

Surge Arresters

IEC Line Discharge Classes 2, 3, 4 & 5



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Introduction

Ohio Brass has been producing high voltage surge arresters since the 1950's and offers a wide variety of metal oxide gapless arresters designed to protect transformers, switchgear, and other equipment from switching and lightning surges. These arresters meet or exceed all requirements of the most current IEC standard and can be selected to match a range of contamination and energy requirements.

Dedication to Quality

Ohio Brass has demonstrated that its Quality Management system is in compliance with ISO 9001:2008 and maintains stringent testing controls in accordance with IEC 60099-4 to ensure that the customer receives high quality with every product. Ohio Brass also performs Quality Assurance tests on every batch of metal-oxide varistor (MOV) blocks. The routine and design tests listed below, in addition to highly controlled manufacturing processes, ensure that Ohio Brass products demonstrate a superior level of quality. Our commitment to quality and continuous improvement is what the industry expects of its Leader.



MOV Block Routine Tests:

- **Physical Inspection** – Visual inspections are performed at several steps of the block manufacturing process.
- **Rated Energy Test** – This procedure confirms the energy capability of each zinc oxide block element.
- **Residual Voltage Test** – Every block undergoes an 8/20 current wave impulse to verify its V-I characteristics.
- **Watts Loss Test** – This test measures the AC watts loss and capacitive current characteristics of the block.

MOV Block Batch QA Tests:

- **Square Wave Energy Test** – Performed on a 5 block sample from each batch, this test is performed to quantify the batch energy capability.
- **High Current Test** – Each 5 block sample is subjected to two high current discharges of the same polarity to ensure high current characteristics.
- **A/C Life Test** – The blocks are placed under test conditions for a minimum of 250 hours to verify performance.

Arrester Routine Tests:

- **Physical Inspection** – Every molded rubber part, block, wrap module, brackets and completed unit is visually examined to reject defective products.
- **Reference Voltage Test** – This test measures the voltage once a predetermined maximum peak current is reached.
- **Partial Discharge Test** – This test ensures that the partial discharge level of the arrester does not exceed a level of 10 pC.
- **Residual Voltage** – Tested on individual blocks

Arrester Type Tests:

- **Testing Compliant with IEC 60099-4**
- **Including:**
 - ❖ Insulation withstand tests on housing
 - ❖ Residual voltage tests
 - ❖ Long-duration current impulse withstand
 - ❖ Operating duty tests
 - ❖ Short circuit tests
 - ❖ Internal partial discharge tests

Type Test Reports are available for download at the website:

<http://www.hubbellpowersystems.com/resources/test-reports/test-reports-arresters.asp>

Table 1: Type Test Reports

IEC Class	Arrester Type	Type Test Report
2	PVI-LP	EU1515
3	EVP	EU1593
3	MH3	EU1590
3	PH3	EU1527
4	MH4	EU1575
4	PH4	EU1522
5	H5	EU1518

Ohio Brass General Arrester Information

Table 2: Ohio Brass Arrester Families

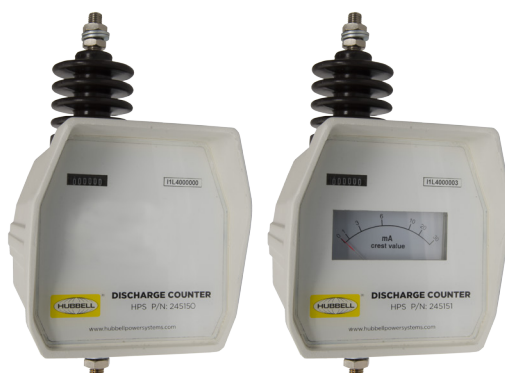
Type	Housing	Nominal Discharge Current (kA)	Pressure Relief Class (kA)	Energy Capability Single Impulse (kJ/kV - U _c)	Energy Capability Single Impulse (kJ/kV - U _r)	Energy Capability 2-Shot (kJ/kV - U _c)	Energy Capability 2-Shot (kJ/kV - U _r)
PVI-LP	ESP Polymer	10	40	3.4	2.8	6.4	5.1
EVP	ESP Polymer	10	63	4.9	4.0	9.0	7.2
MH3	Porcelain	10	63	5.1	4.1	9.2	7.3
PH3	Silicone Composite	10	63	5.1	4.1	8.5	6.8
MH4	Porcelain	20	63	9.2	7.4	13.3	10.6
PH4	Silicone Composite	20	63	9.2	7.4	12.9	10.3
H5	Porcelain	20	63	16.6	13.0	19.8	15.8

All Ohio Brass IEC arresters exceed the pressure relief requirements of IEC 60099-4.

Table 3: Surge Counter Information

Counter Catalog Number	Current Meter	Range of mA Reading	Max No. Counts	Min Count Current	Max High Current Withstand	Nominal Residual Voltage
245150	No	N/A	999,999	200A (8/20 μ s wave)	100 kA (4/10 μ s wave)	5kV Peak (4/10 μ s wave) @ 100 kA
245151	Yes	0 – 30	999,999	200A (8/20 μ s wave)	100 kA (4/10 μ s wave)	5kV Peak (4/10 μ s wave) @ 100 kA
245154	Yes with Aux Output	0 – 30	999,999	200A (8/20 μ s wave)	100 kA (4/10 μ s wave)	5kV Peak (4/10 μ s wave) @ 100 kA

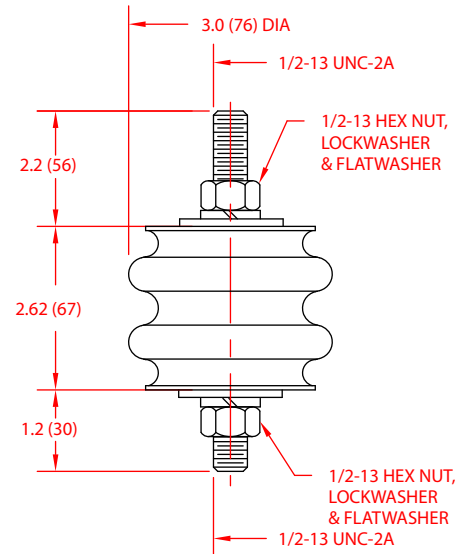
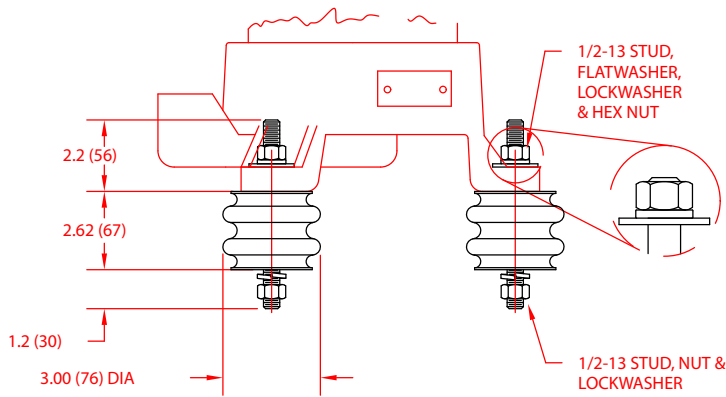
NOTE: Minimum of 4 mm dia. (#6 AWG) insulated ground wire required for connection



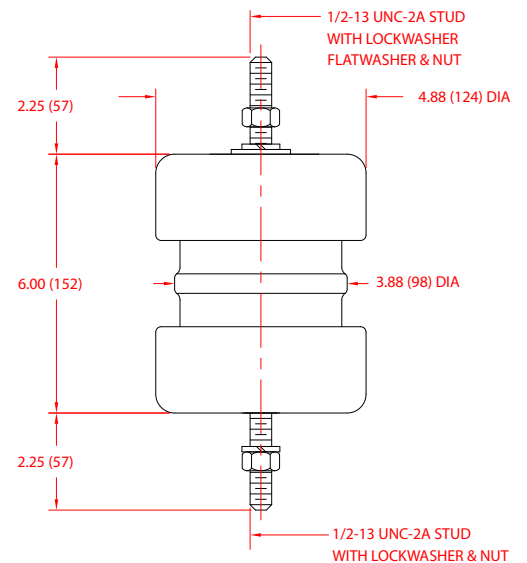
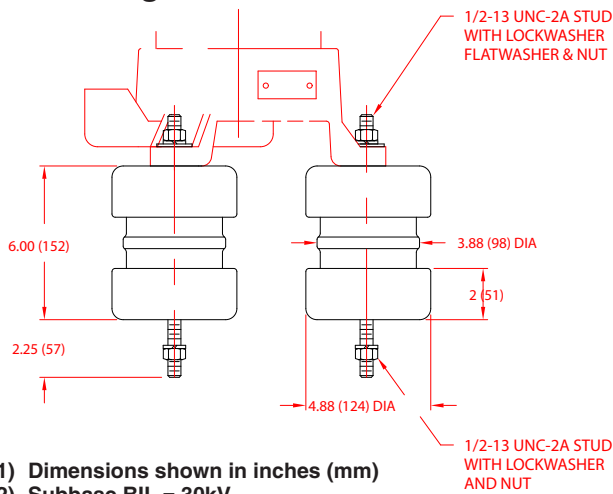
NOTE: Arresters installed with surge counters require the arrester to be isolated from ground with insulated subbases.

Insulating Subbase Drawings

Catalog No. 2730973001 Normal Duty for Arrester <218 kg



Catalog No. 2721453076 Heavy Duty for Arrester >218 kg



NOTES: 1) Dimensions shown in inches (mm)
2) Subbase BIL = 30kV



Table 4: Normally Recommended Arrester U_c for Various System Voltages

System Line-to-Line Voltage (kV)		Arrester U_c (kV)		
Nominal	Maximum	Grounded Neutral Circuit	Temporary Ungrounded, Impedance Grounded or Ungrounded Circuits	
			(1)	(2)
2.4	2.52	2.55	2.55	2.55
4.2	4.4	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
8.3	8.74	5.1	7.65	8.4
11.4	12	7.65	10.2	12.7
12.48	13.1	7.65	12.7	12.7
13.2	13.9	8.4	12.7	12.7
16.7	17.5	10.2	15.3	17.0
20.8	21.8	12.7	19.2	21.6
22.9	24	15.3	19.2	21.6
24.95	26.2	15.3	21.6	24.0
33	34.7	21.6	28.8	31.5
34.3	36	21.6	28.8	33.6
46	48.3	28.8	39.0	48.0
50	52	31.2	42.0	48.0
69	72.5	42.0	60.0	67.2
95	100	60.0	84.0	96.0
110	115.5	67.2	96.0	105.6
115	121	70.0	98.0	110.4
117	123	72.0	105.6	110.4
138	145	84.0	129.6	131.0
161	169	98.0	140.0	152.0
162	170	105.6	140.0	153.6
220	231	134.4	190.0	209.0
230	242	140.0	206.4	220.0
233	245	144.0	206.4	220.8
286	300	180.0	245.0	288.0
330	346.5	206.4	288.0	316.8
345	362	209.0	297.6	335.0
400	420	245.0	336.0	392.0
500	525	312.0	428.0	485.0
524	550	318.0	448.0	—
729	765	448.0	—	—
762	800	462.0	—	—

(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

Selecting an appropriate arrester requires knowledge about the system and specific application parameters such as:

- Maximum system voltage and grounding type (effectively grounded, impedance grounded, ungrounded)
- Insulation level of protected equipment and desired Margin of Protection
- Possible durations and levels of power frequency overvoltages
- Lengths of conductor that will carry switched loads
- Mechanical loads placed on the arrester
- Available line-to-ground fault current
- Environmental conditions and severity of site pollution

The primary factor in determining the correct arrester voltage is its Continuous line-to-ground Operating Voltage rating (U_c or COV). When selecting the appropriate arrester for an effectively grounded neutral system, it is desirable to choose an arrester with the lowest U_c that will meet or exceed the system's maximum line-to-ground voltage. The following example illustrates the selection.

Arrester Application Example

In grounded neutral circuits, a 233kV system usually has a maximum line-to-line continuous voltage of 245kV rms. This 245kV divided by $\sqrt{3}$ equates to a 141.5kV line-to-ground voltage. The appropriate arrester for this application is an arrester with a U_c of 144kV since it is the lowest standard U_c that will meet or exceed the line-to-ground voltage.

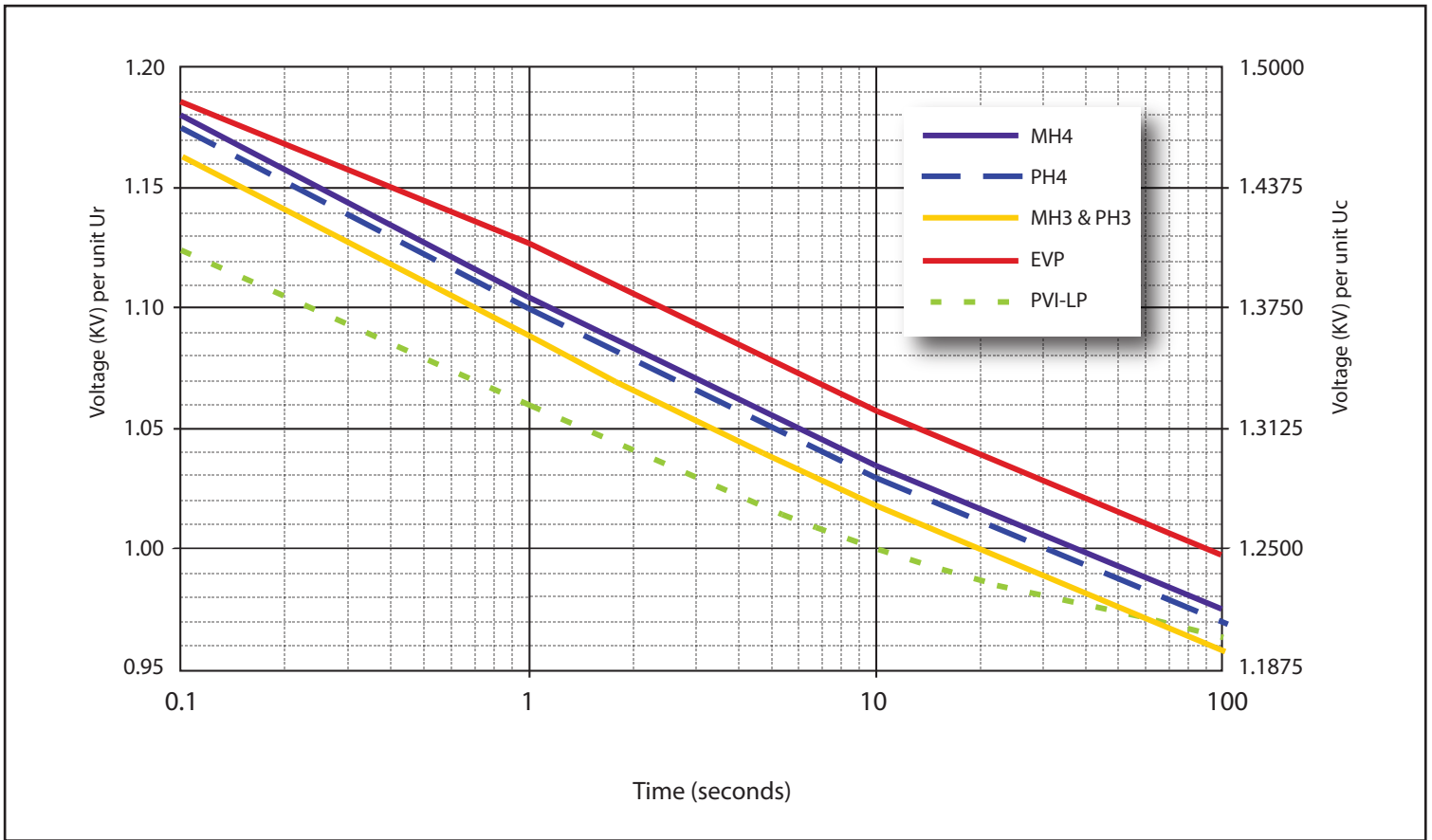
On ungrounded or impedance grounded systems, use the following selection guidelines to choose the best arrester:

- For applications where a ground fault is expected to be removed within 30 minutes, the minimum U_c is the maximum system line-to-line voltage divided by 1.25.
- For extended operation under ground fault conditions as long as 2,000 hours, the minimum U_c is the maximum system line-to-line voltage divided by 1.11.

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).

For further assistance Hubbell Power Systems application engineers are also available to provide system specific recommendations for many different arrester applications.

IEC Temporary Over-Voltage (TOV) Capability with Prior Duty



Temporary Over-Voltage Capability

Hubbell Power Systems 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 temporary overvoltage capability can be determined from the TOV curve. The prior duty curve is based upon absorption of rated energy immediately preceding application of the overvoltage.

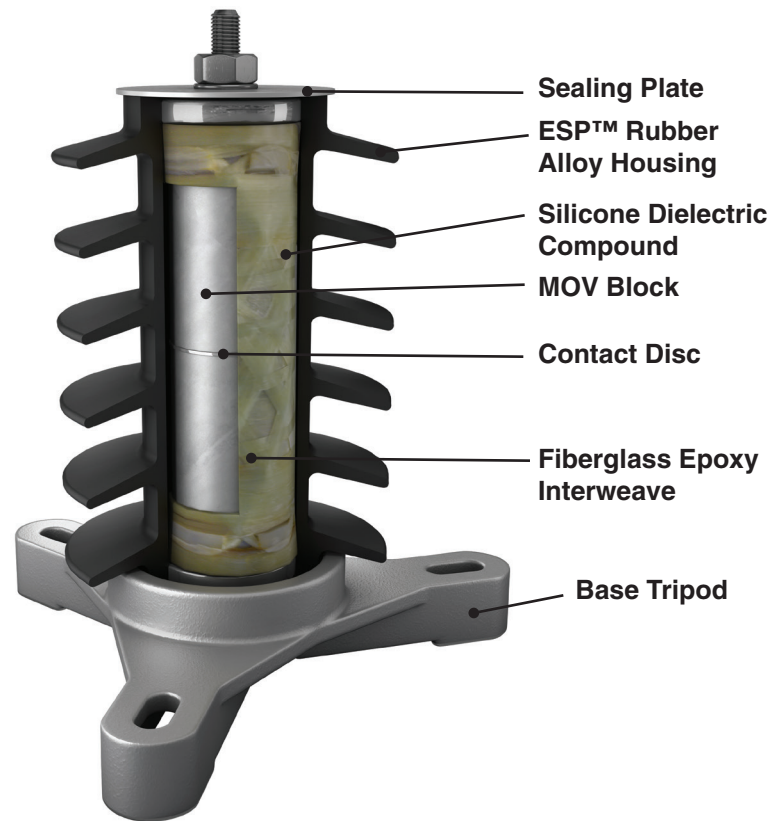
Table 5: Voltage Factors per kV of U_r

	0.1 sec.	1 sec.	10 sec.	100 sec.
MH4	1.180	1.105	1.035	0.975
PH4	1.175	1.100	1.030	0.970
MH3	1.163	1.088	1.018	0.958
PH3	1.163	1.088	1.018	0.958
EVP	1.184	1.127	1.058	0.998
PVI-LP	1.124	1.060	1.000	0.964

Polymer Housed Arresters (Type PVI-LP)

Construction & Features

- MOV blocks are encased within a tightly woven fiberglass braid impregnated with epoxy resin. Silicone dielectric compound fills the interface between fiberglass and rubber housing to render a void-free and hydrophobic assembly.
- Design prohibits leakage and pumping of air across hermetic seals in order to eliminate moisture ingress, a cause of arrester failure.
- Polymer housings are resistant to impact damage and will not shatter in case of a failure.
- Typically less than half the weight of comparable porcelain arresters. This makes transportation, handling and installation much easier.
- Small line end hardware allows close spacing.



