

Open Drives

HVX9000 Open Drives



HVX9000 Open Drives

Product Description

Cutler-Hammer® HVX9000 Series Adjustable Frequency Drives by Eaton's electrical business are the next generation of drives specifically engineered for HVAC, pump and fluid control applications. The power unit makes use of the most sophisticated semiconductor technology and a highly modular construction that can be flexibly adapted to the customer's needs.

The input and output configuration (I/O) is designed with modularity in mind. The I/O is comprised of option cards, each with its own input and output configuration. The control module is designed to accept a total of five of these cards. The cards contain not only normal analog and digital inputs but also fieldbus cards.

These drives continue the tradition of robust performance, and raise the bar on features and functionality, ensuring the best solution at the right price.

Features and Benefits

- Robust design — proven 500,000 hours MTBF
- Integrated 3% line reactors standard on drives from FR4 through FR9
- EMI/RFI Filters standard on all drives from FR4 through FR9
- HAND/OFF/AUTO and DRIVE/BYPASS selector on keypad simplifies control
- Additional I/O and communication cards provide plug and play functionality
- Copy/Paste function allows transfer of parameter settings from one drive to the next
- Keypad can display up to three monitored parameters simultaneously
- Hand-held Auxiliary Power Supply allows programming/monitoring of control module without applying power to the drive
- NEMA Type 1 and NEMA Type 12 enclosures available
- Standard NEMA Type 12 keypad on all drives
- Simplified operating menu allows for typical programming changes, while programming mode provides control of everything
- Accommodates a wide selection of expander boards and adapter boards
- UL Listed
- Quickstart wizard built into programming of drive ensures a smooth start-up
- The HVX can be flexibly adapted to a variety of needs using our pre-installed program
- I/O connections with simple quick connection terminals
- Control logic can be powered from an external auxiliary control panel, internal drive functions and fieldbus if necessary
- Standard option board configuration includes an A9 I/O board and an A2 relay output board installed in slots A and B

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Technical Data and Specifications

Table 1. HVX9000 Specifications

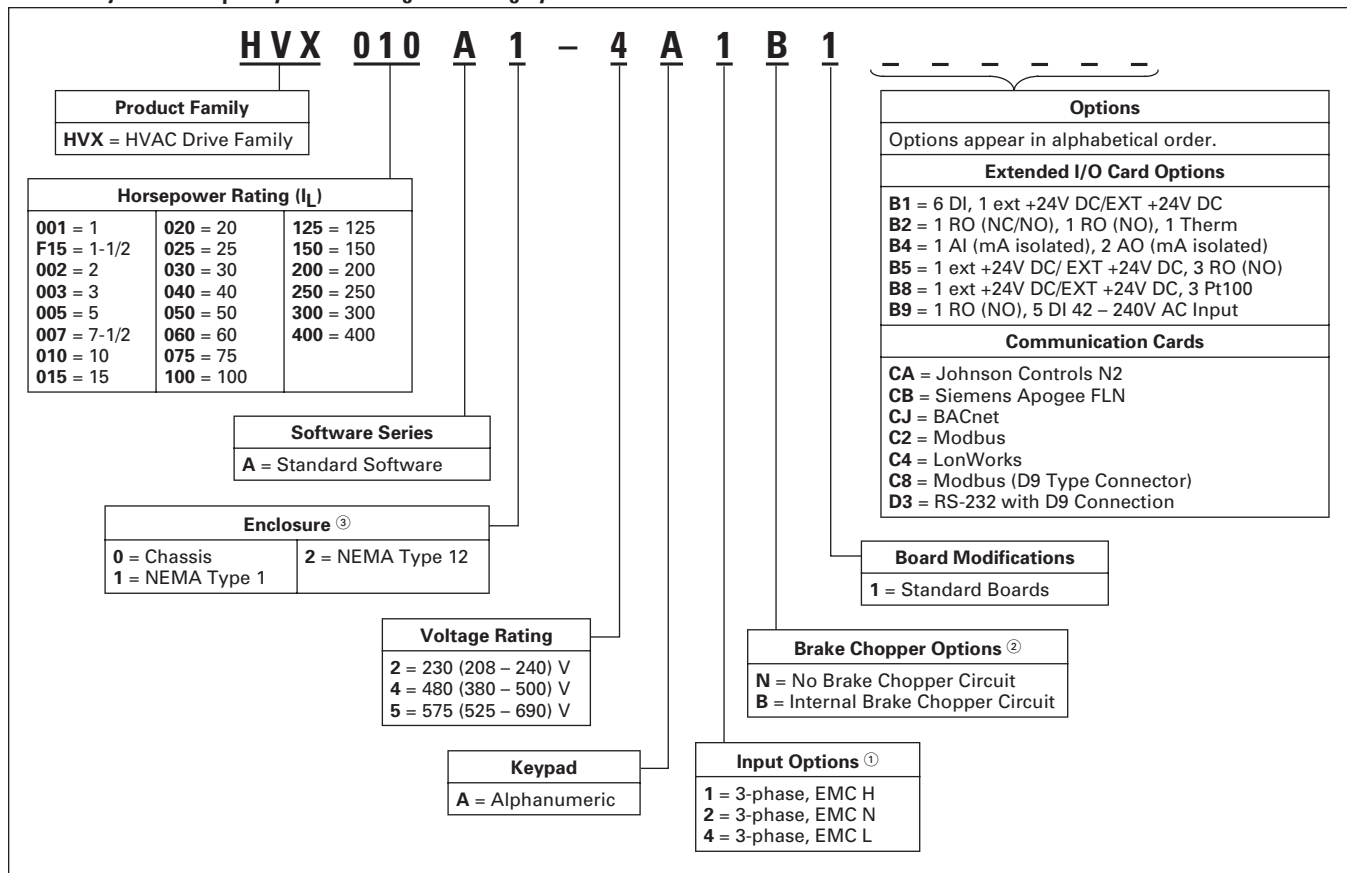
Description	Specification
Input Ratings	
Input Voltage (V_{in})	+10% / -15%
Input Frequency (f_{in})	50/60 Hz (variation up to 45 – 66 Hz)
Connection to Power	Once per minute or less (typical operation)
Short Circuit Withstand Rating	100 kAIC
Output Ratings	
Output Voltage	0 to V_{in}
Continuous Output Current	Ambient temperature max. +104°F(+40°C)
Overload Current	110% (1 min./10 min.)
Output Frequency	0 to 320 Hz
Frequency Resolution	.01 Hz
Control Characteristics	
Control Method	Frequency Control (V/f) Open Loop Sensorless Vector Control
Switching Frequency	Adjustable with Parameter 2.6.9 1 – 40 hp: 1 to 16 kHz; default 10 kHz 50 – 75 hp: 1 to 10 kHz; default 3.6 kHz
Frequency Reference	Analog Input: Resolution .1% (10-bit), accuracy \pm 1% Panel Reference: Resolution .01 Hz
Field Weakening Point	30 to 320 Hz
Acceleration Time	0 to 3000 sec.
Deceleration Time	0 to 3000 sec.
Braking Torque	DC brake: 30% x T_n (without brake option)
Ambient Conditions	
Ambient Operating Temperature	14°F (-10°C), no frost to 104°F (+40°C)
Storage Temperature	-40°F (-40°C) to 158°F (70°C)
Relative Humidity	0 to 95% RH, noncondensing, non-corrosive, no dripping water
Air Quality	Chemical vapors: IEC 721-3-3, unit in operation, class 3C2; Mechanical particles: IEC 721-3-3, unit in operation, class 3S2
Altitude	100% load capacity (no derating) up to 3280 ft. (1000m); 1% derating for each 328 ft. (100m) above 3280 ft. (1000m); max. 9842 ft. (3000m)
Vibration	EN 50178, EN 60068-2-6; 5 to 50 Hz, Displacement amplitude 1 mm (peak) at 3 to 15.8 Hz, Max. acceleration amplitude 1G at 15.8 to 150 Hz
Shock	EN 50178, EN 60068-2-27 UPS Drop test (for applicable UPS weights) Storage and shipping: max. 15G, 11 ms (in package)
Enclosure Class	NEMA Type 1/IP21 or NEMA Type 12/IP54

