



Type EXLIM-T Surge Arresters
Maximum System Voltage 245 to 800 kV

EXLIM-T Metal Oxide Gapless Surge Arresters

EXLIM-T Surge Arresters are used for the protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages. For use when requirements of lightning intensity and energy capability are very high.

Application

The EXLIM-T Surge Arrester has been verified to meet Station Class requirements of IEEE C62.11 (IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits) and Line Discharge Class 5 requirements of IEC 60099-4 (IEC Standard for Metal-Oxide Surge Arresters without gaps for AC Systems). The EXLIM-T Surge Arrester is designed to meet the following performance data:

Performance data

Standard porcelain color	ANSI grey <i>Brown available upon request</i>
Maximum system voltage (V_m)	245 to 800 kV _{rms}
Duty cycle rated voltage (V_r)	180 to 624 kV _{rms}
Classifying current IEEE IEC	10 / 15 / 20 kA _{peak} 20 kA _{peak}
Discharge current withstand strength High current 4 / 10 us Low current 2000 us	150 kA _{peak} 1900 A _{peak}
Energy capability 2 impulses (IEC Cl 7.5.5)* <i>Fulfills requirements of IEEE transmission-line discharge test for 24 kV systems</i>	19.3 kJ/kV of MCOV
Short-circuit / pressure relief capability	65 kA _{rms sym}
Mechanical strength ¹ Permissible static service load (PSSL) Maximum permissible dynamic service load (MPDSL)	5310 ft-lbs / 7200 Nm 13276 ft-lbs / 18000 Nm
Service conditions Ambient temperature Design altitude ^{2,3} Frequency	-50 °C to +45 °C 6000 ft / 1830 m 15 to 62 Hz

Type tested to the following standards:

IEEE standard C62.11

IEC standard 60099-4 Ed 2.1

Notes:

1 Higher strength designs available on request

2 Unless otherwise noted

3 Higher altitude designs available on request

Benefit

Robust design

The EXLIM Surge Arrester is based on a design with over 70 years of field experience, first as a gapped SiC arrester, in climates and conditions all over the world. EXLIM arresters live up to their name: EXcellent voltage LIMiters. The design is robust and well-matched with other apparatus in substations. Each arrester is built up of one or more units. Each unit is made up of a porcelain housing that contains a single column of metal oxide varistors. Each metal oxide varistor is manufactured by ABB where the design is verified routinely through rigorous testing to ensure superior quality. The metal oxide varistors are dispersed throughout the porcelain housing with the necessary spacers as determined by the electrical design of the arrester.

Aluminum flanges that house the hermetic sealing system and compress the metal oxide varistor stack are cemented to the ends of the porcelain housing. The sealing arrangement in each flange consists of a prestressed stainless steel plate with a rubber gasket. In the event that the arrester is stressed in excess of its design capability, the internal pressure causes the sealing plate to deflect open, allowing the ionized gases to flow out through the venting ducts. The seal is verified on every arrester prior to routine testing.

Each arrester is furnished with a mounting base, 4-hole NEMA line pad, and line and ground terminals for electrical connections.

Nameplates

Standard (Mylar)

ABB EXLIM SURGE ARRESTER		MADE IN USA
STYLE NO.	RATING	kV
SERIAL NO.	MCOV	kV
IEEE/IEC CLASS	STATION / 5	PRESS RELIEF CLASS 65 kA
DATE	WT	GRADING RING

Master nameplate (SSTL)

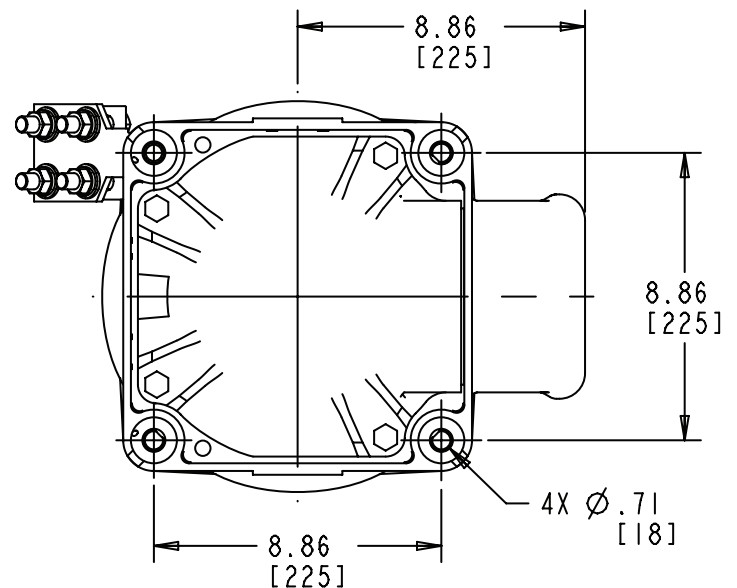
ABB EXLIM SURGE ARRESTER		MADE IN USA
UNIT STACKING ORDER		
STYLE NO.	SERIAL NO.	MCOV
BOT		kV
2ND		kV
3RD		kV

Unit stacking order nameplate (SSTL)

ABB EXLIM SURGE ARRESTER		MADE IN USA
UNIT INFORMATION		
UNIT STYLE NO.		
UNIT SERIAL NO.		
UNIT MCOV		kV

Unit nameplate (SSTL)

Drilling plan



Alternate bolt hole patterns available upon request.