**Cross-Section View of
Typical PVI-LP Arrester**

Table 6: Polymer Type PVI-LP & PVN Overview

Product Type	Housing Material	Line Discharge Class	Voltage Rating Range (kV)	Pressure Relief (kA)	SSL Cantilever
PVI-LP	ESP Polymer	2	3 – 72	40	340

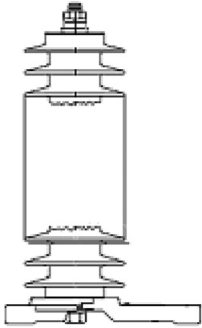

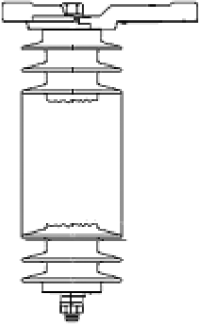
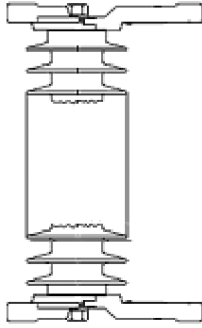

*SSL - Specified short-term load

**PVI-LP
Polymer Housed
IEC Class 2 Arrester
PVI-LP Ordering System**

30YXXX - 3010

**Hardware
Suffix Code.
See page 12.**

**Polymer Housed
Type PVI-LP**

		Standard Arrester Catalog Number	Ur (kV)	Uc (kV)
<p>0</p> <p>Small Top & Tripod Base for Horizontal and Vertical Mounting. (Dimensions & Weights as shown in Physical Characteristics)</p> 	<p>1</p> <p>Small Top & Small Base for Vertical Mounting only. Note: Deduct 23 mm & 1.25 kg from Physical Characteristics</p> 	803	3	2.55
		805	6	5.1
<p>2</p> <p>Tripod Top & Small Base for Underhung Mounting. (Dimensions & Weights as shown in Physical Characteristics)</p> 	<p>3</p> <p>Tripod Top & Tripod Base for Horizontal, Vertical and Underhung Mounting. Note: Add 29 mm & 1.25 kg from Physical Characteristics</p> 	808	9	7.65
		809	10	8.4
		610	12	10.2
		813	15	12.7
		815	18	15.3
		817	21	17
		620	24	19.5
		822	27	22
		824	30	24.4
		629	36	29
831	39	31.5		
636	45	36.5		
639	48	39		
		642	54	42
		648	60	48
		657	72	57
				

PVI-LP Protective Characteristics

Standard Arrester Catalog Number (1)	Ur (kV)	Uc (kV)	Maximum 0.5 μ s Steep Residual Voltage (kV)	Maximum 45 μ s Switching Surge Residual Voltage (kV)	Maximum Residual Voltage Using 8/20 Current Wave (kV)						IEC Prior Duty TOV		
					10kA	500A	1.5kA	3kA	5kA	10kA	20kA	40kA	1 sec kVrms
300803	3	2.55	8.6	6.4	6.8	7.2	7.5	8.1	9.0	10.1	3.4	3.2	3.1
300805	6	5.1	17.1	12.7	13.6	14.4	15.0	16.2	17.9	20.2	6.8	6.4	6.1
300808	9	7.65	25.8	19.1	20.5	21.6	22.6	24.4	27.0	30.4	10.1	9.6	9.2
300809	10	8.4	28.4	21.1	22.6	23.8	24.9	26.9	29.8	33.5	11.1	10.5	10.1
300610	12	10.2	34.1	25.3	27.1	28.6	29.9	32.3	35.8	40.3	13.5	12.8	12.3
300810	12	10.2	34.2	25.4	27.2	28.8	30.0	32.4	35.8	40.4	13.5	12.8	12.3
300813	15	12.7	42.9	31.8	34.1	36.0	37.6	40.6	44.9	50.6	16.8	15.9	15.3
300815	18	15.3	51.6	38.3	40.9	43.2	45.2	48.8	54.0	60.9	20.3	19.1	18.4
300817	21	17	56.9	42.2	45.1	47.7	49.9	53.8	59.6	67.1	22.5	21.3	20.5
300620	24	19.5	68.3	50.6	54.2	57.2	59.9	64.6	71.5	80.6	25.8	24.4	23.5
300820	24	19.5	68.8	47.0	51.6	55.9	58.5	64.2	72.1	84.3	25.8	24.4	23.5
300822	27	22	77.4	57.4	61.4	64.9	67.9	73.2	81.0	91.3	29.2	27.5	26.5
300824	30	24.4	85.3	63.3	67.7	71.5	74.8	80.7	89.3	101	32.3	30.5	29.4
300629	36	29	102	76.0	81.3	85.9	89.8	96.9	107	121	38.4	36.3	34.9
300829	36	29	102	76.0	81.3	85.9	89.8	96.9	107	121	38.4	36.3	34.9
300831	39	31.5	108	80.4	86.1	90.9	95.1	103	114	128	41.7	39.4	38.0
300636	45	36.5	125	92.8	99.3	105	110	118	131	148	48.4	45.6	44.0
300836	45	36.5	129	95.5	103	108	113	122	135	152	48.4	45.6	44.0
300639	48	39	137	101	108	115	120	129	143	161	51.7	48.8	47.0
300642	54	42	148	110	117	125	130	140	155	175	55.7	52.5	50.6
300842	54	42	154	105	116	126	131	144	162	190	55.7	52.5	50.6
300648	60	48	165	122	131	138	145	156	173	195	63.6	60.0	57.8
300848	60	48	171	125	127	138	144	159	179	209	63.6	60.0	57.8
300657	72	57	199	148	158	167	175	188	209	235	75.5	71.3	68.7
300857	72	57	199	148	158	167	175	188	209	235	75.5	71.3	68.7

(1) 300xxx prefix replaced by 301, 302, 303 depending on configuration chosen on page 9.

Note that alternate builds with additional creepage distance are shaded.

PVI-LP Physical Characteristics

Standard Arrester Catalog Number	Ur (kV)	Uc (kV)	Height from Base to Cap (mm)	Creepage Distance (mm)	Insulation Withstand Values			Minimum Mounting (2)		Net Weight (kg)
					1.2/50 BIL (kVcr)	Switching Impulse (kVcr)	Power Frequency 1 min. Wet Withstand (kVrms)	Phase to Phase (mm)	Phase to Ground (mm)	
300803	3	2.55	173	391	100	60	40	112	84	2.8
300805	6	5.1	173	391	100	60	40	117	81	2.8
300808	9	7.65	173	391	100	60	40	119	84	2.8
300809	10	8.4	173	391	100	60	40	124	89	2.8
300610	12	10.2	173	391	100	60	40	124	89	2.8
300810	12	10.2	310	782	165	100	70	124	89	4.5
300813	15	12.7	310	782	165	100	70	157	122	4.5
300815	18	15.3	310	782	165	100	70	168	132	4.5
300817	21	17	310	782	165	100	70	193	157	4.5
300620	24	19.5	310	782	165	100	70	193	157	4.5
300820	24	19.5	447	1173	230	140	105	193	157	6.1
300822	27	22	447	1173	230	140	105	244	208	6.1
300824	30	24.4	447	1173	230	140	105	249	213	6.1
300629	36	29	447	1173	230	140	105	249	213	6.1
300829	36	29	584	1565	310	180	140	249	213	7.7
300831	39	31.5	584	1565	310	180	140	325	290	7.7
300636	45	36.5	584	1565	310	180	140	325	290	7.7
300836	45	36.5	721	1956	390	230	180	325	290	8.9
300639	48	39	584	1565	310	180	140	325	290	7.7
300642	54	42	721	1956	390	230	180	401	366	8.9
300842	54	42	859	2347	450	260	220	401	366	10.5
300648	60	48	721	1956	390	230	180	401	366	8.9
300848	60	48	859	2347	450	260	220	401	366	10.5
300657	72	57	859	2347	450	260	220	503	467	10.5
300857	72	57	996	2738	520	300	250	503	467	11.8

(2) Minimum clearances are based on arrester protective levels for standard configuration and should be increased to meet local requirements for spacing of energized equipment.

Note that alternate builds with additional creepage distance are shaded.

For non-catalog polymer arresters that require higher creep distance or special application please consult your Hubbell Power Systems representative.

PVI-LP Terminals and Hardware

- Clamp type terminals for line and ground are hot dip galvanized iron and will accommodate copper or aluminum conductor sized from 6 mm to 21mm diameter.
- Standard Hardware Code 3010 includes line and ground terminals pictured (Example: 30YXXX-3010)
- For other terminal options please consult your Hubbell Power Systems Representative.

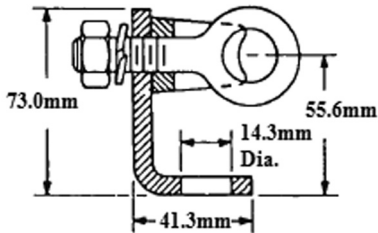


Figure 1

Catalog Number M718743001
Bucket Terminal with L-Bracket

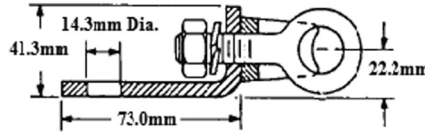


Figure 2

Catalog Number M718743001
Bucket Terminal with L-Bracket

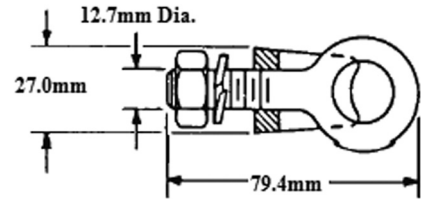


Figure 3

Catalog Number M2714143001
Single Bucket Terminal Assembly
used with all terminal combinations

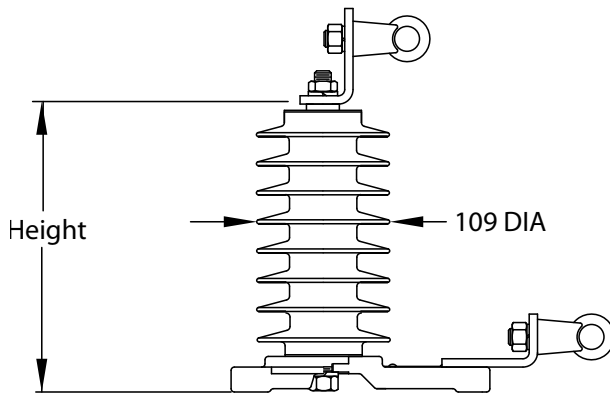


Figure 4: PVI-LP with Eye-Bolt Line Terminal
Hardware Code - 3010

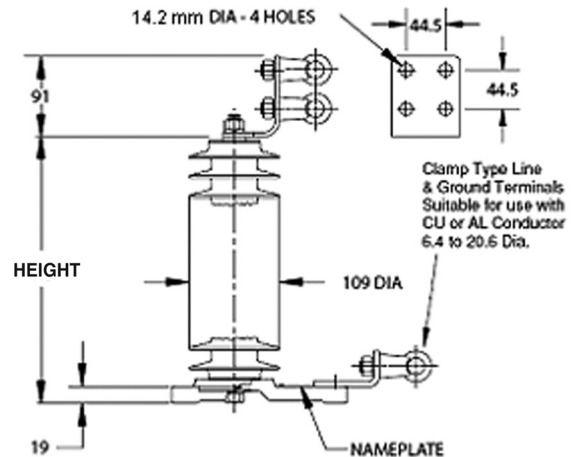


Figure 5: PVI-LP with Four Hole NEMA Line Terminal
Hardware Code - 3012



Figure 6
PVI-LP Nameplate

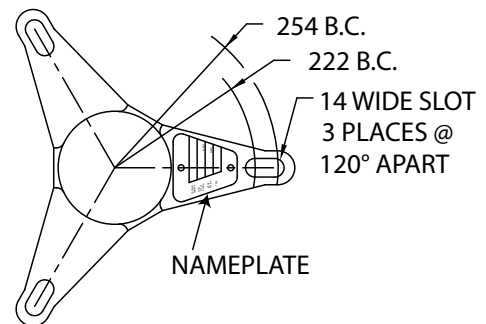


Figure 7: PVI-LP Base Tripod with 14mm slots
for 222mm to 254mm bolt circle mounting.

Polymer Housed Surge Arresters (Type EVP)

Overview

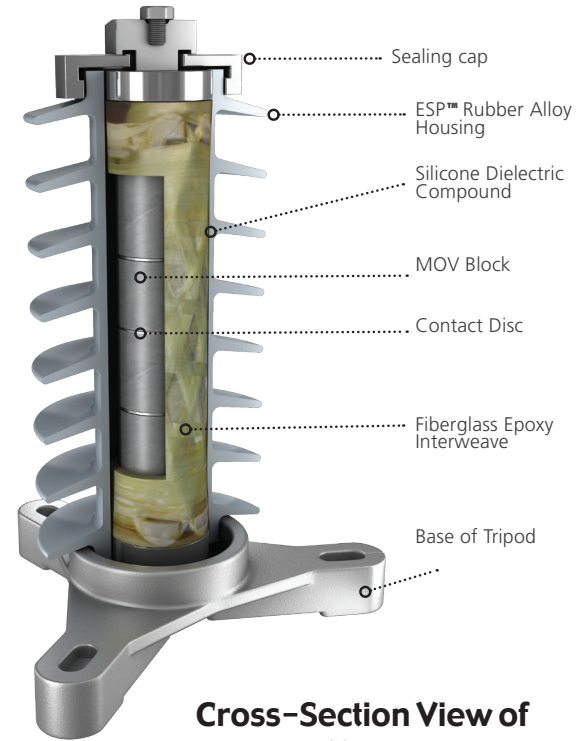
The new EVP Polymer Housed Station Arrester by HPS and Ohio Brass represents the absolute latest in surge arrester technology. Based on proven PVN technology, our EVP line maintains our proprietary ESP™weathershed material and protective levels. However, it has an even more robust sealing system to reduce moisture ingress to an unprecedented minimum. EVP arresters also feature a redesigned housing profile for maximum material utilization, and even make ordering easier by using an intelligent numbering system.

Construction

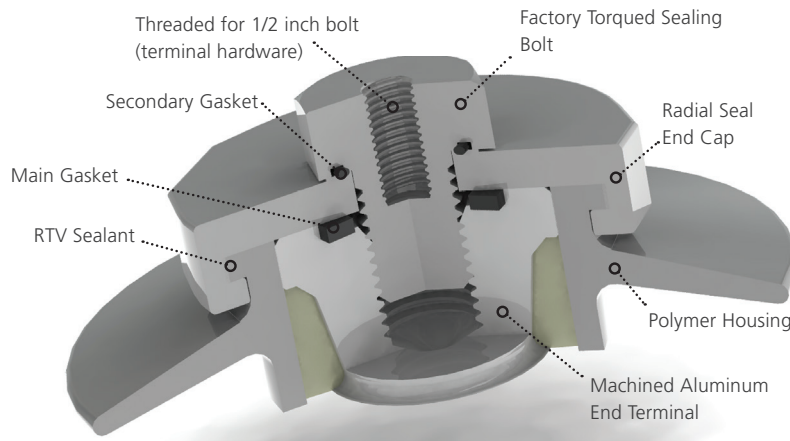
- Optimized wrap pattern and end hardware
- Even more effective sealing system
- Aluminum Top Cap
- Tri-pod base (standard 8.75” to 10” BC) Slotted

Sustainability Features

- 25% Recycled Packaging Material
- 15% Less Production Mass
- 50% Recyclable Packaging



Cross-Section View of Typical EVP Arrester



Detailed View of Sealing

Product Type	Housing Material	Line Discharge Class	Voltage Rating Range (kV)	Pressure Relief Class (kA)	SSL Cantilever (N.m)
EVP	ESP Polymer	3	3-228	63	1800

NOTE: Physical Strength values for tripod base configuration
*SSL - Specified short-term load

Polymer Housed Surge Arresters (Type EVP)

EVP Part Number Selection

EVP X YYY 0 0 - 3010

Step 1: Configuration

Step 2: MCOV Code

X->	0 (standard)	1	2 (underhung)	3
Top	Cap	Cap	Tripod	Tripod
Bottom	Tripod	Cap	Cap	Tripod

Voltage Code	Uc (kV)	Ur (kV)
003	2.55	3
005	5.1	6
008	7.65	9
009	8.4	10
010	10.2	12
013	12.7	15
015	15.3	18
017	17	21
019	19.5	24
022	22	27
024	24.4	30
029	29	36
031	31.5	39
036	36.5	45
039	39	48
042	42	54
048	48	60
053	53	66
057	57	72
070	70	90
074	74	90
076	76	96
078	78	96
084	84	108
088	88	108
098	98	120
106	106	132
115	115	144
131	131	168
140	140	172
144	144	180
152	152	192
154	154	192
180	180	228

Step 3: Housing Creepage

Creepage Distance (mm)	Creepage Code				Insulation Withstand Values		
	Standard Creep 0	Extra Creep 1	Extra Creep 2	Extra Creep 3	1.2/50 BIL (kVcr)	Switching Impulse (kVcr)	Power frequency 1 min. Wet Withstand (kvrms)
498	003-005	-	-	-	101	84	50
765	008-010	003-005	-	-	127	106	63
898	013-015	008-010	003-005	-	153	128	75
1029	017-024	013-015	008-010	003-005	207	173	101
1294	029-031	017-024	013-015	008-010	261	219	125
1562	036-042	029-031	017-024	013-015	313	263	148
1827	048-053	036-042	029-031	017-024	367	308	172
2093	057	048-053	036-042	029-031	421	353	194
3124	070-088	057	048-053	036-042	631	529	275
3654	098-106	070-088	057	048-053	652	546	283
4185	115	098-106	070-088	057	758	635	320
4686	131	115	098-106	070-088	926	776	372
5482	140-154	131	115	098-106	1006	843	395
6278	180	140-154	131	115	1166	977	436
7309	-	180	140-154	131	1409	1181	486

MCOV Code Table

To use table of Housing Creepage Code:

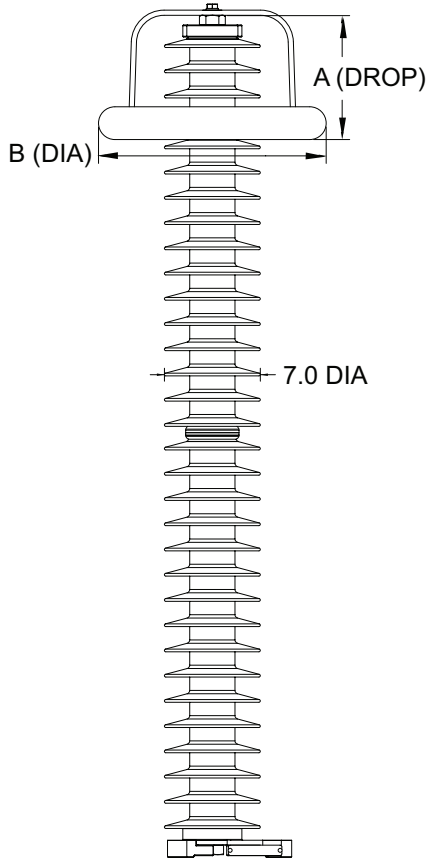
1. Find required Creepage Distance
2. Read across the row to the MCOV code from Step 2
3. Read the digit (0-3) from the column header

Polymer Housed Surge Arresters (Type EVP)

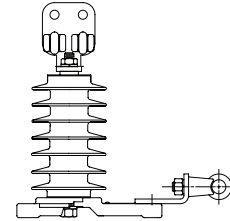
EVP Part Number Selection

EVP X YYY 0 0 - 3010

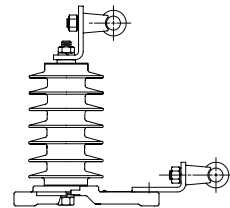
Step 4: Hardware Suffix Code



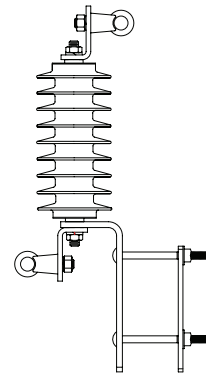
- **3010 (default)**
Line: 4-Hole NEMA pad with (2) Single Eye Bolts.
Ground: Single Eye Bolt



- **3002**
Line: Single Eye Bolt
Ground: Single Eye Bolt



- **3003: Crossarm Mount**
Line: Single Eye Bolt
Ground: Single Eye Bolt



*See page 18-19 for hardware details

Grading Ring Diameters

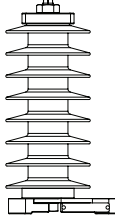
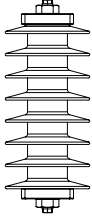
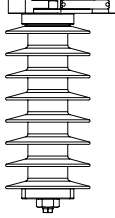
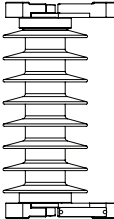
Arrester MCOV	Drop (A) (inches)	Diameter (B) (inches)
140-190	15.0	25.0
209-245	18.0	39.0
318 - 353	35.8	60.0

Grading rings are automatically included if necessary to the design.

