

Automating the World

MODERNIZING WATER OPERATIONS TO MINIMIZE COSTS

Increase water quality, availability, and sustainability.



A WORLD OF OPPORTUNITY

LET'S CHANGE THE FUTURE TOGETHER

AN INDUSTRY IN NEED OF MODERNIZATION

DOING MORE WITH LESS

THERE IS NO FUTURE WITHOUT WATER

Our planet is in a precarious position. It's not something that one person, one company or one country can fix. We must all do our part to enable a sustainable future.

For Mitsubishi Electric Automation, that means sharing know-how and actively collaborating to find new ways of using automation to address today's big problems. Energy consumption. Pollution reduction. Shrinking populations. Sustainable water supply.

Join us.



2.2M people in the U.S. are without running water and basic indoor plumbing.

44 M people in the U.S. have inadequate water systems.

\$8.6B per year the cost to the U.S. economy created by the water access gap.

- WORLD ECONOMIC FORUM

UNDERFUNDED. UNDERSTAFFED. UNDER PRESSURE.

Higher operating costs, rising consumer scrutiny regarding water quality, and a wave of retirements are cause for concern in the water sector. According to the U.S. EPA (Environmental Protection Agency), roughly one-third of the water sector workforce is eligible to retire by 2030.

Modernizing water operations can address all of these issues, as well as problems with pump clogs, water pressure, rapid leak detection, and equipment breakdowns. The opportunities for modernization are massive. Perhaps the biggest opportunity is the ability to do more with less staff.

DELOITTE RECOMMENDS:

Generating operational efficiencies to better use dwindling water, power, and labor resources

Prioritizing investments to consider whole life costsversus just CAPEX

B Improving the quality and speed of decision-making throughout the organization





Drinking water and wastewater plants are typically the largest energy consumers for many municipal governments.

> - U.S. ENVIRONMENTAL **PROTECTION AGENCY**

More than 90% of energy consumed in producing and delivering drinking water is used for pumping.

- FOCUS ON ENERGY





VFDs provide up to 30% overall reduction in energy consumption for significantly lower power bills.

- U.S. DEPARTMENT OF ENERGY

A TRUSTED PROVIDER

MODERNIZE TODAY FOR A BETTER TOMORROW

WE TAKE WATER SECURITY SERIOUSLY

Water insecurity is not just a developing world issue. "Too many Americans face water insecurity due to groundwater exhaustion, infrastructure challenges, climate change conditions, and contamination." says the World Economic Forum.

Water insecurity can be devastating to public health and community prosperity. That's why we're working with water municipalities across the country. By helping them move to more automated, data-driven, and energy-efficient operations, we can help ensure that every community has safe drinking water.



"Tapping into operational data is the first step toward optimized management of water operations."

- FOCUS ON ENERGY

PROVEN APPLICATIONS FOR VFDS

TAKE WATER OPERATIONS TO THE NEXT LEVEL

IMPROVE WORKFORCE EFFECTIVENESS

TAP INTO ONGOING ENERGY SAVINGS

Mitsubishi Electric Series VFDs are used in all aspects of water operations. Energy-saving applications include:

Aeration Blowers

Up to 50% energy savings in discharge pressure by matching air flow to process requirements

Centrifugal Pumps

Up to 50% energy savings in liquid circulation by eliminating the need to throttle valves in the system

Submersible Pumps

Up to 50% energy savings in wastewater transfer by adjusting the lift station pump speed and maintaining a constant pressure

Oxidation Ditch Rotors

Up to 40% energy savings during phosphorus removal by adjusting the speed that mixes wastewater with ferric chloride

Screw Pumps

Up to 15% energy savings by matching the speed of the screw to the wastewater flow



WE MAKE IT EASY

The GOT2000 Series HMI touchscreen interfaces provide easy access for plant operators and service technicians to adjust controls and monitor operating conditions.



