Energy Division

DAH series (IEEE) Distribution metal oxide surge arrester

Tyco Electronics

Our commitment. Your advantage.

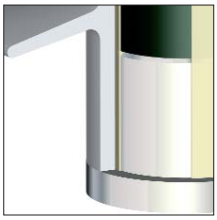
Tyco Electronics Bowthorpe EMP pioneered the development of polymeric composite housed surge arresters in the early 1980's and since then have a proven service experience across the globe, operating in the worlds toughest environments.

Bowthorpe EMP surge arresters provide active over voltage protection that contributes directly to improved reliability of your system, reducing lost minutes and protecting expensive assets.

Bowthorpe EMP "DA" silicone surge arresters have been designed and tested to meet our customers demands with reliability and offering superior operational performance., The DA development was based on 30 years of internal experience in arrester design and manufacture within the Tyco Electronics Energy Division.

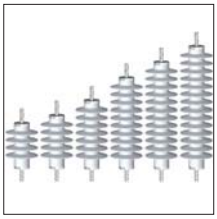
The DAH series is qualified to the latest revision of IEEE C62.11, (2005) and all our reports are independently certified.

The Bowthorpe EMP arrester is made possible by:
1) Proven moisture sealing technology
2) Non-tracking insulating silicone materials.
3) Fully integrated, single piece and void-less design.
4) Reliable ground lead disconnect
5) Safe mode of failure
6) Quality



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 series is available with standard or extra creepage distance. The housing material has proven performance in long term TERT and UV aging tests and proven resistance to flammability.



Integrated design:
Tyco Electronics Bowthorpe EMP 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. The arresters' virtual void-free construction eliminates moisture vapor transmission.

Reliable and consistent GLD
Our robust ground lead disconnect, (GLD) offers operational reliability and consistency. It was designed to operate in event of arrester failure, removing earth 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 series safe and predictable failure characteristics.

Quality:
The DA1 series arrester is manufactured in ISO accredited Tyco Electronics production facilities. We perform 100% routine testing on arresters:
1) Visual inspection
2) Reference voltage test
3) Partial discharge test

Summary Heavy Duty Arrester (DAH) 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)	1.36 * MCOV
High current short circuit (kA)	21
Arrester technology	ZnO gapless Mold in place

Reliability, quality and protection excellence

Qualification testing:
Decades of insulating materials, arrester design and development experience has been combined to create the DA series arrester. The basic construction comprises of high energy ZnO varistors, assembled within a flame retarded composite laminate tube. The following design IEEE C62.11, (2005) design type tests have been carried out on the DA series arresters:

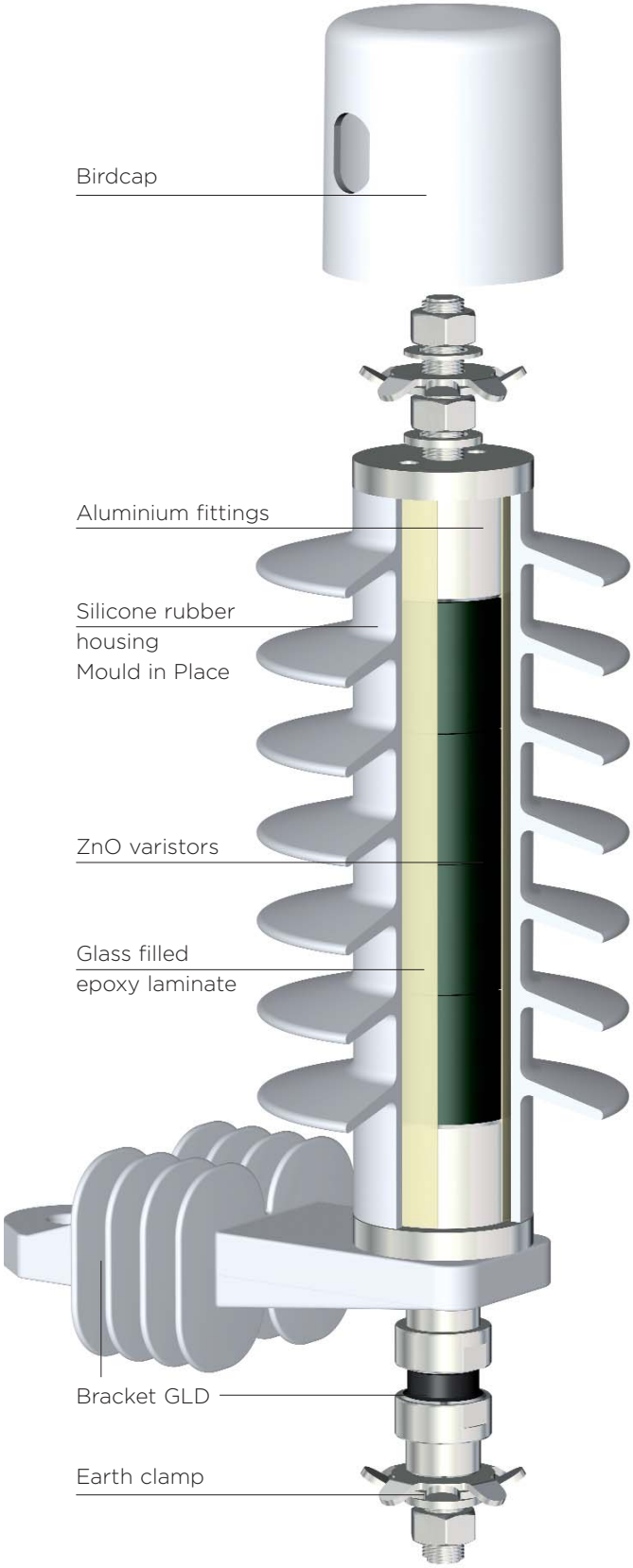
1) Arrester insulation withstand tests
2) Discharge-voltage characteristics
3) Accelerated aging procedure
4) Accelerated aging tests of external polymeric insulating systems
5) Accelerated aging of the polymer housing with exposure the salt fog (rotating wheel)
6) Contamination test
7) Distribution class surge arrester seal integrity design test
8) PD 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 optimised 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 our arrester production facilities are ISO accredited and internal procedures ensure test programs that guarantee quality confirming 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: visual inspection, reference voltage test, watt loss test and PD testing.