EVP Protective Characteristics

Standard Arrester Catalog Number (1)	Ur (kV)	Uc (kV)	Maximum 0.5µs Steep Residual Voltage (kV)			Maximum 45µs Switching Surge Residual Voltage (kV)						Maximum Residual Voltage Using 8/20 Current Wave (kV)						IEC Prior Duty TOV		
			10kA	500A	1000A	1.5kA	3kA	5kA	10kA	20kA	40kA	1 sec kVrms	10 sec kVrms	100 sec kVrms						
EVPO 00300	3	2.55	10.5	6.0	6.3	6.4	6.7	7.1	7.6	8.2	9.3	3.6	3.4	2303.2						
EVPO 00500	6	5.1	18.6	12.0	12.5	12.8	13.5	14.1	15.2	16.4	18.7	7.2	6.7	6.4						
EVPO 00800	9	7.65	27.0	18.0	18.8	19.2	20.2	21.2	22.7	24.6	28.0	10.8	10.1	9.5						
EVPO 00900	10	8.4	29.4	19.8	20.6	21.1	22.2	23.3	25.0	27.0	30.8	11.8	11.1	10.5						
EVPO 01000	12	10.2	35.1	24.0	25.0	25.6	26.9	28.2	30.3	32.8	37.4	14.4	13.5	12.7						
EVPO 01300	15	12.7	43.4	29.9	31.2	31.9	33.5	35.2	37.7	40.8	46.5	17.9	16.8	15.8						
EVPO 01500	18	15.3	51.6	36.1	37.6	38.5	40.4	42.4	45.5	49.1	56.1	21.6	20.2	19.1						
EVPO 01700	21	17	57.8	40.1	41.7	42.7	44.9	47.1	50.5	54.6	62.3	24.0	22.5	21.2						
EVPO 01900	24	19.5	65.7	45.9	47.9	39.0	51.5	54.0	57.9	62.6	71.4	27.5	25.8	24.3						
EVPO 02200	27	22	73.6	51.8	54.0	55.3	58.1	60.9	65.4	70.7	80.6	31.0	29.1	27.4						
EVPO 02400	30	24.4	81.2	57.5	59.9	61.3	64.5	67.6	72.5	78.4	89.4	34.4	32.3	30.4						
EVPO 02900	36	29	97.0	68.6	71.5	73.2	76.9	80.7	86.5	93.6	107	41.0	38.5	36.3						
EVPO 03100	39	31.5	105	74.4	77.4	79.3	83.4	87.4	93.8	101	116	44.5	41.7	39.3						
EVPO 03600	45	36.5	121	86.0	89.6	91.8	96.4	101	108	117	134	51.4	48.3	45.5						
EVPO 03900	48	39	129	91.9	95.7	98.0	103	108	116	125	143	55.0	51.6	48.6						
EVPO 04200	54	42	145	104	108	111	116	122	131	141	161	62.0	58.2	54.9						
EVPO 04800	60	48	160	114	119	122	128	134	144	156	178	68.4	64.2	60.5						
EVPO 05300	66	53	175	126	131	134	141	148	159	172	196	75.2	70.6	66.6						
EVPO 05700	72	57	192	137	143	147	154	161	173	187	214	82.1	77.1	72.7						
EVPO 07000	90	70	242	172	179	184	193	202	217	234	267	102	96.6	91.0						
EVPO 07400	90	74	245	174	182	186	195	205	220	238	271	104	97.9	92.3						
EVPO 07600	96	76 or 78	257	184	191	196	206	216	232	251	286	110	103	97.3						
EVPO 08400	108	84 or 88	289	207	216	221	232	244	261	283	322	124	116	110						
EVPO 09800	120	98	322	231	241	246	259	271	291	315	359	138	130	122						
EVPO 10600	132	106	350	252	262	268	282	296	317	343	391	150	141	133						
EVPO 11500	144	115	382	275	286	293	308	323	346	375	427	164	154	145						
EVPO 13100	168	131	447	321	334	342	360	377	405	438	499	192	180	170						
EVPO 14000	172	140	462	330	344	352	370	388	416	450	513	197	185	175						
EVPO 14400	180	144	480	343	357	366	385	403	433	468	534	205	193	182						
EVPO 15200	192	152 or 154	510	366	381	391	411	430	462	499	569	219	206	194						
EVPO 15800	198	158	526	377	393	403	423	444	476	515	587	226	212	200						
EVPO 18000	228	180	605	435	453	464	487	511	548	593	676	260	244	230						

(1) EVPO prefix replaced by EVP1, EVP2, or EVP3 depending on configuration chosen on page 15.

<p>0</p> <p>Capped Top & Tripod Base</p> 	<p>1</p> <p>Capped Top & Base for Vertical Mounting only. Note: Deduct 15 mm height & 2.8 kg on Physical Characteristics.</p> 	<p>2</p> <p>Tripod Top & Capped Base for Underhung Mounting.</p> 	<p>3</p> <p>Tripod Top & Base. Available through 57 kV Uc. Note: Add 15 mm height & 2.8 kg on Physical Characteristics.</p> 
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Seismic Topics

EVP Physical Characteristics

Standard Arrester Catalog Number	Ur (kV)	Uc (kV)	Height from Base to Cap (mm)	Creepage Distance (mm)	Insulation Withstand Values			Minimum Mounting (2)		Net Weight (kg)
					1.2/50 BIL (kVcr)	Switching Impulse (kVcr)	Power Frequency 1 min. Wet Withstand (kVrms)	Phase to Phase (mm)	Phase to Ground (mm)	
EVPO 00300	3	2.55	251	498	101	84	50	229	114	5.7
EVPO 00500	6	5.1	251	498	101	84	50	229	114	5.7
EVPO 00800	9	7.65	297	765	127	106	63	229	114	6.8
EVPO 00900	10	8.4	297	765	127	106	63	229	114	6.8
EVPO 01000	12	10.2	297	765	127	106	63	229	117	6.8
EVPO 01300	15	12.7	344	898	153	128	75	246	137	7.8
EVPO 01500	18	15.3	344	898	153	128	75	269	155	7.8
EVPO 01700	21	17	437	1029	207	173	101	284	170	9.9
EVPO 01900	24	19.5	437	1029	207	173	101	307	188	9.9
EVPO 02200	27	22	437	1029	207	173	101	328	208	9.9
EVPO 02400	30	24.4	437	1029	207	173	101	351	226	9.9
EVPO 02900	36	29	530	1294	261	219	125	391	262	12.1
EVPO 03100	39	31.5	530	1294	261	219	125	411	282	12.1
EVPO 03600	45	36.5	623	1562	313	263	148	455	320	14.2
EVPO 03900	48	39	623	1562	313	263	148	478	338	14.2
EVPO 04200	54	42	623	1562	313	263	148	521	378	14.2
EVPO 04800	60	48	716	1827	367	308	172	561	411	16.3
EVPO 05300	66	53	716	1827	367	308	172	602	450	16.3
EVPO 05700	72	57	810	2093	421	353	194	645	488	18.6
EVPO 07000	90	70	1177	3124	631	529	275	775	602	26.7
EVPO 07400	90	74	1177	3124	631	529	275	782	610	26.7
EVPO 07600	96	76 or 78	1177	3124	631	529	275	818	640	26.7
EVPO 08400	108	84 or 88	1177	3124	631	529	275	904	716	26.7
EVPO 09800	120	98	1364	3654	652	546	283	1234	914	33.2
EVPO 10600	132	106	1364	3654	652	546	283	1311	983	33.2
EVPO 11500	144	115	1550	4185	758	635	320	1397	1059	37.2
EVPO 13100	168	131	1841	4686	926	776	372	1567	1212	44.0
EVPO 14000	172	140	2121	5482	1006	843	395	1890	1537	54.6
EVPO 14400	180	144	2121	5482	1006	843	395	1938	1585	54.6
EVPO 15200	192	152 or 154	2121	5482	1006	843	395	2024	1671	54.6
EVPO 15800	198	158	2121	5482	1006	843	395	2065	1712	54.6
EVPO 18000	228	180	2400	6278	1166	977	436	2278	1923	60.1

(2) Center-to-center spacing is based on arrester protective levels for standard configuration and should be increased to meet local requirements for spacing of energized equipment

Common Arrester Accessories / Hardware

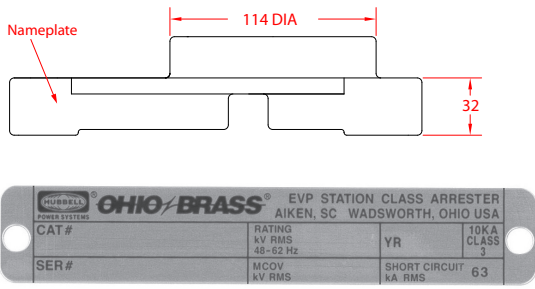
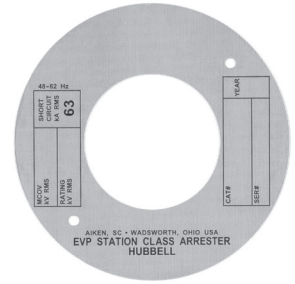


Figure 1:
EVP Base Tripod Side View
with nameplate location

EVP Nameplates

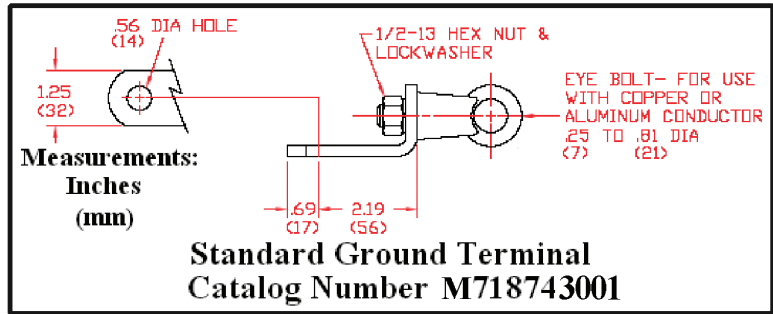
Each arrester is identified with a nameplate attached to the bottom or top casting with information required by IEEE/ANSI, CSA and IEC.



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.

Standard Ground Terminal Assemble

Standard ground terminal includes HDG L-bracket and clamp terminals sized for conductor 7-21 mm dia. (25-250 mm²)



Base Mounting Information

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

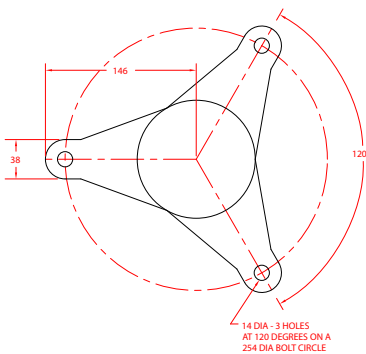
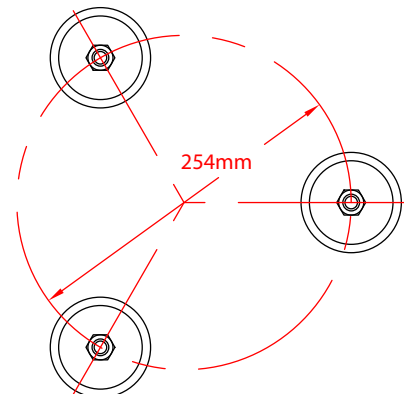


Figure 2
EVP Base Tripod with 14mm holes
for 254mm bolt circle mounting

EVP Packaging

EVP arresters 1.5 meters are longer must be packed in a wooden crate. All -3010 suffix arresters are also packed in wooden crates. Grading rings if required are packed together stacked on a separate wooden pallet.



Grading Ring Drawings

GRADING RING ARRESTER	
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REV 1	CAT / PART / ASSY NO. 274873-3001
DATE 07/11/02	SHEET 1 OF 1
BY DATE 02/25/09	CF THIS SYMBOL IDENTIFIES CRITICAL FEATURES

356 mm ring 274873-3001

GRADING RING ARRESTER	
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REV 1	CAT / PART / ASSY NO. 273670-3001
DATE 07/11/02	SHEET 1 OF 1
BY DATE 02/25/09	CF THIS SYMBOL IDENTIFIES CRITICAL FEATURES

419 mm ring 273670-3001

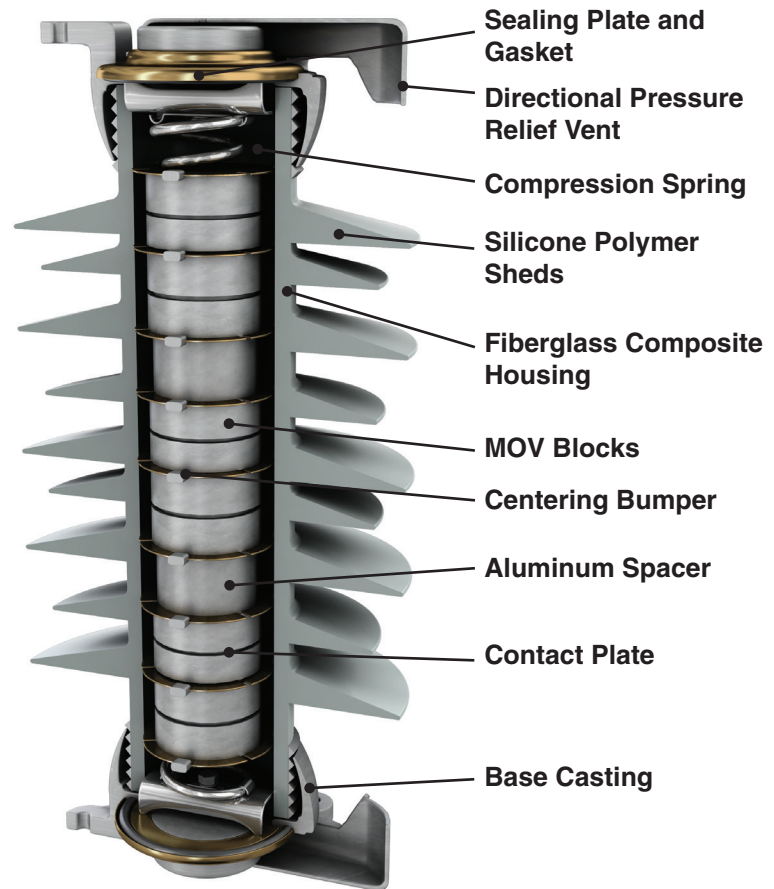
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REV 1	CAT / PART / ASSY NO. 274429-3001
DATE 07/11/02	SHEET 1 OF 1
BY DATE 02/25/09	CF THIS SYMBOL IDENTIFIES CRITICAL FEATURES

708 mm ring 274429-3001

Polymer Housed Arresters (Types PH3 & PH4)

Construction

- Fiberglass Composite Tube Design
- Silicone Rubber Housing
- Nearly 50% lighter than comparable porcelain arrester
- Arrester Sealing verified by two high vacuum leak tests
- High mechanical strength
- High creepage distance designs available
- Same high quality MOV technology as all other Ohio Brass arresters



Cross-Section View of Polymer Composite Housed Arrester

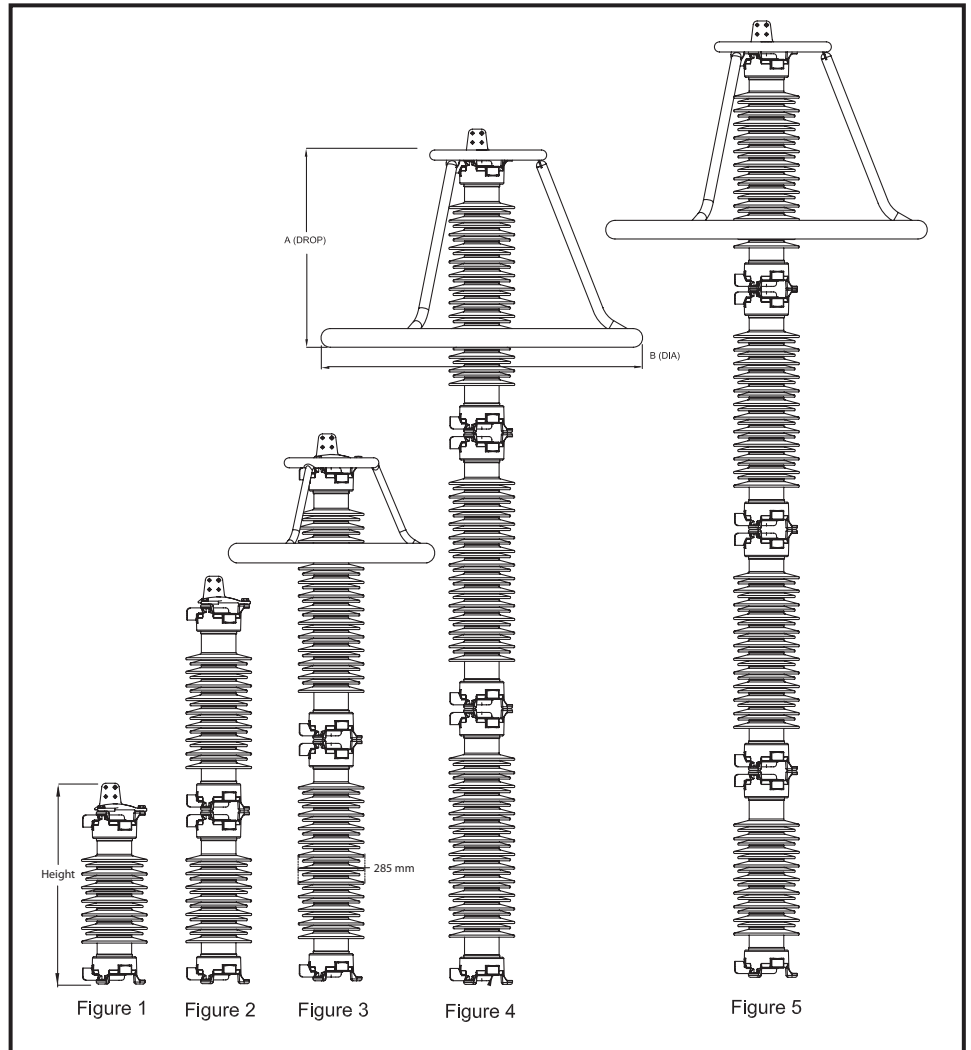
For non-catalog polymer arresters that require higher creep distance or special application please consult your Hubbell Power Systems representative.

Table 7: Type PH3 & PH4 Overview

Product Type	Nominal Discharge Current (kA)	Line Discharge Class	Voltage Rating Range (kV)	Pressure Relief (kA)	Cantilever Strength* (N.m)
PH3	10	3	24-420	63	8,000
PH4	20	4	24-420	63	8,000

*SSL – Specified Short-Term Load

Polymer Housing IEC Class 3 and 4 Arrester



Ohio Brass PH3 & PH4 Ordering System:

Use the following selection tables to build the correct Ohio Brass PH3 or PH4 Catalog Number

Catalog Ordering System											
A	B	C	D	E	F	G	H	I	J	K	L
PH					G						

Step 1: Select the IEC Line Discharge Class from Table 8 and fill in cell B.

Step 2: Select the Max System Voltage (Um) from Table 9 and fill in Cells C through E.

Table 8

Arrester Class	B
Class 3 - PH3 Arrester	3
Class 4 - PH4 Arrester	4

Table 9

Max System Voltage (kV)	C	D	E
36	0	3	6
52	0	5	2
72	0	7	2
100	1	0	0
123	1	2	3
145	1	4	5
170	1	7	0
245	2	4	5
300	3	0	0
362	3	6	2
420	4	2	0

Step 3: Polymer color is gray only.

