

FRENIC-HVAC Inverter

General Specifications



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

Items		Specifications																
Type *8	FRN_ARI ■-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	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125
	Single phase input	AC208V motor AC230V motor	-	1/2	3/4	1.5	2	3	5	7.5	10	10	15	20	30	30	40	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%																
Braking	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. (cos φ)	>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 Rsc=120.

*7) Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)

*8) The underline () replaces a 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) COMING 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 <u> </u> AR1 <u> </u> <u> </u> -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	
		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	
		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	
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. (cos φ)		>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 <u> </u> AR1 <u> </u> <u> </u> -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 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}		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. (cos φ)		>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 R_{sc}=120.

*7) Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)

*8) The underline () replaces a numeric letter depending on the drive capacity.

*9) The box () replaces an alphabetic letter depending on the enclosure. M (IP21), L (IP55) or S (IP00)

*10) EMC filters and DCR does not conform to each corresponding standards when single phase input use.

*11) COMING SOON : The capacity from 60HP to 1000HP of 460V series.

**1-3. Three-phase 575 V series
(1 to 30 HP)**

Items				Specifications									
Type ^{*8}	FRN	ARI	5U : HVAC	001 ⁺¹⁰	002 ⁺¹⁰	003 ⁺¹⁰	005 ⁺¹⁰	007 ⁺¹⁰	010 ⁺¹⁰	015 ⁺¹⁰	020 ⁺¹⁰	025 ⁺¹⁰	030 ⁺¹⁰
Nominal applied motor (Rated output) [HP] ^{*1}	Three phase input	AC460V motor	Rated capacity [kVA] ^{*2}	1	2	3	5	7.5	10	15	20	25	30
			Rated current [A]	-	1/2	3/4	1.5	2	3	5	5	7.5	10
Output ratings	Three phase input	Rated capacity [kVA] ^{*2}	Rated current [A]	1.6	2.7	3.8	6.1	9.2	11	16	21	26	31
			Rated current [A]	1.7	2.8	3.9	6.2	9.3	12	17	22	27	32
	Single phase input	Rated capacity [kVA] ^{*2}	Rated current [A]	-	0.9	1.4	2.3	3.5	4.5	6.5	8.4	10	12
			Rated current [A]	-	1.0	1.5	2.4	3.6	4.6	6.6	8.5	10.5	12.4
Rated voltage [V] ^{*3}				Three-phase, 575 to 600 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, 575 to 600 V, 50/60 Hz									
		Rated current [A] ^{*6}		1.2	2.1	3.0	5.2	7.2	9.7	14.4	19.5	24.0	28.6
		Required power supply capacity [kVA]		1.2	2.1	3.0	5.2	7.2	10	15	20	24	29
	Single phase input	Main power supply : Phases, voltage, frequency		Single-phase, 575 to 600 V, 50/60 Hz									
		Rated current [A] ^{*6}		-	2.1	3.0	5.2	7.2	9.7	14.4	19.5	24.0	28.6
		Required power supply capacity [kVA]		-	1.3	1.8	3.0	4.2	5.6	8.3	12	14	17
Auxiliary control power supply : Phases, voltage, frequency				Single-phase 575 to 600 V, 50/60 Hz									
Auxiliary main power supply : Phases, voltage, frequency ^{*4}				-									
Voltage, frequency variations				Voltage: +10 to -15% (Interphase voltage unbalance : 2% or less) ^{*5} , Frequency: +5 to -5%									
Brak- ing	Torque [%] ^{*7}			20									
	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 C3 (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. (cos φ)			>0.98									
	True P.F.			≥0.90									
Efficiency (at rated load)				95%	96%			97%					98%
Applicable (safety) standards (under application)				UL508C, C22.2 No. 14, IEC/EN 61800-5-1:2007, SEMI F47-0706									
Enclosure	IEC/EN 60529			IP21/ IP55									
	UL 50 (under application)			UL TYPE 1/ UL TYPE 12									
Cooling method				Fan cooling									
Weight/Mass [kg]	IP21			10	10	10	10	10	10	18	18	18	18
	IP55			10	10	10	10	10	10	18	18	18	18

(40 to 300 HP)

Items				Specifications									
Type ^{*8}	FRN	ARI	5U : HVAC	040 ⁺¹⁰	050 ⁺¹⁰	060 ⁺¹⁰	075 ⁺¹⁰	100 ⁺¹⁰	125 ⁺¹⁰	150 ⁺¹⁰	200 ⁺¹⁰	250 ⁺¹⁰	300 ⁺¹⁰
Nominal applied motor (Rated output) [HP] ^{*1}	Three phase input	AC460V motor	Rated capacity [kVA] ^{*2}	40	50	60	75	100	125	150	200	250	300
			Rated current [A]	10	15	20	25	30	40	50	75	100	100
Output ratings	Three phase input	Rated capacity [kVA] ^{*2}	Rated current [A]	40	51	62	76	103	124	145	210	260	287
			Rated current [A]	41	52	63	77	104	125	146	211	262	289
	Single phase input	Rated capacity [kVA] ^{*2}	Rated current [A]	15	20	24	29	40	48	56	81	101	111
			Rated current [A]	15.9	20.2	24.5	30.0	40.5	48.7	56.9	82.2	102	112
Rated voltage [V] ^{*3}				Three-phase, 575 to 600 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, 575 to 600 V, 50/60 Hz									
		Rated current [A] ^{*6}		38.8	48.3	57.9	71.0	94.7	113	140	199	249	272
		Required power supply capacity [kVA]		39	49	58	71	95	113	140	199	248	271
	Single phase input	Main power supply : Phases, voltage, frequency		Single-phase, 575 to 600 V, 50/60 Hz									
		Rated current [A] ^{*6}		38.8	48.3	57.9	71.0	94.7	113	140	199	249	272
		Required power supply capacity [kVA]		23	28	34	41	55	65	81	115	144	157
Auxiliary control power supply : Phases, voltage, frequency				Single-phase 575 to 600 V, 50/60 Hz									
Auxiliary main power supply : Phases, voltage, frequency ^{*4}				-									
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}				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. (cos φ)			>0.98									
	True P.F.			≥0.90									
Efficiency (at rated load)				98%									
Applicable (safety) standards (under application)				UL508C, C22.2 No. 14, IEC/EN 61800-5-1:2007, SEMI F47-0706									
Enclosure	IEC/EN 60529			IP21/ IP55									IP00
	UL 50 (under application)			UL TYPE 1/ UL TYPE 12									UL open type
Cooling method				Fan cooling									
Weight/Mass [kg]	IP21			23	23	50	50	70	70	-	-	-	-
	IP55			23	23	50	50	70	70	-	-	-	-
	IP00			-	-	-	-	-	-	-	62	94	98

*1) US 4-pole standard induction motor.

*2) Rated capacity is calculated by assuming the output rated voltage as 575 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 575V, 50Hz and Rsc=120.

*7) Average braking torque for the motor running alone. (It varies with the efficiency of the motor.)

*8) The underline () replaces a 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) COMING SOON : The capacity from 1HP to 300HP of 575V series.

2. Common specifications

Items		Specifications	Remarks
Output	Setting range	<ul style="list-style-type: none"> Maximum frequency : 25 to 120 Hz Base frequency : 25 to 120 Hz variable setting Starting frequency : 0.1 to 60.0 Hz variable setting Carrier frequency <ul style="list-style-type: none"> 230V series: <ul style="list-style-type: none"> 0.75 to 16 kHz variable setting (1 HP to 25 HP) 0.75 to 10 kHz variable setting (30 HP to 100 HP) *4 0.75 to 6 kHz variable setting (125 HP) *4 460V series: <ul style="list-style-type: none"> 0.75 to 16 kHz variable setting (1 HP to 50 HP) 0.75 to 10 kHz variable setting (60 HP to 125 HP) *4 0.75 to 6 kHz variable setting (150 HP to 900 HP) *4 0.75 to 4 kHz variable setting (1000 HP) *4 575V series: <ul style="list-style-type: none"> 0.75 to 16 kHz variable setting (1 HP to 50 HP) *4 0.75 to 10 kHz variable setting (60 HP to 125 HP) *4 0.75 to 6 kHz variable setting (150 HP to 300 HP) *4 	
	Output frequency Accuracy(Stability)	<ul style="list-style-type: none"> Analog setting : $\pm 0.2\%$ of max. frequency (at $25 \pm 10^\circ\text{C}$) Digital setting : $\pm 0.01\%$ of max. frequency (at -10 to $+50^\circ\text{C}$) 	
	Setting resolution	<ul style="list-style-type: none"> Analog setting : $1/3000$ of max. frequency ($1/1500$ with [V2] input) Digital setting : 0.01 Hz (99.99 Hz or less), 0.1Hz (100.0 to 120 Hz) Link setting : $1/20000$ of max. frequency or 0.01 Hz (fixed) 	
	Control method	<ul style="list-style-type: none"> V/f control Dynamic torque vector control V/f control, the slip compensation is available. 	
	Voltage/frequency characteristic	<ul style="list-style-type: none"> 230V series <ul style="list-style-type: none"> Base frequency and max. output frequency can be set to 80 to 240 V in common. The AVR control ON/OFF can be selected. Non-linear V/f setting (2 points) : Free voltage (0 to 240 V) and frequency (0 to 120 Hz) can be set. 460V series <ul style="list-style-type: none"> Base frequency and max. output frequency can be set to 160 to 500 V in common. The AVR control ON/OFF can be selected. Non-linear V/f setting (2 points) : Free voltage (0 to 500 V) and frequency (0 to 120 Hz) can be set. 575V series *4 <ul style="list-style-type: none"> Base frequency and max. output frequency can be set to 200 to 600 V in common. The AVR control ON/OFF can be selected. Non-linear V/f setting (2 points) : Free voltage (0 to 600 V) and frequency (0 to 120 Hz) can be set. 	
Control	Torque boost	<ul style="list-style-type: none"> Auto torque boost Manual torque boost : Desired torque boost (0.0 to 20.0%) can be set. Select application load with function code. (Constant torque load or variable torque load) 	
	Starting torque	<ul style="list-style-type: none"> 100% or higher/set frequency : 1.0 Hz Base frequency 50 Hz, Slip compensation and auto torque boost operation 	
	Start/stop operation	<ul style="list-style-type: none"> Keypad : Start and stop with FWD, REV and STOP keys. External signals (digital inputs) : Forward (Reverse) rotation, stop command (capable of 3-wire operation), coast-to-stop command, external alarm, alarm reset, etc. Link operation : Operation through RS-485 or field bus (option) communications. Switching operation command : Remote/Local switching, link switching. 	
	Frequency setting	<ul style="list-style-type: none"> Keypad : Can be set with "UP" and "DOWN" keys. External Volume : Can be Set with external potentiometer (1 to $5k\Omega$ 1/2W). Analog input : 0 to ± 10 VDC (± 5 VDC)/0 to $\pm 100\%$ (Terminals [12] and [V2]) 0 to +10 VDC (+5 VDC)/0 to +100% (Terminals [12] and [V2]) +4 to +20 mADC/0 to 100% (Terminal [C1]) 0 to +20 mADC/0 to 100% (Terminal [C1]) UP/DOWN operation : Frequency can be increased or decreased while the digital input signal is ON. Multi-frequency : Selectable from 16 steps (step 0 to 15). Link operation : Frequency can be set via RS-485 (Standard accessory). Switching frequency setting : Frequency setting can be switched (2 settings) by external signal (digital input). Remote/local switching, link switching. Auxiliary frequency setting : Terminal [12], [C1] or [V2] input can be selected respectively as an additional input. Inverse operation : The setting "0 to +10 VDC/0 to 100%" can be switched to "+10 to 0 VDC/0 to 100%" by external command. The setting "+4 to +20 mADC/0 to 100%" can be switched to "+20 to +4 mADC/0 to 100%" by external command. The setting "0 to +20 mADC/0 to 100%" can be switched to "+20 to 0 mADC/0 to 100%" by external command. Programmed PATTERN operation : Maximum 7 stages can be set. 	"+1 to +5 VDC" can be adjusted with bias and analog input gain.
	Output frequency Accuracy(Stability)	<ul style="list-style-type: none"> Analog setting : $\pm 0.2\%$ of max. frequency (at $25 \pm 10^\circ\text{C}$) Digital setting : $\pm 0.01\%$ of max. frequency (at -10 to $+50^\circ\text{C}$) 	
Setting resolution	<ul style="list-style-type: none"> Analog setting : $1/3000$ of max. frequency ($1/1500$ with [V2] input) Digital setting : 0.01 Hz (99.99 Hz or less), 0.1Hz (100.0 to 120 Hz) Link setting : $1/20000$ of max. frequency or 0.01 Hz (fixed) 		

