

9000X Adjustable Frequency Drives

Technical Data

SVX9000 Open Drives
SVX9000 Enclosed DrivesMay 2005
Supersedes June 2004**Overview**

With the combination of the MVX9000 series microdrive and the SVX9000 series sensorless vector control, Eaton's expanded Cutler-Hammer® drive offering now covers a complete line of PWM adjustable frequency (speed) drives in ratings from:

- 208V — 3/4 to 100 hp CT;
1 to 100 hp VT
- 230V — 3/4 to 100 hp CT;
1 to 100 hp VT
- 480V — 1 to 700 hp CT;
1-1/2 to 800 hp VT
- 575V — 2 to 700 hp CT;
3 to 800 hp VT

A full range of enclosure types and options are available to meet a wide array of applications — from simple variable torque to more complex industrial applications such as conveyors, mixers and machine controls.

Application Description**Application Engineering**

Proper selection and application of all drive system components is essential to assure that an adjustable frequency drive system will safely and reliably provide the performance required for any given application. The party responsible for the overall design and operation of the facility must make sure that qualified personnel are employed to select all components of the drive system, including appropriate safety devices. Eaton's Cutler-Hammer AF Drives Application Engineering Department is prepared to provide assistance to answer any questions about the technical capabilities of Cutler-Hammer drives.

Motor Selection

The basic requirement of motor selection is to match the torque vs. speed capability of the motor to the torque vs. speed requirement of the driven load.

Motor Torque vs. Speed Capability

As the speed of a motor is reduced below its 60 Hz base speed, motor cooling becomes less effective because of the reduced speed of the self-cooling fan. This limitation determines the maximum torque for continuous operation at any operating speed. The maximum intermittent operating torque is determined by the motor's torque vs. current characteristics and the output current capability of the adjustable frequency controller.

Multiple Motor Operation

A number of motors can be connected in parallel to a single controller. Since the frequency of the power supplied by the controller is the same for each motor, the motors will always operate at the same speed. Application Engineering assistance must be requested for all multiple motor applications to assure compliance with all controller design limitations.

Special Types of Motors

Standard NEMA Designs A and B three-phase motors are the only motors recommended for use in the majority of applications, but other types of motors are occasionally used. If the existing motor used in the application or the motor proposed for use with the drive system is a type other than NEMA Design A or B, Application Engineering assistance must be requested to make certain that the drive is properly applied.

Controller Selection

The basic requirement of controller selection is to match the output current, voltage and frequency capabilities of the controller with the requirements of the connected motor.

Output Current

The controller must be selected and applied such that the average operating motor current and horsepower do not exceed the continuous current and horsepower ratings of the controller. The intermittent operating current must not exceed the intermittent current rating of the controller.

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Motor Protection

Cutler-Hammer adjustable frequency drives include electronic motor overload protection circuits that are designed to meet the requirements of NEC article 430-2 provided that only one motor is connected to the output of the controller.

Output Voltage and Frequency

When they are shipped, AF controllers are adjusted to provide a maximum output voltage and frequency equivalent to the input line voltage and frequency. The controllers can be adjusted to operate above line frequency, but a hazard of personal injury or equipment damage may exist when the motor is operated above base speed. Before adjusting the drive to operate above line frequency, make sure that the motor and the driven machinery can safely be operated at the resulting speed.

Controller Features

Operator Control and Interface Requirements

Since there are many possible configurations and many ways of achieving a specific end result, it pays to consider the operator control and interface requirements carefully. A simplified and more economical drive package can often be achieved by selecting from standard product offerings rather than specifying a custom designed configuration.

Installation Compatibility

The successful application of an AC drive requires the assurance that the drive will be compatible with the environment in which it will be installed. In planning the installation, be sure to carefully consider the heat produced by the drive, the altitude and temperature limits and the need for clean cooling air. Other important considerations include acoustical noise, vibration, electromagnetic compatibility, power quality, controller input harmonic current and power distribution equipment requirements.

Auxiliary Equipment and Accessories

Adjustable drives are generally designed to have a motor directly connected to the controller output terminals with no other equipment connected in series or parallel. Motor starters, disconnect switches, surge absorbers, dv/dt suppression circuits, output chokes, output transformers and any other equipment under consideration for installation on the output of the controller should not be installed without first requesting Application Engineering assistance. Power factor correction capacitors must never, under any circumstances, be connected at the output of the controller. They would serve no useful purpose, and they may damage the controller.

Enclosure Definitions

■ **NEMA Type 1** — Enclosures are intended for indoor use primarily to provide a degree of protection against contact with enclosed equipment and provide a degree of protection against a limited amount of falling dirt in locations where unusual service conditions do not exist. Top or side openings in the NEMA Type 1 enclosure allow for the free exchange of inside and outside air while meeting the UL rod entry and rust resistance design tests.

■ **NEMA Type 12** — Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt and dripping noncorrosive liquids. To meet UL drip, dust and rust resistance tests, NEMA Type 12 enclosures have no openings to allow for the exchange of inside and outside air.

■ **Chassis IP00** — Similar to Protected Chassis IP20 except power terminals are protected by plastic shielding only. Primarily intended to be mounted inside a surrounding protective enclosure.

■ **NEMA 3R** — Similar in design to NEMA Type 12 except with more stringent design and test requirements.

Motor Protection

DV/DT and Peak Motor Voltage Solutions

Today's AFD products offer significantly improved performance, but at the potential cost of motor insulation stress. The fast switching time of the IGBT devices used in newer AFDs can

cause a transmission line effect in the output power leads to the motor, leading to possibly damaging voltage levels. To meet this need, NEMA has introduced a motor in MG1, Part 31, which provides an insulation system designed to maintain normal motor life in AFD applications. For existing motors, a motor protection scheme is required for longer cable runs. Eaton offers three standard solutions for existing systems.

■ MotoR_x

This patented Cutler-Hammer solution provides an energy recovery system which clamps the peak motor voltage to a safe level for standard motors. This option is used when the distance between a single motor and the drive is 600 feet or less.

■ Output Line Reactor

This option provides an output line reactor, reducing the DV/DT of the AFD output voltage and lessening the transmission line effect, to lower the peak voltage at the motor terminals.

Product Availability Codes

The product availability codes indicate the type of facility (warehouse, Mod Center or factory) that the product will ship from and, if it is not in stock, the number of working days needed to assemble the product from receipt of the order to shipment from the designated facility. Please note that this lead-time does not include any in-transit time from our facility to your facility.

Table 1. Product Availability Codes

Codes	Description
W	Warehouse stocked item. Shipped on customer request date. If item is backordered, please check Vista/VISTALINE or contact your Customer Support Center for product availability.
F1	Factory assemble-to-order. Shipped from factory within 1 working day after receipt of order on Vista.
FA	Factory assemble-to-order. Shipped from factory within 2 – 3 working days after receipt of order on Vista.
FB	Factory assemble-to-order. Shipped from factory within 4 – 10 working days after receipt of order on Vista.
FC	Factory assemble-to-order. Shipped from factory within 11 – 15 working days after receipt of order on Vista.
FD	Factory assemble-to-order. Shipped from factory within 16 – 20 working days after receipt of order on Vista.
FP	Factory assemble-to-order. Shipped from factory on negotiated promise date.
MA	Mod Center assemble-to-order. Shipped from Mod Center within 1 – 3 working days after receipt of order on Vista.
MB	Mod Center assemble-to-order. Shipped from Mod Center within 4 – 10 working days after receipt of order on Vista.
MP	Mod Center assemble-to-order. Shipped from Mod Center on negotiated promise date.

Product availability codes contained herein for a given product may be quantity sensitive and are subject to change without notice. For the most current information, refer to the Product Identification Inquiry (PIN) screen on Vista.

SVX9000 Open Drives



SVX9000 Open Drives

Product Description

Cutler-Hammer® SVX9000 Series Adjustable Frequency Drives from Eaton's electrical business are the next generation of drives specifically engineered for today's commercial and industrial 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

- Robust design — proven 500,000 hours MTBF
- Integrated 3% line reactors standard on drives from FR4 through FR9
- EMI/RFI Filters H standard up to 200 hp CT 480V, 100 hp CT 230V
- Simplified operating menu allows for typical programming changes, while programming mode provides control of everything
- Quick Start Wizard built into the programming of the drive ensures a smooth start-up
- Keypad can display up to three monitored parameters simultaneously
- LOCAL/REMOTE operation from keypad
- Copy/Paste function allows transfer of parameter settings from one drive to the next
- Standard NEMA Type 12 keypad on all drives

- The SVX can be flexibly adapted to a variety of needs using our pre-installed "Seven in One" Precision application programs consisting of:
 - Basic
 - Standard
 - Local/Remote
 - Multi Step Speed Control
 - PID Control
 - Multi-Purpose Control
 - Pump and Fan Control with Auto Change
- Additional I/O and communication cards provide plug and play functionality
- I/O connections with simple quick connection terminals
- UL Listed
- Hand-Held Auxiliary 240 Power Supply allows programming/monitoring of control module without applying full power to the drive
- Control logic can be powered from an external auxiliary control panel, internal drive functions and fieldbus if necessary
- Brake Chopper standard from:
 - 1 – 30 hp/380 – 500V
 - 3/4 – 15 hp/208 – 230V
- NEMA Type 1 and NEMA Type 12 enclosures available, Frame Sizes FR4 – FR9
- Open Chassis FR10 and greater
- Standard option board configuration includes an A9 I/O board and an A2 relay output board installed in slots A and B

Technical Data and Specifications

Table 2. SVX9000 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)
High Withstand Rating	100 kAIC

Output Ratings

Output Voltage	0 to V_{in}
Continuous Output Current	Ambient temperature max. +122°F(+50°C), CT 150% 1 min. Ambient temperature max. +104°F(+40°C), VT 110% 1 min.
Overload Current (CT/VT)	150% CT, 110% VT for 1 min.
Output Frequency	0 to 320 Hz
Frequency Resolution	.01 Hz
Initial Output Current (CT)	250% for 2 seconds

Control Characteristics

Control Method	Frequency Control (V/f) Open Loop: Sensorless Vector Control, Closed Loop: SPX9000 Drives Only
Switching Frequency Frame 4 – 6 Frame 7 – 12	Adjustable with Parameter 2.6.9 1 to 16 kHz; default 10 kHz 1 to 10 kHz; default 3.6 kHz
Frequency Reference	Analog Input: Resolution .1% (10-bit), accuracy $\pm 1\%$ V/Hz 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% $\times T_n$ (without brake option)

Ambient Conditions

Ambient Operating Temperature	14°F (-10°C), no frost to 122°F (+50°C) CT 14°F (-10°C), no frost to 104°F (+40°C) VT
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 1/IP21 or NEMA 12/IP54, Open Chassis/IP20

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, $R = 200 \text{ k}\Omega$ (-10 to 10V joystick control) Resolution .1%; accuracy $\pm 1\%$
Analog Input Current	0(4) to 20 mA; $R_i = 250 \Omega$ differential
Digital Inputs (6)	Positive or negative logic; 18 to 30V 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

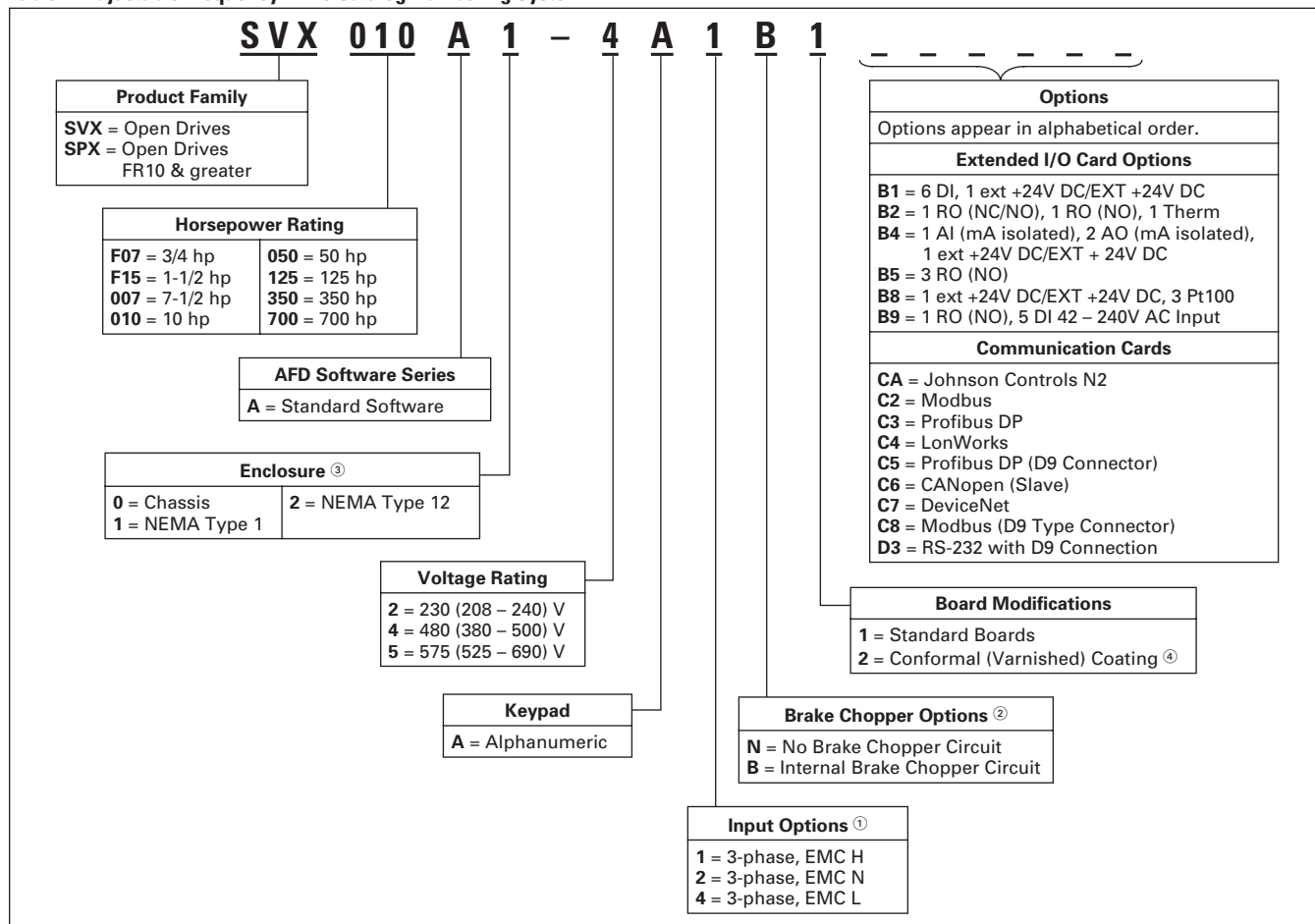
Overcurrent Protection	Trip limit 4.0 $\times I_{CT}$ instantaneously
Overvoltage Protection	Yes
Undervoltage Protection	Yes
Earth Fault Protection	In case of earth fault in motor or motor cable, only the frequency converter is protected
Input Phase Supervision	Trips if any of the input phases are missing
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 (+24V and +10V Reference Voltages)

Table 3. Standard I/O Specifications

Description	Specification
6 – Digital Input Programmable	24V: "0" $\leq 10V$, "1" $\geq 18V$, $R_i > 5 \text{ k}\Omega$
2 – Analog Input Configurable w/Jumpers	Voltage: 0 – $\pm 10V$, $R_i > 200 \text{ k}\Omega$ Current: 0 (4) – 20 mA, $R_i = 250 \text{ k}\Omega$
2 – Digital Output Programmable	Form C Relays 250V AC 2 Amp or 30V DC 2 Amp resistive
1 – Digital Output Programmable	Open collector 48V DC 50 mA
1 – Analog Output Programmable Configurable w/Jumper	0 – 20 mA, $R_L < 500 \text{ ohms}$, resolution 10 Bits/0.1%

Catalog Number Selection

Table 4. Adjustable Frequency Drive Catalog Numbering System



① All 230V Drives and 480V Drives up to 200 hp (CT) are only available with Input Option 1 (EMC level H). 480V Drives 250 hp (CT) or larger are only available with Input Option 2 (EMC level N). 575V drives 200 hp (CT) or larger are only available with Input Option 2. 575V drives up to 150 hp (CT) are only available with Input Option 4 (EMC level L).

② 480V Drives up to 30 hp (CT) are only available with Brake Chopper Option B. 480V Drives 40 hp (CT) or larger come standard with Brake Chopper Option N. 230V Drives up to 15 hp (CT) are only available with Brake Chopper Option B. 230V Drives 20 hp or larger come standard with Brake Chopper Option N. All 575V drives come standard without Brake Chopper Option (N). **Note:** N = No Brake Chopper.

③ 480V Drives 250 hp (CT) or larger are only available with enclosure Style 0 (Chassis).

④ Factory promise delivery. Consult Sales Office for availability.

Product Selection

230V SVX9000 Drives

Table 5. 208 – 240V, NEMA Type 1 Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR4	W	3/4	3.7	1	4.8	SVXF07A1-2A1B1
		1	4.8	1-1/2	6.6	SVX001A1-2A1B1
		1-1/2	6.6	2	7.8	SVXF15A1-2A1B1
		2	7.8	3	11	SVX002A1-2A1B1
		3	11	—	12.5	SVX003A1-2A1B1
FR5	W	—	12.5	5	17.5	SVX004A1-2A1B1
		5	17.5	7-1/2	25	SVX005A1-2A1B1
		7-1/2	25	10	31	SVX007A1-2A1B1
FR6	W	10	31	15	48	SVX010A1-2A1B1
		15	48	20	61	SVX015A1-2A1B1
FR7	W	20	61	25	75	SVX020A1-2A1N1
		25	75	30	88	SVX025A1-2A1N1
		30	88	40	114	SVX030A1-2A1N1
FR8	W	40	114	50	140	SVX040A1-2A1N1
		50	140	60	170	SVX050A1-2A1N1
		60	170	75	205	SVX060A1-2A1N1
FR9	FP	75	205	100	261	SVX075A1-2A1N1
		100	261	—	—	SVX100A1-2A1N1

Table 6. 208 – 240V, NEMA Type 12 Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR4	F1	3/4	3.7	1	4.8	SVXF07A2-2A1B1
		1	4.8	1-1/2	6.6	SVX001A2-2A1B1
		1-1/2	6.6	2	7.8	SVXF15A2-2A1B1
		2	7.8	3	11	SVX002A2-2A1B1
		3	11	—	12.5	SVX003A2-2A1B1
FR5	F1	—	12.5	5	17.5	SVX004A2-2A1B1
		5	17.5	7-1/2	25	SVX005A2-2A1B1
		7-1/2	25	10	31	SVX007A2-2A1B1
FR6	F1	10	31	15	48	SVX010A2-2A1B1
		15	48	20	61	SVX015A2-2A1B1
FR7	W	20	61	25	75	SVX020A2-2A1N1
		25	75	30	88	SVX025A2-2A1N1
		30	88	40	114	SVX030A2-2A1N1
FR8	FP	40	114	50	140	SVX040A2-2A1N1
		50	140	60	170	SVX050A2-2A1N1
		60	170	75	205	SVX060A2-2A1N1
FR9	FP	75	205	100	261	SVX075A2-2A1N1
		100	261	—	—	SVX100A2-2A1N1

480V SVX9000 Drives

Table 7. 380 – 500V, NEMA Type 1 Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR4	W	1	2.2	1-1/2	3.3	SVX001A1-4A1B1
		1-1/2	3.3	2	4.3	SVXF15A1-4A1B1
		2	4.3	3	5.6	SVX002A1-4A1B1
		3	5.6	5	7.6	SVX003A1-4A1B1
		5	7.6	—	9	SVX005A1-4A1B1
		—	9	7-1/2	12	SVX006A1-4A1B1
FR5	W	7-1/2	12	10	16	SVX007A1-4A1B1
		10	16	15	23	SVX010A1-4A1B1
		15	23	20	31	SVX015A1-4A1B1
FR6	W	20	31	25	38	SVX020A1-4A1B1
		25	38	30	46	SVX025A1-4A1B1
		30	46	40	61	SVX030A1-4A1B1
FR7	W	40	61	50	72	SVX040A1-4A1N1
		50	72	60	87	SVX050A1-4A1N1
		60	87	75	105	SVX060A1-4A1N1
FR8	W	75	105	100	140	SVX075A1-4A1N1
		100	140	125	170	SVX100A1-4A1N1
		125	170	150	205	SVX125A1-4A1N1
FR9	W	150	205	200	261	SVX150A1-4A1N1
		200	245	250	300	SVX200A1-4A1N1

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

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR4	F1	1	2.2	1-1/2	3.3	SVX001A2-4A1B1
		1-1/2	3.3	2	4.3	SVXF15A2-4A1B1
		2	4.3	3	5.6	SVX002A2-4A1B1
		3	5.6	5	7.6	SVX003A2-4A1B1
		5	7.6	—	9	SVX005A2-4A1B1
		—	9	7-1/2	12	SVX006A2-4A1B1
FR5	F1	7-1/2	12	10	16	SVX007A2-4A1B1
		10	16	15	23	SVX010A2-4A1B1
		15	23	20	31	SVX015A2-4A1B1
FR6	F1	20	31	25	38	SVX020A2-4A1B1
		25	38	30	46	SVX025A2-4A1B1
		30	46	40	61	SVX030A2-4A1B1
FR7	W	40	61	50	72	SVX040A2-4A1N1
		50	72	60	87	SVX050A2-4A1N1
		60	87	75	105	SVX060A2-4A1N1
FR8	W	75	105	100	140	SVX075A2-4A1N1
		100	140	125	170	SVX100A2-4A1N1
		125	170	150	205	SVX125A2-4A1N1
FR9	W	150	205	200	261	SVX150A2-4A1N1
		200	245	250	300	SVX200A2-4A1N1

