Energy Division

Bowthorpe EMP
Distribution Metal Oxide Surge Arrester
DAH Series (IEEE) Heavy Duty

Tyco Electronics

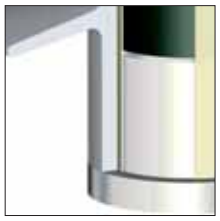
Our commitment. Your advantage.

DAH Series

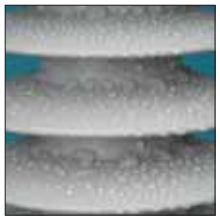
Tyco Electronics' Bowthorpe EMP business group pioneered the development of polymeric composite housed surge arresters in the early 1980's and since then has proven service experience across the globe, operating in the world's toughest environments. DA Series surge arresters provide active over voltage protection that contributes directly to improved reliability of your system, reducing lost minutes and protecting expensive assets.

Tyco Electronics Bowthorpe EMP DA silicone surge arresters have been designed and tested to meet customers' demand for reliability and improved operational performance. DA development was based on 30 years of experience in arrester design and manufacturing within the Tyco Electronics Energy Division.

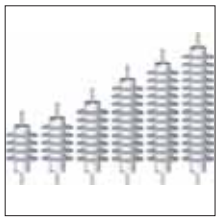
The DAH series is qualified to the latest revision of IEEE C62.11, (2005) and all reports are independently certified.



Sealing:
All arrester cores are encapsulated in silicone insulating housing. A permanent chemical bond connects the arrester core and the non-tracking silicone housing. This invisible interface prevents moisture from entering during severe thermal fluctuations due to normal climatic and energy absorption events.



Polymer housing:
Non-tracking and hydrophobic silicone insulating material is used for DA arrester housings. The DA surge arrester series is available with standard or extra leakage distance. The housing material has proven performance in long term TERT and UV aging tests and proven resistance to flammability.



Integrated design:
Manufacturing integrates all components in a single piece. There are no glued interfaces. The design is void and gap free ensuring peak performance under the harshest conditions.

Reliable and consistent GLD
The robust ground lead disconnect (GLD) offers operational reliability and consistency. It was designed to operate in event of arrester failure, removing ground connection and fault from line. It can be shipped and stored restriction free.

Safe mode of failure:
Our high energy arresters are tested in accordance with the short circuit mode of failure test in IEEE C62.11, (2005). This testing has proven the DAH's safe and predictable failure characteristics.

Quality:
The DAH series arrester is manufactured to international quality standards in Tyco Electronics production facilities. We perform 100% routine testing on arresters:
1) Visual inspection
2) Reference voltage test
3) Power loss test
4) Partial discharge test

Summary of Heavy Duty Arrester (DAH) series technical characteristics

Ur (kV)	3.5 – 36
In (kA)	10
High current impulse (kA)	100
Arrester type	Heavy duty
Long duration current (A /µs)	250 / 2000
10s TOV (kV)	1.4 * MCOV
High current short circuit (kA)	21
Arrester technology	ZnO gapless Mold in place

DAH Series

Qualification testing:
The following IEEE C62.11, (2005) design type tests have been carried out on the DA series arresters:

1) Arrester insulation withstand tests
2) Discharge-voltage characteristics
3) Accelerated aging procedure
4) Accelerated aging tests of external polymeric insulating systems
5) Accelerated aging of the polymer housing with exposure to salt fog (rotating wheel)
6) Contamination test
7) Distribution class surge arrester seal integrity design test
8) Partial Discharge tests
9) High-current short-duration withstand test
10) Low-current long-duration withstand test
11) Duty-cycle tests
12) TOV tests
13) Short-circuit test for polymer housed distribution arresters
14) Distribution arrester disconnector tests
15) Mechanical tests

The silicone insulating material has been designed and optimized for arrester application. The following additional testing was performed in the qualification of the silicone:

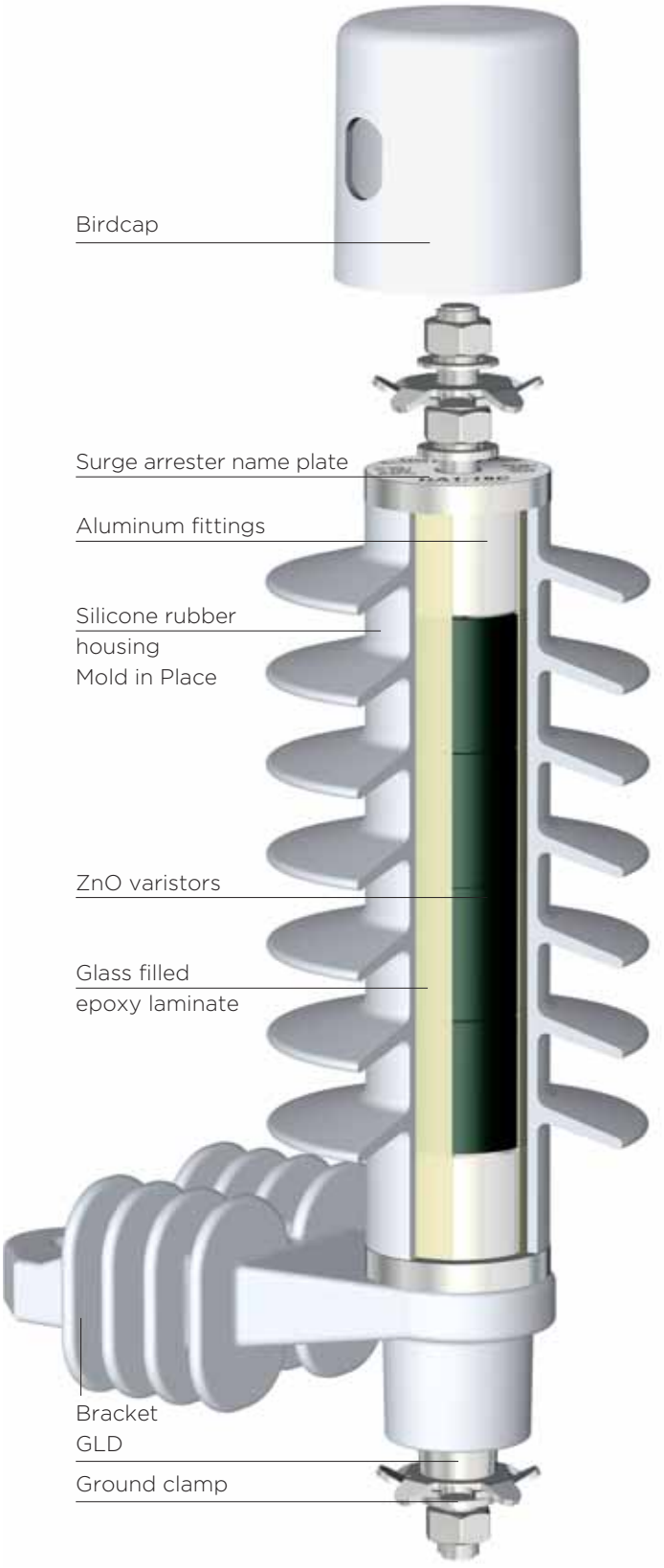
1) Tracking and Erosion
2) UV testing
3) Thermal endurance
4) Dielectric testing
5) Flammability testing.
6) Long term water immersion testing

Production and Quality:
All Tyco Electronics arrester production facilities have implemented QC and QA procedures according to international standards to ensure test programs that guarantee quality conforming products. 100% of all varistors are tested and stamped with unique varistor residual and reference voltage. The following tests are performed on varistors:

1) Residual voltage
2) Reference voltage
3) Leakage current
4) Physical examination to screen damaged varistors
5) LOT test: High current impulse test
6) LOT test: Aging test

At the end of the arrester assembly process, the following mandatory IEEE tests are completed on every arrester:

1) Visual inspection
2) Reference voltage test
3) Power loss test
4) Partial discharge testing



DAH Series

Application:
Designed and optimized to protect distribution assets including transformers and cable-end terminations from lightning and switching surge related over-voltages.

Generic technical data:	
DAH series	3.5 - 36 kV
Rated discharge current (8/20µs):	10 kA
Heavy Duty Arrester	IEEE C62.11, (2005)
Operating duty impulse withstand current (4/10µs):	100 kA
Long duration current impulse (2000µs):	250 A
10 second TOV, (kV)	1.4 * MCOV

Mechanical data	
Cantilever	258 ft.-lbs
Tension	450 lbf
Torque	36.9 ft.-lbs

Bowthorpe EMP DAH series surge arrester benefits:

Tested in accordance with IEEE 62.11, 2005

Direct molded housing to prevent moisture ingress

Low residual voltages

High-energy handling

Safe non-shattering short circuit behavior to higher current levels

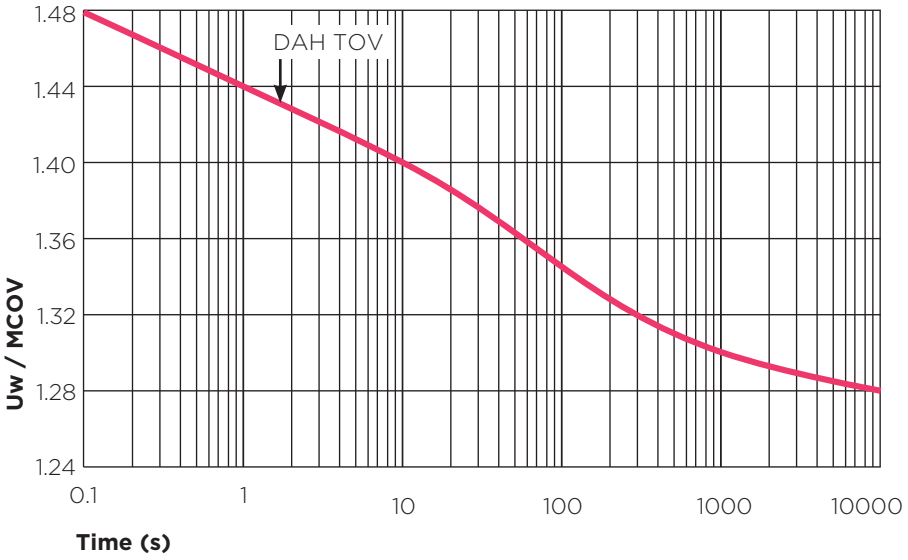
Maintenance free

Hydrophobic silicone housing: (Tracking and erosion resistant)

