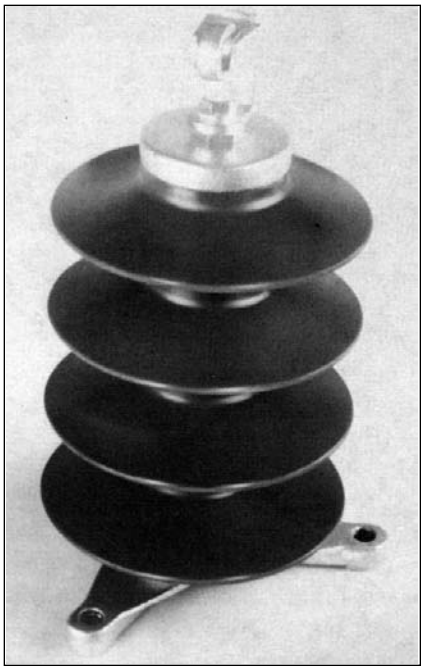
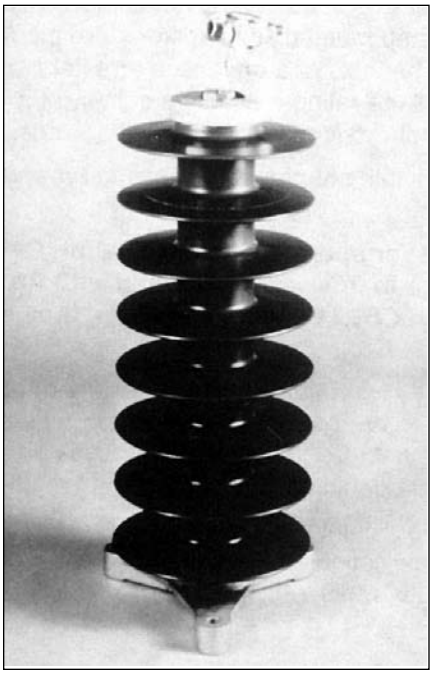
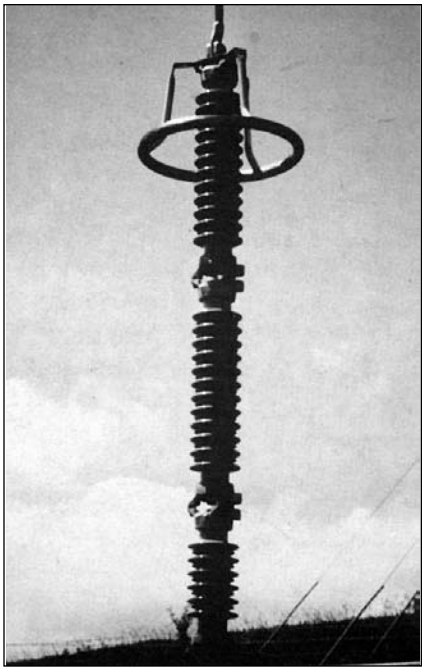
DynaVar®

Station Class and Intermediate Surge Arresters







NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

HUBBELL POWER SYSTEMS, INC. OHIO BRASS

Introduction

With the introduction of the station class Type PVN, Ohio Brass has expanded its line of polymer-housed arresters for distribution, substation and transmission applications. PVN arresters are suitable for applications up through 230 kV. The PVI arresters are suitable for applications up through 138 kV.

These designs combine the advantages of a polymer housing and metal-oxide varistor valve blocks, and offer the benefits of a one piece arrester construction for all voltage ratings. Stacking of individual arrester units is not required with polymer housings.

Also available are porcelain and silicone station (Type VN, SVN and VL) arresters.

All DynaVar Intermediate and Station Class Surge Arresters in this catalog comply with ANSI/IEEE Standard C62.11-1999. In addition, they are tested to IEC 99-4.

The Type PVN Station Class Arresters described in this publication are protected by patent numbers 4,656,555; 4,899,248; 4,905,118; 5,043,838; 5,138,517; 5,159,159 and others pending.

The Type PVI Intermediate Class Arresters described in this publication are protected by patent numbers 4,656,555; 4,899,248; 4,905,118 and others pending.

Table of Contents

General Arrester Information

NORMALLY RECOMMENDED STATION DYNAVAR MCOV FOR VARIOUS SYSTEM VOLTAGES

System L-L Voltage kV		Arrester MCOV (kV)		
		Grounded Neutral Circuits	Temporarily Ungrounded, Impedance Grounded or Ungrounded Circuits	
Nominal	Maximum		(1)	(2)
2.40	2.52	2.55	2.55	2.55
4.16	4.37	2.55	5.1	5.1
4.8	5.04	5.1	5.1	5.1
6.9	7.25	5.1	7.65	7.65
8.32	8.74	5.1	7.65	8.4
12	12.6	7.65	10.2	12.7
12.47	13.1	7.65	12.7	12.7
13.2	13.9	8.4	12.7	12.7
13.8	14.5	8.4	12.7	15.3
20.78	21.8	12.7	19.5	22
22.86	24	15.3	19.5	22
23	24.2	15.3	19.5	22
24.94	26.2	15.3	22	24
34.5	36.2	22	29	36
46	48.3	29	39	48
69	72.5	42	57	70
115	121	70	98	115
138	145	84	115	131
161	169	98	140	152
230	242	140	209	220
345	362	209	—	—
400	420	245	—	—

(1) For normal duty. Line-to-ground fault up to 30 minutes.
(2) For severe duty. Line-to-ground fault up to 2,000 hours.

Arrester Application

The DynaVar arrester is described by its maximum continuous line-to-ground operating voltage (MCOV). The arrester's most important application criterion is the maximum voltage which can be continuously applied.

For effectively grounded neutral systems, any DynaVar arrester with MCOV equal to maximum line-to-neutral kV is the normal application. For example, a 138 kV system usually has a maximum line-to-line continuous voltage of 145 kV rms. 145 kV divided by $\sqrt{3}$ gives 84 kV line-to-ground voltage. The appropriate DynaVar arrester for this application is the DynaVar 84, with MCOV of 84 kV.

For ungrounded or impedance grounded systems, the gapless DynaVar arrester's temporary overvoltage capability is used. For applications where a ground fault is expected to be removed within 30 minutes, the minimum MCOV is maximum system line-to-line voltage divided by 1.25. For extended operation under ground fault conditions up to 2,000 hours but not to exceed five percent of service life, the minimum MCOV is maximum system line-to-line voltage divided by 1.11.

DynaVar arresters are designed to be used where average ambient temperature does not exceed 40°C (104°F) and the daily maximum temperature does not exceed 60°C (140°F).

Pressure Relief

Arrester Type	Pressure Relief Capability-Symmetrical rms kA	
	ANSI Standard C62.11 Minimum	Ohio Brass Demonstrated Values
VLA*	None	10
VL*	40-65	65
VN*	40-65	93
SVN*	40-65	63
PVN**	40-65	80
PVNA**	40-65	40
PVI**	16.1	60
PVI-LP**	16.1	16.1
PVIA**	16.1	16.1

* Rating for initial venting only.
** Polymer arresters will survive multiple venting operations.

All DynaVar station-intermediate arresters exceed pressure relief requirements of ANSI C62.11.

Energy Capability Kilojoules per kV of MCOV

Type	Max. Energy Discharge Capability kJ/kV - MCOV
PVNA, PVI, PVI-LP	5.1 (1)
PVIA	3.6 (4)
PVN	7.3 (2)
VL/VLA	7.3 (2)
VN	11.5 (3)
SVN	11.5 (3)

(1) For currents .65kA or less
(2) For currents 1.00kA or less
(3) For currents 1.5 kA or less
(4) For currents .4 or less

Switching surge capability of DynaVar arresters is expressed in terms of dissipated energy.

These capabilities assume a two shot energy discharge takes place within one minute.

The indicated current levels are not an arrester limitation, but are related to the indicated energy capability.

Calculations based on the conservative assumption that the entire line length is charged to maximum surge voltage are easily made, and the values obtained seldom exceed the considerable energy capability of the DynaVar arrester.

Temporary Overvoltage Capability

DynaVar arresters are gapless and consist of a column of metal-oxide blocks connected between line and ground. The blocks can withstand a significant power frequency overvoltage for a limited time, depending on the magnitude of any immediately preceding surge duty. This duty can be the result of switching surges on higher voltage lines, or from other sources. The energy discharge capability is found in the above table.

All of the TOV curves are available in the Design Test Reports which are listed on page 30-29. The Design Test Reports are available on our web site www.hubbellpowersystems. com or by calling an Ohio Brass representative. The temporary overvoltage capability can be determined from this curve. The prior duty curve of this table is based upon absorption of rated energy immediately preceding application of the overvoltage.

Polymer Housed Arresters (Type PVI and PVN)

Description

The Type PVI & PVN arresters contain the same high-quality metal-oxide varistors used in other Ohio Brass DynaVar arresters which have operated successfully since 1981. They have all the MOV advantages such as high temporary overvoltage capability, contamination resistance, improved surge-duty capability and excellent protective characteristics.

In the unlikely event of arrester failure, violent fragmentation of porcelain is eliminated. Instead, the higher available fault currents may cause splits or tears in the polymer rubber housing while the internal fiberglass wrap restrains the valve elements.

Weight is greatly reduced compared to conventional porcelain-housed designs. Installation is simplified because with the reduced weight, a patented, single housing design can be utilized for all arrester voltage ratings.

The small diameter line end terminal hardware permits closer phase-to-phase and phase-to-ground spacings useful in modern compact substation designs and on mobile transformer applications.

ESP™ Weathershed Material

The arrester housing is made of ESP silicone alloy weathershed material that has been successful in field operations for over a decade. The improved ESP housing resists tracking from surface leakage currents and the housing contour provides exceptional leakage distance. The housing sections are mechanically secured to provide a housing suitable for high pressure hot-washing in locations where contamination is severe and routine station maintenance includes washing procedures. Contact Ohio Brass for recommended procedures.

Construction

The housing consists of one or more molded sections which are mechanically secured into one continuous length for all arrester voltage ratings. The base of the arrester is equipped with a factory installed casting which provides the conventional 8.75 inch diameter bolt circle customarily provided with intermediate and the 10 inch diameter bolt circle for station class surge arresters.

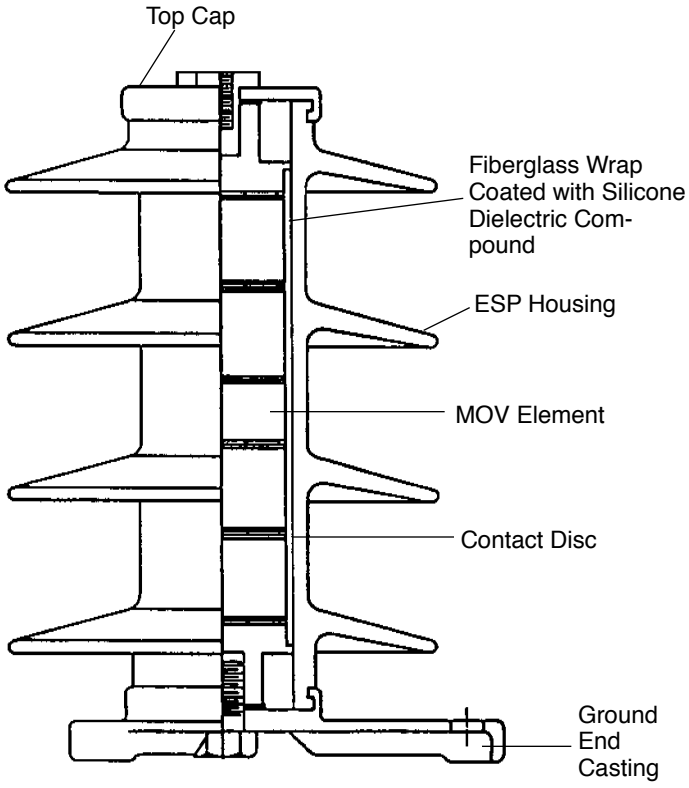
The varistor column is centered and restrained in alignment with tightly woven fiberglass filament strands impregnated with epoxy resin. The interstices between the stranding are filled with a silicone dielectric compound so the design is free of air and moisture. The fiberglass stranding construction provides fault withstand capability in excess of the requirements of IEEE/ANSI C62.11-1999.

Benefits

The PVI and PVN arresters have many additional benefits that are included with the polymer housing.

- A PVI or PVN arrester unit are less than half the weight of an equivalent porcelain-housed arrester. This makes transportation, handling and installation much easier.
- All voltage ratings are of single unit design. Field assembly of stacked units is not required.
- With a reduced diameter of energized line terminal and grading rings, the PVI and PVN arresters reduce space requirements.
- The polymer housing makes the PVI and PVN arresters much safer than porcelain arresters.
- Single-unit, high voltage design provides improved contamination performance over multi-unit designs.
- Closer spacing — Smaller line end casting and smaller grading rings allow closer phase-to-phase spacing.
- Increased creepage — Standard units may fulfill high creep requirements.
- Minimal Internal Atmosphere — Will not “breathe” or leak, eliminates moisture ingress, a cause of arrester failure.

SEISMIC PERFORMANCE: All PVI up to 84kV MCOV, and all PVN up to 115 kV MCOV meet IEEE 693 as of 1997 High Performance Level. 3.2 g Time History.



Section View of Typical PVI/PVN Arrester

Key to the Catalog Numbers

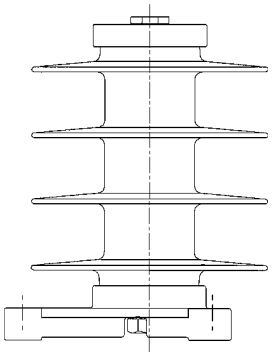
3 1 X X X X

Polymer Housed

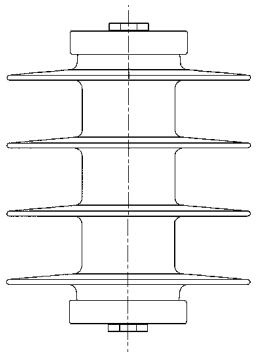
"0" ... Type PVI
"1" ... Type PVN

Standard Arrester Catalog Number	Maximum Continuous Operating Voltage MCOV kV rms
003	2.55
005	5.10
008	7.65
009	8.40
010	10.20
013	12.70
015	15.30
017	17.00
019	19.50
022	22.00
024	24.40
029	29.00
031	31.50
036	36.50
039	39.00
042	42.00
048	48.00
057	57.00
070	70.00
076	76.00
084	84.00
088	88.00*
098	98.00*
106	106.00*
115	115.00*

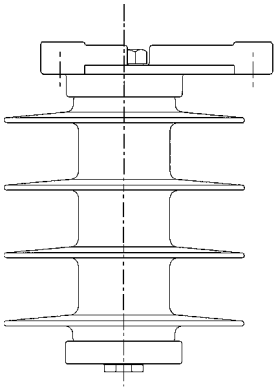
*Available in PVN only.