GOT2000 SERIES HMI

- Adjust and monitor VFD parameters and alarms
- Inspect historical and real-time conditions graphically
- Display work instructions and documentation
- Direct database connection

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TAKE WATER OPERATIONS TO THE NEXT LEVEL

IDENTIFY REAL-TIME INSIGHTS

TAKE WATER OPERATIONS TO THE NEXT LEVEL

TURN ON OPERATIONAL INTELLIGENCE

DIGITIZE PLANT EQUIPMENT

MELSEC iQ-F Series compact controllers make it possible for plant equipment and processes to communicate with each other and with IoT devices to deliver actionable insights.



iQ-F SERIES CONTROLLER

- Control multiple VFDs
- Capture and deliver sensor data to SCADA systems
- Direct connection to the cloud
- Send email alarms
- TLS encryption



GET REAL VALUE FROM DATA

ICONICS software enables rapid connectivity of VFDs and other supervisory control and data acquisition (SCADA) systems. Collect, visualize, analyze, and optimize data, from a single piece of equipment up to multiple facilities. Once connected, the software unifies the data and increases the value you can derive from it.

- Real-time visibility
- Secure remote management
- Role-specific visualization
- Automated decision making

Learn more.

iconics.com/water



CYBER SECURITY

Implementing cybersecurity best practices is critical for the water and wastewater sector to minimize risk of service disruptions and to protect against threats to public health. Put remote access, access control, and data protection policies into place for the entire team without compromising operational productivity.



"We immediately realized the benefits of selecting ICONICS solutions. With GENESIS64, we achieved improved secure visualization of water and sewer levels, as well as monitoring and control of potable water and wastewater, elevation, PSI, intrusion pumps, pump monitors/ controls, pump failure status, and temperature."

> - LAKE CITIES MUNICIPAL UTILITY AUTHORITY



FR-F800 PRODUCT OVERVIEW

OPTIMIZE ENERGY SAVINGS WITH VFDs

VARIABLE FREQUENCY DRIVES

PART NUMBER CONFIGURATION

MULTI OVERLOAD RATINGS

	Overload Rating		Ambient Temp	
	60s	3s		
SLD	110%	120%	40°C	
LD	120%	150%	50°C	

STANDARD INVERTER TYPE (200 VAC, 400 VAC)



SEPARATED CONVERTER/INVERTER TYPE (400 VAC)



STANDARD INVERTER TYPE (600 VAC)



	•			
	Symbol	Circuit	Board Coating	Plated Conductor
	Without	Without	1	Without
V)	60	With		Without
	06	With		With
	Symbol	Туре	Communicator	Туре
	E1	FM	Ethernet	
	E2	CA	Elleniel	

	Symbol	Circuit	Board Coating	Plated Conductor		
	Without	Without		Without		
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	E2	CA	Ellieniel			

SELECTION CHARTS

200VAC - 240VAC

(SLD rating 1 to 150HP single frames)

FR-F820 Selection Chart

Model Number	AMPS For Duty		Horsepower For Duty (NEC)		Frame	Weight	
	SLD	LD	D SLD LD		3120	(ibs)	
FR-F820-00046-E3N6	4.6	4.2	1	1	A	6	
FR-F820-00077-E3N6	7.7	7	2	2	В	6	
FR-F820-00105-E3N6	10.5	9.6	3	3	С	9	
FR-F820-00167-E3N6	16.7	15.2	5	5	С	9	
FR-F820-00250-E3N6	25	23	7.5	7.5	С	9	
FR-F820-00340-E3N6	34	31	10	10	D	17	
FR-F820-00490-E3N6	49	45	20	15	D	17	
FR-F820-00630-E3N6	63	58	20	20	E	20	
FR-F820-00770-E3N6	77	70.5	25	25	F	37	
FR-F820-00930-E3N6	93	85	30	30	F	37	
FR-F820-01250-E3N6	125	114	40	40	F	37	
FR-F820-01540-E360	154	140	60	50	G	48	
FR-F820-01870-E360	187	170	60	60	Н	92	
FR-F820-02330-E360	233	212	75	75	Н	92	
FR-F820-03160-E360	316	288	125	100	К	119	
FR-F820-03800-E3U6	380	346	150	125	L	163	
FR-F820-04750-E3U6	475	432	150	150	L	163	

Important Note: Drives in shaded area MUST be used together with FR-HEL DC Link Choke (sold separately). Weights do not include separate DC Link chokes.