Excellent cantilever and tensile performance

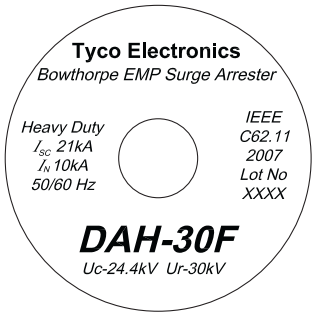
Quality design and manufacturing meeting international standards

Temporary over-voltage curve (TOV)



Uw = TOV withstand voltage; Ur = Rated voltage

Sample product marking, DAH-30F



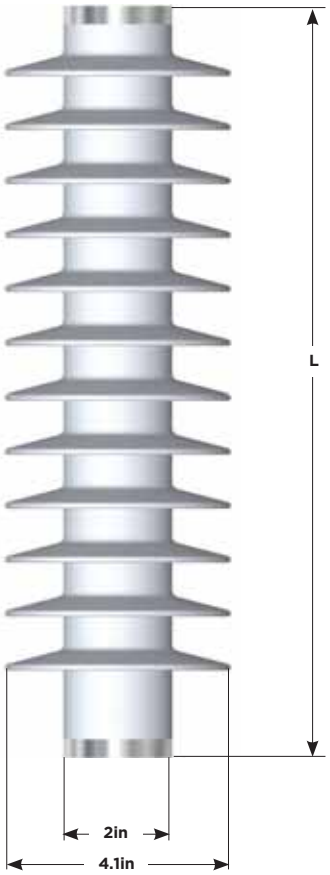
DAH Series

DAH series arrester standard electrical data:

Part Number	Ur kV	MCOV kV	Front of wave	Residual voltage in kV when tested to the following test waveforms: Lightning (8/20µs)						Switching
				1.5kA	3kA	5kA	10kA	20kA	40kA	500A
DAH-04	3.5	2.95	11.1	8.9	9.4	9.8	10.5	11.6	12.6	8.3
DAH-06	6.0	5.10	19.1	15.3	16.1	16.9	18.0	19.9	21.6	14.2
DAH-09	9.0	7.65	28.6	22.9	24.2	25.3	27.0	29.9	32.4	21.3
DAH-10	10.0	8.40	31.8	25.5	26.8	28.1	30.0	33.2	36.0	23.6
DAH-12	12.0	10.2	38.1	30.5	32.2	33.7	36.0	39.8	43.2	28.4
DAH-15	15.0	12.7	47.7	38.2	40.3	42.1	45.1	49.8	54.0	35.5
DAH-18	18.0	15.3	57.2	45.8	48.3	50.6	54.1	59.7	64.8	42.5
DAH-21	21.0	17.0	66.7	53.5	56.4	59.0	63.1	69.7	75.6	49.6
DAH-24	24.0	19.5	76.3	61.1	64.4	67.4	72.1	79.6	86.4	56.7
DAH-27	27.0	22.0	85.8	68.7	72.5	75.8	81.1	89.6	97.2	63.8
DAH-30	30.0	24.2	95.3	76.4	80.5	84.3	90.1	99.5	108.0	70.9
DAH-36	36.0	29.0	114.4	91.6	96.6	101.1	108.1	119.4	129.6	85.1

DAH series arrester standard housing parameters:

Housing code	Leakage	Flash over distance	Dry lightning (1.2 / 50)	10s Wet withstand	Height	Weight
	inches	inches	kV	kV	inches	lb
A	12.95	5.98	150	45	5.79	2.64
B	15.9	6.97	170	55	6.77	2.97
C	21.77	8.94	199	74	8.74	3.96
E	27.64	10.9	219	86	10.7	4.84
F	30.55	11.89	253	95	11.72	5.72
G	36.42	13.86	254	115	13.7	6.45



Housing and Ur compatibility:

Ur	Housing code: A	B	C	E	F	G
Leakage:	12.95	15.9	21.77	27.64	30.55	36.42
3.5	●	■				
6	●	■				
9	●	■				
10	●	■	■			
12	●	■	■			
15		●	■	■		
18			●	■	■	
21			●	■	■	
24				●	■	
27					●	■
30					●	■
36					●	■

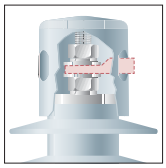
● standard housing ■ optional housing

DAH Series Arrester Ordering Information:

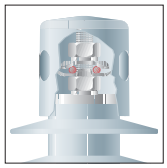
Z	Z	Z	-	Y	Y	M	-	1	2	3	4	5	6	-	P

Naming convention cross reference:
ZZZ = series type: DAH for 10kA, heavy duty arrester
YY = Ur
M = Housing code (see page 5)

