110	216	90	180
110K	02600	132	260	110	216
132K	03250	160	325	132	260
160K	03610	185	361	160	325
185K	04320	220	432	185	361
220K	04810	250	481	220	432
250K	05470	280	547	250	481
280K	06100	315	610	280	547
315K	06830	355	683	315	610
355K	07700	400	770	355	683
400K	08660	450	866	400	770
450K	09620	500	962	450	866
500K	10940	560	1094	500	962
560K	12120	630	1212	560	1094

•Overload current rating

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

*1: Indicates the maximum capacity applicable with the Mitsubishi 4-pole standard motor.

Standard Specifications

Rating (Standard model)

200 V class

Model FR-F820-[ ]			00046	00077	00105	00167	00250	00340	00490	00630	00770	00930	01250	01540	01870	02330	03160	03800	04750
			0.75K	1.5K	2.2K	3.7K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K	90K	110K
Applicable motor capacity (kW) *1		SLD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90/110	132
		LD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Output	Rated capacity (kVA) *2	SLD	1.8	2.9	4	6.4	10	13	19	24	29	35	48	59	71	89	120	145	181
		LD	1.6	2.7	3.7	5.8	8.8	12	17	22	27	32	43	53	65	81	110	132	165
	Rated current (A)	SLD	4.6	7.7	10.5	16.7	25	34	49	63	77	93	125	154	187	233	316	380	475
		LD	4.2	7	9.6	15.2	23	31	45	58	70.5	85	114	140	170	212	288	346	432
	Overload current rating *3	SLD	110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature 40°C																
		LD	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature 50°C																
	Rated voltage *4		Three-phase 200 to 240 V																
Power supply	Rated input AC voltage/frequency		Three-phase 200 to 240 V 50 Hz/60 Hz																
	Permissible AC voltage fluctuation		170 to 264 V 50 Hz/60 Hz																
	Permissible frequency fluctuation		±5%																
	Rated input current (A) *5	SLD	5.3	8.9	13.2	19.7	31.3	45.1	62.8	80.6	96.7	115	151	185	221	269	316	380	475
		LD	5	8.3	12.2	18.3	28.5	41.6	58.2	74.8	90.9	106	139	178	207	255	288	346	432
	Power supply capacity (kVA) *6	SLD	2	3.4	5	7.5	12	17	24	31	37	44	58	70	84	103	120	145	181
		LD	1.9	3.2	4.7	7	11	16	22	29	35	41	53	68	79	97	110	132	165
Protective structure (IEC 60529) *7			Enclose type (IP20)										Open type (IP00)						
Cooling system			Self-cooling		Forced air cooling														
Approx. mass (kg)			1.9	2.1	3.0	3.0	3.0	6.3	6.3	8.3	15	15	15	22	42	42	54	74	74

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 220 V for 200 V class.

*3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the maximum point of the voltage waveform at the inverter output side is the power supply voltage multiplied by about $\sqrt{2}$.

*5 The rated input current indicates a value at a rated output voltage. The impedance at the power supply side (including those of the input reactor and cables) affects the rated input current.

*6 The power supply capacity is the value when at the rated output current. It varies by the impedance at the power supply side (including those of the input reactor and cables).

*7 FR-DU08: IP40 (except for the PU connector section)

