

# FRENIC-ECO Series

FRENIC



# ECO

FUJI INVERTERS

GREAT PERFORMANCE THROUGH DEDICATED DESIGNS  
WELCOME TO THE NEW GENERATION  
OF HVAC INVERTER

# FRENIC-ECO Series Concepts



Best suited functions for  
HVAC application

Contribution to energy-saving

A broad range of model variations

Easy maintenance

Simple operation

Global products

## The HVAC Inverter FRENIC-ECO Series

**FRENIC-ECO** is an inverter exclusively designed for fans and pumps.  
Developed by Fuji Electric, a leading inverter company, to meet global needs for economy.

Features such as the special functions for the HVAC (Heating, Ventilating, and Air-Conditioning) market, space saving, simple operation, a wide variety of models and global compatibility contribute to energy-savings and power-savings for variable torque load equipment.

Requirements for total cost reduction in the fan and pump can be easily met with the FRENIC-Eco.



## Default functions for fans and pumps

### ● Line/inverter switching

A line frequency starting program for the inverter is installed to support line/inverter switching through an external sequence. As well, two types of line/inverter operation switching sequences are built in: Fuji's standard sequence and automatic line switching sequence at an inverter fault.

### ● Full PID control functions

A "small water flow stopping function" and "deviation alarm/absolute value alarm output" are added to the PID regulator that controls the temperature, pressure, flow rate and so on. Further, an anti-reset wind-up function for the prevention of overshooting in the PID control, PID output limiter and integration hold/reset signals are provided as easy-to-adjust PID control functions.

### ● Continued operation upon momentary power failure

The inverter automatically restarts upon recovery from momentary power failure. You can choose starting at the frequency at momentary power failure occurrence or starting at 0Hz. Another option can be chosen: Operation continues at a lower frequency while using the kinetic energy obtained from the inertia of the load at momentary power failure.

### ● Switching among remote/panel/independent inverter operation modes

Through frequency setting 1 and frequency setting 2, operation/stop command 1 and operation/stop command 2, and local operation (keypad operation), the remote/panel/independent inverter operation modes can be selected for both operation commands and frequency commands.

### ● Various frequency setting methods

The best method can be selected for the frequency setting according to the frequency signal to be used.

Keypad operation (▲ and ▼ keys), analog input (4 to 20mA, 0 to +5V, 0 to +10V, +1 to +5, normal or inverse operation), 8-step multi-step frequency (step 0 to 7) setting, UP/DOWN operation, communication, etc.

### ● Motor pick-up during idling

If the motor runs due to natural convection or other similar situations, you can use the pick-up function to start smoothly.

### ● Sleep function with low limiter

A function for stopping the fan or pump at speeds lower than the lower limit is provided to assure the minimum speed. The function can be used also to stop at a low water flow.



## Contribution to energy-saving

### ● Automatic energy-saving operation function

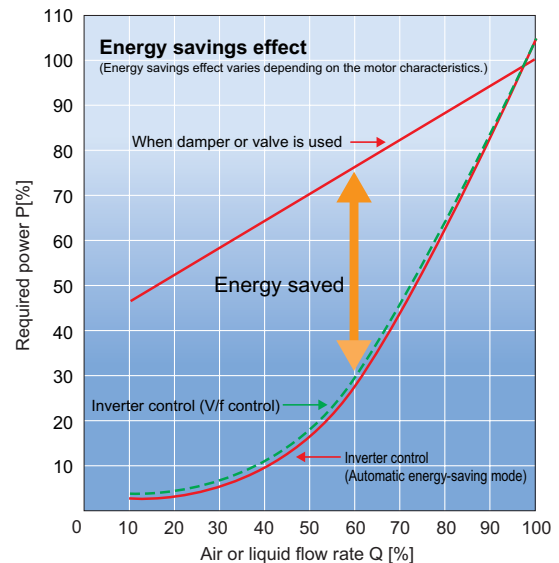
In addition to the motor loss, the inverter loss is also kept to a minimum with the FRENIC-Eco when applied to fans or pumps.

### ● Capable of electric power monitoring

Simplified monitoring of the electric power can be done through the keypad and the communication ports (power consumption, cumulative watt-hour display, watt-hour application display, etc.)

### ● Cooling fan ON/OFF control function

The inverter's cooling fan can be stopped for noise reduction and energy savings whenever the motor is stopped.



### Safety Precautions

1. Use the contents of this catalog only for selecting product types and models. When using a product, read the Instruction Manual beforehand to use the product correctly.
2. Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives. Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, and traffic control, are requested to consult the Fuji's Sales Division. Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.



## Consideration for surrounding environment

### ● Semi-standard series integrated with DC REACTOR (available soon)

In this series, the Guideline for Suppressing Harmonics can be satisfied by integrating optional DC REACTOR (DCR) for harmonic suppression. (55kW or smaller [planned])

### ● All models are equipped with an inrush current suppression circuit.

An inrush current suppression circuit is provided as standard in all models, therefore the cost of peripheral devices such as magnetic switches can be reduced.

### ● Semi-standard series integrated with EMC filter (available soon)

The product can be used to comply with the EMC Directives in EU. (15kW or smaller [planned])

### ● Standard installation of input terminals for auxiliary control power of all models

The terminal is convenient for automatic line/inverter switching operation as the control power of the inverter is standardized.



## Easy maintenance and many protective functions

### ● The lifetime of the main circuit capacitor can be estimated.

Because the capacitor's life compared with its initial value can be checked, the replacement timing of the main circuit capacitor can be determined.