Application:
Protection of MV networks and equipment from lightning and switching surge related over-voltages. Designed and optimised to protect distribution assets including transformers and cable-end terminations.

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)	1.36 * MCOV

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

Bowthorpe EMP DAH benefits:

Tested in accordance with IEEE 62.11, 2005 at independent accredited laboratories

Direct moulded housing to prevent moisture ingress

Low residual voltages

High-energy handling

Safe non-shattering short circuit behavior to higher current levels

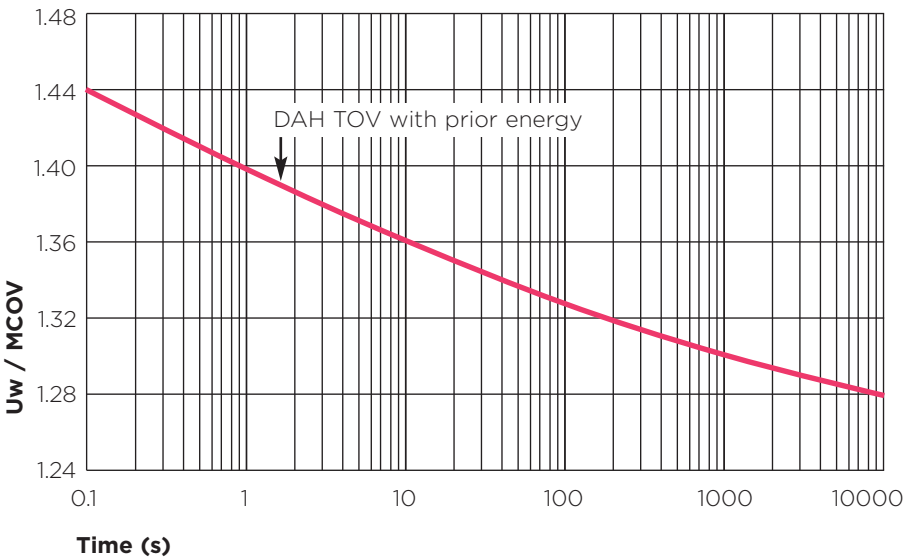
Maintenance free

Hydrophobic silicone housing: (Tracking and erosion resistant)

Excellent cantilever and tensile performance

Quality design and manufacturing, ISO 9001 compliant

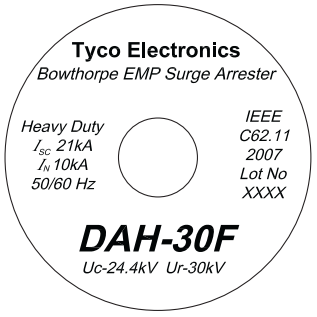
TOV of DAH with 100kA single shot high current prior energy



Temperature of samples (pre-heated): 60° C according to IEEE 62.11, 2005.
TOV Curve applies to an arrester which has a pre-stress applied prior to TOV verification.

