SC9000 EP
Medium voltage adjustable frequency drive

Reliable design and construction you've come to expect

Powering Business Worldwide

Innovative tec

Eaton's second generation of medium voltage adjustable frequency drives, SC9000™ with encapsulated powerpole, combines innovative technology with the reliable design and construction you've come to expect with Eaton products. Designed for use with induction or synchronous motors at 2400 to 4160 V up to 6000 hp, the SC9000 EP delivers maximum benefits while being one of the smallest medium voltage drive in the industry.

Manufactured, assembled and extensively tested in an ISO® 9001: 2000 certified facility—the SC9000 EP has been designed and constructed to exacting UL® certification standards for use in the most rigorous and demanding applications.

Eaton technology yielding real-world benefits

While many medium voltage drives exist in the marketplace, not all are built the same. The benefits shown here are just some of the reasons why the SC9000 EP is best in class where innovative technology yields real-world benefits.

Frame A
300–500 hp at 2400 V
300–1150 hp at 4160 V

hnology
with reliable design

Fully integrated design

Integrated drive with AMPGARD contactor, power fuses and isolation switch.

State-of-the-art test facilities

The SC9000 EP's test facility consists of 5 test bays with combined power of 25,000 hp. Each drive receives a minimum 12-hour and up to 24-hour burn-in at full load. The test bays are equipped with ambient temperature control up to 50 °C.

Protection through technology

Encapsulated powerpole inverter with heat pipe technology helps to increase power density, reduce overall equipment size and protect sensitive electronic components in harsh environments.

Clean room assembly

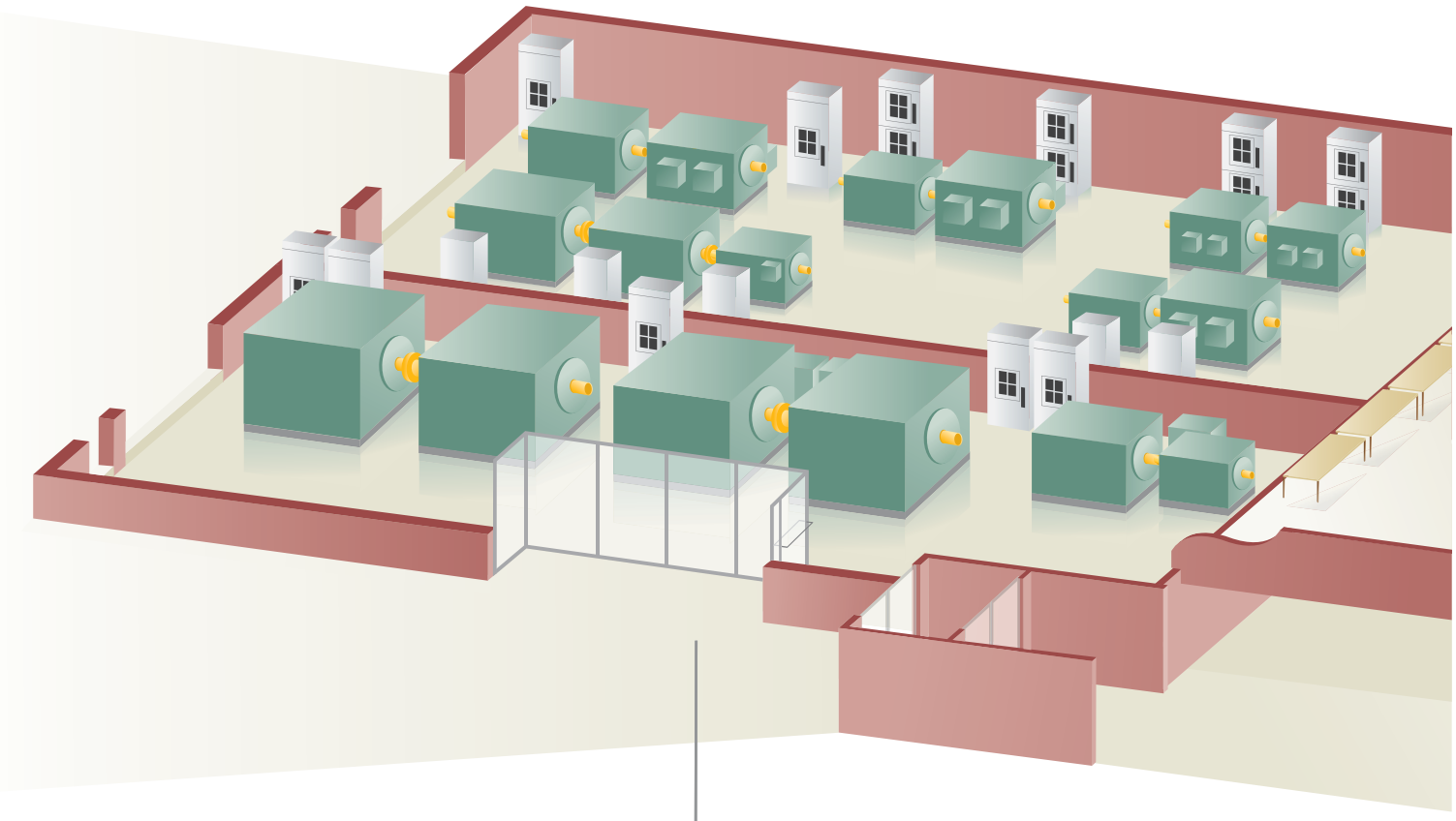
All SC9000 EP electronic components are stocked and assembled in a climate-controlled clean room to ensure no performance degradation from surface contaminations.