Table 9. 480V 380 – 500, Open Chassis Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR10 ①	W	250	330	300	385	SPX250A0-4A2N1
		300	385	—	460	SPX300A0-4A2N1
		350	460	400	520	SPX350A0-4A2N1
FR11	FP	400	520	500	590	SPX400A0-4A2N1
		500	590	—	650	SPX500A0-4A2N1
		—	650	600	730	SPX550A0-4A2N1
FR12	FP	600	730	—	820	SPX600A0-4A2N1
		—	820	700	920	SPX650A0-4A2N1
		700	920	800	1030	SPX700A0-4A2N1

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

575V SVX9000 Drives
Table 10. 525 – 690V, NEMA Type 1 Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR6	W	2	3.33	3	4.5	SVX002A1-5A4N1
		3	4.5	—	5.5	SVX003A1-5A4N1
		—	5.5	5	7.5	SVX004A1-5A4N1
		5	7.5	7-1/2	10	SVX005A1-5A4N1
		7-1/2	10	10	13.5	SVX007A1-5A4N1
		10	13.5	15	18	SVX010A1-5A4N1
		15	18	20	22	SVX015A1-5A4N1
		20	22	25	27	SVX020A1-5A4N1
		25	27	30	34	SVX025A1-5A4N1
		—	—	—	—	—
FR7	W	30	34	40	41	SVX030A1-5A4N1
		40	41	50	52	SVX040A1-5A4N1
FR8	W	50	52	60	62	SVX050A1-5A4N1
		60	62	75	80	SVX060A1-5A4N1
		75	80	100	100	SVX075A1-5A4N1
FR9	W	100	100	125	125	SVX100A1-5A4N1
		125	125	150	144	SVX125A1-5A4N1
		150	144	—	170	SVX150A1-5A4N1
		—	170	200	208	SVX175A1-5A4N1

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

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR6	F1	2	3.33	3	4.5	SVX002A2-5A4N1
		3	4.5	—	5.5	SVX003A2-5A4N1
		—	5.5	5	7.5	SVX004A2-5A4N1
		5	7.5	7-1/2	10	SVX005A2-5A4N1
		7-1/2	10	10	13.5	SVX007A2-5A4N1
		10	13.5	15	18	SVX010A2-5A4N1
		15	18	20	22	SVX015A2-5A4N1
		20	22	25	27	SVX020A2-5A4N1
		25	27	30	34	SVX025A2-5A4N1
		—	—	—	—	—
FR7	FP	30	34	40	41	SVX030A2-5A4N1
		40	41	50	52	SVX040A2-5A4N1
FR8	FP	50	52	60	62	SVX050A2-5A4N1
		60	62	75	80	SVX060A2-5A4N1
		75	80	100	100	SVX075A2-5A4N1
FR9	FP	100	100	125	125	SVX100A2-5A4N1
		125	125	150	144	SVX125A2-5A4N1
		150	144	—	170	SVX150A2-5A4N1
		—	170	200	208	SVX175A2-5A4N1

Table 12. 525 – 690V, Open Chassis Drive

Frame Size	Delivery Code	hp (CT)	Current (CT)	hp (VT)	Current (VT)	Catalog Number
FR10	FP	200	208	250	261	SPX200A0-5A2N1
		250	261	300	325	SPX250A0-5A2N1
		300	325	400	385	SPX300A0-5A2N1
FR11	FP	400	385	450	460	SPX400A0-5A2N1
		450	460	500	502	SPX450A0-5A2N1
		500	502	—	590	SPX500A0-5A2N1
FR12	FP	—	590	600	650	SPX550A0-5A2N1
		600	650	700	750	SPX600A0-5A2N1
		700	750	800	820	SPX700A0-5A2N1

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.

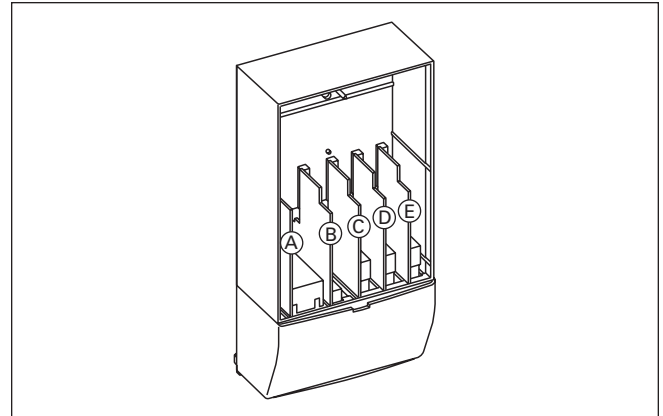


Figure 1. 9000X Series Option Boards

Table 13. Option Board Kits

Option Kit Description ②	Allowed Slot Locations ①	Field Installed	Factory Installed	SVX Ready Programs						
		Catalog Number	Option Designator	Basic	Local/ Remote	Standard	MSS	PID	Multi-P.	PFC
Standard I/O Cards (See Figure 1)										
2 RO (NC/NO)	B	OPTA2	—	X	X	X	X	X	X	X
6 DI, 1 DO, 2 AI, 1AO, 1 +10V DC ref, 2 ext +24V DC/ EXT +24V DC	A	OPTA9	—	X	X	X	X	X	X	X
Extended I/O Card Options										
6 DI, 1 ext +24V DC/EXT +24V DC	B, C, D, E	OPTB1	B1	—	—	—	—	—	X	X
1 RO (NC/NO), 1 RO (NO), 1 Therm	B, C, D, E	OPTB2	B2	—	—	—	—	—	X	X
1 AI (mA isolated), 2 AO (mA isolated), 1 ext +24V DC/EXT +24V DC	B, C, D, E	OPTB4	B4	X	X	X	X	X	X	X
3 RO (NO)	B, C, D, E	OPTB5	B5	—	—	—	—	—	X	X
1 ext +24V DC/EXT +24V DC, 3 Pt100	B, C, D, E	OPTB8	B8	—	—	—	—	—	—	—
1 RO (NO), 5 DI 42 – 240V AC Input	B,C, D, E	OPTB9	B9	—	—	—	—	—	X	X
Communication Cards ③										
Modbus	D, E	OPTC2	C2	X	X	X	X	X	X	X
Johnson Controls N2	D, E	OPTC2	CA	—	—	—	—	—	—	—
Profibus DP	D, E	OPTC3	C3	X	X	X	X	X	X	X
LonWorks	D, E	OPTC4	C4	X	X	X	X	X	X	X
Profibus DP (D9 Connector)	D, E	OPTC5	C5	X	X	X	X	X	X	X
CanOpen (Slave) ④	D, E	OPTC6	C6	X	X	X	X	X	X	X
DeviceNet	D, E	OPTC7	C7	X	X	X	X	X	X	X
Modbus (D9 Type Connector)	D, E	OPTC8	C8	X	X	X	X	X	X	X
RS-232 with D9 Connection	D, E	OPTD3	D3	X	X	X	X	X	X	X
Keypad										
9000X Series Local/ Remote Keypad (Replacement Keypad)	—	KEYPAD-LOC/REM	—	—	—	—	—	—	—	—
9000X Series Remote Mount Keypad Unit (Keypad not included, includes 10 ft. cable, keypad holder, mounting hardware)	—	OPTRMT-KIT-9000X	—	—	—	—	—	—	—	—

^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 OPTC2 is a multi-protocol option card.

^④ SPX9000 Drives only (FR10 and larger).

Brake Chopper Options

The Brake Chopper Circuit option is used for applications that require dynamic braking. Dynamic Braking resistors are not included with drive purchase. Consult the factory for dynamic braking resistors which are supplied separately. Resistors are not UL Listed.

Table 14. Brake Chopper Circuit Option — NEMA Type 1, NEMA Type 12, Chassis

hp (CT)	208/230V	380 – 500V	525 – 690V
2	(Std.)	(Std.)	Option
3	(Std.)	(Std.)	Option
5vt	(Std.)	(Std.)	Option
5ct	(Std.)	(Std.)	Option
7-1/2vt	(Std.)	(Std.)	Option
7-1/2ct	(Std.)	(Std.)	Option
10	(Std.)	(Std.)	Option
15	(Std.)	(Std.)	Option
20	Option	(Std.)	Option
25	Option	(Std.)	Option
30	Option	(Std.)	Option
40	Option	Option	Option
50	Option	Option	Option
60	Option	Option	Option
75	Option	Option	Option
100	Option	Option	Option
125	—	Option	Option
150	—	Option	Option
200vt	—	—	Option
200ct	—	Option	Option
250	—	Option	Option
300	—	Option	Option
350	—	Option	—
400	—	Option	Option
450	—	—	Option
500	—	Option	Option
550	—	—	—
600vt	—	Option	①
600ct	—	①	①
700vt	—	①	—
700ct	—	①	①

① Contact sales office.

Table 15. Conformal (Varnished) Coating Adder — 208 – 240V, 380 – 500V, 525 – 690V (See Catalog Number Description to order.)

Frame	Delivery Code
FR4	FP
FR5	FP
FR6	FP
FR7	FP
FR8	FP
FR9	FP
FR10	FP
FR11	FP
FR12	FP

Table 16. Conformal Coated Board Kits ②

Field Installed	Factory Installed
Catalog Number	Option Designator
OPT_V ④	③

② See Option Catalog Numbers on Page 9.

③ Construct Catalog Numbers for factory installed per Table 4 on Page 5.

④ Replace “—” with the correct Catalog Number from Page 9. Example: OPTC2V.

Accessories

Demo Drive and Power Supply

Table 17. Demo Drive and Power Supply

Description	Catalog Number
9000X Drive Demo	9000XDEMO
Hand Held 24V Auxiliary Power Supply — used to supply power to the control module in order to perform keypad programming before the drive is connected to line voltage	9000XAUX24V

NEMA Type 12 Conversion Kit

The NEMA Type 12 kit option is used to convert a NEMA Type 1 to a NEMA Type 12 drive. The NEMA Type 12 Kit consists of a metal drive shroud, fan kit for some frames, adaptor plate and plugs.

Table 18. NEMA Type 12 Conversion Kit

Frame Size	Delivery Code	Approximate Dimensions in Inches (mm)			Approximate Weight in Lb. (kg)	Catalog Number
		Length	Width	Height	Weight	
FR4	W	13 (330)	7 (178)	4 (102)	4 (1.8)	OPTN12FR4
FR5	W	16 (406)	8 (203)	7 (178)	5 (2.3)	OPTN12FR5
FR6	W	21 (533)	10 (254)	5 (127)	7 (3.2)	OPTN12FR6

Flange Kits

Flange Kit Type 12

The flange kit is utilized when the power section is mounted through the back panel of an enclosure. Includes flange mount brackets and NEMA Type 12 fan components. Metal shroud not included.

Table 19. Flange Kit Type 12 — Frames 4, 5 and 6 ⑤

Frame Size	Delivery Code	Catalog Number
FR4	W	OPTTHRFR4
FR5	W	OPTTHRFR5
FR6	W	OPTTHRFR6

⑤ For installation of an SVX9000 NEMA Type 1 drive into a NEMA Type 12 oversized enclosure.

Flange Kit Type 1

Flange kits for NEMA 1 enclosure drive rating are determined by rating of drive.

Table 20. Flange Kit Type 1 — Frames 4 – 9 ⑥

Frame Size	Delivery Code	Catalog Number
FR4	FP	OPTTHR4
FR5	FP	OPTTHR5
FR6	FP	OPTTHR6
FR7	FP	OPTTHR7
FR8	FP	OPTTHR8
FR9	FP	OPTTHR9

⑥ For installation of an SVX9000 NEMA Type 1 drive into a NEMA Type 1 oversized enclosure.

Flange Kit Type 12

Flange kits for NEMA 12 enclosure drive rating are determined by rating of drive.

Table 21. Flange Kit Type 12 — Frames 4 – 9 ⑦

Frame Size	Delivery Code	Catalog Number
FR4	FP	OPTTHR4
FR5	FP	OPTTHR5
FR6	FP	OPTTHR6
FR7	FP	OPTTHR7
FR8	FP	OPTTHR8
FR9	FP	OPTTHR9

⑦ For installation of an SVX9000 NEMA Type 12 drive into a NEMA Type 12 oversized enclosure.

Dimensions

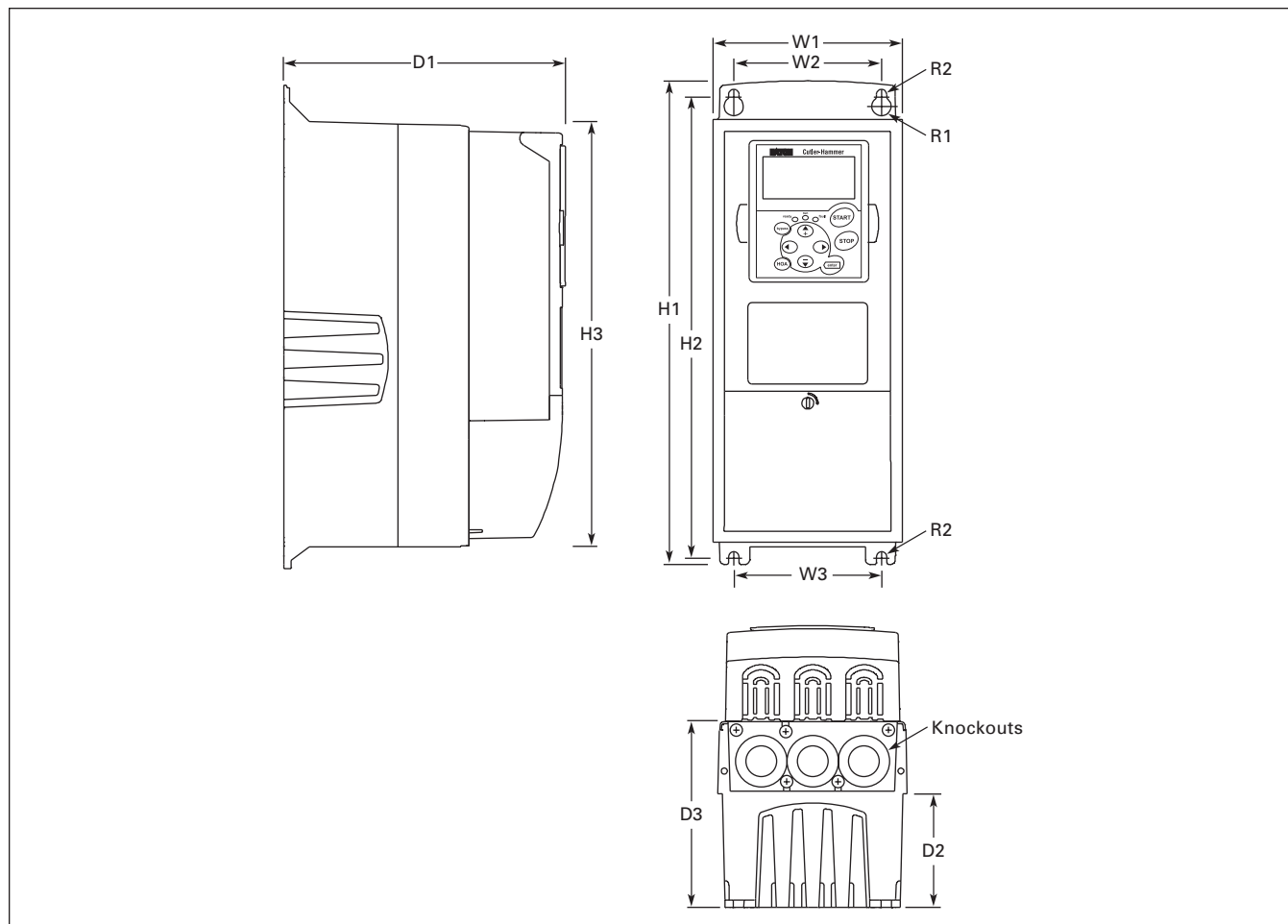


Figure 2. NEMA Type 1 and NEMA Type 12 9000X Drive Dimensions, FR4, FR5 and FR6

Table 22. 9000X Drive Dimensions

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)											Weight Lbs. (kg)	Knockouts @ Inches (mm)	
			H1	H2	H3	D1	D2	D3	W1	W2	W3	R1 dia.	R2 dia.		N1 (O.D.)	
FR4	230V	3/4 – 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 – 5	(327)	(313)	(292)	(190)	(77)	(126)	(128)	(100)		(13)	(7)	(5)	(28)	
FR5	230V	5 – 7-1/2	16.5	16.0	15.3	8.4	3.9	5.8	5.6	3.9	—	.5	.3	17.9	2 @ 1.5	
	480V	7-1/2 – 15	(419)	(406)	(389)	(214)	(100)	(148)	(143)	(100)		(13)	(7)	(8)	(37)	1 @ 1.1
FR6	230V	10 – 15	22.0	21.3	20.4	9.3	4.2	6.5	7.6	5.8	—	.6	.4	40.8	3 @ 1.5	
	480V	20 – 30	(558)	(541)	(519)	(237)	(105)	(165)	(195)	(148)		(15.5)	(9)	(19)	(37)	
	575V	2 – 25														

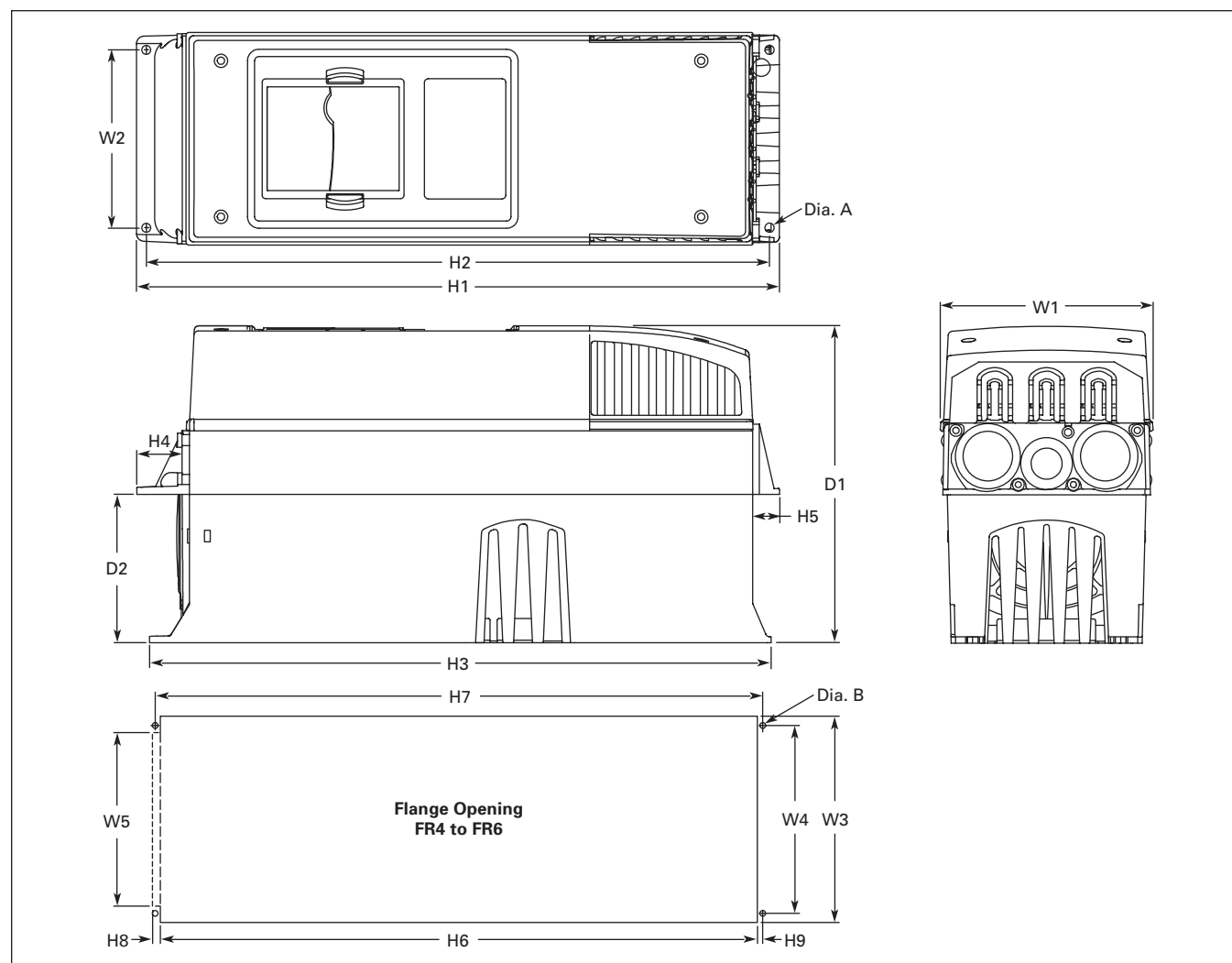


Figure 3. 9000X Dimensions, NEMA Type 1 and NEMA Type 12 with Flange Kit, FR4, FR5 and FR6

Table 23. Dimensions for 9000X, FR4, FR5 and FR6 with Flange Kit

Frame Size	Voltage	Approximate Dimensions in Inches (mm)									
		W1	W2	H1	H2	H3	H4	H5	D1	D2	Dia. A
FR4	230V	5.0	4.5	13.3	12.8	12.9	1.2	.9	7.5	3.0	.3
	480V	(128)	(113)	(337)	(325)	(327)	(30)	(22)	(190)	(77)	(7)
FR5	230V	5.6	4.7	17.0	16.5	16.5	1.4	.7	8.4	3.9	.3
	480V	(143)	(120)	(434)	(420)	(419)	(36)	(18)	(214)	(100)	(7)
FR6	230V	7.7	6.7	22.0	21.6	22.0	1.2	.8	9.3	4.2	.3
	480V	(195)	(170)	(560)	(549)	(558)	(30)	(20)	(237)	(106)	(7)
	575V										