2. Common specifications

Items	Specifications	Remarks
Acceleration/ deceleration time	<ul style="list-style-type: none"> Setting range : 0.00 to 3600 s Switch : The four types of accel./decel. time can be set or selected individually. (switchable during operation) Acceleration/deceleration pattern : Linear accel./decel., S-shape accel./decel. (weak, strong), curvilinear accel./decel. (accel./decel. max. capacity of constant output) Deceleration mode (coast-to-stop) : Coast-to-stop at the operation command OFF. Forcible stop decel. time : Deceleration stop by the forcible stop (STOP). 	
Frequency limiter (Upper limit and lower limit frequencies)	<ul style="list-style-type: none"> Both upper and lower limit frequencies can be variably set in hertz. □ It is possible to choose the operation done from continuous operation at lower limit frequency or operation stop when the set frequency drops below the lower limit. 	
Bias frequency	<ul style="list-style-type: none"> Bias of set reference frequency and PID command can be independently set. (setting range : 0 to ±100%) 	
Analog input	<ul style="list-style-type: none"> Gain : Setting in the range from 0 to 200%. Off-set : Setting in the range from -5.0 to +5.0%. Filter : Setting in the range from 0.00s to 5.00s. 	
Jump frequency	<ul style="list-style-type: none"> Actuation points (3 points) and their common jump widths (0 to 30 Hz) can be set. Resonance points can be detected automatically and be set the jump frequency automatically. 	
Auto-restart after momentary power failure	<ul style="list-style-type: none"> Trip at power failure : The inverter trips immediately after power failure. Trip at power recovery : Coast-to-stop at power failure and trip at power recovery. Continuous operation : Operation is continued using the load inertia energy. Start at the frequency selected before momentary stop : Coast-to-stop at power failure and start after power recovery at the frequency selected before momentary stop. Start at starting frequency : Coast-to-stop at power failure and start at the starting frequency after power recovery. 	
Current limit by hardware	<ul style="list-style-type: none"> Limiting the current by hardware to prevent overcurrent trip due to sharp load change or momentary power failure which cannot be controlled by software current limit. (This function can be cancelled.) 	
Operation by commercial power supply	<ul style="list-style-type: none"> With commercial power switching command, the inverter outputs 50Hz/60 Hz (SW50, SW60). The inverter has the commercial power supply switching sequence. 	
Slip compensation	<ul style="list-style-type: none"> Compensates for decrease in speed according to the load. 	
Torque limiter	<ul style="list-style-type: none"> Switchable between 1st or 2nd torque limit values. 	
Current control (software current limit)	<ul style="list-style-type: none"> Automatically reduces the frequency so that the output current becomes lower than the preset operation level. 	
PID control	<ul style="list-style-type: none"> PID adjuster for process control Switchable between forward and reverse operations Slow flowrate function (pressurized operation available before slow flowrate) Automatic update for slow flowrate frequency PID command : Keypad panel, analog input (from terminals [12], [C1], [V2]), RS-485 communications PID feedback value : Analog input (from terminals [12], [C1], [V2]) Alarm output (absolute value alarm, deviation alarm) PV level detection Scaling for PV value PV value conversion/calculation of analog input PID output limiter Integration reset/hold Antireset windup PID auto tuning 	
Auto search for idling motor speed	<ul style="list-style-type: none"> Estimates the speed of the motor running under no load and starts the motor without stopping it. (Motor electric constant needs tuning : Offline tuning) 	
Automatic deceleration	<ul style="list-style-type: none"> If the DC link voltage or calculated torque exceeds the automatic deceleration level during deceleration, the inverter automatically prolongs the deceleration time to avoid overvoltage trip. (It is possible to select forcible deceleration actuated with more than three times longer deceleration.) If the calculated torque exceeds automatic deceleration level during constant speed operation, the inverter avoids overvoltage trip by increasing the frequency. Automatic deceleration level can be set. 	
Deceleration characteristic (improving braking ability)	<ul style="list-style-type: none"> The motor loss is increased during deceleration to reduce the regenerative energy in the inverter to avoid overvoltage trip. 	
Automatic energy saving operation	<ul style="list-style-type: none"> The output voltage is controlled to minimize the total sum of the motor loss and inverter loss at a constant speed. 	
Overload prevention control	<ul style="list-style-type: none"> If the ambient temperature or IGBT joint temperature increases due to overload, the inverter lowers the output frequency to avoid overload. 	
Voltage Shortage Avoidance Operation	<ul style="list-style-type: none"> The continuous operation is available reducing output frequency during low voltage. 	
Input Phase Loss Protection Avoidance Operation	<ul style="list-style-type: none"> Selectable from trip or continuous low power operation. 	
Off-line tuning	<ul style="list-style-type: none"> Rotary type and non-rotary type are available for tuning the motor constant. 	
Cooling fan ON/OFF control	<ul style="list-style-type: none"> Detects inverter internal temperature of the inverter and stops the cooling fan when the temperature is low. The fan control signal can be output to an external device. 	

Control

2. Common specifications

	Items	Specifications	Remarks
Control	Universal DI	• The status of external digital signal connected with the universal digital input terminal is transferred to the host controller.	
	Universal DO	• Digital command signal from the host controller is output to the universal digital output terminal.	
	Universal AO	• The analog command signal from the host controller is output to the analog output terminal.	
	Rotation direction control	• Preventing reverse rotation • Preventing forward rotation	
	Preventing condensation in motor	• When the inverter is stopped, current is automatically supplied to the motor to keep the motor warm and avoid condensation.	
	Customized logic interface	• Available in 14 steps with the functions of 2-input, 1-output, logical calculation, and timer function.	
	Pump control	• Cascade control (FIXED:1+8 pcs, FLOATING:4 pcs (with option)) • Periodic motor switching • Promptly connection/disconnection for auxiliary motor • Control of maximum starts per hour • Dry pump detection • End of curve detection • Filter clogging prevention • Anti jam • Check valve protection • Boost function • Wet-bulb temperature presumption control	
	Fire mode	• Continues operation without alarm by retry.	
	Pattern operation	• Pattern operation is available by inverter itself.	
	Real time clock (RTC)	• Date, hour and alarm information with date and hour can be displayed, and timer operation can be used with RTC. • Daylight saving time auxiliary function.	Time can be maintained with battery (option).
	Timer operation	• Set 4-timers for one week.	
	Password function	• Prevent improperly operation and/or data undisplayed available. (two level setting.)	
	Mutual operation	• Connectable between inverters with RTU communications. (maximum 3 pcs.)	
	Display	External PID control	• PID processor for process control / On / Off controller (3 channels) • Normal operation / inverse operation • PID command: Keypad, analog input (terminals [I2], [C1] and [V2]), RS-485 • PID feedback value (terminals [I2], [C1] and [V2]) • Alarm output (absolute value alarm, deviation alarm) • PID feedback error detection • Sensor input amount scaling • Sensor input amount conversion / calculation • PID output limiter • Integration reset / hold • Anti-reset wind-up function
Run/stop		Speed monitor (set frequency, output frequency, motor speed, load shaft speed, line speed, and speed indication with percent), Output current [A], output voltage [V], calculated torque [%], input power [kW], PID reference value, PID feedback value, PID output, load [%], motor output [kW], analog input monitor, integral power consumption [kWh], integral power consumption [MWh], effective current value for each phase [A]	
Inverter life warning		• Life judgment of the main circuit capacitor, electrolytic capacitor on printed circuit board, and cooling fan. • Life warning information can be output to an external device. • Ambient temperature : IP21 40°C, IP55 30°C, Load rate : inverter rated current 100%	
Cumulative running hours		• Displays the inverter cumulative running hours, integrated power, cumulative motor running hours, and the number of operation start times. • Outputs the warning when the maintenance time or the number of start times has exceeded the preset value. • Displays the cumulative energy for unit of months, weeks, days and hours and running hours (with RTC).	
Light-alarm		• WARN. LED is lit and light-alarm factor is displayed.	
Trip mode		• Displays the cause of trip.	
Running or trip mode		• Trip history : Saves and displays the cause of the last ten trips (with a code). • Detail data recorded : Saves and displays the detail data recorded on occurrence of the last four trips. • Saves and displays the date, hour and minute with RTC.	
LED display		• LED for light-alarm or alarm occurrence.	
Guidance function		• Needed information can be displayed by pushing "HELP" key.	
Multi language		• Corresponded to Japanese, English, German, French, Spanish, Italian, Chinese, Russian, Greek, Turkish, Polish, Czech, Swedish, Portuguese, Dutch, Malay, Vietnamese, Thai and Indonesian. (Sequential correspond to User Customized Language.)	
Battery level display		• Battery level can be displayed when the battery (option) is connected.	
LCD back-light		• Set lighting time for LCD back-light during key operation only or unlit.	