Design significantly reduces MTTR

The SC9000 EP drive incorporates three-level neutral point clamped (NPC) inverter topology, which reduces the number of components and improves reliability. With the count of 46 active components in the topology, the inverter has MTTF (Mean Time To Failure) of 12.7 years. Competitors with H-bridge, multi-level topology usually have 192 active components and MTTF of 2.8 years.

Reliability

built-in and tested



Eaton's world-class motor room
This facility allows us to test with full voltage and current on a real motor to ensure proper operation. Motors currently range incrementally from 500 hp to 6000 hp, both 50 Hz and 60 Hz operation with input voltages ranging from 2.4 kV to 13.8 kV.

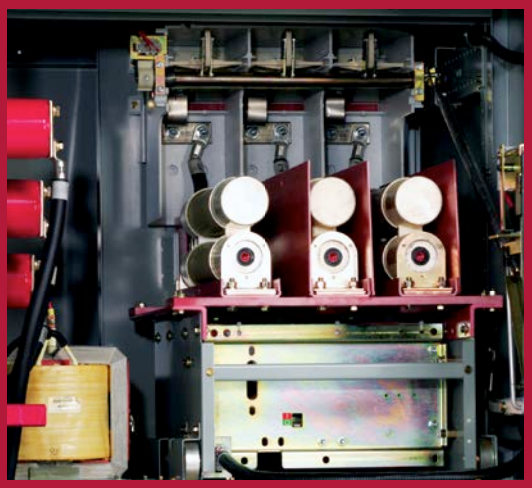
Eaton's medium voltage drive test facility located in Arden, North Carolina

The SC9000 EP uses highly reliable time-proven mechanical and electrical components

The SC9000 EP difference

Eaton has built the SC9000 EP to be the medium voltage motor control solution of choice. As a standalone drive or as a component of an Eaton integrated control gear configuration, the SC9000 EP delivers when it comes to reliability, system flexibility and ease of use. While compact, safe and reliable, the SC9000 EP has the power to perform in the harshest of industries. One three-phase inverter is used to support up to 3700 hp and two in parallel for up to 6000 hp. Heat pipe technology is used to cool power components and, along with encapsulated medium voltage components, create a harsh-environment inverter. Roll-in/roll-out inverter design minimizes downtime (MTTR).

- Fully integrated drive using highly reliable AMPGARD components
- Non-load break isolation switch rated for 10,000 mechanical operations
- SL contactor (highest interrupting rating in the industry at 8500 A)
- Eaton power fuses
- Low-profile handle mechanism



Make an investment in the SC9000 EP, and keep your operations running smoothly, safely and efficiently. Take a moment to learn why Eaton's products are best in class.

The SC9000 EP Powerpole features

- Powerpole sectionalizes the inverter into separate encapsulated phase sections
- Powerpole offers lower overall life cycle costs while maintaining the patented environmental protection of the SC9000 EP—encapsulation of devices, conformal coating of printed circuit boards on controls and mechanical barriers to prevent damage to adjacent components in the event of a fault
- The reliability (FIT) of the SC9000 EP remains high with the three-level topology and patented environmental protection
- Powerpole allows for field replacement of gate drivers and power supplies in under 30 minutes
- Powerpole gives you options in the event of an IGBT failure
  - Roll-in/roll-out stab in inverter for downtime-sensitive applications (less than 30 minutes)
  - Replaceable powerpole modules can be exchanged in less than 2 hours

SC9000 EP means

The SC9000 EP uses the same keypad and programming software as the Eaton SVX9000 line of low voltage drives. This standardization translates into a reliable, easy-to-use system that doesn't require hours of learning new software.