◆ 400 V class

Model FR-F840-[ ]			00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	01800	02160	02600	03250	03610	04320	04810	05470	06100	06830
			0.75K	1.5K	2.2K	3.7K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K	90K	110K	132K	160K	185K	220K	250K	280K	315K
Applicable motor capacity (kW) *1		SLD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75/ 90	110	132	160	185	220	250	280	315	355
		LD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	280	315
Output	Rated capacity (kVA) *2	SLD	1.8	2.9	4	6.3	10	13	19	24	29	36	47	59	71	88	137	165	198	248	275	329	367	417	465	521
		LD	1.6	2.7	3.7	5.8	8.8	12	18	22	27	33	43	53	65	81	110	137	165	198	248	275	329	367	417	465
	Rated current (A)	SLD	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116	180	216	260	325	361	432	481	547	610	683
		LD	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106	144	180	216	260	325	361	432	481	547	610
	Overload current rating *3	SLD	110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature 40°C																							
		LD	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature 50°C																							
	Rated voltage *4		Three-phase 380 to 500 V																							
Power supply	Rated input AC voltage/frequency		Three-phase 380 to 500 V 50 Hz/60 Hz *8																							
	Permissible AC voltage fluctuation		323 to 550 V 50 Hz/60 Hz																							
	Permissible frequency fluctuation		±5%																							
	Rated input current (A) *5	SLD	3.2	5.4	7.8	10.9	16.4	22.5	31.7	40.3	48.2	58.4	76.8	97.6	115	141	180	216	260	325	361	432	481	547	610	683
		LD	3	4.9	7.3	10.1	15.1	22.3	31	38.2	44.9	53.9	75.1	89.7	106	130	144	180	216	260	325	361	432	481	547	610
	Power supply capacity (kVA) *6	SLD	2.5	4.1	5.9	8.3	12	17	24	31	37	44	59	74	88	107	137	165	198	248	275	329	367	417	465	521
		LD	2.3	3.7	5.5	7.7	12	17	24	29	34	41	57	68	81	99	110	137	165	198	248	275	329	367	417	465
Protective structure (IEC 60529) *7			Enclose type (IP20)											Open type (IP00)												
Cooling system			Self-cooling			Forced air cooling																				
Approx. mass (kg)			2.5	2.5	2.5	3.0	3.0	6.3	6.3	8.3	8.3	15	15	23	41	41	43	52	55	71	78	117	117	166	166	166

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 440 V for 400 V class.

*3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the maximum point of the voltage waveform at the inverter output side is the power supply voltage multiplied by about $\sqrt{2}$.

*5 The rated input current indicates a value at a rated output voltage. The impedance at the power supply side (including those of the input reactor and cables) affects the rated input current.

*6 The power supply capacity is the value when at the rated output current. It varies by the impedance at the power supply side (including those of the input reactor and cables).

*7 FR-DU08: IP40 (except for the PU connector section)

*8 For the power voltage exceeding 480 V, set **Pr.977 Input voltage mode selection**.

● Rating (separated converter types)

◆ 400 V class

• Inverter

Model FR-F842-[ ]			07700	08660	09620	10940	12120
			355K	400K	450K	500K	560K
Applicable motor capacity (kW) *1		SLD	400	450	500	560	630
		LD	355	400	450	500	560
Output	Rated capacity (kVA) *2	SLD	587	660	733	834	924
		LD	521	587	660	733	834
	Rated current (A)	SLD	770	866	962	1094	1212
		LD	683	770	866	962	1094
	Overload current rating *3	SLD	110% 60 s, 120% 3 s (inverse-time characteristics) at surrounding air temperature 40°C				
		LD	120% 60 s, 150% 3 s (inverse-time characteristics) at surrounding air temperature 50°C				
	Rated voltage *4		Three-phase 380 to 500 V				
	Regenerative brakingtorque*5 (When the converter unit (FR-CC2) is used)	Maximum brake torque	10% torque/continuous				
Input power	DC power supply voltage		430 to 780 VDC				
	Control power supply auxiliary input		Single phase 380 to 500 V 50 Hz/60 Hz *7				
	Permissible control power supply auxiliary input fluctuation		Frequency ±5%, voltage ±10%				
Protective structure (IEC 60529) *6			Open type (IP00)				
Cooling system			Forced air cooling				
Approx. mass (kg)			163	163	243	243	243

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 440 V.

*3 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the maximum point of the voltage waveform at the inverter output side is the power supply voltage multiplied by about $\sqrt{2}$.

*5 LD rating reference value

*6 FR-DU08: IP40 (except for the PU connector section)

*7 For the power voltage exceeding 480 V, set **Pr.977 Input voltage mode selection**.

