

#### Motor Protection

##### DV/DT and Peak Motor Voltage Solutions

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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.

- **MotoRx** This 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 ft 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.

#### Product Availability Codes

Code	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

SVX9000 Series Adjustable Frequency Drives from Eaton's electrical sector 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 I<sub>H</sub> 480V, 100 hp I<sub>H</sub> 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/ IP54 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
- Hand-held auxiliary 24V 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/IP21 and NEMA Type 12/IP54 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

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## Adjustable Frequency Drives

### SVX9000 Drives

#### Standards and Certifications

##### Product

- IEC 61800-2

##### EMC (At Default Settings)

- Immunity: Fulfills all EMC immunity requirements;
- Emissions: EN 61800-3, LEVEL H

##### Safety

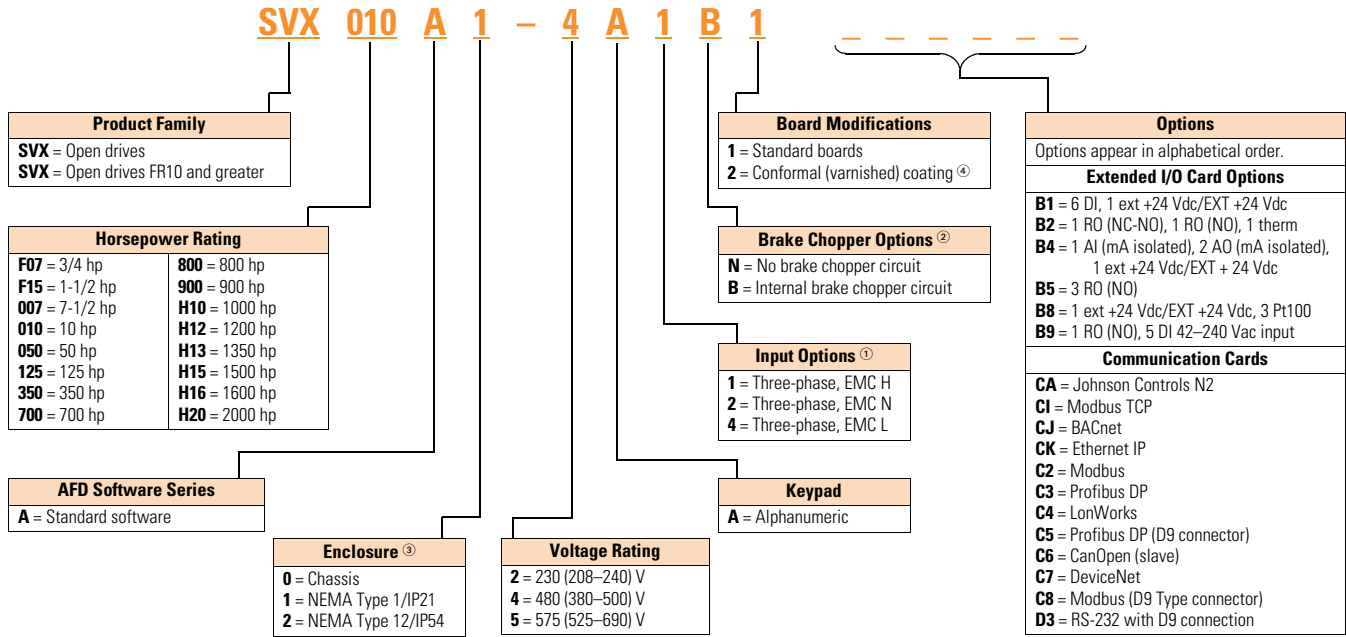
- UL 508C



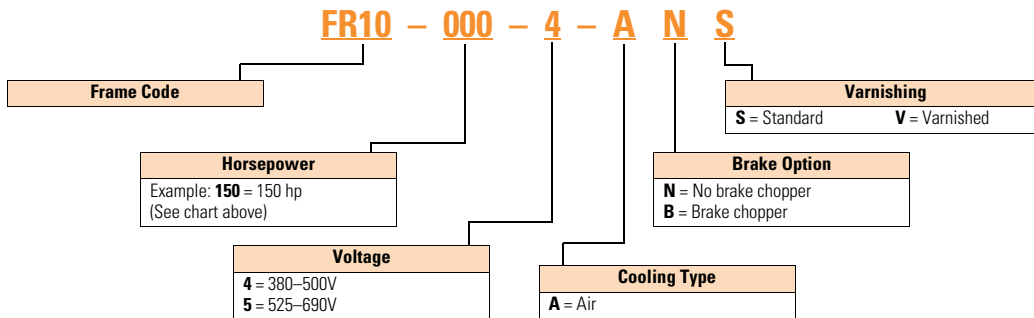