The SC9000 EP keypad

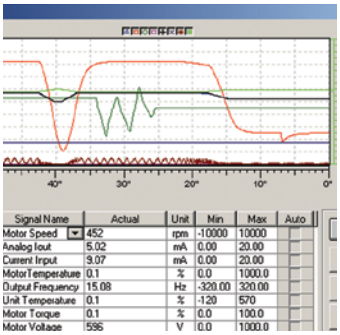
The keypad offers you a full view of the drive's inner workings. You can view and change parameters and monitor actual running values right from the keypad. Plus, the keypad's built-in upload and download capability makes programming the SC9000 EP easy, thereby drastically cutting startup time.

The three-line alphanumeric programmable display with status indicators uses a bright LED display with large, clear characters easily visible in any light condition. Parameters, statuses and diagnostic messages are easily readable, which eliminates the need for awkward codes and lookup tables.

Flexible communication

Multiple communication protocols allow easy communication with all commonly used control systems, such as:

- Modbus®
- CANbus
- PROFIBUS® DP
- LonWorks®
- CANopen
- DeviceNet™
- Modbus TCP
- EtherNet/IP
- BACnet



9000XDrive

The 9000XDrive software program allows you to upload and download drive parameters, which can be changed, saved and ported back to the drive and then printed or saved to a file for future reference. You can also compare these parameters to default values to determine drive configuration. Other operator functions include the ability to set references, start and stop the drive, and monitor and display signals and values.

9000XLoad

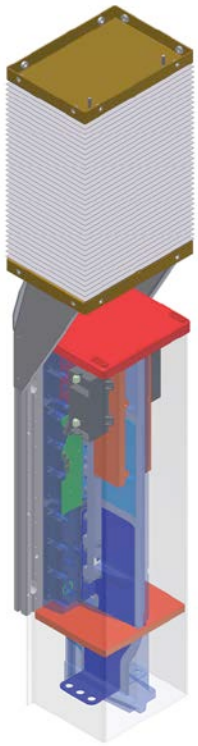
The 9000XLoad tool gives you the ability to upload system, application and option card software intended for engineering, commissioning and servicing.

ease of use

The SC9000 EP powerpole inverter maximizes modularity and customer choices

4160 V, 3 MW / 3500 hp, 50/60 Hz

1.



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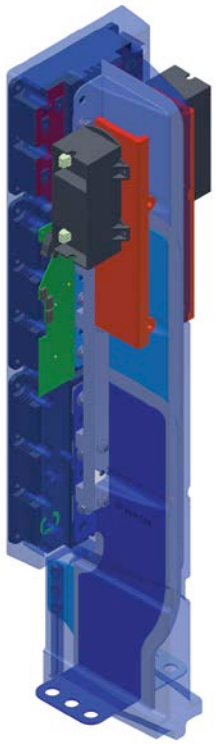

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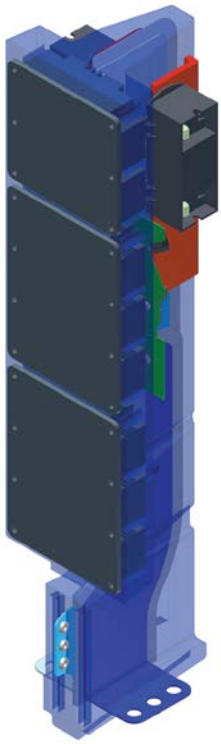


- The encapsulated powerpole inverter design comprises six separate power poles mounted to the heat pipe assembly
- Replaceable encapsulated powerpole provides additional modularity and in-field service-ability in addition to full power module replacement. Once the inverter is installed, it never has to be replaced; only field repair is necessary

1. **Encapsulated Powerpole with Heat Sink and External Cover**
2. **Encapsulated Powerpole Module (front)**
3. **Encapsulated Powerpole Module (back)**

