FRENIC-ACE

The FRENIC-Ace is a high performance, full-featured Drive designed to suit a wide variety of applications including fans, pumps, specialized machinery and more. Equipped with 200 steps of customizable logic and PMAC motor control, the FRENIC-Ace provides compact, but powerful multi-rated specification solutions for virtually all AC drive applications and comes standard with an industry-leading 3-year warranty.

HEAVY DUTY: **(HD) PAR CONSTANTE**	Transportadores, Agitadores, Elevadores, Extrusoras, Molinos, Trituradoras, Troqueladoras, Grúas (Puente, Carro, Gancho), Enrolladora, Cortadora, Trefiladora, etc.
LIGHT DUTY: **(LD) PAR VARIABLE**	HVAC, Bombas y Ventiladores Centrífugos, Chillers, Sopladores, Aire acondicionado

FRENIC-ACE

FRENIC-ACE Model Numbering System Diagram

Description FRN #### E 2 S - 4 GB

Product Code
FRENIC Series

Applicable Current Rating
Three phase 460V class:
Rating current level of ND specification
[Model: 0002 to 0590]
Three phase 230V class:
Rating current level of HND specification
[Model: 0001 to 0115]
Single phase 230V class:
Rating current level of HHD specification
[Model: 0001 to 0011]

Application Range
E= For industrial, High performance,
Multiple Functionality

Development Series
2 - 2nd Generation

Enclosure
S = Standard (IP20 / UL Open Type)

Input Power Source
4 = Three phase 460V class
2 = Three phase 230V class
7 = Single phase 230V class

Destination/Manual
GB = Global model

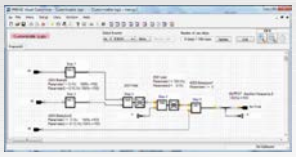
Fuji Electric

High Performance Customizable Inverters

FRENIC-Ace

Customizable Logic

Up to 200 Steps



Safety Function

Safe Torque Off (STO) Input
(Compliant to EN/ISO13849-1, SIL3, PI=e, cat. 3)

PM Motor Control

Sine wave with 180° control by Sensorless Vector control to elevate the control of today's high efficiency, compact Permanent Magnet Motors

Control Inputs/Outputs

- (7) Digital Inputs:
  X1 – X5, FWD, & REV Programmable, 60 Selectable Functions
- (2) Analog Inputs:
  (1) – 0 to +10Vdc
  (1) – 4 to 20mA
- (3) Digital Outputs:
  (1) Form C Relay
  (2) Transistor Outputs, 78 Selectable Functions
- (2) Analog Output: Selectable Type:
  0 to 10Vdc or 4 to 20mA, 19 Selectable Output Signal Functions
- (2) RS-485 Connections:
  RJ45 Port, Terminal
- Operator's Keypad with LED Display:
  Indicating System Operation and Associated Value Conversion, Status of I/O, Operations and Alarms
- Keypad Indications:
  Operations, Number of times unit placed in operation, Duration and kWh output
- 24Vdc Output Terminal:
  100mA Maximum Supply

Motor Control

- V/F Control (IM)
- Dynamic Torque Vector Control (IM)
- V/F Control with Slip Compensation (IM)
- V/F Control with Encoder Option (IM)
- Vector Control with Encoder Option (IM)
- Sensorless Vector Control (PMSM)

Safety and Standard

- EN/ISO13849-1, SIL3, PI=e, cat. 3/PL:e
- UL 508C, CE, KC
- NEMA 1/UL Type 1 Optional Kit
- UL Single Phase Input
- UL Plenums Rating
- RoHS Directive Compliance

Options

- Remote Keypad with USB port
- Remote Multi-Function Keypad
- Communication Option Adapter
- Heatsink Out Adapter *1
- Din Rail Adapter *2
- NEMA1/ UL Type 1 Kit
- Communication, I/O Option Adapter
- Option Cards

-DeviceNet	-Digital I/O
-Profibus DP	-Analog I/O
-Ethernet/Profinet	-RS-485 Dual RJ45
-CANOpen	-Encoder 5V
-CC-Link	-Encoder 12/15V

USB Keypad

Multi Function Keypad

*1 Applicable models; 7.5 -30HP: HHD, 10 - 40HP: HND
*2 Applicable models; 5HP and less: HHD, 7.5HP and less: HND

The FRENIC-Ace is a high performance, full-featured Drive designed to suit a wide variety of applications utilizing Fuji Electric's latest IGBT technology.