1 Line lead accessories

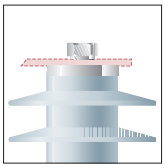


Bxxxxx
Birdcap with F accessory



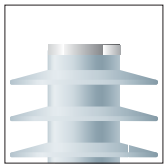
Exxxxx
Birdcap with M accessory

Fxxxxx
1.7" stud for lug connection



Hxxxxx
Cap screw & spring washer

Mxxxxx
1.7" stud for line lead connection

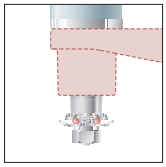


Oxxxxx
No stud. No accessories

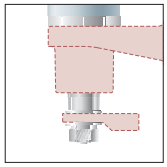
2 Line lead options

x0xxxx	No line lead wire
x1xxxx	18" No. 6 AWG copper line lead with one 3/8" lug
x2xxxx	36" No. 6 AWG copper line lead with one 3/8" lug
x3xxxx	36" No. 6 AWG copper line lead with no lug
x4xxxx	18" No. 4 AWG copper line lead with one 3/8" lug
x5xxxx	36" No. 4 AWG copper line lead with one 3/8" lug
x6xxxx	36" No. 4 AWG copper line lead with no lug
x8xxxx	36" No. 6 AWG copper line lead with two 3/8" lugs

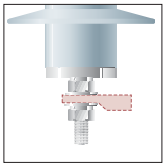
3 Ground lead accessories:



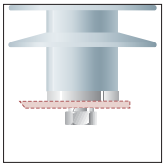
xxDxxx
Disconnect + M accessory



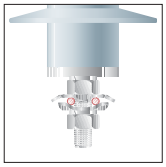
xxExxx
Disconnect + F accessory



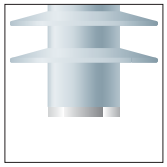
xxFxxx
1.7" stud for lug connection



xxHxxx
3/8"*1"
Cap screw & spring washer



xxMxxx
1.7" stud for line lead connection

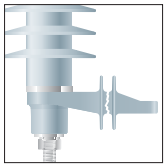


xxOxxx
No stud. No accessories

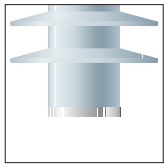
4 Ground lead options

xxx0xx	No Ground Lead Wire
xxx1xx	18" No. 6 AWG Copper Ground Lead with one 3/8" lug
xxx2xx	36" No. 6 AWG Copper Ground Lead with one 3/8" lug
xxx3xx	36" No. 6 AWG Copper Ground Lead with no lug
xxx4xx	18" No. 4 AWG Copper Ground Lead with one 3/8" lug
xxx5xx	36" No. 4 AWG Copper Ground Lead with one 3/8" lug
xxx6xx	36" No. 4 AWG Copper Ground Lead with no lug
xxx8xx	36" No. 6 AWG Copper Ground Lead with two 3/8" lugs
xxx9xx	12" No. 6 AWG Copper Ground strap

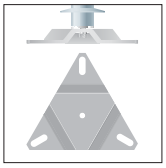
5 Mounting brackets:



xxxxBx
Insulating bracket

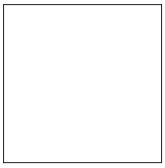


xxxxNx
No mounting accessories

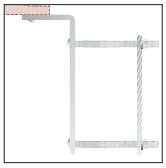


xxxxPx Pedestal mounting base

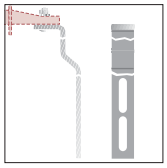
6 Mounting bracket options:



xxxxx0
No option



xxxxx1
NEMA cross arm bracket



Transformer mounting bracket

xxxxx2
8.7"

xxxxx3
11"

xxxxx4
12.25"

xxxxx5
Transformer mounting bracket
14.5"

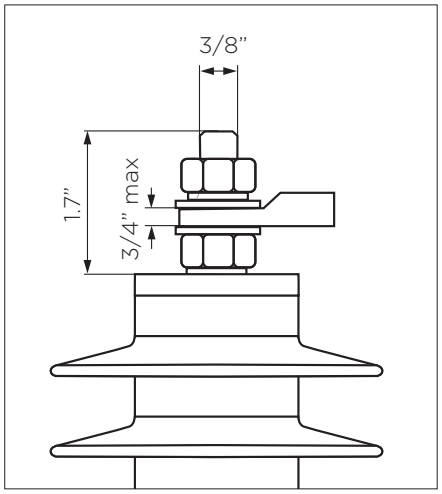
Packaging

I	Individual Packing
S	3 Pack
B	Bulk Packing

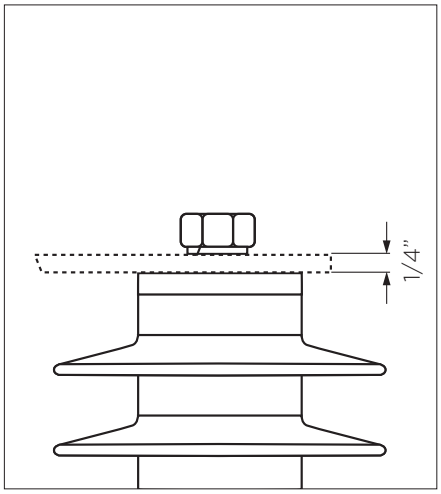
Additional accessories are available upon request