• Converter unit (FR-CC2)

Model FR-CC2-H[]		355K	400K	450K	500K	560K	630K
Applicable motor capacity (kW)		355	400	450	500	560	630
Output	Overload current rating *1	150% 60 s, 200% 3 s				120% 60 s, 150% 3 s	110% 60 s, 120% 3 s
	Rated voltage *2	430 to 780 VDC *4					
Power supply	Rated input AC voltage/frequency	Three-phase 380 to 500 V 50 Hz/60 Hz					
	Permissible AC voltage fluctuation	Three-phase 323 to 550 V 50 Hz/60 Hz					
	Permissible frequency fluctuation	±5%					
	Rated input current (A)	683	770	866	962	1094	1212
	Power supply capacity (kVA) *3	521	587	660	733	833	924
Protective structure (IEC 60529)		Open type (IP00)					
Cooling system		Forced air cooling					
DC reactor		Built-in					
Approx. mass (kg)		213	282	285	288	293	294

*1 The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the converter unit and the inverter to return to or below the temperatures under 100% load.

*2 The converter unit output voltage varies according to the input power supply voltage and the load. The maximum point of the voltage waveform at the converter unit output side is approximately the power supply voltage multiplied by $\sqrt{2}$.

*3 The power supply capacity is the value when at the rated output current. It varies by the impedance at the power supply side (including those of the input reactor and cables).

*4 The permissible voltage imbalance ratio is 3% or less. (Imbalance ratio = (highest voltage between lines - average voltage between three lines) / average voltage between three lines × 100)