Table 24. Dimensions for the Flange Opening, FR4 to FR6

Frame Size	Voltage	Approximate Dimensions in Inches (mm)							
		W3	W4	W5	H6	H7	H8	H9	Dia. B
FR4	230V	4.8	4.5	—	12.4	12.8	—	.2	.3
	480V	(123)	(113)	—	(315)	(325)	—	(5)	(7)
FR5	230V	5.3	4.7	—	16.2	16.5	—	.2	.3
	480V	(135)	(120)	—	(410)	(420)	—	(5)	(7)
FR6	230V	7.3	6.7	6.2	21.2	21.6	.3	.2	.3
	480V	(185)	(170)	(157)	(539)	(549)	(7)	(5)	(7)
	575V								

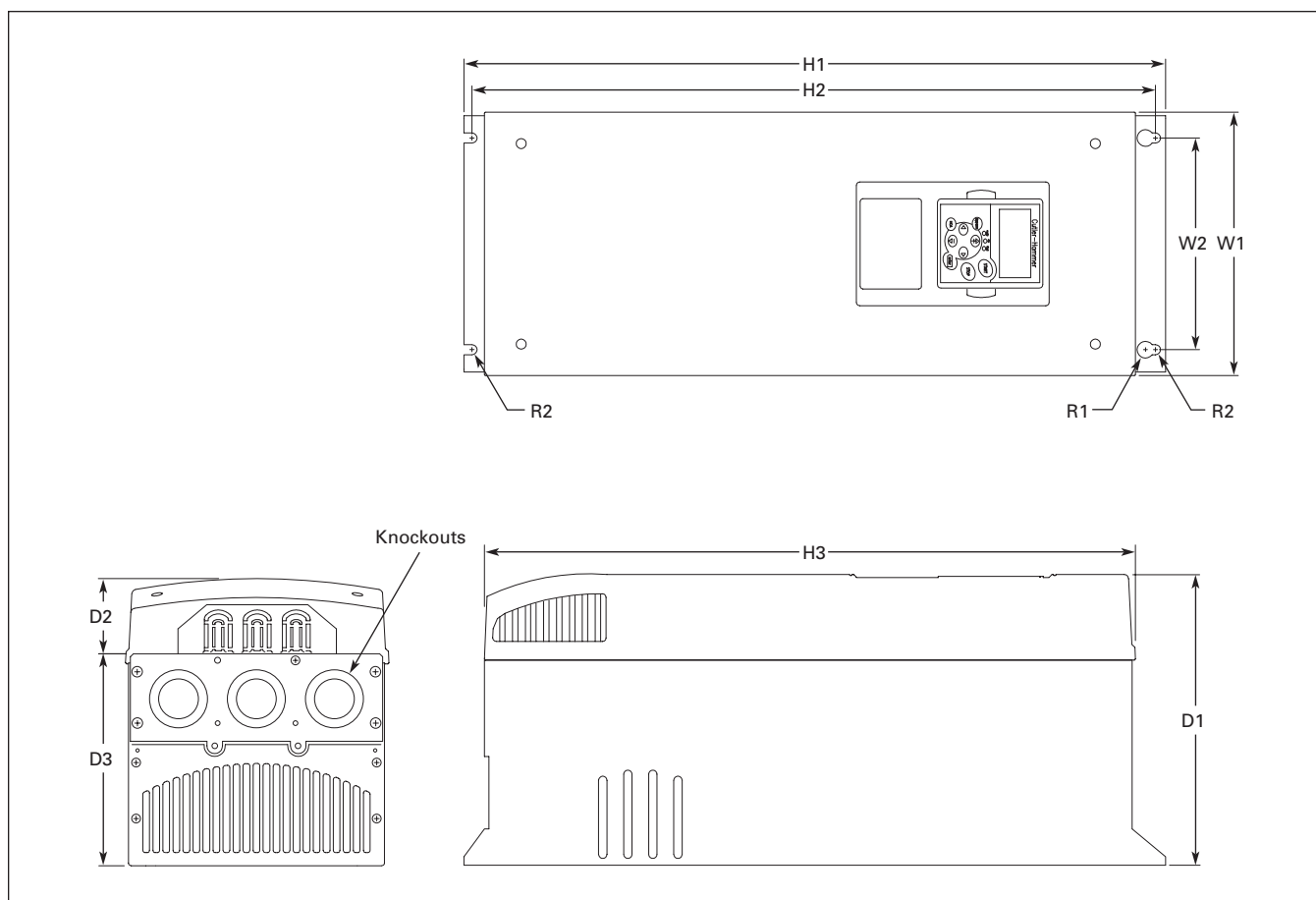


Figure 4. 9000X Dimensions, NEMA Type 1 and NEMA Type 12, FR7

Table 25. 9000X Drive Dimensions, FR7

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)										Weight Lbs. (kg)	Knockouts @ Inches (mm)	
			H1	H2	H3	D1	D2	D3	W1	W2	R1 dia.	R2 dia.		N1 (O.D.)	
FR7	230V	20 – 30	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	40 – 60	(630)	(614)	(590)	(257)	(77)	(184)	(237)	(190)	(18)	(9)	(35)		
	575V	30 – 40													

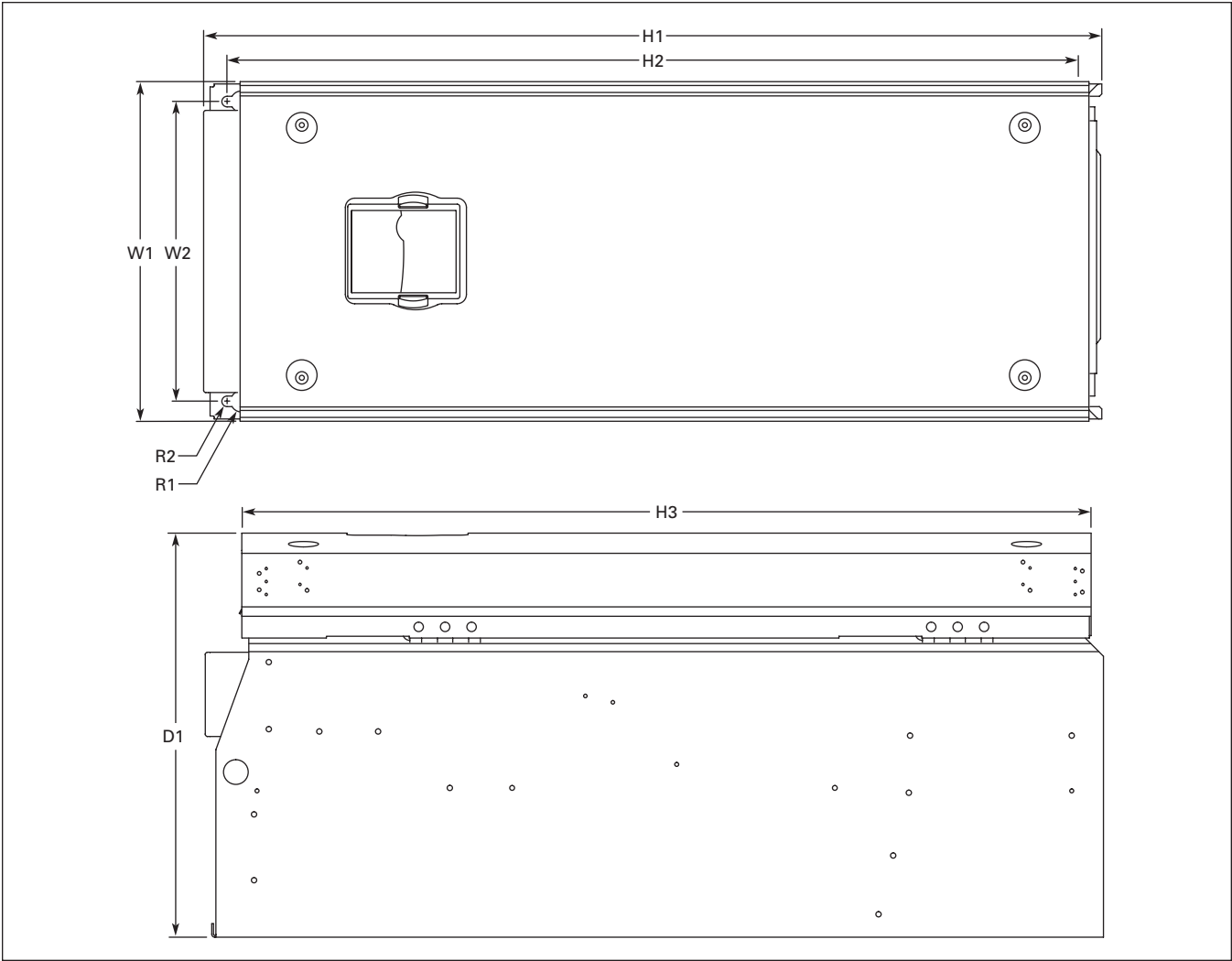


Figure 5. 9000X Dimensions, NEMA Type 1 and NEMA Type 12, FR8

Table 26. 9000X Drive Dimensions, FR8

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)							
			D1	H1	H2	H3	W1	W2	R1 dia.	R2 dia.
FR8	230V	40 – 60	13.5 (344)	30.1 (764)	28.8 (732)	28.4 (721)	11.5 (291)	10 (255)	.7 (18)	.4 (9)
	480V	75 – 125								
	575V	50 – 75								

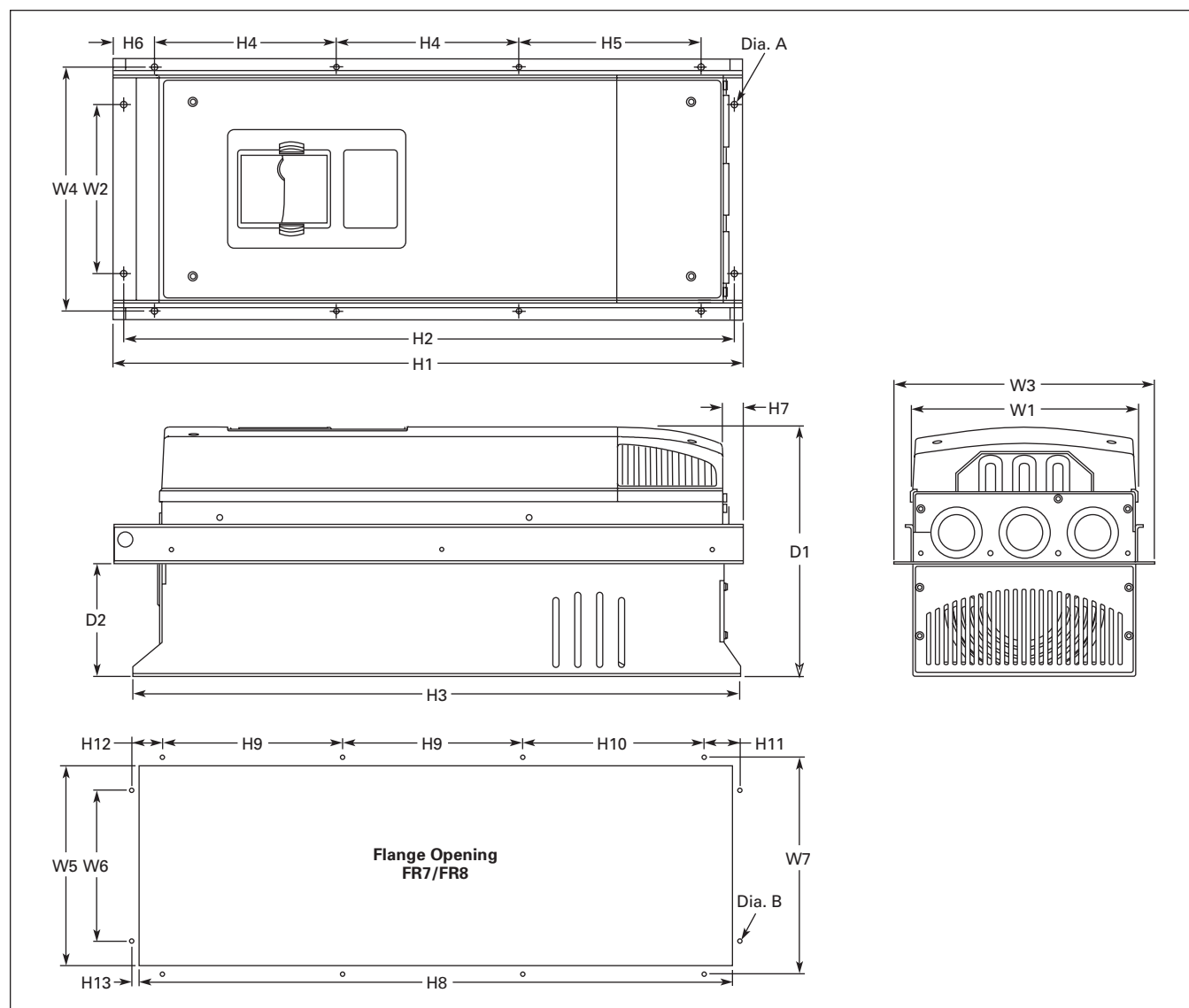


Figure 6. 9000X Dimensions, NEMA Type 1 and NEMA Type 12, with Flange Kit, FR7 and FR8

Table 27. Dimensions for 9000X, FR7 and FR8 with Flange Kit

Frame Size	Voltage	Approximate Dimensions in Inches (mm)													
		W1	W2	W3	W4	H1	H2	H3	H4	H5	H6	H7	D1	D2	Dia. A
FR7	230V	9.3	6.8	10.6	10.0	25.6	24.8	24.8	7.4	7.4	.9	.8	10.1	4.6	.3
	480V	(237)	(175)	(270)	(253)	(652)	(632)	(630)	(189)	(189)	(23)	(20)	(257)	(117)	(6)
	575V														
FR8	230V	11.2	—	14.0	13.0	32.8	—	29.3	10.2	10.4	1.7	2.2	13.5	4.3	.4
	480V	(285)		(355)	(330)	(832)		(745)	(258)	(265)	(43)	(57)	(344)	(110)	(9)
	575V														

Table 28. Dimensions for the Flange Opening, FR7/FR8

Frame Size	Voltage	Approximate Dimensions in Inches (mm)									
		W5	W6	W7	H8	H9	H10	H11	H12	H13	Dia. B
FR7	230V	9.2	6.9	10.0	24.4	7.4	7.4	1.4	1.3	.3	.3
	480V	(233)	(175)	(253)	(619)	(189)	(189)	(35)	(32)	(7)	(6)
	575V										
FR8	230V	11.9	—	13.0	31.9	10.2	10.4	—	—	—	.4
	480V	(301)		(330)	(810)	(258)	(265)				(9)
	575V										

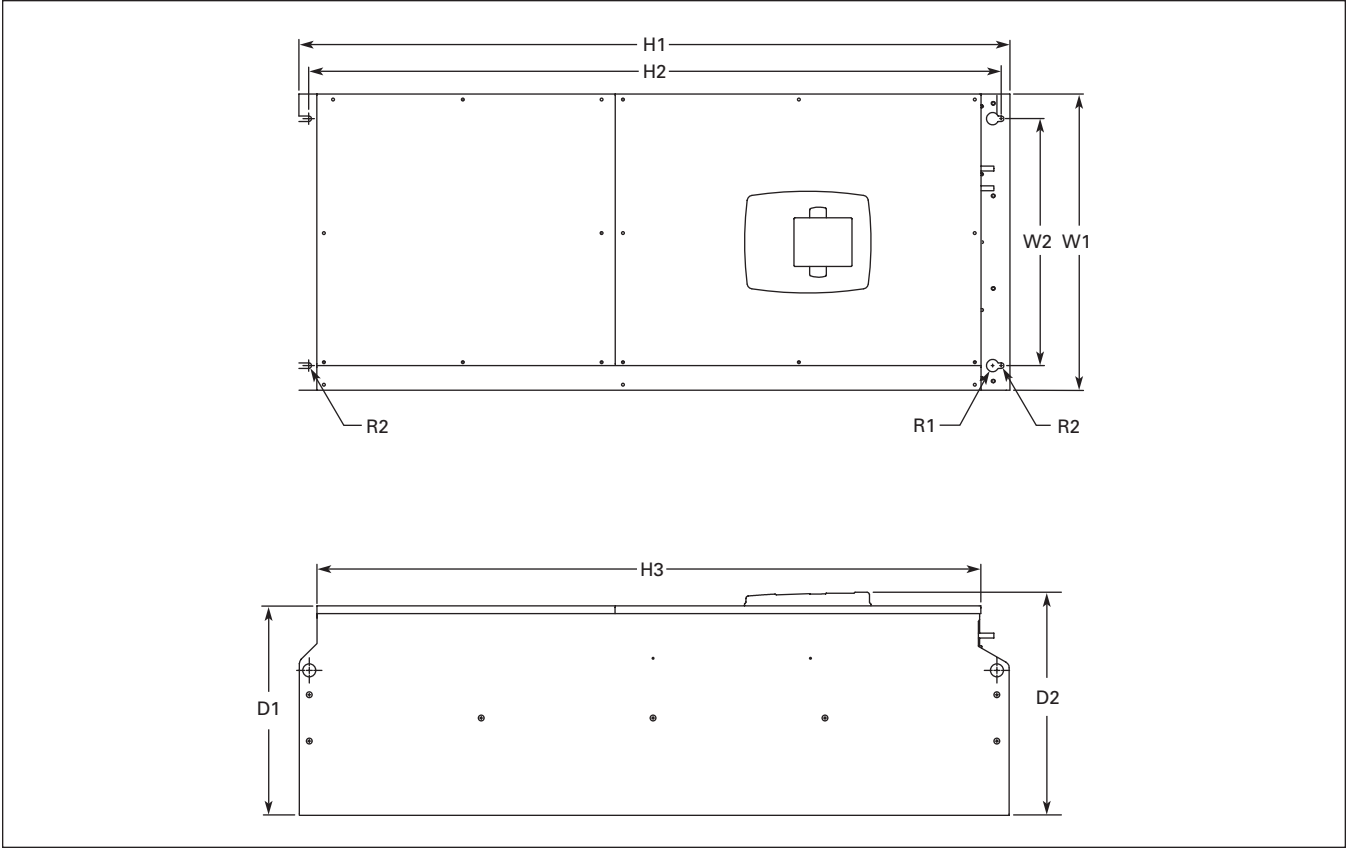


Figure 7. 9000X Dimensions, NEMA Type 1 and NEMA Type 12, FR9

Table 29. 9000X Drive Dimensions, FR9

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)								
			H1	H2	H3	D1	D2	W1	W2	R1 dia.	R2 dia.
FR9	230V	75 – 100	45.3	44.1	42.4	13.4	14.3	18.9	15.7	.8	.4
	480	150 – 200	(1150)	(1120)	(1076)	(340)	(362)	(480)	(400)	(20)	(9)
	575	100 – 175									

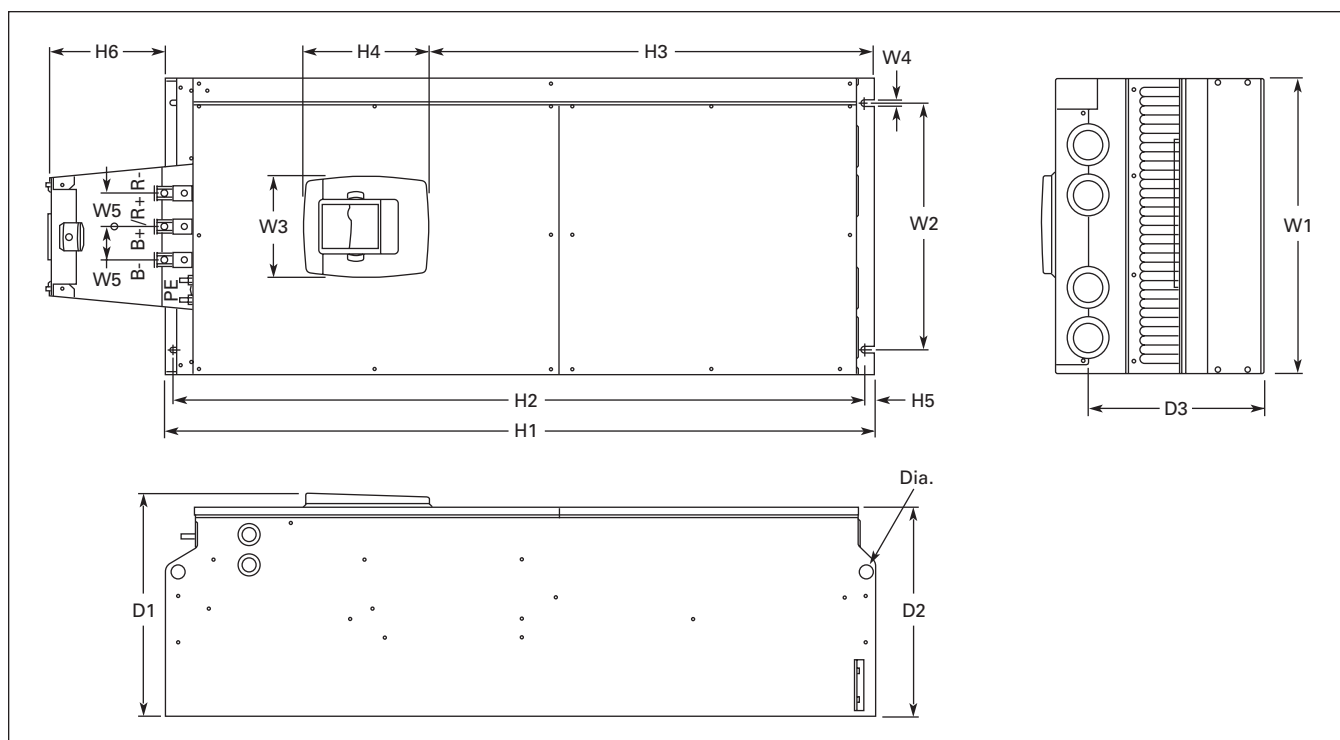


Figure 8. 9000X Dimensions, NEMA Type 1 and NEMA Type 12 FR9

Table 30. Dimensions for 9000X, FR9

Frame Size	Voltage	Approximate Dimensions in Inches (mm)														
		W1	W2	W3	W4	W5	H1	H2	H3	H4	H5	H6 ①	D1	D2	D3	Dia.
FR9	230V	18.9	15.7	6.5	.4	2.1	45.3	44.1	28.3	8.0	.6	7.4	14.2	13.4	11.2	.8
	480V	(480)	(400)	(165)	(9)	(54)	(1150)	(1120)	(721)	(205)	(16)	(188)	(361.5)	(340)	(285)	(21)
	575V															

① Brake resistor terminal box (H6) included when brake chopper ordered.