Eaton medium voltage integrated control gear

Easy integration with other medium voltage control center components

Power Specifications

Voltage Class	**4160**												
Drive rating (A)	38	44	51	57	63	76	89	101	114	124	132	155	
4160 drive output (kVA)	274	317	367	411	454	548	641	728	821	893	954	1117	
Nominal hp 4160 V	300	350	400	450	500	600	700	800	900	1000	1150 ❶	1250	
Frame size	Frame A											Frame B	
Voltage Class	**4160**												
Drive rating (A)	186	217	248	279	310	372	455	493	558	620	682	713	744
4160 drive output (kVA)	1340	1564	1787	2010	2234	2680	3286 ❹	3552	4021	4467	4914	5137	5358
Nominal hp 4160 V	1500	1750	2000	2250	2500	3000 ❷	3700	4000	4500	5000	5500	5750	6000
Frame size	Frame B			Frame C			Frame D			Frame E			
Voltage Class	**3300 ❸**												
Drive rating (A)	48	56	64	72	80	96	112	128	144	160	200	240	
3300 drive output (kVA)	274	320	366	412	457	549	640	732	823	915	1143	1372	
Nominal hp 3300 V	300	350	400	450	500	600	700	800	900	1000	1250	1500	
Frame size	Frame A							Frame B					
Voltage Class	**3300 ❸**												
Drive rating (A)	280		320		360	400	440	480	520	560	600	640	
3300 drive output (kVA)	1600	1829	2058	2286	2515	2744	2972	3201	3429	3658			
Nominal hp 3300 V	1750		2000		2250	2500	2750	3000	3250	3500	3750	4000	
Frame size	Frame C				Frame D				Frame E				
Voltage Class	**2400**												
Drive rating (A)	69	80	91	103	114		134	156	178	201	223		
2400 drive output (kVA)	287	333	378	428	474		557	648	740	836	927		
Nominal hp 2400 V	300	350	400	450	500		600	700	800	900	1000		
Frame size	Frame A						Frame B						
Voltage Class	**2400**												
Drive rating (A)	279		335		390		448		504		561		
2400 drive output (kVA)	1160		1393		1621		1862		2095		2332		
Nominal hp 2400 V	1250		1500		1750		2000		2250		2500		
Frame size	Frame C						Frame D						

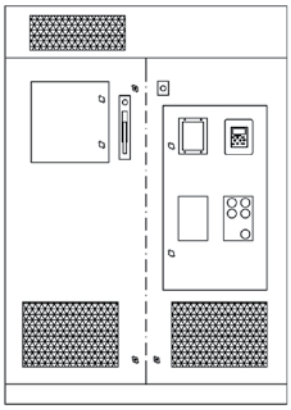
❶ 1000 hp and higher in Frame 'A' require second blower. Redundant cooling option is not available at these higher hp ratings.

❷ 4160 V, 2750 hp and 3000 hp require 137-inch width and additional blowers. Redundant cooling option is not available at these higher hp ratings.

❸ 3300 V, 50 Hz.

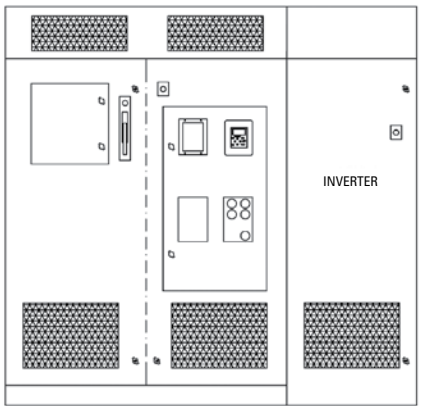
❹ Frame DS with single inverter.

Frame A



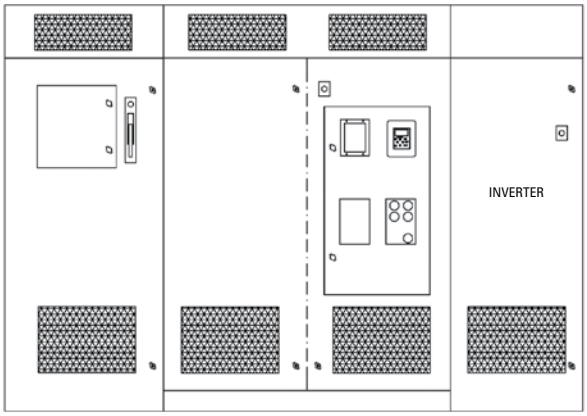
Output Voltage	Motor		Cabinet Size (Inches)			Redundant Blower
	FLA	hp	Width	Height	Depth	Height
2400	67–112	300–500	65	92	50	18.5
3300 ❶	48–112	30–700	65	92	50	18.5
4160	37–112	300–1150 ❷	65	92	50	18.5

