

## Cooper Power Systems® Type EX®-D Single-Phase Units and Accessories

Electrical Apparatus

230-11

Cooper Power Systems Type EX®-D all-film capacitors feature the latest Cooper Power Systems design innovations—extended foil/solderless connections<sup>1</sup> and laser-cut foil. They are designed, manufactured, and tested to meet the requirements of all applicable ANSI/IEEE, NEMA, and IEC standards. In addition they are designed to exceed the requirements of these standards in terms of continuous rms and peak overvoltage withstand capabilities, and in tank rupture characteristics. These capacitors are especially suited to the rigors of industrial power systems for:

- power factor improvement
- harmonic filter applications
- reduction of losses
- reducing voltage drop

EX-D capacitors can be installed singly or in factory-assembled switched or unswitched banks in:

- pole mounted racks
- open air substation banks (for outdoor or indoor application)
- metal enclosures.

The Type EX-D capacitor provides these exclusive benefits:

- 125% continuous rms overvoltage capability
- 135% peak overvoltage capability
- greater safety through improved tank rupture characteristics
- 15,000 Amp fault current handling capability
- 100 kA transient current withstand capability
- ambient operation through +55°C (+131°F)
- low dielectric losses (0.07 watts/kVAR @ 60 Hz)
- superior electrical performance and reliability
- environmentally acceptable Edisolt® XT dielectric fluid.

### CAPACITOR APPLICATION

Capacitor application requires an evaluation of the power system to determine:

- the kVAR needs
  - the most effective location
  - the necessary protection.
- In general, capacitors are installed:
- at the substation, to supply the system var needs most effectively
  - at—or near—the load center, to obtain the optimum var supply and voltage correction
  - at the end of the line, to achieve maximum voltage correction.

### RATINGS

Cooper Power Systems Type EX-D capacitors are rated in continuous kVAR, voltage and frequency for operating within the -40 to +55°C ambient temperature range. Designed to produce not less than rated kVAR at rated voltage and frequency, they are subjected to all applicable NEMA and ANSI/IEEE standard dielectric tests. Single-phase 50- through 400-kVAR capacitors are available.

Capacitor rated voltage is the voltage that can be applied terminal to terminal; for example, a 2400-volt capacitor can be delta-connected on a 2400-volt system or wye-connected on a 2400/ 4160-volt system. In each case, the voltage applied to the capacitor terminals is 2400 volts. Because a capacitor's kVAR output varies as the square of the ratio of applied voltage to rated voltage, application at the proper voltage is essential for optimum operating performance and long service life.



**Figure 1.** EX®-D single-phase, all-film capacitor.

The maximum recommended working voltage of an EX-D capacitor is 125% of rated voltage. Cooper Power Systems capacitors include a safety factor that permits them to tolerate—without damage—momentary overvoltages caused by switching or load changes.

The capacitor units cataloged in this section are designed for operation at a rated frequency of 60 Hz. kVAR output varies directly as the ratio of applied frequency to rated frequency. Capacitors designed to operate at 50 Hz or other frequencies are also available upon request. Table 1 lists the ratings and catalog numbers for standard Type EX-D single- and double-bushing capacitors. Other unit kVAR sizes, voltage ratings and BIL ratings are available.