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#### Catalog Number Selection

##### SVX9000 Adjustable Frequency Drives



#### Power Module



#### Notes

- All 230V drives and 480V drives up to 200 hp (IH) are only available with input option 1 (EMC Level H). 480V drives 250 hp (IH) or larger are available with input option 2 (EMC Level N). 480V drives are available with input option 4 (EMC Level L). 575V drives 200 hp (IH) or larger are only available with input option 2. 575V drives up to 150 hp (IH) are only available with input option 4 (EMC Level L).
- 480V drives up to 30 hp (IH) are only available with brake chopper option B. 480V drives 40 hp (IH) or larger come standard with brake chopper option N. 230V drives up to 15 hp (IH) 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). N = No brake chopper.
- 480V drives 250 hp (I<sub>H</sub>) and larger are available with enclosure style 0 (chassis); 690V drives 200 hp (I<sub>H</sub>) and larger are available with enclosure style 0 (chassis).
- Factory promise delivery. Consult sales office for availability.

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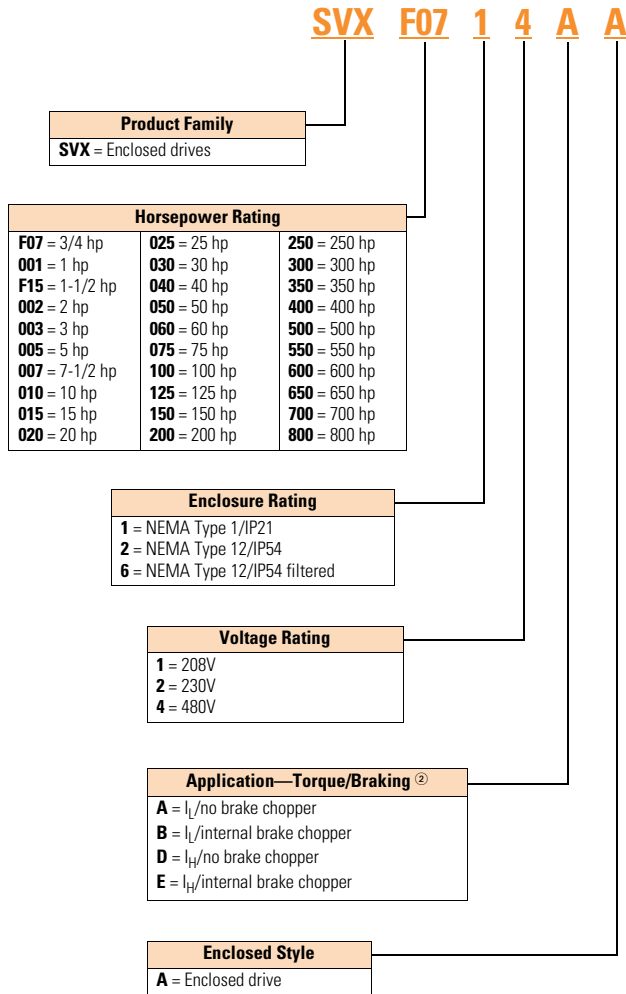
## Adjustable Frequency Drives