Frame B



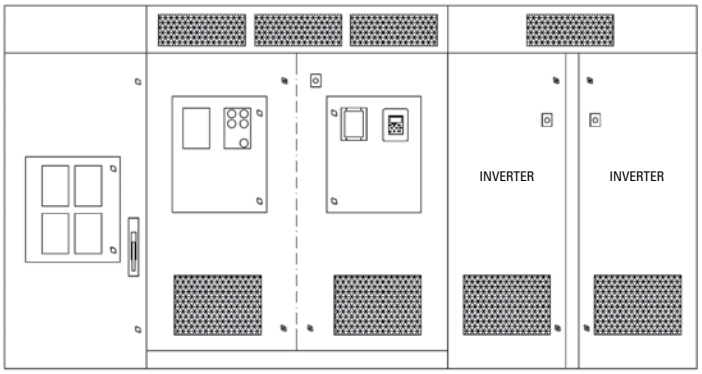
Output Voltage	Motor		Cabinet Size (Inches)			Redundant Blower
	FLA	hp	Width	Height	Depth	Height
2400	134–223	600–1000	95	92	50	20.1
3300 ❶	128–240	800–1500	95	92	50	20.1
4160	124–248	1000–2000	95	92	50	20.1

Frame C



Output Voltage	Motor		Cabinet Size (Inches)			Redundant Blower
	FLA	hp	Width	Height	Depth	Height
2400	279–390	1250–1750	131	92	50	12.1
3300 ❶	280–320	1700–2200	131	92	50	12.1
4160	279–372	2250–3000	131 ❷	92	50	12.1

Frame D and E



Output Voltage	Motor		Cabinet Size (Inches)			Redundant Blower
	FLA	hp	Width	Height	Depth	Height
2400	446–558	2000–2500	198	92	50	12.1
3300 ❶	360–480	2250–3000	198	92	50	12.1
3300 ❶	520–640	3250–4000	222	92	50	12.1
4160 ❸	403–558	3250–4500	198	92	50	12.1
4160	589–744	4750–6000	222	92	50	12.1

❶ 3300 V, 50 Hz.

❷ 1000 hp and higher in Frame A require second blower. Redundant option is not available at these higher hp ratings. 4160 V, 2750 hp and 3000 hp require 137-inch width.

❸ Frame DS 3250–3500 hp with single inverter and 148 inches wide.

Main Breaker | SC9000 EP 3000 hp, 4160 V AFD | RVSS | 2-High FVNR

Eaton is globally the first to offer an integrated lineup of motor control products connected to a common bus. All types of motor starters, load break switches, integrated medium voltage AFDs, AFD sync transfer control and AFD bypasses, as well as main and feeder breakers, can be integrated into a single lineup. This integrated assembly capability reduces installation expense and valuable floor space requirements.

A closer look at the SC9000 EP

The right solution for the harshest environments

The SC9000 EP's rugged design makes it the perfect choice for speed control applications, including harsh-duty industries such as:

- Pipeline
- Water/waste water
- Oil and gas
- Chemical
- Mining and metals
- Utility
- Cement

Quality comes standard

Eaton believes in making products the best they can be. That's why the SC9000 EP has a multitude of standard features, including:

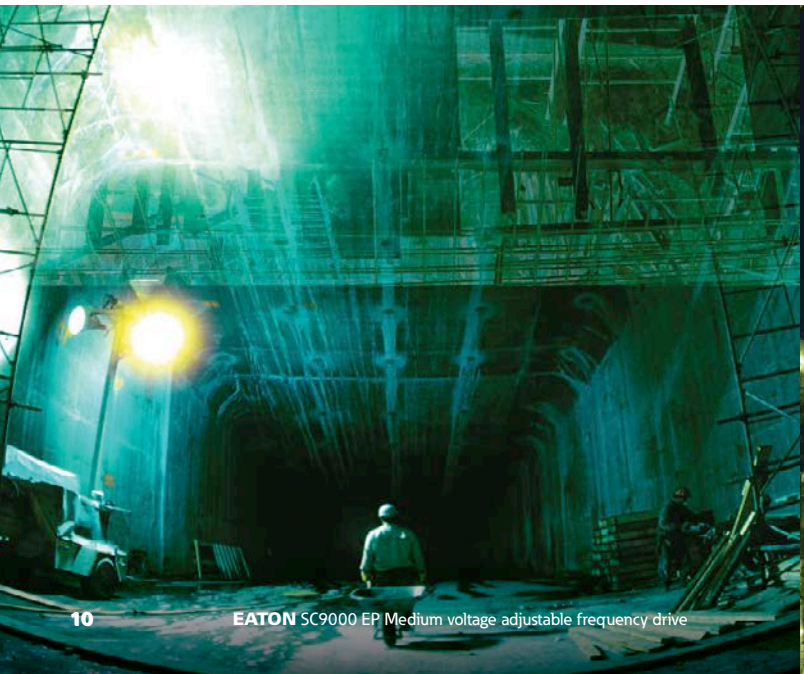
- Fully integrated drive using highly reliable AMPGARD components
- Inherent low part-count 3-level topology with MTTF of 12.7 years
- Clean room assembly
- Ambient temperature control test bays with up to 24-hour burn-in (minimum of 12 hours) at full load and over load

Specifications

Line-side converter		24-pulse diode rectifier
Power semiconductors		IGBTs, diodes
Inverter		Encapsulated IGBT Powerpole
Control		Sensorless open loop (closed loop optional)
		Pulse width modulated (PWM) output
Power section isolation		Fiber-optic cable
Nominal efficiency		97.5%
Service duty	Standard	110% for 1 minute every 10 minutes
	Optional	150% for 1 minute every 10 minutes
Input frequency		50 Hz, 60 Hz ±5%
Output frequency		0–120 Hz
Input voltage		2400 V to 13.8 kV
Output voltage		2400 V to 13.8 kV
Speed regulation		0.1% without tach feedback
		0.02% with tach feedback
Power loss ride-through		5 cycles
Ambient temperature		0 to 40 °C, 50 °C with derating
Altitude		0–3300 ft, >3300 ft—consult factory
Enclosure		NEMA® 1A, gasketed and filtered
Standards		UL®, CSA®, cUL®, IEC, IEEE® 519, seismic

Controls

Local interface	Removable graphical backlit LCD and keypad. RS-232 connection for PC control
Keys	Local/Remote, Start/Stop, Reset, Enter, Up/Down, Forward/Back
Indicators	LCD: Local/Remote, Fault. Door: Contactor open/closed, Fault, Run status/DC bus
Input/outputs	6 Digital in/1 Digital out, 2 Analog in/1 Analog out



Configuration matrix

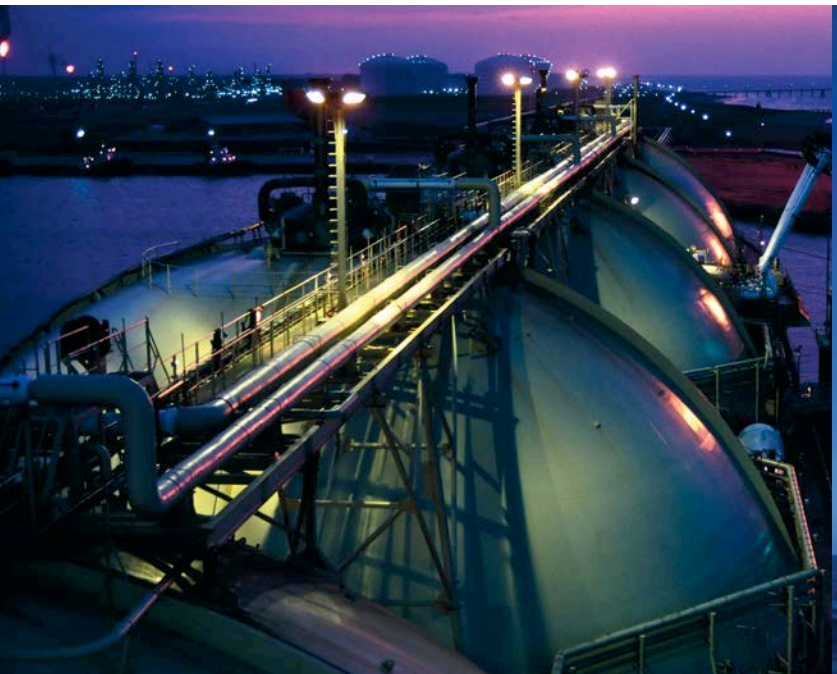
The SC9000 EP model number can be configured by using the table below. For options or requirements outside this table, please consult factory. In the example below, the **SC93C100-V-E** is an SC9000 EP, 4160 V input, 4160 V output, 1000 hp, VT, without bypass.