Step 4: Select the appropriate Site Pollution Serenity Class from Table 11 and fill in cell G.

Table 10

Polymer Color	F
Gray	G

Table 11

Site Pollution	G
Medium (≥ 20 mm creep per kV U_m)	M
Heavy (≥ 25 mm creep per kV U_m)	H
Very Heavy (≥ 31 mm creep per kV U_m)	V

NOTE: Pollution classes per IEC - 600815-1

Step 5: Select the appropriate Rated Voltage (Ur) from Table 12 that corresponds with the Max System voltage selected for C through E and fill in Cells H through J.

Table 12

Max System Voltage (kV)	Rated Voltage (kV)	H	I	J
36	24	0	2	4
	30	0	3	0
	33	0	3	3
	36	0	3	6
	39	0	3	9
52	42	0	4	2
	48	0	4	8
	51	0	5	1
	54	0	5	4
	60	0	6	0
72	54	0	5	4
	60	0	6	0
	66	0	6	6
	72	0	7	2
	75	0	7	5
	78	0	7	8
	81	0	8	1
	84	0	8	4
100	84	0	8	4
	90	0	9	0
	96	0	9	6
123	90	0	9	0
	96	0	9	6
	108	1	0	8
	120	1	2	0
	132	1	3	2
	138	1	3	8
145	108	1	0	8
	120	1	2	0
	132	1	3	2
	138	1	3	8
170	144	1	4	4
	132	1	3	2
	144	1	4	4
245	162	1	6	2
	168	1	6	8
	180	1	8	0
	192	1	9	2
300	198	1	9	8
	216	2	1	6
	228	2	2	8
	216	2	1	6
362	228	2	2	8
	240	2	4	0
	258	2	5	8
	264	2	6	4
	258	2	5	8
420	264	2	6	4
	276	2	7	6
	288	2	8	8
	312	3	1	2
	330	3	3	0
	336	3	3	6
	360	3	6	0
	372	3	7	2
420	378	3	7	8
	390	3	9	0
	396	3	9	6
	420	4	2	0

Step 6: Select the appropriate Line and Ground terminals based on the conductor size ranges in Table 13 and fill in K & L.

Table 13

Line Size (mm ²)	Ground Size (mm ²)	K	L
25 - 240	25 - 240	A	A
	70 - 630	A	B
	500 - 1000	A	C
70 - 630	25 - 240	B	A
	70 - 630	B	B
	500 - 1000	B	C
500 - 1000	25 - 240	C	A
	70 - 630	C	B
	500 - 1000	C	C

PH3 Catalog Ordering Example

- Max System Voltage – 145kV
- Gray Polymer
- Heavy Pollution Level
- Rated Voltage – 120 kV
- Line & Ground Size - 25 to 240mm

Step 1: Use Max system Voltage to fill in C through E – 145kV

◆(PH3**145**xxxxxxx)

Step 2: Select Gray Polymer – G

◆(PH3145**G**xxxxxxx)

Step 3: Select Heavy Pollution – H

◆(PH3145**GH**xxxxx)

Step 4: Select Rated Voltage – 120kV

◆(PH3145**GH120**xx)

Step 5: Select correct terminals

◆(PH3145**GH120AA**)

Step 6: Order Ohio Brass Catalog Number

◆PH3145**GH120AA**

PH4 Catalog Ordering Example

- Max System Voltage – 145kV
- Gray Polymer
- Heavy Pollution Level
- Rated Voltage – 120 kV
- Line & Ground Size - 25 to 240mm

Step 1: Use Max system Voltage to fill in C through E – 145kV

◆(PH4**145**xxxxxxx)

Step 2: Select Gray Polymer – G

◆(PH4145**G**xxxxxxx)

Step 3: Select Heavy Pollution – H

◆(PH4145**GH**xxxxx)

Step 4: Select Rated Voltage – 120kV

◆(PH4145**GH120**xx)

Step 5: Select correct terminals

◆(PH4145**GH120AA**)

Step 6: Order Ohio Brass Catalog Number

◆PH4145**GH120AA**

PH3 Protective Characteristics

Ur kV	Uc kV	Temporary Over-Voltage Withstand at indicated duration			Max 36/90 Switching Impulse Residual Voltage at indicated current				Max 8/20 Lightning Impulse Residual Voltage at indicated current					
		1s kVrms	10s kVrms	100s kVrms	0.25kA kV	0.5kA kV	1kA kV	2kA kV	1.5kA kV	3kA kV	5kA kV	10kA kV	20kA kV	40kA kV
24	19.2	26	24	23	45	46	48	50	50	52	54	58	63	71
27	21.6	29	27	26	51	52	54	57	56	58	61	65	71	81
30	24.0	33	31	29	56	58	60	63	62	65	68	72	78	89
33	26.4	36	34	32	62	63	66	69	68	71	74	79	86	98
36	28.8	39	37	34	68	69	72	75	74	77	81	87	94	107
39	31.2	42	40	37	73	75	78	81	80	84	88	94	102	116
42	33.6	46	43	40	79	81	84	88	87	90	95	101	110	125
48	38.4	52	49	46	90	92	95	100	99	103	108	115	125	142
51	40.8	55	52	49	95	97	101	106	105	109	114	122	132	151
54	43.2	59	55	52	102	104	108	113	112	116	122	130	141	161
60	48.0	65	61	57	112	115	119	125	124	129	135	144	156	178
66	52.8	72	67	63	123	126	131	137	136	141	148	158	171	195
72	57.6	78	73	69	135	138	143	150	148	154	162	173	188	214
75	60.0	82	76	72	140	143	149	156	154	161	168	180	195	222
78	62.4	85	79	75	146	149	155	162	160	167	175	187	203	231
81	64.8	88	82	78	151	154	161	168	166	173	181	194	210	240
84	67.2	91	86	80	157	160	167	174	172	179	188	201	218	248
90	72.0	98	92	86	168	172	179	187	185	193	202	216	234	267
96	76.8	104	98	92	179	183	190	199	197	205	215	230	249	284
108	86.4	118	110	103	202	206	214	225	222	231	242	259	280	320
120	96.0	131	122	115	223	228	238	249	246	256	268	287	311	354
132	105.6	144	134	126	246	251	262	274	271	282	295	316	342	390
138	110.4	150	140	132	257	262	273	286	283	294	308	330	357	407
144	115.2	157	147	138	269	274	285	299	295	308	322	345	373	426
162	129.6	176	165	155	302	308	321	336	332	346	362	388	420	479
168	134.4	183	171	161	313	319	333	348	344	358	375	402	435	496
180	144.0	196	183	172	335	342	357	373	369	384	402	431	466	532
192	153.6	209	195	184	358	365	380	398	394	410	429	460	498	568
198	158.4	215	202	190	369	376	392	411	406	422	442	474	513	585
216	172.8	235	220	207	402	410	428	448	443	461	482	517	559	638
228	182.4	248	232	218	425	433	451	473	467	486	509	546	591	674
240	192.0	261	244	230	446	456	475	497	491	511	535	574	621	708
258	206.4	281	263	247	480	490	510	534	528	550	576	617	667	761
264	211.2	287	269	253	492	502	523	547	541	563	590	632	684	780
276	220.8	300	281	264	513	524	546	571	565	588	616	660	714	814
288	230.4	313	293	276	536	547	570	596	590	614	643	689	745	850
312	249.6	339	318	299	580	592	617	646	638	664	696	746	807	920
330	264.0	359	336	316	614	626	652	683	675	703	736	789	853	973
336	268.8	366	342	322	625	638	665	696	688	716	750	804	870	992
360	288.0	392	366	345	669	683	712	745	737	767	803	861	931	1062
372	297.6	405	379	356	692	706	736	770	761	793	830	890	963	1098
378	302.4	411	385	362	703	717	747	782	773	805	843	904	978	1115
390	312.0	424	397	374	725	740	771	808	798	831	870	933	1009	1151
396	316.8	431	403	379	736	751	783	820	810	843	883	947	1024	1168
420	336.0	457	428	402	781	797	831	870	860	895	937	1005	1087	1240

PH3 Housing Insulation Withstand Values

Creep (mm)	Housing Code	Grading Ring diam (mm)	Lightning Impulse ¹ (kV)	Switching Impulse ¹ (kV)	60Hz PF, 1 min wet ¹ (kV rms)	Total Height incl cap (mm)	Stack Height w/o cap (mm)	Figure # (pg. 17)	Lightning Impulse ² (kV)	Switching Impulse ² (kV)	60Hz PF, 1 min wet ² (kV rms)
2130	1	0	367	266	189	967	824	1	361	291	175
2880	2	0	480	348	247	1127	984	1	457	373	224
3620	3	0	585	424	301	1323	1180	1	546	447	268
4370	4	0	690	500	355	1493	1350	1	634	519	312
5010	12	0	847	614	436	1951	1808	2	768	624	374
5010	12	640	847	614	436	1951	1808	3	708	578	347
5760	22	0	960	696	494	2111	1968	2	863	697	418
5760	22	640	960	696	494	2111	1968	3	787	639	384
6500	23	640	1065	772	548	2307	2164	3	884	712	427
6500	23	990	1065	772	548	2307	2164	3	864	697	418
7240	33	640	1170	848	602	2503	2360	3	981	783	470
7240	33	990	1170	848	602	2503	2360	3	959	767	460
7990	34	640	1275	924	656	2673	2530	3	1065	843	506
7990	34	990	1275	924	656	2673	2530	3	1042	827	496
7990	34	1530	1275	924	656	2673	2530	3	869	701	421
8740	44	990	1380	1000	710	2843	2700	3	1125	884	531
9380	223	640	1545	1120	795	3291	3148	4	1359	1037	622
9380	223	990	1545	1120	795	3291	3148	4	1346	1029	618
9380	223	1530	1545	1120	795	3291	3148	4	1158	906	544
10120	233	1530	1650	1196	849	3487	3344	4	1251	969	581
10860	333	990	1755	1272	903	3683	3540	4	1537	1145	687
10860	333	1530	1755	1272	903	3683	3540	4	1346	1029	618
11610	334	990	1860	1348	957	3853	3710	4	1624	1196	717
11610	334	1530	1860	1348	957	3853	3710	4	1428	1080	648
11610	334	2030	1860	1348	957	3853	3710	4	1342	1027	616
12360	344	990	1965	1424	1011	4023	3880	4	1708	1242	745
12360	344	1530	1965	1424	1011	4023	3880	4	1510	1130	678
13110	444	990	2070	1500	1065	4193	4050	4	1793	1287	772
13110	444	1530	2070	1500	1065	4193	4050	4	1593	1178	707
13110	444	2030	2070	1500	1065	4193	4050	4	1502	1125	675
14480	3333	2030	2340	1696	1204	4863	4720	5	1822	1303	782
16730	3444	2030	2655	1924	1366	5373	5230	5	2070	1423	854
17480	4444	2030	2760	2000	1420	5543	5400	5	2152	1460	876

¹ Linear insulation withstand for comparison based on sum of units

² Insulation withstand with non-linear factors included for reference

PH3 Physical Characteristics

Max System Voltage	Rated Voltage	Max Continuous Voltage L-G	Site Pollution Severity Class					
			Medium (20mm/kV)					
			Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code
36	27	21.6	PH3036GM027	2130	0	80	48	1
36	30	24.0	PH3036GM030	2130	0	89	48	1
36	33	26.4	PH3036GM033	2130	0	96	49	1
36	36	28.8	PH3036GM036	2130	0	104	49	1
36	39	31.2	PH3036GM039	2130	0	112	50	1
52	42	33.6	PH3052GM042	2130	0	120	50	1
52	48	38.4	PH3052GM048	2130	0	136	51	1
52	51	40.8	PH3052GM051	2130	0	143	51	1
52	54	43.2	PH3052GM054	2130	0	152	51	1
52	60	48.0	PH3052GM060	2130	0	167	52	1
72	54	43.2	PH3072GM054	2130	0	152	51	1
72	60	48.0	PH3072GM060	2130	0	167	52	1
72	66	52.8	PH3072GM066	2130	0	182	53	1
72	72	57.6	PH3072GM072	2130	0	199	54	1
72	75	60.0	PH3072GM075	2130	0	206	54	1
72	78	62.4	PH3072GM078	2130	0	214	55	1
72	81	64.8	PH3072GM081	2130	0	222	55	1
72	84	67.2	PH3072GM084	2880	0	231	58	2
100	84	67.2	PH3100GM084	2880	0	231	58	2
100	90	72.0	PH3100GM090	2880	0	247	59	2
100	96	76.8	PH3100GM096	2880	0	262	60	2
123	90	72.0	PH3123GM090	2880	0	247	59	2
123	96	76.8	PH3123GM096	2880	0	262	60	2
123	108	86.4	PH3123GM108	3620	0	296	65	3
123	120	96.0	PH3123GM120	3620	0	327	67	3
123	132	105.6	PH3123GM132	4370	0	360	73	4
123	138	110.4	PH3123GM138	4370	0	375	74	4
145	108	86.4	PH3145GM108	3620	0	296	65	3
145	120	96.0	PH3145GM120	3620	0	327	67	3
145	132	105.6	PH3145GM132	4370	0	360	73	4
145	138	110.4	PH3145GM138	4370	0	375	74	4
145	144	115.2	PH3145GM144	4370	0	391	74	4
170	132	105.6	PH3170GM132	4370	0	360	73	4
170	144	115.2	PH3170GM144	4370	0	391	74	4
170	162	129.6	PH3170GM162	5010	0	443	108	12
170	168	134.4	PH3170GM168	5010	0	458	109	12
245	180	144.0	PH3245GM180	5010	640	490	118	12
245	192	153.6	PH3245GM192	5760	640	523	122	22
245	198	158.4	PH3245GM198	5760	640	538	123	22
245	216	172.8	PH3245GM216	6500	640	587	130	23
245	228	182.4	PH3245GM228	6500	640	619	131	23
300	216	172.8	PH3300GM216	6500	990	587	133	23
300	228	182.4	PH3300GM228	6500	640	619	131	23
300	240	192.0	PH3300GM240	7240	640	651	137	33
300	258	206.4	PH3300GM258	7990	640	700	143	34
300	264	211.2	PH3300GM264	7990	640	716	144	34
362	258	206.4	PH3362GM258	7990	990	700	147	34
362	264	211.2	PH3362GM264	7990	990	716	148	34
362	276	220.8	PH3362GM276	7990	990	747	149	34
362	288	230.4	PH3362GM288	8740	990	780	155	44
420	312	249.6	PH3420GM312	9380	1530	847	202	223
420	330	264.0	PH3420GM330	9380	1530	893	204	223
420	336	268.8	PH3420GM336	10120	1530	912	210	233
420	360	288.0	PH3420GM360	10860	990	976	202	333
420	372	297.6	PH3420GM372	10860	990	1007	204	333
420	378	302.4	PH3420GM378	10860	990	1023	205	333
420	390	312.0	PH3420GM390	11610	990	1056	211	334
420	396	316.8	PH3420GM396	11610	990	1071	211	334
420	420	336.0	PH3420GM420	12360	990	1136	219	344

* Steep Current Impulse Residual Voltage at Specified Current

Note: When mounted with subbase, 2721453076 heavy duty type designated for arresters over 218kg weight

PH3 Physical Characteristics (continued)

Site Pollution Severity Class											
Heavy (25mm/kV)						Very Heavy (31mm/kV)					
Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code	Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code
PH3036GH027	2130	0	80	48	1	PH3036GV027	2130	0	81	48	1
PH3036GH030	2130	0	89	48	1	PH3036GV030	2130	0	89	48	1
PH3036GH033	2130	0	96	49	1	PH3036GV033	2130	0	96	49	1
PH3036GH036	2130	0	104	49	1	PH3036GV036	2130	0	104	49	1
PH3036GH039	2130	0	112	50	1	PH3036GV039	2130	0	112	50	1
PH3052GH042	2130	0	120	50	1	PH3052GV042	2130	0	120	50	1
PH3052GH048	2130	0	136	51	1	PH3052GV048	2130	0	136	51	1
PH3052GH051	2130	0	143	51	1	PH3052GV051	2130	0	143	51	1
PH3052GH054	2130	0	152	51	1	PH3052GV054	2130	0	152	51	1
PH3052GH060	2130	0	167	52	1	PH3052GV060	2130	0	167	52	1
PH3072GH054	2130	0	152	51	1	PH3072GV054	2880	0	153	54	2
PH3072GH060	2130	0	167	52	1	PH3072GV060	2880	0	169	55	2
PH3072GH066	2130	0	182	53	1	PH3072GV066	2880	0	184	56	2
PH3072GH072	2130	0	199	54	1	PH3072GV072	2880	0	200	56	2
PH3072GH075	2130	0	206	54	1	PH3072GV075	2880	0	208	57	2
PH3072GH078	2130	0	214	55	1	PH3072GV078	2880	0	216	57	2
PH3072GH081	2130	0	222	55	1	PH3072GV081	2880	0	223	58	2
PH3072GH084	2880	0	231	58	2	PH3072GV084	2880	0	231	58	2
PH3100GH084	2880	0	231	58	2	PH3100GV084	3620	0	233	62	3
PH3100GH090	2880	0	247	59	2	PH3100GV090	3620	0	249	63	3
PH3100GH096	2880	0	262	60	2	PH3100GV096	3620	0	264	64	3
PH3123GH090	3620	0	249	63	3	PH3123GV090	4370	0	251	67	4
PH3123GH096	3620	0	264	64	3	PH3123GV096	4370	0	266	68	4
PH3123GH108	3620	0	296	65	3	PH3123GV108	4370	0	298	70	4
PH3123GH120	3620	0	327	67	3	PH3123GV120	4370	0	328	71	4
PH3123GH132	4370	0	360	73	4	PH3123GV132	4370	0	360	73	4
PH3123GH138	4370	0	375	74	4	PH3123GV138	4370	0	375	74	4
PH3145GH108	4370	0	298	70	4	PH3145GV108	5010	0	302	101	12
PH3145GH120	4370	0	328	71	4	PH3145GV120	5010	0	333	102	12
PH3145GH132	4370	0	360	73	4	PH3145GV132	5010	0	364	104	12
PH3145GH138	4370	0	375	74	4	PH3145GV138	5010	0	380	105	12
PH3145GH144	4370	0	391	74	4	PH3145GV144	5010	0	396	106	12
PH3170GH132	4370	0	360	73	4	PH3170GV132	5760	0	366	106	22
PH3170GH144	4370	0	391	74	4	PH3170GV144	5760	0	398	108	22
PH3170GH162	5010	0	443	108	12	PH3170GV162	5760	0	445	110	22
PH3170GH168	5010	0	458	109	12	PH3170GV168	5760	0	460	111	22
PH3245GH180	6500	640	493	125	23	PH3245GV180	7990	640	497	133	34
PH3245GH192	6500	640	525	126	23	PH3245GV192	7990	640	529	135	34
PH3245GH198	6500	640	540	127	23	PH3245GV198	7990	640	544	135	34
PH3245GH216	6500	640	587	130	23	PH3245GV216	7990	640	591	138	34
PH3245GH228	6500	640	619	131	23	PH3245GV228	7990	640	622	139	34
PH3300GH216	7990	990	591	141	34	PH3300GV216	9380	990	597	175	223
PH3300GH228	7990	640	622	139	34	PH3300GV228	9380	640	629	173	223
PH3300GH240	7990	640	653	141	34	PH3300GV240	9380	640	659	175	223
PH3300GH258	7990	640	700	143	34	PH3300GV258	9380	640	706	177	223
PH3300GH264	7990	640	716	144	34	PH3300GV264	9380	640	722	178	223
PH3362GH258	9380	990	706	180	223	PH3362GV258	11610	990	712	193	334
PH3362GH264	9380	990	722	181	223	PH3362GV264	11610	990	728	193	334
PH3362GH276	9380	990	753	183	223	PH3362GV276	11610	990	758	195	334
PH3362GH288	9380	990	784	184	223	PH3362GV288	11610	990	790	197	334
PH3420GH312	10860	1530	850	210	333	PH3420GV312	13110	1530	856	223	444
PH3420GH330	10860	1530	897	213	333	PH3420GV330	13110	1530	902	225	444
PH3420GH336	10860	1530	914	213	333	PH3420GV336	13110	1530	919	226	444
PH3420GH360	10860	990	976	202	333	PH3420GV360	13110	990	981	215	444
PH3420GH372	10860	990	1007	204	333	PH3420GV372	13110	990	1013	217	444
PH3420GH378	10860	990	1023	205	333	PH3420GV378	13110	990	1028	217	444
PH3420GH390	11610	990	1056	211	334	PH3420GV390	13110	990	1059	219	444
PH3420GH396	11610	990	1071	211	334	PH3420GV396	13110	990	1075	220	444
PH3420GH420	12360	990	1136	219	344	PH3420GV420	13110	990	1138	223	444