380VAC - 500VAC

(SLD rating 1 to 1000HP single frames)

FR-F840 Selection Chart

Model Number	AMPS For Duty		Horsepower For Duty (NEC)		Frame	Weight	
	SLD	LD	SLD	LD	Size	(ibs)	
FR-F840-00023-E3N6	2.3	2.1	1	1	С	8	
FR-F840-00038-E3N6	3.8	3	2	2	С	8	
FR-F840-00052-E3N6	5.2	4.8	3	3	C	8	
FR-F840-00083-E3N6	8.3	7.6	5	5	C	9	
FR-F840-00126-E3N6	12.6	11.5	7.5	7.5	C	9	
FR-F840-00170-E3N6	17	16	10	10	D	17	
FR-F840-00250-E3N6	25	23	15	15	D	17	
FR-F840-00310-E3N6	31	29	20	20	E	20	
FR-F840-00380-E3N6	38	35	25	25	E	20	
FR-F840-00470-E3N6	47	43	30	30	F	37	
FR-F840-00620-E3N6	62	57	40	40	F	37	
FR-F840-00770-E360	77	70	60	50	G	51	
FR-F840-00930-E360	93	85	60	60	Н	90	
FR-F840-01160-E360	116	106	75	75	Н	90	
FR-F840-01800-E360	180	144	150	100	Н	95	
FR-F840-02160-E3U6	216	180	150	150	J	114	
FR-F840-02600-E3U6	260	216	200	150	J	121	
FR-F840-03250-E3U6	325	260	250	200	L	156	
FR-F840-03610-E3U6	361	325	300	250	L	172	
FR-F840-04320-E3U6	432	361	350	300	M	257	
FR-F840-04810-E3U6	481	432	400	350	M	257	
FR-F840-05470-E3U6	547	481	450	400	N	365	
FR-F840-06100-E3U6	610	547	500	450	N	365	
FR-F840-06830-E3U6	683	610	550	500	N	365	

525VAC - 660VAC

(SLD rating 2 to 850HP single frames)

FR-F860 Seletion Chart

Model Number (*3)	AMPS for Duty		Horsepower for Duty (NEC)		Frame	Weight	
	SLD	LD	SLD	LD	5120	(103)	
FR-F860-00027-E3N6	2.7	2.5	2	1.5	С	11.7	
FR-F860-00061-E3N6	6.1	5.6	5	3	С	12.8	
FR-F860-00090-E3N6	9	8.2	7.5	5	С	12.8	
FR-F860-00170-E3N6	17	16	15	10	D	15.4	
FR-F860-00320-E3N6	32	27	30	25	E	19.8	
FR-F860-00450-E3N6	45	41	40	40	F	37.4	
FR-F860-00680-E360	68	62	60	60	Н	79.2	
FR-F860-01080-E360 (*1)	108	99	100	100	Н	90.2	
FR-F860-01440-E360 (*1)	144	131	150	125	J	114	
FR-F860-01670-E360 (*1)	167	152	150	150	J	114	
FR-F860-02430-E360 (*1)	243	221	250	200	J	121	
FR-F860-02890-E360 (*1)	289	255	300	250	Μ	246	
FR-F860-03360-E360 (*1)	336	304	350	300	М	253	
FR-F860-04420-E360 (*1)	442	402	450	400	Ν	337	
FR-F862-05450-E360+ FR-CC2-C355K-60 (*2)	545	496	550	500	P+R	810	
FR-F862-06470-E360+ FR-CC2-C400K-60 (*2)	647	589	650	600	Q+S	920	
FR-F862-08500-E360+ FR-CC2-C560K-60 (*2)	850	773	850	750	Q+S	1126	
lotes:							

These drives MUST be used with a DC Link Choke (sold separately).
 FR-F862 Drives are inverter stage only; use together with FR-CC2-C rectifier stage. Maximum input and output current of FR-CC2 modules is the value shown. COMBINED weight shown.
 The FR-F860 does not include a built-in parameter. The FR-DU08 or FR-LU08 is sold separately.

