Fuji Electric

Innovating Energy Technology

Controladores de CA de bajo voltaje para aplicaciones de climatización

Variador para climatización
FRENIC-HVAC

FRENIC-HVAC

Fuji Electric's low voltage FRENIC-HVAC series AC drives are designed with a slim-sline foot print for a space saving installation, provide ease of start-up and contain functionality for optimal control for fan and pump applications. These inverters have key features such as: built-in DC reactor, built-in EMC filter, a real time clock, PID (4) controls, torque vector control, removable keypad, fire mode and filter clogging prevention functions. Reduce cost and power consumption by utilizing the high-performance FRENIC-HVAC AC drive.

USO EXCLUSIVO Par Variable: HVAC, Bombas y Ventiladores Centrífugos, Chillers, Sopladores, Aire acondicionado

FRENIC-HVAC

FRENIC-HVAC Model Numbering System Diagram

Description FRN ### AR 1 * - # U

Product Code
FRENIC Series

Applicable Horsepower Rating
001 = 1Hp
010 = 10Hp
100 = 100Hp
1000 = 1000Hp

Application Range
AR = FRENIC-HVAC for HVAC Applications
(Variable Torque Fans & Pumps)

Development Series
1 - 1st Generation

Enclosure
M = UL Type 1 / IP21
L = UL Type 12 / IP55
S = UL Open Type / IP00

Input Power Source
2 = 280/230VAC - 3-Phase or 1-Phase
4 = 460VAC - 3-Phase or 1-Phase
5 = 575VAC - 3-Phase or 1-Phase

Destination/Manual
U = USA/English

Variador para climatización **FRENIC-HVAC**

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Especificaciones

Capacidad (HP)	Serie 208 V: 1 a 125 HP Serie 460 V: 1 a 1,000 HP Serie 575 V: 1 a 300 HP
Capacidad de sobrecarga	110 % por 1 min
Potencia de entrada	Serie 208 V: Mono/trifásica 200 a 240 V, 50/60 Hz Serie 460 V: Mono/trifásica 380 a 480 V, 50/60 Hz Serie 575 V: Mono/trifásica 575 a 600 V, 50/60 Hz Voltaje: +10 % a -15 % (Desbalance de 2 % o menos) Frecuencia: +5 % a -5 %
Control	Control V/F, control vectorial de par dinámico
Voltaje de salida	Serie 208 V: Trifásico 200 a 240 V (con función de regulador automático de tensión, AVR) Serie 460 V: Trifásico 380 a 480 V (con función AVR) Serie 575 V: Trifásico 575 a 600 V (con función AVR)
Frecuencia de salida	120 Hz máximo
Estabilidad de salida	Configuración analógica: ±0.2 % de frecuencia máxima Configuración digital: ±0.01 % de frecuencia máxima (por teclado)
Filtro EMC	Incorporado
Reactor de CC	≤ 60 HP 208 V, 125 HP 460 V, 150 HP 575 V incorporado ≥ 75 HP 208 V, 150 HP 460 V, 200 HP 575 V con controlador externo; se envía con controlador
Desplazamiento del factor de potencia	> 0.98 (en carga nominal)
Factor de potencia real	≥ 0.90 (en carga nominal)
Eficiencia	≥ 97 % (en carga nominal)
Temperatura ambiente	Abierto/tipo 1 según NEMA/UL: -10 a 50 °C (14 a 122 °F), tipo 12 según NEMA/UL: -10 a 40 °C (14 a 104 °F)
Temperatura de almacenamiento	-25 a 70 °C (-13 a 158 °F)
Humedad relativa	5 a 95 % HR (sin condensación)
Ubicación de instalación	Grado 2 de polución según el estándar de IEC 60664-1. (Libre de gases corrosivos, gases inflamables, vapor de aceite, polvo y luz solar directa) Solo para uso en interiores
Altitud	≤ 3,300 ft (1,000 m) , 3,300 ft (1,000 m) a 9,900 ft (3,000 m) con disminución
Carcasa	Tipo 1 y 12 según NEMA/UL: ≤ 60 HP 208 V, 125 HP 460 V/575 V Tipo abierto según UL, tipo 1 por kit de opciones según NEMA/UL: ≥ 75 HP 208 V, 150 HP 460 V/575 V
Seguridad	Categoría 3 según EN ISO13849-1, EN954-1
Estándar	UL, cUL: UL508C, C22.2 N.º 14, EN61800-5:2007 CE: IEC/EN61800-5-1: 2007 (directiva LV); IEC/EN61800-3-12 (directiva EMC) SEMI F47-0706 RoHS: 2002/96/EC

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Variador para climatización **FRENIC-HVAC**

Variadores de CA de bajo voltaje para aplicaciones de climatización

Rendimiento

El controlador para climatización FRENIC de Fuji Electric ha sido diseñado con características y funciones pensadas específicamente para aplicaciones de control motor para climatización. El resultado es un regulador de accionamiento de bajo voltaje que brinda un control de entorno óptimo para mantener las condiciones agradables en ambientes comerciales y en instalaciones industriales, mientras logra una eficiencia mayor a la de los arrancadores de motor convencionales.

Desarrollado bajo estándares de calidad inquebrantables y con flexibilidad para cumplir con las exigencias de varias aplicaciones dentro de los requisitos del control motor para climatización, el controlador para climatización FRENIC es la opción correcta para una gran variedad de instalaciones de climatización.

La facilidad para la puesta en marcha junto con los estándares de diseño robusto de Fuji Electric hacen del controlador para climatización FRENIC la opción preferida de los proveedores de servicio que quieren resultados rápidos y sostenibles.

Características

Control de entradas/salidas

- 9 entradas digitales: X1 a X7; funciones de FWD (avance) y REV (retroceso) programables; 67 funciones seleccionables
- 2 entradas de seguridad (especiales): EN1, EN2
- 3 entradas analógicas: 2 - 0 a + 10 VCC y 1 - 4 a 20 mA
- 6 salidas digitales: 2 relés (1 forma C y 1 forma A) y 4 transistores; 77 funciones seleccionables
- 2 salidas analógicas: tipo seleccionable: 0 a 10 VCC o 4 a 20 mA; 43 funciones seleccionables
- 2 conectores RS-485: Conectores RJ45 para puerto de teclado y RS485 para bloque de terminal de control
- Terminal de salida de 24 VCC: con índice de 200 mA
- TECLADO con gran pantalla de LCD con indicadores de operación de sistema para climatización y conversión de unidades asociadas

Diseño resistente

- Barras colectoras enchapadas en estaño (Sn) y níquel (Ni)
- PCB con revestimiento de protección
- Recubrimiento de panel del ventilador de refrigeración y protección antióxido
- Ventilador de refrigeración con vida útil de 10 años y capacitor con señal de salida de alarma de mantenimiento

Flexibilidad y funcionalidad

- Bloque de terminal de control extraíble
- Filtro CE incorporado en todos los modelos
- DCR en todos los modelos
- Software de programación y localización y de solución de problemas de PC
- Puerto USB en tarjeta de control
- Reloj en tiempo real
- Lógica personalizable
- Control de ahorro de energía automático
- Controladores 4-PID
- Modo de incendios
- Manejo del motor en giro
- Prevención de obstrucción del filtro/funcionamiento de inversión
- Control de presunción de temperatura de bulbo húmedo
- Alarmas "de luz" seleccionables
- Visualización de unidades de medición PID
- Contraseña
- 3 puertos de tarjetas opcionales incorporados
- Entrada monofásica
- BACnet MS/TP, Metasys N2 y Modbus RTUD incorporados