Common specifications

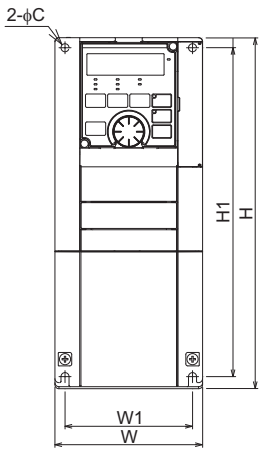
Control specifications	Control method		Soft-PWM control, high carrier frequency PWM control (selectable among V/F control (Optimum excitation control, etc.), Advanced magnetic flux vector control (Advanced optimum excitation control, etc.), and PM motor control)
	Output frequency range		0.2 to 590 Hz (The upper-limit frequency is 400 Hz under Advanced magnetic flux vector control, and PM motor control.)
	Frequency setting resolution	Analog input	0.015 Hz/60 Hz (terminal 2, 4: 0 to 10 V/12 bits) 0.03 Hz/60 Hz (0 to 5 V/11 bits or 0 to 20 mA/approx. 11 bits for terminals 2 and 4, 0 to ±10 V/12 bits for terminal 1) 0.06 Hz/60 Hz (0 to ±5 V/11 bits for terminal 1)
		Digital input	0.01 Hz
	Frequency accuracy	Analog input	Within ±0.2% of the max. output frequency (25°C ±10°C)
		Digital input	Within 0.01% of the set output frequency
	Voltage/frequency characteristics		Base frequency can be set from 0 to 590 Hz. Constant-torque/variable-torque pattern or adjustable 5 points V/F can be selected.
	Starting torque	Induction motor	120% 0.5 Hz (Advanced magnetic flux vector control)
		IPM motor	50%
	Torque boost		Manual torque boost
	Acceleration/deceleration time setting		0 to 3600 s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash countermeasures acceleration/deceleration can be selected.
	DC injection brake (induction motor)		Operation frequency (0 to 120 Hz), operation time (0 to 10 s), operation voltage (0 to 30%) variable
	Stall prevention operation level		Activation range of stall prevention operation (SLD rating: 0 to 120%, LD rating: 0 to 150%). Whether to use the stall prevention or not can be selected. (V/F control, Advanced magnetic flux vector control)
Operation specifications	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) are available. Terminal 1: -10 to +10 V, -5 to 5 V are available.
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16-bit binary (when used with option FR-A8AX)
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signals (twelve terminals)		Low-speed operation command, Middle-speed operation command, High-speed operation command, Second function selection, Terminal 4 input selection, Jog operation selection, Output stop, Start self-holding selection, Forward rotation command, Reverse rotation command, Inverter reset The input signal can be changed using **Pr.178 to Pr.189 (input terminal function selection)**.
	Pulse train input		100 kpps
	Operational functions		Maximum frequency, minimum frequency, 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, DC feeding*1, frequency jump, rotation display, automatic restart after instantaneous power failure, electronic bypass sequence, 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, PID pre-charge function, cooling fan operation selection, stop selection (deceleration stop/coasting), power-failure deceleration stop function, PLC function, life diagnosis, maintenance timer, current average monitor, multiple rating, test run, 24 V power supply input for control circuit, safety stop function, self power management, BACnet communication, PID gain tuning, cleaning, load characteristics storage, emergency drive*1
	Output signal Open collector output (five terminals) Relay output (two terminals)		Inverter running, Up to frequency, Instantaneous power failure/undervoltage*1, Overload warning, Output frequency detection, Fault The output signal can be changed using **Pr.190 to Pr.196 (output terminal function selection)**. Fault codes of the inverter can be output (4 bits) from the open collector.
	Pulse train output		50 kpps
Indication	For meter	Pulse train output (FM type)	Max. 2.4 kHz: one terminal (output frequency) The monitored item can be changed using **Pr.54 FM/CA terminal function selection**.
		Current output (CA type)	Max. 20 mADC: one terminal (output current) The monitored item can be changed using **Pr.54 FM/CA terminal function selection**.
		Voltage output	Max. 10 VDC: one terminal (output voltage) The monitored item can be changed using **Pr.158 AM terminal function selection**.
	Operation panel (FR-DU08)	Operating status	Output frequency, output current, output voltage, frequency setting value The monitored item can be changed using **Pr.52 Operation panel main monitor selection**.
		Fault record	Fault record is displayed when a fault occurs. Past 8 fault records and the conditions immediately before the fault (output voltage/current/frequency/cumulative energization time/year/month/date/time) are saved.
Protective/ warning function		Protective function	Overcurrent trip during acceleration, Overcurrent trip during constant speed, Overcurrent trip during deceleration or 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), Heatsink overheat, Instantaneous power failure*1, Undervoltage*1, Input phase loss*1*2, Stall prevention stop, Loss of synchronism detection*2, Upper limit fault detection, Lower limit fault detection, Output side earth (ground) fault overcurrent, Output phase loss, External thermal relay operation*2, PTC thermistor operation*2, Option fault, Communication option fault, Parameter storage device fault, PU disconnection, Retry count excess*2, CPU fault, Operation panel power supply short circuit/RS-485 terminals power supply short circuit, 24 VDC power fault, Abnormal output current detection*2, Inrush current limit circuit fault*1, Communication fault (inverter), Analog input fault, USB communication fault, Safety circuit fault, Overspeed occurrence*2, 4 mA input fault*2, Pre-charge fault*2, PID signal fault*2, Internal circuit fault, User definition error by the PLC function
		Warning function	Fan alarm, Stall prevention (overcurrent), Stall prevention (overvoltage), Electronic thermal relay function pre-alarm, PU stop, Parameter copy, Safety stop, Maintenance timer 1 to 3*2, USB host error, Operation panel lock*2, Password locked*2, Parameter write error, Copy operation error, 24 V external power supply operation, Load fault warning, Emergency drive*1
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing) (LD ratings) -10°C to +40°C (non-freezing) (SLD rating)
	Surrounding air humidity		With circuit board coating (conforming to IEC60721-3-3 3C2/3S2): 95% RH or less (non-condensing) Without circuit board coating: 90% RH or less (non-condensing)
	Storage temperature*3		-20°C to +65°C
	Atmosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt, etc.)
	Altitude/vibration		Maximum 1000 m above sea level*4, 5.9 m/s^2 or less*5 at 10 to 55 Hz (directions of X, Y, Z axes)

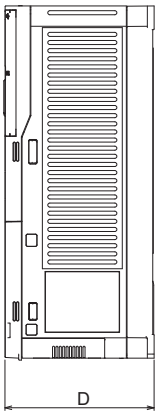
*1 Available only for the standard model.
*2 This protective function is not available in the initial status.
*3 Temperature applicable for a short time, e.g. in transit.
*4 For the installation at an altitude above 1,000 m (up to 2,500 m), derate the rated current 3% per 500 m.
*5 2.9 m/s^2 or less for the FR-F840-04320(185K) or higher.