Model Number	AMPS For Duty		Horsepower For Duty (NEC)		Frame	Weight
	SLD	LD	SLD	LD	Size	(ibs)"
FR-F842-07700-E3U6 + FR-CC2-H355K-60	-	683	-	550	P+R	827
FR-F842-07700-E3U6 + FR-CC2-H400K-60	770	-	650	-	P+S	979
FR-F842-08660-E3U6 + FR-CC2-H400K-60	-	770	-	650	P+S	979
FR-F842-08660-E3U6 + FR-CC2-H450K-60	866	-	700	-	P+S	986
FR-F842-09620-E3U6 + FR-CC2-H450K-60	-	866	-	700	Q+S	1162
FR-F842-09620-E3U6 + FR-CC2-H500K-60	962	-	800	-	Q+S	1168
FR-F842-10940-E3U6 + FR-CC2-H500K-60	-	962	-	800	Q+S	1168
FR-F842-10940-E3U6 + FR-CC2-H560K-60	1094	-	900	-	Q+S	1168
FR-F842-12120-E3U6 + FR-CC2-H560K-60	-	1094	-	900	Q+S	1168
FR-F842-12120-E3U6 + FR-CC2-H630K-60	1212	-	1000	-	Q+S	1168

*Weights of the drive and the CC2 modules are COMBINED Important Note: Drives in shaded area MUST be used together with FR-HEL-H DC Link Choke (sold separately). Weights do not include separate DC Link chokes.

VARIABLE FREQUENCY DRIVES

FEATURES AND ACCESSORIES



Important Note: Drives in shaded area MUST be used together with FR-HEL-H DC Link Choke (sold separately). Weights do not include separate DC Link chokes.

PARAMETER UNITS

VARIABLE FREQUENCY DRIVES



FR-DU08 12-SEGMENT TYPE PARAMETER UNITS (Standard with FR-F800)

User-friendly

- One-touch operation
- Copy/paste parameters
- Removable panel for enclosure door mounting
- Direct panel and external control
- Monitor display
- Alarm indication
- LED one-line display
- 11 indicating lights
- UL Type 1 environment

FR-PU07/BB LCD TYPE PARAMETER UNITS (Optional)

• 4 lines of text

- Numeric buttons for parameter selection
- Battery backup
- Copy/paste parameters
- Removable panel for enclosure door mounting
- Direct panel and external control
- Monitor display
- Alarm indications
- 2 indicating lights
- UL Type 1 environment



FR-LU08 LCD TYPE PARAMETER UNITS (Optional)

- 5 lines of text
- Graph trends
- Start-up wizard
- Real-time clock
- Battery backup
- Copy/paste parameters
- Removable panel for enclosure door mounting

- Direct panel and external control
- Monitor display

MODE SET

PU EXT

- Alarm indication
- 2 indicating lights
- UL Type 1 environment



GENERAL OPTIONS

- AC reactor
- DC reactor
- DC link choke
- Balance reactor
- Line noise filter
- Surge suppressor
- Parameter units (FR-PU07, FR-LU08)
- Parameter unit battery pack
- Brake and resistor units
- Screw terminal block



DC REACTOR (for power supply coordination) FR-HEL-(H)_K



LINE NOISE FILTER FR-BSF01 (for small capacities) FR-BLF



BRAKE UNIT FR-BU2-(H)_K discharging resistor GZG type

GRZG type resistor unit FR-BR-(H)_K MT-BR5-(H)_K

OPTION CARD OPTIONS

Model Number	Description
FR-A8AX	16 Bit Digital Input Card
FR-A8AY	Digital Output / Extended Analog Output Card
FR-A8AR	Relay Output Card
FR-A8ERS-60	A/F800 Series RS-485 Option Card
FR-A8AC	A/F800 120V Control Option
FR-A8AN	F/A800 4-20mA I/O Card
FR-A8NL	A/F800 Series LONWorks Communication Card
FR-A8NC	CC-Link [®] Communications Card
FR-A8NCE	CC-Link IE Communications Card
A8NC-CON	CC-Link Communications Card and Connectors
FR-A8ND	DeviceNet Communications Card
FR-A8NP	Profibus DPV0 Communications Card
A8NDPV1	Profibus DPV1 Communications Card
FR-A8NF	FL-Net Communications Card
A8N-XLT	Multi-protocol RS-485 Communications Card
A8NEIP-2P	EtherNET IP Communications Card
A8NPRT-2P	Profinet Communications Card
A8NECT-2P	EtherCAT [®] Communications Card
A8NETH-2P	Multi-protocol EtherNET Communications Card