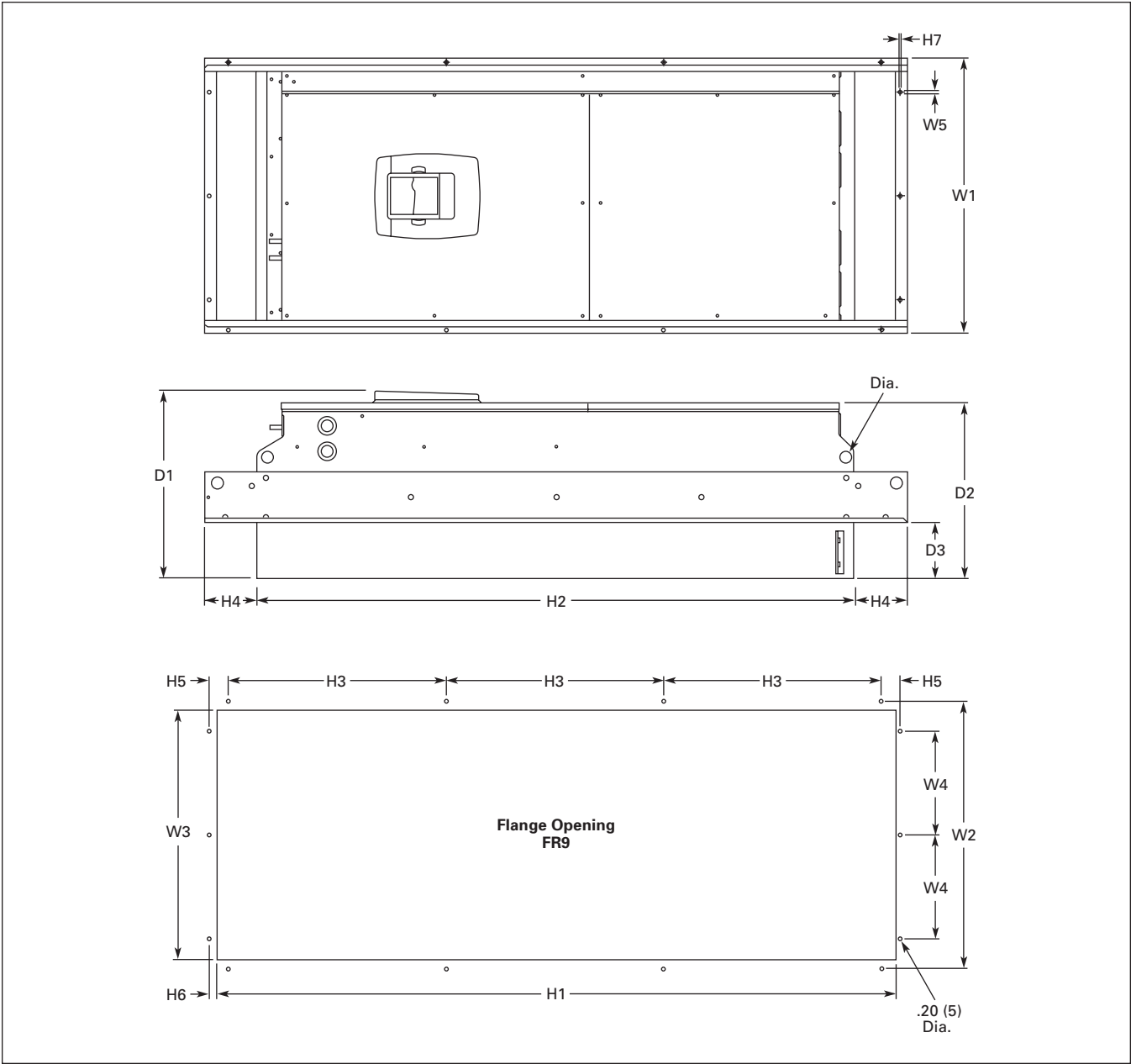


Figure 9. 9000X Dimensions, NEMA Type 1 and NEMA Type 12 FR9 with Flange Kit

Table 31. Dimensions for 9000X, FR9 with Flange Kit

Frame Size	Voltage	Approximate Dimensions in Inches (mm)															
		W1	W2	W3	W4	W5	H1	H2	H3	H4	H5	H6	H7	D1	D2	D3	Dia.
FR9	230V	20.9	20.0	19.1	7.9	.2	51.7	45.3	16.5	3.9	1.4	.4	.1	24.9	13.4	4.3	.8
	480V	(530)	(510)	(485)	(200)	(5.5)	(1312)	(1150)	(420)	(100)	(35)	(9)	(2)	(362)	(340)	(109)	(21)
	575V																

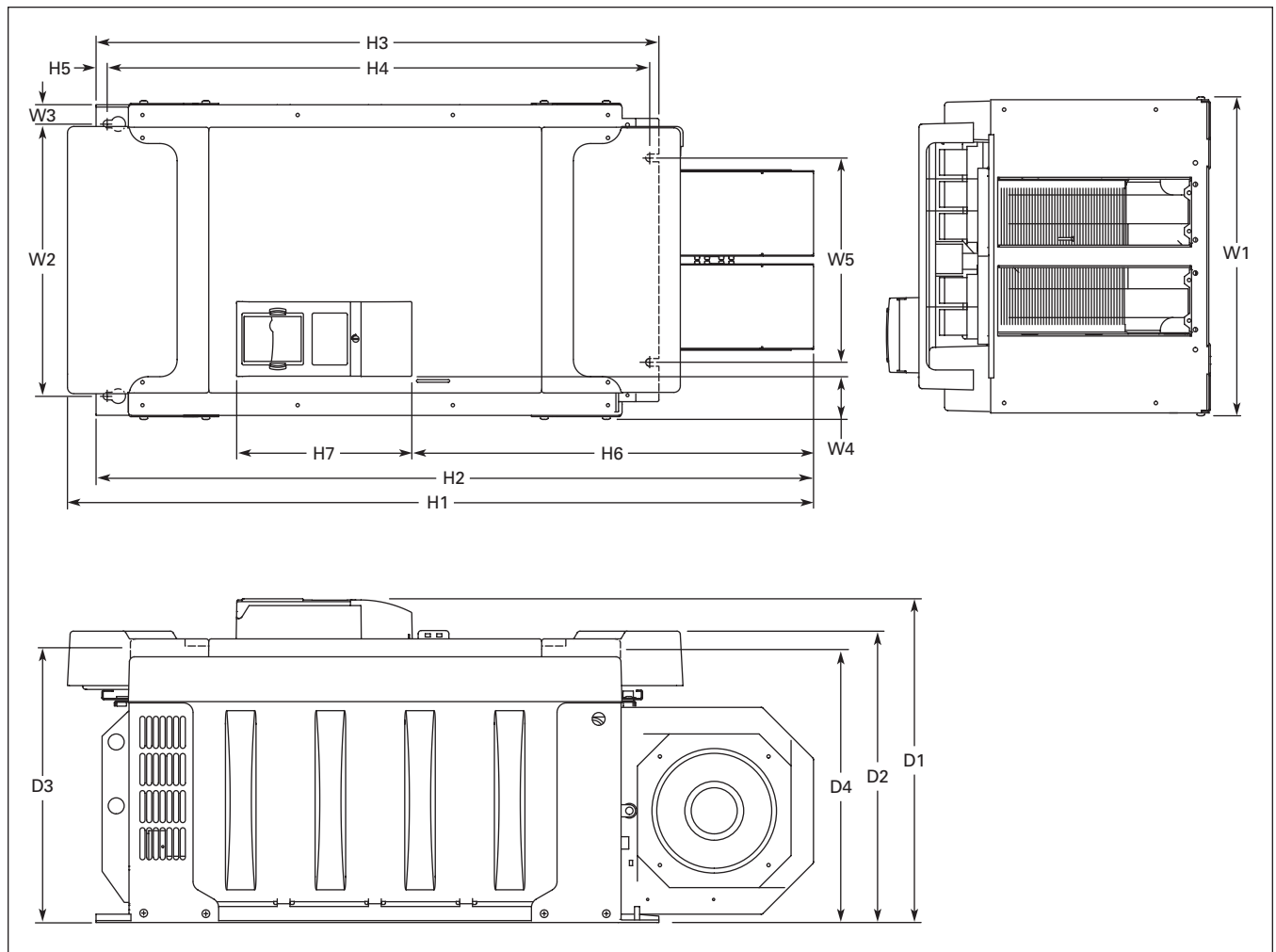


Figure 10. 9000X Dimensions, FR10 Open Chassis

Table 32. Dimensions for 9000X, FR10 Open Chassis

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)															
			W1	W2	W3	W4	W5	H1	H2	H3	H4	H5	H6	H7	D1	D2	D3	D4
FR10	480V	250 – 350	19.7 (500)	16.7 (425)	1.2 (30)	2.6 (67)	12.8 (325)	45.9 (1165)	44.1 (1121)	34.6 (879)	33.5 (850)	.7 (17)	24.7 (627)	10.8 (275)	19.9 (506)	17.9 (455)	16.7 (423)	16.6 (421)
	575V	200 – 300																

Note: 9000X FR12 is built of two FR10 modules. Please refer to SPX9000 installation manual for mounting instructions.

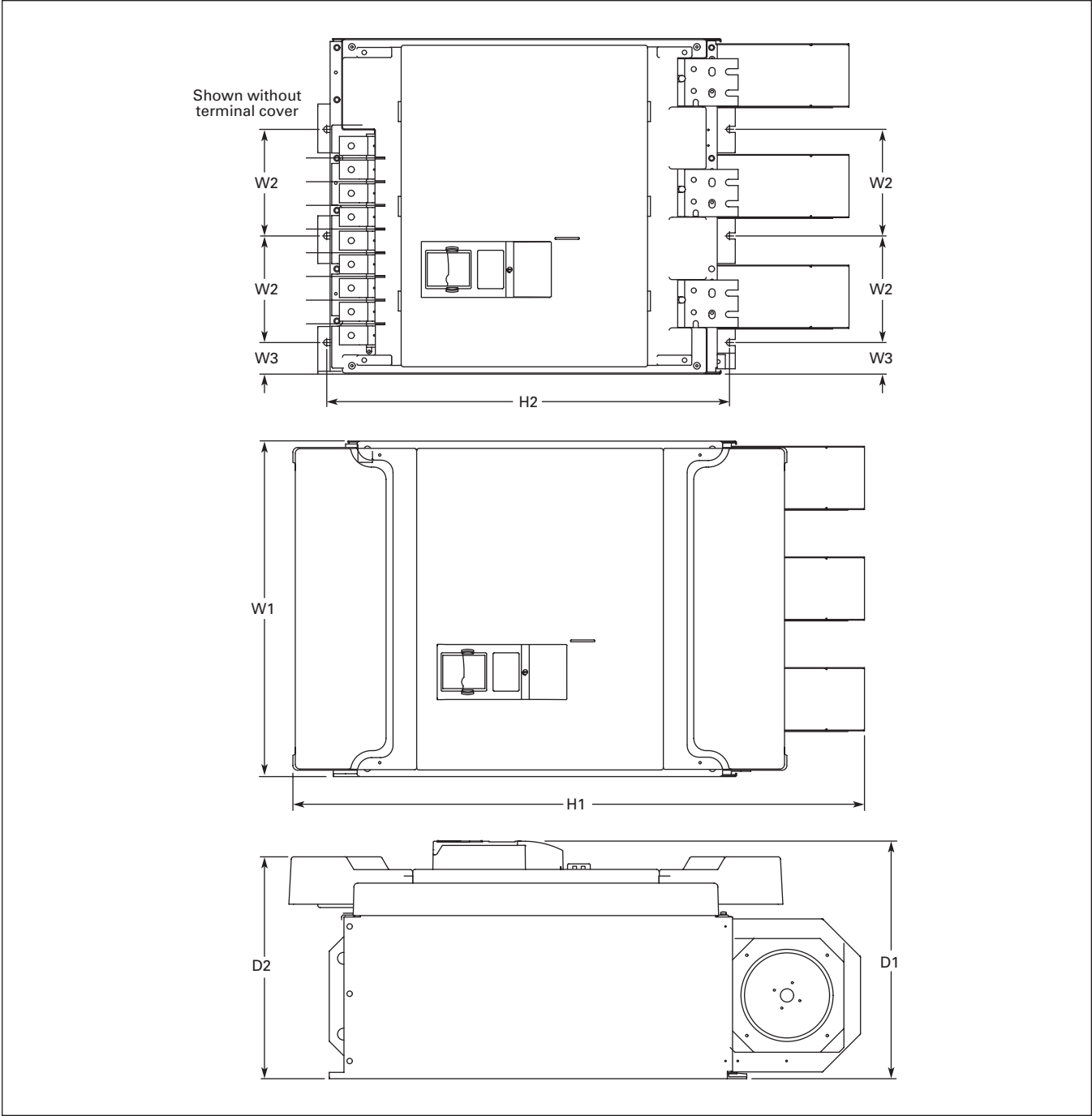


Figure 11. 9000X Dimensions, FR11 Open Chassis

Table 33. Dimensions for 9000X, FR11 Open Chassis

Frame Size	Voltage	hp (CT)	Approximate Dimensions in Inches (mm)						
			W1	W2	W3	H1	H2	D1	D2
FR11	480V	400 – 550	27.9	8.86	2.6	45.5	33.5	19.8	18.4
	575V	400 – 500	(709)	(225)	(67)	(1155)	(850)	(503)	(468)

Table 34. Choke Types

Catalog Number	Frame Size	Choke Type
----------------	------------	------------

Voltage Range 380-500V

SPX 250 4	FR10	CHK0400
SPX 300 4	FR10	CHK0520
SPX 350 4	FR10	CHK0520
SPX 400 4	FR11	2 x CHK0400
SPX 500 4	FR11	2 x CHK0400
SPX 550 4	FR11	2 x CHK0400
SPX 600 4	FR12	2 x CHK0520
SPX 650 4	FR12	2 x CHK0520
SPX 700 4	FR12	2 x CHK0520

Voltage Range 525-690V

SPX 200 5	FR10	CHK0261
SPX 250 5	FR10	CHK0400
SPX 300 5	FR10	CHK0400
SPX 400 5	FR11	CHK0520
SPX 450 5	FR11	CHK0520
SPX 500 5	FR11	2 x CHK0400
SPX 550 5	FR12	2 x CHK0400
SPX 600 5	FR12	2 x CHK0400
SPX 700 5	FR12	2 x CHK0400

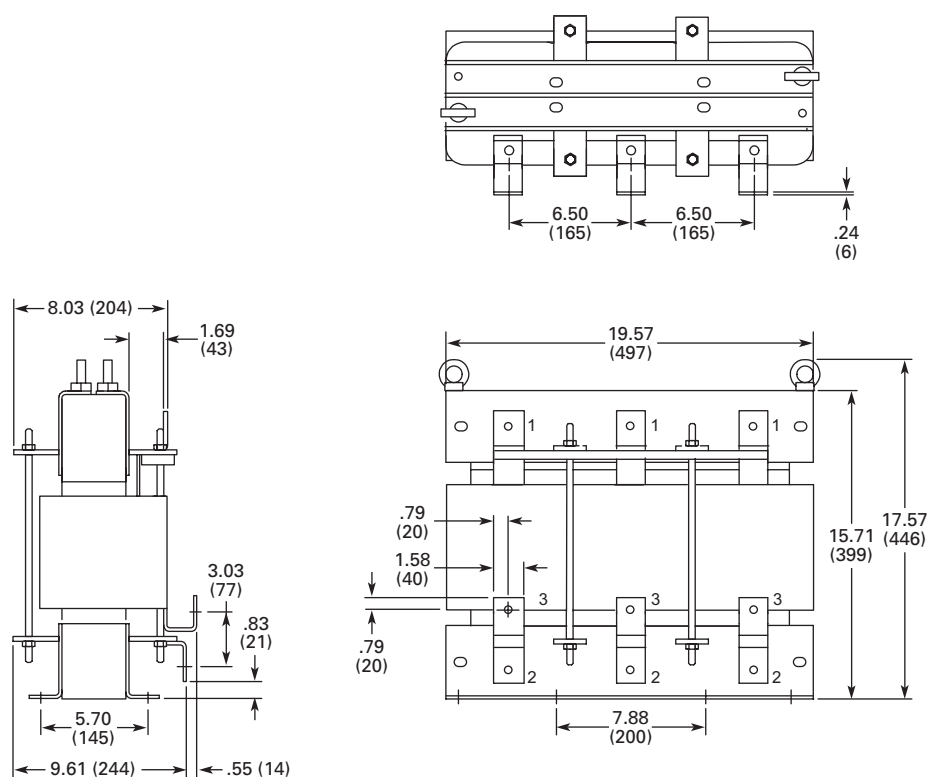


Figure 12. Dimensions of AC Choke CHK0520 in Inches (mm)

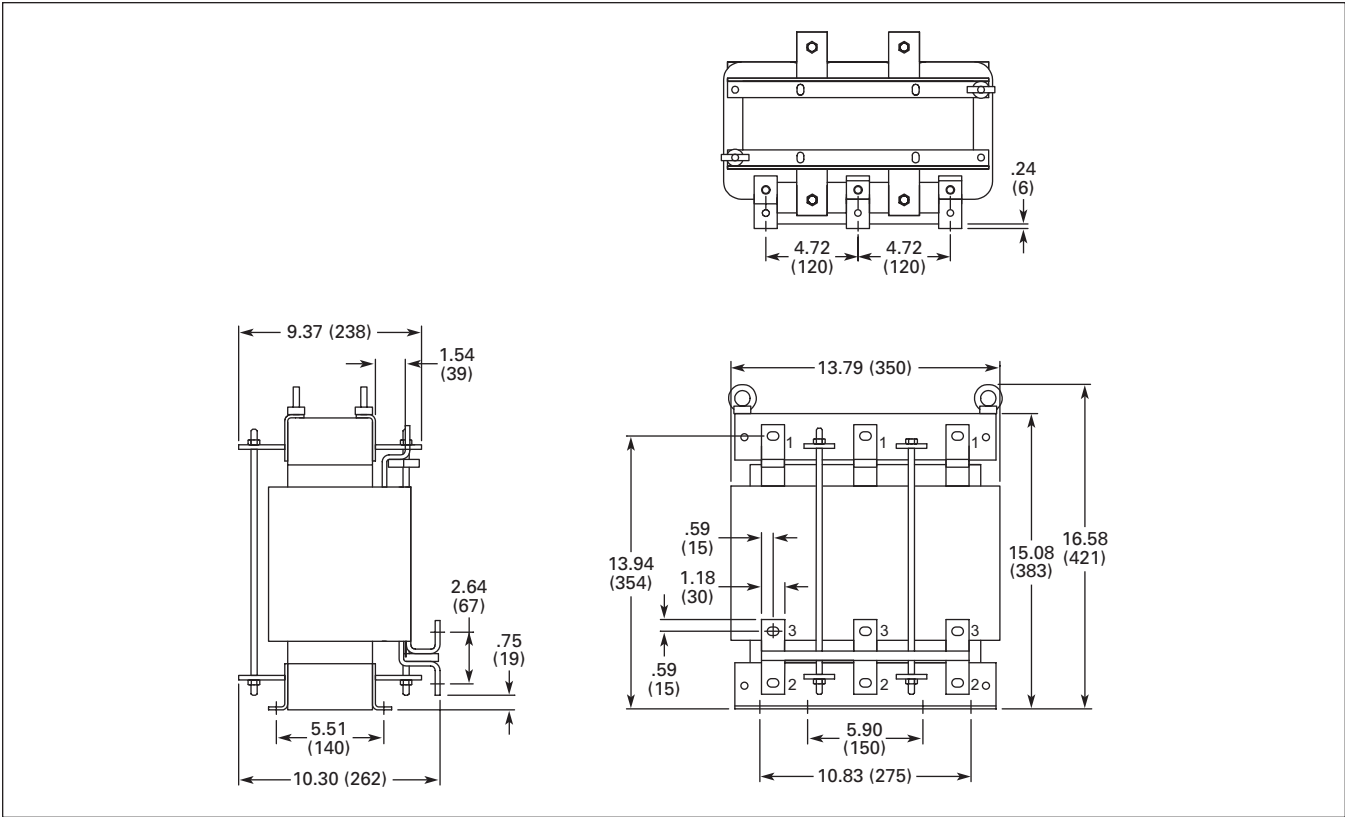


Figure 13. Dimensions of AC Choke CHK0400 in Inches (mm)