Quick selection guide

	System Voltage		Surge Arrester ANSI/IEEE Ratings			
	Maximum V_m (kV _{rms})	Nominal		Three-Wire V_r / V_{MCOV} (kV _{rms})	Four-Wire Grounded V_r / V_{MCOV} (kV _{rms})	Four-Wire Grounded High Impedance V_r / V_{MCOV} (kV _{rms})
		Three-Wire V_n (kV _{rms})	Four-Wire V_n (kV _{rms})			
Medium Voltage	2.52	2.4		3 / 2.55		
	4.37Y / 2.52		4.16Y / 2.4		3 / 2.55	5 / 4.25
	4.37	4.16		5 / 4.25		
	5.04	4.8		6 / 5.1		
	7.24	6.9		9 / 7.65		
	8.73Y / 5.04		8.32Y / 4.8		6 / 5.1	12 / 10.2
	12.6Y / 7.27		12.0Y / 6.93		9 / 7.65	15 / 12.7
	13.09Y / 7.56		12.47Y / 7.2		9 / 7.65	18 / 15.3
	13.86Y / 8.0		13.2Y / 7.62		10 / 8.4	18 / 15.3
	14.49Y / 8.37		13.8Y / 7.97		10 / 8.4	18 / 15.3
	14.49	13.8		18 / 15.3		
	21.82Y / 12.6		20.78Y / 12.0		15 / 12.7	27 / 22
	24.0Y / 13.86		22.86Y / 13.2		18 / 15.3	30 / 24.4
	24.15	23.0		30 / 24.4		
	26.19Y / 15.12		24.94Y / 14.4		21 / 17	33 / 27
	36.23Y / 20.92		34.5Y / 19.92		27 / 22	42 / 34
36.23						
High Voltage	48.30			48 / 39		
	72.50			60 / 48		
	123			108 / 84		
	145			120 / 98		
	170			144 / 115		
	245			192 / 152		
	300			228 / 180		
	362			276 / 220		
	420			336 / 272		
550			420 / 335			

Key

V_n	Nominal System Voltage per NEMA C84.1
V_m	Maximum System Voltage per NEMA C84.1
V_r	Duty Cycle Rated Voltage per IEEE C62.11
MCOV	Maximum Continuous Operating Voltage per IEEE C62.11
TOV	Temporary Overvoltage
SPL	Switching Protective Level
	500 A 3-132 V_r (kV _{rms})
	1000 A 144-240 V_r (kV _{rms})
	2000 A 258-624 V_r (kV _{rms})
LPL	Lightning Protective Level
FOW	Front of Wave

Guaranteed performance data

Electrical characteristics											
Ratings (kV _{rms})		TOV (kV _{rms})		Maximum residual voltage with current wave, (kV _{peak})							
Voltage		with prior energy single impulse of 12.5 kJ/kV _{MCOV}		SPL (SIPL) 30/60 μS	LPL (LIPL) 8/20 μs					FOW 0.5 μs	
V _r	MCOV V _{MCOV}	1 sec	10 sec		1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	10 kA
180	144	213	203	346	358	371	381	396	430	466	424
192	152	227	216	370	382	396	407	423	459	498	453
198	160	234	223	381	394	408	419	436	474	513	467
210	170	248	236	404	417	432	444	462	502	544	495
216	173	255	243	416	430	446	457	476	517	560	510
222	179	262	250	427	442	458	470	489	531	576	524
228	180	269	257	439	453	470	482	502	545	591	538
240	190	283	270	461	477	494	507	528	573	621	565
258	209	305	290	496	513	532	546	568	617	668	608
264	212	312	297	508	525	544	558	581	631	684	622
276	220	326	311	531	549	569	584	608	660	716	651
288	230	340	324	554	572	593	609	634	688	746	679
294	235	347	331	565	584	605	622	647	702	761	693
300	243	354	338	577	596	618	634	660	717	777	707
312	245	368	351	600	620	643	660	687	746	808	736
336	272	397	378	647	668	692	711	740	803	871	792
360	288	425	405	692	715	741	761	792	860	932	848
396	318	468	446	762	787	816	838	872	947	1026	934
420	335	496	473	807	834	864	888	924	1003	1087	989
444	353	524	500	853	882	914	938	977	1061	1149	1046
588	470	694	662	1130	1168	1210	1243	1294	1404	1522	1385
612	490	723	689	1176	1215	1260	1294	1347	1462	1585	1442
624	499	737	702	1199	1239	1284	1319	1373	1490	1615	1470

Note: Contact factory for ratings below 180 kV V_r.