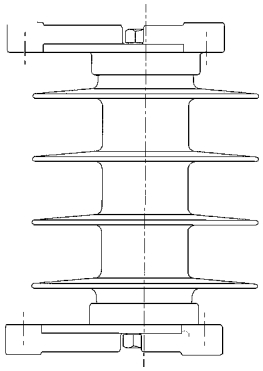
"0" ... Small Top, Tripod Base



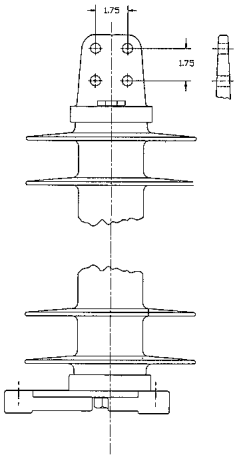
"1" ... Small Top, Small Base (vertical mounting only)



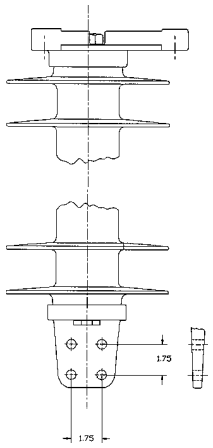
"2" ... Tripod Top, Small Base (underhung)



"3" ... Tripod Top, Tripod Base



"4" ... Spade Top, Tripod Base (only available with Type PVN)



"5" ... Tripod Top, Spade Base (underhung) only available with Type PVN

Type PVI Polymer Housed Intermediate Class Arrester

Protective Characteristics

Type	Standard Arrester Catalog Number	Arrester Ratings		Maximum 0.5μs Discharge Voltage kV (1)	Maximum Switching Surge Protective Level kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
		Duty Cycle Rating kV rms	Maximum Continuous Operating Voltage kV rms			1.5kA	3kA	5kA	10kA	20kA	40kA
PVI	300003	3	2.55	8.6	6.4	6.8	7.2	7.5	8.1	9.0	10.1
PVI	300005	6	5.1	17.1	12.7	13.6	14.4	15.0	16.2	17.9	20.2
PVI	300008	9	7.65	25.8	19.1	20.5	21.6	22.6	24.4	27.0	30.4
PVI	300009	10	8.4	28.4	21.1	22.6	23.8	24.9	26.9	29.8	33.5
PVI	300010	12	10.2	34.1	25.3	27.1	28.6	29.9	32.3	35.8	40.3
PVI	300013	15	12.7	42.9	31.8	34.1	36.0	37.6	40.6	44.9	50.6
PVI	300015	18	15.3	51.6	38.3	40.9	43.2	45.2	48.8	54.0	60.9
PVI	300017	21	17	56.9	42.2	45.1	47.7	49.9	53.8	59.6	67.1
PVI	300019	24	19.5	68.3	50.6	54.2	57.2	59.9	64.6	71.5	80.6
PVI	300022	27	22	77.4	57.4	61.4	64.9	67.9	73.2	81.0	91.3
PVI	300024	30	24.4	85.3	63.3	67.7	71.5	74.8	80.7	89.3	101.0
PVI	300029	36	29	100.0	73.9	79.0	83.5	87.3	94.2	104.0	117.0
PVI	300031	39	31.5	108.4	80.4	86.1	90.9	95.1	102.6	113.6	127.9
PVI	300036	45	36.5	125.1	92.8	99.3	104.9	109.8	118.4	131.1	147.6
PVI	300039	48	39	130.9	97.1	103.9	109.7	114.8	123.8	137.0	154.4
PVI	300042	54	42	148.0	109.8	117.5	124.0	129.8	140.0	155.0	174.6
PVI	300048	60	48	170.6	126.5	135.4	143.0	149.6	161.4	178.7	201.0
PVI	300057	72	57	199.0	147.7	158.1	166.9	174.6	188.4	209.0	235.0
PVI	300070	90	70	250.0	185.7	198.7	209.8	219.5	236.8	262.0	295.0
PVI	300076	96	76	261.7	194.1	207.7	219.4	229.5	247.6	274.1	308.8
PVI	300084	108	84	296.0	219.5	234.9	248.1	259.6	280.0	310.0	349.2
PVI	300088	108	88	296.0	219.5	234.9	248.1	259.6	280.0	310.0	349.2
PVI	300098	120	98	327.7	243.0	260.1	274.7	287.4	310.0	343.2	386.6
PVI	300106	132	106	375.2	278.3	297.8	314.5	329.1	355.0	393.0	443.0
PVI	300115	144	115	392.0	290.9	311.3	328.7	343.9	371.0	411.0	463.0

(1) Maximum discharge voltage for a 10-kA impulse current wave which produces a voltage wave cresting in 0.5 μs. This can be used for coordination where front-of-wave sparkover was formerly used.

(2) Based on a 500A surge of 45-μs time to crest.

Type PVI Polymer Housed Intermediate Class Arrester

Dimensions and Mounting

Type	Standard Arrester Catalog Number	Arrester Ratings: Duty Cycle Rating kV rms	Arrester Ratings: Maximum Continuous Operating Voltage kV rms	Figure Number	"X" Dimension (Inches)	Leakage Distance (Inches)	Minimum Mounting Spacing on center†: Phase to Phase (in-line) (Inches)	Minimum Mounting Spacing on center†: Phase to Ground (Inches)	Net Weight (Pounds)
PVI	300003	3	2.55	1	9.5	19	9.5	5.5	11
PVI	300005	6	5.1	1	9.5	19	9.5	5.5	12
PVI	300008	9	7.65	1	9.5	19	9.5	5.5	12
PVI	300009	10	8.4	1	9.5	19	9.5	5.5	12
PVI	300010	12	10.2	1	9.5	19	9.5	5.5	12
PVI	300013	15	12.7	1	12.0	26	9.5	5.5	15
PVI	300015	18	15.3	1	12.0	26	9.5	5.8	15
PVI	300017	21	17	1	12.0	26	9.5	6.8	15
PVI	300019	24	19.5	1	17.5	40	9.5	7.8	20
PVI	300022	27	22	1	17.5	40	10.5	8.8	20
PVI	300024	30	24.4	1	17.5	40	10.5	8.8	21
PVI	300029	36	29	1	17.5	40	12.5	10.8	21
PVI	300031	39	31.5	1	22.8	54	13.5	11.8	26
PVI	300036	45	36.5	1	22.8	54	15.5	13.8	27
PVI	300039	48	39	1	22.8	54	16.5	14.8	27
PVI	300042	54	42	1	22.8	54	18.5	16.8	28
PVI	300048	60	48	1	33.2	81	20.5	18.8	38
PVI	300057	72	57	1	33.2	81	23.5	21.8	39
PVI	300070	90	70	2	44.0	109	40.0	33.0	52
PVI	300076	96	76	2	44.0	109	42.0	35.0	53
PVI	300084	108	84	2	44.0	109	46.0	39.0	54
PVI	300088	108	88	2	44.0	109	46.0	39.0	54
PVI	300098	120	98	2	66.5	162	51.0	44.0	67.5
PVI	300106	132	106	2	66.5	162	55.0	47.0	67.5
PVI	300115	144	115	2	66.5	162	58.0	50.0	67.5

For standard terminals shown in Figure 1 and 2 (page 30-8) and standard package, order suffix code 3001. For non-standard requirements contact your Ohio Brass representative.

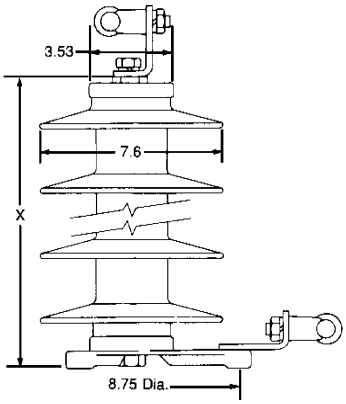


FIGURE 1

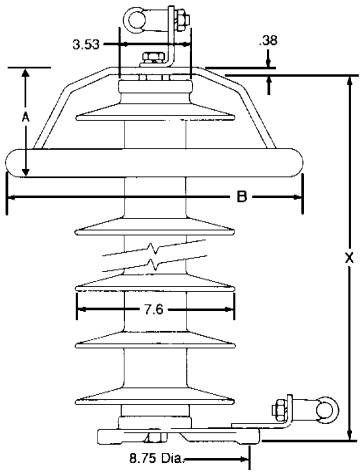


FIGURE 2

PVI Namplates

Each arrester is identified with a nameplate attached to the line end casting.

These nameplates display the maximum continuous operating voltage rating, the duty cycle voltage rating, the pressure relief current rating, the catalog number and the year of the manufacture.

† Minimum clearances are based on arrester protective levels and should be increased when necessary to meet local requirements for spacing of energized equipment.

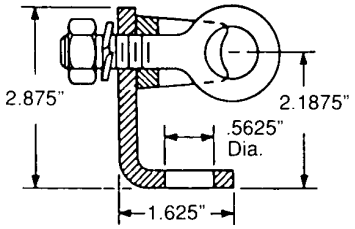
Grading Rings

Rings are required on arresters 70 kV MCOV and above.

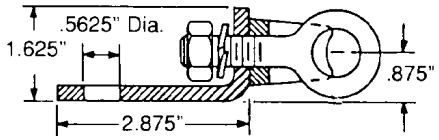
kV - MCOV	Diameter (Inches) (B)	Drop (Inches) (A)
70 - 88	14	4.8
98 - 115	16.5	9

PVI Terminals

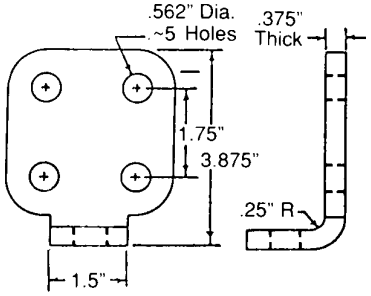
Standard line and ground terminals will accommodate conductor sizes from 1/4 inch to 13/16 inch diameter (.25 - .81 inch diameter). The terminals are of hot-dip galvanized malleable iron, compatible with either aluminum or copper.



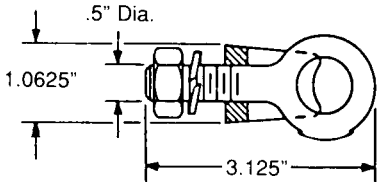
Standard Line terminal Number 71874



Standard Ground terminal Number 71874.



Terminal Number 273373 is not regularly furnished, but is available on order. NOTE: Use suffix code 3002 to order, i.e., 3000033002.



Connector Number 271414 used with all terminal combinations. Range of conductor sizes .25 to .81 inch.

Base Mounting Information

The end casting is furnished with three holes 120° on 8.75 inch diameter bolt circle. These mounting holes are 0.56 inch diameter to accommodate 1/2 inch bolts. (Mounting bolts and washers are not provided with the arrester.)

Bolt Circle (Inches)	Bolt Size (Inches)	Attachment Lug	
		Thickness (Inches)	Hole Size (Inches)
8.75	0.5	0.75	0.56

Mounting Positions

Type PVI arresters may be mounted vertically, horizontally or underhung, provided the cantilever moment is not excessive. (PVI 98, 106, 115kV MCOV arresters are designed for vertical mounting only.) Underhung mounting requires factory assembly of the base mounting hardware at the top of the arrester. Use catalog number series 3020XX3001.

The rated (ultimate) cantilever moments of Type PVI arrester with the tripod base is 10,000 in-lbs and the maximum working moment is 5,000 in-lbs. For the small base, the maximum working moment is 3,000 in-lbs.

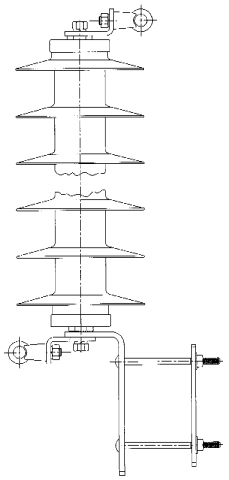
For horizontal mounting, the residual cantilever loads are given below. They already take into account the reasonable worst case loading consisting of 120 m.p.h. wind and the weight of the arrester and represent the maximum residual load that can be applied to the horizontal arrester without exceeding its maximum cantilever working load.

Residual Cantilever Load-Lbs. Horizontal Mounting PVI

kV - MCOV	Cat. No. 300XXX Cat. No. 302XXX
2.55 - 10.2	467
12.7 - 17.0	317
19.5 - 29.0	274
31.5 - 42.0	203
48.0 - 57.0	127
70.0 - 84.0	74

Crossarm Mounting

Type PVI arresters can be easily mounted on a NEMA crossarm bracket, by using catalog #3010XX3011 (available through 42 kV MCOV).