Uw = TOV withstand voltage; Ur = Rated voltage

Sample product marking, DAH-30F



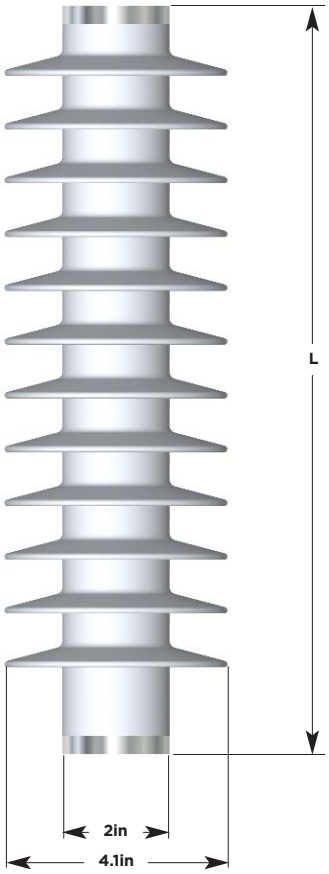
Reliability, quality and protection excellence

DAH series arrester standard electrical data:

Part Number	Ur	MCOV	Front of wave	Residual voltage in kV when tested to the following test waveforms Lightning (8/20µs)					Switching
				1.5kA	3kA	5kA	10kA	20kA	500A
DAH-04	3.5	2.95	11.1	8.9	9.4	9.8	10.5	11.6	8.3
DAH-06	6	5.1	19.1	15.3	16.1	16.9	18.0	19.9	14.2
DAH-09	9	7.65	28.6	22.9	24.2	25.3	27.0	29.9	21.3
DAH-10	10	8.4	31.8	25.5	26.8	28.1	30.0	33.2	23.6
DAH-12	12	10.2	38.1	30.5	32.2	33.7	36.0	39.8	28.4
DAH-15	15	12.7	47.7	38.2	40.3	42.1	45.1	49.8	35.5
DAH-18	18	15.3	57.2	45.8	48.3	50.6	54.1	59.7	42.5
DAH-21	21	17	66.7	53.5	56.4	59.0	63.1	69.7	49.6
DAH-24	24	19.5	76.3	61.1	64.4	67.4	72.1	79.6	56.7
DAH-27	27	22	85.8	68.7	72.5	75.8	81.1	89.6	63.8
DAH-30	30	24.2	95.3	76.4	80.5	84.3	90.1	99.5	70.9
DAH-36	36	29	114.4	91.6	96.6	101.1	108.1	119.4	85.1

DAH series arrester standard housing parameters:

Housing code	Creepage	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



Housing and Ur compatibility:

Ur	Housing code: A	B	C	E	F
Creepage:	329	404	553	702	776
3.5	●	■			
6	●	■			
9	●	■			
10	●	■	■		
12	●	■	■		
15		●	■	■	
18			●	■	■
21			●	■	■
24				●	■
27					●
30					●
36					●

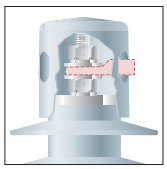
● standard housing ■ optional housing

DAH series arrester ordering information and accessory selection table:

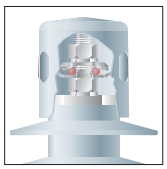
Z	Z	Z	-	Y	Y	M	-	1	2	3	4	5	6	-	P

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

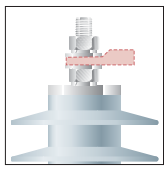
1 Line lead accessories



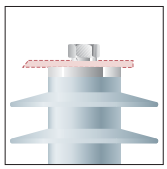
Bxxxxx
Birdcap with F accessory



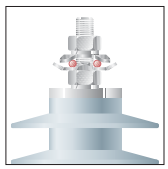
Exxxxx
Birdcap with M accessory



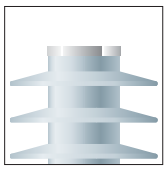
Fxxxxx
1.7in stud for lug connection



Hxxxxx
Cap screw & Spring Washer



Mxxxxx
1.7in stud for line lead connection

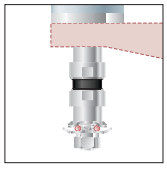


Oxxxxx
No Stud. No Accessories

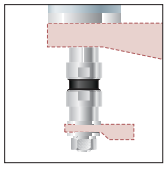
2 Line lead options

x0xxxx	No Line Lead Wire
x1xxxx	18in No. 6 AWG Copper Line Lead & one 3/8in lug
x2xxxx	36in No. 6 AWG Copper Line Lead & one 3/8in lug
x3xxxx	36in No. 6 AWG Copper Line Lead & no lug
x4xxxx	18in No. 4 AWG Copper Line Lead & one 3/8in lug
x5xxxx	36in No. 4 AWG Copper Line Lead & one 3/8in lug
x6xxxx	36in No. 4 AWG Copper Line Lead & no lug

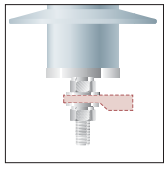
3 Ground lead accessories:



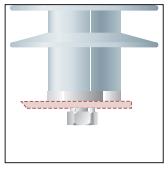
xxDxxx
Disconnect + M accessory



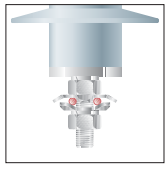
xxExxx
Disconnect + F accessory



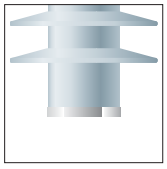
xxFxxx
1.7in stud for lug connection



xxHxxx
3/8in*25 Cap screw & Spring Washer



xxMxxx
1.7in stud for line lead connection

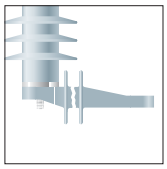


xxOxxx
No Stud. No Accessories

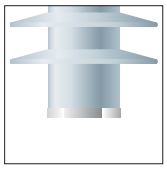
4 Ground lead options

xxx0xx	No Line Lead Wire
xxx1xx	18in No. 6 AWG Copper Line Lead & one 3/8in lug
xxx2xx	36in No. 6 AWG Copper Line Lead & one 3/8in lug
xxx3xx	36in No. 6 AWG Copper Line Lead & no lug
xxx4xx	18in No. 4 AWG Copper Line Lead & one 3/8in lug
xxx5xx	36in No. 4 AWG Copper Line Lead & one 3/8in lug
xxx6xx	36in No. 4 AWG Copper Line Lead & no lug

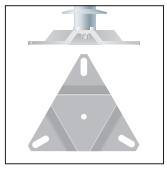
5 Mounting brackets:



xxxxBx
Insulating bracket



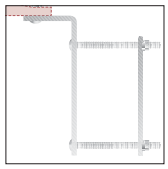
xxxxNx
No Mounting Accessories



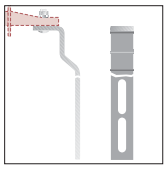
xxxxPx
Pedestal Mounting Base

6 Mounting bracket options:

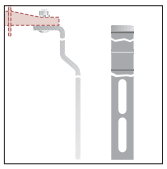
xxxxx0
No Option



xxxxx1
Metric Nema Cross Arm Bracket



XXXXX2
Transformer mounting bracket
8.7 inch



XXXXX4
Transformer mounting bracket
12.25 inch

XXXXX5
Transformer mounting bracket
14.5 inch

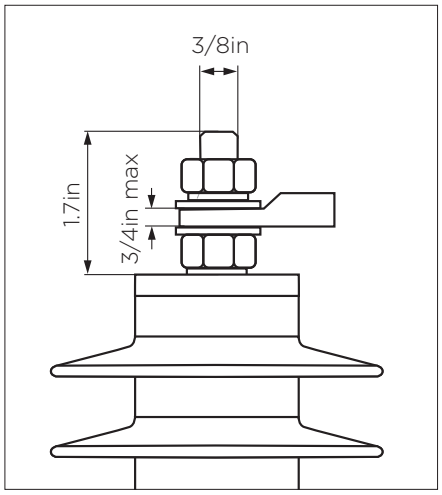
Packaging

I	Individual Packing (as standard)
S	Standard 3 Pack, (with accessories loose in boxes)
B	Bulk Packing

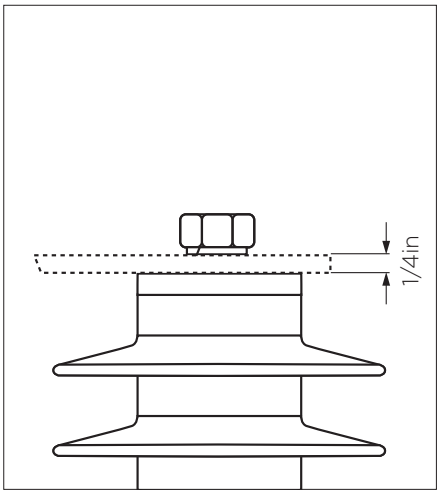
Additional accessories are available on request from surgearresters@tycoelectronics.com

DAH series accessories dimensions

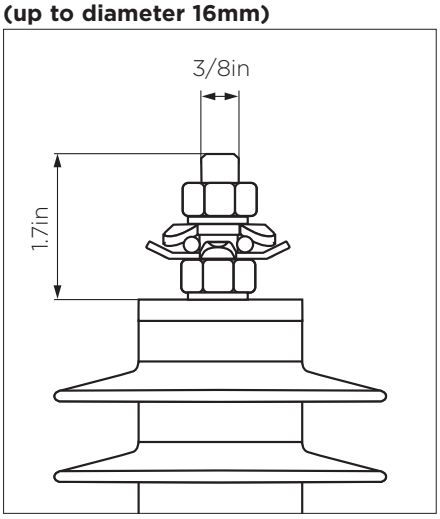
Fxxxxx & xxFxxxx:
Stainless steel lug connection