Style numbers and technical data for housings

Vertical mounting styles with standard creepage distance

Surge Arrester IEEE Ratings V_r / V_{MCOV} (kV)	Style Number	Creepage Distance inches (mm)	Strike Distance inches (mm)	BIL 1.2/50 μ s dry kV _{peak}	Weight (Mass) lbs (kg)	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	Fig
180 / 144	T180GA144A	258.7 (6570)	63.97 (1625)	1172	607 (275)	105.83 (2688)	31.50 (800)		19.69 (500)	1
192 / 152	T192GA152A	258.7 (6570)	63.97 (1625)	1172	607 (275)	105.83 (2688)	31.50 (800)		19.69 (500)	1
198 / 160	T198GA160A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
210 / 170	T210GA170A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
216 / 173	T216GA173A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
222 / 179	T222GA179A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
228 / 180	T228GA180A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
240 / 190	T240GA190A	258.7 (6570)	71.85 (1825)	1172	607 (275)	105.83 (2688)	23.62 (600)		11.81 (300)	1
258 / 209	T258GA209A	258.7 (6570)	63.97 (1625)	1172	607 (275)	105.83 (2688)	31.50 (800)		19.69 (500)	1
264 / 212	T264GA212A	303.8 (7717)	73.03 (1855)	1360	739 (335)	118.82 (3018)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
276 / 220	T276GA220A	303.8 (7717)	73.03 (1855)	1360	739 (335)	118.82 (3018)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
288 / 230	T288GA230A	303.8 (7717)	73.03 (1855)	1360	739 (335)	118.82 (3018)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
294 / 235	T294GA235A	303.8 (7717)	73.03 (1855)	1360	739 (335)	118.82 (3018)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
300 / 243	T300GA243A	303.8 (7717)	73.03 (1855)	1360	739 (335)	118.82 (3018)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
312 / 245	T312GA245A	349.0 (8864)	86.02 (2185)	1548	849 (385)	131.81 (3348)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
336 / 272	T336GA272A	349.0 (8864)	86.02 (2185)	1548	849 (385)	131.81 (3348)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
360 / 288	T360GA288A	360.6 (9161)	91.46 (2323)	1678	937 (425)	147.72 (3752)	47.24 (1200)	39.37 (1000)	23.62 (600)	2
396 / 318	T396GA318A	433.0 (11002)	104.36 (2651)	1946	1048 (475)	175.55 (4459)	70.87 (1800)	39.37 (1000)	31.50 (800)	3
420 / 335	T420GA335A	433.0 (11002)	104.36 (2651)	1946	1048 (475)	175.55 (4459)	70.87 (1800)	39.37 (1000)	31.50 (800)	3
444 / 353	T444GA353A	523.5 (13296)	130.34 (3311)	2322	1191 (540)	201.54 (5119)	70.87 (1800)	39.37 (1000)	31.50 (800)	3

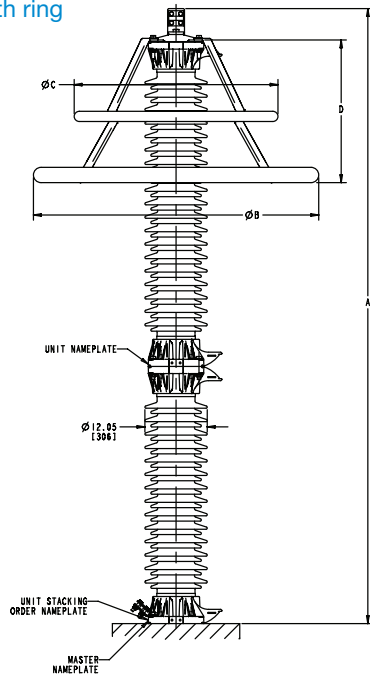
Note: For 588, 612, and 624 kV V_r surge arresters, please contact factory for style numbers and housing data.