PVI-LP®

Polymer Housed Intermediate Class Arrester

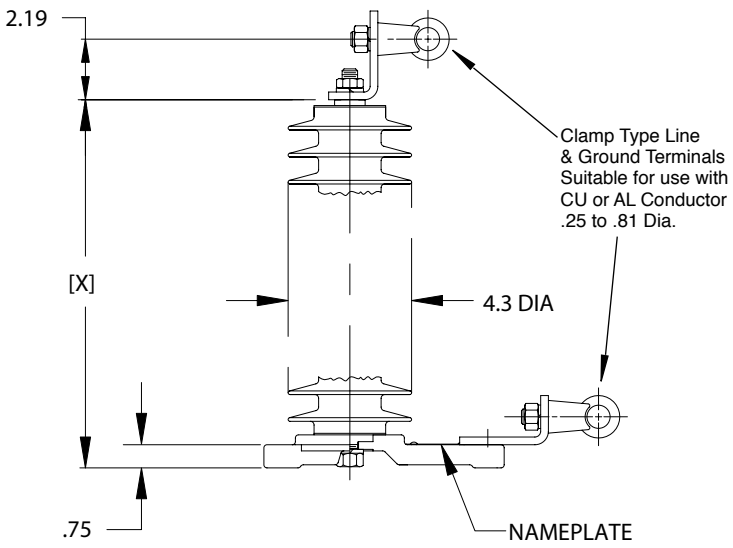


Figure 1 PVI-LP with Eye-bolt Line Terminal

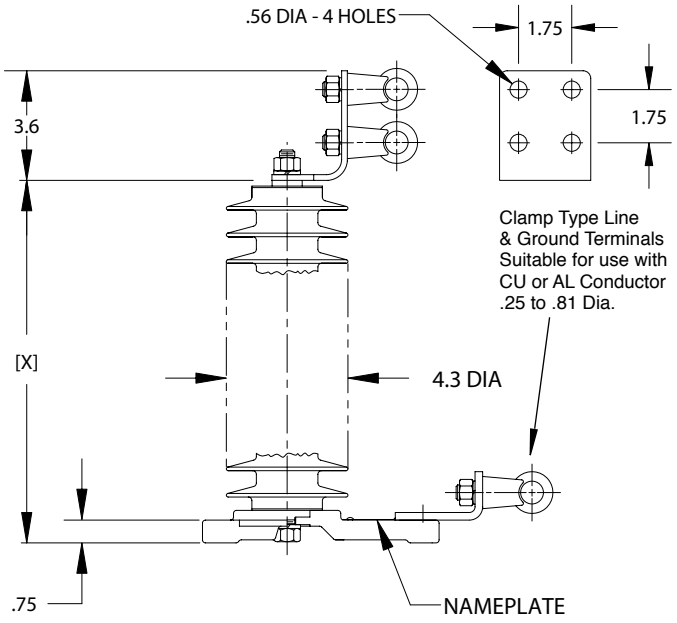


Figure 2 PVI-LP with four-hole NEMA Pad Line Terminal

PVI-LP Terminals:

Standard line and ground terminal and standard domestic packaging: use code3001 (Example: 3008XX3001, Figure 1)
Four hole NEMA line terminal, standard ground terminal and domestic packaging: use code 3002 (Example: 3008XX3002, Figure 2))

Other options: For underhung mounting: use catalog number 3028XX3001 or 3028XX3002.

Dimensions and Mounting

Type	Catalog Number	MCOV	"X" Dimension (inches)	Leakage Distance (inches)	Minimum Mounting Spacing on Center (inches)		Net Weight (pounds)
					Ph-Ph	Ph-Grd	
PVI-LP	300803	2.55	6.8	15.4	4.4	3.3	6.2
PVI-LP	300805	5.1	6.8	15.4	4.6	3.2	6.2
PVI-LP	300808	7.65	6.8	15.4	4.7	3.3	6.2
PVI-LP	300809	8.4	6.8	15.4	4.9	3.5	6.2
PVI-LP	300610	10.2	6.8	15.4	4.9	3.5	6.2
PVI-LP	300813	12.7	12.2	30.8	6.2	4.8	10.0
PVI-LP	300815	15.3	12.2	30.8	6.6	5.2	10.0
PVI-LP	300817	17.0	12.2	30.8	7.6	6.2	10;0
PVI-LP	300620	19.5	12.2	30.8	7.6	6.2	10;0
PVI-LP	300822	22.0	17.6	46.2	9.6	8.2	13.5
PVI-LP	300824	24.4	17.6	46.2	9.8	8.4	13.5
PVI-LP	300629	29.0	17.6	46.2	9.8	8.4	13.5
PVI-LP	300831	31.5	23.0	61.6	12.8	11.4	17;0
PVI-LP	300636	36.5	23.0	61.6	12.8	11.4	17;0
PVI-LP	300639	39.0	23.0	61.6	12.8	11.4	17;0
PVI-LP	300642	42.0	28.4	77.0	15.8	14.4	19.6
PVI-LP	300648	48.0	28.4	77.0	15.8	14.4	19.6
PVI-LP	300657	57.0	33.8	92.4	19.8	18.4	23.1

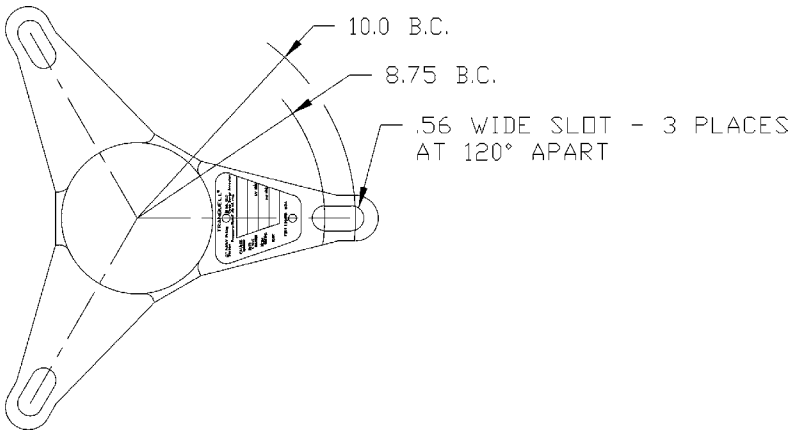
HUBBELL POWER SYSTEMS, INC. OHIO BRASS

PVI-LP®

Polymer Housed Intermediate Class Arrester

Base Mounting Information:

The end casting is furnished with three slots suitable for use on either 8.75" or 10" diameter bolt circle. Mounting hardware is not furnished with the arrester.



Bolt Size (Inches)	Attachment Lug	
	Thickness (Inches)	Slot Width (Inches)
0.5	0.75	0.56

Protective Characteristics

Standard Arrester Catalog Number	Duty Cycle Rating	Maximum Continuous Operating Voltage	Maximum 0.5µs Discharge Voltage	Maximum Switching Surge Protective Level	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
	kV rms	kV rms	kV (1)	kV (2)	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA
300803	3	2.55	8.6	6.4	6.8	7.2	7.5	8.1	9.0	10.1
300805	6	5.1	17.1	12.7	13.6	14.4	15	16.2	17.9	20.2
300808	9	7.65	25.8	19.1	20.5	21.6	22.6	24.4	27.0	30.4
300809	10	8.4	28.4	21.1	22.6	23.8	24.9	26.9	29.8	33.5
300610	12	10.2	34.1	25.3	27.1	28.6	29.9	32.3	35.8	40.3
300813	15	12.7	42.9	31.8	34.1	36.0	37.6	40.6	44.9	50.6
300815	18	15.3	51.6	38.3	40.9	43.2	45.2	48.8	54.0	60.9
300817	21	17.0	56.9	42.2	45.1	47.7	49.9	53.8	59.6	67.1
300620	24	19.5	68.3	50.6	54.2	57.2	59.9	64.6	71.5	80.6
300822	27	22.0	77.4	57.4	61.4	64.9	67.9	73.2	81.0	91.3
300824	30	24.4	85.3	63.3	67.7	71.5	74.8	80.7	89.3	101.0
300629	36	29.0	102.0	76.0	81.3	85.9	89.8	96.9	107.0	121.0
300831	39	31.5	108.4	80.4	86.1	90.9	95.1	102.6	113.6	127.9
300636	45	36.5	125.1	92.8	99.3	104.9	109.8	118.4	131.1	147.6
300639	48	39.0	136.6	101.3	108.4	114.5	119.8	129.2	143.0	161.1
300642	54	42.0	147.9	109.7	117.4	125.0	129.7	139.9	154.9	174.5
300648	60	48.0	165.0	122.4	131.0	138.3	144.7	156.1	172.8	195.0
300657	72	57.0	199.0	147.7	158.1	166.9	174.6	188.4	209.0	235.0

(1) Maximum discharge voltage for a 10-kA impulse current wave which produces a voltage wave cresting in 0.5 microsecond. This can be used for coordination where front-of-wave sparkover was formerly used.

(2) 500A surge of 45-microsecond-time to crest.

Pressure Relief Capability-Symmetrical rms kA: 16.1 (Minimum required by ANSI C62.11)

Energy Capability: 5.1kJ/kV MCOV, based on 2 transmission line discharges.

Cantilever Strength: Maximum working cantilever moment with the tripod base - 2000 inch pounds
Rated ultimate cantilever moment with the tripod base - 4000 inch pounds

PVIA
Intermediate Class Surge Arrester

Dimensions and Mounting

Catalog Number	Rating (kV)	MCOV (kV)	"X" Dimension (inches)	Leakage (inches)	Net Weight (pounds)	'B' (inches)
300703	3	2.55	4.5	8	5.1	4.0
300705	6	5.1	6.9	15.4	5.8	4.0
300708	9	7.65	6.9	15.4	5.8	4.0
300709	10	8.4	6.9	15.4	5.8	4.0
300710	12	10.2	6.9	15.4	5.8	4.0
300713	15	12.7	9.9	26	8.8	4.5
300715	18	15.3	9.9	26	8.8	4.5
300717	21	17	9.9	26	8.8	4.5
300720	24	19.5	12.2	30.8	9.1	4.0
300722	27	22	18.6	52	14.8	4.5
300724	30	24.4	18.6	52	14.8	4.5
300729	36	29	18.6	52	14.8	4.5
300731	39	31.5	18.6	52	14.8	4.5
300736	45	36.5	27.1	78	20.8	4.5
300739	48	39	27.1	78	20.8	4.5
300742	54	42	27.1	78	20.8	4.5
300748	60	48	27.1	78	20.8	4.5
300757	72	57	36	104	26.8	4.5

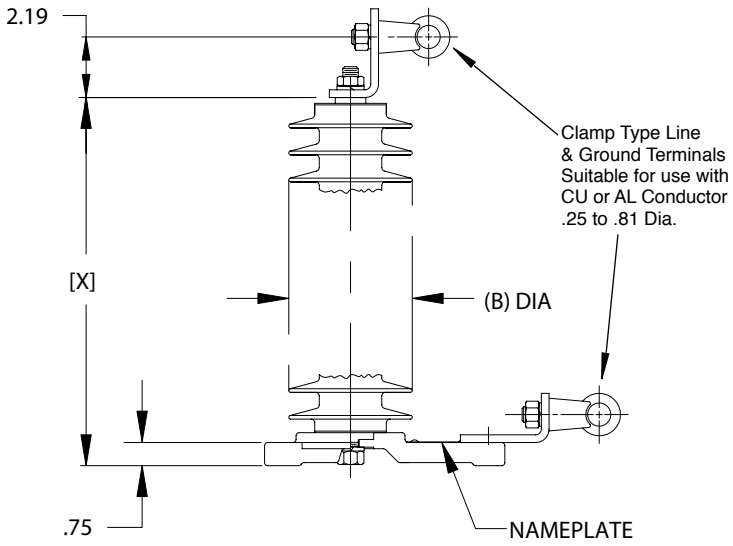


Figure 1 PVIA with Eye-bolt Line Terminal

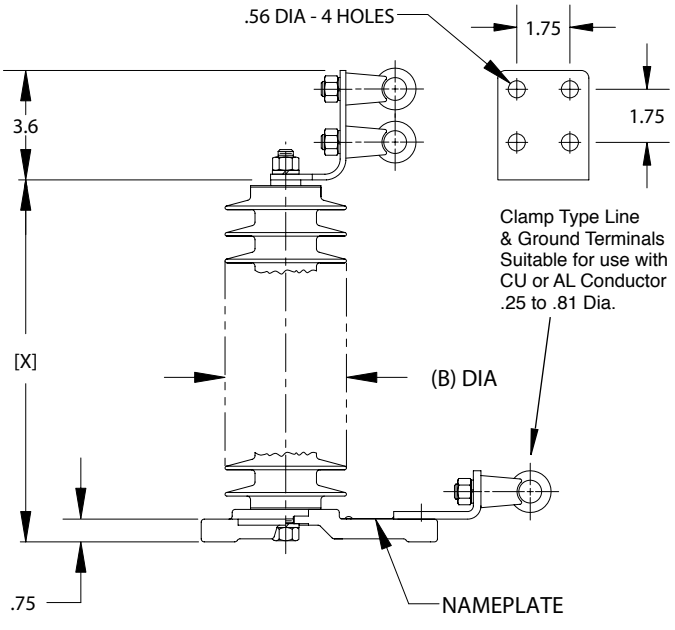


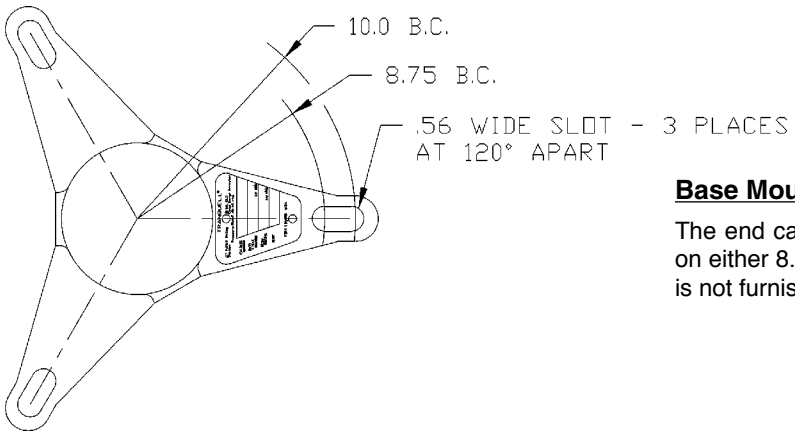
Figure 2 PVIA with four-hole NEMA Pad Line Terminal

Terminals

Standard line and ground terminals supplied with DynaVar arresters will accommodate conductor sizes from .25-inch to .81-inch diameter. The terminals are of hot-dip galvanized ferrous material, compatible with either aluminum or copper.

Line end terminals are available either as a single eye-bolt (Cat. No. suffix 3001) as shown in Fig. 1 (Example 3007033001) or as a 4-hole NEMA pad with single eye-bolt (Cat. No. suffix 3002) as shown in Fig. 2 (Example: 3007033002). Ground end terminals are single eye-bolt, automatically included with either suffix. Terminals are shipped in a separate bag.

Maximum recommended tightening torque to be applied to the line end stud when installing the terminals and the lead is 20 ft-lbs.



Base Mounting Information:

The end casting is furnished with three slots suitable for use on either 8.75" or 10" diameter bolt circle. Mounting hardware is not furnished with the arrester.