FEATURES

ENHANCED CONTROL METHODS

- Volts per hertz (speed control)
- Advanced magnetic flux vector control (fast speed response)
- Real sensorless vector control (fast torque and speed response)

PUMP CLEANING/ -**DE-RAGGING FUNCTION**

The FR-F800 has a function that will remove any foreign object from the impellers of fans or pumps by performing a forward/reverse rotation sequence.





- Pump stir function
- Two PID controllers
- PID output shutoff (sleep) function
- PID automatic switchover function
- Pipe burst detection/ dry run protection
- Pipe soft fill to prevent water hammer
- Water hammer avoidance at stop
- Automatic PID gain tuning
- Direct access to PID setpoint by display



MECHANICAL FAILURE • PREVENTION

The FR-F800-E can store the motor speed/ torque characteristics to monitor the actual motor speed/torque conditions for fast recognition of light or overloaded mechanical issues including:

- Broken fan drive belt
- Motor bearing damage
- Clogged pipes
- Blocked filter





PRE-CHARGE FUNCTION

The FR-F800 performs a function that controls the speed of the pump before enabling the PID controller to avoid water hammering inside the piping.

MULTI-PUMP CONTROL

The FR-F800 controls the flow or pressure of one pump and can add up to 3 additional pumps across the line to maintain the increased flow or pressure demand.



ENERGY SAVINGS AND OPTIMUM **EXCITATION CONTROLS**

- The energy savings function controls the output voltage automatically during constant speed operation to minimize the output power consumption
- The optimum excitation control function controls the output voltage by controlling the excitation current to maximize the motor efficiency

LONGER OUTPUT CABLE LENGTH

- No need for expensive filters or reactors
- Easier to run multiple motors from one drive
- · Easier to mount drives in remote areas that is environment friendly
- Achieve peace of mind and optimum performance by applying with an inverter duty rated monitor

Pr.72 Setting (Carrier Frequency)	FR-A820-00046 (0.4K) FR-A840-00023 (0.4K)X	FR-A820-00077 (0.75K) FR-A840-00038 (0.75K)	FR-A820-00105 (1.5K) or higher FR-A840-00052 (1.5K) or higher
2 (2 kHz) or lower	300 m	500 m	500 m
3 (3 kHz) or higher	200 m	300 m	500 m

CONFORMAL COATED – H2S ENVIRONMENT

- The EB-E800 Series VEDs conform to IEC60721-3-3 class 3C2 levels
- Mitsubishi Electric offers the option of conformal coated bus bars, which are not offered by most of our competitors
- When Mitsubishi Electric is compared to a competitor, ensure the competitor is offering the IEC60721-3-3 class 3C2 because NOT all conformal coating meets this spec

PCB AND BUS BAR COATING

In the FR-A800/F800 Series, the products which have the PCB coating treatment have either a "-60" or "-06" dedicated suffix added to the model name. In the "-06" product, conductor plating is performed in addition to the PCB coating treatment.

FR-F840-00023-2-06 Dedicated Suffix •

Dedicated Sufix	PCB Coating	Plated Conductor
None	Without	Without
-60	With	Without
-06	With	With

FEATURES

DESIGNED FOR HAZARDOUS AND HOT ENVIRONMENTS

3D-vibration analysis is performed to confirm the vibration resistance. The analysis is also useful to find the best layout position and to further improve the product's rigidity. Assuming a hazardous service condition, the product reliability is thoroughly assessed in the design stage. Every effort is made to ensure the best quality of the Mitsubishi Electric VFD.



Resistance against heat is what makes a VFD reliable.

A well-designed heat resistant power module is essential in a reliable VFD. From the power module's design stage, its heat resistance is carefully considered.