Description	Specification
Standards	
Product	IEC 61800-2
Safety	UL 508C
EMC (at default settings)	Immunity: Fulfills all EMC immunity requirements; Emissions: EN 61800-3, LEVEL H
Control Connections	
Analog Input Voltage	0 to 10V, R = 200 Ω differential (-10 to 10V joystick control) Resolution .1%; accuracy \pm 1%
Analog Input Current	0(4) to 20 mA; R_i - 250 Ω differential
Digital Inputs (6)	Positive or negative logic; 18 to 24V DC
Auxiliary Voltage	+24V \pm 15%, max. 250 mA
Output Reference Voltage	+10V +3%, max. load 10 mA
Analog Output	0(4) to 20 mA; R_L max. 500 Ω ; Resolution 10 bit; Accuracy \pm 2%
Digital Outputs	Open collector output, 50 mA/48V
Relay Outputs	2 programmable Form C relay outputs Switching capacity: 24V DC / 8A, 250V AC / 8A, 125V DC / 0.4A
Protections	
Overcurrent Protection	Yes
Overvoltage Protection	Yes
Undervoltage Protection	Yes
Earth Fault Protection	In case of earth fault in motor or motor cable, only the frequency converter is protected
Input Phase Supervision	Trips if any of the input phases are missing
Motor Phase Supervision	Trips if any of the output phases are missing
Overtemperature Protection	Yes
Motor Overload Protection	Yes
Motor Stall Protection	Yes
Motor Underload Protection	Yes
Short Circuit Protection	Yes (Of the +24V and +10V Reference Voltages)

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Catalog Number Selection

Table 2. Adjustable Frequency Drive Catalog Numbering System



① All 230V Drives and 480V Drives up to 250 hp (I_L) are only available with Input Option 1. 480V Freestanding Drives are available with Input Option 4 (EMC Level L). 2. 575V Drives up to 200 hp (I_L) are only available with Input Option 4 (EMC Level L).

② 480V Drives up to 40 hp (I_L) are only available with Brake Chopper Option B. 480V Drives 50 hp (I_L) or larger are only available with Brake Chopper Option N. 230V Drives up to 20 hp (I_L) are only available with Brake Chopper Option B. 575V Drives are standard without Brake Chopper Option (N).