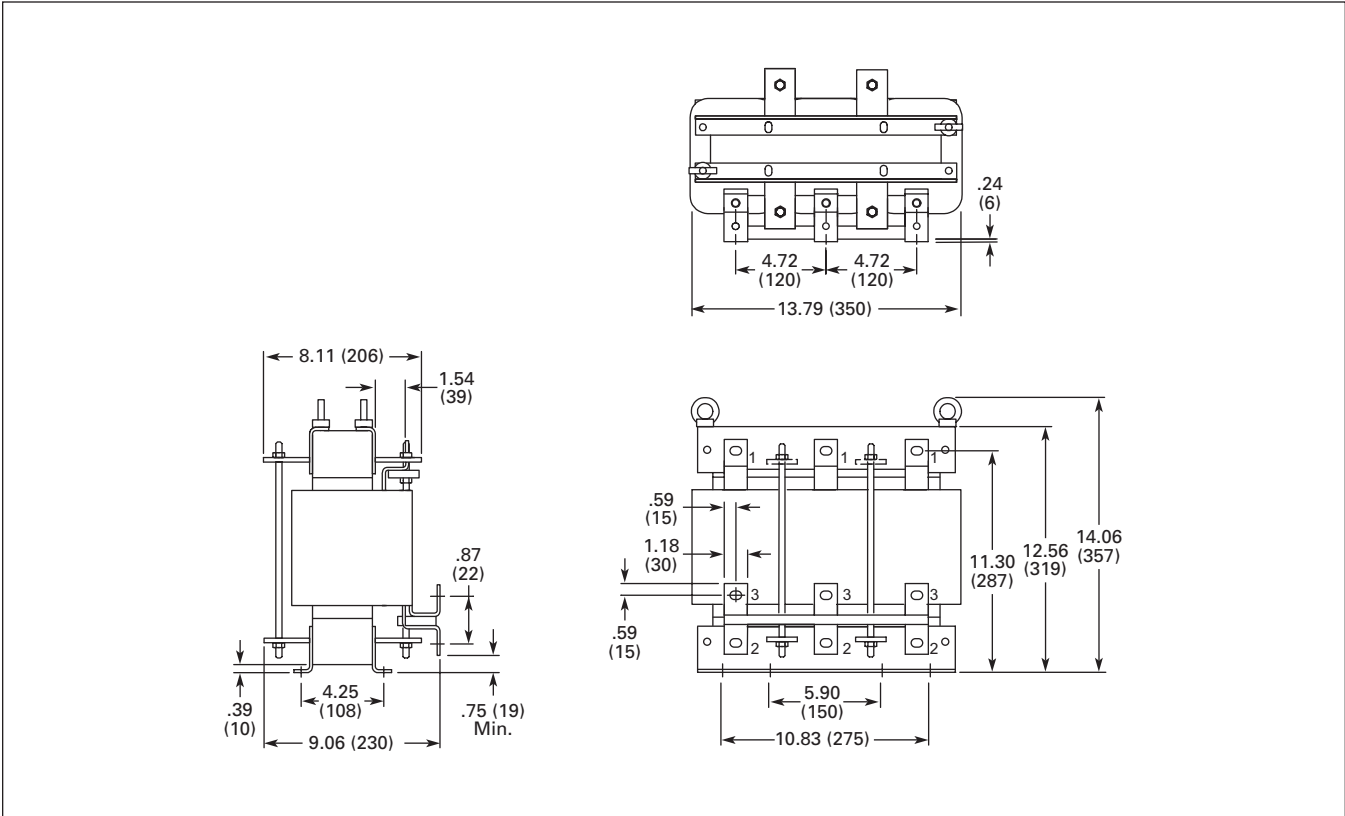


Figure 14. Dimensions of AC Choke CHK0261 in Inches (mm)

Spare Units & Replacement Parts

Table 35. 9000X Spare Units – SVX9000, 208 – 590V, Frames 4 – 9

Description	Catalog Number
Control Unit – Includes the control board, blue base housing, installed SVX9000 software program and blue flip cover. Does not include any OPT boards or keypad. See Figure 1 and Table 13 (Page 9) for standard and option boards and keypad.	CSBS0000000000

Table 36. 9000X Series Replacement Parts — SVX9000 Drives, 208 – 240V

Frame:	4				5				6		7			Delivery Code	Catalog Number
hp (CT):	3/4	1	1-1/2	2	3	5VT ①	5	7-1/2	10	15	20	25	30		
Power Board															
1	1	1												FB	VB00308
			1	1										FB	VB00310
					1	1	1							FB	VB00313
									1	1				FB	VB00316
											1	1	1	FB	VB00319
Electrolytic Capacitors															
2	2	2												W	PP01000
			2	2										W	PP01001
					2	2								W	PP01002
							2							W	PP01003
								2	2					W	PP01004
										2	2	2		W	PP01005
IGBT Module															
1	1													W	CP01304
		1												W	CP01305
			1	1	1									W	CP01306
						1								W	CP01307
							1							W	CP01308
								1						W	PP01022
									1					W	PP01023
										1				W	PP01024
											1			W	PP01025
												1		W	PP01029
Rectifying Board															
											1	1	1	W	VB00242
Chopper/Rectifier															
									1					W	CP01367
										1				W	CP01368
Diode/Thyristor Module															
											3	3	3	W	PP01035
Control Board															
1	1	1	1	1	1	1	1	1	1	1	1	1	1	W	VB00252

① 5 hp VT only has no corresponding CT rated hp rating.

Table 37. 9000X Series Replacement Parts — SVX9000 Drives, 380 – 500V

Frame:	4						5				6				7				8				9				Delivery Code	Catalog Number
hp (CT):	1	1-1/2	2	3	5	7-1/2 VT ①	7-1/2	10	15	20	25	30	40	50	60	75	100	125	150	200								
Power Board																												
1																						FB	VB00205					
	1																					FB	VB00206					
			1																			FB	VB00207					
				1																		FB	VB00208					
					1																	FB	VB00209					
						1																FB	VB00210					
							1															FB	VB00211					
								1														FB	VB00212					
									1													FB	VB00213					
										1												FB	VB00214					
											1											FB	VB00215					
												1										FB	VB00216					
													1									FB	VB00217					
														1								FB	VB00218					
															1							FB	VB00219					
																1						FB	VB00220					
																	1					FB	VB00221					
																		1				FB	VB00236					
Electrolytic Capacitors																												
2	2		2	2																		W	PP01000					
					2	2																W	PP01001					
							2	2														W	PP01002					
									2													W	PP01003					
										2	2	2										W	PP01004					
													2	2	2	4	4	4	8	8		W	PP01005					
IGBT Module																												
1	1		1																			W	CP01304					
				1	1																	W	CP01305					
						1		1														W	CP01306					
									1													W	CP01307					
										1												W	CP01308					
											1											W	PP01020					
												1										W	PP01022					
													1									W	PP01023					
														1								W	PP01024					
															1							W	PP01025					
																1						W	PP01029					
																	1					W	PP01026					
																		1	1			W	PP01027					
Rectifying Board																												
													1	1	1							W	VB00242					
																1	1	1				W	VB00227					
																			1	1		W	VB00459					
Chopper/Rectifier																												
										1	1											W	CP01367					
												1										W	CP01368					
Diode/Thyristor Module																												
													3	3	3							W	PP01035					
																3	3	3				W	CP01268					
																			3	3		W	PP01037					
Rectifying Module Sub-assembly																												
																			1	1		W	FR09810					
Power Module Sub-assembly																												
																			1			W	FR09800					
																				1		W	FR09801					
Control Board																												
1	1		1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	W	VB00252					
																						W	VB00561					

① 7-1/2 hp VT only has no corresponding CT rated hp rating.

② SPX9000 Drives only (FR10 and larger).

Table 38. 9000X Series Replacement Parts — SVX9000 Drives, 525 – 590V

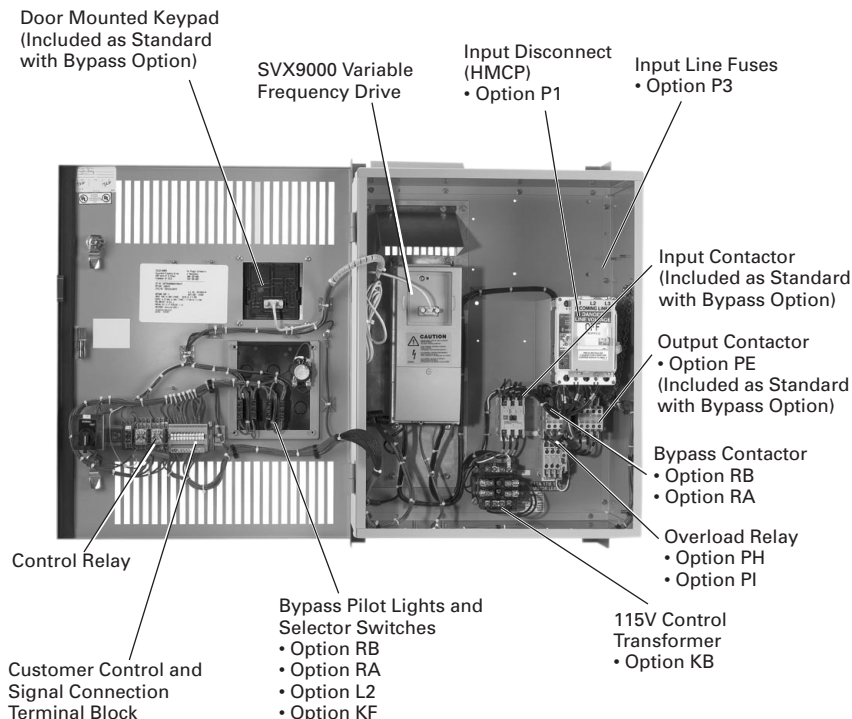
Frame:	6										7		8		9				10			Delivery Code	Catalog Number	
hp (CT):	2	3	5VT ①	5	7-1/2	10	15	20	25	30	40	50	60	75	100	125	150	200 VT ①	200	250	300			
Driver Board																								
	1	1	1		1	1		1	1	1													FB	VB00404
Power Board																								
	1	1	1		1	1		1	1	1	1												FB	VB00414
										1	1												FB	VB00419
																1	1	1					FB	VB00425
Rectifying Board																								
										1	1												FP	VB00442
																1	1	1		1	1	1	FP	VB00460
Fan Power Supply																								
																1	1	1		2	2	2	FP	VB00299
Shunt Board																								
																			6				FP	VB00545
																				6			FP	VB00510
																					6		FP	VB00511
Electrolytic Capacitors																								
	2	2	2		2	2		2	2	2	2												FP	PP01093
										2	2					8	8	8		12	12	12	FP	PP01041
IGBT Module																								
	3	3	3		3	3		3	3														FP	PP01091
										1	1												FP	PP01089
Diode Module																								
	1	1	1		1	1		1	1	1	1												FP	PP01092
Diode/Thyristor Module																								
										3	3												FP	PP01071
																3	3	3					FP	PP01072
IGBT/Diode (brake)																								
	1	1	1		1	1		1	1	1	1	1				2	2	2					FP	PP01040
Rectifying Module Sub-assembly																								
																1	1	1					W	FR09810
																			1	1	1		FP	FR10821 ②
Rectifying Module Sub-assembly (brake)																								
																1	1	1					FP	FR09811
Power Module Sub-assembly																								
																1							FP	FR09802
																	1						FP	FR09803
																		1					FP	FR09804
Power Module Left																								
																			1				FP	FR10806
																				1			FP	FR10807
																					1		FP	FR10808
Power Module Right																								
																			1				FP	FR10809
																				1			FP	FR10810
																					1		FP	FR10811
Cooling Fans																								
	1	1	1		1	1																	W	PP01061
								1	1	1	1												W	PP01062
											1	1											W	PP01063
	1	1	1		1	1		1	1	1	1												W	PP01049
																1	1	1 ③		2	2	2	W	PP01068
																			1	1	1		FP	PP01096
																1	1	1		2	2	2	FP	PP01080
Fuses																								
																1	1	1		1	1	1	W	PP01094
																2	2	2		2	2	2	W	PP01095
Control Board																								
	1	1	1		1	1		1	1	1	1					1	1	1					W	VB00252
																			1	1	1		W	VB00561

① VT only. Has no corresponding CT rated hp rating.

② Rectifying board not included.

③ For NEMA Type 12, two PP01068 internal fans are needed.

SVX9000 Enclosed Drives



Enclosed 9000X Series Drive

Standards and Certifications

- UL Listed
- cUL Listed

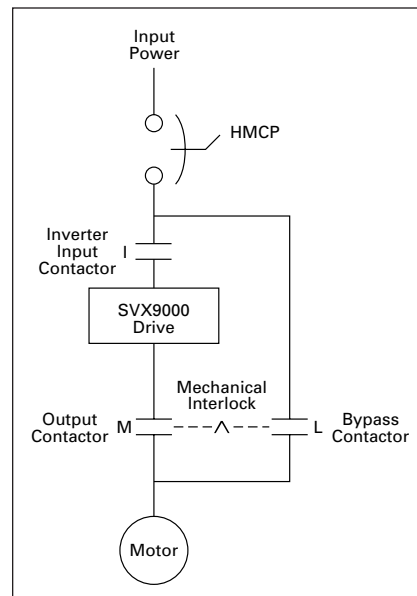


Figure 15. Power Diagram for Bypass
Options RB and RA

Product Description

- **Standard Enclosed** — covers a wide range of the most commonly ordered options. Pre-engineering eliminates the lead time normally associated with customer specific options.
- **Modified Standard Enclosed** — applies to specific customer requirements that vary from the Standard Enclosed offering, such as the need for an additional indicating light or minor modifications to drawings. *Consult your Eaton representative for assistance in pricing and lead time.*
- **Custom Engineered** — for those applications with more unique or complex requirements, these are individually engineered to the customer's needs. *Consult your Eaton representative for assistance in pricing and lead time.*

Features

- NEMA Type 1 or Type 12 enclosures
- Input Voltage: 208V, 230V, 480V and 575V (Future Release)
- Complete range of control, network and power options
- Horsepower range:
 - 208V — 3/4 to 100 hp CT; 1 to 100 hp VT
 - 230V — 3/4 to 100 hp CT; 1 to 100 hp VT
 - 480V — 1 to 200 hp CT; 1-1/2 to 250 hp VT
- HMCP padlockable

Technical Data and Specifications

Table 39. Specifications

Feature Description	9000X Enclosed Products — NEMA Type 1 or NEMA Type 12
Primary Design Features	
45 – 66 Hz Input Frequency	Standard
Output: AC Volts Maximum	Input Voltage Base
Output Frequency Range: Hz	0 – 500
Initial Output Current (CT)	250% for 2 seconds
Overload: 1 Minute (CT/VT)	150%/110%
Enclosure Space Heater	Optional
Oversize Enclosure	Standard
Output Contactor	Optional
Bypass Motor Starter	Optional
Listings	UL, cUL
Protection Features	
Incoming Line Fuses	Optional
AC Input Circuit Disconnect	Optional
Line Reactors	Standard
Phase Rotation Insensitive	Standard
EMI Filter	Standard
Input Phase Loss Protection	Standard
Input Overvoltage Protection	Standard
Line Surge Protection	Standard
Output Short Circuit Protection	Standard
Output Ground Fault Protection	Standard
Output Phase Protection	Standard
Overtemperature Protection	Standard
DC Overvoltage Protection	Standard
Drive Overload Protection	Standard
Motor Overload Protection	Standard
Programmer Software	Optional
Local/Remote Keypad	Standard
Keypad Lockout	Standard
Fault Alarm Output	Standard
Built-In Diagnostics	Standard
Input/Output Interface Features	
Setup Adjustment Provisions: Remote Keypad/Display Personal Computer	Standard Standard
Operator Control Provisions: Drive Mounted Keypad/Display Remote Keypad/Display Conventional Control Elements Serial Communications 115V AC Control Circuit	Standard Standard Standard Optional Optional
Speed Setting Inputs: Keypad 0 – 10V DC Potentiometer/Voltage Signal 4 – 20 mA Isolated 4 – 20 mA Differential 3 – 15 psig	Standard Standard Configurable Configurable Optional
Analog Outputs: Speed/Frequency Torque/Load/Current Motor Voltage Kilowatts 0 – 10V DC Signals 4 – 20 mA DC Signals Isolated Signals	Standard Programmable Programmable Programmable Configurable w/Jumpers Standard Optional

Feature Description	9000X Enclosed Products — NEMA Type 1 or NEMA Type 12
Input/Output Interface Features (Continued)	
Discrete Outputs: Fault Alarm Drive Running Drive at Set Speed Optional Parameters Dry Contacts Open Collector Outputs Additional Discrete Outputs	Standard Standard Programmable 14 1 (2 Relays Form C) 1 Optional
Communications: RS-232 RS-422/485 DeviceNet™ Modbus RTU CanOpen (Slave) Profibus-DP Lonworks® Johnson Controls Metasys™ N2	Standard Optional Optional Optional Optional Optional Optional Optional

Performance Features

Sensorless Vector Control	Standard
Volts/Hertz Control	Standard
IR and Slip Compensation	Standard
Electronic Reversing	Standard
Dynamic Braking	Optional ①
DC Braking	Standard
PID Setpoint Controller	Programmable
Critical Speed Lockout	Standard
Current (Torque) Limit	Standard
Adjustable Acceleration/Deceleration	Standard
Linear or S Curve Accel/Decel	Standard
Jog at Preset Speed	Standard
Thread/Preset Speeds	7
Automatic Restart	Selectable
Coasting Motor Start	Standard
Coast or Ramp Stop Selection	Standard
Elapsed Time Meter	Optional
Carrier Frequency Adjustment	1 – 16 kHz

Standard Conditions for Application and Service

Operating Ambient Temperature	0 – 40°C
Storage Temperature	-40 – 60°C
Humidity (Maximum), Non-condensing	95%
Altitude (Maximum without Derate)	3300 ft. (1000m)
Line Voltage Variation	+10/-15%
Line Frequency Variation	45 – 66 Hz
Efficiency	>96%
Power Factor (Displacement)	.96

① Some horsepower units include dynamic braking chopper as standard — refer to individual drive sections.

Table 40. Standard I/O Specifications

Description	Specification
6 – Digital Input Programmable	24V: “0” ≤ 10V, “1” ≥ 18V, R _i > 5 kΩ
2 – Analog Input Configurable w/Jumpers	Voltage: 0 – ±10V, R _i > 200 kΩ Current: 0 (4) – 20 mA, R _i = 250 kΩ
2 – Digital Output Programmable	Form C Relays 250V AC 2 Amp or 30V DC 2 Amp resistive
1 – Digital Output Programmable	Open collector 48V DC 50 mA
1 – Analog Output Programmable Configurable w/Jumper	0 – 20 mA, impedance 500 ohms, resolution 106 ±3%

Options

Control Panel Options

Table 41. Control Panel Factory Options

Description	Factory Installed	Field Installed
	Option Code	NEMA Type 1 Catalog Number
Local/Remote Keypad SVX9000 Control Panel — This option is standard on all drives and consists of an RS-232 connection, backlit alphanumeric LCD display with nine indicators for the RUN status and two indicators for the control source. The nine pushbuttons on the panel are used for panel programming and monitoring of all SVX9000 parameters. The panel is detachable and isolated from the input line potential. Include LOC/REM key to choose control location.	A	KEYPAD-LOC/REM
Keypad Remote Mounting Kit — This option is used to remote mount the SVX9000 keypad. The footprint is compatible to the SV9000 remote mount kit. Includes 10 ft. cable, keypad holder and mounting hardware.	—	OPTRMT-KIT-9000X

Table 42. Miscellaneous Options

Description	Catalog Number
9000XDrive — A PC-based tool for controlling and monitoring of the SVX9000. Features include: loading parameters that can be saved to a file or printed, setting references, starting and stopping the motor, monitoring signals in graphical or text form, and real-time display. To avoid damage to the drive or computer, SVDriveable must be used.	9000XDRIVE
SVDriveable — 6 ft. (1.8m) RS-232 cable (22 gauge) with a 7-pin connector on each end. Should be used in conjunction with the 9000X Drive option to avoid damage to the SVX9000 or computer. The same cable can be used for downloading specialized applications to the drive.	SVDRIVCABLE
External Dynamic Braking Resistors — Used with the Dynamic Braking Chopper Circuit to absorb motor regenerative energy for stopping the load and to dissipate the energy flowing back into the drive. Resistors are separated into Standard Duty and Heavy-Duty. Standard Duty is defined as 20% duty or less with 100% braking torque, while Heavy-Duty is defined as 50% duty or less with 150% braking torque. <i>Consult factory.</i>	^①

^① Consult factory.