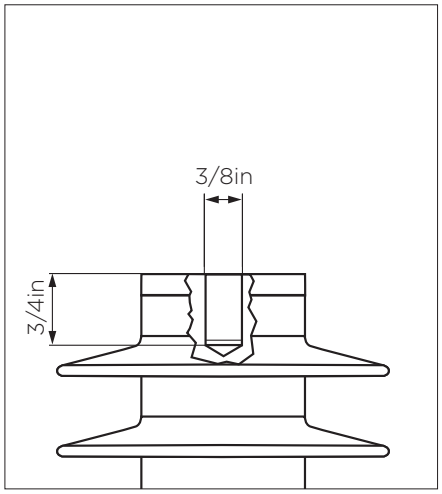
Hxxxxx & xxHxxx
Cap screw connection



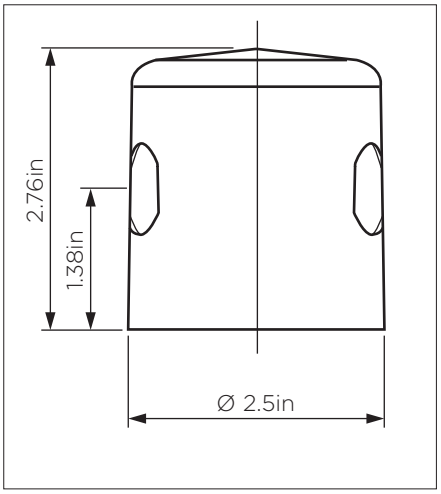
Mxxxxx & xxMxxxx:
Stainless steel line lead connection, (up to diameter 16mm)



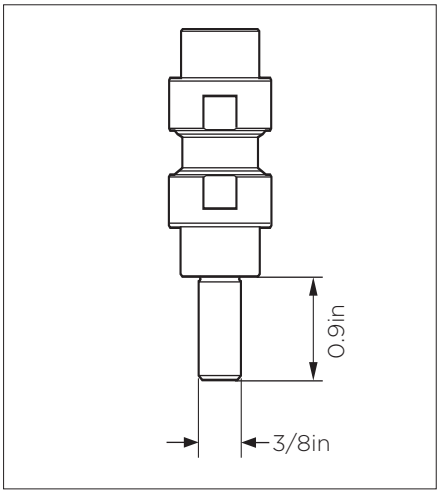
Oxxxxx & xxOxxx
No accessories



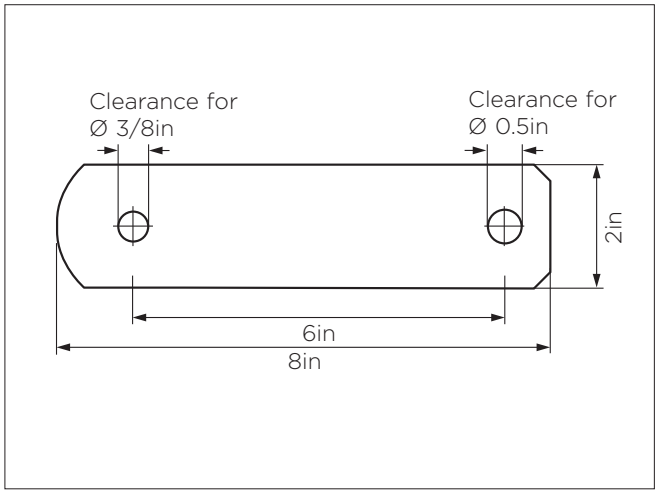
Bxxxxx & Exxxxx:
Tracking and erosion resistant bird protection cover



xxDxxx and xxExxx:
ground lead disconnect



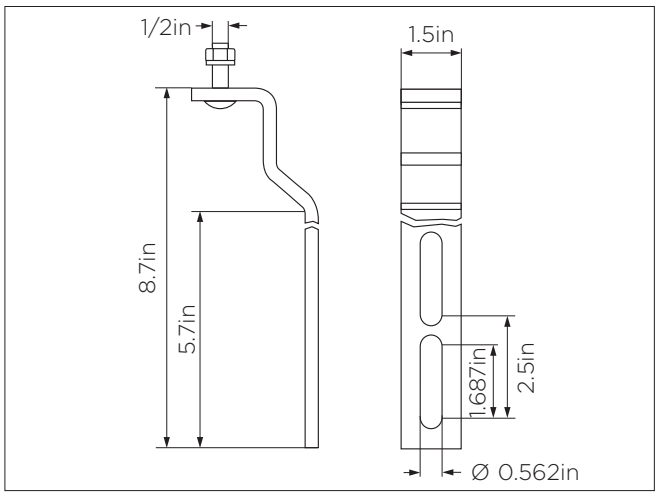
xxxxAx:
Galvanized steel Straight 2hole mounting metal bracket



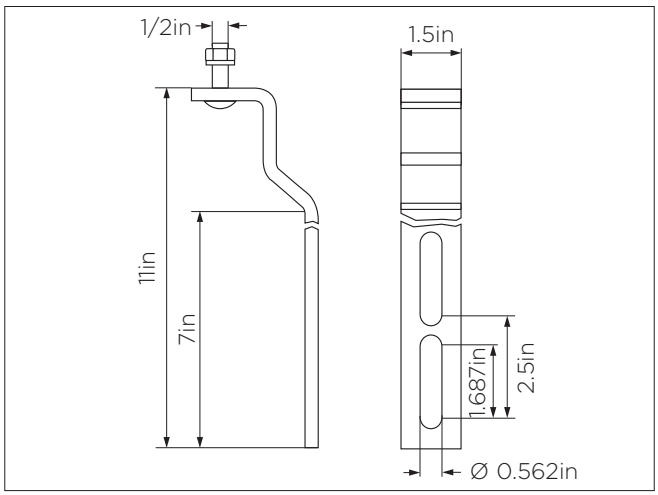
For addition accessory options,
please contact support team at:
surgearresters@tycoelectronics.com

