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SV9000 Series Compact Drive

**Features**

- NEMA Type 1 enclosure (IP20).
- Horsepower range:
  - 200 – 240V — 3/4 to 20 hp CT; 1 to 25 hp VT
  - 380 – 440V — .75 to 22 kW CT; 1.1 to 30 kW VT
  - 440 – 500V — 1 to 30 hp CT; 1-1/2 to 40 hp VT
- Built-in brake chopper
- Built-in line reactor on M4B and M5B frames
- Optimized size with the same features and flexibility as the Standard series
  - I/O configuration is identical
  - Uses the same option cards, keypad and software packages
- Includes seven built-in SVReady software applications

**Standards and Certifications**

- CE
- UL Listed
- cUL Listed

**Technical Data****Table 40-32. Specifications**

Feature Description	SV9000 Standard Drives — Compact NEMA Type 1 (IP20)
<b>Primary Design Features</b>	
1-Phase Input Capability	Optional (derate)
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%
Listings	UL, cUL
CE Mark	Standard

**Protection Features**

Line Reactors	Optional — M3 Frame ① Standard — M4B, M5B ② Frame
Phase Rotation Insensitive	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
Keypad Lockout	Standard
Fault Alarm Output	Standard
Built-In Diagnostics	Standard

**Input/Output Interface Features**

<b>Setup Adjustment Provisions:</b> Drive Mounted Keypad/Display Remote Keypad/Display Personal Computer	Standard Optional Standard
<b>Operator Control Provisions:</b> Drive Mounted Keypad/Display Remote Keypad/Display Conventional Control Elements Serial Communications 115V AC Control Circuit	Standard Optional Standard Standard Optional
<b>Speed Setting Inputs:</b> Keypad Potentiometer/Voltage Signal 4 – 20 mA Isolated 4 – 20 mA Differential 3 – 15 psig	Standard Standard Optional Standard Optional
<b>Analog Outputs:</b> Speed/Frequency Torque/Load/Current Motor Voltage Kilowatts 0 – 10V DC Signals 4 – 20 mA DC Signals Isolated Signals	Standard Programmable Programmable Programmable Optional Standard Optional

① External separately mounted.

② Integral to drive, nominal 3%.

Table 40-32. Specifications (Continued)

Feature Description	SV9000 Standard Drives — Compact NEMA Type 1 (IP20)
<b>Input/Output Interface Features (Continued)</b>	
<b>Discrete Outputs:</b>	
Fault Alarm	Standard
Drive Running	Standard
Drive at Set Speed	Programmable
Optional Parameters	14
Dry Contacts	1
Open Collector Outputs	1
Additional Discrete Outputs	Optional
<b>Communications:</b>	
RS-232	Standard
RS-422/485	Optional
DeviceNet™	Optional
Modbus RTU	Optional
Interbus-S	Optional
Profibus-DP	Optional
Lonworks®	Optional
Johnson Controls Metasys™ N2	Optional

**Performance Features**

Sensorless Vector Control	Standard
Closed Loop Vector Control	Optional
Volts/Hertz Control	Standard
IR and Slip Compensation	Standard
Electronic Reversing	Standard
Dynamic Braking	Standard ①
DC Braking	Standard
PI 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	Standard
Carrier Frequency Adjustment	1 – 16 kHz

**Standard Conditions for Application and Service**

Operating Ambient Temperature	-10 – 50°C CT, -10 – 40°C VT
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 Internal dynamic braking chopper circuit included as standard. Additional external resistors are required. Refer to Dynamic Braking Resistors section on **Pages 40-93 – 40-106**.

Table 40-33. Standard I/O Specifications

6 – Digital Input Programmable	24V: "0" ≤ 10V, "1" ≥ 18V, R <sub>i</sub> > 5 kΩ
1 – Analog Input	Voltage: 0 – ±10V, R <sub>i</sub> > 200 kΩ or Current: 0 (4) – 20 mA, R <sub>i</sub> = 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	0 – 20 mA, impedance 500 ohms, resolution 106 ±3%

**Accessories**

Renewal parts are not available.  
Replacement of the complete drive is recommended.