Seguridad y estándares

- Entrada de seguridad
- UL 508C, CE
- Certificación plena UL
- Abierto, tipo 1 y tipo 12 según NEMA/UL
- RoHS
- SEMI F47-0706

Dimensiones

Índice de voltaje	Motor nominal utilizado (HP)	Tipo	Dimensiones externas		
			Ancho	Alto	Largo
Trifásico 208V	1	FRN001AR1□-2U	150 (5.91)	465 (18.3)	262 (10.3)
	2	FRN002AR1□-2U			
	3	FRN003AR1□-2U			
	5	FRN005AR1□-2U			
	7.5	FRN007AR1□-2U	203 (7.99)	585 (23)	
	10	FRN010AR1□-2U			
	15	FRN015AR1□-2U			
	20	FRN020AR1□-2U		645 (25.4)	
	25	FRN025AR1□-2U			
	30	FRN030AR1□-2U	265 (10.4)	736 (29)	284 (11.2)
	40	FRN040AR1□-2U			
	50	FRN050AR1□-2U	300 (11.8)	885 (34.8)	367.9 (14.5)
	60	FRN060AR1□-2U			
	75	FRN075AR1S-2U	361.2 (14.2)	740 (29.1)	276.3 (10.9)
	100	FRN100AR1S-2U			
	125	FRN125AR1S-2U	535.8 (21.1)	750 (29.5)	291.3 (11.5)
Trifásico 460V	1	FRN001AR1□-4U	150 (5.91)	465 (18.3)	262 (10.3)
	2	FRN002AR1□-4U			
	3	FRN003AR1□-4U			
	5	FRN005AR1□-4U			
	7.5	FRN007AR1□-4U			
	10	FRN010AR1□-4U			
	15	FRN015AR1□-4U	203 (7.99)	585 (23)	262 (10.3)
	20	FRN020AR1□-4U			
	25	FRN025AR1□-4U			
	30	FRN030AR1□-4U			
	40	FRN040AR1□-4U	203 (7.99)	645 (25.4)	262 (10.3)
	50	FRN050AR1□-4U			
	60	FRN060AR1□-4U	265 (10.4)	736 (29)	284 (11.2)
	75	FRN075AR1□-4U			
	100	FRN100AR1□-4U	300 (11.8)	885 (34.8)	367.9 (14.5)
	125	FRN125AR1□-4U			
	150	FRN150AR1S-4U	530 (20.9)	740 (29.1)	315 (12.4)
	200	FRN200AR1S-4U			
	250	FRN250AR1S-4U		1000 (39.4)	360 (14.2)
	300	FRN300AR1S-4U			
	350	FRN350AR1S-4U	680 (26.8)	1000 (39.4)	360 (14.2)
	450	FRN450AR1S-4U			
	500	FRN500AR1S-4U		1400 (55.1)	440 (17.3)
	600	FRN600AR1S-4U			
	800	FRN800AR1S-4U	880 (34.7)	1400 (55.1)	440 (17.3)
	900	FRN900AR1S-4U	1000 (39.4)	1550 (61)	500 (19.7)
	1000	FRN1000AR1S-4U			
Trifásico 575V	1	FRN001AR1□-5U	150 (5.91)	465 (18.3)	262 (10.3)
	2	FRN002AR1□-5U			
	3	FRN003AR1□-5U			
	5	FRN005AR1□-5U			
	7.5	FRN007AR1□-5U			
	10	FRN010AR1□-5U			
	15	FRN015AR1□-5U	203 (7.99)	585 (23)	262 (10.3)
	20	FRN020AR1□-5U			
	25	FRN025AR1□-5U			
	30	FRN030AR1□-5U			
	40	FRN040AR1□-5U	203 (7.99)	645 (25.4)	262 (10.3)
	50	FRN050AR1□-5U			
	60	FRN060AR1□-5U	265 (10.4)	736 (29)	284 (11.2)
	75	FRN075AR1□-5U			
	100	FRN100AR1□-5U	300 (11.8)	885 (34.8)	367.9 (14.5)
	125	FRN125AR1□-5U			
	150	FRN150AR1□-5U			
	200	FRN200AR1S-5U	536.4 (21.2)	1000 (39.4)	366.3 (14.5)
	250	FRN250AR1S-5U			
	300	FRN300AR1S-5U			

□(adjunto) : M : UL TIPO1, L : UL TIPO12

Opciones

Bus de campo:

- EtherNet
- CC-Link
- LONWORKS
- DeviceNet
- Profibus DP
- CANopen

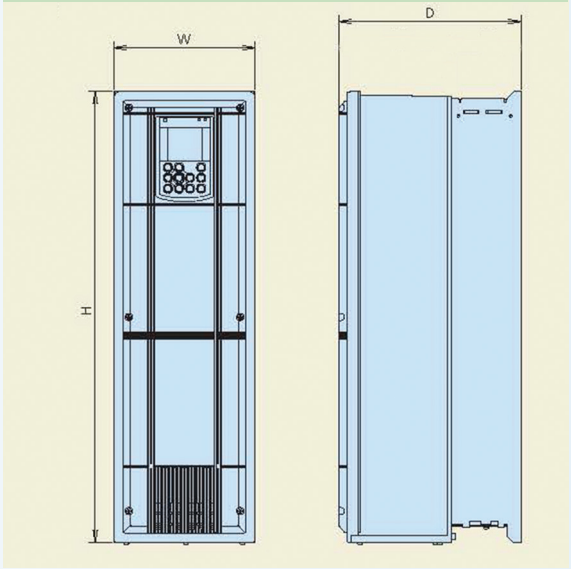
Expansión de entrada/salida:

- Teclado con puerto USB
- Salida de relé
- Entradas y salidas analógicas
- Entrada para sensor de temperatura

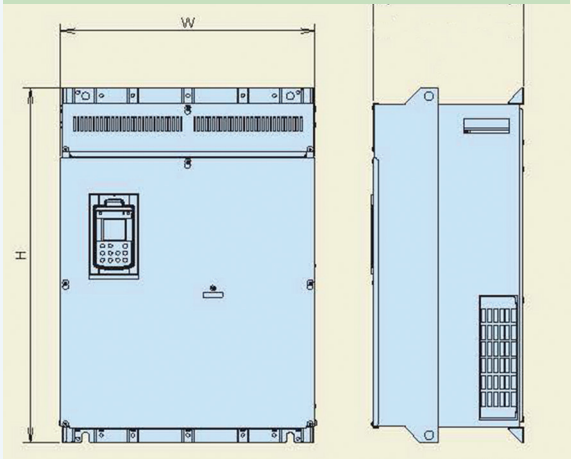
Otros:

- Batería para reloj
- Kit tipo 1 NEMA/UL

60 HP Y MENOS DE 208 V, 125 HP Y MENOS DE 460 V, 150 HP Y MENOS DE 575 V



75 HP Y MÁS DE 208 V, 150 HP Y MÁS DE 460 V, 200 HP Y MÁS DE 575 V



General Specifications

Environmental	
Enclosure	UL Type 1, UL Type 12, UL Open Type w/ Opt. for UL Type 1
Ambient Temperature	+14 to +122°F (-10 to +50°C) - UL Type1 & UL Open Type +14 to +104°F (-10 to +40°C) - UL Type 12
Storage Temperature	-13 to +158°F (-25 to +70°C)
Humidity	5% to 95% With No Condensation
Altitude	0 to 3,300 ft. (1,000 m) Without Derating, Derate Output Current for Higher Altitudes per User's Manual

