Fuji Electric

Innovating Energy Technology

High Performance Inverter

FRENIC-Ace New



24A1-E-0042e

The Next Generation Of Inverters Have Arrived

Introducing Our New Standard Inverter!



Enjoy A Full Range Of Applications

The standard inverter for the next generation, the FRENIC-Ace, can be used in most types of application—from fans and pumps to specialized machinery.

Nominal applied motor [kW]	3-phase 400V series								3-phase 200V series				1-phase 200V series	
	ND rating		HD rating		HND rating		HHD rating		HND rating		HHD rating		HHD rating	
	Model	Rated output current	Model	Rated output current	Model	Rated output current	Model	Rated output current	Model	Rated output current	Model	Rated output current	Model	Rated output current
0.1											FRN0001E2■-2□	0.8A	FRN0001E2■-7□	0.8A
0.2											FRN0002E2■-2□	1.6A	FRN0002E2■-7□	1.6A
0.4							FRN0002E2■-4□	1.5A	FRN0002E2■-2□	2A	FRN0004E2■-2□	3A	FRN0003E2■-7□	3A
0.75	FRN0002E2■-4□	2.1A	FRN0002E2■-4□	1.8A	FRN0002E2■-4□	1.8A	FRN0004E2■-4□	2.5A	FRN0004E2■-2□	3.5A	FRN0006E2■-2□	5A	FRN0005E2■-7□	5A
1.1			FRN0004E2■-4□	3.4A	FRN0004E2■-4□	3.4A			FRN0006E2■-2□	6A				
1.5	FRN0004E2■-4□	4.1A					FRN0006E2■-4□	4.2A			FRN0010E2■-2□	8A	FRN0008E2■-7□	8A
2.2	FRN0006E2■-4□	5.5A	FRN0006E2■-4□	5A	FRN0006E2■-4□	5A	FRN0007E2■-4□	5.5A	FRN0010E2■-2□	9.6A	FRN0012E2■-2□	11A	FRN0011E2■-7□	11A
3	FRN0007E2■-4□	6.9A	FRN0007E2■-4□	6.3A	FRN0007E2■-4□	6.3A			FRN0012E2■-2□	12A				
3.7							FRN0012E2■-4□	9A			FRN0020E2■-2□	17.5A		
5.5	FRN0012E2■-4□	12A	FRN0012E2■-4□	11.1A	FRN0012E2■-4□	11.1A	FRN0022E2■-4□	13A	FRN0020E2■-2□	19.6A	FRN0030E2S-2□	25A		
7.5			FRN0022E2■-4□	17.5A	FRN0022E2■-4□	17.5A	FRN0029E2■-4□	18A	FRN0030E2S-2□	30A	FRN0040E2S-2□	33A		
11	FRN0022E2■-4□	21.5A	FRN0029E2■-4□	23A	FRN0029E2■-4□	23A	FRN0037E2■-4□	24A	FRN0040E2S-2□	40A	FRN0056E2S-2□	47A		
15	FRN0029E2■-4□	28.5A	FRN0037E2■-4□	31A	FRN0037E2■-4□	31A	FRN0044E2■-4□	30A	FRN0056E2S-2□	56A	FRN0069E2S-2□	60A		
18.5	FRN0037E2■-4□	37A	FRN0044E2■-4□	38A	FRN0044E2■-4□	38A	FRN0059E2■-4□	39A	FRN0069E2S-2□	69A	FRN0088E2S-2□	76A		
22	FRN0044E2■-4□	44A	FRN0059E2■-4□	45A	FRN0059E2■-4□	45A	FRN0072E2■-4□	45A	FRN0088E2S-2□	88A	FRN0115E2S-2□	90A		
30	FRN0059E2■-4□	59A	FRN0072E2■-4□	60A	FRN0072E2■-4□	60A	FRN0085E2■-4□	60A	FRN0115E2S-2□	115A				
37	FRN0072E2■-4□	72A	FRN0085E2■-4□	75A	FRN0085E2■-4□	75A	FRN0105E2■-4□	75A						
45	FRN0085E2■-4□	85A	FRN0105E2■-4□	91A	FRN0105E2■-4□	91A	FRN0139E2■-4□	91A						
55	FRN0105E2■-4□	105A	FRN0139E2■-4□	112A	FRN0139E2■-4□	112A	FRN0168E2■-4□	112A						
75	FRN0139E2■-4□	139A	FRN0168E2■-4□	150A	FRN0168E2■-4□	150A	FRN0203E2■-4□	150A						
90	FRN0168E2■-4□	168A	FRN0203E2■-4□	176A	FRN0203E2■-4□	176A	FRN0240E2■-4□	176A						
110	FRN0203E2■-4□	203A	FRN0240E2■-4□	210A	FRN0240E2■-4□	210A	FRN0290E2■-4□	210A						
132	FRN0240E2■-4□	240A	FRN0290E2■-4□	253A	FRN0290E2■-4□	253A	FRN0361E2■-4□	253A						
160	FRN0290E2■-4□	290A	FRN0361E2■-4□	304A	FRN0361E2■-4□	304A	FRN0415E2■-4□	304A						
200	FRN0361E2■-4□	361A	FRN0415E2■-4□	377A	FRN0415E2■-4□	377A	FRN0520E2■-4□	377A						
220	FRN0415E2■-4□	415A	FRN0520E2■-4□	415A	FRN0520E2■-4□	415A	FRN0590E2■-4□	415A						
250			FRN0590E2■-4□	477A										
280	FRN0520E2■-4□	520A			FRN0590E2■-4□	520A								
315	FRN0590E2■-4□	590A												
Rating condition	Overload current rating 120% -1min	Max. ambient temp. 40°C	Overload current rating 150% -1min	Max. ambient temp. 40°C	Overload current rating 120% -1min	Max. ambient temp. 50°C	Overload current rating 150% -1min, 200% -0.5sec	Max. ambient temp. 50°C	Overload current rating 120% -1min	Max. ambient temp. 50°C	Overload current rating 150% -1min, 200% -0.5sec	Max. ambient temp. 50°C	Overload current rating 150% -1min, 200% -0.5sec	Max. ambient temp. 50°C
Application	Fans, pumps Wire drawing		Vertical conveyance		Fans, pumps Wire drawing		Vertical conveyance Winding machines Printing machines		Fans, pumps Wire drawing		Vertical conveyance Winding machines Printing machines		Vertical conveyance Winding machines Printing machines	