### ● A long-life cooling fan is provided.

Use of a long-life cooling fan (design life: 7 years for models smaller than 5.5kW); 4.5 years for models higher than 7.5 and up to 30kW [at ambient temperature: 40°C]) reduces replacement work.

### ● Cumulative running time is recorded and displayed.

The inverter records and displays the cumulative "motor running time" and "inverter running time" (PC board capacitor running time, cooling fan running time), so that they can be used to determine machine and inverter maintenance.

### ● It is possible to output lifetime forecast signal to the transistor output.

This signal is output when the main circuit capacitors in the DC bus circuit, the electrolytic capacitors on the PC boards or the cooling fans are nearing the end of their service life.

### ● The alarm history for the 4 latest alarms is recorded.

Detailed information from back as far as the latest 4 alarms can also be checked.

### ● Protective function against phase loss in input/output

Protection against phase loss in input/output circuits is possible upon start-up and operation.

### ● Protective function for grounding fault

Protection is provided for an overcurrent caused by a grounding fault.

### ● Protection of motor with PTC thermistor

In addition to the protection of the motor with an electronic thermal relay, a PTC thermistor can be used for motor protection.



## Simple operation and wiring

### ● Standard keypad capable of remote operation

The optional extension cable allows easy remote operation. Data can be easily copied to the second or more inverters with the code copying function.

### ● Quick setup function

Only the 19 minimum function codes are displayed to set up drives for fan or pump applications.

### ● Multi-function keypad (option; available soon)

A backlit LCD is installed to allow simple set up through interactive data entry. Function codes can be added or deleted to or from the 19 function codes within the quick setup function.



## Global products

- All standard models comply with the EC Directive (CE marking), UL standards and Canadian standards (cUL certification).

All standard FRENIC-Eco inverters comply with European and North American/Canadian standards, enabling standardization of the specifications for machines and equipment used at home and abroad.

- If the model with built-in EMC filter (available soon) is used, the model conforms to the European EMC Directive (15kW or smaller).

Europe / EC

Directive (CE marking)



North America/Canada

UL standard (cUL certification)



- Sink/source switching

The input/output mode (sink/source) of the digital input terminals can be easily switched.

- Network support (available soon)

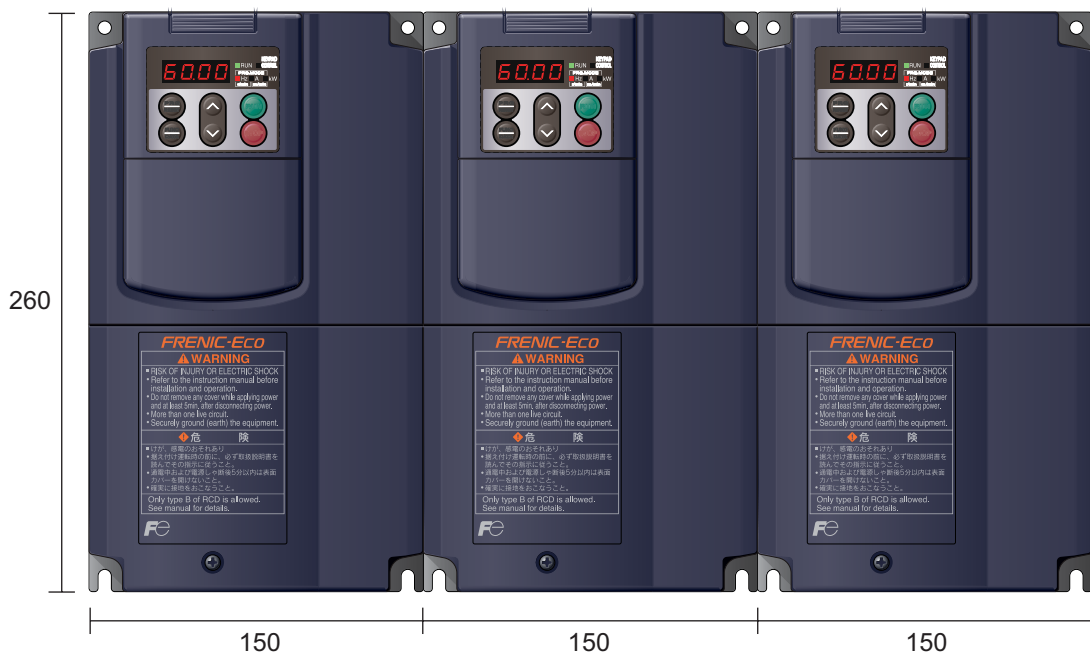
With an optional card, the inverter becomes compatible with various open buses such as DeviceNet, PROFIBUS-DP, LonWorks network, Modbus Plus or CC-Link. A standard RS485 communication port (Modbus RTU) is provided. With an additional RS485 communication card (optional), up to two more ports can be installed.



## Space saving

- Side-by-side mounting is possible.