BUILT-IN COMMUNICATIONS

Built-in Ethernet and Modbus TCP communications

"DRIVE TO DRIVE" COMMUNICATIONS

Drives can communicate without a separate master controller

APPLICATIONS

- Load sharing
- Multi-pump
- "Cascade starting" multiple motors

CC-LINK IE FIELD NETWORK BASIC

- CC-Link IE Field Basic is Mitsubishi Electric's network for products using the standard built-in 100 Mb/s Ethernet ports
- Does not require dedicated master module
- Easy start-up, easy troubleshoot
- Can be used together with TCP/IP communication
- Connectivity expansion



SAFETY DRIVES

All Mitsubishi Electric drives have 'Safety Capability' – STO / SIL2 / SIL3 / PLe

PLC FUNCTION IN THE VFD

- The FR-F800 built-in 6K step PLC allows user customization
- Avoids the need for separate master
- I/O card can be added to expand the PLC function
- The PLC function can manage external functions
- Ease of programming your custom application







TRACE FUNCTION

Diagnose trip information quickly and easily share critical data for analysis using FR-Configurator2 software

ADVANTAGES

- Fast diagnosis
- Shorter setup times
- Active 24/7
- Permanent record



FAST SET UP

Use a standard USB stick to upload/download parameters into multiple drives

ADVANTAGES

- Fast and simple setup
- Easy to store on-site
- Simple to restore parameter sets
- Give to customers



USB 2.0 (full speed) supported

LONG LIFE AND EASY MAINTENANCE

A long-life cooling fan and a long-life capacitor are incorporated to give the drive a 10-year design life.

Degradation degrees of the main circuit capacitor, control circuit capacitor, and inrush current limit resistor can be monitored for product failure prevention.

PROGRAMMING AND REMOTE CONNECTIVITY

VARIABLE FREQUENCY DRIVES

FR-F800 SPECIFICATIONS

FR-CONFIGURATOR2 DRIVE INTERFACE SOFTWARE

- Parameter read and write
- Ease of parameter programming
- Save parameter list
- Batch monitoring
- Trending
- Test operation
- PLC programming
- Startup wizard
- Fast and easy connectivity



FR-CONFIGURATOR2 MOBILE APP

Wireless access with VFDs from a remote location enables setting or changing of parameters, starting and stopping, and monitoring on the screen of mobile devices. Users can easily monitor the VFD operation by checking data such as the running frequency and status of input and output terminals at a glance in one screen. Wireless communication equipment must be prepared in the system that includes the VFD.







Control Method		Soft-PWM control, high carrier frequency PWM control (selectable among V/F control (Optimum excitation control), Advanced magnetic flux vector control (Advanced optimum excitation control) 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		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	0.01Hz	
Frequency	Analog Input	(25°C ±10°C)	
Accuracy Digital Input		Within 0.01% of the set output frequency	
Voltage / Fi Characteris	equency tics	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	Induction Motor	120% 0.5 Hz (Advanced magnetic flux vector control)	
Torque	IPM Motor	50%	
Torque Boo	st	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 (Induction I	n Brake Notor)	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)	
Frequency	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.	
Signal Digital Input		Input using the setting dial of the operation panel or the 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 Signal		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.180 (Input terminal function selection)	
Pulse Train	Input	100kpps	
Puise Train input		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, 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, Ethernet communication, PID control, PID pre-charge function, cooling fan operation selection, stop selection (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 Signals	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 (FM Type)	50 kpps	
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For Meter Operation Panel (FR-DU08)		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 frequency) The monitored item can be changed using Pr.54 FM/CA terminal function selection.	
		Voltage Output	Max. 10 VDC: one terminal (output frequency) The monitored item can be changed using Pr.158 AM terminal function selection.	
		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.	
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Protective / Warning Function		Warning Function	Jvear/month/date/time) are saved. 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, Brake transistor alarm detection(*1), Output side earth (ground) fault overcurrent, Output side earth (ground) fault overcurrent, Output short circuit, 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, 24 VDC power fault, Abnormal output (*2), Analog input fault, USB communication fault, Safety circuit fault, Verspeed occurrence (*2), 4 mA input fault (*2), Pre-charge fault (*2), PID signal fault (*2), Internal circuit fault, User definition error in the PLC function. Fan alarm, Stall prevention (overcurrent), Stall prevention (overvoltage), Regenerative brake pre-alarm (*1, *2), 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 fault, Ethernet communication fault,	
Aml	pient Ter	nperature	-10°C to +50°C (non-freezing) (LD rating)	
Ambient Humidity		midity	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)	
Stor	age Ten	nperature (*3)	-20°C to +65°C	
Atm	osphere		Indoors (without corrosive gas, flammable gas,	
Alti	tude / Vi	bration	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)	
Atm Altii otes: Availa This p Tempe For th	ble only for rotective f erature app e installati	bration or the standard model. function is not available plicable for a short tim on at an altitude above	oil mist, dust and dirt, etc.) 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) e in the initial status. e, e.g. in transit. 1,000 m (up to 2,500 m),	