Codes and Standards
UL508C, C22.2 No.14, EN61800-5-1:2007

Electrical	
Input Voltage: Range(Hz) - Phase	200-240VAC(50/60Hz) - 3Ph (≤25Hp) 200-220VAC(50Hz), 200-230VAC(60Hz) - 3Ph (≥30Hp[LD]) 380-480VAC(50/60Hz) - 3Ph (≤50Hp[LD]) 380-440VAC(50Hz), 380-480VAC(60Hz) - 3Ph (≥60Hp[LD]) 575-600VAC(50/60Hz) - 3Ph
Input Voltage: Tolerance, Unbalance	3-Ph Input = +10% to -15%, ≤2%
Input Frequency: Nominal, Tolerance	50/60Hz, +/-5%
Displacement Power Factor	≥0.98 (@ Rated Load)
Output Voltage: Range-Phase	0 to Maximum Input Voltage-3Ph
Maximum Output Frequency	120Hz
Motor Control Method	V/f, Dynamic Torque Vector, V/f with Slip Compensation
Overload Capacity	110% Rated Current for 1 min.
Analog Inputs	Qty 2: 0 to ±10VDC Qty 1: 0/4 to 20mA
Digital Inputs	Qty 9: Programmable Inputs Qty 2: Enable/Safe Torque Off Inputs
Analog Outputs	Qty 2: Configurable for 0 to +10VDC or 0/4 to 20mA, User Selectable for Proportional Analog Signal Functionality
Digital Outputs	Qty 1: Form C (1N.O. & 1N.C.) Dry Contacts Rated 0.3A @ 230VAC Max, User Selectable Functionality Qty 1: Form A (1N.O.) Dry Contact Rated 0.3A @ 230VAC Max, User Selectable Functionality Qty 4: Transistor Output Rated 50mA @ 27Vdc Max, User Selectable Functionality
Power Supply	Qty 1: 24VDC, 200mA Max

1. Standard Specifications
1-1. Three-phase 230 V series
(1 to 125 HP)

Items			Specifications															
Type *8	FRN___AR1■-2U : HVAC		001	002	003	005	007	010	015	020	025	030 *11	040 *11	050 *11	060 *11	075 *11	100 *11	125 *11
Nominal applied motor (Rated output) [HP] *1	Three phase input	AC208V motor AC230V motor	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125
	Single phase input	AC208V motor	–	1/2	3/4	1.5	2	3	5	5	7.5	10	10	15	20	30	30	40
		AC230V motor	–	1/2	1	2	3	3	5	7.5	10	10	15	20	25	30	30	50
Output ratings	Three phase input	Rated capacity [kVA] *2	1.9	3.1	4.3	7.1	10	12	18	23	29	35	45	58	71	85	112	137
		Rated current [A]	5	8	11	18	27	31.8	46.2	59.4	74.8	88	115	146	180	215	283	346
	Single phase input	Rated capacity [kVA] *2	0.7	1.2	1.6	2.7	4.1	4.9	7.1	9.2	11	13	17	22	27	37	40	52
		Rated current [A]	1.9	3.1	4.2	7.0	10.5	12.4	18.0	23.1	29.1	34.3	44.8	56.9	70.2	95	102	131
	Rated voltage [V] *3		Three-phase, 200 to 240 V (with AVR function)									Three-phase, 200 to 230 V (with AVR function)						
	Overload capability		110% – 1 min (Overload capability interval : IEC 61800-2 compliant)															
	Rated frequency [Hz]		50, 60Hz															
Input ratings	Three phase input	Main power supply : Phases, voltage, frequency	Three-phase, 200 to 240 V, 50/60 Hz									Three-phase, 200 to 220 V, 50 Hz Three-phase, 200 to 230 V, 60 Hz						
		Rated current [A] *6	2.8	5.3	7.5	12.9	18.0	24.2	36.0	48.6	60.0	71.5	96.9	121	145	178	246	291
		Required power supply capacity [kVA]	1.2	2.2	3.0	5.2	7.2	10	15	20	24	29	39	49	58	71	98	116
	Single phase input	Main power supply : Phases, voltage, frequency	Single-phase, 200 to 240 V, 50/60 Hz									Single-phase, 200 to 220 V, 50 Hz Single-phase, 200 to 230 V, 60 Hz						
		Rated current [A] *6	–	5.3	7.5	12.9	18.0	24.2	36.0	48.6	60.0	71.5	96.9	121	145	178	246	291
		Required power supply capacity [kVA]	–	1.3	1.8	3.0	4.2	5.6	8.3	12	14	17	23	28	34	41	57	67
	Auxiliary control power supply : Phases, voltage, frequency		Single-phase 200 to 240 V, 50/60 Hz									Single-phase 200 to 230 V, 50/60 Hz						
	Auxiliary main power supply : Phases, voltage, frequency *4		–									Single-phase 200 to 220 V, 50 Hz Single-phase 200 to 230 V, 60 Hz						
	Voltage, frequency variations		Voltage: +10 to –15% (Interphase voltage unbalance : 2% or less) *5, Frequency: +5 to –5%															
Brak-ing	Torque [%] *7		20									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%															
EMC filter (IEC/EN 61800-3:2004) *10			EMC standards compliance : Category C2 (emission) / 2nd Env. (Immunity)													C3/ 2nd.		
DC reactor (DCR) *10			Built-in (IEC/EN 61000-3-2 *9, IEC/EN 61000-3-12)													Standard accessory (IEC/EN 61000-3-12)		
Power factor (at rated load)	Displacement P.F. (cosϕ)		＞0.98															
	True P.F.		≧0.90															
Efficiency (at rated load)			97%						98%									
Applicable (safety) standards			UL508C, C22.2 No.14, IEC/EN 61800-5-1:2007, SEMI F47-0706(under application)															
Enclosure	IEC/EN 60529		IP21/ IP55													IP00		
	UL 50		UL TYPE 1/ UL TYPE12(under application)													UL open type		
Cooling method			Fan cooling															
Weight/Mass [kg]	IP21		10	10	10	10	18	18	18	23	23	50	50	70	70	–		
	IP55		10	10	10	10	18	18	18	23	23	50	50	70	70			
	IP00		–													42	43	62

*1) US 4-pole standard induction motor.
*2) Rated capacity is calculated by assuming the output rated voltage as 230 V.
*3) Output voltage cannot exceed the power supply voltage. At single-phase input use, the output voltage may be lower than three-phase input.
*4) The auxiliary power input is used as an AC power input when combining the unit to DC power supply such as high power factor PWM converter with power regenerative function. (Generally not to be used.)
*5) Voltage unbalance [%] = (Max. voltage [V] – Min. voltage [V])/Three-phase average voltage [V] x 67 (See IEC61800-3.)
If this value is 2 to 3%, use an optional AC reactor (ACR).
*6) The value is calculated on assumption that the inverter is connected with a power supply 230V, 50Hz and Rsce=120.
*7) Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)
*8) The underline (___) replaces an numeric letter depending on the drive capacity.
The box (■) replaces an alphabetic letter depending on the enclosure. M (IP21), L (IP55) or S(IP00)
*9) It is applicable when the power supply is supplied from 3-phase 200V series transformer which is through 3-phase 400V series transformer.
*10) EMC filters and DCR does not conform to each corresponding standards when single phase input use.
*11) COMMING SOON : The capacity from 30HP to 125HP of 230V series.