Vertical mounting styles with extra creepage distance

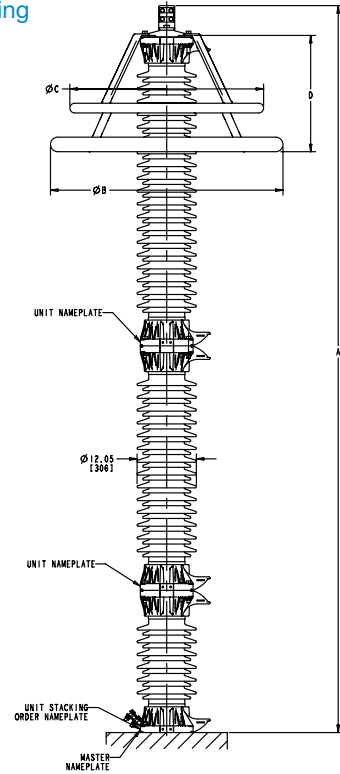
Surge Arrester IEEE Ratings V_r / V_{MCOV} (kV)	Style Number	Creepage Distance inches (mm)	Strike Distance inches (mm)	BIL 1.2/50 μ s dry kV _{peak}	Weight (Mass) lbs (kg)	A inches (mm)	B inches (mm)	C inches (mm)	D inches (mm)	Fig
180 / 144	T180GB144A	303.8 (7717)	76.96 (1955)	1360	660 (300)	118.82 (3018)	31.50 (800)		19.69 (500)	1
192 / 152	T192GB152A	303.8 (7717)	76.96 (1955)	1360	660 (300)	118.82 (3018)	31.50 (800)		19.69 (500)	1
198 / 160	T198GB160A	303.8 (7717)	76.96 (1955)	1360	660 (300)	118.82 (3018)	31.50 (800)		19.69 (500)	1
210 / 170	T210GB170A	303.8 (7717)	84.84 (2155)	1360	671 (305)	118.82 (3018)	23.62 (600)		11.81 (300)	1
216 / 173	T216GB173A	303.8 (7717)	84.84 (2155)	1360	671 (305)	118.82 (3018)	23.62 (600)		11.81 (300)	1
222 / 179	T222GB179A	303.8 (7717)	84.84 (2155)	1360	671 (305)	118.82 (3018)	23.62 (600)		11.81 (300)	1
228 / 180	T228GB180A	303.8 (7717)	84.84 (2155)	1360	671 (305)	118.82 (3018)	23.62 (600)		11.81 (300)	1
240 / 190	T240GB190A	303.8 (7717)	84.84 (2155)	1360	671 (305)	118.82 (3018)	23.62 (600)		11.81 (300)	1
258 / 209	T258GB209A	303.8 (7717)	69.09 (1755)	1360	726 (330)	118.82 (3018)	55.12 (1400)	39.37 (1000)	27.56 (700)	1
258 / 209	T258GC209A	360.7 (9161)	75.71 (1923)	1678	937 (425)	147.72 (3752)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
258 / 209	T258GD209A	478.3 (12149)	109.48 (2781)	2134	1023 (465)	181.50 (4610)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
264 / 212	T264GB212A	360.7 (9161)	75.71 (1923)	1678	937 (425)	147.72 (3752)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
264 / 212	T264GC212A	478.3 (12149)	109.48 (2781)	2134	1023 (465)	181.50 (4610)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
276 / 220	T276GB220A	360.7 (9161)	75.71 (1923)	1678	937 (425)	147.72 (3752)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
276 / 220	T276GC220A	478.3 (12149)	109.48 (2781)	2134	1023 (465)	181.50 (4610)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
288 / 230	T288GB230A	360.7 (9161)	75.71 (1923)	1678	937 (425)	147.72 (3752)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
288 / 230	T288GC230A	478.3 (12149)	109.48 (2781)	2134	1023 (465)	181.50 (4610)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
294 / 235	T294GB235A	360.7 (9161)	75.71 (1923)	1678	937 (425)	147.72 (3752)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
294 / 235	T294GC235A	478.3 (12149)	109.48 (2781)	2134	1023 (465)	181.50 (4610)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
300 / 243	T300GB243A	349.0 (8864)	86.02 (2185)	1548	849 (385)	131.81 (3348)	47.24 (1200)	39.37 (1000)	23.62 (600)	1
300 / 243	T300GC243A	433.1 (11002)	88.62 (2251)	1946	1012 (460)	168.51 (4280)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
300 / 243	T300GD243A	523.5 (13296)	122.47 (3111)	2322	1166 (530)	194.49 (4940)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
312 / 245	T312GB245A	433.1 (11002)	88.62 (2251)	1946	1012 (460)	168.51 (4280)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
312 / 245	T312GC245A	523.5 (13296)	122.47 (3111)	2322	1166 (530)	194.49 (4940)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
336 / 272	T336GB272A	433.1 (11002)	88.62 (2251)	1946	1012 (460)	168.51 (4280)	62.99 (1600)	39.37 (1000)	47.24 (1200)	2
336 / 272	T336GC272A	523.5 (13296)	122.47 (3111)	2322	1166 (530)	194.49 (4940)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
360 / 288	T360GB288A	433.1 (11002)	108.30 (2751)	1946	1012 (460)	168.51 (4280)	55.12 (1400)	39.37 (1000)	27.56 (700)	2
360 / 288	T360GC288A	523.5 (13296)	122.47 (3111)	2322	1166 (530)	194.49 (4940)	62.99 (1600)	39.37 (1000)	39.37 (1000)	2
396 / 318	T396GB318A	562.5 (14287)	135.70 (3447)	2352	1298 (590)	225.24 (5721)	78.74 (2000)	39.37 (1000)	39.37 (1000)	4
396 / 318	T396GC318A	698.0 (17728)	166.80 (4237)	3096	1529 (695)	264.22 (6711)	78.74 (2000)	39.37 (1000)	47.24 (1200)	4
420 / 335	T420GB335A	562.5 (14287)	135.70 (3447)	2352	1298 (590)	225.24 (5721)	78.74 (2000)	39.37 (1000)	39.37 (1000)	4
420 / 335	T420GC335A	698.0 (17728)	166.80 (4237)	3096	1529 (695)	264.22 (6711)	78.74 (2000)	39.37 (1000)	47.24 (1200)	4
444 / 353	T444GB353A	562.5 (14287)	127.83 (3247)	2352	1309 (595)	225.24 (5721)	78.74 (2000)	39.37 (1000)	47.24 (1200)	4
444 / 353	T444GC353A	698.0 (17728)	166.80 (4237)	3096	1529 (695)	264.22 (6711)	78.74 (2000)	39.37 (1000)	47.24 (1200)	4