### SVX9000 Drives

#### Catalog Number Selection

#### SVX9000 Enclosed NEMA Type 1/IP21 and NEMA Type 12/IP54 Drives

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Build Alphabetically and Numerically

Enclosed Options <sup>①④⑤</sup>		Type
<b>K1</b>	Door-mounted speed potentiometer <sup>③</sup>	Control
<b>K2</b>	Door-mounted speed potentiometer with HOA selector switch <sup>③</sup>	Control
<b>K3</b>	3–15 psig follower	Control
<b>K4</b>	HAND/OFF/AUTO switch (22 mm)	Control
<b>K5</b>	MANUAL/AUTO ref switch (22 mm)	Control
<b>K6</b>	START/STOP pushbuttons (22 mm)	Control
<b>KB</b>	115V control transformer (550 VA)	Control
<b>KF</b>	Bypass test switch for RA and RB	Add. bypass
<b>KO</b>	Standard elapsed time meter	Control
<b>L1</b>	Power on and fault pilot lights	Light
<b>L2</b>	Bypass pilot lights for RA, RB bypass options	Add. bypass
<b>LA</b>	Green RUN light (22 mm)	Light
<b>LD</b>	Green STOP light (22 mm)	Light
<b>LE</b>	Red RUN light	Light
<b>LF</b>	Red STOP light (22 mm)	Light
<b>LJ</b>	White power on light (22 mm)	Light
<b>LU</b>	Misc. light (22 mm)	Light
<b>P1</b>	Input disconnect (HMCP) 100 kAIC	Input
<b>P2</b>	Disconnect switch <sup>②</sup>	Input
<b>P3</b>	Input line fuses (200 kAIC)	Input
<b>P7</b>	Input power surge protection	Input
<b>PE</b>	Output contactor	Output
<b>PF</b>	Output filter	Output
<b>PG</b>	MotoRx (up to 600 ft) 1000 V/ $\mu$ S DV/DT filter	Output
<b>PH</b>	Single overload relay	Output
<b>PI</b>	Dual overload relays	Output
<b>PN</b>	Dual overloads for bypass	Add. bypass
<b>RA</b>	Manual HOA bypass controller	Bypass
<b>RB</b>	Manual IOB bypass controller	Bypass
<b>RC</b>	Auto transfer HOA bypass controller	Bypass
<b>RD</b>	Auto transfer IOB bypass controller	Bypass
<b>S5</b>	Floor stand 22 in	Enclosure
<b>S6</b>	Floor stand 12 in	Enclosure
<b>S7</b>	10 in expansion	Enclosure
<b>S8</b>	20 in expansion	Enclosure
<b>S9</b>	Space heater	Enclosure
Communication Options <sup>⑥</sup>		
<b>C2</b> = Modbus	<b>C6</b> = CanOpen (slave)	<b>CA</b> = Johnson Controls N2
<b>C3</b> = Profibus DP	<b>C7</b> = DeviceNet	<b>CI</b> = Modbus TCP
<b>C4</b> = LonWorks	<b>C8</b> = Modbus (D9 type connector)	<b>CJ</b> = BACnet
<b>C5</b> = Profibus DP (D9 connector)		<b>CK</b> = Ethernet IP
		<b>C3</b> = RS-232 with D9 connection
Control Options		
<b>B1</b> = 6 DI, 1 ext +24 Vdc/EXT +24 Vdc	<b>B5</b> = 3 RO (NO)	
<b>B2</b> = 1 RO (NC-NO), 1 RO (NO), 1 therm	<b>B8</b> = 1 ext +24 Vdc/EXT +24 Vdc, 3 Pt100	
<b>B4</b> = 1 AI (mA isolated), 2 AO (mA isolated), 1 ext +24 Vdc/EXT +24 Vdc	<b>B9</b> = 1 RO (NO), 5 DI 42–240 Vac input	
Engineered Options		
<b>HT</b>	High temperature rating for 50°C (FR10 and above) <sup>⑥</sup>	
<b>VB</b>	Varnished boards	