Designed using components with a lifespan of 10 years or more, FRENIC-ACE comes standard with Fuji Electric's industry-leading 3 year warranty while providing compact, powerful multi-rated specification solutions for virtually all AC drive applications.

Key Features

- Multiple Power Ratings
- Variety of Vector Control Modes
- Customizable Logic
- PM Motor Control
- Built-In STO input
- Dual channel RS485 Port
- Optional Multi-Function & USB Keypad
- PC software at no cost

Fuji Electric

FRENIC-Ace

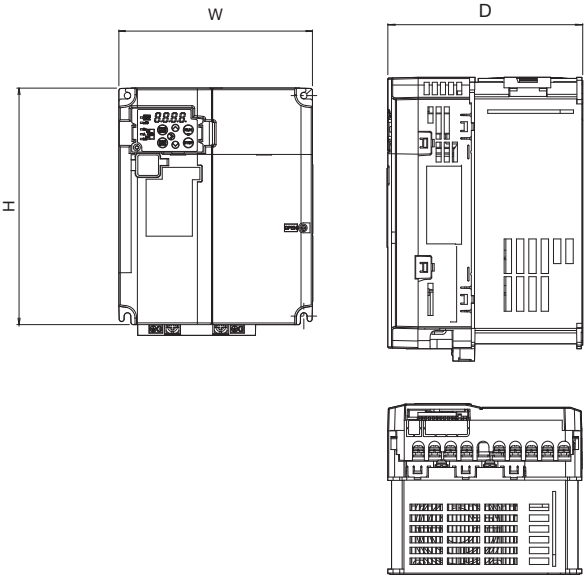
Specifications & Dimensions

Capacity (HP)	1/8 - 3HP, 1ph 230V (HHD) 1/8 - 30HP, 3ph 230V (HHD) 1/4 - 40HP, 3ph 230V (HND) 1/2 - 30HP, 3ph 460V (HHD) 1 - 40HP, 3ph 460V (HND)
Overload Capability	HHD: 150% - 1min, 200% - 0.5sec HND: 120%, 1min
Input Power	230V Single/Three phase: 200 to 240V, 50/60Hz 460V Three phase: 380 to 480V, 50/60Hz Voltage: +10% to -15% (unbalance 2% or less) Frequency: +5% to -5%
Control	V/f Control V/f Control with Slip Compensation Dynamic Torque Vector Control V/f Control with Encoder (Optional) Vector Control with Encoder (Optional) PM Motor Sensorless Vector Control
Output Voltage	Three Phase 200-240V, 380V-480V (with AVR)
Output Stability	Analog setting: +/-0.2% of maximum frequency Digital setting: +/- 0.01% of maximum frequency (by keypad setting)

Output Frequency	Max 500Hz
Speed Control Range	1:1500 IM Vector Control w/encoder 1:100 IM V/F w/encoder 1:10 PM Sensorless Vector Control
Braking Transistor	Built-in
Braking Resistor	Option
EMC Filter	Option - Lead Time
Ambient Temperature	Standard (Open Type) -10 to +50 ˚C (14 to 122 ˚F) NEMA 1/UL Type 1 -10 to +40 ˚C (14 to 104˚F)
Storage Temperature	-25 to +65˚C (-13 to 149 ˚F)
Relative Humidity	5 to 95% RH (without condensation)
Installation Location	Indoors
Altitude	≤ 3,300ft (1,000m), 3,300ft (1,000m) to 9,900ft (3,000m with Derating)
Enclosure	NEMA 1/UL Type1 by Option Kit
Safety	EN / ISO 13849-1:2008, Cat. 3/PL:e
Standard	UL / cUL 508C C22.2 No.14, CE, RoHs, GOST-R, KC