Figures

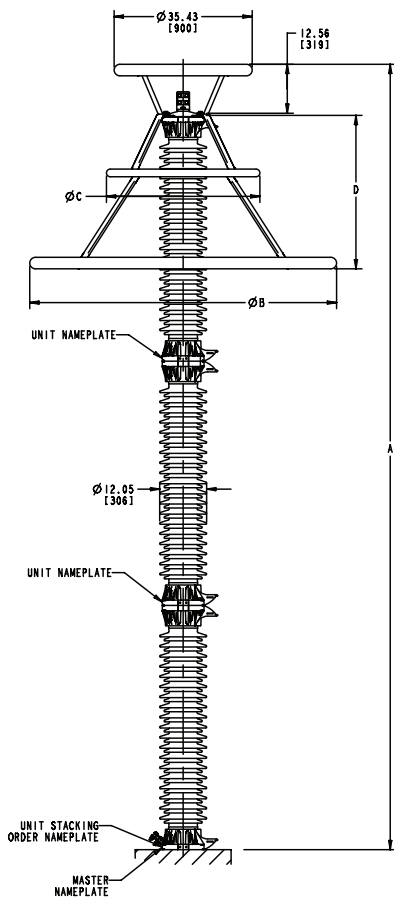
1 Double housing with ring



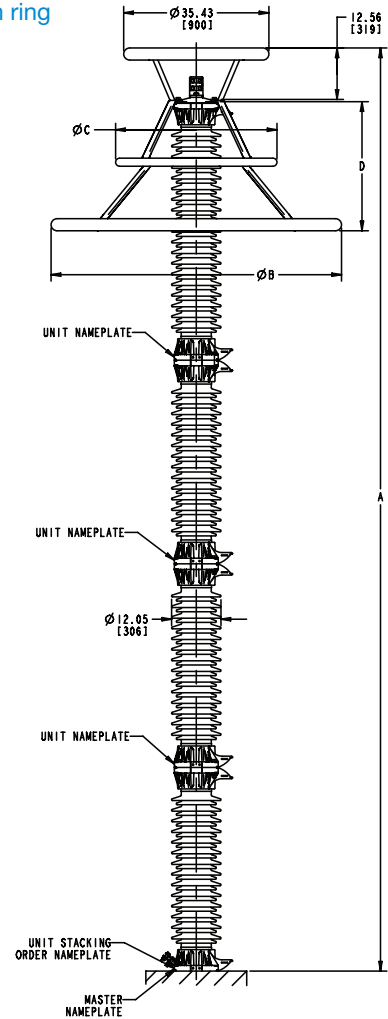
2 Triple housing with ring



3 Triple housing with ring and corona



4 Quadruple housing with ring



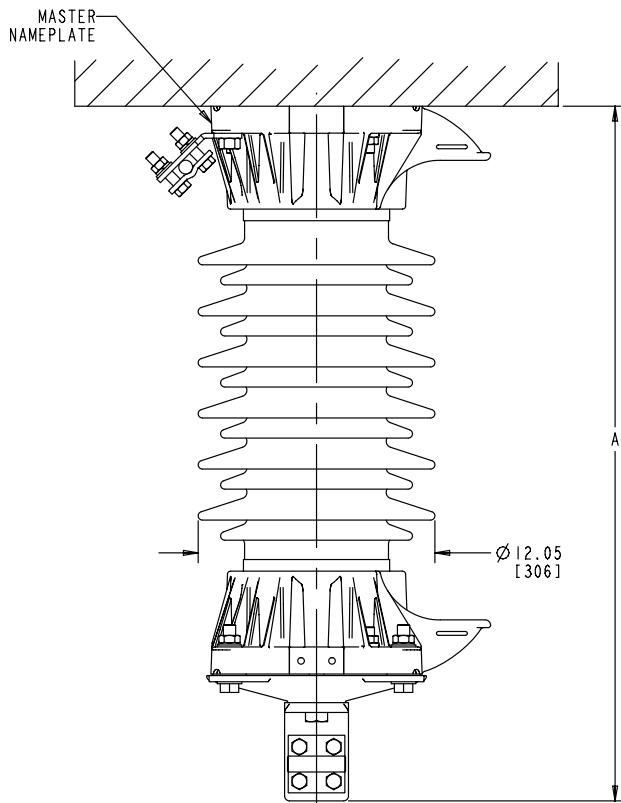
Optional mountings

Under-hung mounted styles

Available for all ratings. To select, add 'UH' to the end of the style number.

(Example: 180 kV T180GA144AUH)

Single housing under-hung