#### Notes

- ① Local/remote keypad is included as the standard control panel.
- ② Brake chopper is a factory installed option only, see drive options on **Page V6-T2-18**. External dynamic braking resistors not included. Consult factory.
- ③ Includes local/remote speed reference switch.
- ④ Some options are voltage and/or horsepower specific. Consult your Eaton representative for details.
- ⑤ See **Pages V6-T2-61** and **V6-T2-62** for descriptions.
- ⑥ See **Pages V6-T2-59** and **V6-T2-60** for complete descriptions.
- ⑦ Applicable only with FR10 and FR11 freestanding designs.
- ⑧ Consult Eaton for availability.

**Control/Communication Option Descriptions**

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

**Available Control/Communications Options**

Option	Description	Option Type
<b>K1</b>	<b>Door-Mounted Speed Potentiometer</b> —Provides the SVX9000 with the ability to adjust the frequency reference using a door-mounted potentiometer. This option uses the 10 Vdc 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 two-position switch (labeled local/remote) is provided on the keypad to select speed reference from the speed potentiometer or a remote speed signal.	Control
<b>K2</b>	<b>Door-Mounted Speed Potentiometer with HOA Selector Switch</b> —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 drive run and speed control commands are via user-supplied dry contact and 4–20 mA signal.	Control
<b>K3</b>	<b>3–15 PSIG Follower</b> —Provides a pneumatic transducer which converts a 3–15 psig pneumatic signal to either 0–8 Vdc or a 1–9 Vdc 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 in (6.4 mm) brass tube union.	Control
<b>K4</b>	<b>HAND/OFF/AUTO Switch for Non-Bypass Configurations</b> —Provides a three-position selector switch that allows the user to select either a HAND or AUTO mode of operation. HAND mode is defaulted to k (keypad operation, and AUTO mode is defaulted to control from an external terminal source. These modes of operation can be configured via programming to allow for alternate combinations of start and speed sources. Start and speed sources include keypad, I/O and fieldbus.	Control
<b>K5</b>	<b>MANUAL/AUTO Speed Reference Switch</b> —Provides a door-mounted selector switch for MANUAL/AUTO speed reference.	Control
<b>K6</b>	<b>START/STOP Pushbuttons</b> —Provide door-mounted START and STOP pushbuttons for either bypass or non-bypass configurations.	Control
<b>KB</b>	<b>115V Control Transformer, 550 VA</b> —Provides a fused control power transformer with additional 550 VA at 115V for customer use.	Control
<b>KF</b>	<b>Bypass Test Switch for RB and RA</b> —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
<b>K0</b>	<b>Standard Elapsed Time Meter</b> —Provides a door-mounted elapsed run time meter.	Control
<b>L1</b>	<b>Power On and Fault Pilot Lights</b> —Provide a white power on light that indicates power to the enclosed cabinet and a red fault light that indicates a drive fault has occurred.	Light
<b>L2</b>	<b>Bypass Pilot Lights for RB, RA Bypass Options</b> —A green light indicates when the motor is running in inverter mode and an amber light that indicates when the motor is running in bypass mode. The lights are mounted on the enclosure door, above the switches.	Addl. bypass
<b>LA</b>	<b>Green RUN Light (22 mm)</b> —Provides a green run light that indicates the drive is running.	Light
<b>LD</b>	<b>Green STOP Light (22 mm)</b> —Provides a green light that indicates the drive is stopped.	Light
<b>LE</b>	<b>Red RUN Pilot Light (22 mm)</b> —Provides a red run pilot light that indicates the drive is running.	Light
<b>LF</b>	<b>Red STOP Light (22 mm)</b> —Provides a red stop light that indicates the drive is stopped.	Light
<b>LJ</b>	<b>White Power On Light (22 mm)</b> —The 22 mm white light that illuminates when the drive assembly is powered.	Light
<b>LU</b>	<b>Misc. Light (22 mm)</b> —Provides a misc. "user defined" pilot light. User to define light function and color.	Light
<b>P1</b>	<b>Input Disconnect Assembly Rated to 100 kAIC</b> —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
<b>P2</b>	<b>Disconnect Switch</b> —Disconnect switch option is applicable only with NEMA Type 1/IP21 and NEMA Type 12/IP54 freestanding drives. 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
<b>P3</b>	<b>Input Line Fuses Rated to 200 kAIC</b> —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
<b>P7</b>	<b>MOV Surge Suppressor</b> —Provides a Metal Oxide Varistor (MOV) connected to the line side terminals and is designed to clip line side transients.	Input
<b>PE</b>	<b>Output Contactor</b> —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, 600 Vac are provided for customer use. Bypass options <b>RB</b> and <b>RA</b> include an output contactor as standard. This option includes a low VA 115 Vac fused control power transformer and is factory mounted in the enclosure.	Output
<b>PF</b>	<b>Output Filter</b> —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
<b>PG</b>	<b>MotoRx (300–600 ft) 1000 V/μS DV/DT Filter</b> —Used to reduce transient voltage (DV/DT) and peak voltages at the motor terminals. This option is comprised of a 0.5% line reactor, followed by capacitive filtering and an energy recovery/clamping circuit. Unlike the output filter (See option <b>PF</b> ), 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 ft (91–183m). <i>This option can not be used with the brake chopper circuit. The output filter (option <b>PF</b>) should be investigated as an alternative.</i>	Output
<b>PH</b>	<b>Single Overload Relay</b> —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