DAH series accessories dimensions

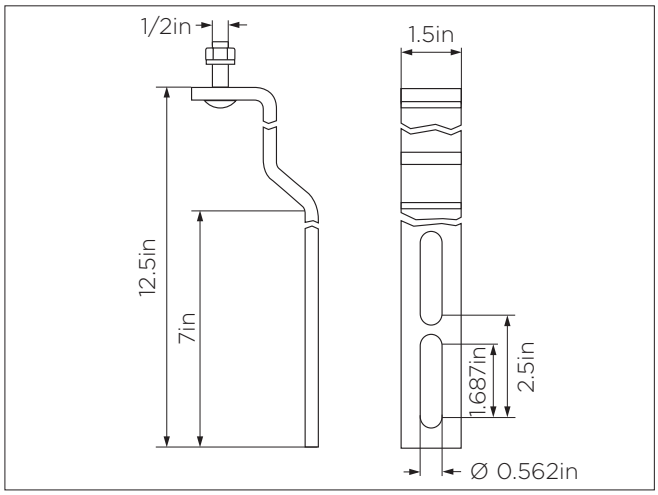
XXXXX2:
Galvanized transformer mounting bracket 8.7 inch



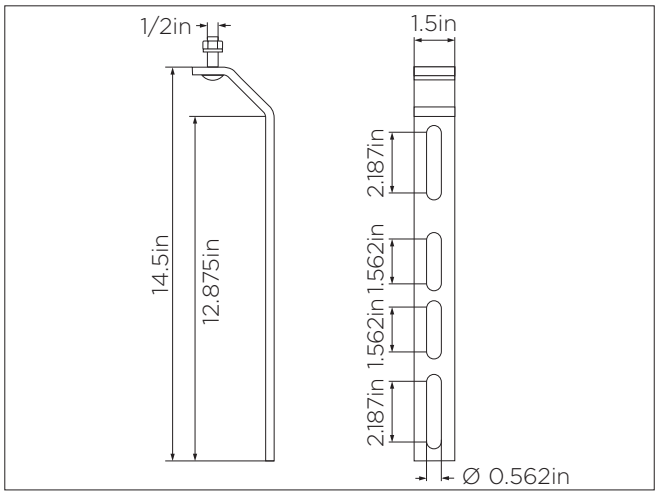
XXXXX3:
Galvanized transformer mounting bracket 11 inch



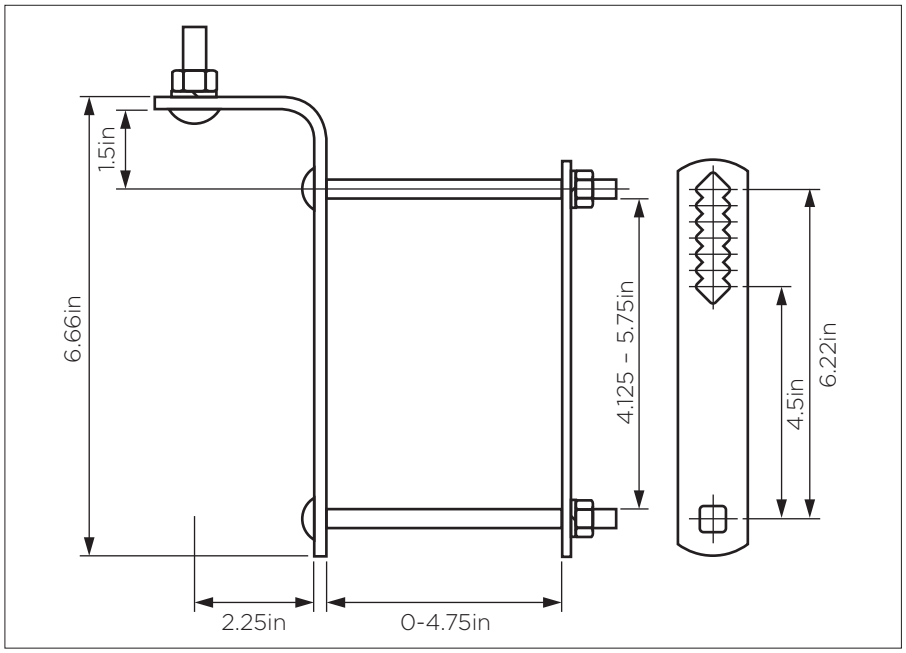
XXXXX4:
Galvanized transformer mounting bracket 12.25 inch