③ 480V Drives 300 – 600 hp (I_L) are available with enclosure style 0 (Chassis). 480V FR10 Freestanding Drives are available with enclosure style 1 (NEMA Type 1) or 2 (NEMA Type 12). FR11 Freestanding Drives are only available with enclosure style 1 (NEMA Type 1).

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Product Selection

230V HVX9000 Drives

Table 3. 208 – 240V, NEMA Type 1 Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR4	F1	1	4.8	HVX001A1-2A1B1	955.
		1-1/2	6.6	HVXF15A1-2A1B1	1,045.
		2	7.8	HVX002A1-2A1B1	1,140.
		3	11	HVX003A1-2A1B1	1,235.
FR5	F1	5	17.5	HVX005A1-2A1B1	1,430.
		7-1/2	25	HVX007A1-2A1B1	1,660.
		10	31	HVX010A1-2A1B1	1,870.
FR6	F1	15	48	HVX015A1-2A1B1	2,155.
		20	61	HVX020A1-2A1B1	2,680.
FR7	F1	25	75	HVX025A1-2A1N1	3,730.
		30	88	HVX030A1-2A1N1	5,330.
		40	114	HVX040A1-2A1N1	5,730.
FR8	F1	50	140	HVX050A1-2A1N1	6,510.
		60	170	HVX060A1-2A1N1	7,330.
		75	205	HVX075A1-2A1N1	8,180.

Table 4. 208 – 240V, NEMA Type 12 Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR4	F1	1	4.8	HVX001A2-2A1B1	1,085.
		1-1/2	6.6	HVXF15A2-2A1B1	1,190.
		2	7.8	HVX002A2-2A1B1	1,300.
		3	11	HVX003A2-2A1B1	1,405.
FR5	F1	5	17.5	HVX005A2-2A1B1	1,625.
		7-1/2	25	HVX007A2-2A1B1	1,885.
		10	31	HVX010A2-2A1B1	2,125.
FR6	F1	15	48	HVX015A2-2A1B1	2,450.
		20	61	HVX020A2-2A1B1	3,040.
FR7	F1	25	75	HVX025A2-2A1N1	4,235.
		30	88	HVX030A2-2A1N1	6,050.
		40	114	HVX040A2-2A1N1	6,500.
FR8	FP	50	140	HVX050A2-2A1N1	7,850.
		60	170	HVX060A2-2A1N1	8,680.
		75	205	HVX075A2-2A1N1	9,520.

480V HVX9000 Drives

Table 5. 380 – 500V, NEMA Type 1 Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR4	F1	1-1/2	3.3	HVXF15A1-4A1B1	1,185.
		2	4.3	HVX002A1-4A1B1	1,235.
		3	5.6	HVX003A1-4A1B1	1,305.
		5	7.6	HVX005A1-4A1B1	1,390.
		7-1/2	12	HVX007A1-4A1B1	1,655.
FR5	F1	10	16	HVX010A1-4A1B1	1,970.
		15	23	HVX015A1-4A1B1	2,115.
		20	31	HVX020A1-4A1B1	2,605.
FR6	F1	25	38	HVX025A1-4A1B1	3,545.
		30	46	HVX030A1-4A1B1	3,950.
		40	61	HVX040A1-4A1B1	4,830.
FR7	F1	50	72	HVX050A1-4A1N1	6,810.
		60	87	HVX060A1-4A1N1	7,010.
		75	105	HVX075A1-4A1N1	8,660.
FR8	F1	100	140	HVX100A1-4A1N1	10,610.
		125	170	HVX125A1-4A1N1	13,710.
		150	205	HVX150A1-4A1N1	14,700.
FR9	F1	200	261	HVX200A1-4A1N1	16,280.
		250	300	HVX250A1-4A1N1	24,470.

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Table 6. 380 – 500V, NEMA Type 1 Freestanding Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR10	W	300	385	HVX300A1-4A4N1	33,800.
	FP	350	460	HVX350A1-4A4N1	40,560.
	W	400	520	HVX400A1-4A4N1	47,200.
FR11	FP	500	590	HVX500A1-4A4N1	56,000.
	FP	550	650	HVX550A1-4A4N1	64,910.
	FP	600	730	HVX600A1-4A4N1	71,220.

Note: Integrated fuses as standard. Limited option selection available; 115V Transformer (KB), Light Kit (L1), HOA (K4), Speed Potentiometer w/HOA (K2), Disconnect Switch (P2). See Freestanding Option Selection on Page 9.

Table 7. 380 – 500V, NEMA Type 12 Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR4	F1	1-1/2	3.3	HVXF15A2-4A1B1	1,345.
		2	4.3	HVX002A2-4A1B1	1,420.
		3	5.6	HVX003A2-4A1B1	1,500.
		5	7.6	HVX005A2-4A1B1	1,575.
		7-1/2	12	HVX007A2-4A1B1	1,885.
FR5	F1	10	16	HVX010A2-4A1B1	2,240.
		15	23	HVX015A2-4A1B1	2,400.
		20	31	HVX020A2-4A1B1	2,960.
FR6	F1	25	38	HVX025A2-4A1B1	4,035.
		30	46	HVX030A2-4A1B1	4,485.
		40	61	HVX040A2-4A1B1	5,490.
FR7	F1	50	72	HVX050A2-4A1N1	7,730.
		60	87	HVX060A2-4A1N1	7,950.
		75	105	HVX075A2-4A1N1	9,830.
FR8	F1	100	140	HVX100A2-4A1N1	12,080.
		125	170	HVX125A2-4A1N1	15,600.
		150	205	HVX150A2-4A1N1	16,700.
FR9	F1	200	261	HVX200A2-4A1N1	18,480.
		250	300	HVX250A2-4A1N1	27,830.