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

## 2 Available Control/Communications Options, continued

Option	Description	Option Type
PI	<b>Dual Overload Relays</b> —This option is recommended when a single drive is operating two 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	<b>Dual Overloads for Bypass</b> —This option is recommended when a single drive is operating two 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
RA	<b>Manual HOA Bypass Controller</b> —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 <b>Page V6-T2-66</b> ).	Bypass
RB	<b>Manual IOB Bypass Controller</b> —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 <b>Page V6-T2-66</b> ).	Bypass
RC	<b>Auto Transfer HOA Bypass Controller</b> —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 <b>Page V6-T2-66</b> ). 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. <b>WARNING:</b> 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	<b>Auto Transfer IOB Bypass Controller</b> —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 <b>Page V6-T2-66</b> ). 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. <b>WARNING:</b> 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	<b>Floor Stand 22 in</b> —Converts a Size 1 or 2, normally wall mounted enclosure to a floor standing enclosure with a height of 22 in (558.8 mm).	Enclosure
S6	<b>Floor Stand 12 in</b> —Converts a Size 2, normally wall mounted enclosure to a floor standing enclosure with a height of 12 in (304.8 mm).	Enclosure
S7	<b>10 in Expansion</b> —In a Size 5 enclosure, the extension allows for bottom cable entry and additional space for customer mounted components. <b>NOTE:</b> Enclosure expansion rated NEMA Type 1/IP21 only.	Enclosure
S8	<b>20 in Expansion</b> —In a Size 5 enclosure, the extension allows for bottom cable entry and additional space for customer mounted components. When the output filter (option <b>PF</b> ) is selected for a drive using a Size 5 enclosure, this expansion box is required and included in the option pricing. Enclosure expansion rated NEMA Type 1/IP21 only.	Enclosure
S9	<b>Space Heater</b> —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

**Enclosed Drive Options****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.

For brake chopper circuit selection and adder—NEMA Type 1/IP21, NEMA Type 12/IP54, consult the factory.