XXXXX5:
Galvanized transformer mounting bracket 14.5 inch



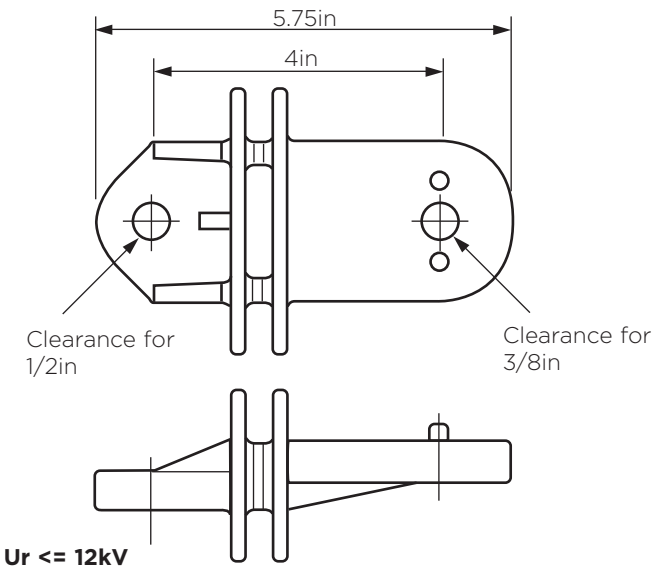
xxxxx1:
Galvanized steel NEMA cross arm mounting bracket



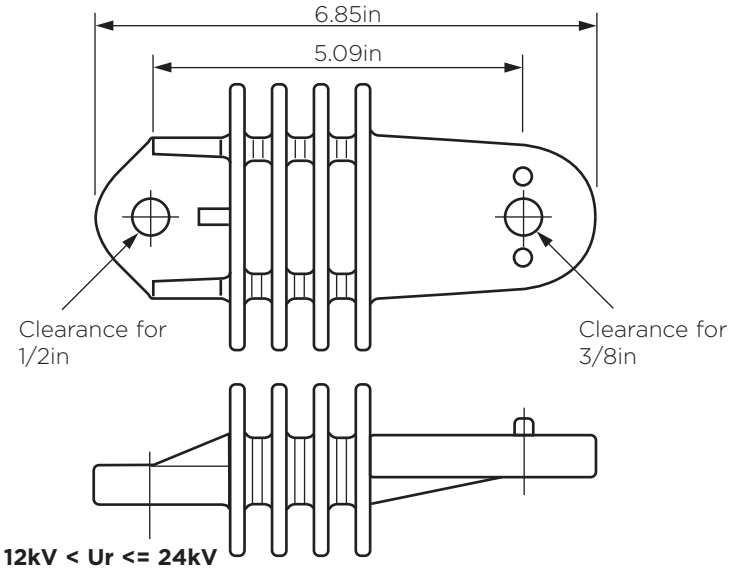
For addition accessory options,
please contact support team at:
surgearresters@tycoelectronics.com