Protective function	Overcurrent protection	• The inverter is stopped for protection against overcurrent.	OC 1	
	Short-circuit protection	• The inverter is stopped for protection against overcurrent caused by a short circuit in the output circuit.	OC 2 OC 3	
	Ground fault protection	• The inverter is stopped for protection against overcurrent caused by a grounding fault in the output circuit. (230V series: 25 HP or less, 460V series: 50 HP or less, 575V series: 50 HP or less ^{*4})		
	Overvoltage protection	• An excessive voltage (230V series: 400 VDC, 460V series: 800 VDC, 575V series: 1000 VDC ^{*4}) in the DC link circuit is detected and the inverter is stopped. If an excessive voltage is applied unintended, the protection can not be guaranteed.	OU 1 OU 2 OU 3	
	Undervoltage protection	• The voltage drop (230V series: 200 VDC, 460V series: 400 VDC, 575V series: 600 VDC ^{*4}) in the DC link circuit is detected to stop the inverter. However, the alarm will not be issued when the re-starting after instantaneous stop is selected.	LU	
	Input phase loss protection	• The input phase loss is detected to protect or shut off the inverter. • When the load to be connected is small, a phase loss would not be detected.	Lin	
	Output phase loss detection	• Detects breaks in inverter output wiring at the start of running and during running and stop the inverter output.	OPL	
	Overheat protection	• Stop the inverter output detecting excess cooling fin temperature in case of a cooling fan fault or overload.	OH 1	
		• Stop the inverter output detecting inner temperature of the inverter unit for a cooling fan fault or overload.	OH 3	
		• Stop the inverter output detecting the cooling fan failure.		
		• Stop the inverter output detecting the charging circuit fault.		
	Overload protection	• Stop the inverter output detecting a switching element temperature calculated with cooling fin temperature and the output current.	OLU	
	External alarm input	• With the digital input signal (THR), the inverter is stopped with an alarm.	OH 2	
	Motor protection	Electronic thermal	• The inverter is stopped with an electronic thermal function set to protect the motor. Protects the general-purpose motor and inverter motor over all frequency range. (The level and thermal time constant (0.5 to 75.0 min) can be set.)	OL 1
		PTC thermistor	• PTC thermistor input stops the inverter to protect the motor. Connect a PTC thermistor between terminal [C1] and [I1] and set the switch on control print board and the function code.	OH 4
		Overload early warning	• Warning signal (OL) is output at the predetermined level before stopping the inverter with electronic thermal function.	—
	Memory error	• Data is checked upon power-on and data writing to detect any fault in the memory and stop the inverter if any.	Er 1	
	Keypad panel communications error	• The keypad panel detects a communication fault between the keypad panel and the inverter main body during the run command from the keypad panel available and to stop the inverter.	Er 2	
	CPU error	• Stop the inverter detecting a CPU error or LSI error caused by noise.	Er 3	
	Option communications error	• When each option is used, a fault of communication with the inverter main body is detected to stop the inverter.	Er 4	
	Option error	• When each option is used, the option detects a fault to stop the inverter.	Er 5	
	Operation error	• "STOP" key priority : Pressing the "STOP" key on the keypad will forcibly decelerate, stop the motor and display "Er6" even if the running command through signal input or communication is selected. • Start check : If the running command is being input when switching the running command method from power-on, alarm reset or the linked operation, the operation starts suddenly. This function prohibits running and displays "Er6".	Er 6	
	Tuning error	• Stop the inverter output when tuning failure, interruption or any fault as a result of tuning is detected during tuning for motor constant.	Er 7	
	RS-485 communications error (port1)	• Stop the inverter output detecting the communication error between the inverter main unit and a mate when the RS-485 connection port of the keypad panel is used to configure the network.	Er 8	
	Data save error upon undervoltage	• When the undervoltage protection occurred, an alarm is displayed if the data is not properly saved.	Er F	
	RS-485 communications error (port2)	• Stop the inverter output detecting the communication error between the inverter main unit and a mate when the RS-485 connection port of the [DX+], [DX-] are used to configure the network.	Er P	
	Hardware error	• Stop the inverter detecting a LSI error on the power printed circuit board caused by noise.	Er H	
Simulation error	• Simulated alarm is output by the keypad panel operation.	Er r		
Current input wire break detection	• Stop the inverter detecting a analog wire break detection (enable / disable selectable).	Co F		
PID feedback error detection	• Stop the inverter output detecting a PID feedback line break. (Selectable valid/invalid.)	PV 1 PV 2 PVA PVb PVC		
Customized logic error detection	• Alarm is output detecting a customized logic setting error.	ECL		

2. Common specifications

Items	Specifications	Remarks
Anti jam protection	• Display the error detecting the starting failure due to overcurrent.	<i>r L o</i>
Filter clogging prevention	• Display the error detecting the overload during PID control.	<i>F o L</i>
Enable circuit failure detection	• Diagnoses the enable circuit condition and stops the inverter output detecting the circuit failure.	<i>E C F</i>
Ground fault protection	• Detects the zero-phase current in the output power, protects the inverter from overcurrent caused by a ground fault in the output circuit, and stops the inverter. For inverters of: 230V series of 30HP or above, 460V series of 60HP or above and 575V series of 60HP or above. *4	<i>E F</i>
Fuse blown	• Detects a break of the main circuit fuse in the inverter and stops the inverter. For inverters of: 230V series of 125HP, 460V series of 150HP or above and 575V series of 150HP or above. *4	<i>F U S</i>
Charger circuit error	• Detects a charger circuit error and stops the inverter. For inverters of: 230V series of 30HP or above, 460V series of 60HP or above and 575V series of 60HP or above. *4	<i>P b F</i>
DC fan locked	• Failure of the air circulation DC fan inside the inverter. For inverters of: 230V series of 75HP or above (IP00), 30HP or above (IP21) and 7.5HP or above (IP55) *4 460V series of 150HP or above (IP00), 60HP or above (IP21) and 15HP or above (IP55) *4 575V series of 150HP or above (IP00), 60HP or above (IP21) and 15HP or above (IP55) *4	<i>F A L</i>
Alarm relay output (for any fault)	• The inverter outputs a relay contact signal when the inverter issues an alarm and stops the inverter output. • The alarm stop state is reset by pressing the "RESET" key or by the digital input signal (RST).	
Light-alarm (warning)	• Light-alarm is displayed when registered alarm or warning as light-alarm is occurred. (continuous running) Covered alarm : External alarm (OH2), Inverter overheat (OH3), Motor overheat (OH4), Motor overload (OL1), Keypad panel communication error (Er2), Optional communication error (Er4), Option error (Er5), RS-485 communication error (port 1) (Er8), RS-485 communication error (port 2) (ErP), DC fan lock detected, Overload early warning (for motor), Heatsink overheat early warning, Life early warning (DC link bus capacitor, electrolytic capacitor on printed circuit board, cooling fan), Reference command loss detected, PID warning output, Low torque detected, Thermistor detection (PTC), Machine life (cumulative motor run time error), Machine life (number of startups error) Current Input Wire Break Detection PID feedback error detection Low battery warning Date&time information lost Mutual operation slave alarm	
Stall prevention	• Operates when the inverter output goes beyond the instantaneous overcurrent limiting level, and avoids tripping, during acceleration and constant speed operation.	
Retry function	• When the motor is tripped and stopped, this function automatically resets the tripping state and restarts operation. (Retry times, waiting time for reset, corresponding trip for retry and retry available time can be set.) It can be confirmed by communication the times of the restarting.	
Surge protection	• The inverter is protected against surge voltage intruding between the main circuit power line and ground.	
Command loss detected	• A loss (breaking, etc.) of the frequency command is detected to output an alarm and the operation is continued at the preset frequency (set at a ratio to the frequency before detection).	
Momentary power failure protection	• If restart upon momentary power failure is selected, the inverter restarts upon recovery of the voltage within the set time.	
Atmosphere	• Free from dusts, direct sunlight, corrosive or flammable gases, oil mist, vapor or water drops. (Pollution degree 2 (IEC60664-1)). Indoor use only. • The atmosphere can contain a small amount of salt. (0.01 mg/cm ² or less per year) • The inverter must not be subjected to sudden changes in temperature that will cause condensation to form.	
Ambient temperature	IP21 • -10 to +50°C (+50 to +60°C : correspond with deleting) -10 to +40°C : installed side-by-side without clearance (230V series: 25 HP or less, 460V series: 50 HP or less, 575V series: 50 HP or less *4) IP55 • -10 to +40°C (+40 to +50°C : correspond with deleting) -10 to +30°C : installed side-by-side without clearance (230V series: 25 HP or less, 460V series: 50 HP or less, 575V series: 50 HP or less *4) IP00 • -10 to +50°C	
Ambient humidity	• 5 to 95 %RH (without condensation)	
Altitude	• 1,000m or lower	
Vibration	230V series: 60 HP or less, 460V series: 125 HP or less, 575V series: 125 HP or less *4 3mm : 2 to less than 9 Hz 10m/s ² : 9 to less than 200Hz 230V series: 75 to 100 HP *4 3mm : 2 to less than 9 Hz 9.8m/s ² : 9 to less than 20Hz 2m/s ² : 20 to less than 55Hz 1m/s ² : 55 to less than 200Hz 230V series: 125 HP, 460V series: 150 to 1000 HP, 575V series: 150 to 300 HP *4 3mm : 2 to less than 9 Hz 2m/s ² : 9 to less than 55Hz 1m/s ² : 55 to less than 200Hz	
Storage temperature	• -25 to +70°C	
Storage humidity	• 5 to 95 %RH (without condensation)	

*1 Detection of all circuit failures is not guaranteed (EN ISO 13849-1 Cat.3 compliant).