**Conformal (Varnished) Coating** <sup>②</sup>

Chassis Frame	Delivery Code
FR4	FP
FR5	FP
FR6	FP
FR7	FP
FR8	FP
FR9	FP
FR10	FP
FR11	FP
FR12	FP
FR13	FP
FR14	FP

**208V and 230V Control Options—3/4–100 hp** <sup>③</sup>

Description	Catalog Number Suffix
Door-mounted speed potentiometer	<b>K1</b>
Door-mounted speed potentiometer with HOA selector switch	<b>K2</b>
3–15 psig follower	<b>K3</b>
HAND/OFF/AUTO switch (22 mm)	<b>K4</b>
MANUAL/AUTO ref switch (22 mm)	<b>K5</b>
START/STOP pushbuttons (22 mm)	<b>K6</b>
115 Volt control transformer 550 VA	<b>KB</b>
Standard elapsed time meter	<b>K0</b>

**480V Control Options—1–800 hp** <sup>③</sup>

Description	Catalog Number Suffix
Door-mounted speed potentiometer	<b>K1</b>
Door-mounted speed potentiometer with HOA selector switch	<b>K2</b>
3–15 psig follower	<b>K3</b>
HAND/OFF/AUTO switch (22 mm)	<b>K4</b>
MANUAL/AUTO ref switch (22 mm)	<b>K5</b>
START/STOP pushbuttons (22 mm)	<b>K6</b>
115 Volt control transformer 550 VA	<b>KB</b>
Standard elapsed time meter	<b>K0</b>

**208V and 230V Light Options—3/4–100 hp** <sup>③</sup>

Description	Catalog Number Suffix
Power on/fault pilot lights (22 mm)	<b>L1</b>
Green RUN light (22 mm)	<b>LA</b>
Green STOP light (22 mm)	<b>LD</b>
Red RUN light (22 mm)	<b>LE</b>
Red STOP light (22 mm)	<b>LF</b>
Power on light (22 mm)	<b>LJ</b>
Misc. light (22 mm)	<b>LU</b>

**480V Light Options—1–800 hp** <sup>③</sup>

Description	Catalog Number Suffix
Power on/fault pilot lights (22 mm)	<b>L1</b>
Green RUN light (22 mm)	<b>LA</b>
Green STOP light (22 mm)	<b>LD</b>
Red RUN light (22 mm)	<b>LE</b>
Red STOP light (22 mm)	<b>LF</b>
Power on light (22 mm)	<b>LJ</b>
Misc. light (22 mm)	<b>LU</b>

**Notes**

- ① External dynamic braking resistors not included. Consult factory.  
 ② See Product Selection on **Pages V6-T2-55 to V6-T2-58**, 208V, 230V and 480V. Consult the factory for adder.  
 ③ Consult factory for adder information.

# 2.3

## Adjustable Frequency Drives

### SVX9000 Drives

2

#### 208V and 230V Bypass Options, 3/4–100 hp <sup>①②</sup>

Description	Catalog Number Suffix
Bypass test switch for RA, RB (and RC, RD—230V)	<b>KF</b>
Bypass pilot lights for RA, RB options	<b>L2</b>
Dual overloads for bypass	<b>PN</b>
Manual HOA bypass controller	<b>RA</b>
Manual IOB bypass controller	<b>RB</b>
Auto transfer HOA bypass controller	<b>RC</b>
Auto transfer IOB bypass controller	<b>RD</b>

#### 480V Bypass Options, 1–800 hp <sup>①②</sup>

Description	Catalog Number Suffix
Bypass test switch for RA, RB, RC, RD	<b>KF</b>
Bypass pilot lights for RA, RB options	<b>L2</b>
Dual overloads for bypass	<b>PN</b>
Manual HOA bypass controller	<b>RA</b>
Manual IOB bypass controller	<b>RB</b>
Auto transfer HOA bypass controller	<b>RC</b>
Auto transfer IOB bypass controller	<b>RD</b>