Nominal HP Rating		Rated Current (Amps)		Model Number	Dimensions W x H x D (inches)	Weight (lbs)
HND (VT/LD)	HHD (CT/HD)	HND (VT/LD)	HHD (CT/HD)			
230VAC - 1-Phase Input						
-	1/8	-	0.8	FRN0001E2S-7GB	2.68 x 5.00 x 3.35	1.1
-	1/4	-	1.6	FRN0002E2S-7GB		
-	1/2	-	3.0	FRN0003E2S-7GB	2.68 x 5.00 x 4.21	1.3
-	1	-	5.0	FRN0005E2S-7GB	2.68 x 5.00 x 5.98	2.0
-	2	-	8.0	FRN0008E2S-7GB	4.33 x 5.51 x 6.02	3.5
-	3	-	11.0	FRN0011E2S-7GB	5.51 X 5.51 X 5.63	4.0
230VAC - 3-Phase Input						
1/4	1/8	1.3	0.8	FRN0001E2S-2GB	2.68 x 5.00 x 3.35	1.1
1/2	1/4	2	1.6	FRN0002E2S-2GB		
1	1/2	3.5	3.0	FRN0004E2S-2GB	2.68 x 5.00 x 3.94	1.3
2	1	6.0	5.0	FRN0006E2S-2GB	2.68 x 5.00 x 5.20	1.8
3	2	9.6	8.0	FRN0010E2S-2GB	4.33 x 5.51 x 5.63	3.3
5	3	12	11.0	FRN0012E2S-2GB		
7.5	5	19.6	17.5	FRN0020E2S-2GB	5.51 x 5.51 x 5.63	4
10	7.5	30	25	FRN0030E2S-2GB	7.09 x 9.05 x 6.22	11
15	10	40	33	FRN0040E2S-2GB		
20	15	56	47	FRN0056E2S-2GB	8.66 x 10.63 x 7.48	18
25	20	69	60	FRN0069E2S-2GB		20
30	25	88	76	FRN0088E2S-2GB	9.84 x 15.75 x 7.68	21
40	30	115	90	FRN0115E2S-2GB		22
460VAC - 3-Phase Input						
1	1/2	1.8	1.5	FRN0002E2S-4GB	4.33 x 5.51 x 4.69	2.6
2	1	3.4	2.5	FRN0004E2S-4GB	4.33 x 5.51 x 5.63	3.3
3	2	5.0	4.2	FRN0006E2S-4GB		3.3
5	3	6.3*1	5.5	FRN0007E2S-4GB		3.5
7.5	5	11*1	9	FRN0012E2S-4GB	5.51 x 5.51 x 5.63	4.2
10	7.5	17.5	13	FRN0022E2S-4GB	7.09 x 9.05 x 6.22	11
15	10	23	18	FRN0029E2S-4GB		11
20	15	31	24	FRN0037E2S-4GB	8.66 x 10.63 x 7.48	18
25	20	38	30	FRN0044E2S-4GB		20
30	25	45	39	FRN0059E2S-4GB	9.84 x 15.75 x 7.68	21
40	30	60	45	FRN0072E2S-4GB		22

*1 Allowable temperature 40°°C (104°F) or less



Fuji Electric

General Specifications

Environmental	
Enclosure	NEMA 1/UL Type 1 by Option kit
Ambient Temperature	Standard (Open Type) -10 to +50 ˚C (14 to 122 ˚F) NEMA 1/UL Type 1 -10 to+40 ˚C (14 to 104 ˚F)
Storage Temperature	-25 to +65˚C (-13 to 149 ˚F)
Relative Humidity	5 to 95% RH (without condensation)
Installation Location	Indoors
Altitude	≤3,300ft (1,000m), 3,300ft (1,000m) to 9,900ft (3,000m with Derating)

Codes and Standards
UL / cUL 508C C22.2 No.14, CE, RoHs, GOST-R,KC, EN / ISOc13849-1:2008,cat. 3/PL:e