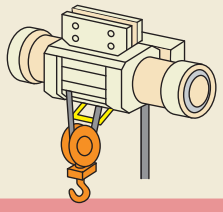
Customizable Logic

Customizable logic function is available as a standard feature. FRENIC-Ace has built-in customizable logic functions with a maximum of 200 steps including both digital and analog operation functions, giving customers the ability to customize their inverters—from simple logic functions to full-scale programming. Fuji Electric also has plans to offer programming templates for wire drawing machines, hoists, spinning machines, and other applications so that the FRENIC-Ace can be used as a dedicated purpose inverter.

Example: Hoist crane application

Programming the FRENIC-Ace main unit with the required logic for controlling a hoist

- (1) Set speed program
- (2) Reset the alarm by using the push-button switch
- (3) Mechanical limit switch function
- (4) Detect load
- (5) Automatic speed drive when no load is detected
- (6) Overload stop function



Dedicated/specialized functions for hoist application implemented by using customizable logic

Superior Flexibility

FRENIC-Ace has readily available interface cards and various types of fieldbus / network to maximize its flexibility.

Option Category	Option Name	Mounting adapter for option card		
		0002 to 0044 (400V), 0001 to 0069 (200V)	0059 to 0072 (400V), 0069 to 0115 (200V)	more than 0085 (400V)
Terminal block	RS-485 communications card	Unnecessary		
	PG interface (5V) card			
	PG interface (12/15V) card			
Communication *1	DeviceNet communication card	The adapter is mounted on the front side of the inverter. (OPC-E2-ADP1)	The adapter is mounted inside of the inverter. (OPC-E2-ADP2)	The adapter is mounted inside of the inverter. (OPC-E2-ADP3)
	CC-Link communication card			
	PROFIBUS-DP communication card *2			
	EtherNet/IP communication card *2			
	ProfiNet-RT communication card *2			
	CANopen communication card *2			
Input / Output interface *1	Digital Input / Output interface card			
	Analog Output interface interface card			

*1 Available by the combination use of the mounting adapter.
*2 Coming soon.

Wide Variety Of Functions As A Standard Feature

- Sensorless dynamic torque vector control
- Motor vector control with PG (with optional card)
- Synchronous motor with sensorless vector control
- 2-channel on-board RS485 communications port
- Standard CANopen compatibility
- Removable keypad device
- Removable control terminal block board