Seismic Performance of PH3 Arresters per IEEE 693-2005
 High (1.0g ZPA) for 2-unit arresters up to $U_r = 288KV$
 Moderate (0.5g ZPA) for 3-unit arresters up to $U_r = 420KV$
 2721453076 subbase recommended for 3-unit arresters

PH4 Protective Characteristics

Ur kV	Uc kV	Temporary Over-Voltage Withstand at indicated duration			Max 36/90 Switching Impulse Residual Voltage at indicated current				Max 8/20 Lightning Impulse Residual Voltage at indicated current					
		1s kVrms	10s kVrms	100s kVrms	0.5kA kV	1kA kV	2kA kV	3kA kV	1.5kA kV	3kA kV	5kA kV	10kA kV	20kA kV	40kA kV
24	19.2	26	25	23	47	49	50	51	51	52	54	57	61	67
27	21.6	30	28	26	53	55	56	58	57	59	61	64	68	75
30	24.0	33	31	29	59	61	63	64	63	65	68	71	76	84
33	26.4	36	34	32	65	67	69	70	69	72	74	78	83	92
36	28.8	40	37	35	71	73	75	77	75	78	81	85	91	100
39	31.2	43	40	38	76	79	81	83	81	85	88	92	98	108
42	33.6	46	43	41	83	85	88	90	88	92	95	99	106	117
48	38.4	53	49	47	94	97	100	102	101	104	108	113	121	134
51	40.8	56	53	49	100	103	106	109	107	111	115	120	129	142
54	43.2	59	56	52	106	109	112	115	113	117	121	127	136	150
60	48.0	66	62	58	118	121	125	128	125	130	135	141	151	167
66	52.8	73	68	64	129	133	137	140	138	143	148	155	166	183
72	57.6	79	74	70	141	145	149	153	150	156	161	169	181	200
75	60.0	83	77	73	147	151	156	159	156	162	168	176	189	208
78	62.4	86	80	76	152	157	162	166	162	169	175	183	196	216
81	64.8	89	83	79	159	164	169	173	170	176	182	191	205	225
84	67.2	92	87	81	165	170	175	179	176	183	189	198	212	234
90	72.0	99	93	87	176	182	187	192	188	196	202	212	227	250
96	76.8	106	99	93	188	194	200	204	201	208	216	226	242	267
108	86.4	119	111	105	211	217	224	230	225	234	242	254	272	300
120	96.0	132	124	116	235	241	249	255	250	260	269	282	302	333
132	105.6	145	136	128	258	265	274	280	275	286	296	310	332	366
138	110.4	152	142	134	269	277	286	293	287	299	309	324	347	382
144	115.2	158	148	140	281	289	298	305	300	311	322	338	362	399
162	129.6	178	167	157	317	326	336	344	338	351	363	381	408	449
168	134.4	185	173	163	328	338	348	357	350	364	377	395	423	466
180	144.0	198	185	175	352	362	373	382	375	390	403	423	453	499
192	153.6	211	198	186	375	386	398	407	400	415	430	451	483	532
198	158.4	218	204	192	386	398	410	420	412	428	443	465	498	548
216	172.8	238	222	210	421	433	447	458	449	467	483	507	543	598
228	182.4	251	235	221	445	457	472	483	474	493	510	535	573	631
240	192.0	264	247	233	469	482	497	509	500	519	537	564	604	665
258	206.4	284	266	250	503	518	534	547	537	558	577	606	649	714
264	211.2	290	272	256	515	530	547	560	549	571	591	620	664	731
276	220.8	304	284	268	538	554	571	585	574	597	617	648	694	764
288	230.4	317	297	279	562	578	596	610	599	622	644	676	724	797
312	249.6	343	321	303	608	626	645	661	648	674	697	732	784	863
330	264.0	363	340	320	644	662	683	700	686	713	738	775	830	913
336	268.8	370	346	326	655	674	696	712	699	726	752	789	845	930
360	288.0	396	371	349	702	722	745	763	748	778	805	845	905	996
372	297.6	409	383	361	725	746	770	788	773	804	832	873	935	1029
378	302.4	416	389	367	737	758	782	801	785	817	845	887	950	1045
390	312.0	429	402	378	760	782	807	826	810	842	872	915	980	1078
396	316.8	436	408	384	772	795	820	839	824	856	886	930	996	1096
420	336.0	462	433	407	819	843	869	890	873	908	939	986	1056	1162
444	355.2	488	457	431	865	890	919	940	923	959	992	1042	1115	1228

PH4 Housing Insulation Withstand Values

Creep (mm)	Housing Code	Grading Ring diam (mm)	Lightning Impulse ¹ (kV)	Switching Impulse ¹ (kV)	60Hz PF, 1 min wet ¹ (kV rms)	Total Height incl cap (mm)	Stack Height w/o cap (mm)	Figure # (pg. 17)	Lightning Impulse ² (kV)	Switching Impulse ² (kV)	60Hz PF, 1 min wet ² (kV rms)
2130	1	0	367	266	189	967	824	1	361	291	175
2880	2	0	480	348	247	1127	984	1	457	373	224
3620	3	0	585	424	301	1323	1180	1	546	447	268
4370	4	0	690	500	355	1493	1350	1	634	519	312
5010	12	0	847	614	436	1951	1808	2	768	624	374
5010	12	640	847	614	436	1951	1808	3	708	578	347
5760	22	0	960	696	494	2111	1968	2	863	697	418
5760	22	640	960	696	494	2111	1968	3	787	639	384
6500	23	640	1065	772	548	2307	2164	3	884	712	427
6500	23	990	1065	772	548	2307	2164	3	864	697	418
7240	33	640	1170	848	602	2503	2360	3	981	783	470
7240	33	990	1170	848	602	2503	2360	3	959	767	460
7990	34	640	1275	924	656	2673	2530	3	1065	843	506
7990	34	990	1275	924	656	2673	2530	3	1042	827	496
7990	34	1530	1275	924	656	2673	2530	3	869	701	421
8740	44	990	1380	1000	710	2843	2700	3	1125	884	531
9380	223	640	1545	1120	795	3291	3148	4	1359	1037	622
9380	223	990	1545	1120	795	3291	3148	4	1346	1029	618
9380	223	1530	1545	1120	795	3291	3148	4	1158	906	544
10120	233	1530	1650	1196	849	3487	3344	4	1251	969	581
10860	333	990	1755	1272	903	3683	3540	4	1537	1145	687
10860	333	1530	1755	1272	903	3683	3540	4	1346	1029	618
11610	334	990	1860	1348	957	3853	3710	4	1624	1196	717
11610	334	1530	1860	1348	957	3853	3710	4	1428	1080	648
11610	334	2030	1860	1348	957	3853	3710	4	1342	1027	616
12360	344	990	1965	1424	1011	4023	3880	4	1708	1242	745
12360	344	1530	1965	1424	1011	4023	3880	4	1510	1130	678
13110	444	990	2070	1500	1065	4193	4050	4	1793	1287	772
13110	444	1530	2070	1500	1065	4193	4050	4	1593	1178	707
13110	444	2030	2070	1500	1065	4193	4050	4	1502	1125	675
14480	3333	2030	2340	1696	1204	4863	4720	5	1822	1303	782
16730	3444	2030	2655	1924	1366	5373	5230	5	2070	1423	854
17480	4444	2030	2760	2000	1420	5543	5400	5	2152	1460	876

¹ Linear insulation withstand for comparison based on sum of units

² Insulation withstand with non-linear factors included for reference

PH4 Physical Characteristics

Max System Voltage Um	Rated Voltage Ur	Max Continuous Voltage L-G Uc	Site Pollution Severity Class					
			Medium (20mm/kV)					
			Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code
36	27	21.6	PH4036GM027	2130	0	96	50	1
36	30	24.0	PH4036GM030	2130	0	105	51	1
36	33	26.4	PH4036GM033	2130	0	113	51	1
36	36	28.8	PH4036GM036	2130	0	121	52	1
36	39	31.2	PH4036GM039	2130	0	130	52	1
52	42	33.6	PH4052GM042	2130	0	139	53	1
52	48	38.4	PH4052GM048	2130	0	156	54	1
52	51	40.8	PH4052GM051	2130	0	164	55	1
52	54	43.2	PH4052GM054	2130	0	172	55	1
52	60	48.0	PH4052GM060	2130	0	189	56	1
72	54	43.2	PH4072GM054	2130	0	172	55	1
72	60	48.0	PH4072GM060	2130	0	189	56	1
72	66	52.8	PH4072GM066	2130	0	206	58	1
72	72	57.6	PH4072GM072	2130	0	223	59	1
72	75	60.0	PH4072GM075	2130	0	231	60	1
72	78	62.4	PH4072GM078	2130	0	240	60	1
72	81	64.8	PH4072GM081	2130	0	249	61	1
72	84	67.2	PH4072GM084	2880	0	261	64	2
100	84	67.2	PH4100GM084	2880	0	261	64	2
100	90	72.0	PH4100GM090	2880	0	278	65	2
100	96	76.8	PH4100GM096	2880	0	294	66	2
123	90	72.0	PH4123GM090	2880	0	278	65	2
123	96	76.8	PH4123GM096	2880	0	294	66	2
123	108	86.4	PH4123GM108	3620	0	332	73	3
123	120	96.0	PH4123GM120	3620	0	366	75	3
123	132	105.6	PH4123GM132	4370	0	403	82	4
123	138	110.4	PH4123GM138	4370	0	419	84	4
145	108	86.4	PH4145GM108	3620	0	332	73	3
145	120	96.0	PH4145GM120	3620	0	366	75	3
145	132	105.6	PH4145GM132	4370	0	403	82	4
145	138	110.4	PH4145GM138	4370	0	419	84	4
145	144	115.2	PH4145GM144	4370	0	436	85	4
170	132	105.6	PH4170GM132	4370	0	403	82	4
170	144	115.2	PH4170GM144	4370	0	436	85	4
170	162	129.6	PH4170GM162	5010	0	497	119	12
170	168	134.4	PH4170GM168	5010	0	514	121	12
245	180	144.0	PH4245GM180	5010	640	548	131	12
245	192	153.6	PH4245GM192	5760	640	584	136	22
245	198	158.4	PH4245GM198	5760	640	601	137	22
245	216	172.8	PH4245GM216	6500	640	656	145	23
245	228	182.4	PH4245GM228	6500	640	689	147	23
300	216	172.8	PH4300GM216	6500	990	656	148	23
300	228	182.4	PH4300GM228	6500	640	689	147	23
300	240	192.0	PH4300GM240	7240	640	728	154	33
300	258	206.4	PH4300GM258	7990	640	782	161	34
300	264	211.2	PH4300GM264	7990	640	799	163	34
362	258	206.4	PH4362GM258	7990	990	782	165	34
362	264	211.2	PH4362GM264	7990	990	799	166	34
362	276	220.8	PH4362GM276	7990	990	832	168	34
362	288	230.4	PH4362GM288	8740	990	869	176	44
420	312	249.6	PH4420GM312	9380	1530	945	224	223
420	330	264.0	PH4420GM330	9380	1530	997	228	223
420	336	268.8	PH4420GM336	10120	1530	1018	233	233
420	360	288.0	PH4420GM360	10860	990	1089	227	333
420	372	297.6	PH4420GM372	10860	990	1123	230	333
420	378	302.4	PH4420GM378	10860	990	1139	231	333
420	390	312.0	PH4420GM390	11610	990	1176	238	334
420	396	316.8	PH4420GM396	11610	990	1194	239	334
420	420	336.0	PH4420GM420	12360	990	1265	248	344

* Steep Current Impulse Residual Voltage at Specified Current

Note: When mounted with subbase, 2721453076 heavy duty type designated for arresters over 218kg weight

PH4 Physical Characteristics (continued)

Site Pollution Severity Class											
Heavy (25mm/kV)						Very Heavy (31mm/kV)					
Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code	Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code
PH4036GH027	2130	0	96	50	1	PH4036GV027	2130	0	96	50	1
PH4036GH030	2130	0	105	51	1	PH4036GV030	2130	0	105	51	1
PH4036GH033	2130	0	113	51	1	PH4036GV033	2130	0	113	51	1
PH4036GH036	2130	0	121	52	1	PH4036GV036	2130	0	121	52	1
PH4036GH039	2130	0	130	52	1	PH4036GV039	2130	0	130	52	1
PH4052GH042	2130	0	139	53	1	PH4052GV042	2130	0	139	53	1
PH4052GH048	2130	0	156	54	1	PH4052GV048	2130	0	156	54	1
PH4052GH051	2130	0	164	55	1	PH4052GV051	2130	0	164	55	1
PH4052GH054	2130	0	172	55	1	PH4052GV054	2130	0	172	55	1
PH4052GH060	2130	0	189	56	1	PH4052GV060	2130	0	189	56	1
PH4072GH054	2130	0	172	55	1	PH4072GV054	2880	0	176	58	2
PH4072GH060	2130	0	189	56	1	PH4072GV060	2880	0	192	59	2
PH4072GH066	2130	0	206	58	1	PH4072GV066	2880	0	209	60	2
PH4072GH072	2130	0	223	59	1	PH4072GV072	2880	0	226	62	2
PH4072GH075	2130	0	231	60	1	PH4072GV075	2880	0	234	63	2
PH4072GH078	2130	0	240	60	1	PH4072GV078	2880	0	243	63	2
PH4072GH081	2130	0	249	61	1	PH4072GV081	2880	0	252	64	2
PH4072GH084	2880	0	261	64	2	PH4072GV084	2880	0	261	64	2
PH4100GH084	2880	0	261	64	2	PH4100GV084	3620	0	265	68	3
PH4100GH090	2880	0	278	65	2	PH4100GV090	3620	0	282	69	3
PH4100GH096	2880	0	294	66	2	PH4100GV096	3620	0	298	70	3
PH4123GH090	3620	0	282	69	3	PH4123GV090	4370	0	285	73	4
PH4123GH096	3620	0	298	70	3	PH4123GV096	4370	0	302	75	4
PH4123GH108	3620	0	332	73	3	PH4123GV108	4370	0	335	77	4
PH4123GH120	3620	0	366	75	3	PH4123GV120	4370	0	369	80	4
PH4123GH132	4370	0	403	82	4	PH4123GV132	4370	0	403	82	4
PH4123GH138	4370	0	419	84	4	PH4123GV138	4370	0	419	84	4
PH4145GH108	4370	0	335	77	4	PH4145GV108	5010	0	345	108	12
PH4145GH120	4370	0	369	80	4	PH4145GV120	5010	0	378	111	12
PH4145GH132	4370	0	403	82	4	PH4145GV132	5010	0	412	113	12
PH4145GH138	4370	0	419	84	4	PH4145GV138	5010	0	429	114	12
PH4145GH144	4370	0	436	85	4	PH4145GV144	5010	0	445	115	12
PH4170GH132	4370	0	403	82	4	PH4170GV132	5760	0	415	116	22
PH4170GH144	4370	0	436	85	4	PH4170GV144	5760	0	449	118	22
PH4170GH162	5010	0	497	119	12	PH4170GV162	5760	0	500	122	22
PH4170GH168	5010	0	514	121	12	PH4170GV168	5760	0	517	123	22
PH4245GH180	6500	640	555	138	23	PH4245GV180	7990	640	562	146	34
PH4245GH192	6500	640	588	140	23	PH4245GV192	7990	640	596	148	34
PH4245GH198	6500	640	605	141	23	PH4245GV198	7990	640	612	149	34
PH4245GH216	6500	640	656	145	23	PH4245GV216	7990	640	663	153	34
PH4245GH228	6500	640	689	147	23	PH4245GV228	7990	640	696	156	34
PH4300GH216	7990	990	663	156	34	PH4300GV216	9380	990	675	190	223
PH4300GH228	7990	640	696	156	34	PH4300GV228	9380	640	709	189	223
PH4300GH240	7990	640	731	158	34	PH4300GV240	9380	640	744	191	223
PH4300GH258	7990	640	782	161	34	PH4300GV258	9380	640	794	195	223
PH4300GH264	7990	640	799	163	34	PH4300GV264	9380	640	811	196	223
PH4362GH258	9380	990	794	198	223	PH4362GV258	11610	990	805	211	334
PH4362GH264	9380	990	811	200	223	PH4362GV264	11610	990	822	212	334
PH4362GH276	9380	990	845	202	223	PH4362GV276	11610	990	856	215	334
PH4362GH288	9380	990	878	205	223	PH4362GV288	11610	990	889	217	334
PH4420GH312	10860	1530	953	232	333	PH4420GV312	13110	1530	963	245	444
PH4420GH330	10860	1530	1005	236	333	PH4420GV330	13110	1530	1015	249	444
PH4420GH336	10860	1530	1022	237	333	PH4420GV336	13110	1530	1032	250	444
PH4420GH360	10860	990	1089	227	333	PH4420GV360	13110	990	1099	240	444
PH4420GH372	10860	990	1123	230	333	PH4420GV372	13110	990	1133	243	444
PH4420GH378	10860	990	1139	231	333	PH4420GV378	13110	990	1150	244	444
PH4420GH390	11610	990	1176	238	334	PH4420GV390	13110	990	1183	246	444
PH4420GH396	11610	990	1194	239	334	PH4420GV396	13110	990	1201	247	444
PH4420GH420	12360	990	1265	248	344	PH4420GV420	13110	990	1269	252	444

Seismic Performance of PH4 Arresters per IEEE 693-2005

High (1.0g ZPA) for 2-unit arresters up to U_r = 288KV

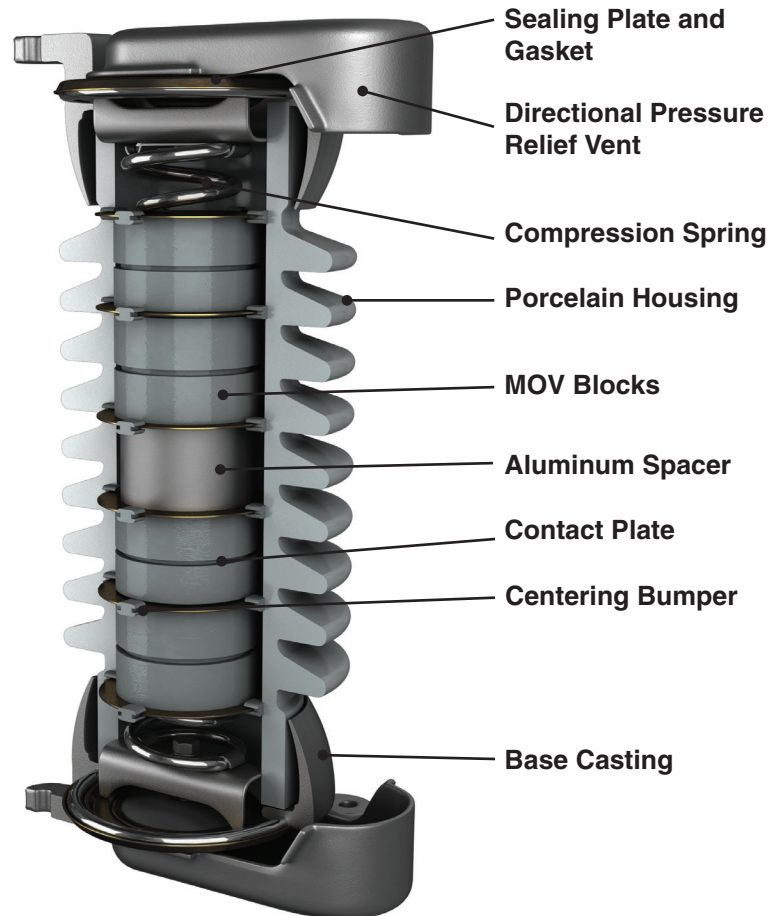
Moderate (0.5g ZPA) for 3-unit arresters up to U_r = 420KV

2721453076 subbase recommended for 3-unit arresters

Porcelain Housed Arresters (Type MH3, MH4 & H5)

Construction

- Rigid, high strength porcelain housing with a long service history
- Compression spring ensures a consistent electrical connection between blocks
- Directional Venting: Pressure relief rupture plate ensures the housing will vent out the end of the arrester. Arc will be directed to the side of the arrester through the pressure relief vent.
- Arrester Sealing verified by two high vacuum leak tests
- Meets requirements for High Seismic Performance Rating per IEEE 693-2005 through 420kV rating.
- Type H5 includes two MOV block columns for extra high energy.