1-2. Three-phase 460 V series
(1 to 75 HP)

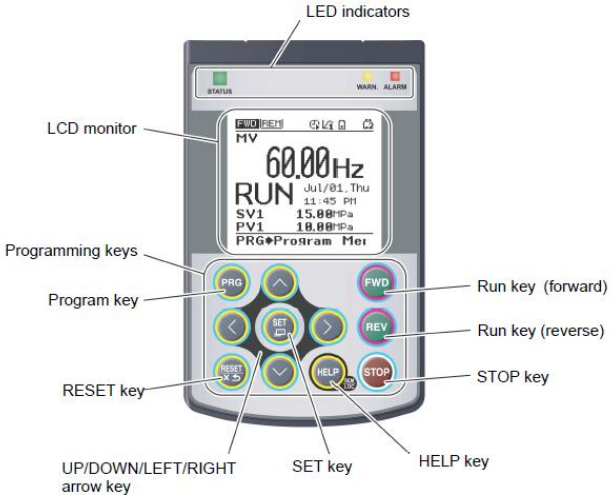
Items			Specifications												
Type *8	FRN___AR1■-4U : HVAC		001	002	003	005	007	010	015	020	025	030	040	050	060 *10	075 *10
Nominal applied motor (Rated output) [HP] *1	Three phase input	AC460V motor	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75
	Single phase input		–	1/2	1	2	3	3	5	7.5	10	10	15	20	25	30
Output ratings	Three phase input	Rated capacity [kVA] *2	1.9	3.2	4.3	7.1	10	14	19	25	31	35	47	59	72	89
		Rated current [A]	2.5	4.1	5.5	9.0	13.5	18.5	24.5	32	39	45	60	75	91	112
	Single phase input	Rated capacity [kVA] *2	–	1.1	1.6	2.7	4.1	5.7	7.5	9.8	12	13	18	23	28	34
		Rated current [A]	–	1.5	2.1	3.5	5.2	7.2	9.5	12.4	15.2	17.5	23.4	29.2	35.4	43.6
	Rated voltage [V] *3		Three-phase, 380 to 480 V (with AVR function)													
	Overload capability		110% - 1 min (Overload capability interval : IEC 61800-2 compliant)													
	Rated frequency [Hz]		50, 60Hz													
Input ratings	Three phase input	Main power supply : Phases, voltage, frequency	Three-phase, 380 to 480 V, 50/60 Hz												Three-phase, 380 to 440 V, 50 Hz Three-phase, 380 to 480 V, 60 Hz	
		Rated current [A] *6	1.4	2.7	3.8	6.5	9.0	12.1	18.0	24.3	30.0	35.8	48.5	60.4	72.3	88.7
		Required power supply capacity [kVA]	1.2	2.2	3.1	5.2	7.2	10	15	20	24	29	39	49	58	71
	Single phase input	Main power supply : Phases, voltage, frequency	Single-phase, 380 to 480 V, 50/60 Hz												Single-phase, 380 to 440 V, 50 Hz Single-phase, 380 to 480 V, 60 Hz	
		Rated current [A] *6	–	2.7	3.8	6.5	9.0	12.1	18.0	24.3	30.0	35.8	48.5	60.4	72.3	88.7
		Required power supply capacity [kVA]	–	1.3	1.8	3.0	4.2	5.6	8.3	12	14	17	23	28	34	41
	Auxiliary control power supply : Phases, voltage, frequency		Single-phase 380 to 480 V, 50/60 Hz													
	Auxiliary main power supply : Phases, voltage, frequency *4		–												Single-phase 380 to 440 V, 50 Hz Single-phase 380 to 480 V, 60 Hz	
	Voltage, frequency variations		Voltage: +10 to -15% (Interphase voltage unbalance : 2% or less) *5, Frequency: +5 to -5%													
Brak-ing	Torque [%] *7		20											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%													
EMC filter (IEC/EN 61800-3:2004) *9			EMC standards compliance : Category C2 (emission) / 2nd Env. (Immunity)													
DC reactor (DCR) *9			Built-in (IEC/EN 61000-3-2, IEC/EN 61000-3-12)													
Power factor (at rated load)	Displacement P.F. (cosφ)		>0.98													
	True P.F.		≧0.90													
Efficiency (at rated load)			95%	96%	97%						98%					
Applicable (safety) standards			UL508C, C22.2 No.14, IEC/EN 61800-5-1:2007, SEMI F47-0706													
Enclosure	IEC/EN 60529		IP21/ IP55													
	UL 50		UL TYPE 1/ UL TYPE 12(under application)													
Cooling method			Fan cooling													
Weight/Mass [kg]	IP21		10	10	10	10	10	10	18	18	18	18	23	23	50	50
	IP55		10	10	10	10	10	10	18	18	18	18	23	23	50	50

(100 to 1000 HP)