When multiple inverter units are installed inside a panel, the installation space can be minimized. (5.5kW or less, ambient temperature: 40°C or less)



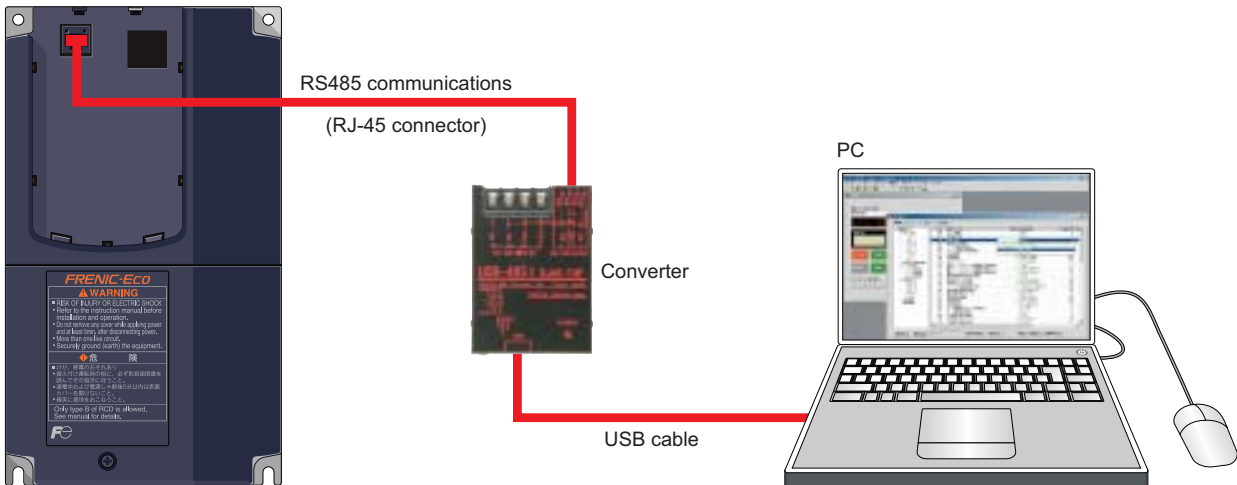
(Unit : mm)

(Ex.: 3-phase 200V 5.5kW)

## Flexible through optionals

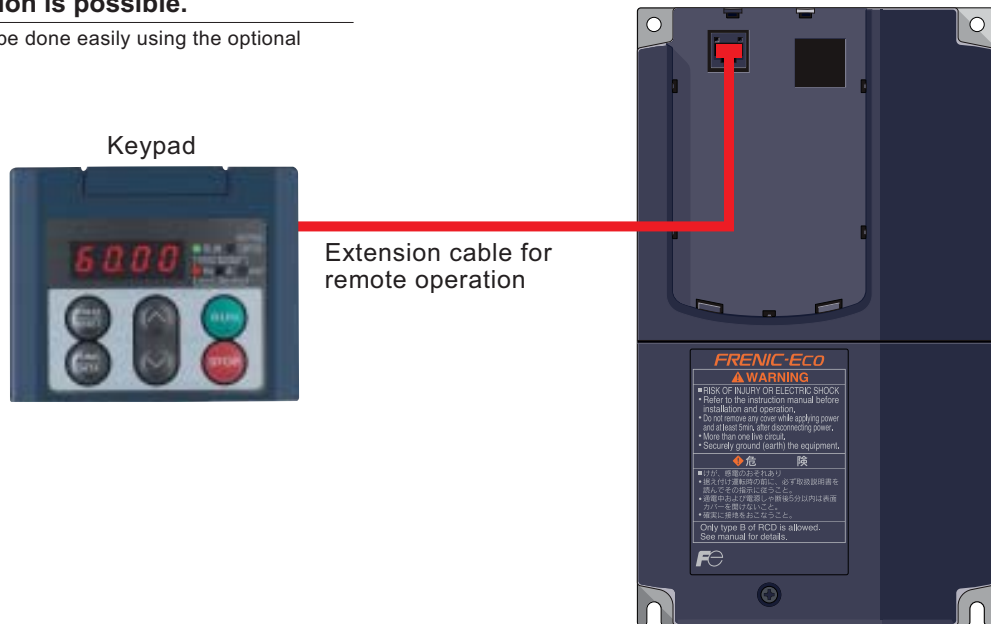
### ● Inverter loader software (option; available soon)

The inverter loader program (Windows-based, option), which simplifies setting of function codes, and data management, is provided.



### ● Remote operation is possible.

Remote operation can be done easily using the optional extension cable.



### ● Function code copy function

Because the optional multi-function keypad (available soon) is provided with a built-in copy function, similar to that installed in the main body as a standard feature, data can be easily copied to the second inverters without requiring individual setups.

### ● External cooling attachment

An external cooling attachment (Option for 30kW or smaller ; available soon. Standard for 37kW or larger) cools the inverter outside the panel. It can be easily mounted on the panel.



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## Standard specifications

Applicable motor rating [kW]	Three-phase 200V series	Three-phase 400V series
0.75	FRN0.75F1S-2A	FRN0.75F1S-4A
1.5	FRN1.5F1S-2A	FRN1.5F1S-4A
2.2	FRN2.2F1S-2A	FRN2.2F1S-4A
3.7	FRN3.7F1S-2A	FRN3.7F1S-4A
5.5	FRN5.5F1S-2A	FRN5.5F1S-4A
7.5	FRN7.5F1S-2A	FRN7.5F1S-4A
11	FRN11F1S-2A	FRN11F1S-4A
15	FRN15F1S-2A	FRN15F1S-4A
18.5	FRN18.5F1S-2A	FRN18.5F1S-4A
22	FRN22F1S-2A	FRN22F1S-4A
30	FRN30F1S-2A	FRN30F1S-4A
37	FRN37F1S-2A	FRN37F1S-4A
45	FRN45F1S-2A	FRN45F1S-4A
55	FRN55F1S-2A	FRN55F1S-4A
75	FRN75F1S-2A	FRN75F1S-4A
90	FRN90F1S-2A	FRN90F1S-4A
110	FRN110F1S-2A	FRN110F1S-4A
132		FRN132F1S-4A
160		FRN160F1S-4A
200		FRN200F1S-4A
220		FRN220F1S-4A
280		FRN280F1S-4A
315		FRN315F1S-4A
355		FRN355F1S-4A
400		FRN400F1S-4A
450		FRN450F1S-4A
500		FRN500F1S-4A