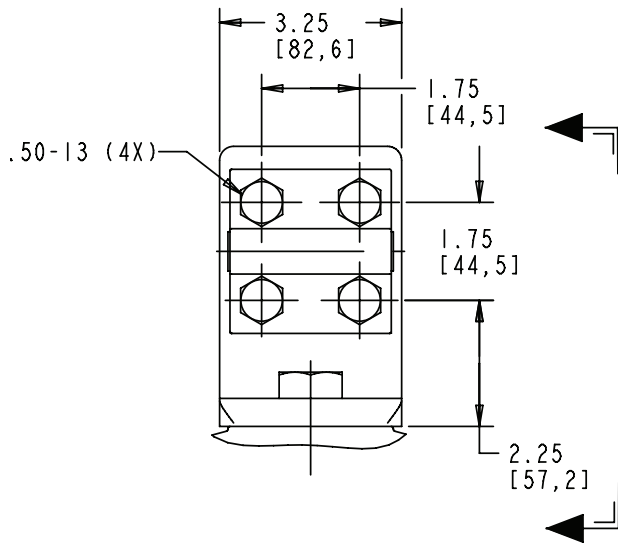
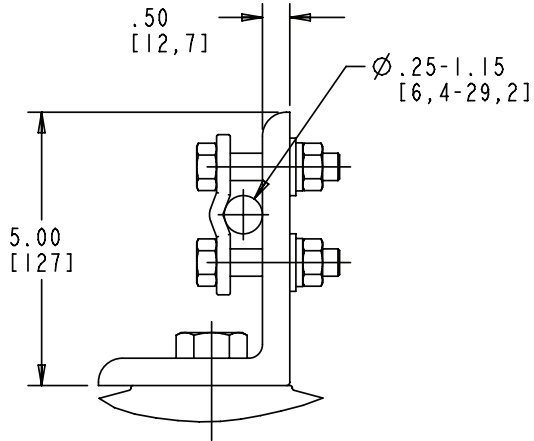


Multi-rated arresters available upon request.

Standard hardware

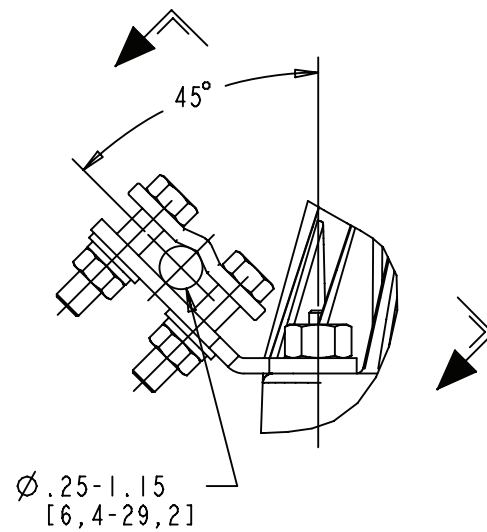
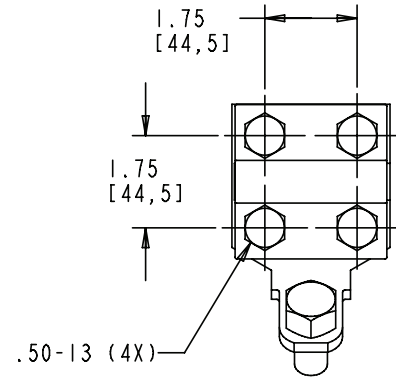
Line terminal

Aluminum / galvanized steel



Ground terminal

Galvanized steel



Note: Line and ground terminals can accommodate copper or aluminum cable size Number 2 to 1000 MCM / 0.25 to 1.15 in. diameter. Ground terminal can be located on any lug.