#### 208V and 230V Enclosure Options, Sizes 0–5 <sup>②</sup>

Description	Catalog Number Suffix
Floor stand 22 in (558.8 mm)	<b>S5</b>
Floor stand 12 in (304.8 mm)	<b>S6</b>
10 in (254 mm) expansion <sup>③</sup>	<b>S7</b>
20 in (508 mm) expansion	<b>S8</b>
Space heater <sup>④</sup>	<b>S9</b>

#### 480V Enclosure Options, Sizes 0–9 <sup>②</sup>

Description	Catalog Number Suffix
Floor stand 22 in (558.8 mm)	<b>S5</b>
Floor stand 12 in (304.8 mm)	<b>S6</b>
10 in (254 mm) expansion <sup>③</sup>	<b>S7</b>
20 in (508 mm) expansion	<b>S8</b>
Space heater <sup>④</sup>	<b>S9</b>

#### Notes

- ① See **Page V6-T2-62** for details.
- ② Consult factory for adder information.
- ③ See **Page V6-T2-67** for dimensions.
- ④ Requires customer supplied 115 Vac supply.
- ⑤ Not required for 208V and 230V applications.
- ⑥ Output filter may be required whenever the distance from the drive to the motor exceeds 100 ft (30m). Refer to **Page V6-T2-61**, option **PF** for further details.”.
- ⑦ Heater packs not included.
- ⑧ Applicable with FR10 and FR11 freestanding designs only.

#### 208V and 230V Power Options, 3/4–100 hp <sup>②</sup>

Description	Catalog Number Suffix
<b>Input</b>	
Input disconnect (HMCP) 100 kAIC	<b>P1</b>
Input line fuses 200 kAIC	<b>P3</b>
Input power surge protection	<b>P7</b>
<b>Output</b>	
Output contactor	<b>PE</b>
Output filter <sup>⑤⑥</sup>	<b>PF</b>
MotoRx (300–600 ft) 1000 V/μs DV/DT filter <sup>⑥</sup>	<b>PG</b>
Single overload relay <sup>⑦</sup>	<b>PH</b>
Dual overload relays <sup>⑦</sup>	<b>PI</b>

#### 480V Power Options, 1–800 hp <sup>②</sup>

Description	Catalog Number Suffix
<b>Input</b>	
Input disconnect (HMCP) 100 kAIC	<b>P1</b>
Input line fuses 200 kAIC	<b>P3</b>
Input power surge protection	<b>P7</b>
<b>Output</b>	
Output contactor	<b>PE</b>
Output filter <sup>⑤⑥</sup>	<b>PF</b>
MotoRx (300–600 ft) 1000 V/μs DV/DT filter <sup>⑥</sup>	<b>PG</b>
Single overload relay <sup>⑦</sup>	<b>PH</b>
Dual overload relays <sup>⑦</sup>	<b>PI</b>

#### Input Options, 250–550 hp <sup>②</sup>

Description	Catalog Number Suffix
<b>480V Only</b>	
Load switch	<b>P2</b> <sup>⑥</sup>



## Technical Data and Specifications

### 9000X Enclosed Drives

Description	NEMA Type 1/IP21 or NEMA Type 12/IP54 Specification
<b>Primary Design Features</b>	
45–66 Hz input frequency	Standard
Output: AC volts maximum	Input voltage base
Output frequency range	0–320 Hz
Initial output current ( $I_H$ )	250% for 2 seconds
Overload (1 minute ( $I_H/I_L$ ))	150%/110%
Enclosure space heater	Optional
Oversize enclosure	Standard
Output contactor	Optional
Bypass motor starter	Optional
Listings	UL, cUL
<b>Protection Features</b>	
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