Outline Dimension Drawings

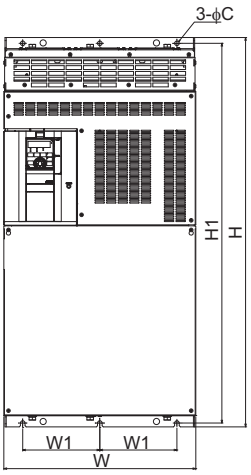
● Standard model

FR-F820-00046(0.75K) to 04750(110K)
FR-F840-00023(0.75K) to 03610(160K)





FR-F840-04320(185K) to 06830(315K)



(Unit: mm)

*This is a sample outline dimension drawing. The shape differs by the model.

◆ 200 V class

Inverter model	W	W1	H	H1	D	C
FR-F820-00046(0.75K)	110	95	260	245	110	6
FR-F820-00077(1.5K)					125	
FR-F820-00105(2.2K)	150	125			140	
FR-F820-00167(3.7K)						
FR-F820-00250(5.5K)						
FR-F820-00340(7.5K)	220	195			170	
FR-F820-00490(11K)						
FR-F820-00630(15K)			300	285	190	
FR-F820-00770(18.5K)	250	230	400	380		10
FR-F820-00930(22K)						
FR-F820-01250(30K)						
FR-F820-01540(37K)	325	270	550	530	195	
FR-F820-01870(45K)	435	380		525	250	12
FR-F820-02330(55K)						
FR-F820-03160(75K)	465	410	700	675		
FR-F820-03800(90K)		400	740	715	360	
FR-F820-04750(110K)						