## Options

Table 40-34. Control/Communication Options for Compact NEMA Type 1 Enclosures <sup>①</sup>

Description	Factory Installed <sup>③</sup>		Field Installed <sup>②</sup>	
	Option Designator	Adder U.S. \$	Catalog Number	Price U.S. \$
<b>Expander I/O Cards</b>				
<i>The Expander I/O Cards provide isolated I/O in addition to the standard I/O included with the SV9000.</i>				
5 Digital Inputs, 2 Analog Inputs (1 voltage, 1 current), 3 Relay Outputs, Analog (current) Output, Thermistor Input, Encoder Input <sup>④</sup>	01	1,305.	SV9IOC100CN	1,205.
5 Digital Inputs, Relay Output, Thermistor Input	02	715.	SV9IOC101CN	615.
5 Digital Inputs, 2 Analog (voltage) Inputs, 3 Relay Outputs, Analog (voltage) Output, Thermistor Input, Encoder Input <sup>④</sup>	03	1,265.	SV9IOC102CN	1,165.
5 Digital Inputs, 3 Relay Outputs, Analog (Current) Output, Thermistor Input	04	750.	SV9IOC103CN	650.
Encoder Board — Provides closed loop speed regulation. <sup>④</sup>	05 <sup>④⑤</sup>	390.	SV9IOC104 <sup>④⑤</sup>	290.
120V AC Interface Board with Analog Output. <sup>⑥</sup>	06 <sup>⑤</sup>	395.	SV9IOC105 <sup>⑤</sup>	295.
<b>Network Cards</b>				
<b>DeviceNet Network Communications</b> — The DeviceNet Network Card is used for connecting the SV9000 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.	30 <sup>⑤</sup>	385.	SV9NCDN <sup>⑤</sup>	385.
<b>Profibus Network Communications</b> — The Profibus Network Card is used for connecting the SV9000 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. The Profibus card additionally includes the following control I/O — 4 digital inputs, 4 digital outputs, 1 relay output, thermistor input, and an encoder input. <sup>④</sup>	31	1,280.	SV9NCPBCN	1,130.
<b>ModBus RTU Network Communications</b> — The Modbus Network Card is used for connecting the SV9000 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. The ModBus card additionally includes the following control I/O — 4 digital inputs, 4 digital outputs, a thermistor input and an encoder input. <sup>④</sup>	32	1,280.	SV9NCMBCN	1,130.
<b>InterBus-S Network Communications</b> — The InterBus-S Network Card is used for connecting the SV9000 as a remote bus device within the InterBus-S system. The interface is connected into the remote bus using a 9-pin DSUB connector. The InterBus card additionally includes the following control I/O — 4 digital inputs, 4 digital outputs, 1 relay output, a thermistor input and an encoder input. <sup>④</sup>	33	1,280.	SV9NCIBCNC	1,130.
<b>LonWorks Network Communications</b> — The LonWorks Network Card is used for connecting the SV9000 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. The LonWorks card additionally includes the following control I/O — 4 digital inputs, 4 digital outputs, 1 relay output, a thermistor input and an encoder input. <sup>④</sup>	34	1,285.	SV9NCLWCNC	1,135.
<b>Johnson Controls Metasys™ N2 Network Communications</b> — The SV9NCN2CN fieldbus board provides communication between the SV9000 drive and a Johnson Controls Metasys™ N2 network. With this connection, the drive can be controlled, monitored and programmed from the Metasys system. Four additional digital inputs and four digital outputs provide for controlling and monitoring drive parameters. The N2 fieldbus is available as a factory installed option and as a field installable kit. The board mounts inside NEMA Type 1, 12 and Chassis drives and is available in an external option box for the Compact NEMA Type 1 drives.	36	1,280.	SV9NCN2CN	1,130.

① Provisions allow for only one Control/Communication Option at a time.

② Option kit includes interface card, option board and expander box kit for field connection to drive.

③ Option board supplied in separate expander box for field connection to factory installed interface card. See **Page 40-23** for mounting dimensions.

④ Requires specific application software and optional motor mounted encoder, consult your Eaton's Cutler-Hammer representative for details.

⑤ Option board is internally mounted inside drive enclosure.

⑥ Replaces (6) standard 24V DC digital inputs.

Table 40-35. I/O Specifications for the Control/Communication Options

Analog voltage, input	0 – ±10V, R <sub>i</sub> ≥ 200 kΩ
Analog current, input	0 (4) – 20 mA, R <sub>i</sub> = 250 Ω
Digital Input	24V: "0" ≤ 10V, "1" ≥ 18V, R <sub>i</sub> > 5 kΩ 120V AC: 85 – 132V 50/60 Hz
Aux. voltage	24V (±20%), max. 50 mA
120V AC Inputs	85V to 132V 50/60 Hz
Reference voltage	10V ±3%, max. 10 mA
Analog current, output	0 (4) – 20 mA, R <sub>L</sub> = 500 kΩ, resolution 10 bit, accuracy ≤ ±3%
Analog voltage, output	0 (2) – 10V, R <sub>L</sub> ≥ 1 kΩ, resolution 10 bit, accuracy ≤ ±3%
Relay output	Max. switching voltage: 300V DC, 250V AC Max. switching load: 8A/24V DC .4A/300V DC 2 kVA/250V AC Max. continuous load: 2A rms
Thermistor input	R <sub>trip</sub> = 4.7 kΩ
Encoder input	24V: "0" ≤ 10V, "1" ≥ 18V, R <sub>i</sub> = 2.2 kΩ 5V: "0" ≤ 2V, "1" ≥ 3V, R <sub>i</sub> = 330 Ω