DAH Series Arrester Accessories

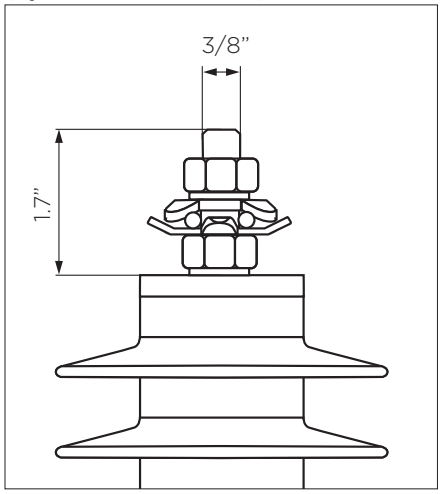
Fxxxxx & xxFxxxx:
Stainless steel lug connection



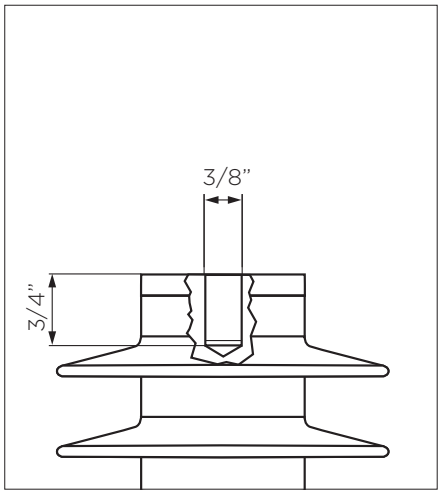
Hxxxxx & xxHxxx
Cap screw connection



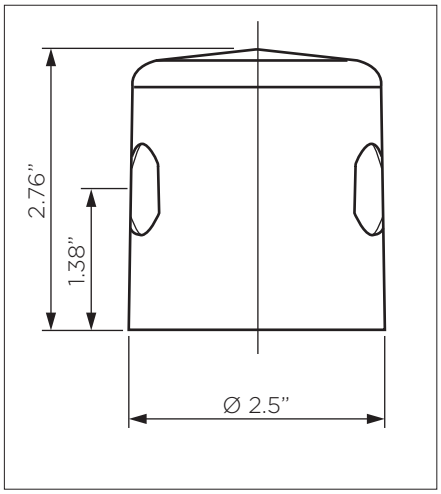
Mxxxxx & xxMxxxx:
Stainless steel line lead connection, (up to diameter 0.63”)



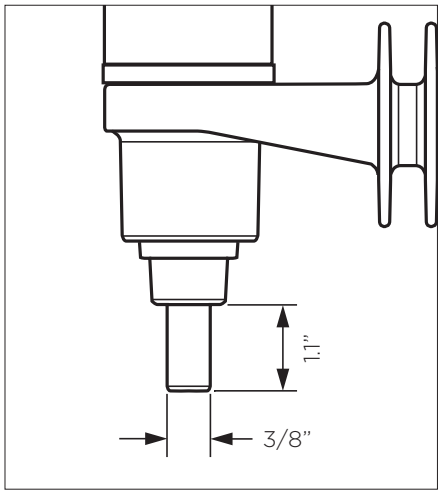
Oxxxxx & xxOxxx
No accessories



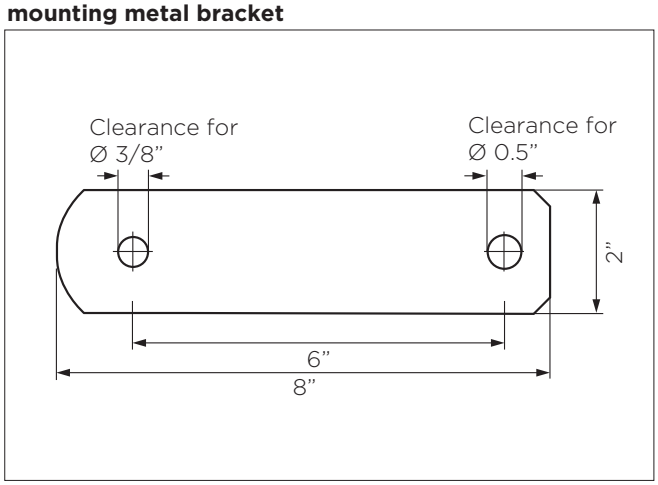
Bxxxxx & Exxxxx:
Tracking and erosion resistant bird protection cover



xxDxxx and xxExxx:
ground lead disconnect



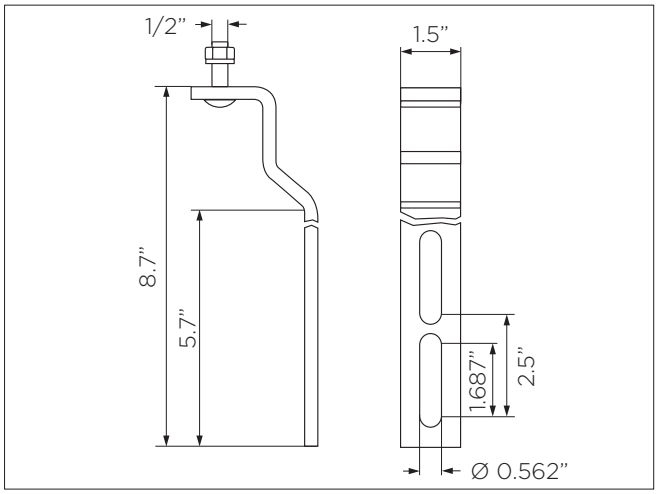
xxxxAx:
Galvanized steel Straight 2hole mounting metal bracket