Table 8. 380 – 500V, NEMA Type 12 Freestanding Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR10	FP	300	385	HVX300A2-4A4N1	35,150.
	FP	350	460	HVX350A2-4A4N1	41,990.
	FP	400	520	HVX400A2-4A4N1	48,650.

Note: Integrated fuses as standard. Limited option selection available; 115V Transformer (KB), Light Kit (L1), HOA (K4), Speed Potentiometer w/HOA (K2), Disconnect Switch (P2). See Freestanding Option Selection on Page 9.

Table 9. 380 – 500V, Open Chassis Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR10 ^①	F1	300	385	HVX300A0-4A2N1	28,300.
		350	460	HVX350A0-4A2N1	35,170.
		400	520	HVX400A0-4A2N1	42,080.
FR11	F1	500	590	HVX500A0-4A2N1	54,500.
	F1	550	650	HVX550A0-4A2N1	63,410.
	F1	600	1300	HVX600A0-4A2N1	69,720.

^① FR10 includes 3% line reactor, but it is not integrated to chassis.

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575V HVX9000 Drives

Table 10. 525 – 690V, NEMA Type 1 Drive

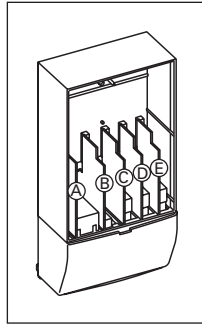
Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$		
FR6	F1	3	4.5	HVX003A1-5A4N1	1,860.		
		5	7.5	HVX005A1-5A4N1	2,250.		
		7-1/2	10	HVX007A1-5A4N1	2,580.		
		10	13.5	HVX010A1-5A4N1	3,205.		
		15	18	HVX015A1-5A4N1	3,960.		
		20	22	HVX020A1-5A4N1	4,715.		
		25	27	HVX025A1-5A4N1	5,440.		
		30	34	HVX030A1-5A4N1	6,270.		
		FR7	F1	40	41	HVX040A1-5A4N1	7,180.
				50	52	HVX050A1-5A4N1	7,960.
FR8	F1	60	62	HVX060A1-5A4N1	8,630.		
		75	80	HVX075A1-5A4N1	11,200.		
		100	100	HVX100A1-5A4N1	14,310.		
FR9	F1	125	125	HVX125A1-5A4N1	15,730.		
		150	144	HVX150A1-5A4N1	19,560.		
		200	208	HVX200A1-5A4N1	21,580.		

Table 11. 525 – 690V, NEMA Type 12 Drive

Frame Size	Delivery Code	hp (I _L)	Current (I _L)	Catalog Number	Price U.S. \$
FR6	F1	3	4.5	HVX003A2-5A4N1	2,110.
		5	7.5	HVX005A2-5A4N1	2,555.
		7-1/2	10	HVX007A2-5A4N1	2,930.
		10	13.5	HVX010A2-5A4N1	3,645.
		15	18	HVX015A2-5A4N1	4,495.
		20	22	HVX020A2-5A4N1	5,360.
		25	27	HVX025A2-5A4N1	6,170.
		30	34	HVX030A2-5A4N1	7,110.
FR7	MP28	40	41	HVX040A2-5A4N1	8,150.
		50	52	HVX050A2-5A4N1	9,030.
FR8	MP28	60	62	HVX060A2-5A4N1	9,800.
		75	80	HVX075A2-5A4N1	12,710.
		100	100	HVX100A2-5A4N1	16,250.
FR9	MP28	125	125	HVX125A2-5A4N1	17,850.
		150	144	HVX150A2-5A4N1	22,200.
		200	208	HVX200A2-5A4N1	24,500.

9000X Series Option Board Kits

The 9000X Series drives can accommodate a wide selection of expander and adapter option boards to customize the drive for your application needs. The drive's control unit is designed to accept a total of five option boards (see Figure 1).



The 9000X Series factory installed standard board configuration includes an A9 I/O board and an A2 relay output board, which are installed in slots A and B.