*2 Alarm (ECF) is occurred when one of the inputs of EN1 or EN2 are OFF (if it exceeds 50 ms, it will be as disagreement.).
Power supply reboot only to reset this alarm.

*3 Apply by wire to turn off enable command and stop the inverter output with feedback signal assigned DECF signal of inverter to safety switch.

*4 COMING SOON : The capacity from 30HP to 125HP of 230V series, 60HP to 1000HP of 460V series and 1HP to 300HP of 575V series.

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks
Main circuit terminals	L1/R, L2/S, L3/T	Main circuit power inputs	Connect three-phase input power lines.	
	RO, TO	Auxiliary power input for the control circuit	Connect single-phase input power lines.	
	RI, TI	Auxiliary power input for main circuit	Connect single-phase input power lines.	230V series: 30 HP or more*3 460V series: 60 HP or more*3 575V series: 60 HP or more*3
	U, V, W	Inverter outputs	Connect a three-phase motor.	
	P(+), N(-)	DC link bus	Terminal for DC bus link system.	
	⓪ 6	Grounding for inverter	Grounding terminals for the inverter.	
Analog input	[13]	Power supply for the potentiometer	Power supply for frequency command potentiometer. The potentiometer of 1/2 W rating or more might be connected.	Variable resistor : 1 to 5 kΩ DC10V, DC10mA max.
	[12]	Analog setting voltage input	• External input voltage to be used as a frequency command. 0 to +10 VDC/0 to 100% (0 to +5 VDC/0 to 100%) 0 to ±10 VDC/0 to ±100% (0 to ±5 VDC/0 to ±100%)	Input impedance : 22kΩ Maximum input : ±15 VDC
		(Inverse operation)	• +10 to 0 VDC/0 to 100%	Gain : 200%
		(PID control)	• Used as PID command value or PID feedback signal.	Offset : ±5%
		(Auxiliary frequency setting)	• Used as additional auxiliary setting to various frequency settings.	Bias : ±100%
		(Accel./decel. time ratio setting)	• Used as ratio setting for acceleration or deceleration time ratio.	Setting filter : 5 s
		(Upper/lower freq. setting)	• Used as frequency setting for upper or lower frequency setting.	
	[C1]	Analog setting current input	• External input current to be used as a frequency command. 4 to 20 mADC/0 to 100%, 0 to 20 mADC/0 to 100%	Input impedance : 250Ω Maximum input : 30 mADC
		(Inverse operation)	• 20 to 4 mADC/0 to 100%, 20 to 0 mADC/0 to 100%	Gain : 200%
		(PID control)	• Used as PID command value or PID feedback signal.	Offset : ±5%
		(PTC thermistor)	• PTC thermistor connection to protect the motor.	Bias : ±100%
		(Auxiliary frequency setting)	• Used as additional auxiliary setting to various frequency settings.	Setting filter : 5 s
		(Accel./decel. time ratio setting)	• Used as ratio setting for acceleration or deceleration time ratio.	
	[V2]	Analog setting voltage input	• External input voltage to be used as a frequency command. 0 to +10 VDC/0 to 100% (0 to +5 VDC/0 to 100%) 0 to ±10 VDC/0 to ±100% (0 to ±5 VDC/0 to ±100%)	Input impedance : 22kΩ Maximum input : ±15 VDC
		(Inverse operation)	• +10 to 0 VDC/0 to 100%	Gain : 200%
(PID control)		• Used as PID command value or PID feedback signal.	Offset : ±5%	
(Auxiliary frequency setting)		• Used as additional auxiliary setting to various frequency settings.	Bias : ±100%	
(Accel./decel. time ratio setting)		• Used as ratio setting for acceleration or deceleration time ratio.	Setting filter : 5 s	
(Upper/lower freq. setting)		• Used as frequency setting for upper or lower frequency setting.		
[11] (2 terminals)	Analog common	Common terminals for frequency command signals. ([12], [13], [C1], [V2], [FM1], [FM2])	These terminals are electrically isolated from terminals [CM]s and [CMY].	
	[X1]	Digital input1	• The following functions can be assigned to terminals [X1] to [X7], [FWD] and [REV]. <Common functions>	
Digital input	[X2]	Digital input2	• SINK/SOURCE is changeable by using the internal slide switch. • These function codes may also switch the logic system between normal and/or negative to define how the inverter logic interprets either ON or OFF status of each terminal.	
	[X3]	Digital input3		
	[X4]	Digital input4		
	[X5]	Digital input5		
	[X6]	Digital input6		
	[X7]	Digital input7		
	[FWD]	Run forward		
	[REV]	Run reverse		
	(SS1)	Select multi-frequency	The combination of the ON/OFF states of digital input signals (SS1), (SS2), (SS4) and (SS8) provides 16 different frequency choices.	
	(RT1)	Select ACC/DEC time (2 steps)	The combination of the ON/OFF states of (RT1) and (RT2) provides four choices of acceleration/deceleration settings.	
	(RT2)	Select ACC/DEC time (4 steps)		
	(HLD)	Enable 3-wire operation	Used as a self-hold signal for 3-wire inverter operation. Turning the (HLD) ON self-holds the (FWD) or (REV) command; turning it OFF releases the self-holding.	
(BX)	Coast to a stop	Turning the (BX) ON immediately shuts down the inverter output so that the motor coasts to a stop without issuing any alarms.		
(RST)	Reset alarm	Turning the (RST) ON clears the alarm state.		
(THR)	Enable external alarm trip	Turning the (THR) OFF immediately shuts down the inverter output so that the motor coasts to a stop, issuing "OH2" if (ALM) is enabled.		

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks
Digital input	(Hz2/Hz1)	Select frequency command2/1	Turning the (Hz2/Hz1) ON selects Frequency command 2.	
	(DCBRK)	Enable DC braking	Turning the (DCBRK) ON activates DC braking.	The negative logic system never applies to those terminals.
	(TL2/TL1)	Select torque limiter level2/1	The (TL2/TL1) switches between torque limiters 1 and 2.	
	(SW50)	Switch to commercial power (50 Hz)	Turning the (SW50) OFF switches to commercial power (50 Hz).	The negative logic system never applies to those terminals.
	(SW60)	Switch to commercial power (60 Hz)	Turning the (SW60) OFF switches to commercial power (60 Hz).	
	(UP)	UP (Increase output frequency)	While the (UP) is ON, the output frequency increases.	
	(DOWN)	DOWN (Decrease output frequency)	While the (DOWN) is ON, the output frequency decreases.	
	(WE-KP)	Enable data change with keypad	Only when the (WE-KP) is ON, function code data can be changed via the keypad panel.	
	(Hz/PID)	Cancel PID control	Turning the (Hz/PID) ON disables the PID control so that the inverter runs the motor with a reference frequency specified by any of the multi-frequency, keypad panel, analog input, etc.	
	(IVS)	Switch normal/inverse operation	The (IVS) switches the output frequency control between normal (proportional to the input value) and inverse in PID process control and manual frequency command. Turning the (IVS) ON selects the inverse operation.	
	(IL)	Interlock	In a configuration where a magnetic contactor (MC) is inserted between the inverter and motor, connecting the auxiliary contact to this terminal enables the input of the (IL) when a power failure occurs, activating the momentary power failure detection function.	
	(LE)	Enable communications link via RS-485 or field bus (option)	Turning the (LE) ON gives priority to commands received via the RS-485 communications link or the field bus option.	
	(U-DI)	Universal DI	Using the (U-DI) enables the inverter to monitor arbitrary digital input signals sent from the peripheral equipment, transmitting the signal status to the host controller.	
	(STM)	Enable auto search for idling motor speed at starting	The (STM) enables auto search for idling motor speed at the start of operation.	
	(STOP)	Force to stop	Turning the (STOP) OFF causes the motor to decelerate to a stop forcibly in accordance with the specified deceleration time.	
	(PID-RST)	Reset PID integral and differential components	Turning the (PID-RST) ON resets PID integral and differential components.	
	(PID-HLD)	Hold PID integral component	Turning this terminal command ON holds the integral components of the PID processor.	
	(LOC)	Select local (keypad) operation	Turning the (LOC) ON gives priority to run/frequency commands entered from the keypad panel.	
	(RE)	Enable to run	Turning the (RE) ON enables motor running.	
	(DWP)	Protect motor from dew condensation	Turning the (DWP) ON supplies a DC current to the motor on halt, in order to generate heat, preventing dew condensation.	The negative logic system never applies to those terminals.
	(ISW50)	Enable integrated sequence to switch to commercial power (50 Hz)	Turning the (ISW50) OFF switches inverter operation to commercial-power operation in accordance with the inverter internal switching sequence (50 Hz).	The negative logic system never applies to those terminals.
	(ISW60)	Enable integrated sequence to switch to commercial power (60 Hz)	Turning the (ISW50) OFF switches inverter operation to commercial-power operation in accordance with the inverter internal switching sequence (60 Hz).	
	(MCLR)	Periodic motor switching time clear	Turning the (MCLR) ON clears periodic switching time of pump control.	
	(STZ)	UP/DOWN frequency reset	Turning the (STZ) ON clears the frequency of UP/DOWN control.	
	(CRUN-M1)	Count the run time of commercial power-driven motor1	Turning the (CRUN-M1) ON accumulates the run time of motor 1 in commercial-power operation. (independent of run/stop and motor selected)	
	(CLC)	Cancel customizable logic	Turning the (CLC) ON enables customizable logic.	
	(CLTC)	Clear customizable logic timers	Turning the (CLTC) ON clears all the timer/counter for customizable logic.	
	(FR2/FR1)	Switch the run command source2/1	Turning the (FR2/FR1) ON switches the run command to (FWD2) or (REV2).	
	(FWD2)	Run forward command2	Turning the (FWD2) ON runs the motor in the forward direction; turning it OFF decelerates it to a stop. (second run command)	The negative logic system never applies to those terminals.
	(REV2)	Run reverse command2	Turning the (REV2) ON runs the motor in the reverse direction; turning it OFF decelerates it to a stop. (second run command)	
	(FWD)	Run forward	Turning the (FWD) ON runs the motor in the forward direction; turning it OFF decelerates it to a stop.	These terminal commands can be assigned only to terminals [FWD] and [REV].
	(REV)	Run reverse	Turning the (REV) ON runs the motor in the reverse direction; turning it OFF decelerates it to a stop.	The negative logic system never applies to those terminals.