Electrical	
Capacity (HP)	1/8 - 3HP,1ph 230 (HHD) 1/8 - 30HP,3ph 230(HHD) 1/4 - 40HP,3ph 230V (HND) 1/2 - 30HP,3ph 460V (HHD) 1 - 40HP,3ph 460V (HND) 50 -450,3ph 460V(HND) **Non-stock item** 40 -350,3ph 460V(HHD) **Non-stock item**
Overload Capacity	HHD: 150% - 1min, 200% - 0.5sec HND: 120%, 1min
Input Power	230V Single/Three phase: 200 to 240V, 50/60Hz 460V Three phase: 380 to 480V, 50/60Hz Voltage: +10% TO -15% (unbalance 2% or less) Frequency: +5% to -5%
Control	V/f Control V/f Control with Slip Compensation Dynamic Torque Vector Control V/f Control with Encoder (Optional) Vector Control with Encoder (Optional) PM Motor Sensorless Vector Control
Output Voltage	Three Phase 200-240V, 380V-480V (with AVR)
Output Stability	Analog setting: +/-0.2% of maximum frequency Digital setting: +/-0.01% of maximum frequency (by keypad settings)
Output Frequency	Max 500Hz
Speed Control Range	1:1500 IM Vector Control w/encoder 1:100 IM V/F w/encoder 1:10 PM Sensorless Vector Control
Braking Transistor	Built-in
Braking Resistor	Option
EMC Filter	Option - Lead Time
(7) Digital Inputs	X1 - X5, FWD, & REV Programmable, 60 selectable functions
(2) Analog Inputs	(1) -0 to +10Vdc (1) -4 to 20mA
(3) Digital Outputs	(1) From C Relay (2) Transistor Output, 78 Selectable Functions
(2) Analog Output: Selectable Type	0 to 10Vdc or 4 to 20mA, 19 Selectable Output Signal Functions.
(2) RS-485 Connections	RJ45 Port Terminal
Operator's Keypad with LED Display	Indicating System Operation and Associated Value Conversion, Status of I/O, Operations and Alarms
Keypad Indications	Operations, Number of times unit placed in operation, Duration and kWh output
24Vdc Output Terminal	100mA Maximum Supply

1. STANDARD SPECIFICATIONS

1.1. Three phase 230V class series

Items			Specifications							
Type (FRN□□□E2S-2GB)			0001	0002	0004	0006	0010	0012	0020	0030
Nominal applied motor [HP]*1		HND	1/4	1/2	1	2	3	5 *9	7.5 *9	10
		HHD	1/8	1/4	1/2	1	2	3	5	7.5
Output ratings	Rated capacity[kVA] *2	HND	0.5	0.8	1.4	2.4	3.8	4.8 *9	7.8 *9	12.0
		HHD	0.3	0.6	1.2	2.0	3.2	4.4	7.0	10.0
	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 *9	19.6 *9	30
		HHD	0.8	1.6	3.0	5.0	8.0	11	17.5	25
	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 [A]*5	HND	1.8	2.6	4.9	6.7	12.8	17.9 *9	28.5 *9	42.7
		HHD	1.1	1.8	3.1	5.3	9.5	13.2	22.2	31.5
	Rated current with DCR [A] *5	HND	0.93	1.6	3.0	4.3	8.3	11.7 *9	19.9 *9	28.8
		HHD	0.57	0.93	1.6	3.0	5.7	8.3	14.0	21.1
	Required power supply capacity [kVA]*6	HND	0.4	0.6	1.2	1.7	3.3	4.6 *9	7.9 *9	11
		HHD	0.2	0.4	0.6	1.2	2.3	3.3	5.6	8.4
Braking	Braking torque [%]*7	HND	75%		53%	68%	48%	29% *9	27% *9	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 80% (HND spec.), 0 to 100% (HHD spec.) of nominal current							
	Braking chopper		Built-in							
	Minimum connectable resistance[ohm]		100				40		33	20
	Braking resistor		Option							
DC reactor(DCR)		HND	Option							
		HHD	Option							
Enclosure (IEC60529)			IP20, UL open type							
Cooling method			Natural cooling				Fan cooling			
Mass [lbs(kg)]			1.1(0.5)	1.1(0.5)	1.3(0.6)	1.6(0.8)	3.3(1.5)	3.3(1.5)	4(1.8)	11(5.0)

*1 US 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity(HP) 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 230 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).

*9 HND spec. of the type 0012 and 0020: allowable ambient temperature 40℃ (+104 °F) or less.
The rated output current at HND spec. is decreased 1% for every 1 ℃ (1.8 °F) when ambient temperature is +40℃ (+104 °F) or more.