Discount Symbol ..... SS-1

Table 40-36. Control Panel Options — Compact NEMA Type 1

Description	Factory Installed		Field Installed	
	Option Designator	Adder U.S. \$	Catalog Number	Price U.S. \$
<b>SVMulti-line Control Panel</b> — This option is standard on all drives and consists of a 4-line, 16 character/line, backlit alphanumeric LCD display with five indicators for the RUN status and two indicators for the control source. The eight pushbuttons on the panel are used for panel programming and monitoring of all SV9000 parameters. The panel is detachable and isolated from the input line potential.	<b>M</b>	Standard	<b>SV9MLPNL</b>	200.
<b>SVGraphic Control Panel</b> — Includes eight lines of text or a 64 x 128 pixel graphical display of key waveforms, or a combination of both text and graphs. It provides: <ul style="list-style-type: none"> <li>■ 3 monitored parameters at the same time in text or graphical trend display</li> <li>■ one monitored parameter can be shown in increased text size with a graph bar</li> <li>■ the selected parameter value is shown on a graph bar</li> <li>■ the parameters of the drive can be uploaded to the panel and then downloaded to another drive</li> </ul>	<b>G</b>	575.	<b>SV9GRPNL</b>	475.
<b>Control Panel Remote Mounting Kit</b> — Includes 9.84 ft. (3 meter) Cable and Mounting Hardware	—	—	<b>SV9PNLRMT</b>	210.
<b>Miscellaneous</b> — Blank Panel — for use when control panel is not needed.	—	—	<b>BLANKPNL</b>	36.
<b>External Dynamic Braking Resistors</b> — Used with the Dynamic Braking Chopper Circuit to absorb motor regenerative energy for stopping the load and to limit 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 and 100% braking torque, while Heavy-Duty is defined as 50% duty or less and 150% braking torque. <i>Refer to Dynamic Braking Resistors section on Pages 40-93 – 40-106.</i>	①	①	①	①
<b>RWT</b> — The Reflective Wave Trap (RWT) decreases the reflective wave voltage spikes at the motor terminals. The RWT is recommended for cable lengths exceeding 100 ft. (30.5m) with a drive of 3 hp and above, and for cable lengths of 33 ft. (10.1m) with a drive of 2 hp and below. This option must be installed within 25 ft. (7.6m) of the motor terminals, and operates with a carrier frequency of up to 12 kHz. <i>(See Publication No. B.37E.01.SE for more information.)</i>	—	—	<b>RWTCHR1</b> <b>RWTCHR4</b>	575. 675.
<b>RFI</b> — The Radio Frequency Interface (RFI) filter is for specific applications that require conformance to CE or EMC (Electromagnetic Compatibility) emission standards. The standard SV9000 fulfills EMC Immunity requirements per Standards EN50082-1, -2 and EN61800-3. Option R1 fulfills I level EMC Standards EN50081-2, EN50082-1, -2 and EN61800-3. Option R2 fulfills C level EMC Standards EN50081-1, -2, EN50082-1, -2 and EN61800-3. <i>For specific installation requirements, contact your Eaton's Cutler-Hammer representative.</i>	—	—	②	②
<b>SVDrive™</b> — A PC-based tool for control and monitoring of the SV9000. 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.	—	—	<b>SVDRIVE</b>	365.
<b>SVDriveable</b> — 6 ft. (1.8m) RS-232 cable (22 gauge) with a 7-pin connector on each end. Should be used in conjunction with the SVDrive option to avoid damage to the SV9000 or computer. The same cable can be used for downloading specialized applications to the drive.	—	—	<b>SVDRIVECABLE</b>	30.

① Refer to Dynamic Braking Resistors section on Pages 40-93 – 40-106.