DAH series accessories dimensions

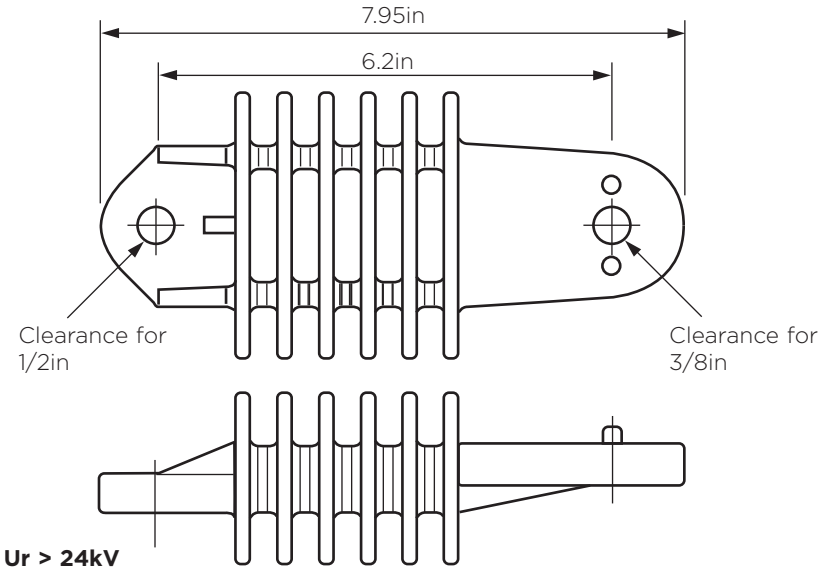
xxxxBx:
Insulating brackets



Ur <= 12kV



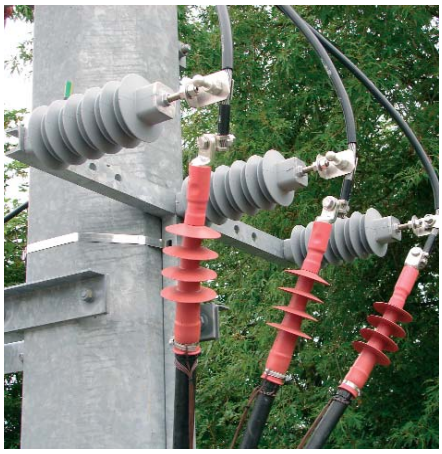
12kV < Ur <= 24kV



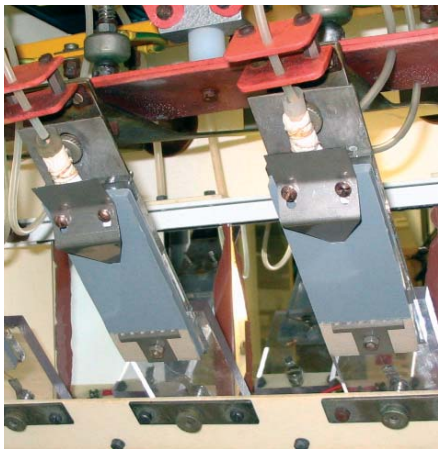
Ur > 24kV

For addition accessory options, please contact support team at: surgearresters@tycoelectronics.com

Other Bowthorpe EMP distribution surge arresters products



Typical application



Tracking and erosion test

Hydrophobic silicone

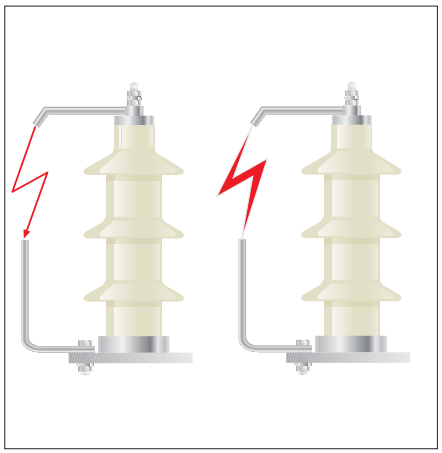
Class 2 OCP series arrester

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

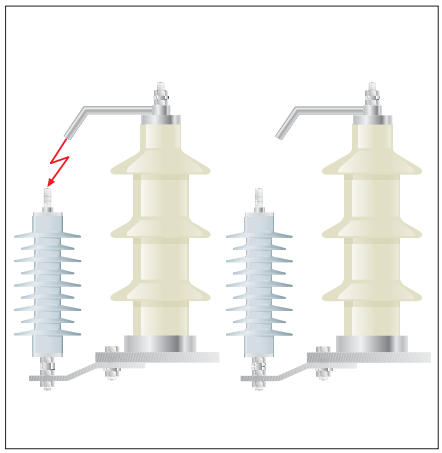
Generic technical data:

OCP2 series		3-29kV 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

CLX – Protection for covered conductor systems.

CLX is designed to use as a lightning protection in overhead lines with covered conductors, designed to prevent conductor breaking.

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

Overview of ZnO surge arresters offered by Tyco Electronics Energy Division

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 which includes the following procedures: 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 quality.

By means of lot numbers the Quality Assurance Program ensures traceability backwards all the way to the details of the compound batch test reports. Quality assurance at Tyco Electronics is not a static, but rather a constantly improving process directed towards our goals: complete customer satisfaction. The Tyco Electronics Energy Division arrester manufacturing sites are accredited to ISO 9001. Our vendor routine tests and internal incoming inspection confirm performance of all critical components used in the assembly of our arresters.

Other products and brochures available from Energy Division

Asset protection	Insulation enhancement systems for substations and overhead. Designed to prevent unplanned outages due to accidential bridging. Contact us at: assetprotection@tycoelectronics.com	
Low-voltage surge arresters	LV arresters are used to provide protection for LV overhead lines, consumer in-house supplies, distribution tranformers and other applicances. Contact us at: surgearresters@tycoelectronics.com	
Medium-voltage surge arresters	Metal oxide varister, distribution arresters for indoor and outdoor applications for protection of overhead lines, DC locomotives and switchgear applications. Contact us at: surgearresters@tycoelectronics.com	
High-voltage surge arresters	Porcelain and polymeric series parallel and single column contructed arresters for protection of transmission systems up to 550 kV. Contact us at: hvsurgearrester@tycoelectronics.com	
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. Contact us at: insulators@tycoelectronics.com	
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. Contact us at: insulators@tycoelectronics.com	

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.

MV Product Management, Tyco Electronics
100-104 Shannon Industrial Estate
Shannon, Co. Clare, Ireland

E:mail: surgearresters@tycoelectronics.com

http://energy.tycoelectronics.com

I&P Product Management, Tyco Electronics
8000 Purfoy Road
Fuquay Varina, NC 27526, US

1-800-327-6996

http://energy.tycoelectronics.com

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