Items			Specifications				
Type (FRN□□□E2S-2GB)			0040	0056	0069	0088	0115
Nominal applied motor [HP]*1		HND	15	20	25	30	40
		HHD	10	15	20	25	30
Output ratings	Rated capacity[kVA] *2	HND	16	22	27	35	46
		HHD	13	19	24	30	36
	Rated voltage[V] *3		Three-phase 200 to 240V (With AVR)				
	Rated current [A] *4	HND	40	56	69	88	115
		HHD	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 [A]*5	HND	60.7	80.0	97.0	112	151
		HHD	42.7	60.7	80.0	97.0	112
	Rated current with DCR [A] *5	HND	42.2	57.6	71.0	84.4	114
		HHD	28.8	42.2	57.6	71.0	84.4
	Required power supply capacity *6 [kVA]	HND	17	23	28	34	45
		HHD	11	17	23	28	34
Braking	Braking torque*7 [%]	HND	15%				
		HHD	20%				
	DC braking		Starting frequency: 0.0 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 80% (HND spec.), 0 to 100% (HHD spec.) of nominal current				
	Braking chopper		Built-in				
	Minimum connectable resistance[ohm]		15	10	8.6	4	
	Braking resistor		Option				
DC reactor(DCR)		HND	Option				
		HHD	Option				
Enclosure (IEC60529)			IP20, UL open type				
Cooling method			Fan cooling				
Mass [lbs(kg)]			11(5.0)	18(8.0)	20(9.0)	21(9.5)	22(10)

*1 US 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity (HP) 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 230 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).

1.2. Three phase 460V class series

Items			Specifications							
Type (FRN□□□E2S-4GB)			0002	0004	0006	0007	0012	0022	0029	0037
Nominal applied motor [HP][*1]		ND	1	2	3	4	7.5	15	20	25
		HD	1	1.5	3	4	7.5	10	15	20
		HND	1	1.5	3	4[*9]	7.5[*9]	10	15	20
		HHD	1/2	1	2	3	5	7.5	10	15
Output ratings	Rated capacity[kVA] [*2]	ND	1.7	3.3	4.4	5.5	9.6	17.1	22.7	29.5
		HD	1.4	2.7	4.0	5.0	8.8	14	18	25
		HND	1.4	2.7	4.0	5.0[*9]	8.8[*9]	14	18	25
		HHD	1.2	2.0	3.3	4.4	7.2	10.3	14	19
	Rated voltage[V] [*3]		Three-phase 380 to 480V (With AVR)							
	Rated current [A] [*4]	ND	2.1	4.1	5.5	6.9	12	21.5	28.5	37
		HD	1.8	3.4	5.0	6.3	11.1	17.5	23	31
		HND	1.8	3.4	5.0	6.3[*9]	11.1[*9]	17.5	23	31
		HHD	1.5	2.5	4.2	5.5	9.0	13	18	24
	Overload capability	ND,HND	120% of nominal current for 1min							
		HD	150% 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 380 to 480V, 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]	ND	2.7	4.8	7.3	11.3	16.8	33.0	43.8	52.3
		HD	2.7	3.9	7.3	11.3	16.8	23.2	33.0	43.8
		HND	2.7	3.9	7.3	11.3[*9]	16.8[*9]	23.2	33.0	43.8
		HHD	1.7	3.1	5.9	8.2	13.0	17.3	23.2	33.0
	Rated current with DCR [*5] [A]	ND	1.5	2.9	4.2	5.8	10.1	21.1	28.8	35.5
		HD	1.5	2.1	4.2	5.8	10.1	14.4	21.1	28.8
		HND	1.5	2.1	4.2	5.8[*9]	10.1[*9]	14.4	21.1	28.8
		HHD	0.85	1.6	3.0	4.4	7.3	10.6	14.4	21.1
	Required power supply capacity [*6] [kVA]	ND	1.2	2.3	3.3	4.6	8.0	16.8	23	28
		HD	1.2	1.7	3.3	4.6	8.0	11.5	17	23
		HND	1.2	1.7	3.3	4.6[*9]	8.0[*9]	11.5	17	23
		HHD	0.7	1.3	2.3	3.5	5.8	8.4	10	17
Braking	Braking torque[*7] [%]	ND	53%	50%	48%	29%	27%	12%		
		HD	53%	68%	48%	29%	27%	15%		
		HND	53%	68%	48%	29%[*9]	27%[*9]	15%		
		HHD	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 connectable resistance[ohm]		200		160		130	80	60	40
	Braking resistor		Option							
DC reactor(DCR)		ND	Option							
		HND,HD	Option							
		HHD	Option							
Enclosure (IEC60529)			IP20, UL open type							
Cooling method			Natural cooling		Fan cooling					
Mass [lbs(kg)]			2.6(1.2)	3.3(1.5)	3.3(1.5)	3.5(1.6)	4.2(1.9)	11(5.0)	11(5.0)	18(8.0)

*1 US 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity (HP) 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 460 V.

