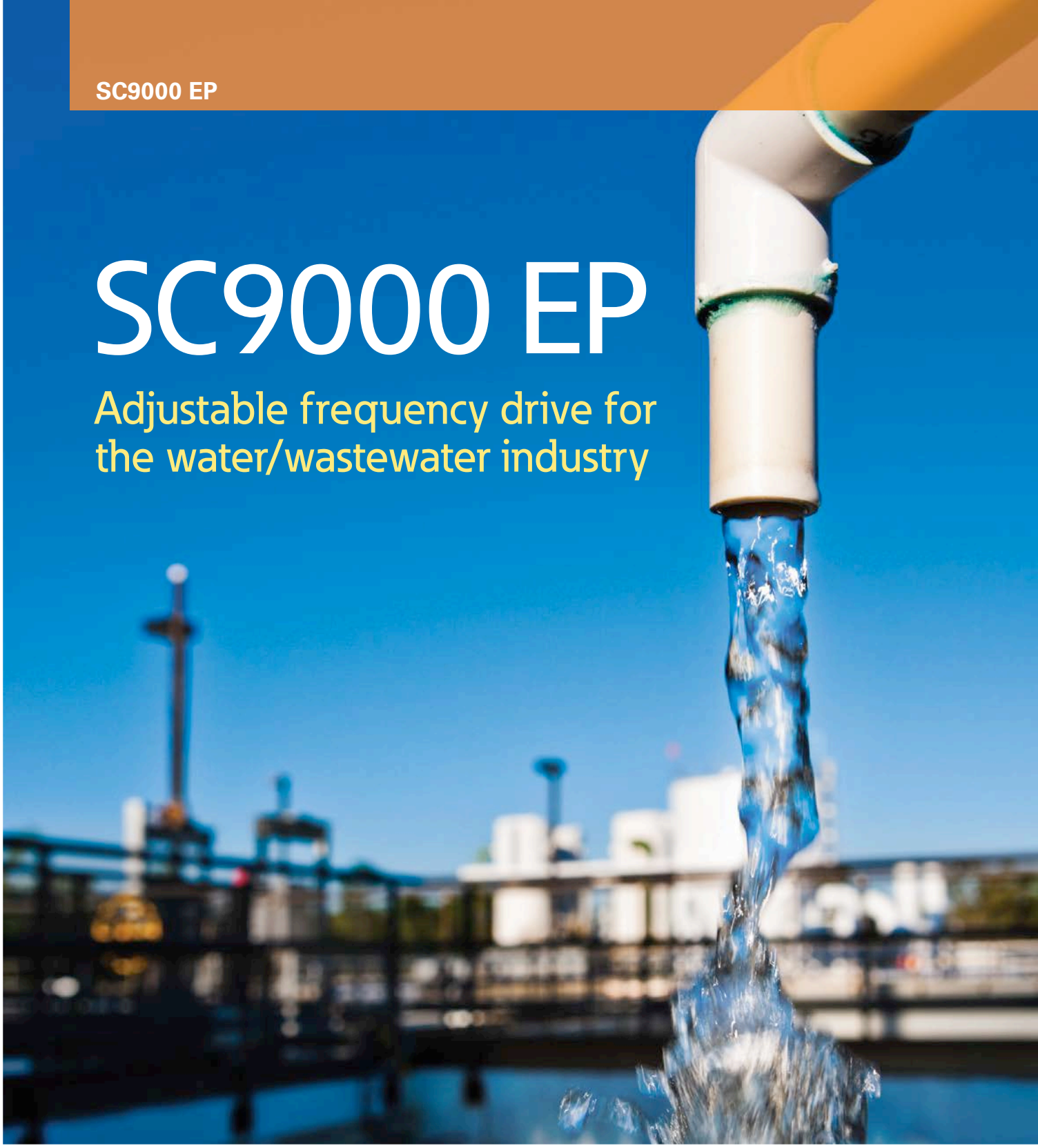
SC9000 EP

Adjustable frequency drive for the water/wastewater industry



Powering Business Worldwide

SC9000 EP medium voltage adjustable frequency drive
Part of Eaton's integrated control gear with Ampgard main breaker and Ampgard motor control center