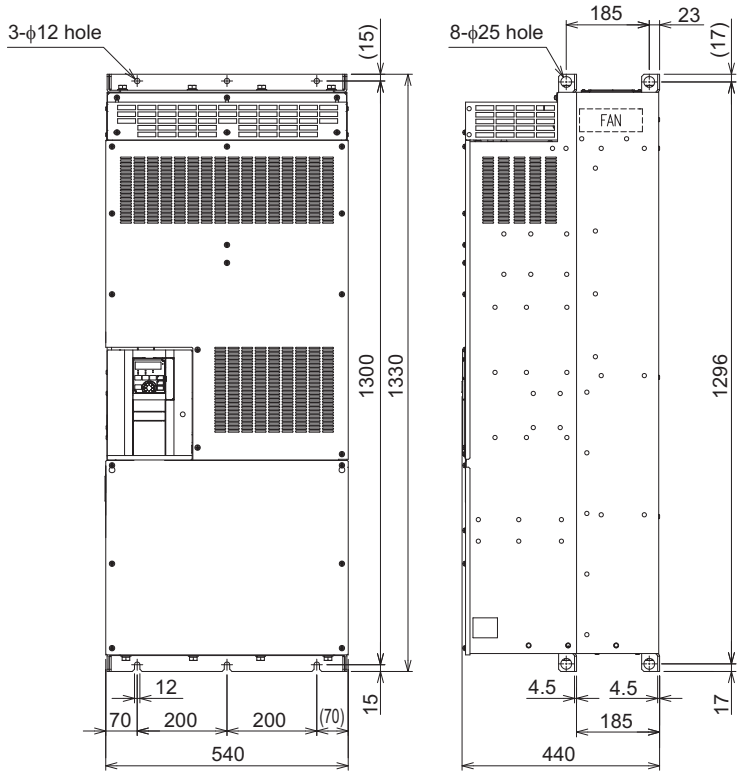
◆ 400 V class

Inverter model	W	W1	H	H1	D	C
FR-F840-00023(0.75K)	150	125	260	245	140	6
FR-F840-00038(1.5K)						
FR-F840-00052(2.2K)						
FR-F840-00083(3.7K)						
FR-F840-00126(5.5K)						
FR-F840-00170(7.5K)	220	195			170	
FR-F840-00250(11K)						
FR-F840-00310(15K)			300	285	190	
FR-F840-00380(18.5K)						
FR-F840-00470(22K)	250	230	400	380		10
FR-F840-00620(30K)						
FR-F840-00770(37K)	325	270	550	530	195	
FR-F840-00930(45K)	435	380		525	250	12
FR-F840-01160(55K)						
FR-F840-01800(75K)						
FR-F840-02160(90K)	465	400	620	595	300	
FR-F840-02600(110K)						
FR-F840-03250(132K)			740	715	360	
FR-F840-03610(160K)						
FR-F840-04320(185K)	498	200	1010	985	380	
FR-F840-04810(220K)						
FR-F840-05470(250K)	680	300		984		
FR-F840-06100(280K)						
FR-F840-06830(315K)						

● Separated converter type

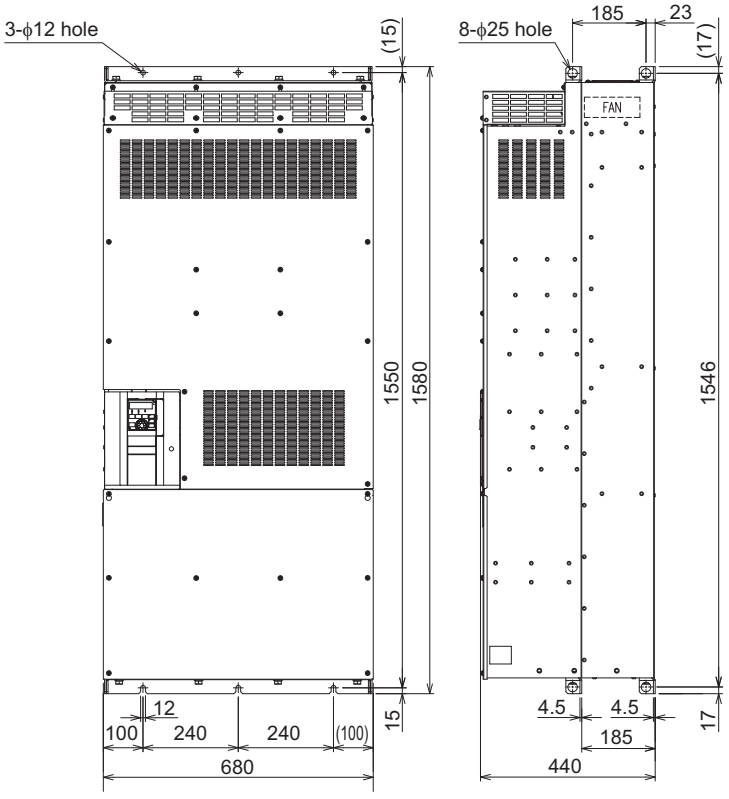
◆ Inverter

FR-F842-07700(355K), 08660(400K)



(Unit: mm)