Bolt Size (Inches)	Attachment Lug	
	Thickness (Inches)	Slot Width (Inches)
0.5	0.75	0.56

Protective Characteristics

Type	Standard Arrester Catalog Number	Duty Cycle Rating kV rms	Maximum Continuous Operating Voltage kV rms	Maximum 0.5µs Discharge Voltage kV (1)	Maximum Switching Surge Protective Level kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
						1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA
PVIA	300703	3	2.55	9.9	6.6	7.2	7.8	8.2	9.1	10.4	12.3
PVIA	300705	6	5.1	20	13.3	14.6	15.7	16.6	18.4	21	24.8
PVIA	300708	9	7.65	26.8	17.8	19.5	21	22.2	24.5	28.1	33.2
PVIA	300709	10	8.4	29.5	19.6	21.5	23.1	24.4	27	31	36.6
PVIA	300710	12	10.2	35.5	23.6	25.9	27.9	29.4	32.5	37.3	44
PVIA	300713	15	12.7	44.2	29.4	32.2	34.7	36.7	40.5	46.5	54.8
PVIA	300715	18	15.3	53.4	35.5	38.9	41.9	44.3	48.9	56.1	66.2
PVIA	300717	21	17	60.7	40.3	44.3	47.6	50.3	55.6	63.8	75.3
PVIA	300720	24	19.5	70.9	47.1	51.7	55.6	58.7	64.9	74.4	87.9
PVIA	300722	27	22	78.6	52.2	57.3	61.7	65.2	72	82.6	97.5
PVIA	300724	30	24.4	88.5	58.7	64.5	69.4	73.3	81	92.9	110
PVIA	300729	36	29	105	69.7	76.5	82.4	87	96.1	110	130
PVIA	300731	39	31.5	115	76.5	84	90	95	105	120.5	142.5
PVIA	300736	45	36.5	133.5	88.5	97.5	105	110.5	122	140	165.5
PVIA	300739	48	39	142	94.5	103.5	111.5	118	130	149.5	176
PVIA	300742	54	42	160.5	107	117	126	133	147	169	199
PVIA	300748	60	48	175	116	127.5	137.5	145	160	183.5	217
PVIA	300757	72	57	214	142.5	156	168	177.5	196	225	265.5

(1) Maximum discharge voltage for a 10-kA impulse current wave which produces a voltage wave cresting in 0.5μs. This can be used for coordination where front-of-wave sparkover was formerly used.

(2) 500A surge of 45-μs-time to crest.

Pressure Relief Capability: 16.1 Symmetrical rms kA
Energy Capability: 3.6kJ/kV MCOV
Cantilever Strength: Maximum working cantilever moment - 1200 inch pounds
Rated ultimate cantilever moment - 3000 inch pounds

Type PVN Polymer Housed Station Class Arrester

Protective Characteristics

Type	Standard Arrester Catalog Number	Arrester Ratings: Duty Cycle Rating kV rms	Arrester Ratings: Maximum Continuous Operating Voltage (MCOV) kV rms	Maximum 0.5µs Discharge Voltage kV (1)	Maximum Switching Surge Protective Level kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV: 1.5kA	3kA	5kA	10kA	20kA	40kA
PVN	31*003	3	2.55	8.4	6.0	6.4	6.7	7.1	7.6	8.4	9.6
PVN	31*005	6	5.1	16.7	11.9	12.8	13.5	14.1	15.2	16.8	19.1
PVN	31*008	9	7.65	25.0	17.8	19.2	20.2	21.1	22.7	25.1	28.3
PVN	31*009	10	8.4	27.8	19.8	21.4	22.5	23.5	25.3	28.0	31.8
PVN	31*010	12	10.2	33.3	23.7	25.6	26.9	28.1	30.3	33.5	38.1
PVN	31*013	15	12.7	41.7	29.7	32.0	33.7	35.2	37.9	42.0	47.6
PVN	31*015	18	15.3	50.1	35.6	38.4	40.4	42.3	45.5	50.4	57.2
PVN	31*017	21	17	56.3	40.1	43.2	45.5	47.6	51.2	56.7	64.4
PVN	31*019	24	19.5	63.9	45.5	49.1	51.6	54.0	58.1	64.3	73.0
PVN	31*022	27	22	72.9	51.9	56.0	58.9	61.6	66.3	73.4	83.3
PVN	31*024	30	24.4	80.4	57.2	61.7	64.9	67.9	73.1	80.9	91.9
PVN	31*029	36	29	95.9	68.3	73.6	77.4	81.0	87.2	96.5	109.6
PVN	31*031	39	31.5	104.2	74.2	80.0	84.1	88.0	94.7	104.8	119.0
PVN	31*036	45	36.5	120.9	86.1	92.8	97.6	102.1	109.9	121.7	138.1
PVN	31*039	48	39	128.7	91.6	98.8.0	103.9	108.7	117.0	129.5	147.1
PVN	31*042	54	42	144.4	102.8	110.9	116.6	122.0	131.3	145.3	165.0
PVN	31*048	60	48	163.5	116.4	125.5	132.0	138.0	148.6	164.5	186.8
PVN	31*057	72	57	191.8	136.6	147.3	154.9	162.0	174.4	193.1	219.2
PVN	31*070	90	70	241.8	172.1	185.6	195.2	204.2	219.8	243.3	276.3
PVN	31*076	96	76	257.4	183.2	197.6	207.8	217.4	234.0	259.0	294.1
PVN	31*084	108	84	288.9	205.6	221.8	233.2	244.0	262.6	290.7	330.1
PVN	31*088	108	88	288.9	205.6	221.8	233.2	244.0	262.6	290.7	330.1
PVN	31*098	120	98	326.9	241.3	251.0	263.9	276.1	297.2	329.0	373.6
* PVN	31*106	132	106	352	252	270	284	298	317	353	404
PVN	31*115	144	115	386.1	285.0	296.5	311.7	326.1	351.0	388.6	441.2
PVN	31*131	168	131	445	330	343	363	380	409	446	503
PVN	31*140	172	140	455	338	351	372	389	419	457	516
PVN	31*144	180	144	476	354	367	389	407	438	478	539
PVN	31*152	192	152	508	377	391	415	434	467	509	575
PVN	31*180	228	180	604	448	465	493	516	556	607	684

* Designates Change

(1) Maximum discharge voltage for a 10kA impulse current wave which produces a voltage wave cresting in 0.5 μs. This can be used for co-ordination where front-of-wave sparkover was formerly used.

(2) Based on a 500A surge of 45-μs time to crest through 88kV MCOV, and 1,000A surge of 45-μs time to crest for 98kV MCOV and higher ratings.

Mounting Positions

Type PVN arresters may be mounted vertically, horizontally or underhung, provided the cantilever moment is not excessive. Underhung mounting requires factory assembly of the base mounting hardware at the top of the arrester. For the correct catalog number replace third digit of the Catalog Number with 2 or 5. Example: 310042 becomes 312042 or 315042 (See page 30-5).

Because PVN arrester construction is non-rigid, there will be an observable deflection when cantilever load is applied.

The rated ultimate cantilever moment of the PVN arrester with the tripod base is 20,000 inch-lbs. The maximum working moment for the 2.55-115 kV MCOV is 10,000 inch-lbs. For 131 thru 180 kV MCOV with the tripod base, the maximum working moment is 5,000 inch-lbs. For the round cap base design, the maximum working moment is 3,000 inch-lbs.

For horizontally mounted 2.55 through 115kV MCOV arresters the following table summarizes the maximum load that can be applied to the top end of the arrester without exceeding the arrester's maximum working load. This calculation assumes a worst case loading consisting of 150 m.p.h. wind and the weight of the horizontally mounted arrester. Ratings above 115 kV MCOV are not recommended for horizontal mounting.

Residual Cantilever Load (lbs.) Horizontal Mounting PVN

kV - MCOV	Cat. No. 310XXX Cat. No. 312XXX	Cat. No. 314XXX Cat. No. 315XXX
2.55 - 8.4	1100	870
10.2 - 15.3	880	690
17 - 24.4	580	490
29 - 39	425	370
42 - 48	330	290
57	175	160
70 - 76	150	140
84 - 98	90	85
106 - 115	50	45

Note: MCOV 84 kV through 180 kV include a grading ring.

Dimensions and Mounting

Type	31*___ Standard Arrester Catalog Number	Arrester Ratings: Duty Cycle Rating kV rms	Arrester Ratings: Maximum Continuous Operating Voltage MCOV kV rms	"X" Dimension (Inches)	Leakage Distance (Inches)	Minimum Mounting Spacing on center†: Phase to Phase (in-line) (Inches)	Minimum Mounting Spacing on center†: Phase to Ground (Inches)‡	Net Weight (Pounds)*
PVN	31*003	3	2.55	10.2	23	12.3	7.7	20.3
PVN	31*005	6	5.1	10.2	23	12.3	7.7	20.8
PVN	31*008	9	7.65	10.2	23	12.3	7.7	21.3
PVN	31*009	10	8.4	10.2	23	12.3	7.7	21.6
PVN	31*010	12	10.2	12.8	31	12.3	7.7	25.2
PVN	31*013	15	12.7	12.8	31	12.3	7.7	25.8
PVN	31*015	18	15.3	12.8	31	12.3	7.7	26.3
PVN	31*017	21	17	18.2	46	12.3	7.7	33.6
PVN	31*019	24	19.5	18.2	46	12.3	8.0	34.2
PVN	31*022	27	22	18.2	46	12.3	8.8	34.7
PVN	31*024	30	24.4	18.2	46	12.3	9.6	35.2
* PVN	31*029	36	29	18.2	46	13.8	11.0	36.5
PVN	31*031	39	31.5	23.5	62	14.6	11.8	43.5
PVN	31*036	45	36.5	23.5	62	16.3	13.5	44.4
PVN	31*039	48	39	23.5	62	17.0	14.2	45.2
PVN	31*042	54	42	28.8	78	18.6	15.8	52.6
PVN	31*048	60	48	28.8	78	20.6	17.8	53.6
* PVN	31*057	72	57	34	92	23.4	20.6	76.7
* PVN	31*070	90	70	44.6	124	27.0	24.5	77.0
* PVN	31*076	96	76	44.6	124	30.5	28.0	80.0
* PVN	31*084	108	84	55.3	156	44.5	36.5	98.9
* PVN	31*088	108	88	55.3	156	44.5	36.5	98.9
PVN	31*098	120	98	55.3	156	49.0	41.0	101.0
* PVN	31*106	132	106	55.3	156	53.0	45.0	105.0
PVN	31*115	144	115	65.8	186	56.0	48.0	120.1
PVN	31*131	168	131	84.4	234	74.0	60.0	152.0
PVN	31*140	172	140	84.4	234	77.0	63.0	152.0
PVN	31*144	180	144	84.4	234	78.0	64.0	152.0
PVN	31*152	192	152	84.4	234	84.0	70.0	152.0
PVN	31*180	228	180	112.2	312	94.0	80.0	201.0

* Designates Change

† Minimum clearances are based on arrester protective levels and should be increased when necessary to meet local requirements for spacing of energized equipment.

‡ The large energized diameter of the 313XXX requires additional clearance.

Other Configurations (see Figures on page 30-11)

* Catalog 310XXX Small top, tripod base with 10 inch B.C. For upright and horizontal mounting (see Fig. 1) (Dimensional weights as shown.)
* Catalog 311XXX Small diameter line and ground terminals for vertical mounting only (deduct 1 inch and 4 pounds).
* Catalog 312XXX Similar to 310XXX for underhung mounting.
* Catalog 313XXX (available through 57 kV MCOV) With 10 inch B.C. at each end for upright, underhung and horizontal mounting (add 1 inch and 5 pounds).
* Catalog 314XXX Integral NEMA pad line terminal and 10 inch B.C. base for upright and horizontal mounting (see Fig. 2 & 3) (add 3.5 inches and 2 pounds).
* Catalog 315XXX Similar to 314XXX for underhung mounting.

For standard terminals shown in Figures 1, 2 and 3 and standard packaging, order suffix code 3001. For non-standard requirements, contact your Ohio Brass representative.

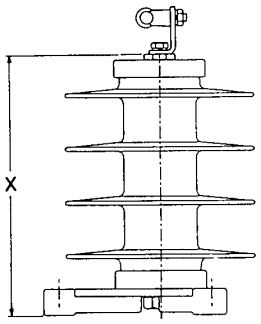


FIGURE 1
310XXX

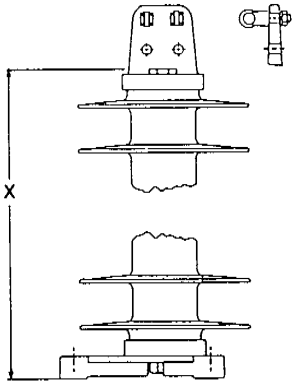


FIGURE 2
314XXX

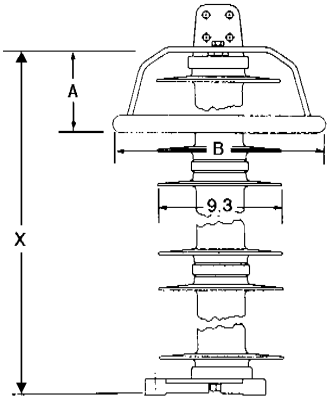


FIGURE 3
314XXX

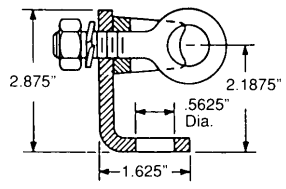
Grading Rings

Rings are required on arresters 84 kV MCOV and above.

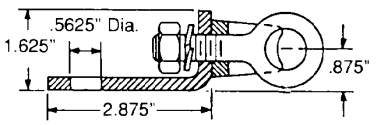
kV - MCOV	Diameter (Inches) (B)	Drop (Inches) (A)
84 - 88	14	4.8
98 - 115	16.5	9
131 - 180	27.9	14.5

PVN Terminals

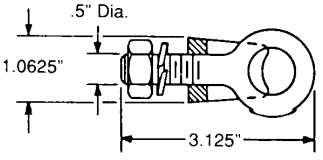
Standard line and ground terminals will accommodate conductor sizes from 1/4 (.25) inch to 13/16 (0.81) inch diameter. The terminals are of hot-dip galvanized malleable iron, compatible with either aluminum or copper.



Line terminal Number 71874 (small top only).