  Available soon

## How to read the model number

# FRN 5.5 F 1 S - 2 A 5 1 1

Code	Series name
FRN	FRENIC series

Code	Applicable motor rating [kW]
0.75	0.75kW
1.5	1.5kW
2.2	2.2kW
3.7	3.7kW
5.5	5.5kW
7.5	7.5kW
11	11kW
15	15kW
∫	∫
450	450kW
500	500kW

Code	Application range
F	For fans and pumps Multi-function keypad (For variable torque load)

Code	Developed inverter series
1	1

Code	Control terminal block
1	Screw terminal (standard)
2	Rod terminal

Code	Built-in option
1	None
2	RS485 communication card

Code	Keypad
1	Keypad (standard)
5	Multi-function keypad (Available soon)
9	No keypad

Code	Version/Manual
A	Asia/English

Code	Input power supply
2	3-phase 200V
4	3-phase 400V

Code	Structure
S	Standard type
E	Type integrated with EMC filter
H	Type integrated with DC REACTOR

Note : When the last three digits of the model number is for a keypad (standard), non built-in option, screw terminal (standard), the model number with a standard specification in the above model number table will apply.

# Standard specifications

## Standard specifications

The HVAC Inverter **FRENIC-ECO**

### Three-phase 200V series

Item		Specifications																		
<b>Type (FRN□□□F1S-2A)</b>		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110		
<b>Applicable motor rating *1)</b>		<b>kW</b>	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 ratings	<b>Rated capacity *2)</b>	<b>kVA</b>	1.6	2.6	3.8	6.2	8.3	11	16	21	25	30	40	49	59	75	102	121	146	
	<b>Rated voltage *3)</b>	<b>V</b>	Three-phase, 200V/50Hz, 200, 220, 230, 240V/60Hz (With AVR function)																	
	<b>Rated current *4)</b>	<b>A</b>	4.2	7.0	10	16.5	22.5	29	42	55	68	80	107	130	156	198	270	320	384	
	<b>Overload capability</b>		120% of rated current for 1min																	
	<b>Rated frequency</b>		50, 60Hz																	
	Input ratings	<b>Phases, voltage, frequency</b>	<b>Main power supply</b>	Three-phase, 200 to 240V, 50/60Hz										Three-phase, 200 to 220V/50Hz Three-phase, 200 to 230V/60Hz						
<b>Auxiliary control power input</b>			Single-phase, 200 to 240V, 50/60Hz										Single-phase, 200 to 220V/50Hz Single-phase, 200 to 230V/60Hz							
<b>Voltage/frequency variations</b>		Voltage: +10 to -15% (Voltage unbalance: 2% or less (*8)), Frequency: +5 to -5%																		
<b>Rated current *5)</b>		<b>A</b>	<b>(with DCR)</b>	3.2	6.1	8.9	15.0	21.1	28.8	42.2	57.6	71.0	84.4	114	138	167	203	282	334	410
			<b>(without DCR)</b>	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80.1	97.0	112	151	185	225	270	—	—	—
<b>Required power supply capacity *6)</b>	<b>kVA</b>	1.2	2.2	3.1	5.3	7.4	10	15	20	25	30	40	48	58	71	98	116	142		
Braking	<b>Torque *7)</b>	<b>%</b>	20										10 to 15							
	<b>DC injection braking</b>		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 60%																	
<b>DC REACTOR(DCR)</b>			Option												Standard					
<b>Applicable safety standards</b>			UL508C, C22.2No.14, EN50178:1997(Applying)																	
<b>Enclosure(IEC60529)</b>			IP20 UL close type										IP00 UL open type							
<b>Cooling method</b>			Natural cooling			Fan cooling														
<b>Weight / Mass</b>		<b>kg</b>					3.3	5.6	6.6	9.3	9.5	11.7	23	31	34	41				

\*1) Fuji's 4-pole standard motor

\*2) Rated capacity is calculated by assuming the output rated voltage as 220V for three-phase 200V series.

\*3) Output voltage cannot exceed the power supply voltage.

\*4) When setting the carrier frequency (F26) to 1 kHz, reduce the load to 80% of its rated value.

\*5) Calculated under Fuji-specified conditions.

\*6) Obtained when a DC REACTOR is used.

\*7) Average braking torque without optional braking resistor (Varies with the efficiency of the motor.)

\*8) Voltage unbalance [%] =  $\frac{\text{Max. voltage [V]} - \text{Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$  (IEC61800-3(5.2.3))

If this value is 2 to 3%, use an AC REACTOR.

## Standard specifications

## The HVAC Inverter FRENIC-Eco

### Three-phase 400V series (0.75 to 55kW)

Item		Specifications														
Type (FRN□□□F1S-4A)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	
Applicable motor rating *1)		kW														
Rated capacity *2)		kVA														
Rated voltage *3)		V														
Rated current *4)		A														
Overload capability		120% of rated current for 1min														
Rated frequency		50, 60Hz														
Input ratings	Phases, voltage, frequency	Main power supply	Three-phase, 380 to 480V, 50/60Hz											Three-phase, 380 to 440V/50Hz Three-phase, 380 to 480V/60Hz		
		Auxiliary control power input	Single-phase, 380 to 480V, 50/60Hz											Single-phase, 380 to 440V/50Hz Single-phase, 380 to 480V/60Hz		
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance: 2% or less (*8)), Frequency: +5 to -5%													
	Rated current *5)	A	(with DCR)	1.6	3.0	4.5	7.5	10.6	14.4	21.1	28.8	35.5	42.2	57.0	68.5	83.2
(without DCR)			3.1	5.9	8.2	13.0	17.3	23.2	33.0	43.8	52.3	60.6	77.9	94.3	114	140
Required power supply capacity *6)		kVA														
Braking	Torque *7)	%											10 to 15			
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 60%													
DC REACTOR(DCR)		Option														
Applicable safety standards		UL508C, C22.2No.14, EN50178:1997(Applying)														
Enclosure (IEC60529)		IP20 UL close type										IP00 UL open type				
Cooling method		Natural cooling							Fan cooling							
Weight / Mass		kg														