Catalog Number Selection

Table 43. SVX9000 Enclosed NEMA Type 1/12 Drive Catalog Numbering System

SVX F07 1 4 A A

Build Alphabetically and Numerically

Product Family		
SVX = Enclosed Drives		

Horsepower Rating		
F07 = 3/4 hp	010 = 10 hp	060 = 60 hp
001 = 1 hp	015 = 15 hp	075 = 75 hp
F15 = 1-1/2 hp	020 = 20 hp	100 = 100 hp
002 = 2 hp	025 = 25 hp	125 = 125 hp
003 = 3 hp	030 = 30 hp	150 = 150 hp
005 = 5 hp	040 = 40 hp	200 = 200 hp
007 = 7-1/2 hp	050 = 50 hp	

Future Release ^①		
250 = 250 hp	350 = 350 hp	H10 = 1000 hp
300 = 300 hp	400 = 400 hp	H11 = 1100 hp

Enclosure Rating	
1	= NEMA Type 1
2	= NEMA Type 12

Voltage Rating	
1	= 208V
2	= 230V
4	= 480V

Application — Torque/Braking ^③	
A	= VT/No Brake Chopper
B	= VT/Internal Brake Chopper
D	= CT/No Brake Chopper
E	= CT/Internal Brake Chopper

Enclosed Style	
A	= Enclosed Drive

Enclosed Options ^{②⑤⑥}			Type
K1	Door-Mounted Speed Potentiometer ^④		Control
K2	Door-Mounted Speed Potentiometer with HOA Selector Switch ^④		Control
K3	3 – 15 psig Follower		Control
KB	115V Control Transformer – 550 VA		Control
KF	Bypass Test Switch for RA and RB		Addl. Bypass
L2	Bypass Pilot Lights for RA, RB Bypass Options		Addl. Bypass
P1	Input Disconnect (HMCP) 100 kAIC		Input
P3	Input Line Fuses (200 kAIC)		Input
PE	Output Contactor		Output
PF	Output Filter		Output
PG	MotoRx (Up to 600 Ft.) 1000 V/μS DV/DT Filter		Output
PH	Single Overload Relay		Output
PI	Dual Overload Relays		Output
PN	Dual Overloads for Bypass		Addl. Bypass
RA	Manual HOA Bypass Controller		Bypass
RB	Manual IOB Bypass Controller		Bypass
RC	Auto Transfer HOA Bypass Controller		Bypass
RD	Auto Transfer IOB Bypass Controller		Bypass
S5	Floor Stand 22"		Enclosure
S6	Floor Stand 12"		Enclosure
S7	10" Expansion		Enclosure
S8	20" Expansion		Enclosure
S9	Space Heater		Enclosure

Communication Options ^⑦	
C2	= Modbus
C3	= Profibus DP
C4	= LonWorks
C5	= Profibus DP (D9 Connector)
C6	= CanOpen (Slave)
C7	= DeviceNet
C8	= Modbus (D9 Type Connector)
CA	= Johnson Controls N2
D3	= RS-232 with D9 Connection

Control Options	
B1	= 6 DI, 1 ext +24V DC/EXT +24V DC
B2	= 1 RO (NC/NO), 1 RO (NO), 1 Therm
B4	= 1 AI (mA isolated), 2 AO (mA isolated), 1 ext +24V DC/EXT +24V DC
B5	= 3 RO (NO)
B8	= 1 ext +24V DC/EXT +24V DC, 3 Pt100
B9	= 1 RO (NO), 5 DI 42 – 240V AC Input

^① Future release.

^② Local/Remote keypad is included as the standard Control Panel.

^③ Brake Chopper is a factory installed option only, see drive option tables on **Pages 34 – 36**. **Note:** External dynamic braking resistors not included. Consult factory.

^④ Includes local/remote speed reference switch.

^⑤ Some options are voltage and/or horsepower specific. Consult your Eaton representative for details.

^⑥ See **Pages 30 and 31** for descriptions.

^⑦ See **Pages 32 and 33** for complete descriptions.

Control/Communication Option Descriptions

Table 44. Available Control/Communications Options

Option	Description	Option Type
K1	Door-Mounted Speed Potentiometer — Provides the SVX9000 with the ability to adjust the frequency reference using a door-mounted potentiometer. This option uses the 10V DC reference to generate a 0 – 10V signal at the analog voltage input signal terminal. When the HOA bypass option is added, the speed is controlled when the HOA switch is in the hand position. Without the HOA bypass option, a 2-position switch (labeled local/remote) is provided on the keypad to select speed reference from the Speed Potentiometer or a remote speed signal.	Control
K2	Door-Mounted Speed Potentiometer with HOA Selector Switch — Provides the SVX9000 with the ability to start/stop and adjust the speed reference from door-mounted control devices or remotely from customer supplied inputs. In HAND position, the drive will start and the speed is controlled by the door-mounted speed potentiometer. The drive will be disabled in the OFF position. When AUTO is selected, the run enable and speed reference are controlled from remote inputs. Speed reference can be either 0 – 10V DC or 4 – 20 mA. The drive default is 4 – 20 mA, parameter is field programmable. Run enable is controlled by a dry contact closure. <i>This option requires a customer supplied 115V power source.</i>	Control
K3	3 – 15 psig Follower — Provides a pneumatic transducer which converts a 3 – 15 psig pneumatic signal to either 0 – 8V DC or a 1 – 9V DC signal interface with the SVX9000. The circuit board is mounted on the inside of the front enclosure panel and connects to the user's pneumatic control system via 6 ft. (1.8m) of flexible tubing and a 1/4 inch (6.4 mm) brass tube union.	Control
KB	115V Control Transformer – 550 VA — Provides a fused control power transformer with additional 550 VA at 115V for customer use.	Control
KF	Bypass Test Switch for RB and RA — Allows the user to energize the AF drive for testing while operating the motor on the bypass controller. The Test Switch is mounted on the inside of the enclosure door.	Addl. Bypass
L2	Bypass Pilot Lights for RB, RA Bypass Options — A green light indicates when the motor is running in inverter mode and an amber light indicates when the motor is running in bypass mode. The lights are mounted on the enclosure door, above the switches.	Addl. Bypass
P1	Input Disconnect Assembly Rated to 100 kAIC — High Interrupting Motor Circuit Protector (HMCP) that provides a means of short circuit protection for the power cables between it and the SVX9000, and protection from high-level ground faults on the power cable. Allows a convenient means of disconnecting the SVX9000 from the line and the operating mechanism can be padlocked in the OFF position. This is factory mounted in the enclosure.	Input
P3	Input Line Fuses Rated to 200 kAIC — Provides high-level fault protection of the SVX9000 input power circuit from the load side of the fuses to the input side of the power transistors. This option consists of three 200 kA fuses, which are factory mounted in the enclosure.	Input
PE	Output Contactor — Provides a means for positive disconnection of the drive output from the motor terminals. The contactor coil is controlled by the drive's run or permissive logic. NC and NO auxiliary contacts rated at 10A, 600V AC are provided for customer use. Bypass Options RB and RA include an Output Contactor as standard. This option includes a low VA 115V AC fused Control Power Transformer and is factory mounted in the enclosure.	Output
PF	Output Filter — Used to reduce the transient voltage (DV/DT) at the motor terminals. The Output Filter is recommended for cable lengths exceeding 100 ft. (30m) with a drive of 3 hp and above, for cable lengths of 33 ft. (10m) with a drive of 2 hp and below, or for a drive rated at 525 – 690V. This option is mounted in the enclosure, and may be used in conjunction with a Brake Chopper Circuit.	Output
PG	MotoRx (300 – 600 Ft.) 1000 V/μS DV/DT Filter — Used to reduce transient voltage (DV/DT) and peak voltages at the motor terminals. This option is comprised of a .5% line reactor, followed by capacitive filtering and an energy recovery/clamping circuit. Unlike the Output Filter (See option PF), the MotoRx recovers most of the energy from the voltage peaks, resulting in a lower voltage drop to the motor, and therefore conserving power. This option is used when the distance between a single motor and the drive is 300 – 600 feet (91 – 183m). <i>This option can not be used with the Brake Chopper Circuit. The Output Filter (option PF) should be investigated as an alternative.</i>	Output
PH	Single Overload Relay — Uses a bimetallic overload relay to provide additional overload current protection to the motor on configurations without bypass options. It is included with the Bypass Configurations for overload current protection in the bypass mode. The Overload Relay is mounted within the enclosure, and is manually resettable. Heater pack included.	Output
PI	Dual Overload Relays — This option is recommended when a single drive is operating 2 motors and overload current protection is needed for each of the motors. The standard configuration includes two bimetallic overload relays, each sized to protect a motor with 50% of the drive hp rating. For example, a 100 hp drive would include two overload relays sized to protect two 50 hp motors. The relays are mounted within the enclosure, and are manually resettable. Heater packs not included.	Output
PN	Dual Overloads for Bypass — This option is recommended when a single drive is operating 2 motors in the bypass mode and overload current protection is needed for each of the motors. The standard configuration includes two bimetallic overload relays, each sized to protect a motor with 50% of the drive hp rating. For example, a 100 hp drive would include two overload relays sized to protect two 50 hp motors. The relays are mounted within the enclosure, and are manually resettable.	Addl. Bypass

Table 44. Available Control/Communications Options (Continued)

Option	Description	Option Type
RA	Manual HOA Bypass Controller — The Manual HAND/OFF/AUTO (HOA) — 3-contactor — bypass option provides a means of bypassing the SVX9000, allowing the AC motor to be operated at full speed directly from the AC supply line. This option consists of an input disconnect, a fused control power transformer, and a full voltage bypass starter with a door mounted HOA selector switch and an INVERTER/BYPASS switch. The HOA switch provides the ability to start and stop the drive in the inverter mode. For applications up to 100 hp, a Freedom Series IEC input contactor, a Freedom Series IEC output contactor, and a Freedom Series IEC starter with a bimetallic overload relay is included. For applications above 100 hp, an Advantage input contactor, an Advantage output contactor and an Advantage starter with electronic overload protection is included. The contactors are mechanically and electrically interlocked (see power diagram on Page 26).	Bypass
RB	Manual IOB Bypass Controller — The Manual INVERTER/OFF/BYPASS (IOB) — 3-contactor — bypass option provides a means of bypassing the SVX9000, allowing the AC motor to be operated at full speed directly from the AC supply line. This option consists of an input disconnect, a fused control power transformer, and a full voltage bypass starter with a door mounted IOB selector switch. For applications up to 100 hp, a Freedom Series IEC input contactor, a Freedom Series IEC output contactor, and a Freedom Series IEC starter with a bimetallic overload relay is included. For applications above 100 hp, an Advantage input contactor, an Advantage output contactor and an Advantage starter with electronic overload protection is included. The contactors are mechanically and electrically interlocked (see power diagram on Page 26).	Bypass
RC	Auto Transfer HOA Bypass Controller — The Manual HAND/OFF/AUTO (HOA) — 3-contactor — bypass option provides a means of bypassing the SVX9000, allowing the AC motor to be operated at full speed directly from the AC supply line. The circuitry provides an automatic transfer of the load to “across the line” operation after a drive trip. This option consists of an input disconnect, a fused control power transformer, and a full voltage bypass starter with a door mounted HOA selector switch and an INVERTER/BYPASS switch. The HOA switch provides the ability to start and stop the drive in either mode. For applications up to 100 hp, a Freedom Series IEC input contactor, a Freedom Series IEC output contactor, and a Freedom Series IEC starter with a bimetallic overload relay is included. For applications above 100 hp, an Advantage input contactor, an Advantage output contactor and an Advantage starter with electronic overload protection is included. The contactors are mechanically and electrically interlocked (see power diagram on Page 26). Door mounted pilot lights are provided which indicate bypass or inverter operation. A green light indicates when the motor is running in inverter mode and an amber light indicates when the motor is running in bypass mode. WARNING: The motor may restart when the overcurrent relay is reset when operating in bypass, unless the IOB selector switch is turned to the OFF position.	Bypass
RD	Auto Transfer IOB Bypass Controller — The Auto INVERTER/OFF/BYPASS (IOB) — 3-contactor — bypass option provides a means of bypassing the SVX9000, allowing the AC motor to be operated at full speed directly from the AC supply line. The circuitry provides an automatic transfer of the load to “across the line” operation after a drive trip. This option consists of an input disconnect, a fused control power transformer, and a full voltage bypass starter with a door mounted IOB selector switch. For applications up to 100 hp, a Freedom Series IEC input contactor, a Freedom Series IEC output contactor, and a Freedom Series IEC starter with a bimetallic overload relay is included. For applications above 100 hp, an Advantage input contactor, an Advantage output contactor and an Advantage starter with electronic overload protection is included. The contactors are mechanically and electrically interlocked (see power diagram on Page 26). Door mounted pilot lights are provided which indicate bypass or inverter operation. A green light indicates when the motor is running in inverter mode and an amber light indicates when the motor is running in bypass mode. WARNING: The motor may restart when the overcurrent relay is reset when operating in bypass, unless the IOB selector switch is turned to the OFF position.	Bypass
S5	Floor Stand 22" — Converts a Size 1 or 2, normally wall mounted enclosure to a floor standing enclosure with a height of 22" (558.8 mm).	Enclosure
S6	Floor Stand 12" — Converts a Size 2, normally wall mounted enclosure to a floor standing enclosure with a height of 12" (304.8 mm).	Enclosure
S7	10" Expansion — In a Size 5 enclosure, the extension allows for bottom cable entry and additional space for customer mounted components. NOTE: Enclosure expansion rated NEMA Type 1 only.	Enclosure
S8	20" Expansion — In a Size 5 enclosure, the extension allows for bottom cable entry and additional space for customer mounted components. When the Output Filter (option PF) is selected for a drive using a Size 5 enclosure, this expansion box is required and included in the option pricing. NOTE: Enclosure expansion rated NEMA Type 1 only.	Enclosure
S9	Space Heater — Prevents condensation from forming in the enclosure when the drive is inactive or in storage. Includes a thermostat for variable temperature control. A 200W heater is installed in enclosures 0 and 1, and a 400W heater is installed in enclosures 2 – 5. Requires a customer supplied 115V remote supply source.	Enclosure

Note: For availability, see Product Selection for base drive voltage required.

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 16**).

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.

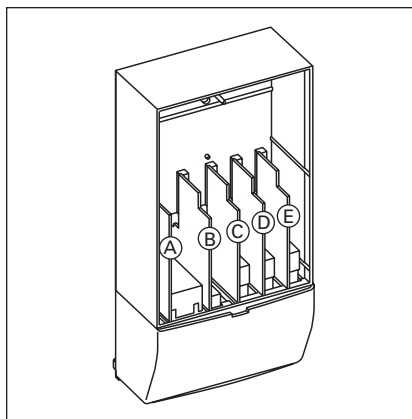


Figure 16. 9000X Series Option Boards

Table 45. Option Board Kits

Option Kit Description ②	Allowed Slot Locations ①	Field Installed	Factory Installed	SVX Ready Programs						
		Catalog Number	Option Designator	Basic	Local/ Remote	Standard	MSS	PID	Multi-P.	PFC
Standard I/O Cards (See Figure 1)										
2 RO (NC/NO)	B	OPTA2	—	X	X	X	X	X	X	X
6 DI, 1 DO, 2 AI, 1AO, 1 +10V DC ref, 2 ext +24V DC/ EXT +24V DC	A	OPTA9	—	X	X	X	X	X	X	X
Extended I/O Card Options										
6 DI, 1 ext +24V DC/EXT +24V DC	B, C, D, E	OPTB1	B1	—	—	—	—	—	X	X
1 RO (NC/NO), 1 RO (NO), 1 Therm	B, C, D, E	OPTB2	B2	—	—	—	—	—	X	X
1 AI (mA isolated), 2 AO (mA isolated), 1 ext +24V DC/EXT +24V DC	B, C, D, E	OPTB4	B4	X	X	X	X	X	X	X
3 RO (NO)	B, C, D, E	OPTB5	B5	—	—	—	—	—	X	X
1 ext +24V DC/EXT +24V DC, 3 Pt100	B, C, D, E	OPTB8	B8	—	—	—	—	—	—	—
1 RO (NO), 5 DI 42 – 240V AC Input	B,C, D, E	OPTB9	B9	—	—	—	—	—	X	X
Communication Cards ③										
Modbus	D, E	OPTC2	C2	X	X	X	X	X	X	X
Johnson Controls N2	D, E	OPTC2	CA	—	—	—	—	—	—	—
Profibus DP	D, E	OPTC3	C3	X	X	X	X	X	X	X
LonWorks	D, E	OPTC4	C4	X	X	X	X	X	X	X
Profibus DP (D9 Connector)	D, E	OPTC5	C5	X	X	X	X	X	X	X
CanOpen (Slave)	D, E	OPTC6	C6	X	X	X	X	X	X	X
DeviceNet	D, E	OPTC7	C7	X	X	X	X	X	X	X
Modbus (D9 Type Connector)	D, E	OPTC8	C8	X	X	X	X	X	X	X
RS-232 with D9 Connection	D, E	OPTD3	D3	X	X	X	X	X	X	X
Keypad										
9000X Series Local Remote Keypad	—	KEYPAD-LOC/REM	—	—	—	—	—	—	—	—
9000X Series Remote Mount Keypad Kit (Keypad not included)	—	OPTRMT -KIT- 9000X	—	—	—	—	—	—	—	—

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 OPTC2 is a multi-protocol option card.

ModBus RTU Network Communications

The Modbus Network Card OPTC2 is used for connecting the SVX9000 as a slave on a Modbus network. The interface is connected by a 9-pin DSUB connector (female) and the baud rate ranges from 300 to 19200 baud. Other communication parameters include an address range from 1 to 247; a parity of None, Odd or Even; and the stop bit is 1.

Johnson Controls Metasys™ N2 Network Communications

The OPTC2 fieldbus board provides communication between the SVX9000 drive and a Johnson Controls Metasys™ N2 network. With this connection, the drive can be controlled, monitored and programmed from the Metasys system. The N2 fieldbus is available as a factory installed option and as a field installable kit.

Profibus Network Communications

The Profibus Network Card OPTC3 is used for connecting the SVX9000 as a slave on a Profibus-DP network. The interface is connected by a 9-pin DSUB connector (female). The baud rates range from 9.6K baud to 12M baud, and the addresses range from 1 to 127.

LonWorks Network Communications

The LonWorks Network Card OPTC4 is used for connecting the SVX9000 on a LonWorks network. This interface uses Standard Network Variable Types (SNVT) as data types. The channel connection is achieved using a FTT-10A Free Topology transceiver via a single twisted transfer cable. The communication speed with LonWorks is 78 kBits/s.

CanOpen (Slave) Communications

The CanOpen (Slave) Network Card OPTC6 is used for connecting the SVX9000 to a host system. According to ISO11898 standard cables to be chosen for CAN bus should have a nominal impedance of 120Ω, and specific line delay of nominal 5 nS/m. 120Ω line termination resistors required for installation.

DeviceNet Network Communications

The DeviceNet Network Card OPTC7 is used for connecting the SVX9000 on a DeviceNet Network. It includes a 5.08 mm pluggable connector. Transfer method is via CAN using a 2-wire twisted shielded cable with 2-wire bus power cable and drain. The baud rates used for communication include 125K baud, 250K baud and 500K baud.

Table 46. I/O Specifications for the Control/Communication Options

Description	Specifications
Analog voltage, input	0 – ±10V, $R_i \geq 200 \text{ k}\Omega$
Analog current, input	0 (4) – 20 mA, $R_i = 250 \Omega$
Digital Input	24V: "0" $\leq 10\text{V}$, "1" $\geq 18\text{V}$, $R_i > 5 \text{ k}\Omega$
Aux. voltage	24V ($\pm 20\%$), max. 50 mA
Reference voltage	10V $\pm 3\%$, max. 10 mA
Analog current, output	0 (4) – 20 mA, $R_L = 500 \text{ k}\Omega$, resolution 10 bit, accuracy $\leq \pm 2\%$
Analog voltage, output	0 (2) – 10V, $R_L \geq 1 \text{ k}\Omega$, resolution 10 bit, accuracy $\leq \pm 2\%$
Relay output	300V DC, 250V AC
Max. switching voltage	8A/24V DC, .4A/300V DC, 2 kVA/250V AC
Max. switching load	2A rms
Max. continuous load	
Thermistor input	$R_{trip} = 4.7 \text{ k}\Omega$
Encoder input	24V: "0" $\leq 10\text{V}$, "1" $\geq 18\text{V}$, $R_i = 2.2 \text{ k}\Omega$ 5V: "0" $\leq 2\text{V}$, "1" $\geq 3\text{V}$, $R_i = 330 \Omega$

SVX Conversion Kit**Table 47. SVX Conversion Kit Frame 4 – 7**

Frame Size	Enclosure Size	Catalog Number	Delivery Code
FR4	0	OPTCON-SVXFR4-SZ00	FB10
FR4	1	OPTCON-SVXFR4-SZ01	FB10
FR5	0	OPTCON-SVXFR5-SZ00	FB10
FR5	1	OPTCON-SVXFR5-SZ01	FB10
FR6	1	OPTCON-SVXFR6-SZ01	FB10
FR6	2	OPTCON-SVXFR6-SZ02	FB10
FR7	2	OPTCON-SVXFR7-SZ02	FB10

Note: The kit consists of a flange kit, adapter plate(s), hardware, remote keypad kit and SVX9000 decal.

Product Selection

When Ordering

- Select a Base Catalog Number that meets the application requirements — nominal horsepower, voltage and enclosure rating (the enclosed drive's continuous output amp rating should be equal to or greater than the motor's full load amp rating). The base enclosed package includes a standard drive, door mounted Local/Remote Keypad and enclosure.
- If Dynamic Brake Chopper or Control/Communication option is desired, change the appropriate code in the Base Catalog Number.
- Select Enclosed Options. Add the codes as suffixes to the Base Catalog Number in alphabetical and numeric order.
- Read all Footnotes.

208V Drives

Table 48. 208V AC Input Base Drive

Enclosure Size ①	hp	Current (A)	NEMA Type 1		NEMA Type 12	
			Frame Size	Base Catalog Number ②	Frame Size	Base Catalog Number ②

208V Constant Torque Drive and Enclosure

0	3/4	3.7	4	SVXF0711EA	4	SVXF0721EA
0	1	4.8	4	SVX00111EA	4	SVX00121EA
0	1-1/2	6.6	4	SVXF1511EA	4	SVXF1521EA
0	2	7.8	4	SVX00211EA	4	SVX00221EA
0	3	11	4	SVX00311EA	4	SVX00321EA
0	5	17.5	5	SVX00511EA	5	SVX00521EA
0	7-1/2	25	5	SVX00711EA	5	SVX00721EA
1	10	31	6	SVX01011EA	6	SVX01021EA
1	15	48	6	SVX01511EA	6	SVX01521EA
2	20	61	7	SVX02011DA	7	SVX02021DA
2	25	75	7	SVX02511DA	7	SVX02521DA
2	30	88	7	SVX03011DA	7	SVX03021DA
3	40	114	8	SVX04011DA	8	SVX04021DA
4	50	143	8	SVX05011DA	8	SVX05021DA
5	60	170	8	SVX06011DA	8	SVX06021DA
5	75	211	9	SVX07511DA	9	SVX07521DA
5	100	273	9	SVX10011DA	9	SVX10021DA

208V Variable Torque Drive and Enclosure

0	1	4.8	4	SVX00111BA	4	SVX00121BA
0	1-1/2	6.6	4	SVXF1511BA	4	SVXF1521BA
0	2	7.8	4	SVX00211BA	4	SVX00221BA
0	3	11	4	SVX00311BA	4	SVX00321BA
0	5	17.5	5	SVX00511BA	5	SVX00521BA
0	7-1/2	25	5	SVX00711BA	5	SVX00721BA
0	10	31	5	SVX01011BA	5	SVX01021BA
1	15	48	6	SVX01511BA	6	SVX01521BA
1	20	61	6	SVX02011BA	6	SVX02021BA
2	25	75	7	SVX02511AA	7	SVX02521AA
2	30	88	7	SVX03011AA	7	SVX03021AA
2	40	114	7	SVX04011AA	7	SVX04021AA
3	50	—	8	SVX05011AA	8	SVX05021AA
4	60	170	8	SVX06011AA	8	SVX06021AA
5	75	—	8	SVX07511AA	8	SVX07521AA
5	100	—	9	SVX10011AA	9	SVX10021AA

① Enclosure dimensions listed on **Pages 37 – 44**.