Standard Ground terminal Number 71874.



Connector Number 271414 used with all terminal combinations. Range of conductor sizes .25 to .81 inch.

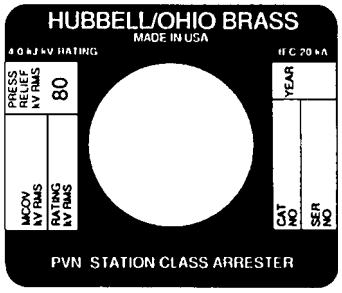
PVI/PVN Packaging

Polymer station and intermediate arresters through 98 kV MCOV are packaged in a cardboard carton. PVN arresters will be packaged in a crate above 98 kV MCOV. Grading rings are packaged separately. Maximum weight of largest PVN arrester is 123 pounds. Maximum weight of largest PVI arresters is 60 pounds.

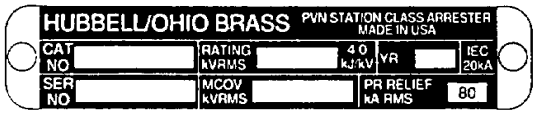
PVN Nameplates

Each arrester is identified with a nameplate attached to the bottom or top casting with information required by IEEE/ANSI, CSA and IEC.

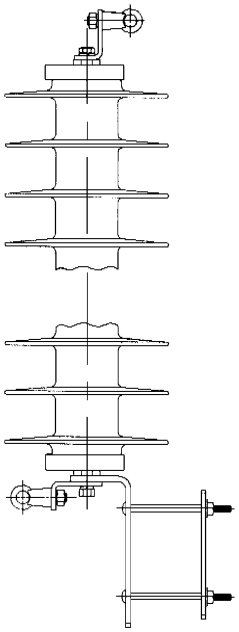
These nameplates display the maximum continuous operating voltage rating, the duty cycle voltage rating, the pressure relief current rating, the catalog number, serial number and the year of manufacture.



Used on Arresters with "small top" option.



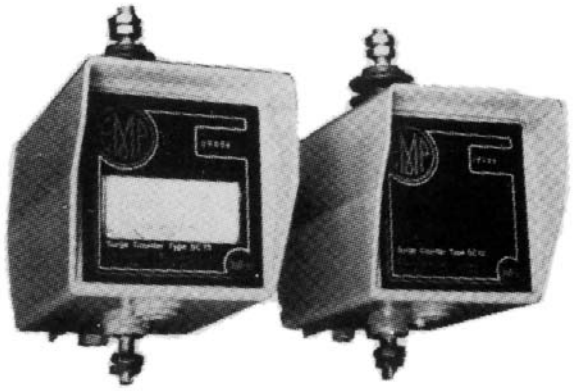
PVN Crossarm Mounting



3110XX3011

Crossarm Mounting Application available through 48kV

Discharge Counters

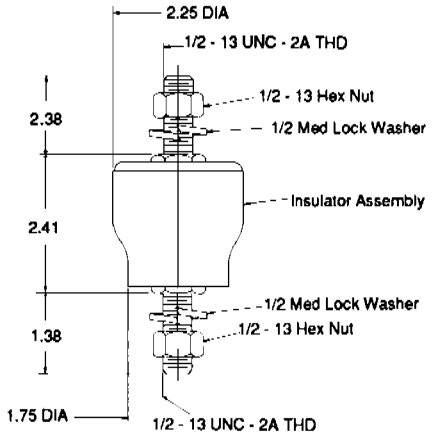


245121 **245120**

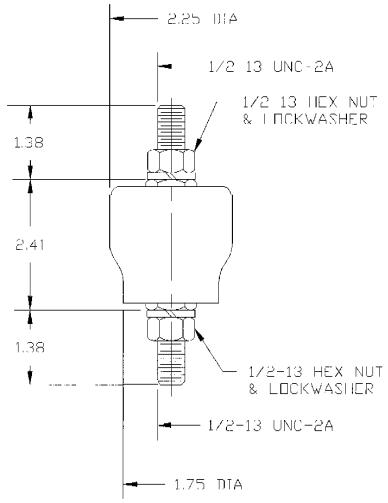
Arrester discharge counters can be furnished with or without a built-in milliammeter which provides a continuous reading of the grading current. Operation of an arrester discharge counter and the optional grading current instrument requires that the arrester base be insulated from the ground.

Insulating Subbases

When ordering, each Catalog Number is a set of three insulating subbases.



Number 2738303001
For use with
PVN arresters



Number 2730973001
For use with
Type PVI arresters

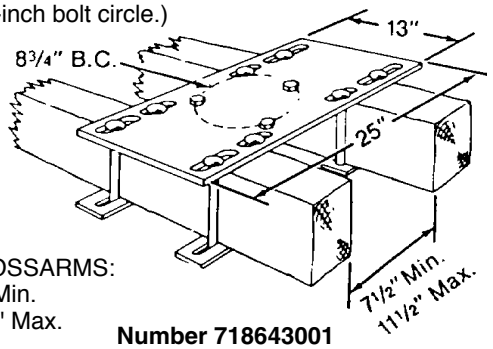
PVN Base Mounting Information

The end casting is furnished with three holes at 120° on a 10 inch diameter bolt circle. (Mounting bolts and washers are not provided with the arrester.)

Arrester MCOV (kV)	Bolt Circle (Inches)	Bolt Size (Inches)	Attachment Lug	
			Thickness (Inches)	Hole Size (Inches)
2.55 - 180	10.0	0.50	1.25	0.56

Station/Intermediate Mounting Brackets

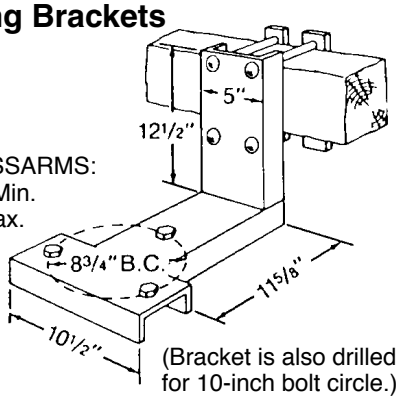
(Bracket is also drilled for 10-inch bolt circle.)



FOR CROSSARMS:
5" x 4½" Min.
8½" x 6½" Max.

Number 718643001

Double crossarm base mounting plate. Maximum arrester size that may be mounted on this bracket is 39 kV MCOV.



FOR CROSSARMS:
1½" x 4½" Min.
4" x 6½" Max.

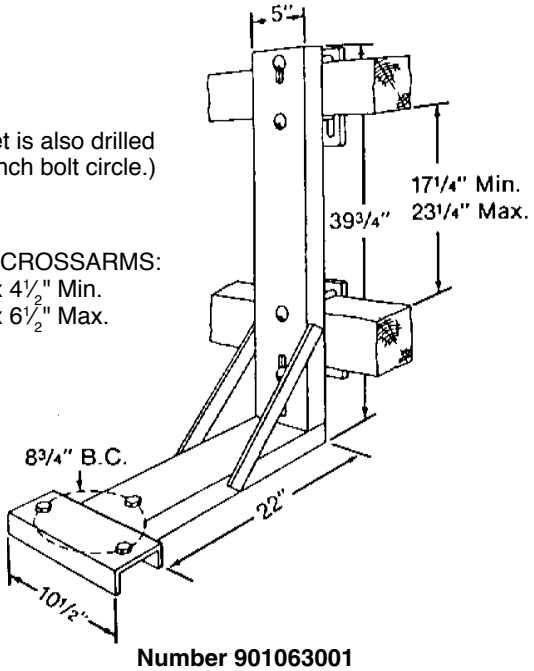
(Bracket is also drilled for 10-inch bolt circle.)

Number 900643001

Single crossarm mounting bracket. Electrical clearances must be observed. Maximum arrester size that may be mounted on this bracket is 48 kV MCOV for type PVN and 31.5 kV MCOV for type PVI. Pipe spacers are included with attachment bolts to clear channel thickness and permit mounting the arrester with bracket in an inverted position.

Note: Some users prefer to use a lightweight distribution arrester bracket as shown on page 30-8 (PVI) and 30-11 (PVN).

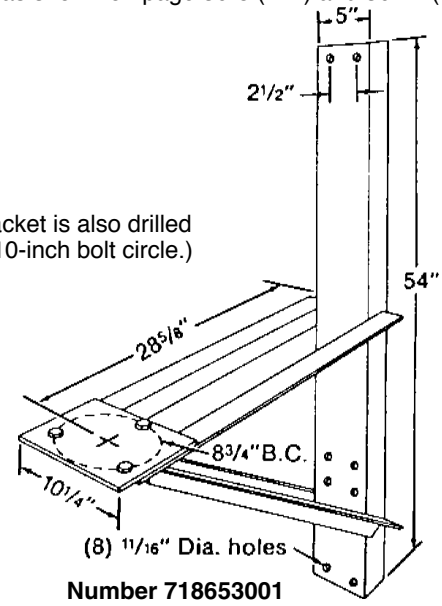
(Bracket is also drilled for 10-inch bolt circle.)



FOR CROSSARMS:
1¾" x 4½" Min.
4½" x 6½" Max.

Number 901063001

Double crossarm mounting bracket. Electrical clearances must be observed. Maximum arrester size that may be mounted on this bracket is 48 kV MCOV. Pipe spacers are included with attachment bolts to clear channel thickness and permit mounting the arrester with bracket in an inverted position.

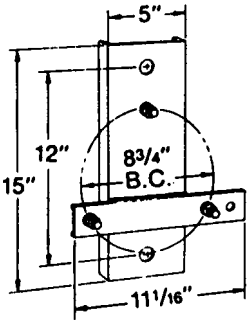


(Bracket is also drilled for 10-inch bolt circle.)

Number 718653001

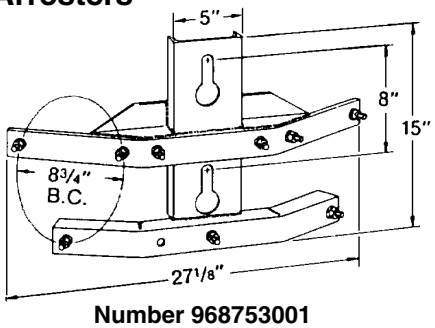
Wall mounting bracket. Electrical clearances must be observed. Maximum arrester size that may be mounted on this bracket is 57 kV MCOV.

ɔunting Brackets for PVI Arresters



Number 968763001

Pole mounting bracket for single arrester. Maximum arrester size that may be mounted on this bracket is 57 kV MCOV. Provides horizontal arrester mounting for armless construction and cable riser poles.



Number 968753001

Pole mounting bracket for three arresters. Maximum arrester size that may be mounted on this bracket is 57 kV MCOV. Provides horizontal arrester mounting for armless construction and cable riser poles.

PVNA

Polymer Housed Station Class Surge Arrester

Dimensions and Mounting

Type	Catalog Number	MCOV (kV)	Figure	"X" Dimension (inches)	Leakage Distance (inches)	Minimum Mounting Spacing on Center (in.)		Net Weight (pounds)
						Ph-Ph	Ph-Grd	
PVNA	31*703	2.55	1	6.9	15.4	4.4	3.3	6.7
PVNA	31*705	5.1	1	6.9	15.4	4.6	3.2	6.7
PVNA	31*708	7.65	1	6.9	15.4	4.7	3.3	6.7
PVNA	31*709	8.4	1	6.9	15.4	4.9	3.5	6.7
PVNA	31*710	10.2	1	6.9	15.4	5.6	4.2	6.7
PVNA	31*713	12.7	1	12.2	30.8	6.2	4.8	10.4
PVNA	31*715	15.3	1	12.2	30.8	6.6	5.2	10.4
PVNA	31*717	17	1	12.2	30.8	7.6	6.2	10.4
PVNA	31*720	19.5	1	12.2	30.8	8.6	7.2	10.4
PVNA	31*722	22	1	17.6	46.2	9.6	8.2	14.1
PVNA	31*724	24.4	1	17.6	46.2	9.8	8.4	14.1
PVNA	31*729	29	1	17.6	46.2	11.8	10.4	14.1
PVNA	31*731	31.5	1	23.0	61.6	12.8	11.4	17.8
PVNA	31*736	36.5	1	23.0	61.6	14.8	13.4	17.8
PVNA	31*739	39	1	23.0	61.6	15.8	14.4	17.8
PVNA	31*742	42	1	28.4	77.0	17.8	16.4	21.5
PVNA	31*748	48	1	28.4	77.0	19.8	18.4	21.5
PVNA	31*757	57	1	33.8	92.4	22.8	21.4	25.2

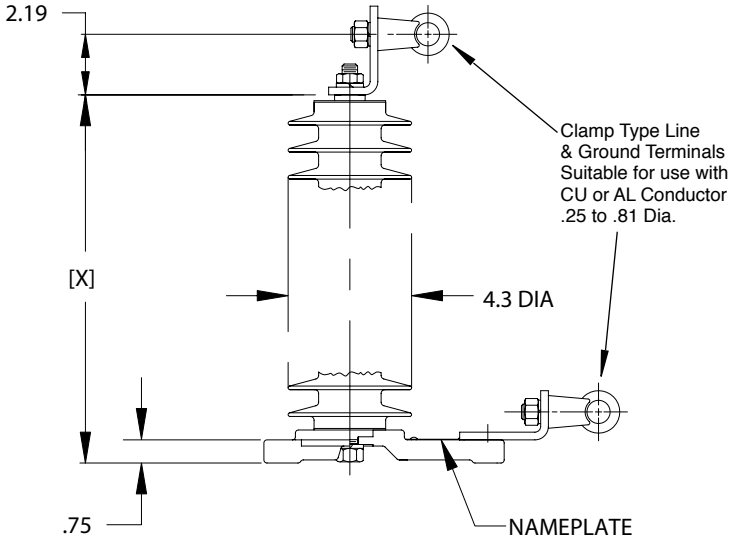


Figure 1

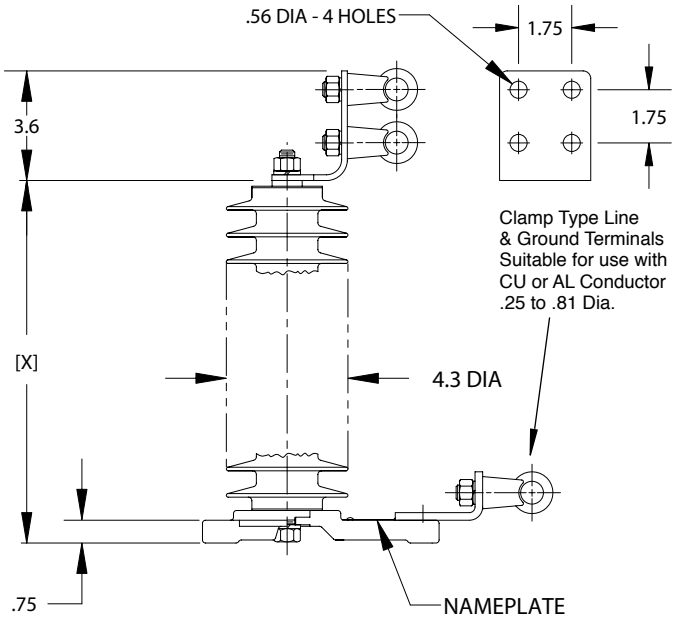


Figure 2

Mounting Configurations:

The third digit designates the mounting configuration. For upright mounting small top and tripod base, order catalog numbers series 3107XX3001 (Figure 1). If a four-hole terminal pad is required, use catalog number series 3107XX3002 (Figure 2). All PVNA arresters are packaged one per carton.