<sup>1</sup>US Patent 4,633,369

Single-Phase Capacitors

**TABLE 1**  
**Ratings and Catalog Numbers for Standard Single- and Double-Bushing Capacitors**

Ratings		50-kVAR Capacitors		100-kVAR Capacitors		150 kVAR Capacitors	
Voltage (volts)	BIL (kV)	Double-Bushing	Single-Bushing	Double-Bushing	Single-Bushing	Double-Bushing	Single-Bushing
2400	75	CEP320A1	CEP320B1	CEP331A1	CEP331B1	CEP332A1	CEP332B1
2770	75	CEP320A2	CEP320B2	CEP331A2	CEP331B2	CEP332A2	CEP332B2
4160	75	CEP320A3	CEP320B3	CEP331A3	CEP331B3	CEP332A3	CEP332B3
4800	75	CEP320A4	CEP320B4	CEP331A4	CEP331B4	CEP332A4	CEP332B4
6640	95	CEP320A5	CEP320B5	CEP331A5	CEP331B5	CEP332A5	CEP332B5
7200	95	CEP320A6	CEP320B6	CEP331A6	CEP331B6	CEP332A6	CEP332B6
7620	95	CEP320A7	CEP320B7	CEP331A7	CEP331B7	CEP332A7	CEP332B7
7960	95	CEP320A8	CEP320B8	CEP331A8	CEP331B8	CEP332A8	CEP332B8
8320	95	CEP324M7	CEP323M3	CEP326M4	CEP325M3	CEP328M6	CEP327M15
9540	95	CEP324M4	CEP323M4	CEP326M24	CEP325M4	CEP328M2	CEP327M21
9960	95	CEP320A9	CEP320B9	CEP331A9	CEP331B9	CEP332A9	CEP332B9
11400	95	CEP324M8	CEP323M5	CEP326M25	CEP325M19	CEP328M13	CEP327M22
	125	—	—	—	—	—	—
	150	—	—	—	—	—	—
12470	95	CEP320A10	CEP320B10	CEP331A0	CEP331B10	CEP332A10	CEP332B10
	125	CEP324M9	—	CEP326M3	—	CEP328M11	—
	150	—	CEP323B6	—	CEP330B6	—	CEP339B6
13280	95	CEP320A11	CEP320B11	CEP331A11	CEP331B11	CEP332A11	CEP332B11
	125	CEP324M10	—	CEP326M9	—	CEP328M9	—
	150	—	CEP323B7	—	CEP330B7	—	CEP339B7
13800	95	CEP320A12	CEP320B12	CEP331A12	CEP331B12	CEP332A12	CEP332B12
	125	CEP324M11	—	CEP326M20	—	CEP328M14	—
	150	—	CEP323B8	—	CEP330B8	—	CEP339B8
14400	95	CEP320A13	CEP320B13	CEP331A13	CEP331B13	CEP332A13	CEP332B13
	125	CEP324M12	—	CEP326M1	—	CEP328M5	—
	150	—	CEP323B9	—	CEP330B9	—	CEP339B9
15125	150	—	CEP323M6	—	CEP325M1	—	CEP327M23
19920	150	—	—	—	CEP334B4	—	CEP333B4
20800	150	—	—	—	CEP325M20	—	—
21600	150	—	—	—	CEP334B5	—	CEP333B5
22130	150	—	—	—	—	—	CEP327M24
22800	150	—	—	—	CEP325M21	—	—
23800	150	—	—	—	—	—	—
24940	150	—	—	—	—	—	—