*3 The 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 0002 to 0012：8kHz, type 0022 to 0168：10kHz, type 0203 to 0590：6kHz

HND spec.・・・type 0002 to 0012：8kHz, type 0022 to 0059：10kHz, type 0072 to 0168：6kHz, type 0203 to 0590：4kHz HD, ND spec.・・・All type：4kHz

*9 HND spec. of the type 0007 and 0012: allowable ambient temperature 40℃ (+104 °F) or less.
The rated output current at HND spec. is decreased 1% for every 1 ℃ (1.8 °F) when ambient temperature is +40℃ (+104 °F) or more.

Items			Specifications							
Type (FRN□□□E2S-4GB)			0044	0059	0072	0085	0105	0139	0168	0203
Nominal applied motor *1 [HP]		ND	30	40	50	60	75	100	125	150
		HD	25	30	40	50	60	75	100	125
		HND	25	30	40	50	60	75	100	125
		HHD	20	25	30	40	50	60	75	100
Output ratings	Rated capacity[kVA] *2	ND	35	47	57	68	84	111	134	162
		HD	30	36	48	60	73	89	120	140
		HND	30	36	48	60	73	89	120	140
		HHD	24	31	36	48	60	73	89	120
	Rated voltage[V] *3		Three-phase 380 to 480V (With AVR)							
	Rated current [A] *4	ND	44	59	72	85	105	139	168	203
		HD	38	45	60	75	91	112	150	176
		HND	38	45	60	75	91	112	150	176
		HHD	30	39	45	60	75	91	112	150
	Overload capability	ND,HND	120% of nominal current for 1min							
		HD	150% 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 380 to 480V, 50/60Hz							Three-phase 380 to 440V, 50Hz Three-phase 380 to 480V, 60Hz *10
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance:2% or less *8, Frequency: +5 to -5%)							
	Rated current without DCR *5 [A]	ND	60.6	77.9	94.3	114	140	—	—	—
		HD	52.3	60.6	77.9	94.3	114	140	—	—
		HND	52.3	60.6	77.9	94.3	114	140	—	—
		HHD	43.8	52.3	60.6	77.9	94.3	114	140	—
	Rated current with DCR *5 [A]	ND	42.2	57.0	68.5	83.2	102	138	164	201
		HD	35.5	42.2	57.0	68.5	83.2	102	138	164
		HND	35.5	42.2	57.0	68.5	83.2	102	138	164
		HHD	28.8	35.5	42.2	57.0	68.5	83.2	102	138
	Required power supply capacity *6 [kVA]	ND	34	45	55	66	81	110	131	160
		HD	28	34	45	55	66	81	110	131
		HND	28	34	45	55	66	81	110	131
		HHD	23	28	34	45	55	66	81	110
Braking	Braking torque *7 [%]	ND	12%			5 to 9%				
		HD	15%			7 to 12%				
		HND	15%			7 to 12%				
		HHD	20%			10 to 15%				
	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			Option				
	Minimum connectable resistance[ohm]		34.4	16		—	—	—	—	—
	Braking resistor		Option							
DC reactor(DCR)		ND	Option					Attached as standard		
		HND, HD	Option						Attached as standard	
		HHD	Option							Attached as standard
Enclosure (IEC60529)			IP20, UL open type			IP00, UL open type				
Cooling method			Fan cooling							
Mass [lbs(kg)]			20(9.0)	21(9.5)	22(10)	55(25)	57(26)	66(30)	73(33)	88(40)

*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 0002 to 0012：8kHz, type 0022 to 0168：10kHz, type 0203 to 0590：6kHz

HND spec.・・・type 0002 to 0012：8kHz, type 0022 to 0059：10kHz, type 0072 to 0168：6kHz, type 0203 to 0590