SC9000 EP

Adjustable frequency drive for the water/wastewater industry

Eaton's highly reliable and award-winning medium voltage drives provide up to 6000 horsepower, and incorporate safety and protections in a compact footprint. The encapsulated powerpole inverter enables the Eaton solution to withstand harsh environmental conditions in industrial environments. SC9000 EP drives incorporate a three-level neutral point clamped (NPC) inverter topology, which reduces the number of power switching devices in the inverter and improves reliability. Eaton's medium voltage adjustable frequency drive is also designed to help customers reduce costs, beyond driving energy efficiencies that lower utility bills, and the industry-leading drive technology enables synchronous transfer, which allows customers to use a single drive to control the power to multiple motors and reduce equipment costs.

SC9000 EP Frame C
Up to 3000 hp at 4160 V, 131 inches W x 50 inches D x 92 inches H

300–2500 hp VT at 2400 V
300–4000 hp VT at 3300 V
300–6000 hp VT at 4160 V
Sync transfer control
Sync motor control
High voltage primary

SC9000 EP double-bus design for synchronous transfer control was first to market. Do not be misled by "cable copycats"

SC9000 EP double-bus design

With the SC9000 EP AFD double-bus, a second 1000 A AFD bus is located above the main bus, adding only 8-inches of additional height to the system.

The SC9000 EP double-bus enables close-coupling of a drive output contactor and multiple motor bypass and motor select contactors under a common bus alignment.

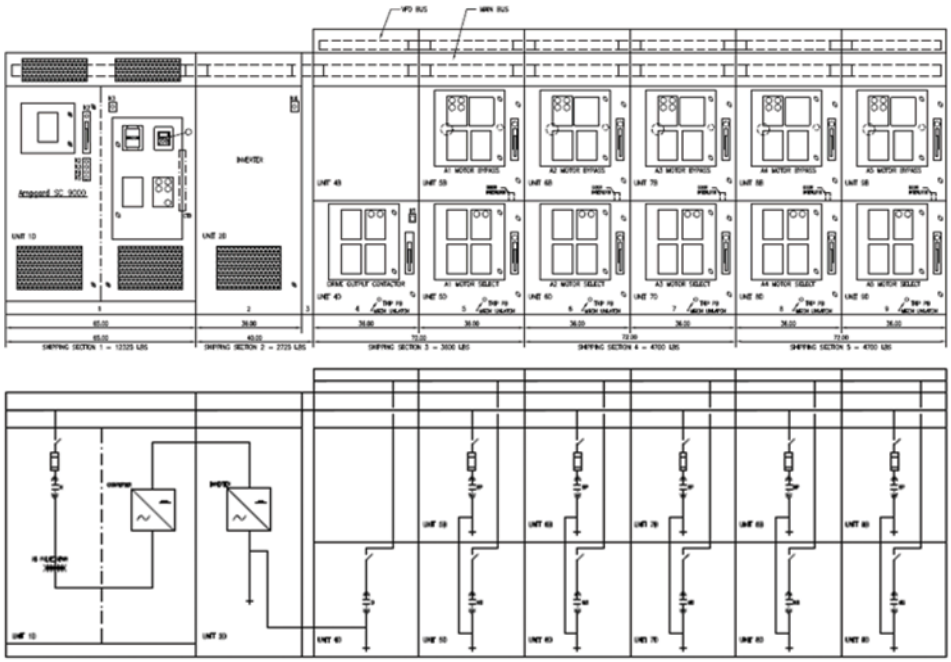
SC9000 EP integrated control gear synchronous transfer control design gives Eaton's customers the benefit of a compact and reliable system:

- Close-coupling of SC9000 EP and motor select contactors eliminates the many cable connections required for typical synchronous transfer systems—an ideal solution for electrical houses and smaller control rooms
- Double-bus configuration with paired motor bypass starter and motor select contactor provides a single location for landing motor leads, optimizing system configuration and connections

The SC9000 EP double-bus is integrated with a 36-inch wide drive output contactor (optional) and 36-inch wide motor bypass starters and motor select contactors structure that can be equipped with a 400 A or 800 A contactor, as required.