SC9	3		C		100–						V		E		–	–
Series	**Input Voltage**		**Output Voltage**			**2400 V Output**	**3300 V Output**	**4160 V Output**	**6600 V Output**	**6900 V Output**	**Duty Rating**		**Style**		**Options**	
Code	**Code**	**Volt**	**Code**	**Volt**	**Code**	**hp**	**hp**	**hp**	**hp**	**hp**	**Code**		**Code**			
SC9	1	2400, 60 Hz	A	2400	030	300	300	300	300	300	V	VT	E	No bypass	Consult factory	
	2	3300, 60 Hz	B	3300	035	350	350	350	350	350	C	CT	F	FVNR bypass	Consult factory	
	3	4160, 60 Hz	C	4160	040	400	400	400	400	400			G	RVAT bypass	Consult factory	
	4	4800, 60 Hz	D	4800	045	450	450	450	450	450			H	RVR bypass	Consult factory	
	5	6600, 60 Hz	E	6600	050	500	500	500	500	500			I	RVSS bypass	Consult factory	
	6	6900, 60 Hz	F	6900	060	600	600	600	600	600			J	FVR bypass		
	7	12,470, 60 Hz	G	12,470	070	700	700	700	700	700			K	RVATR bypass		
	8	13,200, 60 Hz	H	13,200	080	800	800	800	800	800			L	RVRR bypass		
	9	13,800, 60 Hz	I	13,800	090	900	900	900	900	900			M	RVSSR bypass		
	10	2400, 50 Hz			100	1000	1000	1000	1000	1000						
	11	3300, 50 Hz			125	1250	1250	1250	1250	1250						
	12	4160, 50 Hz			150	1500	1500	1500	1500	1500						
	13	4800, 50 Hz			175	1750	1750	1750	1750	1750						
	14	6000, 50 Hz			200	2000	2000	2000	2000	2000						
	15	6600, 50 Hz			225	2250	2250	2250	2250	2250						
	16	6900, 50 Hz			250	2500	2500	2500	2500	2500						
	17	10,000, 50 Hz			275		2750	2750	2750	2750						
	18	11,000, 50 Hz			300		3000	3000	3000	3000						
	19	12,000, 50 Hz			325		3250	3250	3250	3250						
					350		3500	3500	3500	3500						
					375		3750	3750	3750	3750						
					400		4000	4000	4000	4000						
					425			4250	4250	4250						
					450			4500	4500	4500						
					475			4750	4750	4750						
					500			5000	5000	5000						
					525			5250	5250	5250						
					550			5500	5500	5500						
					575			5750	5750	5750						
					600			6000	6000	6000						
					650			6500	6500	6500						
					700			7000	7000	7000						
					750			7500	7500	7500						
					800			8000	8000	8000						
					850			8500	8500	8500						
					900			9000	9000	9000						
					950			9500	9500	9500						
					1000			10,000	10,000	10,000						
					1200			12,000	12,000	12,000						

VT = Variable torque 110% for 1 minute.

CT = Constant torque 150% for 1 minute.

Blue shaded area—consult factory.



Solutions that deliver

Substantial energy savings • Speed control • Extend equipment life • Full starting torque

Eaton Low Voltage Adjustable Frequency Drives

SC9000 EP Frame C+
Up to 3000 hp at 4160 V

Superior service

While Eaton offers products and solutions to meet your most critical electrical power management challenges, we also have one of the largest and most experienced team of power system engineers in the industry. Eaton's Electrical Engineering Services and Systems focuses on understanding your business requirements and optimizing your power system. We not only offer startup, acceptance testing and commissioning services, but our engineers and consultants can help diagnose problems, identify ways to improve performance or transform concepts into flexible, practical solutions that can improve productivity and use of capital. We can help keep your power system safe, efficient, reliable and up to date.

For more information on
Eaton adjustable frequency drives:

Eaton.com/LVDrives

Eaton.com/SC9000

1-877-ETN-CARE, option 2, then option 7

Powering Business Worldwide

Eaton
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United States
Eaton.com

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