：4kHz HD, ND spec.・・・All type：4kHz

Items			Specifications					
Type (FRN□□□E2S-4GB)			0240	0290	0361	0415	0520	0590
Nominal applied motor *1 [HP]		ND	200	250	300	350	450	500
		HD	150	200	250	300	350	400
		HND	150	200	250	300	350	450
		HHD	125	150	200	250	300	350
Output ratings	Rated capacity[kVA] *2	ND	191	231	288	330	414	470
		HD	167	202	242	300	330	380
		HND	167	202	242	300	330	414
		HHD	140	167	202	242	300	331
	Rated voltage[V] *3		Three-phase 380 to 480V (With AVR)					
	Rated current [A] *4	ND	240	290	361	415	520	590
		HD	210	253	304	377	415	477
		HND	210	253	304	377	415	520
		HHD	176	210	253	304	377	415
	Overload capability	ND,HND	120% of nominal current for 1min					
		HD	150% 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 380 to 440V, 50Hz *10 Three-phase 380 to 480V, 60Hz					
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance:2% or less *8, Frequency: +5 to -5%)					
	Rated current without DCR *5 [A]	ND	—	—	—	—	—	—
		HD	—	—	—	—	—	—
		HND	—	—	—	—	—	—
		HHD	—	—	—	—	—	—
	Rated current with DCR *5 [A]	ND	238	286	357	390	500	559
		HD	201	238	286	357	390	443
		HND	201	238	286	357	390	500
		HHD	164	201	238	286	357	390
	Required power supply capacity *6 [kVA]	ND	190	228	284	311	398	445
		HD	160	190	228	284	310	353
		HND	160	190	228	284	310	398
		HHD	131	160	190	228	284	310
Braking	Braking torque [%]*7	ND	5 to 9%					
		HD	7 to 12%					
		HND	7 to 12%					
		HHD	10 to 15%					
	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		Option					
	Minimum connectable resistance[ohm]		—	—	—	—	—	—
	Braking resistor		Option					
DC reactor(DCR)		ND	Attached as standard					
		HND,HD	Attached as standard					
		HHD	Attached as standard					
Enclosure (IEC60529)			IP00, UL open type					
Cooling method			Fan cooling					
Mass [lbs(kg)]			137(62)	139(63)	209(95)	211(96)	286(130)	309(140)

*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 0002 to 0012：8kHz, type 0022 to 0168：10kHz, type 0203 to 0590：6kHz

HND spec.・・・type 0002 to 0012：8kHz, type 0022 to 0059：10kHz, type 0072 to 0168：6kHz, type 0203 to 0590

：4kHz HD, ND spec.・・・All type：4kHz

The rated output current at HD/ND spec. is decreased 2% for every 1 ℃ (1.8 °F) when ambient temperature is +40℃ (+104 °F) or more.

*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%.

Be sure to use the DCR when applicable motor capacity is 100HP or above.

*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 The 400 V class with type 0203 or above is equipped with a set of switching connectors (male) which should be configured according to the power source voltage and frequency.

1.3. Single phase 230V class series

Items			Specifications					
Type (FRN□□□E2S-7GB)			0001	0002	0003	0005	0008	0011
Nominal applied motor [HP][*1]		HHD	1/8	1/4	1/2	1	2	3
Output ratings	Rated capacity[kVA][*2]	HHD	0.3	0.6	1.2	2.0	3.2	4.3
	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		Single-phase 200 to 240V, 50/60Hz					
	Voltage/frequency variations		Voltage: +10 to -10% 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	0.5	0.8	1.5	2.7	4.0
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 connectable resistance[ohm]		100				40	
	Braking resistor		Option					
DC reactor(DCR)		HHD	Option					
Enclosure (IEC60529)			IP20, UL open type					
Cooling method			Natural cooling				Fan cooling	
Mass [lbs(kg)]			1.1(0.5)	1.1(0.5)	1.3(0.6)	2.0(0.9)	3.5(1.6)	4.0(1.8)

*1 US 4-pole standard motor. At the selection of the inverter rating, consider not only the rating capacity (HP) 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 230 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.)

2.COMPLIANCE WITH GLOBAL STANDARDS

Marking	Compliant standards or directives	
CE	LVD	IEC/EN 61800-5-1：2007
	EMC	IEC/EN 61800-3：2004/A1:2012 IEC/EN 61326-3-1:2008 - Emission : Optional EMC filter : Category C2 Integrated EMC filter : Category C2/C3 Type of FRN0001E2E-2A ～ 0020E2E-2A: Category C2 Type of FRN0002E2E-4□ ～ 0012E2E-4□ : Category C2 Type of FRN0001E2E-7□ ～ 0011E2E-7□ : Category C2 Other than the above type : Category C3 - Immunity : Category C3 Second environment
	Safety (*)	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 (Functional Safety : STO) IEC/EN 62061 :2005 SIL3
c UL us LISTED	UL 508C C22.2 No.14	UL Standard for Safety, Power Conversion Equipment, second edition and CSA Standard for Industrial Control Equipment
	GOST-R	Russia
	KC	South Korea
-	RoHS compliant	All models are compliant.