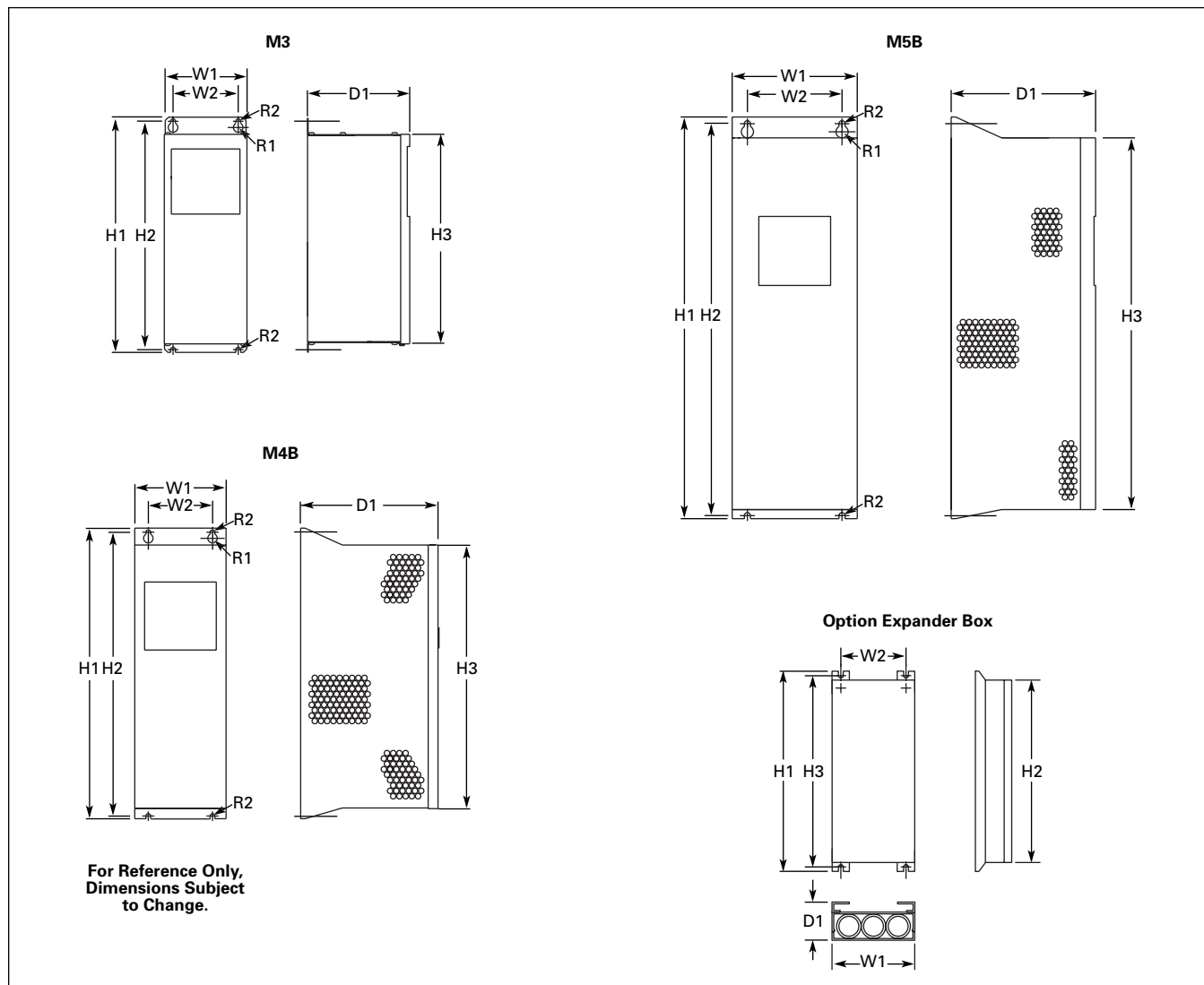
② Contact your Eaton's Cutler-Hammer representative for technical and ordering information.