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks	
Digital input	(FMS)	Fire mode	Turning the (FMS) ON switches the mode of the inverter to fire mode.	The negative logic system never applies to those terminals.	
	(PID2/1)	PID channel switching	Turning the (PID2/1) ON switches PID control 2.		
	(BST)	Boost command	Turning the (BST) ON cancels PID control and starts boost operation.		
	(FS)	Flow switch	Turning the (FS) ON means there is a flow and OFF is no flow.		
	(FRC)	Filter clogging reverse rotation	Turning the (FRC) ON cancels PID control and starts the reverse rotation for removing filter clogging.		
	(PCHG)	Pump control switching	Turning the (PCHG) ON switches the driven pumps.		
	(MENO)	Mutual operation : Master motor	Turning the (MENO) ON allows to operate master motor for mutual operation.		
	(MEN1)	Pump control motor1	Turning the (MEN1) ON allows to operate pump control motor1.		
	(MEN2)	Pump control motor2	Turning the (MEN2) ON allows to operate pump control motor2.		
	(MEN3)	Pump control motor3	Turning the (MEN3) ON allows to operate pump control motor3.		
	(MEN4)	Pump control motor4	Turning the (MEN4) ON allows to operate pump control motor4.		
	(MEN5)	Pump control motor5	Turning the (MEN5) ON allows to operate pump control motor5.		
	(MEN6)	Pump control motor6	Turning the (MEN6) ON allows to operate pump control motor6.		
	(MEN7)	Pump control motor7	Turning the (MEN7) ON allows to operate pump control motor7.		
	(MEN8)	Pump control motor8	Turning the (MEN8) ON allows to operate pump control motor8.		
	(TMC)	Timer cancel	Turning the (TMC) ON disables timer operation.		
	(TM1)	Timer1 enable	Turning the (TM1) ON enables the setting of timer1.		
	(TM2)	Timer2 enable	Turning the (TM2) ON enables the setting of timer2.		
	(TM3)	Timer3 enable	Turning the (TM3) ON enables the setting of timer3.		
	(TM4)	Timer4 enable	Turning the (TM4) ON enables the setting of timer4.		
	(PID-SS1)	Multistage PID	The combination of the ON/OFF states of digital input signals (PID-SS1) and (PID-SS2) provides 4 stages of PID control command can be selected.		
	(PID-SS2)				
	(EPID-SS1)	Multistage	The combination of the ON/OFF states of digital input signals (EPID-SS1) and (EPID-SS2) provides 4 stages of external PID control command can be selected.		
	(EPID-SS2)	external PID			
	(EPID1-ON)	External PID control1 On	Turning the (EPID-ON) ON enables the external PID control and OFF disables it.		
	(EPID2-ON)	External PID control2 On			
	(EPID3-ON)	External PID control3 On			
	(%/EPID1)	External PID control1 cancel	Turning the (%/EPID) ON cancels the external PID control.		Operate with selected command such as multi-frequency/keypad panel/ analog input etc. when external PID is cancelled.
	(%/EPID2)	External PID control2 cancel			
	(%/EPID3)	External PID control3 cancel			
	(EPID1-IVS)	External PID1 normal/ inverse operation switching	Operation mode of external PID control-output signal can be switched between normal/inverse operation. Turning the (EPID-IVS) ON selects inverse operation.		
	(EPID2-IVS)	External PID2 normal/ inverse operation switching			
	(EPID3-IVS)	External PID3 normal/ inverse operation switching			
	(EPID1-RST)	External PID1 integral/ differential reset	Turning the (EPID-RST) ON clears differential value and integral value of external PID.		
	(EPID2-RST)	External PID2 integral/ differential reset			
	(EPID3-RST)	External PID3 integral/ differential reset			
	(EPID1-HLD)	External PID1 integral hold	Turning the (EPID-HLD) ON holds integral of external PID.		
	(EPID2-HLD)	External PID2 integral hold			
	(EPID3-HLD)	External PID3 integral hold			
	[EN1] [EN2]	Enable input1 Enable input2	<ul style="list-style-type: none"> Turning off the circuit between terminals [EN1] and [PLC] or terminals [EN2] and [PLC] stops the inverter's output transistor. (Safe Torque Off : STO) These terminals are exclusively used for the source mode input and cannot be switched to the sink mode. If either one of these input terminals is kept OFF, the inverter interprets it as a discrepancy, causing an alarm "ecf". This alarm state can be cleared only by turning the inverter power off and on clears this alarm. 		
[PLC]	PLC signal power	Connects to the power supply of PLC output signals. This terminal also serves as 24 V power supply.	+24 V (22 to 27 V), Max. 200 mA		
[CM] (2 terminals)	Digital input common	Common terminals for digital input signals.	This terminal is electrically isolated from terminals [CM]s and [11]s.		

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks
Transistor output	[Y1]	Transistor output1	Out of the following signals, the selected one will be issued.	Maximum voltage at OFF : 27 VDC Leakage current at OFF : 0.1 mA or less Maximum current at ON : 50 mADC Maximum voltage at ON : 2 V (at 50mA)
	[Y2]	Transistor output2	These function codes may also switch the logic system between normal and negative to define how the inverter logic interprets either ON or OFF status of each terminal. Applicable to SINK and SOURCE. (No switching is required.)	
	[Y3]	Transistor output3		
	[Y4]	Transistor output4		
	(RUN)	Inverter running	This signal is ON when the inverter is running with the starting frequency or higher.	
	(FAR)	Frequency (speed) arrival signal	ON-signal is generated when frequency/speed reaches at set-value. When the run command is OFF or the frequency command is interpreted as zero, frequency arrival signal is OFF.	
	(FDI)	Frequency (speed) detected	This output signal comes ON when the output frequency exceeds the frequency detection level, and it goes OFF when the output frequency drops below the "Frequency detection level - Hysteresis width."	
	(LU)	Undervoltage detected (Inverter stopped)	This signal is ON when the undervoltage protection function is activated so that the motor is in an abnormal stop state.	
	(IOL)	Inverter output limiting	This signal comes ON when the inverter is activating the current limiter, torque limiter, or anti-regenerative control (automatic deceleration).	
	(IPF)	Auto-restarting after momentary power failure	This signal is kept ON during the period from when the inverter shuts down its output due to a momentary power failure until the restart is completed.	
	(OL)	Motor overload early warning	This signal comes ON when the value calculated by the electronic thermal overload protection exceeds the predetermined detection level. (applicable to Motor 1 only)	
	(RDY)	Inverter ready to run	This signal comes ON when the inverter is ready to run.	
	(SW8)	Switch motor drive source between commercial power and inverter output (For MC on commercial line)	This controls the magnetic contactor located at the commercial power line side, for switching the motor drive source from the commercial power line to inverter output.	
	(SW52-2)	Switch motor drive source between commercial power and inverter output (For secondary side)	This controls the magnetic contactor located at the inverter output side (secondary side), for switching the motor drive source from the commercial power line to inverter output.	
	(SW52-1)	Switch motor drive source between commercial power and inverter output (For primary side)	This controls the magnetic contactor located at the inverter input side (primary side), for switching the motor drive source from the commercial power line to inverter output.	
	(AX)	Select AX terminal function (For MC on primary side)	This signal controls the magnetic contactor located at the inverter input side (primary side).	
	(TU)	Shifted to pattern operation stage	When the stage is shifted in pattern operation, the inverter issues a one-shot ON signal (100 ms), telling the shift of the stage.	
	(TO)	Pattern operation cycle completed	Upon completion of all stages (1 to 7) in pattern operation, the inverter issues a one-shot ON signal (100 ms), telling the completion of all stages.	
	(STG1)	Pattern operation stage number 1	With the combination of STG1, STG2 and STG4, the inverter outputs the current operating stage.	
	(STG2)	Pattern operation stage number 2		
	(STG4)	Pattern operation stage number 4		
	(IOL2)	Inverter output limiting with delay	This signal comes ON when the inverter activating the current limiter, torque limiter, or anti-regenerative control (automatic deceleration) continues for 20 ms or more.	
	(FAN)	Cooling fan in operation	This signal outputs the ON/OFF state of the cooling fan.	
	(TRY)	Auto-resetting	This output signal comes ON when auto-resetting is in progress.	
	(U-DO)	Universal DO	This signal commands a peripheral apparatus according to signal sent from the host controller.	
	(OH)	Heat sink overheat early warning	This outputs a heat sink overheat early warning before an overheat trip actually happens. It is also used to detect an internal air circulation fan failure. Applicable capacity: 230V series: IP21 (30 HP to 60 HP)/ IP55 (7.5 HP to 60 HP)/ IP00 (75 HP to 125 HP) 460V series: IP21 (60 HP to 125 HP)/ IP55 (15 HP to 125 HP)/ IP00 (150 HP to 1000 HP) 575V series: IP21 (60 HP to 125 HP)/ IP55 (15 HP to 125 HP)/ IP00 (150 HP to 300 HP)	*3 *3 *3
	(LIFE)	Lifetime alarm	This outputs a service lifetime alarm according to the internal lifetime criteria. It is also used to detect an internal air circulation fan failure. Applicable capacity: 230V series: IP21 (30 HP to 60 HP)/ IP55 (7.5 HP to 60 HP)/ IP00 (75 HP to 125 HP) 460V series: IP21 (60 HP to 125 HP)/ IP55 (15 HP to 125 HP)/ IP00 (150 HP to 1000 HP) 575V series: IP21 (60 HP to 125 HP)/ IP55 (15 HP to 125 HP)/ IP00 (150 HP to 300 HP)	*3 *3 *3