A 400 A motor bypass starter and a 400 A motor select contactor can be double-stacked in a single, 36-inch wide cabinet for motor systems up to 3000 hp.

800 A motor bypass starter and motor select contactor assemblies require two 36-inch wide structures for a total width of 72-inches per motor.



SC9000 EP synchronous transfer contactor assemblies

Drive output contactor

400 A motor bypass starter and motor select contactor assembly

Contactor rating	Maximum motor hp	Cabinet dimensions for motor bypass and motor select contactor assembly (inches)	Short-circuit rating
400 A	3000	36 W x 92 H x 30 D	8500 A
800 A	6000	72 W x 92 H x 30 D	12,500 A

Medium voltage integrated control gear adjustable frequency drive double-bus design

Frame A 65-inch W 250–1150 hp

Transition reactor

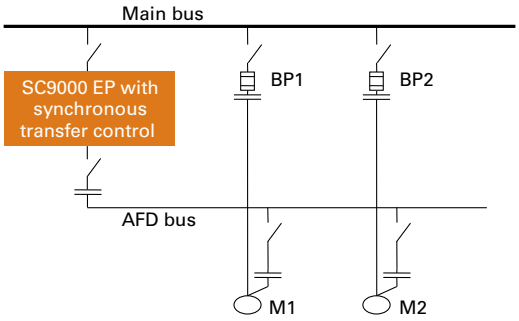
AFD bus output contactor

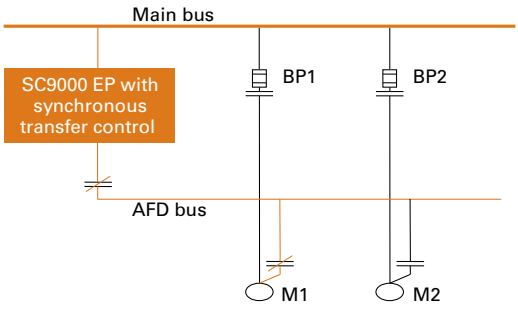
Bypass starters/motor select contactors

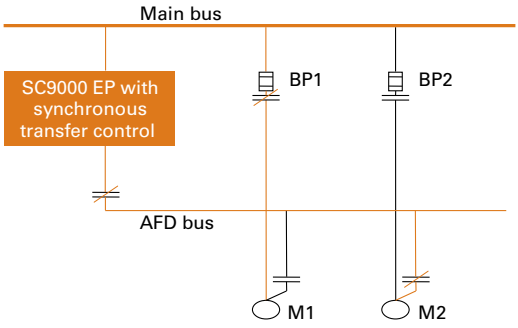
Synchronous transfer systems help power generating facilities maximize the capital efficiency of their systems by controlling multiple motors with one adjustable frequency drive.

Most manufacturers synchronous transfer control systems have multiple drive output and motor select contactors that are interconnected typically via cables to allow the AFD to manage multiple motors.

With the SC9000 EP and Eaton's integrated medium voltage control gear design; the double bus design, drive output, and motor select contactors are all close-coupled under a common bus with no cables, providing a more compact design and superior performance.







The synchronous transfer control device is designed to match the output voltage, frequency, and phase of the SC9000 EP to the incoming utility.

By matching these parameters, the drive system can transfer a motor from the SC9000 EP to the utility without disturbance.

The SC9000 EP and control systems are programmed to start or stop a single motor, as well as sync to other motors as needed.

Upon system startup, the SC9000 EP and AFD bus are energized.

The synchronous transfer control closes the drive output and the designated motor select contactor, and starts the SC9000 EP allowing power to be directed to the desired motor (M1) for operation.

The designated motor can now operate at adjustable speed as needed.