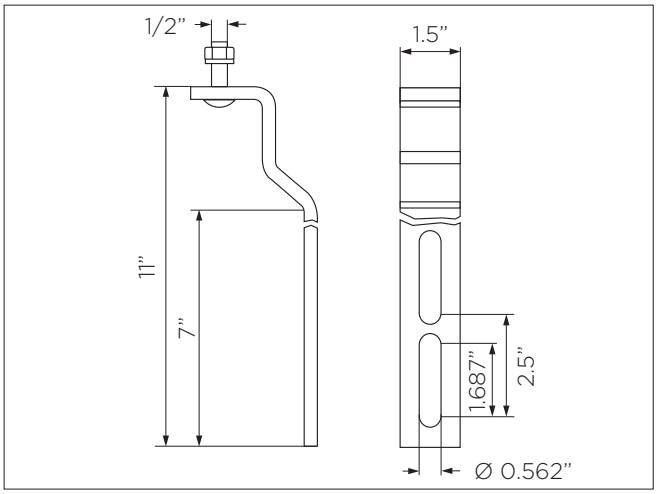
For additional accessory options, please contact your Tyco Electronics Energy sales engineer.

DAH Series Arrester Accessories

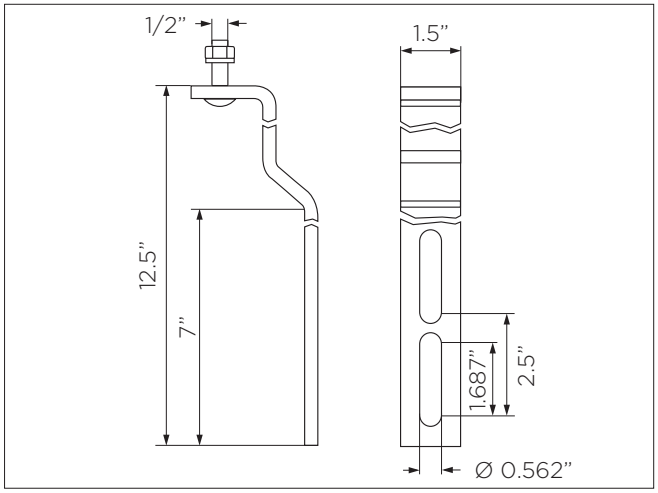
XXXXX2:
Galvanized transformer mounting bracket 8.7”



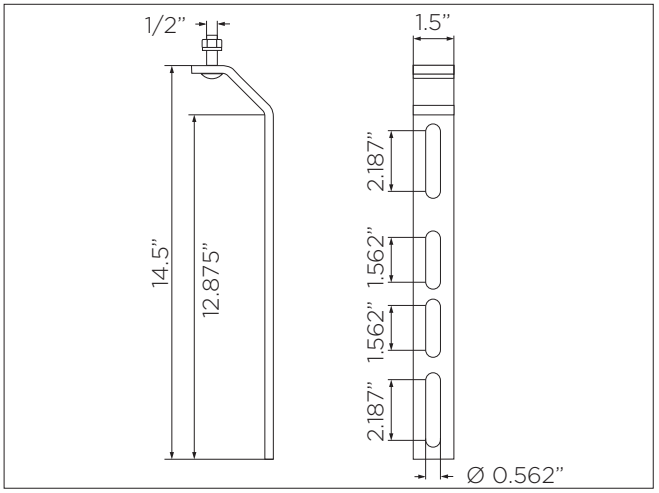
XXXXX3:
Galvanized transformer mounting bracket 11”



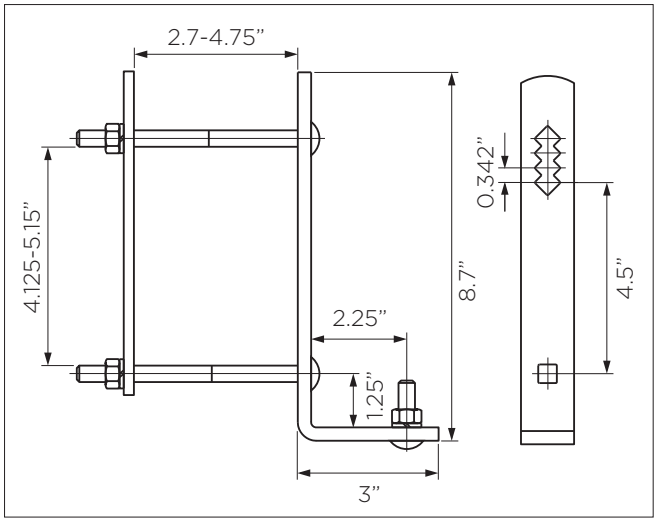
XXXXX4:
Galvanized transformer mounting bracket 12.25”