Figure 1. 9000X Series Option Boards

Table 12. Option Board Kits

Option Kit Description ②	Allowed Slot Locations ①	Field Installed		Factory Installed		
		Catalog Number	Price U.S. \$	Option Designator	Adder U.S. \$	
Standard I/O Cards (See Figure 1)						
2 RO (NC/NO) 6 DI, 1 DO, 2 AI, 1 AO, 1 +10V DC ref, 2 ext +24V DC/ EXT +24V DC	B	OPTA2	94.50	—	—	
	A	OPTA9	189.00	—	—	
Extended I/O Card Options						
6 DI, 1 ext +24V DC/EXT +24V DC 1 RO (NC/NO), 1 RO (NO), 1 Therm 1 AI (mA isolated), 2 AO (mA isolated) 1 ext +24V DC/ EXT +24V DC, 3 RO (NO) 1 ext +24V DC/EXT +24V DC, 3 Pt100 1 RO (NO), 5 DI 42 – 240V AC Input	B, C, D, E	OPTB1	189.00	B1	294.00	
	B, C, D, E	OPTB2	221.00	B2	326.00	
	C, D	OPTB4	336.00	B4	441.00	
	C, D	OPTB5	200.00	B5	305.00	
	B, C, D, E	OPTB8	570.00	B8	675.00	
	B, C, D, E	OPTB9	294.00	B9	399.00	
	Communication Cards ③④					
	Modbus Johnson Controls N2 LonWorks Modbus (D9 Type Connector) Siemens Apogee FLN BACnet RS-232 with D9 Connection	D, E	OPTC2	237.00	C2	342.00
		D, E	OPTC2	237.00	CA	342.00
D, E		OPTC4	580.00	C4	685.00	
D, E		OPTC8	326.00	C8	431.00	
D, E		OPTCB	237.00	CB	342.00	
D, E		OPTCJ	280.00	CJ	385.00	
D, E		OPTD3	189.00	D3	294.00	
Keypad						
9000X Series HAND/OFF/AUTO Keypad	—	KEYPAD-HOA	205.00	—	—	
9000X Series Remote Mount Keypad Unit (Keypad not included, includes 10 ft. cable, keypad holder, mounting hardware)	—	OPTRMT-KIT-9000X	200.00	—	—	

① Option card must be installed in one of the slots listed for that card. Slot indicated in **Bold** is the preferred location.

② AI = Analog Input; AO = Analog Output, DI = Digital Input, DO = Digital Output, RO = Relay Output

③ Only one Communication Module can be installed at a time.

④ OPTC2 is a multi-protocol option card.