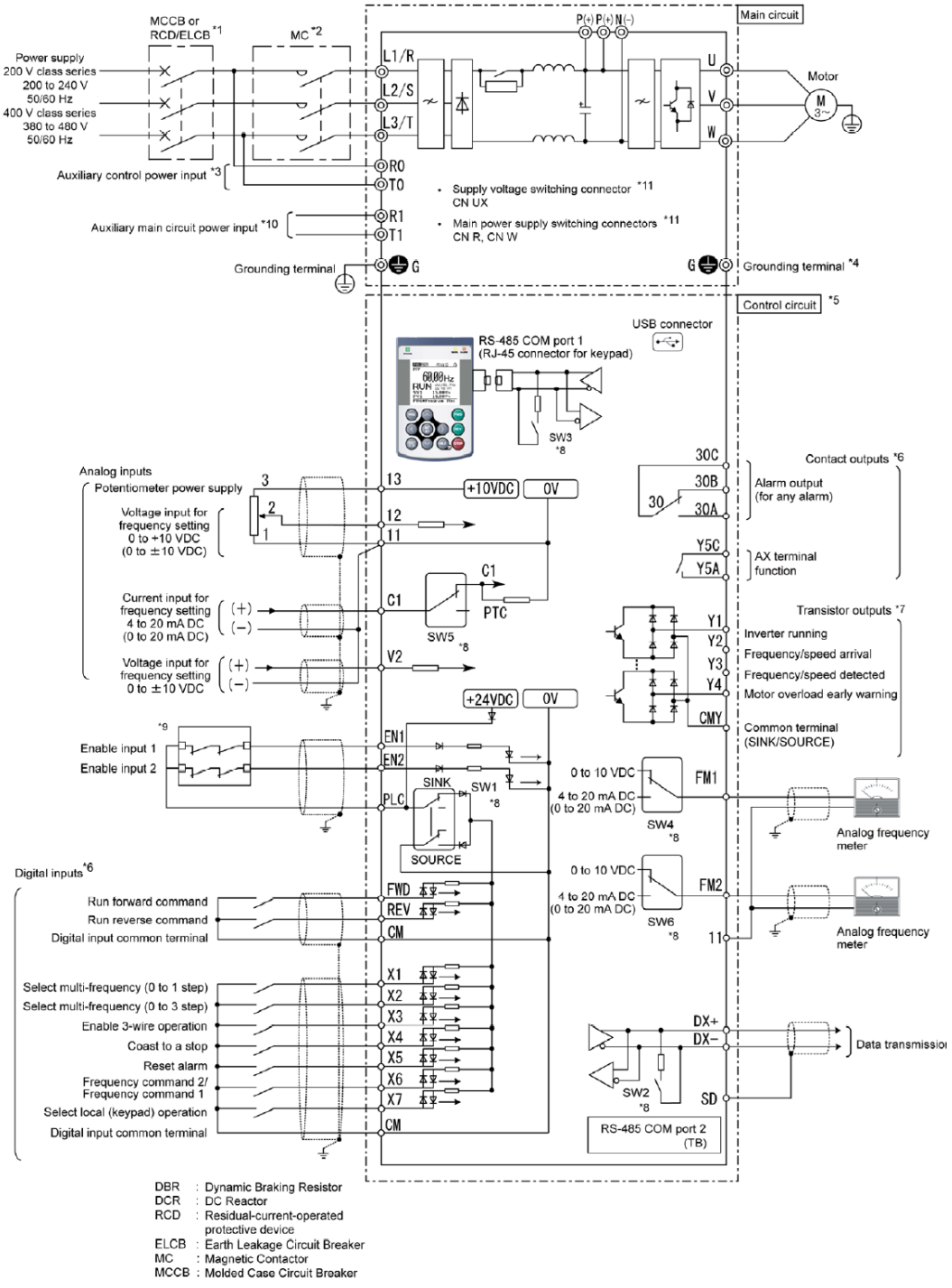
Items			Specifications												
Type *8	FRN___AR1■-4U : HVAC		100 *10	125 *10	150 *10	200 *10	250 *10	300 *10	350 *10	450 *10	500 *10	600 *10	800 *10	900 *10	1000 *10
Nominal applied motor (Rated output) [HP] *1	Three phase input	AC460V motor	100	125	150	200	250	300	350	450	500	600	800	900	1000
	Single phase input		40	50	60	75	75	100	125	150	200	200	300	350	450
Output ratings	Three phase input	Rated capacity [kVA] *2	119	140	167	201	242	300	330	414	517	589	764	932	1091
		Rated current [A]	150	176	210	253	304	377	415	520	650	740	960	1170	1370
	Single phase input	Rated capacity [kVA] *2	46	54	65	78	94	117	128	160	201	229	297	363	425
		Rated current [A]	58.5	68.6	81.9	98.6	118	147	161	202	253	288	374	456	534
	Rated voltage [V] *3		Three-phase, 380 to 480 V (with AVR function)												
	Overload capability		110% - 1 min (Overload capability interval : IEC 61800-2 compliant)												
	Rated frequency [Hz]		50, 60Hz												
Input ratings	Three phase input	Main power supply : Phases, voltage, frequency	Three-phase, 380 to 440 V, 50 Hz Three-phase, 380 to 480 V, 60 Hz												
		Rated current [A] *6	119	141	201	238	286	357	390	500	628	705	881	1115	1256
		Required power supply capacity [kVA]	95	113	161	190	228	285	311	399	501	562	702	889	1001
	Single phase input	Main power supply : Phases, voltage, frequency	Single-phase, 380 to 440 V, 50 Hz Single-phase, 380 to 480 V, 60 Hz												
		Rated current [A] *6	119	141	201	238	286	357	390	500	628	705	881	1115	1256
		Required power supply capacity [kVA]	55	65	93	110	132	165	180	230	289	325	406	513	578
	Auxiliary control power suuply : Phases, voltage, frequency		Single-phase 380 to 480 V, 50/60 Hz												
	Auxiliary main power supply : Phases, voltage, frequency *4		Single-phase 380 to 440 V, 50 Hz Single-phase 380 to 480 V, 60 Hz												
	Voltage, frequency variations		Voltage: +10 to -15% (Interphase voltage unbalance : 2% or less) *5, Frequency: +5 to -5%												
Brak-ing	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%												
EMC filter (IEC/EN 61800-3:2004) *9			C2/ 2nd.		EMC standards compliance : Category C3 (emission) / 2nd Env. (Immunity)										
DC reactor (DCR) *9			Built-in (IEC/EN 61000-3-2, IEC/EN 61000-3-12)		Standard accessory (IEC/EN 61000-3-12)										
Power factor (at rated load)	Displacement P.F. (cosφ)		>0.98												
	True P.F.		≧0.90												
Efficiency (at rated load)			98%												
Applicable (safety) standards			UL508C, C22.2 No.14, IEC/EN 61800-5-1:2007, SEMI F47-0706												
Enclosure	IEC/EN 60529		IP21/ IP55		IP00										
	UL 50		UL TYPE 1/ UL TYPE 12(under application)		UL open type										
Cooling method			Fan cooling												
Weight/Mass [kg]	IP21		70	70	–										
	IP55		70	70											
	IP00		–		62	64	94	98	129	140	245	245	330	530	530

*1) US 4-pole standard induction motor.
*2) Rated capacity is calculated by assuming the output rated voltage as 460 V.
*3) Output voltage cannot exceed the power supply voltage. At single-phase input use, the output voltage may be lower than three-phase input.
*4) The auxiliary power input is used as an AC power input when combining the unit to DC power supply such as high power factor PWM converter with power regenerative function. (Generally not to be used.)
*5) Voltage unbalance [%] = (Max. voltage [V] - Min. voltage [V])/Three-phase average voltage [V] x 67 (See IEC61800-3.)
If this value is 2 to 3%, use an optional AC reactor (ACR).
*6) The value is calculated on assumption that the inverter is connected with a power supply 460V, 50Hz and Rsce=120.
*7) Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)
*8) The uderline (___) replaces an numeric letter depending on the drive capacity.
The box (■) replaces an alphabetic letter depending on the enclosure. M (IP21), L (IP55) or S (IP00)
*9) EMC filters and DCR does not conform to each corresponding standards when single phase input use.
*10) COMMING SOON : The capacity from 60HP to 1000HP of 460V series.

4A. FRENIC-HVAC Multi-Purpose Keypad



4B. Basic wiring diagram (Operation by external signal inputs)



DBR : Dynamic Braking Resistor
DCR : DC Reactor
RCD : Residual-current-operated protective device
ELCB : Earth Leakage Circuit Breaker
MC : Magnetic Contactor
MCCB : Molded Case Circuit Breaker

Note *1:
Install a recommended molded-case circuit-breaker (MCCB) or a ground fault circuit interrupter (GFCI) (with an overcurrent protection function) in the primary circuit of the inverter to protect wiring. At this time, ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.

Note *2:
Install a magnetic contactor (MC) recommended for each inverter to separate the inverter form the power supply, apart from the MCCB or GFCI, when necessary. Connect a surge suppressor in parallel when installing a coil such as the MC or solenoid near the inverter.

Note *3:
To retain an alarm output signal ***ALM*** issued on inverter's programmable output terminals by the protective function or to keep the keypad alive even if the main power has shut down, connect these terminals to the power supply lines. Even without power supply to these terminals, the inverter can run.