XXXXX5:
Galvanized transformer mounting bracket 14.5”



xxxxx1:
Galvanized steel NEMA cross arm mounting bracket



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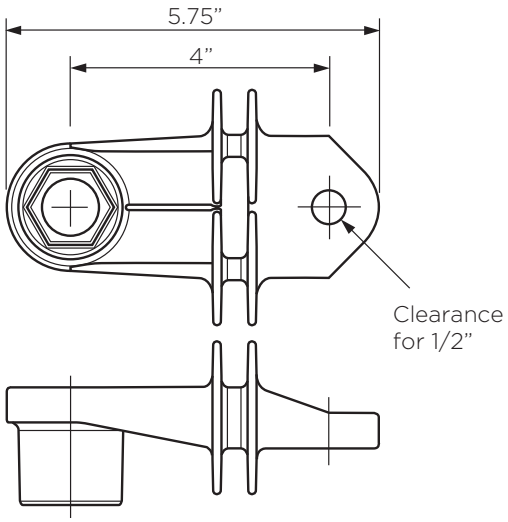
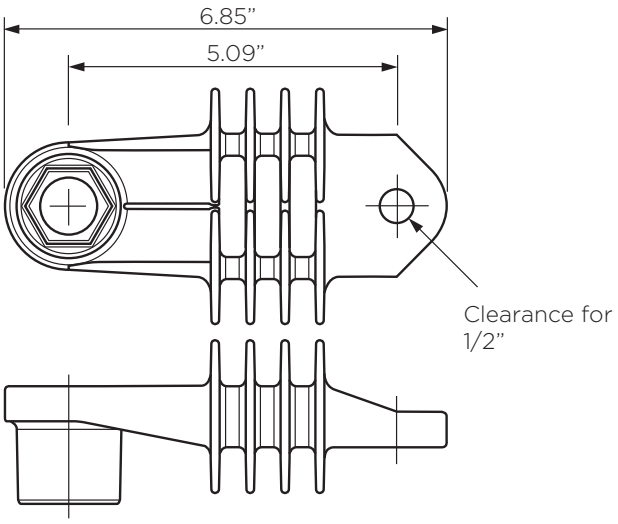
DAH Series Arrester Accessories

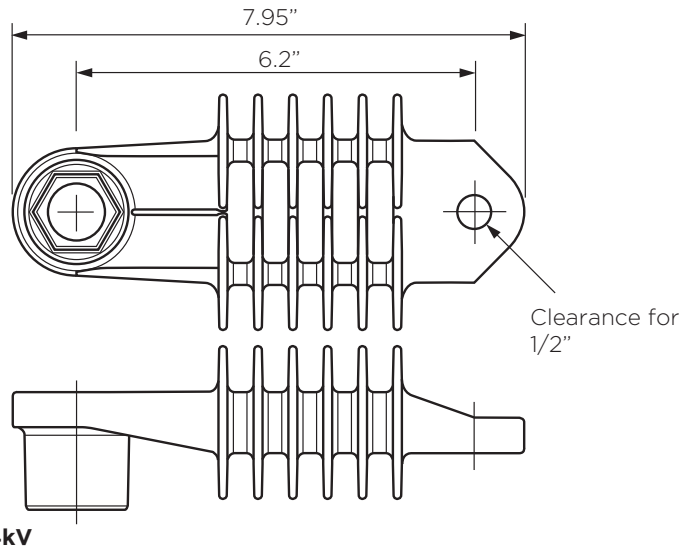
xxxxBx:
Insulating brackets



Ur <= 12kV



12kV < Ur <= 24kV

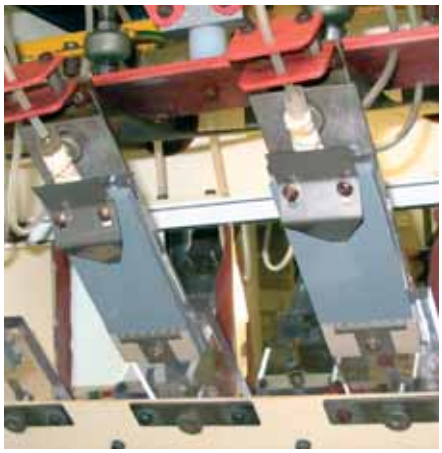


Ur > 24kV

Note:
xxxxBx can only be used with either xxDxxx or xxExxx accessory.