Discount Symbol **SS-6**

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Dimensions

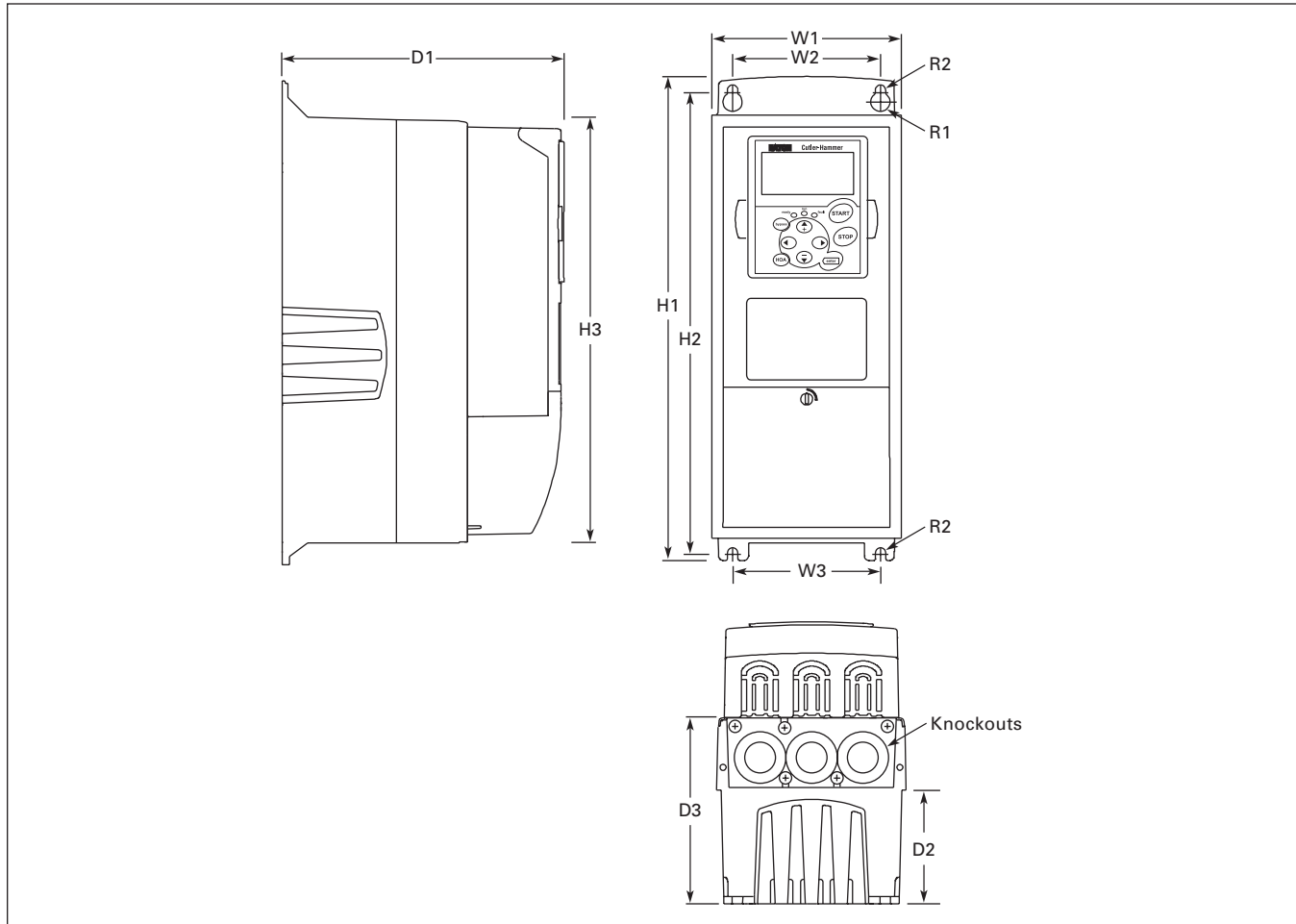


Figure 2. NEMA Type 1 and NEMA Type 12 HVX9000 Drive Dimensions, FR4, FR5 and FR6

Table 22. HVX9000 Drive Dimensions

Frame Size	Voltage	hp (I _L)	Approximate Dimensions in Inches (mm)											Weight Lbs. (kg)	Knockouts @ Inches (mm) N1 (O.D.)
			H1	H2	H3	D1	D2	D3	W1	W2	W3	R1 dia.	R2 dia.		
FR4	230V	1 – 3	12.9	12.3	11.5	7.5	3.0	5.0	5.0	3.9	—	.5	.3	11.0	3 @ 1.1
	480V	1-1/2 – 7-1/2	(327)	(313)	(292)	(190)	(77)	(126)	(128)	(100)		(13)	(7)	(5)	(28)
FR5	230V	5 – 10	16.5	16.0	15.3	8.4	3.9	5.8	5.6	3.9	—	.5	.3	17.9	2 @ 1.5
	480V	10 – 20	(419)	(406)	(389)	(214)	(100)	(148)	(143)	(100)		(13)	(7)	(8)	1 @ 1.1 (28)
FR6	230V	15 – 20	22.0	21.3	20.4	9.3	4.2	6.5	7.6	5.8	—	.6	.4	40.8	3 @ 1.5
	480V	25 – 40	(558)	(541)	(519)	(237)	(105)	(165)	(195)	(148)		(15.5)	(9)	(19)	(37)

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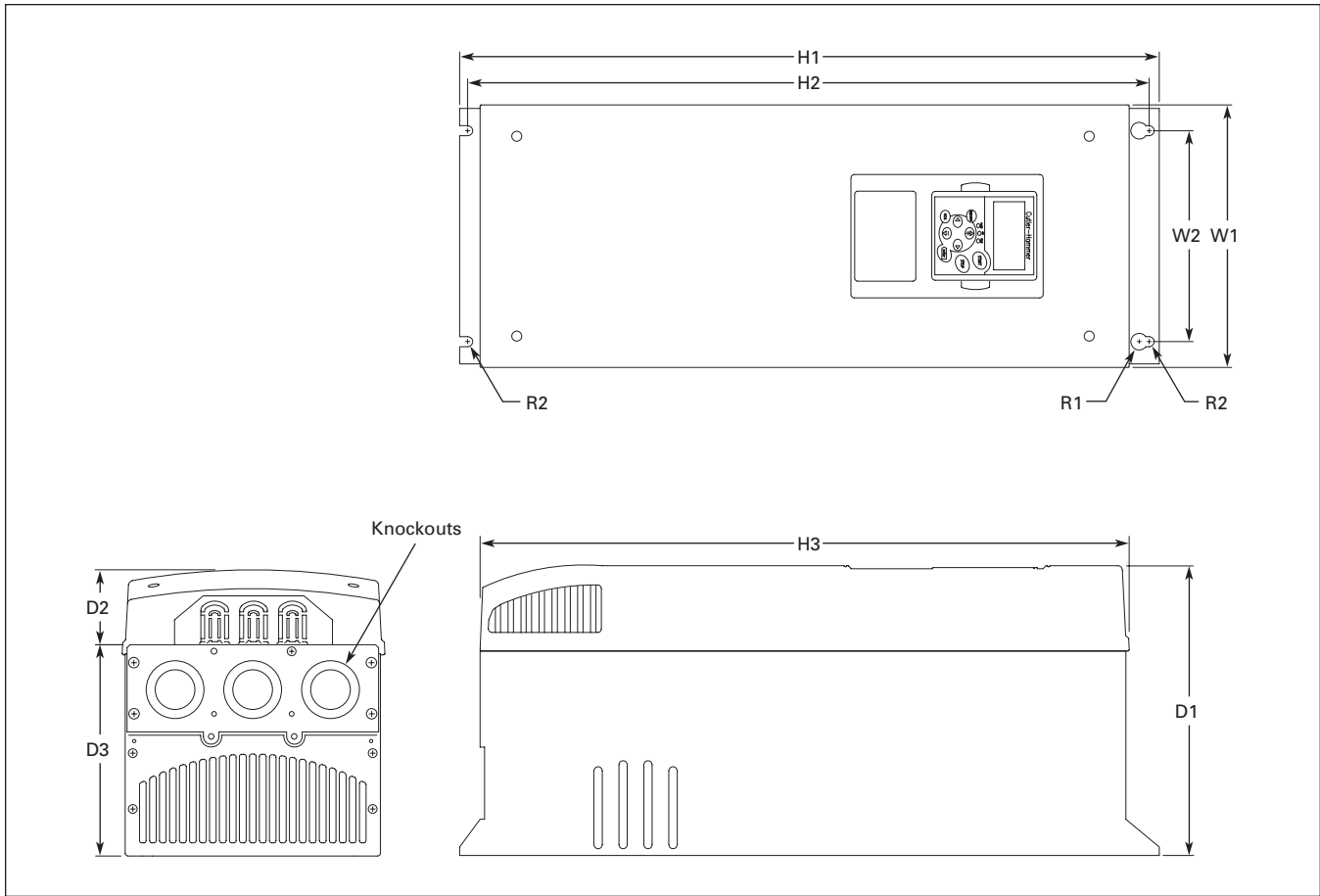