derate the rated current 3% per 500 m.

5. 2.9 m/s² or less for the FR-F840-04320(185K) or higher.



FRAME DIMENSIONS, WARRANTY, AND CERTIFICATIONS

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FRAME DIMENSIONS 200V, 400V, 600V DRIVES

FR-F800-E	Frame	Height	Width	Depth
Model Number	Size	Dimensions	Inches	; (mm)
FR-F820-00046 (N6)	A	12.2 (310) 10.24 (260) w/o conduit box	4.33 (110)	4.41 (112)
FR-F820-00077 (N6)	В	12.2 (310) 10.24 (260) w/o conduit box	4.33 (110)	5.00 (127)
FR-F820-00105, 00167, 00250 (N6) FR-F840-00023, 00038, 00052, 00083, 00126 (N6) FR-F860-00027, 00061, 00090 (N6)	С	12.52 (318) 10.24 (260) w/o conduit box	5.91 (150)	5.51 (140)
FR-F820-00340, 00490 (N6) FR-F840-00170, 00250 (N6) FR-F860-00170 (N6)	D	12.76 (324) 10.24 (260) w/o conduit box	8.66 (220)	6.69 (170)
FR-F820-00630 (N6) FR-F840-00310, 00380 (N6) FR-F860-00320 (N6)	E	14.29 (363) 11.81 (300) w/o conduit box	8.66 (220)	7.48 (190)
FR-F820-00770, 00930, 01250 (N6) FR-F840-00470, 00620 (N6) FR-F860-00450 (N6)	F	20.37 (517) 15.75 (400) w/o conduit box	9.84 (250)	7.48 (190)
FR-F820-01540 FR-F840-00770	G	21.65 (550)	12.80 (325)	7.68 (195)
FR-F820-01870, 02330 FR-F840-00930, 01160, 01800 FR-F860-00680, 01080	н	21.65 (550)	17.13 (435)	9.84 (250)
FR-F840-02160, 02600 FR-F860-01440, 01670, 02430	J	24.41 (620)	18.31 (465)	11.81 (300)
FR-F820-03160	К	27.56 (700)	18.31 (465)	9.84 (250)
FR-F820-03800, 04750 FR-F840-03250, 03610	L	29.13 (740)	18.31 (465)	14.17 (360)
FR-F840-04320, 04810 FR-F860-02890, 03360	М	39.76 (1010)	19.61 (498)	14.96 (380)
FR-F840-05470, 06100, 06830 FR-F860-04420	N	39.76 (1010)	26.77 (680)	14.96 (380)
FR-F842-07700, 08660 FR-F862-05450	Р	52.36 (1330)	21.26 (540)	17.32 (440)
FR-F842-09620, 10940, 12120 FR-F862-06470, 08500	Q	62.20 (1580)	26.77 (680)	17.32

	Frame	Height	Width	Depth
FR-CC2 Model Number	Size	Dimensions	Inches	(mm)
FR-CC2-H315K, H355K, C355K	R	52.36 (1330)	23.62 (600)	17.32 (440)
FR-CC2-H400K, H450H, H500K H560K, H630K, C400K, C560K	S	62.20 (1580)	23.62	17.32

WARRANTY

- FR-F800 extended to 5 years with startup performed through a certified Drives Startup Partner
- FR-F800 has an industry unmatched 0.000045% failure rate

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