② Includes drive, Local/Remote Keypad and enclosure.

230V Drives

Table 49. 230V AC Input Base Drive

Enclosure Size ^③	hp	Current (A)	NEMA Type 1		NEMA Type 12	
			Frame Size	Base Catalog Number ^④	Frame Size	Base Catalog Number ^④

230V Constant Torque Drive and Enclosure

0	3/4	3.7	4	SVXF0712EA	4	SVXF0722EA
0	1	4.8	4	SVX00112EA	4	SVX00122EA
0	1-1/2	6.6	4	SVXF1512EA	4	SVXF1522EA
0	2	7.8	4	SVX00212EA	4	SVX00222EA
0	3	11	4	SVX00312EA	4	SVX00322EA
0	5	17.5	5	SVX00512EA	5	SVX00522EA
0	7-1/2	25	5	SVX00712EA	5	SVX00722EA
1	10	31	6	SVX01012EA	6	SVX01022EA
1	15	48	6	SVX01512EA	6	SVX01522EA
2	20	61	7	SVX02012DA	7	SVX02022DA
2	25	75	7	SVX02512DA	7	SVX02522DA
2	30	88	7	SVX03012DA	7	SVX03022DA
3	40	114	8	SVX04012DA	8	SVX04022DA
4	50	140	8	SVX05012DA	8	SVX05022DA
5	60	170	8	SVX06012DA	8	SVX06022DA
5	75	205	9	SVX07512DA	9	SVX07522DA
5	100	261	9	SVX10012DA	9	SVX10022DA

230V Variable Torque Drive and Enclosure

0	1	4.8	4	SVX00112BA	4	SVX00122BA
0	1-1/2	6.6	4	SVXF1512BA	4	SVXF1522BA
0	2	7.8	4	SVX00212BA	4	SVX00222BA
0	3	11	4	SVX00312BA	4	SVX00322BA
0	5	17.5	5	SVX00512BA	5	SVX00522BA
0	7-1/2	25	5	SVX00712BA	5	SVX00722BA
0	10	31	5	SVX01012BA	5	SVX01022BA
1	15	48	6	SVX01512BA	6	SVX01522BA
1	20	61	6	SVX02012BA	6	SVX02022BA
2	25	75	7	SVX02512AA	7	SVX02522AA
2	30	88	7	SVX03012AA	7	SVX03022AA
2	40	114	7	SVX04012AA	7	SVX04022AA
3	50	140	8	SVX05012AA	8	SVX05022AA
4	60	170	8	SVX06012AA	8	SVX06022AA
5	75	205	8	SVX07512AA	8	SVX07522AA
5	100	261	9	SVX10012AA	9	SVX10022AA

^③ Enclosure dimensions listed on **Pages 37 – 44**.

^④ Includes drive, Local/Remote Keypad and enclosure.

480V Drives

Table 50. 480V AC Input Base Drive

Enclosure Size ①	CT hp	Current (A)	NEMA Type 1		NEMA Type 12	
			Frame Size	Base Catalog Number ②	Frame Size	Base Catalog Number ②
Constant Torque Drive and Enclosure						
0	1	2.2	4	SVX00114EA	4	SVX00124EA
0	1-1/2	3.3	4	SVXF1514EA	4	SVXF1524EA
0	2	4.3	4	SVX00214EA	4	SVX00224EA
0	3	5.6	4	SVX00314EA	4	SVX00324EA
0	5	7.6	4	SVX00514EA	4	SVX00524EA
0	7-1/2	12	5	SVX00714EA	5	SVX00724EA
0	10	16	5	SVX01014EA	5	SVX01024EA
0	15	23	5	SVX01514EA	5	SVX01524EA
1	20	31	6	SVX02014EA	6	SVX02024EA
1	25	38	6	SVX02514EA	6	SVX02524EA
1	30	46	6	SVX03014EA	6	SVX03024EA
2	40	61	7	SVX04014DA	7	SVX04024DA
2	50	72	7	SVX05014DA	7	SVX05024DA
2	60	87	7	SVX06014DA	7	SVX06024DA
3	75	105	8	SVX07514DA	8	SVX07524DA
3	100	140	8	SVX10014DA	8	SVX10024DA
4	125	170	8	SVX12514DA	8	SVX12524DA
5	150	205	9	SVX15014DA	9	SVX15024DA
5	200	245	9	SVX20014DA	9	SVX20024DA
Variable Torque Drive and Enclosure						
0	1-1/2	3.3	4	SVXF1514BA	4	SVXF1524BA
0	2	4.3	4	SVX00214BA	4	SVX00224BA
0	3	5.6	4	SVX00314BA	4	SVX00324BA
0	5	7.6	4	SVX00514BA	4	SVX00524BA
0	7-1/2	12	4	SVX00714BA	4	SVX00724BA
0	10	16	5	SVX01014BA	5	SVX01024BA
0	15	23	5	SVX01514BA	5	SVX01524BA
0	20	31	5	SVX02014BA	5	SVX02024BA
1	25	38	6	SVX02514BA	6	SVX02524BA
1	30	46	6	SVX03014BA	6	SVX03024BA
1	40	61	6	SVX04014BA	6	SVX04024BA
2	50	72	7	SVX05014AA	7	SVX05024AA
2	60	87	7	SVX06014AA	7	SVX06024AA
2	75	105	7	SVX07514AA	7	SVX07524AA
3	100	140	8	SVX10014AA	8	SVX10024AA
4	125	170	8	SVX12514AA	8	SVX12524AA
4	150	205	8	SVX15014AA	8	SVX15024AA
5	200	261	9	SVX20014AA	9	SVX20024AA
5	250	300	9	SVX25014AA	9	SVX25024AA

① Enclosure dimensions listed on **Pages 37 – 44**.

② Includes drive, Local/Remote keypad and enclosure.

Dimensions

Table 51. Approximate Dimensions and Shipping Weight — Enclosed Products

Enclosure Size	Dimensions in Inches (mm)												
	Wide A	High B	Deep C	Mounting							H	Min. Air Space	
				D	D1	E	E1	F	G	G1		J	K
0	19.9 (504)	29.0 (737)	16.4 (416)	18.3 (465)	—	—	—	27.4 (695)	—	—	25.4 (644)	4.0 (102)	3.0 (76)

Table 51. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)										Max. Approx. Ship. Wt. Lbs. (kg)
	Cable Entry					Door Clearance S	T	U	V	W	
	L	M	N	P	R						
0	5.0 (127)	—	—	6.0 (152)	9.6 (245)	26.4 (669)	1.5 (38)	6.3 (160)	4.3 (108)	5.3 (134)	200 (91)

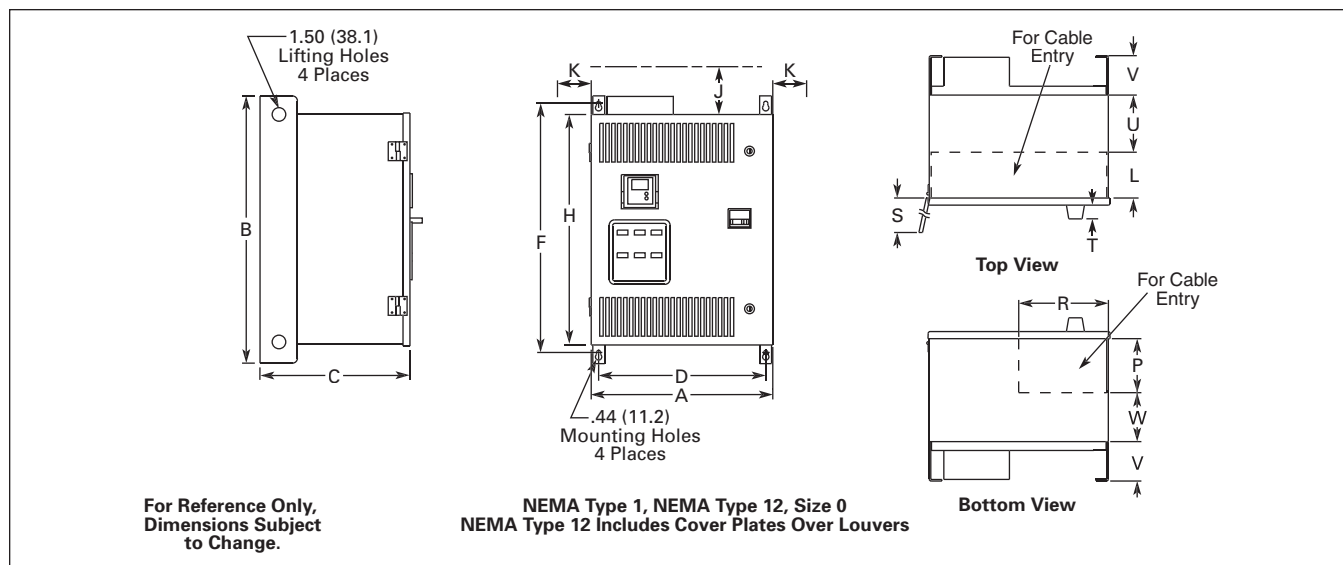


Figure 17. Approximate Dimensions

Table 52. Approximate Dimensions and Shipping Weight — Enclosed Products

Enclosure Size	Dimensions in Inches (mm)												
	Wide A	High B	Deep C	Mounting							H	Min. Air Space	
				D	D1	E	E1	F	G	G1		J	K
1	26.4 (669)	36 (914)	16.3 (414)	24.8 (630)	—	—	—	34.0 (864)	—	—	32.4 (822)	4.0 (102)	3.0 (76)

Table 52. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)														
	Cable Entry					Door Clearance S	T	U	V	W	Floor Stand				
	L	M	N	P	R						X	Y	Z	AA	BB
1	11.0 (279)	6.0 (152)	9.0 (229)	10.0 (254)	6.5 (165)	26.4 (669)	1.5 (38)	4.3 (108)	—	—	56.0 (1422)	4.3 (108)	11.1 (281)	1.8 (46)	0.8 (19)

Table 52. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)														
	Floor Stand											RR	SS	TT	UU
	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP				
1	26.0 (660)	3.5 (90)	5.5 (141)	3.0 (76)	6.0 (152)	2.0 (51)	5.4 (136)	1.1 (28)	8.8 (224)	5.4 (137)	—	—	—	—	—

Max. Approx. Ship. Wt. Lbs. (kg)

230 (104)

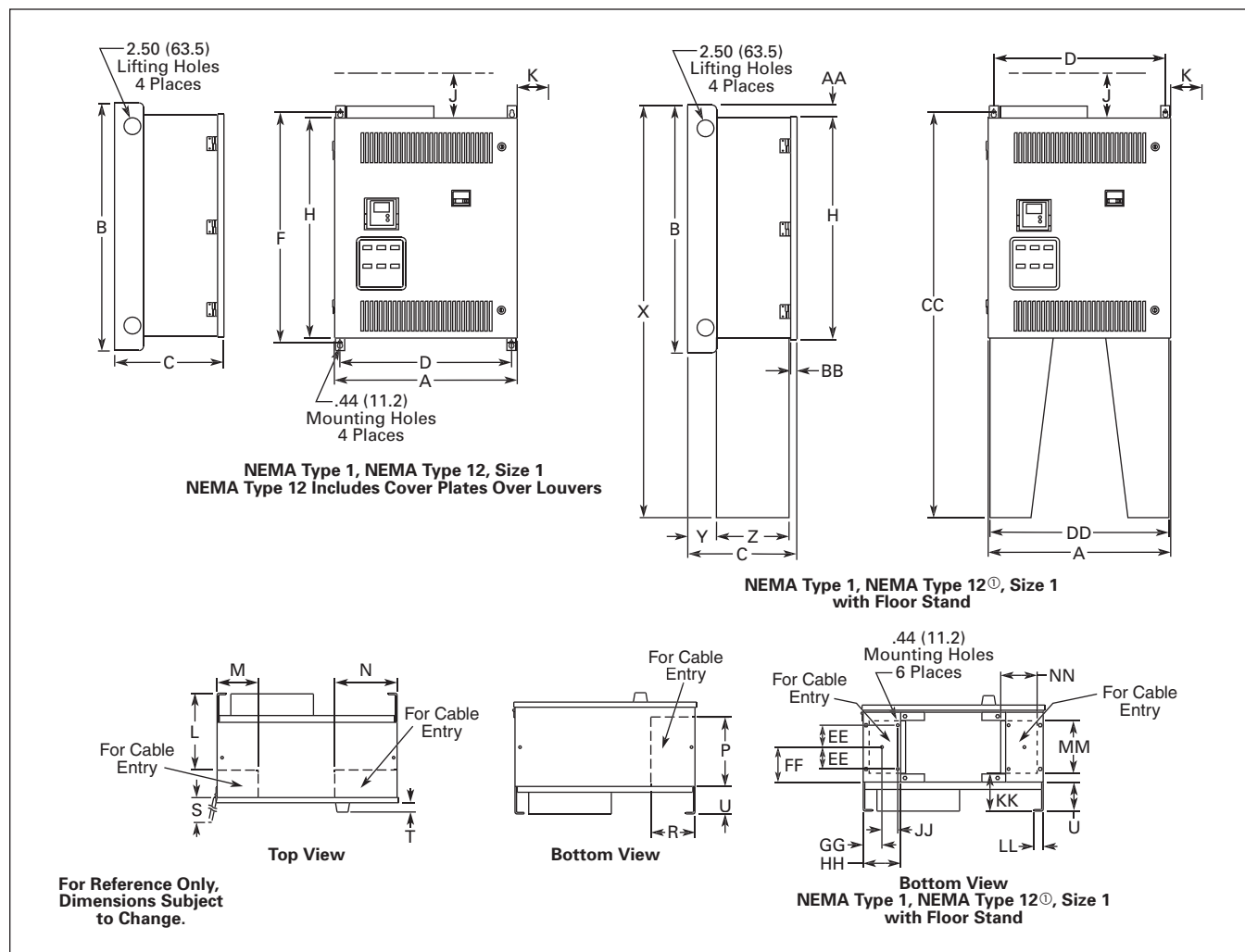


Figure 18. Approximate Dimensions

Table 53. Approximate Dimensions and Shipping Weight — Enclosed Products

Enclosure Size	Dimensions in Inches (mm)											Min. Air Space	
	Wide A	High B	Deep C	Mounting							H		
				D	D1	E	E1	F	G	G1		J	K
2	26.4 (669)	59.0 (1499)	19.4 (492)	24.8 (630)	—	—	—	57.0 (1448)	—	—	55.4 (1406)	4.0 (102)	3.0 (76)

Table 53. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)															
	Cable Entry					Door Clearance S	T	U	V	W	Floor Stand					
	L	M	N	P	R						X	Y	Z	AA	BB	CC
2	5.9 (149)	—	—	12.4 (315)	9.5 (241)	26.4 (669)	1.5 (38)	4.8 (121)	5.9 (151)	—	69.0 (1753)	4.8 (121)	13.6 (344)	1.8 (46)	.8 (19)	68.2 (1732)

Table 53. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)															Max. Approx. Ship. Wt Lbs. (kg)	
	Floor Stand											RR	SS	TT	UU		VV
	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP						
2	26.0 (660)	4.8 (121)	6.8 (172)	3.0 (76)	6.0 (152)	2.0 (51)	5.0 (127)	1.1 (28)	11.3 (288)	79.0 (2007)	78.2 (1986)	—	—	—	—	380 (173)	

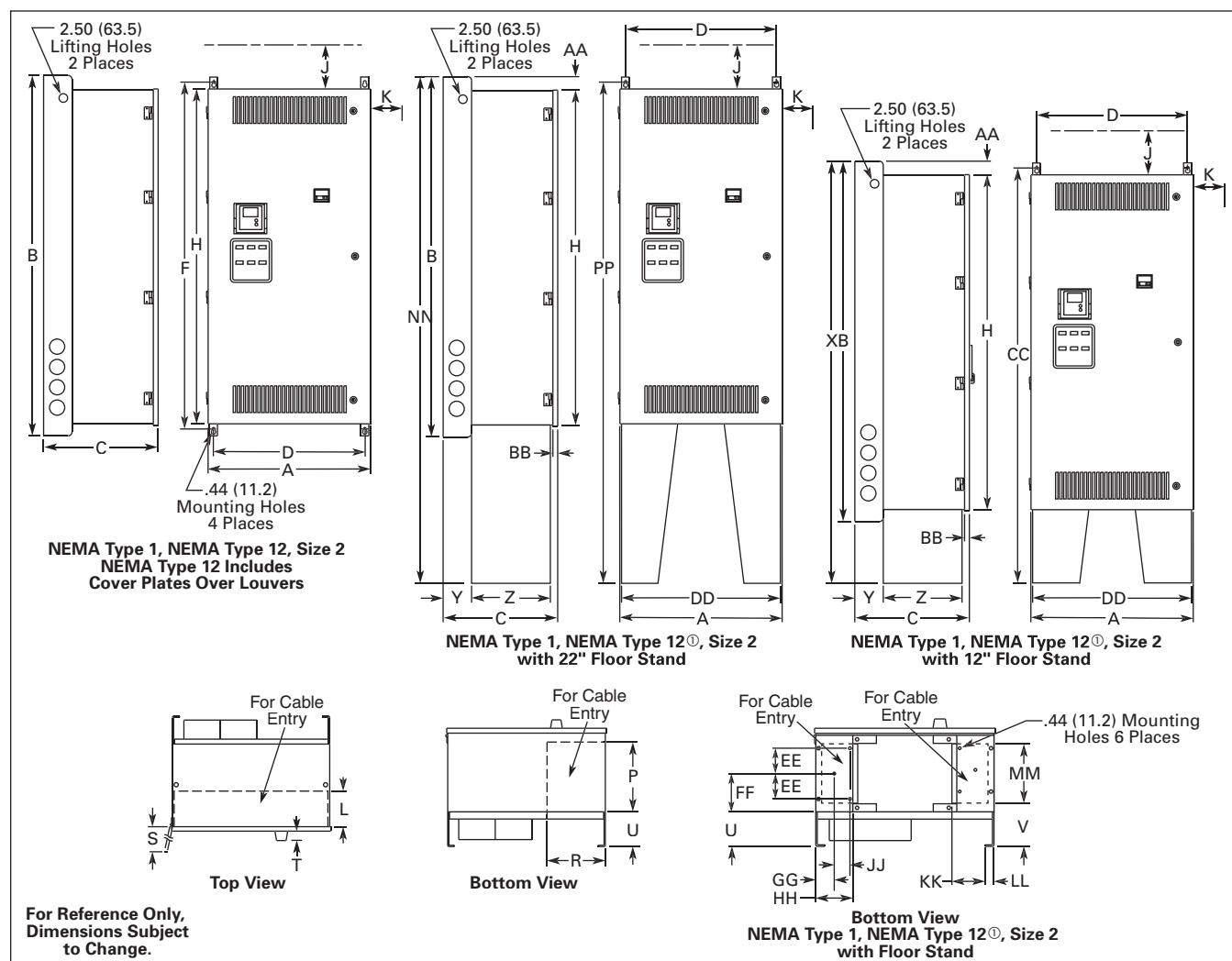


Figure 19. Approximate Dimensions

Table 54. Approximate Dimensions and Shipping Weight — Enclosed Products

Enclosure Size	Dimensions in Inches (mm)												
	Wide A	High B	Deep C	Mounting							H	Min. Air Space	
				D	D1	E	E1	F	G	G1		J	K
3	26.4 (671)	77.0 (1956)	19.4 (493)	19.5 (495)	3.3 (83)	23.0 (584)	1.5 (38)	11.7 (298)	5.5 (140.)	.9 (24)	76.4 (1939)	4.0 (102)	3.0 (76)

Table 54. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)															Max. Approx. Ship. Wt. Lbs. (kg)
	Cable Entry					Door Clearance S	T	U	V	W	RR	SS	TT	UU	VV	
	L	M	N	P	R											
3	5.3 (133)	23.4 (594)	10.0 (254)	1.3 (32)	12.9 (328)	26.4 (669)	1.5 (38)	8.0 (203)	4.8 (121)	6.8 (173)	79.5 (2018)	13.4 (340)	.8 (19)	1.3 (32)	26.0 (660)	690 (313)