For underhung mounting tripod top and small base, order catalog number series 3127XX3001.

PVNA Terminals:

Standard line and ground terminals are included with the arrester and will accommodate conductor sizes from 1/4 (.25) inch to 13/16 (.81) inch. The terminals are hot dipped galvanized malleable iron compatible with either aluminum or copper.

Other hardware options available. Contact your local representative.

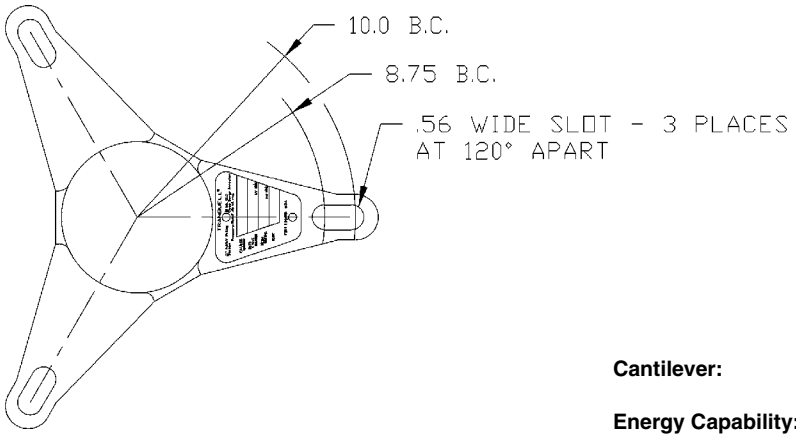
HUBBELL POWER SYSTEMS, INC. OHIO BRASS

PVNA

Polymer Housed Station Class Surge Arrester

Base Mounting Information:

The end casting is furnished with three slots suitable for use on either 8.75" or 10" diameter bolt circle. Mounting hardware is not furnished with the arrester.



Bolt Size (inches)	Attachment Lug	
	Thickness (inches)	Hole Size (inches)
0.5	0.75	0.56

Cantilever: Rated ultimate cantilever moment is 4,000 inch-pounds. Continuous cantilever moment is 2,000 inch-pounds.
Energy Capability: 5.1 kJ/kV MCOV
Pressure Relief: 40 kA rms Symmetrical

Protective Characteristics

Standard Arrester Catalog Number	Duty Cycle Rating kV rms	Maximum Continuous Operating Voltage kV rms	Maximum 0.5µs Discharge Voltage kV (1)	Maximum Switching Surge Protective Level kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
					1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA
31*703	3	2.55	8.5	6.3	6.7	7.1	7.4	8	8.9	10
31*705	6	5.1	16.9	12.5		14.2	14.8	16	17.7	20
31*708	9	7.65	25.3	18.7	13.4	21.2	22.2	23.9	26.5	29.8
31*709	10	8.4	27.6	20.5		23.1	24.2	26.1	28.9	32.5
31*710	12	10.2	33.5	24.9	20.1	28.1	29.4	31.7	35.1	39.5
31*713	15	12.7	42.2	31.3	21.9	35.4	37	39.9	44.2	49.8
31*715	18	15.3	50.5	37.5	26.6	42.4	44.3	47.8	52.9	59.6
31*717	21	17	55.3	41	33.5	46.3	48.5	52.3	57.9	65.2
31*720	24	19.5	67	49.7	40.1	56.2	58.8	63.4	70.2	79.1
31*722	27	22	75.9	56.3	43.9	63.6	66.6	71.8	79.5	89.5
31*724	30	24.4	82.9	61.5	53.2	69.5	72.7	78.4	86.8	98
31*729	36	29	101	74.6	60.2	84.3	88.2	95.1	105	119
31*731	39	31.5	105.8	78.5	65.8	88.7	92.8	100.1	110.8	124.8
31*736	45	36.5	122.3	90.7	79.8	102.5	107.3	115.7	128.1	144.3
31*739	48	39	134	99.4	84	112.3	117.5	126.8	140.4	158.1
31*742	54	42	144	106.8	97.1	120.7	126.3	136.2	150.8	169.8
31*748	60	48	161.6	119.9	106.4	135.5	141.7	152.9	169.3	191
31*757	72	57	195	144.7	114.3	163.6	171.1	184.6	204	230

(1) Maximum discharge voltage for a 10-kA impulse current wave which produces a voltage wave cresting in 0.5μs. This can be used for coordination where front-of-wave sparkover was formerly used.
(2) 500A surge of 45-μs-time to crest.

Type VL and VN Porcelain Housed Station Class Arresters

Introduction

For over 30 years, Ohio Brass has been supplying surge arresters to the electric utility industry. Many unique physical and electrical design changes have been introduced for:

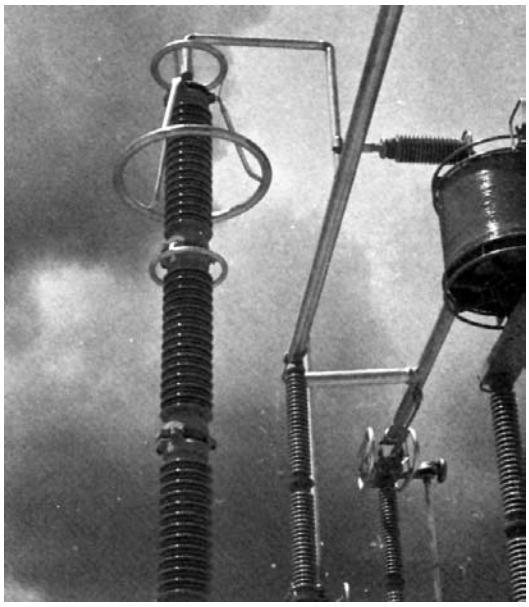
- achieving more compact arrester dimensions
- significantly reducing equipment costs through drastic reductions in insulation levels
- greatly improving protection performance for greater system reliability.

DynaVar® station class arresters, with metal-oxide varistor design, provide improved operating characteristics over silicone-carbide design arresters. They offer superior protective capability and durability under natural and system-generated surge duty.

All VL, VLA & VN DynaVar Station Class Surge Arresters in this catalog comply with ANSI/IEEE Standard C62.11.

Application Guide

For a 12-page Application Guide, request publication EU 1091-H from your Ohio Brass representative.



Description and Operation

Maximum Operating Altitudes

DynaVar station arresters can be applied at the altitudes listed below. For special altitude applications, contact your Ohio Brass representative.

Maximum Operating Altitudes

Arrester Type	Maximum Altitude Above Sea Level	
	feet	meters
VLA, VL, VN	12,000	3,600

Rated cantilever base moments are as follows:
Type VL ..... 70,000 inch-pounds
Type VN..... 150,000 inch-pounds

Maximum recommended working base moment under any combination of loading conditions is 40 percent of the above figures. The side force on the top terminal of VLA arresters should not exceed 100 pounds.

Subbases are available with cantilever strengths consistent with arrester strength.

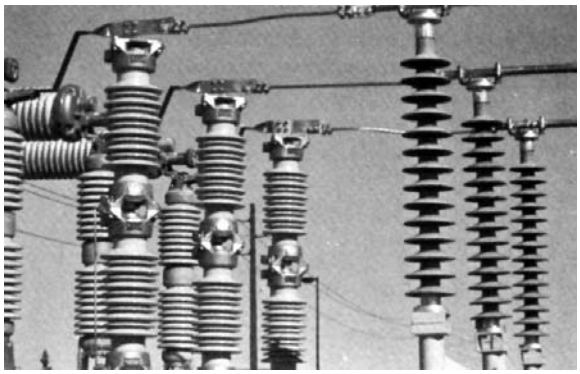
Mechanical Strength

The low silhouette and simple columnar shape of DynaVar arresters minimize wind resistance. They will withstand winds as high as 120 m.p.h. with a generous safety factor.

The tallest DynaVar VL/VN arrester will also withstand in excess of 0.2 g of earthquake shock. As arrester height decreases at lower voltages, strength improves progressively. Throughout the range of sizes, this exceeds general station requirements.

Cantilever Strength

The high cantilever strengths of DynaVar arresters adequately meet service requirements with generous safety factors for windstorms or earthquakes. Horizontal force can be established by dividing cantilever moment by distance between base mounting and center of force.



HUBBELL POWER SYSTEMS, INC. OHIO BRASS

Porcelain Housed Station Class Arresters

Protective Characteristics

Type	Standard Arrester Catalog Number	Duty Cycle Rating kV rms	Arrester MCOV- kV rms	Maximum 0.5µs Discharge Voltage kV (1)	Maximum Switching Surge Protective Level At Classifying Current Levels kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
						1.5kA	3kA	5kA	10kA	20kA	40kA
VLA	217003	3	2.55	9.1	6.3	6.9	7.2	7.5	8	9	10.3
VLA	217005	6	5.1	17.9	12.4	13.6	14.2	14.8	15.8	17.7	20.3
VLA	217008	9	7.65	26.6	18.4	20.2	21.1	22	23.5	26.4	30.2
VLA	217009	10	8.4	29.3	20.3	22.2	23.3	24.2	25.9	29.1	33.3
VLA	218510	12	10.2	35.5	24.6	26.9	28.2	29.4	31.4	35.2	40.4
VLA	217013	15	12.7	44.2	30.6	33.5	35.1	36.6	39.1	43.9	50.3
VLA	217015	18	15.3	53.3	36.8	40.4	42.3	44.1	47.1	52.8	60.6
VLA	218517	21	17.0	59.1	40.9	44.8	46.9	48.9	52.3	58.7	67.2
VLA	218519	24	19.5	67.8	46.9	51.4	53.8	56.1	60	67.3	77.1
VL	216003	3	2.55	9.1	6.3	6.9	7.2	7.5	8	9	10.3
VL	216005	6	5.1	17.9	12.4	13.6	14.2	14.8	15.8	17.7	20.3
VL	219508	9	7.65	26.6	18.4	20.2	21.1	22	23.5	26.4	30.2
VL	219509	10	8.4	29.3	20.3	22.2	23.3	24.2	25.9	29.1	33.3
VL	219510	12	10.2	35.5	24.6	26.9	28.2	29.4	31.4	35.2	40.4
VL	219513	15	12.7	44.2	30.6	33.5	35.1	36.6	39.1	43.9	50.3
VL	216015	18	15.3	53.3	36.8	40.4	42.3	44.1	47.1	52.8	60.6
VL	219517	21	17	59.1	40.9	44.8	46.9	48.9	52.3	58.7	67.2
VL	219519	24	19.5	67.8	46.9	51.4	53.8	56.1	60	67.3	77.1
VL	216022	27	22	76.5	52.9	58	60.8	63.3	67.7	75.9	87
VL	216024	30	24.4	84.9	58.7	64.3	67.4	70.3	75.1	84.2	96.5
VL	219529	36	29	101	69.7	76.4	80	83.4	89.2	100	115
VL	216031	39	31.5	110	75.8	83	86.9	90.6	96.9	109	125
VL	219536	45	36.5	128	88.3	96.8	102	106	113	127	146
VL	219539	48	39	136	93.8	103	108	113	120	135	155
VN	219542	54	42	135	100	107	112	117	125	136	151
VN	219548	60	48	150	111	119	125	130	139	151	168
VN	219557	72	57	178	132	141	148	154	165	179	199
VN	219570	90	70	225	166	178	187	195	208	226	251
VN	219574	90	74	238	176	188	198	206	220	239	265
VN	219576	96	76	238	176	188	198	206	220	239	265
VN	219584	108	84	269	199	213	224	233	249	270	300
VN	219588	108	88	275	203	218	228	238	254	276	306
VN	217598	120	98	306	235	242	254	265	283	307	341
VN	219606	132	106	332	254	263	276	287	307	333	370
VN	219615	144	115	360	276	285	299	312	333	361	402
VN	219631	168	131	416	319	330	346	360	385	418	464
VN	217740	172	140	438	336	347	363	379	405	439	488
VN	217744	180	144	450	345	357	374	390	416	452	502
VN	217752	192	152	476	365	377	395	412	440	477	531
VN	217780	228	180	568	436	450	472	492	526	570	634
VN	217909	258	209	659	526	522	547	570	609	661	735
VN	217912	264	212	662	528	524	550	573	612	664	738
VN	217920	276	220	687	548	544	570	594	635	689	766
VN	217945	312	245	773	617	612	641	668	714	775	862

(1) Maximum discharge voltage for an impulse current wave which produces a voltage wave cresting in 0.5 μs. Discharge currents are 10 kA for 2.55-245 kV MCOV. This can be used for coordination where front-of-wave sparkover formerly was used.

(2) Discharge voltages are based on a 500A surge of 45 μs time to crest through 88 kV MOV and 1,000A surge of 45 μs-time to crest through 180 kV MCOV and 2,000A through 245 kV MCOV.

Nameplates

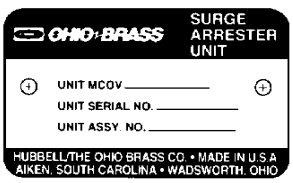
Each arrester is identified with an arrester nameplate attached to the bottom casting. The arrester nameplate is attached to the bottom unit of multiple-unit stacks.