Note *4:
A grounding terminal for a motor; use this terminal if needed..

Note *5:
For the control signal wires, use shielded or twisted wires. Ground shielded wires. To prevent malfunction due to noise, keep the control circuit wiring away from the main circuit wiring as far as possible (recommended: 10cm or more), and never set them in the same wire duct. When crossing the control circuit wiring with the main circuit wiring, set them at right angles.

Note *6:
The connection diagram shows factory default functions assigned to digital input terminals (X1) to (X7), (FWD) and (REV), transistor output terminals (Y1) to (Y4), and relay contact output terminals (Y5A/C) and (30A/B/C).

Note *7:
Terminal (Y1) to (Y4) (transistor outputs) support both SINK and SOURCE modes.

Note *8:
Slide switches on the control printed circuit board (control PCB). Use these switches to customize the inverter operations. For details refer to the User's or Instruction Manuals description of "Setting up the slide switches".

Standard FRENIC-*HVAC* Model Number Outline Dimensions:

230V

Rated voltage	Nominal applied motor (HP)	Type	Outside dimensions [mm(inch)]						Mounting dimensions [mm(inch)]							
			Dwg.no.	W	H	D	D1	D2	Dwg.no.	W1	W2	H1	H2	H3	M	N
3-phase 230V	1	FRN001AR1□-2U	A	150 (5.91)	465 (18.3)	262 (10.3)	162 (6.38)	100 (3.94)	B	115 (4.53)	17.5 (0.69)	451 (17.8)	7 (0.28)	–	2xϕ8 (ϕ0.31)	8 (0.31)
	2	FRN002AR1□-2U														
	3	FRN003AR1□-2U														
	5	FRN005AR1□-2U														
	7.5	FRN007AR1□-2U		203 (7.99)	585 (23)	262 (10.3)	162 (6.38)	100 (3.94)		158 (6.22)	22.5 (0.89)	571 (22.5)	7 (0.28)			
	10	FRN010AR1□-2U														
	15	FRN015AR1□-2U														
	20	FRN020AR1□-2U		203 (7.99)	645 (25.4)	262 (10.3)	162 (6.38)	100 (3.94)		158 (6.22)	22.5 (0.89)	631 (24.8)	7 (0.28)			
	25	FRN025AR1□-2U														
	30	FRN030AR1□-2U	C	265 (10.4)	736 (29)	284 (11.2)	184.5 (7.26)	99.5 (3.92)	D	180 (7.09)	42.5 (1.67)	716 (28.2)	12 (0.47)	8 (0.31)	2xϕ10 (ϕ0.39)	10 (0.39)
	40	FRN040AR1□-2U														
	50	FRN050AR1□-2U		300 (11.8)	885 (34.8)	367.9 (14.5)	240.8 (9.48)	127.1 (5)		215 (8.46)		855 (33.7)	15.5 (0.61)	14.5 (0.57)	2xϕ15 (ϕ0.59)	15 (0.59)
	60	FRN060AR1□-2U														
	75	FRN075AR1□-2U	K	361.2 (14.2)	740 (29.1)	276.3 (10.9)	115 (4.53)	155 (6.1)	K	355 (14)	275 (10.8)	720 (28.4)	690 (27.2)	–	2xϕ10 (ϕ0.39)	10 (0.39)
	100	FRN100AR1□-2U														
	125	FRN125AR1□-2U		535.8 (21.1)	750 (29.5)	291.3 (11.5)	145 (5.71)	140 (5.51)		530 (20.9)	430 (16.9)		688.7 (27.1)		2xϕ15 (ϕ0.59)	15 (0.59)

460V

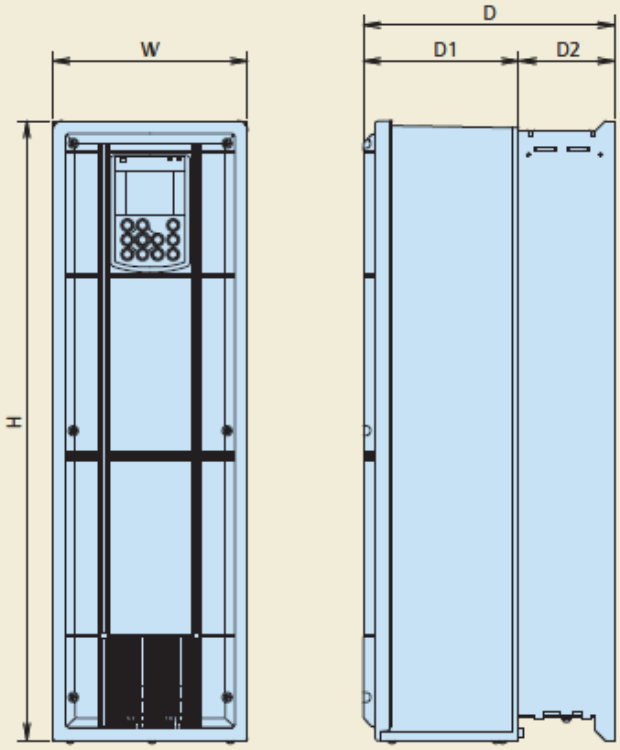
Rated voltage	Nominal applied motor (HP)	Type	Outside dimensions [mm(inch)]						Mounting dimensions [mm(inch)]							
			Dwg.no.	W	H	D	D1	D2	Dwg.no.	W1	W2	H1	H2	H3	M	N
3-phase 460V	1	FRN001AR1□-4U	A	150 (5.91)	465 (18.3)	262 (10.3)	162 (6.38)	100 (3.94)	B	115 (4.53)	17.5 (0.69)	451 (17.8)	7 (0.28)	–	2xϕ8 (ϕ0.31)	8 (0.31)
	2	FRN002AR1□-4U														
	3	FRN003AR1□-4U														
	5	FRN005AR1□-4U														
	7.5	FRN007AR1□-4U														
	10	FRN010AR1□-4U														
	15	FRN015AR1□-4U		203 (7.99)	585 (23)	262 (10.3)	162 (6.38)	100 (3.94)		158 (6.22)	22.5 (0.89)	571 (22.5)	7 (0.28)			
	20	FRN020AR1□-4U														
	25	FRN025AR1□-4U														
	30	FRN030AR1□-4U														
	40	FRN040AR1□-4U		203 (7.99)	645 (25.4)	262 (10.3)	162 (6.38)	100 (3.94)		158 (6.22)	22.5 (0.89)	631 (24.8)	7 (0.28)			
	50	FRN050AR1□-4U														
	60	FRN060AR1□-4U	C	265 (10.4)	736 (29)	284 (11.2)	184.5 (7.26)	99.5 (3.92)	D	180 (7.09)	42.5 (1.67)	716 (28.2)	12 (0.47)	8 (0.31)	2xϕ10 (ϕ0.39)	10 (0.39)
	75	FRN075AR1□-4U														
	100	FRN100AR1□-4U		300 (11.8)	885 (34.8)	367.9 (14.5)	240.8 (9.48)	127.1 (5)		215 (8.46)		855 (33.7)	15.5 (0.61)	14.5 (0.57)	2xϕ15 (ϕ0.59)	15 (0.59)
	125	FRN125AR1□-4U														
	150	FRN150AR1□-4U	E	530 (20.9)	740 (29.1)	315 (12.4)	135 (5.31)	180 (7.09)	F	430 (16.9)	50 (1.97)	710 (28)	15.5 (0.61)	14.5 (0.57)	2xϕ15 (ϕ0.59)	15 (0.59)
	200	FRN200AR1□-4U														
	250	FRN250AR1□-4U			1000 (39.4)	360 (14.2)	180 (7.09)					970 (38.2)				
	300	FRN300AR1□-4U														
	350	FRN350AR1□-4U	G	680 (26.8)	1000 (39.4)	360 (14.2)	180 (7.09)	180 (7.09)	H	290 (11.4)	50 (1.97)	970 (38.2)	15.5 (0.61)	14.5 (0.57)	3xϕ15 (ϕ0.59)	15 (0.59)
	450	FRN450AR1□-4U														
	500	FRN500AR1□-4U			1400 (55.1)	440 (17.3)	260 (10.2)					1370 (53.9)				
	600	FRN600AR1□-4U														
	800	FRN800AR1□-4U	I	880 (34.7)	1400 (55.1)	440 (17.3)	260 (10.2)	180 (7.09)	J	260 (10.2)	50 (1.97)	1370 (53.9)	15.5 (0.61)	14.5 (0.57)	4xϕ15 (ϕ0.59)	15 (0.59)
	900	FRN900AR1□-4U		1000 (39.4)	1550 (61)	500 (19.7)	313.2 (12.3)	186.8 (7.35)		300 (11.8)	49.5 (1.95)	1520 (59.8)				
	1000	FRN1000AR1□-4U														