(*)Three phase 230V class：From Type 0030 to 0115 are compliant with the standard. (Still pending: From type 0001 to 0020)
Three phase 460V class：From Type 0022 to 0590 are compliant with the standard. (Still pending: From type 0002 to 0012) Single phase 230V class：Still pending (From Type 0001 to 0011).

■ Model-GB/ Model-C, Standard terminal block board (without CAN, with FM2)

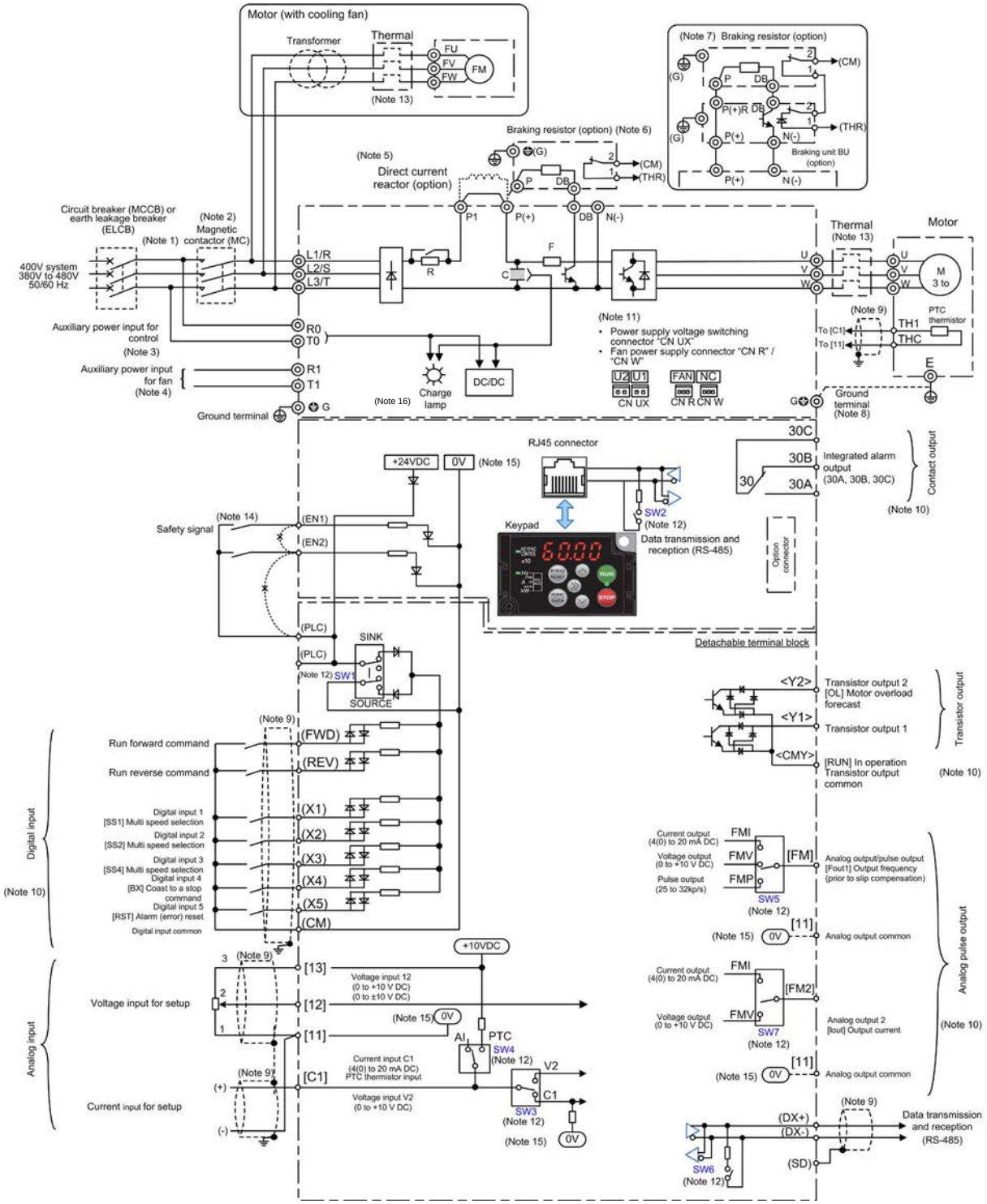


Figure 2.2-2 Standard Terminal Block Board (Without CAN, With FM2)