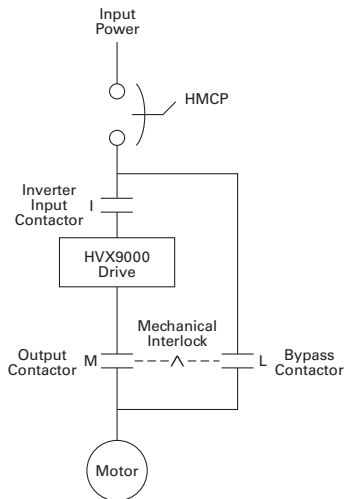
Description	NEMA Type 1/IP21 or NEMA Type 12/IP54 Specification
<b>Input/Output Interface Features</b>	
Setup adjustment provisions	
Remote keypad/display	Standard
Personal computer	Standard
Operator control provisions	
Drive mounted keypad/display	Standard
Remote keypad/display	Standard
Conventional control elements	Standard
Serial communications	Optional
115 Vac control circuit	Optional
Speed setting inputs	
Keypad	Standard
0–10 Vdc potentiometer/voltage signal	Standard
4–20 mA Isolated	Configurable
4–20 mA Differential	Configurable
3–15 psig	Optional
Analog outputs	
Speed/frequency	Standard
Torque/load/current	Programmable
Motor voltage	Programmable
Kilowatts	Programmable
0–10 Vdc signals	Configurable w/jumpers
4–20 mA DC signals	Standard
Isolated signals	Optional
Discrete outputs	
Fault alarm	Standard
Drive running	Standard
Drive at set speed	Programmable
Optional parameters	14
Dry contacts	1 (2 relays Form C)
Open collector outputs	1
Additional discrete outputs	Optional
Communications	
RS-232	Standard
RS-422/485	Optional
DeviceNet™	Optional
Modbus RTU	Optional
CanOpen (slave)	Optional
Profibus-DP	Optional
Lonworks®	Optional
Johnson Controls Metasys™ N2	Optional

#### 9000X Enclosed Drives, continued

Description	NEMA Type 1/IP21 or NEMA Type 12/IP54 Specification
<b>Performance Features</b>	
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
<b>Standard Conditions for Application and Service</b>	
Operating ambient temperature	0 to 40°C
Storage temperature	–40 to 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)	>0.94

#### Wiring Diagram

##### Power Diagram for Bypass Options RB and RA



**Note**

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

#### Standard I/O Specifications

Description	Specification
Six–digital input programmable	24V: "0" ≤10V, "1" ≥18V, R <sub>i</sub> >5 kohms
Two–analog input configurable w/jumpers	Voltage: 0–±10V, R <sub>i</sub> >200 kohms Current: 0 (4)–20 mA, R <sub>i</sub> = 250 ohms
Two–digital output programmable	Form C relays 250 Vac 30 Vdc 2 amp resistive
One–analog output programmable configurable w/jumper	0–20 mA, R <sub>L</sub> max. 500 ohms 10 bits ±2%
One digital output programmable	Open collector 48 Vdc 50 mA

#### I/O Specifications for Control/Communication Options

Description	Specification
Analog voltage, input	0–±10V, R <sub>i</sub> ≥200 kohms
Analog current, input	0 (4)–20 mA, R <sub>i</sub> = 250 ohms
Digital input	24V: "0" ≤10V, "1" ≥18V, R <sub>i</sub> >5 kohms
Auxiliary voltage	24V (±20%), max. 50 mA
Reference voltage	10V ±3%, max. 10 mA
Analog current, output	0 (4)–20 mA, R <sub>L</sub> = 500 kohms resolution 10 bit, accuracy ±2%
Analog voltage, output	0 (2)–10V, R <sub>L</sub> ≥1 kohms, resolution 10 bit, accuracy ±2%
<b>Relay output</b>	
Maximum switching voltage	300 Vdc, 250 Vac
Maximum switching load	8A/24 Vdc, 0.4A/300 Vdc, 2 kVA/250 Vac
Maximum continuous load	2A rms
Thermistor input	R <sub>trip</sub> = 4.7 kohms
Encoder input	24V: "0" ≤10V, "1" ≥18V, R <sub>i</sub> = 2.2 kohms 5V: "0" ≤2V, "1" ≥3V, R <sub>i</sub> = 330 ohms