FRENIC-*HVAC*: Outline Drawings - Reference Model Number Outline Dimension Tables

(for estimating purposes only)

■ Body

A



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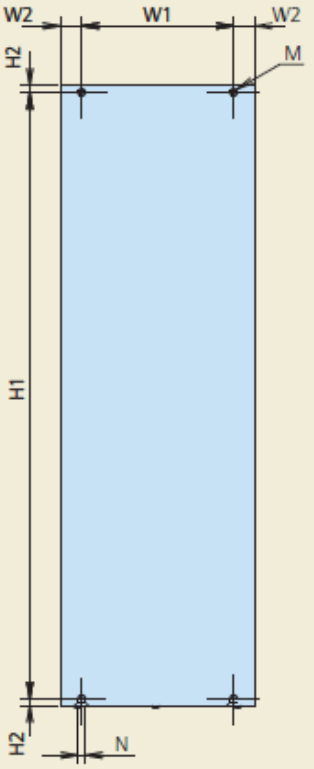
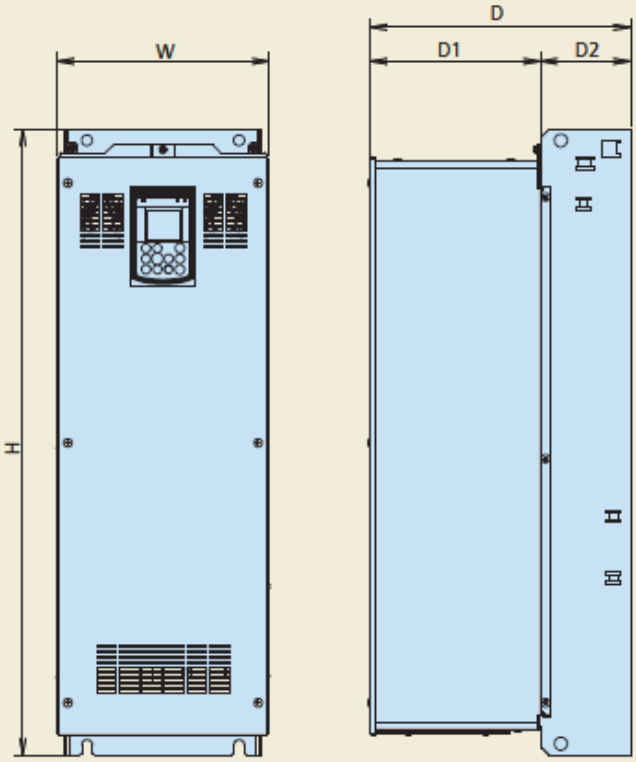


■ Body

C



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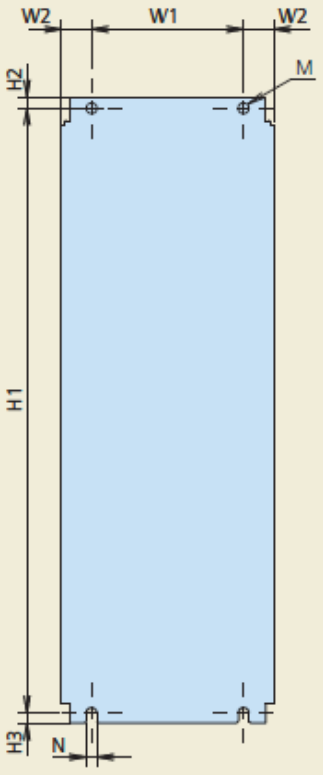
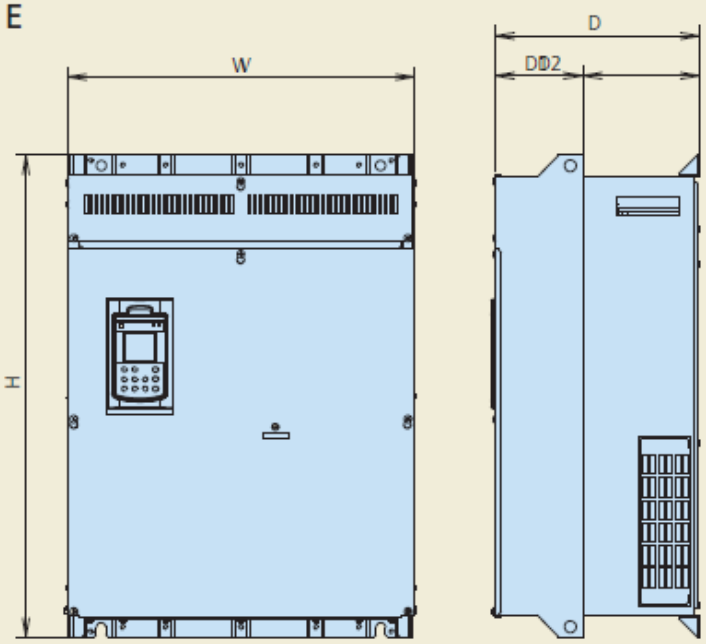


FRENIC-*HVAC*: Outline Drawings - Reference Model Number Outline Dimension Tables

(for estimating purposes only)