15 hp Compact NEMA Type 1 with  
Option Expander Box

## Dimensions

**Table 40-37. Approximate Dimensions — Compact NEMA Type 1**

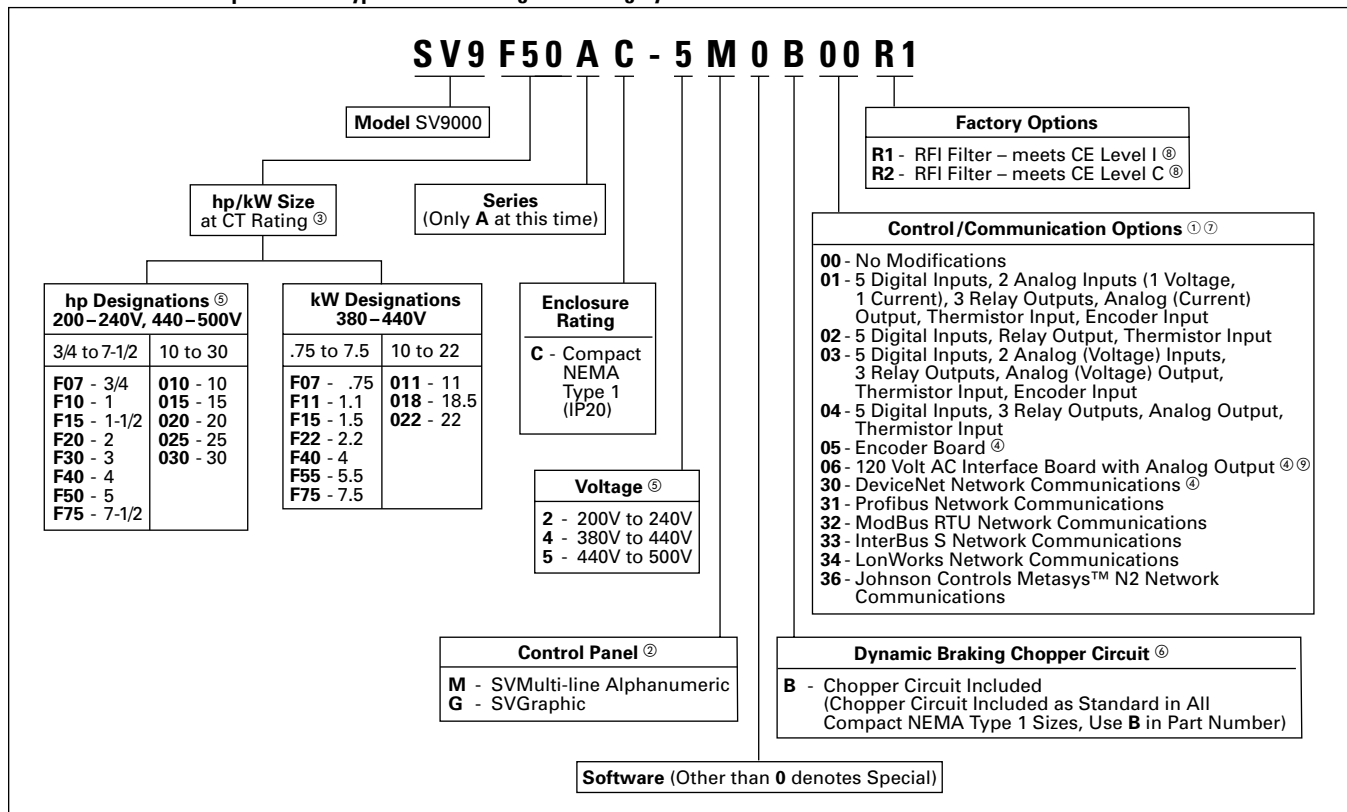
Enclosure Size	Frame	Voltage	Dimensions in Inches (mm)							
			W1	W2	H1	H2	H3	D1	R1	R2
Compact NEMA Type 1	M3	All	4.7 (120)	3.7 (95)	13.5 (343)	13.1 (333)	12.0 (305)	5.9 (150)	.28 (7.0)	.14 (3.5)
	M4B	All	5.3 (135)	3.7 (95)	17.0 (430)	16.5 (420)	15.4 (390)	8.1 (205)	.28 (7.0)	.14 (3.5)
	M5B	All	7.3 (185)	5.5 (140)	23.4 (595)	22.8 (580)	21.7 (550)	8.5 (215)	.35 (9.0)	.18 (4.5)
	Option Expander Box	—	4.7 (120)	3.7 (95)	11.4 (290)	10.2 (260)	11.0 (280)	2.2 (55)	—	—



**Figure 40-5. Approximate Dimensions**

## Catalog Number Selection

Table 40-38. SV9000 Compact NEMA Type 1 Drive Catalog Numbering System



① Control and communication options for Compact NEMA Type 1 are included in a separate expansion box.

② SVMulti-line is included as the standard control panel.

③ Horsepower rating for the SV9000 is selected based on the constant torque (CT) rating. Variable torque (VT) ratings are typically one hp rating higher. Please reference tables on **Page 40-25** for equivalent VT part number.

④ Mounts internal — separate expansion box is not required.

⑤ Horsepower selection for 208V applications must be based on motor's Full Load Amp rating.

⑥ External dynamic braking resistors not included, see **Page 40-22**.⑦ See additional footnotes on **Page 40-21**.

⑧ Requires installation in accordance with CE specifications. Consult your Eaton's Cutler-Hammer representative for technical details and pricing.

⑨ Replaces (6) standard 24V DC digital inputs.