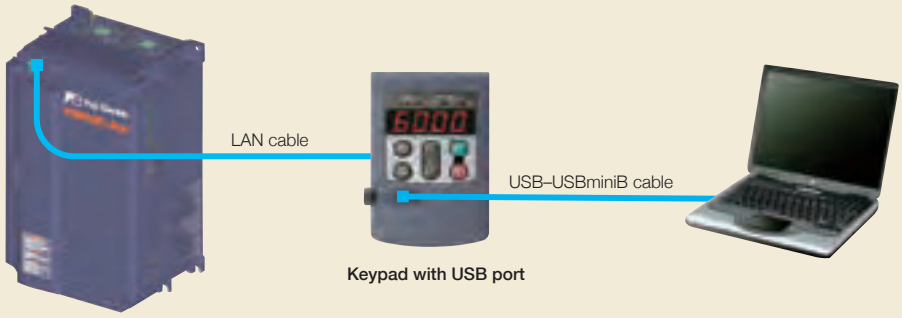
Multi-Function Keypad (option)

FRENIC-Ace has two different multi-function keypads available

- Multi-function keypad with LCD display: Enhanced HMI functionality
- Keypad with USB port : Connect to a computer for more efficient operation (set-up, troubleshooting, maintenance, etc)



Multi-function keypad with LCD screen



Keypad with USB port

Functional Safety

FRENIC-Ace is equipped with STO functional safety function as a standard. Therefore output circuit magnetic contactors are not required for safe stop implementation. Enhanced standard features position FRENIC-Ace ahead of its class (Safety input: 2CH, output: 1CH).

■Complies with (coming soon)

EN ISO 13849-1: 2008, Cat.3 / PL=e
IEC/EN 60204-1: 2005/2006 Stop category 0
IEC/EN 61508-1 to -7: 2010 SIL3
IEC/EN 61800-5-2: 2007 SIL3 (Safety feature: STO)
IEC/EN 62061: 2005 SIL3

10 Years Lifetime Design

FRENIC-Ace components have a design life of ten years.
A longer maintenance cycle also helps to reduce running costs.

Design life *2	Main circuit capacitor		10 years *1
	Electrolytic capacitors on PCB		10 years *1
	Cooling fan		10 years *1
	Life conditions	Ambient temperature	+40°C (104°F)
		Load rate	100% (HHD specifications) 80% (HND/HD/ND specifications)

*1 ND specifications have a rated current of two sizes higher than HHD specifications, so the life is 7 years.
*2 The designed lives are the calculated values and not the guaranted ones.

Standards

■RoHS Directive

Standard compliance with European regulations that limit the use of specific hazardous substances (RoHS)

<Six hazardous substances>	Lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl (PBB), polybrominated biphenyl ether (PBDE)
<About RoHS>	Directive 2002/95/EC, issued by the European Parliament and European Council, limits the use of specific hazardous substances in electrical and electronic devices.

Global Compliance

■Standard compliance

EC Directives (CE Mark)

UL Standard (cUL Certified)

KC*

* Only FRN□□□E2■-○K and FRN□□□E2■-○G●



Standard Model Specifications

Three phase 200V class series

Items			Specifications												
Type			FRN□□□□E2S-2GA, FRN□□□□E2S-2GB							FRN□□□□E2S-2A, FRN□□□□E2S-2E, FRN□□□□E2S-2K, FRN□□□□E2S-2U					
			0001	0002	0004	0006	0010	0012	0020	0030	0040	0056	0069	0088	0115
Nominal applied motor *1 [kW]		HND	0.2	0.4	0.75	1.1	2.2	3.0*10	5.5*10	7.5	11	15	18.5	22	30
		HHD	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
Output ratings	Rated capacity [kVA] *2	HND	0.5	0.8	1.3	2.3	3.7	4.6*10	7.5*10	11	15	21	26	34	44
		HHD	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13	18	23	29	34
	Rated voltage [V] *3		Three-phase 200 to 240V (With AVR)												
	Rated current [A] *4	HND	1.3	2.0	3.5	6.0	9.6	12*10	19.6*10	30	40	56	69	88	115
		HHD	0.8	1.6	3.0	5.0	8.0	11	17.5	25	33	47	60	76	90
	Overload capability	HND	120% of nominal current for 1min												
		HHD	150% of nominal current for 1min or 200% of nominal current for 0.5s												
Input ratings	Main power supply		Three-phase 200 to 240V, 50/60Hz												
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance:2% or less *8, Frequency: +5 to -5%)												
	Rated current without DCR *5 [A]	HND	1.8	2.6	4.9	6.7	12.8	17.9*10	31.9*10	42.7	60.7	80.0	97.0	112	151
		HHD	1.1	1.8	3.1	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80.0	97.0	112
	Rated current with DCR *5 [A]	HND	0.93	1.6	3.0	4.3	8.3	11.7*10	19.9*10	28.8	42.2	57.6	71.0	84.4	114
		HHD	0.57	0.93	1.6	3.0	5.7	8.3	14.0	21.1	28.8	42.2	57.6	71.0	84.4
	Required power supply capacity *6 [kVA]	HND	0.4	0.6	1.1	1.5	2.9	4.1*10	6.9*10	10	15	20	25	30	40
		HHD	0.2	0.4	0.6	1.1	2.0	2.9	4.9	7.3	10	15	20	25	30
Braking	Braking torque *7 [%]	HND	75%		53%	68%	48%	29%*10	27%*10	15%					
		HHD	150%		100%		70%	40%		20%					
	DC braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 60% (ND spec.), 0 to 80% (HD/HND spec.), 0 to 100% (HHD spec.) of nominal current												
	Braking chopper		Built-in												
	Minimum connection resistance[ohm]		100				40		33	20	15	10	8.6	4	
	Braking resistor		Option												
DC reactor (DCR)		HND	Option												
		HHD	Option												
Enclosure (IEC60529)			IP20, UL open type												
Cooling method			Naturalural cooling				Fan cooling								
Mass [kg]			0.5	0.5	0.6	0.8	1.5	1.5	1.8	5.0	5.0	8.0	9.0	9.5	10