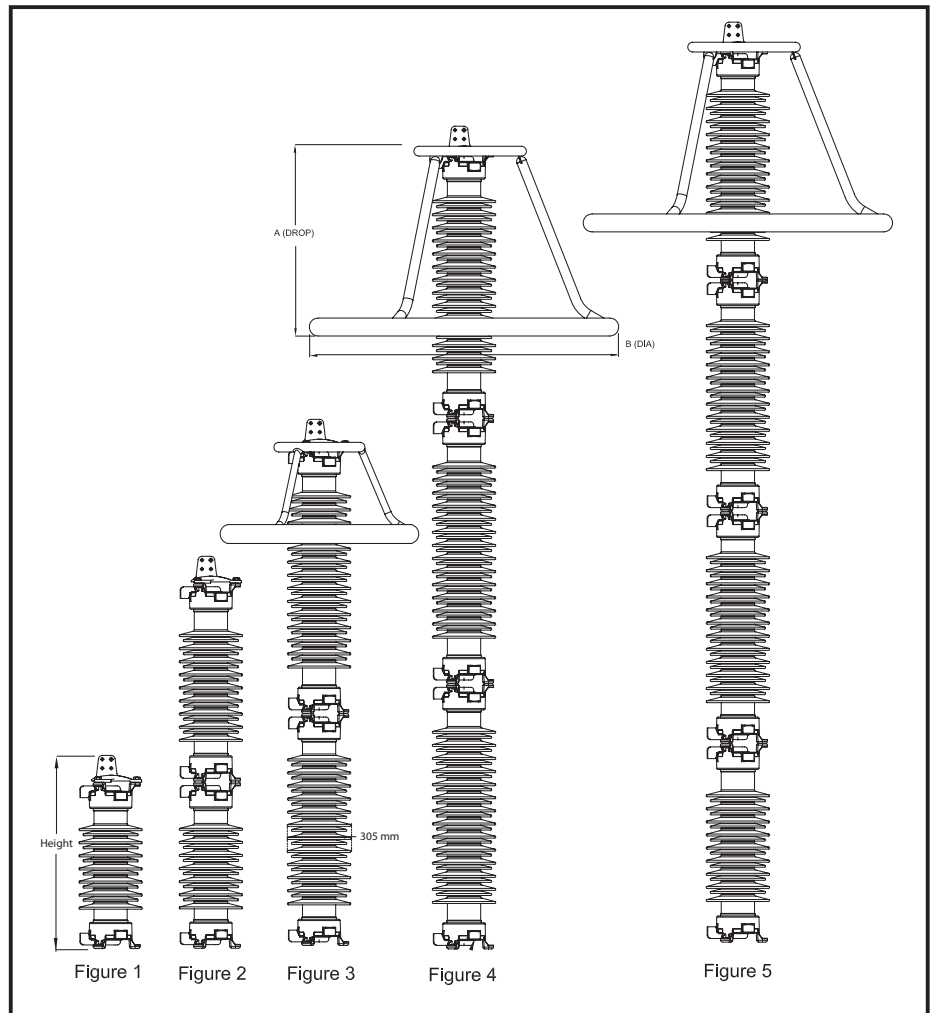
**Cross-Section View of
Porcelain Housed Arrester**

Table 14: Porcelain Housed Arresters Overview

Product Type	Nominal Discharge Current (kA)	Line Discharge Class	Voltage Rating Range (kV)	Pressure Relief (kA)	Cantilever Strength* (N.m)
MH3	10	3	24-420	63	17,000
MH4	20	4	24-420	63	17,000
H5	20	5	550-800	63	31,000

* SSL – Specified Short-Term Load

Porcelain Housed IEC Class 3 and 4 Arrester



Ohio Brass Porcelain Ordering System:

Use the following selection tables to build the correct Ohio Brass MH3 or MH4 Catalog Number. Please see H5 information on page 204-40 to find available H5 Arresters.

Catalog Ordering System											
A	B	C	D	E	F	G	H	I	J	K	L
MH											

Step 1: Select the correct arrester line discharge class from Table 15 and fill in B.

Table 15

Arrester Class	B
Class 3 - MH3 Arrester	3
Class 4 - MH4 Arrester	4

Step 2: Select the Max System Voltage (U_m) from Table 16 and fill in Cells C through E.

Table 16

Max System Voltage (kV)	C	D	E
36	0	3	6
52	0	5	2
72	0	7	2
100	1	0	0
123	1	2	3
145	1	4	5
170	1	7	0
245	2	4	5
300	3	0	0
362	3	6	2
420	4	2	0

Step 3: Select the appropriate Porcelain Color from Table 17 and fill in F.

Table 17

Porcelain Color	F
Gray	G
Brown	B

Step 4: Select the appropriate Site Pollution Severity Class from Table 18 and fill in G.

Table 18

Site Pollution	G
Medium (≥ 20 mm creep per kV U_m)	M
Heavy (≥ 25 mm creep per kV U_m)	H
Very Heavy (≥ 31 mm creep per kV U_m)	V

NOTE: Pollution classes per IEC - 600815-1

Step 5: Select the appropriate Rated Voltage (Ur) from Table 19 that corresponds with the Max System voltage selected for C through E and fill in Cells H through J.

Table 19

Max System Voltage (kV)	Rated Voltage (kV)	H	I	J
36	24	0	2	4
	30	0	3	0
	33	0	3	3
	36	0	3	6
	39	0	3	9
52	42	0	4	2
	48	0	4	8
	51	0	5	1
	54	0	5	4
	60	0	6	0
72	54	0	5	4
	60	0	6	0
	66	0	6	6
	72	0	7	2
	75	0	7	5
	78	0	7	8
	81	0	8	1
	84	0	8	4
100	84	0	8	4
	90	0	9	0
	96	0	9	6
123	90	0	9	0
	96	0	9	6
	108	1	0	8
	120	1	2	0
	132	1	3	2
145	138	1	3	8
	108	1	0	8
	120	1	2	0
	132	1	3	2
170	138	1	3	8
	144	1	4	4
	132	1	3	2
245	144	1	4	4
	162	1	6	2
	168	1	6	8
	180	1	8	0
	192	1	9	2
300	198	1	9	8
	216	2	1	6
	228	2	2	8
	228	2	2	8
362	216	2	1	6
	228	2	2	8
	240	2	4	0
	258	2	5	8
	264	2	6	4
420	258	2	5	8
	264	2	6	4
	276	2	7	6
	288	2	8	8
	312	3	1	2
	330	3	3	0
	336	3	3	6
	360	3	6	0
420	372	3	7	2
	378	3	7	8
	390	3	9	0
	396	3	9	6
	420	4	2	0

Step 6: Select the appropriate Line and Ground terminals based on the conductor size ranges in Table 20 and fill in K & L.

Table 20

Line Size (mm ²)	Ground Size (mm ²)	K	L
25 - 240	25 - 240	A	A
	70 - 630	A	B
	500 - 1000	A	C
70 - 630	25 - 240	B	A
	70 - 630	B	B
	500 - 1000	B	C
500 - 1000	25 - 240	C	A
	70 - 630	C	B
	500 - 1000	C	C

MH3 Catalog Ordering Example

- Max System Voltage – 72kV
- Gray Porcelain
- Medium Pollution Level
- Rated Voltage – 60 kV
- Line & Ground Size - 25 to 240mm

Step 1: Use Max system Voltage to fill in C through E – 145kV

◆ (MH3**072**xxxxxxx)

Step 2: Select Gray Porcelain – G

◆ (MH3072**G**xxxxxxx)

Step 3: Select Medium Pollution – M

◆ (MH3072GMxxxxx)

Step 4: Select Rated Voltage – 60kV

◆ (MH3072GM**060**xx)

Step 5: Select correct terminals

◆ (MH3072GM060**AA**)

Step 6: Order Ohio Brass Catalog Number

◆ (MH3072GM060AA)

MH4 Catalog Ordering Example

- Max System Voltage – 145kV
- Gray Porcelain
- Heavy Pollution Level
- Rated Voltage – 120 kV
- Line & Ground Size - 25 to 240mm

Step 1: Use Max system Voltage to fill in C through E – 145kV

◆ (MH4**145**xxxxxxx)

Step 2: Select Gray Porcelain – G

◆ (MH4145**G**xxxxxxx)

Step 3: Select Heavy Pollution – H

◆ (MH4145GHxxxxx)

Step 4: Select Rated Voltage – 120kV

◆ (MH4145GH**120**xx)

Step 5: Select correct terminals

◆ (MH4145GH120**AA**)

Step 6: Order Ohio Brass Catalog Number

◆ (MH4145GH120AA)

MH3 Protective Characteristics

Ur kV	Uc kV	Temporary Over-Voltage Withstand at indicated duration			Max 36/90 Switching Impulse Residual Voltage at indicated current				Max 8/20 Lightning Impulse Residual Voltage at indicated current					
		1s kVrms	10s kVrms	100s kVrms	0.25kA kV	0.5kA kV	1kA kV	2kA kV	1.5kA kV	3kA kV	5kA kV	10kA kV	20kA kV	40kA kV
27	21.6	29	27	26	51	52	54	57	56	58	61	65	70	80
30	24.0	33	31	29	57	58	60	63	62	64	67	72	78	89
33	26.4	36	34	32	62	63	66	69	68	70	74	79	85	97
36	28.8	39	37	34	68	69	72	75	74	77	80	86	93	106
39	31.2	42	40	37	74	75	78	82	80	84	88	94	102	116
42	33.6	46	43	40	79	81	84	88	86	90	94	101	109	125
48	38.4	52	49	46	90	92	96	100	98	102	107	115	124	142
51	40.8	55	52	49	96	97	101	106	104	109	114	122	132	150
54	43.2	59	55	52	102	104	108	113	111	116	121	130	141	160
60	48.0	65	61	57	112	115	119	125	123	128	134	144	156	178
66	52.8	72	67	63	123	126	131	137	135	141	147	158	171	195
72	57.6	78	73	69	135	138	143	150	148	154	161	173	187	213
75	60.0	82	76	72	140	143	149	156	154	160	168	180	195	222
78	62.4	85	79	75	146	149	155	162	160	166	174	187	202	231
81	64.8	88	82	78	151	154	161	168	166	173	181	194	210	239
84	67.2	91	86	80	157	160	167	174	172	179	187	201	217	248
90	72.0	98	92	86	168	172	179	187	185	192	201	216	233	266
96	76.8	104	98	92	179	183	190	199	197	205	214	230	249	284
108	86.4	118	110	103	202	206	214	225	221	231	241	259	280	319
120	96.0	131	122	115	223	228	238	249	245	255	267	287	310	354
132	105.6	144	134	126	246	251	262	274	270	281	295	316	342	390
138	110.4	150	140	132	257	262	273	286	282	294	308	330	357	407
144	115.2	157	147	138	269	274	285	299	295	307	322	345	373	425
162	129.6	176	165	155	302	308	321	336	332	345	362	388	419	478
168	134.4	183	171	161	313	319	333	348	344	358	375	402	435	496
180	144.0	196	183	172	335	342	357	373	369	384	402	431	466	531
192	153.6	209	195	184	358	365	380	398	393	409	429	460	497	567
198	158.4	215	202	190	369	376	392	411	405	422	442	474	512	584
216	172.8	235	220	207	402	410	428	448	442	460	482	517	559	637
228	182.4	248	232	218	425	433	451	473	467	486	509	546	590	673
240	192.0	261	244	230	446	456	475	497	491	511	535	574	620	708
258	206.4	281	263	247	480	490	510	534	528	549	575	617	667	761
264	211.2	287	269	253	492	502	523	547	540	562	589	632	683	779
276	220.8	300	281	264	513	524	546	571	564	587	615	660	713	814
288	230.4	313	293	276	536	547	570	596	589	613	642	689	745	850
312	249.6	339	318	299	580	592	617	646	638	664	695	746	806	920
330	264.0	359	336	316	614	626	652	683	675	702	735	789	853	973
336	268.8	366	342	322	625	638	665	696	687	716	749	804	869	991
360	288.0	392	366	345	669	683	712	745	736	766	802	861	931	1062
372	297.6	405	379	356	692	706	736	770	761	792	829	890	962	1097
378	302.4	411	385	362	703	717	747	782	773	805	843	904	977	1115
390	312.0	424	397	374	725	740	771	808	798	830	870	933	1009	1150
396	316.8	431	403	379	736	751	783	820	810	843	883	947	1024	1168
420	336.0	457	428	402	781	797	831	870	859	894	937	1005	1086	1239

MH3 Housing Insulation Withstand Values

Creep (mm)	Housing Code	Grading Ring diam (mm)	Lightning Impulse ¹ (kV)	Switching Impulse ¹ (kV)	60Hz PF, 1 min wet ¹ (kV rms)	Total Height incl cap (mm)	Stack Height w/o cap (mm)	Figure # (pg. 29)	Lightning Impulse ² (kV)	Switching Impulse ² (kV)	60Hz PF, 1 min wet ² (kV rms)
1116	0	0	276	220	108	806	663	1	273	230	138
1905	1	0	360	300	159	969	826	1	358	310	186
2540	2	0	441	402	212	1121	978	1	434	379	227
3207	3	0	509	468	294	1286	1143	1	520	455	273
3874	4	0	603	532	345	1451	1308	1	600	523	314
4445	12	0	801	702	371	1947	1804	2	742	640	384
4445	12	640	801	702	371	1947	1804	3	706	612	367
5080	22	0	882	804	424	2099	1956	2	818	700	420
5080	22	640	882	804	424	2099	1956	3	781	671	403
5747	23	0	950	870	506	2264	2121	2	904	766	459
5747	23	640	950	870	506	2264	2121	3	862	734	441
6414	33	0	1018	936	588	2429	2286	2	990	829	497
6414	33	640	1018	936	588	2429	2286	3	944	795	477
6414	33	990	1018	936	588	2429	2286	3	923	780	468
7081	34	640	1112	1000	639	2594	2451	3	1026	854	513
7081	34	990	1112	1000	639	2594	2451	3	1004	839	503
7748	44	0	1206	1064	690	2759	2616	2	1149	939	564
7748	44	640	1206	1064	690	2759	2616	3	1108	911	547
7748	44	990	1206	1064	690	2759	2616	3	1084	895	537
8287	223	990	1391	1272	718	3242	3099	4	1288	1029	618
8954	233	990	1459	1338	800	3407	3264	4	1374	1082	649
8954	233	1530	1459	1338	800	3407	3264	4	1213	981	589
9621	333	990	1527	1404	882	3572	3429	4	1460	1132	679
9621	333	1530	1527	1404	882	3572	3429	4	1292	1032	619
10288	334	990	1621	1468	933	3737	3594	4	1540	1176	706
10955	344	990	1715	1532	984	3902	3759	4	1619	1218	731
10955	344	1530	1715	1532	984	3902	3759	4	1451	1127	676
11622	444	990	1809	1596	1035	4067	3924	4	1699	1259	755
11622	444	1530	1809	1596	1035	4067	3924	4	1531	1172	703
12161	2333	1530	1968	1806	1094	4550	4407	5	1767	1292	775
12828	3333	1530	2036	1872	1176	4715	4572	5	1849	1329	797
13495	3334	990	2130	1936	1227	4880	4737	5	2010	1397	838
13495	3334	1530	2130	1936	1227	4880	4737	5	1929	1364	818
14162	3344	2030	2224	2000	1278	5045	4902	5	1910	1356	813

¹ Linear insulation withstand for comparison based on sum of units

² Insulation withstand with non-linear factors included for reference

MH3 Physical Characteristics

Max System Voltage	Rated Voltage	Max Continuous Voltage L-G	Site Pollution Severity Class					
			Medium (20mm/kV)					
			Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code
36	27	21.6	MH3036GM027	1116	0	81	59	0
36	30	24.0	MH3036GM030	1116	0	88	60	0
36	33	26.4	MH3036GM033	1116	0	96	60	0
36	36	28.8	MH3036GM036	1116	0	103	61	0
36	39	31.2	MH3036GM039	1116	0	112	61	0
52	42	33.6	MH3052GM042	1116	0	120	61	0
52	48	38.4	MH3052GM048	1116	0	135	62	0
52	51	40.8	MH3052GM051	1116	0	142	63	0
52	54	43.2	MH3052GM054	1116	0	151	63	0
52	60	48.0	MH3052GM060	1116	0	166	64	0
72	54	43.2	MH3072GM054	1905	0	152	76	1
72	60	48.0	MH3072GM060	1905	0	167	77	1
72	66	52.8	MH3072GM066	1905	0	183	78	1
72	72	57.6	MH3072GM072	1905	0	199	78	1
72	75	60.0	MH3072GM075	1905	0	207	79	1
72	78	62.4	MH3072GM078	1905	0	214	79	1
72	81	64.8	MH3072GM081	1905	0	222	80	1
72	84	67.2	MH3072GM084	2540	0	232	92	2
100	84	67.2	MH3100GM084	2540	0	232	92	2
100	90	72.0	MH3100GM090	2540	0	248	93	2
100	96	76.8	MH3100GM096	2540	0	263	94	2
123	90	72.0	MH3123GM090	2540	0	248	93	2
123	96	76.8	MH3123GM096	2540	0	263	94	2
123	108	86.4	MH3123GM108	3207	0	296	109	3
123	120	96.0	MH3123GM120	3207	0	326	111	3
123	132	105.6	MH3123GM132	3874	0	360	125	4
123	138	110.4	MH3123GM138	3874	0	375	125	4
145	108	86.4	MH3145GM108	3207	0	296	109	3
145	120	96.0	MH3145GM120	3207	0	326	111	3
145	132	105.6	MH3145GM132	3874	0	360	125	4
145	138	110.4	MH3145GM138	3874	0	375	125	4
145	144	115.2	MH3145GM144	3874	0	392	126	4
170	132	105.6	MH3170GM132	3874	0	360	125	4
170	144	115.2	MH3170GM144	3874	0	392	126	4
170	162	129.6	MH3170GM162	4445	0	443	166	12
170	168	134.4	MH3170GM168	4445	0	459	167	12
245	180	144.0	MH3245GM180	5080	640	491	189	2 2
245	192	153.6	MH3245GM192	5080	640	523	191	2 2
245	198	158.4	MH3245GM198	5080	640	538	191	2 2
245	216	172.8	MH3245GM216	5747	640	587	208	2 3
245	228	182.4	MH3245GM228	6414	640	621	223	3 3
300	216	172.8	MH3300GM216	6414	990	589	225	3 3
300	228	182.4	MH3300GM228	6414	640	621	223	3 3
300	240	192.0	MH3300GM240	6414	640	651	225	3 3
300	258	206.4	MH3300GM258	7081	640	699	240	3 4
300	264	211.2	MH3300GM264	7081	640	715	240	3 4
362	258	206.4	MH3362GM258	7748	990	701	255	4 4
362	264	211.2	MH3362GM264	7748	990	717	256	4 4
362	276	220.8	MH3362GM276	7748	990	748	257	4 4
362	288	230.4	MH3362GM288	7748	990	780	259	4 4
420	312	249.6	MH3420GM312	8954	1530	849	328	2 3 3
420	330	264.0	MH3420GM330	8954	1530	896	331	2 3 3
420	336	268.8	MH3420GM336	8954	1530	912	332	2 3 3
420	360	288.0	MH3420GM360	9621	990	975	335	3 3 3
420	372	297.6	MH3420GM372	10288	990	1009	348	3 3 4
420	378	302.4	MH3420GM378	10288	990	1024	349	3 3 4
420	390	312.0	MH3420GM390	10955	990	1057	362	3 4 4
420	396	316.8	MH3420GM396	10955	990	1073	363	3 4 4
420	420	336.0	MH3420GM420	11622	990	1137	378	4 4 4