### Three-phase 400V series (75 to 500kW)










Item		Specifications														
Type (FRN□□□F1S-4A)		75	90	110	132	160	200	220	280	315	355	400	450	500		
Applicable motor rating *1)		kW														
Rated capacity *2)		kVA														
Rated voltage *3)		V														
Rated current *4)		A														
Overload capability		120% of rated current for 1min														
Rated frequency		50, 60Hz														
Input ratings	Phases, voltage, frequency	Main power supply	Three-phase, 380 to 440V, 50Hz Three-phase, 380 to 480V, 60Hz													
		Auxiliary control power input	Single-phase, 380 to 480V, 50/60Hz													
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance: 2% or less (*8)), Frequency: +5 to -5%													
	Rated current *5)	A	(with DCR)	138	164	201	238	286	357	390	500	559	628	705	789	881
(without DCR)			—	—	—	—	—	—	—	—	—	—	—	—	—	
Required power supply capacity *6)		kVA														
Braking	Torque *7)	%														
	DC injection braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 60%													
DC REACTOR(DCR)		Standard														
Applicable safety standards		UL508C, C22.2No.14, EN50178:1997(Applying)														
Enclosure (IEC60529)		IP00 UL open type														
Cooling method		Fan cooling														
Weight / Mass		kg														

\*1) Fuji's 4-pole standard motor  
 \*2) Rated capacity is calculated by assuming the output rated voltage as 440V for three-phase 400V series.  
 \*3) Output voltage cannot exceed the power supply voltage.  
 \*4) When setting the carrier frequency (F26) to 1 kHz, reduce the load to 80% of its rated value.  
 \*5) Calculated under Fuji-specified conditions.  
 \*6) Obtained when a DC REACTOR is used.  
 \*7) Average braking torque without optional braking resistor (Varies with the efficiency of the motor.)  
 \*8) Voltage unbalance [%] =  $\frac{\text{Max. voltage [V]} - \text{Min. voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$  (IEC61800-3(5.2.3))  
 If this value is 2 to 3%, use an AC REACTOR.