Figure 4. HVX9000 Dimensions, NEMA Type 1 and NEMA Type 12, FR7

Table 25. HVX9000 Drive Dimensions, FR7

Frame Size	Voltage	hp (I _L)	Approximate Dimensions in Inches (mm)										Weight Lbs. (kg)	Knockouts @ Inches (mm) N1 (O.D.)
			H1	H2	H3	D1	D2	D3	W1	W2	R1 dia.	R2 dia.		
FR7	230V	25 – 40	24.8	24.2	23.2	10.1	3.0	7.3	9.3	7.5	.7	.4	77.2	3 @ 1.5 (37)
	480V	50 – 75	(630)	(614)	(590)	(257)	(77)	(184)	(237)	(190)	(18)	(9)	(35)	
	575V	40 – 50												

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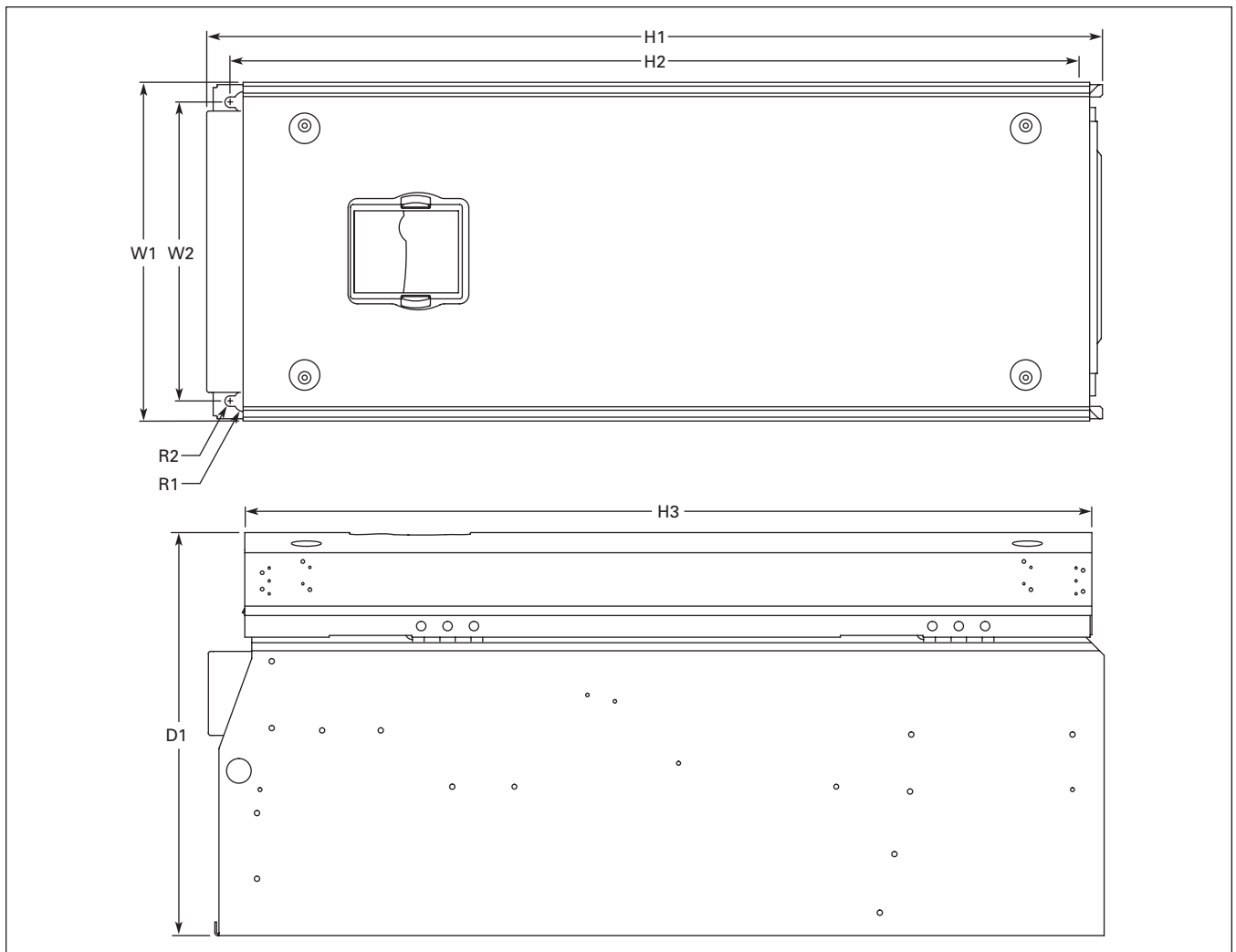