Phase-to-ground clearance

The phase-to-ground clearance in substations is usually based on the selected standard rated lightning and switching impulse withstand voltages. International standards, e.g. IEC 60071-2, recommend minimum clearances.

In general, the clearance between a grounded object and a surge arrester should be the same as the phase-to-ground clearance selected for other high voltage equipment in a substation. If it is not possible to use the normal phase-to-ground clearance in special applications of EXLIM-P Surge Arresters, a smaller clearance may be chosen, considering the protective characteristics of the arrester. At system voltages 24 kV and below, the margin between the rated withstand voltage of the substation and the protective level of the surge arrester is large. Furthermore, distance effects by fast transients do not exist in the immediate vicinity of the surge arrester.

Thus, the recommended minimum phase-to-ground clearance for EXLIM-P Surge Arresters, with regard to lightning and switching overvoltages are presented in Figure 1. These clearances are based on IEC 60071-2, Table VI, and on the protective characteristics of the surge arrester. They include safety margins and altitude correction.

The *Adjusted Protective Level* to be used in Figure 1, is defined as:

- For lightning impulse:

$$L_{pl} \times 1.15 \times e^{H/8150}$$

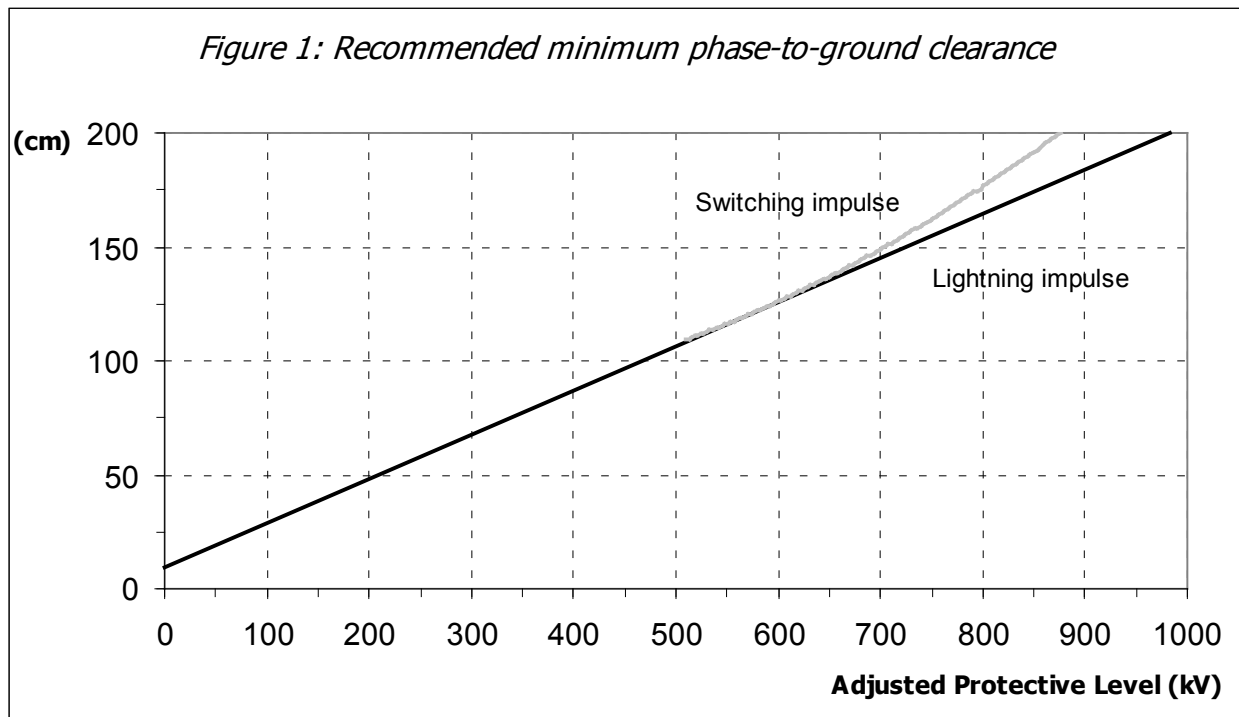
- For switching impulse:

$$S_{pl} \times 1.10 \times e^{H/8150}$$

H is the altitude in meters above sea level.

L_{pl} and S_{pl} are the lightning and switching impulse protective levels for the selected EXLIM-P Surge Arresters at the respective coordinating currents.

The minimum clearance is determined either by lightning or switching impulse withstand, whichever renders a larger value.