# Common specifications

## Common specifications

The HVAC Inverter FRENIC-ECO

	Item	Explanation	Remarks	Related function code	
Output frequency	Setting range				
	Maximum frequency	25 to 120Hz		F03	
	Base frequency	25 to 120Hz		F04	
	Starting frequency	0.1 to 60.0Hz		F23	
	Carrier frequency	<ul style="list-style-type: none"> <li>• 0.75 to 15kHz (200V/400V:0.75 to 22kW)</li> <li>• 0.75 to 10kHz (200V/400V:30 to 75kW)</li> <li>• 0.75 to 6kHz (200V/400V:90 to 500kW)</li> </ul>	The carrier frequency may drop automatically according to the ambient temperature or output current to protect the inverter. This protective operation can be canceled by function code H98.	F26 F27 H98	
	Accuracy (Stability)	<ul style="list-style-type: none"> <li>• Analog setting: <math>\pm 0.2\%</math> of maximum frequency (at <math>25 \pm 10^\circ\text{C}</math>)</li> <li>• Keypad setting: <math>\pm 0.01\%</math> of maximum frequency (at <math>-10</math> to <math>+50^\circ\text{C}</math>)</li> </ul>			
Setting resolution	<ul style="list-style-type: none"> <li>• Analog setting: 1/1000 of maximum frequency (ex. 0.06Hz at 60Hz, 0.12Hz at 120Hz)</li> <li>• Keypad setting: 0.01Hz (99.99Hz or less), 0.1Hz (100.0Hz or more)</li> <li>• Link setting: Selectable from 2 types-                             <ul style="list-style-type: none"> <li>• 1/20000 of maximum frequency (ex. 0.003Hz at 60Hz, 0.006Hz at 120Hz)</li> <li>• 0.01Hz (fixed)</li> </ul> </li> </ul>	Setting with   keys.			
Control method	V/f control				
Control	Voltage/freq. characteristic	Possible to set output voltage at base frequency and at maximum output frequency (common spec.). AVR control can be turned ON or OFF.	Three-phase 200V: 80 to 240V Three-phase 400V: 160 to 500V	F03 to F05	
	(Non-linear V/f setting)	1 point (Arbitrary voltage and frequency can be set.)	Three-phase 200V: 0 to 240V/0 to 120Hz Three-phase 400V: 0 to 500V/0 to 120Hz	H50, H51	
	Torque boost	Torque boost can be set with the function code F09.	Set when 0, 1, 3, or 4 is selected at F37.	F09, F37	
	(Load selection)	Select application load type with the function code F37. 0: Variable torque load 1: Variable torque load (for high starting torque) 2: Auto-torque boost 3: Auto-energy-saving operation (variable torque load in acceleration/deceleration) 4: Auto-energy-saving operation (variable torque load (for high starting torque) for acceleration/deceleration) 5: Auto-energy-saving operation (auto-torque boost in acceleration/deceleration)		F09, F37	
	Starting torque	50% or over			
	Start/stop	Keypad operation	Start (FWD/REV) and stop with   keys	Keypad (standard)	F02
			Start and stop with    keys	Multi-function keypad (optional)	F02
		External signals (7 digital inputs): Forward (reverse) rotation, stop command (capable of 3-wire operation), second operation command, coast-to-stop command, external alarm, alarm reset, etc.			E01 to E05 E98, E99
		Link operation: Operation through RS485 communication and Field Bus communication (option) Operation command switch: Remote/local switch, link switch, second operation command switch			H30, y98
	Frequency setting	Keypad operation: Can be set with   keys.			F01, C30
External potentiometer: Can be set with the external resistor (1 to 5k $\Omega$ , 1/2W)		Connected to analog input terminals 13, 12, 11. A separate variable resistor is necessary.			
Analog input		Can be set with external voltage/current input. 0 to +10V DC (0 to +5V DC)/0 to 100% (terminal 12, V2) 4 to 20mA DC/0 to 100% (terminal C1)	0 to +5V DC: change (200%) in analog input gain setting. +1 to +5V DC: adjustable with bias/analog input gain	F18, C50, C32 to C34, C37 to C39, C42 to C44	
Multistep frequency: Selectable from 8 steps (step 0 to 7)			C05 to C11		
UP/DOWN operation: The frequency rises or lowers while the digital input signal is turned on.			F01, C30		
Link operation: Can be set with RS485 communications and field bus communications (option).			H30, y98		
Frequency setting change: Two types of frequency settings can be switched with an external signal (digital input). Changeover between remote and local (keypad operation) or frequency setup through communication is also possible.			F01, C30		
Auxiliary frequency setting: Inputs at terminal 12, C1 or V2 can be added to the main setting as auxiliary frequency settings.			E61 to E63		
Reverse action: The digital input signal and function code setting sets or switches between the forward and reverse actions. • +10 to 0V DC/0 to 100%(Terminal 12, V2) • 20 to 4mA DC/0 to 100%(Terminal C1)		C53			
Acceleration / deceleration time	0 to 3600s • Acceleration and deceleration pattern can be selected from 4 types: Linear, S-curve (weak), S-curve (strong), Curve (constant output max. capacity). • Shutoff of the operation command coasts the motor to decelerate and stop.		F07, F08 H07 H11		
Frequency limiter	High and low limiters can be set (setting range: 0 to 120Hz)	Selection can be made between continuation of operation and stopping at frequencies equal to or smaller than the lower limit.	F15, F16 H63		
Bias frequency	Bias of set frequency and PID command can be set in the range between 0 and $\pm 100\%$ .		F18, C50 to C52		
Gain for frequency setting	The analog input gain can be set in the range from 0 to 200%.	Voltage signals (terminal 12, V2) and current signal (terminal C1) can be set independently.	C32, C34, C37 C39, C42, C44		
Jump frequency setting	3 operation points and their common jump hysteresis width (0 to 30Hz) can be set.		C01 to C04		
Restart after momentary power failure	<ul style="list-style-type: none"> <li>• The inverter restarts upon recovery from power failure without stopping the motor.</li> <li>• In the "operation continuation mode," recovery of the power supply is waited for while the output frequency slightly drops.</li> <li>• Selection can be made among starting at 0Hz, starting at the frequency immediately before the momentary power failure, and starting at a set frequency for the starting method after power recovery.</li> </ul>		F14 H13 to H16, H92, H93		
Current limit	Keeps the current under the preset value during operation.		F43, F44		
Line/inverter switching	<ul style="list-style-type: none"> <li>• Line/inverter switching (starting at line frequency) can be made with a digital input signal (SW50, SW60).</li> <li>• A built-in line/inverter switching sequence performs sequence control with a digital input signal (ISW50, ISW60) to output a signal (SW88, SW52-1, SW52-2) for controlling an external magnetic contactor (MC). As a built-in sequence, two types can be selected, including the one switching automatically to the line upon an inverter alarm.</li> </ul>		J22		
PID control	Capable of PID regulator control for process			E61 to E63 J01 to J06 J10 to J19	
	Process commands <ul style="list-style-type: none"> <li>• Key operation (UP and DOWN keys): 0 to 100%</li> <li>• Analog input (terminal 12, V2): 0 to +10V DC/0 to 100%</li> <li>• Analog input (terminal C1): 4 to 20mA DC/0 to 100%</li> <li>• UP/DOWN (digital input): 0 to 100%</li> <li>• Communication (RS485, bus option): 0 to 20,000/0 to 100</li> </ul>				