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks
Transistor output	(REF OFF)	Reference loss detected	This signal comes ON when an analog frequency command is missed due to wire breaks.	
	(RUN2)	Inverter output on	This signal is ON when the inverter is running with the starting frequency or higher or when the DC braking is activated.	
	(OLP)	Overload prevention control	This output signal comes ON when the overload prevention control is activated.	
	(ID)	Current detected	This signal comes ON when the output current of the inverter has exceeded the detection level for the time longer than the specified timer period.	
	(PID-ALM)	PID alarm	This outputs an absolute-value alarm and E396alarm when the PID control is enabled.	
	(PID-CTL)	Under PID control	This signal comes ON when the PID control is enabled.	
	(PID-STP)	Motor stopped due to slow flowrate under PID control	This signal is ON when the inverter is in a stopped state by the slow flowrate stopping function under the PID control. (The inverter is stopped even if a run command is entered.)	
	(U-TL)	Low output torque detected	This signal comes ON when the torque value has been below the preset detection level for the time longer than the specified timer period.	
	(FRUN)	Running forward	ON-signal is generated at forward rotation.	
	(RRUN)	Running reverse	ON-signal is generated at reverse rotation	
	(RMT)	In remote operation	This signal comes ON when the inverter is in the remote mode.	
	(THM)	Motor overheat detected by thermistor	This signal comes ON when the motor overheat is detected by the PTC	
	(MCHG)	Periodic motor switching early warning	After the periodic switching conditions are met, the early warning signal comes ON for preset time.	
	(MLIM)	Pump control-output limit signal	This signal comes ON when pump control is in the maximum operating condition.	
	(C1OFF)	Terminal [C1] wire break	When Input current to C1 terminal become less than 2 mA, this is interpreted as wire brake and then ON signal is generated.	
	(FARFDT)	Frequency arrival/detected	This signal comes ON when both (FAR) and (FDT) are ON.	
	(AUX_L)	Auxiliary motor drive signal	In pump control, when pumps are switched, drive signal of an auxiliary motor is output for suppressing the PV variation. To compensate for a lack when pump control is in the maximum operating condition, drive signal of an auxiliary motor is output.	
	(MNT)	Maintenance timer	Alarm/warning signal is generated when time passes or start-up exceeds over the preset value.	
	(L-ALM)	Light alarm	When Alarm or warning, which is set as "light alarm", is generated, inverter indicates "Light alarm" on the display, continuous running and generates this light alarm signal.	
	(ALM)	Alarm output (for any alarm)	This is an alarm relay output as a transistor output.	
	(DECF)	Enable circuit failure detected	This output signal comes ON when the inverter detects a failure of the Enable circuit.	
	(ENOFF)	Enable input OFF	This output signal comes ON when the terminal [EN1] or [EN2] input is turned OFF (opened).	
	(CL01)	Customizable logic output signal1	These are customizable logic output signals as transistor output signals.	
	(CL02)	Customizable logic output signal2		
	(CL03)	Customizable logic output signal3		
	(CL04)	Customizable logic output signal4		
	(CL05)	Customizable logic output signal5		
	(CL06)	Customizable logic output signal6		
	(CL07)	Customizable logic output signal7		
	(TMD)	Timer in operation	This signal comes ON when one of the timer 1 to timer 4 is in operation.	
	(TMD1)	Timer1 in operation	This signal comes ON when timer1 is in operation.	
	(TMD2)	Timer2 in operation	This signal comes ON when timer2 is in operation.	
(TMD3)	Timer3 in operation	This signal comes ON when timer3 is in operation.		
(TMD4)	Timer4 in operation	This signal comes ON when timer4 is in operation.		

3. Terminal functions

Classification	Symbol	Name	Functions	Remarks
Transistor output	(M1_I)	Motor1 inverter driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor1 and inverter output.	
	(M1_L)	Motor1 commercial power supply driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor1 and commercial power supply.	
	(M2_I)	Motor2 inverter driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor2 and inverter output.	
	(M2_L)	Motor2 commercial power supply driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor2 and commercial power supply.	
	(M3_I)	Motor3 inverter driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor3 and inverter output.	
	(M3_L)	Motor3 commercial power supply driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor3 and commercial power supply.	
	(M4_I)	Motor4 inverter driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor4 and inverter output.	
	(M4_L)	Motor4 commercial power supply driven	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor4 and commercial power supply.	
	(M5_L)	Motor5 commercial power supply drive	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor5 and commercial power supply.	
	(M6_L)	Motor6 commercial power supply drive	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor6 and commercial power supply.	
	(M7_L)	Motor7 commercial power supply drive	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor7 and commercial power supply.	
	(M8_L)	Motor8 commercial power supply drive	Signal is output to operate open/close the magnetic contactor (MC) placed between pump control motor8 and commercial power supply.	
	(M-RUN)	Mutual operation	One of inverters is operating by mutual operation.	
	(M-ALM)	Mutual operation alarm	One of inverters is in alarm by mutual operation.	
	(PID2)	PID2 enable	This signal comes ON when PID2 is in enabled state.	
	(PV1-ALM)	PID1 alarm	Absolute value alarm/deviation alarm of PID control is output.	
	(PV2-ALM)	PID2 alarm		
	(PV1-OFF)	PID1 feedback error	This signal comes ON when there is PV signal errors in PID control.	
	(PV2-OFF)	PID2 feedback error		
	(EPID1-CTL)	External PID1 in control	This signal comes ON when external PID is in enabled state.	
	(EPID2-CTL)	External PID2 in control		
	(EPID3-CTL)	External PID3 in control		
	(EPID1-OUT)	External PID1 output	Output of external PID control is ON/OFF duty cycle signal.	
	(EPID2-OUT)	External PID2 output		
	(EPID3-OUT)	External PID3 output		
	(EPID1-RUN)	External PID1 in	This signal comes ON when external PID control is in operation.	
	(EPID2-RUN)	External PID2 in		
	(EPID3-RUN)	External PID3 in		
	(EPV1-ALM)	External PID1 alarm	Absolute value alarm/deviation alarm of external PID control is output.	
	(EPV2-ALM)	External PID2 alarm		
	(EPV3-ALM)	External PID3 alarm		
	(EPV1-OFF)	External PID1 feedback error	This signal comes ON when there is PV signal errors in external PID control.	
	(EPV2-OFF)	External PID2 feedback error		
	(EPV3-OFF)	External PID3 feedback error		
	(PLC)	Transistor output power	Power supply for transistor output load. (24 VDC, 200 mA DC max.) (NOTE : Shared by the digital input [PLC] terminal.)	Use short-circuit terminals between [CM]s and [CMY].
	[CMY]	Transistor output common	Common terminal for transistor output signal terminals.	This terminal is electrically isolated from terminals [CM]s and [I1]s.

3. Terminal functions

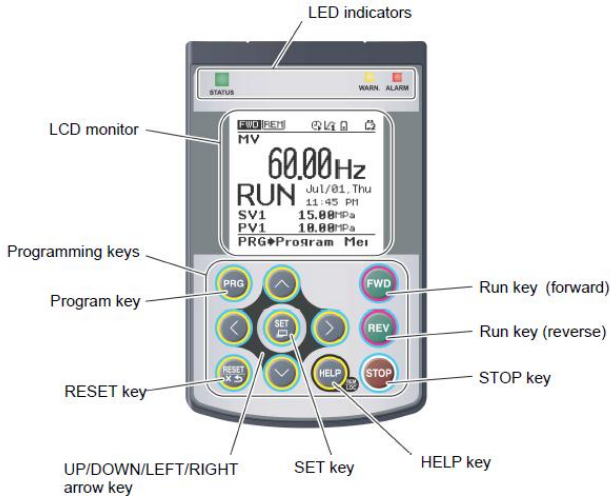
Classification	Symbol	Name	Functions	Remarks
Relay output	[Y5A], [Y5C]	General purpose relay output	<ul style="list-style-type: none"> As a general-purpose relay output, the same functions as [Y1] to [Y4] can be assigned. The logic value is switchable between [Y5A] and [Y5C] are "excited" and "non-excited." 	Contact rating : 250 VAC, 0.3 A, $\cos\phi=0.3$ 48 VDC, 0.5A
	[30A], [30B], [30C]	Alarm relay output (for any error)	<ul style="list-style-type: none"> This outputs a non-voltage contact signal (1c) when the inverter is stopped with the protective function. As a general-purpose relay output, the same functions as [Y1] to [Y4] can be assigned. The logic value is switchable between [30A] and [30C] are "excited" and "non-excited." 	Contact rating : 250 VAC, 0.3 A, $\cos\phi=0.3$ 48 VDC, 0.5A
Analog output	[FM1], [FM2]	Analog monitor	<p>The output can be either analog DC voltage (0 to 10 V) or analog DC current (4 to 20 mA/0 to 20 mA).</p> <p>Any one of the following items can be output with the selected analog form.</p> <ul style="list-style-type: none"> Output frequency (with slip compensation/without slip compensation) Output current Output voltage Output torque Load factor Input power PID feedback amount DC link bus voltage Universal AO Motor output Analog output test PID command PID output PID deviation Customizable logic output signal Inverter cooling fin temperature Reference frequency <p>* When the terminal is outputting 0 to 10 VDC, it is capable of driving up to two meters with 10kΩ impedance.</p> <p>* When the terminal is outputting current, it is capable of connecting a maximum of 500Ω to the meter.</p>	Adjustable gain range : 0% to 300%
	[11]	Analog common		
Communication	RJ-45 connector for the keypad panel	RS-485 communications port1	<p>Out of the following protocols, the desired one can be selected.</p> <ul style="list-style-type: none"> Modbus RTU Fuji general-purpose inverter protocol FRENIC Loader protocol (SX) *1 Metasys N2 *2 BACnet *2 	With power supply to the keypad panel.
	[DX+], [DX-], [SD]	RS-485 communications port2 (Terminal control PCB)	<p>Out of the following protocols, the desired one can be selected.</p> <ul style="list-style-type: none"> Modbus RTU Fuji general-purpose inverter protocol FRENIC Loader protocol (SX) *1 Metasys N2 *2 BACnet *2 	
	CN10	USB connector	<ul style="list-style-type: none"> mini B connector, Ver. 2.0 conformed Possible to connect Inverter Supporting PC Loader *1 	Mounted on control PCB.
Battery	CN11	Connector for battery	Connect battery (option).	