■ Body

E



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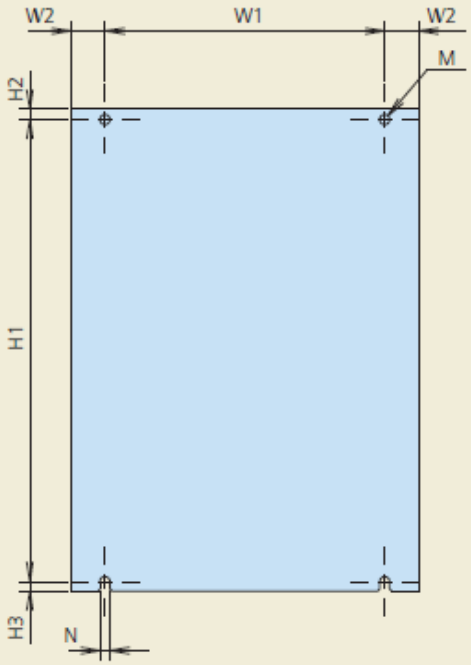
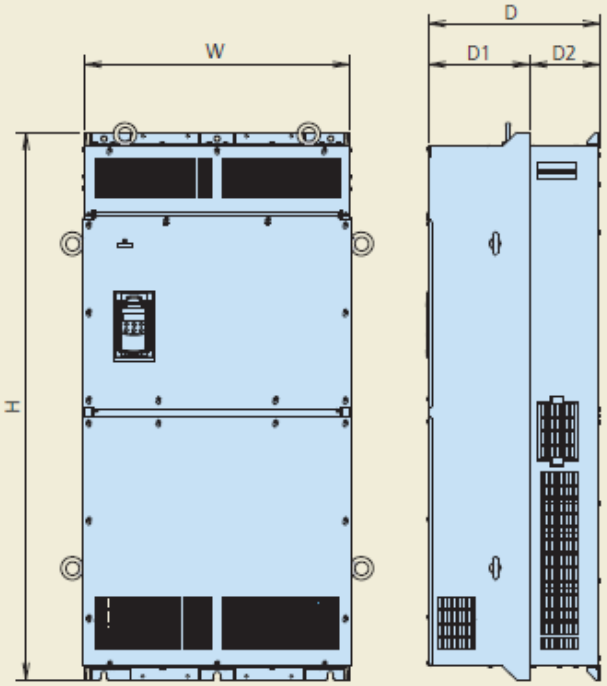


■ Body

G



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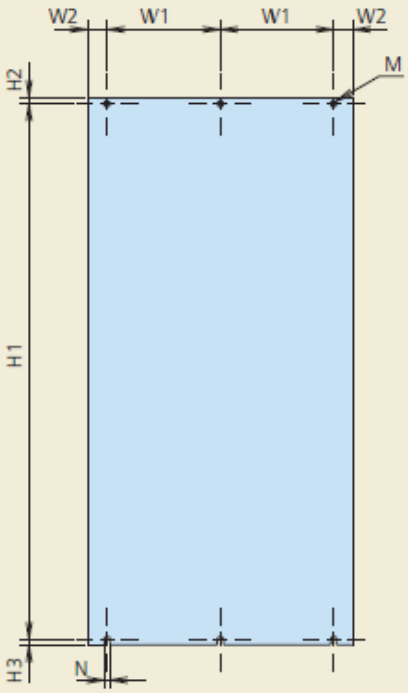
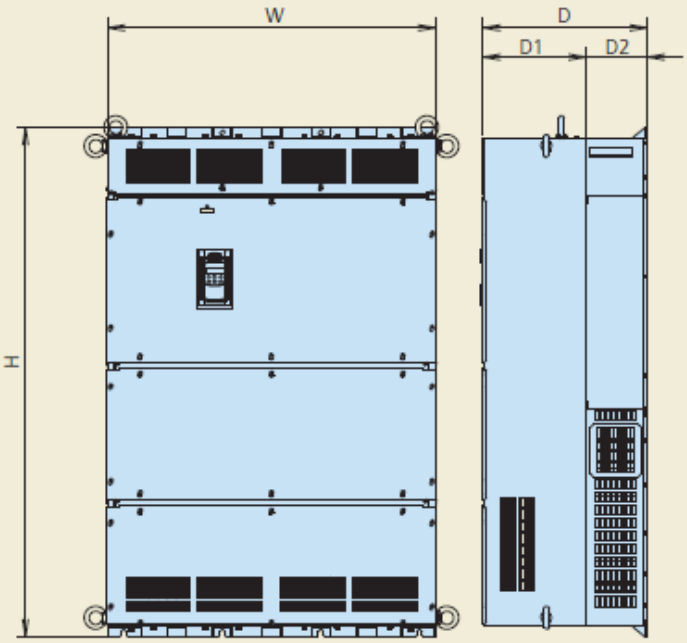


FRENIC-*HVAC*: Outline Drawings - Reference Model Number Outline Dimension Tables

(for estimating purposes only)

Body

I



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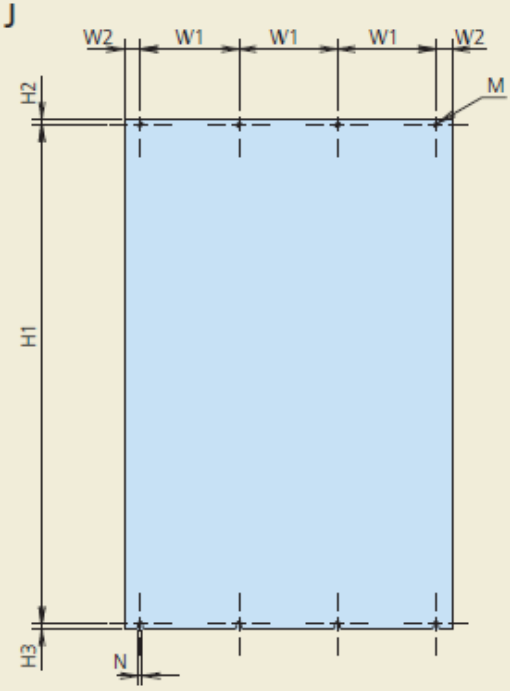
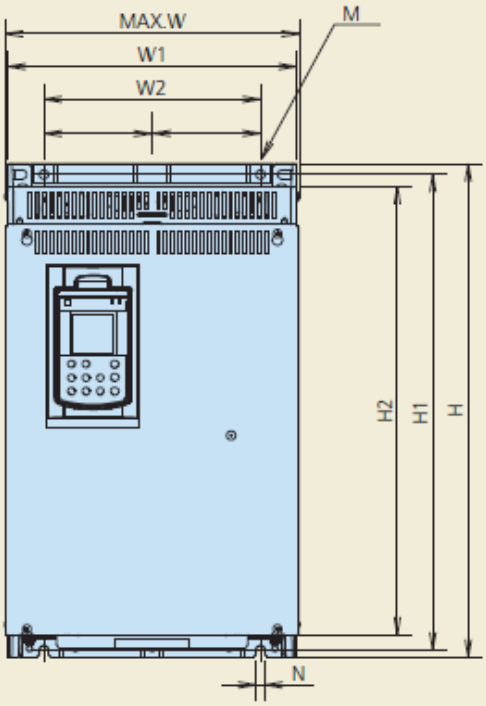
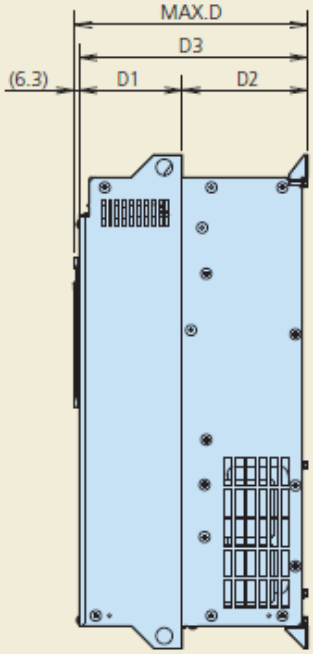


Body

K





FRENIC-*HVAC* Multi-function Keypad

■ Keypad