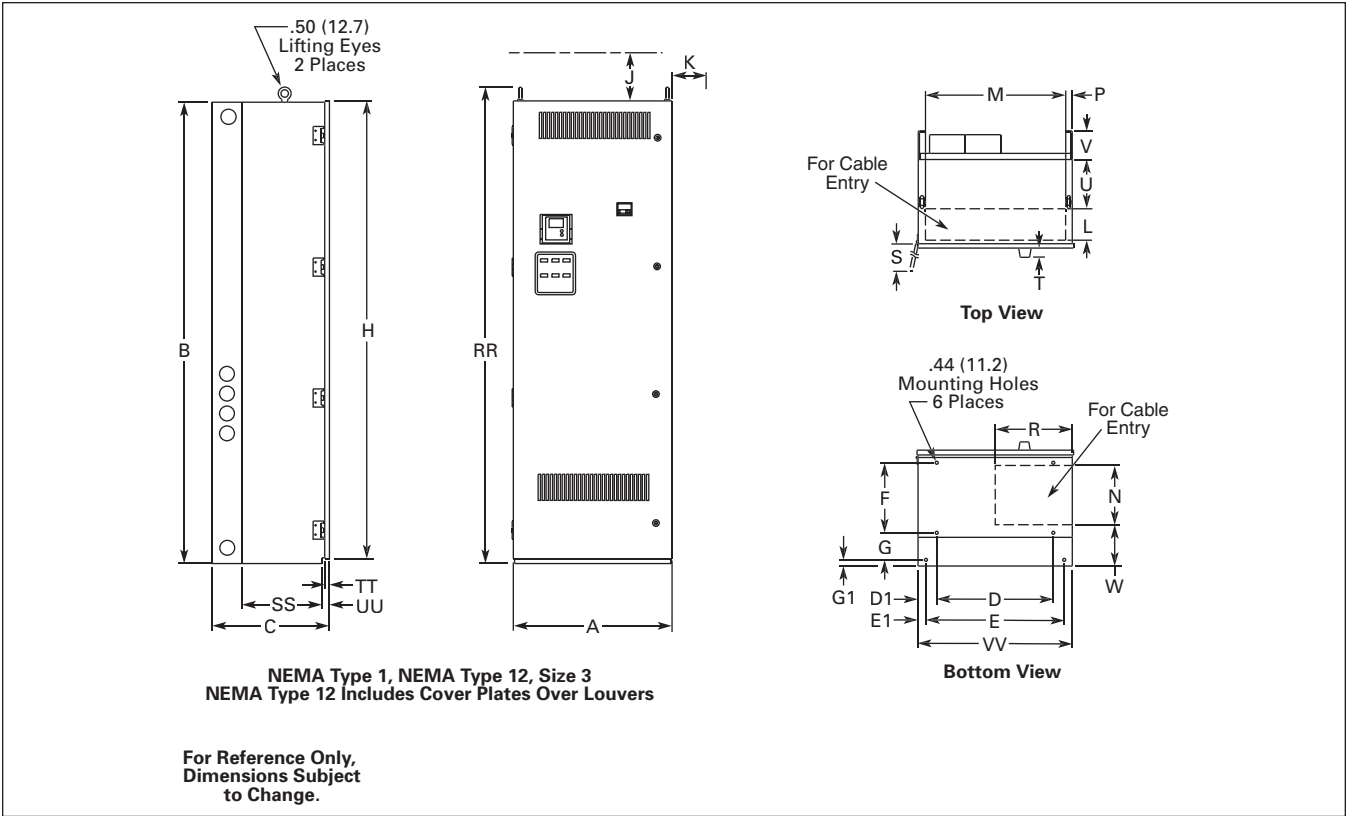


Figure 20. Approximate Dimensions

Table 55. Approximate Dimensions and Shipping Weight — Enclosed Products

Enclosure Size	Dimensions in Inches (mm)												
	Wide A	High B	Deep C	Mounting							H	Min. Air Space	
				D	D1	E	E1	F	G	G1		J	K
4	26.4 (671)	90.0 (2286)	19.4 (493)	19.5 (495)	3.3 (83)	23.0 (584)	1.5 (38)	11.7 (298)	5.5 (140)	.9 (24)	89.4 (2270)	4.0 (102)	3.0 (76)

Table 55. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)														Max. Approx. Ship. Wt. Lbs. (kg)	
	Cable Entry					Door Clearance S	T	U	V	W	RR	SS	TT	UU		VV
	L	M	N	P	R											
4	5.3 (133)	23.4 (594)	13.8 (351)	1.0 (25)	11.2 (286)	26.4 (669)	1.5 (38)	8.0 (204)	4.8 (121)	—	92.5 (2349)	.8 (19)	1.3 (32)	—	—	825 (375)

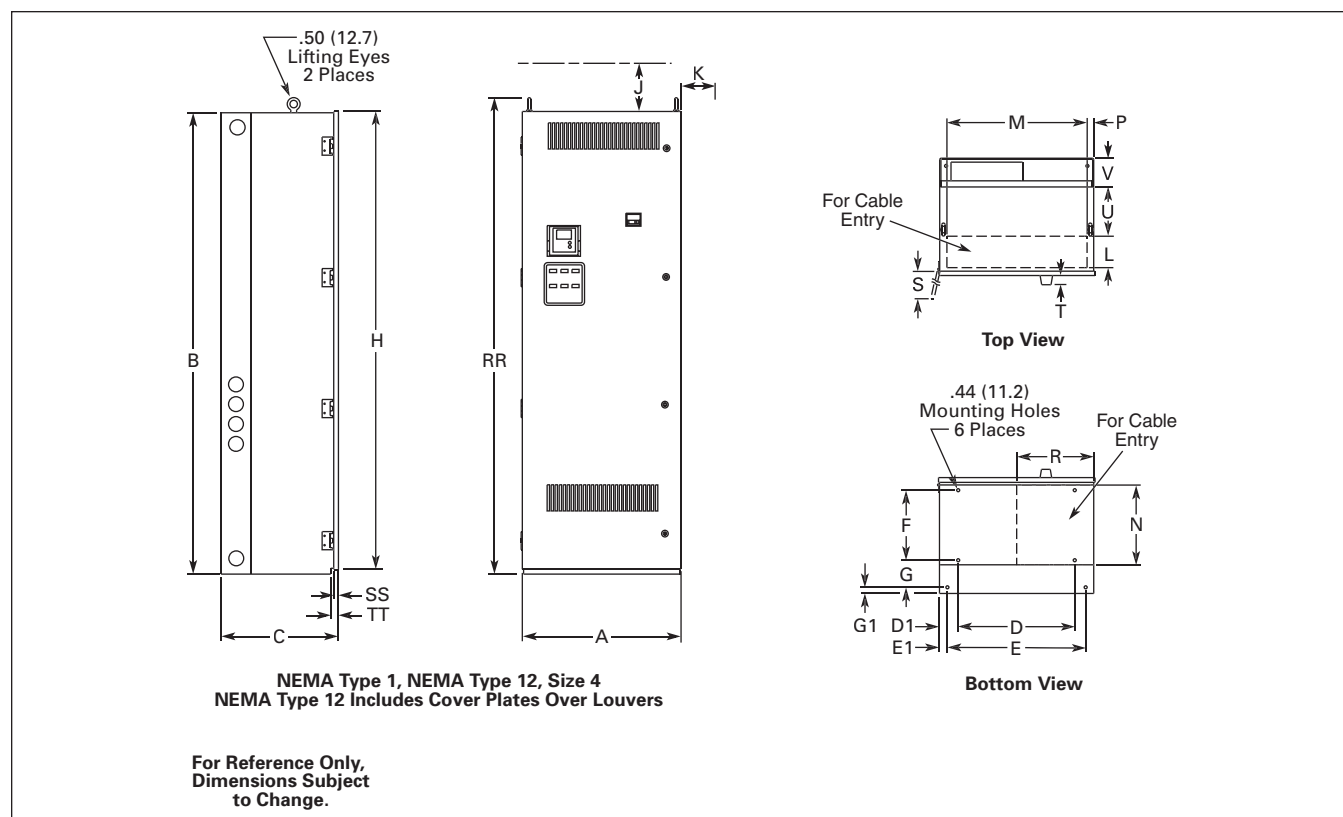


Figure 21. Approximate Dimensions

Table 56. Approximate Dimensions and Shipping Weight — Enclosed Products ①

Enclosure Size	Dimensions in Inches (mm)											Min. Air Space	
	Wide A	High B	Deep C	Mounting							H		
				D	D1	E	E1	F	G	G1		J	K
5	40.0 (1016)	90.0 (2286)	21.3 (541)	36.0 (914)	2.0 (51)	—	—	8.0 (203)	10.8 (273)	—	84.4 (2143)	4.0 (102)	—

Table 56. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)														Max. Approx. Ship. Wt. Lbs. (kg)	
	Cable Entry					Door Clearance S	T	U	V	W	RR	SS	TT	UU		VV
	L	M	N	P	R											
5	15.0 (381)	10.0 (254)	4.8 (122)	2.0 (51)	—	36.3 (921)	20.0 (508)	—	—	—	94.0 (2387)	15.5 (394)	—	—	—	1275 (579)

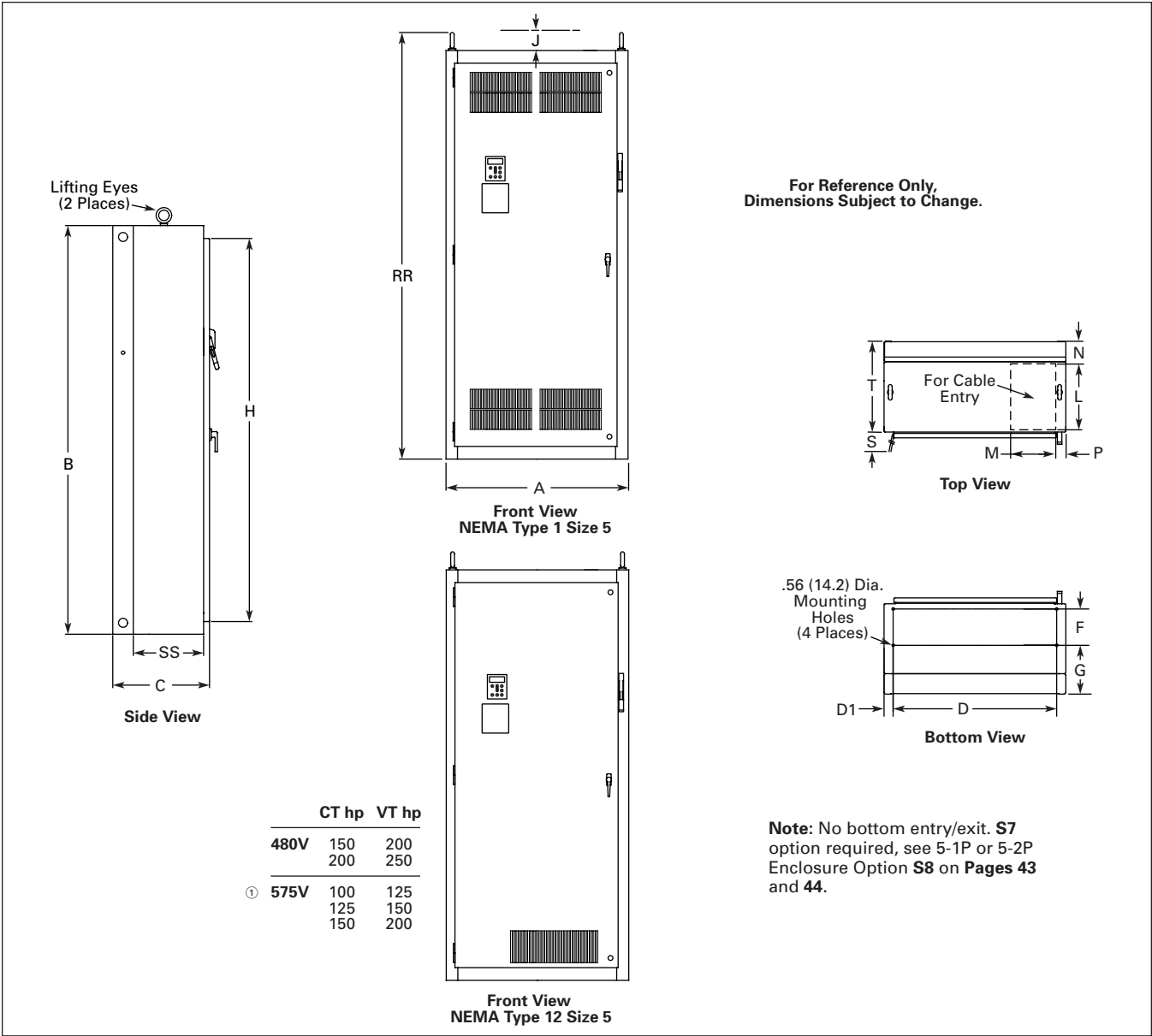


Figure 22. Approximate Dimensions

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Table 57. Approximate Dimensions and Shipping Weight — Enclosed Products ①

Enclosure Size	Dimensions in Inches (mm)			Mounting							H	Min. Air Space	
	Wide A	High B	Deep C	D	D1	E	E1	F	G	G1		J	K
5-1P	50.0 (1270)	90.0 (2286)	21.3 (541)	36.0 (914)	2.0 (51)	—	—	8.0 (203)	10.8 (273)	—	84.4 (2143)	4.0 (102)	—

Table 57. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)															Max. Approx. Ship. Wt. Lbs. (kg)
	Cable Entry					Door Clearance S	T	U	V	W	RR	SS	TT	UU	VV	
	L	M	N	P	R											
5-1P	17.1 (435)	8.0 (203)	1.3 (33)	1.0 (25)	—	36.3 (921)	20.0 (508)	18.4 (466)	1.3 (32)	—	94.0 (2387)	15.5 (394)	—	—	—	1375 (624)

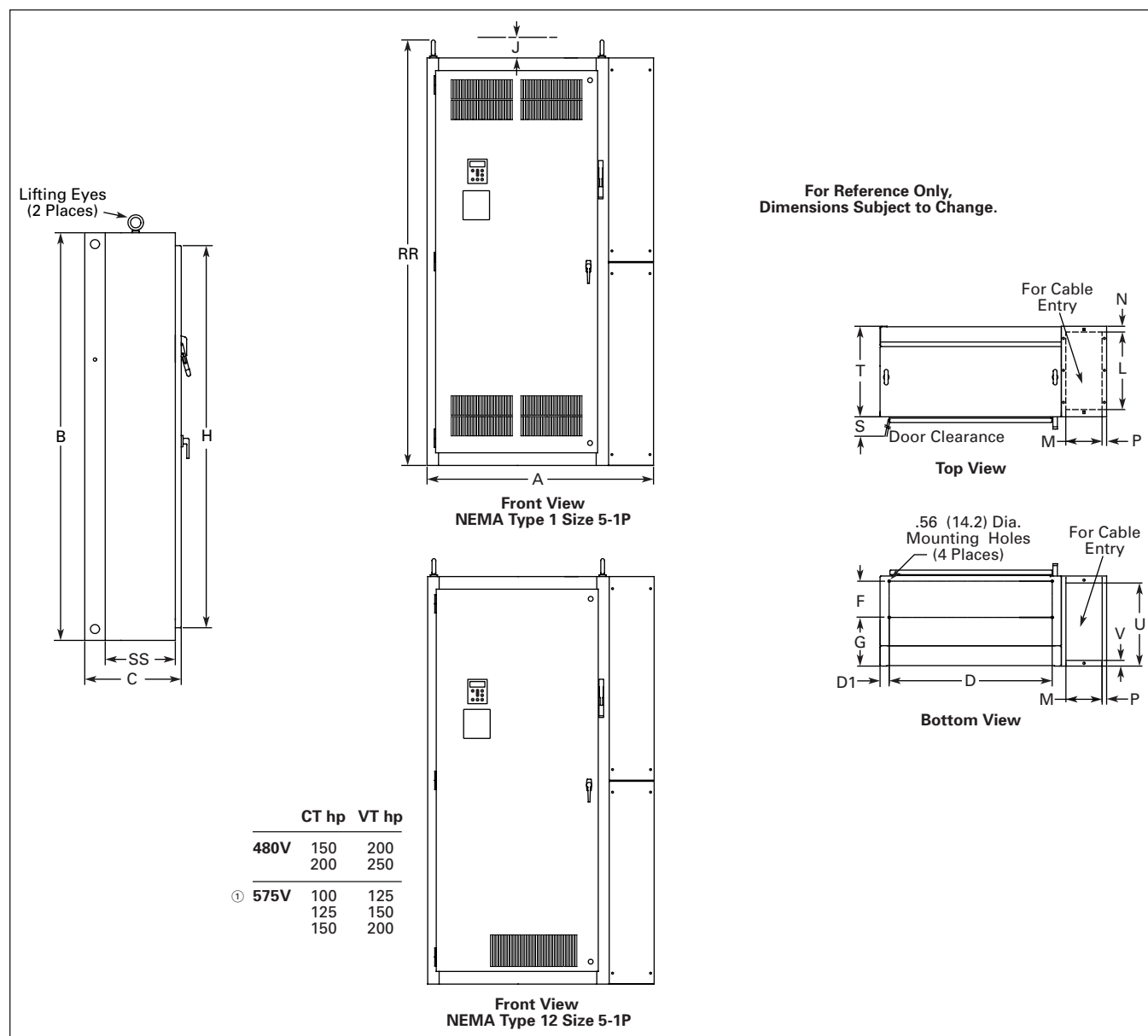


Figure 23. Approximate Dimensions

① Future release.

Table 58. Approximate Dimensions and Shipping Weight — Enclosed Products ①

Enclosure Size	Dimensions in Inches (mm)											Min. Air Space	
	Wide A	High B	Deep C	Mounting							H	J	K
				D	D1	E	E1	F	G	G1			
5-2P	60.0 (1524)	90.0 (2286)	21.3 (541)	36.0 (914)	2.0 (51)	—	—	8.0 (203)	10.8 (273)	—	84.4 (2143)	4.0 (102)	—

Table 58. Approximate Dimensions and Shipping Weight — Enclosed Products (Continued)

Enclosure Size	Dimensions in Inches (mm)														Max. Approx. Ship. Wt. Lbs. (kg)	
	Cable Entry					Door Clearance S	T	U	V	W	RR	SS	TT	UU		VV
	L	M	N	P	R											
5-2P	17.0 (432)	18.0 (457)	1.5 (38)	1.0 (25)	.9 (23)	36.3 (921)	20.0 (508)	18.4 (466)	1.3 (32)	—	94.0 (2387)	15.5 (394)	—	—	—	1585 (720)

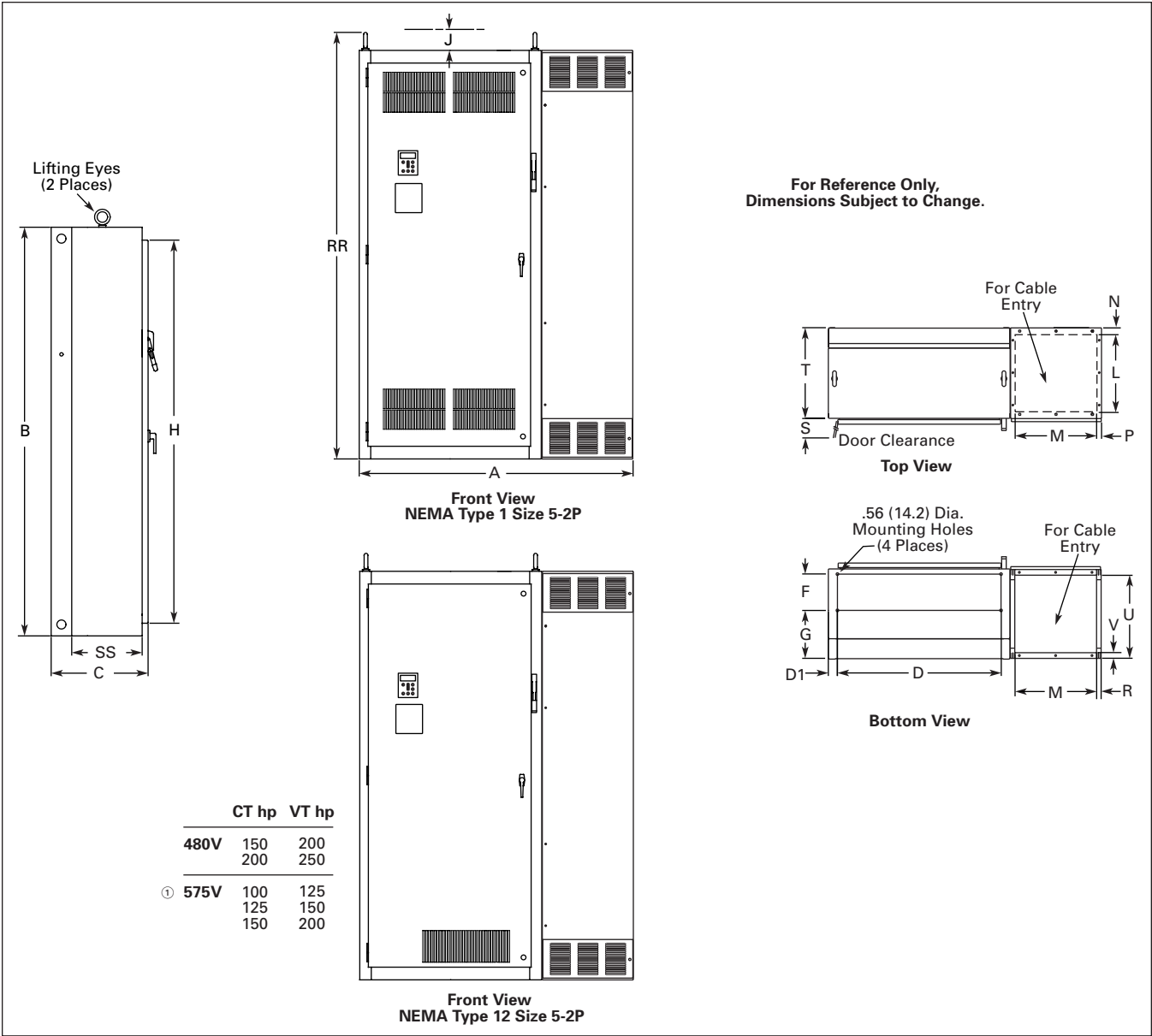


Figure 24. Approximate Dimensions

① Future release.

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