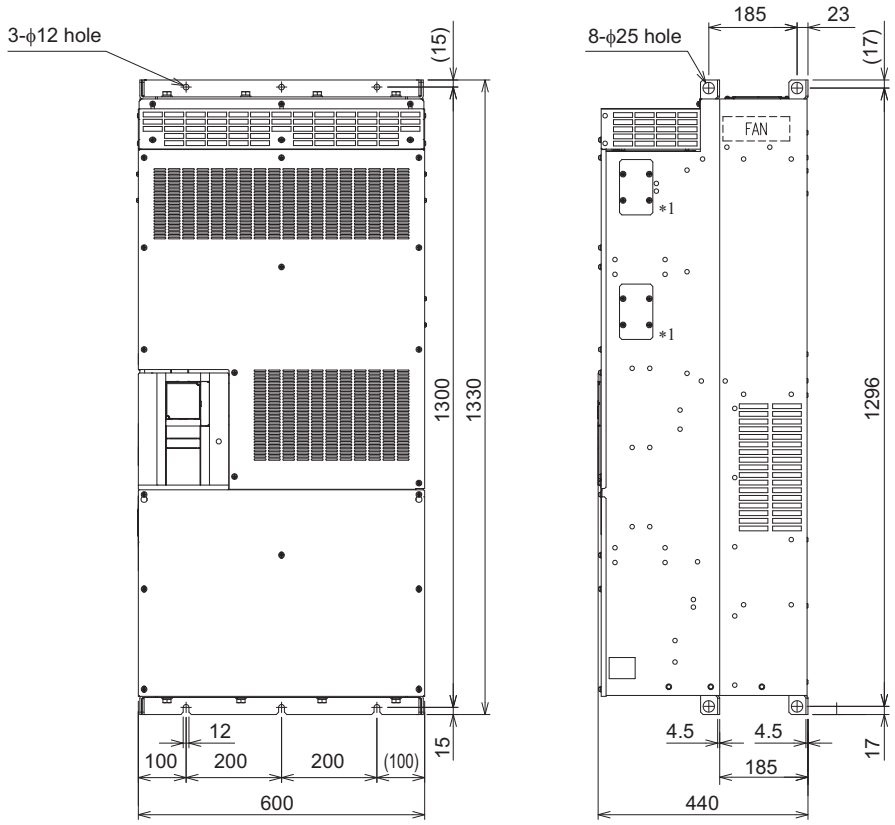
FR-F842-09620(450K), 10940(500K), 12120(560K)



(Unit: mm)

◆ Converter unit

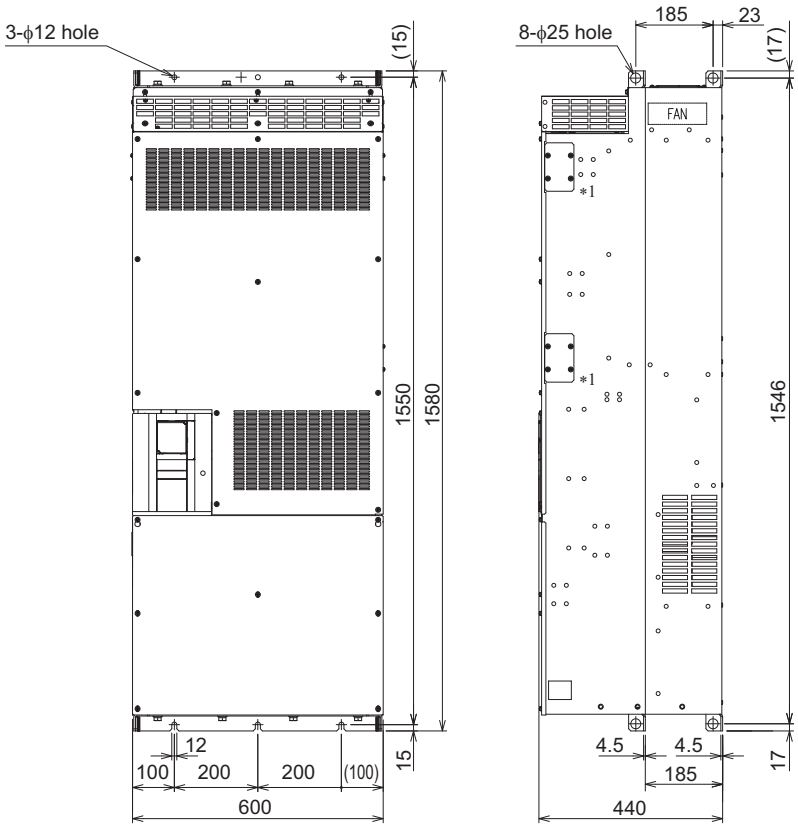
FR-CC2-H355K



Equipped with a DC reactor.

(Unit: mm)

FR-CC2-H400K, H450K, H500K, H560K, H630K



Equipped with a DC reactor.

(Unit: mm)

*1 Do not remove the cover on the side of the converter unit.

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