## Common specifications

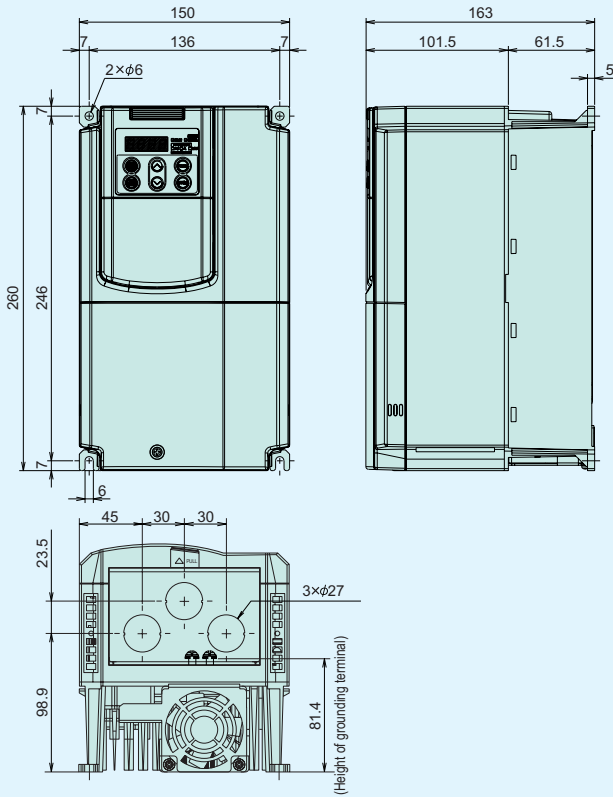
## The HVAC Inverter FRENIC-Eco

	Item	Explanation	Remarks	Related function code		
Control	PID control	Feedback value • Analog input (terminal 12, V2): 0 to +10V DC/0 to 100% • Analog input (terminal C1): 4 to 20mA DC/0 to 100% Accessory functions • Alarm output (absolute value alarm, deviation alarm) • Normal operation/inverse operation • Small water flow stoppage function • Anti-reset wind-up function • PID output limiter • Integration reset/hold		E61 to E6 J01 to J06 J10 to J19		
	Pick-up	Operation begins at a preset pick-up frequency to search for the motor speed to start an idling motor without stopping it.		H09, H17		
	Automatic deceleration	Upon a DC link voltage exceeding the overvoltage limit level during deceleration, the deceleration time automatically extends to avoid an OV trip.		H69		
	Deceleration characteristic	The motor loss increases during deceleration to reduce the load energy regenerating at the inverter to avoid an OV trip upon mode selection.		H71		
	Automatic energy-saving operation	The output voltage is controlled to minimize the total sum of the motor loss and inverter loss at a constant speed.		F37		
	Active drive	The output frequency is automatically reduced to suppress the overload protection trip of the inverter caused by an increase in the ambient temperature, operation frequency, motor load or the like.		H70		
	Auto-tuning	The motor parameters are automatically tuned.		P04		
	Cooling fan ON/OFF control	Detects inverter internal temperature and stops cooling fan when the temperature is low.	An external output is issued in a transistor output signal.	H06		
Indication	Running/stopping	• Speed monitor, output current [A], output voltage [V], torque calculation value, input power [kW], PID reference value, PID feedback value, PID output, load factor, motor output • Select the speed monitor to be displayed from the following. Output frequency [Hz], motor speed [r/min.], load shaft speed [r/min.], % indication		E43 E48		
	Life early warning	The life early warning of the main circuit capacitors, capacitors on the PC boards and the cooling fan can be displayed.	An external output is issued in a transistor output signal.			
	Cumulative run hours	The cumulative motor running hours, cumulative inverter running hours and cumulative watt-hours can be displayed.				
	Trip mode	Displays the cause of trip by codes. • <b>OC 1</b> (Overcurrent during acceleration) • <b>OC 2</b> (Overcurrent during deceleration) • <b>OC 3</b> (Overcurrent at constant speed) • <b>EF</b> (Grounding fault) • <b>LU</b> (Input phase loss) • <b>LU</b> (Undervoltage) • <b>OP 1</b> (Output phase loss) • <b>OU 1</b> (Overvoltage during acceleration) • <b>OU 2</b> (Overvoltage during deceleration) • <b>OV 3</b> (Overvoltage at constant speed) • <b>OH 1</b> (Overheating of the heat sink) • <b>OH 2</b> (External alarm) • <b>OH 3</b> (Inverter overheat) • <b>OH 4</b> (Motor protection (PTC thermistor)) • <b>OL 1</b> (Motor overload) • <b>OL 2</b> (Inverter overload) • <b>FUS</b> (Blown fuse) • <b>PBF</b> (Charging circuit fault) • <b>Er 1</b> (Memory error) • <b>Er 2</b> (Keypad communication error) • <b>Er 3</b> (CPU error) • <b>Er 4</b> (Optional communication error) • <b>Er 5</b> (Option error) • <b>Er 6</b> (Incorrect operation error) • <b>Er 7</b> (Tuning error) • <b>Er 8</b> (RS485 communication error) • <b>Er F</b> (Data save error due to undervoltage) • <b>Er P</b> (RS485 communication error (option))				
	Running or trip mode	Trip history: Saves and displays the last 4 trip codes and their detailed description.				
	Overcurrent protection	The inverter is stopped upon an overcurrent caused by an overload.				
	Short circuit protection	The inverter is stopped upon an overcurrent caused by a short circuit in the output circuit.				
	Grounding fault protection	The inverter is stopped upon an overcurrent caused by a grounding fault in the output circuit.				
	Overvoltage protection	An excessive DC link circuit voltage is detected to stop the inverter.	3-phase 200V / 400VDC 3-phase 400V / 800VDC			
	Surge protection	The inverter is protected against surge voltages intruding across the main circuit power cable and ground.				
Protection	Undervoltage	Stops the inverter by detecting voltage drop in DC link circuit.	3-phase 200V / 200VDC 3-phase 400V / 400VDC	F14		
	Input phase loss	Stops or protects the inverter against input phase loss.	The protective function can be canceled with function code 99.	H98		
	Output phase loss	Detects breaks in inverter output wiring at the start of running and during running, stopping the inverter output.	The protective function can be canceled with function code 99.	H98		
	Overheating	The temperature of the heat sink of the inverter or that inside the inverter unit is detected to stop the inverter, upon a failure or overload of the cooling fan.				
	Overload	The inverter is stopped upon the temperature of the heat sink of the inverter or the temperature of the switching element calculated from the output current.				
	Motor protection	Electronic thermal	The inverter is stopped upon an electronic thermal function setting to protect the motor.	Thermal time constant can be adjusted (0.5 to 75.0min.).	F10 to F12, P99	
		PTC thermistor	A PTC thermistor input stops the inverter to protect the motor.		H26, H27	
		Overload early warning	Warning signal can be output based on the set level before the inverter trips.		F10, F12, E34, E35, P99	
	Stall prevention	The output frequency decreases upon an output current exceeding the limit during acceleration or constant speed operation, to avoid overcurrent trip.				
	Momentary power failure protection	• A protective function (inverter stoppage) is activated upon a momentary power failure for 15msec or longer. • If restart upon momentary power failure is selected, the inverter restarts upon recovery of the voltage within the set time.		F14		
	Retry function	When the motor is tripped and stopped, this function automatically resets the tripping state and restarts operation.	Waiting time before resetting and the number of retry times can be set.	H04, H05		
	Command loss detection	A loss (broken wire, etc.) of the frequency command is detected to output an alarm and continue operation at the preset frequency (set at a ratio to the frequency before detection).		E65		
	Environment	Installation location	Shall be free from corrosive gases, flammable gases, oil mist, dusts, and direct sunlight. (Pollution degree 2 (IEC60664-1)). Indoor use only.			
Ambient temperature		-10 to +50°C	-10 to 40°C when inverters are installed side by side without clearance.			
Ambient humidity		5 to 95% (no condensation)				
Altitude		Altitude [m]	Output derating	* If the altitude exceeds 2,000m, insulate the interface circuit from the main power supply to conform to the Low Voltage Directives.		
			Lower than 1,000		None	
			1,001 to 2,000		Decreases	
2,001 to 3,000	Decreases*					
Vibration	[Smaller than 75kW] 3mm (vibration width) : 2 to less than 9Hz, 9.8m/s <sup>2</sup> : 9 to less than 20Hz 2m/s <sup>2</sup> : 20 to less than 55Hz 1m/s <sup>2</sup> : 55 to less than 200Hz [90kW or more] 3mm (vibration width) : 2 to less than 9Hz, 2m/s <sup>2</sup> : 9 to less than 55Hz 1m/s <sup>2</sup> : 55 to less than 200Hz					
Storage	Amb. temp.	-25 to +65°C				
	Amb. humidity	5 to 95%RH (no condensation)				