*1 Unavailable for concurrent use.

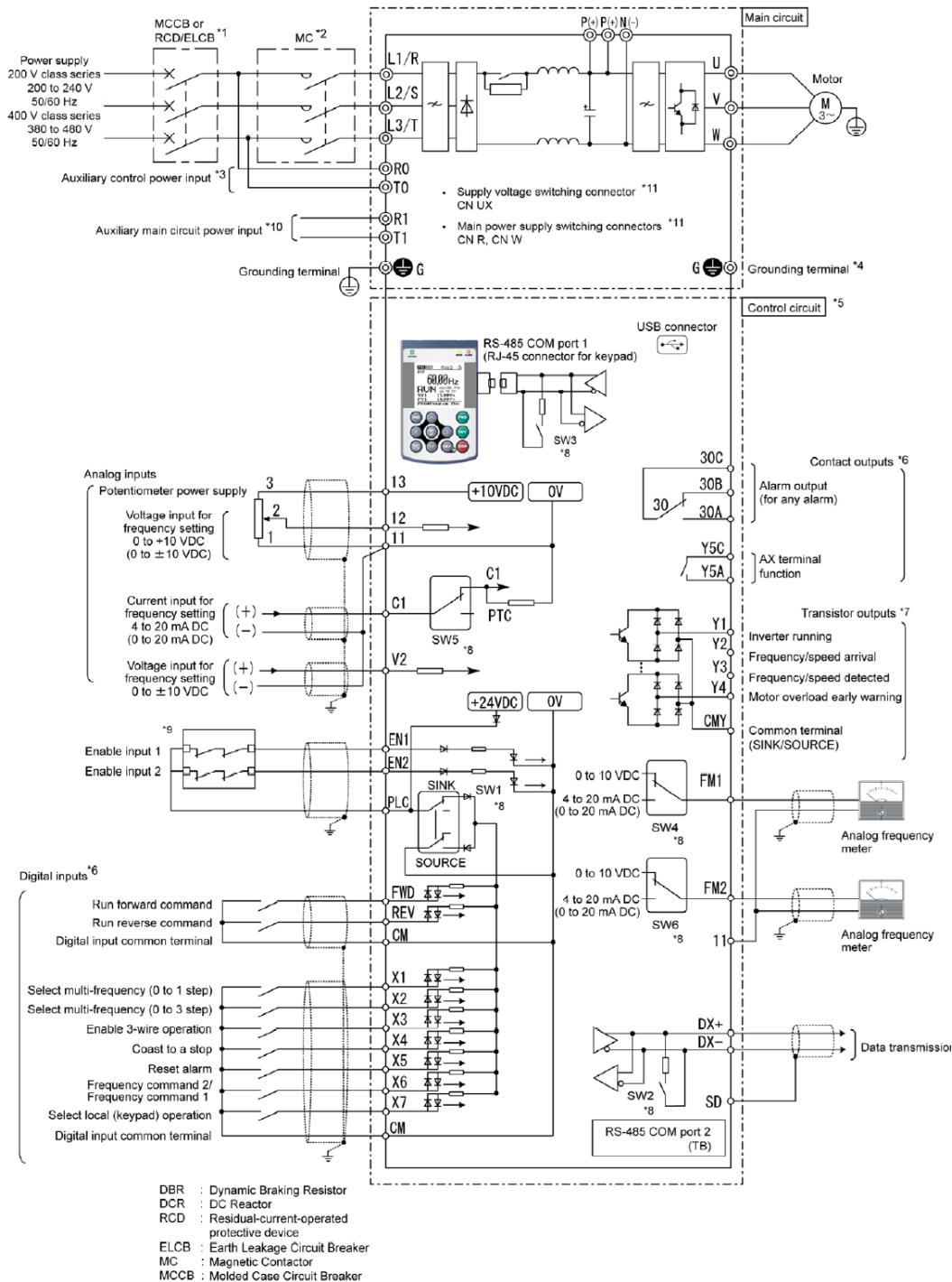
*2 Unavailable for concurrent use.

*3 COMING SOON : The capacity from 30HP to 125HP of 230V series, 60HP to 1000HP of 460V series and 1HP to 300HP of 575V series.

4A. FRENIC-HVAC Multi-Purpose Keypad



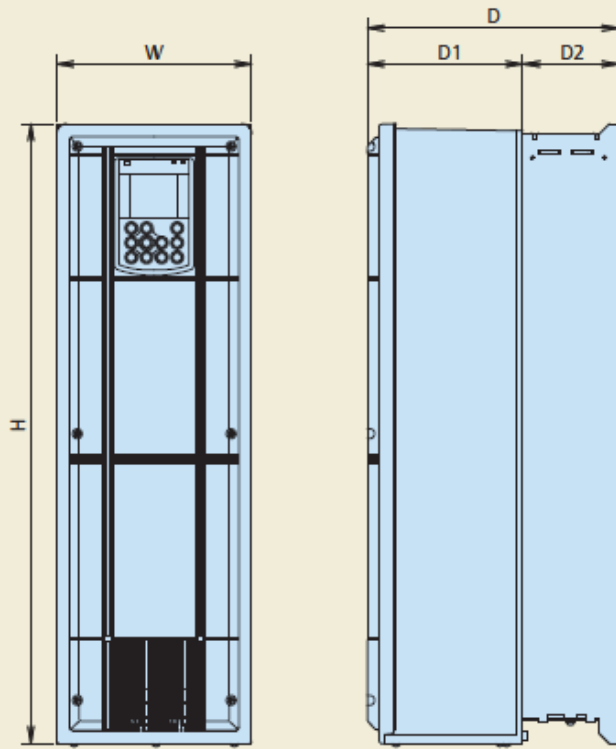
4B. Basic wiring diagram (Operation by external signal inputs)



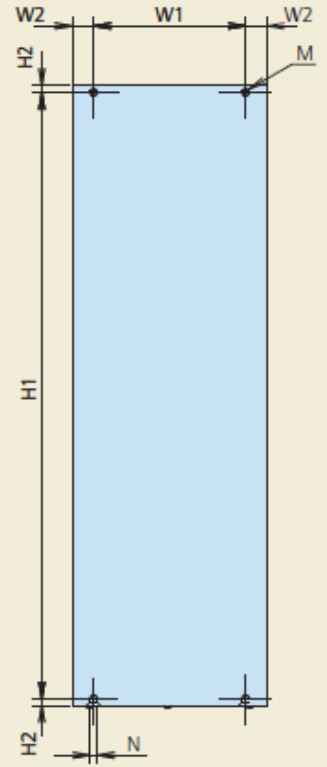
FRENIC-HVAC: Outline Drawings - Reference Model Number Outline Dimension Tables
 (for estimating purposes only)

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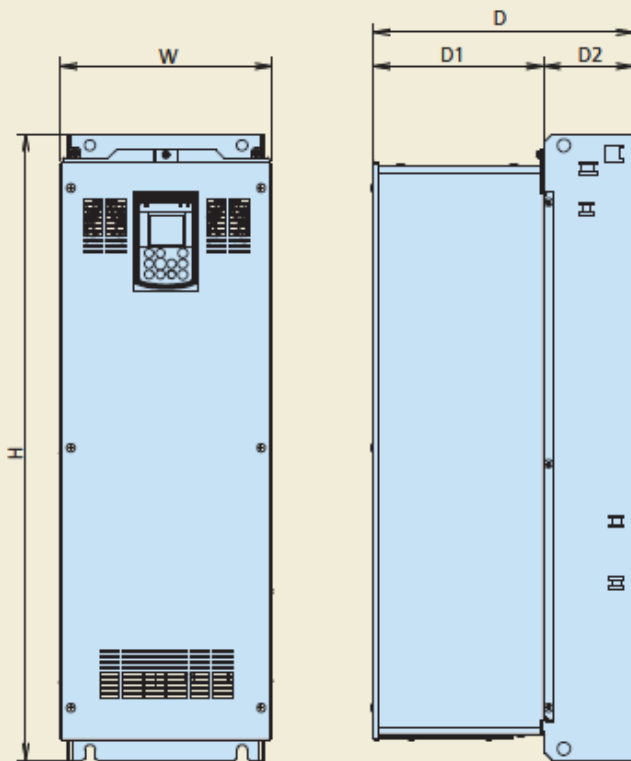


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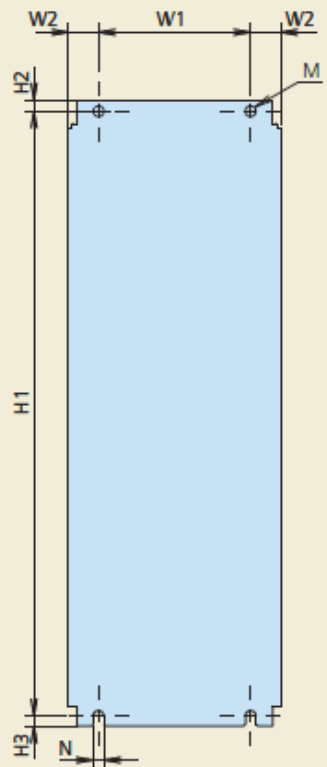