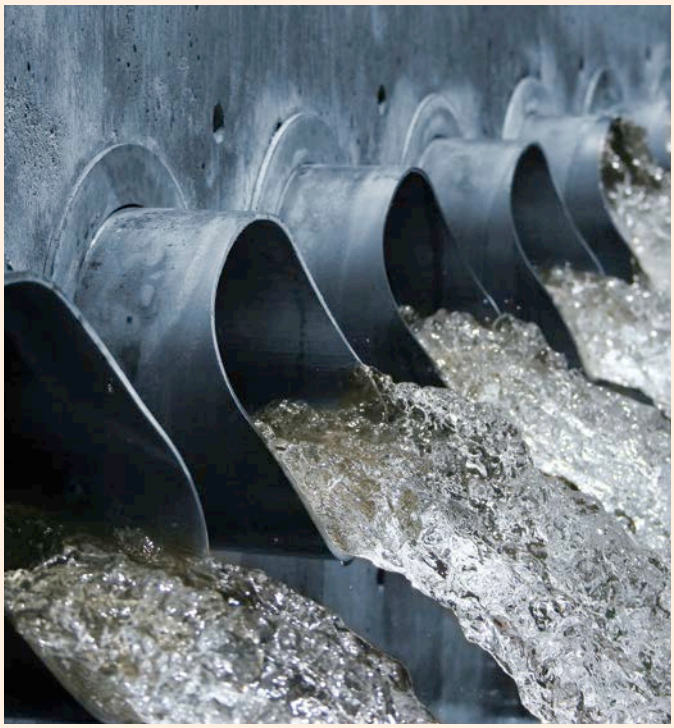
When an additional motor is required, the PLC will send a command to the SC9000 EP to sync with the new motor (M2).

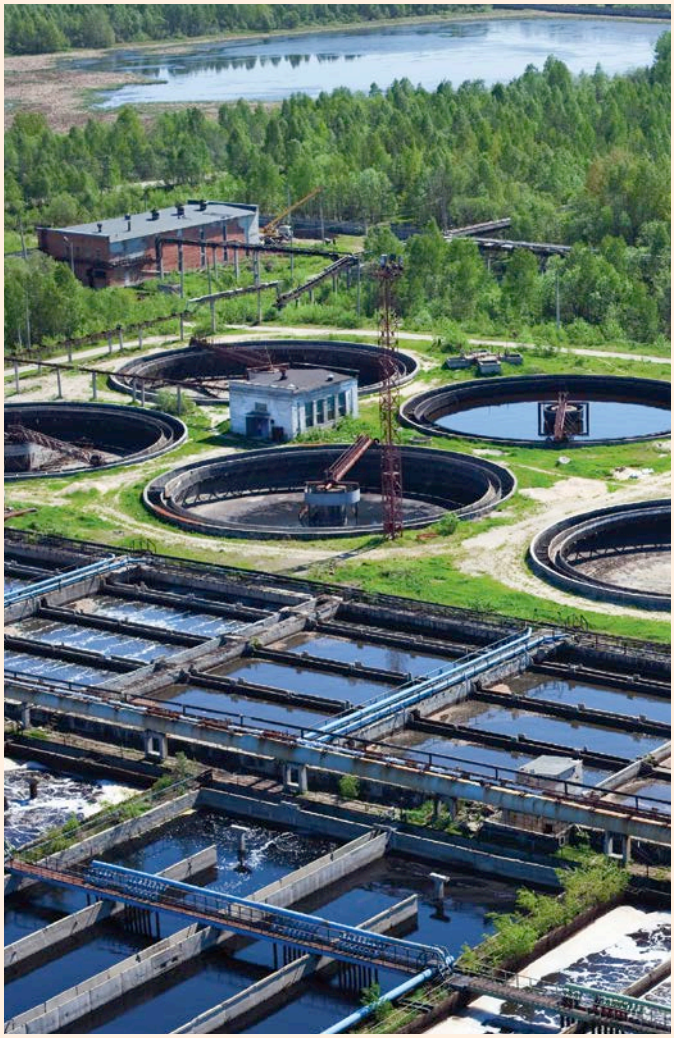
The SC9000 EP adjusts its output to match the utility line voltage, frequency, and phase angle. Once the drive output and line are synchronized, the system will transfer the motor from the drive output to the utility by opening the motor select contactor (M1) and closing the motor bypass contactor (BP1).

Once synchronization is locked, the adjacent motor select contactor (M2) is closed, and the SC9000 EP can now operate the additional motors at adjustable speed as needed.