* Steep Current Impulse Residual Voltage at Specified Current

Note: When mounted with subbase, 2721453076 heavy duty type designated for arresters over 218kg weight

MH3 Physical Characteristics (continued)

Site Pollution Severity Class											
Heavy (25mm/kV)						Very Heavy (31mm/kV)					
Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code	Catalog	Creep (mm)	Ring Dia (mm)	10KA Steep* (kV)	Weight (kg)	Housing Code
MH3036GH027	1116	0	81	59	0	MH3036GV027	1116	0	81	59	0
MH3036GH030	1116	0	88	60	0	MH3036GV030	1116	0	88	60	0
MH3036GH033	1116	0	96	60	0	MH3036GV033	1116	0	96	60	0
MH3036GH036	1116	0	103	61	0	MH3036GV036	1116	0	103	61	0
MH3036GH039	1116	0	112	61	0	MH3036GV039	1116	0	112	61	0
MH3052GH042	1905	0	121	74	1	MH3052GV042	1905	0	121	74	1
MH3052GH048	1905	0	136	75	1	MH3052GV048	1905	0	136	75	1
MH3052GH051	1905	0	143	76	1	MH3052GV051	1905	0	143	76	1
MH3052GH054	1905	0	152	76	1	MH3052GV054	1905	0	152	76	1
MH3052GH060	1905	0	167	77	1	MH3052GV060	1905	0	167	77	1
MH3072GH054	1905	0	152	76	1	MH3072GV054	2540	0	154	88	2
MH3072GH060	1905	0	167	77	1	MH3072GV060	2540	0	169	89	2
MH3072GH066	1905	0	183	78	1	MH3072GV066	2540	0	185	90	2
MH3072GH072	1905	0	199	78	1	MH3072GV072	2540	0	201	90	2
MH3072GH075	1905	0	207	79	1	MH3072GV075	2540	0	209	91	2
MH3072GH078	1905	0	214	79	1	MH3072GV078	2540	0	216	91	2
MH3072GH081	1905	0	222	80	1	MH3072GV081	2540	0	224	92	2
MH3072GH084	2540	0	232	92	2	MH3072GV084	2540	0	232	92	2
MH3100GH084	2540	0	232	92	2	MH3100GV084	3207	0	233	106	3
MH3100GH090	2540	0	248	93	2	MH3100GV090	3207	0	249	107	3
MH3100GH096	2540	0	263	94	2	MH3100GV096	3207	0	264	108	3
MH3123GH090	3207	0	249	107	3	MH3123GV090	3874	0	251	119	4
MH3123GH096	3207	0	264	108	3	MH3123GV096	3874	0	266	120	4
MH3123GH108	3207	0	296	109	3	MH3123GV108	3874	0	298	121	4
MH3123GH120	3207	0	326	111	3	MH3123GV120	3874	0	328	123	4
MH3123GH132	3874	0	360	125	4	MH3123GV132	3874	0	360	125	4
MH3123GH138	3874	0	375	125	4	MH3123GV138	3874	0	375	125	4
MH3145GH108	3874	0	298	121	4	MH3145GV108	5080	0	304	171	2 2
MH3145GH120	3874	0	328	123	4	MH3145GV120	5080	0	334	173	2 2
MH3145GH132	3874	0	360	125	4	MH3145GV132	5080	0	366	174	2 2
MH3145GH138	3874	0	375	125	4	MH3145GV138	5080	0	381	175	2 2
MH3145GH144	3874	0	392	126	4	MH3145GV144	5080	0	398	176	2 2
MH3170GH132	4445	0	365	162	1 2	MH3170GV132	5747	0	368	188	2 3
MH3170GH144	4445	0	397	164	1 2	MH3170GV144	5747	0	400	190	2 3
MH3170GH162	4445	0	443	166	1 2	MH3170GV162	5747	0	446	192	2 3
MH3170GH168	4445	0	459	167	1 2	MH3170GV168	5747	0	462	193	2 3
MH3245GH180	6414	640	495	217	3 3	MH3245GV180	7748	640	498	241	4 4
MH3245GH192	6414	640	527	219	3 3	MH3245GV192	7748	640	530	243	4 4
MH3245GH198	6414	640	542	219	3 3	MH3245GV198	7748	640	545	243	4 4
MH3245GH216	6414	640	589	222	3 3	MH3245GV216	7748	640	592	246	4 4
MH3245GH228	6414	640	621	223	3 3	MH3245GV228	7748	640	624	247	4 4
MH3300GH216	7748	990	592	249	4 4	MH3300GV216	9621	990	600	314	3 3 3
MH3300GH228	7748	640	624	247	4 4	MH3300GV228	9621	640	632	313	3 3 3
MH3300GH240	7748	640	654	249	4 4	MH3300GV240	9621	640	662	315	3 3 3
MH3300GH258	7748	640	701	252	4 4	MH3300GV258	9621	640	709	317	3 3 3
MH3300GH264	7748	640	717	252	4 4	MH3300GV264	9621	640	725	318	3 3 3
MH3362GH258	9621	990	709	320	3 3 3	MH3362GV258	11622	990	714	356	4 4 4
MH3362GH264	9621	990	725	321	3 3 3	MH3362GV264	11622	990	730	357	4 4 4
MH3362GH276	9621	990	756	323	3 3 3	MH3362GV276	11622	990	761	359	4 4 4
MH3362GH288	9621	990	788	325	3 3 3	MH3362GV288	11622	990	793	360	4 4 4
MH3420GH312	10955	1530	854	366	3 4 4	MH3420GV312	13495	1530	863	444	3 3 3 4
MH3420GH330	10955	1530	901	369	3 4 4	MH3420GV330	13495	1530	910	446	3 3 3 4
MH3420GH336	10955	1530	917	370	3 4 4	MH3420GV336	13495	1530	926	447	3 3 3 4
MH3420GH360	10955	990	979	358	3 4 4	MH3420GV360	13495	990	988	436	3 3 3 4
MH3420GH372	10955	990	1011	360	3 4 4	MH3420GV372	13495	990	1020	438	3 3 3 4
MH3420GH378	10955	990	1026	361	3 4 4	MH3420GV378	13495	990	1035	438	3 3 3 4
MH3420GH390	10955	990	1057	362	3 4 4	MH3420GV390	13495	990	1066	440	3 3 3 4
MH3420GH396	10955	990	1073	363	3 4 4	MH3420GV396	13495	990	1082	441	3 3 3 4
MH3420GH420	11622	990	1137	378	4 4 4	MH3420GV420	13495	990	1145	444	3 3 3 4

Seismic Performance of MH3 Arresters per IEEE 693-2005

High (1.0g ZPA) for all 2-unit and 3-unit arresters

2721453076 subbase recommended for multi-unit arresters

MH4 Protective Characteristics

Ur	Uc	Temporary Over-Voltage Withstand at indicated duration			Max 36/90 Switching Impulse Residual Voltage at indicated current				Max 8/20 Lightning Impulse Residual Voltage at indicated current					
		1s	10s	100s	0.5kA	1kA	2kA	3kA	1.5kA	3kA	5kA	10kA	20kA	40kA
kV	kV	kVrms	kVrms	kVrms	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV
27	21.6	30	28	26	53	55	56	58	57	59	61	64	68	75
30	24.0	33	31	29	59	61	63	64	63	65	68	71	76	84
33	26.4	36	34	32	65	67	69	70	69	72	74	78	83	92
36	28.8	40	37	35	71	73	75	77	75	78	81	85	91	100
39	31.2	43	40	38	76	79	81	83	81	85	88	92	98	108
42	33.6	46	43	41	83	85	88	90	88	92	95	99	106	117
48	38.4	53	50	47	94	97	100	102	101	104	108	113	121	134
51	40.8	56	53	50	100	103	106	109	107	111	115	120	129	142
54	43.2	60	56	53	106	109	112	115	113	117	121	127	136	150
60	48.0	66	62	59	118	121	125	128	125	130	135	141	151	167
66	52.8	73	68	64	129	133	137	140	138	143	148	155	166	183
72	57.6	80	75	70	141	145	149	153	150	156	161	169	181	200
75	60.0	83	78	73	147	151	156	159	156	162	168	176	189	208
78	62.4	86	81	76	152	157	162	166	162	169	175	183	196	216
81	64.8	90	84	79	159	164	169	173	170	176	182	191	205	225
84	67.2	93	87	82	165	170	175	179	176	183	189	198	212	234
90	72.0	99	93	88	176	182	187	192	188	196	202	212	227	250
96	76.8	106	99	94	188	194	200	204	201	208	216	226	242	267
108	86.4	119	112	105	211	217	224	230	225	234	242	254	272	300
120	96.0	133	124	117	235	241	249	255	250	260	269	282	302	333
132	105.6	146	137	129	258	265	274	280	275	286	296	310	332	366
138	110.4	152	143	135	269	277	286	293	287	299	309	324	347	382
144	115.2	159	149	140	281	289	298	305	300	311	322	338	362	399
162	129.6	179	168	158	317	326	336	344	338	351	363	381	408	449
168	134.4	186	174	164	328	338	348	357	350	364	377	395	423	466
180	144.0	199	186	176	352	362	373	382	375	390	403	423	453	499
192	153.6	212	199	187	375	386	398	407	400	415	430	451	483	532
198	158.4	219	205	193	386	398	410	420	412	428	443	465	498	548
216	172.8	239	224	211	421	433	447	458	449	467	483	507	543	598
228	182.4	252	236	222	445	457	472	483	474	493	510	535	573	631
240	192.0	265	248	234	469	482	497	509	500	519	537	564	604	665
258	206.4	285	267	252	503	518	534	547	537	558	577	606	649	714
264	211.2	292	273	257	515	530	547	560	549	571	591	620	664	731
276	220.8	305	286	269	538	554	571	585	574	597	617	648	694	764
288	230.4	318	298	281	562	578	596	610	599	622	644	676	724	797
312	249.6	345	323	304	608	626	645	661	648	674	697	732	784	863
330	264.0	365	342	322	644	662	683	700	686	713	738	775	830	913
336	268.8	371	348	328	655	674	696	712	699	726	752	789	845	930
360	288.0	398	373	351	702	722	745	763	748	778	805	845	905	996
372	297.6	411	385	363	725	746	770	788	773	804	832	873	935	1029
378	302.4	418	391	369	737	758	782	801	785	817	845	887	950	1045
390	312.0	431	404	380	760	782	807	826	810	842	872	915	980	1078
396	316.8	438	410	386	772	795	820	839	824	856	886	930	996	1096
420	336.0	464	435	410	819	843	869	890	873	908	939	986	1056	1162
444	355.2	491	460	433	865	890	919	940	923	959	992	1042	1115	1228

MH4 Housing Insulation Withstand Values

Creep (mm)	Housing Code	Grading Ring diam (mm)	Lightning Impulse ¹ (kV)	Switching Impulse ¹ (kV)	60Hz PF, 1 min wet ¹ (kV rms)	Total Height incl cap (mm)	Stack Height w/o cap (mm)	Figure # (pg. 29)	Lightning Impulse ² (kV)	Switching Impulse ² (kV)	60Hz PF, 1 min wet ² (kV rms)
1116	0	0	276	220	108	806	663	1	273	230	138
1905	1	0	360	300	159	969	826	1	358	310	186
2540	2	0	441	402	212	1121	978	1	434	379	227
3207	3	0	509	468	294	1286	1143	1	520	455	273
3874	4	0	603	532	345	1451	1308	1	600	523	314
4445	12	0	801	702	371	1947	1804	2	742	640	384
4445	12	640	801	702	371	1947	1804	3	706	612	367
5080	22	0	882	804	424	2099	1956	2	818	700	420
5080	22	640	882	804	424	2099	1956	3	781	671	403
5747	23	0	950	870	506	2264	2121	2	904	766	459
5747	23	640	950	870	506	2264	2121	3	862	734	441
6414	33	0	1018	936	588	2429	2286	2	990	829	497
6414	33	640	1018	936	588	2429	2286	3	944	795	477
6414	33	990	1018	936	588	2429	2286	3	923	780	468
7081	34	640	1112	1000	639	2594	2451	3	1026	854	513
7081	34	990	1112	1000	639	2594	2451	3	1004	839	503
7748	44	0	1206	1064	690	2759	2616	2	1149	939	564
7748	44	640	1206	1064	690	2759	2616	3	1108	911	547
7748	44	990	1206	1064	690	2759	2616	3	1084	895	537
8287	223	990	1391	1272	718	3242	3099	4	1288	1029	618
8954	233	990	1459	1338	800	3407	3264	4	1374	1082	649
8954	233	1530	1459	1338	800	3407	3264	4	1213	981	589
9621	333	990	1527	1404	882	3572	3429	4	1460	1132	679
9621	333	1530	1527	1404	882	3572	3429	4	1292	1032	619
10288	334	990	1621	1468	933	3737	3594	4	1540	1176	706
10955	344	990	1715	1532	984	3902	3759	4	1619	1218	731
10955	344	1530	1715	1532	984	3902	3759	4	1451	1127	676
11622	444	990	1809	1596	1035	4067	3924	4	1699	1259	755
11622	444	1530	1809	1596	1035	4067	3924	4	1531	1172	703
12161	2333	1530	1968	1806	1094	4550	4407	5	1767	1292	775
12828	3333	1530	2036	1872	1176	4715	4572	5	1849	1329	797
13495	3334	990	2130	1936	1227	4880	4737	5	2010	1397	838
13495	3334	1530	2130	1936	1227	4880	4737	5	1929	1364	818
14162	3344	2030	2224	2000	1278	5045	4902	5	1910	1356	813

¹ Linear insulation withstand for comparison based on sum of units

² Insulation withstand with non-linear factors included for reference

MH4 Physical Characteristics

Max System Voltage	Rated Voltage	Max Continuous Voltage L-G	Site Pollution Severity Class					
			Medium (20mm/kV)					
			Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code
Um	Ur	Uc						
36	27	21.6	MH4036GM027	1116	0	93	61	0
36	30	24.0	MH4036GM030	1116	0	101	62	0
36	33	26.4	MH4036GM033	1116	0	110	63	0
36	36	28.8	MH4036GM036	1116	0	118	63	0
36	39	31.2	MH4036GM039	1116	0	127	64	0
52	42	33.6	MH4052GM042	1116	0	136	64	0
52	48	38.4	MH4052GM048	1116	0	152	65	0
52	51	40.8	MH4052GM051	1116	0	161	66	0
52	54	43.2	MH4052GM054	1116	0	169	67	0
52	60	48.0	MH4052GM060	1116	0	186	68	0
72	54	43.2	MH4072GM054	1905	0	172	80	1
72	60	48.0	MH4072GM060	1905	0	189	81	1
72	66	52.8	MH4072GM066	1905	0	206	82	1
72	72	57.6	MH4072GM072	1905	0	223	84	1
72	75	60.0	MH4072GM075	1905	0	231	84	1
72	78	62.4	MH4072GM078	1905	0	240	85	1
72	81	64.8	MH4072GM081	1905	0	249	86	1
72	84	67.2	MH4072GM084	2540	0	261	98	2
100	84	67.2	MH4100GM084	2540	0	261	98	2
100	90	72.0	MH4100GM090	2540	0	278	99	2
100	96	76.8	MH4100GM096	2540	0	294	100	2
123	90	72.0	MH4123GM090	2540	0	278	99	2
123	96	76.8	MH4123GM096	2540	0	294	100	2
123	108	86.4	MH4123GM108	3207	0	331	117	3
123	120	96.0	MH4123GM120	3207	0	365	119	3
123	132	105.6	MH4123GM132	3874	0	402	134	4
123	138	110.4	MH4123GM138	3874	0	419	135	4
145	108	86.4	MH4145GM108	3207	0	331	117	3
145	120	96.0	MH4145GM120	3207	0	365	119	3
145	132	105.6	MH4145GM132	3874	0	402	134	4
145	138	110.4	MH4145GM138	3874	0	419	135	4
145	144	115.2	MH4145GM144	3874	0	435	137	4
170	132	105.6	MH4170GM132	3874	0	402	134	4
170	144	115.2	MH4170GM144	3874	0	435	137	4
170	162	129.6	MH4170GM162	4445	0	497	178	12
170	168	134.4	MH4170GM168	4445	0	514	179	12
245	180	144.0	MH4245GM180	5080	640	550	202	22
245	192	153.6	MH4245GM192	5080	640	584	204	22
245	198	158.4	MH4245GM198	5080	640	601	205	22
245	216	172.8	MH4245GM216	5747	640	655	223	23
245	228	182.4	MH4245GM228	6414	640	692	239	33
300	216	172.8	MH4300GM216	6414	990	658	240	33
300	228	182.4	MH4300GM228	6414	640	692	239	33
300	240	192.0	MH4300GM240	6414	640	726	242	33
300	258	206.4	MH4300GM258	7081	640	780	258	34
300	264	211.2	MH4300GM264	7081	640	797	259	34
362	258	206.4	MH4362GM258	7748	990	783	273	44
362	264	211.2	MH4362GM264	7748	990	800	274	44
362	276	220.8	MH4362GM276	7748	990	834	277	44
362	288	230.4	MH4362GM288	7748	990	868	280	44
420	312	249.6	MH4420GM312	8954	1530	948	350	233
420	330	264.0	MH4420GM330	8954	1530	999	354	233
420	336	268.8	MH4420GM336	9621	1530	1020	369	333
420	360	288.0	MH4420GM360	9621	990	1087	359	333
420	372	297.6	MH4420GM372	10288	990	1124	374	334
420	378	302.4	MH4420GM378	10288	990	1141	375	334
420	390	312.0	MH4420GM390	10955	990	1177	390	344
420	396	316.8	MH4420GM396	10955	990	1195	392	344
420	420	336.0	MH4420GM420	11622	990	1266	408	444

* Steep Current Impulse Residual Voltage at Specified Current

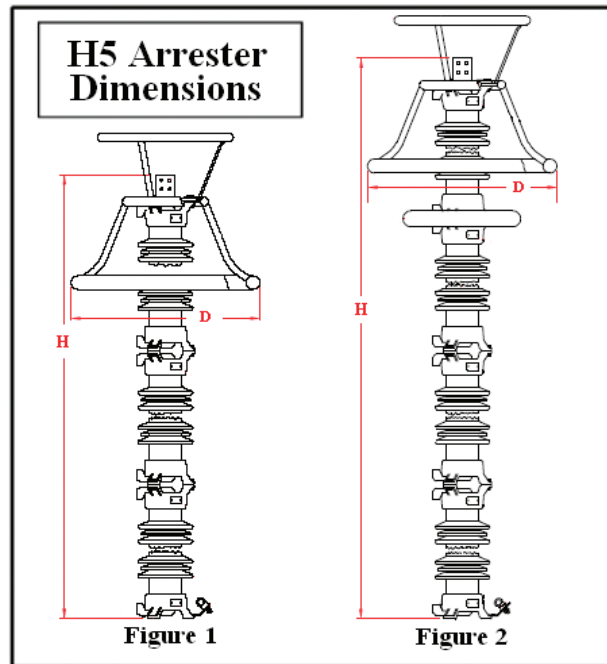
Note: When mounted with subbase, 2721453076 heavy duty type designated for arresters over 218kg weight

MH4 Physical Characteristics (continued)