Phase-to-phase clearance

The phase-to-phase clearance for high voltage equipment in a substation is normally based on the selected standard rated lightning and switching impulse phase-to-phase withstand voltages. International standards, e.g. IEC 60071-3 recommend minimum phase-to-phase clearances. Note that the normal election of surge arrester protective levels does not directly protect the phase-to-phase insulation.

In general, the clearance between surge arresters in adjacent phases should be the same as the phase-to-phase clearance selected for other high voltage equipment in the substation. If it is not possible to use the normal phase-to-phase clearance in a special application of EXLIM-P Surge Arresters, the minimum clearance with regard to lightning overvoltages can be derived from Figure 2.

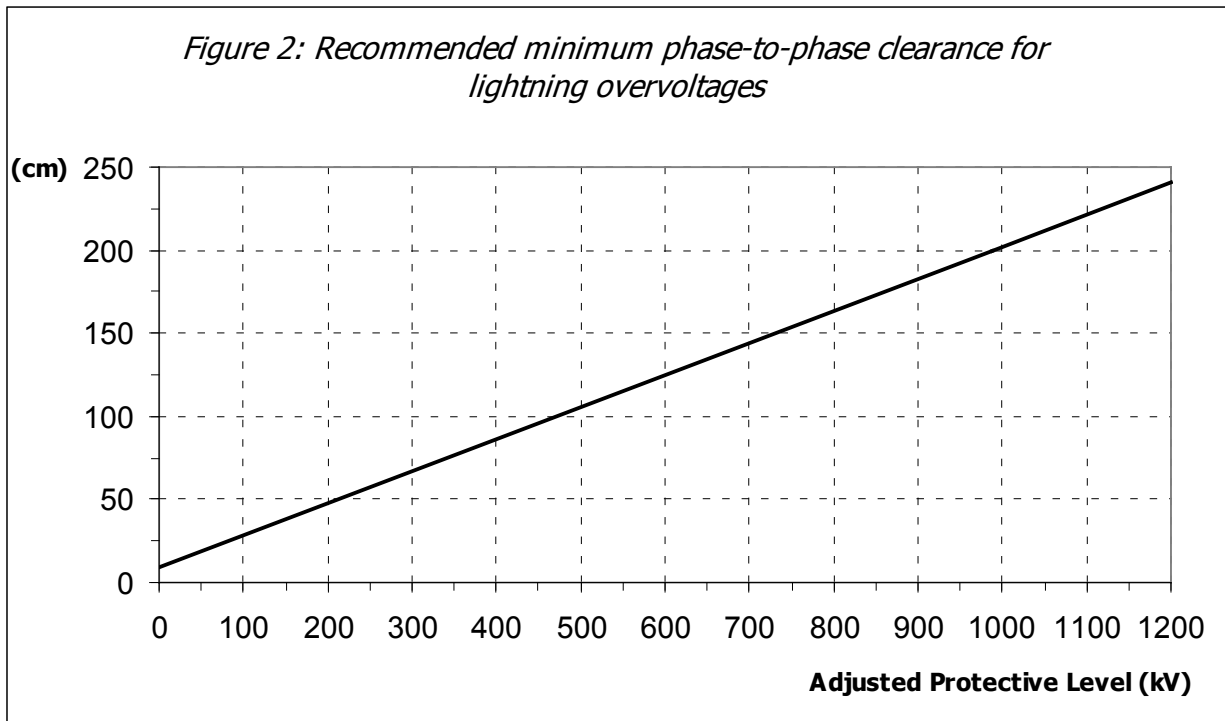
The clearances shown in Figure 2 are based on the assumption that one phase is subjected to a lightning overvoltage, while the voltage on the adjacent phase is at the peak of the maximum power frequency operating voltage (opposite polarity). Obviously, these clearances will also cover the case of lightning overvoltages of the same polarity appearing simultaneously on two or three phases.

The *Adjusted Protective Level* shown in Figure 2 is based on the lightning protective characteristics of the selected EXLIM-P Surge Arresters. It includes safety margin and altitude correction factors and is defined as:

$$L_{pl} \times 1.15 \times e^{H/8150} + V_m \times \sqrt{2} / \sqrt{3}$$

- V_m is the highest voltage for equipment according to IEC 60071-1, which is usually equal to the highest system voltage.
- L_{pl} is the lightning impulse protective level for the selected EXLIM-P Surge Arrester.

The minimum phase-to-phase clearance for arresters with respect to switching overvoltages should always be based on the selected standard rated switching impulse phase-to-phase withstand voltage for the substation. Consequently, the clearances specified in IEC 60071-3, Table VI, are valid for most applications of arresters. If a special application requires a minimized phase spacing, the favorable electrode configuration established by the grading rings on EXLIM-P Surge Arresters may permit a further reduction of the phase-to-phase clearance.



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