**TABLE 1 (continued)**  
**Ratings and Catalog Numbers for Standard Single- and Double-Bushing Capacitors**

Ratings		200-Kvar Capacitors		300-Kvar Capacitors		400-Kvar Capacitors	
Voltage (volts)	BIL (kV)	Double-Bushing	Single-Bushing	Double-Bushing	Single-Bushing	Double-Bushing	Single-Bushing
2400	75	CEP340A1	CEP340B1	—	—	—	—
2770	75	CEP340A2	CEP340B2	—	—	—	—
4160	75	CEP340A3	CEP340B3	—	—	—	—
4800	75	CEP340A4	CEP340B4	—	—	—	—
6640	95	CEP340A5	CEP340B5	—	—	—	—
7200	95	CEP340A6	CEP340B6	CEP360A6	CEP360B6	CEP370A6	CEP370B6
7620	95	CEP340A7	CEP340B7	CEP360A7	CEP360B7	CEP370A7	CEP370B7
7960	95	CEP340A8	CEP340B8	CEP360A8	CEP360B8	CEP370A8	CEP370B8
8320	95	CEP330M13	CEP329M1	CEP332M9	CEP331M8	CEP334M5	CEP333M13
9540	95	CEP340M30	CEP329M31	CEP332M3	CEP331M22	CEP334M6	CEP333M14
9960	95	CEP340A9	CEP340B9	CEP360A9	CEP360B9	CEP370A9	CEP370B9
11400	95	CEP132M18	CEP329M19	CEP332M18	CEP331M23	CEP334M7	CEP333M15
	125	CEP330M32	—	—	—	—	—
	150	—	CEP329M20	—	—	—	—
12470	95	CEP340A10	CEP340B10	CEP360A10	CEP360B10	CEP370A10	CEP370B10
	125	CEP330M9	—	CEP332M14	—	CEP334M4	—
	150	—	CEP343B6	—	CEP363B6	—	CEP373B6
13280	95	CEP340A11	CEP340B11	CEP360A11	CEP360B11	CEP370A11	CEP370B11
	125	CEP330M9	—	CEP332M10	—	CEP334M8	—
	150	—	CEP343B7	—	CEP363B7	—	CEP373B7
13800	95	CEP340A12	CEP340B12	CEP360A12	CEP360B12	CEP370A12	CEP370B12
	125	CEP330M2	—	CEP332M13	—	CEP334M9	—
	150	—	CEP343B8	—	CEP363B8	—	CEP373B8
14400	95	CEP340A13	CEP340B13	CEP360A13	CEP360B13	CEP370A13	CEP370B13
	125	CEP330M1	—	CEP332M5	—	CEP334M2	—
	150	—	CEP343B9	—	CEP363B9	—	CEP373B9
15125	150	—	CEP329M12	—	CEP331M24	—	CEP333M16
19920	150	—	CEP345B4	—	CEP365B4	—	CEP375B4
20800	150	—	CEP329M38	—	CEP331M9	—	CEP333M17
21600	150	—	CEP345B5	—	CEP365B5	—	CEP375B5
22130	150	—	CEP329M48	—	CEP331M25	—	CEP333M20
22800	150	—	CEP329M10	—	—	—	CEP333M11
23800	150	—	CEP329M46	—	CEP331M11	—	CEP333M18
24940	150	—	CEP329M47	—	—	—	CEP333M19

## Bushings

Bushing characteristics are shown in Table 2.

**TABLE 2**  
**Bushing Characteristics and Weights**

BIL (kV)	Creepage Distance (in.)	Strike Distance (in.)	60-Hz Withstand		Approximate Net Weight/ Bushing (lb)
			60-Sec. Dry (kV)	10-Sec. Wet (kV)	
75**	10.38	6.25	35	30	3
95*	10.38	6.25	35	30	3
150*	18.12	9.50	60	50	5
150	22.00	9.50	60	50	6
200	26.00	14.00	80	75	7

\* Bushings furnished on standard capacitors shown in Table 1 and Figure 2.