Figure 5. HVX9000 Dimensions, NEMA Type 1 and NEMA Type 12, FR8

Table 26. HVX9000 Drive Dimensions, FR8

Frame Size	Voltage	hp (I _L)	Approximate Dimensions in Inches (mm)							
			D1	H1	H2	H3	W1	W2	R1 dia.	R2 dia.
FR8	230V	50 – 75	13.5 (344)	30.1 (764)	28.8 (732)	28.4 (721)	11.5 (291)	10 (255)	.7 (18)	.4 (9)
	480V	100 – 150								
	575V	60 – 100								

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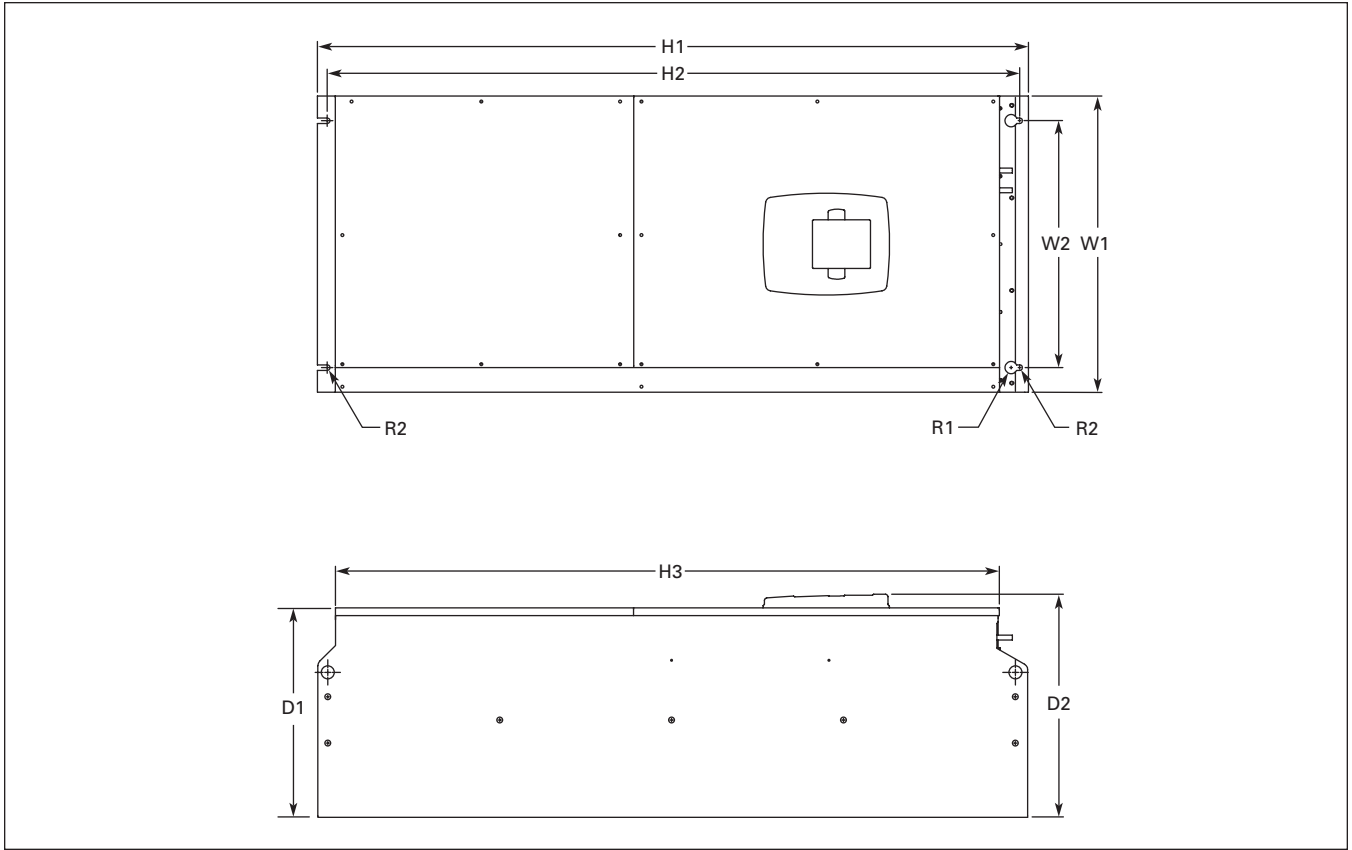


Figure 7. HVX9000 Dimensions, NEMA Type 1 and NEMA Type 12, FR9

Table 29. HVX9000 Drive Dimensions, FR9

Frame Size	Voltage	hp (I _L)	Approximate Dimensions in Inches (mm)								
			H1	H2	H3	D1	D2	W1	W2	R1 dia.	R2 dia.
FR9	480	200 – 250	45.3	44.1	42.4	13.4	14.3	18.9	15.7	.8	.4
	575	125 – 200	(1150)	(1120)	(1076)	(340)	(362)	(480)	(400)	(20)	(9)