SC9000 EP

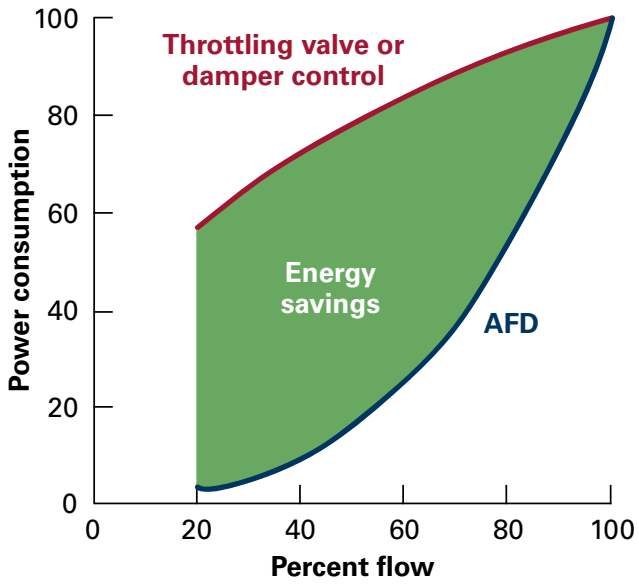
For all of your industrial applications





Affinity laws for pumps and fans

- **Flow rate** varies **directly** with the ratio of the speeds
- **Pressure** varies with the **square** of the ratio of the speeds
- **Horsepower** varies with the **cube** of the ratio of the speeds



With an AFD, running a motor at 50% speed requires only 12.5% horsepower.

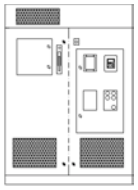
Efficiency, power factor and harmonics typical data			
Speed: 50%	**Load (%)**		
	50	**75**	**100**
Input PF (1)	0.96	0.98	0.98
Input THD (V)	3.13	3.64	3.43
Input THD (I)	7.59	6.40	6.73
Efficiency (%)	0.94	0.96	0.96
Speed: 75%	**Load (%)**		
	50	**75**	**100**
Input PF (1)	0.98	0.99	0.99
Input THD (V)	1.34	2.32	3.15
Input THD (I)	6.76	4.44	3.85
Efficiency (%)	0.97	0.97	0.97
Speed: 100%	**Load (%)**		
	50	**75**	**100**
Input PF (1)	0.98	0.99	0.99
Input THD (V)	2.16	2.20	2.30
Input THD (I)	5.95	4.38	3.13
Efficiency (%)	0.97	0.97	0.97

SC9000 EP—a small package with a lot of power

Power specifications

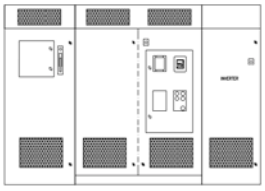
Voltage class	**4160**												
Drive rating (A)	38	44	51	57	63	76	89	101	114	124	132	155	
4160 drive output (kVA)	274	317	367	411	454	548	641	728	821	893	954	1117	
Nominal hp 4160 V	300	350	400	450	500	600	700	800	900	1000	1150 ❶	1250	
Frame size	Frame A											Frame B	
Voltage class	**4160**												
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	5361
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									

Note: Typical for a four-pole motor.

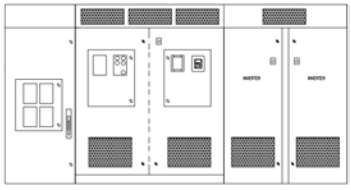


Frame A

Frame B



Frame C



Frame D and E

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 ❸	48–112	300–700	65	92	50	18.5
4160	37–132	300–1150 ❶	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 ❸	128–240	800–1500	95	92	50	20.1
4160	124–248	1000–2000	95	92	50	20.1

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 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 ❸	280–320	1750–2000	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 ❸	360–480	2250–3000	198	92	50	12.1
3300 ❸	520–640	3250–4000	222	92	50	12.1
4160 ❹	403–558	3250–4500	198	92	50	12.1
4160	620–744	5000–6000	222	92	50	12.1

Solutions that deliver

- Highly reliable and improved uptime with modular powerpole inverter
- Integrated control gear eliminates cables, reduces costs and simplifies installation
- High energy density in compact footprint
- Generate substantial energy savings

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

Eaton low voltage adjustable frequency drives

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 & 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/SC9000

Eaton.com/LVDrives

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

Powering Business Worldwide

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