Arrester nameplates display the maximum continuous operating voltage, duty cycle rating, pressure relief current, serial and catalog numbers, and stacking sequence if the unit is the base unit of a multiple stack.

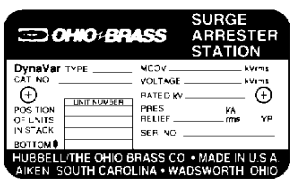
Multiple-unit arresters must be stacked in the order listed on the base nameplate. (Stacking sequence is also listed on the arrester crates.)

Multiple-unit arresters are also identified with a unit nameplate attached to the upper casting of each unit. The unit nameplate identifies the serial number of the specific unit.

Standard Configurations

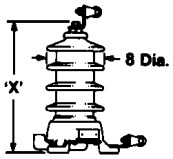


Unit Nameplate

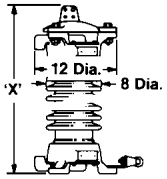


Arrester Nameplate

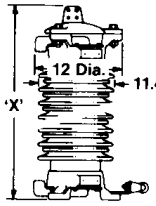
Dimensions and Mounting



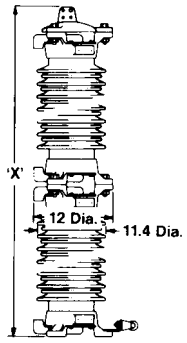
Drawing 1
(Type VLA)



Drawing 2
(Type VL)



Drawing 3
(Type VN)

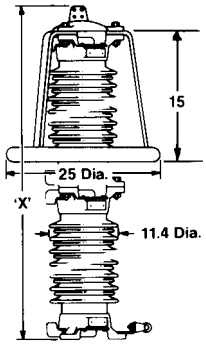


Drawing 4
(Type VN)

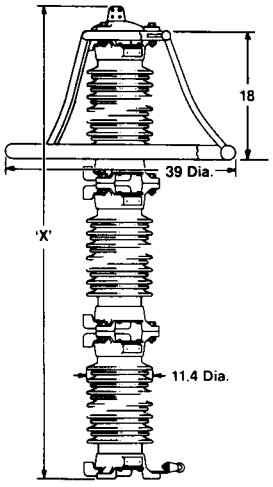
Type	Standard Arrester Catalog Number	Duty Cycle Rating kV rms	Maximum Continuous Operating Voltage kV rms	Drawing Number	"X" Dimension (Inches)	Minimum Leakage Distance (Inches)	Minimum Mounting Spacing on center†		Net Weight (Pounds)
							Phase to Phase (in-line (Inches)	Phase to Ground (Inches)	
VLA	217003	3	2.55	1	12	11.1	11	5.5	35
VLA	217005	6	5.1	1	12	11.1	11	5.5	40
VLA	217008	9	7.65	1	12	11.1	11	5.5	40
VLA	217009	10	8.4	1	12	11.1	11	5.5	40
VLA	218510	12	10.2	1	12	11.1	11	6.5	42
VLA	217013	15	12.7	1	16.25	20	11	7.5	50
VLA	217015	18	15.3	1	16.25	20	11	9	50
VLA	218517	21	17.0	1	16.25	20	11	9	51
VLA	218519	24	19.5	1	16.25	20	11	9	52
VL	216003	3	2.55	2	19.13	6.2	12	6	65
VL	216005	6	5.1	2	19.13	6.2	12	7	65
VL	219508	9	7.65	2	19.13	6.2	13	7	66
VL	219509	10	8.4	2	19.13	6.2	13	8	66
VL	219510	12	10.2	2	21.13	11.1	14	8.5	72
VL	219513	15	12.7	2	21.13	11.1	14	8.5	73
VL	216015	18	15.3	2	24.13	20	16	9	80
VL	219517	21	17	2	24.13	20	16	9	81
VL	219519	24	19.5	2	24.13	20	17	11	82
VL	216022	27	22	2	28.13	31.7	18	12	90
VL	216024	30	24.4	2	28.13	31.7	18	12	91
VL	219529	36	29	2	28.13	31.7	20	14	93
VL	216031	39	31.5	2	31.88	41	21	14	105
VL	219536	45	36.5	2	31.88	41	21	15	107
VL	219539	48	39	2	31.88	41	22	15	109
VN	219542	54	42	3	38.13	60	24	18	180
VN	219548	60	48	3	38.13	60	25	19	185
VN	219557	72	57	3	44.13	80	26	20	220
VN	219570	90	70	3	50.63	101	33	27	250
VN	219574	90	74	3	50.63	101	35	29	260
VN	219576	96	76	3	50.63	101	37	31	265
VN	219584	108	84	3	57.13	122	38	32	280
VN	219588	108	88	3	57.13	122	39	33	285
VN	217598	120	98	3	57.13	122	42	36	290
VN	219606	132	106	4	76.63	140	44	38	395
VN	219615	144	115	4	82.63	160	51	46	425
VN	219631	168	131	4	89.13	181	59	54	465
VN	217740	172	140	5	89.13	181	78	59	475
VN	217744	180	144	5	89.13	181	83	64	480
VN	217752	192	152	5	96.13	202	83	67	515
VN	217780	228	180	5	108.63	244	92	73	590
VN	217909	258	209	6	128.13	262	111	92	700
VN	217912	264	212	6	133.63	282	116	96	725
VN	217920	276	220	6	133.63	282	120	100	730
VN	217945	312	245	6	147.13	324	130	110	800

† Minimum clearances are based on arrester protective levels and should be increased when necessary to meet local requirements for spacing of energized equipment.

‡ Three units.



Drawing 5
(Type VN)



Drawing 6
(Type VN)

See the Dimensions and Mounting Table for more detailed information.

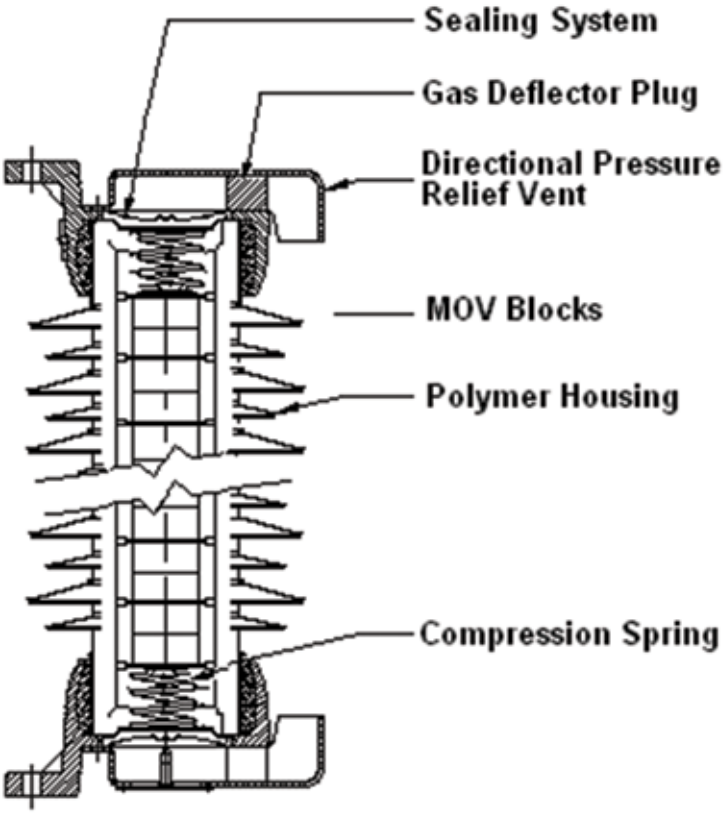
Grading Rings

Where a grading ring is required (Drawings 5 & 6), it is included in the shipment.

Polymer Housed Arresters
(Type SVN)

Construction

- Hollow Core Design
- Silicone Rubber Housing
- Same proven sealing system as used in our porcelain VL & VN designs
- High mechanical strength
- High leakage distance designs available
- Same high quality MOV technology as all other Ohio Brass arresters



Section View of Polymer SVN Arrester

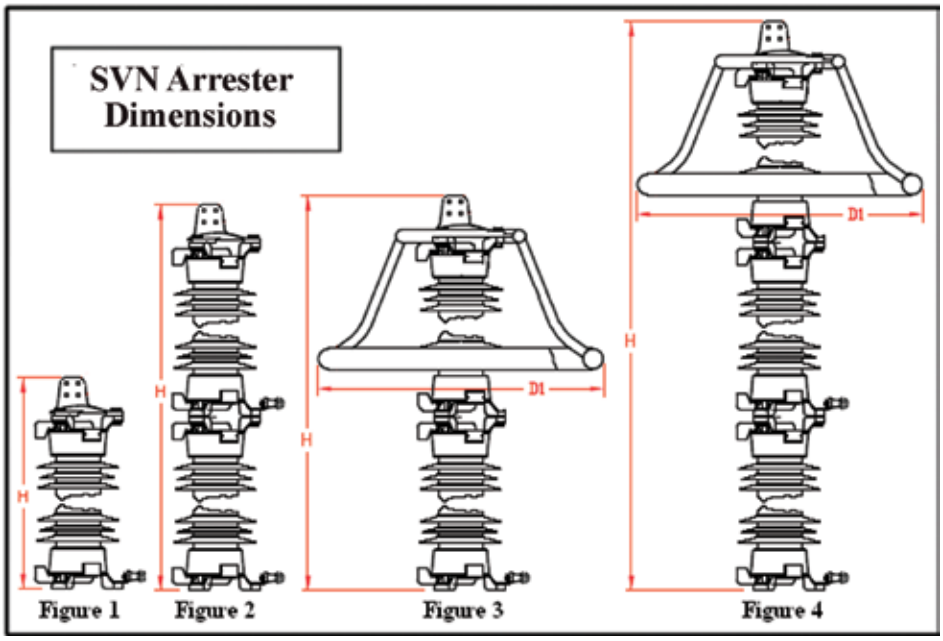
For non-catalog polymer arresters that require higher creepage or special application please consult your Ohio Brass representative.

Polymer Overview (Type SVN)

Product Type	Housing Material	Physical Strength in-lbs
SVN	Silicone	35,000*

*MPSL – Maximum Permissible Service Load

SVN
Polymer Housed
Station Class Arrester



Ohio Brass SVN Ordering System:

Use the following selection tables to build the correct Ohio Brass SVN Arresters.

Catalog Ordering System												
A	B	C	D	E	F	G	H	I	J	K	L
S	V	N				G	A					

Step 1: Enter the Rated Voltage of the Arrester into Cells C through E using Table 1.

Table 1

Rated Voltage (kV)	C	D	E	Rated Voltage (kV)	C	D	E
54	0	5	4	180	1	8	0
60	0	6	0	192	1	9	2
72	0	7	2	228	2	2	8
90	0	9	0	258	2	5	8
96	0	9	6	264	2	6	4
108	1	0	8	276	2	7	6
120	1	2	0	312	3	1	2
132	1	3	2	396	3	9	6
144	1	4	4	420	4	2	0
168	1	6	8	444	4	4	4

Step 2: Select the appropriate MCOV from Table 2 that corresponds with the Rated Voltage selected for C through E and fill in Cells H through J.

Table 2

Rated Voltage (kV)	MCOV	H	I	J
54	42	0	4	2
60	48	0	4	8
72	57	0	5	7
90	70	0	7	0
90	74	0	7	4
96	76	0	7	6
108	84	0	8	4
108	88	0	8	8
120	98	0	9	8
132	106	1	0	6
144	115	1	1	5
168	131	1	3	1
172	140	1	4	0
180	144	1	4	4
192	152	1	5	2
228	180	1	8	0
258	209	2	0	9
264	212	2	1	2
276	220	2	2	0
312	245	2	4	5
396	318	3	1	8
420	335	3	3	5
444	353	3	5	3

Step 3: Select the appropriate Line and Ground terminals based on the conductor size ranges in Table 3 and fill in K & L.

Table 3

Line Size dia. (in)	Ground Size dia. (in)	K	L
0.32 - 0.78	0.32 - 0.78	A	A
0.32 - 0.78	0.38 - 1.12	A	B
0.32 - 0.78	1 - 1.4	A	C
0.38 - 1.12	0.32 - 0.78	B	A
0.38 - 1.12	0.38 - 1.12	B	B
0.38 - 1.12	1 - 1.4	B	C
1 - 1.4	0.32 - 0.78	C	A
1 - 1.4	0.38 - 1.12	C	B
1 - 1.4	1 - 1.4	C	C

SVN Catalog Ordering Example

- Rated Voltage – 54kV
- MCOV – 42kV
- Line & Ground Size - 0.32 - 0.78 inch diameter

Step 1: Fill in C through E
- (SVN**054**GAxxxxx)

Step 2: Select MCOV
- (SVN054GA**042**xx)

Step 3: Select Terminals
- (SVN054GA042**AA**)

Step 4: Order Ohio Brass Catalog Number
- (SVN054GA042AA)

Hollow Core Silicone Housed Station Class Arresters

Protective Characteristics

Type	Standard Arrester Catalog Number	Rated Voltage	MCOV	Maximum 0.5µs Discharge Voltage(1)	Maximum Switching Surge Protective Level At Classifying Current Levels kV (2)	Maximum Discharge Voltage Using an 8/20 Current Wave-kV					
		kVrms	kVrms	kV	kV	1.5kA	3kA	5kA	10kA	20kA	40kA
SVN	SVN054GA042AA	54	42	133	94	103	108	113	121	131	146
SVN	SVN060GA048AA	60	48	152	107	118	124	129	138	150	166
SVN	SVN072GA057AA	72	57	181	127	140	147	153	164	178	198
SVN	SVN090GA070AA	90	70	222	156	172	181	188	201	218	243
SVN	SVN090GA074AA	90	74	235	165	182	191	199	213	231	256
SVN	SVN096GA076AA	96	76	241	170	187	196	205	218	237	263
SVN	SVN108GA084AA	108	84	266	187	207	217	226	241	262	291
SVN	SVN108GA088AA	108	88	279	196	217	227	237	253	274	305
SVN	SVN120GA098AA	120	98	311	228	241	253	264	282	305	340
SVN	SVN132GA106AA	132	106	336	247	261	274	285	305	330	367
SVN	SVN144GA115AA	144	115	365	268	283	297	310	330	358	399
SVN	SVN168GA131AA	168	131	416	305	323	338	353	376	408	454
SVN	SVN172GA140AA	172	140	444	326	345	362	377	402	436	485
SVN	SVN180GA144AA	180	144	457	335	355	372	388	414	449	499
SVN	SVN192GA152AA	192	152	482	354	374	393	409	437	473	527
SVN	SVN228GA180AA	228	180	571	419	443	465	485	517	561	624
SVN	SVN258GA209AA	258	209	663	519	515	540	563	601	651	724
SVN	SVN264GA212AA	264	212	673	526	522	548	571	609	660	735
SVN	SVN276GA220AA	276	220	698	546	542	568	592	632	685	762
SVN	SVN312GA245AA	312	245	777	608	603	633	660	704	763	849
SVN	SVN396GA318AA	396	318	1009	790	783	821	856	914	991	1102
SVN	SVN420GA335AA	420	335	1063	832	825	865	902	963	1043	1161
SVN	SVN444GA353AA	444	353	1120	876	869	912	950	1014	1100	1223

(1) Maximum discharge voltage for an impulse current wave which produces a voltage wave cresting in 0.5 μs. Discharge Currents are 10kA for 42-353 kV MCOV. This can be used for coordination where front-of-wave sparkover formerly was used.