# External Dimensions

## Main body of inverter (5.5kW)

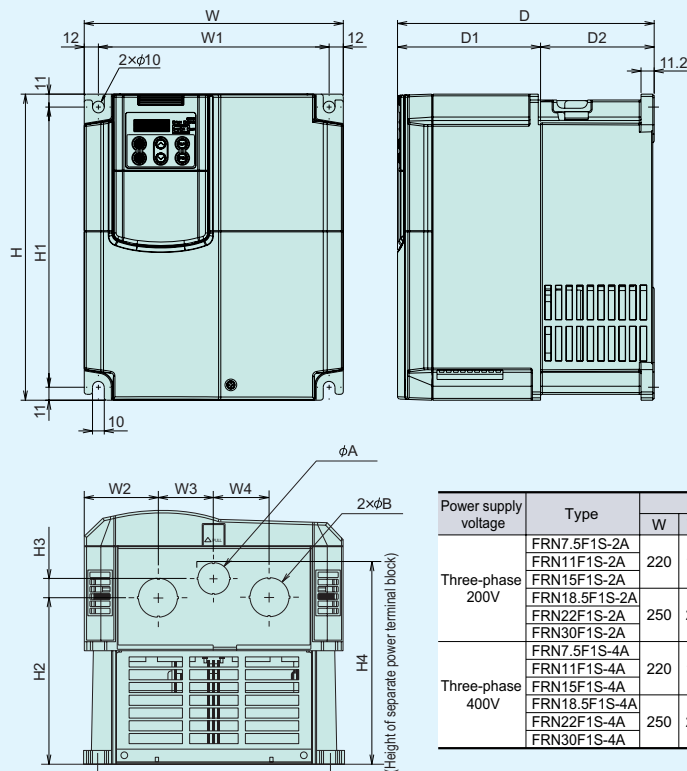
Unit : mm



Power supply voltage	Type
Three-phase 200V	FRN5.5F1S-2A
Three-phase 400V	FRN5.5F1S-4A

## Main body of inverter (7.5 to 30kW)

Unit : mm



Power supply voltage	Type	Dimensions (mm)														
		W	W1	W2	W3	W4	H	H1	H2	H3	H4	D	D1	D2	φA	φB
Three-phase 200V	FRN7.5F1S-2A	220	196	63.5	46.5	46.5	260	238	141.7	16	172.9	215	118.5	96.5	27	34
	FRN11F1S-2A								136.7	21						
	FRN15F1S-2A								136.7	21	175.2					
	FRN18.5F1S-2A								166.2	2						
	FRN22F1S-2A								166.2	2						
FRN30F1S-2A	-	-	186.2	-	-											
Three-phase 400V	FRN7.5F1S-4A	220	196	63.5	46.5	46.5	260	238	141.7	16	172.9	215	118.5	96.5	27	34
	FRN11F1S-4A								136.7	21						
	FRN15F1S-4A								136.7	21	175.2					
	FRN18.5F1S-4A								166.2	2						
	FRN22F1S-4A								166.2	2						
FRN30F1S-4A	-	-	186.2	-	-											