Other Bowthorpe EMP Distribution Surge Arrester Products

Typical application



Tracking and erosion test

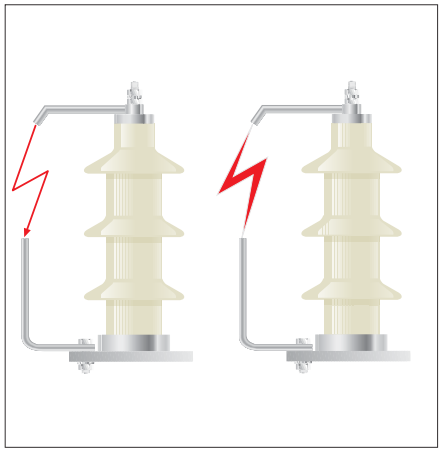
Hydrophobic silicone

Class 2 OCP series arrester

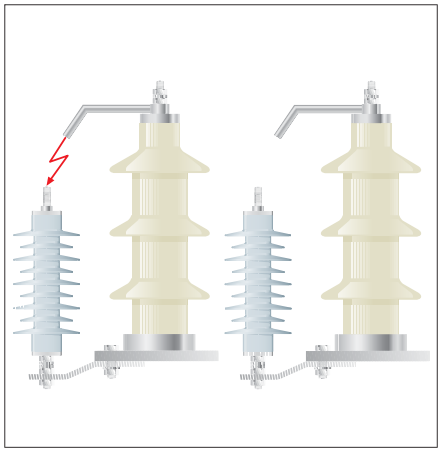
Tyco Electronics Bowthorpe EMP OCP2 surge arresters are used in overhead line to cable junction and substation protection applications. These arresters are manufactured using high energy and low residual voltage ZnO varistors, which display excellent thermal and current handling characteristics, delivering optimal protection.

Generic technical data:		
OCP2 series		3-41kV Uc
Rated discharge current (8/20µs):		10kA
Line discharge class 2 according to		IEC 60099-4
Operating duty impulse withstand current (4/10µs):		100kA
Long duration current impulse (2000µs):		530A
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		40kA
Energy	2 Long duration impulses:	6.0kJ/kVUc

Typical application



without CLX



with CLX

Protection for covered conductor systems

Tyco Electronics Bowthorpe EMP CLX protection for covered conductor systems is designed for lightning protection in overhead lines with covered conductors to prevent conductor breakage.

Generic technical data:		
CLX / MORE series		11-33kV systems
Rated discharge current (8/20µs):		10kA
Operating duty impulse withstand current (4/10µs):		65kA
Long duration current impulse (1000µs):		250A
High current short circuit: (pre-failing method)		25kA
Energy	2 Long duration impulses:	2.9kJ/kVUc

Tyco Electronics Arrester Overview

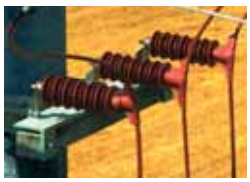
Type	Application	Rating [kA]	Line discharge class	Continuous voltage [kV] from	to
MV arresters for outdoor application					
DAR	Outdoor riser pole arrester	10	Riser	3.5	36
HDA	Outdoor high pollution application	10	1	3	41
OCP2	Outdoor Cable and substation protection	10	2	3	41
Arresters for protection systems					
CLX	Protection of covered conductor systems	10	1	3	36
MV arresters for indoor application					
RDA	Protection of gas insulated switchgear	10	1	3	26
SPA	Protection of air insulated switchgear	10	1	3	36
MPA	Motor protection	10	1	3	6
CPA	Cable sheath protection	10	1	3	6
RSTI-SA	Screened separable surge arrester	5, 10	n.a.	12	24
LV arresters					
LVA	Transformer secondary protection	10	n.a.	0,28	0,441
Arresters for railway application					
HE60	DC railway protection	10	n.a.	1	6

Tyco Electronics Energy Division total commitment to quality

Even the best technology must be backed up by a thorough and consistent quality assurance program. At Tyco Electronics, we subject every product to an extensive quality control regimen. At every production stage, beginning with the raw materials and continuing through to the packaged product, the QC lab tests all physical and electrical characteristics which can influence performance.

By means of lot numbers, the Quality Assurance Program ensures traceability all the way to details of the compound batch test reports. Quality assurance at Tyco Electronics is not static, but a constantly improving process directed toward our goal of complete customer satisfaction. Tyco Electronics Energy Division arrester manufacturing sites are accredited to international quality standards. Our vendor routine tests and internal incoming inspection confirm performance of all critical components used in the assembly of our arresters.

Other Products Available from Tyco Electronics Energy Division

Asset protection	Insulation enhancement systems for substations and overhead. Designed to prevent unplanned outages due to accidental bridging and to help upgrade insulation levels at critical points in systems.	
Low-voltage surge arresters	LV arresters are used to provide protection for LV overhead lines, consumer in-house supplies, distribution transformers and other appliances.	
Medium-voltage surge arresters	Metal oxide varistor, distribution arresters for indoor and outdoor applications for protection of overhead lines, DC locomotives and switchgear applications.	
High-voltage surge arresters	Porcelain and polymeric series parallel and single column constructed arresters for protection of transmission systems up to 550 kV.	
Polymeric insulators	Insulators and insulating components/housings providing reliable solutions for power utilities and railway customers with installations in high pollution environments and applications up to 400 kV.	
Porcelain insulators	Insulators for applications up to system voltages of 132 kV. This range of insulators offers a cost-effective solution for low and medium polluted environments.	

Energy Division – innovative and economical solutions for the electrical power industry: cable accessories, connectors & fittings, insulators & insulation, surge arresters, switching equipment, lighting controls, power measurement and control.

Tyco Electronics Corporation
8000 Purfoy Road
Fuquay Varina, NC 27526-9349
Tel: 800.327.6996
Fax: 800.527.8350
E-mail: naenergy@tycoelectronics.com
www.tycoelectronics.com

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Our commitment. Your advantage.