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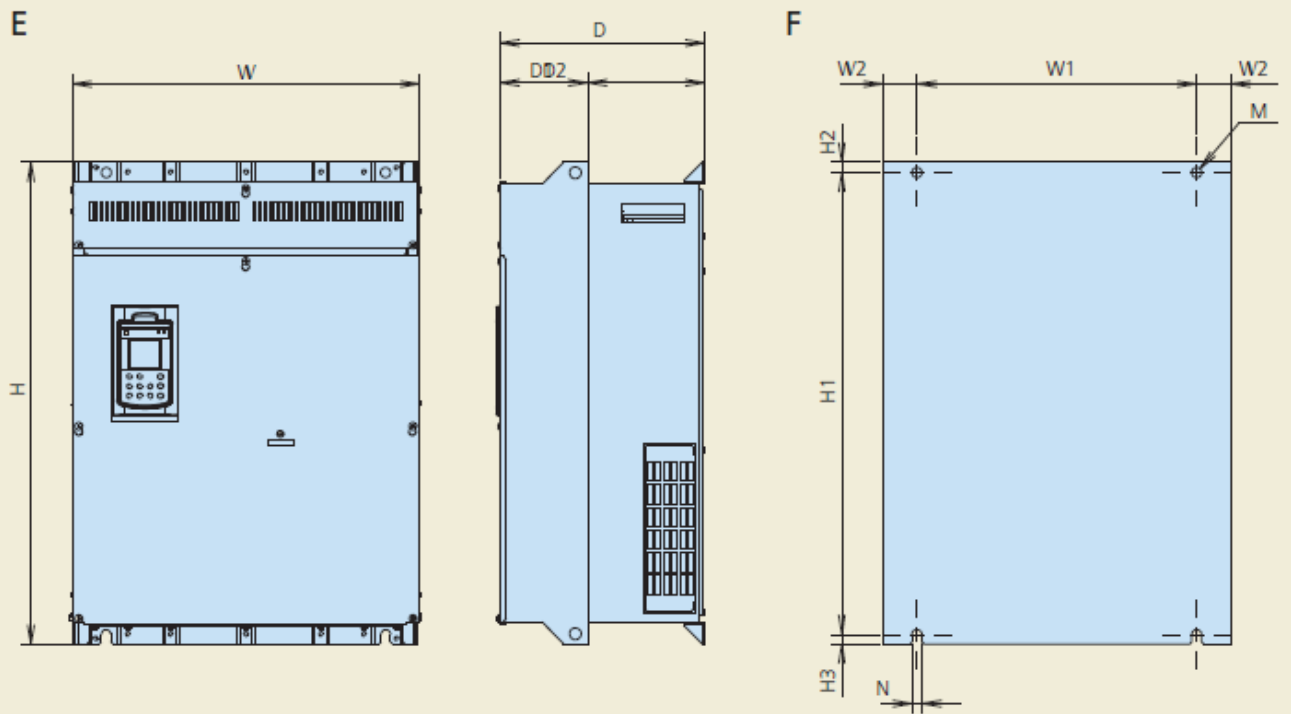


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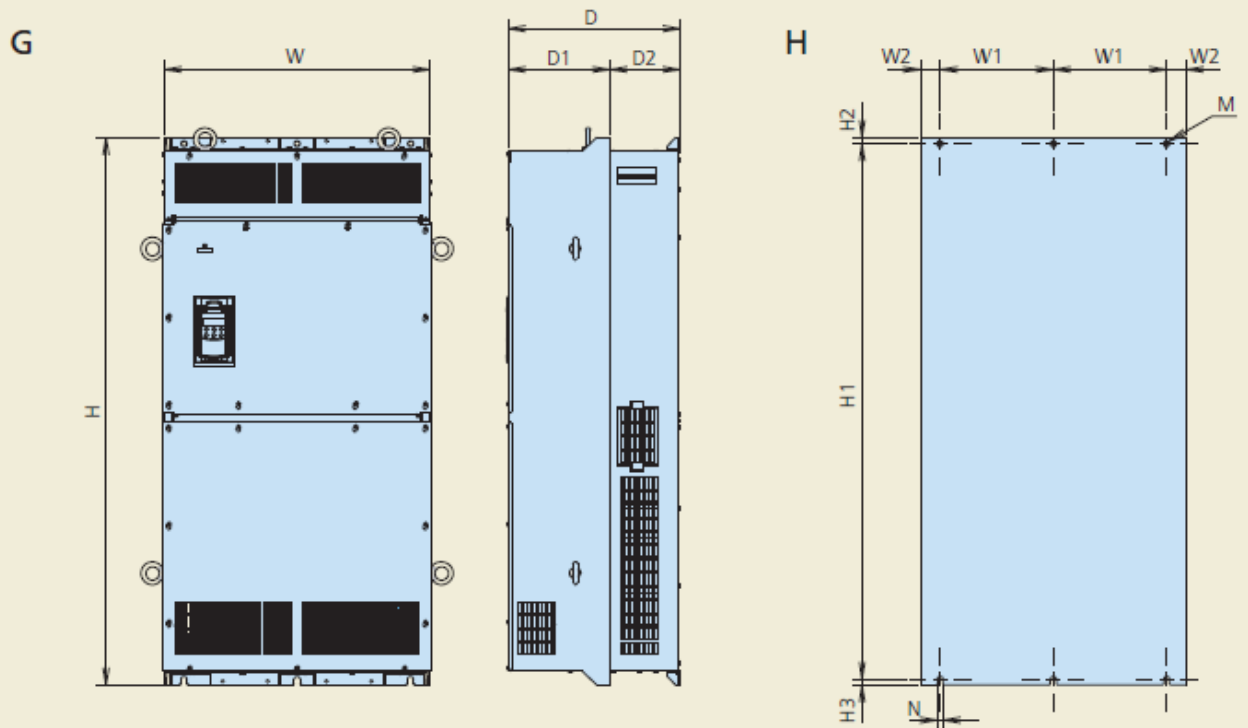


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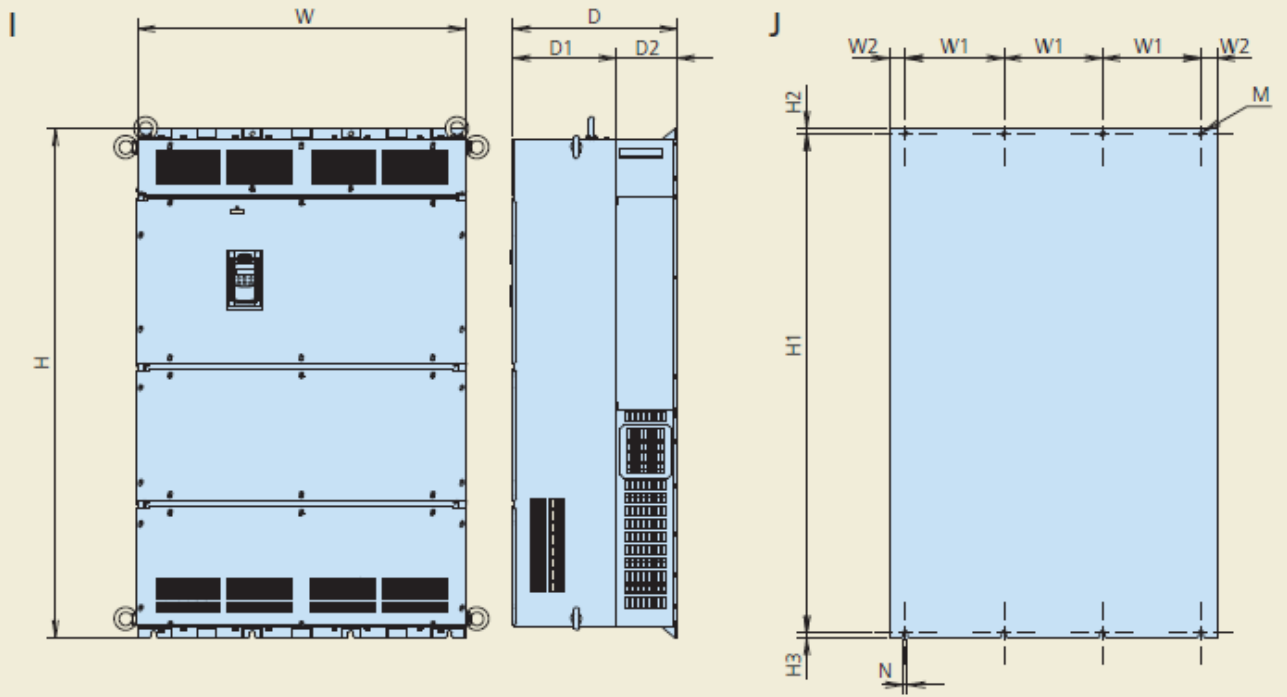


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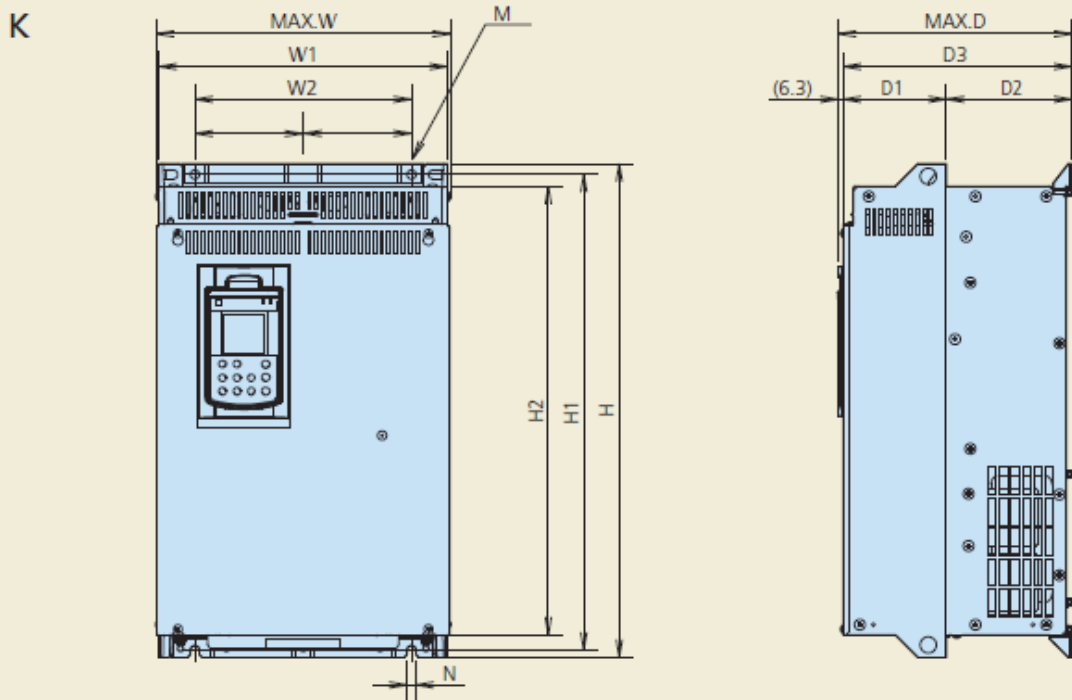


FRENIC-HVAC: Outline Drawings - Reference Model Number Outline Dimension Tables
 (for estimating purposes only)

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■ Body



FRENIC-HVAC Multi-function Keypad

■ Keypad