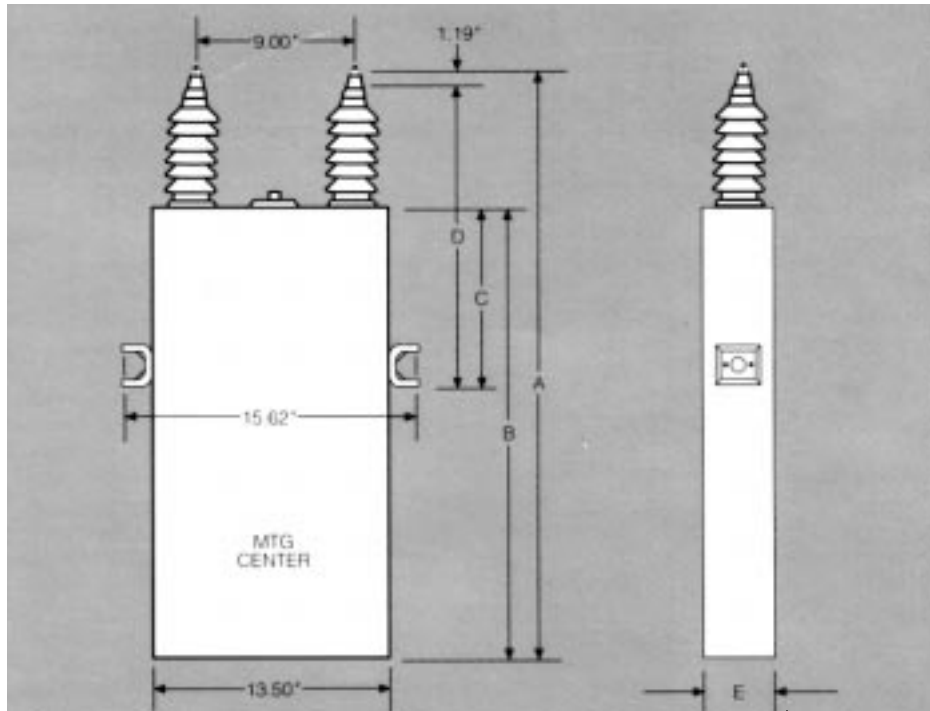
\*\* Same bushing is used on 75 and 95 kV BIL capacitor units.

### CONSTRUCTION FEATURES

Construction features of Cooper Power Systems power capacitors include:

- stainless-steel tank with light-gray finish for resistance to corrosive atmospheres
- light-gray, wet-process-porcelain bushings; glazed for high strength and durability and hermetically sealed to the capacitor tank
- stainless-steel mounting brackets with industry-standard 15.62-in. mounting centers for unit interchangeability; underside of each bracket is unpainted for positive grounding
- parallel-groove terminals that accommodate copper or aluminum conductors from No. 8 solid to No. 1 stranded
- internal discharge resistors that reduce terminal voltage to 50 volts or less within five minutes after the capacitor has been disconnected
- stainless-steel nameplate containing required NEMA and ANSI/IEEE data
- blue non-PCB decal.

### DIMENSIONS AND WEIGHTS



Ratings			Dimensions					Approx. Net Bushing Capacitor* (lb)
Kvar	Voltage (volts)	BIL (kV)	A	B	C	D	E	
50	2400-4800	75	14.25	6.00	5.88	12.94	4.25	30
	6640-14400	95	14.25	6.00	5.88	12.94	4.25	30
	6640-14400	150	17.87	6.00	5.88	16.56	4.25	34
100	2400-4800	75	18.75	10.50	9.88	12.94	4.25	44
	6640-14400	95	18.75	10.50	9.88	12.94	4.25	44
	6640-24940	150	22.37	10.50	9.88	16.56	4.25	48
150	2400-4800	75	22.50	14.25	9.88	16.94	4.50	58
	6640-14400	95	22.50	14.25	9.88	16.94	4.50	58
	6640-24940	150	26.12	14.25	9.88	20.56	4.50	62
200	2400-4800	75	23.25	15.00	9.88	16.94	5.25	66
	6640-14400	95	23.25	15.00	9.88	16.94	5.25	66
	6640-24940	150	26.87	15.00	9.88	20.56	5.25	70
300	6640-14400	95	31.75	23.50	9.88	16.94	4.50	89
	6640-24940	150	35.38	23.50	9.88	20.56	4.50	93
400	6640-14400	95	31.75	23.50	9.88	16.94	5.75	105
	6640-24940	150	35.38	23.50	9.88	20.56	5.75	109

\* For single-bushing capacitors, deduct appropriate weight in Table 2 from weight in this column. To estimate shipping weight for a single- or a double-bushing capacitor, add 4 lb to net weight.

NOTE: Dimensions and weights usually represent the worst case for unit size ranges represented. Contact Cooper Power Systems for exact weights and dimensions on units of specific rating.

**Figure 2.**  
Dimensions and weights of 50-, 100-, 150, 200-, 300-, and 400-kvar capacitors.