*1 Fuji 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity(kW) is enough but also inverter output current is larger than selected the motor's nominal current.
*2 Rated capacity is calculated by assuming the output rated voltage as 220 V.
*3 Output voltage cannot exceed the power supply voltage.
*4 When the carrier frequency (F26) is set to below value or higher, the inverter is sure to be necessary to derate their nominal current.
HHD spec.---type 0001 to 0020 : 8kHz, type 0030 to 0115 : 10kHz,
HND spec.---type 0001 to 0020 : 4kHz, type 0030 to 0069 : 10kHz, type 0088,0115 : 4kHz
*5 The value is calculated assuming that the inverter is connected with a power supply with the capacity of 500 kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50 kVA) and %X is 5%.
*6 Obtained when a DC reactor (DCR) is used.
*7 Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)
*8 Voltage unbalance (%) =(Max. voltage (V) - Min. voltage (V))/Three -phase average voltage (V) × 67 (IEC 61800 - 3)
If this value is 2 to 3%, use an optional AC reactor (ACR).
*10 HND spec. of the type 0012 and 0020: allowable ambient temperature 40 °C (+104 °F) or less.
The rated output current at HND spec. is decreased 1% for every 1 °C (1.8 °F) when ambient temperature is +40 °C (+104 °F) or more.

Standard Model Specifications

Single phase 200V class series

Items			Specifications					
Type			FRN□□□□E2S-7GA, FRN□□□□E2S-7GB					
			0001	0002	0003	0005	0008	0011
Nominal applied motor *1 [kW]		HHD	0.1	0.2	0.4	0.75	1.5	2.2
Output ratings	Rated capacity [kVA] *2	HHD	0.3	0.6	1.1	1.9	3.0	4.2
	Rated voltage [V] *3		Three-phase 200 to 240V (With AVR)					
	Rated current [A] *4	HHD	0.8	1.6	3.0	5.0	8.0	11
	Overload capability	HHD	150% of nominal current for 1min or 200% of nominal current for 0.5s					
Input ratings	Main power supply		Three-phase 200 to 240V, 50/60Hz					
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance:2% or less *8, Frequency: +5 to -5%)					
	Rated current without DCR *5 [A]	HHD	1.8	3.3	5.4	9.7	16.4	24.8
	Rated current with DCR *5 [A]	HHD	1.1	2.0	3.5	6.4	11.6	17.5
	Required power supply capacity *6 [kVA]	HHD	0.3	0.4	0.7	1.3	2.4	3.5
Braking	Braking torque *7 [%]	HHD	150%		100%		70%	40%
	DC braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100% (HHD spec.) of nominal current					
	Braking chopper		Built-in					
	Minimum connection resistance [ohm]		100				40	
	Braking resistor		Option					
DC reactor (DCR)		HHD	Option					
Enclosure (IEC60529)			IP20, UL open type					
Cooling method			Naturalural cooling				Fan cooling	
Mass [kg]			0.5	0.5	0.6	0.9	1.6	1.8

*1 Fuji 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity(kW) is enough but also inverter output current is larger than selected the motor's nominal current.
*2 Rated capacity is calculated by assuming the output rated voltage as 220 V.
*3 Output voltage cannot exceed the power supply voltage.
*4 When the carrier frequency (F26) is set to below value or higher, the inverter is sure to be necessary to derate their nominal current.
HHD spec.---type 0001 to 0011 : 8kHz
*5 The value is calculated assuming that the inverter is connected with a power supply with the capacity of 500 kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50 kVA) and %X is 5%.
*6 Obtained when a DC reactor (DCR) is used.
*7 Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)