Site Pollution Severity Class											
Heavy (25mm/kV)						Very Heavy (31mm/kV)					
Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code	Catalog	Creep (mm)	Ring Dia (mm)	20KA Steep* (kV)	Weight (kg)	Housing Code
MH4036GH027	1116	0	93	61	0	MH4036GV027	1116	0	93	61	0
MH4036GH030	1116	0	101	62	0	MH4036GV030	1116	0	101	62	0
MH4036GH033	1116	0	110	63	0	MH4036GV033	1116	0	110	63	0
MH4036GH036	1116	0	118	63	0	MH4036GV036	1116	0	118	63	0
MH4036GH039	1116	0	127	64	0	MH4036GV039	1116	0	127	64	0
MH4052GH042	1905	0	139	77	1	MH4052GV042	1905	0	139	77	1
MH4052GH048	1905	0	156	78	1	MH4052GV048	1905	0	156	78	1
MH4052GH051	1905	0	164	79	1	MH4052GV051	1905	0	164	79	1
MH4052GH054	1905	0	172	80	1	MH4052GV054	1905	0	172	80	1
MH4052GH060	1905	0	189	81	1	MH4052GV060	1905	0	189	81	1
MH4072GH054	1905	0	172	80	1	MH4072GV054	2540	0	175	92	2
MH4072GH060	1905	0	189	81	1	MH4072GV060	2540	0	192	93	2
MH4072GH066	1905	0	206	82	1	MH4072GV066	2540	0	209	94	2
MH4072GH072	1905	0	223	84	1	MH4072GV072	2540	0	226	96	2
MH4072GH075	1905	0	231	84	1	MH4072GV075	2540	0	234	96	2
MH4072GH078	1905	0	240	85	1	MH4072GV078	2540	0	243	97	2
MH4072GH081	1905	0	249	86	1	MH4072GV081	2540	0	252	98	2
MH4072GH084	2540	0	261	98	2	MH4072GV084	2540	0	261	98	2
MH4100GH084	2540	0	261	98	2	MH4100GV084	3207	0	264	112	3
MH4100GH090	2540	0	278	99	2	MH4100GV090	3207	0	281	113	3
MH4100GH096	2540	0	294	100	2	MH4100GV096	3207	0	298	114	3
MH4123GH090	3207	0	281	113	3	MH4123GV090	3874	0	284	125	4
MH4123GH096	3207	0	298	114	3	MH4123GV096	3874	0	301	126	4
MH4123GH108	3207	0	331	117	3	MH4123GV108	3874	0	335	129	4
MH4123GH120	3207	0	365	119	3	MH4123GV120	3874	0	368	131	4
MH4123GH132	3874	0	402	134	4	MH4123GV132	3874	0	402	134	4
MH4123GH138	3874	0	419	135	4	MH4123GV138	3874	0	419	135	4
MH4145GH108	3874	0	335	129	4	MH4145GV108	5080	0	348	178	22
MH4145GH120	3874	0	368	131	4	MH4145GV120	5080	0	381	181	22
MH4145GH132	3874	0	402	134	4	MH4145GV132	5080	0	415	183	22
MH4145GH138	3874	0	419	135	4	MH4145GV138	5080	0	432	185	22
MH4145GH144	3874	0	435	137	4	MH4145GV144	5080	0	448	186	22
MH4170GH132	4445	0	412	171	12	MH4170GV132	5747	0	418	197	23
MH4170GH144	4445	0	445	174	12	MH4170GV144	5747	0	452	200	23
MH4170GH162	4445	0	497	178	12	MH4170GV162	5747	0	503	204	23
MH4170GH168	4445	0	514	179	12	MH4170GV168	5747	0	520	205	23
MH4245GH180	6414	640	557	229	33	MH4245GV180	7748	640	564	253	44
MH4245GH192	6414	640	591	232	33	MH4245GV192	7748	640	597	256	44
MH4245GH198	6414	640	608	233	33	MH4245GV198	7748	640	614	257	44
MH4245GH216	6414	640	658	237	33	MH4245GV216	7748	640	665	261	44
MH4245GH228	6414	640	692	239	33	MH4245GV228	7748	640	698	263	44
MH4300GH216	7748	990	665	264	44	MH4300GV216	9621	990	681	330	333
MH4300GH228	7748	640	698	263	44	MH4300GV228	9621	640	714	329	333
MH4300GH240	7748	640	733	266	44	MH4300GV240	9621	640	749	331	333
MH4300GH258	7748	640	783	270	44	MH4300GV258	9621	640	800	335	333
MH4300GH264	7748	640	800	271	44	MH4300GV264	9621	640	817	337	333
MH4362GH258	9621	990	800	338	333	MH4362GV258	11622	990	810	375	444
MH4362GH264	9621	990	817	339	333	MH4362GV264	11622	990	826	376	444
MH4362GH276	9621	990	850	342	333	MH4362GV276	11622	990	860	379	444
MH4362GH288	9621	990	884	345	333	MH4362GV288	11622	990	894	381	444
MH4420GH312	10955	1530	958	388	344	MH4420GV312	13495	1530	977	466	3334
MH4420GH330	10955	1530	1009	392	344	MH4420GV330	13495	1530	1029	470	3334
MH4420GH336	10955	1530	1026	393	344	MH4420GV336	13495	1530	1046	471	3334
MH4420GH360	10955	990	1093	384	344	MH4420GV360	13495	990	1113	461	3334
MH4420GH372	10955	990	1127	386	344	MH4420GV372	13495	990	1147	464	3334
MH4420GH378	10955	990	1144	387	344	MH4420GV378	13495	990	1163	465	3334
MH4420GH390	10955	990	1177	390	344	MH4420GV390	13495	990	1197	468	3334
MH4420GH396	10955	990	1195	392	344	MH4420GV396	13495	990	1215	470	3334
MH4420GH420	11622	990	1266	408	444	MH4420GV420	13495	990	1199	474	3334

Seismic Performance of MH4 Arresters per IEEE 693-2005
 High (1.0g ZPA) for all 2-unit and 3-unit arresters
 2721453076 subbase recommended for multi-unit arresters

H5 Porcelain Housed IEC Class 5 Arrester



Terminal Options

- ◆ A standard 4-hole suspension cap and standard ground terminals similar to the Class 3 and 4 arresters are available for the H5 arrester family.
- ◆ Due to the extremely high system voltages, various other terminal options exist to meet your connection requirements.
- ◆ Please consult your Hubbell Power Systems representative to discuss these additional connection options.

H5 Protective Characteristics

U _r (kV)	U _c (kV)	Max steep current impulse residual voltage at indicated current (1)	Max switching impulse residual voltage at indicated current		Max lightning impulse residual voltage at indicated current				
			20 kA	0.5 kA	2 kA	5 kA	10 kA	20 kA	40 kA
			kV	kV	kV	kV	kV	kV	kV
396	316.8	1082	727	770	804	865	909	972	
420	336.0	1142	771	816	853	917	964	1031	
444	355.2	1202	815	863	902	970	1019	1090	
588	470.4	1613	1079	1143	1194	1284	1349	1444	
612	489.6	1672	1123	1189	1243	1337	1404	1502	

(1) Max residual voltage for a 20 kA impulse current wave with virtual front time of 1 μs.

H5 Physical Characteristics

Catalog Number	U _m (kV)	U _r (kV)	U _c (kV)	Site Pollution Severity Class: Medium				
				Creepage Distance (mm)	Height "H" (mm)	Grading Ring Dia. "D" (mm)	H5 Figure Number	Weight (kg)
H5550GM396AA	550	396	316.8	11001	4864	1530	1	1064
H5550GM420AA	550	420	336.0	11001	4864	1530	1	1070
H5550GM444AA	550	444	355.2	11001	4864	1530	1	1075
H5800GM588AA	800	588	470.4	16716	7503	2286	2	1695
H5800GM612AA	800	612	489.6	16716	7503	2286	2	1701

Arrester FAQs

1. What is the difference between a grading ring and a corona ring?

A grading ring is used to ensure a uniform voltage distribution along the length of an electrical device. This is important for surge arresters so that each MOV block in the arrester is energized at the appropriate voltage. The ring mounts downwards from the top of the arrester along the length of the graded blocks.

A corona ring is traditionally used to electrically shield external hardware to prevent corona discharge effects from developing. This corona could lead to degradation of insulating materials or create interference to electronic communication. The ring mounts upwards like a crown from the top of the arrester. Surge arresters below 500KV system voltage do not typically need corona rings.

2. How do I know if I need a grading ring or corona ring for my arrester?

The Hubbell/Ohio Brass Engineers have performed all necessary electric field calculations to make this decision. Therefore, all of our surge arrester part numbers already include rings if required and the end user does not specify the rings – they ship automatically with the arrester, stacked on a separate pallet.

3. Why is the system grounding type important to consider when selecting the U_c/U_r rating?

The type of grounding determines the amount of neutral shift during a fault on the power system. The resulting TOV on the arrester could damage it unless the arrester rating is up-sized properly. Your Hubbell Power Systems sales representative can help with the selection of the proper size arrester for your application.

4. How do I use the pressure relief rating value in making an arrester selection?

If a surge arrester fails it will become shorted and can conduct the available short-circuit current in the substation. To minimize the possibility of a catastrophic failure, the selected arrester should have a pressure relief rating that is greater than the short-circuit current available in the substation.

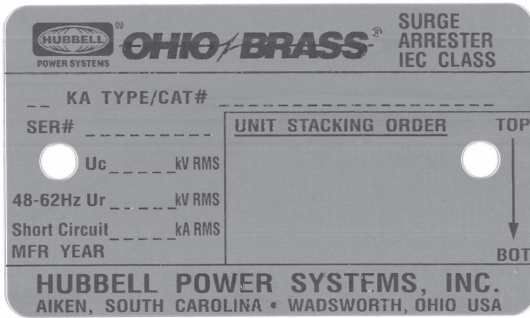
5. What routine maintenance and testing does Hubbell Power Systems recommend for station class surge arresters?

Hubbell Power Systems arresters are designed to provide years of operating service outdoors without any required maintenance or testing. The most commonly performed maintenance is pressure washing of the housing. The most commonly performed field test of arrester health is in-service infrared analysis to determine if the arrester shows a long term trend of increasing heat buildup which may indicate replacement is needed if the heat becomes excessive.

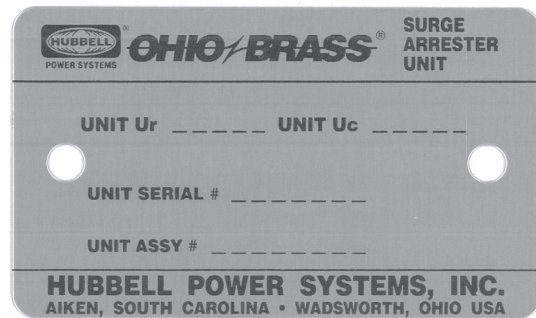
6. I have a question that is not covered in this section.

We'll be happy to answer any of your arrester questions and we design customized arresters to meet many application needs. Just contact your local Hubbell Power Systems sales representative or call our main customer service line at (+1) 573.682.5521.

Common Arrester Accessories / Hardware



Arrester nameplate attached to bottom unit of each arrester



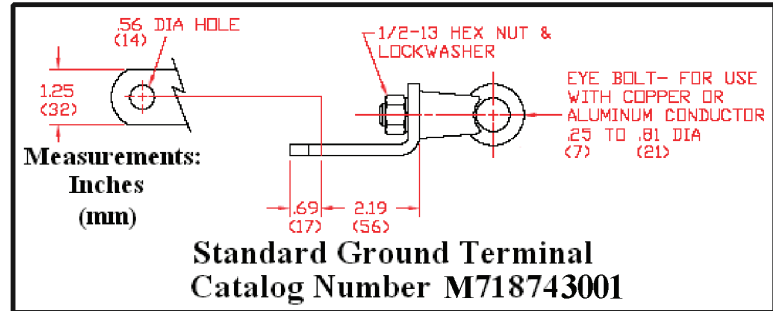
Unit nameplate attached to every unit of arrester.

NOTE: Additional information can be engraved on a blank nameplate. Requires custom catalog number.

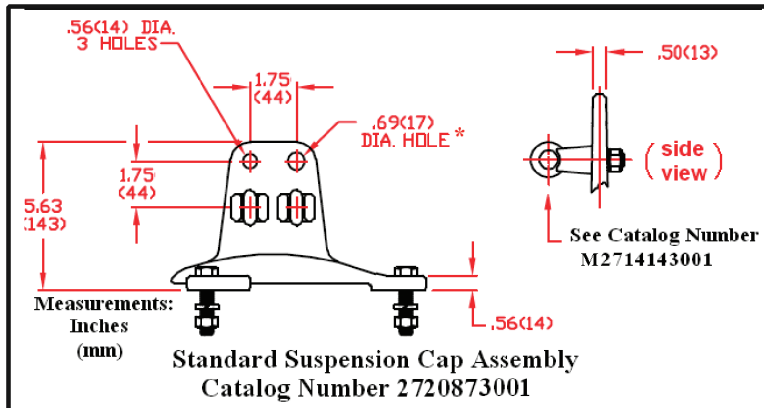
Standard ground terminal includes HDG L-bracket and clamp terminals sized for conductor 7-21 mm dia. (25-250 mm²)



Standard Ground Terminal Assembly



Standard Suspension Cap



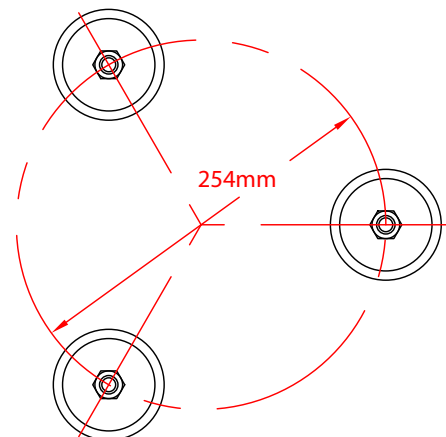
*NOTE: 17 mm hole used for lifting hook.



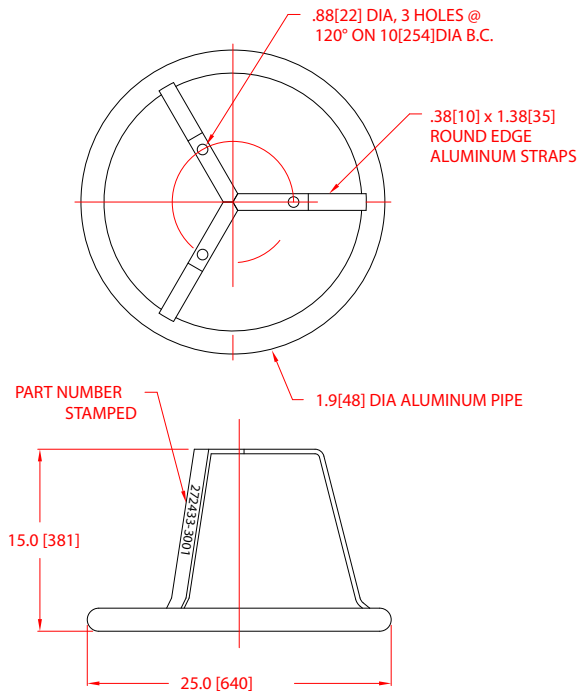
HDG suspension cap with integrated 4-hole NEMA pad is furnished with all MH3, MH4, PH3, PH4 arresters to fit the 254mm bolt circle.

The oversized 17mm hole is provided to be used with a lifting hook and crane.

All MH3, MH4, PH3, PH4 arresters mount to a 254mm bolt circle, which may include sub-bases (see page 5).

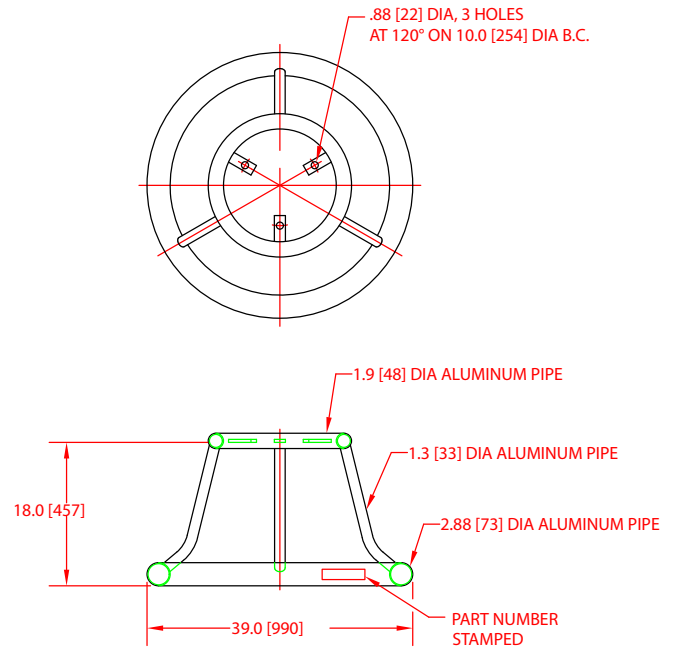


Grading Ring Drawings



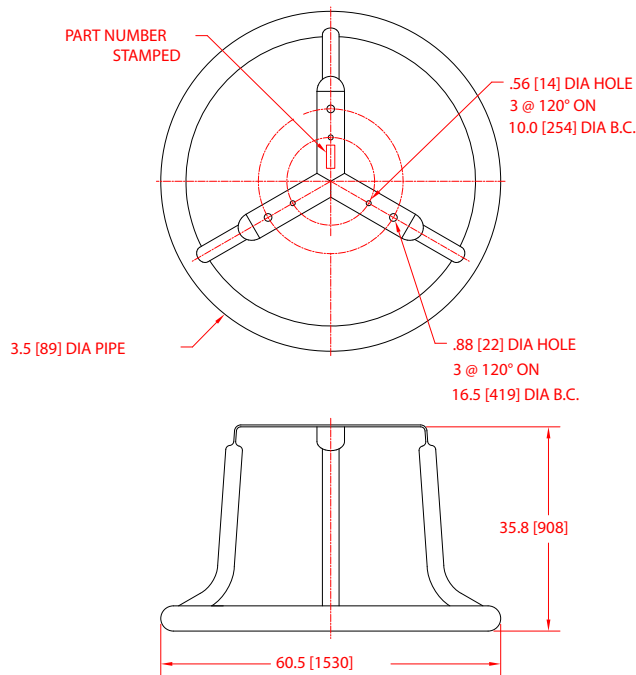
NOTE:
1) DIMENSIONS ARE IN INCHES [MILLIMETERS]

640 mm Ring 272433-3001



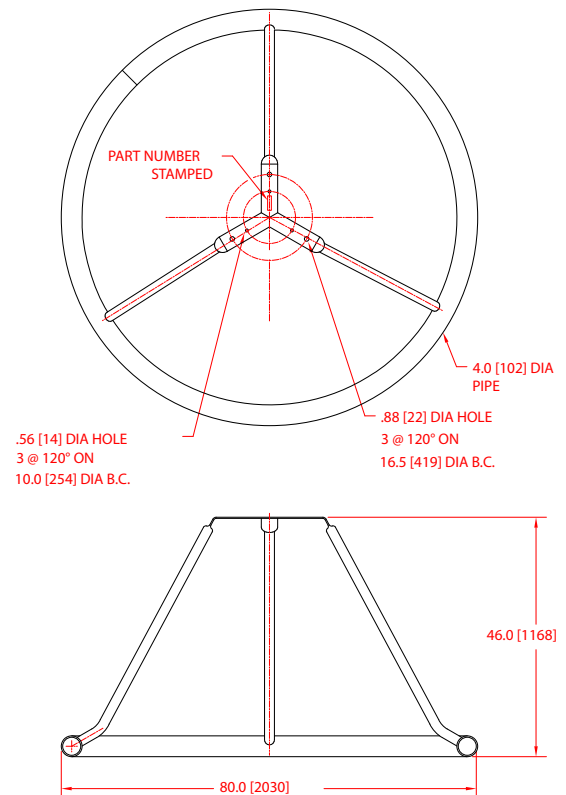
NOTES:
1) DIMENSIONS ARE IN INCHES [MILLIMETERS]

990 mm Ring 272807-3001



NOTE:
1) DIMENSIONS ARE IN INCHES [MILLIMETERS].

1530 mm Ring 274296-3001



NOTE:
1) DIMENSIONS ARE IN INCHES [MILLIMETERS].

2030 mm Ring PSB274008-3001



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