(2) Discharge voltages are based on a 500A surge of 45 μs time to crest through 88kV MCOV and a 1000A surge of 45 μs to crest through 180 kV MCOV and 2000A through 245 kV MCOV.

Nameplates

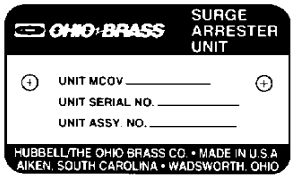
Each arrester is identified with an arrester nameplate attached to the bottom casting. The arrester nameplate is attached to the bottom unit of multiple-unit stacks.

Arrester nameplates display the maximum continuous operating voltage, duty cycle rating, pressure relief current, serial and catalog numbers, and stacking sequence if the unit is the base unit of a multiple stack.

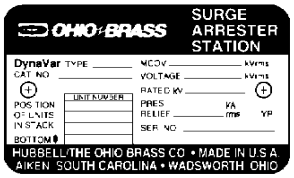
Multiple-unit arresters must be stacked in the order listed on the base nameplate. (Stacking sequence is also listed on the arrester crates.)

Multiple-unit arresters are also identified with a unit nameplate attached to the upper casting of each unit. The unit nameplate identifies the serial number of the specific unit.

Standard Configurations



Unit Nameplate



Arrester Nameplate

Dimensions and Mounting

Type	Standard Arrester Catalog Number	Duty Cycle kV rms	Maximum Continuous Operating Voltage kV rms	Figure Number (Page 23)	"H" Dimension (Inches)	Minimum Leakage Distance (Inches)	Minimum Mounting Spacing on Center (1)		Net Weight (Pounds)
							Phase to Phase (in-line) (Inches)	Phase to Ground (Inches)	
SVN	SVN054GA042AA	54	42	1	38.1	83	17	21	104
SVN	SVN060GA048AA	60	48	1	38.1	83	19	23	107
SVN	SVN072GA057AA	72	57	1	38.1	83	23	28	112
SVN	SVN090GA070AA	90	70	1	44.4	113	28	34	125
SVN	SVN090GA074AA	90	74	1	44.4	113	30	36	130
SVN	SVN096GA076AA	96	76	1	44.4	113	30	37	128
SVN	SVN108GA084AA	108	84	1	52.1	142	34	41	141
SVN	SVN108GA088AA	108	88	1	52.1	142	35	42	144
SVN	SVN120GA098AA	120	98	1	52.1	142	39	47	149
SVN	SVN132GA106AA	132	106	1	58.8	171	42	51	167
SVN	SVN144GA115AA	144	115	1	58.8	171	46	55	172
SVN	SVN168GA131AA	168	131	2	76.9	196	52	63	231
SVN	SVN172GA140AA	172	140	3	76.9	196	63	82	257
SVN	SVN180GA144AA	180	144	3	76.9	196	65	84	257
SVN	SVN192GA152AA	192	152	3	83.2	225	68	88	262
SVN	SVN228GA180AA	228	180	3	90.9	254	79	101	291
SVN	SVN258GA209AA	258	209	3	105.3	313	108	150	349
SVN	SVN264GA212AA	264	212	3	105.3	313	109	151	351
SVN	SVN276GA220AA	276	220	3	105.3	313	102	134	330
SVN	SVN312GA245AA	312	245	4	129.7	367	112	146	406
SVN	SVN396GA318AA	396	318	4	151.8	455	161	222	539
SVN	SVN420GA335AA	420	335	4	158.5	484	168	230	564
SVN	SVN444GA353AA	444	353	4	165.2	514	165	218	532

(1) Minimum clearances are based on arrester protective levels and should be increased when necessary to meet local requirements for spacing of energized equipment

Grading Rings

Where a grading ring is required (Figures 3 and 4 on page 23), it is included in the shipment.

Dimensions and Mounting (continued)

Base Mounting Information

End castings of Types VLA, VL, VN and SVN arresters are furnished with three holes at 120 degrees on a 10-inch diameter bolt circle. Mounting holes will accommodate 1/2-inch bolts.

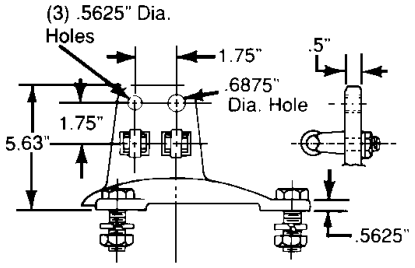
Rated cantilever strength is achieved with 1/2-inch bolts.

Mounting bolts, nuts and washers are not furnished with DynaVar arresters.

Arrester Type	Bolt Circle Inches	Bolt Size Inches	Attachment Lug Thickness Inches	Attachment Lug Hole Size Inches
VLA, VL, VN, SVN	10	1/2	0.63	0.56

Suspension Cap Details

Seen in Drawings 2, 3, 4, 5 and 6



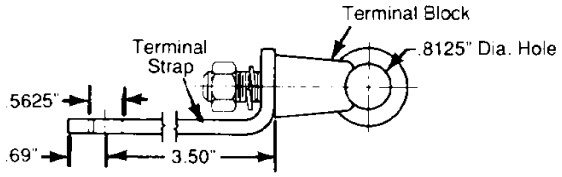
Catalog No. 272087

Suspension cap for Type VL, VN and SVN arresters. This cap is the standard normally furnished on VL, VN and SVN shipments.

Terminals

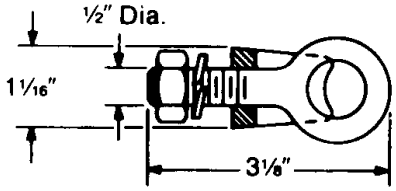
Line and ground terminals for conductors from .25 to .81-inch diameter are supplied with DynaVar arresters. These terminals are made from hot-dip galvanized malleable iron, compatible with either aluminum or copper. The arrangement of mounting terminals on arresters makes it possible to align them in any direction to accommodate the angle of the incoming lead wire.

Contact your Ohio Brass representative for quotation where conductor size exceeds standard terminal capacity.



Terminal Number 71874 used for both line and ground connection of VLA and ground of VL, VN and SVN arresters. Note figure above shows typical ground configuration.

Note: For standard terminals and standard package, order suffix 3001 for VL/VLA and suffix 5001 for VN. For non-standard requirements, contact your Ohio Brass representative. For SVN, order end the Catalog number with AA.



Connector Number 271414 used with all terminal combinations. Range of conductor sizes .25 to .81-inch.

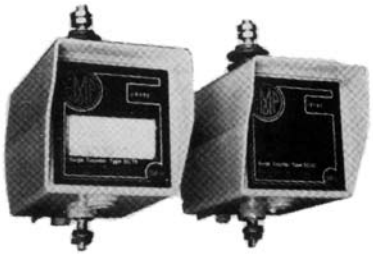
Mounting Positions

DynaVar Types VL, VLA, VN and SVN may be mounted in upright or, within mechanical limitations, horizontal position. Types VL, VN and SVN may be either base-supported or top-suspended. Type VLA may be mounted inverted if not exposed to the weather. Either end of these types may be electrically connected to line or ground.

Packing for Shipment

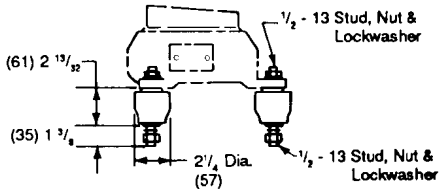
All VN and SVN arresters are packed with each porcelain unit in a separate wooden crate. Most VL and all VLA arresters are packed with each porcelain unit in a separate cardboard carton. All packing includes proper labeling for correct assembly upon construction. Stacking bolts when required are included. Grading rings are packed and shipped separately with tagging for easy identification. Please contact your Ohio Brass representative if special packing is required.

Discharge Counters

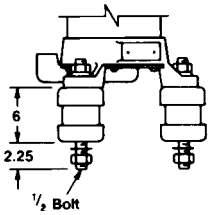


245121 **245120**

Arrester discharge counters can be furnished with or without a built-in milliammeter which provides a continuous reading of the grading current. Operation of an arrester discharge counter and the optional grading current instrument requires that the arrester base be insulated from the ground. Insulating subbases are required to mount the discharge counter.



Number 2730973001
For use with Type VLA and VL arresters.



Number 2721453076
For use with Type VN and SVN arresters.

Arrester Routine Factory Testing

After assembly operations, the arresters are 100 percent tested as follows:

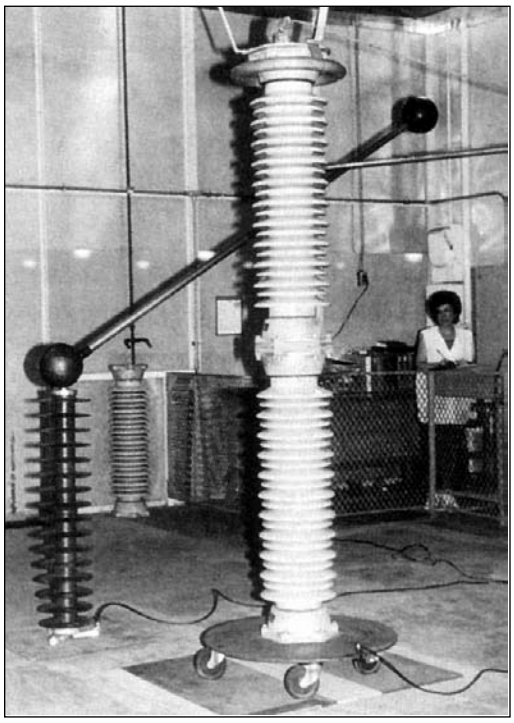
Starting Voltage — The voltage necessary to produce 1 mA peak resistive current is measured. For example, an acceptable range for a 48 kV MCOV rated VN station class arrester is 55.2 - 62.4 kV rms.

Internal Ionization — RIV must be equal to or less than 10-microvolts above background with an applied voltage of 1.05 times MCOV and less than 50-microvolts with an applied voltage of 1.25 times MCOV.

Grading Current — Grading current is measured at MCOV. The acceptable peak current range is as follows:

-- Type VN and SVN: 1.35 ± .25 mA
-- Type VL: .97 ± .16 mA
-- Type PVI: .60 ± .15 mA
-- PVN: .93 ± .15 mA

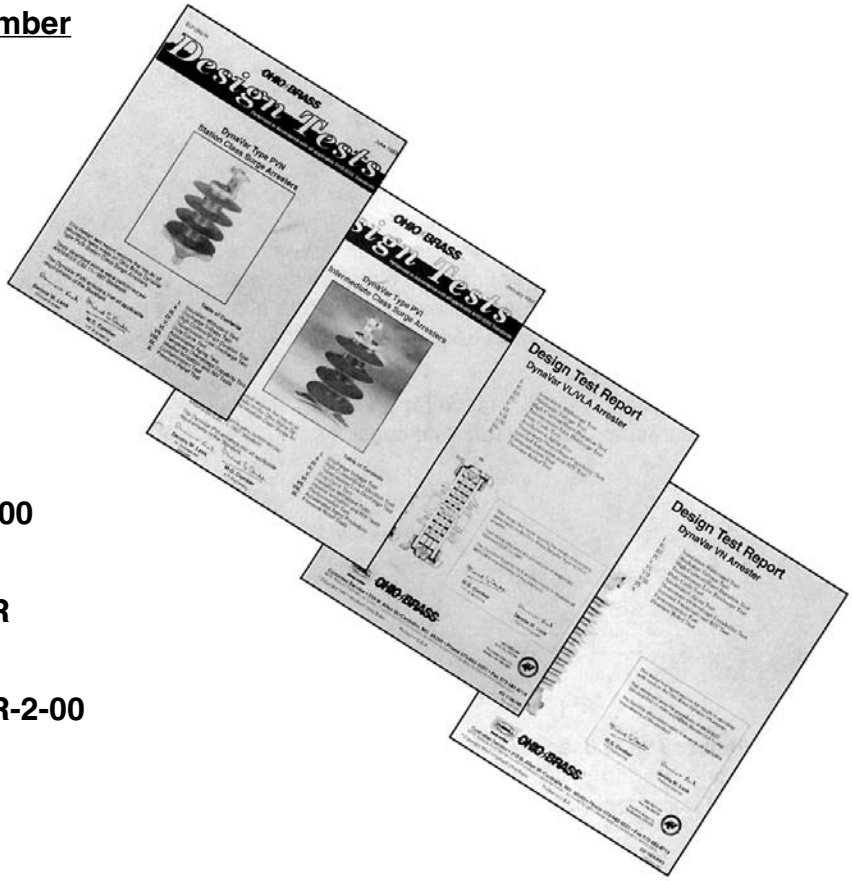
The above testing procedure indicates our diligence in producing high quality metal-oxide arresters.



Fully assembled DynaVar standard polymer-housed station arrester (left) undergoes routine electrical testing prior to shipment.

Complete Design Test Reports are Available.

Arrester	Report Number
Type PVN	EU1295-H
Type PVNA	EU1502-H
Type PVI	EU1250-H
Type PVI-LP	EU1464-H
Type PVIA	EU1498-H-00
Type VL/VLA	EU1196-HR
Type VN	EU1029-HR-2-00
Type SVN	EU-1526-H



These may be ordered from your Ohio Brass representative.